Annales Universitatis Scientiarum Budapestinensis, Sectio Geologica
32, 49-56 (1999) Budapest

Uppermost Pleistocene shrews (Mammalia, Soricidae) from Vaskapu Cave (N-Hungary)

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(with 4 figures and 4 tables)

Abstract

Three shrew species (*Sorex araneus* LINNAEUS 1758, *Sorex minutus* LINNAEUS 1766 and *Sorex alpinus* SHINZ 1837) were found in the fossiliferous sediments of Vaskapu Cave, near Felsõtárkány. The probable stratigraphical position of the sample is Upper Pleistocene, Pilisszántó Horizon (Upper Würm), about 15,000 years B.P. A cold period of the Late Pleistocene with wooded environment is indicated by the soricid assemblage.

Introduction

Palaeontological excavations were prepared under the leading of Dr. J. HÍR in the Lök-völgyi Cave, near Eger in the summer of 1994. The present author was one of the members of the researcher group. Under the preliminary field walks HÍR discovered an other fossil locality near the site of the excavations. He identified it as an unexplored part of an old locality, Vaskapu Cave. A sample of about 150 kg was removed from sediments and washed in the field that summer. The sample yielded a rich and well-preserved fossil fauna, containing also 92 shrew bones and teeth. This Soricidae finding is presented in this paper.

The Vaskapu "Cave" is a rock shelter, situated about 3.5 km NW of Felsõtárkány, by the left side of the panorama road leading from Eger to Miskolc, 350 m above see level. It was originally described as a fossil locality by M. MOTL. She correlated the deposit of the "cave" with the upper part of the Late Pleistocene (MOTL 1941).

The morphological terms and the measurements (in millimetres) are used after REUMER 1984. The material is stored in the collection of the Museum of Pásztó.

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Systematic part

Class Mammalia LINNAEUS 1735
Order Insectivora BOWDICH 1821
Family Soricidae GRAY 1821
Subfamily Soricinae FISCHER VON WALDHEIM 1817
Tribe Soricini FISCHER VON WALDHEIM 1817
Genus *Sorex* LINNAEUS 1758

Type species: *Sorex araneus* LINNAEUS 1758

Sorex araneus LINNAEUS 1758
Figs 1-2

Material. 25 left and 11 right mandible fragments, 5 left and 1 right I_1, 1 right M_3, 11 left and 9 right maxillary fragments, 1 left I^1.

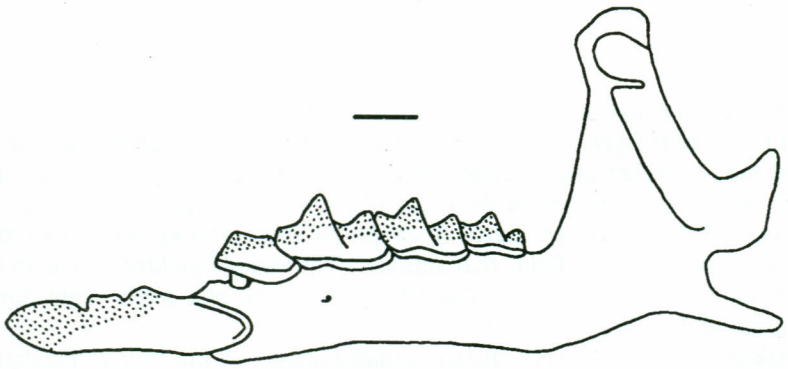

Fig. 1. *Sorex araneus* LINNAEUS 1958, left mandible with I_1 and P_4-M_3, buccal view, Vaskapu Cave, working number 6. Horizontal bar = 1 mm.

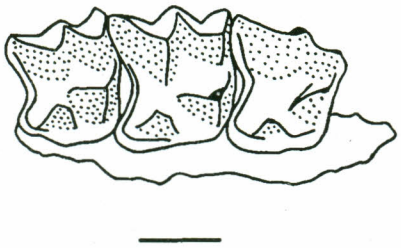

Fig. 2. *Sorex araneus* LINNAEUS 1958, right maxillary fragment with P^4-M^2, occlusal view, Vaskapu Cave, working number 22. Horizontal bar = 1 mm.

Measurements. See Tab. 1.

		min.	mean	max.	n	s. e.	s. d.
I^1	L	-	1.80	-	1	-	-
	H	-	1.36	-	1	-	-
P^4	LL	1.14	1.19	1.30	5	0.0496	0.0601
	BL	1.46	1.64	1.88	5	0.0992	0.1365
	W	1.52	1.64	1.80	5	0.0720	0.0936
M^1	LL	1.48	1.50	1.56	5	0.0288	0.0320
	BL	1.48	1.55	1.62	5	0.0384	0.0466
	AW	1.42	1.58	1.82	5	0.0944	0.1299
	PW	1.70	1.75	1.88	5	0.0528	0.0665
M^2	LL	1.24	1.31	1.36	4	0.0350	0.0436
	BL	1.32	1.36	1.40	4	0.0200	0.0283
	AW	1.56	1.65	1.84	4	0.0975	0.1135
	PW	1.28	1.45	1.68	4	0.1700	0.1752
M^3	L	0.50	0.56	0.62	2	0.0600	0.0600
	W	1.26	1.31	1.36	2	0.0500	0.0500
I_1	L	3.88	4.03	4.25	5	0.1030	0.1288
	H	1.00	1.09	1.19	5	0.0500	0.0625
A_1	L	0.93	0.99	1.05	4	0.0375	0.0451
	H	0.54	0.63	0.66	4	0.0438	0.0508
P_4	L	1,03	1,15	1,33	6	0,0979	0,1062
	H	0,80	0,90	1,00	6	0,0542	0,0665
M_1	L	1,60	1,70	1,88	12	0,0639	0,0795
	W	0,85	0,93	1,15	12	0,0559	0,0812
M_2	L	1,35	1,43	1,60	12	0,0516	0,0677
	W	0,78	0,83	0,89	12	0,0257	0,0308
M_3	L	1,05	1,11	1,15	9	0,0284	0,0323
	W	0,60	0,67	0,75	9	0,0259	0,0381

Table 1. Measurements of *Sorex araneus* LINNAEUS 1958 from Vaskapu Cave. Min. = minimum value, mean = mean value, max. = maximum value, n = number of specimens, s. e. = standard error, s. d. = standard deviation.

Description. The anterior edge of the coronoid process is slightly concave. The external temporal fossa is deep and long, the coronoid spicule is hardly developed or missing. The internal temporal fossa is high and triangular, the mandibular foramen is placed under the posterior part of its lower margin. The upper condylar facet is cylinder-shaped, mesially not protruding. Its length is less than the width of the interarticular area. The tiny mental foramen is situated under the M_1 re-entrant valley or protocone. There is a well-developed cingulum on the postero-buccal margin of the upper incisor. There are five unicuspid antemolars in the maxilla. The paracone is very strongly-built in P^4. The parastyle is protruding, it is separated from the protocone by a wide valley. There is a parastylar crest between the parastyle and the paracone. The hypocone is well-developed. The hypocone is well-developed in M^1-M^2. A ridge is running from the protocone towards the hypocone. The parastyle of M^1 is far shorter than the metastyle,

but the parastyle is the longer one in M^2. The third upper molar is triangular. Only the tricuspid talon and the parastyle are present in the tooth. I_1 is tricuspulate, without, or with only slight postero-buccal cingulum. It extends backwards to the half of the lower premolar. P_4 is bicuspulate, but there is only one cusp on A_1. Parastylar crest is weak and low in M_1-M_2. The M_3 talonid is basined with hypoconid and entoconid. The cingulum is well developed on both sides of the lower antemolars and molars. There is a dark red pigmentation on the top of the cusps.

Sorex minutus LINNAEUS 1766
Fig. 3

Material. 8 left and 8 right mandible fragments, 1 right maxillary fragment.

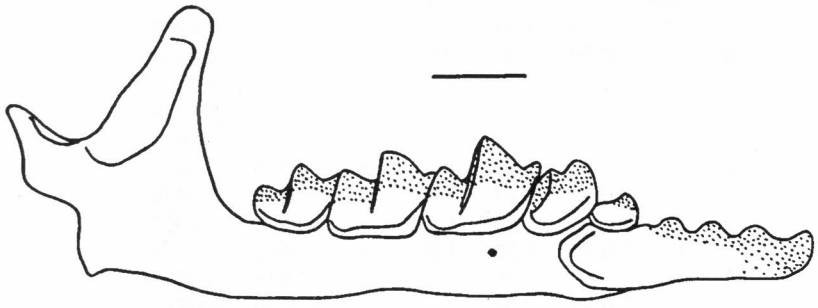

Fig. 3. *Sorex minutus* LINNAEUS 1966, right mandible with the complete dentition, buccal view, Vaskapu Cave, working number 68. Horizontal bar = 1 mm.

Measurements. See Tab. 2.

Description. The mandible is delicately built, but relatively long. The anterior edge of the coronoid process is concave. The external temporal fossa is deep and long, the coronoid spicule is absent in some specimens. The internal temporal fossa is high and triangular, continuing to the top of the coronoid in most cases. Its lower margin points to the upper facet of the condyle. The condyle is placed far backwards. The upper condylar facet is cylindrical, the lower one is protruding and widening towards the median. The interarticular area is moderately broad. The mandibular foramen is situated under the posterior corner of the fossa temporalis interna. The mental foramen is placed bellow the protocone of M_1. The P^4 hypocone is separated from the L-shaped protocone by a wide valley. The parastyle is connected to the paracone by a parastylar crest. The hypocone of M^1 and M^2 is only weakly developed as a cusp on the cingulum surrounding the hypoconal flange. The paracone and the protocone are separated by a wide valley. In M^1 the parastyle is significantly shorter than the metastyle, but they are equal sized in M^2. The lower incisor is tricuspulate. A weak cingulum is present along

the buccal-posterior margin. The posterior part of the tooth extends backwards at the buccal side of the mandible to half-way along P_4. A_1 is unicuspid. P_4 is two-cusped, with the anterior cusp always considerably higher than the posterior one. The entoconid crest is low in M_1-M_2. The re-entrant valley opens at some distance above the buccal cingulum. The talonid of M_3 is basined and provided with both hypoconid and entoconid. The mandibular antemolar, the praemolar and the molars have well-developed cingulum both in the lingual and the buccal sides. There is a dark red pigmentation on the cusps of the teeth.

		min.	mean	max.	n	s. e.	s. d.
P^4	LL	-	0.90	-	1	-	-
	BL	-	1.10	-	1	-	-
	W	-	1.20	-	1	-	-
M^1	LL	-	1.10	-	1	-	-
	BL	-	1.18	-	1	-	-
	AW	-	1.23	-	1	-	-
	PW	-	1.25	-	1	-	-
M^2	LL	-	1.18	-	1	-	-
	BL	-	1.13	-	1	-	-
	AW	-	1.25	-	1	-	-
	PW	-	1.18	-	1	-	-
I_1	L	2.75	2.78	2.80	2	0.0250	0.0250
	H	0.78	0.78	0.79	2	0.0062	0.0062
A_1	L	0.60	0.68	0.75	3	0.0528	0.0615
	H	0.33	0.43	0.49	3	0.0667	0.0714
P_4	L	0.79	0.88	0.95	7	0.0454	0.0517
	H	0.58	0.62	0.68	7	0.0283	0.0322
M_1	L	1.15	1.31	1.40	8	0.0688	0.0788
	W	0.63	0.68	0.75	8	0.0375	0.0415
M_2	L	1.10	1.16	1.28	9	0.0506	0.0636
	W	0.61	0.65	0.70	9	0.0253	0.0293
M_3	L	0.80	0.94	1.03	9	0.0648	0.0745
	W	0.48	0.56	0.73	9	0.0515	0.0720

Table 2. Measurements of *Sorex minutus* LINNAEUS 1966 from Vaskapu Cave. For the abbreviations see Tab. 1.

Sorex alpinus SHINZ 1837
Fig. 4

Material. 1 left mandible fragment with P_4-M_2.

Measurements. See Tab. 3.

Description. The anterior edge of the coronoid process is straight. The external temporal fossa is divided by a weak coronoid spicule. The upper condyloid facet of the processus condyloideus is mesially projecting, the lower one laterally widening. The interarticular facet is quite narrow. The internal temporal fossa is low and trapezoid.

The mandibular foramen is placed under the middle of its lower margin. The mental foramen is situated slightly behind the re-entrant valley of the first lower molar. P_4 is two-cusped. The entoconid crest is low and weak in M_1-M_2. The top of the teeth are pigmented. The bucccal and the lingual cingula are well-developed in all present elements.

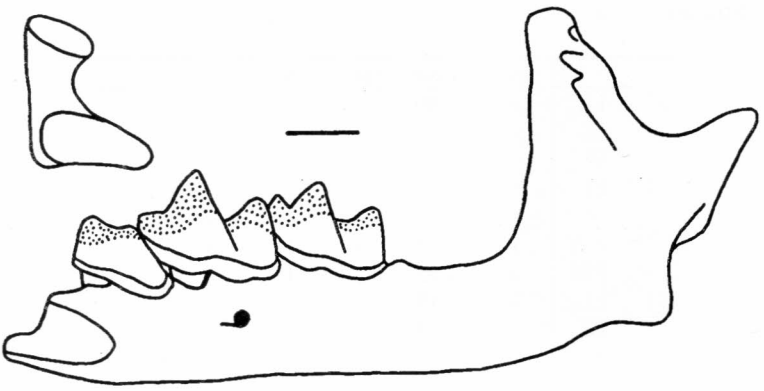

Fig. 4. *Sorex alpinus* SHINZ 1837, left mandible fragment with P_4-M_2, buccal view, and the condyle, posterior view, Vaskapu Cave, working number 92. Horizontal bar = 1 mm.

	L	H	W
P_4	1.60	0.96	-
M_1	1.83	-	1.10
M_2	1.58	-	1.00

Table 3. Measurements of *Sorex alpinus* SHINZ 1837 from Vaskapu Cave.

Discussion and conclusions

Taxonomy

The measurements of *S. alpinus* considerably overlap those of *S. araneus*. The two forms can be distinguished by the shorter I^1 talon, the bicuspid A_1, the more posteriorly situated foramen lacrimale and the mesially projecting upper condyloid facet of the Alpine species (UJHELYI 1994). Only the processus condyloideus was useful among the differential characters in the fragmented mandible of *S. alpinus* from the Vaskapu assemblage.

One hand, we have only one previous report on *S. alpinus* from the fossil fauna of Hungary (Peskő Cave, in: VÉRTES 1965). Otherwise, being two hardly distinguished species, some Hungarian *S. alpinus* occurrence might have been mentioned in the literature as the very common Quaternary shrew, *S. araneus*. This problem needs a comprehensive review in the future.

The here discussed Alpine shrew species has been recently reported in the western frontier of the country (UJHELYI 1994). By the climatic reasons its appearance in such eastern areas as the here studied locality is impossible.

Environment.

However there are also *Neomys* and *Crocidura* forms present in the Late Pleistocene of Central Europe, only *Sorex* species occur in the Vaskapu Soricidae sample. *S. araneus* is the dominant element of the fauna (Tab. 4). According to REUMER (1984) the fossil *Sorex* is indicative for a moist environment with well-developed vegetation. All the tree reported species recently have a preference for wooded or bushy areas. *S. araneus* is a very common recent shrew in most of the wet-soiled woods of Europe. *S. minutus* also occurs in humid areas with close vegetation. *S. alpinus* lives in the mountain forests of the Alps and in the lower, but wet-climated hills in the surroundings of the high mountains. We therefore assume a humid environment with a good vegetation cover in the time of the deposition of the Vaskapu sediments.

Soricidae species	Nr. of specimens	Min. nr. of individuals	Relative frequency
Sorex araneus	64	24	72.72 %
Sorex minutus	27	8	24,24 %
Sorex alpinus	1	1	3,03 %

Table 4. Catalogue of the Vaskapu soricid material.

Palaeoclimatology and biostratigraphy.

Because of the long-time coexistence of *S. araneus* and *S. minutus* (JÁNOSSY 1979, KORDOS, 1975, RZEBIK-KOWALSKA, 1991) the species composition is not enough to clear the stratigraphic position. Fortunately the special ecological character of the shrew fauna gives some information to answer this question.

During the cold episodes of the Pleistocene the shrew fauna of Europe was dominated by the genus *Sorex* (RZEBIK-KOWALSKA 1995). Such climate is marked by the exclusive occurrence of this genus in the sediments of the Vaskapu Cave as well. According to JÁNOSSY (1979) there was a cold event in the older part of the Late Würm in the Carpathian Basin. This period was characterized by a fauna reflecting the climate of the boundary zone between tundra and taiga of today. Not even arctic but also Alpine species were extremely abundant. By the occurrence of *Sorex alpinus* we can correlate the studied Vaskapu shrew sample with this period, the Upper Pleistocene, Upper Würm, Pilisszántó Horizon, about 15,000 years B.P. This stratigraphical classification is supported by the occurrence of *S. alpinus* in Peskő Cave, wich is dated to this age by MOTL (in: VÉRTES 1965).

Acknowledgements

The special thanks of the author go to Dr. J. HÍR (director of the Museum of Pásztó) for the chance to study the Soricidae material from Vaskapu Cave. The researches were supported by the FKFP 0143/1997 project.

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