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Small mammals from Palaeolithic sites of the Crimea

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ABSTRACT

The Crimean region is unique in the abundance of Palaeolithic sites, particularly numerous in mountain parts of the peninsula. Most are attributed to the Middle Palaeolithic. During recent decades, the sites have been investigated by the Ukrainian archeologists V.P. Chabai, A.I. Yevtushenko, Yu.E. Demidenko, A.P. Veselsky, and others. Integrated studies performed by a large group of specialists included assessment of the geological and geomorphological setting of every site, and analysis of paleontological remains recovered from cultural layers (large and small mammals, birds, molluscs, as well as pollen and spores). Cultural layers of the sites have been dated using various methods (^{14}C, TL, ESR).

Studies have included several thousand small mammal bone remains recovered from seven multi-layered Palaeolithic sites in the Crimea, providing the basis for reconstructions of environments at different stages of human habitation. The oldest finds of small mammals are attributed to the last interglacial, and the youngest to the Denekamp (Bryansk) interstadial. More than 20 species of small mammals have been identified, which permitted recognition of specific features of faunal assemblages differing in age. The faunas display a certain stability of species composition over a period of almost 100,000 years. No species typical of cold environments have been found, and the faunas are dominated by open landscape dwellers. Forest and near water species are present in small quantities. Some mammals identified in the sites do not occur in the Crimea at present. On the other hand, a number of species inhabiting the Crimea today have not been found in the fossil assemblages. On the whole, the Mountain Crimea was a refugium for mammals, and possibly also for other organisms, during the last glaciation. Due to its southern position, the Crimea retained rather comfortable environmental and climate conditions throughout the Late Pleistocene. Similarly, the environments were undoubtedly hospitable for humans.

1. Introduction

Fossil mammal faunas of the Crimea, including those recovered from Palaeolithic sites, have been studied for the last 50 years (e.g. Gromov, 1961; Burke, 1999a,b, 2004; Baryshnikov, 1987; Baryshnikov et al., 1990; Patou-Mathis, 1999, 2004a,b, 2005). The primary emphasis was placed on studies of large mammals. Small mammal faunas were hardly given any attention for a long time after the basic work of Gromov (1961). In the 1990s, the author began systematic studies of the faunas as a part of work carried out by the Ukrainian archeologists on Middle and Late Palaeolithic sites. Bone remains of small mammals from all the cultural layers were collected and subsequently analyzed, the sediments being thoroughly sieved and washed. As a result, several thousand identifiable bone remains were recovered from seven Palaeolithic sites located in Western and Eastern Crimea: Kabazi II, Kabazi V, Starosele, Chokurcha, Buran Kaya III, Karabi Tamchin and Suiren I (Markova, 1999, 2004a,b,c, 2005, 2007) (Fig. 1). Small mammal bones were taken from most of cultural layers excavated in those multi-layered sites.

2. Materials and methodical approach

Small mammal remains were collected at every Palaeolithic site layer-by-layer, the bone-bearing sediments being sieved and subsequently washed. The small mammal bones recovered from the Crimean open or cave sites are relatively well preserved, without signs of transport. Mandibles with teeth are found in abundance. On the other hand, many bones are brittle, attributed to their accumulation with predatory bird dung.

After manual cleaning, small mammal bones were studied using a binocular microscope SMC-4 at ×30–40 magnification. Bone remains have been measured and compared with modern Mammalia collections from the Zoological Museum, Moscow State University and from RAS Zoological Museum, St.-Petersburg, as

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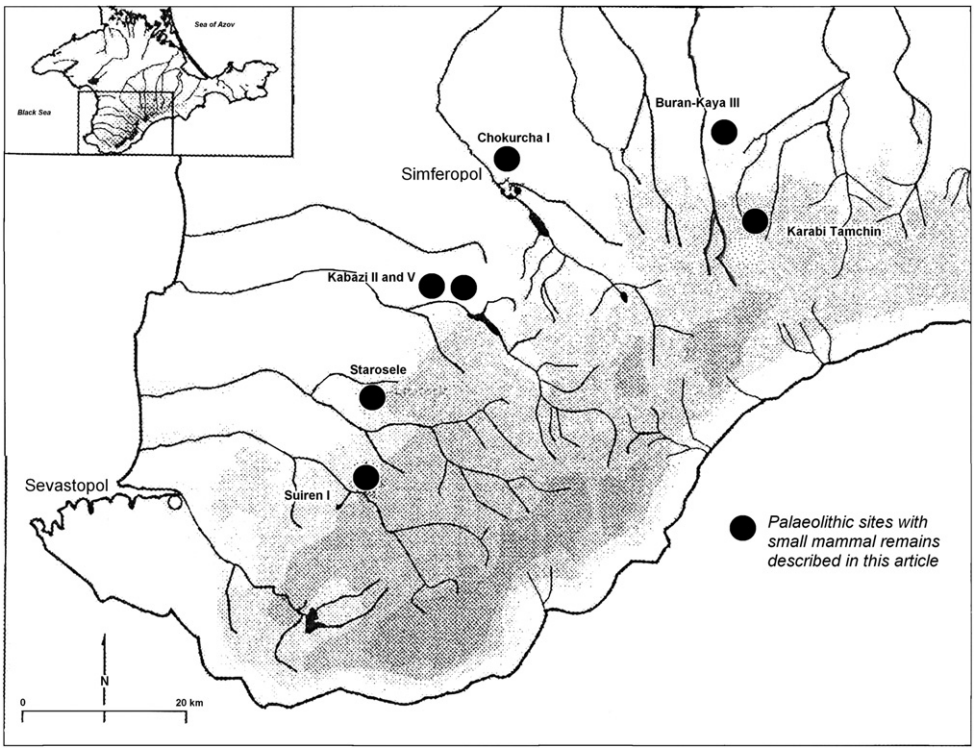

Fig. 1. Location of the Crimean Palaeolithic sites containing the small mammal remains described in this article.

well as with fossil rodent collections belonging to the RAS Institute of Geography, Moscow. Bone remains of indicator species were sketched.

After studying several thousand small mammal remains attributed to Rodentia, Insectivora, and Lagomorpha, 21 species were identified as inhabitants of Mountain Crimea during the Late Pleistocene. From individual stratigraphic units of Palaeolithic sites, the total number of identified species recovered is usually much less than 20, and depends on the thoroughness of sampling and environment of accumulation.

3. Species composition and diversity of small mammals

The taxonomic composition of small mammals from the Crimean Palaeolithic sites differs noticeably from that of the modern fauna. Species richness is comparable with modern (at present there are 20 species belonging to the mentioned orders in Crimea).

Study of species richness and composition of small mammal assemblages from successive geochronological intervals succeeded in tracing characteristics of small mammal faunas dated to MIS 5–MIS 3 (Mikulino = Eemian Interglacial to the final phase of the Middle Valdai megainterstadial; Fig. 2).

3.1. Mikulino (Eemian) interglacial – MIS 5e-d

The Mikulino interglacial fauna is represented by fossils recovered from the lower units of the Kabazi II site (units V-VI). Attribution to this interglacial is based on pollen and geological evidence (Gerasimenko, 2005; Chabai, 2005). Fourteen species of rodents, insectivores and lagomorphs have been identified in Kabazi II, V-VI, including: Insectivora: *Crocidura leucodon* Herm., Lagomorpha: *Lepus* sp., Rodentia: *Spermophilus pygmaeus* Pallas, *Marmota bobac* Muller, *Spalax microphthalmus* Güld., *Ellobius talpinus* Pallas, *Dryomys nitedula* Pallas, *Apodemus (Sylvamus) flavicollis* Melch., *Cricetulus migratorius* Pallas, *Eolagurus luteus* Eversmann, *Lagurus lagurus* Pallas, *Arvicola terrestris* L., *Microtus (Stenocranius) gregalis* Pallas, and *Microtus (Microtus) obscurus* Eversmann (Fig. 1).

Species found in the lower units of the Kabazi II site may be divided into four groups according to their environmental preferences:

1) Inhabitants of open landscapes, primarily steppe, forest-steppe and semi-deserts. Among these are little ground squirrel *S. pygmaeus*, bobak marmot *M. bobac*, mole rat (*S. microphthalmus),* mole lemming (*E. talpinus*), grey (migratory) hamster (*C. migratorius*), yellow steppe lemming (*E. luteus*) and steppe lemming (*L. lagurus*), and narrow-skulled vole (*M. (Stenocranius) gregalis*);
2) Voles of superspecies *Microtus arvalis* (to which *M. obscurus* is attributed), widespread in meadow landscapes;
3) Water voles (*A. terrestris*) lived near water bodies;
4) Forest biotopes were hospitable for forest dormouse (*D. nitedula*) and yellow-necked (field) mouse (*A. flavicollis*) typically recovered from lower units of Kabazi II. White-toothed shrew (*C. leucodon*) also seems to have preferred bush and forest biotopes.

Judging from the taxonomic composition of Crimean fauna, environments of the Crimean mountains in Mikulino time were highly diversified (Fig. 2). In the vicinities of the site open steppe landscapes on sunlit slopes and plateaus alternated with forest and bush biocenoses on shaded slopes and depressions. Floodplain meadows occupied valley bottoms.

Several species identified from the indicated units have disappeared from this region, probably as early as the Holocene. Mole rat and bobak marmot are found at present somewhat farther north on the East European Plain, in the steppe and forest-steppe zones.

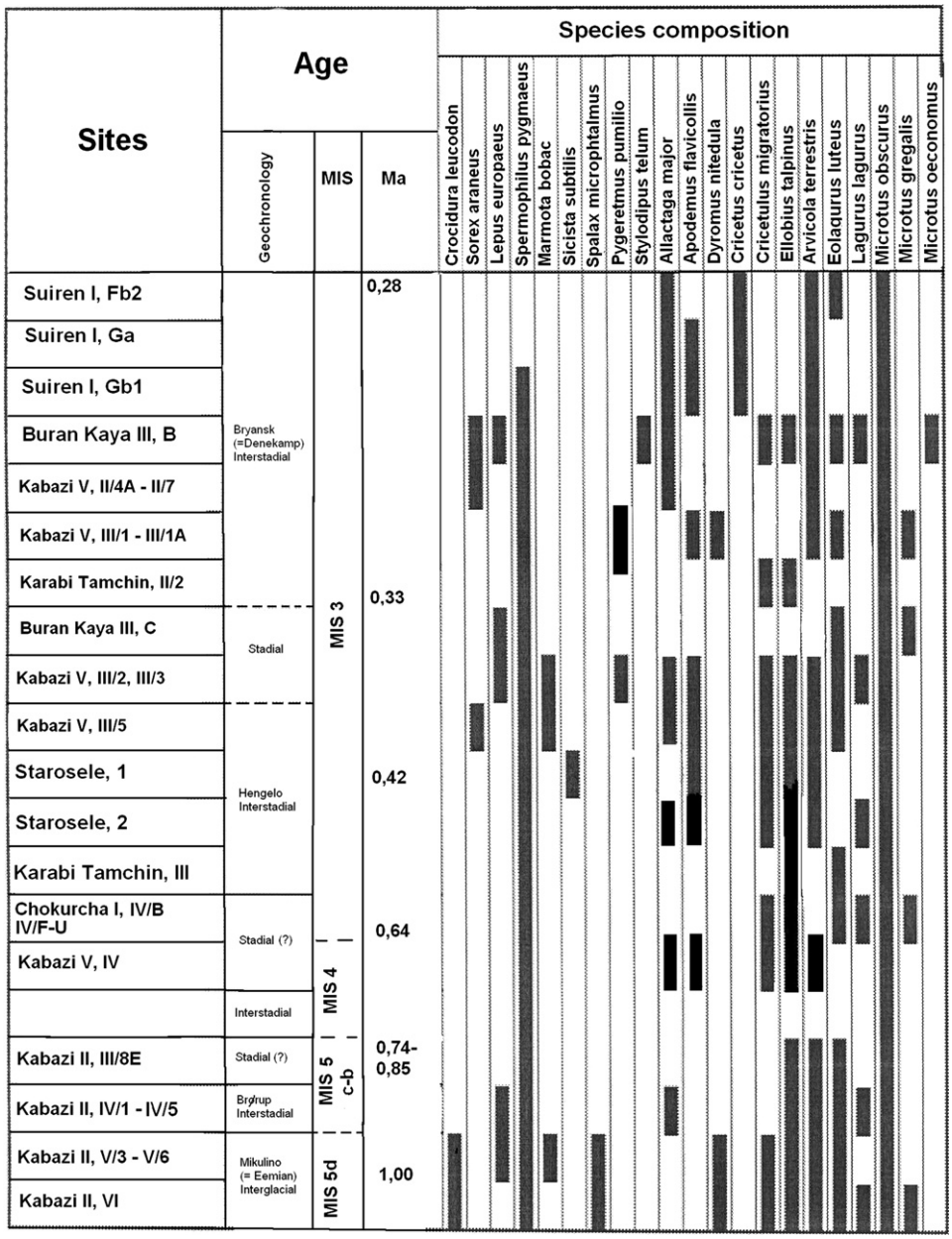

Fig. 2. Species composition of small mammals recovered from cultural layers of the Palaeolithic sites in the Crimea.

Mole rat occurs in forest-steppes and high-grass steppe as far east as the Volga and as far north as Tula and Penza. In the West Caucasian forelands it prefers depressions with fertile soils and dense grass and herb vegetation. In the Crimea this species has been found only at the Kabazi II site and only in the Mikulino interglacial deposits.

Forest dormouse is a typical inhabitant of southern deciduous forests, and at present it is also absent from the modern Crimean fauna, though occurs in forests of Moldavia, the Caucasus and Kopet-Dag. Yellow steppe lemming lived in the East European steppes through the whole Pleistocene. In colder stages (such as the Valdai and earlier glaciations) its range expanded northward and westward, while in the Holocene it was strikingly reduced in area and at present the species is found only in the Zaisan Basin (Central Asia), in Mongolia and China.

Narrow-skulled vole and its ancestral forms were present in steppe faunas over the last million years. In common with yellow steppe lemming and steppe lemming, the species penetrated far north and west during glaciations and inhabited open periglacial landscapes of various kinds. It was a typical constituent of the Mammoth faunal assemblage (Markova and Kolfschoten, 2008). At present, the narrow-skulled vole occurs in northeast European Russia, in the Urals, over the greater part of Siberia and the Amur drainage basin (the Zeya lower reaches). It prefers open landscapes, from tundra and high mountains to steppes and semi-deserts.

3.2. Early Valdai (MIS 5c-b)

From the palynological evidence, unit IV of the Kabazi II is dated to the early stages of the last glaciation and is correlatable with interstadial warming Brørup – St Germain – Priluki (Gerasimenko, 2005). Small mammal fauna recovered from this unit includes 8 species: Lagomorpha: *Lepus* sp., Rodentia: *S. pygmaeus* Pallas,

Allactaga major Kerr, *E. talpinus* Pallas, *E. luteus* Eversmann, *L. lagurus* Pallas, and *A. terrestris* L., *M. (Microtus) obscurus* Eversmann. The fauna is poorer in composition than that of earlier units. It is dominated by species of open landscapes, with some species present that typically live near water bodies and in meadows. No species adapted to forest environments have been found. The fauna likely reflects changes in climate related to the Valdai cooling and increase in aridity, with suppression of forest communities as a result.

Scarce remains of small mammals recovered from the overlying horizon Kabazi II, III/8E included *E. talpinus* Pallas, *E. luteus* Eversmann, *A. terrestris* L., and *M. (Microtus) obscurus* Eversmann. No typical forest species have been identified in the assemblage, considered as evidence of increasing aridity (Figs. 1 and 2).

The fauna of Kabazi V, III/7 and III/6 seemingly belongs to the early Valdai stadial cooling (the earlier stage of the Weichselian) (MIS 4). The fauna includes 6 species: *S. pygmaeus* Pallas, *A. major* Kerr, *E. talpinus* Pallas, *E. luteus* Eversmann, *A. terrestris* L., and *M. (Microtus) obscurus* Eversmann. Marked by predominance of species typical of open landscapes and absence of forest animals, the fauna is similar to that recovered from Kabazi II site, unit III/8E.

3.3. Middle Valdai (MIS 3)

Early humans were widespread in the Crimea over a prolonged period of the Middle Valdai interstadial (~64–24 ka BP). Faunas recovered from Palaeolithic sites Chokurcha I (cultural layer IV) and Starosele (horizons 3 and 4) are likely to belong to the first half of the megainterstadial.

A characteristic feature of faunas attributable to that interval is prevalence of species typical of open steppe landscapes, among them grey hamster (*C. migratorius*), northern mole-vole *(E. talpinus*), steppe lemming (*L. lagurus*), and others. Ever-present constituents of the faunas are Altaic vole *M. obscurus* (this species is dominant in all the Crimean faunas) and water vole (*A. terrestris*), an intrazonal species living near water bodies. No forest species has been found.

Some later radiocarbon-dated faunas are correlatable with *Hengelo interstadial* (Kabazi V, III/5 and III/4; Starosele, 1 and 2; Karabi Tamchin, III). Apart from a greater amount of steppe inhabitants are several species (in Starosele, 1, and Kabazi V, III/5–III/4) related to forested areas, such as yellow-necked (field) mouse (*A. flavicollis*), mole (*Talpa* sp.), and common shrew (*Sorex araneus*). At present, the yellow-necked mouse occurs all over the mountain forest zone in the Crimea. Mole prefers to live at the forest edge and on floodplains. Common shrew is widespread and dwells mostly in forest and forest-steppe landscapes as well as near rivers and lakes. It seems likely that the warm interval featured somewhat increased rainfall that resulted in expansion of forested area and wider occurrence of forest dwellers.

The Hengelo interstadial was followed by a stadial cooling. Archeological and geological data attribute horizons Kabazi V, III/3 and III/2, and Buran Kaya III, C, to that cooling (Chabai, 2008). Small mammal fauna recovered from the horizons includes a considerable number of species: *S. pygmaeus* Pallas, *M. bobac* Mull., *A. major* Kerr, *Pygerethmus pumilio* Kerr, *D. nitedula* Pallas, *A. flavicollis* Melch., *E. talpinus* Pallas, *C. migratorius* Pallas, *A. terrestris* L., *E. luteus* Eversmann, *L. lagurus Pallas, M. obscurus* Eversmann, and *M. gregalis* Pallas. The fauna is similar in species composition to the underlying units of Kabazi V. In the Kabazi V, III/2, III/3 dominant are inhabitants of open landscapes, though some forest animals, yellow-necked mouse (*A. flavicollis*) and forest dormouse (*D. nitedula*), are also present. In the same layers, bone remains of lesser five-toed jerboa (*P. pumilio*) are found. At present, this species lives in arid environments with clayey soils and sparse vegetation including succulents. Diversity of habitats near the Palaeolithic sites sustained such ecologically different animals as yellow-necked mouse and forest dormouse on one hand and lesser five-toed jerboa and yellow steppe lemming (*E. luteus*) on the other. Small mammal fauna recovered from Buran Kaya III, C, includes only species typical of open landscapes and those living near water. Of interest is the presence of narrow-skulled vole (*M. gregalis*) remains in this layer. Originally a representative of steppe fauna, this species was widespread during the last glacial.

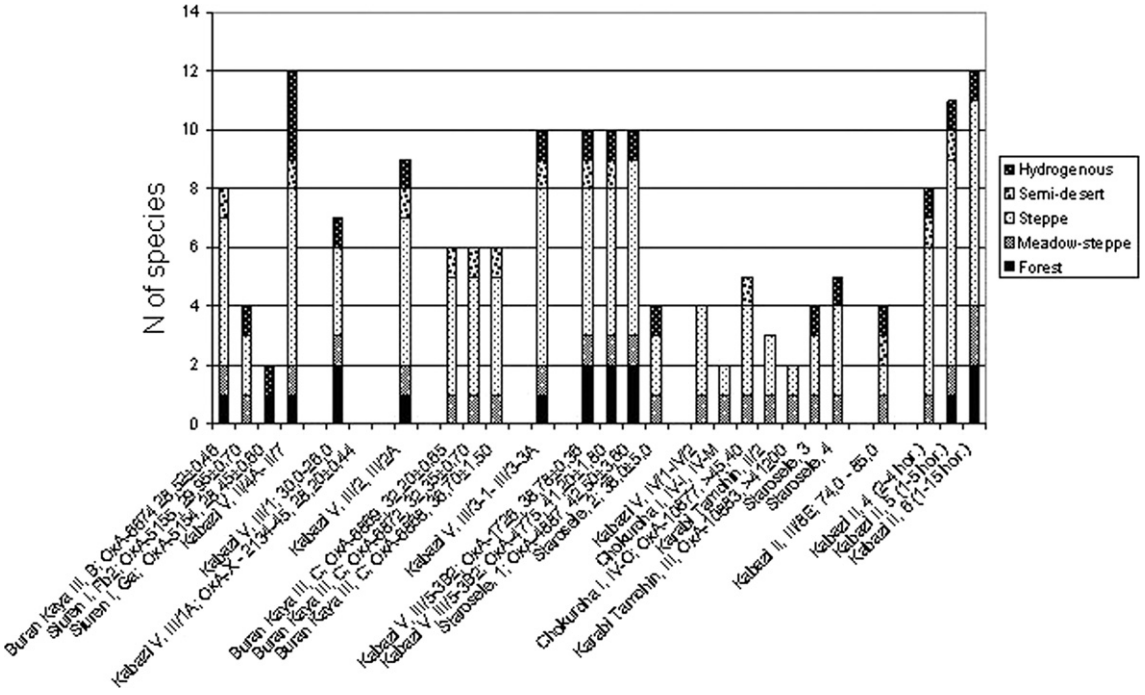

Fig. 3. Ecological groups of small mammals from the Palaeolithic sites in Crimea. Names of sites and dates (AMS and ESR) are shown on *X* axis, and number of species in ecologically different groups on *Y* axis.

In the Bryansk interstadial (=Denekamp), the presence of the forest species yellow-necked mouse (*A. flavicollis*) was recorded in the fauna from Syuren I site (Fb2, Ga, Gb1). Buran Kaya III, unit B, (also correlated with this interstadial) yielded no forest species. Among the open landscape species recovered from the named horizons at Syuren I and Buran Kaya III were identified little ground squirrel (*S. pygmaeus*), great jerboa (*A. major*), European hamster (*Cricetus cricetus*), yellow steppe lemming (*E. luteus*), and Altaic vole (*M. obscurus*) (Fig. 2). Remains of thick-tailed three-toed jerboa (*Stylodipus telum*) were found in Buran Kaya III, unit B. This rodent is a characteristic dweller of deserts, semi-deserts and partly steppes in the southern Ukraine (sandy landscapes east of the Dnieper lower reaches), in the lower reaches of the Don, in the North Caucasian forelands, in the middle and lower reaches of the Volga, and in Kazakhstan and Central Asia. Its preferred habitats are stony and clayey surfaces, sands, solonetz soils, and more rarely *Artemisia* and grass steppe. Finds suggest that patches of semi-desert or dry steppe landscapes existed in the vicinity of the Buran Kaya III site (most likely, on plateaux) even during the Bryansk (Denekamp) interstadial. Remains of some species typical of forest and near water biotopes: common shrew (*S. araneus*), forest dormouse (*D. nitedula*), and tundra vole (*Microtus oeconomus*), were recovered from horizons II, III/1 of Kabazi V site correlatable with the Bryansk interstadial. Common shrew inhabits forests, forest-steppes and river floodplains of European Russia and Siberia, and avoids wetlands and dry forests. Tundra vole occurs mostly in wetlands from forest-tundra to forest-steppe with the exception of southern European Russia, the Caucasus and part of the Amur drainage basin. *M. oeconomus* now is abundant on wet meadows and glades, on cleared areas in forests, in open woodlands and bushes near lakes and on floodplains. In common with other sites in Crimea, the fauna from the Kabazi V horizons related to the Bryansk warming was dominated by Altaic vole *M. obscurus*. Being a grass eater, the vole prefers moderately wet biotopes with a well-developed grass stand. The mosaic pattern of the Crimean mountains permitted steppe and semidesert animals to dwell in the vicinity of forest and meadow species habitats (Fig. 3).

4. Conclusion

The main features of small mammal faunas recovered from the sites in the Crimea may be summarized as follows:

1) Faunas of the Palaeolithic sites in the Crimea lacks cold-tolerant species, such as collared lemming (*Dicrostonyx torquatus*), Siberian lemming (*Lemmus sibiricus*), arctic shrew (*Sorex arcticus*), and the like;
2) Dominant in all the faunas are inhabitants of open landscapes. Some have persisted in the Crimea up to the present; others changed their range drastically and live at present farther east or in northern regions (yellow steppe lemming, narrow-skulled vole, thick-tailed three-toed jerboa, dwarf fat-tailed jerboa, bobak marmot) (Figs. 2 and 3).
3) Forest species remains are few in number. Animals adapted to forest biotopes were recorded in faunal assemblages synchronous to the Mikulino (Eemian) interglacial (materials from Kabazi II, V, VI), as well as in faunas correlatable with Hengelo (Kabazi V, III/5; Starosele 1) and Denekamp–Bryansk interstadials (Buran Kaya III, B; Syuren I, Ga; Kabazi V, II/4a-II/7, III/1 and III/1A) (Figs. 2 and 3). The presence of those species suggests more humid environments during those intervals. There is no question, however, that forest animals persisted in Crimea even during stadial cooling, though their ranges were considerably reduced.
4) Some species of open landscapes described in the Palaeolithic sites in the Crimea are found now farther to the east. Yellow steppe lemming occurs at present in the Zaisan Basin, in Mongolia, and China; narrow-skulled vole inhabits treeless landscapes in the northeast of Eastern Europe, in the Urals, and in tundras and steppes of Siberia. Ranges of lesser five-toed jerboa and thick-tailed three-toed jerboa were reduced and shifted eastward. Mole rat remains were only found in the Mikulino layers of Kabazi II; at present it occurs in Eastern Europe, north of the Crimean peninsula. The range of bobak marmot (now absent from the Crimea) has changed in a similar way.

The study of small mammal faunas recovered from seven Palaeolithic sites in the Crimea allows a conclusion that the peninsula (island in Mikulino time) served as a refugium during the Late Pleistocene, including the LGM. It was there that a sizeable group of species survived during the unfavorable interval of the Valdai cold stage. The geographical position of the Crimea and resulting stability of climate, as well as the relative isolation from the East European Plain, ensured survival of many small mammals throughout the Late Pleistocene. Species of different ecological preferences found suitable habitats in the diversified landscapes of the mountainous Crimea. Unlike the faunal assemblages recovered from localities in the central and northern regions of the East European Plain and dated to the last glaciation, the Valdai faunas in the Crimea preserved a high species richness of small mammals. A complete absence of cold-tolerant small mammals from cultural layers of Middle and Late Palaeolithic sites in Crimea suggests rather mild climatic conditions in the region throughout the Late Pleistocene. Undoubtedly, the environments were also hospitable for humans.

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