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PALEOECOLOGY OF THE ACHEULIAN CAVE SITE SEL-UNGUR *(Soviet Central Asia)*

ABSTRACT — An integrated analysis was implemented of the multilayered Acheulian cave site Sel-Ungur in Kirghizia Cave deposits are represented by tuffas, silts, loams with rock debris. Sedimentation strata were formed in one climatic cycle. The pollen of coniferous and large-leaved species that are now not found in Soviet Central Asia was identified. Bone fossils of small mammals have archaic forms. Taxons of small mammals are abundant. Teeth and fragments of skull of the Pre-Neanderthal man were found. The stone industry is Early Paleolithic. Uranium-ionium dating of the upper strata of the section is: 126,000 ±5,000 years. Cultural layers are dated Middle Pleistocene.

KEY WORDS: cave — Early Paleolithic — Pre-Neanderthal man — Middle Pleistocene

The multilayered Acheulian site Sel-Ungur is located in the widest and highest part of the Obishir intermountain valley at the absolute altitude of about 1,900 m. The entrance to the cave is at about 50 m above the valley's bottom in the lower portion of the slopes of the Katrantau Ridge (up to 2,600 m high); the latter is the forerange of the Alai system bordering the Ferghana depression (*Fig. 1*). The Katrantau Ridge is mostly built of Devonian and Carboniferous limestones with heavy fracturing and karst.

The Obishir Valley stretches from west to east for about 20 km. Its system of flows is formed by the bottom stream Gavianii and several smaller streams descending from the adjacent mountains. The bottom of the Obishir valey is buillt of a deep cover of Neogene-Quaternary sediments of the deluvial-proluvial-alluvial genesis.

The cave opens by an arch entrance 20—25 m high. The floor of the cave is uneven, barred by fallen blocks. This part of the cave forms something like an outward hall, adjoined from the south by the Acheulian cultural layers.

Below, there is a brief description of the site's section from 2.25 m of depth from the conventional zero mark (see column in the *Fig. 2*):

layer 1, thickness 0.5 m, depth 2.75 m — tuffa light-grey, large-porous;
layer 2, thickness 0.35 m, depth 3.10 m — tuffa light-grey, cemented;
layer 3, thickness 0.45 m, depth 3.55 m — tuffa large-porous with bone fossils. *Cultural layer 1.*
layer 4, thickness 0.4 m, depth 3.95 m — tuffa weakly cemented. *Cultural layer 2.*
layer 5, thickness 0.2 m, depth 4.15 m — weakly cemented brecciform mass;
layer 6, thickness 0.7 m, depth 4.85 m — coarse clastic material with rubble, *Cultural layer 3.*
layer 7, thickness 0.35, depth 5.20 m — silt light-cinnamonic;
layer 8, thickness 0.25, depth 5.45 m — coarse clastic material with rubble. *Cultural layer 4.*
layer 9, thickness 0.35 m, depth 5.80 m — silty loam, grey-cinnamonic;
layer 10, thickness 1.2 m, depth 7.0 m — loam grey-cinnamonic, heavy. *The upper part of the layer, down to 6.0 m, corresponds to the 5-th cultural layer.*
layer 11, thickness 0.40 m, depth 7.40 m — loam pale-brown;
layer 12, thickness 0.60 m, visible depth 8.0 m — grey loam.
In all layers clastic material is abundant.

The cave's section was given a series of analyses.

According to grain size the strata of the cave sediments are divided onto two unequal parts (*Fig. 2*). Unlike the upper practically homogeneous portion of the section, the lower (below about 4.0 m) is cha-

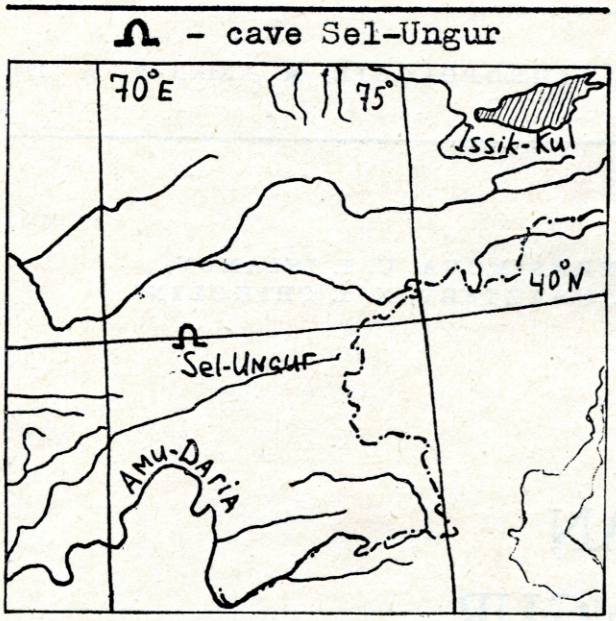

FIGURE 1. *Scheme of Location of the Site Sel-Ungur.*

racterized by more significant variations in grain sizes, explicating rather dynamic conditions of sediment accumulation. The cultural layers show no specific features of rock structure.

In grain-size structure (within the fraction 0.1—0.01 mm) the light fraction dominates, composed predominantly of quartz, muscovite, carbonates and clay-mica aggregates. Feldspars are constantly found along the section, though in much lesser amounts. Individual grains of volcanic glass were found in samples of the 4-th (7, 8, 9) and 5-th cultural layers. The 2-nd and 3-rd cultural layers are characterized by increased content of chalcedony and opal (see *Fig. 2*).

Practically a half of the heavy fraction is composed of the group of non-transparent minerals including the group of ore minerals and non-transparent titaniferous minerals. The transparent minerals of the heavy fraction are represented by the zircon-sphene-garnet-epidote-amphibole-mica association and comparatively low content of rutile, anatase, spinel, monazite, apatite, dolomite, and pyroxenes, both clinopyroxenes, and orthopyroxenes.

The presence of foraminifera, grains of resistant minerals (tourmaline, sphene, garnet), showing surface transformation by the physical and chemical processes, indicates the participation of the processes of inflow and resedimentation of more ancient rocks in the formation of the mineralogical composition of the cave sediments.

The mineralogical composition supports a division of the section into the upper and the lower parts (see

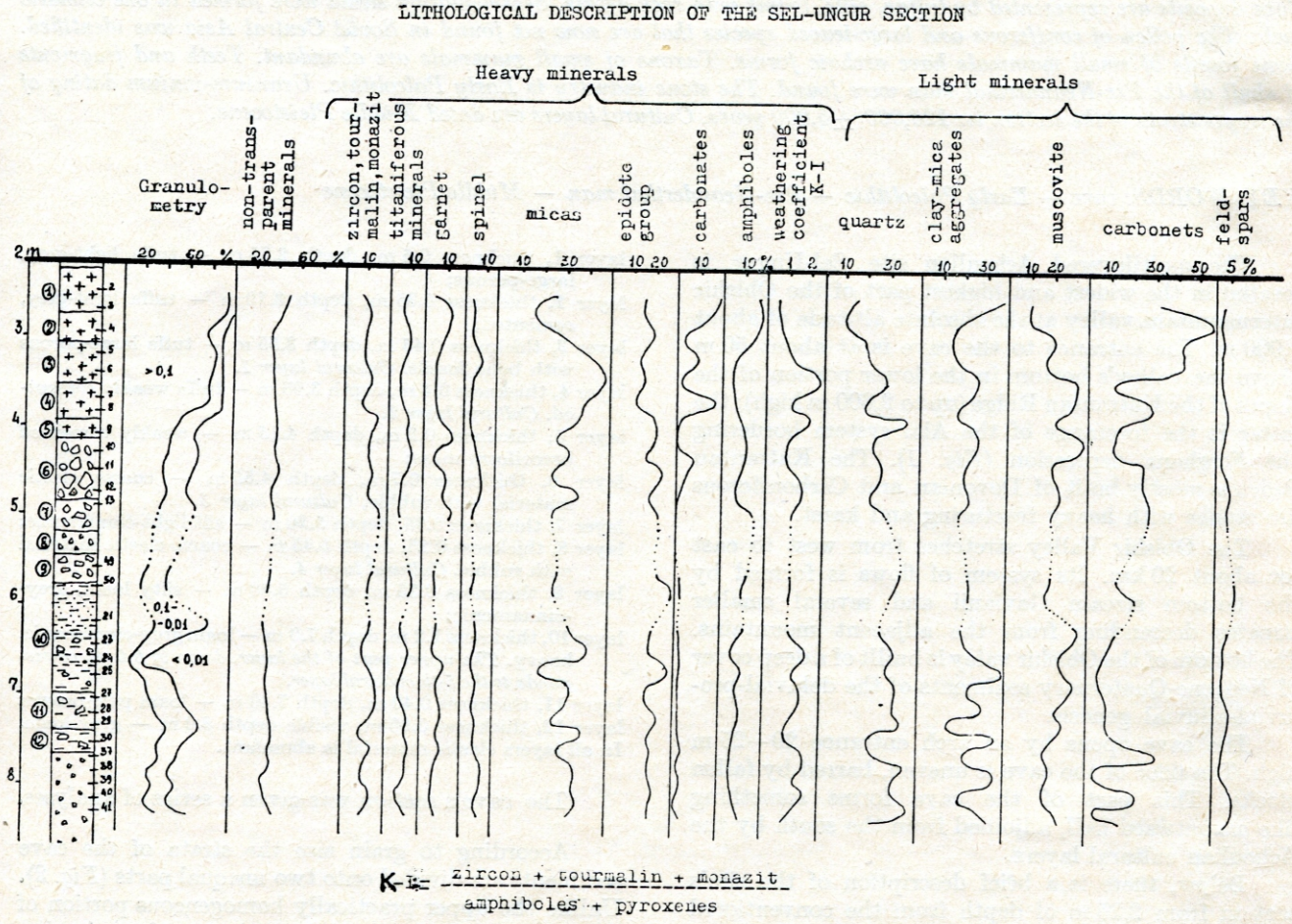

FIGURE 2. *Lithological Description of the Sel-Ungur Section.*

Fig. 2). Specific characteristics of the mineralogy and grain size in the lower and upper strata reflect some differentiation of the conditions of sedimentation of the cave deposits.

The whole series of the cave sediments is to different levels reworked by the processes of weathering. The cultural layers stay separate, their characteristic feature is an increase of weathering from the fifth to the first cultural layer. The permanent predominance of coloured grains in hornblendes and epidotes, the presence of pyroxenes and alkaline hornblende that are most irresistant to weathering, indicate a rather high level of conservation of the mineral matter. At the same time, one can notice the presence of grains with signs of weathering, decolourization, corrosion of the surfaces of minerals, accumulation of the pelitic material in the cleavage cracks.

Judging by the results of the mineralogical analyses, the site's section is rather homogeneous in mineral composition and the level of weathering. The sedimentation strata have, obviously, been formed in one climatic cycle.

The spore-pollen analysis has been done. In pollen content the samples are not homogeneous, several of them do not have it. The taxonomic characteristics of the spore-pollen spectra show no significant variations in the section. This suggests that in the period of sedimentation of the layers with the Acheulian findings, the environmental conditions were about the same.

The section is divided into two levels that are sharply contrasting in proportion of the pollen grains in the total spectral range. In the lower part of the section, below the 2-nd cultural layer, starting from 4.10 m (see column of *Fig. 2*) the concentration of pollen is very low. This part of the section is characterized by clear predominance of pollen of tree species over herbaceous species (62—85 % of the total). Of the tree species most abundant is pollen of birch (Betula) — up to 80 %, hazel (Corylus) pollen is significant — up to 10 %. Among the coniferous species pollen of pine of the subgenera Haploxylon and Diploxylon, of spruce (Picea) is found; their proportion in the spore-pollen spectra becomes notably lower up the section. Of the leaved species, pollen of lime (Tilia), elm (Ulmus), oak (Quercus), alder (Alnus), tamarisk (Tamaricaceae), hornbeam (Carpinus), oriental hornbeam (C. orientalis), hop hornbean (Ostrya), hop (Humulus) has been identified. An increased content of pollen of broad-leaved species is observed in the sterile horizon below the cultural layer 5: lime — 14.5 %, oak — 3 %, hornbeam — 2.5 %, elm — 1.5 %, spruce — 8.5 %.

In pollen of the hearbaceous species in the very bottom of the section (layer 12, depth 7.55 m) forbs, mostly ranunculi (Ranunculaceae), predominate. Higher up the section, the Chenopodiaceae and wormwood (Artemisia) are most abundant; pollen of grasses (Poaceae) is found in significant amounts; one could also see specimens of forbs, compositae, including Echinops and cornflower (Centaurea), of cruciferae (Brassicaceae), of Polygonaceae, Caryophyllaceae, Dipsacaceae, Ephedra. Plantain (Plantago lanceolata L.) was registered.

Samples of the upper part of the section (cultural layers 1 and 2, lithological layers 1—4, see column on *Fig. 2*) show higher concentrations of pollen. The share of pollen of tree species decreases. As well as in the lower part of the section, pollen of birch dominates; then come the coniferous species (pine, and spruce in lesser amounts), pollen of juniper (archa?). Of the leaved species, grapes (Vitis) and wallnut (Juglans) were registered.

In pollen of the herbaceous species wormwood dominates; the share of Poaceae, Chenopodiaceae, Polygonaceae, forbs is high. Pollen of Ephedra is permanently found. Pollen grains of plantain, cornflower (Centaurea cyanus L.) have also been registered. In general, the herbpollen is much more diversified in composition than in the lower part of the section. Besides the above mentioned taxons, the following were observed: leguminous (Fabaceae), umbelliferous (Apiaceae), Scrophulariaceae, Euphorbiaceae, Campanulaceae, Rubiaceae, Rosaceae, Ericales, Malvaceae, Convolvulaceae, Knautia.

The comparison of the results of studies in mountain regions of Kazakhstan and Central Asia of the surface samples (Chupina, 1971) and the Holocene sediments (Pakhomov, 1973) brings one to the following conclusions:

The differentiation of the upper and lower parts of the section is explained by the conditions of formation of the pollen rain in the part of the cave, where sampling was done. This part of the cave is barred from the entrance by a large rock block that had fallen there even before the layers exposed by excavations were formed. This block was a practically impermeable hindrance for pollen of herbaceous plants. Pollen of tree species penetrated in more significant quantities. This circumstance accounted both for low concentration of pollen in samples and for predominance of pollen of tree species. In the course of the filling of the cave by sediments and the rising of its floor, the conditions for penetration of pollen of the herbaceous species into this part of the cave became much more favourable, this changed the general composition of pollen in samples taken from the upper layers of the section: pollen of the hearbaceous species coming from the nearest vicinities predominates. Part of pollen, undoubtedly, has been brought to the cave by man. This is especially true for pollen of the species pollinated by insects.

The abundance of the pollen of wormwood (Chenopodiaceae) along with pollen of the plants spread in the disturbed environments is explained by human activities promoting growth of the sinanthropic plants. Some of these plants grew on a steep sod-free and rocky mountain slope adjoining the cave.

Rather large amounts of pollen of Poaceae, the presence of pollen of Dipsacaceae indicate steppic cenoses in the intermountain valley and the lower parts of mountain slopes.

Alder and some birches grew in the floodplain of the river valley. Most of the birch pollen was transported, most probably, from offspurs of the Alai

and Katrantau Ridges. Pollen of the broad-leaved and coniferous species indicates belts of forest vegetation in the mountains. The upper belt was formed by pine and spruce forests (see *Fig. 7*).

The vegetation was more mesophyllous, as compared to the present one, indicating more humid climatic regimes than now.

The broad-leaved forests included the species that are not found any more in Central Asia: lime, elm, oak, and also oriental hornbeam and hop hornbeam — representatives of the sub-Mediterranean flora. According to palynological data (Pakhomov, 1973; Grighina, 1968; Podchevarova, 1984), these species grew in mountains of the Pamirs-Alai and Southern Tien Shan, as far as Southern Ferghana, till the Middle Pleistocene. In the spore-pollen spectra of Sel-Ungur Lower Quaternary exotic species were not registered, but those specific of the Middle Quaternary were found. Palynological data indicate that the cave sediments of Sel-Ungur belong, most probably, to the Middle Pleistocene.

The species composition of small mammals was very peculiar, judging by their fossils found in the multilayered site of Sel-Ungur (see *Table I*).

TABLE I. *Species Composition of Small Mammals in the Site Sel-Ungur*

Species	Numbers of Layers		
	3	4	5
Lagomorpha:			
Ochotona (Ochotona) rufescens (Gray, 1842)**	170*	21	90
Rodentia:			
Ellobius tancrei Blasius, 1884	46	1	15
Cricetulus migratorius (Pallas, 1773)	40	15	16
Meriones (Pallasiomys) libycus (Lichtenstein, 1823)	10		18
Alticola (Alticola) argentatus (Severtzov, 1879)	20		5
Clethrionomys centralis (Miller, 1906)	5		
Microtus (Neodon) ex gr. juldaschi (Severtzev, 1879)	230	18	150

* Number of identifiable bone fossils.
** Identification of M. A. Yerbaeva.

Juniper voles Microtus (Neodon) juldaschi (*Fig. 3*) are now spread in the forest and high-mountain belts of the Pamirs—Alai and western and north-western Tien Shan — at altitudes from 400 to 4,500 m a. s. l. They are attracted to humid meadows along small rivers and streams, small gullies, archa forests; they are not specific in selection of habitat (Ognev, 1950; Gromov, Poliakov, 1977). This species is noted by primitive structure of teeth resembling the Allophaiomys, extinct at the beginning of the Early Pleistocene. The conservation of the archaic features

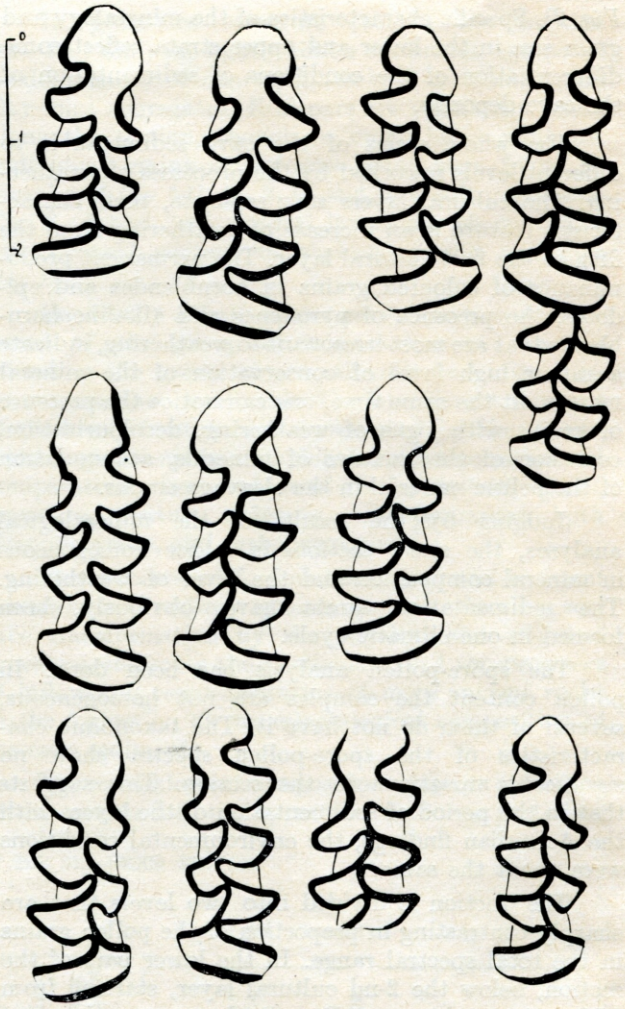

FIGURE 3. *Structure of Grinding Surface M_1 Microtus (Neodon) ex gr. juldaschi in Layer 5 of the Site Sel-Ungur.*

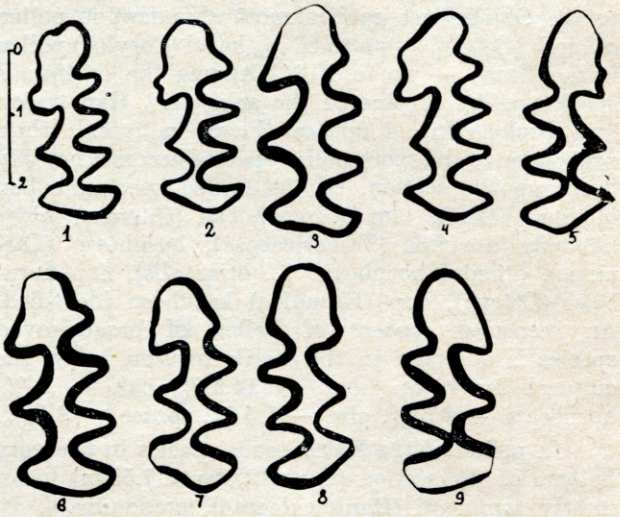

FIGURE 4. *Structure of Grinding Surface M_1 Ellobius tancrei in Layer 3 of the Site Sel-Ungur.*
Phases of Molar Development: 1,2 — closing of pulp; 3—5, 7, 8 — roots account for 1/3 of height of crown, 4 — phase of root origination, 6,9 — roots account for 1/2 of the height of crown.

in M. juldaschi is, probably, due to their isolation in the mountain areas of the Tien Shan and Pamirs. The vole of the Microtus genus found at Sel-Ungur is distinguished by the size of teeth from the Microtus (Blanfordimys) afghanus, that also has primitive structure.

Ellobius tancrei (*Fig. 4*) are now inhabiting the mountain and high-mountain meadows and steppes of Central and Middle Asia up to 4,000 m a. s. l., in particular, the mountain regions of Kirghizia.

Find of the fossils of Meriones libycus in the cultural layers of Sel-Ungur indicate semidesert areas in the vicinities of the site, probably associated with the slopes of southern aspect or dry channels of streams and of river valleys. Rocky areas and taluses are the favourite habitat of Alticola argentatus (*Fig. 5*) that is widely spread in the Pamirs-Alai and the Altai-Sayan mountain country starting from 400 m a. s. l. and up to the nival belt.

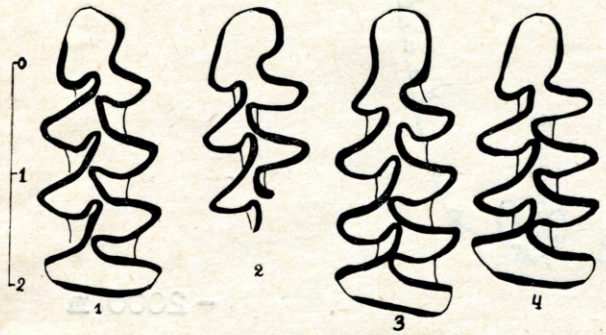

FIGURE 5. *Structure of Grinding Surface M_1 Alticola argentatus.*

Ochotona rufescens is spread from the lowland and mountain meadow-steppes and forest-steppes to desert steppes and deserts up to 2,000 m a. s. l. They are most abundant in the subzone of northern deserts.

Clethrionomys centralis (*Fig. 6*) now inhabit the forest belt in the Tien Shan and Pamirs-Alai mountains within the altitudinal range 1,800/3,500 m a. s. l. They are common for spruce forests of middle mountains and are also found in floodplain forests and shrub growths along mountain rivers (Vinogradov, Gromov, 1984). In Sel-Ungur several teeth of Clethrionomys centralis were found in the layer 3 (see *Table I*).

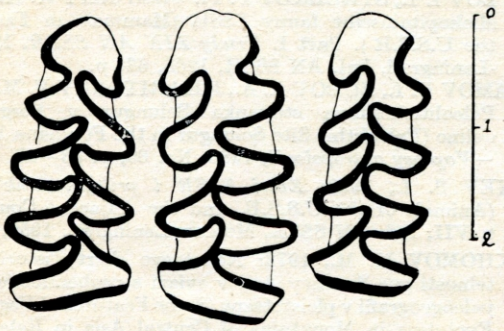

FIGURE 6. *Structure of Grinding Surface M_1 Clethrionomys centralis.*

The absence of fossils of Clethrionomys centralis in other layers is, probably, due to the fact that fossil bones are relatively less abundant in these horizons.

Eurasian hamsters (Cricetulus migratorius) are spread in open landscapes — from forest steppes to semideserts. They are most common in the lowland and mountain steppes.

Ochotona rufescens also prefer open mountain landscapes reaching up to 2,000 m. They make burrows in taluses and rockfalls.

Thus, data on composition of small mammals fauna of Sel-Ungur reconstruct the environmental conditions of mountain steppes with areas of forest and shrub growth along mountain streams and rivers with desertified slopes of the southern aspects and dry channels of seasonal streams; there were rock outscops or placers in the vicinities of the site. Thus reconstructed, the structure of landscapes (see *Fig. 7*) agrees well with the palynological data.

The composition of microtheriofauna was changing only slightly during the existence of the site. The basic ratios of species were also permanent.

The following taxons of large mammals were identified: Canis cf. lupus L., Vulpes vulpes L., Ursus spelaeus Rosenmüller et Heiroth, Mustelidae sp., Crocuta spelaea Goldfuss, Panthera (Leo) cf. spelaea Goldfuss, Uncia uncia Schreber, Equus sp., E. hydruntinus Regalia, Dicerorhinus cf. kirchbergensis Jaeger, Sus scrofa L., Cervus cf. elaphus bactrianus Lydekker, Gazella subgutturosa Güldenstaedt, Capra sibirica Pallas, Ovis cf. ammon L., Bos primigenius Bojanus, Bos (Poëphagus) mutus Przewalski (?) (Batyrov, Batirov, 1988). Fossils of yak (?), cave lion, cave bear were found in Soviet Central Asia for the first time.

Sel-Ungur is one of the richest sites of fossil fauna of large and small mammals in Soviet Central Asia. The unique character of its faunistic complex and the absence of data for comparison make its dating difficult. There are no diagnostic species that would allow to date the complex to the Lower Pleistocene. At the same time, the archaic features of the bone fossils of small mammals, especially of Microtus (Neodon) ex gr. juldaschi, do not allow for the Late Pleistocene dating. All this makes us suggest the Middle Pleistocene age of the cave sediments, and, consequently, of their cultural layers.

The upper layers of the section, above the first cultural layer, were dated by the uranium-ionium analysis of a piece of travertine: 126,000 $\pm$5,000 years (LU-936). This dating means that the formation of the cave sediments in this site finished by the Mikulino Interglacial. This dating does not contradict conclusions of studies by other techniques.

The ancient age of the Sel-Ungur site is confirmed by the archaic character of the archeological Early Paleolithic industry. The collection of tools includes: choppers, scrapers, a hand chopper, a wood-chopper, dented and sinuated tools. Human teeth belong, as concluded by anthropologists, „apparently, to Homo erectus" (Islamov et al., 1988). Also a rather large part of the cervical skelet was found, belonging, according to the preliminary analysis by V. P. Alekseev, to the Pre-Neanderthal man.

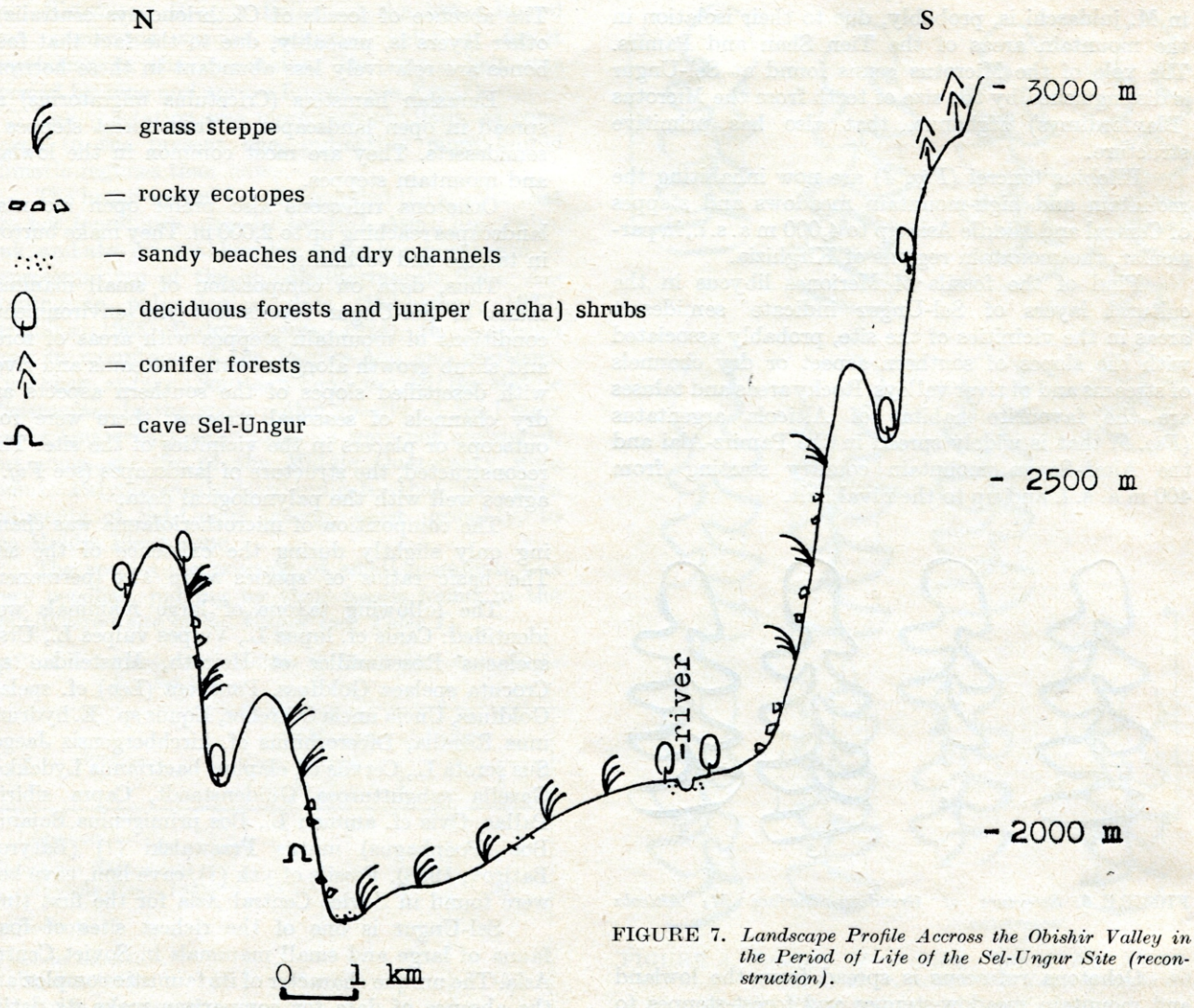

FIGURE 7. *Landscape Profile Accross the Obishir Valley in the Period of Life of the Sel-Ungur Site (reconstruction).*

It should be mentioned that judging by data of various analyses, the strata of the cave sediments that enclose the cultural layers, appear homogeneous, showing no significant changes of the ecological regimes and conditions of sedimentation in the period of formation of the site's sediments.

Thus, the multilayered cave site Sel-Ungur is a most ancient stratified archeological monument with the archeological finds and fossils, both in Soviet Central Asia and in the adjacent regions. This explains the importance of this unique monument for archeology and paleogeography of the Quaternary.

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