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The macromammal remains and revised faunal list of the Somssich Hill 2 locality (late Early Pleistocene, Hungary) and the Epivillafranchian faunal change

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Abstract – The Somssich Hill 2 locality (South Hungary, Villány Hills) yielded the richest late Early Pleistocene vertebrate fauna from Hungary and one of the richest ones from the Carpathian Basin. The assemblage contains 67 distinguishable mammal taxa. The present paper gives the taxonomic, biostratigraphical and palaeoecological evaluation of 19 taxa of the sensu lato macromammal remains (leporids, carnivores, ungulates). The material indicates late Early Pleistocene age and represents the so-called Epivillafranchian faunal turnover and a dominantly cold steppe palaeoenvironment. With 48 figures and 4 tables.

Key words – biostratigraphy, Epivillafranchian, late Early Pleistocene, macromammals, palaeoecology, South Hungary, Villány Hills

INTRODUCTION

The locality Somssich Hill 2 is situated on the top of the Somssich Hill near the municipality of Villány (South Hungary) (Fig. 1). Somssich Hill is a member of the Villány Hills which region has yielded many important and rich Pliocene and Early Pleistocene palaeovertebrate faunas in the past. Some of them (e.g., Villány 3, Beremend 15, and Csarnóta 2) are of international significance considering the Quaternary vertebrate taxonomy and biostratigraphy. Already Kormos (1937) described some palaeovertebrate remains from Somssich Hill but real excavations were carried out later under the leadership of Professor Dénes Jánossy between 1975 and 1984. The material was preserved in strongly calcified loess like deposits from an entirely sediment-filled karstic fissure. From a 9.5 metre deep sequence 50 layers were sampled on average 20–30 cm in thickness, but there were several thinner ones. The excavations yielded extremely rich Pleistocene vertebrate and gastropod fauna. The results of the

first studies on the record were published in Jánossy (1983, 1986, 1990), Hír (1998) and Krolopp (2000); however, these works provided only preliminary faunal lists or worked up only a part of the whole record of the remains. An exception is Hír (1998) because he evaluated and published almost the whole cricetid record from the locality.

In 2013 a 4 year term research project started, the main goals of which were the followings:

– to examine the unstudied part of the material collected by Jánossy;

– to provide taxonomic descriptions and revisions;

– to evaluate the fauna (and the locality) from biostratigraphical, palaeoecological and taphonomical point of view.

The results have been published in several papers not only in scientific but also in popular scientific journals, here we list only some scientific papers written in English: Pazonyi *et al.* (2013, 2018), Botka & Mészáros (2014, 2015, 2016, and this volume), Striczky & Pazonyi (2014), Mészáros (2015), Szentesi (2016). The listed and the above-mentioned works studied mainly the microvertebrates (micromammals and palaeoherpetological materials) and snails. The main goal of the recent paper is to publish the results of the studies on the macromammal remains.

MATERIAL AND METHODS

The studies and revisions on the macromammal remains were among the final, but very important works considering the research on the palaeovertebrate record of the locality. Here we have to define what we mean under "macromammals" in the case of Somssich Hill 2. The earlier studies were done on the micromammals: bats, insectivores, and small sized rodents, e.g. cricetids, voles, dormice, etc. In further studies we dealt with all other groups, so the cat-

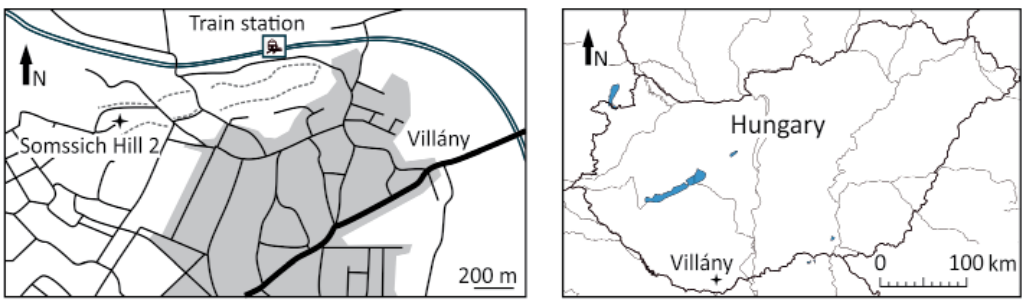


Fig. 1. Geographic location of the Somssich Hill 2 site (Villány Hills, South Hungary)

egory "macromammals" includes all other mammal remains collected from the locality, i.e. leporids, carnivores and ungulates. During our work we focused on the hitherto un-inventoried remains and also on the material which has been washed from the deposits of the locality but up to now has been unsorted. We also made revisions on the already described and inventoried remains. For taxonomic identifications we used in addition to the referred papers the following collections or parts of collections housed in the Department of Palaeontology and Geology of the Hungarian Natural History Museum, Budapest: the comparative bone collection of recent mammals; the so-called Kormos Collection (Pliocene and Early Pleistocene vertebrates collected by Tivadar Kormos from some localities of the Villány Hills); collection of type specimens; palaeovertebrate records from Gombaszög (now Gombasek), Tarkő, and Vértesszőlős. We also used Prof. Jánossy's brief and sketchy manuscript in which he took some notes and preliminary descriptions on some vertebrate taxa from Somssich Hill 2 (Jánossy 1999).

Compared to the extremely rich microvertebrate record the Somssich Hill macromammal material is rather scanty and contains mainly fragments except for two groups of carnivores (mustelids and canids) and the hare remains. The latter (*Lepus terraerubrae* Kretzoi) is the only macromammal species from the locality which is really abundant with tens of thousands of isolated teeth, bones, postcranial and cranial fragments. Because of the fragmentary preservation of the remains and the lack of the cranial remains in most cases only their size was usable characteristic for their identification hence in many cases it is uncertain.

Notes to the list of the remains – In the following chapter we list the remains of species in the order of the layers. Only a few remains got individual inventory numbers (starting with V.), so in many cases one inventory number belongs to more than one and different kind of remains. In the case of the so-called cabinet register one inventory number (starting with VER) belongs to one or more remains of the same species from the same layer. In the case of teeth we indicate the lower teeth with lower case and the upper ones with upper case, respectively. The standard measurements of the teeth were taken with digital calliper following von den Driesch (1976).

SYSTEMATIC PALAEONTOLOGY

Order Lagomorpha Brandt, 1855
Family Leporidae Fischer von Waldheim, 1817
Subfamily Leporinae Trouessart, 1880
Genus *Lepus* Linnaeus, 1758

Lepus terraerubrae Kretzoi, 1956

Material – Isolated teeth, mandibular fragments, postcranials and postcranial fragments. The remains were found in all layers of the sequence of the locality but they are especially abundant in layers 4, 5, 6, 7, and 8, the most abundant in layer 5. From here we counted the postcranials and the result was more than 20,000 remains (mainly small fragments). We estimated the amount of the *Lepus* remains at about 80 percent of that. On the basis of the whole calcanei and distal fragments of ulnae they belonged to more than 20 individuals. The isolated teeth from this layer gave similar result (at least 19 individuals).

Remarks – Although the species was described by Kretzoi (1956) only in a footnote the species name is valid and the whole leporid material from Somssich Hill 2 represents this species (Chiara Angelone, pers. comm.).

Order Carnivora Bowdich, 1821
Family Canidae Fischer von Waldheim, 1817
Genus *Canis* Linnaeus, 1758

Canis mosbachensis Soergel, 1925
(Figs 2–5)

Material – **Layer 5:** Deciduous upper incisivus fragment, vertebra caudalis; caninus fragment; 2 phalanges II (V.82.105); – Phalanx I; right M_1 fragment (V.82.95) (Figs 2–3).

Layer 6: Right P_3 fragment (V.82.110).

Layer 12: Right P_4 fragment (V.84.16).

Layer 19: Phalanx II distal fragment (VER 2018.2617.).

Layer 21: Left MC II, os pisiforme; 2 MC IV fragments; metapodium distal fragment; right MC I; left MC I distal fragment; phalanx I; 2 phalanx I proximal fragments; 2 anterior phalanges II; 2 posterior phalanx II; posterior phalanx II proximal fragment; 2 anterior phalanges III; posterior phalanx III (VER 2018.2631.); – Right MT V; 2 metapodium fragments; right MC V and MC IV (in one piece); 2 phalanges I, 2 phalanx I fragments; 2 anterior phalanges II; posterior phalanx II, posterior phalanx II distal fragment; 4 phalanges III; left astragalus (VER 2018.2633.).

Layer 22b: Deciduous upper caninus fragment (VER 2018.2626.).

Layer 34: Left upper caninus fragment (VER 2018.2659.) (Fig. 4).

Layer 35: Deciduous caninus fragment (VER 2018.2650.); – Left upper caninus fragment (VER 2018.2651.).

Layer 41: Left M^1 (VER 2018.2683.) (Fig. 5).

Remarks – The taxonomic status of the *Canis mosbachensis* is rather uncertain or more exactly it's a subject of debate (Rook & Torre 1996; Cherin *et al.* 2014). Some authors think this species to be a synonym of *C. arnensis* or *C. etruscus*, in some papers we can find the expression "*Canis arnensis* advanced form" for similar remains. We agree with those authors who think *C. mosbachensis* is a valid species name and this species is a transitional form between *C. etruscus* and *C. lupus* and a possible ancestor of the latter. One of the main characteristics of *C. mosbachensis* is its clearly smaller size than that of *C. lupus* but it is larger than that of *C. arnensis*. As the wolf remains from Somssich Hill 2 are rather scanty, the size was the most important differential characteristics in their identification. The measurements of M^1 and upper canine from Somssich Hill 2 fit well but these are a bit larger than *C. mosbachensis* from Pirro Nord in Petrucci *et al.* (2013). They are clearly smaller than those of the recent *C. lupus* and *C. mosbachensis* from the Middle Pleistocene localities of Vértesszőlős and Tarkő (both localities are in Hungary), but very similar to the *C. mosbachensis* remains from Gombaszög (early Middle Pleistocene, now in Slovakia as Gombasek). Length of M^1: 14.40 mm, width of M^1: 18.09 mm; Length of the crown of the upper canine (VER 2018.2651.): 18.94 mm.

Genus *Vulpes* Frisch, 1775

Vulpes praecorsac Kormos, 1932
(Figs 6–11, Table 1)

Material – **Layer 2:** Phalanx I fragment; right I^2 (V.81.25).

Layer 3: Phalanx I; 3 phalanges III; scaphoideum; right P^1 (V.81.68).

Layer 4: Left P_3; right P^1 (V.82.148); – Left radius distal fragment (VER 2018.2611.); – Left tibia distal fragment; phalanx I; 2 phalanges II (VER 2018.2620.); – Left upper caninus; right P_3 (VER 2017.8222.) (Fig. 6).

Layer 5: Left M^1 (VER 2018.2614.); – Left I^2; left P^2 (V.82.105).

Layer 6: Left P_1 (V.82.110).

Layer 9: Caninus fragment (V.83.64).

Layer 20: Right I^3 (VER 2018.2618.).

Layer 21: Right P_1.

Layer 22b: Left M_1 (VER 2018.2630.) (Fig. 10); – Right M^2; right I^2; upper incisivus (VER 2018.2635.).

Layer 24: Vertebra caudalis (VER 2018.2625.).

Layer 28: Phalanx I (VER 2018.2623.).

Layer 32: Left P_2 (VER 2018.2645.).

Layer 35: Right M_1 (VER 2018.2638.); – Right M_2; 2 phalanges I (VER 2018.2640.); – Left and right lower caninus (from the same individual) (VER 2018.2657.); – Right mandible fragment with M_2 (VER 2018.2669.).

Layer 36: Right ulna proximal fragment (VER 2018.2643.); – Left lower caninus fragment (VER 2018.2662.).

Layer 37: Left mandible fragment with M_1; right M^1 (VER 2018.2641.).

Layer 39: Right P_3 fragment; right M_2; right M_3 (VER 2018.2648.).

Layer 40: Left mandible with caninus, P_1-P_4, alveoli of M_1, M_2 (Figs 8–9); right upper caninus fragment; phalanx II; left humerus distal fragment and left ulna proximal fragment of the same individual (VER 2018.2678.).

Layer 41: MC III distal fragment; left upper caninus (VER 2018.2666.) (Fig. 7); – Left M_1; left P_4 (VER 2018.2676.).

Layer 42: Right mandible fragment with P_3-M_1; left mandible fragment with the alveolus of P_2, stumps of P_3 and P_4, M_1; right M1; left calcaneus; right astragalus; 2 right mandibula fragments (VER 2018.2679.).

Layer 43: Right dP_2; right dP_3 fragment (VER 2018.2675.); – Right I_2 (VER 2018.2687.); – Right maxilla fragment with P^4 and alveoli of P^2 and P^3 (VER 2018.2691.).

Layer 44: Right maxilla fragment with M^1 (Fig. 11); right dP^3, right dP_3, left dP_4 fragment (VER 2018.2682.).

Layer 47: Left ulna proximal fragment (VER 2018.2684.).

Remarks – The fox remains from Somssich Hill 2 are rather small, according to de Bonis *et al.* (2007) the measurements of M_1-s fall into the *Vulpes praecorsac* Kormos, *V. alopecoides* Major, and *V. vulpes* M_1 ranges (Table 1). Compared to *V. praeglacialis* remains the Somssich Hill 2 fox specimens are clearly smaller. The teeth are narrow. This feature is very similar to *V. lagopus*, *V. vulpes*, *V. corsac*, and *V. praecorsac*. The canines are narrow. The lower edge of the mandible is almost straight with very little curving. On the P_3-s the tiny posterior accessory cuspids (which are characteristric of *V. alopecoides* and *V. vulpes*) are missing or very vestigial. On the basis of the mentioned characteristics the Somssich Hill 2 foxes can be ranked into Kormos's species *Vulpes praecorsac*, for the original description see

Table 1. Length data of the Somssich Hill 2 fox M_1-s compared to some other species

	Vulpes vulpes	*Vulpes corsac*	*Vulpes alopecoides*	*Vulpes praecorsac*	*Vulpes praecorsac*
	data from de Bonis *et al.* 2007	data from de Bonis *et al.* 2007	data from de Bonis *et al.* 2007	data from de Bonis *et al.* 2007	Somssich Hill 2
M_1 length (mm)	~12.80–16.58	~10.77–13.13	~12.50–13.63	~12.00–13.40	12.65–14.23

Kormos (1932). Jánossy (1999) also identified the remains as *V. praecorsac* but he described some uncertain arctic fox remains as *Alopex* sp. However, it seems that all of the Somssich Hill 2 foxes very probably represent only one species.

Family Ursidae Fischer von Waldheim, 1817
Genus *Ursus* Linnaeus, 1758

Ursus sp.
(Fig. 12)

Material – **Layer 4:** Left dI^3 (VER 2017.8222.); – Left deciduous lower caninus fragment (VER 2017.8221.) (Fig. 12).

Remarks – The identification of the remains is rather uncertain. Very probably the specimens are *Ursus deningeri* remains, but on the basis of deciduous teeth the precise identification is impossible.

Family Mustelidae Fischer von Waldheim, 1817
Genus *Meles* Brisson, 1762

Meles cf. *meles* Linnaeus, 1758
(Figs 13–16, Table 2)

Material – **Layer 1:** Phalanx I (V.81.21).

Layer 4: Proximal fragments of a left and a right ulna; right femur fragment (Fig. 13); left tibia; left tibia distal fragment; right humerus fragment (diaphysis) (the whole tibia belonged to a smaller individual, the other 5 specimens very probably belonged to the same larger individual) (VER 2018.2610.).

Layer 5: MC II (V.82.105).

Layer 8: Left lower caninus fragment (V.83.18).

Layer 14: Left upper caninus fragment (V.89.4).

Layer 15: Left tibia distal fragment; phalanx III (V.89.47).

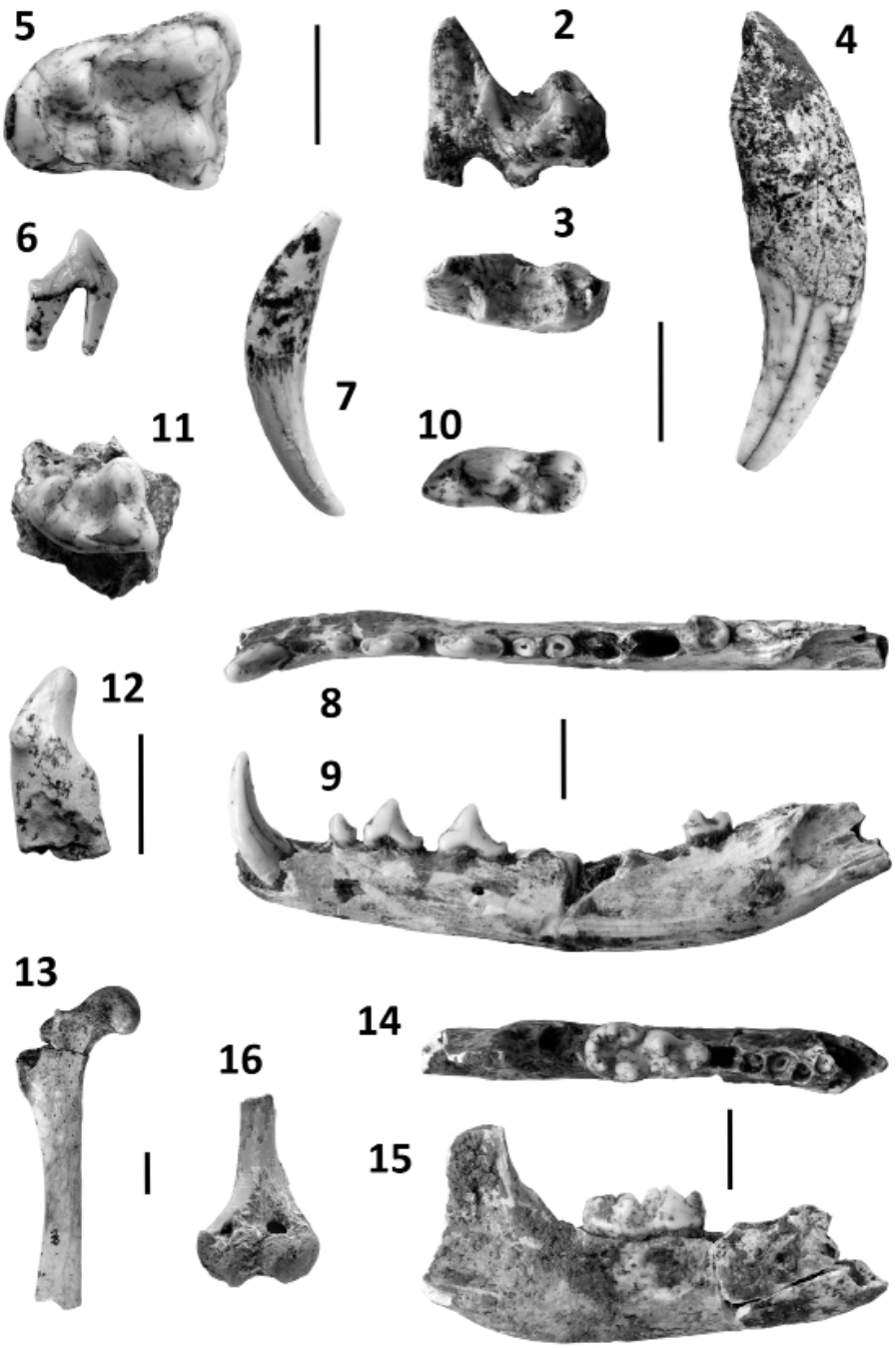
Layer 31: Left dP^4 (VER 2018.2692.).

Layer 32: Upper incisivus (VER 2018.2647.).

Layer 33: Left lower caninus (VER 2018.2656.); – Left lower caninus (VER 2018.2658.); – Left mandibula fragment with M_1; right mandibula fragment with C, P_3, M_1 (Figs 14–15) (the specimens belonged to the same individual together with the VER 2018.2656. caninus) (VER 2018.2660.).

Layer 39: Left radius distal fragment (VER 2018.2665.).

Layer 41: Left lower caninus (VER 2018.2667.); – Left P^4 (VER 2018.2677.).



Figs 2–16. Carnivora remains from Somssich Hill 2. – **Figs 2–3.** *Canis mosbachensis* Soergel right M_1 fragment (V.82.95). – **Fig. 2.** Lingual view. – **Fig. 3.** Occlusal view. – **Fig. 4.** *Canis mosbachensis* Soergel left upper caninus fragment (VER 2018.2659.), lingual view. – **Fig. 5.** *Canis mosbachensis* Soergel left M^1 (VER 2018.2683.), occlusal view. – **Fig. 6.** *Vulpes praecorsac* Kormos right P_3 (VER 2017.8222.), buccal view. – **Fig. 7.** *Vulpes praecorsac* Kormos left upper caninus (VER 2018.2666.),

Between layer 43 and 50: Left humerus fragment (VER 2018.2681.) (Fig. 16).

From mixed deposits: MT II (VER 2018.2688.).

Remarks – The badger remains from Somssich Hill 2 are a bit smaller than the extant *Meles meles* (very probably that is why Jánossy (1999) described them as *Meles* cf. *atavus*), but their morphology corresponds with that. Considering Table 2. in Petrucci *et al.* (2013) the measurements of Somssich Hill M_1-s are similar to those of the Pirro Nord specimen (Table 2). They are smaller than *Meles hollitzeri* but a bit larger than *Meles atavus*. They fall into the range of *Meles thorali*, but the length of the trigonid of the M_1 is clearly smaller than that of *M. thorali*. There is not any accessory cuspid between protoconid and paraconid which cuspid would be a diagnostic feature of *Meles atavus* so the Somssich Hill 2 badger remains can be ranked into the *Meles meles* species. According to many authors, some of the above mentioned species names could be used as subspecies of *Meles meles* because of the highly polimorphic feature of this species (e.g., Wolsan 2001, Petrucci *et al.* 2013).

Table 2. Dimensions of the Somssich Hill 2 badger M_1-s compared with data from Petrucci *et al.* (2013)

	Meles meles	*Meles meles*	*Meles atavus*	*Meles hollitzeri*	*Meles thorali*	*Meles* cf. *meles*
	Italy	Italy	Romania	Germany	France	Hungary
	extant	Pirro Nord		Untermassfeld	St. Vallier	Somssich Hill 2
M_1 length (mm)	15.40–17.40	16.40	15.20	16.42	15.40–17.00	15.37–15.66
M_1 width (mm)	7.20–8.20	7.00	6.90	7.11	6.90–7.50	7.27–7.30
M_1 trigonid length (mm)	8.30–9.60	8.80	–	9.03	9.40–10.00	8.20–8.30

buccal view. – **Figs 8–9.** *Vulpes praecorsac* Kormos left mandible fragment (VER 2018.2678.). – **Fig. 8.** Buccal view. – **Fig. 9.** Dorsal view. – **Fig. 10.** *Vulpes praecorsac* Kormos left M_1 (VER 2018.2630.), occlusal view. – **Fig. 11.** *Vulpes praecorsac* Kormos right maxilla fragment with M^1 (VER 2018.2682.), occlusal view. – **Fig. 12.** *Ursus* sp. left deciduous lower caninus fragment (VER 2017.8221.), buccal view. – **Fig. 13.** *Meles* cf. *meles* Linnaeus right femur fragment (VER 2018.2610.), anterior view. – **Figs 14–15.** *Meles* cf. *meles* Linnaeus right mandibula fragment (VER 2018.2660.). – **Fig. 14.** Dorsal view. – **Fig. 15.** Buccal view. – **Fig. 16.** *Meles* cf. *meles* Linnaeus left humerus fragment (VER 2018.2681.), anterior view. All scale bars = 10 mm

Genus *Mustela* Linnaeus, 1758

Mustela palerminea Petényi, 1864
(Fig. 17)

Material – **Layer 4:** Right P^4 (V.84.16).

Layer 5: 2 right M^1s; left maxilla fragment with P^3 and P^4; left and right P^4 fragments (V.82.105).

Layer 6: Right P^4; right M^1 (VER 2017.8230.).

Layer 8: Right mandibula fragment with C, P_2, alveoli of P_3 and P_4; left mandibula fragment with M_1; left maxilla fragment with P^4; right P_4 (V.83.35).

Layer 9: Right mandibula fragment with M_1; left upper caninus (V.83.53).

Layer 10: Phalanx I (V.83.119).

Layer 12: Left M_1 fragment (V.84.16).

Layer 20: Left M_1; premolar fragment (VER 2018.2619.).

Layer 32: 2 right mandibula fragments with P_3-M_2; right mandibula fragment with P_4, M_1 (VER 2018.2663.); – Left P_4 (VER 2018.2646.).

Layer 33: Left P^3 (VER 2018.2654.); – Right mandibula fragment with P_3, P_4, M_1 (VER 2018.2655.).

Layer 42: Right mandibula fragment with C, P_2-M_1, M_2 fragment (VER 2018.2680.) (Fig. 17).

Layer 43: Left and right P_3; left and right P_4; left and right P^3; left and right P^4; left upper caninus (VER 2018.2672.).

Remarks – For the determination of the Somssich Hill 2 small mustelids the main characteristic feature was the size of the remains. On the basis of the length data of the lower first molars (M_1) two size ranges were allowed to distinguish (Table 3), the larger one fits in with the size range of *Mustela palerminea*, which is

Table 3. Dimensions of the Somssich Hill 2 small mustelid M_1-s compared with data from Petrucci *et al.* (2013) supplemented with data of some recent specimens from Hungary

	Mustela erminea	*Mustela nivalis*	*Mustela palerminea*					
	Europe (with data from Hungary)	France and Hungary	France	Spain	Hungary	Germany	Italy	Hungary
	extant	extant	L'Escale-Lunel viel	Atapuerca		Erpfingen	Pirro Nord	Somssich Hill 2
M_1 length (mm)	5.02–6.24	4.04–4.66	4.70–5.00	4.80–5.00	4.40–5.50	4.60–5.30	5.34	5.12–5.41

a bit smaller than the extant *M. erminea* and the smaller one fits in with the size range of *M. praenivalis*, which is a bit smaller than the extant *M. nivalis*.

Mustela praenivalis Kormos, 1934
(Fig. 18)

Material – **Layer 4:** Left M_1; right P^4 (V.82.148).

Layer 5: Left mandibula fragment with M_1 and alveoli of M_2; right maxilla fragment with C and P^2; left lower caninus; left and right P^4 (V.82.105).

Layer 6: Right P^4; right M^1 (V.82.110).

Layer 8: Right lower caninus (V.83.22).

Layer 15: Left mandibula fragment with P_4 and M_1 (V.89.37).

Layer 33: Right lower caninus (VER 2018.2653.).

Layer 34: Right upper caninus (VER 2018.2652.).

Layer 37: Left lower caninus (VER 2018.2642.).

Layer 39: Right mandibula fragment with P_4 and M_1 (VER 2018.2649.).

Layer 41: Left mandibula fragment with P_4, M_1, M_2 and alveoli of P_3 (VER 2018.2664.) (Fig. 18).

Layer 43: Right mandibula fragment with M_1 and alveoli of P_4 and M_2; right maxilla fragment with P^4; left P^4 fragment; left lower caninus fragment; left upper caninus fragment (VER 2018.2671.).

Remarks – There are some extremely small sized specimens amongst the least weasel remains. They certainly belonged to adult and not juvenile individuals. These can be identified as remains of an extremely small female, but another possible option if we suppose the presence of a third weasel species, is a dwarf sized one which could be the early representative of the extant least weasel (*Mustela nivalis nivalis*) or its probable ancestor.

Such remains from the Somssich Hill 2 record:

Layer 43: Right lower caninus and right upper caninus (VER 2018.2673.).

Layer 19: Right humerus fragment; left upper caninus (VER 2018.2616.).

Genus *Lutra* Brisson, 1762

Lutra sp.

Material – **Layer 2:** Phalanx I fragment (V.81.31).

Remarks – In size and morphology the specimen is very similar to the extant *Lutra lutra*.

Genus *Pannonictis* Kormos, 1931

Pannonictis sp.
(Figs 19–22)

Material – **Layer 34:** Right P_4 (VER 2018.2693.).
Layer 35: Left P_4 (Figs 21–22); right P_3 (VER 2018.2639.) (Figs 19–20).

Remarks – The precise identification of the scanty isolated *Pannonictis* teeth is not possible, but considering their size the specimens probably represent the larger species, *Pannonictis pliocaenica* Kormos.

Genus *Martes* Pinel, 1792

Martes foina cf. *intermedia* (Severtzov, 1873)
(Figs 23–25)

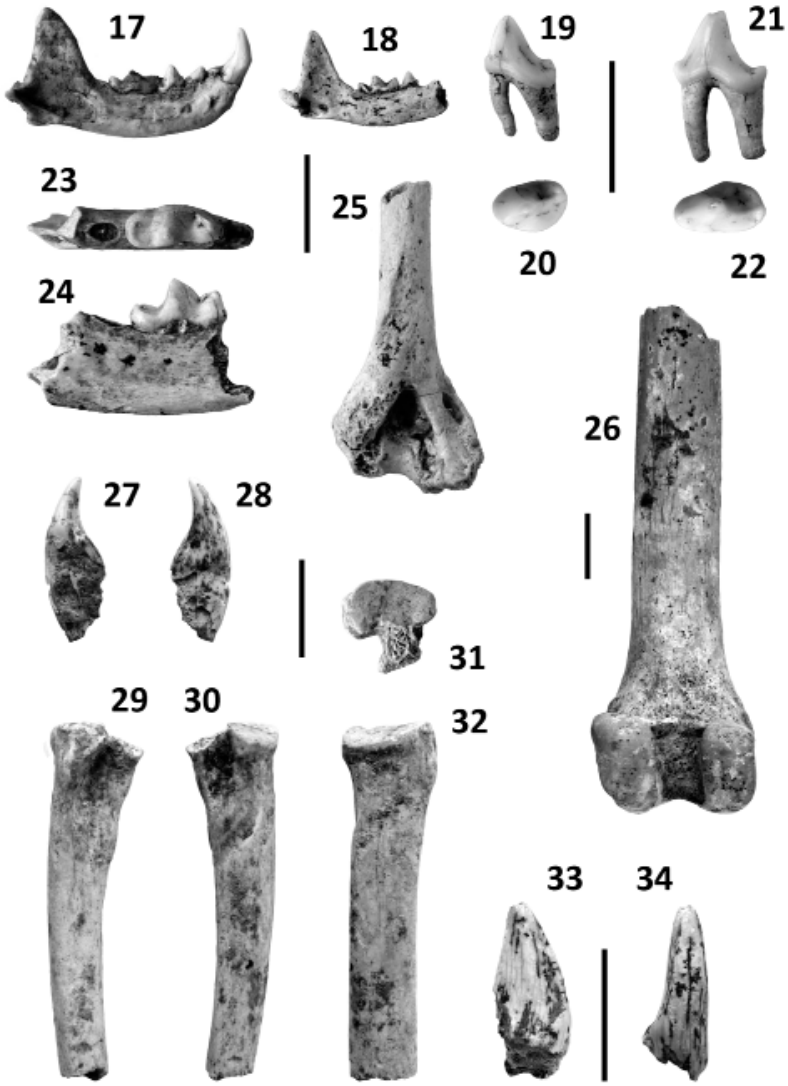
Material – **Layer 4:** Left mandibula fragment with M_1 and alveoli of M_2 (VER 2017.8220.) (Figs 23–24).
Layer 31: Left humerus distal fragment (VER 2018.2661.) (Fig. 25).

Remarks – The remains fall into the size range of the extant *M. foina* but somewhat smaller than the average.

Family Felidae Fischer von Waldheim, 1817
Genus *Felis* Linnaeus, 1758

Felis cf. *lunensis* Martelli, 1906
(Figs 26–32)

Material – **Layer 2:** Phalanx II (V.81.37).
Layer 4: Left femur distal fragment (Fig. 26); right radius distal and proximal fragment; right ulna proximal fragment; right scapula distal fragment; 2 vertebrae caudalis; 3 phalanges I; 4 phalanges II (VER 2018.2612.).
Layer 8: Deciduous right lower caninus (V.83.24) (Figs 27–28).
Layer 22b: Caninus fragment (VER 2018.2634.).
Layer 36: Vertebra cervicalis (VER 2018.2644.).
From mixed deposits: MT III proximal fragment (Figs 29–32); phalanx II (VER 2018.2690.).



Figs 17–34. Carnivora remains from Somssich Hill 2. – **Fig. 17.** *Mustela palerminea* Petényi right mandibula fragment (VER 2018.2680.), buccal view. – **Fig. 18.** *Mustela praenivalis* Kormos left mandibula fragment (VER 2018.2664.), lingual view. – **Figs 19–20.** *Pannonictis* sp. right P_3 (VER 2018.2639.). – **Fig. 19.** Lingual view. – **Fig. 20.** Occlusal view. – **Figs 21–22.** *Pannonictis* sp. left P_4 (VER 2018.2639.). – **Fig. 21.** Buccal view. – **Fig. 22.** Occlusal view. – **Figs 23–24.** *Martes foina* cf. *intermedia* (Severtzov) left mandibula fragment (VER 2017.8220.). – **Fig. 23.** Occlusal view. – **Fig. 24.** Lingual view. – **Fig. 25.** *Martes foina* cf. *intermedia* (Severtzov) left humerus fragment (VER 2018.2661.), posterior view. – **Fig. 26.** *Felis* cf. *lunensis* Martelli left femur fragment (VER 2018.2612.), posterior view. – **Figs 27–28.** *Felis* cf. *lunensis* Martelli deciduous right lower caninus (V.83.24). – **Fig. 27.** Lingual view. – **Fig. 28.** Buccal view. – **Figs 29–32.** *Felis* cf. *lunensis* Martelli left MT III fragment (VER 2018.2690.). – **Fig. 29.** Lateral view. – **Fig. 30.** Medial view. – **Fig. 31.** Proximal view. – **Fig. 32.** Anterior view. – **Figs 33–34.** *Homotherium* sp. right I3 fragment (V.82.100). – **Fig. 33.** Lingual view. – **Fig. 34.** Anterior view. All scale bars = 10 mm

Remarks – The cat remains from Somssich Hill 2 originally were described by Jánossy (1999) as jungle cat (*Felis chaus*) remains, because the morphology and the measurements are very similar to the latter; however, we have no evidence of the occurrence of this species in early Middle or Early Pleistocene sites. As the Somssich Hill 2 specimens are clearly larger than the recent or the Pleistocene wild cat (*Felis silvestris*) remains, but there are not any isolated teeth or other cranial remains in the record, we provisionally ranked them into *Felis lunensis*, which species is also larger than *F. silvestris*. According to the data of Stach (1961) who published some measurements on *F. lunensis* and described the Pliocene *Felis wenzensis* as a new species, it seems that the estimated body size of the Somssich Hill 2 cat is more similar to the larger *F. wenzensis* than to *F. lunensis*. However, we can rule out the former species because it is definitely older stratigraphically. *F. lunensis* together with "*Chaus* sp." has already been listed by Jánossy (1990) in the faunal list of Somssich Hill 2 but later in Jánossy (1999) only the *Felis chaus* was described.

Genus *Lynx* Kerr, 1792

Lynx sp.
(Figs 35–36)

Material – **Layer 4:** Upper caninus fragment (VER 2017.8222.).

Layer 8: Juvenile left mandibula fragment with dP_4 (VER 2018.2621.).

Layer 22b: Left and right M_1 fragments (very probably from the same individual) (VER 2018.2627.) (Fig. 35).

Layer 24: Phalanx I (from a semiadult individual) (VER 2018.2637.).

Layer 28: Left M_1 fragment (VER 2018.2711.) (Fig. 36).

Remarks – The dimensions of the Somssich Hill 2 lynx remains fit in with those of the extant *Lynx lynx* Linnaeus. The length of the only measurable M_1 (VER 2018.2711. – L: 14.68 mm) is very close to *Lynx issiodorensis* (Croizet & Jobert) from Florence (L: 14.4 mm) (data from Petrucci *et al.* (2013)), but also rather close to *Lynx lynx strandi* Kormos (L: 15.23 mm). The latter was mentioned also in Jánossy (1999), but on the one hand it is definitely older than Somssich Hill 2 and on the other hand Kormos' species is very probably synonymous with *L. issiodorensis*. It is very probable that the Somssich Hill lynx is *L. issiodorensis*, however, the scanty material does not allow such precise identification.

Genus *Panthera* Oken, 1816

Panthera sp.
(Figs 37–42)

Material – **Layer 8:** Left P_3 fragment (V.83.21) (Figs 37–38).
Layer 22b: Right dP^3 fragment (VER 2018.2628.) (Figs 39–40); – 2 left deciduous I^3; left deciduous I^2; deciduous upper incisivus; right deciduous I_2; 8 fragments of deciduous teeth (VER 2018.2636.).
From mixed deposits: Right anterior phalanx II digiti II (VER 2018.2686.) (Figs 41–42).

Remarks – The rather scanty and fragmentary material allows only very uncertain identification. On the basis of their dimensions and comparing the Somssich Hill 2 big cat specimens with equivalent specimens of *Panthera onca gombaszogensis* (Kretzoi) from Gombaszög (Gombasek) one can suppose that the Somssich Hill 2 specimens belong to this species.

Genus *Homotherium* Fabrini, 1890

Homotherium sp.
(Figs 33–34)

Material – **Layer 5:** Right I^3 fragment (V.82.100) (Figs 33–34).

Remarks – The single incisor remain is unsuitable for sure and precise identification, but its dimensions and the age of the locality suggest that it represents the smaller *Homotherium latidens* Owen.

Order Perissodactyla Owen, 1848
Family Equidae Gray, 1821
Genus *Equus* Linnaeus, 1758

Equus sp.
(Fig. 43)

Material – **Layer 5:** Upper incisivus fragment (VER 2018.2613.).
From mixed deposits: Phalanx II distal fragment (VER 2018.2685.) (Fig. 43).

Remarks – The remains obviously originated from a small sized horse species, but the scanty material does not allow any certain identification.

Family Rhinocerotidae Gray, 1820

Rhinocerotidae indet.

Material – **Layer 2:** 2 tooth fragments (V.81.41).
Layer 43: Premolar fragment (VER 2018.2674.).

Remarks – Due to the very fragmentary preservation of the remains their identification is rather uncertain. The only usable feature was the thickness of the enamel of the tooth fragments.

Order Artiodactyla Owen, 1848
Family Suidae Gray, 1821
Genus *Sus* Linnaeus, 1758

Sus sp.
(Figs 44–45)

Material – **Layer 4:** Right dP^2 fragment (V.82.148) (Figs 44–45).
Layer 22b: P_1 (?) fragment (VER 2018.2629.).

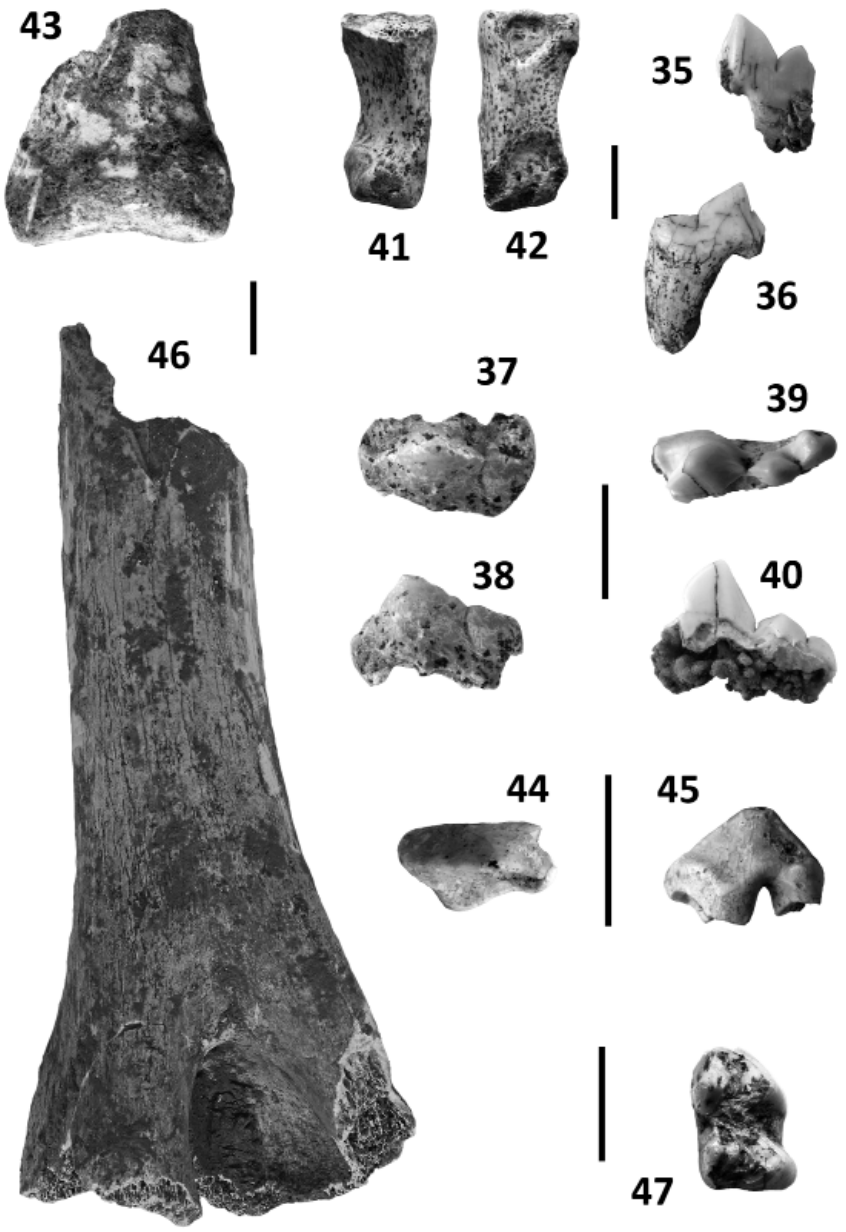
Remarks – Because of the lack of comparative material of milk dentition from different mammal species the identification of the Somssich Hill 2 *Sus* sp. remains is very uncertain.

Family Cervidae Goldfuss, 1820
Genus *Cervus* Linnaeus, 1758

Cervus sp.
(Fig. 46)

Material – **Layer 7:** Upper molar fragment (VER 2018.2615.).
Layer 8: 2 teeth fragments (V.83.15).
Layer 31: Right humerus fragment (VER 2018.2699.) (Fig. 46).

Remarks – The remains were described by Jánossy (1999) as *Cervus* cf. *acoronatus*, but the very fragmentary specimens do not allow such precise identifications. Their only usable feature is their size on the basis of which the specimens probably belonged to a deer similar in size to *Cervus elaphus*.



Figs 35–47. Large mammal remains from Somssich Hill 2. – **Fig. 35.** *Lynx* sp. right M_1 fragment (VER 2018.2627.), buccal view. – **Fig. 36.** *Lynx* sp. left M_1 fragment (VER 2018.2711.), buccal view. – **Figs 37–38.** *Panthera* sp. left P_3 fragment (V.83.21). – **Fig. 37.** Occlusal view. – **Fig. 38.** Buccal view. – **Figs 39–40.** *Panthera* sp. right dP3 (VER 2018.2628.). – **Fig. 39.** Occlusal view. – **Fig. 40.** Lingual view. – **Figs 41–42.** *Panthera* sp. right anterior phalanx II digiti II (VER 2018.2686.). – **Fig. 41.** Posterior view. – **Fig. 42.** Anterior view. – **Fig. 43.** *Equus* sp. phalanx II fragment (VER 2018.2685.), anterior view. – **Figs 44–45.** *Sus* sp. right dP2 fragment (V.82.148). – **Fig. 44.** Occlusal view. – **Fig. 45.** Lingual view. – **Fig. 46.** *Cervus* sp. right humerus fragment (VER 2018.2699.), posterior view. – **Fig. 47.** *Capreolus* sp. right M_2 (VER 2017.8232.), occlusal view. All scale bars = 10 mm

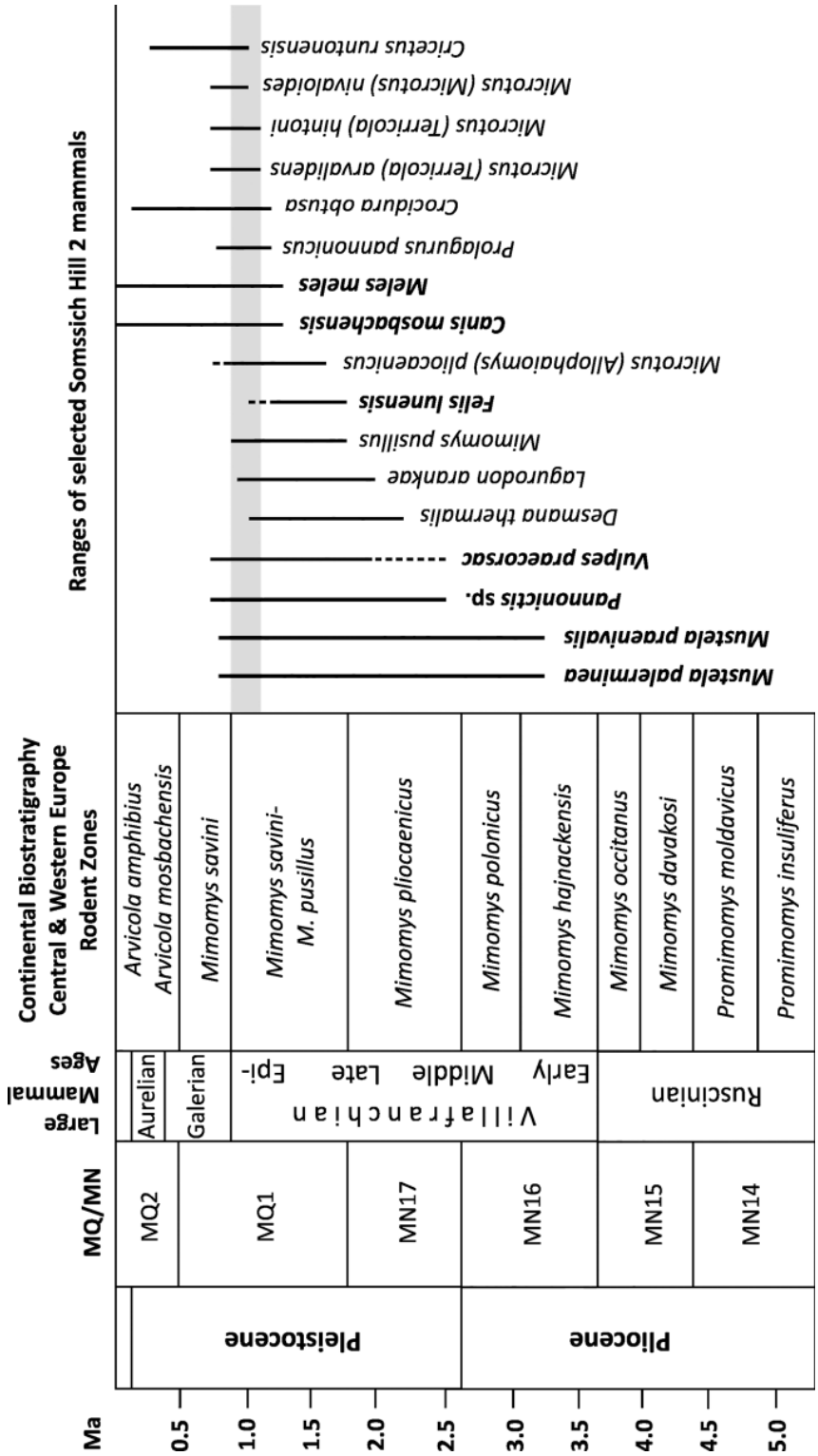


Fig. 48. Ranges of some selected micro- and macromammal taxa of Somssich Hill 2 and the biostratigraphic position of the locality

Genus *Capreolus* Gray, 1821

Capreolus sp.
(Fig. 47)

Material – **Layer 1:** Right M_2 (VER 2017.8232.) (Fig. 47).
Layer 2: 2 upper (?) tooth fragments (V.81.42).

Remarks – The roe deer remains from Somssich Hill 2 were identified by Jánossy (1999) as *Capreolus suessenbornensis* Kahlke but the very poor material is unsuitable for more precise identification than genus level. The dimensions of the Somssich Hill 2 remains fit in with those of *C. suessenbornensis*, but also with the extant *C. capreolus*, so any certain determination is impossible.

On the basis of the taxonomic evaluation of the macromammal record discussed in the above, we revised the faunal lists of the Somssich Hill 2 locality which were published in Jánossy (1990, 1999) and Pazonyi *et al.* (2018) (Table 4). An interesting phenomenon that we had to delete two taxa; these are *Alces* sp. and *Macaca* sp. Although originally they were listed both in Jánossy (1990) and (1999) we were not able to find such remains neither amongst the inventoried nor amongst the uninventoried material from Somssich Hill 2.

BIOSTRATIGRAPHY

Despite the fragmentary and somewhat poor material the macromammal remains from the Somssich Hill 2 locality allow us to correlate the age of the fauna to the so-called Epivillafranchian biochron (or formal biochron as it was mentioned in Bellucci *et al.* 2015).

The term Epivillafranchian was originally introduced by Bourdier in 1961 but it was not frequently applied in the literature (Bellucci *et al.* 2015). However, since the 1990s it seems to be more widely used among others in Kahlke (2007), Garcia *et al.* (2008), Kahlke *et al.* (2011), and Bellucci *et al.* (2015). The main characteristic of this formal biochron is a faunal turnover during which most of the Tertiary or early and middle Villafranchian relict species became extinct and some new species appeared endowing the faunal assemblages with a modern shape. In the case of some mammal groups larger species evolved or in some cases intermediate forms appeared considering their size. The measurements of such remains in many cases fall in between the size range of the early or middle Villafranchian species and the Middle Pleistocene forms of the same species. For example the dimensions of the Somssich Hill 2 *Canis mosbachensis* remains are larger than the Villafranchian *Canis arnensis* but a bit

Table 4. Revised faunal list of the palaeovertebrates from the Somssich Hill 2 locality

Pisces	*Glis minor* (Kowalski, 1956)
Carassius sp.	*Muscardinus dacicus* Linnaeus, 1758
Osteichthyes indet.	*Dryomimus eliomyoides* Kretzoi, 1959
Amphibia	*Sicista praeloriger* Kormos, 1930
Salamandra cf. *salamandra* (Linnaeus, 1758)	*Apodemus sylvaticus* (Linnaeus, 1758)
Triturus cristatus (Laurenti, 1768)	*Allocricetus bursae* Schaub, 1930
Lissotriton cf. *vulgaris* (Linnaeus, 1758)	*Allocricetus ehiki* Schaub, 1930
Bombina variegata (Linnaeus, 1758)	*Cricetus nanus* (Schaub, 1930)
Pelobates fuscus (Laurenti, 1768)	*Cricetus runtonensis* Newton, 1909
Bufo bufo (Linnaeus, 1758)	*Villanyia exilis* Kretzoi, 1956
Bufotes viridis (Laurenti, 1768)	*Mimomys savini* Hinton, 1910
Hyla arborea (Linnaeus, 1758)	*Mimomys pusillus* (Méhely, 1914)
Rana temporaria (Linnaeus, 1758)	*Mimomys reidi* Hinton, 1910
Reptilia	*Pitymimomys pitymyoides* (Jánossy et Meulen, 1975)
Emys cf. *orbicularis* (Linnaeus, 1758)	*Borsodia newtoni* (Forsyth Major, 1902)
Testudo lambrechti Szalai, 1934	*Pliomys episcopalis-hollitzeri* group
Lacerta cf. *viridis* (Laurenti, 1768)	*Clethrionomys hintonianus-kretzoii* group
Anguis sp.	*Lagurodon arankae* (Kretzoi, 1954)
Pseudopus cf. *pannonicus* Kormos, 1911	*Prolagurus pannonicus* (Kormos, 1930)
Ophisaurus sp.	*Allophaiomys pliocaenicus* Kormos, 1932
Hierophis cf. *viridiflavus* (Lacepède, 1789)	*Microtus* (*Terricola*) *arvalidens* (Kretzoi, 1958)
Hierophis cf. *gemonensis* (Laurenti, 1768)	*Microtus* (*Terricola*) *hintoni* (Kretzoi, 1941)
Coronella austriaca Laurenti, 1768	*Microtus* (*Microtus*) *nivaloides* Forsyth Major, 1902
Elaphe cf. *paralongissima* Szyndlar, 1984	*Talpa fossilis* Petényi, 1864
Elaphe cf. *quatuorlineata* Lacepède, 1789	*Desmana thermalis* Kormos, 1930
Zamenis longissimus (Laurenti, 1768)	*Crocidura kornfeldi* Kormos, 1934
Natrix natrix Linnaeus, 1758	*Crocidura obtusa* Kretzoi, 1938
Natrix tessellata Laurenti, 1768	*Sorex minutus* Linnaeus, 1766
Telescopus cf. *fallax* (Fleischmann, 1831)	*Sorex runtonensis* Hinton, 1911
Vipera cf. *ammodytes* Linnaeus, 1758	*Sorex* (*Drepanosorex*) *savini* Hinton, 1911
Vipera cf. *berus* Linnaeus, 1758	*Neomys newtoni* Hinton, 1911
Aves	*Asoriculus gibberodon* (Petényi, 1864)
Anser subanser Jánossy, 1983	*Beremendia fissidens* (Petényi, 1864)

Table 4. (continued)

Aythya sp. (large species)	*Beremendia minor* Rzebik-Kowalska, 1976
Anas cf. *acuta* Linnaeus, 1758	*Erinaceus* cf. *praeglacialis* Brunner, 1933
Anas sp. (*querquedula* size)	*Rhinolophus ferrumequinum* (Schreber, 1774)
Tetrao partium (Kretzoi, 1962)	*Myotis* cf. *nattereri* (Kuhl, 1817)
Francolinus capeki Lambrecht, 1933	*Myotis* cf. *brandtii* (Eversmann, 1845)
Coturnix cf. *coturnix* Linnaeus, 1758	*Myotis dasycneme* Boie, 1825
Otis sp.	*Plecotus* cf. *auritus* Linnaeus, 1758
Stryx cf. *intermedia* Jánossy, 1972	*Miniopterus schreibersii* (Kuhl, 1817)
Surnia robusta Jánossy, 1977	*Eptesicus nilssoni* (Keyserling et Blasius, 1839)
Athene noctua cf. *lunellensis* Mourer-Chauviré, 1975	*Canis mosbachensis* Soergel, 1925
Aquila cf. *heliaca* Savigny, 1809	*Vulpes praecorsac* Kormos, 1932
Falco tinnunculus atavus Jánossy, 1972	*Ursus* sp.
Falco cf. *vespertinus* Linnaeus, 1766	*Meles* cf. *meles* Linnaeus, 1758
Picus cf. *viridis* Linnaeus, 1758	*Mustela palerminea* Petényi, 1864
Dendrocopos submajor Jánossy, 1974	*Mustela praenivalis* Kormos, 1934
Galerida cf. *cristata* Linnaeus, 1758	*Lutra* sp.
Sitta europaea-group	*Pannonictis* sp.
Hirundo cf. *rustica* Linnaeus, 1758	*Martes foina* cf. *intermedia* (Severtzov, 1873)
Passeriformes indet.	*Felis* cf. *lunensis* Martelli, 1906
Mammalia	*Lynx* sp.
Lepus terraerubrae Kretzoi, 1956	*Panthera* sp.
Ochotona sp.	*Homotherium* sp.
Trogontherium cf. *cuvieri* (Laugel, 1862)	*Equus* sp.
Nannospalax cf. *advenus* (Kretzoi, 1977)	Rhinocerotidae indet.
Spermophilus primigenius (Kormos, 1934)	*Sus* sp.
Sciurus whitei hungaricus Jánossy, 1962	*Capreolus* sp.
Glis sackdillingensis Heller, 1930	*Cervus* sp.

smaller than the Middle Pleistocene *C. mosbachensis* remains. A similar phenomenon was observed amongst the small mustelids, as the range of the length of *Mustela palerminea* lower first molars (M_1) from Somssich Hill 2 is between those of the Villafranchian *M. palerminea* and the Middle Pleistocene (and recent) *M. erminea*.

The macromammal assemblage of the Somssich Hill 2 locality shows many similarities with several European late Villafranchian and early Galerian faunas and localities, for example Pirro Nord and Colle Curti in Italy, some sites of Atapuerca in Spain, Le Vallonet and Sainzelles in France, and Untermassfeld in Germany (Petronio *et al.* 2011; Bellucci *et al.* 2015; Gliozzi *et al.* 1997; Palombo & Valli 2004; Garcia & Arsuaga 1999; Kahlke 1997; Kahlke & Gaudzinski 2005).

The faunal change is more obvious amongst the micromammals but it is also present amongst the macromammals (Fig. 48). The two small mustelids (*Mustela palerminea* and *M. praenivalis*), the large mustelid *Pannonictis*, and the extinct corsac fox (*Vulpes praecorsac*) are disappearing species of the fauna. There is a large sized wild cat, *Felis* cf. *lunensis* in the Somssich Hill 2 fauna, which was known only from older localities and it has rather strict biostratigraphical appearance. On the basis of the Somssich Hill 2 record we have to extend the biostratigraphical range of this species, but of course we have to note that the identification of the Somssich Hill 2 remains is a bit dubious. Definitely newcomer species are the medium sized wolf (*Canis mosbachensis*) and the badger (*Meles meles*). In the macromammal record of the Somssich Hill 2 one can find two further newly occurring species; however, their identification is unfortunately uncertain due to the rather fragmentary and scanty material. These species are *Panthera onca gombaszogensis* and *Cervus cervus acoronatus*.

Mainly on the basis of the micromammals and supported by ESR data the age of the locality was dated to ca. 1 Ma (Pazonyi *et al*. 2018) but some kinds of mixing of the deposits were demonstrable. Some micromammal species evidently can be present in the fauna only due to reworking processes during which remains of biostratigraphically older species were washed into the fissure from older deposits near the site.

PALAEOECOLOGY AND TAPHONOMY

The deposits of the Somssich Hill 2 locality were divided into five different palaeoecological units (Pazonyi *et al*. 2018). The bulk of the fossil record indicates steppe and predominantly cold steppe conditions. However, there were warmer periods during the deposition of the sediments and some more or less forested environments or at least small forested spots were probably present in the vicinity of the site during almost the whole time span. A similar result was published by Botka & Mészáros (this volume).

Surely steppe indicators amongst the macromammals are the hare (*Lepus terraerubrae*) and the corsac fox (*Vulpes praecorsac*), the remains of which are

the most abundant in the Somssich Hill 2 record. *Canis mosbachensis* and the few *Homotherium* sp., *Equus* sp., and probably the Rhinocerotidae indet. remains also indicate steppe or at least open vegetation, but there are some more or less forest dweller species as *Mustela palerminea* and *M. preanivalis*, *Meles* cf. *meles*, *Lynx* sp., *Panthera* sp. (cf. *P. onca gombaszogensis*), *Felis* cf. *lunensis*, and the very uncertain *Ursus* sp. *Lutra* sp. and *Pannonictis* sp. remains indicate water or swampy conditions in the neighbourhood. This assumption seems to be confirmed by the presence of some water indicator species amongst the micromammals and birds but also amongst the herpeto- and malacofauna (Pazonyi *et al*. 2018; Botka & Mészáros 2014, this volume; Szentesi 2014; Krolopp 2000; Jánossy 1999).

According to the very fragmentary conditions of the macromammal material (predominantly small fragments of postcranials and isolated teeth or tooth fragments) earlier it was assumed that a kind of a natural filter existed during the deposition of the sediments and the remains. However, Pazonyi *et al*. (2018) showed that the low proportion of weathered and abraded bones suggests that water transport was limited and the remains were transported into the fissure from the close proximity of the locality.

A very strange and interesting feature of the Somssich Hill 2 palaeovertebrate material is the fact that there are not any hyena remains, although generally the hyenas are common and frequent members of the palaeovertebrate faunas. We have to note that there are some uncertain deciduous tooth fragments identified as *Panthera* sp. remains which can be also hyena milk tooth fragments, but these are no more than 3–4 specimens. A probable explanation for this peculiarity could be that just the hyenas were the factor which produced the huge amount of bone fragments. But the taphonomical investigations of the record revealed that the bite marks are lacking on the bone fragments and there are no traces of long digestive processes which would be characteristic for hyenas (or for other mammalian predators, e.g. *Vulpes precorsac*, the remains of which are the most frequent in the case of Somssich Hill 2). However, we have to note, that such investigations were done only on a small part of the record. We can assume that not only the extremely abundant micromammal remains but also the bulk of the macromammal remains were probably accumulated due to predation of owls and originated from owl pellets. Up to the present, three strigid owl species have been described from the locality: *Surnia robusta* Jánossy, *Athene noctua* cf. *lunellensis* Mouret-Chauviré, and *Strix* cf. *intermedia* Jánossy, but Jánossy (1999) supposed that a large sized owl (a *Bubo* species) must have occurred in the territory because it would be a probable reason for the presence of the abundant leporid material.

*

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