

Late Pliocene and Eopleistocene micromammal faunas of southeastern Kazakhstan

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Abstract. Fossil small mammal assemblages from the Late Pliocene and early Early Pleistocene (Eopleistocene) of Kazakhstan are discussed. They represent five faunas, which are (from oldest to youngest): Kiikbay, Ily, Charyn, Djalánash and Kopaly.

Key words: micromammals, Pliocene, Pleistocene, Kazakhstan.

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I. INTRODUCTION

Almost twenty years of studies of small mammal faunas in southeastern Kazakhstan have yielded important information on the faunal succession and biostratigraphy of the region during the Pliocene and Pleistocene (LYTCHEV & SAVINOV 1974; KOZHAMKULOVA et al. 1987; AUBEKEROV et al. 1990; TJUTKOVA 1990; TJUTKOVA & KAIPOVA 1993). All localities discussed in the present paper lie in the intermontane depressions of the Zaily Alatau Range (Kopet-Dala, Tekess and Djalánash) in southern Kazakhstan (Fig. 1).

The description of the geological context of localities is being carried out by A. V. TIMUSH, N. N. KOSTENKO, B. J. AUBEKEROV & B. I. PINKHASOV and forms the subject of separate studies. It should only be noted that the Kopaly section represents two hundred meters of continental deposits of the Upper Pliocene - Pleistocene, saturated with organic remains, mainly bones of vertebrates. This section was sampled for palaeomagnetic analysis in 1980 and 1988. The data have shown that the deposits were formed in the Matuyama Epoch. The lower part of the section corresponds to the Reunion Normal Subchron and the middle part to the Olduvai Normal Subchron (AUBEKEROV et al. 1990).

The Adyrgan burial was dated to 2.2 Ma (the Matuyama Epoch, Reunion Normal Subchron) based on the results of paleomagnetic investigations (TLEUBERDINA 1990). The remains of charas, molluscs, amphibians, fish, birds, large and small mammals were collected from these localities. Spores and pollen have also been found.

On the basis of small mammal studies five faunal assemblages were distinguished that gradually replaced each other from the Late Pliocene to the Eopleistocene (= the end of the early Villafranchian - beginning of the Biharian). Although each assemblage corresponds to a defined geological age, each is known only for a single locality (with the exception of the Ily assemblage) and their spatial distribution in Kazakhstan is not yet clear. Therefore, we use here the term "fauna" instead

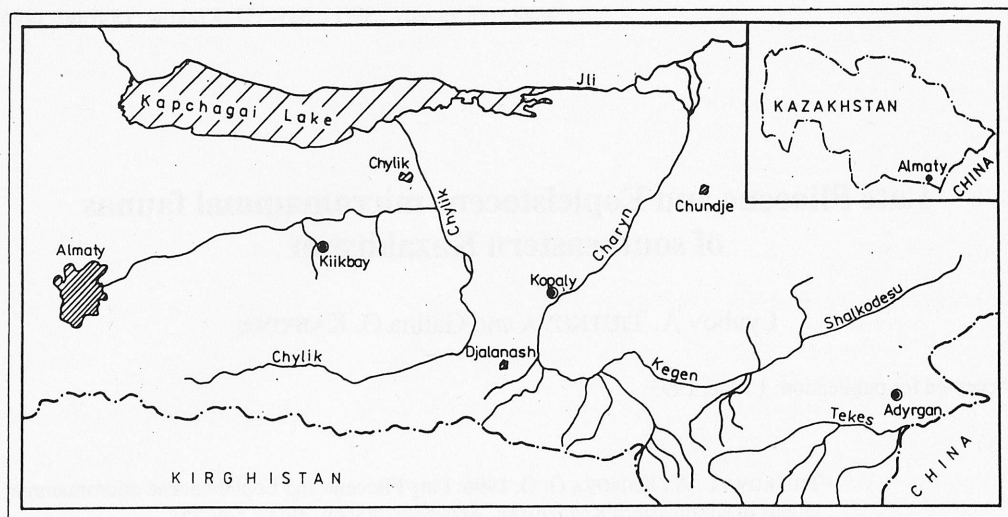


Fig. 1. Location of the Late Pliocene and Early Pleistocene small mammal faunas in south-eastern Kazakhstan.

of "faunal complex" following GROMOV (1966), GALKINA (1977) and VANGENGEM (1982). Faunas are distinguished on the basis of their taxonomic composition, the appearance of one species (or genus) and disappearance of another and the level of evolutionary development of particular forms.

II. THE FAUNAS

K i i k b a y f a u n a

This fauna is known from the Kiikbay locality (Table I). The characteristic feature of this fauna is the presence of *Hypolagus brachygnatus* KORMOS, 1934 and *Ochotonoides complicidens* BOULE & TEILHARD DE CHARDIN, 1934 and the absence of typical *Ochotona* species. Among voles only *Mimomys antis* SAVINOV, 1974 and *M. pliocaenicus* FORSYTH MAJOR, 1902 are present (Fig. 2). The structure of the molars of *M. antis* is very interesting. They combine archaic characters (lack or only small quantities of cement in the reentrant angles, well developed roots, crowns that are not high, three roots on M1, two enamel islets on M3) and progressive ones (two roots on M3, *Mimomys*-type enamel differentiation). The local *M. pliocaenicus* is most closely related to that from Beteke (ZAZHIGIN 1980) in its tooth structure and the height of the crowns, but has higher tracts.

Based on the stratigraphic distribution of the forms that constitute this fauna and also taking into account the morphological peculiarities of the voles, the age of the fauna is comparable to that of Kysyl-Aigyr (ZAZHIGIN & ZYKIN 1984) and Kotlovina (KRASNOV & NIKIFOROVA 1973). It corresponds to the middle Akchagyl (end of the early Villafranchian) and the end of MN 16.

I l y f a u n a

This fauna is defined on the basis of small mammal remains from the first fossiliferous horizon of the Kopoly section and the Adyrgan burial (Table I, Fig. 3). Forms that survived until the end

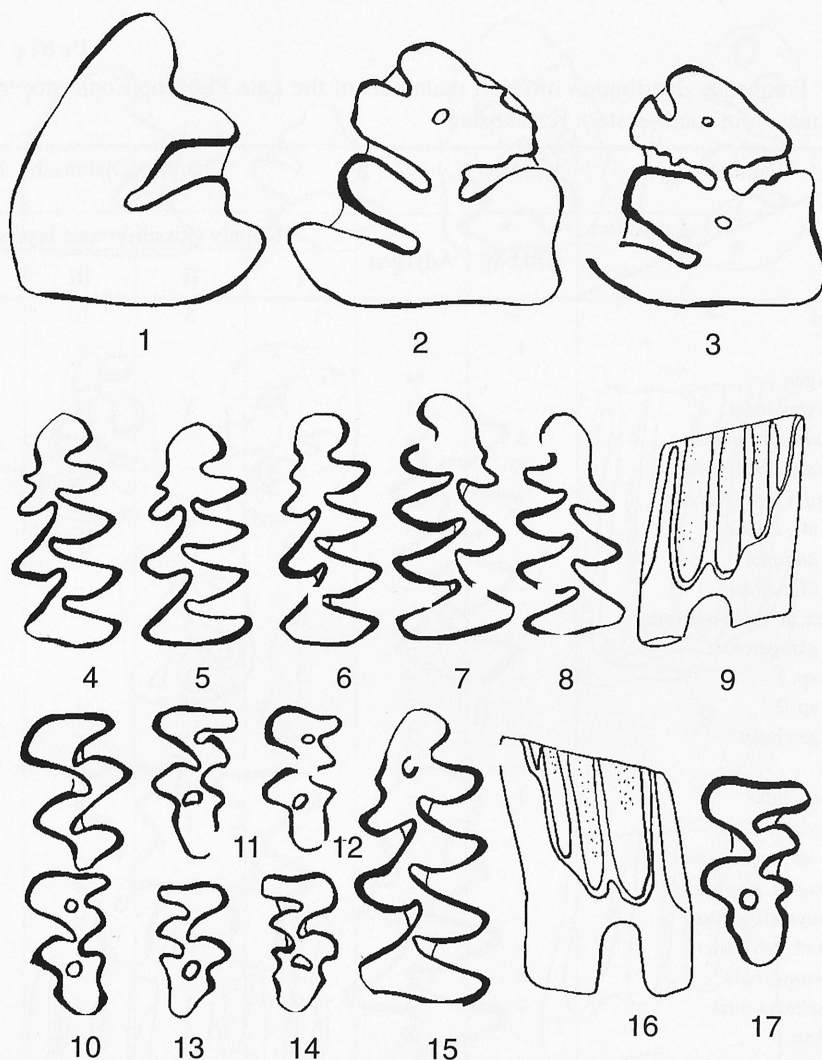


Fig. 2. Small mammals characteristic of the Kiikbay fauna. 1 – *Hypolagus brachygnatus*; 2-3 – *Ochotonoides complicidens*; 4-14 – *Mimomys antis*; 15-17 – *Mimomys pliocaenicus*.

of the Pliocene (*Orientalomys*, *Promimomys*) and forms that had just appeared at that time (*Cricetulus*) are present simultaneously in the assemblage. The evolutionary level of *Villanyia petenyii* (MÉHELY, 1914) in Ily (the lingual shift of the root on M2, the presence of three roots on M1, but already two on M2, the height of crown and tracts, the lack of enamel differentiation) is close to the *Villanyia* characteristic of the Khaprovian faunas (middle Villafranchian).

The Adyrgan mice are also comparable to Khaprovian assemblages (TOPACHEVSKY & NESIN 1989) in their evolutionary level. Their M1 have a strongly posteriorly displaced t/1; t/4 is confluent with t/8, but not with t/5. Representatives of the genus *Mimomys* (*M. haplodentatus* SAVINOV & TJUTKOVA, 1987) are more advanced in their tooth structure than *M. antis* and *M. pliocaenicus* from Kiikbay in the more developed hypsodonty of the molars and the greater height of the tracts and abundantly cement-filled reentrant angles. The mark on M3 is still present. One of the peculiarities

Table I

Frequency distribution of small mammals of the Late Pliocene-Eopleistocene
faunas from south-eastern Kazakhstan

Faunas		Kiikbay	Ily	Charyn	Djalanash	Kopaly	
Taxa	Localities	Kiikbay	Adyrgan	Kopaly (fossilifereous layers)			
				I	II	III	IV
Insectivora		—	—	—	5	10	—
<i>Sorex</i> sp.		1	—	—	—	—	—
Leporidae gen.		—	4	—	—	—	—
Leporinae gen. indet.		—	3	1	5	4	7
<i>Hypolagus brachygnatus</i>		8	—	3	—	—	—
<i>Ochotonoides complicidens</i>		29	—	—	—	—	—
<i>Ochotonoides progressivus</i>		2	—	—	—	—	—
<i>Ochotona</i> aff. <i>eximia</i>		—	—	—	3	—	—
<i>Ochotona antiqua</i>		—	—	—	16	—	—
<i>Ochotona</i> cf. <i>pallasi</i>		—	—	—	11	—	—
<i>Ochotona</i> ex. gr. <i>roylei-macrotis</i>		—	—	10	1	—	—
<i>Ochotona aktogaiensis</i>		—	—	1	—	—	—
<i>Ochotona</i> sp. 1		—	—	3	2	—	—
<i>Ochotona</i> sp. 2		—	—	3	86	1	—
Sciuridae gen indet.		—	1	—	—	—	—
<i>Hystrix</i> sp.		—	—	2	—	—	—
Gliridae gen. indet.		1	—	—	—	—	—
<i>Sicista bagajevi</i>		—	—	—	1	—	3
<i>Allactaga</i> aff. <i>anderssoni</i>		—	—	—	1	—	—
<i>Pygerethmus</i> cf. <i>pygmaeus</i>		2	—	—	—	—	—
<i>Orientalomys adirganus</i>		—	49	—	—	—	—
<i>Apodemus</i> cf. <i>sylvaticus</i>		—	—	—	—	1	—
<i>Ellobius primigenius</i>		6	—	—	—	—	—
<i>Ellobius tscharynensis</i>		—	—	9	2	4	2
<i>Cricetulus</i> sp.		—	29	—	—	—	—
<i>Allocricetus eversmani</i>		3	—	1	1	2	—
<i>Phodopus minutus</i>		1	—	—	—	—	—
<i>Meriones</i> cf. <i>meridianus</i>		—	1	—	—	—	—
<i>Meriones</i> sp.		—	—	—	1	2	5
<i>Clethrionomys mirus</i>		—	—	—	5	237	662
<i>Prolagurus praepannonicus</i>		—	—	—	—	150	5
<i>Villanyia petenyii</i>		—	15	3	—	—	—
<i>Villanyia</i> sp.		—	—	1	1	—	—
<i>Promimomys</i> cf. <i>baschkirica</i>		—	1	—	—	—	—
<i>Mimomys pliocaenicus</i>		9	—	—	—	—	—
<i>Mimomys antis</i>	177	—	—	—	—	—	—
<i>Mimomys newtoni</i>	—	—	—	14	4	—	—
<i>Mimomys</i> ex. gr. <i>newtoni-intermedius</i>	—	7	—	—	—	—	—
<i>Mimomys haplodentatus</i>	—	—	—	477	486	—	—
<i>Mimomys</i> sp. 1	2	—	—	—	—	—	—
<i>Mimomys</i> sp. 2	—	1	—	—	—	—	—
<i>Allophaiomys deucalion</i>	—	—	—	—	31	321	155
<i>Microtus</i> sp.	—	—	—	—	—	—	1

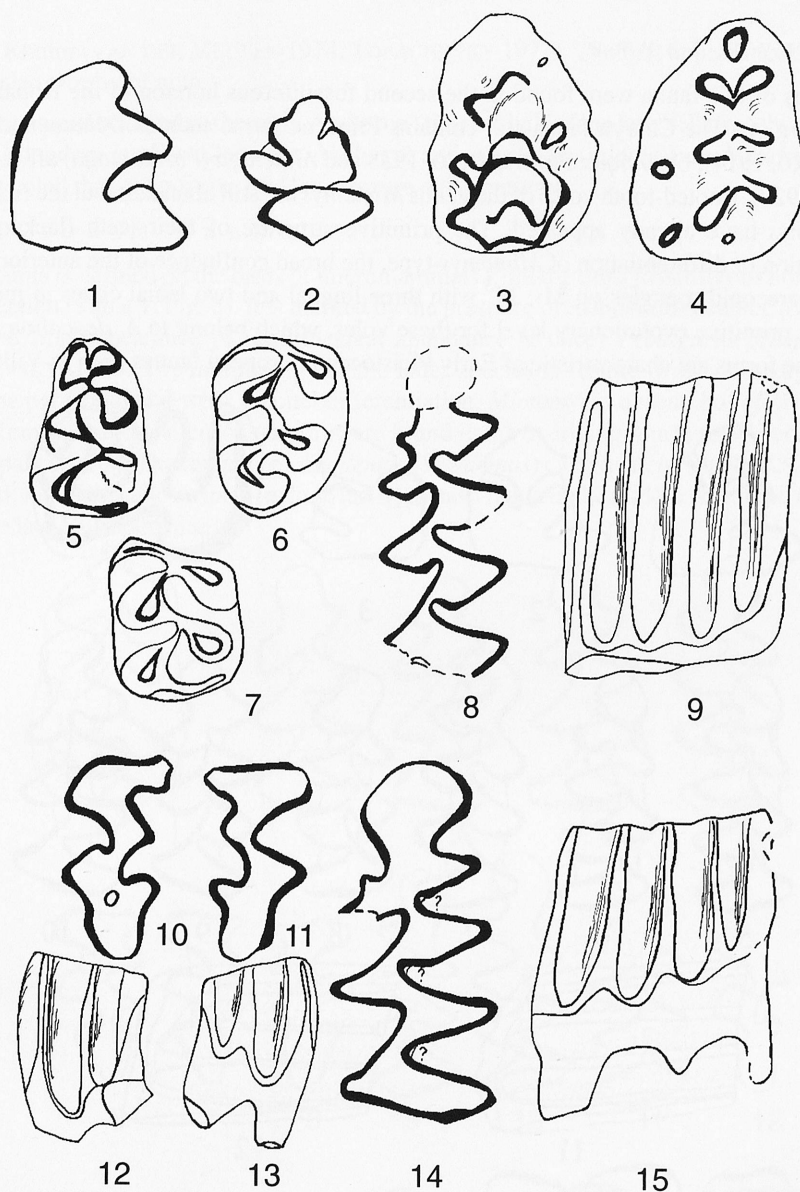


Fig. 3. Small mammals characteristic of the Ily fauna. 1 – *Hypolagus brachygnatus*; 2 – *Ochotona aktogaiensis*; 3-4 – *Orientalomys adirganus*; 5-7 – *Cricetulus* sp.; 8-13 – *Villanyia petenyii*; 14-15 – *Promimomys* cf. *baschkirica*.

of the Ily fauna is a complete absence of rootless voles, which appear in the following Charyn fauna. It is extremely important that the remains of Ily *Mimomys* and Charyn *Allophaiomys* were found in a single section.

Thus, based on the faunal list of the Ily micromammals and stratigraphic range of the particular species, this fauna can be assigned an age analogous to that of the Podpusk-Lebyazhinsk (VANGENGEM & ZAZHIGIN 1969) and Khapry (KRASNOV & NIKIFOROVA 1973) faunal complexes. This corresponds to the late Akchagyl (middle Villafranchian) or MN 17.

Charyn fauna

Remains of this fauna were found in the second fossiliferous horizon of the Kopaly section (Table I, Fig. 4). The Charyn fauna still contains Pliocene forms such as *Ochotona* aff. *eximia* (KHOMENKO, 1914), *O. antiqua* PIDOPLICHKO, 1938 and *Allactaga* (*Paralactaga*) aff. *anderssoni* (YOUNG, 1927). Rooted-tooth voles of the genus *Mimomys* are still abundant, but the first rootless *Allophaiomys* have already appeared. The primitive structure of their teeth (lack of enamel differentiation or differentiation of *Mimomys*-type, the broad confluence of the anterior unpaired cap with paraconid triangles on M₁; M³ with three lingual and two labial cones in most cases) indicates a primitive evolutionary level for these voles, which belong to *A. deucalion* KRETZOI, 1969. These forms are characteristic of Early Pleistocene European faunas such as Villany 5 and

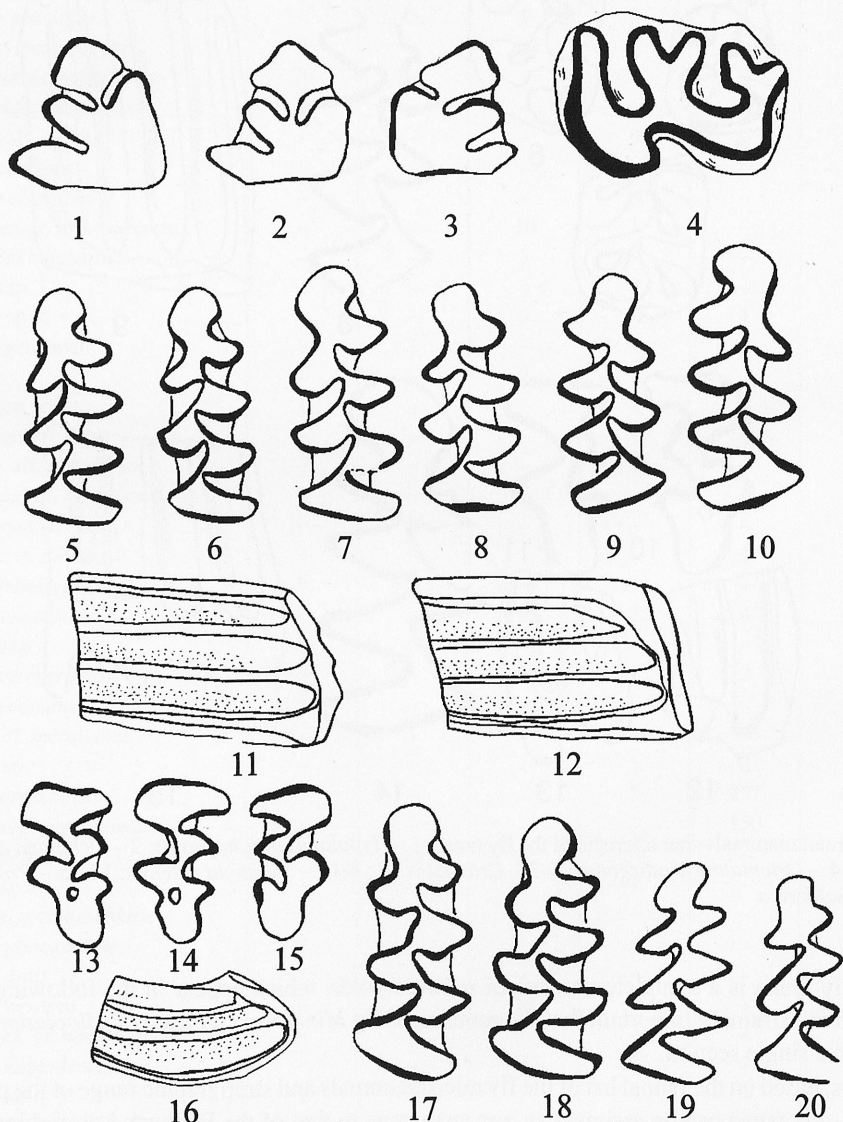


Fig. 4. Small mammals characteristic of the Charyn fauna. 1 – *Ochotona* aff. *eximia*; 2 – *Ochotona antiqua*; 3 – *Ochotona* cf. *pallasi*; 4 – *Allactaga* aff. *anderssoni*; 5-16 – *Mimomys haplodentatus*; 17-18 – *Allophaiomys deucalion*; 19-20 – *Clethrionomys mirus*.

Morskoy Khutor (VAN DER MEULEN 1974; TOPACHEVSKY 1973). The first appearance of *Clethrionomys* is also worthy of note.

This fauna can be dated to the early Apsheron (the first half of the late Villafranchian). Though its lower boundary is placed between Akchagyl and Apsheron (middle Late Villafranchian), it should be noted that older forms of *Mimomys* are still dominant.

D j a l a n a s h f a u n a

This fauna is defined on the basis of micromammals from the third fossiliferous horizon of the Kopaly section (Table 1, Fig. 5). It is marked by the presence of *Allophaiomys* and *Clethrionomys* and by the first appearance of (and in great abundance at once) *Prolagurus praepannonicus* TOPACHEVSKY, 1965. The morphology of the latter species is simple, with a broadly confluent neck of the paraconid and weak enamel differentiation. *Mimomys* is absent, but *Microtus* not yet present. Remains of the latter (one tooth) were found in the overlying fourth fossiliferous horizon of the Kopaly section. The remains of *Apodemus* (*Sylvaemus*) cf. *sylvaticus* LINNAEUS, 1758 were also found. All of this allows us to include the Djalanash fauna in the middle Apsheron (the second half of the late Villafranchian).

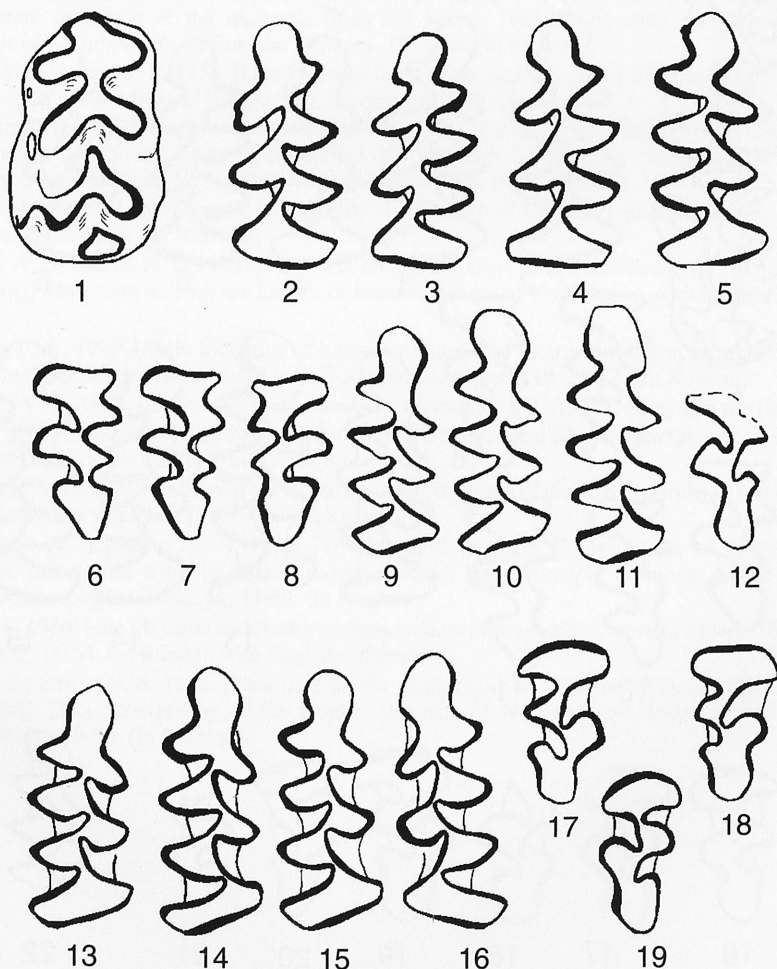


Fig. 5. Small mammals characteristic of the Djalanash fauna. 1 – *Apodemus* cf. *sylvaticus*; 2-8 – *Clethrionomys mirus*; 9-12 – *Prolagurus praepannonicus*; 13-19 – *Allophaiomys deucalion*.

The age of the Charyn and Djalanash faunas is identical to that of Kizykha (VANGENGIM & ZAZHIGIN 1969) and corresponds to the Oddessian faunistic complex (late Villafranchian, MN 18) (KRASNOV & NIKIFOROVA 1973).

K o p a l y f a u n a

The small mammal fauna of the fourth fossiliferous horizon of the Kopaly section is most similar to that of Razdolye (VANGENGIM & ZAZHIGIN 1969) and to the Taman faunal complex (KRASNOV & NIKIFOROVA 1973) (Table 1, Fig. 6). The first appearance of voles of the genus *Microtus* is indicative of this affinity. The small number of remains of this genus in the assemblage can be due to taphonomic processes or be suggestive of a low frequency of *Microtus* in the region at the time. At the same time, a change in the whole fauna is observed. The abundance of *Prolagurus praepannonicus* has decreased sharply. *Allophaiomys deucalion* is also less frequent in comparison with the Djalanash fauna. The Kopaly *Allophaiomys* is smaller than that present in the Charyn and Djalanash faunas and has a tendency to complication of its dental pattern; the anterior unpaired cusp is not so widely confluent with the anteroconid. However, this character has not yet reached

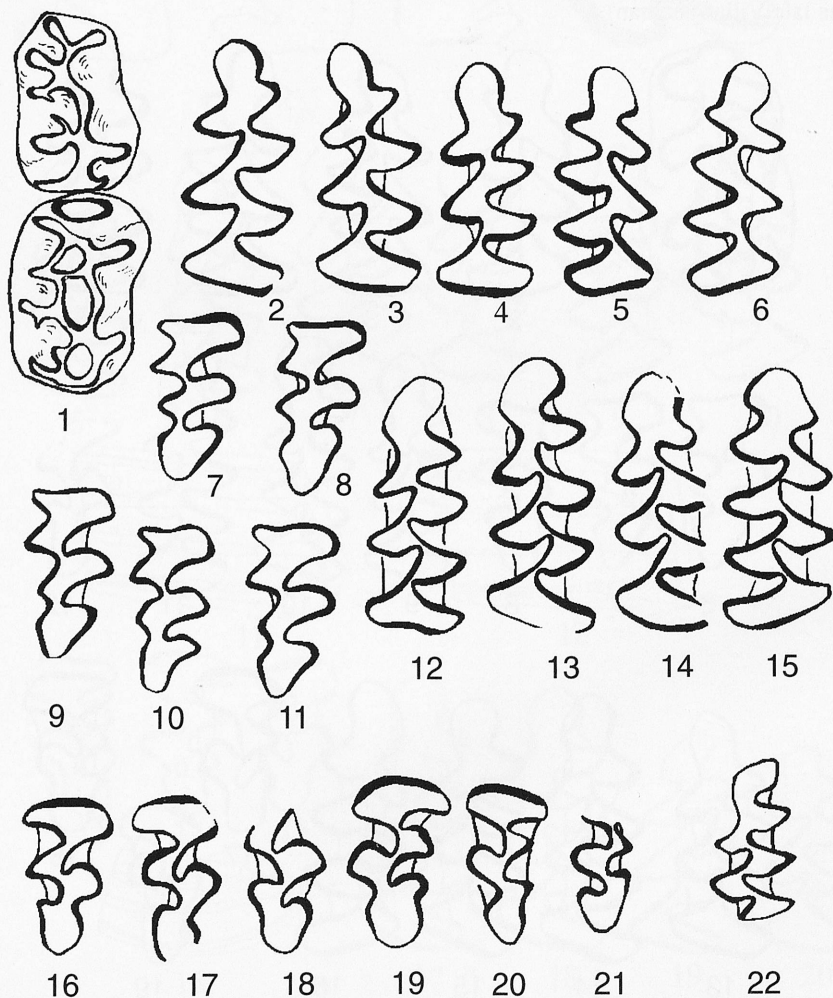


Fig. 6. Small mammals characteristic of the Kopaly fauna. 1 – *Sicista bagajevi*; 2-11 – *Clethrionomys mirus*; 12-21 – *Allophaiomys deucalion*; 22 – *Microtus* sp.

the level of *A. pliocaenicus* KORMOS, 1933. The abundance of *Clethrionomys* is increasing. Unfortunately, we have no material from the overlying deposits, and therefore cannot say definitely what the upper age limit of this fauna is. The Kopaly fauna can be dated to the beginning of the late Apsheon (beginning of Biharian) or the beginning of MNQ 19-21.

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