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Small fossil mammals from the Kurtak Archaeological Region (Krasnoyarsk District)

ANATOLY A. KRUKOVER[1] - VITALIY P. CHEKHA[2]

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Abstract: New data on the small mammal fauna from the Quaternary deposits of the Berezhekovo site of the Kurtak archaeological region are presented. Small mammal remains of *Cricetulus* sp., *Citellus* sp., *Allophaiomys pliocaenicus, Prolagurus pannonicus* and *Mimomys intermedius* have been recorded in situ in the fluvial sediments (Berezhekovo 21/5 locality) and at seven other sites from sandy deposits along the Krasnoyarsk reservoir.

Among the small mammal remains gathered on the present beach, four groups of species characteristic of different stages of the microfauna development are identified: group I – Razdolye faunal complex (late Eopleistocene); group II – Viatkino faunal complex (early Middle Pleistocene); group III – fauna typical of the beginning of Middle Pleistocene; group IV – species that existed within a wide time span. Species of group II are associated with the localities confined to lower erosional sections. This allows these layers to be dated to the early Middle Pleistocene.

[1]*United Institute of Geology, Geophysics and Mineralogy, Siberian Branch of the Russian Academy of Sciences (UIGGM SB RAS), Universitetsky prospekt 3, 630090 Novosibirsk, Russia*

[2]*Institute of Archaeology and Ethnography, Siberian Branch of the Russian Academy of Sciences (IAE SB RAS), Laboratory of Archaeology and Palaeogeography of Central Siberia, Akademgorodok, Krasnoyarsk Scientific Centre, 660034 Krasnoyarsk, Russia*

INTRODUCTION

The Kurtak archaeological region is situated in the North Minusinsk Basin in the southern part of Central Siberia, and occupies a portion of the left bank of the Krasnoyarsk reservoir about 20 km long (Fig. 1). The Quaternary deposits are most comprehensively represented at the Berezhekovo site. They occur here 50 to 70 m above the original (now flooded) Yenisey River level and are represented by loessic accumulations of different geological age, separated by palaeosol horizons and fluvial sediments (Fig. 2).

A section has been studied in detail from the geological viewpoint. Rich palaeontological, palaeomagnetic and palaeopedological data, TL and ^{14}C dates have been obtained in the process of archaeological investigations (sine 1990, DROZDOV et al. 1990, 1992, ARKHIPOV et al. 1992).

In 1992–1993, the authors performed systematic palaeontological investigations which allowed a more precise understanding of the age of the lower part of the Quaternary deposits at the Berezhekovo site. Remains of small mammals were found in situ in the fluvial unit (Berezhekovo locality) and collected at seven other sites on the beach of the Krasnoyarsk reservoir (Fig. 2).

OCCURRENCES OF SMALL MAMMALIAN FAUNA

1. LOCALITIES ON THE BEACH

Present day erosion of the exposed Pleistocene outcrops led to large accumulations of the fossil faunal material on the surface of the reservoir beach. Table 2 indicates the species defined from several study sites (Fig. 2).

The fauna is heterogenous in composition. Four groups of species characteristic of different stages of microtheriofauna development have been identified. They can be correlated with the faunal complexes of small mammals of West Siberia described in detail by ZAZHIGIN (1980).

Group I contains scarce M_1 species *Allophaiomys pliocaenicus* and *Prolagurus pannonicus*, of a comparatively progressive structure. They can be tentatively associated with the Razdol'ye Complex of microtheriofauna (a late stage of faunal development with *Allophaiomys pliocaenicus*, from the second half of Eopleistocene. These remains have been presumably reworked from the Berezhekovo 212/5 locality 212/5 locality (Table 2). Group II includes species like *Microtus* ex gr. *hintoni-gregaloides, M.* cf. *nivaloides, Prolagurus posterius, Lagurus transiens* etc., typical of the

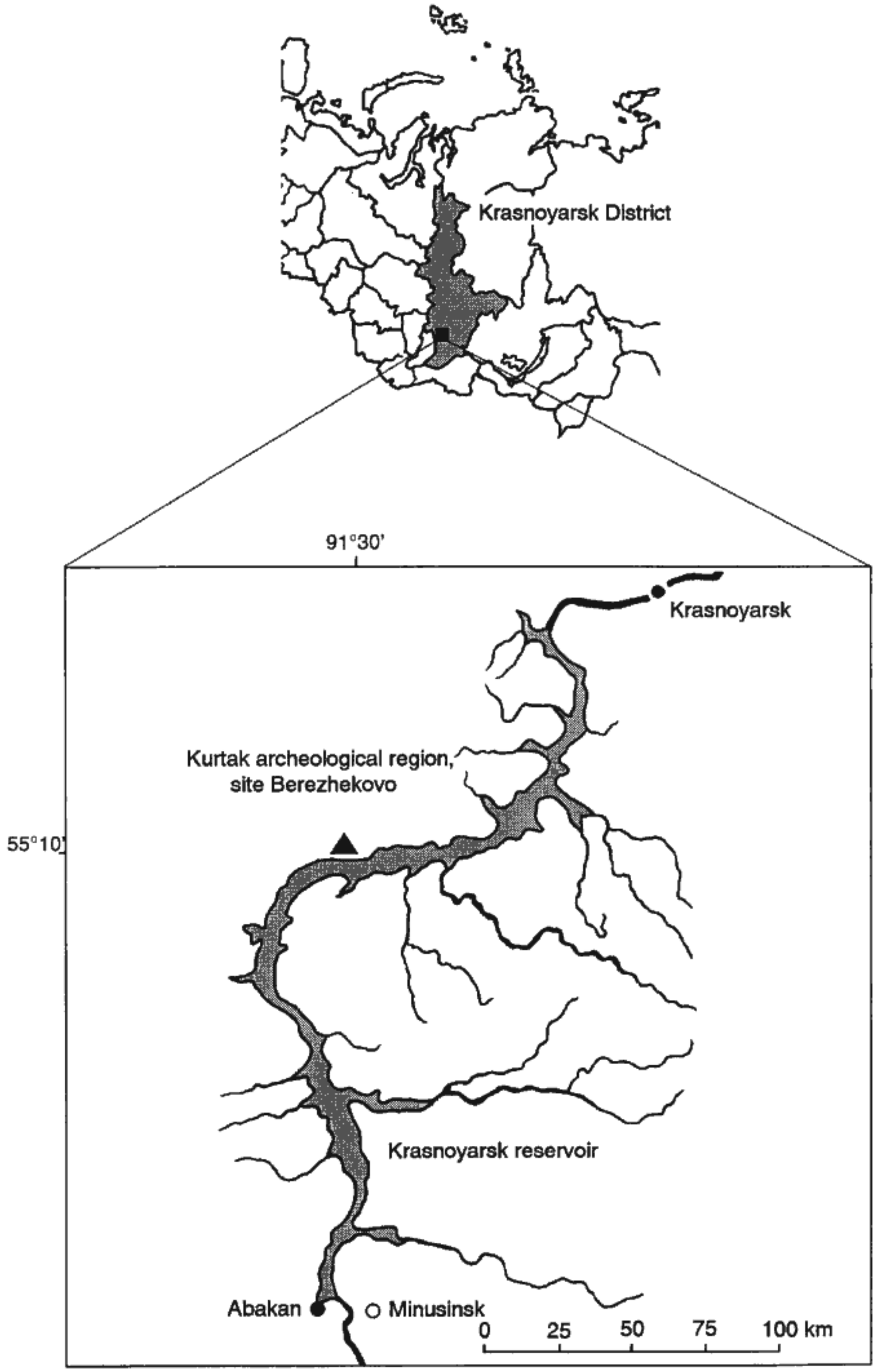

Fig. 1. Location of the Berezhekovo site of the Kurtak archaeological region (Northern Minusinsk Basin).

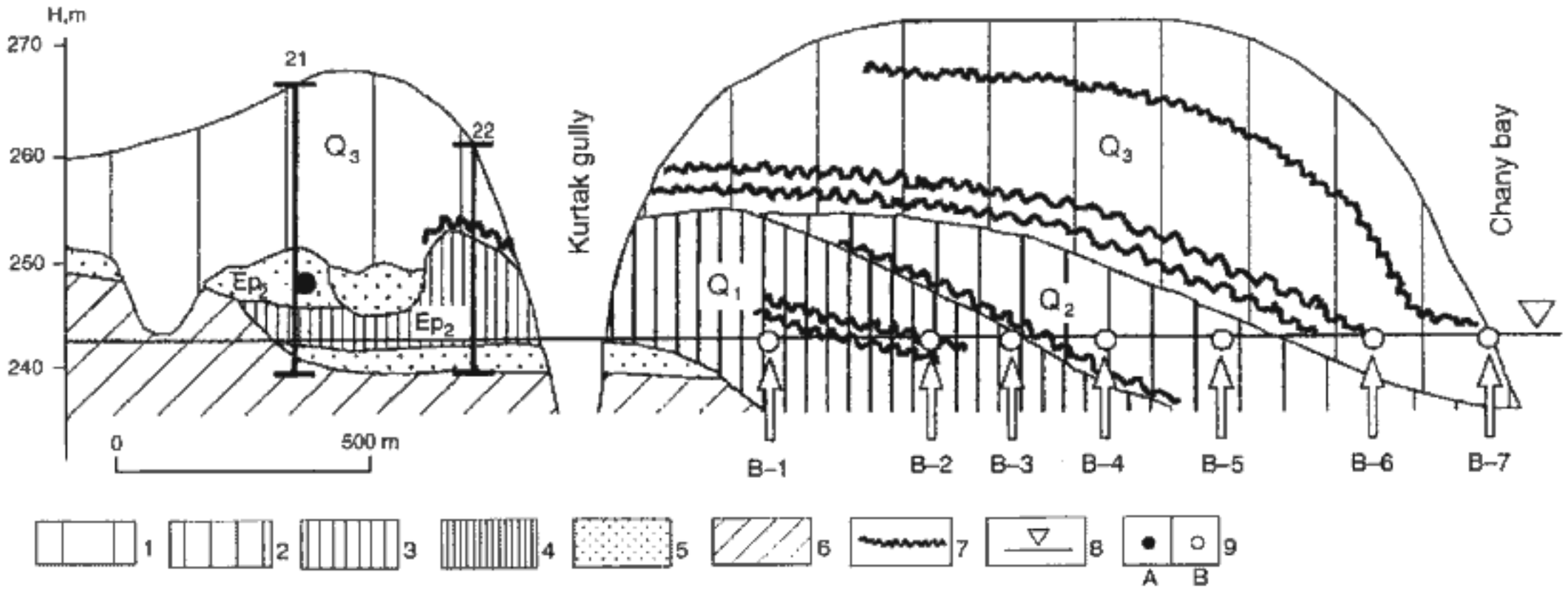

Fig. 2. Schematic geological profile of the Berezhekovo site.
1 – loess, loess-like loam and sandy loam of different geological age; 2 – colluviated loess; 3 – sand and silt; 4 – alluvium; 5 – sand and gravel; 6 – Carboniferous sandstone; 7 – paleosols; 8 – water level in the Krasnoyarsk reservoir; 9 – palaeontological localities, A – in situ, B – washed on the present beach.

early Middle Pleistocene (the Viatkino Complex according to ZAZHIGIN 1980), i.e. < 780 ka BP.

Group III consists of species which appeared for the first time during the Late Pleistocene. They occur at all localities being redeposited from loess deposits.

Species that existed during a long interval (from Lower Pleistocene untill the present time) as well as those whose first appearance is not dated, compose group IV. Like group III, these species are present at all localities.

In analyzing the composition and quantitative ratio of the single groups (see Table 2 and Fig. 3) identified in the area, the following conclusions can be drawn.

1. Species of group I (late Eopleistocene) occur very rarely. They are identified at the sites situated 200–700 m south of the Kurtak gully, in a zone of earliest Quaternary loess and palaeosol distribution in the Kurtak area.

2. The early Pleistocene species (group II) occur in great amounts at Berezhekovo 1 and 2 localities, which are close to the places of intensive erosion of the lowest buried soils (Fig. 2, 3). Most of the forms probably originate from these soils. Thus, the palaeosols occurring at the base of these sections and loess-like loams are supposed to be of an early Middle Pleistocene age. This conclusion is confirmed by a TL date of 540 ± 42 ka BP obtained from the basal soil (ARKHIPOV et al. 1992).

3. Species of groups III and IV occur at all localities. The constant occurrence of species existing from the beginning of Middle Pleistocene indicates the availability of deposits of the corresponding geological age.

2. BEREZHEKOVO 21/5 LOCALITY – in situ

The locality occurs within the fluvial deposits (Fig. 2); the stratigraphy of the sampling site is shown in Fig. 4. Remains of small mammals, are found in sand lenses (layer 5). In total, 28 well-preserved fossil remains are found (only 5 of them, i.e. 17.9 % are damaged).This indicates minimal reworking of the material before burial. Taxonomically, the following species have been identified:

Cricetulus sp. (maxilla fragment with M^1 and isolated M_1, *Citellus* sp. (2 mollars), *Allophaiomys pliocaenicus* (4 M_1),

Prolagurus pannonicus (5 M_1) and *Mimomys intermedius* (1M^1 and 1M^3).

BRIEF DESCRIPTION OF THE INDEX SPECIES

Family *Arvicolidae* GRAY, 1821

Prolagurus pannonicus KORMOS, 1930

Fig. 5: 1–5, material 5M^1, 1M^1, 1M^2
Locality: Berezhekovo 21/5
Age: Eopleistocene
Measurement: Length 2.28 2.35 2.35 2.10 2.00
Width 0.85 0.90 0.88 0.85 0.75
Description: Molars are rootless, deprived of cement. Enamel is thicker on anterior sides of triangles of the lower molars and on posterior sides of triangles of the upper molars. The occlusal surface of M_1 forms a posterior lobe and 3 alternating triangles. Triangles of the anteroconid complex are connected with each other and separated from the anterior cap. Two M_1 have a simple structure of anterior cap (Fig. 5: 1–2). One M_1 has a progressive feature – an additional slightly concave enamel fragment on the anterior-buccal side of the anterior cap (Fig. 5: 3). A complex structure of the anterior cap of juvenile samples of M_1 (Fig. 5: 4–5) cannot be considered.

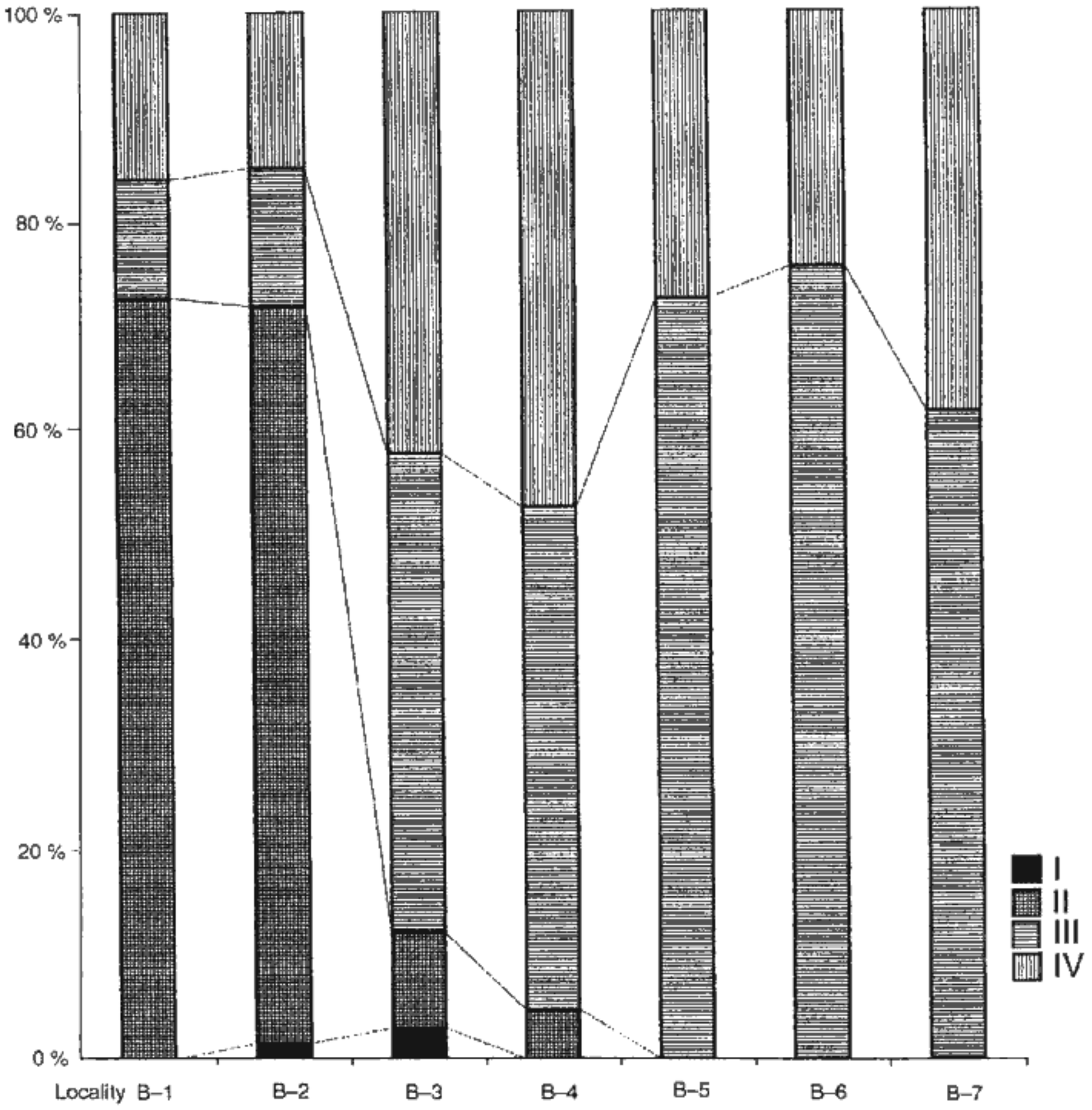

Fig. 3. The relative proportions of small mammal species for groups I–IV (localities on the beach).

Allophaiomys pliocaenicus KORMOS, 1933

Fig. 5: 6–9, material $4M_1$, IM_2, $6M^1$, $2M^2$
Locality: Berezhekovo 21/5
Age: Eopleistocene
Measurement: M^1 Length 2.50 2.43 2.25
Width 1.00 1.00 0.90
Description: Molars are rootless. The synclines are filled with crown cement. The occlusal surface of M_1 forms a posterior lobe, 3 alternating triangles and the anteroconid complex consisting of the broadly communicating 2 triangles and the anterior cap. One M_1 has a round anterior cap (Fig. 5: 6), two others (Fig. 5: 7–9) have small concave enamel spots from both sides of the anterior cap. In addition, one of M1 (Fig. 5: 8) shows a tendency towards a separation of triangles of an anteroconid complex.

The enamel has an equal thickness on both anterior and posterior sides of triangles ($2M_1$ – Fig. 5: 8–9) being slightly thicker on anterior sides- a very weakly manifested Microtus-type of enamel differentiation ($2M_1$, Fig. 5: 6–7).

Mimomys intermedius NEWTON, 1881

Fig. 5: 10, material $1M^3$, $1M^1$
Locality: Berezhekovo 21/5
Age: Eopleistocene
Measurement: M^3 – length 1.8; width 0.80
Description: The teeth are very hypsodont, but rooted as shown by closing of the re-entrant angles toward the base. Synclines are filled with cement. Enamel is differentiated according to the Mimomys-type: it is thicker on the anterior sides of triangles.

The occlusal surface of M^3 forms 2 lingual and 2 buccal re-entrant angles. The second buccal re-entrant

angle is deep, filled with cement and does not form an enamel islet. Dentine tracts are well developed. Enamel is lacking on side parts of the anterior loop and the dorsal part of the posterior cap. Such a structure of M^3 is typical of *M. intermedius*.

DISCUSSION

Most of the fossil material in the Berezhekovo 21/5 locality consists of rootless voles *Prolagurus* and *Allophaiomys*. Rooted forms are rare. Such a proportion is typical of the Radzoľye faunal complex (ZAZHIGIN 1980). This

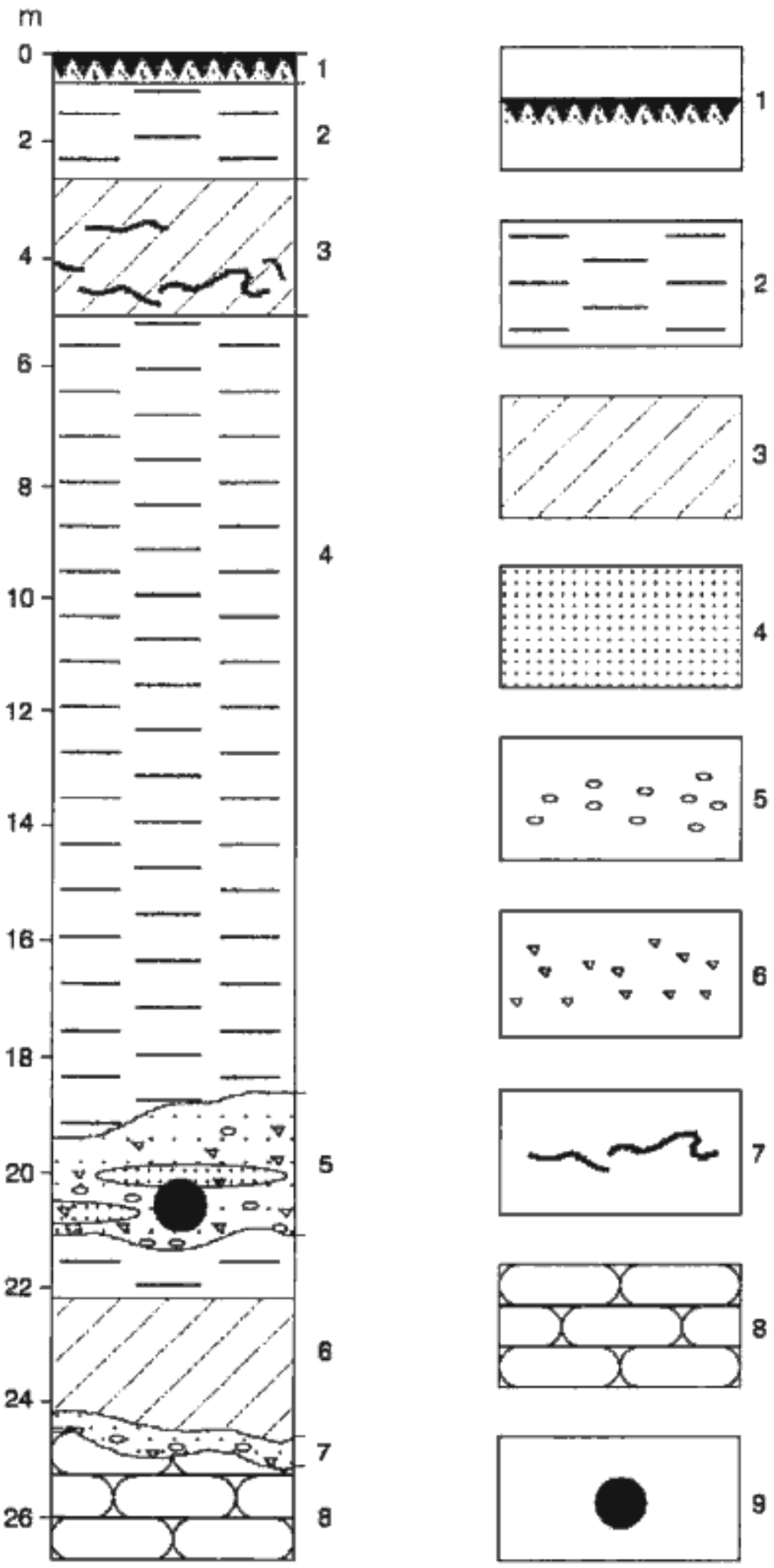

Fig. 4. Geological section 21.
1 – modern soil; 2 – sandy loam, silt; 3 – loam; 4 – sand; 5 – gravel; 6 – pebble; 7 – humus-loam concretions; 8 – Carboniferous sandstone; 9 – the Berezhekovo 21/5 locality sampling site.

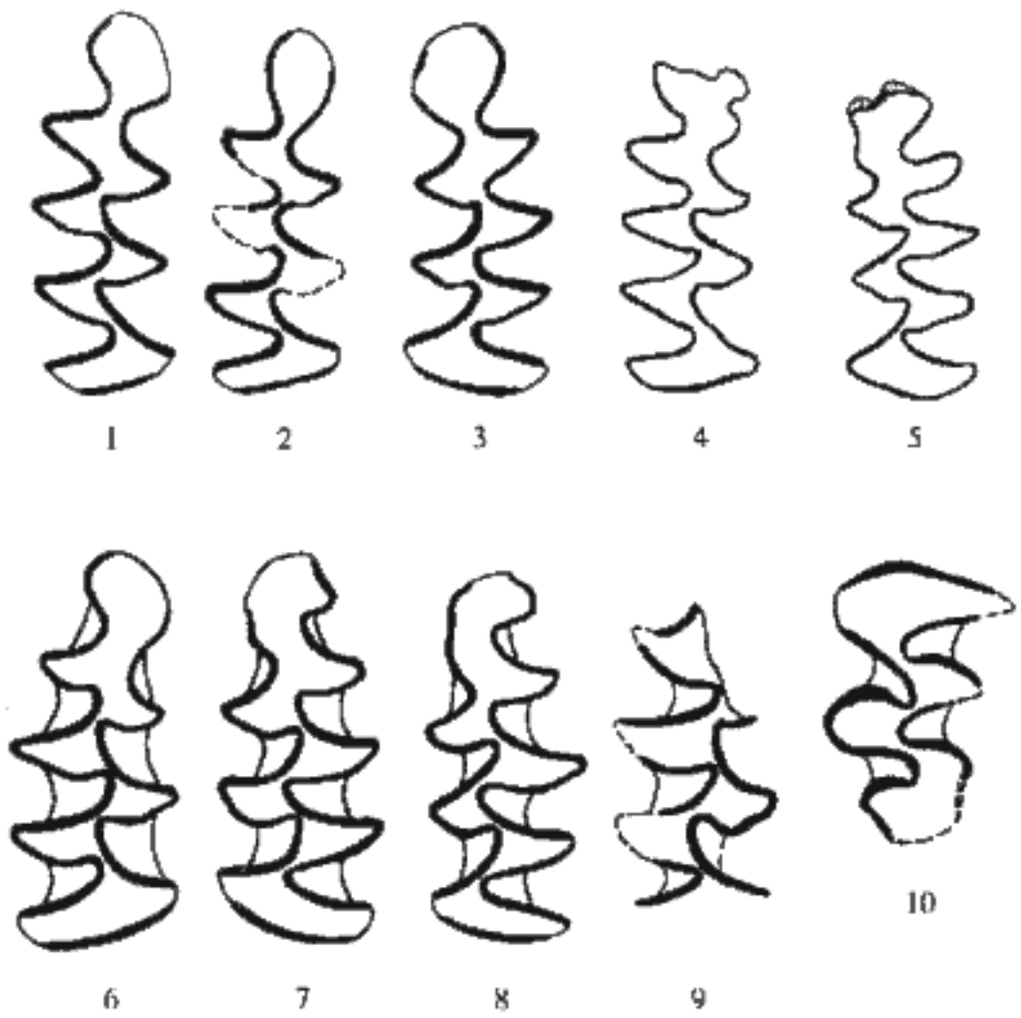

Fig. 5. Vole molars from the Berezhekovo 21/5 locality.
1–5 – *Prolagurus pannonicus* (M_1); 6–9 – *Allophaiomys pliocaenicus* (M_1); 10 – *Mimomys intermedius* (M^3).

Table 1. Stratigraphical scheme of Quaternary

Global scale				General scale				Faunal complex (West Siberia)
System	Series	Geochronometry MA BR	Magnetostr.	System	Super-subdivision (series)	subdivision (subseries)	link	
Quaternary	Holocene	0.01	Brunhes	Quaternary	Holocene			
	Pleistocene Upper				Pleistocene	Pleistocene	Upper	
	Pleistocene Middle						Middle	
	Pleistocene Lower		Matuyama				Lower	Vlatkino
						Eopleistocene	Upper	Razdol'ye
		1.6					Lower	Kisicha
ICS, 1989				ISC of Russia				

complex is well described in West Siberia and correlated with the Taman Complex of Ukraine and the European part of Russia and with the Biharian fauna (the Nagyharsanyhegian substage according to JANOSSY 1986).

The Razdoľye Complex differs from the ancient Kisicha Complex by a lesser variability of the Mimomys

Table 2. Small mammals from the river bank locality

Group	Species	Locality						
		B-1	B-2	B-3	B-4	B-5	B-6	B-7
I	*M. oeconomus aut Allophaiomys* sp.		3	1				
	Prolagurus		2					
II	*M. ex gr. hintoni-gregaloides*	26	179	1	1			
	M. nivaloides	5	40	1				
	Prolagurus posterius	1						
	Lagurus transiens		5	1				
	Mimomys sp.		1					
	Myospalax sp.		2					
III	*Microtus gregalis*	2	30	12	5	25	19	25
	M. arvalis-agrestis		2		1	1		
	Lagurus lagurus	3	10	2	3	12	10	17
	Eolagurus eolagurus				1		4	
	Arvicola terrestris		1		1	2	2	4
	Myospalax myospalax					1		2
IV	*M. oeconomus*	1	8	4	1	4	2	10
	Eolagurus sp.		2					
	Clethrionomys glareolus	5	14	1	1	1		3
	Clethrionomys rufocanus		4	1		4	1	3
	Lemmus sp.	1	3	2	1	1	2	1
	Insectivora gen.		5	1	1	2	1	
	Lepus sp.		1					1
	Ochotona sp.		3	2	2	2	1	2
	Citellus sp.		5	2	1			2
	Cricetus sp.		2		1	1		
	Cricetulus sp.		1	1	1	2	1	
	Ellobius sp.				1		2	2

species, the appearance of more complicated morphotypes of occlusal surface of the M_1 *Allophaiomys pliocaenicus* and *Prolagurus pannonicus*, and the emergence of the first *Microtus (M.* ex gr. *hintoni-gregaloides*).

The Berezhekovo fauna is similar to faunas of the Razdol'ye Complex both in ratio of rooted and rootless voles' number and morphology of M_1 *A. pliocaenicus* and *P. pannonicus*. It is noteworthy that in Berezhekovo there are no *M.* ex gr. *hintoni-gregaloides* typical of the Razdol'ye faunal complex. However, fossil remains of these voles (*M.* cf. *hintoni* according to ZAZHIGIN 1980) have been found in the neighbouring Section 22 in a layer identical to layer 6 of section 21 (Fig. 2 – see sine 1990). Thus, the lack of *M.* ex gr. *hintoni-gregaloides* in the Berezhekovo 21/5 can be explained by the overall low amount of the collected material.

The presence of the fossil fauna of the Razdol'ye Complex in the lower layers of Section 21 allows the fossil-bearing deposits to be assigned to the second half of Eopleistocene. This conclusion is confirmed by palaeomagnetic investigations, indicating that the lower layers in the section belong to the reverse magnetic polarity zone (Matuyama Epoch).

CONCLUSION

The new fossil material from the Quaternary deposits of the Berezhekovo area allows a more precise age estimate to be made of the strata occurring at the bottom part of sections. The Razdol'ye and Viatkino faunal complexes date these deposits into the second half of Eopleistocene and early Pleistocene. This confirms the assumption that the Quaternary sequence of the Kurtak archaeological region is most completely represented at the Berezhekovo site.

Recommended for print by O. Fejfar

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APPENDIX

QUATERNARY RODENTS OF THE NE PART OF THE ALTAI-SAYAN MOUNTAIN REGION

O. V. ANDRENKO - N. D. OVODOV - V. S. ZAZHIGIN - V. P. CHEKHA

The summarised data show the presence of three specific groups of small fauna:

a) modern species having the same past geographical distribution as the present one; b) living species found beyond the present distribution zones; c) extinct species. Particularly relevant is the second group, which indicates changing Pleistocene environments by the presence of southern steppe and semi-desert species (i.e. *Allactaga* sp., *Ellobius talpinus, Cricetulus-Allocricetulus* sp., *Eolagurus lubeus*) and northern tundra and forest-tundra species (i.e. *Dicrostonyx gulielmi, Lemmus obensis, Microtus middendorfi-hyperboreus*). The second group also includes specific non-analogue (mixed) cold periglacial communities of small fauna, comprising typical southern steppe rodent taxa (e.g. *Articola argentatus, Lagurus lagurus*) in direct association with the typical northern taxa (e.g. *Dicrostonyx gulielmi*).

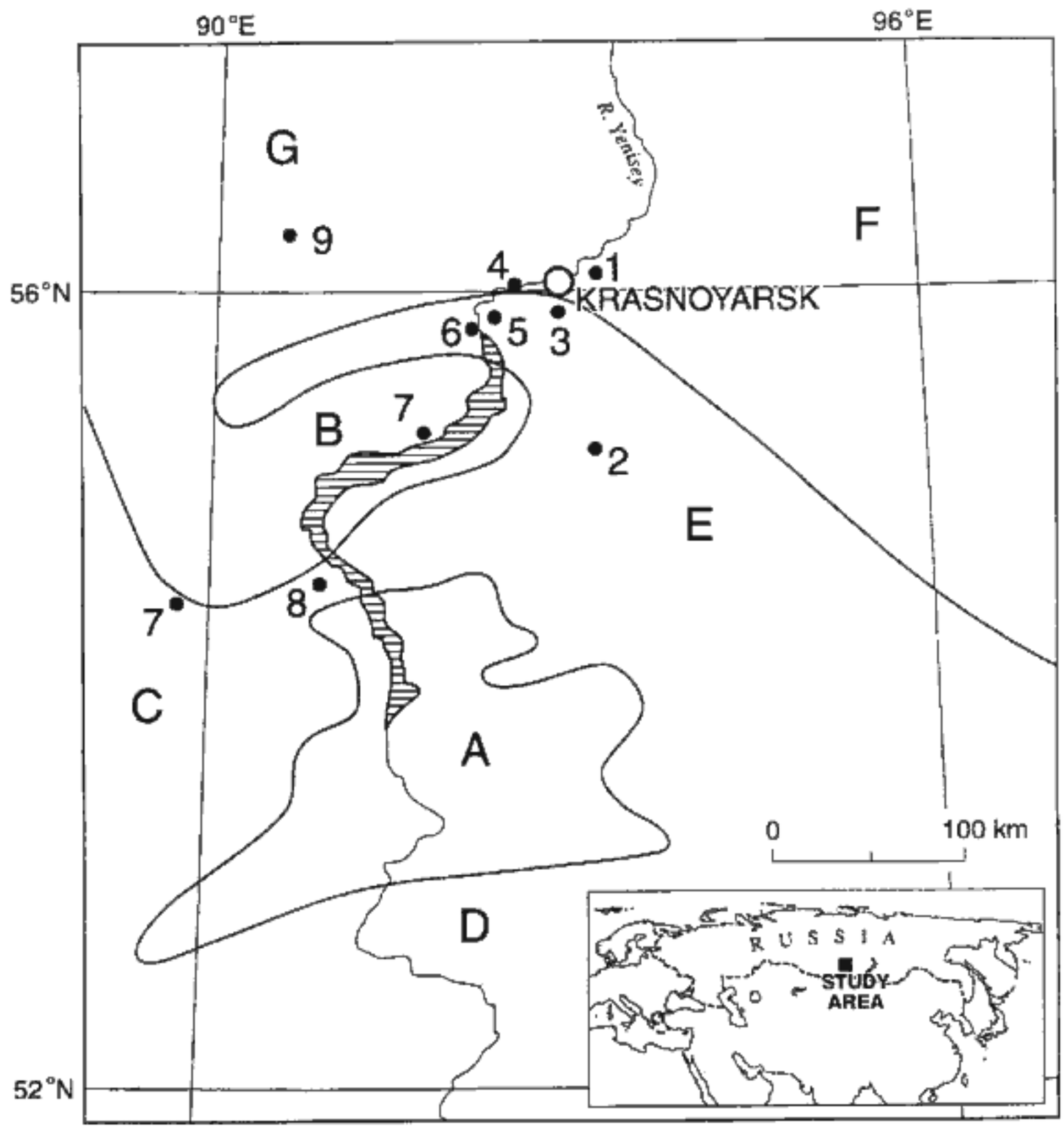

Fig. 1. Location of the study areas and investigated sites. Geographical areas. A – Southern Minusinsk Basin; B – Northern Minusinsk Basin; C – Kuznetskiy Alatau Mountains; D – Western Sayan Mountains; E – Eastern Sayan Mountains; F – Kansk Basin; G – Krasnoyarsk Valley. Locations (open-air/cave) sites. 1 – Esaulovka 3 Site; 2 – Yelenev Cave; 3 – Torgansk Caves; 4 – Karaulnaya 1–3 Caves; 5 – Listvenka Site; 6 – Tunnel, Birrusinsk and Aidashinsk Caves; 7 – Kurtak Sites; 8 – Malaya Sia Site.

Table 1. Taxonomic distribution of the Pleistocene and Holocene rodents from cave and open-air sites in the northeastern part of the Altai-Sayan Mountain region. Chronological assignment: N2 (Lower Pleistocene), Q1 (early Middle Pleistocene), Q2 (late Middle Pleistocene), Q3/4 (late Upper Pleistocene), Q4 (Holocene).

	Esulovka-3 Site	Torgashinsky caves	Yelenev Cave			Karaulnaya - 1 Cave	Karaulnaya - 2 Cave	Cryntal Cave	Western Karaulnaya 3 Cave	Soviniy Naves Cave	Tugarino v Cave		Listvenka Site	Tunnel Cave	Birussinsky Eaves	Aidashinsk Cave	Kurtak Sites						Malaya Sia Site	
	Q_3^4	Q_4	Q_3^4	Q_3^4	Q_4	Q_4	Q_4	Q_4	Q_3^4	Q_4	Q_4	Q_4	Q_3^4	Q_3^4	Q_4	Q_4	N_2	Q_1	Q_2	Q_3	E	Q_3	Q_4
Pteromys sp.		+		+	+	+	+	+		+	+	+		+	+	+							+
Sciurus sp.		+		+	+	+	+	+		+	+	+		+	+						+		+
Tamias sp.		+		+	+	+	+			+	+	+			+								+
Citellus undulatus				+	+								+						+		+		
Citellus sp.		+	+	+	+	+	+	+		+	+		+	+	+	+	+		+	+	+	+	+
Marmota baibacina		+		+	+	+	+			+					+	+					+	+	+
Castor fiber				+		+										+						+	+
Sicista sp.				+	+															+			+
Allactaga sp.																				+			
Apodemus agrarius					+	+																	
Apodemus peninsulae				+	+	+																	+
Apodemus sp.		+		+	+						+												+
Micromys cf. minutus				+	+																		
Rattus norvegicus										+													+
Ellobius talpinus																					+	+	
Ellobius cxgr. talpinus																			+		+		
Myospalax myospalax																			+	++	+		
Myospalax sp.																				+	+		
Myospalax cxgr. myospalax																					+		
Myospalax cf. myospalax																					+		
Cricetus cricetus		+		+	+	+	+	+		+						+					+		+
Cricetus sp.				+	+																+		
Phodopus-Cricetulus-Allocricetulus sp.		+		+	+	+		+	+		+			+		+				+		+	+
Alticola			+	+	+				+	+	+	+		+									+
Clethrionomys rufocanus		+	.	+	+	+	+	+		+	+	+		+	+	+				+	+		+
Clethrionomys glareolus		+			.	+								+	+	+					+		
Clethrionomys rutilus		+	.	+	+	+		+	+	+	+	+		+	+	+				+	+		+
Clethrionomys rutilus-glareolus		+		+	+									+									
Clethrionomys sp.				+	+									+			+				+		
Prolagurus pannonicus																		+					
Prolagurus sp.																		+					
Lagurus transiens														+									
Lagurus lagurus			+	+	+				+		+			+					+	+	+	+	
Lagurus sp.																					+		
Eolagurus luteus					+						+												
Eolagurus sp																			+				
Dicrostonyx gulielmi	+		+						+				+										
Dicrostonyx torquatus									+					+							+		
Dicrostonyx cf torquatus																					+		
Dicrostonyx sp.			+										+								+		
Lemmus obensis																			+	+	+		
Lemmus sp.																					+		
Myopus schisticolor			+	+	+				+	+	+			+	+						+		
Mimomys sp.																				+			
Arvicola terrestris		+	.	+	+	+	+	+		+	+	+			+	+				+	+	+	+
Arvicola cf. terrestris																					+		
Arvicola sp.																				+			
Allophjomys pliocaenicus																					+		
Allophjomys cf. pliocaenicus																	+			+			
Allophjomys sp.																				+			
Pitymys arvoloides																			+				
Microtus (Stenocranius) gregalis			+	+	+	+			+	+	+	+	+	+		+			+	+	+	+	+
Microtus (Pitymys) cf. hintoni																	+			+			
Microtus (Pitymys) gregaloides																	+	+			+		
Microtus (Pitymys) cxgr. hintoni gregaloides																	+			+	+		
Microtus (Microtus) oeconomus		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				+	+	+	+
Microtus (Microtus) cf. oeconomus																			+		+		
Microtus (Microtus) ex gr. oeconomus																		+					
Microtus (Microtus) agrestis		+		+	+	+			+	+	+	+		+	+	+					+		
Microtus (Microtus) arvalis		+		+	+				+	+				+	+	+					+	+	
Microtus arvalis-agrestis				+	+				+	+	+	+		+									
M.middendorffii-hyperboreus				+						+	+			+									
Microtus sp.		+	+	+	+	+	+			+	+	+	+	+	+		+	+	+	+			+