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Pliocene and Pleistocene *Insectivora* (*Mammalia*) of Poland. VIII. *Soricidae*: *Sorex* LINNAEUS, 1758, *Neomys* KAUP, 1829, *Macroneomys* FEJFAR, 1966, *Paenelimnoecus* BAUDELOT, 1972 and *Soricidae* indeterminata.

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RZEBIK-KOWALSKA B., Pliocene and Pleistocene *Insectivora* (*Mammalia*) of Poland. VIII. *Soricidae*: *Sorex* LINNAEUS, 1758, *Neomys* KAUP, 1829, *Macroneomys* FEJFAR, 1966, *Paenelimnoecus* BAUDELOT, 1972 and *Soricidae* indeterminata. Acta zool. cracov., 34(2): 323-424.

Abstract. Three new species of the genus *Sorex* are described from the Pliocene of Poland: *S. casimiri* n. sp., *S. pseudoalpinus* n. sp. and *S. polonicus* n. sp. Fifteen further species of the genus *Sorex* have been noted in 18 Pliocene and Pleistocene localities. One species of the genus *Neomys* and one of *Macroneomys* have also been found. One mandibular fragment of *Paenelimnoecus* is described. Additionally, 8 more forms of indeterminate *Soricidae* were represented in the material studied. The systematic position of the above-mentioned taxa, their measurements and illustrations are given.

Key-words: fossil mammals, *Insectivora*, *Soricidae*, Pliocene, Pleistocene, Poland.

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I. INTRODUCTION

The present paper is the eighth part of the series of studies concerning the remains of insectivores from the Neogene and the Pleistocene of Poland. The previous papers (RZEBIK-KOWALSKA 1971, 1975, 1976, 1981, 1989, 1990 a and b) dealt with *Erinaceidae*, *Desmaninae* and *Soricidae* (*Paranourosorex*, *Amblycoptus*, *Beremendia*, *Blarinoides*, *Neomysorex*, *Episoriculus*, *Petenyia*, *Blarinella*, *Deinsdorfia*, *Zelceina*, *Mafia*, *Sulimskia*, and *Paenelimnoecus*). The present study is devoted to four genera of the family *Soricidae*: *Sorex* LINNAEUS, 1758, *Neomys* KAUP, 1829, *Macroneomys* FEJFAR, 1966 and *Paenelimnoecus* BAUDELOT, 1972. The members of this last genus were described in a previous paper (part VII). However, a fragmentary mandible, which is very typical of but much bigger than the known specimens of *P. pannonicus*, was found later (after the issue of part VII) and seems to deserve a description.

As part VIII is the last of the series dealing with the material, it contains also a description of remains which do not belong to the forms already described, but are too fragmentary to allow the creation of new names.

A short description of the localities from which the material for this study has been obtained is given in previous papers of this cycle. Measurements were taken according to the pattern presented in my papers of 1976 and 1988a. The lists of denominations placed below the successive species contain only the names used for forms found in materials from Poland. The highest number of identical elements (e.g., right first lower molar, M_1) has been assumed to be the minimum number of individuals.

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

I am indebted to Mr. Marek KAPTURKIEWICZ for the illustrations.

II. SYSTEMATIC PART

Family *Soricidae* FISCHER VON WALDHEIM, 1817

Subfamily *Soricinae* FISCHER VON WALDHEIM, 1817

Tribe *Soricini* FISCHER VON WALDHEIM, 1817

Genus *Sorex* LINNAEUS,1758

According to REPENNING (1967), the genus *Sorex* is characterized by: dental formula ($\frac{1-6-3}{1-2-3}$); tooth pigmentation; I_1 with three well-developed cusps on cutting edge; M_1 with entoconid crest connecting entoconid and metaconid; M_3 with unreduced and basined heel; mandibular condyle with articular facets slightly to moderately separated, lower facet extending labially to or beyond plane of mandible at lower sigmoid notch and interarticular area of condyle not appreciably constricted; mental foramen usually below protoconid of M_1 or anteriorly of this point; P^4 and M^1 with strong emargination of posterior basal outline and P^4 with protocone not as lingual in position as hypoconal flange.

In his work of 1984 REUMER added two more features: the long and slender angular process and the slightly concave ventral margin of the elongate mandible.

All these characters can be found in materials discussed below as belonging to this genus.

Sorex minutus LINNAEUS,1758

(Text-figs. 1-2)

1956 - *Sorex* sp., K. KOWALSKI, Insectivores, bats..., pp. 351 - 352, Pl. II, fig. 1.

1958a - *Sorex* sp., K. KOWALSKI, An Early Pleistocene fauna..., p.12, Text-fig. 3.

1959 - *Sorex* cf. *minutus* LINNAEUS, 1766, A. SULIMSKI, Pliocene insectivores..., pp. 142-143, Pl.IV, fig. 3a, b.

1960a - *Sorex* cf. *minutus* LINNAEUS, 1766, K. KOWALSKI, Pliocene insectivores..., p. 168, Pl.XX, fig. 3.

1962a - *Sorex minutus* LINNAEUS, 1766, A. SULIMSKI, Supplementary studies..., pp. 460-461, Pl.II, fig.5, Text-fig. II, fig. 3a-b.

1962b - *Sorex* cf. *minutus* L., A.SULIMSKI, Discovery of the fossil vertebrate..., p. 221.

1963 - *Sorex minutus* LINNAEUS, 1766, K. KOWALSKI et al., The postglacial fauna..., pp. 20-21.

1964 - *Sorex minutus* LINNAEUS, 1766, K. KOWALSKI, Palaeoecology of mammals..., p. 77.

1964 - *Sorex minutus* L. (1766), B.STACH, Remains of insectivores..., p. 10. (thesis).

1967 - *Sorex minutus* LINNAEUS, 1766, K. KOWALSKI et al., A study of the deposits..., pp. 18, 21.

1982 - *Sorex* cf. *minutus* LINNAEUS, P. BOSÁK et al., New locality of Early Pleistocene..., p. 221.

1983 - *S. minutus* L., Z. BOCHEŃSKI et al., Upper Holocene fauna..., p. 451.

Material. The list of specimens is given in Table I. It contains remains of maxillae and mandibles with teeth of all types and processes except the angular process.

Description of material. This species is still living and widely distributed in Eurasia. As it is also very well known from the Pliocene and Pleistocene localities of Europe its description seems superfluous. A description of detailed morphology and synonymy of the fossil members of this form can be found in REUMER (1984). In the present paper only some differences between Hungarian, Dutch and Polish as well as fossil and recent populations will be discussed.

As far as they are known, the European fossil specimens are of similar size. The Polish specimens are only slightly smaller than those of similar age from Tegelen and Villany 3.

Recent populations of *S. minutus* are also more or less the same size. So, e.g., the maximum height of the ascending ramus of the mandible is 3.25 mm in specimens from Poland, 3.40 mm in specimens from France (JAMMOT 1977) and 3.20 mm in those from Siberia (JUDIN 1989) and Germany (HUTTERER 1990a). The maximum value of this measurement in the European Pleistocene localities does not exceed 3.40 mm (HINTON 1911, RABEDER 1972, KOENIGSWALD 1973, BARTOLOMEI 1964).

This dimension is strikingly greater (up to 3.61 mm) in shrews from Osztramos 3/2 in Hungary identified as *S. minutus* (REUMER 1984). It is also much greater than in the Polish fossil material where the maximum height of this ramus is 2.90 mm in the Early Pliocene Podlesice, 3.37 mm in the final Early Pleistocene Zamkowa Dolna Cave C and 3.06 mm in the Late Pleistocene Nietoperzowa Cave.

As regards recent populations, Greece, where, according to HUTTERER (1990a), this element reaches 4.10 mm is an exception. As the size of the specimens identified as S. *minutus* from Osztramos 3/2 is clearly bigger than that of all the fossil and almost all recent members of this species, it is possible that we are concerned here with another species, the more so because Osztramos 3/2 is a Pliocene locality.

Table I

Sorex minutus LINNAEUS, 1766

Locality	Number of fragmentary maxillae and detached upper teeth	Number of fragmentary mandibles and detached lower teeth	Total	Minimum number of individuals
Podlesice MF/6	2	20	22	9
Zalesiaki 1B MF/1950	0	5	5	2
Węże 1 MF/1949	17	26	43	14
Rębielice Królewskie 1A MF/65	4	47	51	30
Rębielice Królewskie 2 MF/1951	0	5	5	3
Kielniki 3B MF/1952	0	8	8	6
Kadzielnia MF/30	0	5	5	3
Kielniki 3A MF/1953	0	2	2	1
Zalesiaki 1A MF/1954	1	15	16	6
Zamkowa Dolna Cave C MF/1955	4	74	78	30
Kozi Grzbiet MF/1956	3	26	29	14

An analysis of the remains from eleven Polish localities shows that the older, e.g., Ruscinian and Villanyian specimens are slightly smaller and more slender than the Biharian and Recent ones. The specimens from Zamkowa Dolna Cave C and Kozi Grzbiet are slightly bigger, or rather more massive than those from the recent Polish populations. On the other hand, in the Ruscinian material the members of this species from Węże 1 (MN15) are the smallest. It is interesting to note that at Węże 1 most of the taxa (not only shrews, but also rodents) are smaller than the animals of the same lineages in geologically older and younger localities.

Some morphological differences can also be seen between the fossil and the recent *S. minutus*. First of all, the coronoid process of the Ruscinian and Villanyian shrews is, as a

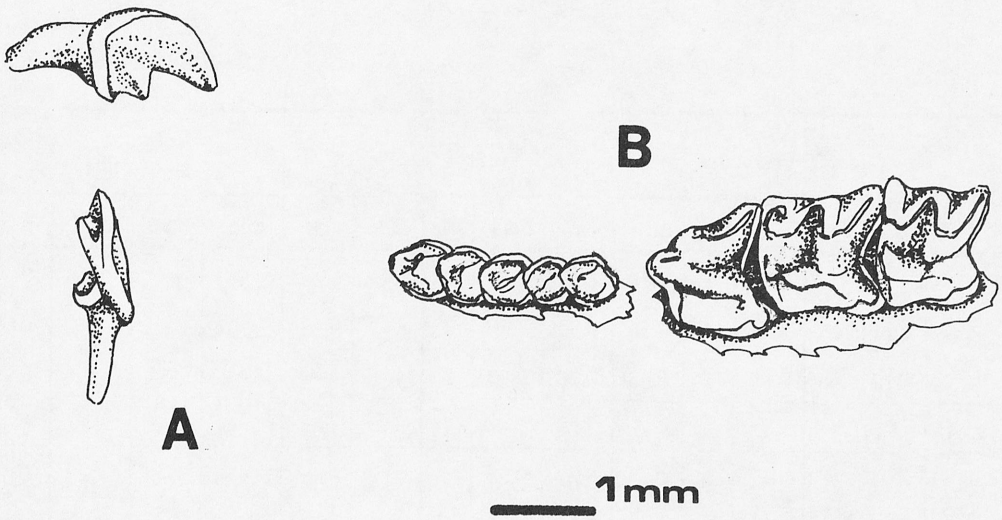

Fig.1. *Sorex minutus*. A - right I^1 from Podlesice, spec. no. MF/6/1, B - fragment of right maxilla (broken) with A^1-M^2 from Węże 1, spec. no. MF/1949/4.

rule, nearly straight. As concerns mandibular foramina, there are always two of them in recent material, whereas in Podlesice there is only one, in Węże 1 and Rębielice Królewskie 1A two, and in Zalesiaki 1A two separated or confluent.

The morphology of the fossil upper dentition is similar to that of the recent teeth, with the exception of the Węże 1 material, where metalophs of M^1 and M^2 are weaker or absent.

Measurements. See Tables II and III.

Systematic position and distribution. The resemblances, mainly in size, but also in morphology (for example: the presence of the fissident upper incisor I^1, A^5 totally visible from the external side and so on), refer these remains to *S. minutus*.

Another small species of *Sorex* which should be taken into consideration is *S. praeminutus*. JAMMOT (1977) thinks, however, that both the material and the diagnosis of it are not sufficient to erect a new species. Besides, its dimensions and morphology lie within the range of variation of *S. minutus*. Described by HELLER (1963) from the Biharian (Q_2) locality Deinsdorf in Germany, according to that author *S. praeminutus* precedes in time *S. minutus*. The presence of *S. minutus* in much older Pliocene localities does not, however, confirm this opinion.

Sorex biharicus described by TERZEA (1970) from Romania and dating from the last glaciation is according to JAMMOT (1977) and others, also a synonym of *S. minutus*. Its supposedly different A_1 with a second cuspule is very often present also in *S. minutus*.

SULIMSKI (1962a) described a new species *S. subminutus* from Węże 1. According to his personal communication the material from that locality got lost. The dimensions published for *S. subminutus* are very small: the height of the ascending ramus of the

Sorex minutus
Dimensions of upper

		Podlesice		Węże 1						Rębielice Królewskie 1A			
			n	min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n
I^1	L	1.13	1	1.16	1.17	1.18	2	–	–	–	–	–	0
	L of talon	0.51	1	0.56	0.58	0.60	3	–	–	–	–	–	0
	H of talon	0.89	1	0.88	0.90	0.93	3	–	–	–	–	–	0
A^1-A^5	l		0	–	2.26	–	1	–	–	–	–	–	0
A^1	L	–	0	0.59	0.62	0.65	2	–	–	–	–	–	0
	W	–	0	0.57	0.58	0.60	2	–	–	–	–	–	0
A^2	L	–	0	0.58	0.59	0.60	2	–	–	–	–	–	0
	W	–	0	0.57	0.58	0.59	2	–	–	–	–	–	0
A^3	L	–	0	0.40	0.47	0.55	2	–	–	–	–	–	0
	W	–	0	0.53	0.54	0.55	2	–	–	–	–	–	0
A^4	L	–	0	0.43	0.48	0.51	3	–	–	–	–	–	0
	W	–	0	0.50	0.52	0.56	3	–	–	–	–	–	0
A^5	L	–	0	0.36	0.42	0.52	4	–	–	–	–	–	0
	W	–	0	0.48	0.50	0.53	4	–	–	–	–	–	0
P^4	L (bucc.)	1.29	1	1.15	1.23	1.34	11	0.06	4.88	1.22	1.24	1.26	2
M^1	L (max.)	1.22	1	1.09	1.23	1.36	15	0.06	4.88	1.21	1.24	1.27	3
	L (med.)	0.96	1	0.90	0.97	1.05	15	0.05	5.15	0.93	0.98	1.04	3
	W (max.)	1.38	1	1.23	1.41	1.48	16	0.08	5.67	1.41	1.46	1.51	3
M^2	L (max.)	1.14	1	1.09	1.10	1.16	8	0.03	2.65	1.11	1.12	1.13	3
	L (med.)	0.92	1	0.80	0.88	0.95	9	0.05	5.68	0.90	0.92	0.93	3
	W (ant.)	1.18	1	1.22	1.27	1.35	8	0.05	3.85	1.26	1.29	1.31	3
	W (post.)	1.30	1	1.23	1.29	1.33	8	0.04	3.10	1.23	1.29	1.32	3
M^3	L	–	0	0.65	0.65	0.66	2	–	–	–	–	–	0
	W	–	0	1.12	1.12	1.12	2	–	–	–	–	–	0

Table II

LINNAEUS, 1766
dentition (in mm)

Zalesiaki 1A		Zamkowa Dolina Cave C				Kozi Grzbiet		Poland (recent)					
	n	min.	$\bar{x}$	max.	n		n	min.	$\bar{x}$	max.	n	sd	cv
–	0	–	–	–	0	1.04	1	0.97	1.06	1.20	27	0.05	4.72
–	0	–	–	–	0	0.57	1	0.45	0.52	0.63	33	0.04	7.69
–	0	–	–	–	0	0.85	1	0.83	0.95	1.02	23	0.04	4.21
–	0	–	–	–	0	–	0	2.02	2.21	2.35	36	0.08	3.62
–	0	–	–	–	0	0.67	1	0.60	0.66	0.72	38	0.03	4.54
–	0	–	–	–	0	0.58	1	0.52	0.59	0.63	38	0.02	3.39
–	0	–	–	–	0	0.56	1	0.50	0.57	0.64	40	0.04	7.02
–	0	–	–	–	0	0.53	1	0.47	0.55	0.61	40	0.03	5.45
–	0	–	–	–	0	0.60	1	0.54	0.59	0.63	40	0.03	5.08
–	0	–	–	–	0	0.51	1	0.49	0.54	0.60	40	0.02	3.70
–	0	–	–	–	0	–	0	0.40	0.50	0.55	40	0.03	6.00
–	0	–	–	–	0	–	0	0.43	0.49	0.55	40	0.03	6.12
–	0	–	–	–	0	–	0	0.44	0.51	0.57	38	0.03	5.88
–	0	–	–	–	0	–	0	0.45	0.51	0.56	38	0.03	5.88
1.20	1	–	–	–	0	1.23	1	1.09	1.20	1.29	40	0.04	3.33
1.20	1	1.24	1.27	1.30	3	–	0	1.16	1.21	1.33	39	0.04	3.31
0.93	1	0.98	1.01	1.02	3	–	0	0.89	0.93	0.99	39	0.02	2.15
1.28	1	1.30	1.38	1.43	3	–	0	1.25	1.38	1.47	39	0.05	3.62
–	0	1.05	1.10	1.17	3	–	0	1.01	1.09	1.15	39	0.03	2.75
–	0	0.85	0.91	0.95	3	–	0	0.80	0.86	0.93	39	0.03	3.49
–	0	1.21	1.28	1.32	3	–	0	1.11	1.20	1.27	39	0.04	3.33
–	0	1.21	1.27	1.30	3	–	0	1.14	1.24	1.30	39	0.04	3.23
–	0	–	–	–	0	–	0	0.60	0.67	0.71	40	0.03	4.48
–	0	–	–	–	0	–	0	0.98	1.06	1.17	39	0.04	3.77

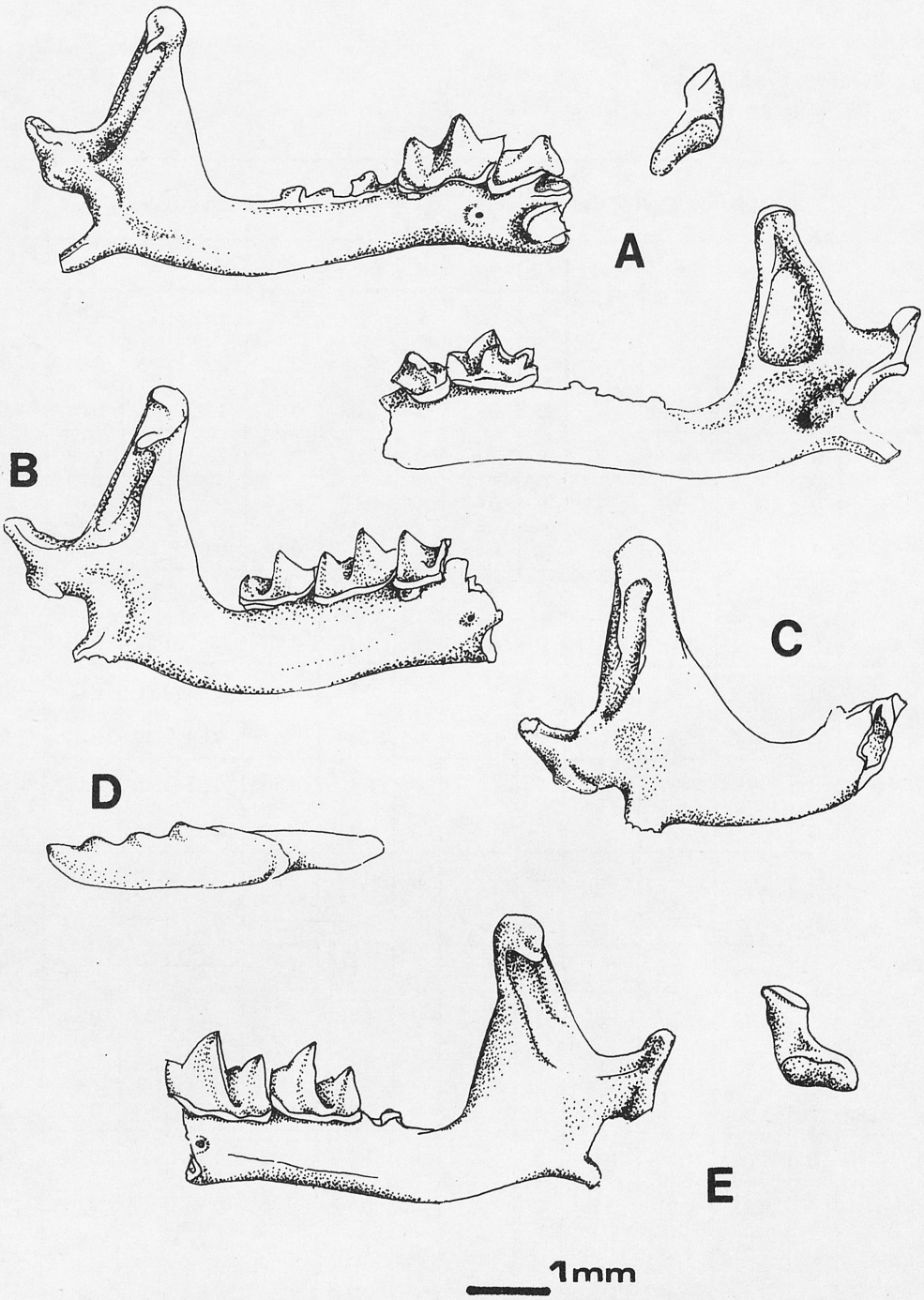

Fig.2. *Sorex minutus*. A - right mandible with P_4-M_1 from Podlesice, spec. no. MF/6/1, B - fragment of right mandible with M_1 (broken) - M_3 from Rębielice Królewskie 1A spec. no. MF/65/22, C - fragment of right mandible from Kadzielnia, spec. no. MF/30/3, D - left I_1 from Zamkowa Dolna Cave C, spec. no. MF/1955/46, E - fragment of left mandible with M_1-M_2 from Kozi Grzbiet, spec. no. MF/1956/2.

mandible equals 2.5-2.8 mm (n=15) and the height of the mandible under M_2 0.4-0.6 mm (n=24). Besides, I^1 of this species is non bifid. In my abundant material from Węże 1 there were no specimens with these characteristics. Without access to the original material of *S. subminutus* it is difficult to decide its taxonomic position. A possible explanation would be that SULIMSKI's material belongs to *S. minutus* but his measuring methods were different (although I^1 differ in these two species). Neither can *S. subminutus* be an ancestor of *S. minutus*, because this last occurred in localities older than Węże 1. *S. subminutus* has never been discovered outside the type locality with the exception of Montoussé 5 in France from where it was mentioned in the faunal list without any further data (CLOT et al., 1976). In his thesis of 1977 JAMMOT writes that it is absent in France but mentioned from Iles Medas in Spain.

If *S. subminutus* is specifically different from *S. minutus* it could rather be relative to *S. minutissimus* (see p. 341).

So we can state that, although the Pliocene and the Early Pleistocene populations of *S.minutus* are a little different from the present ones, the differences are not sufficient to recognize them to be different species.

As mentioned above, now *S. minutus* inhabits a big geographical area, containing Europe from North Spain and Ireland in the West to the European part of the S.U. in the East, Caucasus, Siberia and the Far East including Sakhalin, China and Japan. In favourable environments it can be met with anywhere in Poland. It is also very often present in European fossil localities.

Hitherto, the oldest revised locality with *S. minutus* was Osztramos 7 (Hungary), dated to MN15/16. My studies show that *S. minutus* was already present at Podlesice, that is, in the Early Pliocene (MN14).

Outside Poland the fossil *S. minutus* was noted among others in the Pliocene localities of: Czechoslovakia (Ivanovce; FEJFAR 1966), Hungary (Csarnóta 2, Osztramos 7, Villány 3; REUMER 1984), Germany (Schernfeld; DEHM 1962), Netherlands (Tegelen; REUMER 1984), France (Valerots Caves; CHALINE 1972) and the Soviet Union (near Ufa; SUKHOV 1976).

Besides, many Pleistocene localities yield remains of this shrews. Among the Biharian ones there are: Sackdilling (HELLER 1956), Husarenhof 4 (KOENIGSWALD 1973) in Germany, Chlum (FEJFAR 1964), Přezletice (FEJFAR 1964), Stránská Skála (MUSIL 1965, 1968) in Czechoslovakia, Deutsch-Altenburg 2 (RABEDER 1973) in Austria and Montagnola Senese (FONDI 1972) in Italy.

It is also very often found in the Middle and Late Pleistocene localities of Europe, among others at Westbury-sub-Mendip (BISHOP 1982) and Tornewton Cave (RZEBIK 1968) in England, at Petersbuch (KOENIGSWALD 1970) in Germany, at Hotilor Cave (TERZEA 1971) in Romania, at Morovitsa Cave (POPOV 1989) in Bulgaria, at Potočka Zijalka (RAKOVEC 1956) in Jugoslavia and at Spessa III (BARTOLOMEI 1964) in Italy.

Sorex minutus
Dimensions of mandible and

		Podlesice						Zalesiaki 1B			
		min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n
I_1	L	–	–	–	0	–	–	–	–	–	0
	H	0.61	0.62	0.64	3	–	–	–	–	–	0
A_1	L (bucc.)	0.65	0.76	0.87	3	–	–	–	–	–	0
P_4	L (bucc.)	0.84	0.88	0.97	8	0.04	4.54	–	0.86	–	1
	L of talonid (bucc.)	0.32	0.40	0.45	3	–	–	–	0.45	–	1
	W (occl.)	0.48	0.52	0.55	7	0.02	3.85	–	0.53	–	1
M_1	L (occl.)	1.06	1.14	1.21	17	0.04	3.51	1.19	1.19	1.20	2
	W (occl.)	0.62	0.66	0.70	16	0.02	3.03	0.67	0.69	0.71	2
M_2	L (occl.)	0.94	1.01	1.08	15	0.04	3.96	0.92	1.05	1.10	4
	W (occl.)	0.60	0.63	0.67	15	0.02	3.17	0.57	0.65	0.72	4
M_3	L (occl.)	0.88	0.93	0.96	5	–	–	–	0.87	–	1
	W (occl.)	0.49	0.50	0.52	4	–	–	–	0.47	–	1
M_1-M_3	L (occl.)	2.93	2.99	3.06	4	–	–	–	–	–	0
H of mandible below M2		0.83	0.92	1.03	18	0.6	6.52	0.88	0.94	0.96	4
H of ascending ramus		2.85	2.87	2.90	2	–	–	–	2.80	–	1
W of coronoid process		0.51	0.52	0.53	2	–	–	–	0.49	–	1
H of condyloid process		1.21	1.36	1.51	2	–	–	1.26	1.38	1.51	2
W of interarticular area		0.39	0.44	0.51	3	–	–	0.41	0.47	0.54	2

Table III

LINNAEUS, 1766
lower dentition (in mm).

Węże 1						Rębielice Królewskie 1A					
min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n	sd	cv
2.35	2.44	2.54	2	–	–	–	–	–	0	–	–
0.64	0.66	0.68	3	–	–	–	0.65	–	1	–	–
–	0.87	–	1	–	–	–	–	–	0	–	–
0.87	0.90	0.96	6	–	–	0.81	0.83	0.87	3	–	–
0.38	0.44	0.51	7	0.05	9.09	0.43	0.45	0.47	3	–	–
0.48	0.55	0.59	7	0.03	5.45	0.49	0.51	0.55	3	–	–
1.08	1..11	1.15	14	0.02	1.80	1.10	1.17	1.23	19	0.03	2.56
0.63	0.66	0.74	14	0.03	4.54	0.60	0.66	0.75	21	0.03	4.54
0.96	1.00	1.07	22	0.03	3.00	0.95	1.03	1.10	20	0.04	3.88
0.57	0.62	0.70	22	0.03	4.84	0.58	0.62	0.69	20	0.03	4.84
0.85	0.90	0.95	18	0.03	3.33	0.89	0.93	0.96	9	0.02	2.15
0.45	0.50	0.57	18	0.02	4.00	0.49	0.52	0.55	9	0.02	3.85
2.83	2.90	3.08	9	0.08	2.76	2.98	3.03	3.08	6	–	–
0.85	0.93	1.02	22	0.05	5.38	0.82	0.89	1.01	29	0.05	5.62
2.85	2.99	3.08	6	–	–	2.78	2.93	3.17	18	0.11	3.75
0.45	0.51	0.60	8	0.05	9.80	0.48	0.54	0.60	23	0.03	5.56
1.35	1.42	1.45	5	–	–	1,15	1.28	1.38	17	0.06	4.69
0.46	0.49	0.56	6	–	–	0.33	0.45	0.53	20	0.04	8.89

		Rębielice Królewskie 2				Kielniki 3B					
		min.	$\bar{x}$	max.	n	min.	$\bar{x}$	max.	n	sd	cv
I_1	L	–	–	–	0	–	–	–	0	–	–
	H	–	–	–	0	–	–	–	0	–	–
A_1	L (bucc.)	–	–	–	0	–	0.94	–	1	–	–
P_4	L (bucc.)	–	–	–	0	–	–	–	0	–	–
	L of talonid (bucc.)	–	–	–	0	–	–	–	0	–	–
	W (occl.)	–	–	–	0	–	–	–	0	–	–
M_1	L (occl.)	1.16	1.16	1.16	2	1.21	1.23	1.26	4	–	–
	W (occl.)	0.66	0.66	0.66	2	0.66	0.74	0.78	5	–	–
M_2	L (occl.)	–	1.07	–	1	1.04	1.12	1.18	6	–	–
	W (occl.)	–	0.65	–	1	0.62	0.69	0.73	7	0.04	6.67
M_3	L (occl.)	–	–	–	0	0.94	0.99	1.03	6	–	–
	W (occl.)	–	–	–	0	0.53	0.58	0.64	6	–	–
M_1-M_3	L (occl.)	–	–	–	0	3.20	3.29	3.37	2	–	–
H of mandible below M2		0.83	0.88	0.96	4	0.89	1.04	1.11	7	0.08	7.69
H of ascending ramus		–	3.03	–	1	–	3.25	–	1	–	–
W of coronoid process		–	0.49	–	1	–	0.75	–	1	–	–
H of condyloid process		–	–	–	0	–	–	–	0	–	–
W of interarticular area		–	0.59	–	1	–	0.49	–	1	–	–

Table III ctd

Kadzielnia				Kielniki 3A				Zalesiaki 1A					
min.	$\bar{x}$	max.	n	min.	$\bar{x}$	max.	n	min.	$\bar{x}$	max.	n	sd	cv
–	–	–	0	–	–	–	0	2.66	2.69	2.74	4	–	–
–	–	–	0	–	–	–	0	0.66	0.68	0.71	4	–	–
–	–	–	0	–	0.98	–	1	–	0.81	–	1	–	–
–	–	–	0	–	1.03	–	1	0.82	0.84	0.86	2	–	–
–	–	–	0	–	0.47	–	1	0.46	0.50	0.54	2	–	–
–	–	–	0	–	0.59	–	1	0.53	0.53	0.53	2	–	–
1.29	1.30	1.31	2	–	1.22	–	1	1.17	1.22	1.25	6	–	–
0.72	0.73	0.75	2	–	0.75	–	1	0.70	0.71	0.74	7	0.01	1.41–
1.13	1.14	1.14	3	1.12	1.12	1.12	2	1.04	1.07	1.10	6	–	–
0.68	0.68	0.69	3	0.68	0.70	0.73	2	0.66	0.68	0.70	6	–	–
–	1.03	–	1	0.96	0.97	0.99	2	0.95	0.97	1.01	8	0.02	2.06
–	0.56	–	1	0.55	0.58	0.61	2	0.53	0.54	0.56	8	0.01	1.85
–	–	–	0	–	3.26	–	1	3.13	3.18	3.28	4	–	–
0.95	0.98	1.00	4	1.05	1.08	1.12	2	0.86	0.90	0.93	9	0.03	3.33
3.25	3.33	3.43	3	–	–	–	0	3.04	3.12	3.21	7	0.06	1.92
0.66	0.67	0.68	3	–	–	–	0	0.51	0.55	0.60	7	0.04	7.27
1.48	1.52	1.57	2	–	–	–	0	1.50	1.50	1.50	2	–	–
0.45	0.48	0.51	2	–	–	–	0	0.50	0.53	0.57	6	–	–

		Zamkowa Dolna Cave C					
		min.	$\bar{x}$	max.	n	sd	cv
I_1	L	2.75	2.99	3.13	13	0.10	3.34
	H	0.67	0.73	0.77	13	0.03	4.11
A_1	L (bucc.)	–	0.76	–	1	–	–
P_4	L (bucc.)	0.85	0.90	0.95	2	–	–
	L of talonid (bucc.)	0.47	0.50	0.54	2	–	–
	W (occl.)	0.61	0.61	0.61	2	–	–
M_1	L (occl.)	1.23	1.28	1.32	25	0.03	2.34
	W (occl.)	0.62	0.72	0.80	25	0.04	5.55
M_2	L (occl.)	1.05	1.14	1.18	22	0.03	2.63
	W (occl.)	0.58	0.68	0.72	22	0.03	4.41
M_3	L (occl.)	0.97	1.00	1.05	4	–	–
	W (occl.)	0.54	0.57	0.59	4	–	–
M_1-M_3	L (occl.)	3.21	3.27	3.33	2	–	–
H of mandible below M2		0.93	1.01	1.10	36	0.04	3.96
H of ascending ramus		3.07	3.24	3.37	10	0.09	2.77
W of coronoid process		0.54	0.63	0.76	10	0.06	9.52
H of condyloid process		1.32	1.42	1.55	8	0.07	4.93
W of interarticular area		0.40	0.48	0.54	13	0.04	8.33

Table III ctd

Kozi Grzbiet						Poland (recent)					
min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n	sd	cv
–	2.96	–	1	–	–	2.52	2.69	2.85	34	0.08	2.97
–	0.66	–	1	–	–	0.60	0.66	0.70	40	0.03	4.54
–	–	–	0	–	–	0.62	0.73	0.83	38	0.04	5.48
0.85	0.87	0.89	2	–	–	0.77	0.90	0.99	40	0.05	5.60
0.42	0.46	0.50	2	–	–	0.42	0.50	0.59	40	0.04	8.00
–	0.51	–	1	–	–	0.48	0.52	0.58	40	0.03	5.77
1.13	1.18	1.25	11	0.04	3.39	1.11	1.18	1.25	40	0.03	2.54
0.63	0.69	0.75	12	0.04	5.80	0.66	0.70	0.75	40	0.02	2.86
0.98	1.04	1.08	18	0.03	2.88	0.99	1.06	1.10	40	0.03	2.83
0.59	0.64	0.70	20	0.03	4.69	0.58	0.66	0.72	40	0.03	4.54
0.90	0.95	1.00	12	0.03	3.16	0.91	0.97	1.04	40	0.03	3.09
0.51	0.53	0.56	11	0.02	3.77	0.48	0.52	0.57	40	0.02	3.85
3.08	3.13	3.17	5	–	–	3.00	3.14	3.28	40	0.07	2.23
0.78	0.90	1.06	22	0.07	7.78	0.86	0.93	1.08	40	0.05	5.38
2.98	3.05	3.09	3	–	–	2.90	3.12	3.25	40	0.08	2.56
0.62	0.67	0.76	3	–	–	0.48	0.58	0.69	40	0.06	10.34
1.38	1.45	1.52	2	–	–	1.37	1.51	1.62	39	0.06	3.97
0.48	0.53	0.62	3	–		0.41	0.49	0.56	40	0.04	8.16

Sorex minutissimus ZIMMERMANN, 1780
(Text-fig. 3)

1964 - *Sorex minutissimus* ZIMMERMANN (1780), B. STACH, Remains of insectivores ..., pp. 11-12. (thesis).

Material. The list of specimens is given in Table IV. It contains one fragment of a maxilla with P^4 and some fragments of mandibles with all teeth except A_1 and processes with the exception of the angular process.

Description of material. The rostrum is depressed above the antemolars. The deepest part is situated above A^3-A^4. The infraorbital foramen in the shape of a triangle with rounded corners lies between the middle of the length of the paracone of P^4 and the mesostyle of M^1. The oval lacrimal aperture is situated above the metastyle of M^1. The five alveoli of the upper antemolars diminish in size from A^1 to A^5. The smallest is partially hidden behind the parastyle of P^4.

Table IV

Sorex minutissimus ZIMMERMANN, 1780

Locality	Number of fragmentary maxillae and detached upper teeth	Number of fragmentary mandibles and detached lower teeth	Total	Minimum number of individuals
Kozi Grzbiet MF/1938	1	10	11	7
Mamutowa Cave, layer 2 MF/1938	0	2	2	1
Nietoperzowa Cave, 18 MF/1939	0	1	1	1

P^4 is narrow. Its parastyle is rather long, the parastylar crest of the medium height. The L-shaped protocone is separated from the hypocone by a wide, shallow valley. This valley is closed on the inner side by a sharp ridge. The hypocone is very small. It forms the beginning of the cingulum surrounding the hypoconal flange and posterior margin of the tooth. The hypoconal flange is rather flat and not very wide. A weak cingulum is also visible around the parastyle. The emargination of P^4 is considerable. The pigmentation is red.

The horizontal ramus of the mandible is comparatively massive, its lower margin is concave. It meets the ascending ramus at a slightly obtuse angle. The coronoid process is narrow, rounded at the tip and bending slightly anteriorly and lingually. The U-shaped coronoid spicule is protruding. The external temporal fossa is very distinct. It is deep below

the coronoid spicule, and bordered by a ridge which runs parallel to the posterior edge of the coronoid process. It reaches below the upper sigmoid notch (¼ of the condyle length). The internal temporal fossa is narrow, the weak horizontal bar is present. Two mandibular foramina are situated in a groove. The mental foramen lies below the buccal re-entrant valley of M_1 or a little farther to the front, anteriorly, but not farther than the tip of its protocone. The condyloid process is not very high, especially its interarticular area is comparatively short and rather wide. The upper facet is cylindrical, the lower one wide, slightly concave. The weak sigmoid spicule is present.

I_1 is comparatively massive, tricuspulate with distinct cusps and not protruding cingulum. P_4 is big, with a wide cingulum on both sides. Its postero-lingual basin does not reach the cingulum. The *Sorex*-type molars are characterized by their high entoconid crest. The buccal cingulum is rather narrow and protruding, the lingual one very wide. The lower lingual margins of these teeth are navicular, the mesoconids absent. M_2 is smaller than M_1, M_3 is unreduced, with a basined talonid.

Measurements. See Table V.

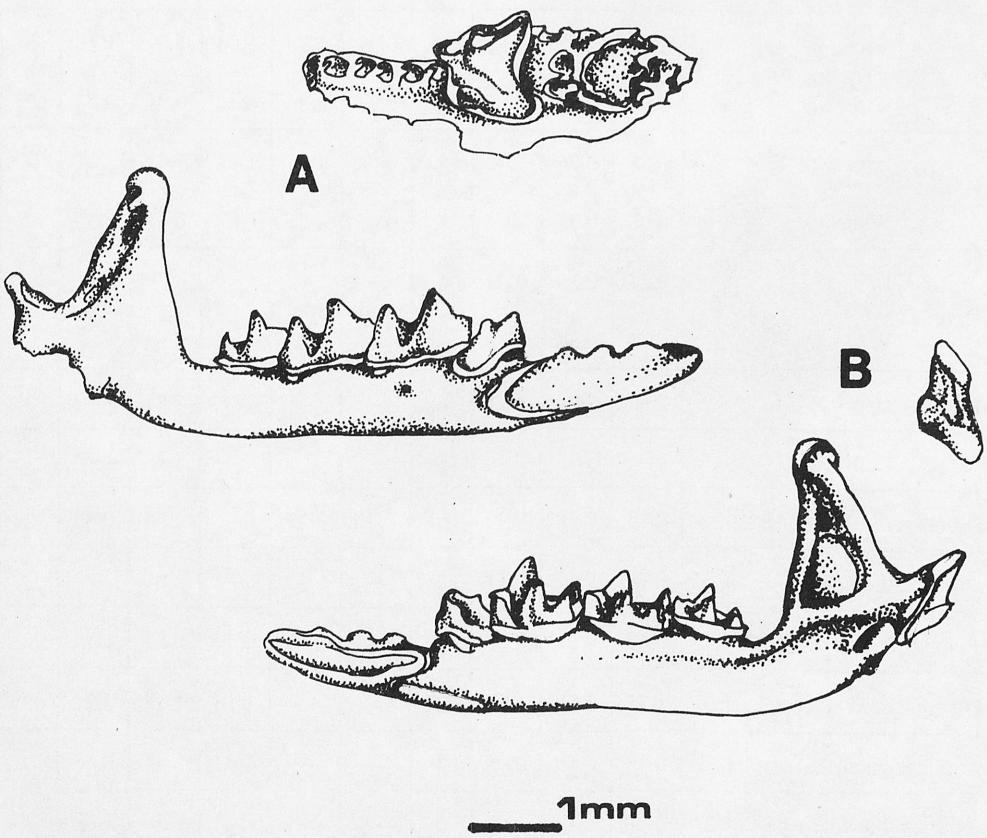

Fig. 3. *Sorex minutissimus*. A - fragment of left maxilla with P^4 from Kozi Grzbiet, spec. no. MF/1937/1, B - right mandible with I_1 and P_4-M_3 from Mamutowa Cave (l. 2), spec. no. MF/1938/1

Table V

Sorex minutissimus ZIMMERMANN, 1780
Dimensions of mandible, upper and lower dentition (in mm).

		Kozi Grzbiet						Mamutowa Cave			
		min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n
P^4	L (bucc.)	–	1.07	–	1	–	–	–	–	–	0
I_1	L	–	–	–	0	–	–	–	2.44	–	1
	H	–	–	–	0	–	–	0.62	0.65	0.68	2
P_4	L (bucc.)	0.85	0.85	0.85	2	–	–	–	0.87	–	1
	L of talonid (bucc.)	0.40	0.41	0.43	2	–	–	–	0.45	–	1
	W (bucc.)	0.51	0.53	0.56	2	–	–	–	0.53	–	1
M_1	L (occl.)	1.02	1.07	1.12	10	0.03	2.80	1.06	1.09	1.13	3
	W (occl.)	0.62	0.68	0.74	10	0.04	5.88	0.70	0.71	0.72	3
M_2	L (occl.)	0.88	0.96	1.00	8	0.04	4.17	1.01	1.01	1.01	2
	W (occl.)	0.58	0.63	0.67	8	0.03	4.76	0.63	0.65	0.67	2
M_3	L (occl.)	0.81	0.85	0.89	6	–	–	–	0.88	–	1
	W (occl.)	0.45	0.52	0.55	6	–	–	–	0.56	–	1
M_1-M_3	L (occl.)	2.75	2.84	2.91	6	–	–	–	2.89	–	1
I_1-M_3	L (occl.)	–	–	–	0	–	–	–	5.40	–	1
H of mandible below M_2		0.85	0.88	0.90	10	0.02	2.27	0.82	0.85	0.88	2
H of ascending ramus		2.73	2.77	2.81	2	–	–	–	2.84	–	1
W of coronoid process		0.57	0.59	0.61	3	–	–	0.49	0.51	0.54	2
H of condyloid process		1.25	1.25	1.25	2	–	–	1.16	1.18	1.21	2
W of interarticular area		0.48	0.48	0.48	3	–	–	0.43	0.44	0.45	2
L of mandible without I_1		–	–	–	0	–	–	–	6.30	–	1

Systematic position and distribution. Very small size, comparatively low condyloid process, massive I_1 with distinct cusps and the position of the mental foramen indicate that the remains described above belong to *S. minutissimus*.

A comparison with the recent *S. minutissimus* from Siberia (JUDIN 1989) shows that the fossil specimens are more delicate, although the very scanty fossil material does not allow a conclusive opinion.

From the recent *S. minutus* our remains differ in their smaller size, more massive I_1 (with more distinct cusps), comparatively lower condyle and mental foramen situated farther to the back.

There are no differences between the fossil remains from different Polish localities either in morphology or in dimensions.

Polish specimens seem to be a little bigger than two mandibles of *S. minutissimus* from the Middle Pleistocene locality Husarenhof 4 in Germany (KOENIGSWALD 1973). According to KOENIGSWALD, the specimens from Husarenhof 4 are similar to the Pliocene *S. subminutus* described from Węże 1 in Poland (SULIMSKI 1962a). The specimens described as *S. subminutus* have nonbifid I^1 and very small dimensions in common with *S. minutissimus*. These two species differ in the position of the mental foramen which in *S. subminutus* is situated farther to the front. The dimensions of *S. subminutus* are also slightly smaller. Such differences can be explained e.g., by the trend towards an increase in size and backward shift of the mental foramen, which changes occur in many evolutionary lineages of shrews. There is a considerable distance of time, however, between the Middle Pliocene Węże 1 with *S. subminutus* and the earliest remains of *S. minutissimus*, which date from the end of the Early Pleistocene. The problem of the evolution of *S. minutissimus* cannot be solved unless new forms have been found such as would bridge this gap.

In Poland this species was noted for the first time by STACH (1964) from layers of Mamutowa and Nietoperzowa Caves, dated to the last glaciation. New material from Kozi Grzbiet shows that it was already present here at the end of the Early Pleistocene. Out of Poland *S. minutissimus* is known from the Lower Pleistocene locality Husarenhof 4 (KOENIGSWALD 1973) and the Middle Pleistocene Breitenberghöhle (BRUNNER 1958) in Germany. It was also found at Cagny (JAMMOT 1974) in France, and at Morovitsa Cave (POPOV 1989) in Bulgaria, which localities are dated to the Middle Pleistocene. In the Late Pleistocene it is mentioned from the sediments of undetermined age of Vivian Vault Chamber at Tornewton Cave in the British Isles (RZEBIK 1968), and in a cave near Bavay in France (HEIM DE BALSAC 1940).

Today it is widely distributed from Finland to North Mongolia and Japan (JUDIN 1989).

Sorex bor REUMER, 1984
(Text-fig. 4)

1958a - *Sorex cf. runtonensis* HINTON, 1911, K. KOWALSKI, An Early Pleistocene..., pp. 11-12, fig. 2.

1960a - *Sorex runtonensis* HINTON, 1911, K. KOWALSKI, Pliocene insectivores..., pp. 167-168, Pl. XX, fig. 2 (partim).

1960b - *Sorex* sp., K. KOWALSKI, An Early Pleistocene..., p. 5.

M a t e r i a l . The list of specimens is given in Table VI. It contains remains of maxillae with A^5 and P^4-M^2 and mandibles with all teeth and processes.

Table VI

Sorex bor REUMER, 1984

Locality	Number of fragmentary maxillae and detached upper teeth	Number of fragmentary mandibles and detached lower teeth	Total	Minimum number of individuals
Podlesice MF/1944	0	5	5	3
Węże 1 MF/1945	0	104	104	38
Rębielice Królewskie 1A MF/64	1	202	203	86
Rębielice Królewskie 2 MF/1947	6	12	18	4
Kielniki 3B MF/1948	0	5	5	2
Kadzielnia MF/29	0	3	3	1
Kamyk MF/79	0	44	44	11
Kielniki 3A MF/1946	0	6	6	2

D e s c r i p t i o n o f m a t e r i a l . An original detailed description of this species on the basis of the material from Hungary is to be found in REUMER (1984). Here only a comparison between the Hungarian remains and those from different Polish localities is presented.

In general, the dimensions of the Hungarian and Polish specimens of the same age are similar. The specimens from the younger Polish localities, which have no counterparts in Hungary, are a little bigger.

As concerns mandibular morphology, in the Polish specimens the internal temporal fossa may be provided with a horizontal bar, which is (judging by REUMER's description) absent in Hungarian shrews. Besides, the old Ruscinian specimens, those from Węże 1

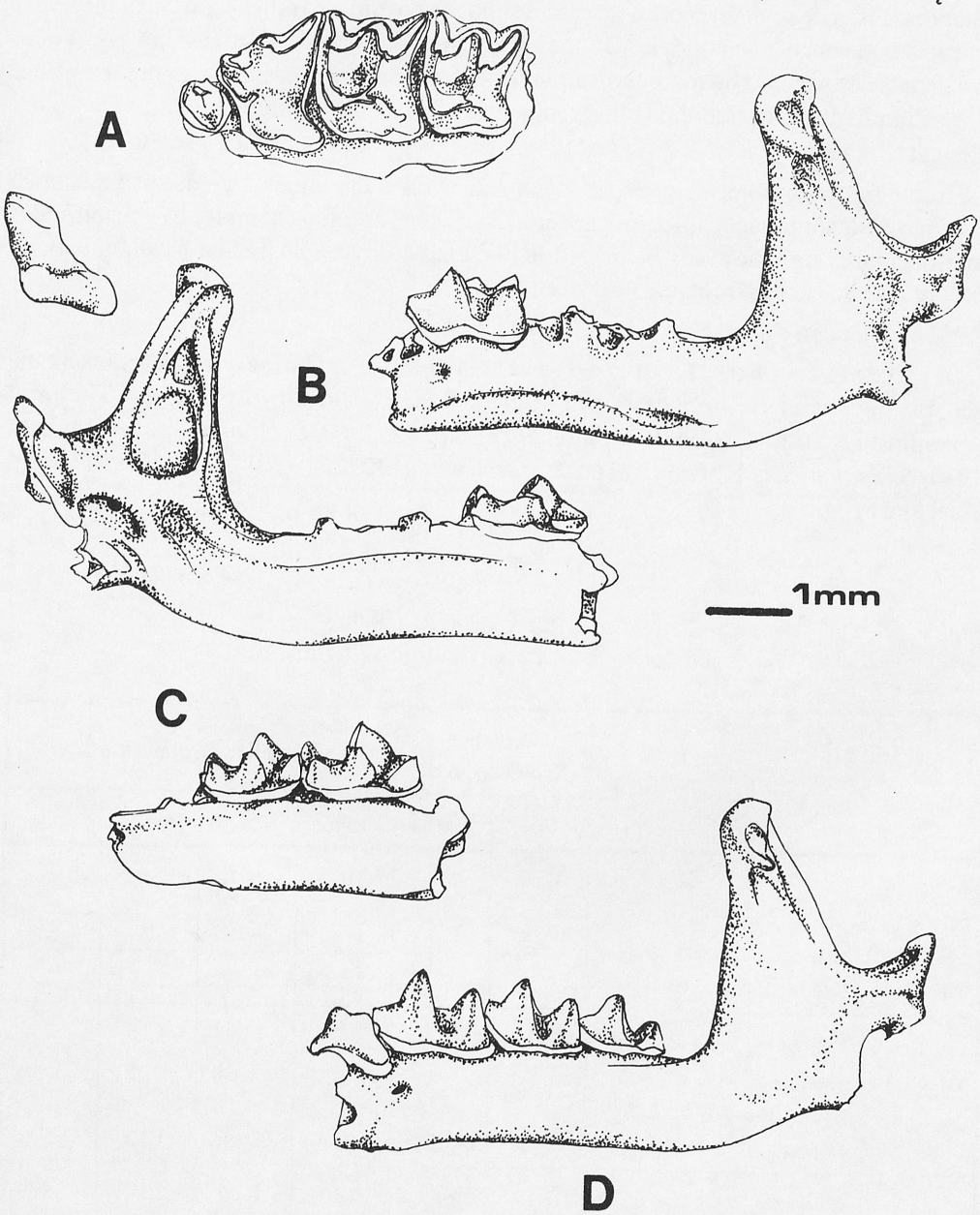

Fig.4. *Sorex bor*. A - fragment of left maxilla with A^5-M^2 from Rębielice Królewskie 1A, spec. no. MF/64/1, B - left mandible with M_1 from Podlesice, spec. no. MF/1944/2, C - fragment of left mandible with M_1-M_2 from Kamyk, spec. no. MF/79/14, D - left mandible with P_4-M_3 from Rębielice Królewskie 1A, spec. no. MF/64/10.

and Rębielice Królewskie 1A, more approach the typical material than do the specimens from Podlesice. In this last locality some specimens resemble *S.minutus* rather than *S. bor* in such characters as the presence of a more pronounced longitudinal bar of the external temporal fossa, less visible coronoid spicule and the not quite parallel position of the upper and lower facets of the condyle. On the other hand, at Rębielice Królewskie 1A, where the mandibles seem to be more typical, there are some differences in the upper dentition. For example in relation to the Hungarian material A^5 is big, comparable in size with the biggest fifth antemolar of *S. minutus*; the metalophs of M^1 and M^2 are present.

In the material from the younger localities, besides the bigger size of specimens we can find also some morphological differences. There are, for example, two mandibular foramina, although they may be placed in one long groove. The mental foramen may be situated farther to the front, e.g., between P_4 and M_1.

Measurements. See Tables VII and VIII.

Systematic position and distribution. So far, seven species fitting the generic diagnosis have been described from the Ruscinian localities of Europe. They are: *S. minutus* LINNAEUS, 1766, *S. subminutus* SULIMSKI, 1962, *S.* cf. *praealpinus* HELLER, 1930, *S. runtonensis* HINTON, 1911, *S. praearaneus* KORMOS, 1934, *S. bor* REUMER, 1984 and *Sorex* sp.

Table VII

Sorex bor REUMER, 1984
Dimensions of upper dentition (in mm).

		Rębielice Królewskie 1A		Rębielice Królewskie 2			
		x	n	min.	x	max.	n
A5	L	0.60	1	–	0.61	–	1
	W	0.58	1	–	0.62	–	1
P4	L (bucc.)	1.33	1	1.24	1.26	1.29	4
M1	L (max.)	1.28	1	1.23	1.29	1.35	5
	L (med.)	1.06	1	1.00	1.03	1.07	5
	W (max.)	1.45	1	1.44	1.48	1.52	5
M2	L (max.)	1.10	1	1.10	1.14	1.16	3
	L (med.)	0.90	1	0.90	0.92	0.94	3
	W (ant.)	1.32	1	1.25	1.31	1.35	3
	W (post.)	1.52	1	1.30	1.33	1.38	3

Our specimens are the same size as *S. bor* ; all other species are either smaller or bigger and show differences in morphology. Also such characters as their intermediate size between *S. minutus* and *S. runtonensis*, the morphology of the lower incisor (a narrow cingulum), long and flat A_1, P_4 with a deep basin, the presence of the coronoid spicule, the absence of a longitudinal bar in the external temporal fossa and the shape of the very narrow coronoid process, the anterior edge of which is only slightly concave to almost straight, while the posterior one is straight, permit us to include them in *S. bor*.

Of course, some of these characters are not always identical with those of REUMER's typical specimen, but his drawings also show some variability in the Hungarian material. The differences in the upper dentition may be due to individual variability: the Hungarian material is limited to one and the Polish to two specimens. REUMER (1984) writes about the presence of one mandibular foramen in *S. bor* and *S. minutus*, whereas in his Plate 5, fig. 1b (p.29) showing *S. minutus*, we can see two foramina. This indicates that this character is very variable, which is confirmed by *S. bor* from Poland.

Although the morphological differences between *S. bor* and *S. minutus* are not always clear, we can distinguish them on the basis of their measurements, especially in a case where both these forms occur together in the same locality. *S. bor* is then bigger.

In the youngest localities it approaches in size *S. runtonensis*, but is always slender and more delicate than the former.

S. bor resembles extant *S. caecutiens* LAXMANN, 1788 in many characters, mainly in the shape of the coronoid process, the shallow external temporal fossa, the position of the mental foramen, more or less two-cusped A_1 and the morphology of molars characterized by the high entoconid crest, undulate buccal cingulum and the presence of the small mesoconids. In contrast to *S. caecutiens* it is, however, smaller, its I_1 has a narrow cingulum, the internal temporal fossa seems to be higher, the upper sigmoid notch more open, the condylus lower and the interarticular area wider in its lower and narrower in the upper part.

S. caecutiens is now widely distributed in Eurasia, from North-East Poland to Sakhalin. As a fossil, under the name of *S. macropygmaeus* MILLER, 1901 it was mentioned from the Early Pleistocene of the Ukraine and Moldavia (TATARINOV 1970). It is the time when *S. bor* had already disappeared from Poland. As the differences between these species are not very substantial and the increase in size is common in the shrew lineages, *S. caecutiens* may be a descendant of *S. bor*. Unfortunately, the remains from geologically younger localities are very scarce and more material is needed to confirm this opinion.

S. praecaecutiens MEZHZHERIN and POKATILOV, 1969 described from the Pleistocene of Western Transbaikalia is much bigger than *S. caecutiens*, and according to MEZHZHERIN (1972), rather similar to *S. (Drepanosorex) praearaneus*.

Up to now *S. bor* has been found only in Hungary and Poland. First described from the Early Ruscinian (MN14) locality Osztramos 9, it was also present in slightly younger Osztramos 1 and in the Early Villanyian (MN16) Osztramos 7 (REUMER 1984).

It may well be that the specimens described by HORÁČEK (HORÁČEK and LOŽEK 1988) from Včeláre (MN17) as *S. fejfari* belong to *S. bor* (see p. 372).

Sorex bor
Dimensions of mandible and

		Podlesice				Węże 1					
		min.	$\bar{x}$	max.	n	min.	$\bar{x}$	max.	n	sd	cv
I_1	L	–	3.10	–	1	2.40	2.45	2.51	4	–	–
	H	–	0.81	–	1	0.64	0.70	0.75	16	0.03	4.29
A_1	L (bucc.)	–	–	–	0	0.76	0.84	0.93	8	0.05	5.95
P_4	L (bucc.)	–	1.05	–	1	0.85	0.92	1.00	22	0.05	5.43
	L of talonid (bucc.)	–	0.43	–	1	0.41	0.48	0.58	24	0.04	8.33
	W (occl.)	–	0.67	–	1	0.53	0.58	0.61	24	0.02	3.45
M_1	L (occl.)	1.29	1.32	1.34	4	1.20	1.24	1.30	32	0.03	2.42
	W (occl.)	0.81	0.82	0.85	4	0.72	0.76	0.81	32	0.02	2.63
M_2	L (occl.)	–	1.14	–	1	1.10	1.13	1.17	33	0.02	1.77
	W (occl.)	–	0.77	–	1	0.68	0.71	0.77	33	0.02	2.82
M_3	L (occl.)	–	1.04	–	1	0.96	0.99	1.04	24	0.02	2.02
	W (occl.)	–	0.63	–	1	0.55	0.59	0.67	24	0.03	5.08
M_1-M_3	L (occl.)	–	3.36	–	1	3.18	3.29	3.40	19	0.09	2.74
H of mandible below M_2		1.20	1.21	1.23	3	0.95	1.06	1.20	40	0.07	6.60
H of ascending ramus		3.41	3.54	3.62	3	3.18	3.33	3.47	14	0.09	2.70
W of coronoid process		0.61	0.64	0.67	3	0.51	0.61	0.71	15	0.06	9.84
H of condyloid process		1.46	1.64	1.88	3	1.56	1.64	1.74	12	0.06	3.66
W of interarticular area		0.54	0.56	0.60	3	0.47	0.56	0.62	13	0.04	7.14
L of mandible without I_1		–	–	–	0	7.39	7.55	7.72	2	–	–

Table VIII

REUMER, 1984
lower dentition (in mm).

Rębielice Królewskie 1A						Rębielice Królewskie 2					
min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n	sd	cv
–	–	–	0	–	–	–	–	–	0	–	–
0.69	0.72	0.75	2	–	–	–	–	–	0	–	–
0.94	0.94	0.95	2	–	–	–	–	–	0	–	–
0.92	0.99	1.04	7	0.05	5.05	0.98	0.98	0.98	2	–	–
0.44	0.52	0.62	8	0.06	11.54	0.51	0.56	0.61	2	–	–
0.57	0.62	0.68	8	0.04	6.45	0.62	0.63	0.64	2	–	–
1.20	1.29	1.36	32	0.04	3.10	1.30	1.31	1.32	4	–	–
0.74	0.79	0.87	32	0.03	3.80	0.76	0.81	0.82	5	–	–
1.05	1.15	1.22	34	0.04	348	1.14	1.18	1.20	7	0.02	1.70
0.70	0.74	0.79	34	0.03	4.05	0.72	0.76	0.80	7	0.03	3.95
0.95	1.02	1.12	14	0.05	4.90	1.01	1.05	1.08	4	–	–
0.55	0.60	0.63	14	0.02	3.33	0.60	0.61	0.62	4	–	–
3.23	3.32	3.40	11	0.07	2.11	3.41	3.43	3.45	2	–	–
0.98	1.09	1.23	56	0.06	5.50	1.01	1.14	1.25	12	0.07	6.14
3.33	3.59	3.85	49	0.14	3.90	3.54	3.61	3.71	6	–	–
0.55	0.68	0.80	51	0.06	8.82	0.66	0.70	0.73	8	0.02	2.86
1.40	1.57	1.75	45	0.08	5.09	1.41	1.46	1.62	6	–	–
0.47	0.54	0.67	50	0.05	9.26	0.45	0.52	0.56	7	0.04	7.69
–	–	–	0	–	–	–	–	–	0	–	–

		Kielniki 3B				Kadzielnia			
		min.	$\bar{x}$	max.	n	min.	$\bar{x}$	max.	n
I_1	L	–	–	–	0	–	–	–	0
	H	–	–	–	0	–	–	–	0
A_1	L (bucc.)	–	0.94	–	1	–	–	–	0
P_4	L (bucc.)	–	–	–	0	–	1.04	–	1
	L of talonid (bucc.)	–	–	–	0	–	0.51	–	1
	W (occl.)	–	–	–	0	–	0.67	–	1
M_1	L (occl.)	–	–	–	0	1.36	1.37	1.38	2
	W (occl.)	–	–	–	0	0.78	0.80	0.82	2
M_2	L (occl.)	–	1.20	–	1	1.15	1.18	1.22	2
	W (occl.)	–	0.75	–	1	0.76	0.76	0.77	2
M_3	L (occl.)	–	–	–	0	–	–	–	0
	W (occl.)	–	–	–	0	–	–	–	0
M_1-M_3	L (occl.)	–	–	–	0	–	–	–	0
H of mandible below M_2		1.07	1.16	1.23	3	1.12	1.25	1.38	2
H of ascending ramus		3.57	3.75	3.87	3	3.61	3.61	3.62	2
W of coronoid process		0.67	0.69	0.71	3	0.71	0.73	0.75	2
H of condyloid process		1.73	1.81	1.89	3	–	–	–	0
W of interarticular area		0.47	0.49	0.50	3	–	0.62	–	1
L of mandible without I_1		–	–	–	0	–	–	–	0

Table VIII ctd

Kamyk						Kielniki 3A			
min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n
–	–	–	0	–	–	–	–	–	0
–	–	–	0	–	–	0.74	0.76	0.78	2
–	–	–	0	–	–	0.91	0.93	0.95	2
–	1.09	–	1	–	–	–	1.04	–	1
–	–	–	0	–	–	–	0.66	–	1
–	–	–	0	–	–	–	0.60	–	1
1.24	1.33	1.42	13	0.06	4.51	–	1.41	–	1
0.74	0.76	0.80	13	0.02	2.63	–	0.86	–	1
1.11	1.17	1.23	11	0.03	2.56	1.24	1.26	1.27	3
0.69	0.72	0.75	12	0.02	2.78	0.78	0.81	0.84	3
1.04	1.06	1.08	6	–	–	1.09	1.10	1.11	3
0.55	0.58	0.61	6	–	–	0.56	0.58	0.61	2
3.40	3.41	3.42	2	–	–	–	3.69	–	1
1.01	1.05	1.13	23	0.03	2.86	1.10	1.17	1.24	6
3.41	3.55	3.72	8	0.09	2.53	3.74	3.78	3.83	2
0.65	0.70	0.75	9	0.03	4.29	0.78	0.81	0.85	2
1.41	1.51	1.70	7	0.10	6.62	–	1.90	–	1
0.44	0.50	0.58	8	0.04	8.00	0.58	0.58	0.58	2
–	–	–	0	–	–	–	–	–	0

In Poland we can trace it from the Early Pliocene (MN14) Podlesice until the Early Biharian (Q_1) locality Kielniki 3A. REUMER (1984) writes, that *Sorex* sp. mentioned by SULIMSKI et at. (1979) from the Middle Pliocene locality Mała Cave in Poland may also belong to *S. bor*.

Sorex casimiri n.sp.
(Text-fig. 5)

1960a - *S. runtonensis* HINTON, 1911, K. KOWALSKI, Pliocene insectivores...,pp.167-168.

Holotype. Right mandible with A_1-M_3, and both coronoid and condyloid processes, Rębielice Królewskie 1A, MF/1964/7.

Material. The list of specimens is given in Table IX. It contains only one right fragment of a maxilla with A^5-M^2 and numerous mandibles with all types of teeth and processes with the exception of the angular process.

Type locality. Rębielice Królewskie 1A.

Type horizon. Middle Pliocene (Middle/Upper Villanyian, MN16).

Name derivation. This species is named in honour of Professor Kazimierz KOWALSKI, who first described the Rębielice Królewskie material.

Diagnosis. Middle sized species of *Sorex* with red pigmented teeth, narrow tricuspulate I_1 with very narrow, hardly visible cingulum, long A_1 characterized by small second cuspule, *Sorex*-type P_4 and molars, slender ascending ramus and very narrow, straight coronoid process, distinct coronoid spicule in the shape of a semicircle, which covers most of the tip of the coronoid process, high condyloid process, mental foramen

Table IX

Sorex casimiri n.sp.

Locality	Number of fragmentary maxillae and detached upper teeth	Number of fragmentary mandibles and detached lower teeth	Total	Minimum number of individuals
Zalesiaki 1B MF/1966	0	2	2	2
Zamkowa Dolna Cave B MF/1965	0	29	29	12
Rębielice Królewskie 1A MF/1964	1	29	30	13

situated anteriorly under P_4 or P_4/M_1 in older forms and under the anterior root of M_1 or the tip of its protocone in younger forms.

Description of holotype. The horizontal ramus of the mandible is concave under M_1/M_2. The ascending ramus forms slightly obtuse angle with the horizontal one. The coronoid process is high and narrow, almost straight, rounded at the tip. The coronoid spicule is distinct, in the shape of a semicircle. It begins near the anterior edge of the coronoid process and continues backwards to the posterior one. The external temporal fossa is deep, with its longitudinal bar very distinct. It reaches the level of the upper sigmoid notch. The high condyle is entirely visible from the buccal side. Its upper facet is cylindrical, the lower one rather narrow, slightly concave. The interarticular area is relatively broad and flat, its width in the upper and the lower part is nearly the same. The small pterygoid spicule is visible. Two mandibular foramina are situated in a groove. The internal temporal fossa is high and triangular, with a horizontal bar. The mental foramen is situated under the anterior corner of M_1.

The long A_1 is characterized by its small second cuspule and small shallow postero-lingual basin. On the other hand, the postero-lingual basin of two-cusped P_4 is deep and reaches the cingulum. The lower molars, typical of the *Sorex* species, have fairly high entoconid crests, broad trigonids and talonids. M_3 is unreduced, with a well-developed talonid, which is basined and provided with a clearly distinguishable hypoconid and entoconid. The cingula are well developed on both sides of all teeth, especially the lingual one is distinct. The buccal cingulum of M_1 is undulate.

Description of the remaining material. The infraorbital foramen is short. It begins above the paracone of P^4 and ends above the P^4/M^1 junction. The big lacrimal aperture lies above the mesostyle of M^1.

Dental formula: $\frac{1-6-3}{1-2-3} = 32$

The big A^5 is totally visible from behind P^4 on the buccal side. It is unicuspid, rather short and broad, particularly on the lingual side. The cingulum is visible around this tooth. P^4 is also big, with rather a long and high parastyle surrounded by a cingulum. Its protocone is big, in the shape of a cusp. The hypocone is of middle size, visible as a denticule of the lingual cingulum. It is separated from the protocone by a wide valley. This valley is almost closed by a crest running from the protocone in a posterolingual direction. The hypoconal flange is flat, surrounded by the cingulum.

The upper molars also have big protocones and rather distinct hypocones separated from them by a valley. Their trigon valley is closed by the metalophs. M^2 is smaller than M^1. The posterior emargination of the teeth is rather strong. Isolated lower incisors, I_1, which probably belong here, are narrow, tricuspulate and with a narrow cingulum hardly visible.

The remaining lower jaws from Rębielice Królewskie 1A do not differ much from the holotype. The differences can be seen in the farther to the front situated mental foramen, which in some specimens lies under the P_4/M_1 junction and in the internal temporal fossa, the horizontal bar of which may be very weak or lacking.

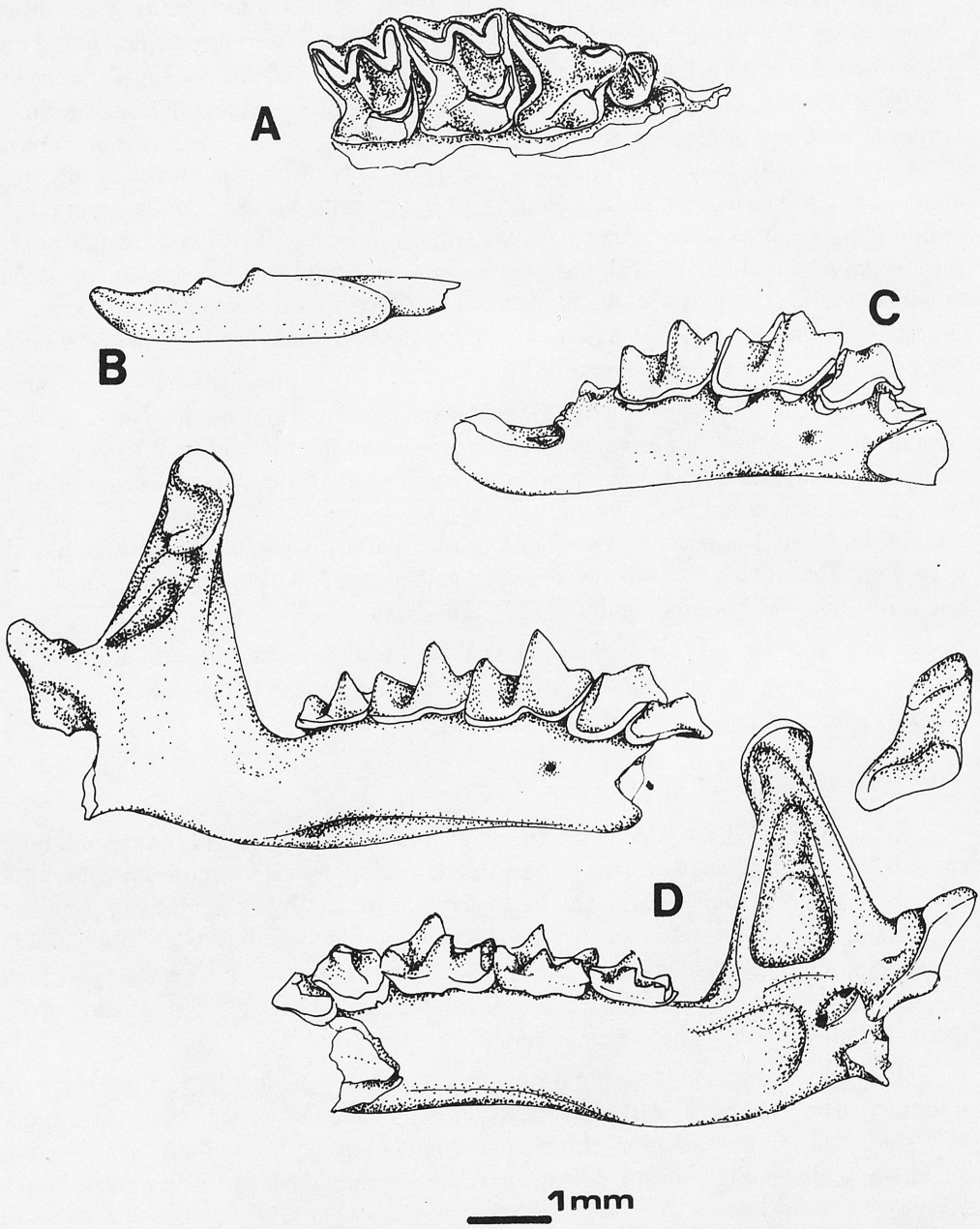

Fig.5. *Sorex casimiri* n. sp. A - fragment of right maxilla with A^5-M^2 from Rębielice Królewskie 1A, spec. no. MF/1964/1, B - left I_1 from Zamkowa Dolna Cave B, spec. no. MF/1965/26, C - fragment of right mandible with P_4-M_2 from Zamkowa Dolna Cave B, spec. no. MF/1965/3, D - right mandible with A_1-M_3 from Rębielice Królewskie 1A, spec. no. MF/1964/7 (holotype).

The geologically older specimens from Zalesiaki 1B and Zamkowa Dolna Cave B are more delicate and a little smaller then the specimens from Rębielice Królewskie 1A. In consequence, their coronoid process is more slender and narrow, not only at the tip, but also at the height of the condyle. Their coronoid spicule may also be less distinct and a little shorter. Their mental foramen is situated further to the front, sometimes under P_4 or between P_4 and M_1.

Measurements. See Tables X and XI.

Systematic position. The remains described above differ from all fossil and Eurasian living species of the genus *Sorex*. They are distinctly bigger than *Sorex minutus* or even *Sorex bor*, but much smaller than other Pliocene forms, such as *S. polonicus* n. sp., *S.* (*Drepanosorex*) *praearaneus* or *S. pseudoalpinus*.

Table X

Sorex casimiri n. sp.
Dimensions of upper dentition (in mm).

		Rębielice Królewskie 1A	
		x	n
A5	L	0.58	1
	W	0.68	1
P4	L (bucc.)	1.51	1
M1	L (max.)	1.32	1
	L (med.)	1.05	1
	W (max.)	1.60	1
M2	L (max.)	1.11	1
	L (med.)	0.93	1
	W (ant.)	1.45	1
	W (post.)	1.35	1

Although both *S. pseudoalpinus* n. sp. and *S. casimiri* n. sp. have two-cusped A_1, in the latter species this tooth is much shorter. Besides, its coronoid process is more slender than and not so straight as in *S. pseudoalpinus* n. sp. and the molar cingulum more undulate.

On the other hand, in size our material pretty well fits *Sorex* sp. described by REUMER (1984) from the localities of similar age: Csarnóta 2 and Osztramos 7 in Hungary. The

Sorex
Dimensions of mandible and

		Zalesiaki 1B			
		min.	$\bar{x}$	max.	n
I_1	L	–	–	–	0
	H	–	–	–	0
A_1	L (bucc.)	–	–	–	0
P4	L (bucc.)	–	–	–	0
	L of talonid (bucc.)	–	–	–	0
	W (occl.)	–	–	–	0
M_1	L (occl.)	–	1.41	–	1
	W (occl.)	–	0.80	–	1
M_2	L (occl.)	1.21	1.22	1.23	2
	W (occl.)	0.77	0.79	0.81	2
M_3	L (occl.)	–	1.13	–	1
	W (occl.)	–	0.62	–	1
M_1-M_3	L (occl.)	–	3.68	–	1
H of mandible below M_2		1.10	1.12	1.14	2
H of ascending ramus		–	–	–	0
W of coronoid process		–	–	–	0
H of condyloid process		–	–	–	0
W of interarticular area		–	–	–	0

Table XI

casimiri n. sp.
lower dentition (in mm).

Zamkowa Dolna Cave B						Rębielice Królewskie 1A					
min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max	n	sd	cv
3.45	3.56	3.66	4	–	–	–	–	–	0	–	–
0.73	0.77	0.81	5	–	–	–	–	–	0	–	–
	0.92	–	1	–	–	0.86	0.90	0.94	3	–	–
0.98	1.04	1.10	7	0.04	3.85	1.10	1.14	1.19	5	–	–
0.48	0.53	0.58	7	0.04	7.55	0.47	0.52	0.55	6	–	–
0.60	0.68	0.73	7	0.04	5.88	0.67	0.72	0.76	6	–	–
1.35	1.39	1.45	16	0.03	2.16	1.33	1.38	1.45	20	0.03	2.17
0.78	0.85	0.93	17	0.04	4.71	0.78	0.84	0.87	20	0.02	2.38
1.18	1.25	1.31	14	0.04	3.20	1.18	1.22	1.26	16	0.03	2.46
0.74	0.78	0.83	14	0.02	2.56	0.74	0.77	0.80	16	0.02	2.60
1.03	1.07	1.14	7	0.03	2.80	1.02	1.04	1.07	6	–	–
0.60	0.63	0.67	7	0.02	3.17	0.58	0.61	0.65	6	–	–
3.48	3.59	3.68	4	–	–	3.42	3.50	3.55	6	–	–
1.16	1.29	1.39	23	0.06	4.65	1.14	1.30	1.42	21	0.07	5.38
3.80	4.04	4.20	10	0.12	2.98	3.90	4.02	4.22	9	0.09	2.24
0.68	0.78	0.88	10	0.07	8.97	0.80	0.85	0.90	11	0.03	3.53
1.62	1.75	1.98	7	0.12	6.86	1.72	1.83	1.92	8	0.06	7.23
0.51	0.57	0.63	10	0.04	7.02	0.60	0.66	0.73	9	0.04	6.06

lack of the ascending ramus in the Hungarian remains, their somewhat bigger teeth and one mandibular foramen do not permit us establish their identity without doubt.

S. casimiri n.sp. approaches the geologically younger species *S. runtonensis* in size but differs from it in the mental foramen placed farther to the front, a different type of the coronoid spicule (which in *S. runtonensis* is V-shaped and lies higher) and a more delicate coronoid. This very slender (not only at the tip but also at the level of the condyle) coronoid process is also characteristic of *S. caecutiens*. Both these species show many resemblances, for instance, long two-cusped A_1, the same type of the condyle and the anterior position of the mental foramen. It is difficult to say, however, if the geologically old *S. casimiri* n.sp. was an ancestor of the recent *S. caecutiens*. Besides small differences in morphology (such as the different shape of the coronoid spicule or the presence of rather straight molar cingula), it is bigger. All the data show, however, that, with the only exception of *Crocidura sicula* MILLER,1901 from the Mediterranean Islands (HUTTERER 1990b), there is no tendency for the soricids to decrease in size with geological time. As mentioned above (p. 345), it is more probable that *S. caecutiens* is a descendant of *S. bor*.

Sorex pseudoalpinus n.sp.
(Text-fig. 6)

1962a - *Sorex* cf. *praealpinus* HELLER, 1930, A. SULIMSKI, Supplementary studies..., Pl.II, fig.6, text-pl. II, fig. 7a-b.

Material. 9 fragments of maxillae with A^1-M^3 and 18 mandibles with four broken I_1, A_1-M_3, two coronoid and two broken condyloid processes. They represent at least 10 animals. All the material derives from only one locality, Węże 1, MF/1943.

Holotype. Fragment of left mandible with broken I_1 (between first and second cusps) and A_1-M_2, without any processes, from Węże 1, MF/1943/12.

Type locality. Węże 1.

Type horizon. Early Middle Pliocene (Upper Ruscinian, MN15).

Name derivation. At first sight this species resembles *S. alpinus*.

Diagnosis. A middle-sized *Sorex* species. Lower incisor I_1 with distinct cuspules; two-cusped A_1 long, but shorter than P_4; its posterior cusp smaller and lower than the anterior one; M_1 and M_2 with very narrow cingula and cusps curved backwards; coronoid process high and straight and its coronoid spicule distinct, in the shape of a big semicircle; upper antemolar A^3 smaller than two neighboring teeth, A^2 and A^4; M^1 and M^2 devoid of metalophs.

Description of holotype. I_1 is broken behind the first cuspule. Its second and third cuspules are distinct. A weak, narrow cingulum is present along the buccal side. A_1 is long on the buccal side, two-cusped. The posterior cusp is smaller and lower than the anterior one. A long postero-lingual basin is clearly marked, although shallow. Clear, wide cingula are present on both sides. P_4 is relatively large. It has also two cusps and wide cingula on both sides. Its postero-lingual basin is relatively deep, but it does not reach the cingulum. The length of this tooth is only slightly bigger than that of A_1. The lower molars are of the typical *Sorex* shape. In M_1 the entoconid crest is rather high, the buccal

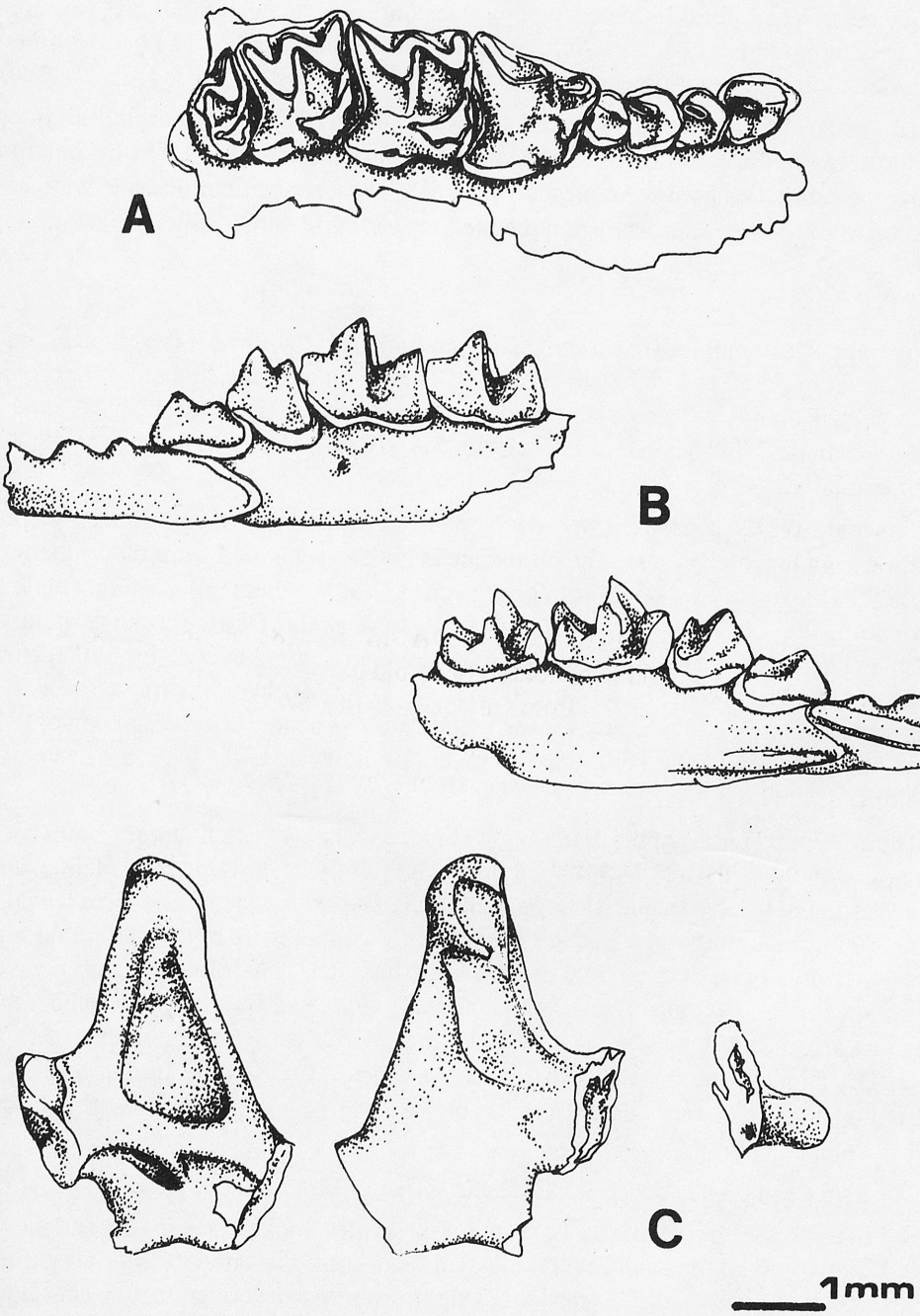

Fig.6. *Sorex pseudoalpinus* n. sp. from Węże 1. A - fragment of right maxilla with A^2-M^3, spec. no. MF/1943/1, B - fragment of left mandible with I_1 (broken) - M_2, spec. no. MF/1943/12 (holotype), C - fragment of left mandible, spec. no. MF/1943/1.

cingulum is slightly undulate and narrow, but the lingual one is wide. The cusps, especially protoconid and metaconid are curved backwards. A small mesoconid is present on the oblique crest. The buccal re-entrant valley does not reach the cingulum. M_2 (except for the lingual cingulum which is straight) is similar to M_1 but smaller. The mental foramen is situated under the anterior root of M_1.

Description of the remaining material. The infraorbital foramen is situated between the paracone of P^4 and the end of the parastyle of M^1. The big and round lacrimal aperture lies above the mesostyle of M^1. The zygomatic process is wide at the base, a part of M^2 (the mesostyle and the metastyle) and M^3 are visible against it.

Dental formula: $\frac{1-6-3}{1-2-3}=32$

Five upper antemolars are present. They are unicuspid with well-developed cingula. The buccal cingulum is wider. The A^1 and A^2 are the biggest, the first one is as big as or a little bigger than A^2. Both teeth are longer than broad. A^3 is smaller than A^2 and A^4, A^5 is the smallest, but visible in buccal view. A^3-A^5 are almost as long as wide. A^5 is wider lingually.

P^4 is massive. Its parastyle is well developed and connected to the paracone by a rather long and high parastylar crest. The protocone is big and separated from the hypocone by a valley. The hypocone does not form a cusp, but the beginning of the cingulum surrounding the concave hypoconal flange, the posterior side of the tooth and the parastyle. The most characteristic features of M^1 and M^2 are their distinct hypocones, rather narrow hypoconal flanges and the lack of metalophs. M^3 is very wide on the lingual side. It has a big paracone, protocone, mesostyle and metacone. The posterior emargination of P^4 and upper molars is moderate. As in most remains from Węże 1, the teeth are secondarily decolorised.

The horizontal ramus of the mandible is elongated and its ventral margin concave. The coronoid process is straight, its rounded tip bends slightly towards the front. The coronoid spicule is distinct, in the shape of a large semicircle. The external temporal fossa is shallow. The high internal temporal fossa in the shape of a isosceles triangle is provided with a weak horizontal bar. All condyloid processes are damaged. Their lower facets, preserved in two specimens, are not very large and slightly elongated lingually. Two mandibular foramina are placed in a depression, below the posterior corner of the internal temporal fossa. The mental foramen is situated between P_4 and M_1 or a little further to the back, but not further than the anterior corner of M_1. M_3 is not reduced, with a basined, well-developed talonid.

Measurements. See Tables XII and XIII.

Systematic position. The remains presented above agree in size and morphology with two mandibles and several isolated teeth from the same locality classified by SULIMSKI (1962a) as *S.* cf. *praealpinus*. This species was described for the first time by HELLER (1930) from Sackdilling Höhle, the locality dated to the Late Biharian (Q_2). In HELLER's opinion, similar in size and morphology to *S. alpinus* SCHINZ, 1837, *S. praealpinus* must have been an ancestor of the former. According to SULIMSKI (1962a),

Table XII

Sorex pseudoalpinus n. sp.
Dimensions of upper dentition (in mm).

		Węże 1			
		min.	$\bar{x}$	max.	n
I^1	L	–	–	–	0
	L of talon	–	0.88	–	1
	H of talon	–	–	–	0
A^1-A^5	L	–	2.92	–	1
A^1	L	0.90	0.92	0.96	3
	W	0.74	0.79	0.84	3
A^2	L	0.81	0.84	0.87	4
	W	0.73	0.74	0.76	4
A^3	L	0.60	0.64	0.67	5
	W	0.65	0.67	0.68	5
A^4	L	0.67	0.71	0.74	6
	W	0.66	0.68	0.70	6
A^5	L	0.49	0.50	0.51	3
	W	0.52	0.54	0.58	3
P^4	L (bucc.)	1.53	1.55	1.57	5
M^1	L (max.)	1.40	1.46	1.50	6
	L (med.)	1.07	1.12	1.16	6
	W (max.)	1.58	1.69	1.77	6
M^2	L (max.)	1.30	1.30	1.31	2
	L (med.)	1.03	1.05	1.07	2
	W (ant.)	–	1.51	–	1
	W (post.)	–	1.52	–	1
M^3	L	0.79	0.79	0.80	2
	W	1.26	1.28	1.30	2

Table XIII

Sorex pseudoalpinus n. sp.
Dimensions of mandible and lower dentition (in mm).

		Węże 1					
		min.	$\bar{x}$	max.	n	sd	cv
I_1	L	–	–	–	0	–	–
	H	0.81	0.86	0.93	4	–	–
A_1	L (bucc.)	1.02	1.14	1.18	5	–	–
P_4	L (bucc.)	1.10	1.18	1.26	11	0.05	4.24
	L of talonid	0.57	0.61	0.65	11	0.02	3.28
	W (occl.)	0.73	0.75	0.79	11	0.02	2.67
M_1	L (occl.)	1.41	1.45	1.50	14	0.03	2.07
	W (occl.)	0.86	0.88	0.95	14	0.02	2.27
M_2	L (occl.)	1.22	1.28	1.34	13	0.05	3.91
	W (occl.)	0.78	0.81	0.83	13	0.01	1.23
M_3	L (occl.)	1.06	1.12	1.19	7	0.04	3.57
	W (occl.)	0.60	0.63	0.67	7	0.03	4.76
M_1-M_3	L (occl.)	3.64	3.71	3.82	6	–	–
H of mandible below M_2		1.23	1.31	1.41	13	0.06	4.58
H of ascending ramus		4.10	4.18	4.27	2	–	–
W of coronoid process		0.85	0.88	0.92	2	–	–
H of condyloid process		–	–	–	0	–	–
W of interarticular area		–	0.67	–	1	–	–

in spite of some differences, the material from Węże 1 resembled the remains from Sackdilling Höhle in several characters, the most important of which was the structure of the coronoid process and two-cusped shape of A_1.

More specimens show, however, that these differences are more considerable and that specimens from Węże 1 resemble *S. alpinus* or *S. praealpinus* only superficially. In relation to HELLER's type material from Sackdilling Höhle our specimens are bigger and more massive, which is especially true of the horizontal ramus of the mandible, the coronoid process and the teeth (particularly M_1-M_3). In contrast to HELLER's specimens, their condyle has a wider interarticular area and wider, less elongated lower facet. Their A_1, although long and two-cusped, is usually shorter than the next antemolar P_4, (see p. 360). If A_1 and P_4 are equal in length (in one of the 4 specimens present) the second cusp of A_1 is always smaller and lower. On the other hand, in recent *S. alpinus* and, also judging from HELLER's (1930) material (Taf.XV, fig. 8b), in its ancestor *S. praealpinus*, A_1 is buccally longer than the last premolar (P_4), and both their cusps are the same size. This fact is confirmed by my study of the *S. praealpinus* remains from Kielniki 3B and Kozi Grzbiet in Poland (see p. 364).

From the extant *S. alpinus*, *S. pseudoalpinus* n.sp. differs in the same characters as from *S. praealpinus*, and also in its distinct semicircular coronoid spicule, more distinct cuspules of I_1, wider buccal cingulum of A_1 and P_4 and more distinct lingual cingula of all its teeth.

The big upper jaws found in the material and probably belonging to *S. pseudoalpinus* n. sp. also differ from *S. alpinus* and its ancestor *S. praealpinus*. The membership of these upper jaws in this species is very probable, because from among the 3 forms of the genus *Sorex* described from Węże 1 (*S. minutus*, *S. bor*, *S. pseudoalpinus* n. sp.) they correspond in size only with the mandibles of *S. pseudoalpinus* n. sp.

The differences can be seen, above all, in the unusual configuration of their antemolars, in which A^3 is smaller than A^2 and A^4. This arrangement is unknown in other *Sorex* species of the Old World, with the exception of recent *S. beringianus*, described by JUDIN in 1967 on the basis of some individuals from the Kuril Islands. These animals are only a little bigger than *S. minutus*. JUDIN (1989) writes that in this specific character *S. beringianus* is similar to the Nearctic *S. lyelli* MERRIAM, 1902 and *S. longirostris* BACHMAN, 1837. OCHOTINA (1977) does not regard *S. beringianus* as a distinct species.

Besides the above mentioned character, *S. pseudoalpinus* n. sp. differs from *S. praealpinus* and *S. alpinus* in the shape of A^5, which in *S. pseudoalpinus* n. sp. is short and in the remaining two species long.

Among all Pliocene *Sorex* species only *Sorex* sp. 3 described from Podlesice and *Sorex* sp. found by REUMER (1984) at Osztramos 7 and Csarnóta 2 in Hungary are similar in size to *S. pseudoalpinus* n.sp. The first of them can be easily excluded from these considerations on the basis of its morphological features such as the presence of only single-cusped A_1, one mandibular foramen, the higher entoconid crest of the lower molars etc.

The second, according to REUMER, is most probably identical with the material from Węże 1 described by SULIMSKI (1962a) as *S.* cf. *praealpinus*, although it differs in the structure of the condyle and the position of the mental foramen. However, when it has been compared with more abundant material, these differences seem to lie within the variation of *S. pseudoalpinus* n.sp. Its comparison (as *Sorex* sp.) with the Pleistocene taxa is given by REUMER (1984).

S. pseudoalpinus n. sp. does not seem to have any desendants in geologically younger localities.

Sorex praealpinus HELLER, 1930
(Text-fig. 7)

M a t e r i a l . The list of specimens is given in Table XIV. It contains the remains of a maxilla fragment with A^5-M^1 and mandibles with all types of teeth and processes with the exception of the angular process.

Table XIV

Sorex praealpinus HELLER, 1930

Locality	Number of fragmentary maxillae and detached upper teeth	Number of fragmentary mandibles and detached lower teeth	Total	Minimum number of individuals
Kielniki 3B MF/1941	0	4	4	2
Zamkowa Dolna Cave C MF/1942	1	0	1	1
Kozi Grzbiet MF/1940	0	22	22	8

D e s c r i p t i o n o f m a t e r i a l . The almost round infraorbital foramen lies between the paracone of P^4 and the mesostyle of M^1. The damaged lacrimal aperture is visible above the metastyle of M^1. Unicuspid A^5 is long and narrow, with a narrow cingulum around the tooth. Its postero-lingual part is concave. It is whole seen from the buccal side. P^4 has a big parastyle surrounded by the cingulum, high parastylar crest and big protocone separated from the hypocone by a valley. Three ridges originate from the protocone: one running backwards, one extending in a lingual direction, and farther to the cingulum surrounding the hypoconal flange, and the third one directed buccally. This last one points towards the parastyle and continues as the cingulum mentioned above. The hypocone is distinct, but not very big. The cingulum running around the large and flat hypoconal flange

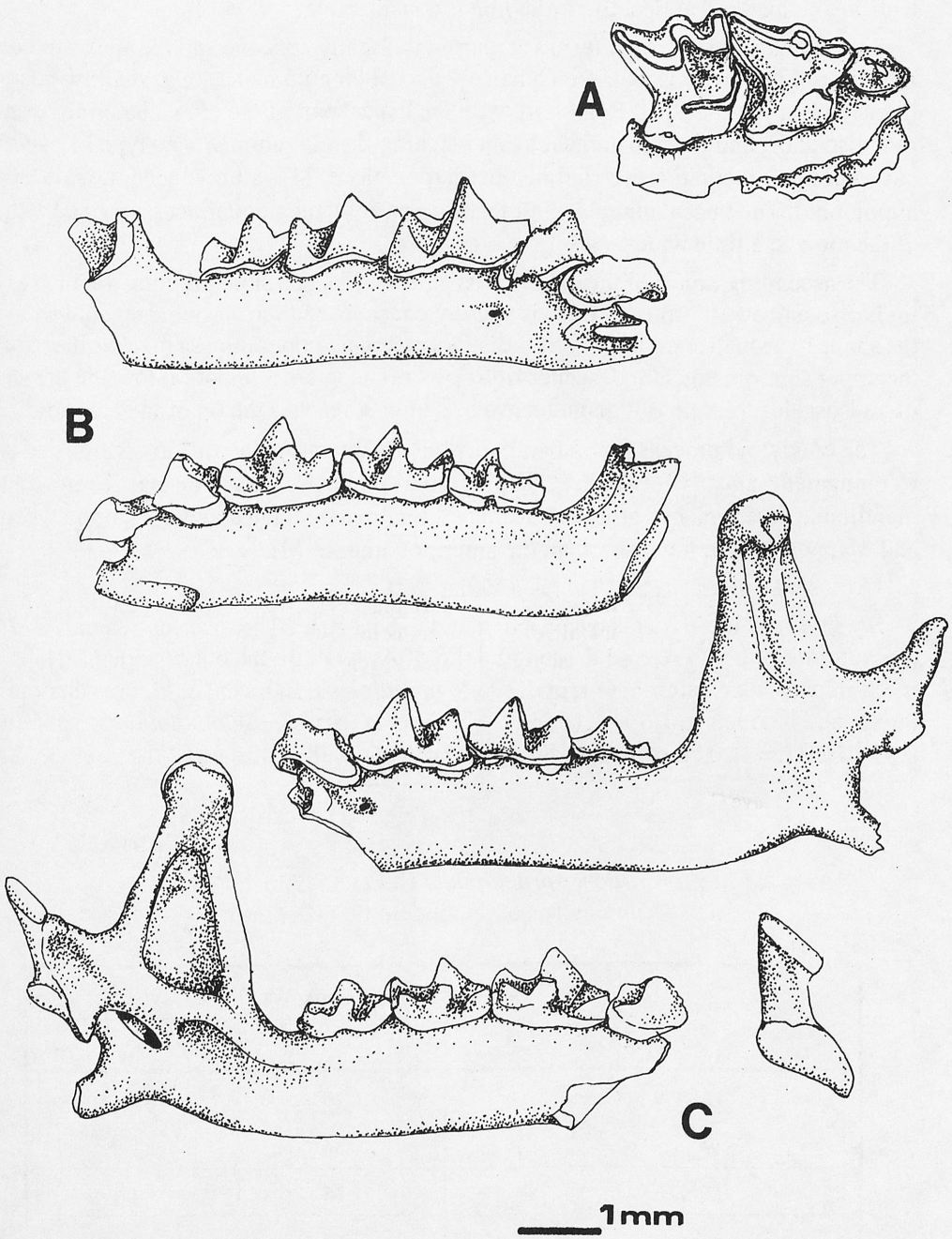

Fig.7. *Sorex praealpinus*. A - fragment of right maxilla with A^5-M^1 from Zamkowa Dolna cave C, spec. no. MF/1942/1, B - fragment of right mandible with A_1-M_3 from Kielniki 3B, spec. no. MF/1941/1, C - left mandible with P_4-M_3 from Kozi Grzbiet, spec. no. MF/1940/4.

starts from this cusp. M^1 has a big parastyle, big protocone and distinct hypocone similar to that in P^4. Its hypoconal flange is also large and flat. The low metaloph is visible. The teeth are stained red at tips. Emargination is considerable.

Tricuspulate I_1 is narrow. Its lower margin is slightly concave and the apex turned up. A_1 is very long, two-cusped, with a narrow buccal cingulum and long, shallow postero-lingual basin. Two-cusped P_4 is short, with the buccal part of the crown hanging over the root also short and postero-lingual basin reaching the cingulum. *Sorex*-type M_1 and M_2 have strong entoconid crests and distinct hypolophids. M_3 is unreduced, devoid of the hypolophid. The buccal cingula of all teeth are narrow, the lingual ones, especially those of the molars, a little wider.

The ascending ramus of the mandible is narrow. The coronoid process, rounded at the tip is also narrow. Its anterior edge is slightly concave, and the coronoid spicule weak, in the shape of a small semicircle. The indistinct external temporal fossa reaches the level of the upper sigmoid notch or descends little lower. The internal temporal fossa in the shape of an isosceles triangle is high and narrow. It almost reaches the tip of the coronoid.

The condyloid process is comparatively big. Its interarticular area is narrow, and so is its elongated lingually lower facet. The sigmoid spicule is weak or absent. There are two mandibular foramina in a groove. The mental foramen is situated under P_4, or between P_4 and M_1, not further, however, than the anterior corner of M_1.

Measurements. See Tables XV and XVI.

Systematic position and distribution. The size, in general, and the measurements of A^5, A_1 and the length ratio of A_1 to P_4 on the buccal side (1.04 - 1.07, n=2), in particular, refer these remains to *S. praealpinus*. In recent *S. alpinus* this ratio is higher and it comes to 1.08 - 1.19 (n=7), whereas in fossil *S. pseudoalpinus* n. sp. only to 0.93 - 1.00 (n=4). The morphology of A^5 and A_1 as well as this of I_1, the condyloid and

Table XV

Sorex praealpinus HELLER, 1930
Dimensions of upper dentition (in mm).

		Zamkowa Dolna Cave C	
		x	n
A^5	L	0.70	1
	W	0.56	1
P^4	L (bucc.)	1.65	1
M^1	L (max.)	1.47	1
	L (med.)	1.10	1
	W (max.)	1.67	1

Table XVI

Sorex praealpinus HELLER, 1930
Dimensions of mandible and lower dentition (in mm).

		Kielniki 3B									
		min.	$\bar{x}$	max.	n	min.	$\bar{x}$	max.	n	sd	cv
I_1	L	–	–	–	0	–	3.53	–	1	–	–
	H	–	–	–	0	–	0.76	–	1	–	–
A_1	L (bucc.)	–	1.23	–	1	–	1.12	–	1	–	–
P_4	L (bucc.)	–	1.18	–	1	0.95	1.05	1.10	6	–	–
	L of talonid (bucc.)	–	0.50	–	1	0.47	0.57	0.64	6	–	–
	W (occl.)	–	0.71	–	1	0.65	0.68	0.73	6	–	–
M_1	L (occl.)	1.43	1.46	1.49	4	1.40	1.43	1.48	12	0.02	1.40
	W (occl.)	0.82	0.87	0.90	4	0.85	0.88	0.91	12	0.02	2.27
M_2	L (occl.)	1.25	1.29	1.32	3	1.21	1.25	1.30	11	0.03	2.40
	W (occl.)	0.79	0.81	0.84	3	0.74	0.79	0.82	11	0.03	3.80
M_3	L (occl.)	1.17	1.17	1.17	2	1.07	1.12	1.16	5	–	–
	W (occl.)	0.66	0.67	0.68	2	0.60	0.61	0.63	5	–	–
M_1-M_3	L (occl.)	3.91	3.91	3.91	2	3.66	4.74	3.80	3	–	–
H of mandible below M_2		1.16	1.22	1.27	4	1.10	1.22	1.29	13	0.06	4.92
H of ascending ramus		–	–	–	0	3.86	3.94	4.09	10	0.07	1.78
W of coronoid process		–	–	–	0	1.80	2.01	2.22	7	0.16	7.96
H of condyloid process		–	–	–	0	1.80	2.01	2.22	7	0.16	7.96
W of interarticular area		–	–	–	0	0.53	0.60	0.70	11	0.06	10.00

coronoid processes, and the anterior position of the mental foramen support that determination.

S. praealpinus was described by HELLER in 1930 (see p. 358) and considered to be ancestral to *S. alpinus*. As its remains are rather scanty and their description incomplete, it is good opportunity to add some more details here.

A comparison of HELLER's (1930, 1958) material from Sackdilling Höhle and Erpfingen with the Polish remains shows, that these latter are a little bigger but smaller than the now living *S. alpinus*. The morphology of all these forms is practically identical.

The oldest remains described as *S. praealpinus* were those from Węże 1 in Poland, the locality dated to the beginning of the Middle Pliocene (MN15). A revision of the material shows that their identification was wrong and that they belong to *S. pseudoalpinus* n.sp. (for the comparison see p. 361). Now, the oldest remains of this shrew derive from the Late Pliocen (MN17) locality Shernfeld in Germany (DEHM 1962). In Poland, they occur at Kielniki 3B, the locality of the same age. After a rather long gap the species appears again at the end of the Early Pleistocene (Upper Biharian, Q_2) in Poland and in other parts of Europe. Besides HELLER's localities, it is mentioned from Sudmer-Berg 2 (KOENIGSWALD 1972), Windloch (BRUNNER 1934) and Hohensülzen (STORCH et al. 1973) in Germany and in Deutsch-Altenburg 2 (RABEDER 1973) in Austria (as *S.* cf. *praealpinus*). This species is always rare, and so is its descendant *S. alpinus*, very infrequent in owl-pellets. Only *S. alpinus* is known from the fossil faunas starting from the Middle Pleistocene. It has survived as a relic species in the mountains of Europe.

Sorex polonicus n.sp.
(Text-fig. 8)

Material. The material contains remains of 10 mandibles with all types of teeth and processes with the exception of the angular process. At least 4 individuals are represented. All material derives from only one locality, Rębielice Królewskie 1A, MF/1963.

Holotype. Fragment of left mandible with M_1, coronoid and condyloid processes, MN/1963/1.

Type locality. Rębielice Królewskie 1A.

Type horizon. Middle Pliocene (Middle/Upper Villanyian, MN16).

Name derivation. Described from Poland.

Diagnosis. Relatively big *Sorex* species with wide, red pigmented teeth, high condyle, narrow at the tip but wide at the level of the upper sigmoid notch coronoid process and mental foramen situated rather to the front.

Description of holotype. The ascending ramus forms a nearly right angle with the horizontal one. The horizontal ramus is slightly concave under M_1 and M_2. The coronoid process is very narrow, rounded at the tip and wide at the level of the upper sigmoid notch. The coronoid spicule in the shape of a semicircle is distinct and situated in ⅔ of the height of the coronoid process. The upper sigmoid notch is open and the external temporal fossa distinct. It descends to ⅓ of the condyle. The condyle is high. Its upper facet is narrow, the lower one slightly concave and wide, wider on the buccal side

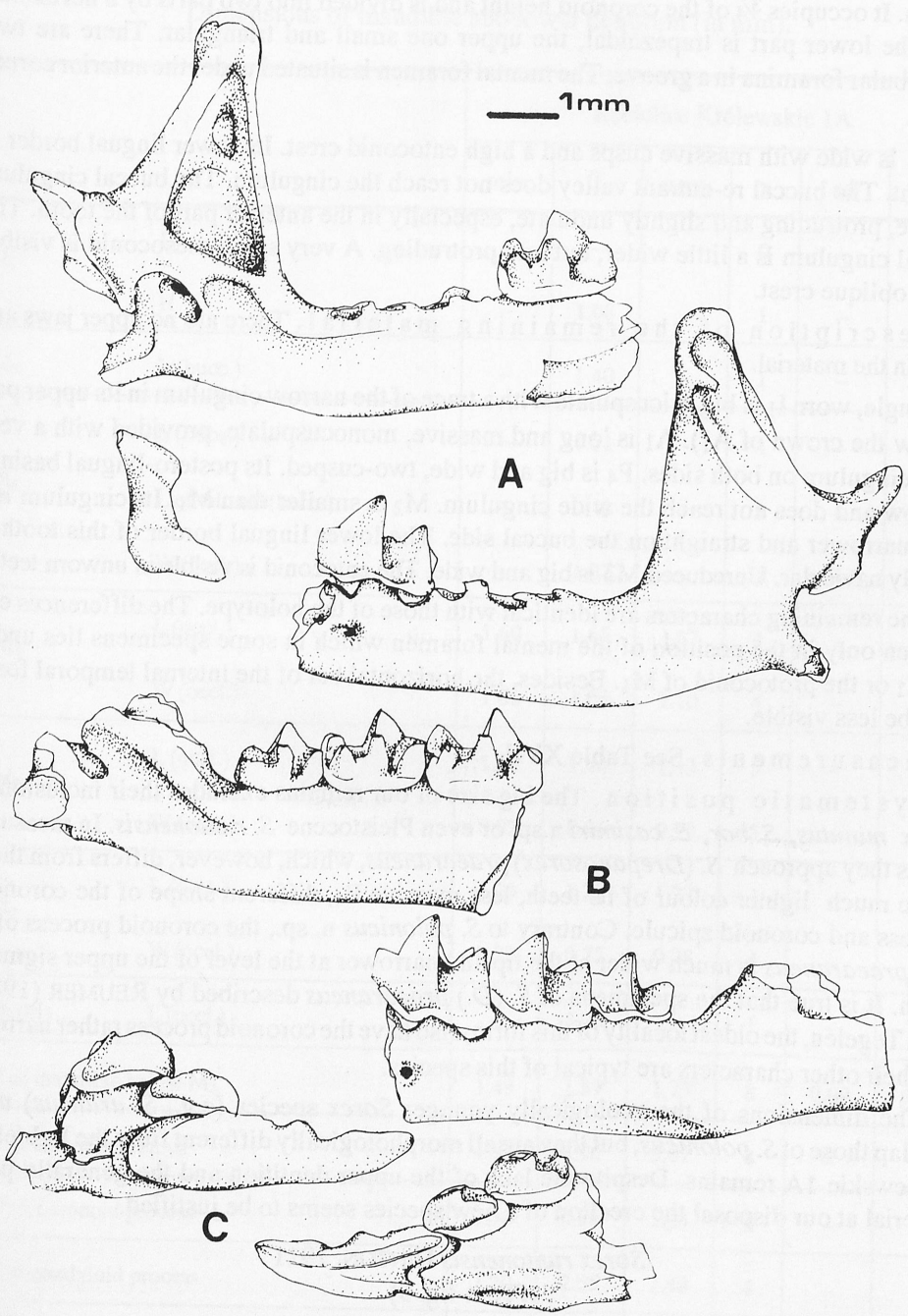

Fig.8. *Sorex polonicus* n. sp. from Rębielice Królewskie 1A. A - left mandible with M_1, spec. no. MF/1963/1 (holotype), B - fragment of left mandible with M_1-M_3, spec. no. MF/1963/3, C - fragment of right mandible with I_1-P_4, spec. no. MF/1963/2.

than on the lingual. The rectangular interarticular area is narrow, leaving more than half of the lower facet free. The small sigmoid spicule is visible. The internal temporal fossa is high. It occupies ¾ of the coronoid height and is divided into two parts by a horizontal bar. The lower part is trapezoidal, the upper one small and triangular. There are two mandibular foramina in a groove. The mental foramen is situated under the anterior corner of M_1.

M_1 is wide with massive cusps and a high entoconid crest. Its lower lingual border is straight. The buccal re-entrant valley does not reach the cingulum. The buccal cingulum is wide, protruding and slightly undulate, especially in the anterior part of the tooth. The lingual cingulum is a little wider, but less protruding. A very small mesoconid is visible on its oblique crest.

Description of the remaining material. There are no upper jaws and teeth in the material.

Single, worn I_1 is big, tricuspulate with a trace of the narrow cingulum in its upper part (below the crown of A_1). A_1 is long and massive, monocuspulate, provided with a very wide cingulum on both sides. P_4 is big and wide, two-cusped. Its postero-lingual basin is shallow and does not reach the wide cingulum. M_2 is smaller than M_1. Its cingulum is a little narrower and straight on the buccal side. The lower lingual border of this tooth is slightly navicular. Unreduced M3 is big and wide. The entoconid is visible in unworn teeth.

The remaining characters are identical with those of the holotype. The differences can be seen only in the position of the mental foramen which in some specimens lies under P_4/M_1 or the protoconid of M_1. Besides, the horizontal bar of the internal temporal fossa may be less visible.

Measurements. See Table XVII.

Systematic position. The big size of our remains excludes their inclusion in *Sorex minutus*, *S. bor*, *S. casimiri* n.sp. or even Pleistocene *S. runtonensis*. In measurements they approach *S.* (*Drepanosorex*) *praearaneus*, which, however, differs from them in the much lighter colour of its teeth, less massive P_4, different shape of the coronoid process and coronoid spicule. Contrary to *S. polonicus* n. sp., the coronoid process of *S. (D.) praearaneus* is much wider at the tip and narrower at the level of the upper sigmoid notch. It is true that the specimens of *S.* (*D.*) *praearaneus* described by REUMER (1984) from Tegelen, the oldest locality of this form, also have the coronoid process rather narrow, but their other characters are typical of this species.

The dimensions of the geologically younger *Sorex* species (e.g., *S. araneus*) may overlap those of *S. polonicus*, but they are all morphologically different from the Rębielice Królewskie 1A remains. Despite the lack of the upper dentition and the generally poor material at our disposal the erection of a new species seems to be justified.

Sorex runtonensis HINTON, 1911
(Text-fig. 9)

Material. The list of specimens is given in Table XVIII. It contains remains of mandibles with all types of teeth and processes with the exception of the angular process.

Table XVII

Sorex polonicus n. sp.
Dimensions of mandible and lower dentition (in mm).

		Rębielice Królewskie 1A					
		min.	$\bar{x}$	max.	n	sd	cv
I_1	L	–	–	–	0	–	–
	H	–	1.08	–	1	–	–
A_1	L (bucc.)	–	1.40	–	1	–	–
P_4	L (bucc.)	–	1.51	–	1	–	–
	L of talonid (bucc.)	–	0.48	–	1	–	–
	W (occl.)	–	1.02	–	1	–	–
M_1	L (occl.)	1.60	1.65	1.67	4	–	–
	W (occl.)	1.02	1.05	1.10	4	–	–
M_2	L (occl.)	1.38	1.44	1.49	5	–	–
	W (occl.)	0.92	0.96	0.99	5	–	–
M_3	L (occl.)	1.23	1.25	1.27	4	–	–
	W (occl.)	0.72	0.75	0.78	4	–	–
M_1-M_3	L (occl.)	–	4.23	–	1	–	–
H of mandible below M_2		1.49	1.59	1.73	8	0.09	5.66
H of ascending ramus		4.85	4.96	5.07	4	–	–
W of coronoid process		0.90	0.98	1.05	4	–	–
H of condyloid process		2.20	2.35	2.48	4	–	–
W of interarticular area		0.61	0.69	0.80	4	–	–

Table XVIII

Sorex runtonensis HINTON, 1911

Locality	Number of fragmentary maxillae and detached upper teeth	Number of fragmentary mandibles and detached lower teeth	Total	Minimum number of individuals
Kielniki 1 MF/1959	0	1	1	1
Zalesiaki 1A MF/1960	0	17	17	7
Kozi Grzbiet MF/1961	0	247	247	79

Description of material. Unfortunately, upper teeth are lacking in the Polish material and so only a description of the mandible and lower dentition is given. Although this species is very common in the Quaternary deposits of Europe and very often mentioned in the lists of faunas, its detailed morphology is not known.

The lower margin of the horizontal ramus is slightly concave under M_2. The ascending ramus of the mandible forms a somewhat obtuse angle with its horizontal branch. The coronoid process is straight and narrow, its tip is rounded or a bit pointed and bends slightly towards the inside. The V-shaped coronoid spicule is not very protruding. The external temporal fossa is distinct. It is provided with two longitudinal ridges running parallel to the posterior edge of the coronoid process. The anterior ridge reaches the upper sigmoid notch, the posterior one is shorter. The fossa is deep, especially below the coronoid spicule.

The internal temporal fossa is high, in the shape of an isosceles triangle. It is provided with a horizontal bar. Two mandibular foramina are situated in a groove, under the posterior corner of the internal temporal fossa. The mental foramen is generally situated below the buccal re-entrant valley of M_1, but in some specimens lies farther to the front, not further, however, than the anterior corner of this tooth.

The condyloid process is high and its lingually concave interarticular area narrow, so that the lower facet is partially free. The upper facet is cylindrical, the lower one wide, slightly concave and more or less curved downwards. The pterygoid spicule is present.

Tricuspulate I_1 is long. Its lower margin is concave, cingulum narrow and apex slightly bent upwards. A_1 is long with a trace of the second cusp. The buccal part of the crown overhanging the root is also long. Its postero-lingual basin is shallow and cingula wide on both sides.

Two-cusped P_4 has a distinct postero-lingual basin, which does not reach the lingual cingulum. This cingulum is wider than the buccal one. M_1 is characterized by a high

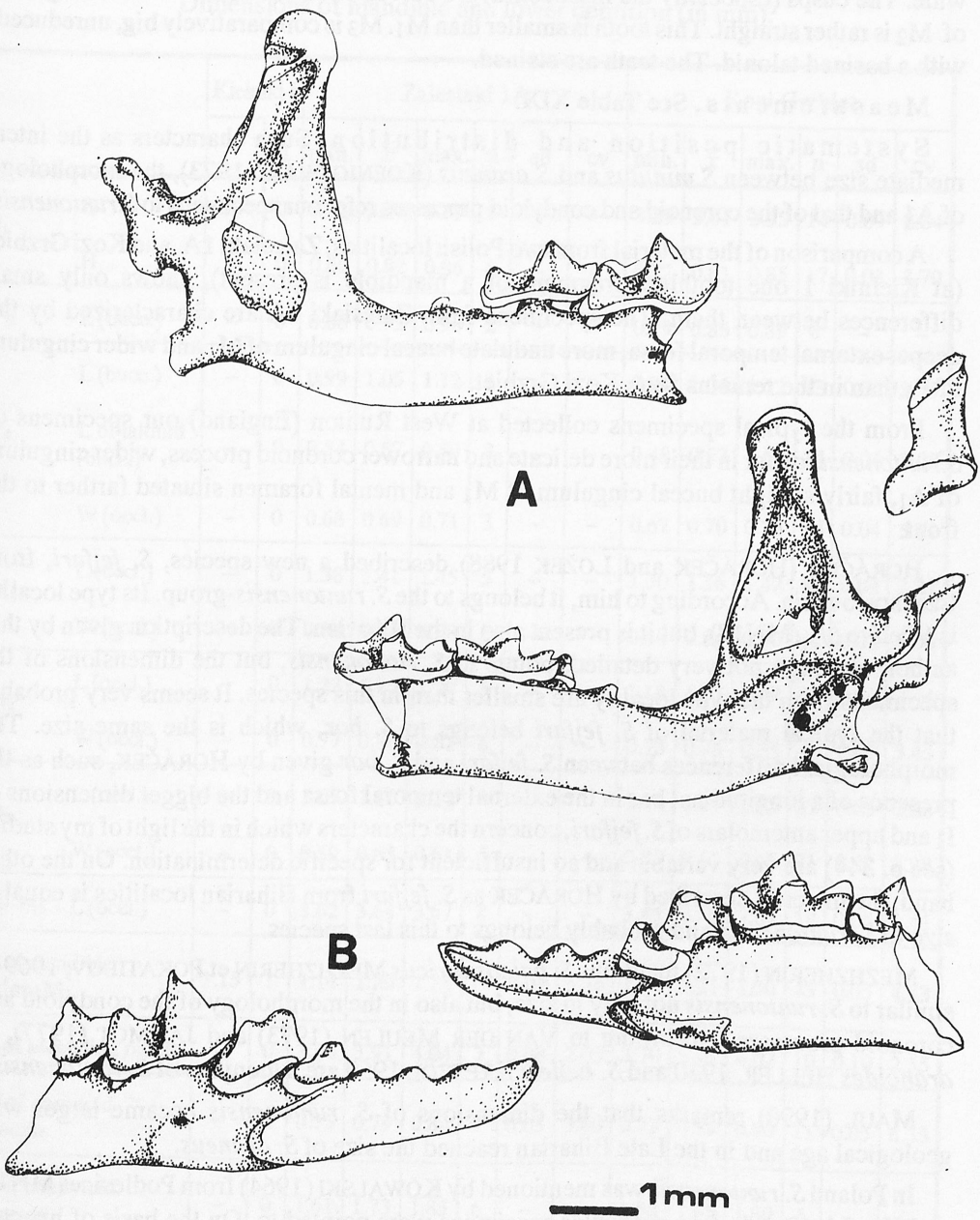

Fig.9. *Sorex runtonensis* from Kozi Grzbiet. A - fragment of right mandible with M_1-M_2, spec. no. MF/1961/10, B - fragment of right mandible with I_1-M_1, spec. no. MF/1961/1.

entoconid crest. Its deep buccal re-entrant valley opens right above the cingulum, which is rather narrow and generally straight or only slightly undulate. The lingual cingulum is wide. The cusps (especially the mesoconid) are curved backwards. The buccal cingulum of M_2 is rather straight. This tooth is smaller than M_1. M_3 is comparatively big, unreduced, with a basined talonid. The teeth are stained.

Measurements. See Table XIX.

Systematic position and distribution. Such characters as the intermediate size between *S.minutus* and *S.araneus* (KOENIGSWALD 1973), the morphology of A1 and that of the coronoid and condyloid processes refer our specimens to *S.runtonensis*.

A comparison of the material from two Polish localities, Zalesiaki 1A and Kozi Grzbiet (at Kielniki 1 one toothless fragment of a mandible is present), shows only small differences between them. The specimens from Zalesiaki 1A are characterized by the deeper external temporal fossa, more undulate buccal cingulum of M_1 and wider cingulum of P_4 than in the remains from Kozi Grzbiet.

From the typical specimens collected at West Runton (England) our specimens of *S.runtonensis* differ in their more delicate and narrower coronoid process, wider cingulum of A_1, fairly straight buccal cingulum of M_1 and mental foramen situated farther to the front.

HORÁČEK (HORÁČEK and LOŽEK 1988) described a new species, *S. fejfari*, from Czechoslovakia. According to him, it belongs to the *S. runtonensis*-group. Its type locality is Včeláre 6/1 (MN17), but it is present also in the Biharian. The description given by that author, although not very detailed, points to *S. runtonensis*, but the dimensions of the specimens from the type locality are smaller than in this species. It seems very probable that the typical material of *S. fejfari* belongs to *S. bor*, which is the same size. The morphological differences between *S. fejfari* and *S. bor* given by HORÁČEK, such as the presence of a longitudinal bar in the external temporal fossa and the bigger dimensions of I_1 and upper antemolars of *S. fejfari*, concern the characters which in the light of my studies (see p. 344) are very variable and so insufficient for specific determination. On the other hand, the material described by HORÁČEK as *S. fejfari* from Biharian localities is equal in size to *S. runtonensis* and probably belongs to this last species.

MEZHZHERIN (1972) mentions *S. paleosibiricus* MEZHZHERIN et POKATILOV, 1969 as similar to *S. runtonensis* not only in size, but also in the morphology of the condyloid and coronoid processes. According to VAN DER MEULEN (1973) and JAMMOT (1977), *S. aranoides* HELLER, 1930 and *S. helleri* KRETZOI, 1959 are synonyms of *S. runtonensis*.

MAUL (1990) remarks that the dimensions of *S. runtonensis* became larger with geological age and in the Late Biharian reached the size of *S. araneus*.

In Poland *S. runtonensis* was mentioned by KOWALSKI (1964) from Podlesice (MN14) and Kamyk (Q_1), but no particular specimens were pointed to. On the basis of his poor material the same author (1958a, 1960a) described it from Rębielice Królewskie 1A (MN16) and Kadzielnia (MN17/Q1). More abundant material showed that the specimens from the former locality belong to *S. bor* and and those from the latter to *S.subaraneus*.

Table XIX

Sorex runtonensis HINTON, 1911
Dimensions of mandible and lower dentition (in mm).

		Kielniki 1		Zalesiaki 1A						Kozi Grzbiet					
			n	min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n	sd	cv
I_1	L	–	0	3.21	3.29	3.39	3	–	–	3.29	3.41	3.55	14	0.09	2.64
	H	–	0	0.80	0.82	0.86	5	–	–	0.72	0.81	0.85	17	0.03	3.70
A_1	L (bucc.)	–	0	0.86	0.92	0.98	2	–	–	0.79	0.83	0.89	6	–	–
P_4	L (bucc.)	–	0	0.99	1.05	1.12	3	–	–	0.99	1.06	1.12	13	0.04	3.77
	L of talonid (bucc.)	–	0	0.54	0.57	0.59	3	–	–	0.48	0.57	0.62	14	0.04	7.02
	W (occl.)	–	0	0.68	0.69	0.71	3	–	–	0.62	0.70	0.76	14	0.04	5.71
M_1	L (occl.)	–	0	1.38	1.41	1.45	5	–	–	1.30	1.36	1.42	42	0.03	2.21
	W (occl.)	–	0	0.84	0.86	0.88	5	–	–	0.80	0.84	0.90	42	0.02	2.38
M_2	L (occl.)	–	0	1.23	1.25	1.29	5	–	–	1.18	1.23	1.29	42	0.03	2.44
	W (occl.)	–	0	0.77	0.80	0.82	6	–	–	0.73	0.78	0.84	42	0.03	3.45
M_3	L (occl.)	–	0	1.07	1.10	1.12	4	–	–	1.00	1.04	1.08	21	0.03	2.88
	W (occl.)	–	0	0.59	0.63	0.64	4	–	–	0.55	0.61	0.65	21	0.02	3.28
M_1-M_3	L (occl.)	–	0	3.62	3.64	3.67	2	–	–	3.46	3.55	3.67	19	0.05	1.41
H of mandible below M_2		1.15	1	1.14	1.20	1.28	11	0.04	3.33	1.10	1.21	1.30	45	0.05	4.13
H of ascending ramus		–	0	3.80	3.91	4.04	7	0.08	2.05	3.70	3.92	4.02	10	0.10	2.55
W of coronoid process		–	0	0.75	0.79	0.84	7	0.03	3.80	0.73	0.79	0.90	11	0.05	6.33
H of condyloid process		–	0	1.61	1.73	1.85	6	–	–	1.58	1.65	1.80	6	–	–
W of interarticular area		–	0	0.50	0.55	0.64	7	0.05	9.09	0.49	0.57	0.64	8	0.05	8.77

Besides these four localities, *S. runtonensis* was also recorded from Węże 1 and 2 (MN15) (SULIMSKI 1959, 1962a, b) and Żabia Cave (Q_1) (BOSÁK et al., 1982). I have not found *S. runtonensis* either at Węże 1 or in other Pliocene localities. As mentioned above, I had no opportunity to examine SULIMSKI's material from Węże 1 because, according to him, it got lost.

Outside Poland *S. runtonensis* was recorded from such Pliocene localities as Csarnóta 2 in Hungary (as *S.* cf. *runtonensis*, KRETZOI 1956) and Valerots in France (CHALINE 1972). REUMER (1984) did not found it in the material from Csarnóta re-examined by him.

So, the remains of *S. runtonensis*, probably unknown before the Pleistocene, become common since the beginning of this period. They are particular abundant in the Late Biharian. Besides England (where the species was first found, HINTON 1911), it is known from Sackdilling (HELLER 1956), Hohensülzen (STORCH et al., 1973), Husarenhof (KOENIGSWALD 1973) in Germany, from Deutsch-Altenburg 2 (RABEDER 1973), Hundsheim (KORMOS 1937, FRIANT 1949) in Austria, from Valerots (Q_2) (CHALINE, DELINGETTE 1965, CHALINE 1972), Montoussé 5 (CLOT et al., 1976) in France, from Monte-Peglia (VAN DER MEULEN 1973) in Italy, from Podumci (KOWALSKI 1958b) in Jugoslavia, from Zlaty Kůň (C 718) near Koněprusy (FEJFAR 1956, 1961), Chlum (FEJFAR 1961) and Stránská Skála (RZEBIK-KOWALSKA 1972) in Czechoslovakia, and from Gombaszög (KRETZOI 1941), Osztramos 8 (JÁNOSSY 1972), Villány 6-8 (JÁNOSSY 1970) in Hungary.

Sorex subaraneus HELLER, 1958
(Text-fig. 10)

1958a - *Sorex* cf. *runtonensis* HINTON, 1911, K. KOWALSKI, An Early Pleistocene fauna.., pp. 11-12 (partim, because one of those specimens got lost).

Material. The list of specimens is given in Table XX. It contains remains of maxillae with all types of teeth except I^1 and M^3 and mandibles with all types of teeth and processes with the exception of the angular process.

Description of material. The infraorbital foramen in the shape of a triangle with rounded angles is situated between the paracone of P^4 and the parastyle of M^1, or a little farther to the back. The oval lacrimal aperture lies above the mesostyle or metastyle of M^1. The zygomatic process is pretty wide. In palatal view the part of M^2 (from the mesostyle to the end of the metastyle) and M^3 are visible against it in the background.

The antemolars A1 and A2 are big, although the second is a little smaller than the first. The next two antemolars, A^3 and A^4, are very similar in size, but usually A^4 is smaller than A^3. They are smaller than the first pair. A^5 is variable in size, but always wider than long. It is almost totally visible from behind the parastyle of P^4. All the antemolars are provided with narrow cingula around the teeth, without any cingular cusps. Their postero-lingual parts are concave.

P^4 is characterized by its big pointed parastyle, big protocone in the shape of a cusp and the distinct hypocone. This last element, in the shape of a denticle, forms the beginning of a narrow cingulum. The cingulum surrounds the large and nearly flat hypoconal flange.

Table XX

Sorex subaraneus HELLER, 1958

Locality	Number of fragmentary maxillae and detached upper teeth	Number of fragmentary mandibles and detached lower teeth	Total	Minimum number of individuals
Kadzielnia MF/1958	0	6	6	3
Ręblice Królewskie 4 MF/1962	1	5	6	3
Kozi Grzbiet MF/1957	25	102	127	38

The protocone and hypocone are separated by a wide valley delimited by ridges on all sides (also anteriorly).

M^1 has a big hypocone in the shape of a cusp, separated from the protocone by a deep, narrow valley. The cingulum around the protocone is weak. The hypoconal flange is only slightly concave and the metaloph not very high. M^2 is smaller with a lower metaloph than M^1. The emargination of P^4 and molars is moderate. The pigmentation is bright red.

Big I_1 is tricuspulate. Its first cusp is the longest, the middle one the highest. The cingulum is narrow, not very protruding. The apex is almost straight. The tooth forms an obtuse angle with the horizontal ramus of the mandible. A_1 is long, more or less two-cusped. P_4 is two-cusped. Its postero-lingual basin is deep, but does not reach the cingulum. The cingulum of both antemolars is wide.

The molars are large and their talonids are wide. M_1 has a long, not very high entoconid crest; its metaconid is slightly curved backwards, the buccal re-entrant valley opens low, but it does not reach the cingulum. The buccal cingulum is only slightly undulate and narrower than the lingual one. M_2 is smaller and its buccal cingulum is fairly straight. M_3 is big, unreduced.

The ascending ramus is large. It forms a slightly obtuse angle with the horizontal ramus, whose lower margin is concave between M_1 and M_2. The coronoid process is straight, rather wide. Its posterior margin is concave, the tip wide, pointed or flat, curved lingually. The coronoid spicule is not very protruding, but distinct, in the shape of a small semicircle.

The external temporal fossa is large, distinct, but shallow. Only its part under the coronoid spicule is a little deeper. It reaches the upper sigmoid notch or descends lower, to ¼ of the height of the condyle. The internal temporal fossa is high, in the shape of an isosceles triangle. Two mandibular foramina lie in a groove. The mental foramen lies under the trigonid of M_1, between the anterior corner and the buccal re-entrant valley of this tooth.

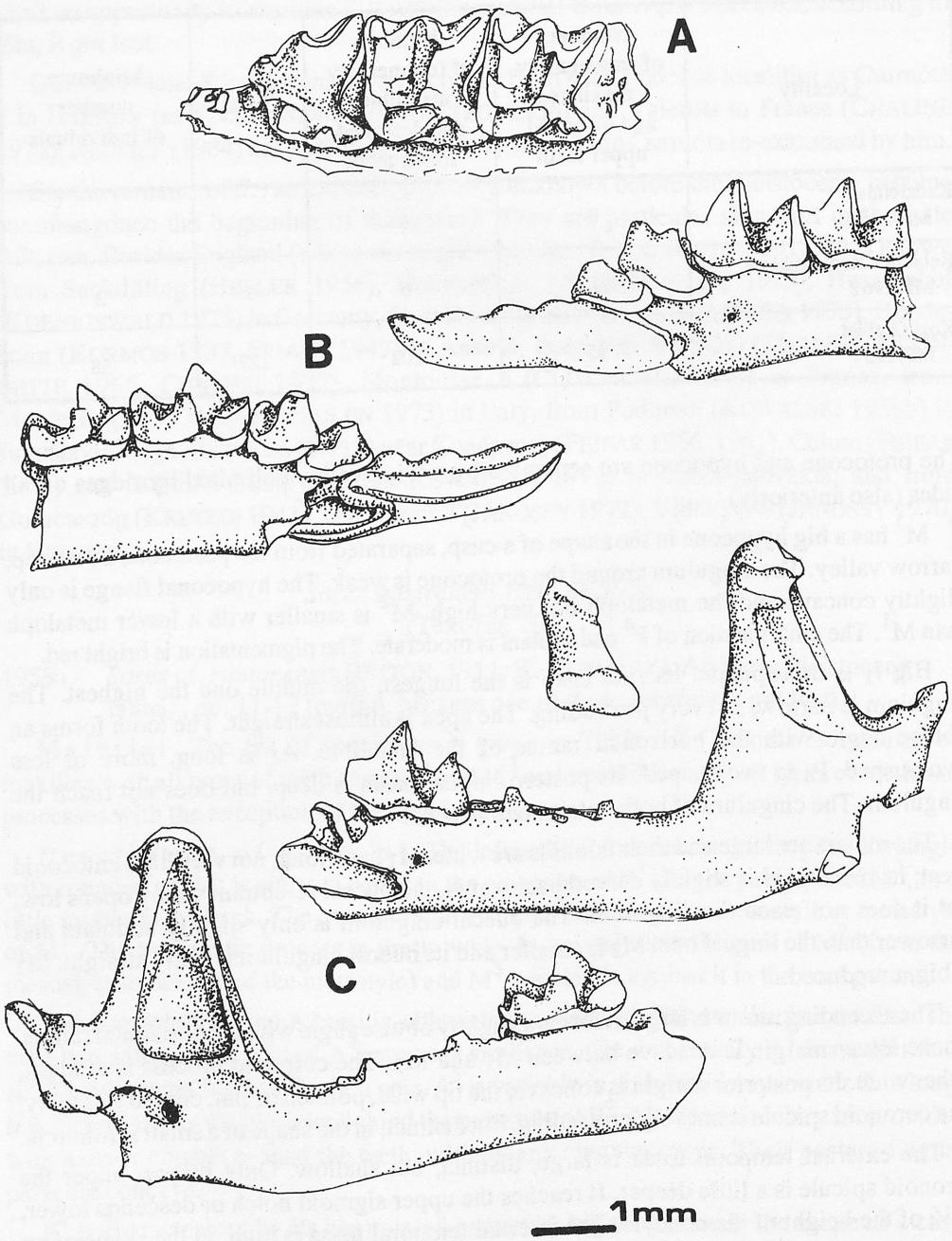

Fig. 10. *Sorex subaraneus* from Kozi Grzbiet. A - fragment of left maxilla with P^4-M^2, spec. no. MF/1957/3, B - fragment of left mandible with I_1-M_2, spec. no. MF/1957/1, C - left mandible with M_1, spec. no. MF/1957/18.

The condyle varies in height. The upper facet is cylindrical, the lower wide and slightly concave. The interarticular area is moderately wide in its upper part, but its lower part is almost as wide as the lower facet. The sigmoid spicule is present.

Measurements. See Tables XXI and XXII.

Systematic position and distribution. The size of our specimens approaches that of *S. runtonensis* HINTON, 1911 and *S. subaraneus* HELLER, 1958 and is a little smaller than the size of recent *S. araneus* LINNAEUS, 1758.

As concerns morphology, it is similar to *S. subaraneus* described by HELLER (1958) from Erpfingen (Germany) and dated to the end of Biharian (Q_2). This is visible in the shape of the coronoid and condyloid processes, A_1, I_1 and in the position of the mental foramen. These features, especially the shape of the coronoid and condyloid processes are not very stable. According to JAMMOT (1977), this variety is the reason why so many *Sorex* species have been described from the Pleistocene of Europe. Discrimination of the fossil forms of the genus *Sorex* presents the same problems as it does in the case of the recent forms. JAMMOT (1977) thinks that *S. subaraneus*, which was morphologically very variable, was the initial form for two recent chromosome races: *S. araneus* and *S. coronatus* MILLET, 1828.

From *S. runtonensis* *S. subaraneus* differs in its more massive mandible, the shape of the coronoid process, wider not only at the tip, but also at the level of the upper sigmoid notch, the shorter internal temporal fossa and the different shape of the condyle, which is comparatively wide and low, its interarticular area being trapezoid (not rectangular). Only a small part of the lower facet protrudes freely. A_1 of our form bears a trace of the second cusp and I_1 is bigger, wider and its cingulum is less distinct than in *S. runtonensis*. The size of *S. runtonensis* and *S. subaraneus* being similar, and the morphology of the processes in *S. subaraneus* variable, it is hard to discriminate these two species from one another. If they appear together in one locality *S.subaraneus* will always be a little bigger. The only morphological differences between *S. subaraneus* and the recent *S. araneus* occur in the shape of A_1, which in *S. subaraneus* is longer and provided with an additional small cusp (very rare in *S. araneus*), and in the molars, whose entoconid crest is higher. In M_1 the buccal cingulum is more undulate in *S. subaraneus*.

There are no differences in size and morphology between the specimens from 3 Polish localities. The material from Kadzielnia is probably the oldest known of this species.

Besides Poland and the type locality Erpfingen, this species is known from other localities in Germany as for example Hunas (HELLER 1966), and from Turold (HORÁČEK and LOŽEK 1984) in Czechoslovakia, Uppony I (JÁNOSSY at al., 1968, JÁNOSSY 1969 part I and II), Vértesszöllös (JÁNOSSY 1969 p.I) in Hungary, Varbeshnitsa (POPOV 1988) in Bulgaria and Montoussé 5 (CLOT et al., 1976) and La Fage (JAMMOT 1977) in France.

Table XXI

Sorex subaraneus HELLER, 1958
Dimensions of upper dentition (in mm).

		Kozi Grzbiet						Rębielice Królewskie 1A	
		min.	$\bar{x}$	max.	n	sd	cv		n
I^1	L	–	–	–	0	–	–	–	0
	L of talon	–	–	–	0	–	–	–	0
	H of talon	–	1.12	–	1	–	–	–	0
A^1	L	0.82	0.87	0.92	2	–	–	–	0
	W	0.76	0.80	0.85	2	–	–	–	0
A^2	L	0.84	0.87	0.90	2	–	–	–	0
	W	0.74	0.77	0.81	2	–	–	–	0
A^3	L	0.71	0.71	0.72	2	–	–	–	0
	W	0.63	0.67	0.72	2	–	–	–	0
A^4	L	–	0.53	–	1	–	–	0.60	1
	W	–	0.66	–	1	–	–	0.61	1
A^5	L	0.53	0.54	0.55	2	–	–	0.58	1
	W	0.62	0.62	0.62	2	–	–	0.62	1
P^4	L (bucc.)	1.47	1.52	1.60	14	0.05	3.29	1.57	1
M^1	L (max.)	1.39	1.45	1.57	17	0.05	3.45	–	0
	L (med.)	1.07	1.12	1.22	17	0.04	3.57	–	0
	W (max.)	1.50	1.60	1.71	17	0.05	3.12	–	0
M^2	L (max.)	1.17	1.26	1.36	7	0.06	4.76	–	0
	L (med.)	1.00	1.04	1.08	8	0.03	2.88	–	0
	W (ant.)	1.44	1.50	1.55	8	0.04	2.67	–	0
	W (post.)	1.38	1.42	1.47	7	0.04	2.82	–	0

Subgenus *Drepanosorex* KRETZOI, 1941

Sorex (*Drepanosorex*) *praearaneus* KORMOS, 1934
(Text-figs. 11-12)

Material. The list of specimensis is given in Table XXIII.

It contains remains of the maxillae and mandibles with all types of teeth and processes with the exception of M^3 and the angular process.

Description of material. An original description of this species is to be found in Kormos (1934). An emended diagnosis, detailed description, systematic position, generic status and synonymy were published by REUMER (1984, 1985). Therefore, only a description of the upper jaws, missing from REUMER's paper, is added. They are characterized by a deep depression above the antemolars, especially A^2-A^3. The subtriangular infraorbital foramen begins above the paracone of P^4 and extends to the parastyle of M^1, or a little farther to the back. The lacrimal aperture lies above the mesostyle of M^1 or posteriorly to it, between the mesostyle and metastyle of this tooth. The zygomatic process is of medium width, the metastyles of M^2 and M^3 are visible against its background.

A comparison of the Polish material from six localities shows no differences in size and morphology with the exception of the oldest remains from the Late Pliocene of Zamkowa Dolna Cave A (MN17). In this locality the coronoid process is lower and comparatively narrow at the tip, but wide at the level of the condyloid process. This character is probably typical of all geologically older members of this species, as the coronoid processes, similar in shape are also present at Tegelen (MN17) in The Netherlands (REUMER 1984, Pl.10, fig. 2a-b).

In the typical specimens from the end of the Late Pliocene and the Early Pleistocene (Villány 3, Osztramos 3/2 in Hungary, Kielniki 3B, 3A, 1, Kadzielnia and Kamyk in Poland) the coronoid process is nearly the same width over its whole height, because its tip is wide, and the base relatively narrow. This shape is characteristic of all the species of the subgenus *Drepanosorex*.

The only morphological difference between the Hungarian and Polish specimens is visible in the presence of rather distinct hypocones in P^4 and upper molars in the latter specimens.

Measurements. See Tables XXIV and XXV.

Systematic position and distribution. Such features as the fissidency of I^1, relatively large dimensions of the condyle, the shape of the coronoid process and the anterior position of the mental foramen make the basis for the assignment of the remains described above to the subgenus *Drepanosorex*. Inside this subgenus the size of the specimens, their limited robustness and the exoedaenodonty of the anterior dentition refer them to *S.* (*D.*) *praearaneus*.

It is true that the oldest specimens from Zamkowa Dolna Cave A like those from Tegelen are a bit different from the typical remains. In many characters, especially in the morphology of the coronoid and condyloid process they resemble recent *Sorex unguicu-*

Sorex subaraneus
Dimensions of mandible and

		Kadzielnia			
		min.	$\bar{x}$	max.	n
I_1	L	–	–	–	0
	H	–	–	–	0
A_1	L (bucc.)	–	–	–	0
P_4	L (bucc.)	–	–	–	0
	L of talonid (bucc.)	–	–	–	0
	W (occl.)	–	–	–	0
M_1	L (occl.)	1.47	1.48	1.49	3
	W (occl.)	0.88	0.94	0.98	3
M_2	L (occl.)	1.28	1.30	1.33	3
	W (occl.)	0.87	0.89	0.92	3
M_3	L (occl.)	–	1.10	–	1
	W (occl.)	0.68	0.69	0.70	2
M_1-M_3	L (occl.)	–	–	–	0
H of mandible below M_2		1.35	1.41	1.47	5
H of ascending ramus		4.33	4.44	4.54	2
W of coronoid process		0.76	0.92	1.01	3
H of condyloid process		–	–	–	0
W of interarticular area		–	0.75	–	0

Table XXII

HELLER, 1958
lower dentition (in mm).

Rębielice Królewskie 4				Kozi Grzbiet					
min.	$\bar{x}$	max.	n	min.	$\bar{x}$	max.	n	sd	cv
–	–	–	0	3.47	3.59	3.88	22	0.09	2.51
–	0.85	–	1	0.83	0.89	1.00	38	0.04	4.49
–	–	–	0	0.85	0.94	1.07	13	0.06	6.38
–	–	–	0	1.08	1.14	1.22	33	0.04	3.51
–	–	–	0	0.50	0.59	0.71	35	0.05	8.47
–	–	–	0	0.70	0.75	0.83	34	0.03	4.00
1.47	1.47	1.48	2	1.40	1.45	1.53	60	0.03	2.07
0.88	0.89	0.91	2	0.85	0.89	0.95	61	0.03	3.37
1.25	1.27	1.36	4	1.25	1.29	1.38	46	0.03	2.33
0.81	0.82	0.84	4	0.76	0.83	0.88	46	0.03	3.61
–	1.17	–	1	1.04	1.13	1.21	29	0.04	3.54
–	0.63	–	1	0.60	0.65	0.71	29	0.03	4.61
–	–	–	0	3.60	3.74	4.03	20	0.10	2.67
1.25	1.28	1.34	3	1.21	1.31	1.46	45	0.05	3.82
–	–	–	0	4.15	4.26	4.61	15	0.14	3.29
–	–	–	0	0.86	0.92	1.03	13	0.06	6.52
–	–	–	0	1.60	1.72	1.85	7	0.11	6.39
–	–	–	0	0.57	0.61	0.70	10	0.04	6.56

Table XXIII

Sorex (*Drepanosorex*) *praearaneus* KORMOS, 1934

Locality	Number of fragmentary maxillae and detached upper teeth	Number of fragmentary mandibles and detached lower teeth	Total	Minimum number of individuals
Zamkowa Dolna Cave A MF/1929	37	98	135	35
Kielniki 3B MF/1930	0	5	5	4
Kadzielnia MF/1931	0	3	3	2
Kamyk MF/1932	1	25	26	10
Kielniki 3A MF/1933	2	9	11	2
Kielniki 1 MF/1934	0	1	1	1

latus DOBSON, 1890. Also the position of the mental foramen, the size of A^4, which is the smallest of the upper antemolars in their buccal aspect, and the more dark colour of the teeth are similar in these two species.

The remaining material from five Polish localities does not differ from that from Hungary.

According to REUMER (1984) *S.* (*D.*) *praearaneus* is the oldest (MN17) and most primitive member of the lineage, in which successive species (*S. praearaneus, margaritodon, savini*, and *austriacus*) increase in size with time and so does their exoedaenodonty and the size of the condyles. The Late Biharian (Q_2) *S.* (*D.*) *austriacus* is the most specialized and robust form with the most bulbous teeth.

In 1988 HORÁČEK (HORÁČEK, LOŽEK 1988) described a new species of this subgenus, *S.* (*D.*) *postsavini* from Petersbuch in Germany. He is of the opinion, that it might be a descendant of *S.* (*D.*) *savini* HINTON, 1911 and that it has some characters in common with the recent species *Sorex isodon* TUROV, 1924 and *S. unguiculatus.* First determined as *S.* cf. *margaritodon* by KOENIGSWALD (1970) and dated to the Middle Pleistocene, it is, however, smaller than *S.* (*D.*) *savini* and its anterior teeth are only slightly exoedaenodont. Horáček explains this phenomenon by the bifurcation of the main *Drepanosorex* lineage (probably at the level of *S.* (*D.*) *savini*), which gave rise to a branch leading to *S.* (*D.*) *austriacus*, and another to *S.* (*D.*) *postsavini.* In this case the second branch would

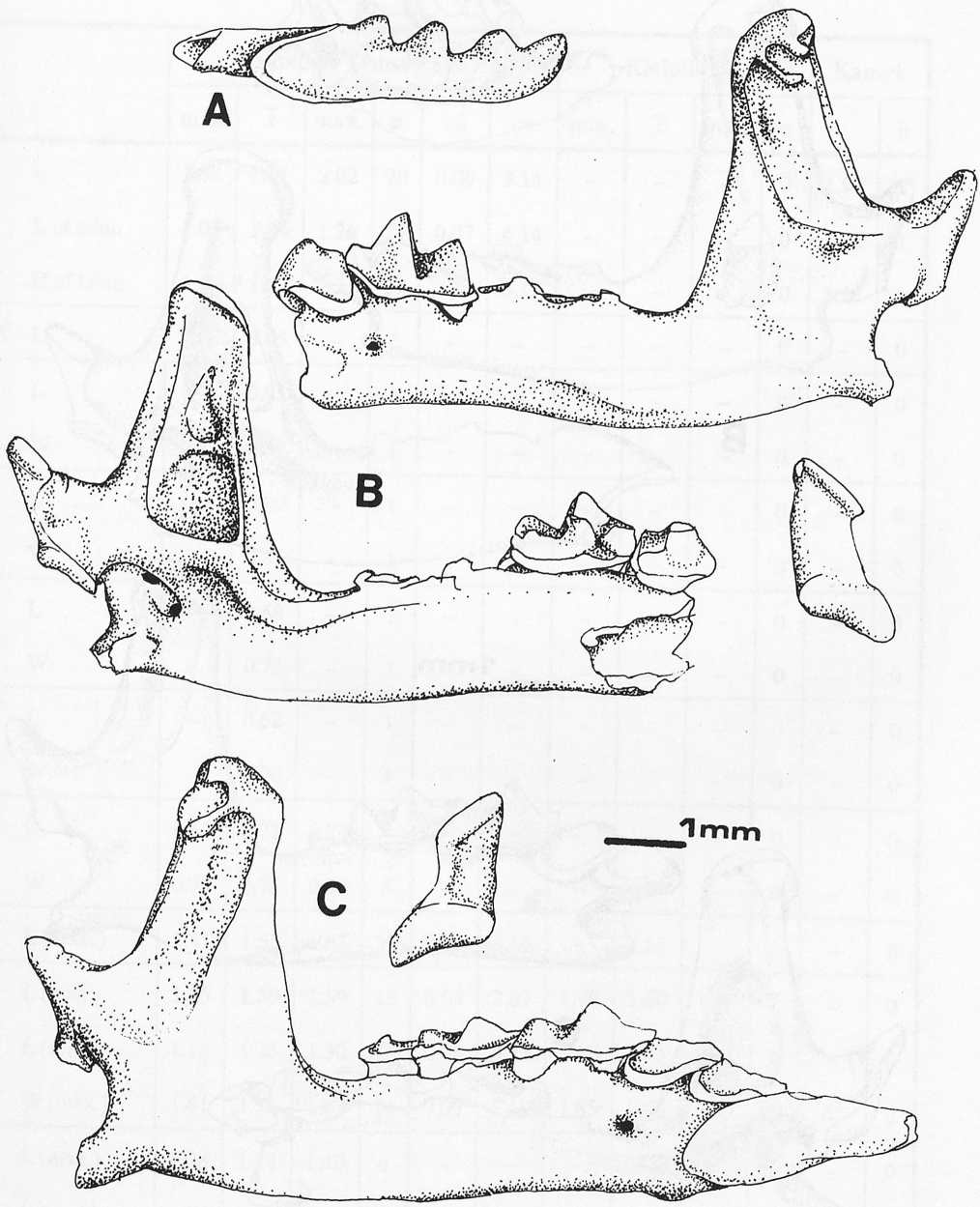

Fig. 11. *Sorex* (*Drepanosorex*) *praearaneus*. A - right I_1 from Zamkowa Dolna cave A, spec. no. MF/1929/59, B - left mandible with P_4-M_1 from Zamkowa Dolna Cave A, spec. no. MF/1929/7, C - right mandible with I_1- M_3 from Kielniki 3B, spec. no. MF/1930/1.

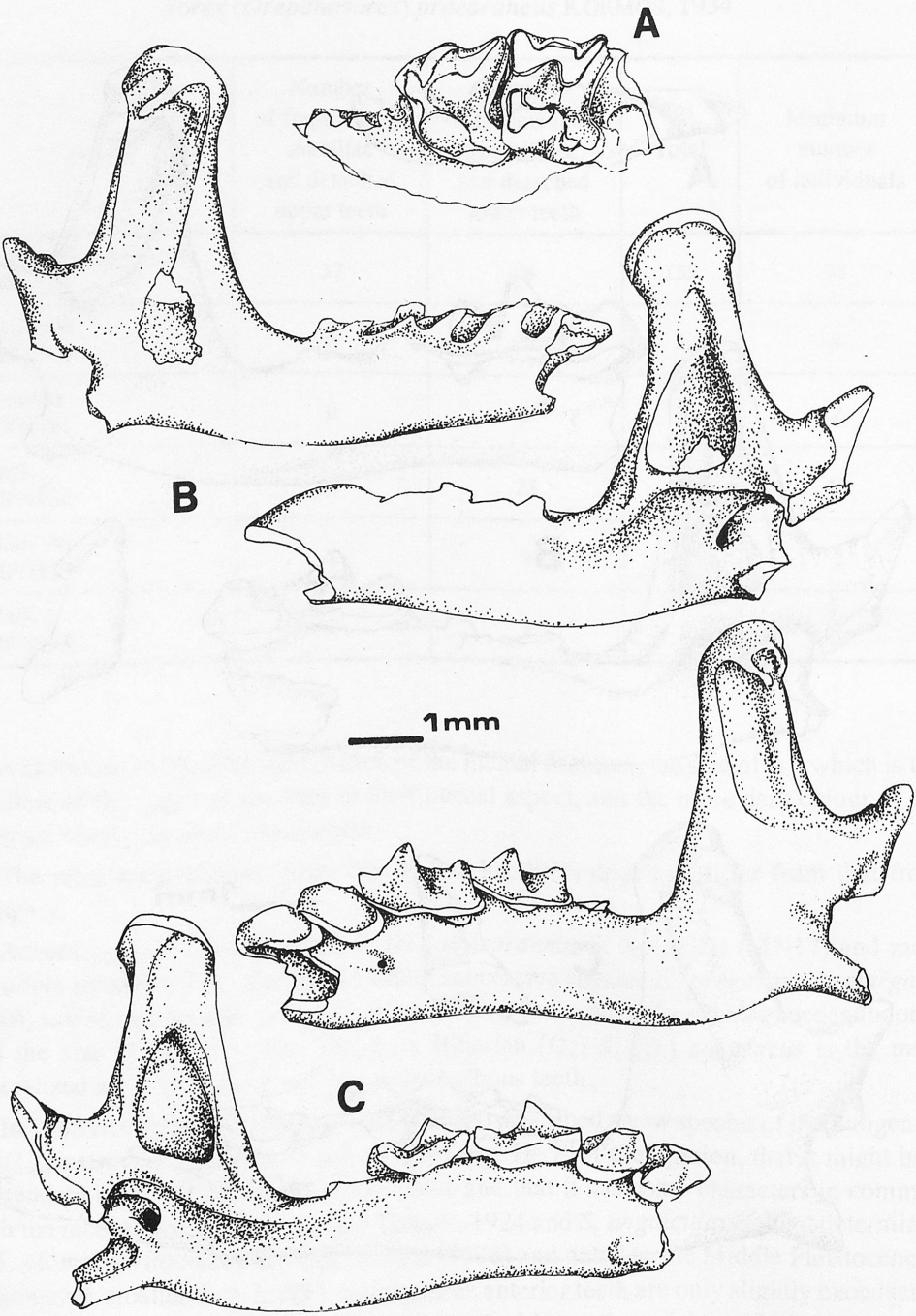

Fig. 12. *Sorex* (*Drepanosorex*) *praearaneus*. A - fragment of left maxilla with P^4-M^1 from Kielniki 3A, spec. no. MF/1933/1, B - right mandible from Kielniki 3A, spec. no. MF/1933/1, C - left mandible with A_1-M_2 from Kadzielnia, spec. no. MF/1931/2.

Table XXIV

Sorex (*Drepanosorex*) *praearaneus* KORMOS, 1934
Dimensions of upper dentition (in mm).

		Zamkowa Dolna Cave A						Kielniki 3A				Kamyk	
		min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n		n
I^1	L	1.82	1.91	2.02	20	0.06	3.14	–	–	–	0	1.90	1
	L of talon	1.03	1.14	1.26	21	0.07	6.14	–	–	–	0	1.05	1
	H of talon	1.17	1.27	1.35	21	0.04	3.15	–	–	–	0	1.25	1
A^1A^5	L	–	3.05	–	1	–	–	–	–	–	0	–	0
A^1	L	–	0.95	–	1	–	–	–	–	–	0	–	0
	W	–	0.89	–	1	–	–	–	–	–	0	–	0
A^2	L	–	0.90	–	1	–	–	–	–	–	0	–	0
	W	–	0.85	–	1	–	–	–	–	–	0	–	0
A^3	L	–	0.68	–	1	–	–	–	–	–	0	–	0
	W	–	0.73	–	1	–	–	–	–	–	0	–	0
A^4	L	–	0.62	–	1	–	–	–	–	–	0	–	0
	W	–	0.70	–	1	–	–	–	–	–	0	–	0
A^5	L	0.67	0.71	0.74	4	–	–	–	–	–	0	–	0
	W	0.71	0.76	0.78	5	–	–	–	–	–	0	–	0
P^4	L (bucc.)	1.41	1.55	1.67	10	0.08	5.16	–	1.66	–	1	–	0
M^1	L (max.)	1.45	1.50	1.59	15	0.04	2.67	1.49	1.50	1.51	2	–	0
	L (med.)	1.15	1.23	1.30	16	0.04	3.25	1.18	1.21	1.25	2	–	0
	W (max.)	1.61	1.74	1.85	14	0.09	5.17	1.85	1.86	1.87	2	–	0
M^2	L (max.)	1.28	1.34	1.40	6	–	–	–	1.35	–	1	–	0
	L (med.)	1.07	1.10	1.17	6	–	–	–	1.10	–	1	–	0
	W (ant.)	1.45	1.54	1.59	6	–	–	–	1.61	–	1	–	0
	W (post.)	1.45	1.52	1.57	6	–	–	–	1.58	–	1	–	0

Sorex (*Drepanosorex*)
Dimensions of mandible

		Zamkowa Dolna Cave A						Kielniki 3B			
		min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n
I_1	L	3.78	4.01	4.33	22	0.14	3.49	–	–	–	0
	H	0.90	1.01	1.10	23	0.05	4.95	1.01	1.02	1.03	2
A_1	L (bucc.)	–	1.08	–	1	–	–	1.18	1.19	1.20	2
P_4	L (bucc.)	1.07	1.16	1.25	12	0.05	4.31	–	1.18	–	1
	L of talonid (bucc.)	0.50	0.63	0.85	12	0.09	14.29	0.60	0.65	0.72	3
	W (occl.)	0.71	0.83	0.90	12	0.05	6.02	0.86	0.89	0.90	3
M_1	L (occl.)	1.44	1.52	1.60	39	0.04	2.63	1.49	1.56	1.62	5
	W (occl.)	0.89	0.96	1.01	39	0.03	3.12	0.97	1.02	1.05	6
M_2	L (occl.)	1.26	1.33	1.39	27	0.03	2.26	1.27	1.34	1.40	4
	W (occl.)	0.81	0.87	0.93	28	0.03	3.45	0.88	0.91	0.93	4
M_3	L (occl.)	1.10	1.15	1.23	10	0.04	3.48	–	1.10	–	1
	W (occl.)	0.66	0.71	0.78	11	0.04	5.63	–	0.68	–	1
M_1-M_3	L (occl.)	3.78	3.90	4.03	10	0.09	2.31	–	3.85	–	1
H of mandible below M_2		1.36	1.48	1.68	45	0.08	5.41	1.49	1.59	1.67	5
H of ascending ramus		4.22	4.60	4.88	20	0.16	3.48	5.02	5.06	5.10	2
W of coronoid process		0.87	0.99	1.12	21	0.07	7.07	1.19	1.20	1.21	2
H of condyloid process		1.91	2.02	2.19	19	0.07	3.46	1.96	2.20	2.45	2
W of interarticular area		0.56	0.69	0.80	24	0.06	8.70	0.69	0.70	0.71	2

Table XXV

praearaneus KORMOS, 1934
and lower dentition (in mm).

Kadzielnia				Kamyk						Kielniki 3A				Kielniki 1	
min.	$\bar{x}$	max.	n	min.	$\bar{x}$	max.	n	sd	cv	min.	$\bar{x}$	max.	n		n
–	–	–	0	–	–	–	0	–	–	3.96	4.10	4.25	2	4.01	1
–	–	–	0	–	–	–	0	–	–	1.04	1.04	1.05	2	1.05	1
–	1.16	–	1	–	1.07	–	1	–	–	–	–	–	0	–	0
–	1.17	–	1	1.14	1.20	1.29	4	–	–	–	–	–	0	–	0
–	0.71	–	1	0.53	0.60	0.68	4	–	–	–	–	–	0	–	0
–	0.90	–	1	0.84	0.86	0.89	3	–	–	–	–	–	0	–	0
1.52	1.55	1.58	2	1.47	1.55	1.67	13	0.05	3.22	1.53	1.55	1.57	2	–	0
1.00	1.01	1.02	2	0.93	0.98	1.07	14	0.04	4.08	0.93	0.97	1.02	2	–	0
1.31	1.34	1.39	3	1.28	1.34	1.38	12	0.03	2.24	1.28	1.35	1.44	3	–	0
0.90	0.92	0.94	3	0.84	0.90	0.94	12	0.03	3.33	0.88	0.89	0.90	3	–	0
1.10	1.11	1.12	2	1.15	1.19	1.22	5	–	–	–	1.07	–	1	–	0
0.68	0.69	0.70	2	0.65	0.70	0.72	5	–	–	–	0.65	–	1	–	0
–	3.91	–	1	3.90	3.94	3.97	3	–	–	–	–	–	0	–	0
1.47	1.51	1.55	3	1.40	1.48	1.58	16	0.06	4.05	1.42	1.49	1.55	4	–	0
4.96	4.98	5.00	2	4.57	4.80	5.00	10	0.13	2.71	5.01	5.04	5.08	2	–	0
1.21	1.24	1.27	2	0.98	1.07	1.18	9	0.06	5.61	1.22	1.30	1.38	2	–	0
2.10	2.20	2.31	2	1.95	2.14	2.24	8	0.09	4.21	2.12	2.13	2.14	2	–	0
0.71	0.75	0.80	2	0.62	0.71	0.78	9	0.06	8.45	0.68	0.68	0.68	2	–	0

present a reversed morphocline (size and exoedaenodonty decreasing) and would lead to the recent species *S. isodon* or *S. unguiculatus*.

As no tendency for the size to decrease with time is so far known in the Pliocene and Pleistocene shrews from Europe (see p. 356), it is more probable that that bifurcation took place earlier (in the Pliocene at the level of *S.* (*D.*) *praearaneus* or an ancestor of it) and then two lineages developed parallel. One leading to more specialized forms (suggested by REUMER 1984); the other remaining more primitive, may have been selected under different conditions, in which exoedaenodonty and size increased only slightly with time. In that case in spite of the name suggesting the origin from *S.* (*D.*) *savini*, *S.* (*D.*) *postsavini* would be rather a descendant of *S.* (*D.*) *praearaneus*. The morphology of the teeth and the coronoid process is almost identical in the last two forms, and only the condyle of *S.* (*D.*) *postsavini* is different (shorter, with a wider interarticular area), although it is massive too. HORÁČEK (1988) pointed to the dark colour of teeth as characteristic of *S.* (*D.*) *postsavini*. However, as mentioned above, dark-pigmented teeth can be found in the members of *S.* (*D.*) *praearaneus*.

It is therefore probable that *S.* (*D.*) *praearaneus* or its descendant lasted longer than is generally supposed. Its survival until the Middle and Late Pleistocene was already mentioned in literature. PASA (1947) reports it from Soave in Italy by the name of *Sorex pachyodon*. It is also described as *Sorex praearaneus tetragonurus* MEZHZHERIN et SVISTUN, 1972 from the alluvial sediments of the Ukraine dated to the Late Pleistocene (MEZHZHERIN 1972). Its dimensions, description and drawings confirm this determination.

S. (*D.*) *praearaneus* was mentioned by KOWALSKI (1956) from Podlesice (MN14) in Poland as *Sorex* cf.*praearaneus*, but its morphology does not agree with the diagnosis of this subgenus and species. In the present paper it is described as *Sorex* sp. 3 (see p. 402).

Also SULIMSKI (1962a) writes about the presence of *S.* cf. *praearaneus* at Węże 1 (MN15), but I have not found it in my material from this locality.

Its presence at Ivanovce (MN15) in Czechoslovakia (FEJFAR 1966) also seems to be doubtful.

The toothless mandibular fragment mentioned (without description and dimensions) from Żabia Cave (Q_2) (BOSÁK et al., 1982) once as *Sorex* ex. gr. *pachyodon /margaritodon*_and in another place as *Sorex* (*Drepanosorex*) cf. *pachyodon* also belonged probably to *S.* (*D.*) *praearaneus*.

REUMER (1984) described it from Tegelen in The Netherlands and from Villány 3 and Osztramos 3/2 in Hungary. Besides Poland, Hungary and The Netherlands, it is known from Soave (PASA 1947) in Italy (as *S. pachyodon*) and from the Ukraine (MEZHZHERIN 1972).

Sorex (*Drepanosorex*) *savini* HINTON, 1911
(Text-figs. 13-14)

Material. The list of specimens is given in Table XXVI. It contains fragments of maxillae with I^1-A^2 and P^4-M^2 and mandibles with all types of teeth and processes with the exception of the angular process.

Description of material. The infraorbital foramen begins over the paracone of P^4 and extends to the parastyle of M^1. The lacrimal aperture lies above the mesostyle of M^1. The zygomatic process is wide and short. The mesostyle and metastyle of M^2 as well as M^3 are visible against it in the background.

The emargination of P^4 and upper molars is slight. The pigment, if perceptible, is light orange. I^1 is bifid. Its apex and single-cusped pointed talon are bulbous. The undulate, protruding cingulum does not reach the upper part of the tooth. There is a weak groove between the apex and the talon. Single-cusped A^1 and A^2 are big, wide and bulbous on the buccal side. They are a little longer than wide. Their cingula are also wide. A^2 is smaller than A^1. The alveolus of A^3 is large, and that of A^4 much smaller. A^5 has the smallest alveolus, totally visible from the buccal side.

P^4 is massive. Its parastyle is not protruding. The parastylar crest is short and rather high. The L-shaped protocone is strong. The hypocone is bulbous, in the shape of a cusp. The hypoconal flange of P^4 is rounded and only slightly concave. The weak cingulum surrounding the parastyle is visible below the protocone and on the posterior side of the tooth. A small additional cuspule can be seen between the parastyle and the protocone. The deep valley between the protocone and the hypocone can be closed by a ridge.

M^1 is also massive, its big protocone and hypocone are in the shape of cusps. The metaloph is lacking. The hypoconal flange is small. The cingulum is present on the lingual

Table XXVI

Sorex (*Drepanosorex*) *savini* HINTON, 1911

Locality	Number of fragmentary maxillae and detached upper teeth	Number of fragmentary mandibles and detached lower teeth	Total	Minimum number of individuals
Zalesiaki 1A MF/1927	6	8	14	4
Zamkowa Dolna Cave C MF/1928	0	1	1	1
Kozi Grzbiet MF/1926	12	21	33	10

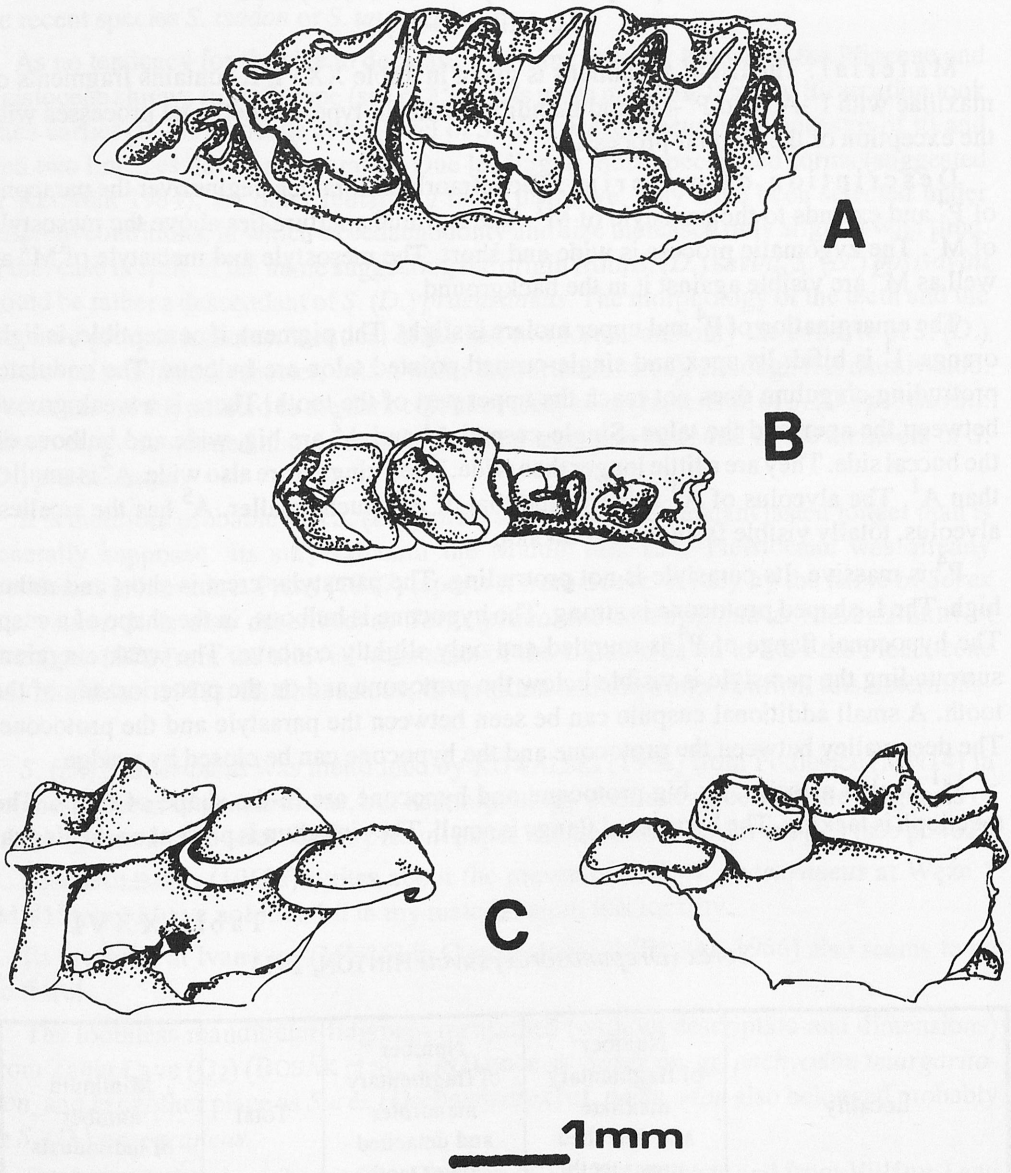

Fig. 13. *Sorex* (*Drepanosorex*) *savini* from Zalesiaki 1A. A - fragment of left maxilla with P^4-M^2, spec. no. MF/1927/6, B - fragment of right maxilla with A^1-A^2, spec. no. MF/1927/4, C - fragment of right mandible with A_1-M_1, spec. no. MF/1927/7.

side of the protocone, between the protocone and the hypocone, and on the posterior side of this tooth. M^2 is smaller than M^1.

The horizontal ramus of the mandible is very high and its lower margin slightly concave between M_1 and M_2. It forms an only slightly obtuse or almost right angle with the

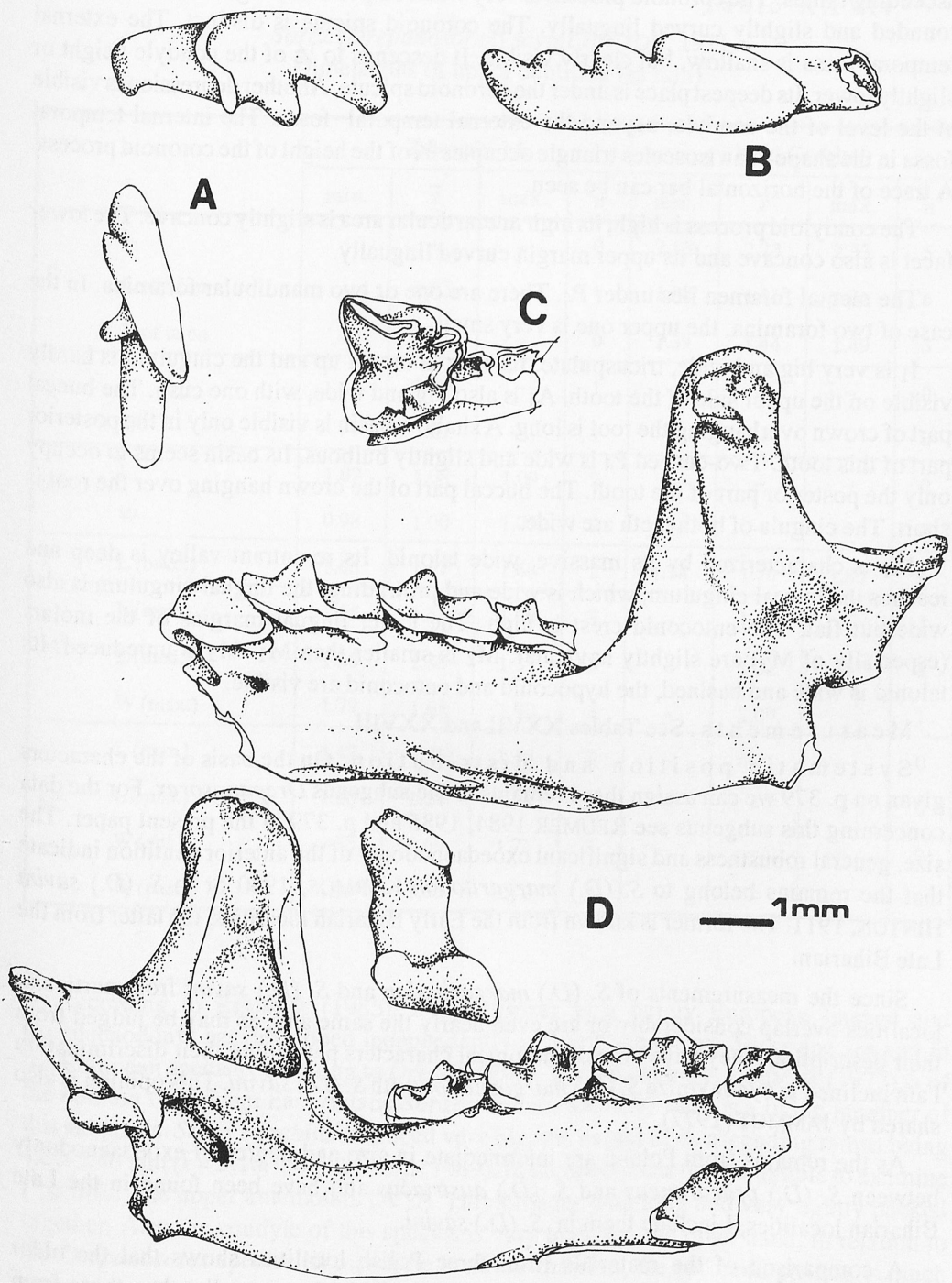

Fig. 14. *Sorex* (*Drepanosorex*) *savini* from Kozi Grzbiet. A - right I^1, spec. no. MF/1926/1, B - left I_1, spec. no. MF/1926/6, C - right P^4, spec, no. MF/1926/4, D - left mandible with P_4-M_3, spec. no. MF/1926/1.

ascending ramus. The coronoid process is very wide. Its posterior edge is concave, the tip rounded and slightly curved lingually. The coronoid spicule is distinct. The external temporal fossa is shallow, but clearly visible. It descends to ⅓ of the condyle height or slightly lower. Its deepest place is under the coronoid spicule. Another depression is visible at the level of the condyle, beyond the external temporal fossa. The internal temporal fossa in the shape of an isosceles triangle occupies ¾ of the height of the coronoid process. A trace of the horizontal bar can be seen.

The condyloid process is high, its high interarticular area is slightly concave. The lower facet is also concave and its upper margin curved lingually.

The mental foramen lies under P_4. There are one or two mandibular foramina. In the case of two foramina, the upper one is very small.

I_1 is very big and wide, tricuspulate. Its apex is turned up and the cingulum is hardly visible on the upper side of the tooth. A_1 is also big and wide, with one cusp. The buccal part of crown overhanging the root is long. A shallow basin is visible only in the posterior part of this tooth. Two-cusped P_4 is wide and slightly bulbous. Its basin seems to occupy only the posterior part of the tooth. The buccal part of the crown hanging over the root is short. The cingula of both teeth are wide.

M_1 is characterized by its massive, wide talonid. Its re-entrant valley is deep and reaches the buccal cingulum, which is wide and protruding; the lingual cingulum is also wide but flat. The entoconid crest is high. The lower lingual margins of the molars (especially of M_2) are slightly navicular. M_2 is smaller than M_1. M_3 is unreduced. Its talonid is wide and basined, the hypoconid and entoconid are visible.

Measurements. See Tables XXVII and XXVIII.

Systematic position and distribution. On the basis of the characters given on p. 379 we can assign these remains to the subgenus *Drepanosorex*. For the data concerning this subgenus see REUMER 1984, 1985 and p. 379 in the present paper. The size, general robustness and significant exoedaenodonty of the anterior dentition indicate that the remains belong to *S.* (*D.*) *margaritodon* KORMOS, 1930 or to *S.* (*D.*) *savini* HINTON, 1911. The former is known from the Early Biharian localities, the latter from the Late Biharian.

Since the measurements of *S.* (*D.*) *margaritodon* and *S.* (*D.*) *savini* from particular localities overlap considerably or are even nearly the same and, as may be judged from their descriptions they have no morphological characters permitting their discrimination I am inclined to synonymize *S.* (*D.*) *margaritodon* with *S.* (*D.*) *savini*. This opinion is also shared by JAMMOT (1977).

As the remains from Poland are intermediate in size and degree of exoedaenodonty between *S.* (*D.*) *praearaneus* and *S.* (*D.*) *austriacus* and have been found in the Late Biharian localities, I include them in *S.* (*D.*) *savini*.

A comparison of the materials from three Polish localities shows that the older specimens from Zamkowa Dolna Cave C and Zalesiaki 1A are smaller than those from Kozi Grzbiet dated to the end of the Late Biharian. They have two mandibular foramina, whereas the specimens from Kozi Grzbiet only one.

Table XXVII

Sorex (*Drepanosorex*) *savini* HINTON, 1911
Dimensions of upper dentition (in mm).

		Zalesiaki 1A				Kozi Grzbiet			
		min.	$\bar{x}$	max.	n	min.	$\bar{x}$	max.	n
I^1	L	–	–	–	0	2.13	2.23	2.33	5
	L of talon	–	0.85	–	1	1.08	1.21	1.31	6
	H of talon	–	–	–	0	1.39	1.44	1.49	5
A^1	L	–	1.20	–	1	–	–	–	0
	W	–	1.01	–	1	–	–	–	0
A^2	L	1.07	1.08	1.09	2	–	–	–	0
	W	0.98	1.00	1.03	2	–	–	–	0
P^4	L (bucc.)	1.66	1.67	1.68	2	1.74	1.76	1.80	4
M^1	L (max.)	1.55	1.57	1.60	3	–	1.63	–	1
	L (med.)	1.36	1.38	1.39	3	–	1.32	–	1
	W (max.)	1.79	1.83	1.90	3	–	2.00	–	1
M^2	L (max.)	1.42	1.43	1.45	3	–	–	–	0
	L (med.)	1.20	1.24	1.28	3	–	–	–	0
	W (ant.)	1.65	1.69	1.75	3	–	–	–	0
	W (post.)	1.60	1.65	1.72	3	–	–	–	0

According to REUMER (1985), *Drepanosorex* is a purely European lineage and exoedaenodonty has developed independently in North American *Sorex* species and in the European species belonging to *Drepanosorex*. On the contrary, JAMMOT (1977) is of the opinion that recent East Asiatic *Sorex mirabilis* OGNEV, 1937 is a living member of this subgenus. *Sorex mirabilis* is indeed very big, the height of its ascending ramus being 4.80-5.40 mm ($\bar{x}$ = 5.10, n = 19) (JUDIN 1989). In the specimens that I was able to examine I^1 is bifid, the upper antemolars (A^2-A^5) are broader than long and very tightly packed together. Also the condyle of this species is very high. On the other hand, in relation to the *Drepanosorex* species its mandible is not so massive, the coronoid process is much narrower and curved forward and the mental foramen is placed posteriorly, between the protoconid and re-entrant valley of M_1. Also I^1 is characterized by its very narrow apex and talon, the emargination of P^4 and upper molars is much more distinct and the

Table XXVIII

Sorex (*Drepanosorex*) *savini* HINTON, 1911
Dimensions of mandible and lower dentition (in mm).

		Zalesiaki 1A				Zamkowa Dolna Cave C		Kozi Grzbiet					
		min.	$\bar{x}$	max.	n		n	min.	$\bar{x}$	max.	n	sd	cv
I_1	L	–	4.22	–	1	–	0	4.32	4.41	4.53	3	–	–
	H	1.04	1.07	1.10	3	–	0	1.16	1.19	1.25	8	0.03	2.52
A_1	L (bucc.)	1.26	1.27	1.28	2	–	0	–	–	–	0	–	–
P_4	L (bucc.)	1.20	1.25	1.31	2	–	0	1.36	1.37	1.38	2	–	–
	L of talonid (bucc.)	0.64	0.64	0.64	2	–	0	0.65	0.72	0.80	2	–	–
	W (occl.)	0.94	0.94	0.94	2	–	0	0.96	0.97	0.99	2	–	–
M_1	L (occl.)	–	1.64	–	1	1.72	1	1.58	1.70	1.75	9	0.05	2.94
	W (occl.)	–	1.07	–	1	1.03	1	1.01	1.10	1.16	8	0.05	4.54
M_2	L (occl.)	–	–	–	0	–	0	1.44	1.49	1.58	9	0.05	3.36
	W (occl.)	–	–	–	0	–	0	0.93	1.02	1.11	9	0.06	5.88
M_3	L (occl.)	–	–	–	0	–	0	1.24	1.29	1.32	5	–	–
	W (occl.)	–	–	–	0	–	0	0.82	0.86	0.91	5	–	–
M_1-M_3	L (occl.)	–	–	–	o	–	0	4.34	4.38	4.42	2	–	–
H of mandible below M_2		1.57	1.59	1.61	2	1.65	1	1.61	1.83	2.03	6	–	–
H of ascending ramus		4.80	5.05	5.33	3	5.33	1	–	5.68	–	1	–	–
W of coronoid process		1.22	1.23	1.24	3	1.27	1	–	1.48	–	1	–	–
H of condyloid process		–	2.60	–	1	–	0	2.55	2.67	2.79	2	–	–
W of interarticular area		0.77	0.83	0.91	3	–	0	0.93	0.98	1.03	2	–	–

pigmentation intense. It is, however, the most important fact that the teeth of *S. mirabilis*, though big, are not so massive and do not show any traces of exoedaenodonty.

The biology of this shrew is nearly unknown. Although often captured near streams (e.g., my specimens from North Korea), the morphology of their teeth does not suggest a diet composed of molluscs.

The differences discussed above show that its affinity with European *Drepanosorex* species is rather doubtful. ERBAJEVA (1974) mentioned *S. mirabilis* from the very old Villanyian (MN16) fauna of Beregovaja in Siberia.

Outside Poland *S.* (*D.*) *savini* is known from numerous localities of Europe. It was found, among others, at West Runton (HINTON 1911), Sugworth (BRIGGS et al., 1975) and Westbury-Sub-Mendip (BISHOP 1982) in England, Erpfingen (HELLER 1936), Mosbach (BAHLO and MALEC, 1969), Sudmer-Berg 2 (KOENIGSWALD 1972), Husarenhof 4 (KOENIGSWALD 1973) in Germany, Přezletice (FEJFAR 1969), Zlaty Kůň (C 718) near Konĕprusy (FEJFAR 1956, 1961), Gombasek (FEJFAR 1961) in Czechoslovakia, Deutsch-Altenburg 2 (RABEDER 1973) in Austria, Tarkö (JÁNOSSY (1969 p.II, 1970), Uppony I (JÁNOSSY 1969 p.I) in Hungary, and Valerots (CHALINE 1972, JAMMOT 1977) in France (all localities dated to Q_1/Q_2, Q_2 and Q_2/Q_3).

Sorex (cf. *Drepanosorex*) sp. 1
(Text-fig. 15)

Material. One mandibular fragment with M_1-M_2 and coronoid and condyloid processes from Kozi Grzbiet, MF/1924.

Description of material. The horizontal ramus of the mandible is high, its lower margin only slightly concave below M_2. The coronoid process is straight, its tip wide, rounded and bending lingually. The coronoid spicule, situated high is short but protruding. The external temporal fossa is distinct and wide, deepest above and below the coronoid spicule. It reaches the middle of the condyle. The internal temporal fossa is high, in the shape of an isosceles triangle. It occupies ¾ of the coronoid height and is provided with a horizontal bar. The condyloid process is relatively short, its interarticular area very wide. The upper facet is cylindrical and placed obliquely to the buccal border of the interarticular area. The lower facet is moderately wide and slightly concave. It forms a right angle with the buccal border of the interarticular area. The pterygoid spicule is distinct. There is only one mandibular foramen situated near the middle of the lower margin of the internal temporal fossa. The mental foramen lies under the tip of the protoconid of M_1. The pigmentation is dark cherry.

The molars are slightly bulbous. In M_1 the buccal re-entrant valley does not reach the cingulum, in M_2 it descends a little lower. The entoconid crest is very high. The buccal cingulum is distinct but narrow and rather straight, the lingual cingulum is wide. The lingual lower border of the molars is slightly navicular. M_2 is smaller than M_1.

Measurements. See Table XXIX.

Systematic position. The size of the specimen, general robustness and slightly bulbous molars, especially M_1, suggest its belonging to the subgenus *Drepanosorex*.

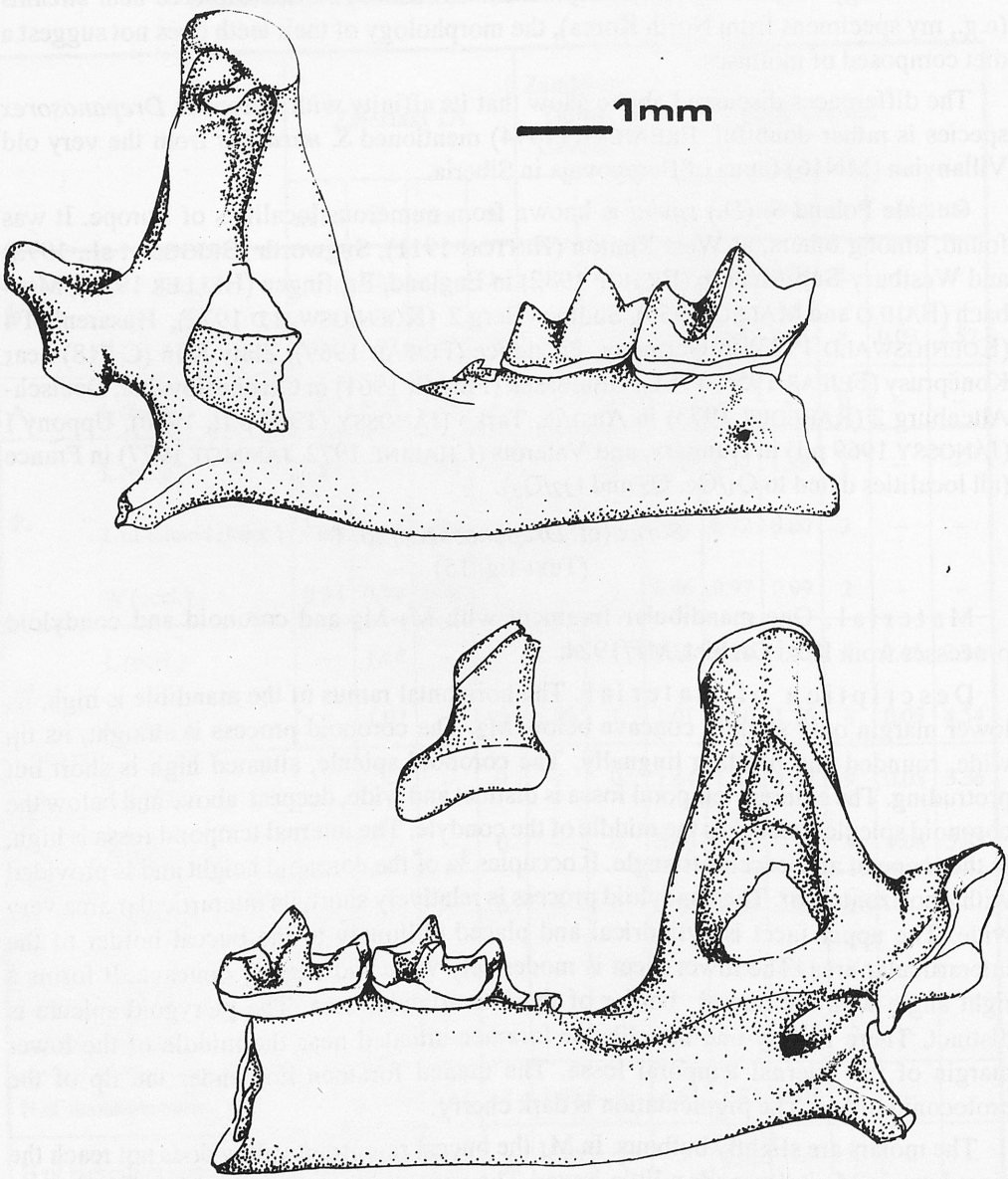

Fig. 15. *Sorex* (*Drepanosorex*) sp.1 from Kozi Grzbiet. Right mandible with M_1-M_2, spec. no. MF/1924/1.

At first sight *Sorex* (cf. *Drepanosorex*) sp. 1 seems to be most similar to *S.* (*D.*) *postsavini* described by HORÁČEK (HORÁČEK, LOŽEK 1988). Both are characterized by the same size, their comparatively low condyles and the dark colour of their teeth. A direct

Table XXIX

Sorex (*Drepanosorex*) sp.1
Dimensions of mandible and lower dentition (in mm).

		Kozi Grzbiet	
			n
M_1	L (occl.)	1.56	1
	W (occl.)	1.08	1
M_2	L (occl.)	1.45	1
	W (occl.)	0.90	1
H of mandible below M_2		1.64	1
H of ascending ramus		5.04	1
W of coronoid process		1.28	1
H of condyloid process		2.05	1
W of interarticular area		0.86	1

comparison of these forms contradicts, however, their specific identity. The mandible from Kozi Grzbiet differs from that of *S.* (*D.*) *postsavini* in its straight and wide coronoid process, shorter coronoid spicule, mental foramen placed further to the back, the presence of only one mandibular foramen, the longer lower facet of the condyle, and in different lower molars, which are more bulbous, with their entoconid crests longer and lingual lower margins slightly navicular.

S. (cf. *Drepanosorex*) sp. 1 differs also from *S.* (*D.*) *savini* not only of the Kozi Grzbiet population where both are present, but also from other remains from different European localities. It is distinctly smaller, its external temporal fossa is more distinct, condyle shorter and the interarticular area is trapezoid, not rectangular in shape. It has only one mandibular foramen and different pigmentation of teeth.

In size it is similar to *S.* (*D.*) *praearaneus*, from which it differs morphologically. In *S.* (cf. *Drepanosorex*) sp. 1 the condyle has a different shape and the mental foramen lies farther to the rear.

Sorex sp. 1
(Text-fig. 16)

Material. A fragmentary mandible, with M_1-M_2 and the coronoid and condyloid processes, from Podlesice, MF/1921.

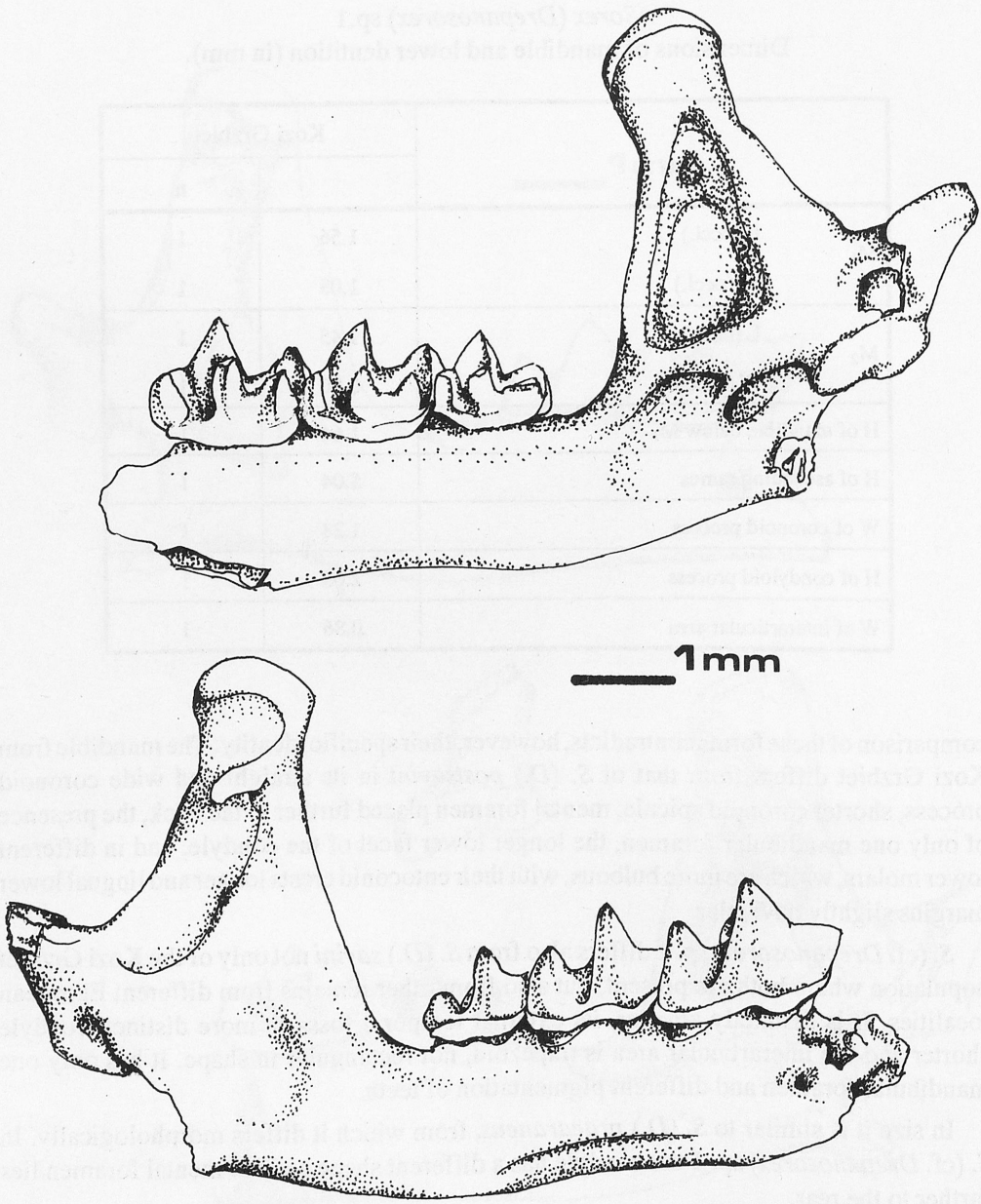

Fig. 16. *Sorex* sp. 1 from Podlesice. Right mandible with M_1-M_3, spec. no. MF/1921/1.

Description of material. Teeth pigmented. The horizontal ramus of the mandible concave under M_2. The ascending ramus forms a slightly obtuse angle with the horizontal one. The tip of the coronoid process is rather wide, rounded and curved

anteriorly, its posterior edge being concave. It is also wide at the level of the upper sigmoid notch. The coronoid spicule is small and not protruding, in the shape of a semicircle. It is situated in two thirds of the height of the coronoid process. The external temporal fossa extends downwards to ½ of the condyle height and it is rather shallow. Only the part below the coronoid spicule is more excavated. The internal temporal fossa, in the shape of an isosceles triangle, is rather high. It extends to ⅔ of the height of the coronoid process.

The condyloid process is big. The upper facet is cylindrical, the lower is wide on the labial side and narrow on the lingual. The interarticular area (a little damaged) is high and rather wide. Only one mandibular foramen is situated in the middle of the lower edge of the internal temporal fossa. The mental foramen lies below the protoconid of M_1, right under the anterior corner of this tooth.

Table XXX

Sorex sp. 1
Dimensions of mandible and lower dentition (in mm).

		Podlesice	
			n
M_1	L (occl.)	1.58	1
	W (occl.)	1.04	1
M_2	L (occl.)	1.43	1
	W (occl.)	0.95	1
M_3	L (occl.)	1.30	1
	W (occl.)	0.71	1
M_1-M_3	L	4.06	1
H of mandible below M_2		1.45	1
H of ascending ramus		4.93	1
W of coronoid process		1.16	1
H of condyloid process		2.34	1
W of interarticular area		0.75	1

The molars are very massive. Their re-entrant valleys do not reach the cingulum. The labial cingulum is wide, slightly undulate and not protruding. The lingual one is also wide, but flat. The entoconid crest is long and very high. The lower lingual margins of molars are rounded (navicular) and the tips of their cusps straight. M_3 is unreduced.

Measurements. See Table XXX.

Systematic position. See p. 401.

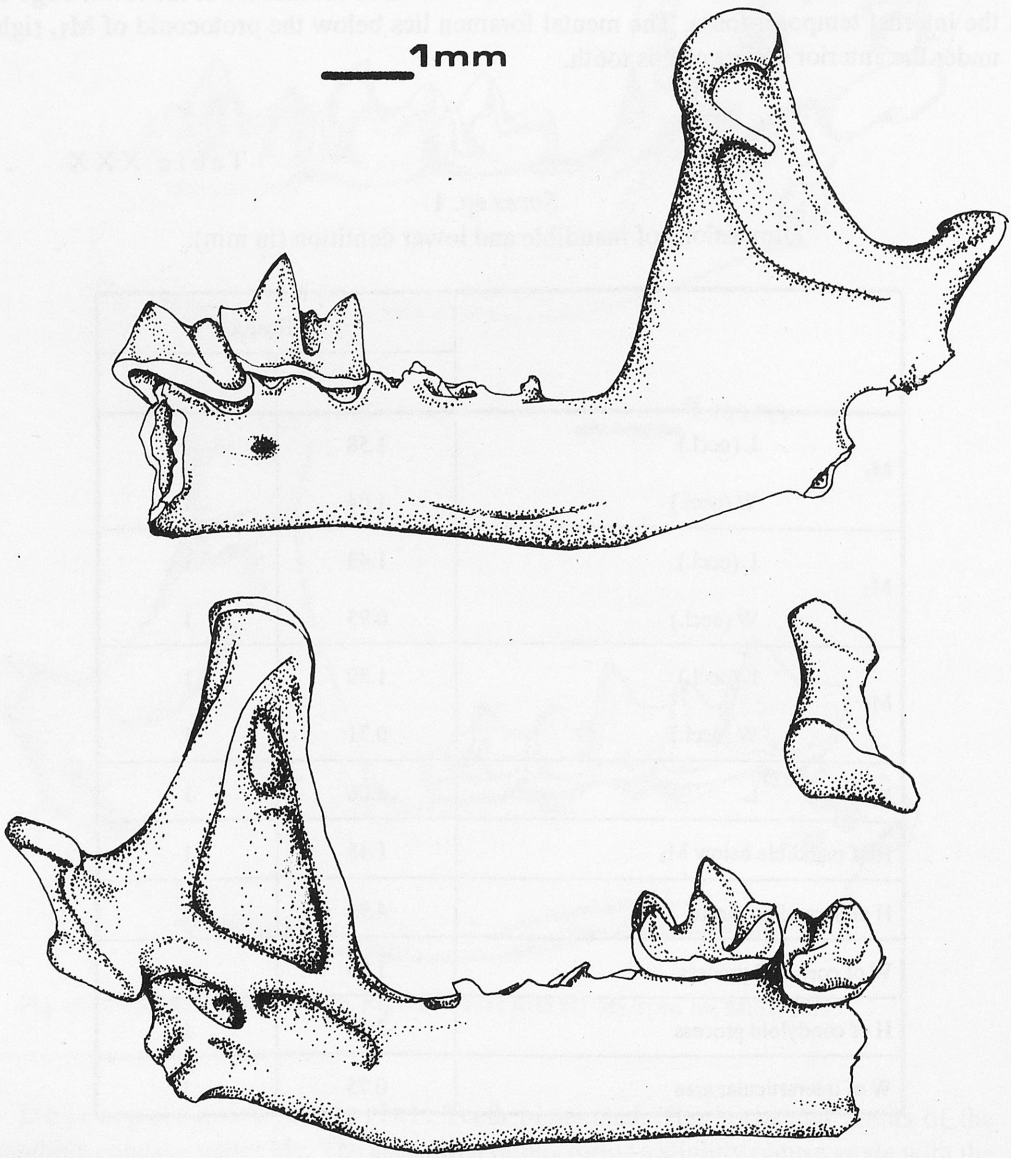

Fig. 17. *Sorex* sp. 2 from Podlesice. Left mandible with P_4-M_1, spec. no. MF/1923/1.

Sorex sp. 2
(Text-fig. 17)

Material. One fragment of a mandible with P_4-M_1 and coronoid and condyloid processes, from Podlesice, MF/1923 and two fragments of mandibles from Rębielice Królewskie 1A MF/1922, one toothless with condyle and coronoid process, other with P_4-M_1, but without processes.

Description of material. As these mandibles are similar to that identified as *Sorex* sp. 1, only P_4, which is absent from that specimen is here described. Some differences between the specimens from Podlesice and Rębielice Królewskie 1A and between *Sorex* sp. 1 and *Sorex* sp. 2 are also given.

P_4 has two cusps separated labially by a shallow groove, a large postero-lingual basin and wide, protruding cingula on both sides.

The ascending ramus in the specimen from Rębielice Królewskie 1A is higher than that from Podlesice (see Table XXXI).

Sorex sp. 2 differs from *Sorex* sp. 1 in its slightly bigger size, wider coronoid process at the condylar level (upper sigmoid notch), two mandibular foramina, higher internal temporal fossa with a weak horizontal bar, more distinct coronoid spicule and deeper external temporal fossa. Its first lower molar M_1 is characterized by the small mesoconid, less undulated lingual lower margin and lower entoconid crest.

Measurements. See Table XXXI.

Systematic position. The size of both *Sorex* sp. 1 and *Sorex* sp. 2 approaches that of fossil *S. polonicus* n. sp. from Rębielice Królewskie 1A and recent *S. araneus*, although P_4 of *Sorex* sp. 2 and the condyloid process of both of them are bigger.

As concerns the morphology, however, they have no counterparts among the fossil and living species. They differ from *S. araneus* in the different shape of the coronoid process. In *Sorex* sp. 2 the shape of the coronoid spicule and that of P_4 are also different. In *Sorex* sp. 1 there is only one mandibular foramen and the mental foramen is situated farther to the front. The most important difference, however, can be seen in the condyloid process, which in both *Sorex* sp. 1 and 2 is similar to that in *S.* (*Drepanosorex*) rather than to *S. araneus*. In both of them it is higher than in *S. araneus* and its interarticular area is uniformly wide, rectangular, and not trapezoid as it is usually in *S. araneus*. In comparison with *S.* (*Drepanosorex*), however, they are smaller, more slender and their teeth are more strongly pigmented.

In appearance they also differ distinctly from *S. polonicus* n. sp. In contrast with *S. polonicus* n. sp. *Sorex* sp. 1 has only one mandibular foramen, anteriorly curved coronoid process, lower entoconid crest and straight lingual margins of its molars. On the other hand, *Sorex* sp. 2 is a little bigger than *S. polonicus* n. sp., its coronoid process is wider, the mental foramen situated farther to the front and P_4 more massive, with two cusps separated labially by a distinct groove. In its P_4 with a labial groove between the cusps, the high condyle and the anterior position of the mental foramen *Sorex* sp. 2 resembles recent *S. unguiculatus* DOBSON, 1890 but it is robust.

Table XXXI

Sorex sp. 2
Dimensions of mandible and lower dentition (in mm).

		Podlesice		Rębielice Królewskie 1 A			
		min.	n	min.	$\bar{x}$	max.	n
P_4	L (bucc.)	1.43	1	–	1.44	–	1
	L of talonid (bucc.)	0.60	1	–	0.63	–	1
	W (occl.)	0.92	1	–	1.02	–	1
M_1	L (occl.)	1.59	1	–	1.59	–	1
	W (occl.)	1.06	1	–	1.06	–	1
M_2	L (occl.)	–	0	–	1.42	–	1
	W (occl.)	–	0	–	0.97	–	1
H of mandible below M_2		1.68	1	1.63	1.65	1.68	2
H of ascending ramus		5.05	1	–	5.30	–	1
W of coronoid process		1.13	1	–	1.13	–	1
H of condyloid process		2.25	1	–	2.29	–	1
W of interarticular area		0.72	1	–	0.75	–	1

Other Pliocene species: *S. minutus*, *S. bor* and *S. casimiri* n. sp., in addition to their different morphology, are much smaller.

Sorex sp. 3
(Text-fig. 18)

1956 - *Sorex* cf. *praearaneus* KORMOS, 1934, K. KOWALSKI, Insectivores, bats..., pp. 350-351, Pl. I, Fig. 4, Text-fig. 1a.

Material. Two mandibular fragments, one with broken I_1, A_1-M_3 and all processes, other with M_1-M_2 and coronoid and condyloid processes, both from Podlesice, MF/5.

Description of material. Teeth pigmented but secondarily decolorized. The horizontal ramus of the mandible is concave under M_1/M_2. The ascending ramus forms a slightly obtuse angle with the horizontal one. The coronoid process is very narrow, straight, or slightly curved anteriorly. Its posterior edge is also straight or slightly concave. Its tip is rounded. The V-shaped coronoid spicule is distinct, moderately protruding, directed obliquely downwards. It is long and begins very near the anterior edge of the coronoid

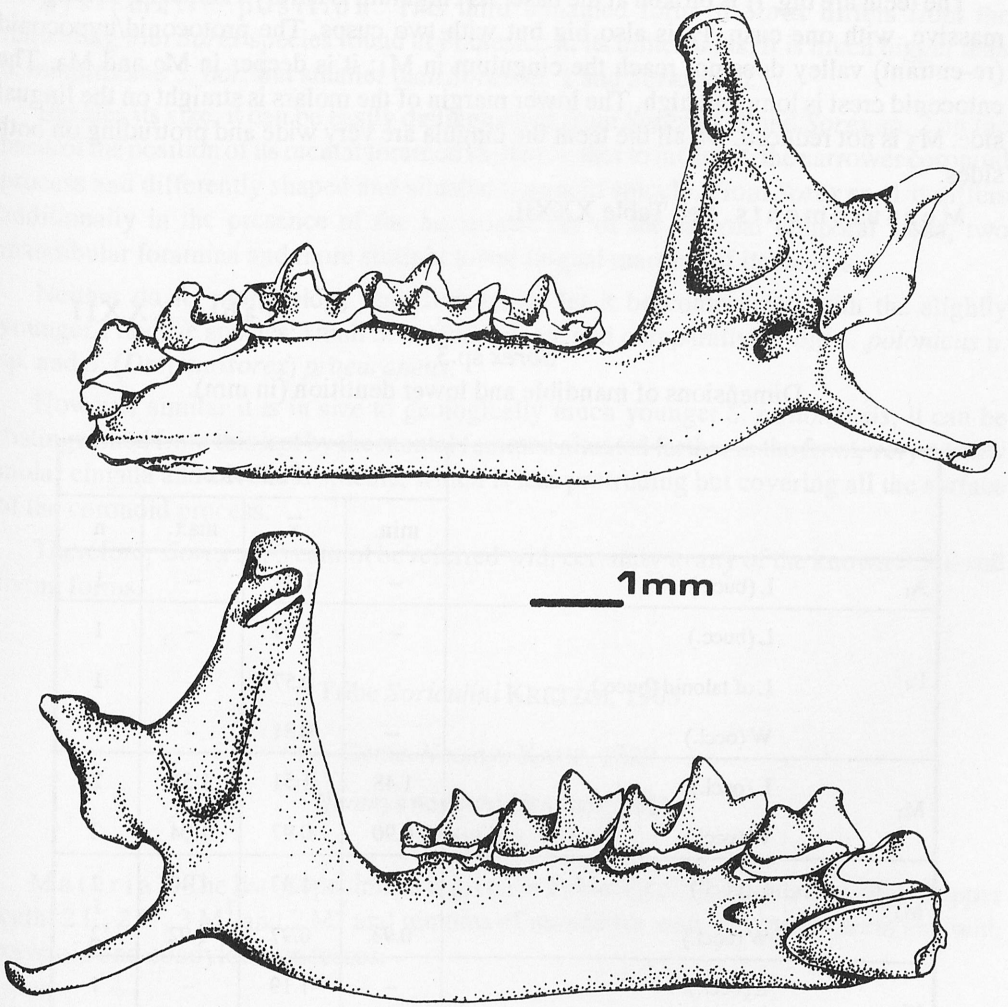

Fig. 18. *Sorex* sp. 3 from Podlesice. Right mandible with A_1-M_3, spec. no. MF/5/6.

process. It is situated in two thirds of the height of the external temporal fossa. This fossa is shallow and not very distinct. It extends downwards to ⅓ or ¼ of the height of the condyle. The internal temporal fossa in the shape of an isosceles triangle is high and extends to the tip of the coronoid. It is provided with a horizontal bar which separates the small, triangular and shallow part from the trapezoidal and deep lower part of this fossa.

The condyle is big. The upper facet is broader in its lingual part and narrower in labial. It is only slightly concave. The interarticular area is high, almost uniformly wide all along and slightly concave. The small pterygoid spicule is visible. The angular process is long and narrow. Two mandibular foramina are placed in a groove, the upper one being very small. The mental foramen lies between P_4 and M_1 (anteriorly to the first root of M_1).

The teeth are big. I_1 is broken at the base. Its cingulum is hardly visible. A_1 is long and massive, with one cusp. P_4 is also big but with two cusps. The protoconid/hypoconid (re-entrant) valley does not reach the cingulum in M_1; it is deeper in M_2 and M_3. The entoconid crest is long and high. The lower margin of the molars is straight on the lingual side. M_3 is not reduced. On all the teeth the cingula are very wide and protruding on both sides.

Measurements. See Table XXXII.

Table XXXII

Sorex sp.3
Dimensions of mandible and lower dentition (in mm).

		Podlesice			
		min.	$\bar{x}$	max.	n
A_1	L (bucc.)	–	1.24	–	1
P_4	L (bucc.)	–	1.29	–	1
	L of talonid (bucc.)	–	0.57	–	1
	W (occl.)	–	0.81	–	1
M_1	L (occl.)	1.48	1.51	1.55	2
	W (occl.)	0.90	0.97	1.04	2
M_2	L (occl.)	1.35	1.37	1.40	2
	W (occl.)	0.93	0.97	1.02	2
M_3	L (occl.)	–	1.19	–	1
	W (occl.)	–	0.77	–	1
M_1-M_3	L (occl.)	–	3.94	–	1
H of mandible below M_2		1.41	1.49	1.58	2
H of ascending ramus		4.32	4.35	4.39	2
W of coronoid process		0.84	0.88	0.93	2
H of condyloid process		1.84	1.92	2.00	2
W of interarticular area		0.62	0.63	0.65	2

Systematic position. This third unnamed form of *Sorex* differs from the remaining four *Sorex* species found at Podlesice in its dimensions. It is much bigger than *S. minutus* and *S. bor*, but smaller than *Sorex* sp. 1 and *Sorex* sp. 2.

Besides its size, it can be easily distinguished from *Sorex* sp. 1 and *Sorex* sp. 2 on the basis of the position of its mental foramen shifted farther to the front, the narrower coronoid process and differently shaped and situated coronoid spicule. From *Sorex* sp. 1 it differs additionally in the presence of the horizontal bar of the internal temporal fossa, two mandibular foramina and more straight lower lingual margins of its molars.

Neither do its morphology and dimensions let it be confounded with the slightly younger Pliocene species: small *S. casimiri* n. sp. and comparatively big *S. polonicus* n. sp. and *S.* (*Drepanosorex*) *praearaneus*.

However similar it is in size to geologically much younger *S. runtonensis*, it can be distinguished from this last by the mental foramen situated farther to the front, very narrow molar cingula and coronoid spicule, which is less protruding but covering all the surface of the coronoid process.

Therefore, *Sorex* sp. 3 cannot be referred with certainty to any of the known fossil and living forms.

Tribe *Soriculini* KRETZOI, 1965

Genus *Neomys* KAUP, 1829

Neomys newtoni HINTON, 1911
(Text-fig. 19)

Material. The list of specimens is given in Table XXXIII. It contains isolated upper teeth: 2 I^1, 2 P^4, 3 M^1 and 2 M^2 and remains of mandibles with all types of teeth and with coronoid and condyloid processes.

Table XXXIII

Neomys newtoni HINTON, 1911

Locality	Number of fragmentary maxillae and detached upper teeth	Number of fragmentary mandibles and detached lower teeth	Total	Minimum number of individuals
Zalesiaki 1A MF/1936	1	1	2	1
Kozi Grzbiet MF/1935	7	7	14	4

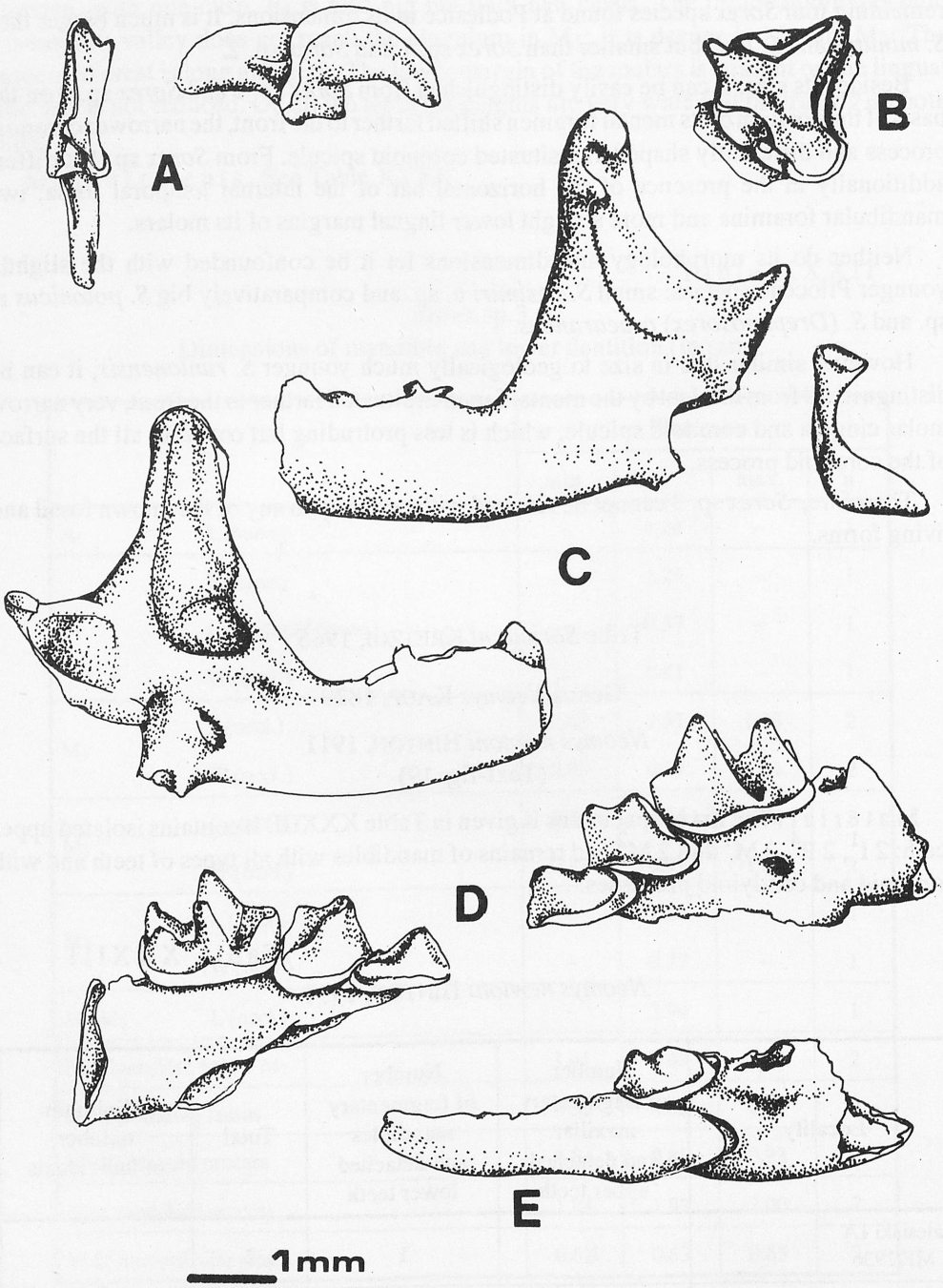

Fig. 19. *Neomys newtoni*. A - right I^1 from Zalesiaki 1A, spec. no. MF/1936/1, B - left P^4 from Kozi Grzbiet, spec. no. MF/1935/6, C - fragment of left mandible from Kozi Grzbiet, spec. no. MF/1935/3, D - fragment of left mandible with A_1-M_1 from Kozi Grzbiet, spec. no. MF/1935/5, E - fragment of left mandible with I_1-A_1 from Kozi Grzbiet, spec. no. MF/1935/6.

Description of material. The teeth are big. I^1 is bifid, narrow, with a comparatively high talon and narrow apex. The lower margin of the talon is concave. The posterior margin of the tooth is undulate. The cingulum is visible along the posterior and upper sides of this tooth. P^4 has a big parastyle. The parastylar crest is long, but not very high. It is buccally surrounded by the cingulum. The big L-shaped protocone is shifted mediad (in the direction of the parastyle) and separated from the hypocone by a valley. The hypocone is distinct. It forms the beginning of the wide cingulum surrounding the massive and slightly concave hypoconal flange.

M^1 has a big U-shaped protocone, but its metaloph is low. The hypocone is distinct in the shape of a cusp. It is separated from the protocone by a valley. A weak cingulum is visible around the protocone, between the protocone and hypocone and around the hypoconal flange, which is nearly flat. M^2 is smaller than M^1 but its hypoconal flange is deeper. The posterior emargination of P^4 and molars is moderate. The pigmentation is brown-red.

I_1 is massive, long and monocuspulate. Its anterior part, from the apex to the cuspule, is particularly elongated. Its cingulum is wide, but hardly visible. A_1 is very long and wide with a trace of the second cuspule. Its buccal and lingual cingula are wide and the shallow postero-lingual basin is distinct. Two-cusped P_4 is very high, its postero-lingual basin deep, the cingulum wide and the buccal part of the crown overhanging the root is insignificant and narrow.

M_1 is characterized by the moderate entoconid crest, a trace of the mesoconid, and the only slightly undulate buccal cingulum. The lingual cingulum is wider than the buccal. The re-entrant valley does not reach the cingulum. M_2 is smaller than M_1. M_3 is big, unreduced.

The lower margin of the horizontal ramus is only slightly concave. The ascending and horizontal rami form an obtuse angle. The coronoid process is narrow, its anterior and posterior margins are concave and its tip is rounded and curved slightly buccally. The coronoid spicule is rather distinct, in the shape of a big semicircle, situated in ⅔ of the height of the coronoid process. The external temporal fossa is weak and shallow, its deepest part being situated above the coronoid spicule. The internal temporal fossa is very small, in the shape of an equilateral triangle with rounded angles. The upper part of the coronoid process (above the internal temporal fossa) is basined. The two mandibular foramina lie very near one another in a groove.

The condyle is relatively high. Its upper facet is very small, the interarticular area very narrow, and the lower facet is wide on the buccal side and narrow on the lingual. This lower facet is placed more lingually, so it is partly hidden in labial view. The mental foramen is situated under the buccal re-entrant valley of M_1.

Measurements. See Table XXXIV and XXXV.

Systematic position and distribution. The morphology of I^1, P^4, upper molars, I_1, A_1, P_4 and the coronoid and condyloid processes indicates that these remains belong to the genus *Neomys*. On the other hand, they differ from *Episoriculus* in the morphology of the condyle, which in this last genus has the interarticular area much

Table XXXIV

Neomys newtoni HINTON, 1911
Dimensions of upper dentition (in mm).

		Zalesiaki 1A		Kozi Grzbiet			
			n	min.	$\bar{x}$	max.	n
I^1	L	1.84	1	–	1.97	–	1
	L of talon	0.74	1	–	0.89	–	1
	H of talon	1.37	1	–	1.37	–	1
P^4	L (bucc.)	–	0	1.76	1.79	1.82	2
M^1	L (max.)	–	0	1.68	1.73	1.77	3
	L (med.)	–	0	1.30	1.33	1.35	3
	W (max.)	–	0	2.00	2.05	2.07	3
M^2	L (max.)	–	0	1.63	1.63	1.63	2
	L (med.)	–	0	1.30	1.31	1.33	2
	W (ant.)	–	0	1.68	1.75	1.83	2
	W (post.)	–	0	1.72	1.85	1.98	2

wider and the lower facet of the same width both lingually and buccally. Also I_1 of *Episoriculus* is of different proportions, because its anterior part from the apex to the cuspule is short. The A/B ratio is 2.72-3.00 (n=6) in *Episoriculus*, and 1.81-2.44 (n=13) in *Neomys* (RZEBIK-KOWALSKA 1988b). In one specimen from Kozi Grzbiet it is 1.82.

So far five fossil *Neomys* species have been described: *N. bohlini* YOUNG, 1934 from the Pleistocene of Choukoutien I in China, *N. castellarini* PASA, 1947 from the Middle Pleistocene of Soave in Italy, *N. intermedius* BRUNNER, 1952 from the Middle Pleistocene of Markgrabenhöhle in Germany and two species from the Middle Pleistocene of England, *N. browni* HINTON, 1911 from Grays Thurrock and *N. newtoni* HINTON, 1911 from West Runton.

According to REPENNING (1967) and JAMMOT (1977), the remains of the Choukoutien species belong to the genus *Chodsigoa* KASTSCHENKO, 1907, and *N. castellarini* to the genus *Episoriculus* (JAMMOT 1977).

The three remaining species, rare in fossil materials and, if present, always in small numbers, are difficult to distinguish, because little is known about the variability of their morphology, and no evident size differences have been found between them.

Table XXXV

Neomys newtoni HINTON, 1911
Dimensions of mandible and lower dentition (in mm).

		Zalesiaki 1A		Kozi Grzbiet			
			n	min.	$\bar{x}$	max.	n
I_1	L	–	0	–	4.03	–	1
	H	–	0	–	0.96	–	1
A_1	L (bucc.)	–	0	1.23	1.26	1.29	2
P_4	L (bucc.)	–	0	1.25	1.29	1.32	3
	L of talonid (bucc.)	–	0	0.58	0.68	0.81	3
	W (occl.)	–	0	0.84	0.87	0.90	3
M_1	L (occl.)	–	0	1.65	1.68	1.71	2
	W (occl.)	–	0	0.91	0.98	1.06	2
M_2	L (occl.)	–	0	–	1.54	–	1
	W (occl.)	–	0	–	0.99	–	1
M_3	L (occl.)	–	0	–	1.29	–	1
	W (occl.)	–	0	–	0.72	–	1
H of mandible below M_2		1.20	1	1.45	1.49	1.54	2
H of ascending ramus		4.08	1	4.23	4.28	4.33	2
W of coronoid process		0.90	1	0.79	0.79	0.80	2
H of condyloid process		–	0	–	2.03	–	1
W of interarticular area		0.33	1	0.28	0.35	0.42	2

The diagnosis of *N. intermedius* is based exclusively on the fact that its dimensions are intermediate between those of recent *N. anomalus* CABRERA, 1907 and *N. fodiens* (PENNANT, 1771) (BRUNNER 1952). This is hardly sufficient to recognize it to be a new species (JAMMOT 1977).

According to HINTON (1911), the most important character which differs *N. browni* from *N. newtoni* is the morphology of their condyle. In *N. newtoni* the interarticular area of the condyle is distinctly narrow and its lower facet also much narrower and longer than in *N. browni*. *N. newtoni* is slightly smaller than *N. browni*. As the specimens from both

localities in Poland are characterized by their very narrow interarticular area and comparatively long and narrow lower facet of the condyle, they are included in *N. newtoni*.

Compared with the extant species, they are more similar to *N. anomalus* than to *N. fodiens*, from which they differ in small size, the morphology of the condyle (very narrow interarticular area) and the presence of two mandibular foramina.

The specimens from Zalesiaki 1A are smaller than those from Kozi Grzbiet and their upper groove in the coronoid process is deeper and not so distinctly separated from the internal temporal fossa. The tip of their coronoid process is curved backwards and the horizontal ramus of the mandible is more slender.

Neomys was mentioned only once from the Pliocene localities of Poland by KOWALSKI (1960a), i.e., from Rębielice Królewskie. Unfortunately the specimen has disappeared. Most probably it was a member of *Episoriculus*.

Out of Poland and West Runton, from which *N. newtoni* was first described, it was mentioned from Voigstaedt in Germany (MAUL 1990), from Monte Peglia in Italy as *N.* cf. *newtoni* by VAN DER MEULEN (1973) and from La Fage in France by JAMMOT (1977). From Austria RABEDER (1972) mentioned it as *N. anomalus* from Hundsheim, but his material must have belonged to *N. newtoni*. The specifically undetermined *Neomys* remains were recorded from all over Europe; for example, from Windloch in Germany by BRUNNER (1934) and HELLER (1956); from Westbury-Sub-Mendip in England by BISHOP (1982) and from Montoussé 3 in France by CLOT et al. (1976). It has not been recorded from the Early Pleistocene.

Genus *Macroneomys* FEJFAR, 1966

Macroneomys brachygnatus FEJFAR, 1966
(Text-fig. 20)

Material. One fragment of a mandible with M1 and M2 from Kozi Grzbiet, MF/1925.

Description of material. The horizontal ramus of the mandible is very high, its lower margin only slightly concave under M_1 and M_2. It is broken between P_4 and M_1, so the position of the mental foramen cannot be determined. It can be stated, however, that it was not situated farther to the back than below the protoconid of M_1. The teeth are very wide, massive and bulbous on the buccal side, especially as concerns the protoconids. Their buccal re-entrant valley does not reach the cingulum. Their entoconid crest is high, the lingual lower margin slightly navicular. The buccal cingulum, although slightly damaged, must have been rather narrow but protruding. The lingual cingulum is wide. The teeth are worn, without pigment, which is probably due to wear or to its secondary disappearence.

Measurements (in mm). M_1: L = 2.10, W = 1.57; M_2: L = 1.70, W = 1.30; H of horizontal ramus under M_2 = 2.28.

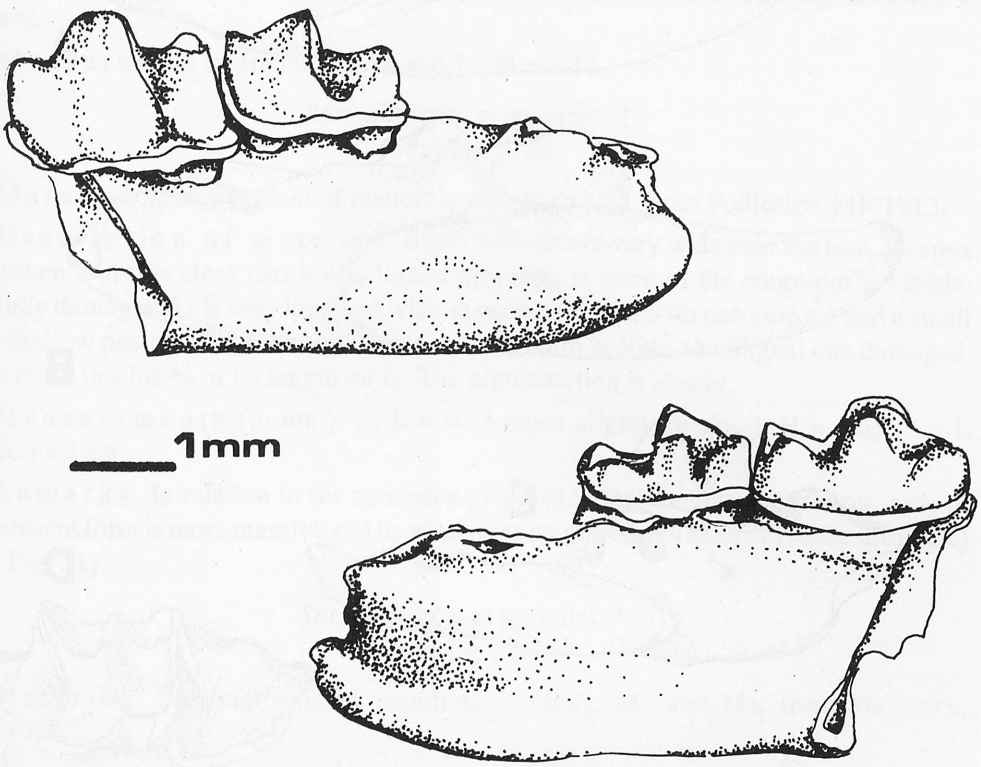

Fig. 20. *Macroneomys brachygnatus* from Kozi Grzbiet. Fragment of left mandible with M_1-M_2, spec. no. MF/1925/1.

Systematic position and distribution. The very big size and exoedaenodonty of molars indicate that this fragment belongs to *Macroneomys brachygnatus*. This species was first described by FEJFAR (1966) from the Late Biharian of Zlaty Kůň in Czechoslovakia and for a long time it was unknown from elsewhere. The material from the Middle Biharian of Kövesvarad (Hungary) mentioned by JÁNOSSY (1963) under the name of "*Soricide_(Soriculus* - *Neomys* - Gruppe), 1" may, however, according to FEJFAR (1966) have belonged to this form. In 1975 JAMMOT reports one mandible from the Middle Pleistocene locality La Fage in France. Recently (beyond Poland) MAUL (1990) describes it from Voigtstedt in Germany. This species was very rare everywhere.

Soricidae gen. et sp. indet. 1
(Text-fig. 21A)

Material. One I_1 from Podlesice, MF/1912.

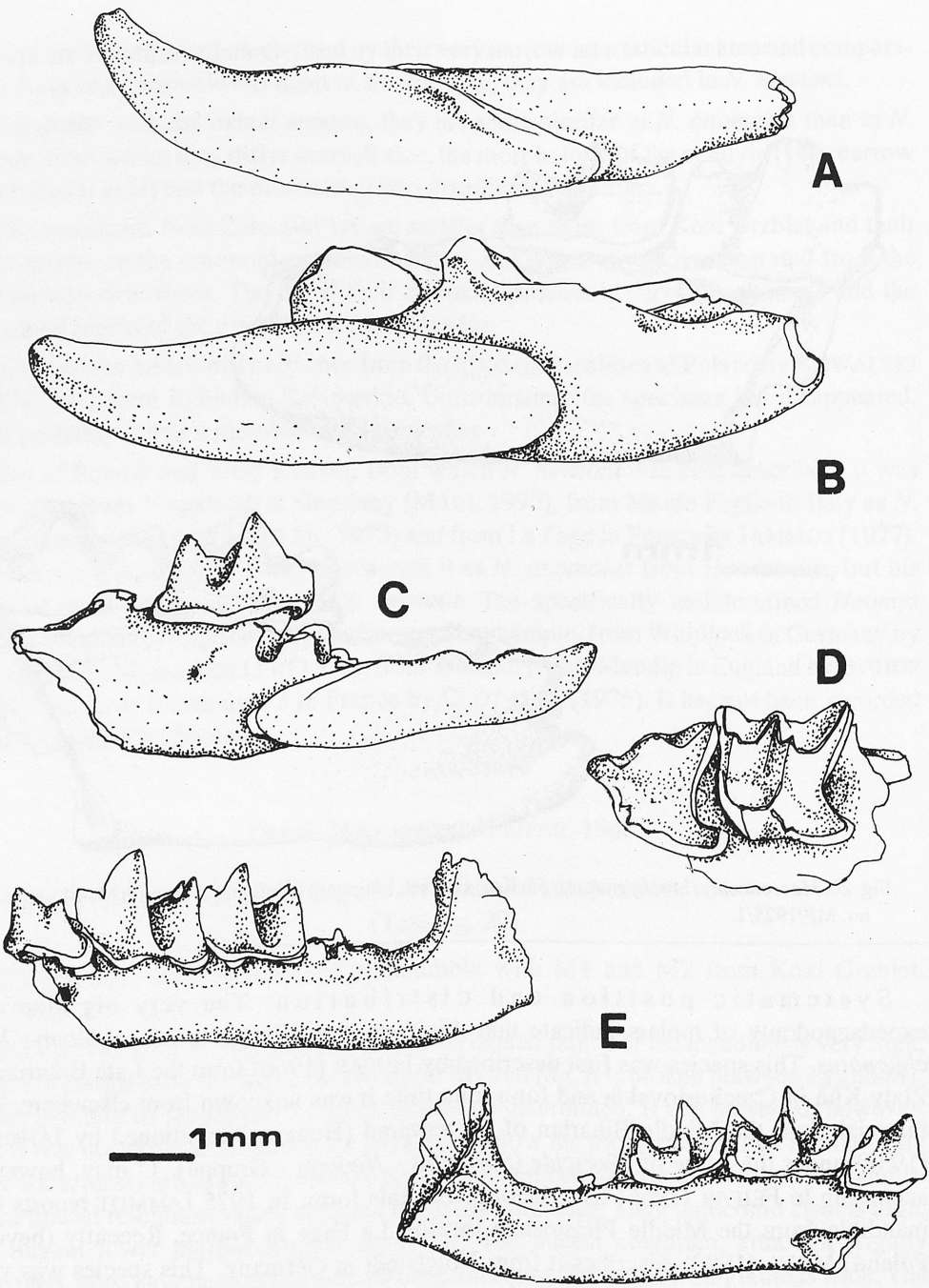

Fig. 21. A - *Soricidae* gen. et sp. indet. 1 from Podlesice, left I_1, spec. no. MF/1912/1, B - *Soricidae* gen. et sp. indet. 2 from Podlesice, fragment of left mandible with I_1-A_1, spec. no. MF/1913/1, C - *Soricidae* gen. et sp. indet. 3 from Podlesice, fragment of right mandible with I_1 and M_1, spec. no. MF/1914/2, D - *Soricidae* gen. et sp. indet. 4 from Podlesice, fragment of left maxilla with P^4-M^1, spec. no. MF/1915/1, E - *Soricidae* gen. et sp. indet. 5 from Węże 1, fragment of left mandible with P_4-M_2, spec. no. MF/1916/1.

Description of material. This tooth is very big and acuspulate. Its apex is directed sharply upwards and pointed. The crown near the root is narrow. A very distinct trace of the cingulum can be seen in the upper part of the crown. The pigmentation is absent.

Measurements (in mm). I_1: L = 6.10, H = 1.47.

Soricidae gen. et sp. indet. 2
(Text-fig. 21B)

Material. One fragment of mandible with I_1 and A_1, from Podlesice, MF/1913.

Description of material. Big I_1 with crown very wide near the root. Its apex is broken, but it is clear that it was turned upwards. A trace of the cingulum is visible. Slightly damaged A_1 is very long and wide in occlusal view, with one cuspule and a small and shallow postero-lingual basin. Its buccal cingulum is wide, the lingual one damaged. This tooth lies for ¾ of its length on I_1. The pigmentation is absent.

Measurements (in mm). I_1: L = 6.23 (apex slightly broken), H = 1.65; A_1: L (bucc.) = 1.66.

Remarks. In relation to the specimen given as *Soricidae* gen. et sp. indet. 1, I_1 of the present form is more massive and its apex turns up gently, not sharply (under the angle) (see Fig. 21).

Soricidae gen. et sp. indet. 3
(Text-fig. 21C)

Material. Six fragments of mandibles with I_1, M_1 and M_2, from Podlesice, MF/1914.

Description of material. I_1 is bicuspulate, with a tendency to form a third cuspule. The cusps are not very protruding. The apex is slightly upturned. The buccal cingulum is absent or vestigial in the upper part of the crown.

M_1 is characterized by its deep re-entrant valley, which almost reaches the buccal cingulum. This cingulum is wide and straight. The lingual cingulum is also wide, but not protruding. The entoconid crest is of medium size. An open valley separates the entoconid from the hypolophid. M_2 is similar to M_1 but smaller. The mental foramen is situated far backwards, behind the re-entrant valley of M_1, at the beginning of its second root. The red pigmentation is present.

Measurements. See Table XXXVI.

Remarks. Among the species of similar size present in Podlesice this form is only slightly smaller than *Mafia dehneli* (KOWALSKI, 1956) (RZEBIK-KOWALSKA 1990b), but its molars are provided with entoconid crests. It differs from *Sorex* sp. 1 and *Sorex* sp. 2 from the same locality, among others, in the farther to the back situated mental foramen.

Soricidae gen. et sp. indet. 4
(Text-fig. 21D)

Material. Three P^4 and one M^1 from Podlesice, MF/1915.

Table XXXVI

Soricidae gen. et sp. indent. 3
Dimensions of mandible and lower dentition (in mm).

		Podlesice			
		min.	$\bar{x}$	max.	n
I_1	L	4.05	4.08	4.11	3
	H	0.88	0.93	0.98	4
M_1	L (occl.)	1.68	1.72	1.78	6
	W (occl.)	0.96	1.00	1.09	6
M_2	L (occl.)	1.54	1.54	1.55	2
	W (occl.)	0.85	0.87	0.90	2
H of mandible below M_2		1.70	1.75	1.83	4

Description of material. The alveolus of A^5 suggests that this tooth must have been totally or at least partially hidden behind the parastyle of P^4.

P^4 is very short, so it seems to be very narrow (see fig. 21). Its parastyle is big and protruding, the parastylar crest long, of medium height. The L-shaped protocone is not very distinct. It is separated from the beginning of the cingulum by a shallow valley. This cingulum surrounds the hypoconal flange and the posterior part of the tooth. The hypoconal flange is long, narrow and strongly concave, on the lingual side upturned. The beginning of the cingulum may be considered to be a trace of the hypocone.

M^1 is wide, with the hypoconal flange which is also very narrow but not concave. The very weak hypocone and rather high metaloph are visible. The posterior cingulum is narrow, the emargination considerable. The pigmentation is dark red to nearly black.

Measurements (in mm). P^4: L (bucc.) = min. 1.67, $\bar{x}$. 1.71, max. 1.74 (n=3); M^1: L (max.) = 1.67, L (med.) = 1.28, W (max.) = 1.80 (n=1).

Soricidae gen. et sp. indet. 5
(Text-fig. 21E)

Material. Three mandibular fragments with P_4- M_3, without processes, from Węże 1, MF/1916.

Description of material. The lower margin of the horizontal ramus of the mandible is slightly concave. In two specimens the mental foramen lies in a far anterior position, e.g., in front of the root of P_4. P_4 is two-cusped, the anterior cusp considerably higher than the posterior one. Both cusps are very pointed. Its postero-lingual basin is not

very deep and does not reach the cingulum. Distinct, narrow cingula occur on both sides of this tooth.

M_1 too, has particularly pointed cusps and its metaconid is slightly curved backwards. The small mesoconid is present on the oblique crest. The metaconid and protoconid are close together. The entoconid crest is high. The buccal re-entrant valley is deep and almost reaching the cingulum. The cingulum is present on both sides, being broader on the lingual side and undulate, B-shaped on the buccal. M_2 is similar to M_1 but smaller, its buccal cingulum is straight. M_3 has a well-developed, basined talonid, with a distinct hypoconid and entoconid. The teeth are unpigmented.

Measurements. See Table XXXVII.

Remarks. The three specimens under study have no counterparts among the fossil and recent species of shrews. Their white teeth and the far anterior position of the mental foramen could suggest their membership in the genus *Oligosorex* KRETZOI, 1959 (subfamily *Crocidosoricinae* REUMER, 1987) known from the Miocene, because even in the genus *Crocidura* (which has its mental foramen situated farthest to the front of all shrews, that is, under the root of P_4 or between P_4 and M_1) it is situated farther to the back.

Table XXXVII

Soricidae gen. et sp. indent. 5
Dimensions of mandible and lower dentition (in mm).

		Węże 1			
		min.	$\bar{x}$	max.	n
P_4	L (bucc.)	1.06	1.10	1.15	2
	L of talonid (bucc.)	–	0.51	–	1
	W (occl.)	0.66	0.66	0.67	2
M_1	L (occl.)	1.44	1.46	1.48	3
	W (occl.)	0.95	0.95	0.96	3
M_2	L (occl.)	1.28	1.29	1.31	3
	W (occl.)	0.84	0.86	0.88	3
M_3	L (occl.)	–	1.09	–	1
	W (occl.)	–	0.68	–	1
M_1-M_3	L	–	3.73	–	1
H of mandible below M_2		1.15	1.19	1.23	3

On the contrary, in occlusal view P_4 of our specimens differs from that in the *Crocidurinae* and *Crocidosoricinae* and rather resembles *Soricinae* (REUMER 1987). As neither the number of lower antemolars nor the morphology of the condyle and other elements, is known from our material, it is difficult to establish their systematic position. They are similar to "*Soricidae* I gen. et sp. indet. Form C" (p. 66, Abb. 13c) described by ENGESSER (1972) from the Late Miocene of Sansan in France, but they are of much younger geological age.

Soricidae gen. et sp. indet. 6
(Text-fig. 22A)

Material. One fragment of a mandible with M_1-M_2 and coronoid and condyloid processes from Rębielice Królewskie 1A, MF/1917 and another fragment of a mandible without teeth and with coronoid process preserved from Rębielice Królewskie 2, MF/1918.

Description of material. The lower margin of the horizontal ramus of the mandible is concave below M_1/M_2. The ascending ramus is strongly convex on the buccal side at the level of the condyle. It forms a slightly obtuse angle with the horizontal ramus. The coronoid process is high and narrow in the upper part and at the level of the upper sigmoid notch. Its tip is rounded and bent lingually. Its posterior margin is slightly concave. The coronoid spicule is distinct, and protruding. It lies very low, in one mandible from Rębielice Królewskie 1A at 3/5 of the height of the coronoid process, in the other form from Rębielice Królewskie 2 even lower, in the middle of the height of this process.

The external temporal fossa is distinct and deep. It reaches the middle of the condyle. The condyloid process is low in buccal view. Its upper facet is cylindrical, the interarticular area low and narrow, the lower facet is very long, three times as long as the width of the interarticular area, so that more than half of it is free. It is a little concave. The internal temporal fossa in the shape of an isosceles triangle is very high. It reaches the tip of the coronoid process. A weak bar is visible.

In the specimen from Rębielice Królewskie 1A there is one big mandibular foramen situated in the middle of the lower margin of the internal temporal fossa. In the specimen from Rębielice Królewskie 2 there are two mandibular foramina, the second one is totally hidden under the lower condylar facet. The angular process is narrow near its base. The mental foramen is situated under the buccal re-entrant valley of M_1.

The molars are narrow. Their buccal cingulum is wide and straight. The lingual one is also wide, but flat. The buccal re-entrant valley does not reach the cingulum. The entoconid crest is rather high. There are no valleys between the entoconids and hypolophids.

Measurements. See Table XXXVIII.

Remarks. These molars are the same type as in the fragmentary mandible with M_2 described as *Soricinae* gen. et sp. indet. 1 from Osztramos 7 (see REUMER 1984, Plate 8, fig. 8a-c, p. 37). The mental foramen of this fragment is also situated far backwards.

Table XXXVIII

Soricidae gen.et sp. indent. 6
Dimensions of mandible and lower dentition (in mm).

	Rębielice Królewskie 1A		Rębielice Królewskie 2	
		n	min.	n
M_1 L (occl.)	1.45	1	–	0
M_1 W (occl.)	0.78	1	–	0
M_2 L (occl.)	1.18	1	–	0
M_2 W (occl.)	0.73	1	–	0
H of mandible below M_2	1.37	1	1.34	1
H of ascending ramus	4.26	1	4.44	1
W of coronoid process	0.83	1	0.97	1
H of condyloid process	1.74	1	–	0
W of interarticular area	0.55	1	–	0

Soricidae gen. et sp. indet. 7
(Text-fig. 22B)

Material. One upper P^4 from Rębielice Królewskie 1A, MF/1919.

Description of material. The tooth is very big, with massive and protruding parastyle and long and rather high parastylar crest. Its protocone in the shape of a cone lies in the basin. The denticulate cingulum is of variable width. It is the widest in the anterior part and even missing from the postero-lingual part of this tooth. A very small cuspule may represent the hypocone. The hypoconal flange is concave and narrow. The pigmentation is dark red.

Measurements (in mm). L (bucc.) = 2.64.

Remarks. In size this specimen exceeds these teeth of *Beremendia fissidens* (PETÉNYI, 1864) and *Blarinoides mariae*, SULIMSKI, 1959. It is different in shape and not

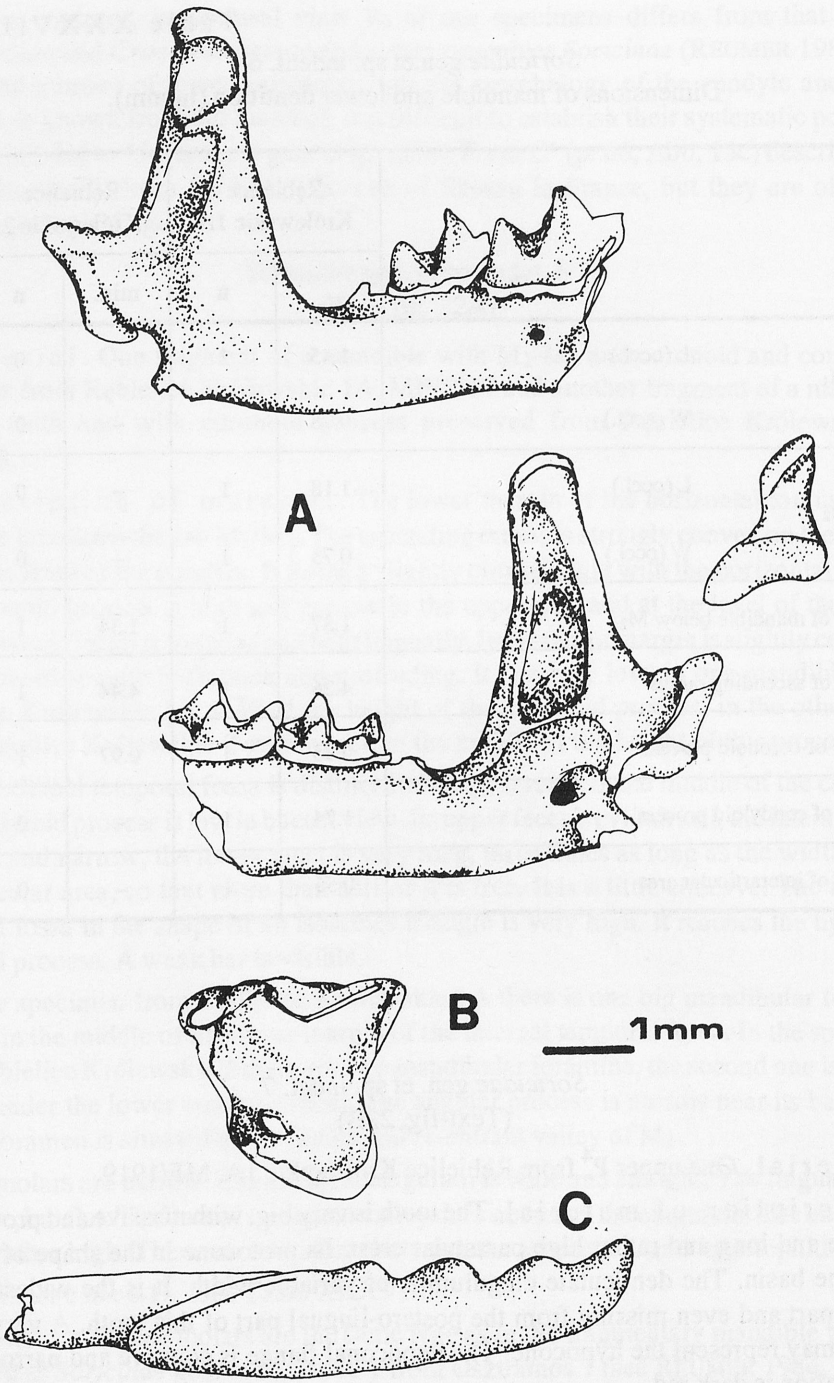

Fig. 22. A - *Soricidae* gen. et sp. indet. 6 from Rębielice Królewskie 1A, fragment of right mandible with M_1-M_2, spec. no. MF/1918/1, B - *Soricidae* gen. et sp. indet. 7 from Rębielice Królewskie 1A, left P^4, spec. no. MF/1919/1, C - *Soricidae* gen. et sp. indet. 8 from Rębielice Królewskie 2, right I_1, spec. no. MF/1920/1.

so massive as in *Paranourosorex gigas* RZEBIK-KOWALSKA, 1975 (RZEBIK-KOWALSKA 1975, 1976).

Soricidae gen. et sp. indet. 8
(Text-fig. 22C)

Material. One I_1 from Rębielice Królewskie 2, MF/1920.

Description of material. The tooth is big, tricuspulate. The cuspules are high and bulbous on the buccal side, the valleys between them V-shaped. The apex is upturned.

Table XXXIX

Paenelimnoecus sp.
Dimensions of mandible and lower dentition (in mm).

	Zalesiaki 1A	
		n
M_1 L (occl.)	1.12	1
M_1 W (occl.)	0.76	1
M_2 L (occl.)	1.04	1
M_2 W (occl.)	0.77	1
M_3 L (occl.)	0.80	1
M_3 W (occl.)	0.57	1
M_1-M_3	2.86	1
H of mandible below M_2	1.31	1
H of ascending ramus	3.35	1
W of coronoid process	0.76	1
H of condyloid process	1.58	1
W of interarticular area	0.52	1

The crown near the root is narrow. The cingulum is weak in the upper part, the pigment dark-red.

Measurements (in mm). L = 5.93, H = 1.25.

Remarks. The specimen is bigger than I_1 of *Mafia, Sulimskia* REUMER, 1984 and *Blarinella europaea* REUMER, 1984 but smaller than that of *Beremendia* and *Blarinoides* (RZEBIK-KOWALSKA 1976, 1989, 1990b).

Tribe *Allosoricini* FEJFAR, 1966
= *Neomyini* REPENNING, 1967 (partim)

Genus *Paenelimnoecus* BAUDELOT, 1972

Paenelimnoecus sp.

Material. One fragment of mandible with damaged I_1 and P_4, with M_1-M, and coronoid and condyloid processes, from Rębielice Królewskie 1A, MF/1967.

Description of material. This specimen is morphologically identical with the material of *P. pannonicus* (KORMOS, 1934) present in the same locality, but the dimensions of its mandible lie out of the range of the size variability of this last species.

Measurements. See Table XXXIX.

Remark. According to ZIEGLER (1989) genus *Paenelimnoecus* belongs to subfamily *Crocidosoricinae* REUMER, 1987.

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