

Quaternary history of *Meles meles* in Bulgaria (Carnivora: Mustelidae)

Zlatozar BOEV

National Museum of Natural History, Bulgarian Academy of Sciences, 1, Blvd. Tsar Osvoboditel,
1000 Sofia, Bulgaria; boev@nmnhs.com; zlarozarboev@gmail.com

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Abstract. An analysis of the past geographical and altitudinal distribution of the European badger (*Meles meles*) remains in Bulgaria is given. The paper summarizes all scattered data gathered during the last 120 years on the distribution of the species. Data from 42 localities (Early Pleistocene – Subrecent) from 20 out of 28 provinces of the country are presented. The Quaternary fossil record proves a wide distribution of *M. meles* in the lowland and hilly landscapes of northern and south-eastern Bulgaria. The localities are spread at the range of 0–580 m a. s. l., although majority of them were located at the altitudes of 155–370 m a. s. l. Almost all data originate from the prehistoric cave dwellings of the Paleolithic man, and later prehistoric, antique, and medieval settlements. No differences were found in the distribution of the species in Bulgaria during the Pleistocene and Holocene.

Key words. Quaternary mammals, Mustelidae, Balkan, wildlife of Bulgaria, European mammals.

INTRODUCTION

The European badger, *Meles meles* (Linnaeus, 1758) is the second largest mustelid of the Palaearctic after the wolverine, *Gulo gulo* (Linnaeus, 1758). Its present range covers much of the western and central parts of Europe, east to the Volga river and the northern Caucasus, since recently the Caucasian badger (*Meles canescens* Blanford, 1875) has been recognised as a distinct species (LARIVIÈRE & JENNINGS 2023). In Bulgaria, *M. meles* is distributed throughout the country (POPOV & SEDEFČEV 2003), it is considered a typical representative of the forest mesophilic fauna, its population was estimated at about 30,000 individuals in 1986 (PEŠEV et al. 2004).

The wide distribution of the species is largely due to its wide food spectrum. The badger equally uses animal and plant (including mushrooms) food (EVSTIGNEEV & SOLONINA 2020), hibernates (partly) and arranges large reliable underground dens, in which it roosts and hides from adverse conditions outside. Usually, the badger leaves its den only to forage. In the wild of Europe, the badger has no enemies, except the grey wolf (*Canis lupus* Linnaeus, 1758) and man.

The Quaternary history of *Meles meles* was summarized by GROMOV & BARANOVA (1981), it was widespread from the Early Pleistocene to the Recent era, with the oldest record from western Europe, and from Late Pleistocene from south-western Europe and Crimea. Its presence has been proven in the forest, steppe, and desert zones of Europe, the northern limits of its distribution range reach the Arctic Circle. In northern parts of its range, the distribution overlaps with that of the wolverine. In the mountains in southern regions, it reaches up to 3000 m a. s. l.

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In eastern Europe (Russia), the badger has been present only during the Holocene (GROMOV & BARANOVA 1981).

MATERIAL AND METHODS

Table 1 presents the known fossil evidence of the badger bone remains, arranged in chronological order, additional data are provided (altitude, archaeological excavations, reference).

The chronostratigraphy follows COHEN et al. (2013): Gelasian (GE) 2.588–1.800 Ma (formerly covering parts of the Late Pliocene – Early Pleistocene); Calabrian (CA) 1.800–0.774 Ma (Early Pleistocene); Chibanian (CH) 0.770–0.129 Ma (Middle Pleistocene); Late Pleistocene (UP) 0.129–0.0117 Ma; Greenlandian (GR) 0.0117–0.0082 Ma (Early Holocene); Northgrippian (NO) 0.0082–0.0042 Ma (Middle Holocene); and Meghalayan (ME) 0.0042–0.0001 Ma (Late Holocene). In most cases, the altitude of the deposits is given as the altitude of the nearest settlement. Taxonomy follows LARIVIÈRE & JENNINGS (2023).

RESULTS AND DISCUSSION

The fossil record of the genus *Meles* Brisson, 1762 in Bulgaria includes three taxa: (1) *Meles* sp. from the Calabrian of the Kozarnika (Suhi Peč) cave (GUADELLI et al. 2005, SIRAKOV et al. 2013); (2) *Meles thoralis* Viret, 1951 from the Gelasian and Meghalayan in Slivnica (SPASSOV 1997) and Varšec (SPASSOV 2000), and (3) *Meles meles* from the Calabrian to the Recent (Table 1).

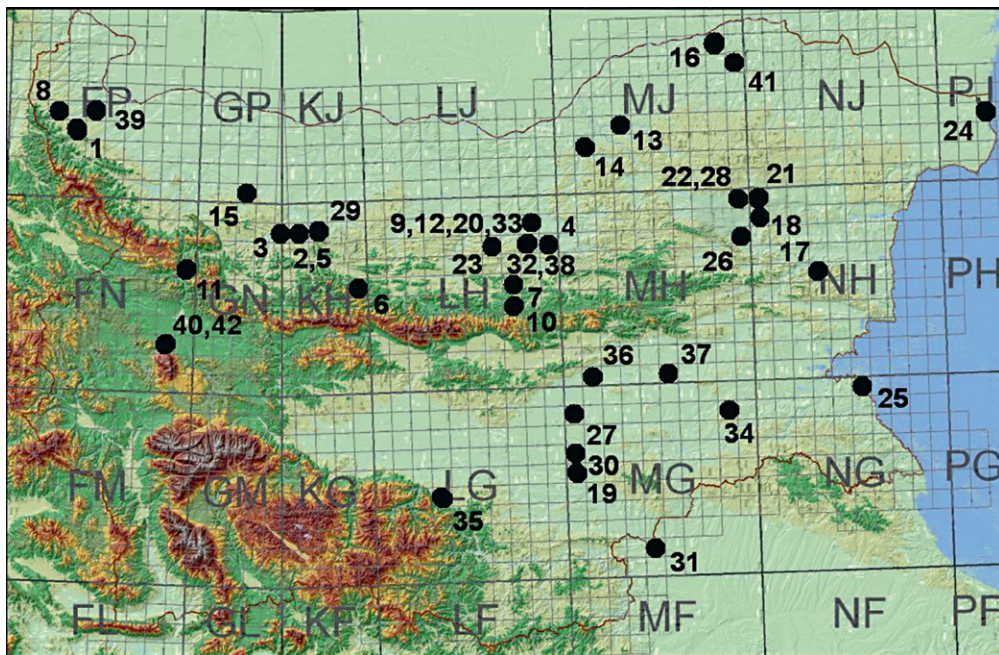


Fig. 1. Fossil and subfossil distribution of *Meles meles* in Bulgaria. Numbers correspond to the list of localities in Table 1.



Fig. 2. Some bone findings of *Meles meles* from archaeological sites in Bulgaria: a – mandibula sin. from Šipot; b – four humeri (left) and four femori (right) from Šipot; c – radius dex. from Serdica; d – ilium and ischium dex. from Serdica. Photos by Z. BOEV.

The past distribution of the badger has not yet been the subject of research in Bulgaria. The presented data are the first of their kind and provide the first information about its presence in the wild of the country in the past. The literature evidence shows that the first data on the past presence of *M. meles* in Bulgaria were published 120 years ago (STOĀNOV 1904). Since that time at least 42 sites of fossil/subfossil bone remains of this species have been uncovered in the country (Table 1, Fig. 1). All data (except for Širokovo and Pisanec) originate from the prehistoric cave dwellings of the Paleolithic man, and later prehistoric, antique (Fig. 2), and medieval settlements. All findings have been made occasionally and no special paleontological research has been undertaken.

Based on the documented localities, in the Quaternary the badger was distributed mainly in the north-eastern part of the country, while its presence was significantly less common in the predominantly mountainous south-western part of Bulgaria. The earliest known presence of the species in the territory of the country was recorded from the Late Pleistocene (MNQ 18–26 – end of Saalian, Eemian, and Weischelian) about 1,000,000–700,000 years BP.

The altitudinal distribution of the badger in Bulgaria was confined to the range of 0–555 m a. s. l. However, majority of the records are located at 155–370 m a. s. l., i.e. in lowlands and

Table 1. Localities of fossil and subfossil bone remains of the European Badger in Bulgaria. Numbers correspond to those in the map (Fig. 1), BP – before present, r/w – railway station

No., site	location (province)	altitude [m a. s. l.]	age [years BP]	excavations: years, leaders	reference
1 Kozarnika (Suhi Peč) Cave	Oršec r/w (Vidin)	481	Late Pleistocene, MNQ 18–26, end of Saalian, Eemian and Weischelian), 1,000,000–700,000	1996–2005, N. SIRAKOV, J.-L. GUADELLI	MARKOV 1951, NIKOLOV 1983, GUADELLI et al. 1999, 2005, FERNANDEZ 2009, SIRAKOV et al. 2016a
2 Cave 16	Karlukovo (Loveč)	250	Late Pleistocene, 50,000–20,000	1985, V. POPOV	PEŠEV et al. 2004
3 Samuilica-2 Cave	Kunino (Vraca)	ca. 360	Middle-Late Paleolithic, 90,000–42,000	1956–1959, N. DŽAMBAZOV	DJAMBAZOV 1981
4 Manastira Cave	Arbanasi (Veliko Tărnovo)	392	Middle-Early Late Paleolithic, >46,500	2012–2013, A. GUADELLI	GUADELLI et al. 2014
5 Temnata Dupka Cave	Karlukovo (Loveč)	250	Middle-Late Paleolithic	1938, R. POPOV; 1982, N. SIRAKOV	POPOV 1938, GUADELLI & DELPECHE 2000, BERON et al. 2006
6 Toplâ Cave	Golâma Želâzna (Loveč)	460	Late Pleistocene, Würm	1898–1900, M. KOIČEV, G. BONČEV, I. STOĀNOV 2015, N. SIRAKOV	STOĀNOV 1904, NIKOLOV 1983, BERON et al. 2006 SIRAKOV et al. 2016b
7 Bačo Kiro Cave	Drânovo (Gabrovo)	325	Late Paleolithic, 29,000		
8 Magurata Cave	Rabiša (Vidin)	230	Late Paleolithic	2010, S. IVANOVA	NIKOLOV 1983
9 Malkata Cave	Belâkovec (Veliko Tărnovo)	355	Early Paleolithic	1897–1909, R. POPOV	POPOV 1911, 1914, NIKOLOV 1983, BERON et al. 2006
10 Polički Cave	Drânovo (Gabrovo)	390	Paleolithic	1890, S. ŪRINIČ	POPOV 1911, 1936, 1937, POPOV & VAPCAROV 1972, BERON et al. 2006
11 Suhata Cave	Lakatnik r/w (Sofia)	580	end of Late Pleistocene – transition to Holocene	1948–1949, G. MARKOV	MARKOV 1951, NIKOLOV 1983, BERON et al. 2006
12 Popin Pčelin Cave	Belâkovec (Veliko Tărnovo)	370	Paleolithic, Neolithic	1906–1907, R. POPOV	POPOV 1925, BERON et al. 2006

No., site	location (province)	altitude [m a. s. l.]	age [years BP]	excavations: years, leaders	reference
13 Pisanec rock niche	Pisanec (Ruse)	135	Late Pleistocene – Early Holocene	1993–2002, I. MITEV	MITEV 2016
14 Širokovo niche	Širokovo (Ruse)	117	Early-Late Holocene	1993–2002, I. MITEV	MITEV 2006, 2016
15 Ohoden	Ohoden (Vraca)	210	Early Neolithic, 6,000	2002–2011, G. GANEVSKI	N. SPASSOV, unpubl. data
16 Malák Preslavec	Malak Preslavec (Silistra)	62	Early Neolithic, 8,000	1987–1989, I. PANAJOTOV	RIBAROV 1992, MITEV 2016
17 Golámo Delčevo	Golámo Delčevo (Varna)	185	Early Neolithic, 8,000	1931, D. ZLATARSKI; 1968, H. TODOROVA	IVANOV & VASILEV 1975
18 Ovčarovo	Ovčarovo (Targoviše)	295	Early Neolithic 7,500–7,200 Chalcolithic 6,400–6,000	1971–1973, H. TODOROVA; 1976, I. ANGELOVA	VASILEV 1985
19 Čavdarova Češma	Simeonovgrad (Haskovo)	80	Neolithic, 4,900–4,850	1960s, 2014–2015, J. BOÂDŽIEV	BOÂDŽIEV et al. 2016, KARASTOANOVA 2018
20 Carskata Cave	Belákovec (Veliko Tărnovo)	355	Neolithic	1900s, R. POPOV	POPOV 1921, 1925, NIKOLOV 1983
21 Madara	Madara (Šumen)	210	Neolithic	1924–1927, R. POPOV	POPOV 1924
22 Caves at Krumovi Porty	Šumen (Šumen)	502	Neolithic	1903, R. POPOV	POPOV 1908, NIKOLOV 1983
23 Emenska Cave	Emen (Veliko Tărnovo)	178	?Neolithic	1883 K. ŠKORPIL; 1924 V. MIKOV; 1948–1949, G. MARKOV; 1959, N. ANGELOV, A. NIKOLOVA	MARKOV 1951, NIKOLOV 1983, BERON et al. 2006
24 Durankulak	Durankulak (Dobrič)	26	Neolithic–Chalcolithic, 6,000–5,000	1973–1975, H. TODOROVA	MANHART 1998, NOBIS 2002a, b, NOBIS & NINOV 2002, SPASSOV & ILIEV 2002, MITEV 2016
25 Sozopol	Sozopol (Burgas)	0	Late Neolithic – Early Bronze Age, 4,000–2,400	1992–1993, M. AVRAMOVA	DIMITROV & AVRAMOVA 1994, SPASSOV & ILIEV 1994
26 Salmanova	Salmanovo (Šumen)	92	Early Chalcolithic, 5,000	1906, 1914, R. POPOV	POPOV 1908
27 Sarnevo	Sarnevo (Stara Zagora)	129	Late Neolithic 7,400	2010, K. BĂČVAROV	GORCZYK & KARASTOYANOVA 2018

Table 1. (continued)

No., site	location (province)	altitude [m a. s. l.]	age [years BP]	excavations: years, leaders	reference
28 Kodžademenska	Šumen (Šumen)	83	Late Chalcolithic, 8,000	1907, R. POPOV	POPOV 1929
29 Reduite	Teliš (Pleven)	186	Chalcolithic – Early Bronze Age, 5,450–5,220	1990s, V. GERGOV	RIBAROV & BOEV 1997
30 Galabovo	Galabovo (Haskovo)	350	Chalcolithic – Middle Bronze Age	1989, G. RIBAROV	BOEV 1999
31 Kapitan Andreevo	Kapitan Andreevo (Haskovo)	30	Late Neolithic, 7,200–1,000	2000s, V. NIKOLOV, H. POPOV	KARASTOANOVA 2018
32 Hotnica	Hotnica (Veliko Tŕrnovo)	100	Late Chalcolithic – Early Bronze Age, 7,000–6,000	1956–1959, N. ANGELOV; 1990, S. ČOHADŽIEV	BOEV 2009, SPASSOV et al. 2015
33 Golámata Cave	Belákovec (Veliko Tŕrnovo)	355	Chalcolithic-Early Bronze Age	1898–1905, R. POPOV	POPOV 1921, 1936, NIKOLOV 1983, BERON et al. 2006
34 Mečata Dupka Cave	Leárovo (Ámbol)	279	Early Holocene	1988, G. RIBAROV	BOEV 1999
35 Dolnoslav	Dolnoslav (Plovdiv)	366	Late Chalcolithic, 6,000	1983, B. KOLEVA	BOEV 1999, SPASSOV et al. 2001
36 Stoánova	Karanovo (Sliven)	191	Late Iron Age, 2,700–2,600	2011, G. RIBAROV	G. RIBAROV, unpubl. data
37 Ása-Tepe	Ámbol (Ámbol)	155	Late Iron Age, 3,000	1979–1989, D. GERGOVA, I. ILIEV	RIBAROV & BOEV 1990
38 Nicopolis- ad-Istrum	Nikŕp (Veliko Tŕrnovo)	135	2,000–1,500	1984–1989, A. POULTER, T. IVANOV	BOEV 1991, BOEV & BEECH 2007
39 Šipot	Šipot (Vidin)	236	Late Antiquity, 1,700–1,400	2021, A. MANEV	BOEV 2022
40 Sordica (northern wall)	Sofiá (Sofiá)	555	1,700–1,400	2018–2020, P. STOÁNOVA	BOEV 2019, 2020
41 Popina	Popina (Siliŕtra)	17	1,500–900	1950s, Ź. VAŹAROVA	IVANOV 1956, NIKOLOV 1983
42 Forum Sordica	Sofiá (Sofiá)	555	1,700–100 and 400–200	2016–2017, V. KÁCAROVA; 2017–2019, P. STOÁNOVA	BOEV 2016, 2017

hilly areas. In fact, only some 15% of the sites are found in a mountainous landscape (sites 1, 6, 7, 8, 10, and 11; Fig. 1). Based on the data available, it cannot be claimed that after the end of the Pleistocene, the species would have gradually began to occupy habitats at relatively higher altitudes. Out of the total of 42 localities, 17 are caves. All Pleistocene sites (13) are also caves, and of the Holocene sites (29), only five are caves.

CONCLUSIONS

All data (except for the localities of Širokovo and Pisanec) originate from the prehistoric cave dwellings of the Paleolithic man, and later prehistoric, antique, and medieval settlements. The earliest presence of the species in Bulgaria was dated to the Late Pleistocene. The fossil record from Bulgaria proves the wide distribution of the badger in the lowland and hilly landscapes in northern and south-eastern Bulgaria, spreading across the range of 0–580 m a. s. l. No differences were found in the altitudinal distribution of the species during the Pleistocene (135–580 m a. s. l.) and Holocene (0–555 m a. s. l.). Only a small portion of the sites are located in a mountainous landscape, while the great majority of them are found in lowlands and hilly areas.

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