



Late Pleistocene birds and mammals from the Kiliite Cave (central Stara Planina Mts – central North Bulgaria)

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Abstract. The studied fossil material of birds and mammals from a new Late Pleistocene site in the Stara Planina (Balkan) mountain range is herein presented. The age of the site was determined on the basis of the taxonomic composition of the mammal fauna. A total of 28 taxa (10 birds, 15 small and 3 large mammals) have been identified from 103 bone/teeth specimens. Of these, 14.3% of the established species are extinct/disappeared – *Perdix palaeoperdix*, *Megaloceros giganteus*, *Ursus ingressus* and *Cuon* sp. Most numerous are the remains of *Microtus arvalis-agrestis*, representing 42.7% of all finds.

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INTRODUCTION

The Balkan mountain range is one of the largest mountains in Bulgaria and the Balkans. Of the more than 6,200 caves in Bulgaria, only an insignificant number have been studied in palaeozoological terms. However, several Pleistocene deposits have been discovered in the Stara Planina Mts, including some associated with activities of ancient people that are of key importance for learning about not only the culture and lifestyle of the ancient cave dwellers, but also the character of the natural environment and palaeofaunal diversity. These include the caves Kozarnika, Mirizlivka, Morovitsa, Temnata Dupka, Prohodna, Devetashka, Kozarska, Krachimir, Cave No 16, Svinska Dupka, Toplya, etc. (Boev, 1999). So far, no Pleistocene cave deposits

with a rich fauna have been discovered in the central part of the Stara Planina Mts. This study presents the first information on faunas from the Kiliite Cave (also known as the Suhata Peshtera Cave and the Varenitsata Cave) with data on 28 species (10 birds, 15 small and 3 large mammals).

MATERIAL AND METHODS

The material was collected (NN and DG) during three separate visits (4 July 2008, 13 April 2013 and 23 March 2014) and examined using the comparative osteological collections of the Vertebrate Animals Department of the National Museum of Natural History (Bulgarian Academy of Sciences) in Sofia (NMNHS). The bone/teeth finds were col-

lected from two test pits (20×20 cm), each 30 cm deep, in the cave at 15 m from the cave entrance located alongside the cave walls. The sediments were collected in 10 cm thick units and after that were washed. The washed sediments were carefully sorted under a magnifying lens and the bones and teeth were extracted.

The Kiliite Cave is located about 548 m a.s.l. near Stanchov Han Village (Gabrovo District, Central North Bulgaria), N42°48'09.6" E25°34'43.4"; the cave length is 87 m and the surface area is 200 m². It was discovered in 1986. Archaeological finds indicate that the cave was inhabited from the end of the Late Bronze Age and the beginning of the Early Iron Age to the end of the Late Iron Age (12th–1st century BC) (BSF, 2023).

Cave clay was collected in the cave from the floor at the entrance and from about 15 m from the entrance inside the cave (along the cave walls). It was then washed in a sieve at the nearby stream, labelled and stored.

Avian finds consist of 23 bones and bone fragments (Table 1). They are kept and inventoried at the Vertebrate Animals Department of the NMNHS (Nos NMNHS: 15225–15247). The mammalian finds consist of 80 bone/teeth remains (Table 2) and are kept at the Palaeontology and Mineralogy Department of the NMNHS.

Abbreviations: dex. – right; i – lower incisor; I – upper incisor; m – lower molar; M – upper molar; mand. – mandible; MNI – minimum number of individuals; sin. – left.

TAXONOMIC NOTES

Class Aves Linnaeus, 1758

Order Galliformes Temminck, 1820

Family Phasianidae Horsfield, 1821

Genus *Perdix* Brisson, 1760

***Perdix palaeoperdix* Mourer-Chauviré, 1975**

Material: 3 bones, MNI 3 (*Perdix perdix/palaeoperdix*) (Table 1). The Middle-Late Pleistocene *P. palaeoperdix* is considered to be the sister taxon to *P. perdix* (see Mourer-Chauviré, 1975). Its long bones in general were significantly shorter than these of the modern grey partridge. The collected specimens from the Kiliite Cave show the same correlations to *P. perdix*.

Records in Bulgaria: Kozarnika (Suhi Pech) Cave, Devetashka Cave, Filipovska Cave, Razhishka Cave (Boev, 1999, 2001).

Records abroad: Early Pleistocene (MNQ 19) – Middle Pleistocene (MNQ 24) from China, France, Greece, Romania, Spain, and Turkey (Tyrberg, 1998).

***Perdix perdix* (Linnaeus, 1758)**

Material: 1 (cf. 2) bone, MNI 1 (Table 1). The grey partridge inhabits bog and marshland, steppes, lowland meadows and open scrub (Harrison, 1982).

Records in Bulgaria: Morovitsa Cave, Kozarnika (Suhi Pech) Cave, Cave No 16, Bacho Kiro Cave, Filipovska Cave, Mechata Dupka Cave, Kozarska Cave, Razhishka Cave (Boev, 1999, 2001).

Records abroad: Early Pleistocene (MNQ 19/20) – present from Austria, Azerbaijan, Belarus, Bosnia and Herzegovina, China, Croatia, Czech Republic, France, Georgia, Germany, Hungary, Ireland, Italy, Israel, Moldova, Poland, Romania, Russia, Serbia, Slovakia, Spain, Syria, Ukraine, and United Kingdom (Tyrberg, 1998).

Genus *Coturnix* Garsault, 1764

***Coturnix coturnix* (Linnaeus, 1758)**

Material: 3 bones, MNI 2 (Table 1). The northern limit of the distribution of the common quail approaches the July 15 °C isotherm (Harrison, 1982). This is an important feature for the reconstruction of the Pleistocene palaeoenvironment around the Kiliite Cave. The species occupies grassland and areas of low herbage, and well-drained terrains in the north. It occurs from the desert edge and steppes to warmer alpine meadows to the south (Harrison, 1982).

Records in Bulgaria: Kunino, Cherdzhenitsa, Morovitsa, Kozarnika (Suhi Pech) Cave, Cave No 16, Bacho Kiro Cave, Temnata Dupka Cave, Devetashka Cave, Filipovska Cave, Tsareva Tsarkva Cave, Razhishka Cave (Boev, 1999, 2001).

Records abroad: Early Pleistocene (MNQ 19) – present from Austria, China, Croatia, Czech Republic, France, Georgia, Germany, Hungary, Israel, Italy, Japan, Malta, Moldova, Romania, Russia, Spain, Ukraine, and United Kingdom (Tyrberg, 1998).

Passeriformes Linnaeus, 1758

Family Corvidae Leach, 1820

Genus *Coloeus* Kaup, 1829

***Coloeus monedula* (Linnaeus, 1758)**

Material: 2 bones, MNI 1 (Table 1). The western jackdaw occurs in open areas with well-grown trees or rock outcrops, along coasts with cliffs, rugged

Table 1

Representation and measurements of the Late Pleistocene avian finds from the Kiliite Cave

Species	Bone	Collection No.	Measurement	Dimension (mm)	Note
Galliformes					
Phasianidae					
<i>Perdix perdix/palaeoperdix</i>	Tmt dex. dist.	15230	Width of tr. mt. 3	3.14	tr. mt. 2 are missing
<i>Perdix perdix/palaeoperdix</i>	Tmt dex. dist.	15241	Thickness at fossa metatarsi I	2.11	tr. mt. 3 and 4 are missing
<i>Perdix perdix/palaeoperdix</i>	Tmt dex. dist.	15232	Width of tr. mt. 4	2.38	tr. mt. 2 and 3 are missing
<i>Perdix perdix</i>	Os quadratum dex.	15244	Maximal thickness	2.09	
<i>Perdix cf. perdix</i>	Phalanx 1 dig. 3 pedis dex.	15237	Total length	10.05	
<i>Perdix cf. perdix</i>	Trabecula lateralis sterni	15247	Total length	20.50	
<i>Coturnix coturnix</i>	Tmt sin. prox.	15236	Width of proximal diaphysis	4.57	burnt
<i>Coturnix coturnix</i>	Tmt sin. dist.	15234	Thickness of tr. mt. 3	2.14	tr. mt. 3
<i>Coturnix coturnix</i>	Phalanx prox. dig. maj. dex.	15246	Maximal length	7.95	
Passeriformes					
Corvidae					
<i>Coloeus monedula</i>	Mandibula dex. prox.	15228	Thickness before articular part	1.61	pars articularis
<i>Coloeus monedula</i>	Mandibula sin. prox.	15227	Maximal height of rhamus mandibulae	4.19	pars articularis
<i>C. monedula/Pyrrhocorax graculus</i>	Phalanx dist. dig. 4 pedis sin.	15239	Total length	7.27	apical part damaged
<i>Pica pica</i>	Femur sin. dist.	15235	Width of distal diaphysis	7.70	
<i>Pica pica</i>	Tbt. dex. dist.	15231	Width of distal diaphysis	5.95	tr. tbt.
<i>Garrulus cf. glandarius</i>	Tmt. dex.	15240	Minimal thickness of diaphysis	2.34	diaphysis – splinter
Sturnidae					
<i>Sturnus vulgaris</i>	Phalanx 1 dig. 1 pedis dex.	15233	Maximal length	6.37	
Muscicapidae					
<i>Monticola cf. saxatilis</i>	Coracoid dex. omal	15245	Thickness of proc. acrocoracoideus	1.95	
Turdidae					
<i>Turdus cf. viscivorus</i>	Scapula dex. prox.	15226	Width of corpus scapulae before fac. artic. humeralis	3.16	
Sylviidae					
<i>Curruca cf. nisoria</i>	Maxilla	15225	Total length	11.32	apex maxillae
Aves ordo indet.					
Aves ordo indet.	Ulna dex.	15229	Total length	15.42	diaphysis – splinter
Aves ordo indet.	Tbt.	15238	Thickness of diaphysis	6.55	diaphysis – splinter; burnt
Aves ordo indet.	Tmt. dist.	15243	Total length	12.91	diaphysis – splinter; burnt
Aves ordo indet.	Phalanx dig. pedis	15242	Width of distal articular end	2.55	dist. part
Total birds:					23

Table 2
Representation of the mammalian taxa in the Late Pleistocene record of the Kiliite Cave

Species	Bones	MNI	No. of finds
Eulipotyphla			
Talpidae			
<i>Talpa europaea</i>	humerus sin.	1	1
Soricidae			
<i>Sorex minutus</i>	mand. dex.	1	1
<i>Sorex araneus</i>	mand. dex. – 3	3	3
<i>Neomys</i> sp.	man. dex. + sin.		2
Lagomorpha			
Leporidae			
<i>Lepus</i> sp.	broken M2 or M3?	1	1
Rodentia			
Sciuridae			
<i>Spermophilus citellus</i>	p4 sin.		1
Gliridae			
<i>Glis glis</i>	mand. sin. – 5	5	5
Cricitidae			
<i>Mesocricetus newtoni</i>	m1 sin. – 3; M1 sin.	3	3
<i>Arvicola amphibius</i>	m1 sin. – 2; M3 sin. – 2	2	2
<i>Clethrionomys glareolus</i>	man. sin.; m1 sin.	2	2
<i>Chionomys nivalis</i>	m1 sin.	1	1
<i>Microtus subterraneus</i>	mand. dex.; m1 – 5 dex. + 2 sin.	6	8
<i>M. arvalis-agrestis</i>	mand. 12 dex. + 9 sin.; m1 – 17dex. + 6 sin.	29	44
Muridae			
<i>Apodemus flavicollis-sylvaticus</i>	m1 2 dex. + 1 sin.	2	3
Spalacidae			
<i>Nannospalax leucodon</i>	m1 – 2 sin.	2	2
Artiodactyla			
Cervidae			
<i>Megaloceros giganteus</i>	m2, 2 nd phalanx	1	2
Carnivora			
Ursidae			
<i>Ursus</i> aff. <i>ingressus</i>	two I3, fragment from premolar	2	
Canidae			
? <i>Cuon</i> sp.		2	2
Macromammalia ordo indet.			7
Total mammals:			80

hills with rocky outcrops, in open forest by grassland, and riverine forests. In mountains, it may be found up to the tree line (Harrison, 1982).

Records in Bulgaria: Temnata Dupka Cave, Kozarnika (Suhi Pech) Cave, Bacho Kiro Cave, Devetashka Cave, Filipovska Cave, Tsareva Tsarkva Cave, Kozarska Cave, Razhishka Cave (Boev, 1999, 2001).

Records abroad: Early Pleistocene (MNQ 19) – present from Austria, Belgium, Bosnia and Herzegovina, China, Czech Republic, France, Georgia, Germany, Greece, Israel, Italy, Moldova, Poland, Portugal, Romania, Russia, Serbia, Spain, Ukraine, United Kingdom (Tyrberg, 1998).

Genus *Pica* Brisson, 1760

Pica pica (Linnaeus, 1758)

Material: 1 bone, MNI 1 (Table 1). The Eurasian magpie occurs in open areas and scrub of dense trees, open forest, clearings, and forest edge, heathland, scrub on hills and mountains, shelterbelts, orchards, gardens, grassland with scattered patches of trees, tall shrubs, forest steppes, trees in any open country (Harrison, 1982).

Records in Bulgaria: Temnata Dupka Cave, Cave No 16, Devetashka Cave, Filipovska Cave, Mirizlivka Cave (Boev, 1999, 2001).

Records abroad: Early Pleistocene (MNQ 19) – present from Austria, Belgium, Bosnia and Herzegovina, China, Croatia, Czechia, France, Germany, Hungary, Ireland, Israel, Italy, Lithuania, Moldova, Morocco, Portugal, Romania, Russia, Serbia, Spain, Syria, Ukraine, and United Kingdom (Tyrberg, 1998).

Genus *Garrulus* Brisson, 1760

Garrulus glandarius (Linnaeus, 1758)

Material: 1 bone (cf.), MNI 1 (Table 1). The Eurasian jay occurs in broadleaf forests with oak (species' principal food tree), mixed and conifer forests in lowland and mountains up to the tree line, in riverine forests, shelterbelts and plantations, parklands, orchards, and secluded gardens (Harrison, 1982).

Records in Bulgaria: Kozarnika (Suhi Pech) Cave, Cave No 16, Devetashka Cave, Razhishka Cave (Boev, 1999, 2001).

Records abroad: Early Pleistocene (MNQ 20) – present from Austria, Belgium, Czechia, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Kyrgyzstan, Lebanon, Luxembourg, Moldova, Poland, Romania, Russia, Slovenia, Spain, Ukraine, and United Kingdom (Tyrberg, 1998).

Family Sturnidae Rafinesque, 1815

Genus *Sturnus* Linnaeus, 1758

Sturnus vulgaris Linnaeus, 1758

Material: 1 bone, MNI 1 (Table 1). The common starling occurs in open, grassy areas where cavities for nesting exist, in open forests, forest edges, open mountain forests with grassy clearings, riverine forests, in meadows, scattered trees, orchards, and groves (Harrison, 1982).

Records in Bulgaria: Temnata Dupka Cave, Cave No 16, Devetashka Cave, Filipovska Cave (Boev, 1999, 2001).

Records abroad: Early Pleistocene (MNQ 19) – present from Austria, Bosnia and Herzegovina, China, Croatia, Czechia, France, Greece, Hungary, Iraq, Ireland, Israel, Italy, Lithuania, Malta, Moldova, Palestine, Poland, Romania, Russia, Serbia, Slovakia, Spain, Ukraine, and United Kingdom (Tyrberg, 1998).

Family Muscicapidae Fleming, 1822

Genus *Monticola* Boie, 1822

Monticola saxatilis (Linnaeus, 1766)

Material: 1 bone, MNI 1 (Table 1). The common rock thrush occurs on dry, open hill and mountain

slopes with rocks, screes and boulders, patches of herbage, and sparse shrubs or trees, in arid, stony lowland areas (Harrison, 1982).

Records in Bulgaria: Cherdzhenitsa Cave, Kozarnika (Suhi Pech) Cave, Cave No 16, Toplya Cave (Boev, 1999, 2001).

Records abroad: Middle Pleistocene (MNQ 24) – present from Austria, France, Italy, Mongolia, Poland, Romania, and Spain (Tyrberg, 1998).

Family Turdidae Rafinesque, 1815

Genus *Turdus* Linnaeus, 1758

Turdus viscivorus Linnaeus, 1758

Material: 1 bone, MNI 1 (Table 1). The Mistle thrush occurs in mature, open forest with little undergrowth, in mountain forest with well-grown trees, in shelterbelts and rows of trees in cultivation and hedgerows, and parkland and gardens, and in open grassland (Harrison, 1982).

Records in Bulgaria: Temnata Dupka Cave, Devetashka Cave, Kozarnika (Suhi Pech), Cave (Boev, 1999, 2001).

Records abroad: Middle Pleistocene (MNQ 22) to present from Austria, Belgium, Czech Republic, France, Germany, Hungary, Iraq, Ireland, Italy, Moldova, Poland, Romania, Russia, Slovakia, Spain, Ukraine, and United Kingdom (Tyrberg, 1998).

Family Sylviidae Leach, 1820

Genus *Curruca* Bechstein, 1802

Curruca nisoria (Bechstein, 1792)

Material: 1 bone, MNI 1 (Table 1). The Barred warbler occurs in thorny and well-grown shrubs, on the edge of mixed or broadleaf forest, clearings, undergrowth of open forest, riverine forest, parklands, orchards, hedgerows, shelterbelts, or in overgrown marshy or moist areas and the shrubby borders of lakes and rivers (Harrison, 1982).

Records in Bulgaria: Not recorded (Boev, 1999, 2001).

Records abroad: Middle Pleistocene (MNQ 23) – present from France (Tyrberg, 1998).

Class Mammalia Linnaeus, 1758

Order Eulipotyphla Waddell *et al.*, 1999

Family Talpidae Fischer, 1814

Genus *Talpa* Linnaeus, 1758

Talpa europaea (Linnaeus, 1758)

Material: humerus sin. (MNI – 1). The European mole occurs commonly all over Bulgaria, up to

2700 m. Moles from the mountains are smaller than those of the lowlands (Peshev *et al.*, 2004).

Records in Bulgaria: Middle Pleistocene – Morovitsa Cave, Kozarnika, Mechata Dupka Cave; Late Pleistocene – Kozarnika, Cave No 16, Mechata Dupka Cave –1, Temnata Dupka, Razhishka Cave, Borikovska Cave; Holocene – Razhishka Cave, Kastrakli Cave, Cave No15.

Records abroad: The species has a well-documented history across Europe extending from the Middle Pleistocene (Kurten, 1968).

Family Soricidae Fischer, G., 1814

Genus *Sorex* Linnaeus, 1758

***Sorex minutus* (Linnaeus, 1766)**

Material: mand. dex. (MNI – 1). The Eurasian pygmy shrew is a common species in our mountains, but has patchy distribution in the lowlands where it prefers mesophilic habitats, ecologically more plastic than *S. araneus* (Peshev *et al.*, 2004).

Records in Bulgaria: Varshets, Temnata – IV, Kozarnika (Early and Late Pleistocene), Varbeshitsa, Mechata Dupka Cave, Magurata Cave, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Borikovska Cave, Bosnek Cave, Kastrakli Cave (Popov, 2018).

Records abroad: Early Pliocene (MN14) – present from Austria, Belgium, Croatia, Czech Republic, Denmark, France, Germany, Greece, Hungary, Italy, Moldova, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Switzerland, Serbia, United Kingdom.

This species is very often found in the Middle and Upper Pleistocene deposits of Europe. It has remained morphologically unchanged for more than 4 million years (Rzebik-Kowalska, 1998).

***Sorex araneus* (Linnaeus, 1758)**

Material: 3 mand. dex. in different stages of preservation (MNI – 3). The common shrew is widely distributed across Eurasia. In Bulgaria, it is a widespread species in the mountains but is also found at lower altitudes (Peshev *et al.*, 2004).

Records in Bulgaria: Kozarnika (Middle Pleistocene), Morovitsa Cave, Mechata Dupka Cave, Magurata Cave, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Razhishka Cave, Borikovska Cave, Bosnek Cave, Kastrakli Cave (Popov, 2018).

Records abroad: Early Pleistocene – present from Austria, Belgium, Croatia, Czech Republic, Denmark, France, Germany, Greece, Hungary, Italy, Moldova, Netherlands, Poland, Portugal, Roma-

nia, Russia, Slovakia, Slovenia, Spain, Switzerland, Serbia, Ukraine, United Kingdom (Rzebik-Kowalska, 1998).

Genus *Neomys* Kaup, 1829

***Neomys* sp.**

Material: 2 broken semi-mandibles – dex. and sin. (MNI – 1). Fragmented materials do not allow species identification. Two water shrews occur nowadays in Bulgaria – *N. anomalus* and *N. fodiens*. *Neomys anomalus* is a widespread species found in different habitats; it is not so connected with water, in contrast to *N. fodiens*, which lives close to running waters, mountain streams and brooks, usually above 500 m a.s.l.

Records in Bulgaria: The first record of both species, *N. fodiens* and *N. anomalus*, from Bulgaria were from the Late Pleistocene (Popov, 2018).

Records abroad: Fossil records of *N. fodiens* and *N. anomalus* are known from the Middle Pleistocene of Europe (Rzebik-Kowalska, 1998).

Order Lagomorpha Brandt, 1855

Family Leporidae Fischer de Waldheim, 1817

Genus *Lepus* Linnaeus, 1758

***Lepus* sp. (Linnaeus, 1758)**

Material: broken M 2 or 3 dex.? (MNI – 1). The brown hare (*Lepus europaeus* Linnaeus, 1758) is the most widespread mammal in our fauna, and is found in various habitats. Quite probably, the remains belong to *L. europaeus*, which is found in all fossil assemblages younger than Middle Pleistocene, but always with very fragmented elements (Popov, 2018).

Records abroad: It has a well-documented history across Europe in deposits younger than Middle Pleistocene (Kurten, 1968).

Order Rodentia Bowdich, 1821

Family Sciuridae Fischer de Waldheim, 1817

Genus *Spermophilus* Cuvier, 1825

***Spermophilus citellus* (Linnaeus, 1766)**

Material: p4 sin. (MNI – 1). The European ground squirrel lives in open steppe-like habitats and overgrazed pastures in the lowland and mountains up to 2400 m (Peshev *et al.*, 2004).

Records in Bulgaria: Probably the oldest fossil records of the European souslik are found in Bulgaria from the Middle Pleistocene (Popov, 2018), e.g., Morovitsa Cave, Mechata Dupka Cave 2,

Magurata Cave, Kozarnika, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Bosnek Cave, Cave No 15, Borikovska Cave, Mechata Dupka Cave 1, Razhishka Cave.

Records abroad: Found in many fossil sites across Europe, usually within the range of its current distribution (Middle Pleistocene – Holocene). Kowalski (2001) put all fossils from extant souslik species under the name *Spermophilus* sp.

Family Gliridae Muirhead in Brewster, 1819

Genus *Glis* Brisson, 1762

***Glis glis* (Linnaeus, 1766)**

Material: 5 mand. sin. with teeth (MNI – 5). The European edible dormouse occurs in temperate deciduous forests (*Quercus-Fagus*) in Eurasia. It is one of the most common dormouse species in Bulgaria nowadays, found throughout the country (Peshev *et al.*, 2004). It is quite a common species in the Middle Pleistocene–Holocene assemblages in Bulgaria (Popov, 2018).

Records in Bulgaria: Morovitsa Cave, Mechata Dupka Cave 2, Magurata Cave, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Bosnek Cave, Cave-15, Razhishka Cave, Kastrakli Cave (Popov, 2018).

Records abroad: Early Pleistocene–present. During the Pleistocene, the European edible dormouse was widely distributed across Europe; it is found in areas that overlap with its current distribution – Austria, Belgium, Croatia, Czech Republic, France, Germany, Greece, Hungary, Italy, Moldova, Poland, Romania, Russia, Slovenia, Spain, Switzerland, Serbia (Kowalski, 2001).

Family Cricetidae Fischer, J., 1817

Genus *Mesocricetus* Nehring, 1894

***Mesocricetus newtoni* (Nehring, 1898)**

Material: 3 m1 sin., M1 sin. (MNI – 3). The Romanian hamster is endemic to the lower Danube Plain. It occurs in North Bulgaria, and in Dobrogea – both in the Romanian and Bulgarian parts. There are two records south of the Balkan Mts that are probably remnants from its past wider distribution (Peshev *et al.*, 2004).

Records in Bulgaria: It is quite a common species in the Middle Pleistocene–Holocene assemblages in Bulgaria (Popov, 2018). Kozarnika (Early and Middle Pleistocene), Morovitsa Cave, Mechata Dupka Cave, Magurata Cave, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Razhishka Cave, Boriko-

vska Cave, Bosnek Cave, Cave-15, Kastrakli Cave (Popov, 2018).

Records abroad: During the Pleistocene, it was widespread throughout the Balkans. It has been recorded from NE Italy, Serbia, Greece, and Romania (Kowalski, 2001). Its distribution has been shrinking since the Late Pleistocene. Its current distribution consists of North Bulgaria and Romanian Dobrogea. There are two records in SE Bulgaria (south of the Balkan Mountain).

Genus *Arvicola* Lacépède, 1799

***Arvicola amphibius* (Linnaeus, 1758)**

Material: 2 m1 sin., 2 M3 sin. (MNI – 2).

Records in Bulgaria: The European water vole is commonly found (but with low relative abundance) in fossil deposits in Bulgaria that are younger than Middle Pleistocene: Kozarnika (Middle Pleistocene), Morovitsa Cave, Mechata Dupka Cave, Magurata Cave, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Borikovska Cave, Bosnek Cave, Cave-15, Kastrakli Cave (Popov, 2018).

Records abroad: Middle Pleistocene – present from Austria, Belarus, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, Denmark, France, Germany, Great Britain, Hungary, Italy, Luxemburg, Moldova, Netherlands, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine (Kowalski, 2001). It is one of the most common rodents in the Upper Pleistocene deposits of Europe (Kowalski, 2001).

Genus *Clethrionomys* Tilesius, 1850

***Clethrionomys glareolus* (Scheber, 1780)**

Material: mand. sin., m1 sin. (MNI – 2). The bank vole is a mesophilic species found in the mountain areas of Bulgaria (Peshev *et al.*, 2004).

Records in Bulgaria: It is found in all fossil assemblages dating from the Middle Pleistocene–Holocene in Bulgaria – Kozarnika (Middle Pleistocene), Morovitsa Cave, Mechata Dupka Cave, Magurata Cave, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Razhishka Cave, Borikovska Cave, Bosnek Cave, Cave-15, Kastrakli Cave (Popov, 2018).

Records abroad: Early Pleistocene – present from Austria, Belarus, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, France, Germany, Great Britain, Greece, Hungary, Italy, Lithuania, Moldova, Netherlands, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, Serbia (Kowalski, 2001).

Genus *Chionomys* Miller, 1908

Chionomys nivalis (Martins, 1842)

Material: m1 sin. (MNI – 1). The European snow vole has a disjunctive distribution; it is found in mountain areas from the Pyrenees to the Caucasus and the Zagros Mountains (Iran) (Peshev *et al.*, 2004).

Records in Bulgaria: It is found in all fossil assemblages dating from the Middle Pleistocene to the Holocene in Bulgaria – Kozarnika, Morovitsa Cave, Mechata Dupka Cave, Magurata Cave, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Razhishka Cave, Borikovska Cave, Bosnek Cave, Cave-15, Kastrakli Cave (Popov, 2018).

Records abroad: Middle Pleistocene – present from Austria, Belgium, France, Czech Republic, France, Germany, Greece, Hungary, Italy, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Switzerland, and Serbia (Kowalski, 2001).

Genus *Microtus* Schrank, 1798

Microtus ex gr. *arvalis-agrestis*

Material: mand. 12 dex.+9 sin., m1 – 17 dex.+6 sin. (MNI – 29). Nowadays, in Bulgaria, grey voles [subgenus *Microtus* (*Microtus*)] are represented by two morphologically very similar species, namely *M. arvalis* Pallas, 1778, and *M. rossiaemeridionalis* Ognev, 1924 (Peshev *et al.*, 2004). In the Pleistocene sediments (younger than Middle Pleistocene), there are represented other morphologically similar species, *M. agrestis* Linnaeus, 1761 (see Popov, 2018), and the recently genetically confirmed *M. ilaeus* Thomas, 1912 (see Baca *et al.*, 2021), which makes identification of their remains difficult on the basis of the very similar pattern of the morphology of the first lower molar.

Records in Bulgaria: Voles *Microtus* ex gr. *arvalis-agrestis* are well represented in all fossil sites dating from the Middle Pleistocene to the Holocene – Kozarnika, Morovitsa Cave, Mechata Dupka Cave 1 and 2, Magurata Cave, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Razhishka Cave, Borikovska Cave, Bosnek Cave, Cave-15, Kastrakli Cave (Popov, 2018).

Records abroad: Middle Pleistocene–Holocene from Austria, Belarus, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, Germany, Hungary, Italy, Romania, Russia, Slovakia, Slovenia, Spain, Switzerland, Serbia (Kowalski, 2001).

Microtus subterraneus (de Selys Longchamps, 1836)

Material: mand. dex., m1 – 5 dex.+2 sin. (MNI – 6). Nowadays, the range of the European pine vole in

Bulgaria covers the mountain areas (Rila-Rhodope Massif, the Balkan Mountains), with a scattered distribution at low elevations, along the Danube, Strandzha – Sakar region (Peshev *et al.*, 2004).

Records in Bulgaria: It is found in all fossil assemblages of Middle Pleistocene–Holocene age in Bulgaria – Kozarnika, Morovitsa Cave, Mechata Dupka Cave, Magurata Cave, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Razhishka Cave, Borikovska Cave, Bosnek Cave, Cave-15, Kastrakli Cave (Popov, 2018).

Records abroad: Middle Pleistocene–present in Austria, Belarus, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, France, Germany, Hungary, Moldova, Netherlands, Poland, Romania, Russia, Slovenia, Switzerland, Serbia (Kowalski, 2001).

Family Muridae Illiger, 1811

Genus *Apodemus* Kaup, 1829

Apodemus flavicollis/sylvaticus

Material: m1 – 2 dex. + 1 sin. (MNI – 2). Wood mice from the subgenus *Apodemus* (*Sylvaemus*), *A. flavicollis* (yellow-necked mouse) and *A. sylvaticus* (wood mouse), are some of the most common rodents nowadays in Europe, found in various habitats. The identification of separate teeth in fossil sites is a challenge; they are very similar in the morphology of their occlusal surface. In many faunal lists, they are presented as *A. flavicollis-sylvaticus* (Kowalski, 2001).

Records in Bulgaria: Fossil remains of *A. flavicollis* were found in the Lower Pleistocene sediments (Varshets) and *A. sylvaticus* from the Middle Pleistocene (Morovitsa Cave) (Popov, 2018).

Records abroad: Both species are found in many fossil sites across Europe dating younger than the Middle Pleistocene (Kowalski, 2001).

Spalacidae Gray, 1821

Genus *Nannospalax* Palmer, 1903

Nannospalax leucodon (Nordmann, 1840)

Material: m1 – 2 sin. (MNI – 1). The lesser blind mole-rat is widespread all over the country, from sea level up to 2800 m (Peshev *et al.*, 2004).

Records in Bulgaria: It is found in all fossil assemblages of Middle Pleistocene–Holocene age in Bulgaria, but always in small numbers, e.g., Kozarnika (Middle Pleistocene), Morovitsa Cave, Mechata Dupka Cave, Magurata Cave, Temnata Dupka Cave, Cave No 16, Bacho Kiro Cave, Razhishka

Cave, Borikovska Cave, Bosnek Cave, Cave-15, Kastrakli Cave (Popov, 2018).

Records abroad: Middle Pleistocene–present in Austria, Bosnia and Herzegovina, Croatia, Greece, Hungary, Moldova, Romania, Serbia (Kowalski, 2001).

Large mammals

The remains of large mammals are very scarce (few individual bones) and fragmented. Therefore, only for some individual remains can their identity be more reliably determined. Among them, of some interest are a few bones of cervids and carnivores.

Artiodactyla Owen, 1848

Family Cervidae Goldfuss, 1820

Genus *Megaloceros* Brookes, 1828

***Megaloceros giganteus* (Blumenbach, 1799)**

Material: 2nd (?) lower molar and a 2nd phalanx with characteristic morphology and size. The Irish elk is characteristic of the Late Pleistocene fauna of the country, together with other typical ungulates of the more southerly open plain or mountain areas of Europe (Spassov and Popov, 2007; Ivanova *et al.*, 2016; Boev, 2019).

Records in Bulgaria: Varbeshnitsa, Kozarnika Cave, Mishin Kamik Cave, Muselievo, Magurata Cave, Temnata Dupka Cave, Bacho Kiro Cave (Boev, 2019).

Carnivora Bowdich, 1821

Family Ursidae Fischer de Waldheim, 1817

Genus *Ursus* Linnaeus, 1758

***Ursus* aff. *ingressus* Rabeder *et al.*, 2004**

Material: I 3, fragment of a milk premolar, 2 I3, probably from the same individual. This cave bear material is tentatively determined as *Ursus* aff. *ingressus* (Gamssulzen cave bear), as this cave bear species is the typical representative of the Bulgarian/Balkan Late Pleistocene cave bears (Frémondeau *et al.* 2020).

Family Canidae Fischer de Waldheim, 1817

Genus *Cuon* Hodgson, 1838

?*Cuon* sp.

Material: two I3, most probably from the same individual, belong to a large canid. They are relatively small for wolf and can tentatively be attributed to *Cuon*, whose remains in the Late Pleis-

tocene of Bulgaria are quite rare (Ivanova *et al.*, 2016; Boev, 2022).

Records in Bulgaria: Kozarnika Cave, Mishin Kamik Cave, Magurata Cave, Leyarnite Cave, Bacho Kiro Cave (Boev, 2022).

CONCLUSIONS

The composition of the bird fauna from the Kiliite Cave suggests a former presence of forest-steppe habitats around the cave, including both open grasslands (*Perdix perdix/palaeoperdix*, *Coturnix coturnix*) and light forests and scattered trees (*Sturnus vulgaris*, *Curruca nisoria*, *Pica pica*), along with rocky (*Monticola saxatilis*, *Corvus monedula*, *Corvus monedula/Pyrrhocorax graculus*) habitats. Broad-leaved deciduous forests (*Turdus viscivorus*, *Garrulus glandarius*) prevailed, but also coniferous forests might have been present.

Excluding petrophilic species (four specimens, 21.0%) as inhabitants of intrazonal landscapes, it turns out that forest (dendrophilic) species among the studied material are represented by six specimens (31.6%), and open grassland species by nine (47.4%). From these observations, we can indirectly conclude that the open grasslands probably dominated over the woodland habitats in the vicinity of the Kiliite Cave.

The small mammal assemblage from the Kiliite Cave consists of modern species that occur in Bulgaria. The presence of *Ch. nivalis* and *M. newtoni* is typical for the Late Pleistocene (Popov, 2018). In the modern fauna, both species do not occur together. *Mesocricetus newtoni* lives in the lowlands of the Danube Plain, while *Ch. nivalis* is associated with rocky habitats in our mountains, e.g., Rila-Rhodope Massif, Vitosha, Pirin, and it is rare in the Balkan Mountains. Small mammals have very strict requirements for microhabitat and microclimate, and they can be a useful tool for reconstruction of the palaeohabitats surrounding a fossil site. According to their ecological peculiarities, the small mammals can be grouped in the following five groups (following Popov, 1984, 2018): (1) forest (mesophilic species) – *S. araneus*, *S. minutus*, *G. glis*, *Cl. glareolus* (18.6%); (2) forest–meadow (mesophilic species) – *Neomys* sp., *T. europaea*, *A. amphibious*, *M. subterraneus* (16.9%); (3) steppe – *M. newtoni*, *Sp. citellus*, (6.8%); (4) steppe-forest – *N. leucodon*, *M. arvalis/agrestis*, *Apodemus* sp., *Lepus* sp. (55.9%); and (5) rocky habitats – *Ch. nivalis* (1.7%).

Most numerous are the remains of *Microtus arvalis-agrestis*, representing 42.7% of all finds.

It could be assumed that the habitat surrounding the Kiliite Cave in the Late Pleistocene was more open with grassland. The species from this habitat type are well represented in the sediments – *M. arvalis/agrestis*, *M. newtoni*, *Sp. Citellus*. This grassland was probably surrounded by forest, as typical species of this habitat type were found – *G. glis*, *Cl. glareolus*. This conclusion is supported also by the presence of *Megaloceros giganteus*.

In summer (July), temperatures are estimated to have been above 15 °C, which is the July isotherm for the distribution of the common quail (*Coturnix coturnix*), a migratory bird in the modern avifauna of the Balkans and Europe. This temperature approaches that in the modern climate for the area. According to Stanev (1973), today the region of the cave lies within the 18 °C July isotherm.

Four species/taxa present in the fauna from the Kiliite Cave have disappeared from the recent fauna of Bulgaria, Balkans and Europe: *Perdix palaeoperdix*, *Megaloceros giganteus*, *Ursus ingressus* and

Cuon sp. These taxa (except for *Cuon*) are extinct, i.e., one-seventh (14.3%) of the established species.

The taphonomy of this site is probably mixed. It is possible that some of the bones of small birds and mammals were accumulated by the eagle owls (*Bubo bubo*) that inhabited the cave (Andrews, 1990). Another part is possibly of anthropogenic origin. One of the common quail bones shows signs of being burned. It is possible that some of the remains were repositioned. The too limited samples of the material allow the obtained results to be taken only as preliminary data for the palaeofauna of this cave. The finding of remains of *Megaloceros giganteus*, *Ursus* aff. *ingressus*, and ?*Cuon* sp. shows age homogeneity of the megafauna and definitively dates the collected samples as Pleistocene, most probably Late Pleistocene.

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