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Pliocene Small mammals from the Udunga site of the Transbaikal area

Pequeños mamíferos del Plioceno del sitio de Udunga del área de Transbaikalia

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Abstract: In the Transbaikal area, the oldest known fauna is from Udunga site of the early Late Pliocene which was attributed to the Udunginian Faunistic Complex. It is characterized by its peculiar mammal fauna, including some Ruscinian forms previously unknown in this region, and several new large and small mammalian taxa found in the Transbaikal area for the first time. Among small mammals, a new cricetid taxon (*Gromovia daamsi* n. gen., n. sp.) is recognized and described here. The analysis of the fauna shows the predominance of forest inhabitants.
Key words: Rodentia, Lagomorpha, *Gromovia daamsi* nov. gen., nov. sp. Pliocene, Transbaikalia

Resumen: En Transbaikalia (Siberia), la más antigua fauna conocida procede del yacimiento de Udunga del Plioceno superior basal, que define el Complejo Faunístico Udungiense. Se caracteriza por su fauna peculiar de mamíferos, incluyendo alguna forma del Ruscieniense previamente desconocida en esta región, y varios taxa nuevos de grandes y pequeños mamíferos hallados en Transbaikalia por primera vez. Entre los pequeños mamíferos se reconoce y describe aquí un nuevo cricétido (*Gromovia daamsi* n. gen., n. sp.). El análisis de la fauna muestra la predominancia de habitantes de bosque.
Palabras clave: Rodentia, Lagomorpha, *Gromovia daamsi* nov. gen., nov. sp. Plioceno, Transbaikalia

INTRODUCTION

The Udunga local fauna has been known for more than ten years (IMETKHENOV, KALMYKOV, 1990). Rather abundant remains of large mammals were discovered here around the end of eightieth of the last century (SOTNIKOVA & KALMYKOV, 1991; VISLOBOKOVA & KALMYKOV, 1994; VISLOBOKOVA *et al*., 1993, 1995) and preliminary data on small mammals of this site were provided by ERBAJEVA (1996) and ERBAJEVA and ALEXEEVA (1997). On the basis of the peculiarity of the mammal composition this fauna was proposed as the Udunginian faunistic complex of the Early Pliocene (Mein' mammal zone MN 15) (SOTNIKOVA & KALMYKOV, 1991; KALMYKOV, 1992). Later it appeared that the geological age of the Udunginian faunal complex is the early Late Pliocene (corresponds to Early Piacenzian) (mammal zone MN 16a) which was established on the base of the analysis of mammals and their stratigraphic range (VISLOBOKOVA *et al.,* 1993). This age for the fauna was confirmed by VISLOBOKOVA *et al.* (1995) also by the data on artiodactyls.

The Udunginian Faunistic Complex is the earliest in the Pliocene Transbaikalian mammal sequence. It is followed by Chikoian (MN 16b) and Itantsinian (MN 17) Pliocene faunas that have provided the faunal changes during the Late Pliocene (ERBAJEVA & ALEXEEVA, 2000).

During the last decade, new samples of mammals including lagomorphs and rodents were collected from Udunga locality (Fig. 1) by the authors and by I. VISLOBOKOVA. The test samples for small mammals were of 15-20 kg each. Fossil remains in samples were not rich. In total more than 10 tons of sediments were wet screened during several years of working in

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the site. We used sieves with mesh sizes of 0.5 and 1.0 mm. The preservation of small mammals is variable. The most of them, especially remains of arvicolids, murids, siphneids and ochotonids are represented by isolated teeth and by fragments of the mandibles.

The study of the small mammals from this site shows that they differ significantly from the following Chikoian Faunistic Complex and include new taxon for the Transbaikal area unknown previously in the region. The analysis of the Udunga fauna with the descriptions of new taxon of cricetids, as well as of some other small mammals is presented in this paper.

The small mammal remains are stored in the Geological Institute of the Siberian Branch of the Russian Academy of Sciences, Ulan-Ude.

The terminology used here to describe dental structure of ochotonids follows LOPEZ MARTINEZ (1989) and ERBAJEVA (1988) and that of cricetids follows LINDSAY(1988). Capital and lower-case letters, P2//P/3 (premolar) and M1//M/1 (molar), refer to upper and lower cheek-teeth, respectively.

We follows Standard chronostratigraphy (HARDENBALL *et al*., 1997) in that the Pliocene consists of two units – Lower and Upper, the latter of which includes Piacenzian and Gelasian. The fauna of Udunga site corresponds to Early Piacenzian and with Mein' mammal zone MN 16a.

The measurements of the teeth are from the occlusal surface and form the external borders of the enamel, expressed as the maximum length (L) and width (W) of teeth. All measurements are in millimetres.

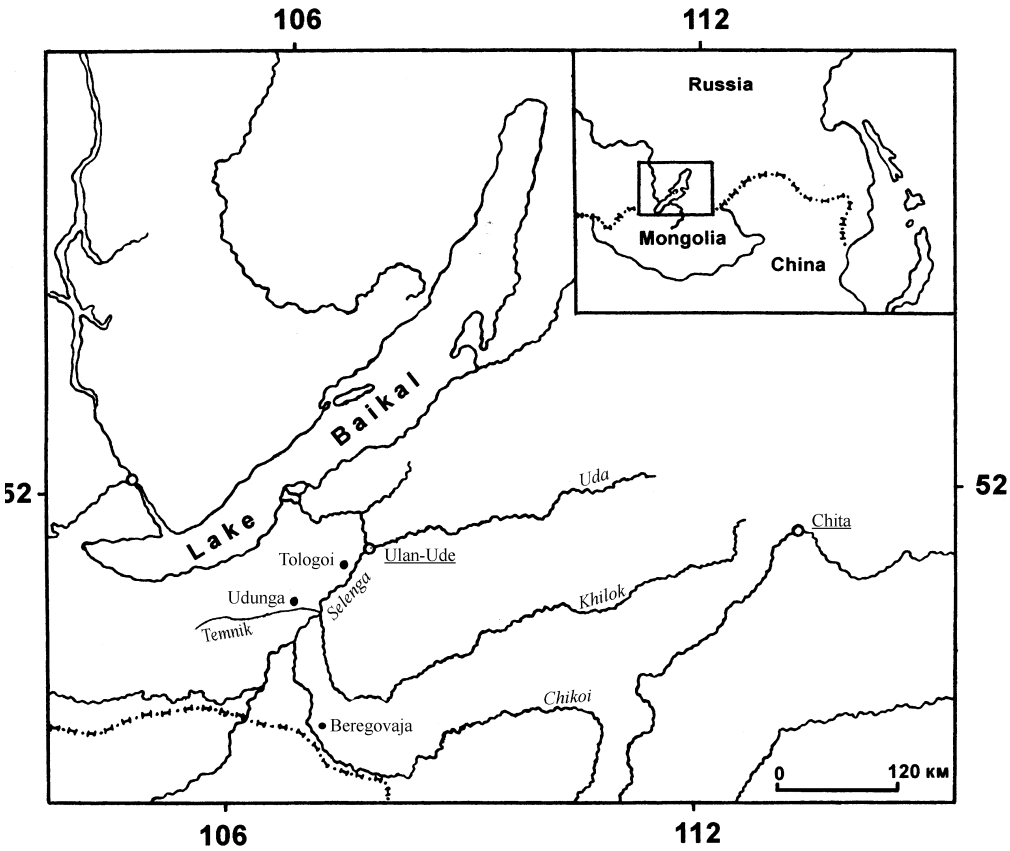

Figure 1. The location of the Transbaikalian sites.
Figura 1. Situación de los yacimientos de Transbaikalia

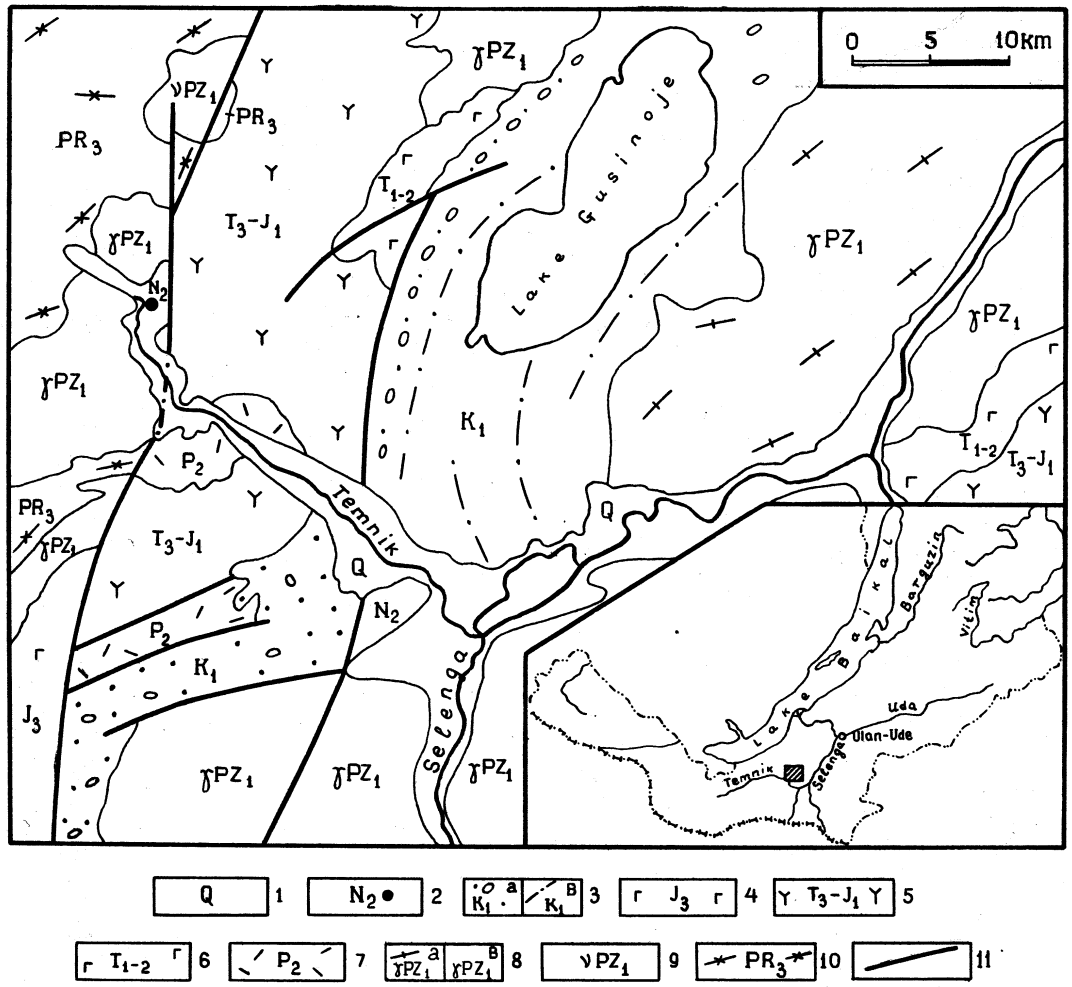

Figure 2. Geological map of the surrounding Udunga site region. 1- Quaternary deposits; 2 Tertiary deposits and location (*) of the site; 3 - Lower Cretaceous: a - coarse grained sandstone; b - siltstone, argillite; 4 - Upper Jurassic: volcanic lava; 5 - Upper Triassic- Lower Jurassic: volcanic lava; 6 - Triassic: volcanic lava; 7 - Upper Permian: volcanic lava; 8 - Lower Paleozoic: a - granite & volcanic lava; b - granite; 9 - Lower Paleozoic: gabbro; 10 - Upper Proterozoic: carbonate; 11 - fault.

Figure 2. Mapa geológico de los alrededores de Udunga; 1- depósitos cuaternarios; 2 - depósitos tertiarios y situacion (*) del yacimiento; 3 - Cretácico inferior: a - areniscas gruesas; b - limos, arcillitas; 4 - Jurásico: lavas; 5 - Triásico- Jurásico inferior: lavas; 6 - Triásico: lavas; 7 - Pérmico superior: lavas; 8 - Paleozoico inferior: a - granito y lavas; b - granito; 9 - Paleozoico inferior: gabbro; 10 - Proterozoico superior: carbonatos; 11 - falla.

GEOLOGICAL SETTINGS AND FAUNAL ANALYSIS

The Udunga site is located on the left bank of the Temnik river, the tributary of the Selenga river in the vicinity of Udunga village (N51008'23" E 105058'55"). Here at the Khambinsky Ridge foot in one of the old gully infilled by red sediments of the Upper Neogene Chikoi Suite rather numerous fossil mammal remains were found. In studied region red bed distributed in restricted region as it is indicated in Fig. 2. In Udunga site these red sediments are overlaped with erosion by the grey one (Fig. 3). However the Chikoi Suite deposits are widely distributed in the Transbaikal area and they are exposed at the Beregovaya and Tologoi sites (Fig. 1).

The exposed gully deposition in the section consists of (Fig. 3):

1. 1 m (exposed) boulders and gravels cemented by sands.

2. 1-1.2 m dark brown clay and sandy loam with rock debris. The trace of fossil soil on the top of horizon. Fossil remains of small mammals (first faunistic horizon).

3. 1.5 m reddish-brown loam with rock debris and gruss with lenses of sandy loam. Remains of large and small mammals (second faunistic horizon).

4. 1 m reddish loam with scarce rock debris and gruss. In lower part of horizon fossil remains of small mammals (third faunistic horizon).

5. 0.7-1 m alternating reddish loam and sandy-loam.

6. 1.0-1.5 m loess-like sediments with abundant rock debris and gruss with spots of carbonate. Scarce remains of small mammals.

In this section three main stratified sedimentary units are recognized:

the lowermost unit (layer 1) consists of boulders, gravels and sands; apparent thickness more than 1 m; no fossil remains were found here;

the middle unit includes four horizons (layers 2-5) represented by reddish-brown loam and clay, reddish loam and sandy-loam with rock debris and gruss; total thickness of this unit is in average about 4 m. The unit yielded numerous fossil remains of both large and small mammals.

the upper unit consists of greyish loess-like sediments with abundant rock debris and gruss and scarce fossils; thickness varies from 1.0 m to 1.5 m. The unit lies on the eroded surface of the red beds of the middle unit. Only remains of a jerboa similar to the modern *Allactaga sibirica* were recovered from this unit.

The middle unit is the main faunal bed containing abundant mammalian remains. Within it four successive horizons are distinguishible, of which three include mammal remains. In the lowermost horizon only small mammal fossils were recovered (the first faunistic horizon) (Table 1). The following horizon includes rather abundant fossil remains of both large and small mammals (the second faunistic horizon) (Table 1). The third horizon comprised a single isolated fossils close to the forms from second horizon (the third faunistic horizon) (Table 1). In the fourth, uppermost horizon of the unit no fossils were found.

The stratigraphic sequences in this middle unit span rather short periods of geologic time and the mammal fauna of this unit is the Udunginian Faunistic Complex. It includes *Hypolagus multiplicatus* (ERBAJEVA, 1976), *H. transbaicalicus* (ERBAJEVA, 1976), *Ochotonoides complicidens* (BOULE & TEILHARD DE CHARDIN, 1928), *Ochotona* aut *Ochotonoides* sp., *Ochotona* aff. *sibirica* (ERBAJEVA, 1988), *Ochotona* sp. (middle size), *Kowalskia* sp., *Gromovia daamsi* nov. gen., nov. sp., *Cricetinus* cf. *varians* ZDANSKY, 1928, *Orientalomys* cf. *sibiricus* (ERBAJEVA, 1975), *Castor* sp., *Promimomys* cf. *gracilis* KRETZOI, 1959, *P.* cf. *stehlini* KORMOS, 1931, *Prosiphneus praetingi* TEILHARD DE CHARDIN, 1942, *Villanyia* ex gr. *eleonorae* (ERBAJEVA, 1975), *Mimomys* cf. *minor* FEIFAR, 1961, *Parapresbytis eohanuman* BORISSOGLEBSKAYA, 1981, *Hipparion houfenense* TEILHARD DE CHARDIN et YOUNG, 1931, *H. tchicoicum* IVANIJEV, 1966, *Pliocrocuta pyrenaica* (DEPERET, 1890), *Lynx issiodorensis* (CROIZET et JOBERT, 1828), *Homotherium crenatidens* FABRINI, 1890, *Parameles suillus* (TEILHARD DE CHARDIN, 1945), *Ursus minimus* DEVEZE et BOULLET, 1827, *Parailurus* sp., *Arctomeles* sp., *Nyctereutes* sp., *Ailurus* sp., *Gulo minor* SOTNIKOVA, 1982, *Zygolophodon* sp., *Orchonoceros gromovi* VISLOBOKOVA, 1979, *Axis shansius* TEILHARD DE CHARDIN et TRASSAERT, 1937, *Capreolus constantini* VISLOBOKOVA, DMITRIEVA & KALMYKOV, 1995, *Gazella sinensis* TEILHARD DE CHARDIN et PIVETEAU, 1930, *Antilospira zdanskyi* TEILHARD DE CHARDIN et TRASSAERT, 1938, *Ovis* sp., a.o. (SOTNIKOVA & KALMYKOV, 1991; VISLOBOKOVA *et al*., 1993; VISLOBOKOVA & KALMYKOV, 1994; VISLOBOKOVA *et al*., 1995; ERBAJEVA, 1996; etc.).

This fauna is recognized as the earliest in the Transbaikalian sequences by the presence of the Ruscinian rooted voles *Promimomys* unknown here previously, by few arvicolids of the genera *Villanyia* and *Mimomys* and by the species composition of carnivores. The first discovery in the region of primates *Parapresbytis*, small panda, hamsters of the genera *Kowalskia* and *Gromovia* is the most remarkable feature of the Udunginian fauna. The small mammalian association at Udunga shows a predominance of lagomorphs among which leporids of the genus *Hypolagus* and *Ochotonoides* of pikas are dominant. Within rodent taxa, cricetids and *Prosiphneus* were numerous and arvicolids were scarce.

The detailed mammal analysis shows that Udunginian Faunistic Complex is older than the subsequent Chikoian one known from the sites Tologoi and Beregovaya. In spite of the presence of common taxa (*Hipparion, Castor, Hypolagus, Ochotona, Ochotonoides, Prosiphneus, Mimomys, Villanyia*) in the sites, these faunas differ significantly by the

species composition and by the quantitative ratio of their small mammal taxa. The Udunga faunal assemblages comprise some Ruscinian mammals (*Promimomys*), abundance lagomorphs and scarce rooted voles *Mimomys* and *Villanyia.* The latter two genera became a dominant group of arvicolids in the following Chikoian faunas, where they composed near 70% of the total quantity among small mammals, as compared with Udunginian fauna in which *Mimomys* and *Villanyia* are only up to 6-7%.

As it was mentioned above, small mammal remains at Udunga site were recovered from three faunistic horizons of the middle unit of which the lower two horizons contain rather abundant fossils, while in the third horizon the mammal remains were scarce. The species composition and quantity of their fossil remains from the sites Udunga (Udunginian Faunistic Complex) and Beregovaya (following Chikoian Faunistic Complex) is given in the Table 1.

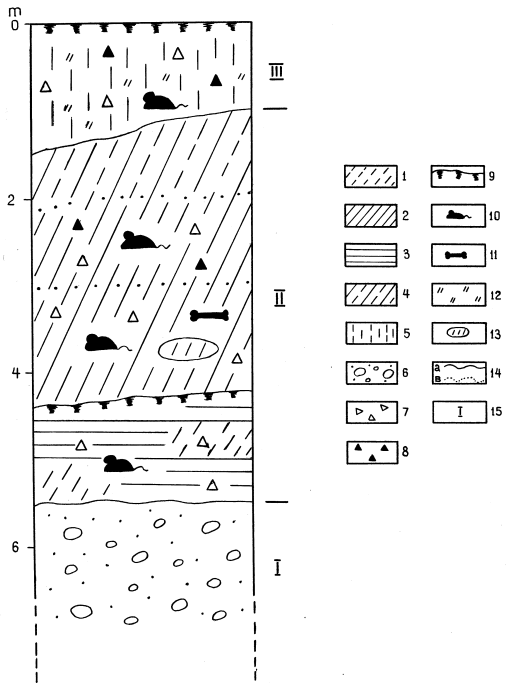

Figure 3. Lithostratigraphic scheme of the Udunga site section: 1 - sandy loam; 2- loam; 3 - clay; 4 - alternation of the loam and sandy-loam; 5 - loess-like loam; 6 - boulders, gravel and sands; 7 - rock debris; 8 - gruss; 9 - soil; 10 - small mammals remains; 11- large mammals remains; 12 - carbonate; 13 - lenses of sandy loam; 14 - boundaries between horizons: a - distinct, b - unclear transition; 15 - number of the units.
Figura 3. Esquema litoestratigráfico de la sección del yacimiento de Udunga: 1 - arenoso; 2- loam; 3 - arcilla; 4 - alternancia de humus y humus arenoso; 5 - suelo tipo loess; 6 - bloques, gravas y arenas; 7- debritas; 8 - gruss; 9 - suelo; 10 - restos de micromamíferos; 11- restos de macromamíferos; 12 - carbonato; 13 - lentejones de humus arenoso; 14 - límites entre horizontes: a - netos, b - transición difusa; 15 - nº de unidades.

The comparative analysis of the small mammal associations from the different horizons of the middle unit at the Udunga site shows that in spite of the presence of common species, the fauna from the lower horizon of this unit differs slightly from the overlying two horizons by the quantitative ratio of rodents and lagomorphs and by the appearance of new taxa in the upper horizons. The predominance of the genera *Hypolagus* and *Ochotonoides* of lagomorphs and *Prosiphneus* and cricetids among rodents is characteric for the fauna of the lower (first faunistic) horizon. In the fauna of the next upper (second and third) horizons lagomorphs and *Prosiphneus* continue to be the dominant group, however, cricetids became reduced slightly in their number and arvicolids are still not numerous. This fauna differs from the preceding one by the appearance of new small mammal taxa such as *Ochotona* aut *Ochotonoides*, *Ochotona* aff. *gromovi*, *Ochotona* aff. *sibirica*, *Gromovia daamsi* nov. gen. et nov. sp., *Castor* sp., *Kowalskia* sp. The difference in species composition of these horizons probably reflects some changes of the local biota of Transbaikalia during the early Late Pliocene.

Notes on the small mammal species and descriptions of new taxon

The lagomorph taxa from Udunga locality are represented by the genera *Hypolagus*, *Ochotonoides* and *Ochotona,* which are known as well from the Chikoian Faunistic Complex discovered from the sites Tologoi and Beregovaya following in the Transbaikalian sequences.

Leporids are represented by two species - *Hypolagus multiplicatus* and *H. transbaicalicus* - which differ by slightly larger size of the former taxon, by having well pronounced crenulations in hypostriae of P3/-M1/ and less developed crenulations in M2/; moreover P2/ has two anterior flexids whereas in *H. transbaikalicus* there is only one; the latter species has rather weak crenulated hypostriae in P3/-M1/ and plications completely absent in M2/. These species differ as well by the more robust p3 in *Hypolagus*

Taxa	Udunga		Beregovaya
	Faunistic horizons		
	1	2, 3	
I n s e c t i v o r a			
Sorex mirabilis OGNEV, 1937			2*/0.2 **
Sorex sp.			2/0.4
Beremendia fissidens PETENYI, 1864			1/0.2
Petenyia hungarica KORMOS, 1930			1/0.2
L a g o m o r p h a			
Hypolagus transbaicalicus (ERBAJEVA), 1976	10*/7.7**	23/5.2	13*/0.6**
Hypolagus multiplicatus (ERBAJEVA), 1976	3/2.4	32/7.2	18/0.8
Pentalagini gen.			1/0.2
Leporidae gen.		49/11	3/0.2
Ochotona aut *Ochotonoides*		1/0.23	
Ochotona gromovi ERBAJEVA, 1976			4/0.4
Ochotona aff. *gromovi* ERBAJEVA, 1976		3/0.67	
Ochotona intermedia ERBAJEVA, 1976			1/0.2
Ochotona sp. (middle size)	2/1.5	9/2	
Ochotona sibirica (ERBAJEVA, 1988)			360/7.5
Ochotona aff. *sibirica* (ERBAJEVA, 1988)		5/1.1	
Ochotonoides complicidens BOULE et TEILHARD DE CHARDIN, 1928	29/22.3	167/37.6	28/1.8
R o d e n t i a			
Castor sp.		17/3.8	1/0.2
Sicista pliocaenica ERBAJEVA, 1975			20/1.2
Orientalomys cf. *sibirica* (ERBAJEVA), 1975	1/0.8	2/0.45	7/0.6
Micromys cf. *minutus* PALLAS, 1771			5/0.6
Cricetinus cf. *varians* ZDANSKY, 1928	15/11.5	14/3.15	18/1.0
Gromovia daamsi nov. gen. et nov. sp.		2/0.45	
Cricetulus sp.			195/7.7
Kowalskia sp.		3/0.67	
Promimomys cf. *gracilis* KRETZOI, 1959	2/1.5	2/0.45	
Promimomys cf. *stehlini* KORMOS, 1931	2/1.5	1/0.23	
Mimomys minor FEJFAR, 1961			64/2.3
Mimomys cf. *minor* FEJFAR, 1961	2/1.5	4/0.9	
Mimomys pseudintermedius ERBAJEVA, 1976			12/0.8
Mimomys cf. *reidi* HINTON, 1910			25/1.3
Villanyia eleonorae ERBAJEVA, 1975			2323/68.8
Villanyia ex. gr. *eleonorae* ERBAJEVA, 1975	2/1.5	12/2.7	
Microtinae gen.		5/1.1	
Prosiphneus praetingi TEILHARD de CHARDIN, 1942	41/31.5	82/18.6	92/2.8
Prosiphneus sp.	7/5.4	11/2.5	
Total amount fossil remains and individuals	131*	444*	3200*/525^{x}

Table 1. - List of small mammals from the middle unit at the sites Udunga and Beregovaya and quantitative ratio of fossils (*) and individuals (**) (in %).

Tabla 1. - Lista de micromamíferos de la Unidad Media de los yacimientos de Udunga y Beregovaya, y relación cuantitativa de restos fósiles (*) y de individuos (**) (en %).

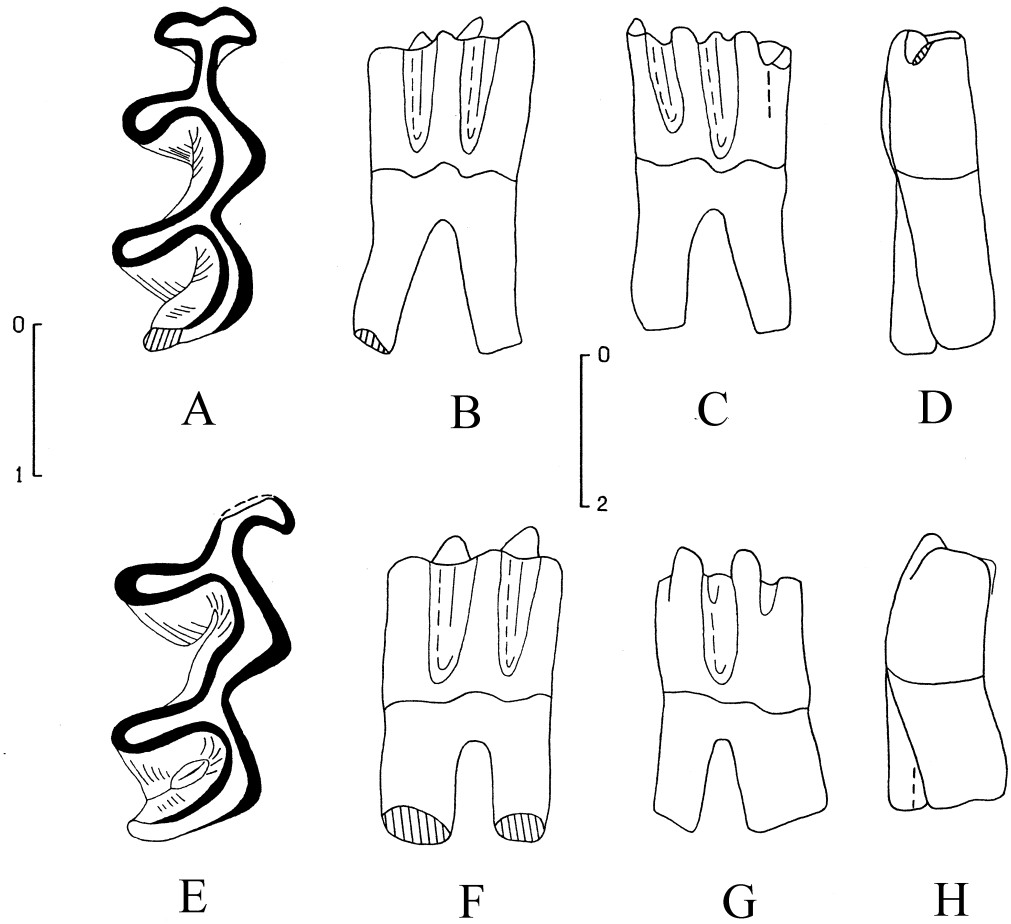

Figure 4. *Gromovia daamsi* nov. gen., nov. sp. A - D - M/1 (A - occlusal surface view, B - labial side view, C - lingual side view, D - distal side view); E - H - M/2 (E - occlusal surface view, F - labial side view, G - lingual side view, H - distal side view).
Figure 4. Gromovia daamsi nov. gen., nov. sp. A - D - M/1 (A - superficie oclusal, B - vista lateral labial, C - vista lateral lingual D - vista lateral distal); E - H - M/2 (E - superficie oclusal, F - vista lateral labial, G - vista lateral lingual, H - vista lateral distal).

multiplicatus and by slender P/3 in *H. transbaicalicus* (ERBAJEVA, 1996).

The family Ochotonidae is represented by two genera - *Ochotonoides* and *Ochotona. Ochotonoides complicidens* (Fig. 7 D, E) is a large pika with anteroconid having deep antero-external flexid and variable plications in paraflexid and protoflexid of P/3. It is conspecific with the pikas from the other Transbaikalian localities and however, the species from the Udunginian fauna differs slightly from that of Chikoian one by the level of its evolutionary development being of the archaic type. It has P/3 with plications in anterior borders of para- and protoflexids or without plications. Among specimens from Chikoian faunas there are P/3 having well developed crenulations on both anterior and posterior borders of the para- and protoflexids. The small pika is close to *Ochotona sibirica* (Fig. 7 C), however, it differs from the nominative taxon by having sligthly larger anteroconid of P/3.

Of the rodents, *Prosiphneus praetingi* is a rather characteristic form of the Udunga fauna. It is conspecific with early Late Pliocene tsokors from other Transbaikalian, Mongolian and Northern Chinese sites.

Arvicolids are represented by taxa of three genera: *Promimomys, Mimomys* and *Villanyia*. The latter two genera include species morphologically close to the Transbaikalian voles known from the sites Beregovaya and Tologoi, they are *Mimomys* cf. *minor* and *Villanyia* ex gr. *eleonorae*. The genus *Promimomys* is discovered for the Transbaikalian faunas for the first time. It includes two species – *Promimomys* cf. *stehlini* and *Promimomys.* cf. *gracilis.* They both are characterized by the absence of cement in the molar reentrant valleys, by relatively low tracts of the tooth crown, by the enamel band of teeth being of the same thickness along tooth borders.

The most significant taxa at the Udunga fauna are a new genus and species of the cricetid rodent *Gromovia* and a unknown previously a large ochotonid – *Ochotona* aut *Ochotonoides* having peculiar morphotype of the tooth, the description of that is given below.

Order Rodentia BOWDICH, 1821
Family Cricetidae FISCHER, 1817
Subfamily Cricetinae FISCHER, 1817

Genus *Gromovia* nov. gen.

Type species: *Gromovia daamsi* nov. gen., nov. sp.

Derivatio nominis: Named for Prof. Igor M. GROMOV, outstanding small mammalian zoologist (Zoological Institute, Russian Academy of Sciences, Saint Petersburg).

Diagnosis: Large size cricetid with rooted and semihypsodont crown of the teeth; M/1 is much longer than wide; large, subequally bilobed anteroconid, metaconid, entoconid, protoconid and hypoconid hardly inflated and joined to each other by rather wide lophids; M/2 is almost of the same length as m1.

Differential diagnosis: The genus *Gromovia* nov. gen. differs from almost all genera by having much higher teeth crowns, by its not inflated teeth cusps and by having M/2, which is of the same length as M/1.

The genus *Blancomys* WEERD, ADROVER, MEIN & SORIA, 1977 differs from *Gromovia* nov. gen. by its:
larger size of the teeth
simple structure of the teeth occlusal surface
shorter M/2 than M/1.

The genus *Cricetodon* LARTET, 1851 differs from *Gromovia* nov. gen. by its:
larger size of the teeth
lower teeth crown
M/2 being shorter than M/1.

The genera *Celadensia* MEIN, MOISSENET & ADROVER, 1983, *Plesiodipus* YOUNG, 1927, *Allocricetus* SCHAUB, 1930, *Hypsocricetus* DAXNER-HOECK, 1992 being close to the genus *Gromovia* nov. gen. by their size, differ from the latter by:
lower teeth crown
significantly shorter M/2 in contrast to M/1.

The genus *Microtocricetus* FAHLBUSCH & MAYR, 1975 differs from *Gromovia* nov. gen. by its:
lower teeth crown
complicated occlusal surface of the teeth.

The genera *Kowalskia* FAHLBUSCH, 1969, *Trilophomys* DEPERET, 1890, *Baranomys* KORMOS, 1933, *Collimys* DAXNER-HOECK, 1972, *Democricetodon* FAHLBUSCH, 1964, *Cricetinus* ZDANSKY, 1928, *Cricetulus* MILNE-EDWARDS, 1867,

Phodopus MILLER, 1910 differ from *Gromovia* nov. gen. by their:
lower teeth crown
significantly shorter M/2 in contrast to M/1
much smaller teeth size
comparatively wider teeth.

Gromovia daamsi nov. gen., nov. sp.
Fig. 4 A – H; Fig. 5 A, B; Fig. 6 A, B

Derivatio nominis: Dedicated to Prof. Remmert Daams, the great small mammalian palaeontologist.

Holotype: isolated right M/1, Collection◊ GIN 2001/001/2, Fig. 4 A – D, Fig. 5 A, Fig. 6 A, B

Hypodigm: isolated right M/2, Fig. 4 E – H, Fig. 5 B.

Type locality (Fig. 1): Udunga, left bank of the Temnik river, vicinity of the village Udunga, Western Transbaikalia.

Age: Late Pliocene (MN 16a)

Measurements: Table 2.

Diagnosis: the same as for the genus.

Description: Teeth are rather high crowned, with two roots of which the anterior one in M/1 is slightly larger than the posterior; in contrast to the first molar in M/2 the anterior root is much smaller and narrower than the posterior one, which is large and wide; linea sinuosa in these teeth is almost straight; occlusal outline of tooth is long and narrow, slightly tapering anteriorly; both anterior and posterior side of the teeth are steep (vertically); occlusal surface of the teeth are slightly worn.

M/1 (Fig. 4 A-D, Fig. 5 A, Fig. 6 A, B): cusps of cheek teeth are steep-sided and not robust; lingual

Figure 5. *Gromovia daamsi* nov. gen., nov. sp. M/1 and M/2 (occlusal surface view, A - M/1, B - M/2).
Figura 5. Gromovia daamsi nov. gen., nov. sp. M/1 y M/2 (superficie oclusal, A - M/1, B - M/2).

Figure 6. *Gromovia daamsi* nov. gen., nov. sp. M/1 (A - lingual side view, B - labial side view).
Figura 6. Gromovia daamsi nov. gen., nov. sp. M/1 (A - vista lateral lingual, B - vista lateral labial).

cusps are transversely elongated and the labial ones in contrast to the former are narrower and elongated antero-posteriorly; the lingual cusps are situated more anteriorly than the labial ones; a posterolophid (posterior cingulum) terminates the tooth posteriorly. Anteroconid relatively narrow without any additional cingulum, it has an anteriorly shallow groove which continues along the tooth crown downwards; metaconid and entoconid are wider and shorter than protoconid and hypoconid. External valley of the tooth is rather shallow; two anterior internal valleys are deep and run downwards to the border of the tooth crown, the third (posterior) valley in contrast to the anterior ones is transversely wide but shallow.

M/2 (Fig. 4 E-H, Fig. 5 B): in occlusal outline longer than wide, slightly narrower posteriorly; greatest width in the mid of tooth; lingual cusps slightly wider and shorter than labial ones; anterior cingulum developed only labially; metaconid and entoconid as in M/1 wider transversely than protoconid and hypoconid; the latter slightly smaller than protoconid; posterior cingulum is directed postero-internally. All cusps join each other by rather wide lophids. Both labial valleys of the tooth are shallow; the anterior lingual valley is not developed, the second, middle valley in contrast to the anterior is deep, but the posterior lingual valley is less deep and shallow than the preceding one and wide (Fig. 4 E).

Teeth	M/1	M/2
Length	2.25	2.25
Width	0.95	1.1
tooth Height (labial side)	4.5	4.25
Height of tooth crown	2.1	2.2

Table 2. Measurements of the lower teeth of *Gromovia daamsi* nov.gen., nov. sp. (mm).
Tabla 2. Medidas de los dientes inferiores de Gromovia daamsi nov. gen. nov. sp. (mm).

Comparison: *Gromovia* has the most slender dentition among all Transbaikalian and Asian cricetids. It differs from the genus *Cricetulus* and *Phodopus* by its much larger size and relatively narrow teeth, from the genera *Cricetinus* and *Kowalskia* it differs by its higher tooth crown, by the structure of occlusal surface, by uninflated cusps which join each other even at the early stage of teeth worn and by relatively long M/2 regarding to M/1. All other genera have M/1 which is much longer than M/2.

Order Lagomorpha BRANDT, 1855
Family Ochotonidae THOMAS, 1897
Subfamily Ochotoninae THOMAS, 1897
Ochotona LINK, 1795 aut *Ochotonoides* TEILHARD de CHARDIN & YOUNG, 1931
Fig. 7 A, B

Material: fragment of right lower jaw with P/3-M/3, Collection ◊ - GIN 2001/001/1, Fig. 7 A, B.
Locality (Fig. 1): Udunga, left bank of the Temnik river in vicinity of the village Udunga, Western Transbaikalia, Russia.
Age: Late Pliocene (MN 16a)
Measurements: Table 3.

Description: Large sized ochotonid. Only the fragmentary right mandible is preserved, its diastema region with incisor is absent and the anterior part of the horizontal ramus below P/3 and P/4 is broken. The mandible is rather thick and high, its depth below m1 is higher than below M/3 (Table 3). On the lateral side of the mandible, near the ventral border, there are mental foramina, one below M/2 and several small ones below m1. The lower incisor ends below P/4, forming a strong tubercle on the lingual side of the mandible. The mandibular foramen is rather wide and elongated dorso-ventrally. Another foramen situated behind the tooth row at the base of the ascending ramus is rather large and rounded in its shape.

The occlusal surface of P/3 is of triangular shape, its large anteroconid is completely separated from the posteroconid by deeply cement-filled paraflexid and protoflexid having plicated anterior borders. The hypoflexid is filled as well with thick cement. The anterior margin of the anteroconid is rounded, having very shallow antero-internal groove continuous all along the tooth shaft.

The enamel band along the margins of the anteroconid and on the posterior border of the posteroconid is thin and rather thick on the anterior sides of the latter. Despite the fact that the posterior borders of paraflexid and protoflexid are straight on the occlusal surface, in view from bottom side the posterior border of the paraflexid is slightly plicated as the anterior one (fig. 7 B). Posteroconid of the tooth is rather short and wide with very shallow depression on the lingual side.

P/4-M/2 consist of trigonid and talonid joined by cement. Trigonids of P/4 and M/1 are wider than talonids and trigonid of M/2 is slightly narrower than talonid.

L crown	P/3-M/3	P/3-M/2	P/3-M/1	P/3-P/4	
Ochot./Ochotonoides	11.3	10.2	7.6	5.0	
O. complicidens	11.8	10.9	7.8	5.7	
	L P/3	Ltri	Ltal	Wtri	Wtal
Ochot./Ochotonoides	2.5	1.35	1.5	1.5	2.5
O. complicidens	2.8	1.25	1.55	2.0	2.85
	L P/4				
Ochot./Ochotonoides	2.5	1.3	1.21	2.6	2.85
O. complicidens	2.55	1.45	1.1	2.75	2.9
	L M/1				
Ochot./Ochotonoides	2.6	1.41	1.25	2.85	2.95
O. complicidens	2.6	1.4	1.15	2.7	2.85
	L M/2				
Ochot./Ochotonoides	2.6	1.35	1.2	2.8	2.1
O. complicidens	2.65	1.45	1.15	2.9	2.85
	L M/3	width			
Ochot./Ochotonoides	1.1	2.1			
O. complicidens	1.0	2.2			
	Mandible height below			depth below	
	M/1	M/3		M/1	M/3
Ochot./Ochotonoides	9.5	8.7		5.1	4.3
O. complicidens	9.8	8.8		5.0	4.2

Table 3. Comparison of measurements of the mandible and lower teeth in *Ochotona* aut *Ochotonoides* and *Ochotonoides complicidens* from Udunga site. L = length, W = width, Ltri = length of the trigonid, Ltal = length of the talonid, Wtri = width of the trigonid, Wtal = width of the talonid.

Tabla 3. Comparación de medidas de la mandíbula y dentición inferior de Ochotona *aut* Ochotonoides *y* Ochotonoides complicidens *de Udunga. L = longitud, W = anchura, Ltri = longitud del trigonido, Ltal = longitud del talonido, Wtri = anchura del trigonido, Wtal = anchura del talonido.*

Comparisons

Ochotona aut *Ochotonoides* differs from all taxa of the genus *Ochotona* in having well preserved plicated paraflexid and protoflexid in P/3. It differs from all species of the genus *Ochotonoides* by the absence of anteroflexids on the anteroconid of P/3. It differs from the taxa of the genera *Pliolagomys* Erbajeva, 1983 and *Ochotonoma* Sen, 1998 by its larger size, by the anteroconid having rounded anterior margin and by the absence of anteroflexids. From *Proochotona* Chomenko, 1914 it differs by completely separated anteroconid and posteroconid in P/3 and by having plicated paraflexid and protoflexid.

Despite taxon under descriptions well resembles *Ochotonoides* by its size (Table 3) and by having marked plications in para- and protoflexids, it differs significantly from *Ochotonoides complicidens* by lack of any flexids on the anteroconid, which is the main characteristic feature of the genus *Ochotonoides*. *Ochotona* aut *Ochotonoides* differs from the Transbaikalian large sized ochotonids *Ochotona gromovi* Erbajeva, 1976 and *Ochotona tologoica* Habaeva, 1958 as well as from the Chinese *Ochotona lagrelli* Schlosser, 1924 from Ertemte in having larger size and plicated paraflexid and protoflexid in P/3. Moreover, they all differ by the anteroconid structure of P/3. *Ochotona lagrelli* has

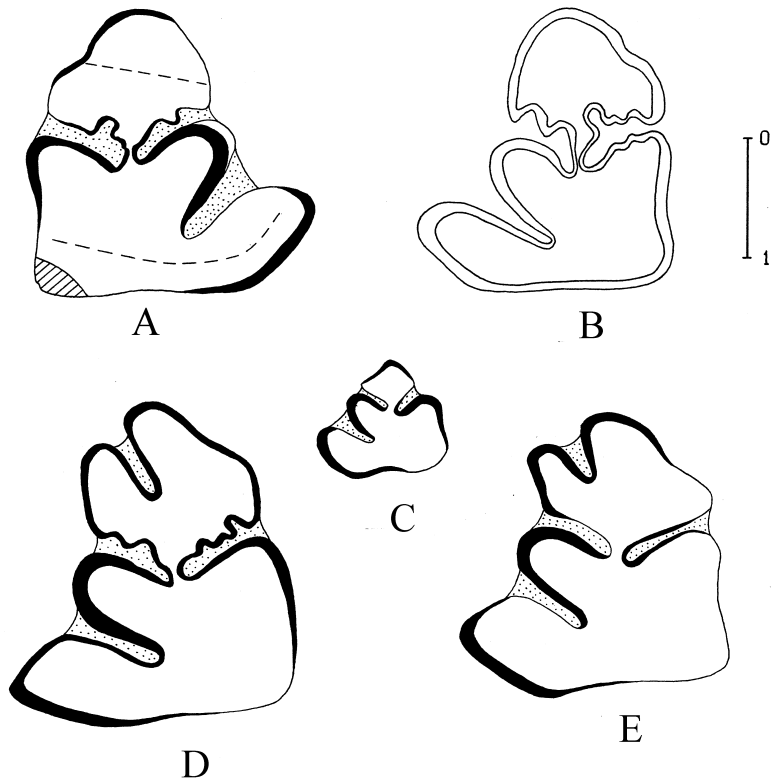

Figure 7. *Ochotona aut Ochotonoides*: A, B - P/3 (A - occlusal surface view, B - bottom side view); *Ochotona aff. O. sibirica* (ERBAJEVA, 1988): C - P/3 (occlusal surface view); *Ochotonoides complicidens* BOULE et TEILHARD de CHARDIN, 1928: D, E - P/3 (occlusal surface view).

Figura 7. Ochotona aut Ochotonoides: A, B - P/3 (A - superficie oclusal, B - vista por el lado de la raíz); Ochotona aff. O. sibirica (ERBAJEVA, 1988): C - P/3 (superficie oclusal); Ochotonoides complicidens BOULE et TEILHARD de CHARDIN, 1928: D, E - P/3 (superficie oclusal).

an anteroconid of romboid shape with sharp borders, P/3 of *Ochotona tologoica* possesses an anteroconid of rectanular shape, and *Ochotona gromovi* has an anteroconid of P/3 of romboid shape with rounded borders and rather long posteroconid in contrast to the shorter posteroconid in ochotonid from Udunga. The latter differs from all small and middle sized extinct and extant ochotonids from Eurasia by its much larger size and by P/3 having plicated protoflexid and paraflexid.

PALEOECOLOGICAL IMPLICATIONS

On the basis of the excavation data the Udunga site has been associated with an ancient river having several valley terraces one of which at 25-30m (IMETKHENOV & KALMYKOV, 1990; KALMYKOV, 1992) was cut by an old gully. The infill as found, was composed of red sediments containing abundant fossils. During the deposition rather humid environmental conditions existed what is evidenced by the mammal composition, pollen data and mineralogical analysis of sediments.

It was established, that at the beginnig of the Pliocene the Transbaikal area as a part of the Baikal rift zone experienced a complicated geological evolution. The tectonic processes influenced the sedimentation and paleoenvironmental diversification. In the region as well as in Northern Mongolia the climate has changed towards cool and more arid in contrast to the preceding Miocene one (LOGACHEV *et al*., 1964; DEVYATKIN, 1981; BELOVA, 1985; MALAEVA, 1989). In the vegetation many thermophilic elements

became reduced and some open landscape inhabitants appeared. The climate was still rather humid and woodland predominated (BELOVA, 1985; POKATILOV, 1994). Such kind of paleoenvironment continued to exist in the Transbaikal area at the beginnig of the Late Pliocene when in this region the most ancient mammalian fauna of that time occurred. It is recognized as Udunginian faunistic complex presented the earliest stage in the mammal sequences of the region. The species composition of both large and small mammals occurred in the middle unit of the Udunga site shows that the inhabitants of the forest biotops were abundant at that time, whereas the proportion of steppe and meadow dwellers were relatively less (Table 1). On the base of the analysis of small mammal associations it is possible to propose that among them two assemblages can be recognized which probably reflect two substages in the local faunal development. They differ slightly by the species composition and by the ratio of quantity of some lagomorphs and rodents. The fauna of lowermost horizon (horizon 1) is characterized by the predominance of forest dwellers such as leporids, murids and bush inhabitants (*Ochotonoides*) (Table 1). Of the meadow forms the genera *Cricetinus* and *Prosiphneus* are rather numerous, ochotonids of the genus *Ochotona* and arvicolids (*Promimomys*, *Mimomys* and *Villaniya*) were scarce. The fauna of the following second and third faunistic horizons (horizons 2, 3) of the middle unit differs from the preceding one by slightly increasing of the small mammal taxa diversity (Table 1). The forest and bush inhabitants continue to be numerous. However in this faunal assemblage the quantity of the steppe and meadow animals are raised and an aquatic form (*Castor*) appeared. These data demonstrate that during the existence of the Udunga fauna the replacement of the local paleoenvironments took place.

The remains of large mammals are known mainly from the second faunistic horizon (horizon 2). Their species composition shows that in the Udunga fauna the forest inhabitants (*Zyglophodon, Parameles, Ursus, Gulo, Nyctereutes, Lynx, Axis, Capreolus*, Alcinae) were predominant, though open landscape dwellers (*Gazella, Antilospira, Hipparion* and *Ovis*) were significant elements and mixed habitats (*Orchonoceros*) were present (SOTNIKOVA & KALMYKOV, 1991; VISLOBOKOVA, *et al*., 1995). On the basis of the presence in the fauna of the genera *Parapresbytis* and *Ailurus,* being inhabitants of humid broad-leaf forests of Indo-Malaya at present, MASHCHENKO (1994) was of the opinion that the environment in Transbaikalia at that time was probably similar to the modern one of the northern parts of the South China subtropical zone.

The predominance in the paleovegetation of the forest elements such as *Tsuga, Juglans, Carpinus, Corylus, Ulmus, Tilia, Quercus, Acer, Larix*, and *Pinus* are evidenced by the pollen data. The meadow and steppes were in subordinate position and the climate was rather warm and humid (MALAEVA,1989). The latter is confirmed by the mineralogical analysis as well (DERGAUSOVA et al., 1991).

Thus both paleontological, faunal and floral, and mineralogical data obtained at the Udunga site demonstrated that at the beginnig of the Late Pliocene woodland were widely distributed and warm and humid climate existed in the Transbaikal area. Moreover the tendency towards aridisation and cool condition have been traced in this site on the basis of the analysis of the small mammal composition. The progressive cooling has led to the predominance of the open landscapes and to existence of more arid climate which is evidenced from the mammal fauna of the following Transbaikalian Chikoi Faunistic Complex (Table 1).

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