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Insectivora (Mammalia) from the Miocene of Bełchatów, Poland. III. Dimylidae SCHLOSSER, 1887

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Abstract. Scarce remains of Dimylidae have been found in three different layers of Miocene sediments at Bełchatów in central Poland. Horizon C, dated to the Early Miocene (MN4), contained *Plesiodimylus* cf. *chantrei* and *Chainodus intercedens*. In horizon B (early Middle Miocene, MN5/6) *P. chantrei* and *C. intercedens* were also present. In horizon A (end of the Middle Miocene, MN9) *Plesiodimylus chantrei*, *Plesiodimylus* sp. and ?*Chainodus* sp. have been identified. These remains are described and illustrated and their systematic position discussed.

Key words: fossil mammals, Insectivora, Dimylidae, Miocene, Poland.

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I. INTRODUCTION

The present paper is the third part of a series of studies of the remains of Insectivora from the Miocene locality of Bełchatów in central Poland. The previous papers (RZEBIK-KOWALSKA 1993, 1994a) dealt with members of the families Metacodontidae and Soricidae. The present study is devoted to two genera of the family Dimylidae: *Plesiodimylus* GAILLARD, 1897 and *Chainodus* ZIEGLER, 1990.

A description of the locality from which the material for this study has been obtained, as well as a discussion of its age, are given in papers by BURCHART et al. (1988), STWORZEWICZ & SZYNKIEWICZ (1989), STUCHLIK et al. (1990) and KOWALSKI (1993a, b) as well as in the first paper of this series. Measurements were taken according to the pattern used for Dimylidae by MÜLLER (1967). The highest number of identical elements (e. g., right first lower molars, M_1) has been assumed to be the minimum number of individuals.

The specimens described are housed in the collection of the Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Cracow.

A c k n o w l e d g m e n t s. The study of the fossil fauna from Bełchatów was supported by grant no. 6 6219 92 03 from the Polish Scientific Committee. I am indebted to dr Adam SZYNKIEWICZ who discovered most of the levels with small mammals in Bełchatów and who provided data on the geological background, Miss Beata SŁOWIK who picked the small mammal remains from the samples and Mr Marek KAPTURKIEWICZ who made the illustrations.

II. SYSTEMATIC PALAEONTOLOGY

Family Dimylidae SCHLOSSER, 1887

Genus *Plesiodimylus* GAILLARD, 1897

Plesiodimylus cf. *chantrei* GAILLARD, 1899

Bełchatów C, MN4

M a t e r i a l. The number of specimens is given in Table I. The following upper and lower teeth or their fragments were found: 1 ?I^1 (sin.), 4 P^4 (dext.), 2 M^1 (dext.), 2 M^1 (sin.), 1 lingual fragment of M^1 (dext.), 2 lingual fragments of M^1 (sin.), 2 M^2 (dext.), 3 fragments of M^2 (dext.), 1 fragment of M^2 (sin.), 1 P_1 (sin.), 8 M_1 (dext.), 1 M_1 (sin.), 1 fragment of M_1 (dext.), 4 fragments of M_1 (sin.), 4 M_2 (dext.), 4 M_2 (sin.), 3 fragments of M_2 (dext.) and 2 fragments of M_2 (sin.).

T a b l e I

Plesiodimylus cf. *chantrei* GAILLARD, 1899 from Bełchatów C

Number of upper teeth or fragments thereof	Number of lower teeth or fragments thereof	Total	Minimum number of individuals
18	28	46	9

D e s c r i p t i o n o f m a t e r i a l. (Fig. 1). The crown of ?I^1 (Fig. 1A) is tetrahedral. Its walls are triangular in shape. The lingual and ventral (lower) facets are flat, the buccal one is convex and provided with a distinct cingulum. The apex is worn, the root is bent.

The P^4 (Fig. 1B) is bicuspulate. The main cusp is high and anteriorly rounded. A sharp posterior crest runs from the tip of the main cusp and merges into the posterior cingulum. The cingulum runs all round the tooth, except on the antero-lingual side of the smaller cusp. This cusp is more or less half the height of, and well separated from, the main cusp. It lies lingual to the main cusp, usually in the posterior half of its length. A clear shelf is present in the postero-lingual part of the tooth.

The M^1 (Fig. 1C) has the paracone connected to the metacone by a ridge. Its mesostyle is absent, but a small thickening is visible on the buccal side of the ridge in two of the four teeth. The parastyle takes the form of a small cusp. It is separated from the paracone and protocone by a depression. A straight longitudinal valley divides the tooth into buccal and lingual parts. The posterior arm of the protocone and the anterior arm of the hypocone run in the direction of the middle cusp, which is always present; its buccal arm ends against the base of the paracone/metacone ridge. The protocone and hypocone are separated by a valley. In consequence of this separation, the lingual side of the tooth is more or less emarginated, though bordered by a cingulum. The metastyle is formed by the posterior extension of the metacone. It is not very long. The buccal cingulum is narrow, the posterior one wide.

The M^2 is characterized by a high protocone, which is the largest cusp. In one specimen the antero-lingual corner of the tooth is round (Fig. 1E), in others it is angular (Fig 1D). A faint mesostyle is present but not split.

The P_1 (Fig. 1F) is long and has only one cusp. This cusp lies in front of the crown. Two ridges run forwards and backwards from the tip of this cusp. In some specimens there is also a third, weak ridge. It runs on the lingual side of the tooth from the tip to the lingual cingulum and divides the concave wall into smaller anterior and larger posterior parts. The buccal side of the tooth is slightly convex. A continuous cingulum borders the tooth crown, except on its anterior side.

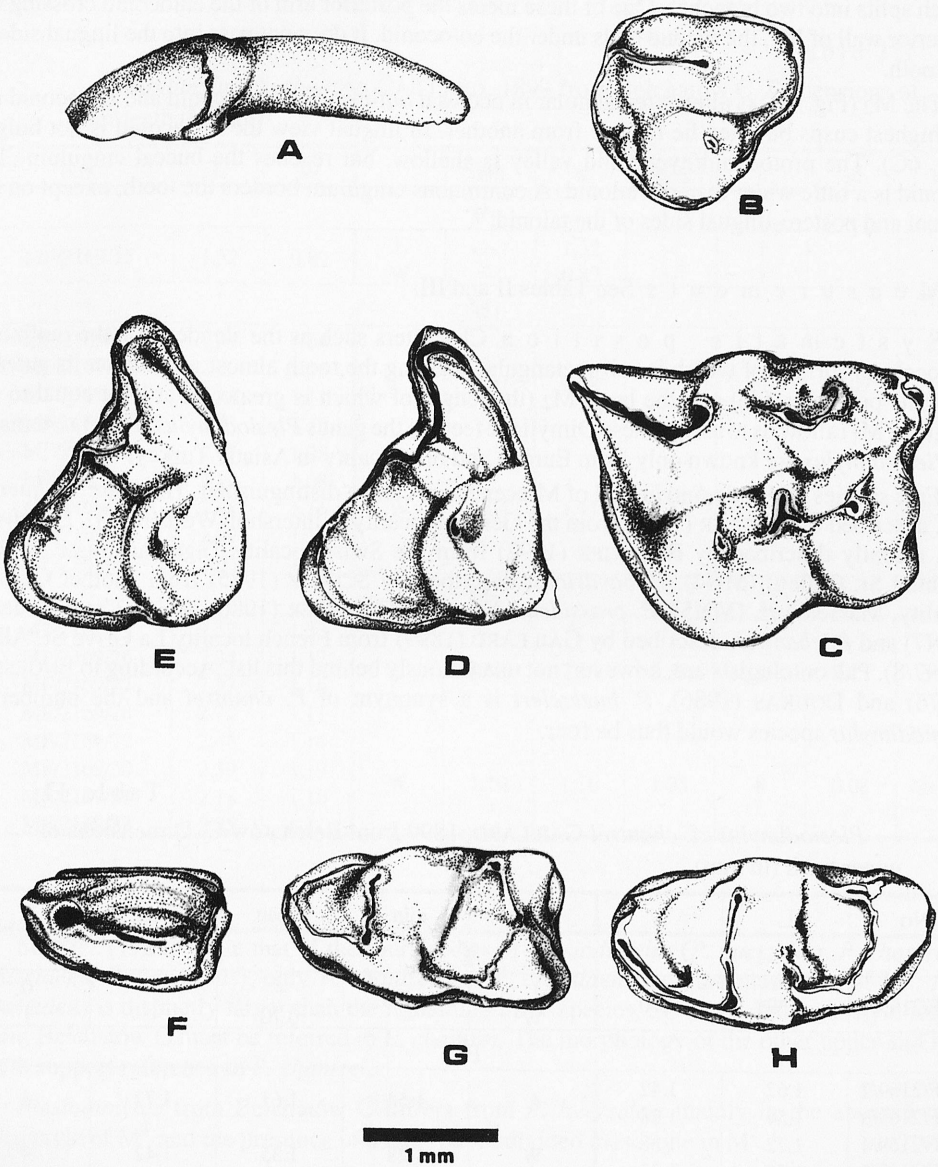

Fig. 1. *Plesiodimylus* cf. *chantrei* from Bełchatów C. A – $?I^1$ sin., spec. No. MF/2169/1; B – P^4 dext., MF/2169/2; C – M^1 dext., MF/2169/6; D – M^2 dext., MF/2169/11; E – M^2 dext., MF/2169/10; F – P_1 sin., MF/2169/15; G – M_1 sin., MF/2169/24; H – M_2 sin., MF/2169/30.

The M_1 (Fig. 1G) is sub-rectangular in occlusal outline. The protoconid and metaconid are higher than the hypoconid and entoconid and lie close together. In lingual view the posterior slope of the metaconid is smooth, without an angular bulge (Fig. 6C). The protoconid/hypoconid valley is very shallow and does not reach the buccal cingulum. The talonid is a little wider than the trigonid. The lingual cingulum is short. It closes the paraconid/metaconid valley and continues forwards, surrounding the paraconid. The buccal cingulum continues into a posterior cingulum,

which splits into two branches. One of these meets the posterior arm of the entoconid crossing the posterior wall of M_1, the second ends under the entoconid. It does not pass into the lingual side of the tooth.

The M_2 (Fig. 1H) is almost rectangular in occlusal outline. The protoconid and metaconid are the highest cusps but they lie far one from another. In lingual view the metaconid is not bulged (Fig. 6C). The protoconid/hypoconid valley is shallow, but reaches the buccal cingulum. The trigonid is a little wider than the talonid. A continuous cingulum borders the tooth, except on the lingual and postero-lingual sides of the talonid.

Measurements. See Tables II and III.

Systematic position. Characters such as the slender M_1 (the outline of the occlusal surface of which is sub-rectangular, making the tooth almost as wide on its anterior as on its posterior side) and the large M_2 (the length of which is greater or at least equal to the length of M_1) allow us to assign these Dimylidae teeth to the genus *Plesiodimylus*. Thus far, remains of *Plesiodimylus* are known only from Europe and one locality in Asiatic Turkey.

Five species of *Plesiodimylus*, all of Miocene age, can be distinguished. These are: *P. huerzeleri*, described by MÜLLER (1967) from the German locality Wintershof-West (MN3), *P. helveticus*, recently described by BOLLIGER (1992) from the Swiss locality Tägernaustrasse in Jona (Kanton St. Gallen) (MN4), *P. bavaricus*, described by SCHÖTZ (1985) from another German locality, Massendorf, (MN5), *P. crassidens*, found by ENGESSER (1980) at Sari Çay in Turkey (MN7) and *P. chantrei*, described by GAILLARD (1899) from French locality La Grive St. Alban (MN7/8). Paleontologists are, however, not unanimously behind this list. According to ENGESSER (1976) and DOUKAS (1986), *P. huerzeleri* is a synonym of *P. chantrei* and the number of *Plesiodimylus* species would thus be four.

Table II

Plesiodimylus cf. *chantrei* GAILLARD, 1899 from Bełchatów C. Dimensions of upper teeth (in mm)

No.	L	W		min.	mean	max.	n
			$?I^1$				
MF/2169/1	1.39*	0.70	L W	– –	– 0.70	– –	0 1
			P^4				
MF/2169/2 MF/2169/3	1.62 1.54	1.42 1.28	L	1.54	1.61	1.72	4
MF/2169/4 MF/2169/5	1.72 1.58	1.38 1.32	W	1.28	1.35	1.42	4
			M^1				
MF/2169/6 MF/2169/7	2.63 2.50	2.10 1.97	L	2.50	2.60	2.66	3
MF/2169/8 MF/2169/9	2.66 2.50*	2.02 2.07*	W	1.97	2.03	2.10	3
			M^2				
MF/2169/10 MF/2169/11	1.65 1.77	2.14 2.11	L	1.63	1.71	1.77	5
MF/2169/12 MF/2169/13 MF/2169/14	1.77 1.63 1.73	– – –	W	2.11	2.12	2.14	2

* – slightly damaged

Table III

Plesiodimylus cf. *chantrei* GAILLARD, 1899 from Bełchatów C. Dimensions of lower teeth (in mm)

No.	L	W		min.	x	max.	n	sd	cv
				P_1					
MF/2169/15	1.52	0.87	L	–	1.52	–	1	–	–
			W	–	0.87	–	1	–	–
				M_1					
MF/2169/16	1.99	1.04							
MF/2169/17	2.09	1.13							
MF/2169/18	2.14	1.11	L	1.97	2.08	2.18	9	0.07	3.36
MF/2169/19	2.13	1.18							
MF/2169/20	1.97	1.08							
MF/2169/21	2.14	1.08							
MF/2169/22	2.18	1.16	W	1.04	1.11	1.18	9	0.04	3.60
MF/2169/23	2.09	1.10							
MF/2169/24	2.03	1.12							
				M_2					
MF/2169/25	2.59	1.33							
MF/2169/26	2.34	1.12							
MF/2169/27	2.37	1.16	L	2.18	2.35	2.59	8	0.13	5.53
MF/2169/28	2.22	1.11							
MF/2169/29	2.44	1.14							
MF/2169/30	2.39	1.19							
MF/2169/31	2.18	1.10	W	1.10	1.16	1.33	8	0.08	6.90
MF/2169/32	2.25	1.11							

SCHÖTZ (1985) wrote that of the four species of *Plesiodimylus* (*P. huerzeleri*, *P. chantrei*, *P. crassidens*, *P. bavaricus*), only *P. chantrei* and *P. crassidens* lack the mesostyle of M^1. As *P. crassidens* is distinctly larger than the remaining three species, the small and mesostyle-less M^1 from Bełchatów C must be referred to *P. chantrei*. The morphology of the other upper and lower teeth support reference to *P. chantrei*.

Plesiodimylus from Bełchatów C differs from *P. huerzeleri* mainly in the absence of the mesostyle of M^1 and the presence of a faint but undivided mesostyle in M^2.

These teeth differ from *P. bavaricus* in the same features as from *P. huerzeleri* and in addition in the morphology of the metaconids of M_1 and M_2, which in lingual view are slender and devoid of any angular swelling of the posterior slopes (Fig. 6C). *Plesiodimylus* from Bełchatów C differs from *P. helveticus* mainly in the smaller and narrower teeth and in the lack of a mesostyle on M^1. The Bełchatów C specimens differ from *P. crassidens* mainly in their much smaller size.

Size comparison between particular *Plesiodimylus* teeth from Bełchatów C and analogous teeth of *P. chantrei* from other European localities indicates that the former are much smaller (see Figs. 2,3). In some measurements the biggest teeth from Bełchatów C overlap the smallest teeth from La Grive (M_1) and Anwil (M_2), but in others they lie below the range of variation of *P. chantrei*. They seem to be the smallest *Plesiodimylus* teeth known.

The small size, as well as some small morphological differences such as the presence of a well-developed parastyle and wider metastyle in M^1 and a more voluminous protocone in M^2, do

not allow us to be sure that we have to do with typical *P. chantrei*. This uncertainty is supported by the general opinion (see ENGESSER 1972) that *P. chantrei*, which lived throughout Europe during almost the entire Miocene, did not increase in size with time as many other insectivores have done. On the other hand, there is general agreement that *P. chantrei* shows great morphological variability. As the *Plesiodimylus* specimens from Bełchatów C show the greatest morphological similarity to *P. chantrei*, they have been refered to this form (as *P.* cf. *chantrei*) in spite of their small dimensions.

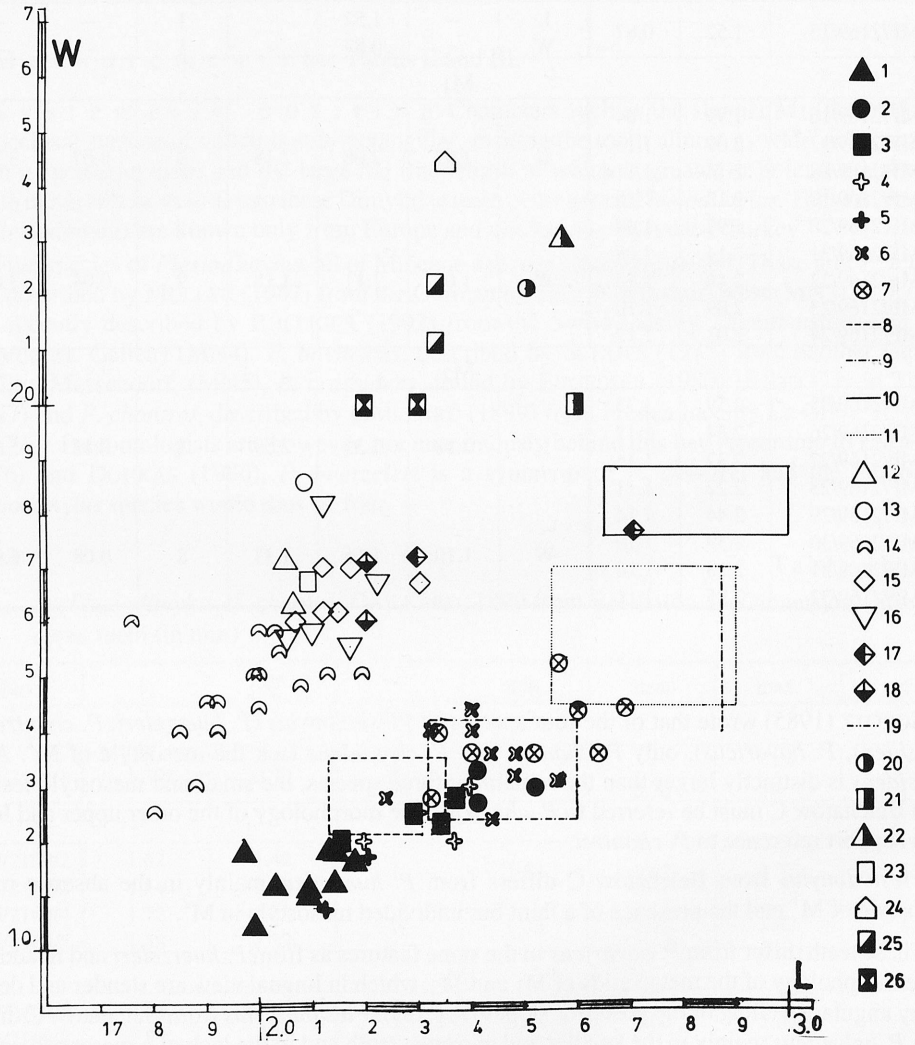

Fig. 2. Scatter diagram showing the length (L) and width (W) (in mm) of M_1 in *Plesiodimylus* cf. *chantrei* from Bełchatów C (1), *Plesiodimylus chantrei* from Bełchatów B (2), Bełchatów A (3), La Grive St. Alban (4), Viehhausen (5) (MÜLLER 1967), Sansan (6) and Anwil (7) (BOLLIGER 1992), *P. huerzeleri* from Wintershof-West (8) (MÜLLER, 1967), *P. bavaricus* from Massendorf (9) (SCHÖTZ 1985), *P. crassidens* from Sari Çay (10) (ENGESSER 1980), *P. helveticus* from Tagernaustrasse in Jona (11) (BOLLIGER 1992), *Chainodus intercedens* from Bełchatów C (12), Bełchatów B (13), Wintershof-West (14), Bissingen (15) and Erkertshofen (16) (MÜLLER 1967), *C. sulcatus* from Nordbassin (17) and Budenheim (18) (STEPHAN-HARTL 1972), *C. ulmensis* from Ulm-Westangente (19), *C. eggingensis* from Eggingen (20), Haslach (21) and Eggingen/Haslach (22) (ZIEGLER 1990), ?*Chainodus* sp. from Bełchatów A (23), *Metacordylodon schlosseri* from Opole (24) (FAHLBUSCH 1989), La Grive St. Alban (25) and Anwil (26) (MÜLLER 1967).

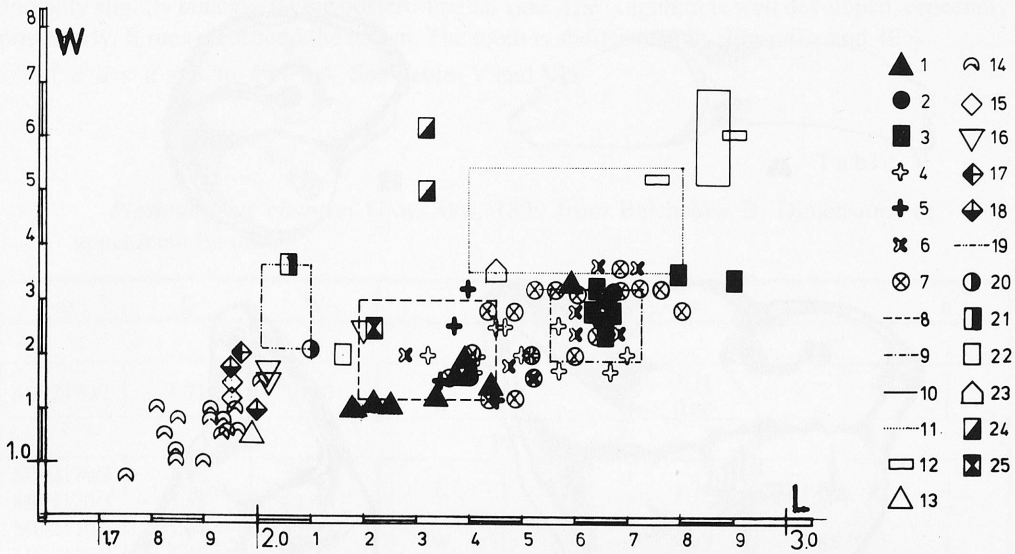

Fig. 3. Scatter diagram showing the length (L) and width (W) (in mm) of M_2 in *Plesiodimylus* cf. *chantrei* from Bełchatów C (1), *Plesiodimylus chantrei* from Bełchatów B (2), Bełchatów A (3), La Grive St. Alban (4), Viehhausen (5) (MÜLLER 1967), Sansan (6) and Anwil (7) (BOLLIGER 1992), *P. huerzeleri* from Wintershof-West (8) (MÜLLER 1967), *P. bavaricus* from Massendorf (9) (SCHÖTZ 1985), *P. crassidens* from Sari Çay (10) (ENGESSER 1980), *P. helveticus* from Tagernaustrasse in Jona (11) (BOLLIGER 1992), *Plesiodimylus* sp. from Bełchatów A (12), *Chainodus intercedens* from Bełchatów C (13), Wintershof-West (14), Bissingen (15) and Erkertshofen (16) (MÜLLER 1967), *C. sulcatus* from Nordbassin (17) and Budenheim (18) (STEPHAN- HARTL 1972), *C. ulmensis* from Ulm-Westangente (19) (ZIEGLER 1990), *C. eggingensis* from Eggingen (20) and Haslach (21) (ZIEGLER 1990), ?*Chainodus* sp. from Bełchatów A (22), *Metacordylodon schlosseri* from Opole (23) (FAHLBUSCH 1989), La Grive St. Alban (24) and Anwil (25) (MÜLLER 1967).

Plesiodimylus chantrei GAILLARD, 1899

Bełchatów B, MN5/6

M a t e r i a l. The number of specimens is given in Table IV. The material includes the following upper and lower teeth or fragments thereof: 1 ?I^1 (dext.), 5 P^4 (sin.), 1 fragment of P^4 (dext.), 2 M^1 (sin.), 1 M^1 (dext.), 3 fragments of M^1 (sin.), 1 fragment of M^1 (dext.), 1 M^2 (sin.), 1 fragment of M^2 (dext.), 1 fragment of M^2 (sin.), 1 P_1 (dext.), 3 P_1 (sin.), 1 fragment of P_1 (sin.), 1 P_4 (dext.), 2 M_1 (dext.), 1 M_1 (sin.), 1 fragment of M_1 (sin.), 2 M_2 (dext.), 1 M_2 (sin.), 3 fragments of M_2 (dext.) and 2 fragments of M_2 (sin.). (No. MF/2170).

D e s c r i p t i o n o f m a t e r i a l. (Fig. 4). Only teeth not represented at Bełchatów C are described. The P_4 (Fig. 4F) bears one cusp, from which a sharp ridge runs backwards. The anterior side of the tooth is rounded. The walls of the crown are generally convex

Table IV

Plesiodimylus chantrei GAILLARD, 1899 from Bełchatów B

Number of upper teeth or fragments thereof	Number of lower teeth or fragments thereof	Total	Minimum number of individuals
17	18	35	5

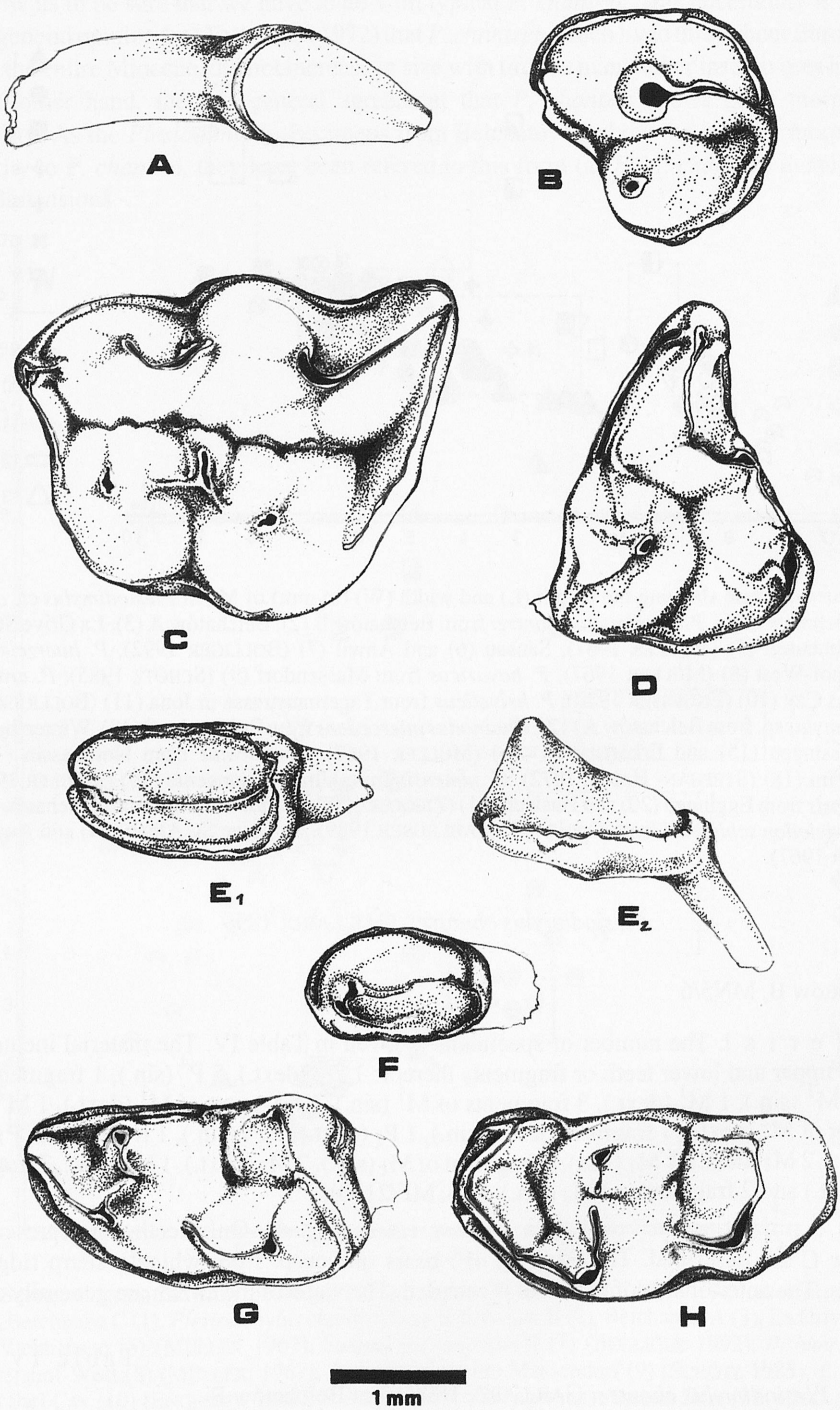

Fig. 4. *Plesiodimylus chantrei* from Bełchatów B. A – ?I^1 dext., MF/2170/1; B – P^4 sin., 2170/2; C – M^1 sin., MF/2170/6; D – M^2 sin., MF/2170/9; E_1 – P_1 sin., MF/2170/12; E_2 – same specimen (buccal view); F – P_4 dext., MF/2170/16; G – M_1 sin., MF/2170/17; H – M_2 sin., MF/2170/20.

and only slightly concave on the postero-lingual side. The cingulum is well developed, especially posteriorly. It runs all around the crown. The tooth is shorter than P_1 (Figs. $4E_1$ and $4E_2$).

M e a s u r e m e n t s. See Tables V and VI.

Table V

Plesiodimylus chantrei GAILLARD, 1899 from Bełchatów B. Dimensions of upper teeth (in mm)

No.	L	W		min.	x	max.	n
			$?I^1$				
MF/2170/1	1.71	0.80	L	–	1.71	–	1
			W	–	0.80	–	1
			P^4				
MF/2170/2	1.88	1.65	L	1.55	1.74	1.88	4
MF/2170/3	1.55	1.43					
MF/2170/4	1.64	1.39	W	1.39	1.47	1.65	4
MF/2170/5	1.88	1.43					
			M^1				
MF/2170/6	3.11	2.33	L	3.11	3.22	3.34	2
MF/2170/7	3.34	2.48					
MF/2170/8	2.70*	2.17*	W	2.33	2.40	2.48	2
			M^2				
MF/2170/9	1.85	2.52	L	1.73	1.82	1.87	3
MF/2170/10	1.73	–					
MF/2170/11	1.87	–	W	–	2.52	–	1
* – slightly damaged							

Table VI

Plesiodimylus chantrei GAILLARD, 1899 from Bełchatów B. Dimensions of lower teeth (in mm)

No.	L	W		min.	x	max.	n
			P_1				
MF/2170/12	1.73	0.96	L	1.59	1.66	1.73	4
MF/2170/13	1.71	0.94					
MF/2170/14	1.62	0.89	W	0.89	0.93	0.96	3
MF/2170/15	1.59	–					
			P_4				
MF/2170/16	1.34	0.75	L	–	1.34	–	1
			W	–	0.75	–	1
			M_1				
MF/2170/17	2.41	1.33	L	2.41	2.45	2.52	3
MF/2170/18	2.52	1.30					
MF/2170/19	2.41	1.27	W	1.27	1.30	1.33	3
			M_2				
MF/2170/20	2.66	1.30	L	2.40	2.59	2.67	4
MF/2170/21	2.64	1.26					
MF/2170/22	2.40	1.16	W	1.16	1.26	1.32	4
MF/2170/23	2.67	1.32					

S y s t e m a t i c p o s i t i o n. In size and morphology, the Bełchatów B specimens lie within the range of variation of *P. chantrei*.

Bełchatów A, MN9

M a t e r i a l. The number of specimens is given in Table VII. The material includes the following upper and lower teeth or fragments thereof: 1 ?I^1 (dext.), 1 ?P^1 (dext.), 2 ?P^3 (dext.), 1 P^4 (dext.), 1 P^4 (sin.), 3 lingual fragments of M^1 (dext.), 3 lingual fragments of M^1 (sin.), 1 lingual fragment of M^2 (dext.), 3 P_1 (dext.), 2 M_1 (dext.), 2 M_1 (sin.), 3 M_2 (dext.), 3 M_2 (sin.), 3 fragments of M_2 (dext.) and 6 fragments of M_2 (sin.). (No. MF/2171).

Table VII

Plesiodimylus chantrei GAILLARD, 1899 from Bełchatów A

Number of upper teeth or fragments thereof	Number of lower teeth or fragments thereof	Total	Minimum number of individuals
13	22	35	6

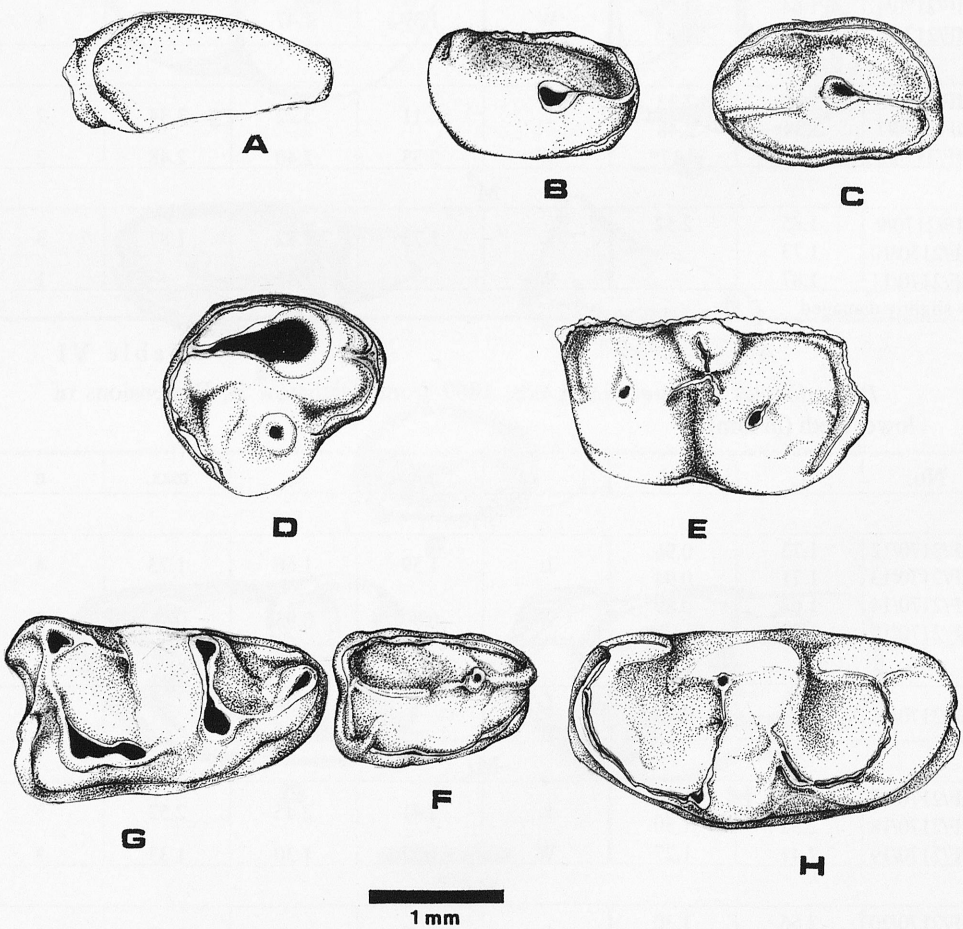

Fig. 5. *Plesiodimylus chantrei* from Belchatów A. A – ?I^1 dext., MF/2171/1; B – ?P^1 dext., MF/2171/2; C – ?P^3 dext., MF/2171/3; D – P^4 dext., MF/2171/5; E – lingual fragment of M^1 sin., MF/2171/11; F – P_1 dext., MF/2171/ 8; G – M_1 dext., MF/2171/11; H – M_2 sin., MF/2171/14.

Description of material. (Fig. 5). Only teeth not found at Bełchatów C and B are described. The single-cusped ?P^1 (Fig. 5B) is high. The tip of the cusp is situated more or less in the anterior 1/3 of the crown. A distinct ridge runs from the tip backwards and the anterior side is rounded. The walls of the crown are slightly convex, although two shallow depressions (in the antero-lingual and postero-lingual parts of the tooth) are present. A strong cingulum surrounds the postero-buccal, posterior and lingual sides of this tooth.

The third upper antemolar ?P^3 (Fig. 5C) is larger than ?P^1, and single-cusped. Its tip lies more or less in the middle of the tooth. It is connected to the posterior margin of the crown by a sharp ridge. A second, less distinct, ridge runs from the tip to the lingual cingulum. It divides the concave lingual wall of the tooth into two parts: a shallow anterior and deeper posterior one. A third anterior ridge does not reach the tip. The buccal side of the crown is convex. A strong cingulum runs around the tooth.

Measurements. See Tables VIII and IX.

Table VIII

Plesiodimylus chantrei GAILLARD, 1899 from Bełchatów A. Dimensions of upper teeth (in mm)

No.	L	W		min.	x	max.	n?
			?I^1				
MF/2171/1	1.69*	0.78	L	–	–	–	0
			W	–	0.78	–	1
			?P^1				
MF/2171/2	1.51	0.87	L	–	1.51	–	1
			W	–	0.87	–	1
			?P^3				
MF/2171/3	1.68	1.01	L	1.68	1.74	1.81	2
MF/2171/4	1.81	1.07	W	1.01	1.04	1.07	2
			P^4				
MF/2171/5	1.64	1.37	L	–	1.64	–	1
MF/2171/6	–	1.65	W	–	1.37	–	1

* – slightly damaged

Systematic position. In size and morphology the *Plesiodimylus* teeth from Bełchatów A lie within the range of variation of *P. chantrei*.

Differences between *P.* cf. *chantrei* and *P. chantrei* from Bełchatów C, B and A

The only notable difference between specimens of *P. chantrei* from these three localities is size. The specimens from Bełchatów C are the smallest. This increase in tooth size from the oldest to the youngest (in spite of previous opinion that it did not take place) is particularly clear in M_2 (see Table X). The lack of complete upper molars in Bełchatów A and the small number of lower molars in Bełchatów B and A makes detailed morphological comparison difficult.

The presence of *P. chantrei* at Bełchatów C, B and A extends its range towards the northeast. It is the first record of this genus and species in Poland.

Table IX

Plesiodimylus chantrei GAILLARD, 1899 from Bełchatów A. Dimensions of lower teeth (in mm)

No.	L	W		min.	mean	max.	n	sd	cv
				P_1					
MF/2171/7	1.43	0.83	L	1.43	1.46	1.51	3	–	–
MF/2171/8	1.43	0.87							
MF/2171/9	1.51	0.83	W	0.83	0.84	0.87	3	–	–
				M_1					
MF/2171/10	2.15	1.20	L	2.15	2.29	2.37	4	–	–
MF/2171/11	2.34	1.23							
MF/2171/12	2.37	1.28	W	1.20	1.24	1.28	4	–	–
MF/2171/13	2.29*	1.25							
				M_2					
MF/2171/14	2.90	1.33							
MF/2171/15	2.63	1.28	L	2.63	2.71	2.90	6	0.11	4.06
MF/2171/16	2.67	1.28							
MF/2171/17	2.65	1.24							
MF/2171/18	2.79	1.35	W	1.24	1.30	1.35	6	0.04	3.08
MF/2171/19	2.64	1.32							

* – slightly damaged

Table X

Comparison of molar measurements of *Plesiodimylus chantrei* GAILLARD between Bełchatów C, B, and A

	Bełchatów C				Bełchatów B				Bełchatów A			
	min.	x	max.	n	min.	x	max.	n	min.	x	max.	n
					M^1							
L	2.50	2.60	2.66	3	3.11	3.22	3.34	2	–	–	–	0
W	1.97	2.03	2.10	3	2.33	2.40	2.48	2	–	–	–	0
					M^2							
L	1.63	1.71	1.77	5	1.73	1.82	1.87	3	–	–	–	0
W	2.11	2.12	2.14	2	–	2.52	–	1	–	–	–	0
					M_1							
L	1.97	2.08	2.18	9	2.41	2.45	2.52	3	2.15	2.29	2.37	4
W	1.04	1.11	1.18	9	1.27	1.30	1.33	3	1.20	1.24	1.28	4
					M_2							
L	2.18	2.35	2.59	8	2.40	2.59	2.67	4	2.63	2.71	2.90	6
W	1.10	1.16	1.33	8	1.16	1.26	1.32	4	1.24	1.30	1.35	6

Remains of *P. chantrei* dated from MN 4 (ZIEGLER & FAHLBUSCH 1986) to MN 11 (STORCH 1978) are known from many Spanish (HÜRZELER 1944, ENGESSER 1980, AGUSTÍ & GIBERT 1982, AGUSTÍ et al. 1985), French (BAUDELOT 1972, CROCHET & GREEN 1982) and German (ZIEGLER & FAHLBUSCH 1986, HEISSIG 1989) localities, as well as from Switzerland (ENGESSER 1972, ENGESSER et al. 1981, KÄLIN 1993), Austria (THENIUS 1951, BACHMAYER & WILSON 1984), Slovakia (ZAPFE 1951), the Czech Republic (FEJFAR & KVAČEK 1993), Hungary (KORDOS 1991) and Greece (DOUKAS 1986). In view of the fact that in some of them [Vieux-Collonges (MEIN 1958), Vermes 1 (ENGESSER et al. 1981), Dorn-Dürkheim (STORCH 1978) etc.] upper teeth are unknown, some identifications, according to SCHÖTZ (1985), should be treated with caution.

Plesiodimylus sp.

Bełchatów A, MN9

Material and measurements (in mm).

M_2 sin., No. MF/2177/1: L 2.75; W 1.53.

M_2 sin., No. MF/2177/2: L 2.90; W 1.63.

Description of material. (Fig. 6A). In comparison with *P. chantrei* from Bełchatów A (Fig. 6B) these two teeth are relatively large and massive. Their anterior part is very wide, the trigonids are wider than the talonids, and the trigonid and talonid valleys are very shallow. In lingual view, the posterior slope of the metaconid has a bulge (Fig. 6C). The wide and protruding cingulum closes trigonid valleys on the lingual side and continues on the anterior, buccal and partly the posterior sides of teeth.

Systematic position. The large size, which is outside the range of variation of *P. huerzeleri*, *P. chantrei* and *P. bavaricus*, indicates that we have to do either with the largest European species, *P. helveticus*, or the largest of all *Plesiodimylus* species, *P. crassidens*. The smaller of the two Bełchatów A teeth lies within the range of variation of *P. helveticus*, but the other is much bigger, longer than the longest M_2 of *P. crassidens*. In addition, the lenght/width ratio of these two teeth (1.78, 1.80) is more like that of *P. crassidens* (1.71-1.87, n=3) [calculated from ENGESSER's (1980) scatter diagram] and *P. helveticus* (1.68-1.96, n=18) [calculated from BOLLIGER (1992)] than that of *P. chantrei* (2.00-2.18, n=6).

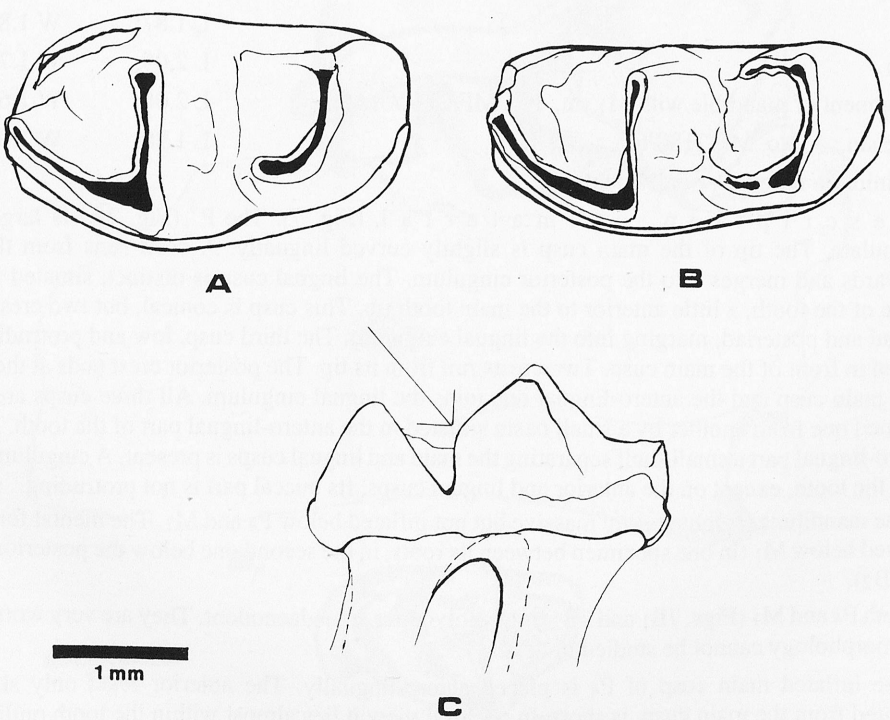

Fig. 6. A – Schematic of sin. M_2 of *Plesiodimylus* sp. from Bełchatów A, MF/2172/2; B – schematic of sin. M_2 of *Plesiodimylus chantrei* from Bełchatów A, MF/2171/18; C – schematic of sin. M_2 in lingual view – arrow indicates angular swelling on the posterior slope of the metaconid.

The morphology of these two massive teeth (wide trigonids, reduced talonids, very shallow trigonid and talonid valleys) also resembles the morphology of *P. crassidens* and *P. helveticus*. However, it is difficult to say to which of them the *Plesiodimylus* teeth from Bełchatów A may belong, because neither a description of the M_2 of *P. helveticus* nor a differential diagnosis of the M_2 *P. helveticus* and *P. crassidens* are given by BOLLIGER (1992). It seems that the teeth from Bełchatów A differ from *P. crassidens* in their less reduced talonids and stronger cingula and from *P. helveticus* also in the occlusal outline (they are wider anteriorly). Although *P. helveticus* was found in Switzerland, relatively near Bełchatów, the age difference between the two localities (MN4 and MN9) is great. On the other hand, identification of the specimens from Bełchatów A with *P. crassidens* from Turkey (MN7/8) is also difficult to accept because of the great distance separating these localities. This gap may, however, be the result of limited palaeontological knowledge of Miocene insectivores in the region separating Bełchatów and Sari Çay.

Genus *Chainodus* ZIEGLER, 1990

Chainodus intercedens (MÜLLER, 1967)

Bełchatów C, MN4

Material and measurements (in mm).

P^4 dext., No. MF/2180/1:	L 2.25;	W 1.74.
P^4 sin., No. MF/2180/2:	L 2.11;	W 1.75.
P^4 sin., No. MF/2180/3 (damaged):	L 2.24.	
fragment of mandible with P_4 and M_1 dext., No. MF/2180/4:		
P_4	L 1.87;	W 1.83
M_1	L 2.05;	W 1.71
fragment of mandible with M_1 sin., No. MF/2180/5: M_1	L 2.06;	W 1.62
M_2 sin., No. MF/2180/6:	L 1.98;	W 1.05

Minimum number of individuals = 2.

Description of material. (Fig. 7). The P^4 (Fig. 7A) is large and tricuspulate. The tip of the main cusp is slightly curved lingually. A crest runs from the tip backwards and merges into the posterior cingulum. The lingual cusp is distinct, situated in the middle of the tooth, a little anterior to the main tooth tip. This cusp is conical, but two crests run anteriad and posteriad, merging into the lingual cingulum. The third cusp, low and protruding, is situated in front of the main cusp. Two crests run from its tip. The posterior crest ends at the base of the main cusp and the antero-lingual one joins the lingual cingulum. All three cusps are well separated one from another by a small basin situated in the antero-lingual part of the tooth. In the postero-lingual part a small shelf separating the main and lingual cusps is present. A cingulum runs round the tooth, except on the anterior and lingual cusps. Its buccal part is not protruding.

The mandibular fragments are massive but not inflated below P_4 and M_1. The mental foramen is placed below M_1 (in one specimen between its roots, in the second one below the posterior root; Fig. $7B_2$).

Both P_4 and M_1 (Figs. $7B_1$ and $7B_2$) are amblyodont, exoedaenodont. They are very worn, and their morphology cannot be studied in detail.

The inflated main cusp of P_4 is placed antero-lingually. The anterior lobe, only slightly separated from the main cusp, is short. In occlusal view it lies almost within the tooth outline. A distinct cusp occupied the postero-lingual corner of the tooth. The lingual margin of the tooth is straight and not very short. A cingulum is present in the lingual, posterior and postero-buccal sides of the tooth.

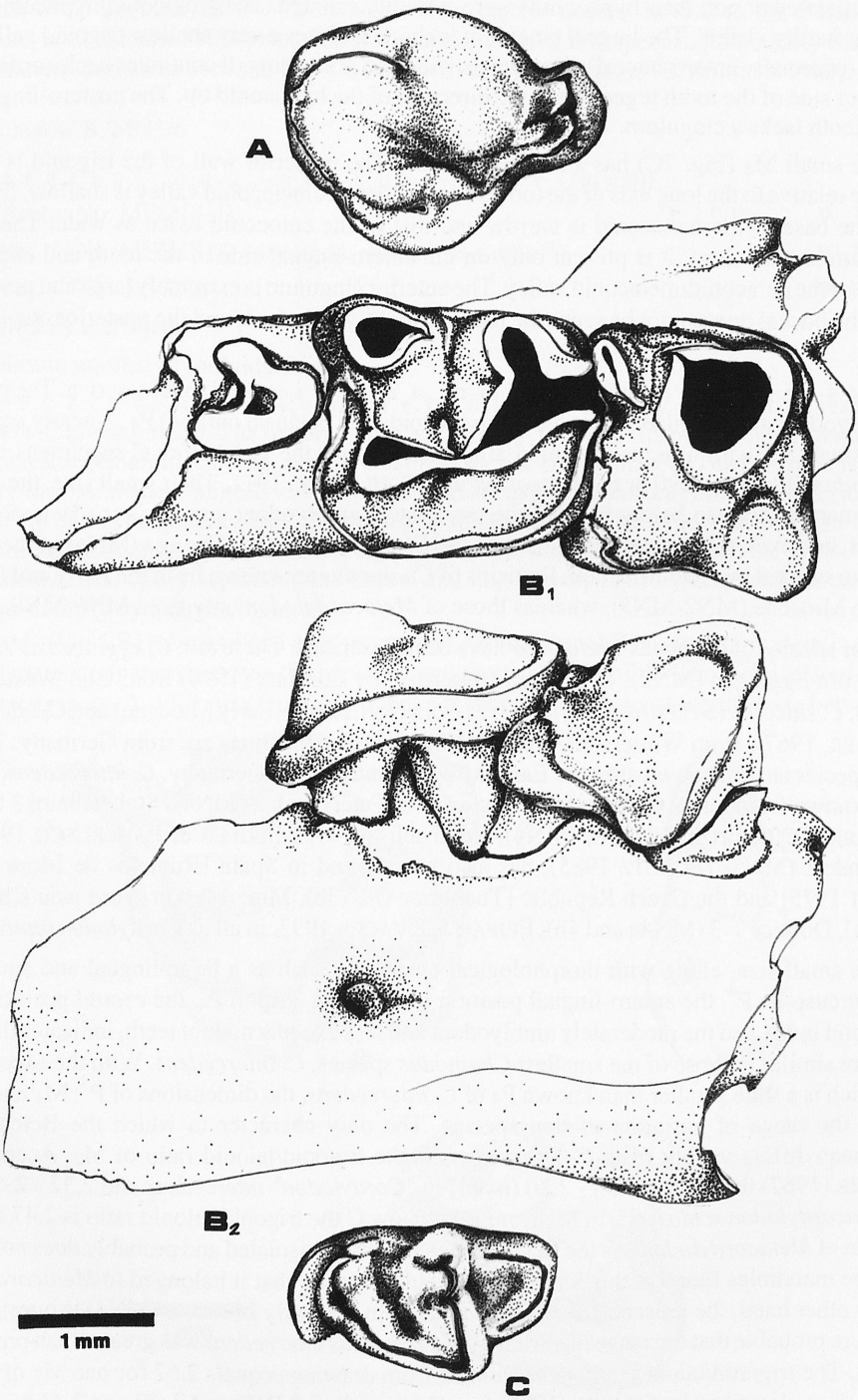

Fig. 7. *Chainodus intercedens* from Bełchatów C. A – P^4 dext., MF/2180/1; B_1 – fragment of mandible with P_4 – M_1 dext. (occlusal view), MF/2180/4; B_2 – the same specimen (buccal view); C – M_2 sin., MF/2180/6.

The anterior margin of M_1 is rounded. The paraconid lies near the middle of this margin. As mentioned above, all teeth are worn and it is difficult to say if their paraconids and metaconids were separated or not; their hypoconids were certainly isolated. The protoconid/hypoconid valley of M_1 is hardly visible. The lingual cingulum is short. It closes a very shallow trigonid valley. The buccal (especially antero-buccal) cingulum is wide and protruding. It continues backwards. On the posterior side of the tooth it goes up in the direction of the hypoconid tip. The postero-lingual side of the tooth lacks a cingulum.

The small M_2 (Fig. 7C) has a reduced talonid. The posterior wall of the trigonid is slightly oblique relative to the long axis of the tooth. The protoconid/metaconid valley is shallow. In lingual view the base of the metaconid is narrow and that of the entoconid twice as wide. The lingual cingulum is very short, it is present only on the antero-lingual side of the tooth and ends in the middle of the paraconid/metaconid valley. The anterior cingulum is extremely large and protruding, while the buccal one cannot be seen (the tooth is slightly damaged) and the posterior one is hardly visible.

Systematic position and distribution. The presence of amblyodont and exoedaenodont teeth, a trapezoidal (in occlusal outline) P_4, a nearly square M_1 and a small M_2 with a reduced talonid allows us to refer the Bełchatów C specimens either to *Chainodus* ZIEGLER, 1990 or to *Metacordylodon* SCHLOSSER, 1911. Their small size, the position of the mental foramen below M1 and the moderately amblyodont and less exoedaenodont teeth suggest, however, that they belong to one of the *Chainodus* species. The age (MN4) of the locality seems to support this identification. Remains of *Chainodus* are known from the Early and the early Middle Miocene (MN2-MN5), whereas those of *Metacordylodon* only from MN6-MN9.

Four species of the genus *Chainodus* have been described. These are: *C. eggingensis* ZIEGLER, 1990 from Eggingen (MN2), *C. ulmensis* described by ZIEGLER (1990) from Ulm-Westtangente (MN2), *C. sulcatus* (STEPHAN-HARTL, 1972) from Nordbassin (Early Miocene) and *C. intercedens* (MÜLLER, 1967), from Wintershof-West (MN3). All these localities are from Germany. The first three species are not known after the Early Miocene and outside Germany. *C. intercedens*, besides being known from many German localities, such as Petersbuch 2 (MN4), Stubersheim 3 (MN3b) (ZIEGLER 1990), Erkertshofen 2 (MN4), Rembach (MN4) (ZIEGLER & FAHLBUSCH 1986) and Massendorf (MN5) (SCHÖTZ 1985), has also been found in Spain [Rubielos de Mora (MN4), GIBERT 1975] and the Czech Republic [Tuchořice (MN3b), Mine Merkur-Nord near Chomutov (MN3a), Dolnice 1-3 (MN4a and 4b), FEJFAR & KVAČEK 1993, in all as *Cordylodon intercedens*].

The small size, along with morphological characters such as a large lingual and small third anterior cusp on P^4, the antero-lingual position of the main cusp in P_4, the central position of the paraconid in M_1 and the moderately amblyodont and less exoedaenodont teeth, indicates that these teeth are similar to those of the smallest *Chainodus* species, *C. intercedens*. With the exception of P_4, which is a little smaller than known P_4 of *C. intercedens*, the dimensions of P^4, M_1 and M_2 lie within the range of variation of that species. The only character in which the Bełchatów C specimens differs visibly from *C. intercedens* is the trigonid/talonid ratio of M_2. According to MÜLLER (1967) this equals 1.08 - 2.10 (n=23) in "*Cordylodon*" *intercedens* and 2.32 - 2.46 (n=3) in *Metacordylodon schlosseri*. In M_2 from Bełchatów C the trigonid/talonid ratio is 2.47 and thus like that of *Metacordylodon*. As the M_2 from Bełchatów C is isolated and probably does not belong with the mandibles found at this locality, one could suppose that it belonged to *Metacordylodon*. On the other hand, the presence of *Metacordylodon* in the Early Miocene (MN4) is questionable. It is more probable that the range of variation in *Chainodus intercedens* was greater than previously known. The trigonid/talonid ratio as calculated from drawings equals 2.67 for one M_2 of "*C*". cf. *intercedens* described by SCHÖTZ (1985) from Massendorf (MN5) and 2. 22 and 2.44 for two M_2 of "*C*". *intercedens* described from Rembach (MN4) by ZIEGLER & FAHLBUSCH (1986). In view of this, the M_2 from Bełchatów C has been tentatively included in *C. intercedens*.

The specimens from Bełchatów C differ from *C. eggingensis* and *C. ulmensis* in their very small dimensions (see scatter-diagrams, Figs. 2 and 3). In addition, their tooth morphology is different from that of *C. eggingensis* and *C. ulmensis*. The species nearest in size to the Bełchatów C specimens is *C. sulcatus*. However, characters of the teeth of this species, particularly the P_4 and M_1, eliminate confusion between the two forms (STEPHAN-HARTL 1972, ZIEGLER 1990).

Bełchatów B, MN5/6

Material and measurements (in mm).

M^1 dext.	No. MF/2181/1:	L 2.90*,	W 2.28.
M^2 sin.	No. MF/2181/2 (damaged, anterior part only):		W 2.16.
M_1 sin.	No. MF/2181/3:	L 2.09,	W 1.86.

* - slightly damaged

Minimum number of individuals = 1

Description of material. (Fig. 8). Only teeth not represented at Bełchatów C are described. The quadrangular M^1 (Fig. 8A) is large. Its buccal side is the longest, the lingual side (emarginated) the shortest and the posterior side S-shaped. The parastyle is absent. The very low paracone is slightly divided. The largest cusp is a coniform metacone. A ridge runs from the tip of this cusp backwards, continuing as the metastyle. The hypocone is bigger than the protocone and bicuspulate. A small shelf is present on the lingual side between the protocone and the hypocone. The valley separating the buccal and lingual cusps is very large and cuspless. It is closed posteriorly by a large cingulum.

The M^2 (Fig. 8B) is broken and only its anterior part is present. The anterior margin is convex, but a slight emargination between the paracone and protocone is visible. The well isolated conical protocone is large. A ridge runs from its tip in the buccal direction, reaching the base between the

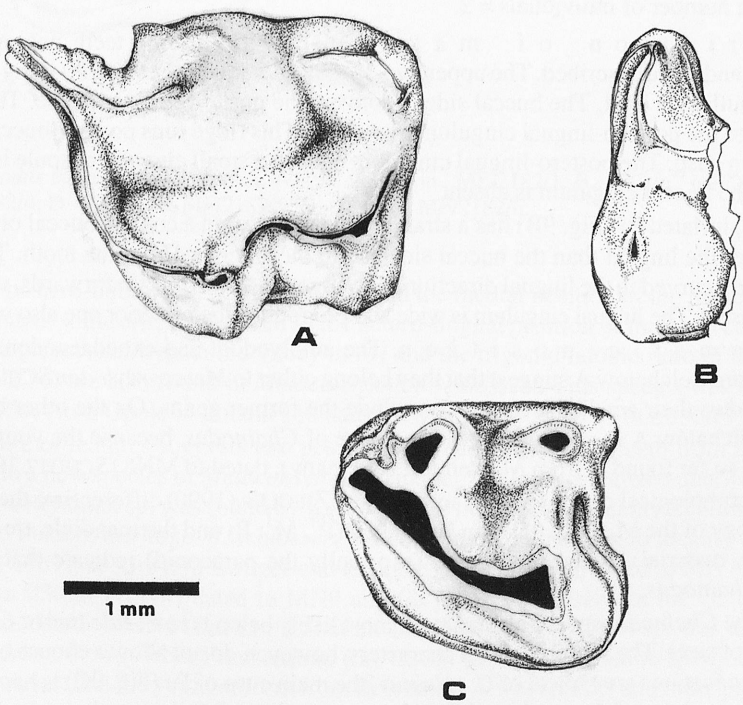

Fig. 8. *Chainodus intercedens* from Bełchatów B. A – M^1 dext., MF/2181/1; B – fragment of M^2 sin., MF/2181/2; C – M_1 sin., MF/2181/3.

protocone and paracone. The paracone is smaller but distinct. The antero-buccal cingulum is large, the postero-buccal one narrow.

S y s t e m a t i c p o s i t i o n. The morphology of the teeth from Bełchatów B, especially of the amblyodont M_1 (Fig. 8C), characterized by the more or less central position of the paraconid (unfortunately the tooth is very worn and it is difficult to say if its cusps were separated or not), indicates that they belong to *C. intercedens*. As concerns dimensions, the first upper and first lower molars do not differ from those in *C. intercedens*, but the M^2 is a little bigger than the corresponding teeth from Erkertshofen (W = 2.05 - 2.12, n = 2; MÜLLER 1967) and Petersbuch 2 (W = 1.75 - 2.06, n = 6; ZIEGLER 1990) (this tooth is not present in the type locality of Wintershof-West).

As the range of variation of M_2 in *C. intercedens* is not known (on account of the limited number of specimens) and as the size difference between the Bełchatów B tooth and those from other localities is not very great, this tooth has also been tentatively included in *C. intercedens*.

?*Chainodus* sp.

Bełchatów A, MN9

M a t e r i a l a n d m e a s u r e m e n t s (in mm)

?C dext. No. MF/2182/1:	L 1.57,	W 1.16
P_1 sin. No. MF/2182/2:	L 2.67,	W 1.65
P_4 sin. No. MF/2182/3:	L 2.41,	W 2.13
P_4 sin. No. MF/2182/4:	L 2.30,	W 1.86
M_1 dext. No. MF/2182/5 (slightly damaged*):	L 2.09,	W 1.67*
M_2 sin. No. MF/2182/6:	L 2.16,	W 1.20.

Minimum number of individuals = 2.

D e s c r i p t i o n o f m a t e r i a l. (Fig. 9). Only teeth not represented at Bełchatów C and B are described. The upper two-rooted antemolar (?C; Fig. 9A) is big and massive. Its occlusal outline is oval. The buccal side is convex, the posterior one concave. The main cusp is connected to the postero-lingual cingulum by a ridge. This ridge runs postero-buccally from the tip of the main cusp. The postero-lingual cingulum ends in a small cingular cuspule in front of the main cusp. The buccal cingulum is absent.

The large, inflated P_1 (Fig. 9B) has a straight lingual side and a convex buccal one. Its cusp is situated nearer the lingual than the buccal side and in the anterior 1/4 of the tooth. The tip of the cusp is strongly curved in the lingual direction. The edge runs from this tip forwards, where a small cuspule is present. The lingual cingulum is wide and protruding, the posterior one also wide, but flat.

S y s t e m a t i c p o s i t i o n. The amblyodont and exoedaenodont teeth of the Dimylidae from Bełchatów A suggest that they belong either to *Metacordylodon* SCHLOSSER, 1911 or to *Chainodus*; their small size seems to exclude the former genus. On the other hand, the age (MN9) of Bełchatów A speaks against the presence of *Chainodus*, because the youngest species of this genus so far found is from Massendorf (Germany), dated to MN5 (SCHÖTZ 1985).

Of the morphological characters that according to ZIEGLER (1990) differentiate the genera, only the morphology of the M_1 (Fig. 9D) can be studied (P^4, M^1, P_3 and the mandible are absent in the Bełchatów A material). Its isolated cusps (especially the paraconid) indicate that it should be referred to *Chainodus*.

Among the *Chainodus* species the material most likely belongs to *C. sulcatus* or *C. intercedens* (on the basis of size). The morphological characters, however, do not allow a choose between these species. Some features are typical of *C. sulcatus* [the main cusp of P_4 (Fig. 9C) is hardly separated from the anterior lobe of the tooth], while others are typical of *C. intercedens* (the presence of a short and straight lingual margin and the lingual position of the main cusp in P_4, the presence of

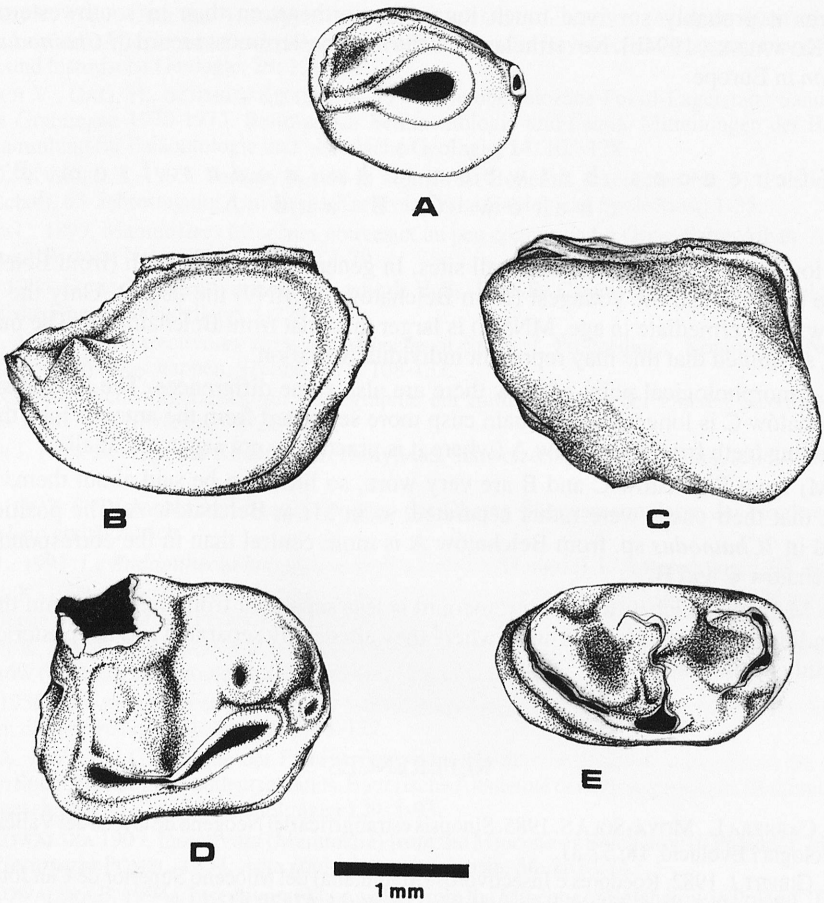

Fig. 9. ?*Chainodus* sp. from Bełchatów A. A – ?C upper sin., MF/2182/1; B – P_1 sin., MF/2182/2; C – P_4 sin., MF/2182/4; D – M_1 dext., MF/2182/5; E – M_2 sin., MF/2182/6.

the posterior, postero-buccal and lingual cingula and the medial position of the paraconid in M_1). On the other hand, some characters, such as the antero-lingual position of the main cusp in P_4, the absence of the protoconid/hypoconid valley in M_1 and the trigonid/talonid ratio of M_2 (Fig. 9E), which equals 2.86, are also found in *Metacordylodon schlosseri*. This species was described by ANDREAE (1904) from Opole in Poland and dated to MN7/8 (see also FAHLBUSCH 1989).

This mixture of features suggests two possibilities. The amblyodont teeth from Bełchatów A could belong to a new species of *Metacordylodon*, smaller and less specialized than *M. schlosseri*. A small *Metacordylodon* sp. was found by KÄLIN (1993) in the Swiss locality Zeglingen, dated to MN6. Outside Poland, the large *M. schlosseri* has been found in the French locality La Grive St. Alban (VIRET 1931), at Anwil in Switzerland (ENGESSER 1972), both dated to MN7/8, Castel de Barbera, Spain (GIBERT 1974) dated to MN9 and (as *M.* cf. *schlosseri*) in the German locality Sandelzhausen, dated to MN6 (FAHLBUSCH et al. 1974). *Metacordylodon* sp. was also listed by FEJFAR & KVAČEK (1993) from Franzensbad (the Czech Republic), dated to MN5. It is difficult to believe, however, that the younger form from Bełchatów A was smaller and more primitive than the older ones. It is more probable that the specimens from Bełchatów A belonged to a highly specialized species of *Chainodus*, in which they have tentatively been included. Like many other

insectivores it probably survived much longer in northeastern than in southwestern Europe (RZEBIK-KOWALSKA 1994b). Nevertheless it is the northeasternmost record of *Chainodus* / *Metacordylodon* in Europe.

Differences between *Chainodus* from Bełchatów C, B and A

Only lower teeth are available from all sites. In general, the oldest teeth (from Bełchatów C, MN4) are the smallest, the youngest (from Bełchatów A, MN9) the largest. Only the M_1 from Bełchatów B (intermediate in age, MN5/6) is larger than that from Bełchatów A. The material is, however, so limited that this may represent individual variation.

From a morphological point of view there are also some differences. The lingual side of P_4 from Bełchatów C is longer and the main cusp more separated from the anterior lobe than in the corresponding teeth from Bełchatów A (where it is practically not separated at all).

The M_1 from Bełchatów C and B are very worn, so little can be said about them. It seems, however, that their cusps were rather separated, as in M_1 at Bełchatów A. The position of the paraconid in ?*Chainodus* sp. from Bełchatów A is more central than in the corresponding teeth from Bełchatów C and B.

In the M_2 from Bełchatów C the protoconid is less separated from the metaconid than in the corresponding tooth from Bełchatów A, where they are deeply separated and the posterior wall of the trigonid is almost absent.

REFERENCES

AGUSTÍ J., CABRERA L., MOYÁ-SOLÁ S. 1985. Sinopsis estratigrfica del Neógeno de la fosa del Vallés-Penedés. Paleontologia i Evolució, **18**: 57-81.

AGUSTÍ J., GIBERT J. 1982. Roedores e Insectívoros (Mammalia) del Mioceno Superior de Can Jotresa y Can Perellada (Valls- Peneds, Catalua). Paleontologia i Evolució, **17**: 29-41.

ANDREAE A. 1904. Dritter Beitrag zur Binnenconchylienfauna des Miocäns von Oppeln in Schlesien. Mitteilungen Roemer-Museum Hildesheim, **20**: 1-22.

BACHMAYER F., WILSON R. 1984. Die Kleinsäugerfauna von Götzendorf, Niederösterreich. Mitteilungen der Österreichischen Akademie der Wissenschaften. Mathematisch-naturwissenschaftliche Klasse, Abteilung 1, **193**: 303-319.

BAUDELOT S. 1972. Etude des Chiroptères, Insectivores et Rongeurs du Miocène de Sansan (Gers). Unpublished thesis, 364 pp.

BOLLIGER T. 1992. Kleinsäugerstratigraphie in der miozänen Hörnlischüttung (Ostschweiz). Documenta Naturae, **75**: 1-296.

BURCHART J., KASZA L., LORENC S. 1988. Fission-track zircon dating of tuffitic intercalations (Tonstein) in the brown-coal mine "Bełchatów". Bulletin of the Polish Academy of Sciences, Earth Sciences, **36**: 281-286.

CROCHET J.-Y., GREEN M. 1982. Contributions à l'étude des micromammifères du gisement Miocène supérieur de Montredon (Hérault). Palaeovertebrata, **12**: 119-131.

DOUKAS C. 1986. The mammals from the Lower Miocene of Aliveri (Island of Evia, Greece). V. The insectivores. Proceedings Koninklijke Nederlandse Akademie van Wetenschappen, Amsterdam, Section B **89**: 15-38.

ENGESSER B. 1972. Die obermiozäne Säugetierfauna von Anvil (Baselland). Tätigkeitsbericht der Natursforschenden Gesellschaft Baselland Liestal, **28**: 37-363.

ENGESSER B. 1976. Zum Milchgebiss der Dimyliden (Insectivora, Mammalia). Eclogae Geologicae Helvetiae, **69**: 795-808.

ENGESSER B. 1980. Insectivora und Chiroptera (Mammalia) aus dem Neogene der Türkei. Schweizerische Paläontologische Abhandlungen, **102**: 45-149.

ENGESSER B., MATTER A., WEIDMANN M. 1981. Stratigraphie und Säugetierfaunen des mittleren Miozäns von Vermes (Kt. Jura). Eclogae Geologicae Helvetiae, **74**: 893-952.

FAHLBUSCH V. 1989. Über den Holotypus von *Metacordylodon schlosseri* (ANREAE, 1904) (Insectivora, Mamm.) aus dem Miozän von Opole (Oppeln). Mitteilungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie, **29**: 159-162.

FAHLBUSCH V., GALL H., SCHMIDT-KITTLER N. 1974. Die obermiozäne Fossil-Lagerstätte Sandelzhausen. 10. Die Grabungen 1970-1973. Beiträge zur Sedimentologie und Fauna. Mitteilungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie, **14**: 103-128.

FEJFAR O., KVAČEK Z. 1993. Tertiary basins in Northwest Bohemia (excursion Nr. 3). Paläontologische Gesellschaft, 63. Jahrestagung, Universita Karlova, Česká Geologická Společnost: 1-35.

GAILLARD C. 1899. Mammifères Miocènes nouveaux ou peu connus de La Grive-Saint-Alban. Archives du Muséum d'Histoire Naturelle de Lyon, **7**: 1-79.

GIBERT J. 1974. Etude des Insectivores du Miocene de Valls- Penedès Calatayud-Daroca et Rubielos de Mora. Unpublished thesis, Sabadell, pp. 1-224.

GIBERT J. 1975. New insectivores from the Miocene of Spain. I. Proceedings. Koninklijke Nederlandse Akademie van Wetenschappen, Section B **78**: 108-133.

HEISSIG K. 1989. Neue Ergebnisse zur Stratigraphie der mittleren Serie der Oberen Süsswassermolasse Bayerns. Geologica Bavarica, **94**: 239-257.

HÜRZELER J. 1944. Beiträge zur Kenntnis der Dimylidae. Schweizerische Palaeontologische Abhandlungen, **65**: 1-44.

KÄLIN D. 1993. Stratigraphie und Säugetierfaunen der Oberen Süsswassermolasse der Nordwestschweiz. Thesis, Universität Zürich.

KORDOS L. 1991. Le *Rudapithecus hungaricus* de Rudabánya (Hongrie). L'Anthropologie, **95**: 343-362.

KOWALSKI K. 1993a. *Microtocricetus molassicus* FAHLBUSCH and MAYR, 1975 (Rodentia: Mammalia) from the Miocene of Bełchatów (Poland). Acta zoologica cracoviensia, **36**: 251-258.

KOWALSKI K. 1993b. *Neocometes* SCHAUB and ZAPFE, 1953 (Rodentia: Mammalia) from the Miocene of Bełchatów (Poland). Acta zoologica cracoviensia, **36**: 259-265.

MEIN P. 1958. Les mammifères de la faune sidérolithique de Vieux- Collonges. Nouvelles Archives du Muséum d'Histoire Naturelle de Lyon, **5**: 1-122.

MÜLLER A. 1967. Die Geschichte der Familie Dimylidae (Insectivora, Mamm.) auf Grund der Funde aus tertiären Spaltenfüllungen Süddeutschlands. Bayerische Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Klasse, Abhandlungen **129**: 1-93.

RZEBIK-KOWALSKA 1993. Insectivora (Mammalia) from the Miocene of Bełchatów in Poland. I. Metacodontidae: *Plesiosorex* POMEL, 1854. Acta zoologica cracoviensia, **36**: 267-274.

RZEBIK-KOWALSKA B. 1994a. Insectivora (Mammalia) from the Miocene of Bełchatów in Poland. II. Soricidae FISCHER VON WALDHEIM, 1817. Acta zoologica cracoviensia, **37**: 137-155.

RZEBIK-KOWALSKA B. 1994b. The Plio-Pleistocene patterns of distribution of the Soricidae in Poland. [In:] J. F. MERRITT, G. L. KIRKLAND, R. K. ROSE (eds.) – Advances in the biology of shrews. Carnegie Museum of Natural History, Special Publication, **18**: 307-312.

SCHÖTZ M. 1985. Die Dimyliden (Mammalia, Insectivora) aus der Kiesgrube Massendorf (Obere Süsswassermolasse Niederbayerns). Mitteilungen der Bayerische Staatssammlung für Paläontologie und historische Geologie, **25**: 95-130.

STEPHAN-HARTL R. 1972. Die altmiozäne Säugetierfauna des Nordbassin und der Niederräder Schleusenkammer (Frankfurt/M., Hessen) und ihre stratigraphische Stellung. Abhandlungen des Hessischen Landesamtes für Bodenforschung, **64**: 1-97.

STORCH G. 1978. Die turolische Wirbeltierfauna von Dorn-Dürkheim, Rheinhessen (SW-Deutschland). 2. Mammalia: Insectivora. Senckenbergiana Lethaea, **58**(6): 421-449.

STUCHLIK L., SZYNKIEWICZ A., LAŃCUCKA-ŚRODONIOWA M., ZASTAWNIAK E. 1990. [Results of the hitherto palaeobotanical investigations of the Tertiary brown coal bed "Bełchatów (Central Poland)]. Acta Palaeobotanica, **30**: 259-305. (In Polish, English summary).

STWORZEWICZ E., SZYNKIEWICZ A. 1989. [Miocene land snails from eastern part of Bełchatów brown coal delf]. Kwartalnik Geologiczny, **32**: 655-662 (In Polish, Russian summary).

THENIUS E. 1951. Eine Wirbeltierfaunula mit *Plesiodimylus* aus dem O-Pannon des Wiener Beckens. Annalen das Naturhistorischen Museums, Wien, **58**: 85-95.

VIRET J. 1931. Découverte de *Metacordylodon schlosseri* à la Grive-Saint-Alban. Bulletin de la Société d'Histoire Naturelle, Toulouse, **61**: 253-257.

ZAPFE H. 1951. Die Fauna der miozänen Spaltenfüllung von Neudorf a. d. March (ČSR.), Insectivora. Sitzungsberichte der Österreichischen Akademie der Wissenschaften. Mathematisch- Naturwissenschaftliche Klasse 1, **160**: 449-480.

ZIEGLER R. 1990. Didelphidae, Erinaceidae, Metacodontidae und Dimylidae (Mammalia) aus dem Oberoligozän und Untermiozän Süddeutschlands. Stuttgarter Beiträge zur Naturkunde aus dem Staatlichen Museum für Naturkunde, Serie B, **158**: 1-99.

ZIEGLER R., FAHLBUSCH V. 1986. Kleinsäuger-Faunen aus der basalen Oberen Süsswasser-Molasse Niederbayerns. Zitteliana, München, **14**: 3-80.