

Geographical Distribution of Cave Bears (*Ursus spelaeus* ROSENMÜLLER et HEINROTH, 1794) in the Territory of Slovakia

by

Martin SABOL^{*)}

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Zusammenfassung

Überreste des Höhlenbären sind die häufigsten Fossilien im Gebiet der Slowakei. Ihre Reste wurden in mehr als 60 Höhlen gefunden und stammen aus der Zeit vom Eem-Interglazial bis zum letzten Glazial. Die vorliegende Arbeit bietet aktualisierte Informationen über die geographische Verteilung der Höhlenbären im Staatsgebiet der Slowakei.

Summary

Fossils of cave bears (*Ursus spelaeus*) are the most frequent of ursid findings in the territory of Slovakia. So far, their fossils have been found in sediments of more than 60 Slovak caves. They are dated from the Eem Interglacial to the Last Glacial. The article provides updated data on the geographical distribution of cave bears in the territory of Slovakia.

Key words: cave bears, geographical distribution, Late Pleistocene, Slovakia

1. Introduction

Fossil findings of ursids are relatively frequently found in the territory of Slovakia. Many of them serve as good indicators not only for a basic reconstruction of paleoenvironment, but also for the definition of individual time horizons of the higher order and macrobiozonation. So far, approximately 17 fossil and subfossil ursid taxa have been described from sediments of Slovak sites, which are dated from the Late Badenian until the Early Holocene. They are: *Hemicyon sansaniensis* LARTET, 1851; *Hemicyon cf. sansaniensis* LARTET, 1851; *Hemicyon*

goeriachensis (TOULA, 1884), *Ursavus brevirohinus* (HOFMANN, 1887); *Ursus tibetanus mediterraneus* (FORSYTH MAJOR, 1872); *Ursus tibetanus cf. mediterraneus* (FORSYTH MAJOR, 1872); *Ursus deningeri* REICHENAU, 1904; *Ursus cf. deningeri* REICHENAU, 1904; *Ursus spelaeus* ROSENMÜLLER et HEINROTH, 1794; *Ursus cf. spelaeus* ROSENMÜLLER et HEINROTH, 1794; *Ursus cf. taubachensis* (RODE, 1931); *Ursus arctos* ssp. LINNÉ, 1758; *Ursus arctos priscus* GOLDFUSS, 1822; *Ursus arctos cf. priscus* GOLDFUSS, 1822; *Ursus arctos arctos* LINNÉ, 1758; *Ursus* sp., and Ursidae gen. et spec. indet. (cf. *Ursus minimus* DEVÉZE et BOUILLET, 1827). The fossils of cave bears (*Ursus spelaeus*) are the most frequent of all. Their largest quantity has been found in the Last Glacial cave sediments.

2. Distribution of Cave Bears

Cave bears reached the largest geographical distribution from all ursids which lived in the territory of the Western Carpathians Mts. Hereby, this ursid species is the most frequently occurring in the Pleistocene of Slovakia (Fig. 1). Its fossils have been found in more than 60 Slovak caves dated from Middle to Late Pleistocene (Tab. 1). Most of these fossils come from cave sediments, whereas findings from karst fillings and sediments of non-karst origin are rare.

Cave bears have been probably present in the territory of Slovakia already by the start of the Last Interglacial or by the end of the Middle Pleistocene. They migrated here from the south or from the south-west. During this period, their geographical distribution in Slovakia was restricted more or less in the southern parts only. This is proven by findings of cave bears from basal deposits of the Jasov Cave (LOŽEK et al., 1957). The cave sediments are dated from the end of the Saal Glacial to the beginning of the Last Glacial. However, it is not excluded that this fossil bear species have been present in the territory of the Western Carpathians Mts. already during the final phase of the Middle Pleistocene. Some findings from lower layers of the Medvedia Cave in the Slovenský raj Mts., which are differing from those from the overlying sediments by the degree of the fossilisation (JANÁČIK & SCHMIDT, 1965;

^{*)} Dr. Martin SABOL, Department of the Geology and Paleontology, Faculty of Sciences, Comenius University, Mlynská dolina, SK–842 15 Bratislava, e-mail: sabol@nic.fns.uniba.sk

SCHMIDT, 1970), can serve as evidence of that. Because the detailed biostratigraphy of sediments in other areas of individual Slovak orographic units is meanwhile unknown, the isolated presence of cave bears in the southern parts of Slovakia already during the Saal Glacial is not excluded (SCHMIDT, 1970).

The species recorded its larger distribution during the Last Interglacial. Probably under the influence of warmer climate, cave bears also expanded to the western parts of Slovakia in this period (Pajštún - Trojuholník ?, Čertova pec Cave (MUSIL, 1996)).

In the time of the Last Glacial, cave bears probably migrated to the territory of the Western Carpathians Mts. from the west (from the territory of Moravia) too. However, the northern boundary of their geographical distribution was probably shifted south during the colder periods of this Pleistocene final phase (especially during the colder events of the stadial character) through the influence of strong periglacial conditions for life. In spite of that, cave bears reached the largest distribution in this time. It is supported by most of their fossils. They have been found in various cave sediments, which were deposited in the time of the Last Glacial. During the final phase of this glacial, cave bears began dying out in the Slovak territory. Hereby, this period of their extinction

was accompanied by the abatement their metrical and morphological characters, the presence of arctoid features on the tooth crowns, and the presence of pathological ones, which have been especially found in the osteological remains of young individuals (e. g. fossils from the Aksamitka Cave (MUSIL, 1953, 1956) and the Horná Tufna Cave). The first „symptoms” of this degeneration began to appear together with rapid decrease of the individual quantity in some cave bear paleopopulations already in the period after the Hengelo interstadial event. This process has been continued to the end of the Pleistocene (MUSIL, 1986).

Some reasons of cave bear extinction are known. However whole this process, when the individual quantity of single populations has been decreased only, but not the areas of their distribution, is still not reassuringly resolved. The last populations of cave bears in the Slovak territory of the Western Carpathians Mts. began gradually dying out in the period between 10 000 to 15 000 years BP (SCHMIDT, 1970). During this period, as atypical smaller individuals (e. g. findings from the Medvedia Cave under Sivý hill) so relatively large ones (e. g. findings from the upper layers of the Medvedia Cave in the Slovenský raj Mts.) are known. Skulls of some of these large individuals are longer than 50 cm! It is not out of question that this part

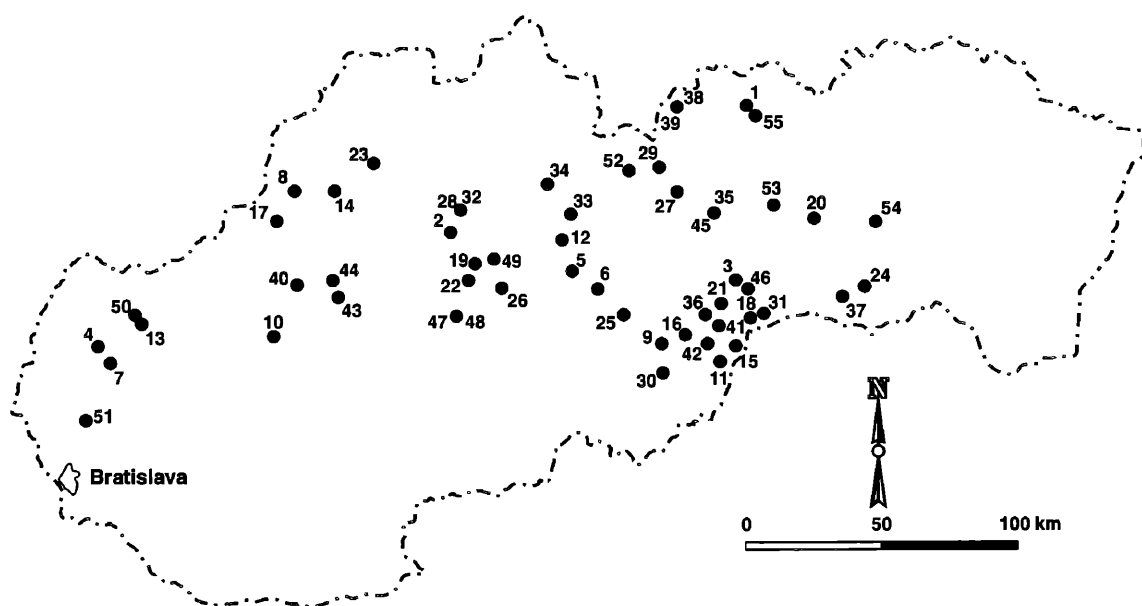


Figure 1: Findings of cave bears (*Ursus spelaeus*) in the territory of Slovakia. 1. Aksamitka, 2. Belianska Valley, 3. Bezmenná Cave in Malý hill, 4. Biela skala near Sološnica, 5. Bystriansky závrť, 6. Cave in Hrádok near Predajná, 7. Cave in Kozí chrbát hill, 8. Cave near Kvašov, 9. Chválovska Cave, 10. Čertova pec, 11. Činčiany Cave, 12. Demänová cave system (Beníková, Demänová Cave of Freedom, Demänová Ice Cave, Okno, Vyvieranie, Zbojnická Cave), 13. Deravá skala, 14. Dolný Moštenec, 15. Domic, 16. Dračia diera, 17. Dúpna, 18. Gombasek, 19. Harmanec Cave, 20. Homološova diera, 21. Honce near Rožňava, 22. Horná Tufna, 23. Jánošík Cave in the Súľovské skaly Mts., 24. Jasov Cave, 25. Klenovec, 26. Kupčovie izbička, 27. Líštie diery, 28. Lóm in the Gader Valley, 29. Lučivná, 30. Malá driencanská Cave, 31. Malá l'adnica, 32. Mažarná, 33. Medvedia Cave in the Jánska Valley, 34. Medvedia Cave in Sivý hill, 35. Medvedia Cave in the Slovenský raj Mts., 36. Mervová Cave in Plešivec, 37. Moldava Cave, 38. Muráň Cave, 39. Nový, 40. Omastiná, 41. Ostružia Cave in the Slovenský Karst Mts., 42. Peskö, 43. Predkovia Cave near Pružiná, 44. Prepoštská Cave, 45. Psie diery, 46. Pstružia Cave, 47. Rudlová, 48. Sásová, 49. Sokol, 50. Tmavá skala, 51. Trojuholník, 52. Važec Cave, 53. Vel'ká near Poráč, 54. Vel'ká ružínska Cave, 55. Zbojnická Cave near Haligovce.

Locality	Altitude	Chronostratigraphical Age
Aksamitka	756 m	Last Glacial
Belianska Valley	?	Late Pleistocene
Beníkova	908 m	Late Pleistocene
Bezmenná Cave in Malý hill	?	Late Pleistocene
Biela skala	ca. 550 m	Late Pleistocene
Bystriansky zvrst	676 m	Last Glacial
Cave in Hrádok near Predajná	ca. 480 m	Late Pleistocene
Cave in Kozí chrbát hill	ca. 550 m	Late Pleistocene
Cave near Kvašov	ca. 400 m	Late Pleistocene
Chválovska Cave	255 m	Late Pleistocene
Čertova pec	ca. 300 m	Late Pleistocene
Činčany Cave	215 m	(Saale) – Last Glacial
Dermánová Cave of Freedom	870 m	Late Pleistocene
Dermánová Ice Cave	840 m	Late Pleistocene
Deravá skala	460 m	Late Pleistocene (Last Glacial)
Dolný Moštenec	ca. 400 m	Late Pleistocene
Domica	339 m	Late Pleistocene
Dračia diera	ca. 550 m	Late Pleistocene
Dúrna	ca. 400 m	Late Pleistocene
Gombasek	ca. 250 m	Late Pleistocene
Harmanec Cave	821 m	Last Glacial
Homološova diera	776 m	Late Pleistocene
Honca	ca. 400 m	Late Pleistocene
Horná Túfna	975 m	Last Glacial
Jánošik Cave (Súl'ovské skaly Mts.)	590 m	Late Pleistocene
Jasov Cave	256 m	Middle ? – Late Pleistocene
Klenovec	ca. 500 m	Late Pleistocene
Kupčovie izbička	ca. 700 m	Last Glacial
Liščie diery	938 m	Last Glacial
Lom (Gader Valley)	887 m	Late Pleistocene
Lučivná	ca. 800 m	Late Pleistocene
Malá drienčanská Cave	ca. 250 m	Late Pleistocene
Malá ľadnica	460 m	Last Glacial
Mažarná	830 m	Late Pleistocene
Medvedia Cave (Jánska Valley)	878 m	Last Glacial
Medvedia Cave (Sivý hill)	1.133 m	Last Glacial
Medvedia Cave (Slovenský raj Mts.)	905 m	Last Glacial (M. ? – L. Pleistocene)
Mervová Cave in Plešivec	ca. 600 m	Late Pleistocene
Moldava Cave	ca. 250 m	Late Pleistocene
Muráň Cave	1.559 m	Last Glacial
Nový	?	Late Pleistocene
Okno	915 m	Last Glacial
Omastiná	ca. 300 m	Late Pleistocene
Ostružia Cave (Slovenský Karst Mts.)	?	Last Glacial
Peskö	ca. 200 m	Last Glacial
Predkovia Cave near Pružiná	590 m	Late Pleistocene
Prepoštská Cave	242 m	Last Glacial
Psie diery	991 m	Late Pleistocene (Last Glacial?)
Pstružia Cave	250 m	Last Glacial
Rudlová	ca. 600 m	Late Pleistocene
Sásová	ca. 600 m	Late Pleistocene
Sokol (abri)	ca. 1.000 m	Late Pleistocene (Last Glacial?)
Tmavá skala	500 m	Late Pleistocene
Trojuholník	356 m	Middle – Late Pleistocene ?
Vážec Cave	784 m	Late Pleistocene
Veľ'ka near Poráč	ca. 800 m	Late Pleistocene
Veľ'ka ružinska Cave	614 m	Late Pleistocene
Vyvieranie	791 m	Last Glacial
Zbojnická Cave (Dermánová Valley)	866 m	Late Pleistocene
Zbojnická Cave near Haligovce	780 m	Late Pleistocene

Table 1: Altitude and assumed chronostratigraphical age of sediments of the Slovak localities where fossils of cave bears have been found.

of Slovakia (Slovenský raj Mts. and Nízke Tatry Mts.) was one of the last refuges of relatively large cave bears in Central Europe in the changing environments during the period between the end of the Last Glacial and the beginning of the Holocene.

From the paleoecological point of view, the occurrence of *Ursus spelaeus* in the territory of Slovakia was mainly associated with areas where the most part consisted of coniferous and mixed forests in the near inaccessible rocky terrain of Mesozoic rocks with the quantity of dry refuges (such as caves) and the presence of water (SCHMIDT, 1970). Solitarily, some individuals have been also occurred in steppe or steppe-forest piedmont areas of depressions and basins (e. g. the Čertova pec Cave). It is only further evidence of the wide ecological valence of this eurythermic species with large geographical and individual variability. Whereas the upper occurrence limit of cave bears in the Alps area was moved until 3 000 metres above sea (MUSIL, pers. comm.), their upper occurrence limit in the territory of the Western Carpathians Mts. was only moved from 1.300 to 1.600 metres above sea in relation to the changing snow line (SCHMIDT, 1970) with average altitude of general occurrence approximately 620 metres above sea (Tab. 1).

From the paleobiogeographical point of view, the continuous distribution of cave bears in the Slovak territory of the Western Carpathians Mts. can be followed in the both western and central part of Slovakia only. The Malé Karpaty Mts. and the Biele Karpaty Mts. form the western boundary of the cave bear's distribution in the Slovak territory. Northwards, the Klippen belt and the Vysoké Tatry Mts. formed their northern boundary-line. The southern distribution boundary is formed by the

southern border of the Považský Inovec Mts., the Tribeč Mts., and the western, northern and eastern borders of the Central Slovak Neovolcanites. The western border of the Ondava Highlands and the Košice depression form the eastern boundary of the proven natural range of the Slovak cave bear paleopopulations. The geographical distribution of this species is hypothetically assumed in the territory of Eastern Slovakia (Ondava Highlands, East Slovak Neovolcanites), Central Slovak Neovolcanites (Kremnica Mts., Štiavnica Mts., Javorie hill, Krupina Highlands), the Javorníky Mts., and the Slovenské Beskydy Mts. (SCHMIDT, 1970) (Fig. 2). However, the presence of cave bears in these areas has not yet been proven. It can be caused by the absence of larger horizontal cave spaces here.

The areas of alpine glaciers formed enclaves in the continuous area of the cave bear occurrence in the Slovak territory of the Western Carpathians Mts. during the Middle and Late Pleistocene (Fig. 2). Difficult relief and hard climate conditions excluded the possibility of their presence in these regions (SCHMIDT, 1970).

3. Conclusions

Cave bears are the most frequently occurred of all fossil ursids in the territory of Slovakia. So far, their fossils have been found in sediments of more than 60 Slovak localities, especially caves. They have been dated from the Eem Interglacial to the Last Glacial Period. However, it is not excluded that cave bears have been present in the Slovak territory of the Western Carpathians Mts. already during the Saal Glacial. The main occurrence of cave bears was

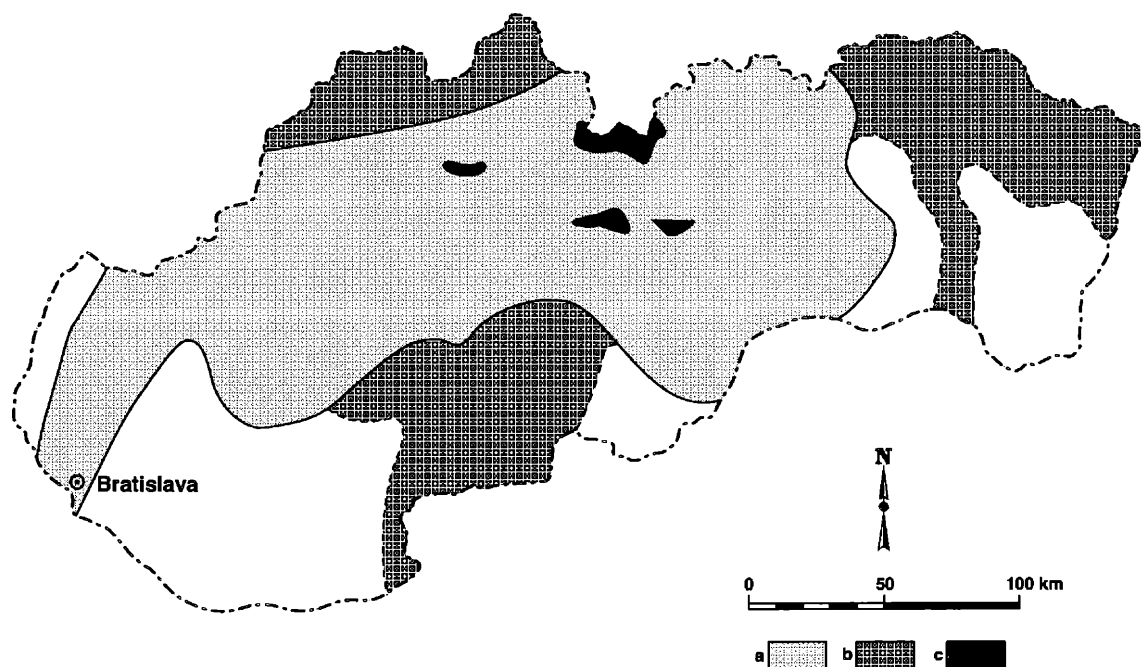


Figure 2. Geographical distribution of cave bears (*Ursus spelaeus*) in the territory of Slovakia (modified after SCHMIDT, 1970). a – area of the verified geographical distribution of cave bears, b – area of the assumed geographical distribution of cave bears, c – area of alpine glaciers.

especially associated with the mountain areas of the both western and central part of Slovakia. Absence of the fossils of this ursid species in some other parts of the Slovak territory (eastern and north-western Slovakia, Central Slovak Neovolcanites) is probably caused by the absence of larger horizontal caves.

4. Acknowledgements

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