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# A Late Pleistocene wolverine *Gulo gulo* (LINNÉ, 1758) skeleton from the Sloup Cave in the Moravian Karst, Czech Republic

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(With 5 figures and 1 table)

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## Abstract

A senile male wolverine skeleton *Gulo gulo* (LINNÉ, 1758) from the historical excavations of WANKEL from the Sloup Cave, Moravian Karst, Czech Republic is described. This is the only wolverine record in the Sloup cave, a famous cave bear den, but also a hyena den site. A brief overview of all recently known Late Pleistocene cave and open air wolverine sites in the Czech Republic is given. The skeleton from Sloup, and from all other caves, was found in bone accumulations with non-cave bear fauna mainly as the result of hyena activity. The absence of juvenile wolverine material in the caves proves these extinct carnivores were imported by hyenas as prey or carcasses. Wolverines did not use caves for protection or raising cubs in the Late Pleistocene, nor do they today.

**Keywords:** *Gulo gulo* (LINNÉ, 1758), male skeleton, Sloup Cave, palaeobiogeography, Czech Republic, taphonomy, palaeoecology, Late Pleistocene.

## Introduction

Wolverine skeleton remains are quite rare in Europe and were found in the Upper Pleistocene mostly along with isolated bone remains in caves (e.g. REYNOLDS 1912; PACHER & DÖPPES 1997; DÖPPES 2001; DIEDRICH & DÖPPES 2004). Wolverines were first described in the Czech Republic from the open air loess site Prague-Podbaba (KAFKA 1903). This material, skeleton remains, was recently re-described in the context of a hyena bone accumulation site (DIEDRICH 2008a). Wolverines were listed from Moravian Caves first by WANKEL (1868), and later by MUSIL (1956). At archaeological Czech sites, *G. gulo* was mentioned by MUSIL (1958) in Dolní Vestonice. Recent descriptions about wolverines in the Bohemian Karst began with material from the hyena den cave Srbsko Chlum-Komin (DIEDRICH 2008b). An overview of wolverine remains was mentioned in the statistics of hyena den bone accumulations for the caves at Srbsko-Chlum Komin and Chlupacova Sluj (DIEDRICH & ŽÁK 2006).

The here-studied material from Sloup was described briefly by WANKEL (1858, 1868), who figured only the skull and baculum. This *Gulo gulo* material was mentioned by MUSIL (1956) and was listed by DÖPPES (2001). Here for the first time all material

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Fig. 1: Wolverine sites in the Czech Republic. *Gulo gulo* (LINNÉ, 1758) was found at several hyena den sites, mainly in caves. Only in Prague Podbaba, an open air loess site, which was most likely a hyena den prey storage site along the river, additional skeleton remains were found outside the caves (after MUSIL 1956, 1958; DÖPPES 2001; DIEDRICH 2008 a, b).

housed in the Natural History Museum Vienna (= NHMV) is described in detail and figured with all bones, which were also newly inventoried (Tab. 1). A missing metapod (cf. DÖPPES 2001) was recently rediscovered through collections management.

## Material

The Sloup Cave megafauna was confirmed in the WANKEL collections material, which was received in 1885 as one of the first palaeontological collections of the Natural History Museum Vienna. The following Late Pleistocene animals can be newly identified: *Ursus spelaeus*, *Crocota crocota spelaea*, *Panthera leo spelaea*, *Gulo gulo*, *Canis lupus*, *Mammuthus primigenius*, *Coelodonta antiquitatis*, *Bison priscus*, *Bos primigenius*, *Equus ferus* cf. *przewalski*, *Megaloceros giganteus*, *Rangifer tarandus*, *Capra ibex* and possibly *Saiga tartarica*.

WANKEL's large bone collection mostly consisted of several hundred cave bear bones. This was historically excavated from the cave at different places which he marked on his cave map (cf. MUSIL 2002). There were only about 139 non-cave bear bones and 23 hyena coprolites. This collection from the Sloup Cave was donated by the Anthropologische Gesellschaft and bookmarked in the Museum's catalogue in 1885. The historical paper labels with a red frame and up to three digit numbers are important for the identification of bones, which are from the Sloup Cave but mixed-up with material from the

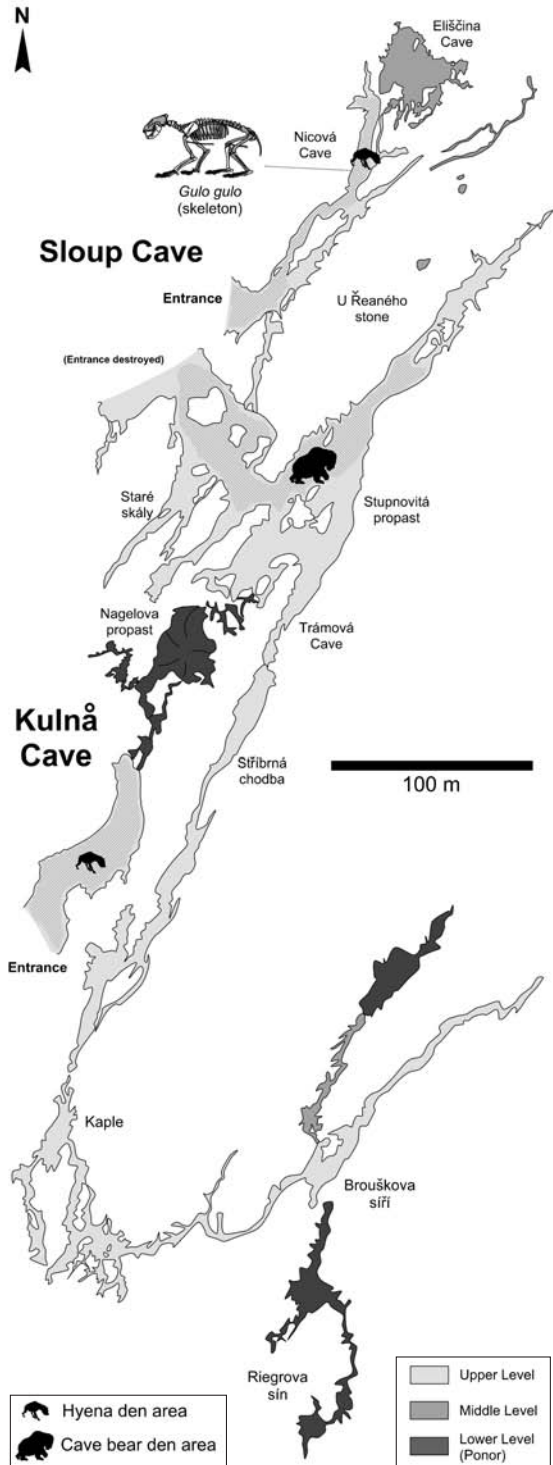


Fig. 2: Cave map of the Sloup Cave and area where the wolverine material was most likely historically found (map re-drawn after ZAJÍČEK et al. 2007).

Výpustek Cave (Moravia, Czech Republic). These labels are attached to the here-described bones of the wolverine as well.

Family Mustelidae SWAINSON, 1835

Genus *Gulo* PALLAS, 1780

*Gulo gulo* (LINNÉ, 1758)

**Material:** The material with new collection numbers (No. 2008z0088/0001-0015) is listed in Tab. 1 and comprises a skull, right and left humerus, right ulna and radius, right metacarpus IV, both femora, the left tibia and the baculum. All bone sutures are fully fused. Only the main measurements are given here in Tab. 1 for gender identification.

The skull is incomplete and missing the left jugal and parts of the frontals (Fig. 4). This was filled in with plaster. All right I to C are missing. The left I1-2 is absent. The alveols of all I1-2 seem to be closed which indicates a loss of teeth while the animal was still alive. The left I3 is broken off but the root is polished. The right P4 is partly broken off, but also during the animal's lifetime. The left P1 is missing and the P2 is incomplete. The total skull length measures 17.4 cm, the maxillary width is 5.8 cm. Both fore limb humeri are present (Figs. 5.1-2) which are each 14.5 cm in total length and in distal width, 4.1 cm. Their proportions are similar, proving they came from one individual. The right ulna (Fig. 5.3) and radius (Fig. 5.4) are both more or less complete. One right metacarpus IV with a length of 7.5 cm (Fig. 5.5) is preserved. The axial skeleton is

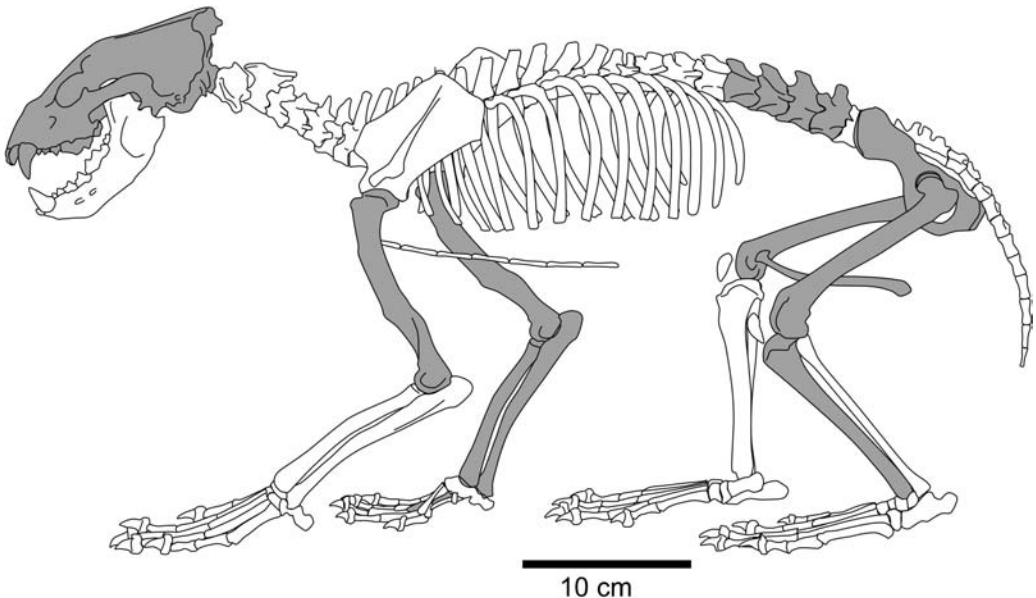


Fig. 3: Present bones (grey) from a male *Gulo gulo* individual from the Sloup Cave, Moravia, Czech Republic.

Tab. 1: *Gulo gulo* bones all from one senile male individual from the Sloup Cave, Moravia, Czech Republic (No. 2008z0088/0001-0015).

No.	Inv.-No.	Bone type	Commentary	left	right	Individual Age	Sex	Bite marks	Original	Old collection	Collection
1	0001	Cranium	Nearly complete, without right C1/2, left I1/2 Total length 17.4 cm, Maxillary width 5.8 cm			Senile	Male		x	Wankel 1885	Natural History Museum Vienna
2	0002	Humerus	Complete, Length 14.5 cm Distal width 4.1 cm		x	Senile	Male		x	Wankel 1885	Natural History Museum Vienna
3	0003	Humerus	Complete, Length 14.5 cm Distal width 4.1 cm	x		Senile	Male		x	Wankel 1885	Natural History Museum Vienna
4	0004	Ulna	Complete, Length 14.6 cm		x	Senile	Male		x	Wankel 1885	Natural History Museum Vienna
5	0005	Radius	Complete, Length 12.1 cm		x	Senile	Male		x	Wankel 1885	Natural History Museum Vienna
6	0006	Metacarpus	Mc IV, Length 7.5 cm		x	Senile	Male		x	Wankel 1885	Natural History Museum Vienna
7	0007	Lumbar vertebra	L2			Senile	Male		x	Wankel 1885	Natural History Museum Vienna
8	0008	Lumbar vertebra	L3			Senile	Male		x	Wankel 1885	Natural History Museum Vienna
9	0009	Lumbar vertebra	L4			Senile	Male		x	Wankel 1885	Natural History Museum Vienna
10	0010	Lumbar vertebra	L5			Senile	Male		x	Wankel 1885	Natural History Museum Vienna
11	0011	Pelvis	Half	x		Senile	Male		x	Wankel 1885	Natural History Museum Vienna
12	0012	Femur	Complete, Length 15.3 cm		x	Senile	Male		x	Wankel 1885	Natural History Museum Vienna
13	0013	Femur	Complete, Length 15.3 cm	x		Senile	Male		x	Wankel 1885	Natural History Museum Vienna
14	0014	Tibia	Nearly complete, Length 14.7 cm	x		Senile	Male	x	x	Wankel 1885	Natural History Museum Vienna
15	0015	Baculum	Complete			Senile	Male		x	Wankel 1885	Natural History Museum Vienna

represented by four lumbar vertebrae, most probably the L2-5 (Fig. 6). The left pelvic bone (Fig. 5.7) is lacking parts of the ischium. The hind limb bones are represented with both quite massive femora (Fig. 5.8-9). Again they are similar in their proportions with a length of 15.3 cm each, proving again, one individual. Only the left tibia (Fig. 5.10) was found within the material. On the proximal joint, groove-like damage is present, which resulted from other carnivore activities. Finally the baculum is complete (Fig. 5.11).

### Discussion

All large long bone sizes, when compared to the data of fossil and modern wolverines from DÖPPES (2001, 2005) indicate a male, whose bones are up to 14 % larger than female ones. The best proof of a male wolverine is the presence of the baculum. The bones from the Sloup Cave match one skeleton individual whose large and similar long bone proportions correspond to other described material (cf. DÖPPES 2001, DIEDRICH & DÖPPES 2004). The high degree of the skull suture fusion, loss of teeth and overgrown alveoli prove a senile individual age. Also, all fused bone sutures, including the vertebra discs, match only one adult animal. Finally, all similar coloured and preserved bones were found in one small area of the cave, the “Nicová Cave” part, where the hyena remains and its prey and coprolites were also found (cf. WANKEL 1858, 1868), which indicates an area of hyena den use. One wolverine bear seems to be represented only from the Sloup Cave, which has already been proposed by WANKEL (1868). It was most likely imported as a complete carcass or prey by the Ice Age spotted hyenas. The incomplete skull might have been the result of hyena or carnivore activity. There is a bite impression on the tibia bone, but the skull is refilled with plaster and the other mark is difficult to singularly prove hyena origin. The cave was clearly used as a hyena den. This is proved by many hyena bone remains, including skulls, juvenile material and even several coprolites; most material is in the collections of the Natural History Museum Vienna. A similar situation was observed in the taphonomical record at the Czech Srbsko Chlum-Komin Cave, also at the German Rösenbecker cave (DIEDRICH 2008a) and the Perick Caves (DIEDRICH & DÖPPES 2004; DIEDRICH 2008a). At the Perick Caves, only adult to senile wolverine remains were found in hyena den caves in which many prey bone remains were found. From the South German Beilstein Cave only several juvenile wolverine remains were described (DÖPPES 2001).

At all sites, the wolverines make up less than 0.1-0.2 % of the hyena prey fauna remains. The almost complete absence of juvenile *G. gulo* remains indicates that caves generally were not used to raise cubs. Like modern wolverines, the Pleistocene ones must have used snow burrow dens. This has been observed in Norway and North America (e.g. KROTT 2002). The same cave non-use has been observed for lions and lion skeletons in caves like the Srbsko Chlum Komin Cave (DIEDRICH & ŽÁK 2006). Wolverines were most likely killed because they were hyena antagonists and their carcasses seem to have been imported into the caves; but, in some cases, they were not scavenged further by the hyenas. This has been proved also for Late Pleistocene lion remains from different European caves (DIEDRICH 2007). In some cases the cracking of the lower jaws indicate such scavenging (cf. DIEDRICH 2008a). Carnivores were the last prey to be eaten and scavenged, the same as modern African hyenas who come into contact with



them only in special situations or in the absence of their main prey (cf. KRUK 1972; ESTES 1999).

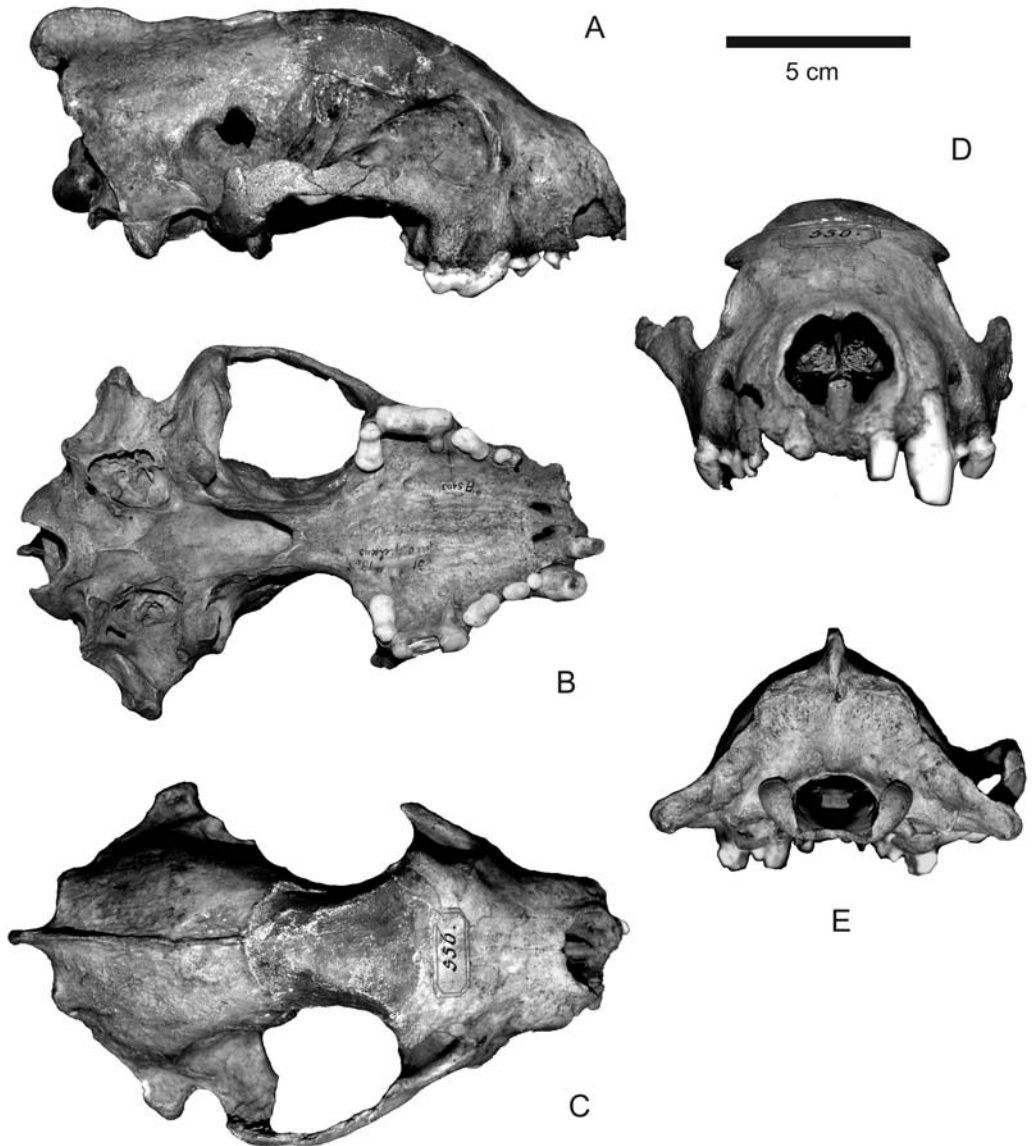


Fig. 4: Skull of the *Gulo gulo* (LINNÉ, 1758) male skeleton remains from the Sloup Cave, Moravia, Czech Republic. 1. Cranium. (No. 2008z0088/0001), A. lateral right, B. ventral, C. dorsal, D. frontal, E. occipital.

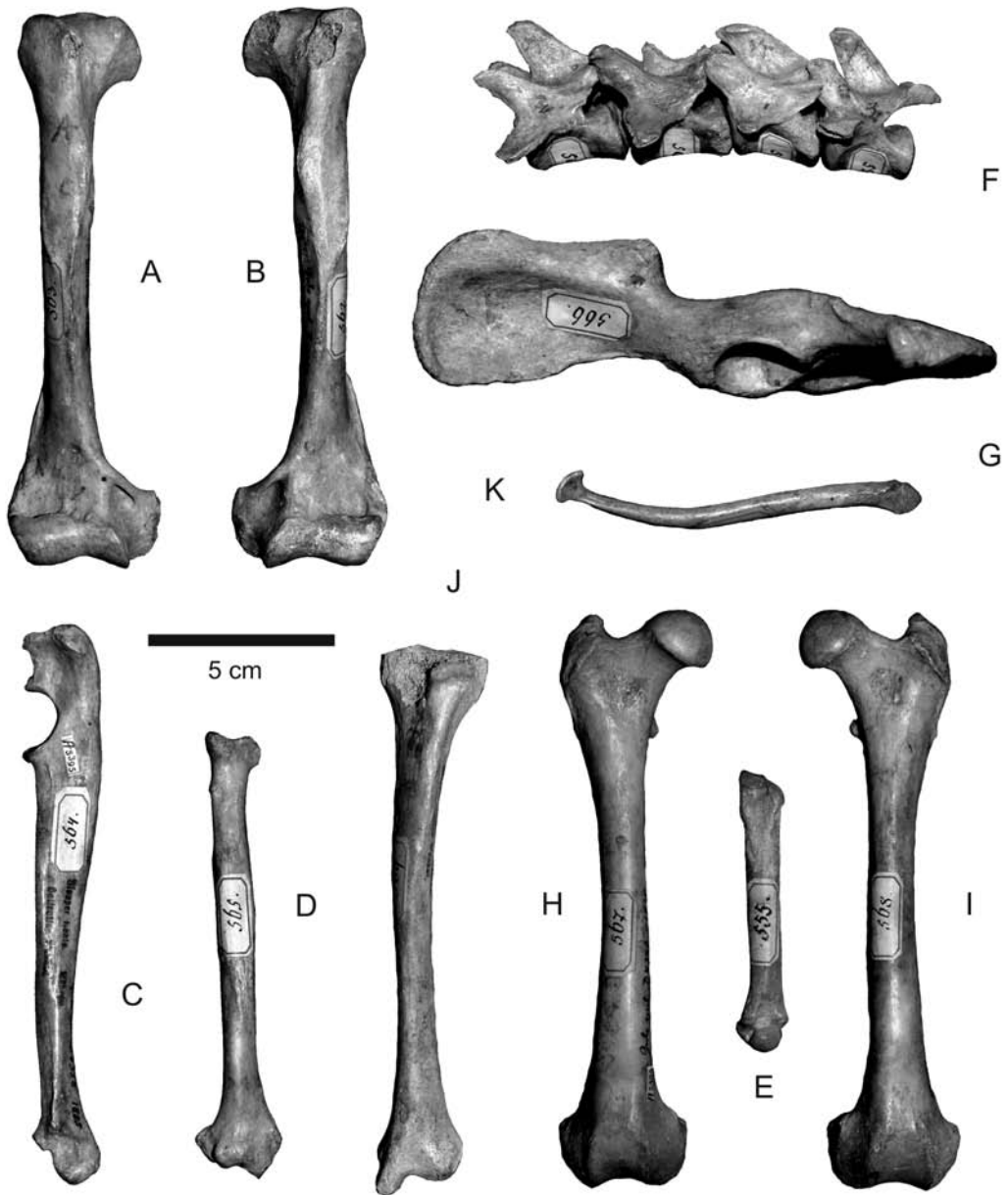


Fig. 5: Postcranial bones of the *Gulo gulo* (LINNÉ, 1758) male skeleton remains from the Sloup Cave, Moravia, Czech Republic. A. Right humerus (No. 2008z0088/0002), cranial. B. Left humerus (No. 2008z0088/0003), cranial. C. Right ulna (No. 2008z0088/0004), lateral. D. Right radius (No. 2008z0088/0005), lateral. E. Right Mc IV (No. 2008z0088/0006), cranial. F. Articulated middle lumbar vertebrae (No. 2008z0088/0007-0010), lateral. G. Left pelvic remain (No. 2008z0088/0011), lateral. H. Right femur (No. 2008z0088/0012), cranial. I. Left femur (No. 2008z0088/0013), cranial. J. Left tibia (No. 2008z0088/0014), cranial. K. Baculum (No. 2008z0088/0015), lateral.



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