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Fossil rodents (*Rodentia, Mammalia*) from the Sel'-Ungur Acheulian cave site (Kirghizstan)

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Abstract. Several characteristic species are present in this multilayered cave site, such as *Ellobius* ex gr. *tancrei*, *Meriones libycus selunguricus*, *Alticola argentatus*, *Microtus* (*Neodon*) ex gr. *juldaschi* and others together with numerous Acheulian artefacts and the remains of molars and a fragment of the skull of *Homo erectus*. The fauna most likely is of Middle Pleistocene age.

Key words: Pleistocene, *Rodentia*, Acheulian, Kirghizstan.

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I. INTRODUCTION

The Acheulian cave site Sel'-Ungur is located about 1900 m above sea level in the Obishir valley on the lower slope of the Karantau Ridge, which is a front ridge of the Alai Range (Kirghizstan). The multilayered site contained 5 cultural layers with Acheulian artefacts. Some significant anthropological remains were also found [teeth and a fragment of the occipital part of a skull, identified as *Homo erectus* (ISLAMOV et al. 1988)]. The layer above the horizon bearing Acheulian artefacts has been dated by the uranium-ionium technique to 126,000 ± 5000 years B.P. (Leningrad State University laboratory).

Multidisciplinary studies of the site have been carried out for many years. Archaeological material was analysed and so was the composition of sediments and fossils. BATYROV and BATIROV (1988) described large mammal remains, KREMENETSKI (in VELICHKO et al. 1990), analysed spore and pollen assemblages. The author received small mammal remains recovered from principal cultural layers by washing and screening. Cultural layers 3 and 5 appeared to be the most abundant in remains of small mammals.

The third cultural layer (5 m below the cave floor) consisted of coarse debris with silty matrix (cave tufa); cultural layer 4 at a depth of 5.5 m was enriched with angular debris,

layer 5 at a depth of 6 m consisted of grey-brown heavy loam. The geological sequence of the Sel'-Ungur site was studied by VELICHKO and UDARTZEV (in VELICHKO et al. 1990).

All remains of small mammals are well preserved, yellowish in colour. A large number of mandibles have been collected. The small mammal bones were accumulated in the cultural layers as a result of the feeding behaviour of owls. A few thousands of bone remains have been found, about a thousand of them could be identified to specific level.

Cultural layer 3 contained remains of 8 small mammal species:

Lagomorpha:

Ochotona (*Ochotona*) *rufescens* (GRAY, 1842)*	170**

Rodentia:

Ellobius (*Ellobius*) ex gr. *tancrei* BLASIUS, 1884	61
Apodemus sp.	2
Cricetulus migratorius PALLAS, 1773	54
Meriones (*Pallasiomys*) *libycus selunguricus* ssp. nov.	10
Alticola (*Alticola*) *argentatus* (SEVERTZOV, 1879)	21
Clethrionomys centralis (MILLER, 1906)	5
Microtus (*Neodon*) ex gr. *juldaschi* (SEVERTZOV, 1879)	230

Cultural layer 4 appeared to be considerably less rich in fossils, only 5 species of lagomorphs and rodents were determined:

Lagomorpha:

Ochotona (*Ochotona*) *rufescens* (GRAY, 1842)*	21

Rodentia:

Ellobius (*Ellobius*) ex gr. *tancrei* BLASIUS, 1884	7
Cricetulus migratorius PALLAS, 1773	9
Alticola (*Alticola*) *argentatus* (SEVERTZOV, 1873)	6
Microtus (*Neodon*) ex gr. *juldaschi* (SEVERTZOV, 1879)	18

In the oldest, 5th cultural layer, fossils increase in number, though the species composition remains practically the same.

Lagomorpha:

Ochotona (*Ochotona*) *rufescens* (GRAY, 1842)*	90

Rodentia:

Ellobius (*Ellobius*) ex gr. *tancrei* BLASIUS, 1884	15
Cricetulus migratorius PALLAS, 1773	28
Meriones (*Pallasiomys*) *libycus selunguricus* ssp. nov.	35
Alticola (*Alticola*) *argentatus* (SEVERTZOV, 1879)	15
Clethrionomys centralis (MILLER, 1906)	3
Microtus (*Neodon*) ex gr. *juldaschi* (SEVERTZOV, 1879)	288

*Determined by M. A. ERBAEVA

**Number of remains

II. SYSTEMATICS

Order *Rodentia* BOWDICH, 1821

Family *Muridae* GRAY, 1821

Genus *Apodemus* KAUP, 1879

Apodemus sp.

Material. 2 M_1 from the 3rd cultural layer.

Description and comparison. Lengths of 2 M_1: 1.75, 1.80 mm. Widths over the first pair of cusps: 0.80, 0.80 mm; over the second pair of cusps: 1.00, 1.10 mm; over the third pair of cusps: 1.05, 1.15 mm. The first cusp of the trefoil is distinct but small (Fig. 1). There are three additional external cusps on the teeth. Each tooth has two roots. It is difficult to distinguish different species of *Apodemus* by size of their teeth.

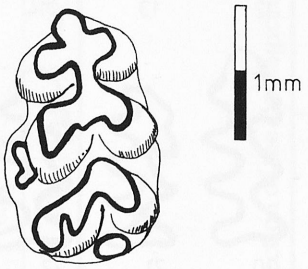

Fig. 1. Occlusal surface of M_1 of *Apodemus* sp. from the 3rd cultural layer.

Family *Cricetidae* FISCHER von WALDHEIM, 1817

Subfamily *Cricetinae* FISCHER von WALDHEIM, 1817

Tribe *Ellobiini* GILL, 1872

Genus *Ellobius* FISCHER von WALDHEIM, 1814

Ellobius (*Ellobius*) ex gr. *tancrei* BLASIUS, 1884

Material. 16 M_1, 2 M_2, 7 M_3, 20 M^1, 10 M^2, 1 M^3 from the 3rd cultural layer; 3 M_1, 2 M_2, 1 M^1 from the 4th cultural layer; 23 M_1, 9 M_2, 6 M_3, 13 M^1, 10 M^2, 1 M^3 from the 5th cultural layer.

Description. Characteristic of all the molar teeth is their massive structure, significant breadth of enamel, absence of cement and presence of roots.

M_1 is two-rooted, with wide confluent dentine areas on the occlusal surface. There are three salient angles on the external side of M_1 and usually four on the internal (Fig. 2: 1-29). The tooth is characterized by a prismatic fold, which is better marked on the teeth with weakly worn grinding surfaces (Fig. 2: 1, 2, 10, 13,16-23). This fold is absent on the strongly worn teeth. If the height of the crown is approximately 4 mm, the prismatic fold is mostly well seen; but in the crowns less than 3.5 mm high, the prismatic fold is usually lacking. The maximum height of the prismatic fold which is characteristic of high-crowned teeth reaches 2 mm.

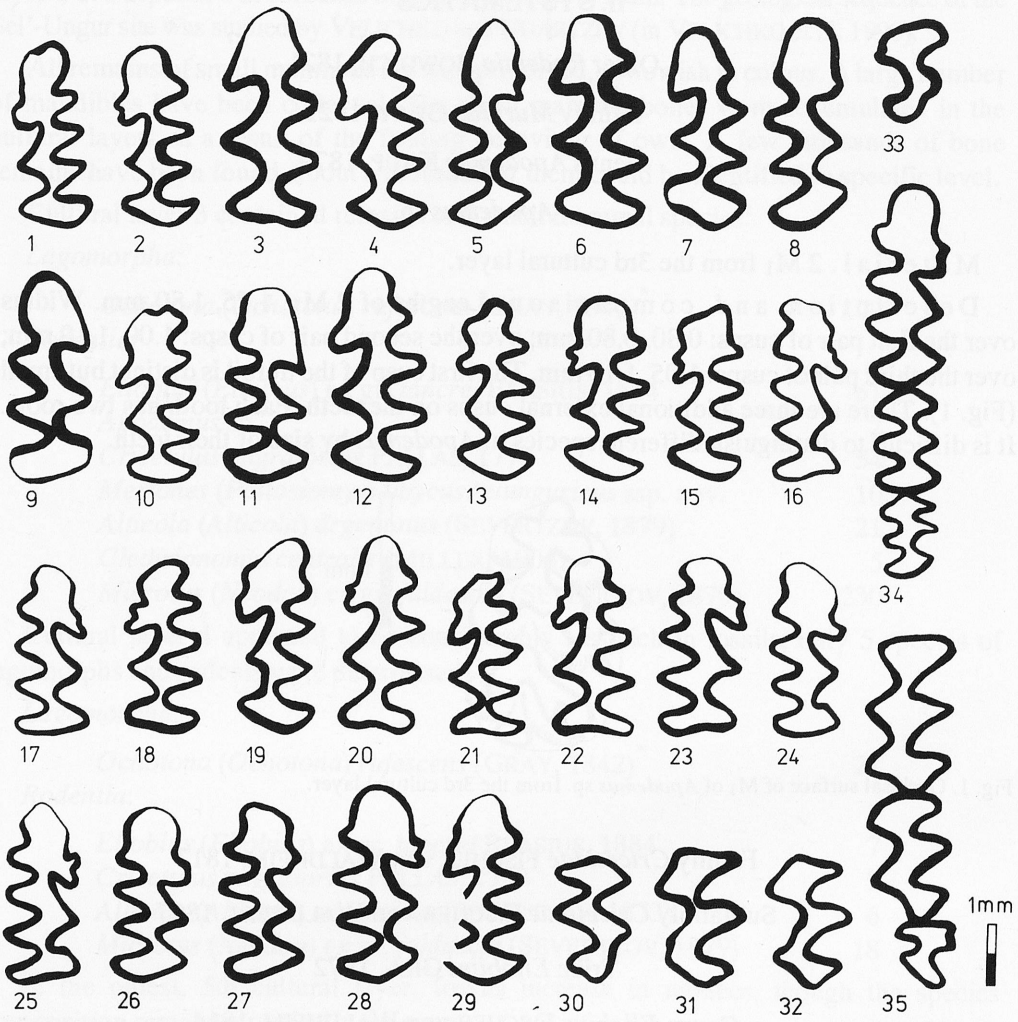

Fig. 2. Occlusal surface of teeth of *Ellobius* ex gr. *tancrei* (1-33) and recent *E. tancrei* (34-35). 1-9: M_1 from the 3rd cultural layer; 10-29: M_1 from the 5th cultural layer; 30-32: M^2 from the 5th cultural layer; 33: M^3 from the 5th cultural layer; 34-35: M_1-M_3 and M^1-M^3, respectively (coll. of Moscow University Zoological Muzeum). 21-23: teeth without roots; 1, 2, 4, 10-12, 16-20: teeth with initial root-formation; 13-15, 24-26: roots comprise 1/6 of the crown height; 3, 5, 7, 28, 29: roots comprise 1/3 of the crown height; 6, 9: roots comprise 1/2 of the crown height.

The dimensions of the teeth in Sel'-Ungur *Ellobius* are noticeably smaller than in the recent *Ellobius tancrei* (Tables I, II, III).

M_2 is two-rooted, with 3 broad confluent dentine areas on the occlusal surface, with 3 salient angles on the external and the internal sides of the tooth. For dimensions of M_2 see Table II.

M_3 is two-rooted, with 3 dentine areas and 3 salient angles on the external and internal sides of the tooth.

Table I

Size of M_1 of *Ellobius* ex gr. *tancrei* from the Sel'-Ungur site. Measurements, in mm. M – mean, OR – observed range, V – variance, SD – standard deviation.

Layer	N	Length of M_1				Breadth of M_1				Height of crown				Frequency of prismatic fold
		M	OR	V	SD	M	OR	V	SD	M	OR	V	SD	(%)
3	16	2.90	2.25-3.25	0.09	0.31	1.27	1.00-1.45	0.02	0.13	3.62	1.65-4.65	0.77	0.88	60
4	3	3.17	3.00-3.30	0.06		1.40	1.30-1.50	0.01						100
5	23	2.96	2.50-3.45	0.06	0.23	1.36	1.20-1.55	0.01	0.08	4.07	2.70-4.50	0.22	0.46	60

Table III

Size of M_1 and M^3 of recent *Ellobius tancrei*, in mm (Collection of the Zoological Museum of Moscow University) N=10

The region of collection	Length of M_1				Breadth of M_1				Length of M^3				Breadth of M^3			
	M	OR	V	SD	M	OR	V	SD	M	OR	V	SD	M	OR	V	SD
Tadzhikistan (Asht and Gissar regions)	3.00	2.75-3.40	0.05	0.22	1.28	1.10-1.35	0.01	0.10	1.25	1.10-1.40	0.01	0.11	1.06	0.95-1.15	0.01	0.07
Kazakhstan (Zaisan depression, Zailiiski Alatau mountains)	3.10	2.90-3.50	0.05	0.22	1.37	1.25-1.50	0.02	0.13	1.25	1.00-1.40	0.01	0.08	1.06	0.95-1.15	0.02	0.12

M^1 is three-rooted (with big roots on the anterior and posterior parts of tooth and a small one in the middle of the tooth), with 3 dentine areas. On each side of M^1 there appear 3 salient angles.

M^2 asymmetrical in structure, is two-rooted, with 3 salient angles on its internal side and 2 angles on the external side.

M^3 is small (Table II), with one root.

Comparisons. M_1 of the Sel'-Ungur mole-vole can be distinguished from the same tooth of *Ellobius talpinus* and *E. fuscocapillus* by the presence of a well-developed prismatic fold on the anteroconid complex. In this character the Sel'-Ungur mole-vole is similar to recent *Ellobius tancrei*, the oriental mole-vole (Fig. 1: 34-35).

M^2 of Sel'-Ungur *Ellobius* can be distinguished from M^2 of *E. fuscocapillus* and *E. lutescens* by its simpler structure, without the additional angle on the external side of the

Table II

Size of M^1, M^2, M^3, M_2, M_3 of *Ellobius* ex gr. *tancrei* from the Sel'-Ungur site. Measurements in mm. M – mean, OR – observed range, V – variance, SD – standard deviation

Layer	N	M	OR	V	SD	M	OR	V	SD
		Length				Breadth			
M^1									
3	20	2.79	2.50-3.10	0.06	0.24	1.48	1.30-1.60	0.01	0.08
4	1	2.65				1.50			
5	13	2.64	2.40-2.95	0.03	0.17	1.48	1.40-1.80	0.02	0.15
M^2									
3	10	2.20	2.15-2.25	0.01	0.09	1.36	1.30-1.50	0.01	0.08
4									
5	10	2.08	2.10-2.35	0.15	0.39	1.39	1.10-1.50	0.01	0.11
M^3									
3	1	1.40				1.15			
4									
5	1	1.55				1.15			
M_2									
3	2	2.13	2.10-2.15			1.38	1.35-1.40		
4	3	1.97	1.90-2.00			1.28	1.25-1.30		
5	9	1.94	1.80-2.20	0.03	0.18	1.32	1.20-1.50	0.01	0.10
M_3									
3	7	1.97	1.85-2.00	0.01	0.06	1.21	1.15-1.25	0.01	0.05
4									
5	6	1.81	1.75-2.00	0.01	0.10	1.02	0.95-1.10	0.01	0.06

tooth. The salient angle of M^3 is also simpler in structure than it is in M^3 of *E. fuscocapillus* and *E. lutescens*, but more complex than in M^3 of *E. talpinus*.

The remains of *Ellobius tancrei* were described from the Mousterian site Ogzy-Kichik in Tadzhikistan (STALMAKOVA and KIREEV 1986). Unfortunately, the authors did not give the dimensions of these teeth, but according to the figure of M_1 with a prismatic fold, we may think that they belong to this species.

In their morphology the remains of *Ellobius* from Sel'-Ungur are close to the recent oriental mole-vole *Ellobius tancrei*. However, the dimensions of teeth from Sel'-Ungur are smaller than in recent *E. tancrei*. Therefore we described this form as *Ellobius* ex gr. *tancrei*.

Tribe *Cricetini* FISCHER von WALDHEIM, 1817

Genus *Cricetulus* MILNE-EDWARDS, 1817

Cricetulus migratorius PALLAS, 1773

Material. 15 M_1, 6 M_2, 3 M_3, 14 M^1, 12 M^2, 4 M^3 from the 3rd cultural layer; 3 M_1, 4 M_2, 2 M_3 from the 4th cultural layer; 7 M_1, 5 M_2, 1 M_3, 13 M^1, 2 M^2, from the 5th cultural layer.

Description and comparisons. M_1 with 6 well-developed cusps, which are situated right opposite each other. There are closed depressions between these cusps (Fig. 3: 1). The anterior pair of cusps is situated closer to each other than are the middle and posterior ones.

On M_2 there are well-developed cusps; the internal branch of the anterior cingulum exceeds in length the external one.

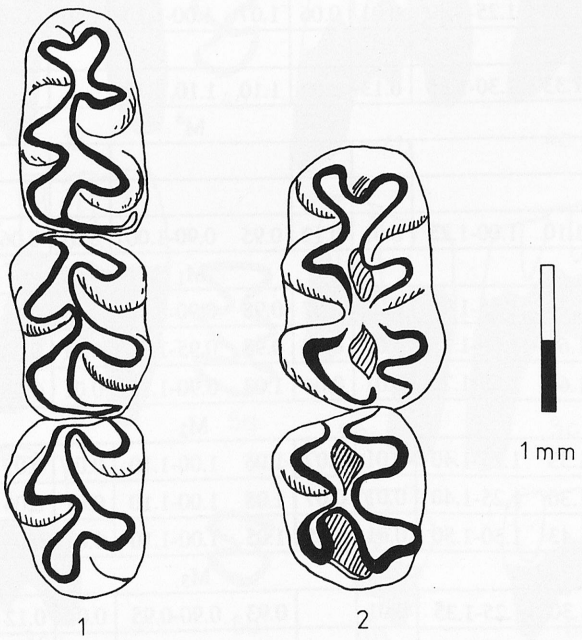

Fig. 3. The occlusal surface of teeth of *Cricetulus migratorius* from the 3rd cultural layer: 1 – M_1-M_3; 2 – M^1-M^2.

The length of M_3 is smaller than that of M_2. The cusps are situated opposite each other and form an islet.

M^1 presents an asymmetrical structure of the anterior pair of cusps, which are well isolated from each other. The external cusp is bigger than the internal one (Fig. 3: 2).

There are 4 cusps on M^2. The external branch of the anterior collar is well developed. M^3 has also well-developed external branch of the anterior collar.

The length of the upper and lower molars of the gray hamster are similar to those in recent *Cricetulus migratorius* (Table IV). The breadth of M^1 of the recent *Cricetulus* is smaller than the same parameter of M_1 from the Sel'-Ungur site. This is reflected by the breadth-to-length ratio in M^1. This ratio has a lower value in the Sel'-Ungur hamster than in recent *Cricetulus migratorius*.

Table IV

Size of teeth of *Cricetulus migratorius* from the Sel'-Ungur site.

Layer	N	M	OR	V	SD	M	OR	V	SD	M	OR	V	SD
		Length				Breadth				Breadth/Length x 100			
						M^1							
3	14	1.75	1.65-2.00	0.01	0.11	1.05	1.00-1.25	0.01	0.06	60.60	59.60-6.50	21.85	4.67
4													
5	9	1.83	1.75-2.00	0.01	0.08	1.09	1.00-1.20			59.40	57.10-60.00	12.90	3.59
						M^2							
3	12	1.32	1.25-1.40	0.01	0.06	1.07	1.00-1.20	0.01	0.06	81.00	80.00-85.00	39.19	6.26
4													
5	2	1.33	1.30-1.35	0.13	0.04	1.10	1.10, 1.10	–	–	82.00	80.00-84.00	4.81	2.19
						M^3							
3													
4													
5	4	1.10	1.00-1.25	0.01	0.12	0.95	0.90-1.00	0.01	0.06	86.00	80.00-90.00	75.67	8.70
						M_1							
3	15	1.69	1.55-1.75	0.01	0.07	0.98	0.90-1.10	0.01	0.06	59.05	58.06-62.86	16.25	4.03
4	3	1.65	1.60-1.75	0.01	0.07	0.98	0.95-1.00	0.01	0.03	59.50	57.00-62.50	7.75	2.78
5	7	1.65	1.55-1.75	0.01	0.04	1.03	0.90-1.10	0.01	0.05	61.00	58.06-62.83	14.01	3.74
						M_2							
3	6	1.33	1.25-1.40	0.01	0.07	1.06	1.00-1.10	0.01	0.05	79.80	78.00-80.00	24.88	4.99
4	4	1.30	1.25-1.40	0.01	0.07	1.08	1.00-1.10	0.01	0.05	80.00	78.00-82.00	18.59	4.31
5	5	1.43	1.30-1.50	0.01	0.05	1.05	1.00-1.10	0.01	0.05	73.40	73.30-76.90	27.25	5.22
						M_3							
3	3	1.30	1.25-1.35	0.01		0.93	0.90-0.95	0.01	0.12	75.00	72.00-77.77		
4	2	1.05	1.05, 1.05	0.01		1.03	1.00-1.05	–	–	87.50	84.00-91.00		
5	1	1.10				0.85				77.27			

Subfamily *Gerbillinae* ALSTON, 1876

Genus *Meriones* ILLIGER, 1811

Meriones libycus selunguricus ssp. nov.

Holotype: detached right M^1 (SU-1) deposited in the collection of the Institute of Geography, Russian Academy of Sciences.

Location: Sel'-Ungur, 5th cultural layer, Kirghizstan.

Age: Middle Pleistocene.

Dimensions: Table V.

Material. 2 M_1, 2 M_2, 5 M^1 from the 3rd cultural layer; 15 M_1, 2 M_2, 11 M^1, 1 M^2 from the 5th cultural layer.

Description. All teeth are massive, of simple pattern, rooted, without cement, with broad enamel and low elevations of linea sinuosa.

M_1 is characterized by 3 external and 3 internal angles, slightly curved backward. M_1 is three-rooted, with big anterior and posterior roots and a small root placed in the middle of the tooth, close to the external side. Enamel band broad and undifferentiated, without gaps. Linea sinuosa rather low (Fig. 4: 1, 2).

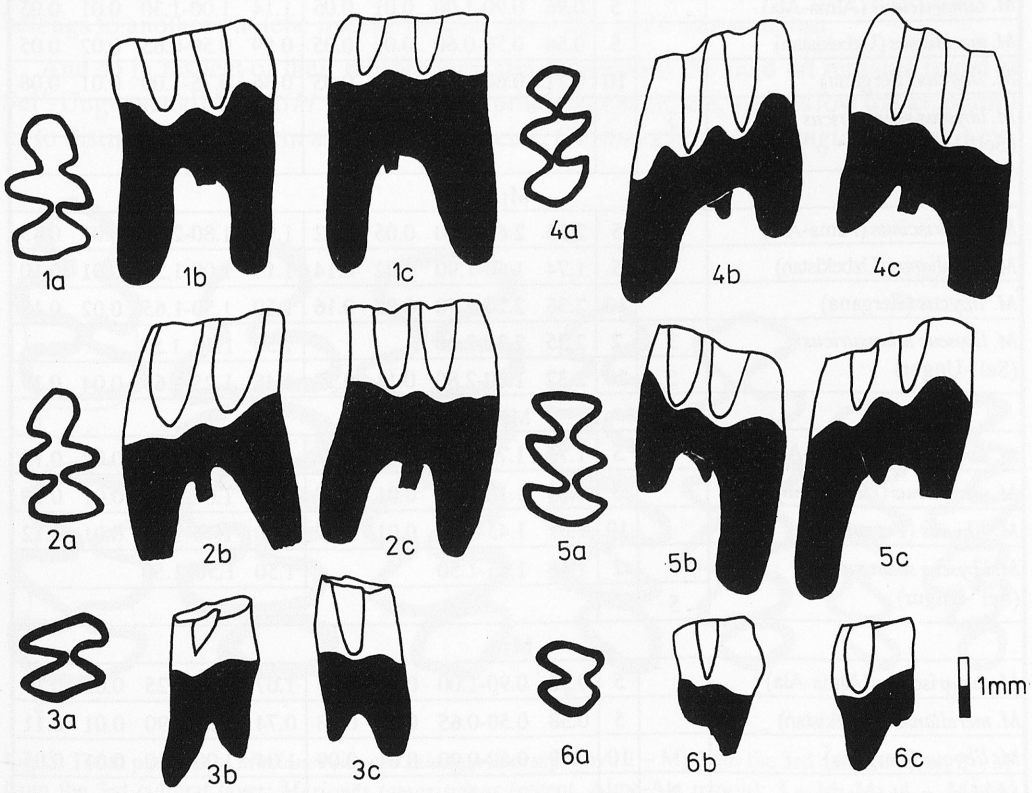

Fig. 4. Tooth pattern of *Meriones libycus selunguricus* ssp. nov. from the 5th cultural layer: 1 – M_1, 2 – M_1 (holotype), 3 – M_2 4 – M^1, 5 – M^1, 6 – M^2, a – occlusal view, b – lingnal view, c – labial view. All teeth from the 5th cultural layer.

Table V

Sizes of teeth of fossil and recent species of *Meriones*, mm

Region	Layer	N	M	OR	V	SD	M	OR	V	SD
			Length				Breadth			
M^1										
M. tamariscinus (Alma-Ata)		5	2.85	2.60-3.00	0.03	0.17	2.06	2.00-2.10	0.00	0.05
M. meridianus (Uzbekistan)		5	1.77	1.60-2.00	0.25	0.16	1.24	1.10-1.25	0.03	0.16
M. libycus (Fergana)		10	2.38	2.20-2.55	0.01	0.12	1.65	1.50-2.00	0.02	0.14
M. libyscus selunguricus (Sel'-Ungur)	3	5	2.36	2.15-2.55	0.03	0.18	1.44	1.15-1.80	0.06	0.26
	5	14	2.33	2.00-2.50	0.04	0.32	1.49	1.25-1.60	0.01	0.07
M^2										
M. tamariscinus (Alma-Ata)		5	1.60	1.50-1.70	0.10	0.10	1.88	1.80-2.00	0.01	0.08
M. meridianus (Uzbekistan)		5	1.04	1.00-1.10	0.01	0.05	1.13	1.00-1.40	0.03	0.16
M. libycus (Fergana)		10	1.42	1.30-1.50	0.01	0.82	1.54	1.40-1.70	0.01	0.09
M. libyscus selunguricus (Sel'-Ungur)	3	–								
	5	1	1.60				1.50			
M^3										
M. tamariscinus (Alma-Ata)		5	0.96	0.90-1.00	0.01	0.05	1.14	1.00-1.30	0.01	0.05
M. meridianus (Uzbekistan)		5	0.56	0.50-0.60	0.01	0.05	0.59	0.50-0.65	0.02	0.05
M. libycus (Fergana)		10	0.71	0.60-0.75	0.01	0.05	0.86	0.75-1.00	0.01	0.08
M. libyscus selunguricus (Sel'-Ungur)	3									
	5									
M_1										
M. tamariscinus (Alma-Ata)		5	2.93	2.60-3.30	0.05	0.22	1.93	1.80-2.10	0.02	0.13
M. meridianus (Uzbekistan)		5	1.74	1.60-1.90	0.02	0.14	1.13	1.00-1.25	0.01	0.10
M. libycus (Fergana)		10	2.36	2.20-2.70	0.03	0.16	1.59	1.50-1.65	0.02	0.15
M. libyscus selunguricus (Sel'-Ungur)	3	2	2.35	2.30-2.40			1.50	1.50, 1.50		
	5	20	2.32	1.80-2.80	0.11	0.32	1.45	1.25-1.65	0.04	0.19
M_2										
M. tamariscinus (Alma-Ata)		5	1.75	1.70-1.80	0.01	0.04	1.78	1.70-2.00	0.02	0.13
M. meridianus (Uzbekistan)		5	1.13	1.10-1.25	0.01	0.07	1.09	1.00-1.25	0.01	0.10
M. libycus (Fergana)		10	1.51	1.45-1.70	0.01	0.09	1.50	1.40-1.80	0.01	0.12
M. libyscus selunguricus (Sel'-Ungur)	3	2	1.48	1.45-1.50			1.50	1.50, 1.50		
	5									
M_3										
M. tamariscinus (Alma-Ata)		5	0.96	0.90-1.00	0.01	0.05	1.07	0.90-1.25	0.02	0.13
M. meridianus (Uzbekistan)		5	0.58	0.50-0.65	0.01	0.08	0.74	0.60-0.90	0.01	0.11
M. libycus (Fergana)		10	0.79	0.60-0.90	0.01	0.09	1.04	1.00-1.10	0.01	0.05
M. libyscus selunguricus (Sel'-Ungur)	3									
	5									

M_2 has 2 internal and external salient angles, two dentine areas on the occlusal surface and two roots (Fig. 4: 3).

M^1 is three-rooted (the anterior and posterior roots are big, the middle one is small and located near the external part of the tooth). M^1 has three external and three internal salient angles (Fig. 4: 4, 5).

M^2 is characterized by 2 salient angles on each side of the tooth and 2 roots (Fig. 4: 6).

For the size of the Sel'-Ungur *Meriones* teeth see Table V.

Comparisons. The teeth of Sel'-Ungur *Meriones* were compared with the teeth of recent *M. tamariscinus*, *M. meridianus* and *M. libycus*, which inhabit these regions (Fig. 5; Table V). The teeth of sand rats from the Sel'-Ungur site are very similar in morphology and dimensions to the teeth of recent *Meriones libycus*. They are noticeably bigger than the teeth of *Meriones tamariscinus* PALLAS, and smaller than those of *Meriones meridianus* PALLAS. The occlusal surfaces of molars of all these species are rather similar. However, in *M. tamariscinus* the salient angles are more rounded than in *M. libycus* and *M. meridianus*.

There are only a few fossil specimens of this genus found in Middle Asia. Unfortunately, the dimensions of the sand rat teeth from the Moustierian site Ogzy-Kichik (STALMAKOVA and KIREEV 1986) are unknown. The dentine tracks of Sel'-Ungur teeth are lower than those of recent *M. libycus*, but higher than those of Early Pleistocene *Meriones* from the Lakhuti locality (Tadzhikistan) (ZAZHIGIN 1988). In our opinion, *Meriones* from Lakhuti belongs to another phyletic lineage of sand rats – that of *M. tamariscinus*.

And so in respect of their morphology and dimensions the sand rat remains found at Sel'-Ungur stand close to *M. libycus*. Some primitive characters, such as low tracks, permit us to distinguish this form as a new subspecies, *Meriones libycus selunguricus* ssp. nov.

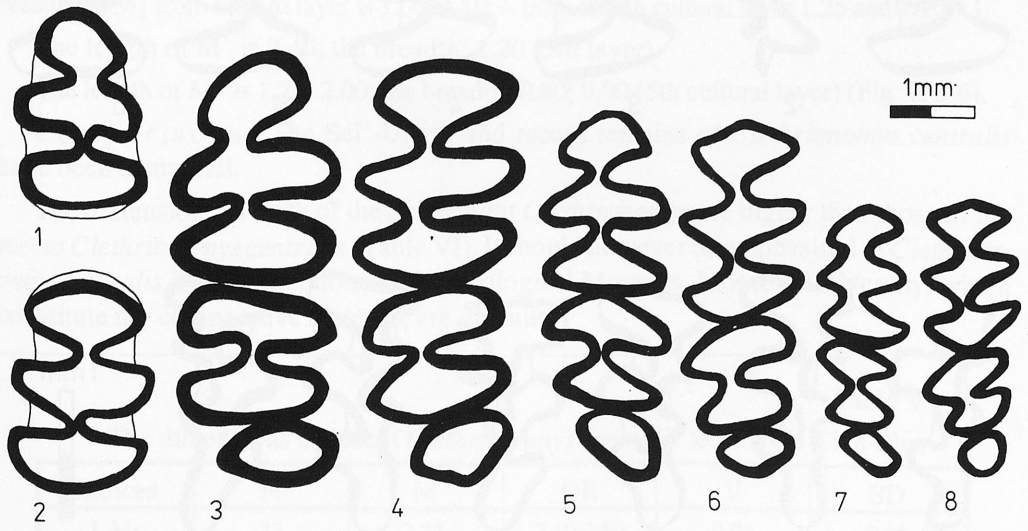

Fig. 5. Tooth patterns of *Meriones libycus selunguricus* ssp. nov.: 1 – M_1 from the 3rd cultural layer; 2 – M^1 from the 3rd cultural layer; *Meriones tamariscinus* (recent, Alma-Ata region): 3 – M_1-M_3, 4 – M^1-M^3, *Meriones libycus* (recent, Fergana depression): 5 – M_1-M_3, 6 – M^1-M^3, *Meriones meridianus* (recent Uzbekistan): 7 –M_1-M_3, 8 – M^1-M^3.

Tribe *Clethrionomyini* HOOPER et HART, 1962

Subtribe *Alticoli* GROMOV, 1977

Genus *Alticola* BLANFORD, 1881

Alticola (Alticola) argentatus (SEVERTZOV, 1979)

Material. 10 M_1, 6 M^1, 5 M^3 from the 3rd cultural layer; 2 M_1 from the 4th cultural layer; 7 M_1, 7 M_3, 1 M^1, 1 M^2, 5 M^3 from the 5th cultural layer.

Description and comparison. The teeth are unrooted, with a small amount of cement. The enamel band is differentiated. There are gaps in the enamel band on the top of the anterior loop of M_1 and the posterior loop of M^3.

M_1 has 5-6 isolated dentine fields (Fig. 6: 1-6). In the structure of occlusal surface these teeth resemble those of *Cletrionomys*.

Length of M_1 (L) from the 3rd cultural layer is 2.50-2.64-2.80 (n=10), from the 4th layer: 2.40; 2.45, from the 5th layer: 2.50-2.61-2.80 (n=7).

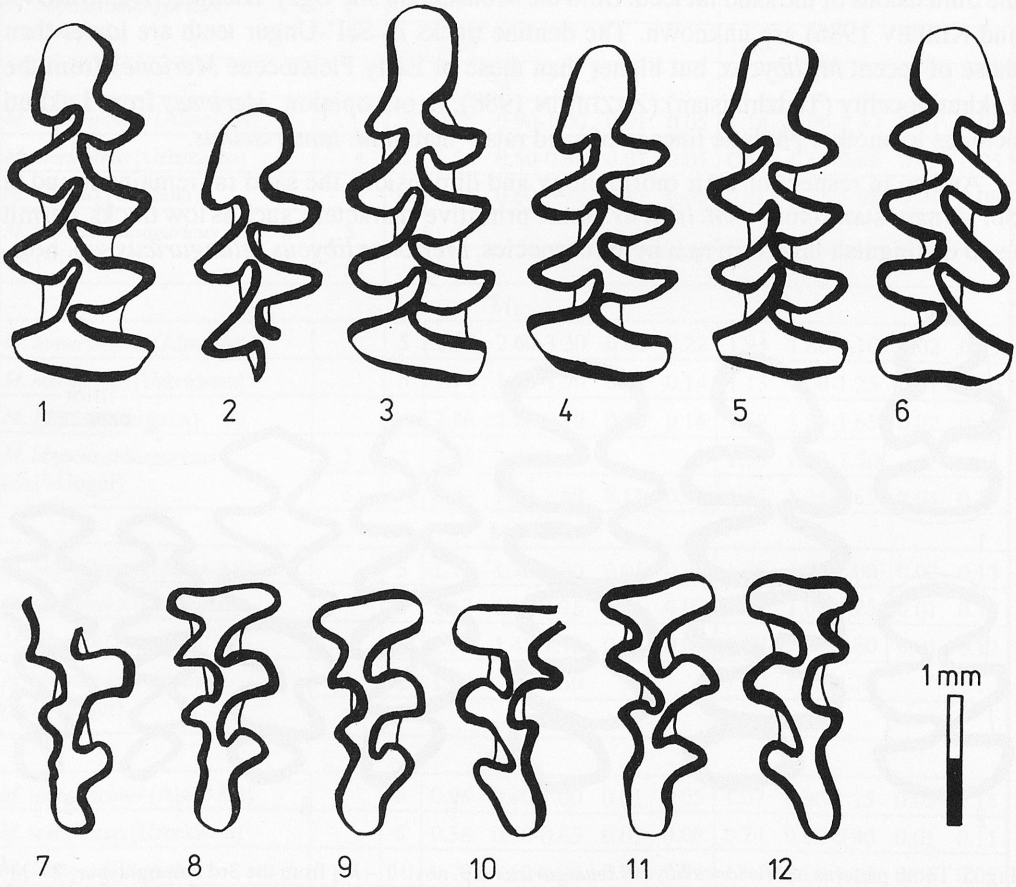

Fig. 6. Occlusal surface of *Alticola argentatus* teeth: 1-4 – M_1 from the 3rd cultural layer; 5-6 – M_1 from the 5th cultural layer; 7-10 – M^3 from the 3rd cultural layer; 11-12 – M^3 from the 5th cultural layer.

The breadth of M_1 (B) from the 3rd cultural layer is 0.90-1.05-1.25 (n=10), from the 4th layer: 1.00, 1.10; from the 5th cultural layer: 0.85-0.99-1.05 (n=7).

Length of the anteroconid (A) of M_1 from the 3rd cultural layer is 1.20-1.36-1.50 (n=10), from the 4th layer: 1.25; 1.25, from the 5th layer: 1.15-1.35-1.40 (n=7).

The ratio A/L x 100 is 50.00-51.85-55.55 (n=10) (3rd cultural layer); 51.00; 52.08 (4th cultural layer); 50.00-54.74-62.00 (n=6) (5th cultural layer).

M^3 has broad confluent dentine areas (Fig. 6: 7-12). L of M^3 is – 1.75-1.90-2.20 (n=5) (3rd cultural layer); 1.75-1.88-2.00 (n=5) (5 cultural layer). The breadth of M^3 is 0.80-0.85-1.00 (n=5) from the 3rd cultural layer; 0.80-0.83-0.88 (n=5) from the 5th cultural layer.

In the dimensions and morphology of teeth *Alticola* from Sel'-Ungur is similar to high-mountain voles *Alticola argentatus*.

Subtribe *Clethrionomyi* GROMOV, 1977

Genus *Clethrionomys* TILESIUS, 1850

Clethrionomys ex gr. *centralis* (MILLER, 1906)

Material. $3M_1$ and 1 M^1 from the 3rd cultural layer; 1 M_1 and 2 M^3 from the 5th cultural layer.

Description. Rooted teeth with abundant cement and slightly differentiated enamel.

M_1 has 5 or 6 dentine areas. In spite of only slightly differentiated enamel, there are gaps in the enamel band on the top of the anterior loop (Fig. 7: 1-4). The dimensions are rather large: L of M_1: 2.50; 2.65; 2.75 (n=3) – from the 3rd cultural layer; 2.75 from the 5th cultural layer. The breadth of M_1 from the 3rd layer is 1.00; 1.10; – from the5th cultural layer 1.25 and 1.10.

The length of M^1 is 2.40; the breadth: 1.20 (3rd layer).

The length of M^3 is 1.75; 2.00; the breadth: 0.80; 0.90 (5th cultural layer) (Fig. 7: 5-6).

Comparisons. The Sel'-Ungur and recent remains of *Clethrionomys centralis* have been compared.

The dimensions of teeth of the Sel'-Ungur *Clethrionomys* are bigger than those of the recent *Clethrionomys centralis* (Table VI). It should however be emphasired of *Clethrionomys centralis* in the collections of the Zoological Museum, Moscow University, which constitute my comparative material, are juvenile.

Table VI

The dimensions of recent *Clethrionomys centralis* teeth from Tien-Shan

Indices	N	M	OR	V	SD
L M_1	22	2.22	2.10-2.50	0.03	0.18
B M_1	22	0.94	0.85-1.10	0.01	0.08
L M^3	22	1.63	1.40-1.75	0.01	0.08
B M^3	22	0.78	0.70-0.90	0.01	0.05

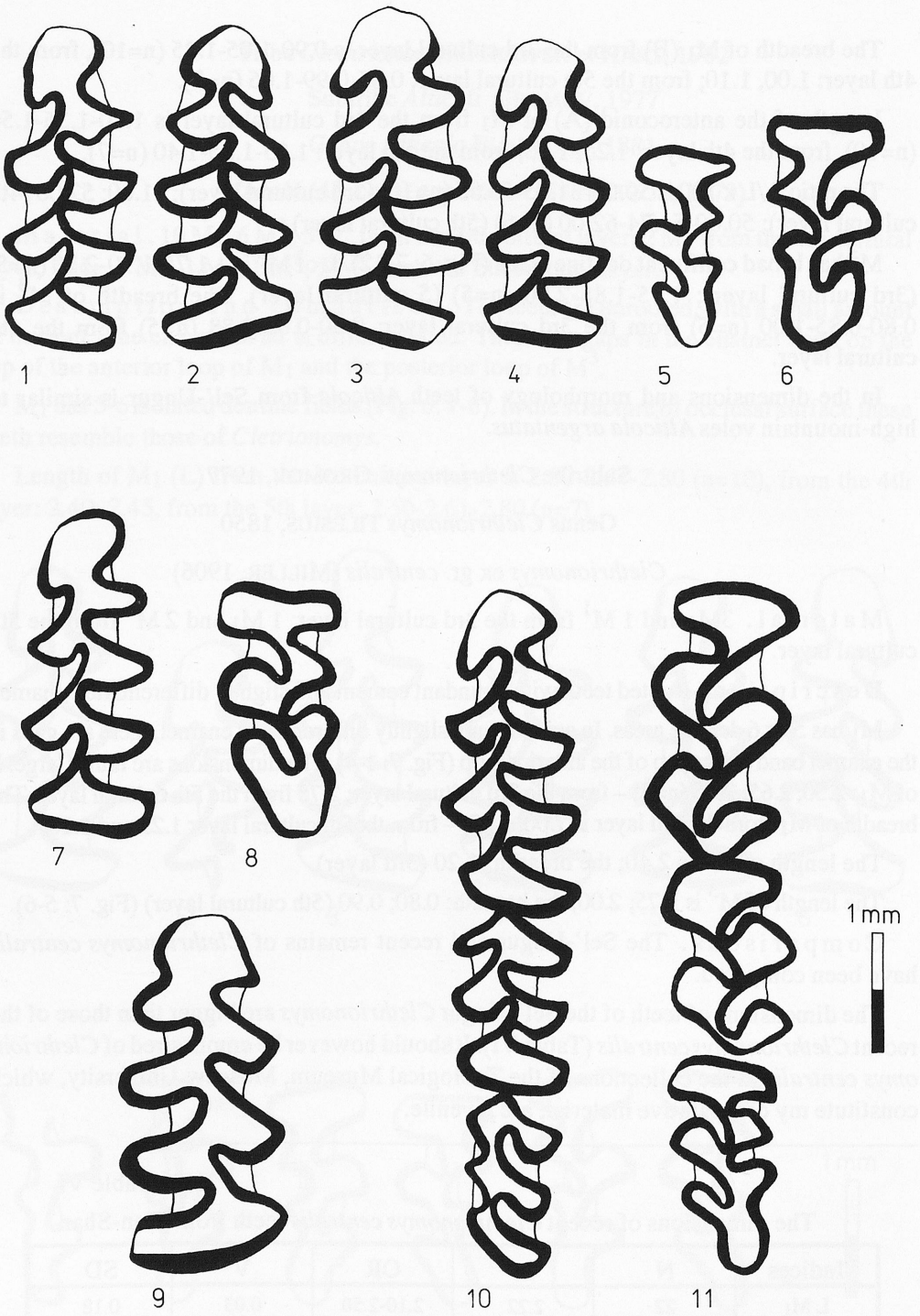

Fig. 7. Occlusal surface of *Clethrionomys* ex gr. *centralis* (1-6) and recent *Clethrionomys centralis* from Tien-Shan (7-11). 1 – M_1 (the 5th cultural layer); 2-4 – M_1 (the 3rd cultural layer), 5-6 – M^3 (the 5th cultural layer); 7 – M_1, 8 – M^3, 9 – M_1, 10 – M_1-M_3, 11 – M^1-M^3.

Tribe *Microtini* MILLER, 1896 (= *Arvicolini* KRETZOI, 1955)

Genus *Microtus* SCHRANK, 1798

Subgenus *Neodon* HODGSON, 1849

Microtus (*Neodon*) ex gr. *juldaschi* (SEVERTZOV, 1879)

Material. 103 M_1, 50 M_2, 144 M^1, 61 M^2, 46 M^3 from the 3rd cultural layer; 6 M_1, 4 M_2 from the 4th cultural layer; 120 M_1, 20 M_2, 12 M_3, 90 M^1, 30 M^2, 15 M^3 from the 5th cultural layer.

Description. The teeth are rootless, with abundant cement. The enamel band is differentiated according to *Microtus* type. Gaps appear in the enamel band only on the top of the anterior loop of M_1 and the posterior loop of M^3.

M_1 has always only 5 dentine fields on the occlusal surface. There are 5 salient angles on the internal side of M_1 and 4 on the external one. The cap of the anterior loop is always broad, confluent with the successive part of the anteroconid complex (Fig. 8), and very similar in structure to *Allophaiomys*. The dimensions are small (Table VII). The ratio A/L x 100 fluctuates between 41 and 55 ($\bar{x}$=47) (Table VII). These values are of an archaic nature as regards *Microtini* and come close to those in *Allophaiomys*. So, for example, these values in *Allophaiomys* from the Biharian localities are as follows:

Chlum – 35.71-45.054-49.21 (n=148), Holštein – 40.78-45.88-50.36 (n=23), Včelare 4D – 45.67-48.78-53.03 (n=11) (FEJFAR and HORÁČEK 1983).

The A/L ratio of recent juniper voles fluctuates between 46.80-50.71-59.99 (Table VII); this suggests that they are more derived than those from Sel'-Ungur site.

M_2 has 5 or seldom 4 isolated dentine fields and 3 salient angles on both external and internal sides of the tooth.

M_3 is characterized by 3 dentine areas on the occlusal surface and 3 salient angles on each side of the tooth.

M^1 has 5 dentine areas on the occlusal surface. Some M^1's have additional re-entrants on the middle salient angle (Fig. 9: 1). One per cent of M^1 of the recent *Microtus* (*Neodon*) also have that character, which is never present in *Microtus afghanus* molars.

M^2 is characterized by 4 isolated dentine areas. Sometimes additional re-entrent angles appear on the middle salient angle (Fig. 9: 2).

M^3 has usually 3, sometimes 4 slightly confluent dentine areas (Fig. 9: 3-17). On the external and internal sides of this tooth there are usually 3 salient angles. The anterior loop usually has a "mushroom" shape.

The dimensions of teeth of *Microtus* (*Neodon*) *juldaschi* are presented in Table VII.

Comparisons. The teeth of the Sel'-Ungur *Microtus* were compared with the teeth of recent Middle Asia voles of the subgenera *Neodon* and *Blanfordimys*. These recent forms have teeth of primitive structure, which resembles that in *Allophaiomys*.

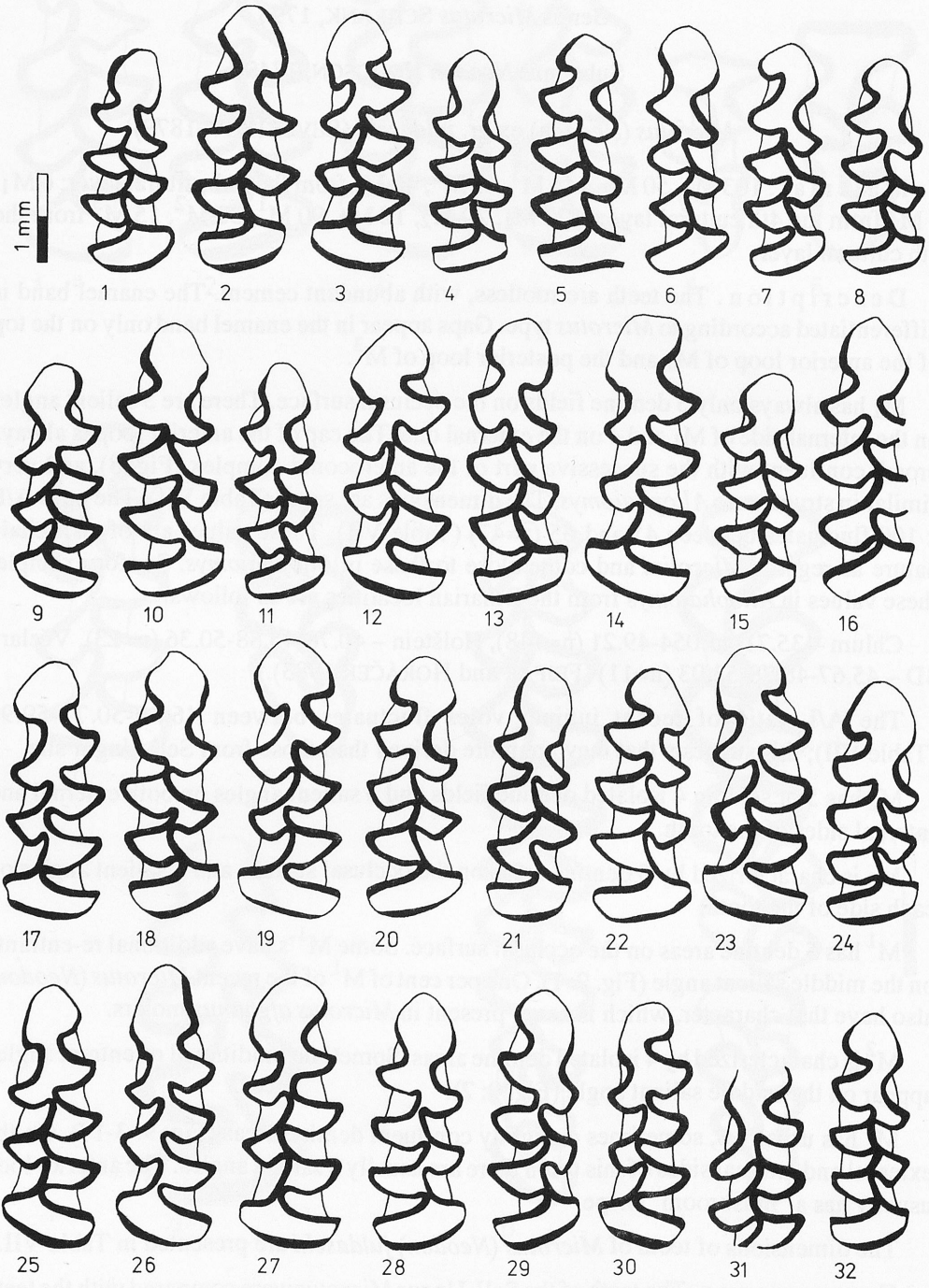

Fig. 8. Occlusal surface of M_1 of *Microtus* (*Neodon*) ex gr. *juldaschi* from the 5th (1-21) and the 3rd (22-32) cultural layers.

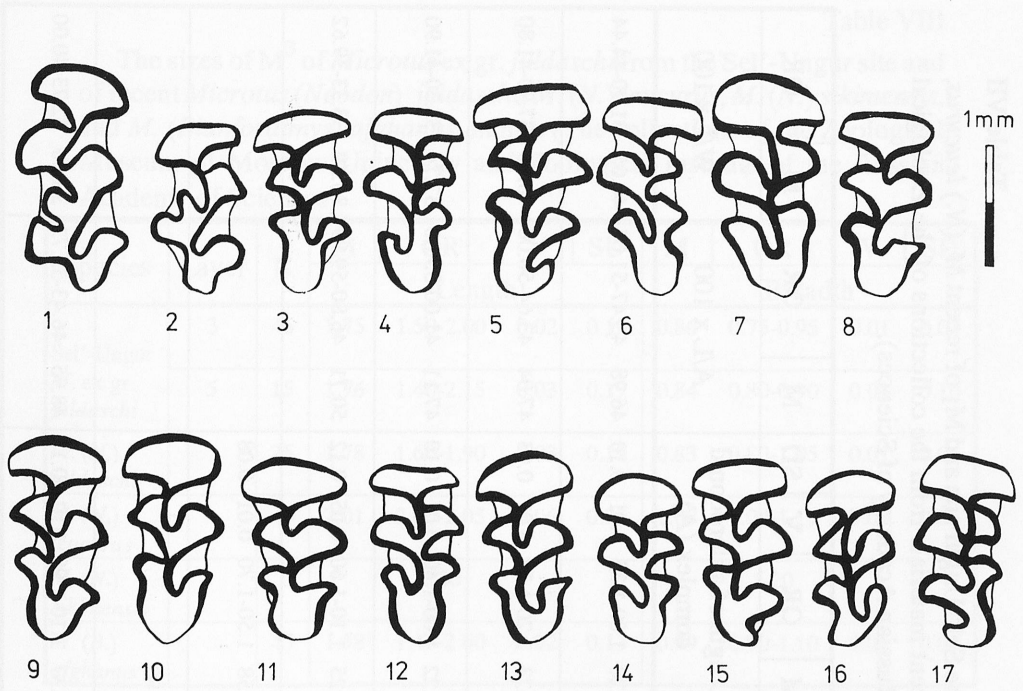

Fig. 9. Occlusal surface of *Microtus* (*Neodon*) ex gr. *juldaschi* teeth from the 5th (1-2) and the 3rd (3-17) cultural layers. 1 – M^1, 2 – M^2, 3-17 – M^3.

M_1 of recent *Microtus* (*Blanfordimys*) *afghanus* is large (Table VII) and has a distinctly isolated head of the anteroconid complex. There are usually 6 dentine areas on the occlusal surface (Fig. 10: 1, 3).

M^3 of recent *M.* (*B.*) *afghanus* has usually (85%) 4 isolated dentine areas (Fig. 10: 2, 4) (Table VIII).

M_1 of recent voles of the subgenus *Neodon* [*M.* (*N.*) *juldaschi* =*M.* (*N.*) *carruthersi*, *M.* (*N.*) *leucurus*, *M.* (*N.*) *sikimensis*] has always 5 dentine areas on the occlusal surface (Fig. 11: 1-5). The elements of the anteroconid complex are always broadly confluent. In contrast to M_1 of recent *Microtus juldaschi* M_1 of Sel'-Ungur voles has as a rule a rounded head of the anteroconid without secondary complications. Similarly to M^1 and M^2 of the recent *Neodon*, 1-5% of the fossil teeth have an additional re-entrent on the middle salient angles, a character absent in the subgenus *Blanfordimys* (Fig. 11: 10).

In morphology and dimensions the Sel'-Ungur voles resemble *Microtus* (*Phaiomys*) *lakhutensis* ZAZHIGIN, 1988 from the Lakhuti 2 (ZAZHIGIN 1988). However, ZAZHIGIN indicated the archaic structure of enamel of the Lakhuti form and on the basis of this character distinguished a new species. The enamel structure of the Sel'-Ungur *Microtus* is rather similar to that in recent *Microtus (Neodon) juldaschi* [=*M.* (*N.*) *carruthersi*].

Table VII

The sizes of M_1 of *Microtus* (*Neodon*) ex gr. *juldaschi* from the Sel'-Ungur site and M_1 of recent *M.* (*N.*) *leucurus*, *M.* (*N.*) *sikimensis*, *M.* (*Blanfordimys*) *afghanus*, in mm (the recent materials from the collections of the Zoological Museum of Moscow University and Zoological Institute of the Russian Academy of Sciences).

Species	Layer	N	M	OR	V	SD	M	OR	V	SD	M	OR	V	SD	M	OR	M	OR
			Length				Breadth				Length of anteroconid complex (A)				A/L x 100		W/L x 100	
Sel'-Ungur *M.* ex gr. *juldashi*	3	103	2.55	2.20-2.80	0.02	0.17	1.02	0.80-1.05	0.05	0.07	1.20	1.00-1.35	0.01	0.10	46.98	43.47-51.02	40.05	31.90-44.44
	4	6	2.61	2.50-2.75	0.01	0.12	1.03	0.95-1.15	0.01	0.07	1.23	1.20-1.30	0.01	0.03	47.04	43.64-50.00	40.16	37.90-41.80
	5	120	2.56	2.20-3.00	0.05	0.23	1.01	0.90-1.05	0.03	0.06	1.22	1.00-1.40	0.01	0.10	47.11	41.00-55.00	37.74	33.30-41.90
M. (*N.*) *juldaschi*		25	2.47	2.20-2.80	0.02	0.16	0.91	0.85-1.05	0.01	0.07	1.25	1.10-1.60	0.05	0.12	50.71	46.80-59.99	36.59	33.33-39.62
M. (*N.*) *leucurus*		5	3.17	3.00-3.30	0.02	0.16	1.28	1.25-1.30	0.01	0.03	1.58	1.50-1.70	0.01	0.08				
M. (*N.*) *sikimensis*		1	3.25				1.15				1.80							
M. (*B.*) *afghanus*		45	2.76	2.55-3.15	0.02	0.13	1.01	0.90-1.10	0.00	0.05	1.37	1.10-1.90	0.01	0.11	48.95	46.43-52.73	36.80	32.73-40.00

Table VIII

The sizes of M^3 of *Microtus* ex gr. *juldaschi* from the Sel'-Ungur site and of recent *Microtus* (*Neodon*) *juldaschi*, *M.* (*N.*) *leucurus*, *M.* (*N.*) *sikimensis*, and *M.* (*Blanfordimys*) *afghanus*, in mm (The collections of the Zoological Museum of Moscow University and Zoological Institute of the Russian Academy of Sciences).

Species	Layer	N	M	OR	V	SD	M	OR	V	SD
			Length				Breadth			
Sel'-Ungur *M.* ex gr. *juldaschi*	3	46	1.75	1.50-2.00	0.02	0.12	0.86	0.75-0.95	0.01	0.07
	5	15	1.76	1.40-2.15	0.03	0.17	0.84	0.80-0.90	0.01	0.10
M. (*N.*) *juldaschi*		25	1.78	1.60-1.90	0.03	0.19	0.83	0.80-1.05	0.01	0.06
M. (*N.*) *leucurus*		5	2.01	2.00-2.05	0.06	0.25	1.08	1.00-1.15	0.01	0.06
M. (*N.*) *sikimensis*		1	2.30				1.20			
M. (*B.*) *afghanus*		45	1.58	1.40-2.00	0.02	0.13	0.99	0.90-1.10	0.01	0.07

The remains of *Microtini* from the Ogzy-Kichik site were described as *Microtus* (*Neodon*) *carruthersi* (STALMAKOVA and KIREEV 1986). This last species is morphologically and genetically not distinguishable from *M.* (*N.*) *juldaschi*.

Undoubtedly, the Sel'-Ungur voles are related to the phyletic line of *Microtus* (*Neodon*) *juldaschi* [=*M.* (*N.*] *carruthersi*) but can be distinguished from the recent *Neodon* by

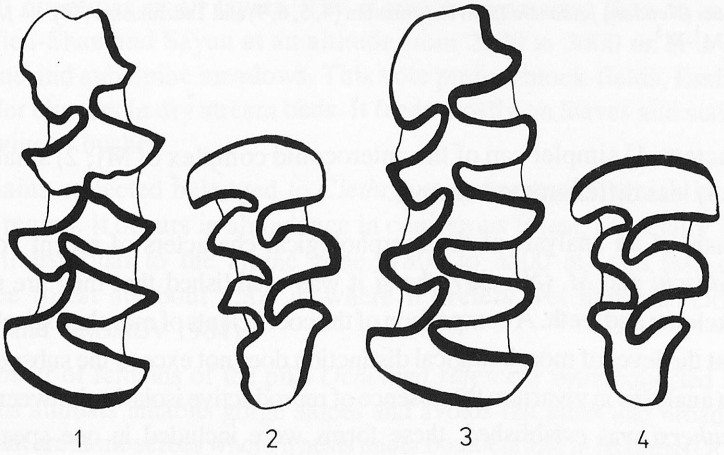

Fig. 10. Occlusal surface of teeth of the recent *Microtus* (*Blanfordimys*) *afghanus* (Tadzhikistan): 1 – M_1, 2 – M^3, 3 – M_1, 4 – M^3.

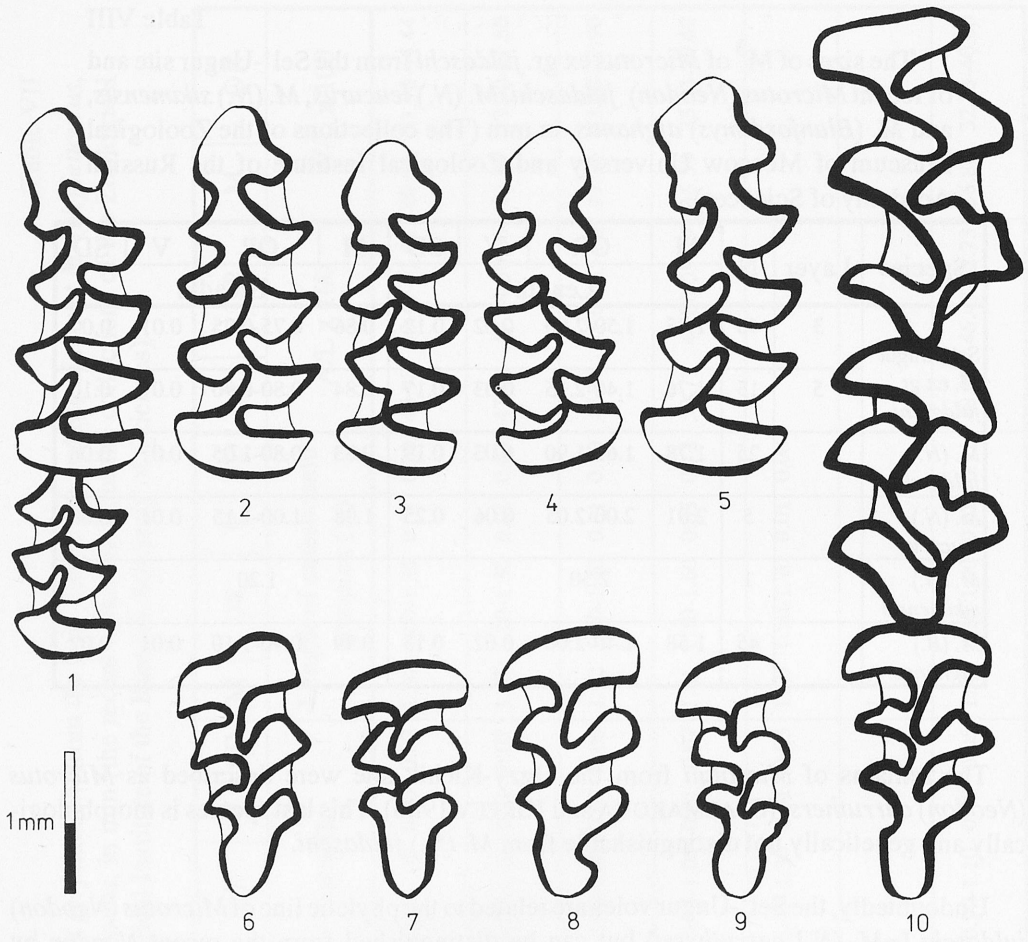

Fig. 11. The occlusal surface of teeth of the recent *Microtus* (*Neodon*) *carruthersi* from Tadzhikistan (1, 2, 3, 7, 8) and *Microtus* (*Neodon*) *juldaschi* from Kirghizstan (4, 5, 6, 9) and Tadzhikistan (10). 1 – M_1-M_2, 2-5 – M_1, 6-9 – M^3, 10 – M^1-M^3.

several characters: 1) simpler cap of the anteroconid complex of M_1; 2) smaller A/L ratio (Table VII); 3) less differentiated enamel.

On the basis of an analysis of the morphological characters of recent voles *Microtus* (*Neodon*) *juldaschi* and *M.* (*N.*) *carruthersi* it was established that they are similar in the structure of skeleton and teeth. A comparison of the coefficients of morphological resemblance has shown that the level of morphological distinction does not exceed the subspecies rank. On the basis of an analyses in vivarium the absence of reproductive isolation between *M. juldaschi* and *M. carruthersi* was established; these forms were included in one species, *Microtus* (*Neodon*) *juldaschi* (SEVERTZOV, 1879) (BOLSHAKOV et al. 1980; VASILEVA 1977). This permits us to refer the Sel'-Ungur form to *Microtus* (*Neodon*) ex gr. *juldaschi.*

III. DISCUSSION

The rodent fauna of the cultural layers of the Sel'-Ungur Acheulian cave site revealed its characteristic composition. Most of the remains belong to endemic species of the Central Asian mountainous region. This refers above all to dominating taxa, such as *Microtus* (*Neodon*) ex gr. *juldaschi*, *Ellobius* ex gr. *tancrei*, *Meriones libycus selunguricus* ssp. nov., *Alticola argentatus*, and *Clethrionomys* ex gr. *centralis*.

The ecology of the species identified from this locality is described below according to the data published.

The juniper voles *Microtus juldaschi* (=*M. carruthersi*) are widely distributed in montain forest and alpine zones of the Pamir-Alai and Western Tien-Shan Mountains. They inhabit every moist meadow and alpine grass plot by streams, in gorges and wet subalpine meadows, up to 4500 m a.s.l. Their colonies are met among the hay-plants (*Prangos pabularia*), in englantine and honeysuckle bushes, under junipers and maple trees (OGNEV 1950; GROMOV and POLYAKOV 1977). The archaic characters of the teeth of the subgenus *Neodon* probably survived owing to the isolation in the mountainous areas of Central Asia.

Nowadays oriental mole-voles *Ellobius tancrei* inhabit montane and alpine meadows and steppes of Central Asia, up to 4000 m a.s.l.; they are most abundant in the montain meadow and alpine zones, and avoid waterlogged soils and sands, as well as localities deeply frozen in winter.

The remains of *Meriones libycus selunguricus* found in Sel'-Ungur indicate the presence of semidesert habitats in the region. This species has a very large range, including Asian semideserts and deserts, and is widely spread over ephemeral plant deserts in foothills, on loess and sandy-loess soils and fixed sand. It occurs in the mountains up to 2000 m a.s.l. (PAVLINOV et al. 1990).

It is worth mentioning that remains of high-mountain vole *Alticola argentatus* were found in small quantities in all layers. The recent *A. argentatus* lives in mountains of Pamir-Alai, Tien-Shan and Sayan at an altitude from 2000 to 3000 m. It is particularly typical of alpine and subalpine meadows. This vole prefers block-fields, fissures in solid rocks or boulder clusters in dry stream beds. It feeds mostly on leaves and stalks of grass, on bark and twigs of bushes.

A few remains collected belonged to *Clethrionomys centralis*, which is an endemic species of the region. It occurs in abundance in coniferous forest, especially in the upper spruce zone, transitional to the alpine zone (1800 to 3500 m) and less common in aspen-appletree forest at about 1500 m where it prefers wet habitats (OGNEV 1950; VINOGRADOV and GROMOV 1984).

A great number of remains of the pika *Ochotona rufescens* were collected from all the layers. Now this animals inhabits gorge slopes and avoids flat areas and broad valleys. Its preferable habitat are stone screes where it nests under boulders and in fissures (OGNEV 1940).

Only a few of the identified remains belonged to the genus *Apodemus*. At present mice are most abundant in the montain forests, spreading up to the alpine zone (up to 3500 m a.s.l.).

The grey hamster (*Cricetulus migratorius*) is much more typical of the Sel'-Ungur fauna. The species prefers open landscapes from forest-steppe to semidesert, being most common in steppes both in mountains and on plains.

The above description of the ecological preference of species determined from the Sel'-Ungur site shows that their environmental requirements vary in a broad range. This can be explained by the specific mosaic pattern of montane landscapes, where differently directed slopes provide a great variety of habitats. The remains of rodents and pikas originate mostly from owl pellets. The birds prey upon small mammals within a distance of 1-2 km from the cave and bring the prey from various biotopes, sometimes even from different altitudinal zones. As a result species of different ecological requirements may be found together in fossil localities of this kind.

The fauna recovered from the Sel'-Ungur cultural layers indicates montane-steppe environments with forests and shrubs in wet depressions and on stream banks; dry (desert-like) habitats occurred on south-facing slopes and in dry beds of ephemeral streams. Rocks and block fields were also present in the vicinity of the cave.

Pollen and spores were analysed by KREMENETSKI (in VELICHKO et al. 1990) who identified abundant pollen of *Artemisia*, *Chenopodiaceae* and of some taxa associated with human activity. In the opinion of KREMENETSKI, the large quantity of *Gramineae* and *Dipsacaceae* suggests the predominance of steppe biocoenosis. Alder and birch grew on the floodplain, though birch pollen was mostly brought by wind from the Alai and Karantau Mountains. The presence of broad-leaved and coniferous species in the spectra indicates the fairly close presence of the montain forest zone (pine and spruce forests). On the whole, KREMENETSKI on the basis of palynological data came to the conclusion that the fossiliferous cave deposits were of Middle Pleistocene age.

The morphological characters of the rodent remains show noticeable differences from recent populations. It refers to the morphology of most species, including *Microtus* (*Neodon*) ex gr. *juldaschi*, *Ellobius* ex gr. *tancrei*, *Meriones libycus selunguricus*, *Clethrionomys* ex gr. *centralis*. There are, however, no species which would be indisputable evidences for the Early Pleistocene age of the Sel'-Ungur fauna of small mammals. Dating is difficult for the lack of comparative fossil material. The positions of the fossiliferous layers below the layer dated by the uranium-ionium technique at 126,000 ± 500 (LU-936) years B.P indicates that early man (*Homo erectus*) lived here before the last interglacial period. The data given above permit us to assign the Middle Pleistocene age to all the bone bearing layers of the Sel'-Ungur Acheulian site.

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