# Insectivora (Mammalia) from the Miocene of Bełchatów in Poland. II. Soricidae FISCHER VON WALDHEIM, 1817

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Abstract. Isolated teeth of cf. Florinia stehlini, Heterosorex sp. and Heterosoricinae gen. et sp. indet. have been found in horizon C, dated to the Early Miocene (MN4), cf. *Miosorex, Dinosorex* cf. zapfei ENGESSER, 1975 and Soricidae gen. et spec. indet. in horizon B, dated to the early Middle Miocene (MN5/6) and cf. Crusafontina and *Dinosorex* sp. in horizon A, dated to the end of the Middle Miocene (MN9), all situated at Belchatów, in the central part of Poland. The systematic position of above-mentioned taxa, their measurements and illustrations are given.

Key-words: fossil mammals, Insectivora, Soricidae, Miocene, Poland.

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### I. INTRODUCTION

The present paper is the second part of a series of studies on the remains of *Insectivora* from the Miocene locality of Belchatów in Central Poland. The previous paper (RZEBIK-KOWALSKA 1993) dealt with a member of the family *Metacodontidae*.

The present study is devoted to two genera of the subfamily *Crocidosoricinae: Florinia* ZIEGLER, 1989 and *Miosorex* KRETZOI, 1959, two genera of the subfamily *Heterosoricinae: Heterosorex* GAILLARD, 1915 and *Dinosorex* ENGESSER, 1972 and to one genus of the subfamily *Soricinae: Crusafontina* GIBERT, 1974.

A short description of the locality from which the material for this study has been obtained is given in papers by STWORZEWICZ and SZYNKIEWICZ (1989), STUCHLIK et al. (1990), KOWALSKI (1993a and b) as well as in the previous paper of this cycle. Measurements were taken according to the pattern generally used for *Soricidae* (REUMER 1984). The highest number of identical elements (e. g., right first lower molars, M<sub>1</sub>) 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 in Cracow.

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I am indebted to dr Adam SZYNKIEWICZ who discovered most of the layers with small mammals in Bełchatów and provided data on the geological background, to Miss Beata SŁOWIK who selected the small mammal remains from the samples and to Mr Marck KAPTURKIEWICZ for the illustrations.

### **II. SYSTEMATIC PART**

# Family Soricidae FISCHER von WALDHEIM, 1817 Subfamily Crocidosoricinae REUMER, 1987

The subfamily *Crocidosoricinae* was established by REUMER in 1987 for shrews possessing the most plesiomorphic characters. They lived in Eurasia and North Africa during the Oligocene and Miocene. According to REUMER, members of that extinct subfamily gave rise, during the Miocene, to other subfamilies of shrews.

# Genus Florinia, ZIEGLER, 1989 cf. Florinia stehlini (DOBEN-FLORIN, 1964)

### Bełchatów C, MN4

M a t e r i a l. 1M<sub>2</sub> dext. (broken into two parts and fixed, figured), (No. MF/2152/1).

Description of material. The second lower molar is characterized by a very high entoconid crest and by a broad and protruding buccal, posterior, and less protruding but visible, lingual cingula. There is also a furrow between the entoconid and the hypolophid (Fig. 1A).

S y s t e m a t i c p o s i t i o n. The very small size, similar to that of other known  $M_2$  of *Florinia stehlini* and its very typical morphology (ZIEGLER 1989) allow us to identify this tooth, in all probability, as *Florinia*, and therefore as *F. stehlini*, the only species known in this genus. Also the geological age of the locality supports this identification because all the remains of *Florinia* described so far, derived from the Early Miocene (MN3, MN4).

The synonyms of *Florinia stehlini* and the relationship of this genus to other *Crocido-soricinae* can be found in ZIEGLER (1989). Besides Poland, this shrew is known from Wintershof-West (type locality), Petersbuch 2, Erkertshofen 2 and Rauscheröd 1b/1c in Bavaria, Germany.

Genus Miosorex KRETZOI, 1959

cf. Miosorex sp.

# Bełchatów B, MN5/6

M a terial.  $I^1$  dext. (broken, only apex and part of the talon preserved, figured), (No. MF/2153/1).

Description of material. The first upper incisor is not fissident. Its upper margin is convex and its apex rather broad and strongly curved down. There is an acute angle between the apex and talon, which are separated by a shallow groove on the buccal side. The ventral edge of the apex is straight, with a small denticle situated near the talon. The talon is well developed, convex on the buccal side (Fig. 1B).

S y s t e m a t i c p o s i t i o n. A direct comparison of the tooth fragment with  $I^1$  of various *Crocidosoricinae* from the Middle Miocene localities of Europe shows the greatest similarity in size and morphology to *Miosorex*.

Several species of this genus lived on this continent from the Early to Late Miocene (BAUDELOT 1972, GIBERT 1974, ZIEGLER 1989).

Subfamily Soricinae FISCHER VON WALDHEIM, 1817 Tribe Amblycoptini KORMOS, 1926 Genus Crusafontina GIBERT, 1974 cf. Crusafontina sp.

### Bełchatów A, MN9

Material and measurements (in mm).  $I^1$  sin. (broken, proximal part only) W 1.69, (No. MF/2155/1);  $I^1$  sin. (broken, proximal part only, figured) W 1.66, (No. MF/2155/2);  $I^1$  dext. (broken, proximal part only) W 1.58, (No. MF/2155/3);  $I_1$  dext. (broken, proximal part only) W 1.58, (No. MF/2155/3);  $I_1$  dext. (broken, proximal part only) W 1.13, (No. MF/2155/4).

Minimum number of individuals = 2

Description of material. All fragmentary  $I^1$  are robust, their buccal posterior edges are straight or slightly undulate, and provided with a cingulum along 3/4 of their lengths (beginning on the lingual side). At its upper end the cingulum is wide. Their talons are well developed, two-cusped, with very strong and convex (bulbous) anterior and small posterior cusps. Between the apex and talon there is a shallow groove on the buccal side (Fig. 1D<sub>1</sub>).

I<sub>1</sub> is also robust, its cingulum is absent (Fig. 1D<sub>2</sub>).

S y s t e m a t i c p o s i t i o n. All the tooth fragments described are much bigger than all Miocene soricid incisors with the exception of *Crusafontina endemica* described by GIBERT (1974) from the Valesian locality Can Llobateres in Spain.

According to STORCH (1978) and STORCH and QIU (1991), Anourosorex kormosi BACHMAYER and WILSON, 1970 from the early Late Miocene (MN11) locality Kohfidisch in Austria (BACHMAYER and WILSON 1980) and A. inexpectatus (SCHLOSSER, 1924) from the end of the Miocene (Late Turolian, MN13) of Ertemte in China should be included in this genus. They are morphologically related to C. endemica, but different from the still living A. squamipes MILNE-EDWARDS, 1872 and fossil A. oblongus STORCH and QIU, 1991 from the Late Miocene (Middle Turolian) of the Chinese locality Lufeng. This last species has characters identical with those of the living species. STORCH and QIU are of the opinion that these two lineages must have separated before the Late Miocene.

Not all palaeontologists (see BACHMAYER and WILSON 1980) agree with that idea. In this situation we do not know whether all the remains earlier described from Europe as *Anourosorex* can be included to the genus *Crusafontina*.

A revision of the Crusafontina/Anourosorex group is needed.

The measurements (widths) of the specimens from Bełchatów A lie between those from Spain (W of  $I^1 = 1.76-1.88$ , avg. 1.79, W of  $I_1 = 1.04-1.12$ , avg. 1.07; GIBERT 1975) and from Austria (W of  $I^1 = 1.0$ , W of  $I_1 = 0.9-1.0$ ; BACHMAYER and WILSON 1970). The very badly preserved material and non-diagnostic teeth make a closer identification impossible.



Fig. 1. A – M<sub>2</sub> dext., cf. Florinia stehlini from Bełchatów C, spec. No. MF/2152/1; B – fragment of I<sup>1</sup> dext., cf. *Miosorex* sp. from Bełchatów B, spec. No. MF/2153/1; C – fragment of I<sub>1</sub> sin., Soricidae gen. et sp. indet. from Bełchatów B, spec. No. MF/2154/1; D<sub>1</sub> – fragment of I<sup>1</sup> sin., cf. *Crusafontina* sp. from Bełchatów A, spec. No. MF/2155/2; D<sub>2</sub> – fragment of I<sub>1</sub> dext., cf. *Crusafontina* sp. from Bełchatów A, spec. No. MF/2155/2; D<sub>2</sub> – fragment of I<sub>1</sub> dext., cf. *Crusafontina* sp. from Bełchatów A, spec. No. MF/2155/2; D<sub>2</sub> – fragment of I<sub>1</sub> dext., cf. *Crusafontina* sp. from Bełchatów A, spec. No. MF/2155/2; D<sub>2</sub> – fragment of I<sub>1</sub> dext., cf. *Crusafontina* sp. from Bełchatów A, spec. No. MF/2155/2; D<sub>2</sub> – fragment of I<sub>1</sub> dext., cf. *Crusafontina* sp. from Bełchatów A, spec. No. MF/2155/4.

### Subfamily Heterosoricinae VIRET and ZAPFE, 1951

The members of this extinct subfamily (family according to REUMER 1987) lived in North America and Eurasia during the Oligocene and Miocene. The oldest, Early Oligocene form, *Domnina thompsoni* SIMPSON, 1941, comes from Montana in the USA (REPENNING 1967), the youngest one, Late Miocene *Heterosorex wangi* STORCH & QIU, 1990, was found in China (STORCH and QIU 1990). At present, the origin of the heterosoricines is unknown and the relationships of the taxa described from these three continents are unclear (ENGESSER 1975, 1979).

A revision of the systematics of *Heterosoricinae* can be found in ENGESSER (1975).

So far, in the Miocene localities of Europe two genera /Heterosorex GAILLARD, 1915 and Dinosorex ENGESSER, 1972/ represented by six species /H. neumayrianus (SCHLOSSER, 1887), H. delphinensis GAILLARD, 1915, H. ruemkeae DOUKAS, 1986, D. sansaniensis (LARTET, 1851), D. pachygnatus ENGESSER, 1972 and D. zapfei EN-GESSER, 1975/ have been found.

H. neumayrianus was found for the first time in the Late Oligocene locality of Eggingen (=Eckingen) in Germany. Later, on the basis of the Early Miocene (MN3) materials from Wintershof-West (Germany) DOBEN-FLORIN (1964) described a new subspecies of H. neumayrianus, H. n. subsequens. Now, H. neumayrianus is also known from other German localities such as Petersbuch 2, Erkertshofen 1 and 2, Rembach and Forsthart (ZIEGLER and FAHLBUSCH 1986), as well as Stubersheim 3, Ulm-Westtangente, and Budenheim (DOBEN-FLORIN 1964, ZIEGLER 1989). All of them are dated to the Early Miocene (MN2-4). According to DOBEN-FLORIN (1964), the only specimen from Weisen-au (Germany) has been lost.

Outside Germany, *H. neumayrianus* was mentioned by FLANDRIN et al. (1968) from the Early Miocene (Late Aquitanian) Eoulx basin (Basses-Alpes) in France and by ADROVER (1975) from the Early Miocene (MN2b) Navarrete del Rio (Prov. Teruel) in Spain. Its subspecies *H. n. subsequens* was listed (as "*H. subsequens* (MÜLLER)") by AGUSTI et al. (1988) from Mas Antolino 2 (MN4) in the Ribesalbes-Alcora basin and at Rubielos de Mora (Prov. Teruel) of the same age, both in Spain.

The holotype and only specimens of *H. delphinensis* come from the Middle Miocene (MN7) of La Grive Saint-Alban in France (GAILLARD 1915).

*H. ruemkeae*, described from the Early Miocene of the Greek locality Aliveri (Evia island) by DOUKAS in 1986, has not been found so far in other parts of Europe.

The type locality of *Dinosorex sansaniensis* is Sansan in France, dated to MN6. This species was also found at another, older (MN4) French locality, Vieux-Collonges (MEIN 1958), and at Gallenbach 2B and 2C (both MN6) (Lower Bavaria), Gisseltshausen 1a (MN6) and 1b (MN7), representing Upper Freshwater Molasse ("Middle Series") (HEIS-SIG 1989) as well as at Sandelzhausen (MN6) (FAHLBUSCH et al. 1974) in Germany and in younger Spanish localities in the Valles-Penedes basin such as Can Mata I (MN8) (AGUSTI et al. 1985) and Castell de Barbera, Can Llobateres, Hostalets, San Quirico and Can Ponsic. Most of them are dated to the Late Vallesian (MN9) (AGUSTI, GIBERT 1982).

D. pachygnatus was described from the Middle Miocene (MN8) of Anvil in Switzerland. AGUSTI et al. (1982) mentioned D. cf. pachygnatus from the Seu d'Urgell basin (locality Can Petit) in Spain (Early Vallesian age, MN9?).

D. zapfei was described on the basis of Neudorf (MN6) material, previously identified by ZAPFE (1951) as H. sansaniensis. According to ENGESSER (1975), the remains from two German localities Grosslappen (MN8/9) (STROMER 1928) and Viehhausen (MN5/6), earlier assigned to Trimylus schlosseri, (SEEMANN 1938), should be tentatively included in this species. Besides, D. zapfei was found at Vermes 1 (Middle Miocene, MN5) in

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Switzerland (ENGESSER et al. 1981) and D. aff. *zapfei* at Petersbuch 2 (MN4), Erkertshofen 2 (MN4), Forsthart (MN4) and Puttenhausen (MN5), all in Germany (ZIEGLER, FAHLBUSCH 1986).

In the Miocene localities of Europe and Asia Minor the remains of *Heterosoricinae*, identified to subfamily or to the genus only, were found also at Petite Chamberonne (Aquitanien) /Hétérosoriciné indét., ENGESSER et al. 1993/, Messen (MN1 and MN2a) /"Heterosoricine" (*Heterosorex*?), ENGESSER 1976/ and Vermes 2 (MN8) /Heterosoricine, ENGESSER et al. 1981/, all three in Switzerland, at Brunn-Vösendorf (Late Miocene, Pannonian) /T. schlosseri, THENIUS 1951/ in Austria, Dorn-Dürkheim (Upper Miocene) /*Dinosorex* sp., TOBIEN 1980/ in Germany, Ballestar (Late Miocene) /Heterosoricinae indet., AUGUSTI et al. 1982/ in Spain and Sari Çay (MN7) /*Dinosorex* sp., ENGESSER 1980/ in Turkey.

Unfortunately, the *Heterosoricinae* materials from Bełchatów consist only of isolated teeth. The absence of such important diagnostic elements as mandibles and antemolars made their identification very difficult. All these teeth are also black, so that pigmentation, if present is not visible. Nevertheless, this is the first record of the *Heterosoricinae* from Poland. Their presence here extends their range in Europe towards the North-East.

# Genus Heterosorex GAILLARD, 1915 Heterosorex sp.

### Bełchatów C, MN4

Material and measurements (in mm).  $I^1$  dext. (broken, apex only, figured) W<sub>2</sub> 1.51, (No. MF/2156/1); M<sup>2</sup> dext. (broken, lingual part only, figured) L 1.44, (No. MF/2156/2).

Minimum number of individuals = 1.

D e s c r i p t i o n o f m a t e r i a l. The apex of  $I^1$  is bifid and its anterior part wide (Fig. 2A). The parastyle, mesostyle and metastyle of  $M^2$  are broken. Its paracone and metacone are much better developed than the protocone. The metacone is the highest cusp. The hypocone is absent. The continuous endoloph, which connects the protocone to postero-lingual ridge, surrounds the hypoconal flange. The hypoconal flange is large and deeply concaved. The metaloph is not present. The deep trigon basin opens anteriorly and posteriorly (Fig. 2B).

S y s t e m a t i c p o s i t i o n. The morphology of both tooth fragments (especially of the strong and bifid upper incisor  $I^{1}$ ) refers them to *Heterosoricinae*. Weakly developed lingual cusps (low protocon and lack of hypocon) of  $M^2$  as well as its small size point to the genus *Heterosorex*. According to the data from the literature, in *Heterosorex* the length of  $M^2$  ranges from 1.4 to 2.0 mm, while in *Dinosorex* this tooth is longer, its length oscillating between 1.83 and 2.34 mm.

The small size of *Heterosorex* teeth and the geological age of Bełchatów C suggest that they belong either to *H. neumayrianus* or to *H. ruemkeae*. The presence of South-European *H. ruemkeae* in the Central part of this continent seems to be possible, because in the younger (Early Pliocene, MN14) Polish locality, Podlesice, two such southern elements, both described from Greece, were found: *Ruemkelia* aff. *dekkersi* (RÜMKE, 1985) (*Desmaninae*, *Talpidae*) (HARRISON and RZEBIK-KOWALSKA 1992, RZEBIK-KOWALSKA



Fig. 2. *Heterosorex* sp. from Bełchatów C. A – fragment of I<sup>1</sup> dext., spec. No. MF/2156/1; B – fragment of M<sup>2</sup> dext., spec. No. MF/2156/2.

and PAWŁOWSKI 1994) and Desmanella aff. dubia RÜMKE, 1976 (Uropsilinae, Talpidae) (HARRISON and RZEBIK-KOWALSKA 1994).

Unfortunately, the material is not sufficient to decide in favor of one or the other of the two above-mentioned species. It is nevertheless the first record of this genus in Poland. Its presence at Belchatów extends its range towards the North-East.

Genus Dinosorex ENGESSER, 1972 Dinosorex cf. zapfei ENGESSER, 1975

### Bełchatów B, MN5/6

M a t e r i a l. A number of specimens is given in Table I. It contains the following upper and lower teeth or their fragments:  $2 I^{1}$  (dext.) and 1 fragment of  $I^{1}$  (dext.),  $1 A^{1}$  (sin.) and 1 fragment of  $A^{1}$  (dext.), 2 fragments of  $P^{4}$  (sin.) and 1 fragment of  $P^{4}$  (dext.), 1 I<sub>1</sub> (sin.), 1 I<sub>1</sub> (sin.), 1 I<sub>1</sub> (dext.) and 1 fragment of I<sub>1</sub> (dext.), 1 M<sub>2</sub> (dext.), 1 M<sub>2</sub> (dext.), 1 M<sub>2</sub> (sin.) and 1 M<sub>3</sub> (sin.), (No. MF/2157).

Description of material. The tip of strong upper  $I^1$  is bifid. The buccal surface of its talon is wrinkled. The buccal cingulum is present but not very much protruding (Fig. 3A). The first upper antemolar ( $A^1$ ) is large. Its buccal side is convex, the lingual side being concave. The main cusp is high and it lies nearer the anterior than the



Fig. 3. Dinosorex cf. zapfei from Bełchatów B. A – I<sup>1</sup> dext. (buccal and occlusal view), spec. No. MF/2157/1; B – A<sup>1</sup> sin., spec. No. MF/2157/3; C<sub>1</sub> – fragment of P<sup>4</sup> dext., spec. No. MF/2157/11; C<sub>2</sub> – fragment of P<sup>4</sup> sin., spec. No. MF/2157/12.

Table I

Number of upper teeth or their fragmentsNumber of lower teeth or their fragments		Total	Minimum number of individuals
8	9	17	3

Dinosorex cf. zapfei ENGESSER, 1975 from Bełchatów B

posterior side. Its tip is connected with anterior and posterior margins of the crown by sharp ridges. A less distinct ridge runs from the tip to the small lingual cuspule. It divides the lingual basin into two parts: a shallow anterior part and a deep posterior one. The lingual margin of the tooth is more or less smooth. In the postero-lingual corner of the other (fragmentary) tooth another small cuspule is also present. On the lingual margin, between postero-lingual and antero-lingual cuspules, two denticles are visible. The posterior basin is divided into two parts by a short ridge. The strong posterior cingulum continues on the buccal side. There is no lingual cingulum (Fig. 3B).

 $P^4$  is characterized by its not very distinct parastyle and not very long metastyle. Its lingual outline is nearly square. The hypoconal flange is very deep. The low protocone forms the antero-lingual corner of the crown, the hypocone is visible as a small cuspule on the lingual margin of the tooth (Figs.  $3C_1-C_2$ ).

I<sub>1</sub> is long and strong without any cuspules on its dorsal margin. The apex is only slightly curved upwards. The buccal surface of the talon is wrinkled. A very week (flat) cingulum is present (Fig. 4A).

The lower molars are graded in size:  $M_1 > M_2 > M_3$ . The talonid of  $M_1$  is wider than the trigonid. The hypolophid is closely conected with the entoconid, not separated by a groove ("modus A"). The entoconid crest is absent. The protoconid/hypoconid valley opens near the buccal cingulum. The cingulum is strong and large on the buccal and posterior sides of the tooth. It mounts to the end of the hypolophid on the postero/lingual corner of the tooth (Fig. 4B).  $M_2$  is smaller than  $M_1$ . It is similar in morphology, although its paraconid and metaconid are closer together (the paraconid/metaconid valley is narrower) than in  $M_1$  and it has a low entoconid crest (Fig. 4C).  $M_3$  is relatively small. Its talonid is short and much narrower than the trigonid (Fig. 4D).

Measurements. See Table II.

S y s t e m a t i c p o s i t i o n. The material is very scarce and badly preserved but the presence of a relatively strong and acuspulate  $I_1$  among the teeth enables its assignment to the genus *Dinosorex*. The measurements of the teeth lie within the range of variation of *D. zapfei*, among the specimens from Neudorf and Vermes 1 (see scatter-diagram, Fig. 5).

According to ENGESSER (1975), the lower molars of *D. zapfei*, unlike those of other *Dinosorex* species, are characterized by their strongly decreasing size (from  $M_1$  to  $M_3$ ), the presence of weak buccal and posterior cingula not connected with the hypolophids in the postero-lingual corners, by the hypolophid/entoconid position known as "modus A", and lack of entoconid crests.



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Fig. 4. A-D. Dinosorex cf. zapfei from Bełchatów B. A – I<sub>1</sub> sin., spec. No. MF/2157/5; B – M<sub>1</sub> dext., spec. No. MF/2157/7; C – M<sub>2</sub> sin., spec. No. MF/2157/8; D – M<sub>3</sub> dext., spec. No. MF/2157/10; E – Heterosoricinae gen. et sp. indet. from Bełchatów C, M<sub>1</sub> dext., spec. No. MF/2162/1.

Soricidae from the Miocene of Bełchatów

No.	L	W	W2
	I	1	Los esternos procesos en la contra en la contr La contra en la contr
MF/2157/1	3.85	1.72	1.38
MF/2157/2	4.07	1.93	1.37
(Rest), I Marsh	A	1 succession was great	
MF/2157/3	2.19	1.50	
MF/2157/4	2.12	-	ø <u> </u>
	I	1	0 0 0 P
MF/2157/5	6.84	1.89	
MF/2157/6	6.77	1.80	Charles The school
their fractions	N	11	-of help ideals
MF/2157/7	2.57	1.50	_
e transie	N	12	
MF/2157/8	2.08	1.42	ng of Belopskike is a
MF/2157/9	2.11	1.35	is a signify split. T
territori erre Andrea	N	13	
MF/2157/10	1.51	1.05	_

Dinosorex cf. zapfei ENGESSER, 1975 from Belchatów B. Dimensions of upper and lower teeth (in mm)

Unfortunately, some of these characters, especially the type of modus and the presence or absence of entoconid crests on the lower molars, are not always distinct in the *Dinosorex* genus (their intermediate states are possible) which makes the identification of these teeth difficult.

All the teeth from Bełchatów being isolated, their mutual proportions are also difficult to estimate. However, as in the typical Neudorf specimens, the lower molars of *Dinosorex* from Bełchatów B have a direct (or nearly direct) course of the hypolophid to entoconid ("modus A") and the entoconid crest of  $M_1$  is lacking. On the other hand, they differ from the holotype in rather large buccal and posterior cingula, which continue to the hypolophids, forming the vertical bands in the postero-lingual corners of the teeth. In  $M_2$ , the low entoconid crest is visible.

The large postero-buccal cingula extending to the hypolophids are also present in the lower molars of *Dinosorex* from Petersbuch 2, Erkertshofen, Forsthart and Puttenhausen in Germany, but on the grounds of the presence of "modus A" these teeth have been identified by ZIEGLER and FAHLBUSCH (1986) as D. aff. zapfei.

The similarity between the Belchatów B specimens and those described by ZIEGLER and FAHLBUSCH decided on the assignment of the first to D. aff. zapfei. The discovery of this species in Poland extends its range towards the North-East.

Table II



#### Dinosorex sp.

### Bełchatów A, MN9

M a terial. The number of specimens is given in Table III. It contains the following upper and lower teeth or their fragments:  $2I^{1}$  (dext.),  $1I^{1}$  (sin.) and 4 damaged  $I^{1}$  (all sin.),  $2A^{1}$  (sin.),  $1A^{1}$  (dext.),  $2P^{4}$  (dext.), 2 fragments of  $P^{4}$  (sin.),  $1M^{1}$  (dext.), 1 damaged  $M^{1}$  (also dext.), 1 damaged  $M^{1}$  (sin.),  $3M^{2}$  (dext.), 3 damaged  $M^{2}$  (sin.),  $1M^{3}$  (sin.),  $1I_{1}$  (sin.), 1 fragment of  $I_{1}$  (sin.),  $1A_{1}$  (dext.),  $1A_{1}$  (dext.),  $2M_{1}$  (dext.),  $2M_{1}$  (sin.),  $2M_{2}$  (dext.), 1 damaged  $M_{2}$  (dext.),  $3M_{2}$  (sin.),  $3M_{3}$  (dext.),  $1M_{3}$  (sin.) and 1 damaged  $M_{3}$  (sin.), (No. MF/2158).

### Table III

Dinosorex sp. from Belchatów A

Number of upper teeth or their fragments	Number of lower teeth or their fragments	Total	Minimum number of individuals
26	22	48	5

D e s c r i p t i o n o f m a t e r i a l. Only teeth not represented at Bełchatów B are described.  $M^{T}$  is nearly quadrate in occlusal view. Its mesostyle is slightly split. The anterior arm of the protocone ends at the base of the paracone. The metaloph is absent. The deep trigon valley is open and communicates with the deep hypoconal flange by a varying in height bridge. In one specimen a small cuspule lies on the internal slope of the protocone. The hypocone is high and pointed. Its anterior arm is connected with the posterior arm of the protocone and the posterior one with the posterior cingulum surrounding the hypoconal flange. The third short interior arm ends free at the hypoconal flange/trigon valley bridge. There is a small depression between the anterior and interior arms of the hypocone and a deeper one between the protocone and hypocone (Fig. 6D).  $M^{2}$  is strongly trapezoidal in occlusal view (its posterior side is shorter than the anterior one) but its detailed morphology is similar to that of  $M^{1}$  (Fig. 6E).  $M^{3}$  has a strong paracone and protocone. The posterior arm of the protocone ends free. The metacone is very small and the hypocone absent. The central basin of the tooth is deep (Fig. 6F).

 $A_1$  is unicuspid and deeply notched on its posterior side. The cusp is situated at the front of the tooth, at 1/3 of its length. The lingual side of  $A_1$  is flat, devoid of cingulum, the buccal one is slightly convex and cingulum is present on it (Figs. 7B<sub>1</sub>-B<sub>2</sub>).

# Morphological differences between Dinosorex of Bełchatów A and B

All *Dinosorex* teeth from Bełchatów A are bigger and the upper and lower incisors even considerably bigger than those from Bełchatów B. Besides, in the specimens from Bełchatów A the buccal surface of  $I^1$  is smoother, and its apex less curved. The lingual side of stout  $P^4$  is more square, its parastyle better developed and the cingulum at the posterior border wider. The M<sub>1</sub> and M<sub>2</sub> from Bełchatów A have more or less well-developped entoconid crests, which in the teeth from Bełchatów B are lacking.

Measurements. See Table IV.



Fig. 6. *Dinosorex* sp. from Bełchatów A.  $A - I^{1} \sin$ , spec. No. MF/2158/1;  $B - A^{1} \sin$ , spec. No. MF/2158/7;  $C - P^{4}$  dext., spec. No. MF/2158/10;  $D - M^{1}$  dext., spec. No. MF/2158/14;  $E - M^{2}$  dext., spec. No. MF/2158/17;  $F - M^{3} \sin$ , spec. No. MF/2158/20.



Fig. 7. Dinosorex sp. from Bełchatów A. A – I<sub>1</sub> sin., spec. No. MF/2158/21; B<sub>1</sub> – A<sub>1</sub> sin., spec. No. MF/2158/23; B<sub>2</sub> – A<sub>1</sub> sin., spec. No. MF/2158/22; C – M<sub>1</sub> dext., spec. MF/2158/24; D – M<sub>2</sub> sin., spec. No. MF/2158/28; E – M<sub>3</sub> sin., spec. No. MF/2158/34.

No.	L		W	W2
1. 1994.844		I <sup>1</sup>		
MF/2158/1	5.30		2.05	1.78
MF/2158/2	4.85		2.06	1.65
MF/2158/3	_		2.02	1.99
MF/2158/4	Link			1.65
MF/2158/5			1.98	-
MF/2158/6	_		2.02	_
1111/2150/0		A <sup>1</sup>		
MF/2158/7	2.42		1.68	
MF/2158/8	2 30		1.60	
MF/2158/0	2.50		1 70	
1411 / 2130/7	2.31	p <sup>4</sup>	1.70	
ME/2158/10	2.23	1	2 10	
ME/2159/10	2.23		2.10	
ME/2150/11	2.13		2.21	•
ME/2138/12	2.34		2.20	
WIF/2138/13	2.23	MI		-
ME/0150/14	2.12	M	2.22	
MF/2158/14	2.12		2.33	1
MF/2158/15	2.31	1.		-
MF/2158/16	2.15	2	-1.1	-
	0.01	M	0.1.1	
MF/2158/17	2.04		2.14	-
MF/2158/18	1.94		2.20	-
MF/2158/19	2.00	1	2.24	
Last 1		<u>M'</u>	the second s	
MF/2158/20	1.14	1	1.65	-11-1
11 M 22	the second s	<u>I1</u>		1. 196
MF/2158/21	8.16		2.10	-
	/	A1		
MF/2158/22	1.61		1.22	
MF/2158/23	1.51		1.14	<u> </u>
	and the second second	M1		TA THE AN
MF/2158/24	2.55		1.69	1.1.1.1.1.
MF/2158/25	2.57		1.59	
MF/2158/26	2.76		1.60	1100000
MF/2158/27	2.66	1.	1.61	
	S. 18	M <sub>2</sub>		
MF/2158/28	2.18		1.31	
MF/2158/29	2.26		1.42	
MF/2158/30	2.32		1.31	and and the second s
MF/2158/31	2.27		1.40	Seattle 12
MF/2158/32	2.27		1.35	
MF/2158/33	2.22		1.50	
1111 / 0130/33	<u> </u>	Ma	1.00	
MF/2158/34	1.65	1413	1 13	
ME/2150/34	1.05		1.15	
ME/2130/33	1.70		1.20	
ME/2150/30	1.75		1.10	and an about the state
ME/2130/37	1.05		1.10	Salar a secondaria
MF/2158/38	1.69		1.10	

Dinosorex sp. from Bełchatów A. Dimension of upper and lower teeth (in mm)

S y s t e m a t i c p o s i t i o n. The size of specimens, the presence of strong, smooth  $I_1$  and strong protocones and hypocones in  $M^1$  and  $M^2$  allow us to assign those teeth to the genus *Dinosorex*. The size of the lower molars (see scatter-diagram, Fig. 5) and the direct contact of their hypolophids with the entoconids ("modus A") refer these teeth to *D. zapfei*. They however differ from this last species in much stouter  $I^1$ , much stronger and longer  $I_1$ , the square outline of the lingual side of  $P^4$  and the presence of rather high (although V-shaped) entoconid crests in  $M_1$  and  $M_2$ .

From *D. pachygnatus* the Bełchatów A specimens differ in smaller (especially lower) molars, the presence of "modus A" in  $M_1$  and  $M_2$  and the shape and size (bigger) of  $P^4$ .

In comparison with *D. sansaniensis* they have also smaller molars, which are characterized by a direct contact of the hypolophids with the entoconids ("modus A").

This mixture of different species characters does not allow us to assign the specimens from Belchatów A to any known species of *Dinosorex*. On the other hand, the material is too scarce and fragmentary to describe a new species.

Heterosoricinae gen. et sp. indet.

#### Bełchatów C, MN4

Material and measurements (in mm). M<sub>1</sub> dext. (figured) L 2.16, W 1.27 (No. MF/2162/1).

Description of material. This tooth is characterized by direct contact of the hypolophid with the entoconid ("modus A"). Its talonid is wider than the trigonid. The protoconid/hypoconid valley opens near the buccal cingulum. The cingulum is large on the buccal and particularly on the posterior side of the tooth. It continues to the hypolophid and forms a vertical band in the postero-lingual corner of the tooth. The low entoconid crest is present. The paraconid and metaconid are not close to each other and, as a result, the trigonid valley is wide (Fig. 4E).

S y s t e m a t i c p o s i t i o n. The presence of a relatively wide trigonid valley in this molar allows us to be sure that we are concerned with  $M_1$  and not with  $M_2$ , generally similar to M1 but different in having this valley narrow. The small size of the tooth refers it to the genus *Heterosorex*. On the other hand, the presence of such a morphological feature as "modus A" (hypolophid closely conected with the entoconid) indicates its membership in *Dinosorex zapfei*, the only heterosoricine species known so far for this feature. All the species of *Dinosorex* (also *D. zapfei*), even the oldest ones, described from localities resembling Bełchatów in age (Early Miocene) are, however much bigger. Also other characters, such as the presence of a low entoconid crest and of wide bucco-posterior cingulum forming the vertical band in the postero-lingual corner of the tooth, speak against its inclusion in *D. zapfei*. So far there is no uniform opinion about the validity of particular features, especially about the validity of modi (A and B) in heterosoricids' identification. The identification of isolated teeth, bearing mixed features of different species, is therefore particularly difficult.

Soricidae gen. et sp. indet.

### Bełchatów B, MN5/6

Material and measurements (in mm). I<sub>1</sub> sin. (broken, proximal part only, figured) W 1.01 (No. MF/2154/1).

Description of material. The posterior (proximal) margin of the crown (the base) is characterised by a depression. A cingulum is present along the buccal margin, but it is not very pronounced. The depression between two cuspules is deep and V-shaped (Fig. 1C).

Systematic position. The base of the crown is very untypical and it is difficult to say whether it is pathological or not. Nothing more can be said about it.

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