



PAVLOVIAN HUNTERS ON THE MARGIN – ARCHAEOZOOLOGICAL ANALYSIS OF THE ANIMAL REMAINS DISCOVERED AT THE PAVLOV II SITE (1966 – 67 EXCAVATIONS)

JAROSŁAW WILCZYŃSKI^{1,*}, PIOTR WOJTAL¹, JIŘÍ SVOBODA^{2,3}

¹ Institute of Systematics and Evolution of Animals, PAS, Sławkowska 17, 31-016 Kraków, Poland;
e-mail: wilczynski@isez.pan.krakow.pl, wojtal@isez.pan.krakow.pl.

² Department of Anthropology, Faculty of Science, Masaryk University, Kotlářská 2, 602 00 Brno, the Czech Republic;
e-mail: jsvoboda@sci.muni.cz.

³ Institute of Archaeology of the CAS, Brno, v. v. i., Čechyňská 17, 612 00 Brno, the Czech Republic.

*corresponding author

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Abstract: Our archaeozoological studies concerns animal remains discovered during fieldworks led by B. Klíma in 1966 – 1967. The study does not include a few bone tools and personal ornaments made from animal teeth. There were analysed 968 remains of different animal species. Among the mammals, the most numerous are bones and teeth of mammoth, horse, wolf, and reindeer. Other taxa are less numerous, but we point out presence of cave lion bones. The quantity of animal remains discovered at Pavlov II is much lower in comparison with other Pavlovian sites from Pavlov-Dolní Věstonice area. The localization of archeological trench, on the periphery/margin of a larger Pavlovian site, most likely had effect on not large number osteological finds. Nevertheless, our study confirms the importance different Pleistocene species in the everyday life of Gravettian hunters-gatherers. They relied not only on herbivores, but also carnivores, such as wolves, wolverines, bears and cave lions.

Key words: Gravettian, hunters-gatherers, southern Moravia, subsistence strategies

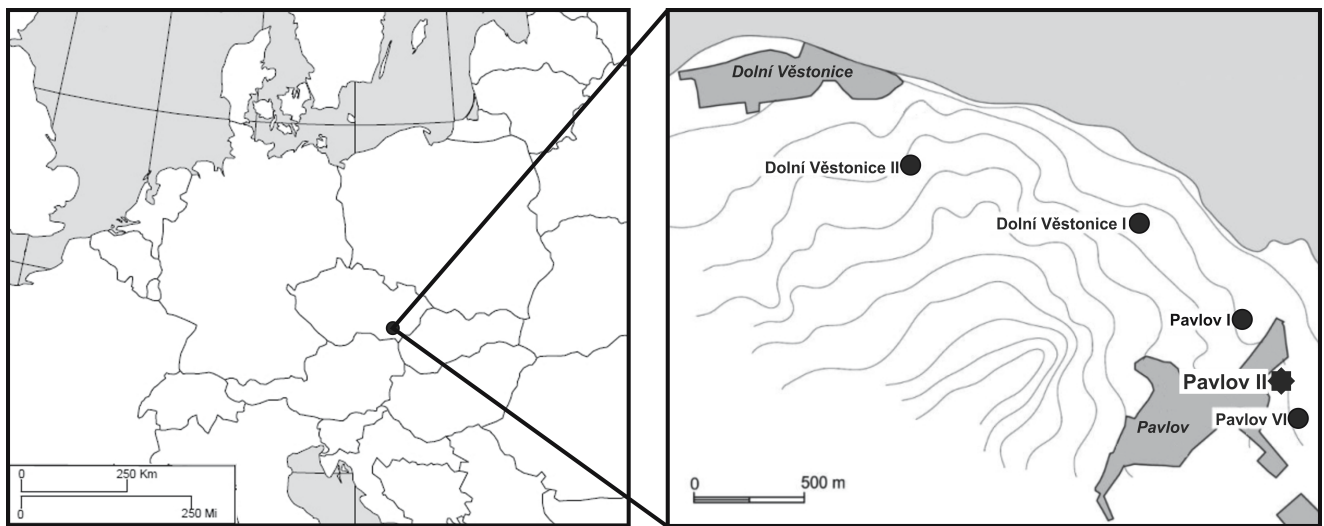
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Introduction

Large-scale excavations at the Pavlov II site were carried out in 1966 and 1967 by B. Klíma. During this fieldwork, numerous lithic finds were found in an undisturbed cultural layer, concentrated mainly around hearths, along with bone tools and ornaments (including Tertiary mollusc shells), and animal bones of different taxa (Klíma 1967). Traces of human occupations discovered at this site was clearly connected with the Pavlovian settlement (Early Gravettian) as is the case in neighbouring localities such as Pavlov I and Dolní Věstonice I and II (Text-fig. 1). This determination was made on the basis of the lithic material as well as stratigraphic position of the discovered finds. A later excavation in 2009 was prompted by house construction at the site, and focused on the western and north-western site peripheries. It provided information that was previously missing, namely charcoal samples for ¹⁴C dating (GrA-44392: 27,020 ± 140 BP; GrA-44290: 27,190 ± 140 BP) and palaeopedological, palaeobotanical, and malacozoological

data; a few bone fragments from undetermined mammals were also recovered (Svoboda 2011: 16–20). Therefore, all bones analysed here originate from the first, 1966 – 1967, fieldwork. Our study does not include four fragments of bone point, a single awl, and three fragmented pendants made from animal teeth, including a single unfinished piece (Klíma 1967).

Mammalian bones and teeth from the 1966 – 1967 excavations at the site are stored in the osteological collection in the Moravian Museum in Brno (Moravské zemské muzeum). Information regarding the place of discovery (sectors of the site) is available for less than half of the studied osteological material (419 bones and teeth). Therefore, it is not possible to present a complete and accurate plan of all animal remains discovered at the site. Nevertheless, on the basis of the plan published in the monographic study of the site, we may state that the majority of animal remains were found close to the southern and eastern wall of the main trench (Klíma 1976). This is the same area where the largest concentration of lithic material and hearths were located.



Text-fig. 1. Location of the Pavlov II site.

Material and methods

The osteological material collected from the site were identified based on comparative collections at the Institute of Systematics and Evolution of Animals, Polish Academy of Sciences in Kraków, and publications about the anatomy of large mammalian species (Gromova 1950, Pales and Garcia 1981a, b).

Two quantified calculations were made of the remains: NISP (Number of Identified Specimens), MNI (Minimum Number of Individuals) and MNE (Minimal Number of Elements) (Klein and Cruz-Urbe 1984, Lyman 1994). All bones were subjected to close observations in order to identify traces of activity made by Palaeolithic hunters, including cut marks, percussion marks, and evidence of burning (Binford 1981, Shipman and Rose 1983, Olsen and Shipman 1988, Lyman 1994, Stiner et al. 1995, Bennet

1999, Théry-Parisot 2002, Villa et al. 2002) as well as marks resulting from other biotic and abiotic factors (e.g., root etching, trampling, weathering) (Sutcliffe 1970, Haynes 1980, 1983, Binford 1981, Lyman 1994). To find signs of human activity (especially cut marks), bones were carefully inspected using a strong directional light. Each suspected mark was examined under low-power magnification. The extent of tooth wear (Gipson et al. 2000) was used to estimate age at death for individual wolves.

Results

State of preservation

The osteological material is generally well preserved, although many specimens were covered by calcitic precipitations. Single bones have root-etching on their

Table 1. Pavlov II site. Animal remains discovered during excavations in 1966 – 67.

Taxon	NISP	%NISP identifiable	MNI	% MNI
<i>Lepus</i> sp. (hare)	42	8.73	4	19.05
<i>Gulo gulo</i> (wolverine)	24	4.99	3	14.29
<i>Panthera spelaea</i> (cave lion)	22	4.57	1	4.76
<i>Vulpes lagopus</i> / <i>Vulpes vulpes</i> (Arctic/red fox)	3	0.62	1	4.76
<i>Canis lupus</i> (wolf)	68	14.14	3	14.29
<i>Ursus arctos</i> (brown bear)	1	0.21	1	4.76
<i>Equus ferus</i> (horse)	88	18.30	3	14.29
<i>Mammuthus primigenius</i> (woolly mammoth)	179	37.21	2	4.76
<i>Rangifer tarandus</i> (reindeer)	54	11.23	3	14.29
Identifiable	481	100	21	100
Small mammal (fox-hare sized)	11	–	–	–
Medium mammal (wolf-reindeer sized)	51	–	–	–
Large mammal (horse-bear sized)	57	–	–	–
Unidentifiable	368	–	–	–
Total unidentifiable to taxon	487	–	–	–
Total	968	100	21	100

Table 2. Skeletal element representation of woolly mammoth (*Mammuthus primigenius*), expressed as NISP and MNE at Pavlov II site.

Skeletal parts	NISP				MNE			
	dex	sin	indet.	Total	dex	sin	indet.	Total
Maxilla								
Cranium								
Mandible								
Tusk			1	1			1	1
Tooth			1	1			1	1
Sternum								
Atlas								
Axis								
Vertebrae			4	4				2
Ribs			37	37			3	3
Scapula			1	1			1	1
Humerus								
Radius								
Ulna								
Carpals			1	1			1	1
Innominate			1	1			1	1
Femur	1		4	5			2	
Patella								
Tibia		1	1	2		1		1
Fibula								
Calcaneus								
Astragalus			1	1			1	1
Tarsals								
Metapodial total								
Phalanx			1	1			1	1
Long bone fragments				35				
Indet. elements				89				
Total NISP/MNE				179				13

surfaces, which significantly hindered archaeozoological analysis. During the excavations some bones were discovered in anatomical order and some were still connected by calcitic precipitations, which are visible on remains of different taxa, specifically hare (three thoracic vertebrae and tarsal bones connected with tibia), wolf (connected metatarsal bones), and cave lion (metatarsal bones discovered together with astragalus and calcaneus bone). Discovery of such remains suggests the presence of a local depression in the site surface where the articulated body parts came to rest, this was confirmed during fieldwork (Klíma 1976). Bones in anatomical position were also observed at the neighbouring Pavlov I site, where almost complete animal skeletons were discovered (Svoboda 2005, Svoboda et al. 2016). We note that in the entire osteological collection from Pavlov II, no gnawing marks were identified.

Faunal composition and skeletal representation

We analysed 968 bones and teeth from different animal species (including birds and mammals). More than half of the whole assemblage (NISP = 481) could be identified to taxon (Tab. 1). Two bones of raven (*Corvus corax*) were

discovered and described in an earlier publication (Wertz et al. 2015). Among the mammals, the most numerous (>50 specimens) are remains of mammoth (NISP = 179), horse (NISP = 88), wolf (NISP = 68), and reindeer (NISP = 54) (Tab. 1). Other taxa are less numerous, but we point out the presence of 22 bone specimens from cave lion.

The largest number of specimens belongs to woolly mammoth (*Mammuthus primigenius*) (NISP = 179). Such a high proportion of mammoth in the total number of animal remains is partly due to the relative ease of identifying the likeliest taxon for such large bones. Most of the mammoth NISP count (n = 89) derives from indeterminate bone fragments which were assigned to mammoth on the basis of their dimensions and thick cortical bone. Also discovered were 37 rib fragments and 35 long limb mammoth bone fragments (Tab. 2). Despite the large number of calculated mammoth specimens, there are only 13 skeletal elements represented, including teeth and bones (Tab. 2). The mammoth remains belonged to a minimum of two individuals, an adult (represented by one femur and tibia, and a juvenile, represented by two second milk molars (m2).

Table 3. Skeletal element representation of horse (*Equus ferus*), expressed as NISP and MNE at Pavlov II site.

Skeletal parts	NISP				MNE			
	dex	sin	indet.	Total	dex	sin	indet.	Total
Maxilla								
Cranium				2				
Isolated upper teeth	13	12	1	26	13	12	1	
Mandible	3	1	1	5	3	1		4
Isolated lower teeth	2	4	8	14	1	4	8	
Tooth fragments			7	7			6	
Sternum								
Atlas								
Axis								
Vertebrae			1	1				
Ribs								
Scapula	1			1	1			1
Humerus								
Radius	1	1	1	3	1	1		2
Ulna	1	1		2	1	1		2
Carpals								
Metacarpals								
Innominate		3	1	4		3		3
Femur	1	1	2	4	1	1		1
Patella								
Tibia		2		2		2		2
Fibula								
Calcaneus	1			1	1			1
Astragalus	1	1		2	1	1		2
Tarsals	4	1		5	2	1		3
Metatarsals			1	1				
Metapodial			4	4			2	2
Phalanx			3	3			3	3
Sesamoid			1	1				
Total NISP/MNE				88				67

In the material bones are present from both the axial skeleton (ribs, vertebrae) and the appendicular skeleton (limbs).

The next most frequently represented taxon in the osteological material from Pavlov II is horse (*Equus ferus*); the horse remains belong to a minimum of three individuals, including two adults and one young individual about 6 months old which had erupted but unworn molars. The most numerous horse elements are complete teeth and teeth fragments (NISP = 47; Tab. 3). Well represented are also long bone fragments, including femur (NISP = 4) and radius (NISP = 3). Fragments of innominate are also relatively abundant (NISP = 4) as well as foot bones (tarsals, phalanges, sesamoids) (Tab. 3).

Remains of wolf (*Canis lupus*) (NISP = 69) are the most numerous carnivore finds in the assemblage (Tab. 1). A minimum of three adults were found at the site. One of them is an old individual. The state of wear of this individual's upper carnassial indicates that it was killed at about 12 years of age (Text-fig. 2a1–a2). Because presence only

postcranial elements other two wolf individuals not allow precisely determine they age. All parts of the body were found from this taxon, including skull (NISP = 16), axial elements (vertebra; NISP = 18), and limb bones representing mainly distal parts of the limbs: tarsals, metapodials, and phalanges (NISP = 26). Long limb bones are less numerous (Tab. 4). The frequency of wolf remains suggests that whole carcasses were transported to the site and left there.

Reindeer (*Rangifer tarandus*) remains (NISP = 54) are well represented in this assemblage and belong to a minimum of three adult individuals (Tab. 1). The most abundant specimens are long bone fragments (e.g., from humerus, femur or metacarpal) and fragments of vertebrae (Tab. 5). Also numerous are phalanges (NISP = 17). We point out the absence of identifiable head elements such as mandibles, and fragments or isolated teeth (Tab. 5). Only three antler fragments were identified. Because the antler specimens are small (one is 40 cm long, the other two less than 6 cm) and the burrs are not present, we cannot determine if they were shed antlers or not.

Table 4. Skeletal element representation of wolf (*Canis lupus*), expressed as NISP and MNE at Pavlov II site.

Skeletal parts	NISP				MNE			
	dex	sin	indet.	Total	dex	sin	indet.	Total
Maxilla	4	4		8	3	2		
Cranium	1		3	4	1			1
Isolated upper teeth		2		2		2		2
Mandible	3	1		4	2	1		3
Isolated lower teeth								
Tooth								
Sternum								
Atlas			5	5			3	3
Axis			3	3			3	3
Vertebrae			10	10			9	9
Ribs								
Scapula								
Humerus		1		1		1		1
Radius			1	1			1	1
Ulna		3		3		3		3
Carpals								
Metacarpals								
Innominate								
Femur								
Patella								
Tibia	1			1	1			1
Fibula								
Calcaneus								
Astragalus								
Tarsals	1			1				
Metatarsals	4			4				
Metapodial			1	1				
Phalanx			20	20			19	19
Sesamoid								
Total NISP/MNE				68				46

Remains of hare (*Lepus* sp.) (NISP = 42) belong to a minimum of four individuals (Tab. 1). All parts of the hare skeleton are present – skull, axial elements, and limb bones (Tab. 6).

Wolverine (*Gulo gulo*) remains (NISP = 24) belong to a minimum of three individuals. Skull fragments are well represented. Also identified are jaws (NISP = 4) and mandible fragments (NISP = 5). Long limbs are not numerous; only two humerus fragments, one ulna fragment, and one femur fragment were found. Five metacarpal bones and one phalanx were also in the assemblage. A complete set of left metacarpals (from I to V) in the material may have come from one individual. During the excavations, two atlas vertebrae (one complete and one fragment) and a fragment of a thoracic vertebra were also collected.

Cave lion (*Panthera spelaea*) is represented mainly by distal parts of the limbs, with numerous phalanges (NISP = 10). There are also tarsals (calcaneus, cuboideum, cuneiforme, naviculare) and metatarsal bones (II, III and V

metatarsal) (Text-fig. 2b1–b2). All these elements are from the right side, so we assume that a mostly complete right foot of a cave lion was deposited. We note the lack of skull and long bones.

Only one tooth (a premolar), a humerus, and an ulna of Arctic/red fox (*Vulpes lagopus/vulpes*) were collected during the excavations at Pavlov II. The scarcity of fox remains is not a result of excavation technique because a large number of small bones from other taxa were found, such as astragalus, calcaneus, and metatarsals from hare.

An important addition that we can add to the faunal list published in Klíma's monograph (1976) is a third right metatarsal bone from brown bear (*Ursus arctos*) (Text-fig. 2c1–c2), a taxon not mentioned in the earlier publication.

Signs of human activity

Only one bone in the Pavlov II osteological materials has a sign of human activity. A cut mark is located near the distal articulation end of a reindeer 2nd phalanx (Text-fig.

Table 5. Skeletal element representation of reindeer (*Rangifer tarandus*), expressed as NISP and MNE at Pavlov II site.

Skeletal parts	NISP				MNE			
	dex	sin	indet.	Total	dex	sin	indet.	Total
Maxilla								
Cranium								
Antler			3	3			1	1
Isolated upper teeth								
Mandible								
Isolated lower teeth								
Tooth								
Sternum								
Atlas								
Axis			1	1			1	1
Vertebrae			6	6			5	5
Ribs								
Scapula	1	1		2	1	1		2
Humerus	2	3		5	2	3		5
Radius								
Ulna		1	1	2		1		1
Carpals								
Metacarpals	1	1	1	3	1	1		2
Innominate		1		1		1		1
Femur	1	1	1	3	1	1		2
Patella	1			1	1			1
Tibia		2		2		2		2
Fibula								
Calcaneus		1		1		1		1
Astragalus								
Tarsals								
Metatarsals	1		1	2				
Metapodial			3	3				
Phalanx			17	17			16	16
Reduced phalanx			2	2			2	2
Sesamoid								
Total NISP/MNE				54				42

2d). According to Binford (1981), this kind of mark would have been created during the skinning of a reindeer carcass.

Among the numerous mammoth bone fragments are two parts of long bones with percussion marks and a single bone flake. These were the results of intentional actions taken by people to split bones open for marrow extraction or bone tool preparation. Other signs of human activity were not found in the osteological materials from Pavlov II.

Discussion and conclusion

Although the bone assemblage discovered at Pavlov II site is not large, comprising only 968 bones and teeth, it offers a useful set of clues about subsistence strategies in Upper Palaeolithic hunter-gatherer societies. Mammalian remains discovered at this locality are clearly similar to the discoveries

at other Pavlovian sites such as Pavlov I, Dolní Věstonice I and II, Jarošov II, Boršice or Krems-Wachtberg (Fladerer 2001, Musil 2005, Škrdla et al. 2008, Wojtal et al. 2011, 2012, 2015, in press, Wojtal and Wilczyński 2015, Wilczyński et al. 2015). Also the presence of single bone tools and ornaments, accompanied by Tertiary marine shells, corresponds to finds made at other Pavlovian sites – both in terms of their quantity and type. At these localities mammoth, reindeer, and horse were the main sources of protein, and among the bird bones ravens and ptarmigan are dominant (Bocheński et al. 2009, Wojtal et al. 2012, Wilczyński et al. 2015, Wertz et al. 2015, 2016). Even though the Pavlov II faunal composition is similar to what is known from other Pavlovian sites, the quantity of discovered remains is much lower. This is most likely a result of the recovered part of the original site being only the periphery/margin of a once larger site, where the density of animal remains would have been expectably lower

Table 6. Skeletal element representation of hare (*Lepus* sp.), expressed as NISP and MNE at Pavlov II site.

Skeletal parts	NISP				MNE			
	dex	sin	indet.	Total	dex	sin	indet.	Total
Maxilla			1	1				
Cranium								
Isolated upper teeth								
Mandible	3	4		7	3	4		7
Isolated lower teeth								
Tooth								
Sternum								
Atlas								
Axis								
Vertebrae			4	4			4	4
Ribs								
Scapula	1			1	1			1
Humerus	3	1		4	3	1		4
Radius		2		2		2		2
Ulna	1	4		5	1	4		5
Carpals								
Metacarpals								
Innominate	2	4		6	2	6		6
Femur		1		1		1		1
Patella								
Tibia	2			2	2			2
Fibula								
Calcaneus	3	1		4	3	1		4
Astragalus	1			1	1			1
Tarsals								
Metatarsals	4			4	4			4
Metapodial								
Phalanx								
Sesamoid								
Total NISP/MNE				42				41

than in the more central part of the site. This possibility is supported by the spatial distribution of lithic finds and faunal remains (Klíma 1976), and the very rare signs of human activity visible on bones from this assemblage (only one cut mark).

All Pavlovian localities yielded a diversified taxonomic representation of animals, with a significant percentage of carnivores (Fladerer 2001, Musil 2005, Wojtal et al. 2011, 2012, 2015, in press, Wojtal and Wilczyński 2015, Wilczyński et al. 2015). Pavlov II also has a high proportion of carnivores. Wolf and cave lion remains are the most numerous, with a lower proportion of wolverine and isolated finds of bear and foxes. In contrast to other Pavlovian sites, we see a significantly lower number of fox remains (Wojtal et al. 2012, Wilczyński et al. 2015). This difference cannot be explained by the excavation methods used, and may therefore indicate human avoidance of fox or lack of interest in it. One explanation may be the season when this site was occupied (e.g., spring/summer), and if fox fur

was less attractive to the hunters at this time. However a clearer explanation of this situation will only be possible after detailed laboratory analysis. A similar low number of foxes were recorded at Boršice site where seasonality of human occupation was determined to have been from May to October (Škrdla et al. 2008).

The bone assemblage from Pavlov II contains a large amount of very fragmented mammoth bones, the majority being ribs fragments and single pieces of long limb bones (especially femur fragments). The MNE for mammoth bones is only 13. When considering teeth, only two milk molars and a tusk fragment were discovered. This, together with the percussion marks on mammoth bones, may suggest that the mammoth remains were transported to this site from elsewhere, possibly for consumption purposes. Nevertheless, we do not exclude the possibility that mammoths were killed at the site, which ideally would be supported by the presence of more numerous cranial elements and vertebrae or small bones such as metapodials or phalanges.



Text-fig. 2. Pavlov II site – selected mammals remains. **a.** Wolf (*Canis lupus*) – right maxilla, 12 year old individual with heavily worn teeth (P⁴ – M²), 1 – buccal view, 2 – occlusal view; **b.** Cave lion (*Panthera spelaea*) – right 2nd, 3rd, 5th metatarsal, 1 – palmar view, 2 – external view; **c.** Brown bear (*Ursus arctos*) – right 3rd metatarsal, 1 – palmar view, 2 – external view; **d.** Reindeer (*Rangifer tarandus*) – cut mark located near the distal articulation end of a 2nd phalanx.

The reindeer remains in this site are lacking the body parts found in other Central European open air sites which contain abundant reindeer remains (e.g., Moravany Lopata, Trencianskie Bohuslavice, Grubgraben, Sagvar). At Pavlov II, there are no cranial elements (in particular teeth), and there are only three relatively small antler fragments. A greater diversity of reindeer skeletal elements was found at the other sites, including numerous teeth and fragments of crania and mandible which sometimes dominate over all the other elements (Vörös 1982, Logan 1990, Lipecki and Wojtal 1998, Vlačičky 2012). A somewhat similar situation to that in Pavlov II is observable at the Late Gravettian site Jaksice II (Poland), where cranial elements of reindeer are also missing. However, Jaksice differs in other ways from the Moravian sites in having very low counts of distal parts of limbs, vertebrae, and ribs. The composition of skeletal parts at Jaksice could be explained by transport of only selected parts of animal carcasses from a long distance (Wilczyński 2015). But the

lack of cranial elements in the assemblage from Pavlov II may be the result of either the transport of selected reindeer body parts to the site from elsewhere, or, conversely, the removal of skulls and antlers from the site to another locality.

Despite the small size of the Pavlov II bone assemblage, it does provide the possibility to reconstruct hunter-gatherer behaviour during an early stage of Gravettian culture. This study confirms the importance of different Pleistocene mammals in the everyday life of Gravettian people, who relied on herbivores such as mammoths, reindeer, horses, and hares, as well as carnivores, such as wolves, wolverines, bears and cave lions.

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