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Results of Archaeological Excavations Conducted at the Rakhat Monument in Almaty Region (Based on the Reporting Materials for 2015-2016)

Galymzhan Bexeitov [α], Turaly Tulegenov [σ], Erbolat Ospanov [ρ] & Botakoz Satayeva [ω]

Abstract- In the article was described the geographical location of the settlement area andunique features of the region Rakhat. During 1994-2005 settlement area was carried out archaeological excavation of the joint Kazakh-American expedition under the leadership by K.M. Baipakov, F.P. Grigoriev, K.Chang. There were done expertise and description to the archaeological excavation of monuments which located in settlement area of Rakhat in the Institute of Archaeology named after A.Kh. Margulan in 2004. As well as, in the Upper Paleolithic place the various levels of mineral excavation, exploration work were characterized fully by the leadership of O.N. Artyukova in the location of Rakhat in 2006-2007.

The work of the members of the archaeological expedition was analyzed under the leadership ofB.Nurmaganbetov of the reserve-museum "Issyk" in 2011-2016. Along with archaeological excavation, new research methods of the scientists of Natural sciences were utilized, in the international scientific -research laboratory "Geoarcheology" of al-Farabi university was made expert examination of the results and the current state and future of archaeological excavations which carried out in the framework of the State Program "The people in the flow of history" in the location of Rakhatby the leadership of G.T.Bexeitov in 2015.

In addition, there were paid more attention to the palynological, geological and geomorphological characteristics of the region and through carrying out snip excavations in the upper paleolithic nomad camp and mounds were done expertise to found stone artifacts. The paleoanthropological examination was considered to bone skeletons of Rakhat mounds of E.P.Kitov. The ceramic vessels were collected expert work by E.Sh.Akymbek the leading researcher of A.Kh.Margulan Institute of Archeology which detected during the archaeological excavations.

Also, in autumn and spring of 2017, there was noted about archaeological exploration initiated by G.T.Bexeitov Candidate of Historical Sciences, associate professor, the director of the international scientific-research laboratory "Geoarcheology" of al-Farabi university.

Keywords: archeology, geology - geomorphology, palynology, anthropology, climate, artifacts, sharp stone (nucleus), ribbed cleavage, ceramics, interment, paleolithic camp, settlement area, nomadic camp, mound, monument, excavation.

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I. Introduction

Gaining independence of our republic and becoming a sovereign state, it still allows us to study our history in a new way. In this regard, many research works have been carried out on the historic sites worthy of national interest in the history of our country, and mystery pages of our history are being discovered. Today the country`s rapid development requires to study deeply the historical truth, own way of the history of the nation needs to write a new data based on artifacts found during archaeological excavations.

Our people have gone through many difficult times on this path. It is obvious that from the ancient times to the present day the history of the Kazakh people, which has not survived, has not lost its continuity. Ceramic, bow spearhead, skeletal remains and rock artifacts are particularly important in determining the age of historical sites, because the period can be determined depending on their structure of creation, the nature of the species, the specificity of preservation. One of the most intricate and unexploredforms of research at that time are the monuments which located near the settlement area of Rakhat (the Enbekshikazakh district, Almaty region).

Rakhat monuments are a historically significant site located at the foot of the mountains which is 5 kilometers away from southern burial grounds "Esik", Enbekshikazakh district, Rakhat rural district of Almaty region. At the moment, civilized nations and nationalities are primarily interested in their past and present. It demonstrates the importance of the true history of our people, through the research and deep scientific expertise.

Geographical coordinates of the village: N: 43°20.250 '; E: 077 ° 22.614. The total area of monument is occupied 88.7 hectares.It is one of the most historically significant objects of the 5 km square of the Issyk-Talgar highway, on the southern slope of the Esik monastery in Enbekshikazakh district of Almaty region [1].

In its turn, exploration and excavations were carried out in the organization of archaeological

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research of settlement.In the monuments of Rakhat were carried out effective scientific-research works by leaders of archaeological excavation of the joint Kazakh-American expedition:K.M.Baipakov, F.P. Grigoriev, K.Chang. [2].

During the expedition of settlement area, characteristic of the Sak-Uysun stages as dwelling shelters, semi-cellars and dwellings made of semi-bricks were dug, collected ceramic remains and artifacts and conducted examination in the foreign scientific-research centers. As a result, through using the scientific- research methods which inherent to the natural sciences, the prevalence of fruitful result of archeological excavations of the joint expedition in the information society has become important.

There was conducted archeological excavation of 5 mounds in the location of Rakhat by the staff of Institute of Archeology named afterA.Kh. Margulan in 2004. As well as, the monuments and settlements of the location Rakhat were not included only in the region of Zhetysu, also in a number of important complexes of Central Asia. Sak, Uysun, Huns, Turks people, other ancient and subsequent tribes lived in the parts of the Ile-Alatau can take an important role in the area of Jetysu[3].

The first efficient excavations work in Paleolithic nomad camp of the location Rakhat was carried out in 2006-2007. Expedition was led by O.A.Artyukhova, as a result found artifacts gave opportunities to determine the age of nomad camps. It is possible to say that the historical roots of the settlement is very deep, because it is the evidence that magnificent monuments and nomad camps of the Stone, Bronze, Iron ages were settled here. [4].

The scientific staff of the "Esik"historical-reserve museum had organized archaeological exploration and excavations in the Rakhat settlement that led by B.Nurmukhanbetuly between 2011-2012, consequently scientific study suggests that the history of this region had started from the Stone Age, by digging the mounds inherent to Sak, Uysun, Huns and Turks an invaluable contribution was added to the history of Kazakh [5].

On October 15, 2015 the international scientific-research laboratory "Geoarcheology" of Kazakh National university in the framework of the State Program "The people in the flow of history" was held a considerable archaeological excavations in the nomadic camps and mounds inherent to the period of Sak-uysun, near the village Rakhat in the Upper Paleolithic nomadic camp "Rakhat". The connection of archaeological research with Natural science as Chemistry, Physics, and Biology, there were fulfilled works by using new methods of scientific study as geomorphology, geology, palynology, trasology and dendrology.

In autumn and spring 2017 archeological exploration was held by managing G.T.Bexeitov Can.His.Sc., associate professor, the director of the international scientific -research laboratory "Geoarcheology" of KAZNU. As a result, it is planned to carry out excavations at the monuments located near Rakhat in 2018.

II. Materials and Methods

Report on research work (2015). "Natural - scientific methods in the study and dating of archaeological monuments and museumification of objects of historical and cultural heritage" (interim). Almaty, Scientific program of the international scientific laboratory on Archaeological dating of artifacts 178 p. 2015.

Report on scientific and research work: scientific program of the international scientific laboratory on archaeological dating of artifacts (final) 149 p. 2016.

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Nurmukhanbetov B.N., Tulegenov T.Zh. The use of the Esik-Rakhat archaeological complex to restore the ethno-cultural environment, to attract tourists. // Materials of the international scientific and methodological conference "VIII Orazbaev readings" - Almaty, 2016.- p.486-489.

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Bexeitov G.T., Satayeva B.E. Current condition and research problems of the archaeological excavations conducted were made in the monuments of near the location– Rakhat in 2015 // Fundamentalis scientiam № 3 Spanish scientific journal. 2017.– P. 14-18.

The list of methods of excavation, fixation and analysis of material applied to Paleolithic monuments are extensive. Nowadays to study the spatial distribution of artifacts are being applied stratigraphic, microstratigraphic analyzes, planographic analysis, a

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method for searching connections between finds (repair), and statistical-combinatorial analysis. Within each of these methods, there are many different methodological nuances and directions.

So far as the study of any archaeological monument begins with the identification in the thickness of the geological rock layers containing cultural remnants, clarifying the degree of preservation of these layers, the nature of their occurrence and structure, microstratigraphic analysis is of particular importance.

Archeological microstratigraphy of the culturally-containing layer is especially important when studying the powerful or rich layers of long-term settlements with a complex structure. When the area is used for a long time, the original structure of the monument is "smeared" due to multiple overlapping traces of a particular activity or structural elements on each other.

A carefully selected totality of methods and acceptanceofanalysis microstratigraphy of the cultural layer, taking into account its specificity, allowedsolvingsuch matters as

1. confirmation or refutation of the presence of different cultural layers, identified in the process of excavation,
2. a clear separation of the depth of occurrence of the findingsfrom every layers,
3. identification of signs of layer occurrence "in situ" or signs of its violation,
4. allocation of micro-lamination sites, i.e. stable levels of occurrence of findings within the layer, characterizing the discrete nature of its accumulation,
5. restoration of a reliable picture of the paleorelief of the monument.

In combination with data from paleoecological studies, quantitative and qualitative analysis of planning and repair, microstratigraphic analysis opens up wide opportunities for obtaining social information.

III. Results

Excavations in Rakhat monuments between 2015-2016

Today, the rapid development of our independent country requires to study the historical truth, the own history of the nation based on new findings. One of the regions that needs such research is the Rakhat monuments located in Zhetysu. The research works of Paleolithic stone age in Kazakhstan have been left behind for half a century compared with the research methods of foreign scientists.

a) Rahat (Soldatravine) the Upper Paleolithic camp

Archaeological excavations have discovered the historical moments of the region in the country and contribute to the study of society in the first community. A lot of stone tools of the first people had been found in the nomad camps of the Stone Age which located in KazakhstanThis archaeological monument is evidence of the existence of the first community in Kazakhstan. One and unique of them is Rakhat Paleolithic nomad camp N 4321464, E07722672 [7].



Figure 1: ("Rakhat" Upper Paleolithic camp) General view

Rakhat Upper Paleolithic campwas located 1040 m above the sea level in the eastern part of the villages Rakhat and Krasny Vostok,in the eastern part of Soldat ravine of the foothills of Ili Alatau mountains. During the determination of the age of the camp two sites were selected and stratigraphic snip excavation was dug. As a result, found stone artifacts proved to be a unique monument in the chronological epoch of the Stone Age in the Zhetysu region [8].

The first scientific research works in 2006-2007. It was carried out under the leadership of Artyukhova.

The eastern hills of the nomad camp were larger enough to the north. Further scientific-research works have been carried out to prevent further destruction of the Stone Age monuments. During the study, there were found traces of the hearth in solid rock layers and floodplain sediments. The abundance of stone artifacts allowed conductinga comprehensive study to this monument [9].

The ecological condition of the nomad campenabledto collect materials and artifacts that allowedrestoring the flora and fauna, to determine the

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age of the monument. According to archaeological excavations, it was found out that any excavation work was carried out in the monument whilecomparatively defining absolute age of biological and cultural evolution of ancient people.

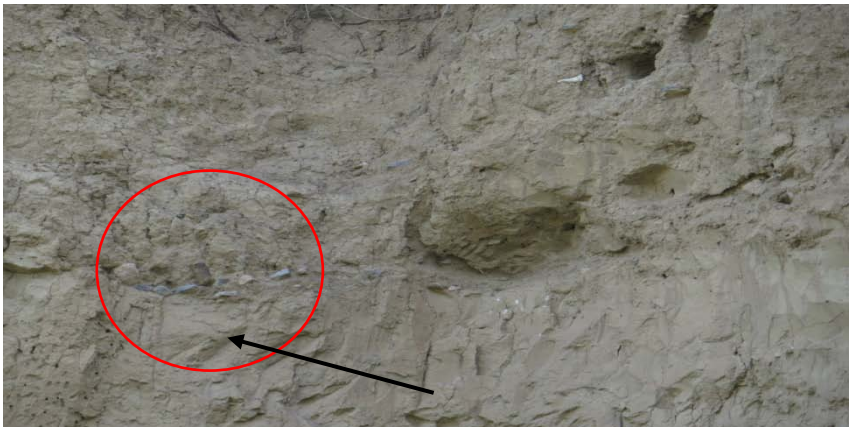

Figure 2: A cultural layer with stone artifacts

In the process of detecting monuments and nomad campsof the Paleolithic period, stratigraphic snip excavations on 2x4 m were carried out for the purpose of determining the age of the region by managing G.T. Bexeitov Can.His.Sc., associate professor, the director of the international scientific -research laboratory "Geoarcheology" in 2015, the age of nomad camp was supposed to be the period of the upper Paleolithic. Unfortunately, the excavations did not show a layer of cultural sediments in the region. Only the collected stone artifacts from the surface of the fossil have been studied.

The total number of findings consist of 48 copies of stone artifacts which obtained during the research of archeological expedition "Geoarcheology"of camp Rakhat. Among them, the following types of stone products have been distinguished according to their manufacturing techniques and function: Nuclei -2ex, nucleus forms -5ex, ribbed chips -1ex, flakes and debris-40ex. The nucleus is a subtriangular form of red porphyrite measuring 12x14x7.8cm (Figure 3).

It is made of undulating river pebbles. The removal of regular chips - flakes were made without preliminary processing of the nucleus. The principle of chipping is split from one working surface of the product. Special preparation of the strike site was not carried out. The surface of the product is slightly covered with patina.



Figure 3: Rakhat camp. Nucleus

The next nucleus is made of gray porphyrites of round shape, measuring 9x10.5x8 cm (Figure 4). The chip was produced from the working surface of the product without preliminary preparation. The nucleus was prepared a strike site which is prepared by removing a single chipped stone artifact horizontally. The base of the nucleus is flat. From the nucleus was the removal of one chip of the flake [7].

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Figure 4: Rakhat camp. Nucleus

Nucleated forms are made of gray and pinkish porphyrite (Figure 5-6). There are products on the flake among the nucleus forms. They almost do not have brightly marked chips. Artifacts have subtriangular and subquadratic forms. The surface of the products is partially patinated.



Figure 5: Rakhat camp. Nucleated forms



Figure 6: Rakhat camp. Nucleated forms

The brightly marked ribbed chip is 11.5x5.5x3.5cm in size (Figure 7). The workpiece for the product was gray porphyrite. This chip is a technical chip or as it is also called the chip of the nucleus, when the working part of the nucleus becomes unfit for removing regular chips. The ribbed chip is an arcuate, elongated shape.

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Figure 7: Rakhat camp. Ribbed chip

Flakes in the number of 40 copiesare made of gray, pink and reddish-brown porphyrite. Flakes are related to production waste. From this collection was not foundwares which could be attributed to tools. The absence of stone artifacts of tool set from the collections of the Rakhat settlementwas considered the possibility of holding quarry work by the local people [7].

The analysis and study of artifacts carried out in the laboratory allow preliminary dating of the Rakhat nomad camp by the late Paleolithic. The comprehensive study of the monument in the framework of the State Program "The people in the flow of history" will allow us to reconstruct the paleoecological conditions of life of primitive people, to simulate a picture of the ancient and ancient history of our country, which will significantly raise the level of teaching history in the Higher educational establishments of the country. The obtained models of adaptation and behavioral strategy of the ancient human in different epochs of the Stone Age in the foothills of the Tien-Shan will help to predict the changes in environmental conditions in this seismically active densely populated region of the country.

Received collections of stone artifacts will be replenished by republic and regional museums.

b) *Archaeological excavations conducted by the international scientific - research laboratory "Geoarcheology" for 2015-2016 in the mounds of Rakhat settlement.*

The archaeological complex of the Rakhat ravine is located on a flat site near the river of the same name as Rakhat (Figure 1). New research on this monument showed the presence on the complex of monuments related to different times as - the Bronze Age, the times of Sak and Uysun. In the field season was set the task to identify the structural features of the early Iron Age mounds and determine the location of the Sak time settlement (Figure 8).

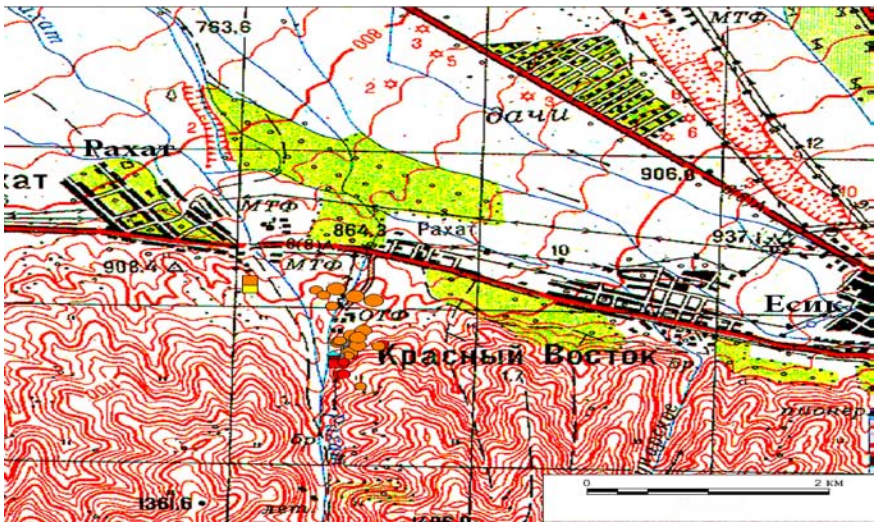

Figure 8: Rakhat. Topographical location of mounds

During the excavations were also obtained extensive ceramic and osteological materials which can be correlated mainly with the layers of the Sak nomad camp. All the heights of the earth's surface were drawn from the conventional zero (the western corner of the square (A-1) A-4), which is tied to the absolute altitude. Counting of all depths for structural details of

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monuments, ware, ceramic and osteological materials were conducted from the surface of the earth [10].

For a more convenient counting of all the squares during further studies on the monumentwas changed their numeration. The count is held from the northern corner of the excavation [11].

Research at the Rakhat facility. The burial ground is located on the top of the hill. Unsystematic, compact burial ground, consisting of five camps, flattened hilly with banding and calculating stones. All research materials of this monument are in process of treatment and detailed analysis (Figure 10).

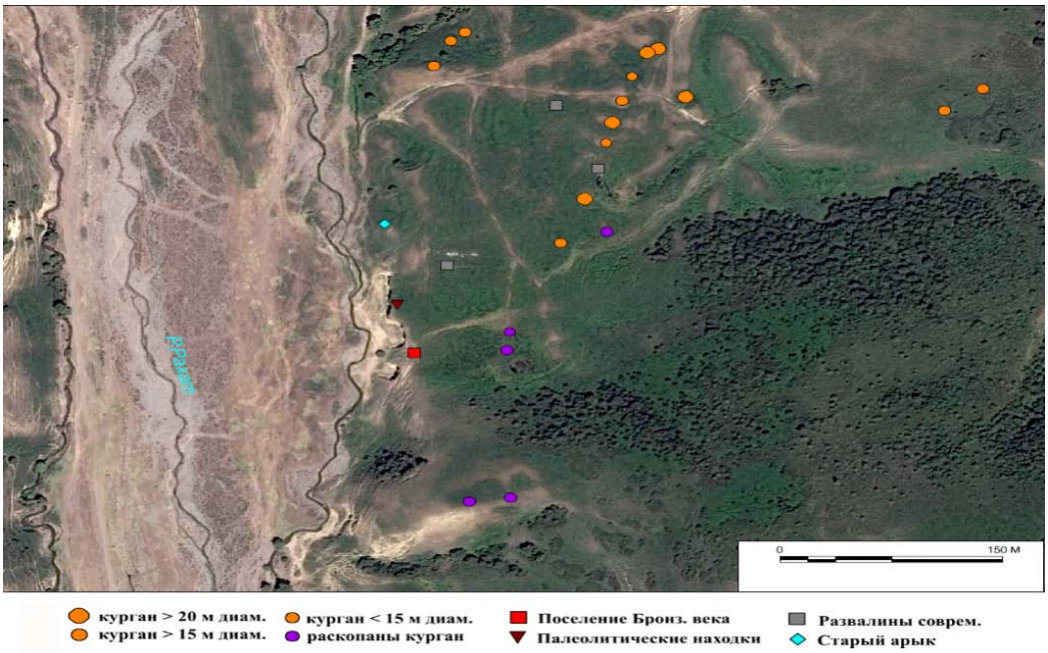

Figure 9: Rakhat. Location of mounds in the area

Mound №1.Diameter is: from north to south - 9 meters, from east to west - 8 meters, height is - 45 cm. During the excavation works № 1 there was found a ceramic bowl of the burial hole at the depth of 1.7 m. (Appendix 2) [9].



Figure 10: Mound №1. Tomb

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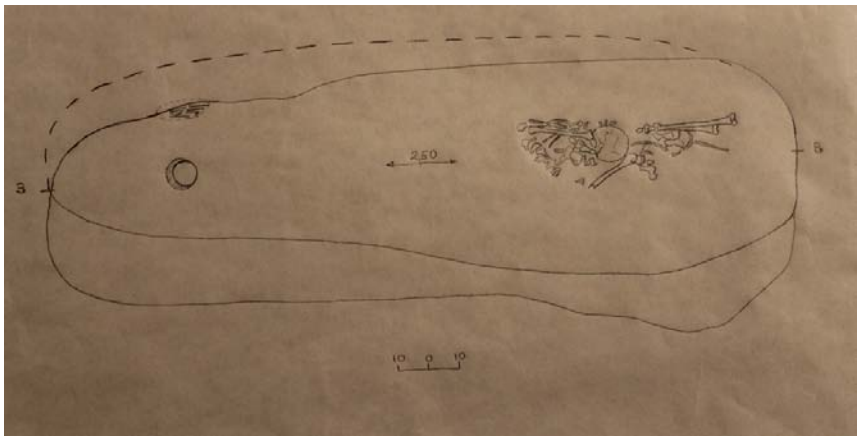

Figure 11: Mound №1. Graphic design.

Mound №2It is located 2 meters in the east from mound № 1. There were founds bones of child aged 14 - 15 years old [9].

The mound №2 was absolutely robbed. Depending on the genetic nature, it is the bone of woman about aged 18 to 25 without skull. There are signs of cribra orbitalia above fractures of the skull, which may be indicator of anemia. Hence, the buried human was died because of illness [14].

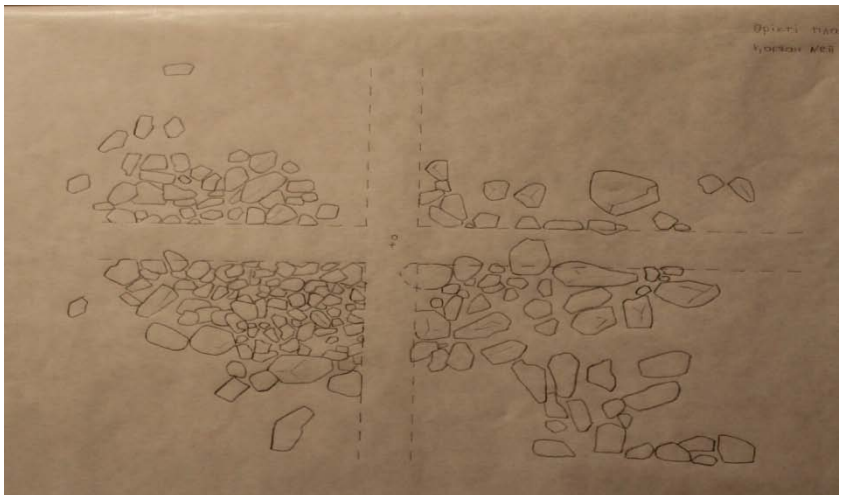

Figure 12: Mound №2. The scheme of excavations.

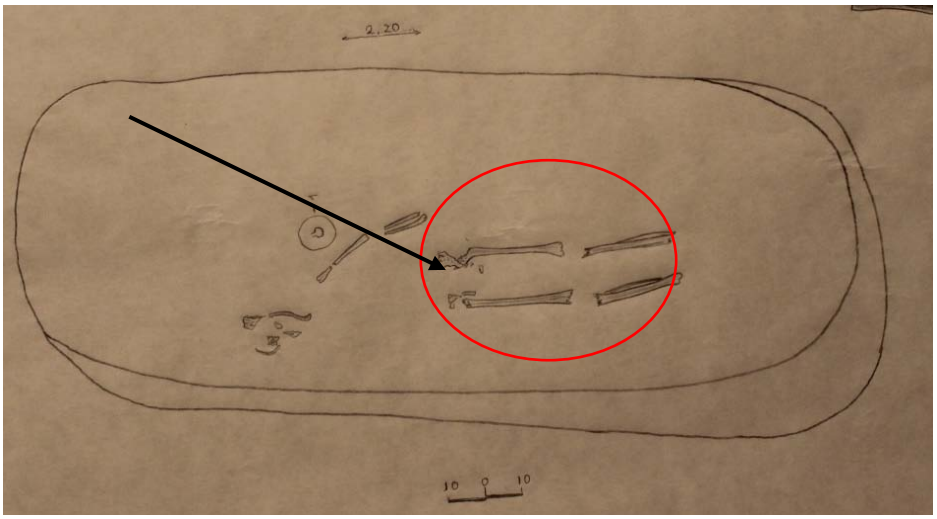

Figure 13: Mound №2. The scheme of tomb.

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Mound №3. The mounds that have a diameter of 9 m and a height of 0.5 m were excavated and explored. Ceramic vessels were found on the left side of the human skeleton in the burial hole during excavation of №3 [7].

Ceramic vessels were detected on the left side of the mankind skeleton in the burial hole during excavation of №3 [9].



Figure 14: Mound №3. Before fossil.



Figure 15: Mound №3. View from the East



Figure 16: Mound №3. The tomb

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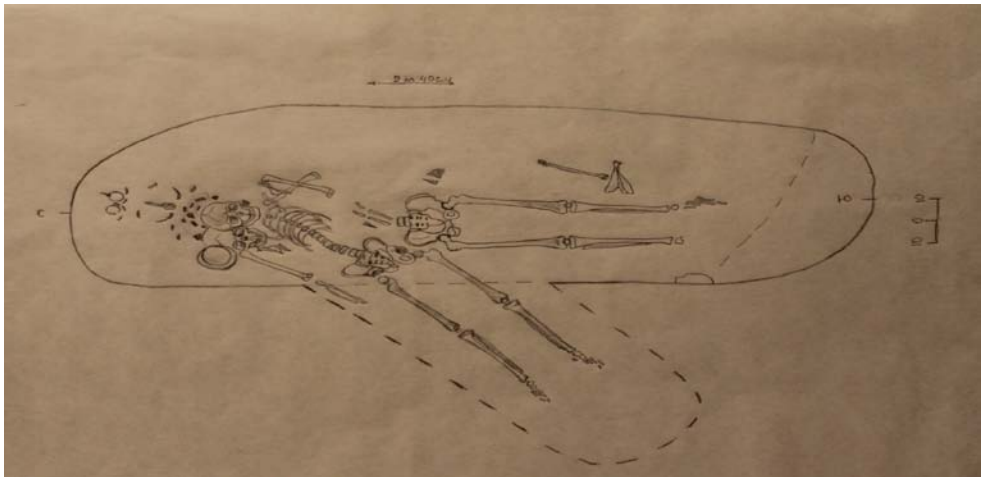

Figure 17: Mound №3. The scheme of the tomb

c) *Stratigraphic snip excavationconducted in Rakhat settlement*

At the same time stratigraphic snips to nomad camps were constructed inherent of Sak time. Generally there was detected waste of ceramics inherent of Sak time. The period of obtained materials is basically a period of Sak, while ceramic wastes found in the lower part of the fossil are based on the technique of Bronze Age. In this regard we can notice that the historical roots of settlement are deep [6].



Figure 18: (Rakhat. Stratigraphic snip excavation)

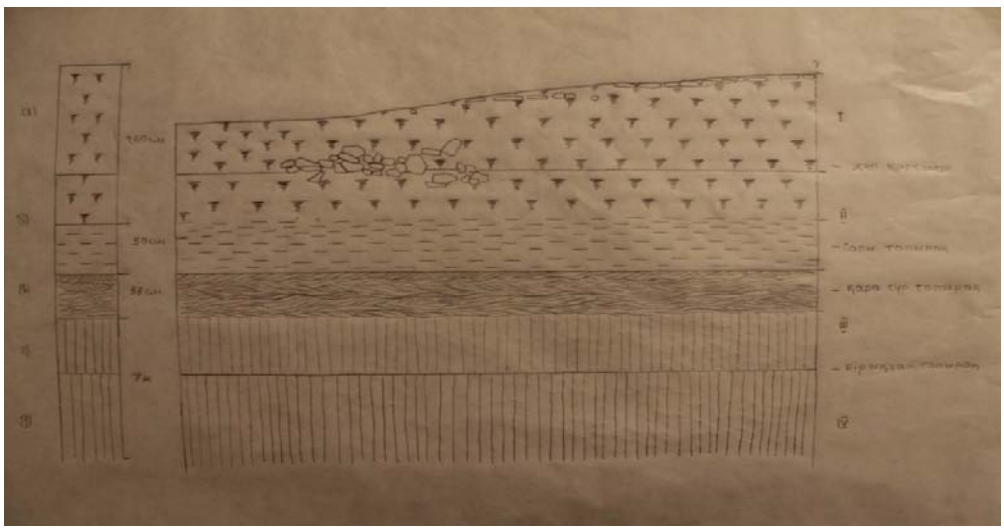

Figure 19: Stratigraphic snip scheme

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During excavations, many ceramic debris and waste of boneswere found. As a result of the deeper excavation of fossils, many artifacts of the same era were appeared from a variety of cultural layers. Looking at the artifacts found in the same cultural layers, it is evident that the settlement had a workshop on its own. As a result of deep digging, the area was divided into 6 square meters and a full description was made. Approximately 100 ceramic debris and waste of bones were found out from the nomad camp as a result of the excavation [6].

d) *Paleoanthropological study of materials from the excavations of the field season 2015-2016.*

Work with anthropological material was carried out in the research laboratory of paleoanthropological study of Kazakhstan at the Institute of Archeology named after A.Kh. Margulan in 2016.

The preservation of anthropological material is satisfactory. Determination of sex and age were conducted by standard methods M.M. Gerasimov (1955), V.P. Alekseev, G.F. Debets (1964), V.I. Pashkova (1963), V.P. Alekseev (1966), Philip Walker and others (1988). A correlation was recorded between the data, on the one hand, the tooth age, and, on the other, the skelet. Measurement and description of osteological characteristics were carried out using standard anthropological and forensic methods (Alekseev, Debets, 1964; Alekseev, 1966; Buzhilova, 1998; Dobryak, 1960; Pashkova, 1963). For the evaluation of the sign values were utilized the absolute value clauses compiled by V.V. Bunak and A.G. Tikhonov. To assess the categories of indicators and the shape of bone sections were used data of V.P. Alekseev [20]. Rakhat burial ground[9].

The remains of four individuals from the burials of three mounds were investigated. The preservation of anthropological materials is satisfactory. Sex and age determinations are presented in Table 1.

Table 1: Sex-age determinations of individuals from the burial ground of Rakhat (E.P. Kitov)

Mound / burial	Sex	Age (year)
Mound 1	Male	35-45
Mound 2	Female	18-25
Mound 3 b.1 low.	Male	40-45
Mound 3 b.1 upp.	Male	25-35

Mound №1

It is represented by a skull of poor preservation. Restoration was not applied. The facial section is represented by the maxilla and the nasal region. The brainpan is visually of medium length, medium-high, brachicranal. The facial section has medium-wide and high, with high and medium-wide nasal bones with an average protrusion of the nose. Nasal bones are long. The similar features of combination are characteristic of the Sak-Uysun groups of the Zhetisu (Figure 6).



Figure 20: Craniological features of the individual from the mound №1

Postcranial skeleton is represented by almost all strongly fragmented bones. The bones were broken, the broken places were wiped, which is probably connected with the ancient robbery of the mound.

According to the estimated grades of V.V. Bunak (Mamonova, 1986), the branchial bone, elbow and femoral bone have a short length. The brachial and femoral bones are also characterized by large circles of diaphysis, which determines their greater strength and overall massiveness. Bones are massive.

The height was calculated on the basis of the following formulas: according to K. Pearson and A. Lee - 154.6 cm; according to S. Dupertuis and D. Hadden - 160.6 cm. On average height was 157.6 cm, that is, a small one.

The mound №2

A skeleton without a skull is represented by separate bones of the postcranial skeleton of a woman aged 18 to 25 years. The traces of cribra orbitalia are fixed on the skull, which may indicate anemia.

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The mound №3

Two burials were found in the burial mound. The main (lower) is represented by the male skeleton of 35-45 years.

Lower burial. The skull is hyper dolichocranic with a combination of a long length and a very small width of the brain box. The height of the cranial vault from average po and from b is small. The horizontal circle through average g, transverse arc po-br-po and sagittal arc are estimated by average values. The frontal bone is very narrow. The angle of the forehead from n is small, the bending height of the forehead is large. The width of the base of the skull is very small.

The facial skeleton is medium-wide by value upper, small in average width and zygomatic diameters. Orbits are medium-wide and low, very low according to the index. Nose of platinum proportions is in low height and width. Noseband is medium upper and medium wide. In the horizontal plane, the face is clinognathic on the upper and lower levels. Canine fossa is medium deep. The lower jaw is characterized by a small condylar, a small angular and middle anterior width and an average thickness of the body and a very small width of the limb.

The remains of the skeleton are of a satisfactory degree of preservation from the burial place.

According to estimated grades of V.V. Bunak (Mamonova, 1986), all long tubular bones are characterized by a long length. In this case, the clavicles, branchial bone, femoral and tibil bones have large values of the circumferences of the diaphyses, which cause their greater strength and massiveness. The bones of the forearm for a long length have average values of the circumferences of the diaphyses, which causes their gracilis. Diaphysis of the femoral bone in the middle part of the diaphysis is flattened in the transverse direction. In the upper part of the diaphysis of the femoral bone, asymmetry is observed in this indicator: the right femoral bone is flattened in the transverse direction, the left femoral is in the sagittal. Such asymmetry could be formed due to an uneven weight on the femoral bones in the process of their growth. Tibil bones symmetrically flattened in the sagittal direction in the upper part of the diaphysis [21].

According to the intermembranal index (73.0), the lower part of the body is considerably shortened relatively to the upper one. The forearm is elongated relatively to the shoulder, the shin is elongated relatively to the hip. The shoulder is elongated in relation to the thigh, and the forearm is elongated in relation the shin.

The height was calculated on the basis of the following formulas: according to K. Pearson and A. Lee - 169.1 cm; according to S. Dupertuis and D. Hadden - 174.3 cm. The average height was 171.7 cm, that is, a relatively high one.

Pathology. Frazzle bone of the postcranial skeleton corresponds to the biological age of the individual. There are degenerative-dystrophic changes in the vertebrae, shoulder, hip and knee joints with compensatory reaction in the form of marginal bony growths [22].



Figure 21: Craniological features of the individual from the mound 3

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Upper burial. The skull is mesocarpal, with a combination of a large length and a large width of the brain box. The height of the arch from the *po* is large, from the *b* is small. The horizontal circle through *g* is large, the transverse arch *po-br-po* and the sagittal arc are estimated by average values. The frontal bone is very wide. The angle of the forehead profile from *n* is small, the bending height of the forehead is large. The width of the base of the skull is very large.

The facial skeleton is wide by value the upper, medium width and zygomatic diameter. The orbits are medium-wide and medium-high, mesophilic according to the indicator. Nose of platinum proportions is at high altitude and very large width. The transfer is low and medium wide. In the horizontal degree of the face is flattened on the upper and lower levels. Canine fossa is flattened. The lower jaw is characterized by a large condylar, angular and large front width, as well as large values of the thickness of the body and the width of the limb.



Figure 22: Craniological features of the individual from the mound 3

The remains of the skeleton are of a satisfactory degree of preservation from the burial place.

The remains of the skeleton with bones of varying degrees of preservation are occurred in the burial place. According to estimated grades V.V. Bunak (Mamonova, 1986), all long tubular bones are characterized by a short length, with large circles of diaphyses, which determines their greater strength and overall massiveness. Bones are visually shortened and very massive.

The growth was calculated on the basis of the following formulas: according to K. Pearson and A. Lee - 153.8 cm; according to S. Dupertuis and D. Hadden - 159.8 cm. The average growth was 156.8 cm, that is, a small one.

Both individuals are of different anthropological types. Lower has a characteristic, often found in the Bronze Age and less often in the early Iron Age – strongly expressed European look. The upper is clearly expressed Mongoloid face, typical of the Middle Ages.

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However, the anthropological characteristics can not serve as a support for dating and it is necessary to obtain radiocarbon dates, in order to more accurately determine the time of burial. The specific appearance of the buried may possibly introduce new hypotheses into the processes taking place in the given territory in the EIC, that the dates are specified. The individual from the burial mound №1 finds wide analogies (with the reservation for poor skull preservation) among the population of the region of the early Iron Age.

Table 2: Craniological characteristics of skulls from the burial grounds of Rakhat (E.P. Kitov)

Symptom	Burial ground	Rakhat	Rakhat
	Round/burial	m. 3 b.lower	m. 3 b. upper
	Sex	♂	♂
1	2	3	4
	Linear:		
1	Longitudinal diameter	186,0	188,0
8	Transverse d.	130,0	149,0
17	Altitudinal d.	135,0	125,0
20	Ear height	114,0	118,0
5	Length of main skull	99,0	96,0
9	Small.width of forehead	92,0	100,0
10	Large.width of forehead	110,0	124,0
11	Width of main skull	117,0	142,0
12	The width of the neck	106,0	116,0
25	Sagittal arc	386,0	383,0
26	The frontal arc	126,0	130,0
27	Parietal arc	139,0	130,0
28	Occipital arc	121,0	123,0
29	Frontal chorda	111,0	113,0
30	Parietal chorda	123,0	118,0
31	Occipital chorda	98,0	96,0
40	Length of main face	-	102,0
43	Upper width of face	105,0	113,0
45	Zygomatic diameter	126,0	144,0
46	Average width of face	92,0	104,0
47	Full height of face	-	130,0
48	Upper height of face	70,0	81,0
51	The width of the orbit	41,3	45,0
51a	The width of orbit from	-	42,0
52	The height of the orbit	30,2	34,8
54	The width of the nose	23,7	31,2
55	The height of the nose	46,5	55,0
60	Length of alveoli.arc	54,0	58,0
61	The width of alveoli.arc	61,0	70,0
62	The length of the sky	-	50,2
63	The width of the sky	-	44,6
1	2	3	4
sc	Symotic width	8,1	5,8
ss	Symotic height	3,5	2,0
mc	Maxillafr.width	19,5	20,2
ms	Maxillafr.height	7,5	3,7
dc	Dacryal width	-	24,2
ds	Dacryal height	-	8,0
FC	Deep. canine fossa	5,0	3,0
Sub NB	The height of the forehead bend	23,5	27,3
	The corner:		
32	The forehead inclination	81	85,0
GM/FH	Forehead profiles fr. g.	72	80,0
72	General Facial	-	-
73	Middle-faced	90	90,0

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74	Alveolar part	-	70,0
75	Bone propensity	-	66,0
75(1)	Nose protrusions	-	18,0
77	Nasomal	133	140,0
zm	Zygomaxil	124	141,0
Pointers:			
8/1	Cranial	69,9	79,3
17/1	Height-longitudinal	72,6	66,5
17/8	Height-cross	103,8	83,9
20/1	High-long.from h.	61,3	62,8
20/8	Height-cross neg.	87,7	79,2
9/8	Frontal transverse	70,8	67,1
9/43	Front painting	87,6	88,5
40/5	Protruding parts of face	-	106,3
48/45	Upper face	55,6	56,3
47/45	General facial	-	90,3
52/51	Orbit	73,1	77,3
54/55	Nasal	51,0	56,7
61/60	Alveolar	113,0	120,7
63/62		-	88,8
ss/sc	The simotic	43,2	34,5
ms/mc	Maxilla front	38,5	18,3
ds/dc	Dacryal	-	33,1
Descriptive:			
Above noseband		3,0	2,0
Occip.hillock		2,0	2,0
Osseous segment		2,5	2,0
Noseband		2,0	2,0
Lower jaw:			
65	Width of condylar	115,0	132,0
66	Angular width	101,0	113,0
67	Front width	43,0	48,0
69	Height of symphysis	35,0	37,0
69(1)	Height of body	33,0	37,0
69(3)	Body thickness	13,0	16,0
70	Height of limb	-	-
71a	Least width of limb	28,8	36,0
C	Ind.height of chin	65,0	70,0

Table 3: Osteometric data on the postcranial skeletons of male individuals from the burial grounds of Rakhat (E.P. Kitov)

Cipher		Rakhat, m.1	
1	2	7	8
collarbone		right	left
1	the largest length	x	x
4	vert.diam.	x	x
5	sag.diam.	x	x
6	sur.	x	x
6/1	Indic.strengths	x	x
shoulder blade			
1	morphology.width	x	x
2	morph.leng.	x	x
12	leng.joint	x	x
13	wid.joint	x	x
branchial bone			
1	The larg.length	x	290
2	com.leng.	x	287

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3	width upp.e.	x	x
4	width low.e .	x	x
5	the larg.leng.mid.diam.	x	24
6	the low.l.mid.diam.	x	18
7	the low.sur.d.	x	x
7a	sur.mid.d.	x	70
8	sur.head	x	x
9	the lar.wid.head	x	x
10	ver.l.head	x	x
11	width of unit	x	x
7/1	Indic.strengths of ulnar	x	x
1	2	7	8
1	the larg.leng.	255	x
2	phys.leng.	279	x
11	sag.leng.d.	12	x
14	upp.sag.l.d.	22	x
12	trans.l.d.	16	x
13	upp.trans.l.d.	18	x
3	the low.sur.l.	36	x
3/2	Indic.strengths of radial	12,9	x
1	the larg.leng.	x	x
2	phys.leng.	x	x
4	trans.l.d.	x	x
4a	trans.l.mid.d.	x	x
5	sag.l.d.	x	x
5a	sag.l.mid.d.	x	x
3	the low.cir.l.(Alekseev)	x	x
	the low.cir.l.(as all)	x	x
5/5	sur.mid.l.	x	x
3/2	Indic.strengths	x	x
pelvis			
1	height	x	208
2	the larg.width	x	x
12	wid.influ.m.	x	146
sacrum			
1	arc length	x	x
2	front height	x	x
5	upper width	x	x
femoral			
1	the larg.leng.	422	x
2	leng.natur.	x	x
21	wid.low.e.	x	x
6	sag.l.mid.e.	28	x
10	upp.sag.l.	27	x
7	trans.l.mid.d.	26	x
9	upp.trans.l.	28	x
	upp.low.l.	24	x
	upp.larg.l.	29	x
18	head height	43	x
19	width of head	43	x
20	sur.head	141	x
8	sur.mid.l.	86	x
6/7	Ind.pilasters	107,7	x

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1	2	7	8
10/9	Ind.platimeria	96,4	x
8/2	Ind.massiveness	x	x
larg.brich			
1a	the larg.leng.	x	x
1	gen.leng.	x	x
3	wid.upp.e.	x	x
6	wid.low.e.	x	x
8	sag.(larg.) l.mid.d.	x	x
8a	sag.l.d.at lev.cir.	x	x
9	wid.mid.l.	x	x
9a	wid.l.at lev.cir.	x	x
10	sur.mid.l.	x	x
10a	sur.l.at lev.cir.	x	x
10б	smal.cir.l.	x	x
9a/8a	Ind.platimeria	x	x
10/1	Ind.massiveness	x	x
Small brich			
1	larg.leng.	x	x
2	larg.wid.mid.l.	x	x
3	smal.wid.mid.l.	x	x
	Indicators:		
	radial-branchial (R1/H1)	x	x
	birch-femoral (T1a or T1/F2)	x	x
	branchial-femoral (H1or H2/F2)	x	x
	radial-birch (R1/T1)	x	x
	Intermembral (R1+H1/T1+F)	x	x
	Height:		
	by K.Pearson, A.Lee		154,6
	S. Dupertuis and D. Hadden		160,6

Table 4: Osteometric data on the postcranial skeletons of a female individual from the Rakhat burial ground (E.P. Kitov)

Rakhat m.2, b.2			
Collarbone		Right	Left
1	2	3	4
1	larg.leng.	129	x
4	vert.diam.	8	x
5	sag.diam.	10	x
6	sur.	30	x
6/1	Ind.strengths	23,3	-
shoulder blade			
1	morph.wid.	x	x
2	morph.leng.	x	x
12	leng.joint	x	x
13	wid.joint	x	x
Branchial bone			
1	larg.leng.	x	298
2	com.leng.	x	295
3	wid.upp.e.	45	44
4	wid.low.e.	x	51
5	larg.l.mid..	19	18
6	smal.l.mid.d.	12	13
7	smal.cir.l.	53	53
7a	sur.mid.l.	52	53

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8	sur.head	125	124
9	larg.wid.head	37	38
10	upp.l.head	41	41
11	width of unit	x	x
7/1	Indic.strengths of ulnar	-	17,8
1	larg.leng.	243	x
2	phys.leng.	215	x
11	sag.l.d.	10	x
14	upp.l.d.	18	x
12	trans.l.d.	13	x
13	upp.trans.l.d.	16	x
3	smal.cir.l.	31	x
3/2	Ind.strengths	14,4	-
radial			
1	larg.leng.	218	x
2	phys.leng.	207	x
4	trans.l.d.	12	x
4a	trans.l.mid.d.	13	x
5	sag.l.d.	9	x
1	2	3	4
5a	sag.l.mid.d.	9	x
3	smal.cir.l.(Alekseev)	33	x
	smal.cir.l.(as all)	33	x
5(5)	cir.mid.l.	35	x
3/2	Ind.strengths	15,9	-
pelvis			
1	height	x	x
2	larg.width	x	x
12	wid.influ.m.	x	x
sacrum			
1	arc length	x	x
2	front height	x	x
5	upper width	x	x
femoral			
1	larg.leng.	x	408
2	leng.natur.	x	406
21	wid.low.e.	x	71
6	sag.l.mid.d.	x	22
10	upp.sag.l.	x	20
7	trans.l.mid.d.	x	22
9	upp.trans.l.	x	26
	upp.smal.l.	x	20
	upp.larg.l.	x	26
18	height of head	x	40
19	wid. head	x	40
20	sur.head	x	130
8	cir.mid.l.	x	71
6/7	Ind.plasters	-	100
10/9	Ind.platimeria	-	76,9
8/2	Ind.massiveness	-	17,5
larg.birch			
1a	larg.leng.	327	331
1	com.leng.	322	326
3	wid.upp.e.	64	64
6	wid.low.e.	46	45
8	sag.(larg.) l.mid.d.	24	23
8a	sag.l.d.at lev.cir.	29	28
9	wid.mid.l.	15	16
9a	wid.l.at lev.cir.	18	17

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10	cir.mid.l.	64	63
10a	cir.l.at lev.cir.	76	75
1	2	3	4
10б	smal.cir.l.	59	60
9a/8a	Ind.platimeria	62,1	60,7
10/1	Ind.massiveness	19,9	19,3
sm.birch			
1	larg.leng.	x	x
2	larg.wid.mid.l.	x	x
3	larg.wid.mid.l.	x	x
	Indicators:		
	radial-branchial (R1/H1)	-	-
	birch-femoral (T1a or T1/F2)	-	80,3
	branchial-femoral (H1or H2/F2)	-	73,4
	radial-birch (R1/T1)	64,3	-
	Intermembral (R1+H1/T1+F2)	-	-
	Height:		
	by K.Pearson, A.Lee		159,5
	S. Dupertuis and D. Hadden		157,4
	by Debets		156,0
	by Bunak		154,1
	Average (HEIGHT)		156,7

e) Results of the findings of the discovered ceramics during the field research of the international "geoarcheology" laboratory for 2015-2016 years

During the excavation in mound №1, ceramic tableware was found in the burial hole with a depth of 1.7 m [7].

The plate (Figs. 29, 30). The crockery was made of semi-ellipse, constructed with clay mixed with organic things and fine sand. At the bottom of the rounded wall, the bent curve moves upward and has a sharp angle in the cross-section. Burns are not uniform, while the color is light brown but not uniform. The length diameter is 16 cm, the height is 7 cm, the wall thickness is 0.6-0.8 cm.



Figure 23: Mound.№1. The plate

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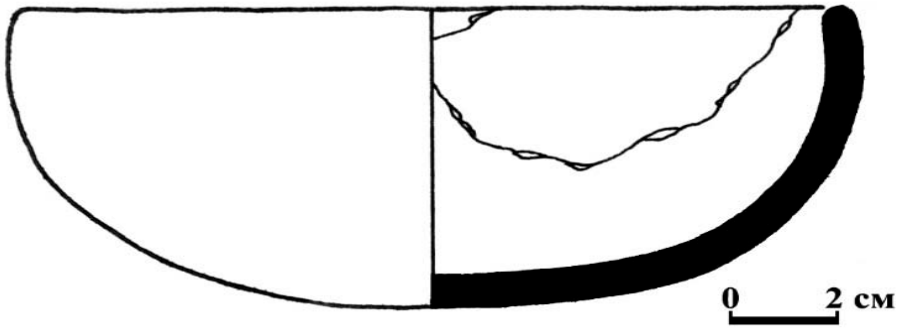

Figure 24: The Rakhat cemetery. Mound №1. The plate

Ceramic vessels were found on the left side of the human skeleton at the burial hole during the excavation of mound №3 [7].

The bowl (fig. 31, 32). The half-spherical crockery is composed of fine sand and mica blended clay. From the bottom of the round, the wall is unevenly folded and folded in the cross section, with a bent arc. It can be seen from the outside that the density of the cookware increases by fracturing the wall with solid things. Burns are uniform, light brown red. The lenght diameter is 10.5 cm, the diameter of the side is 12.8 cm, the height is 8.8 cm, the wall thickness is 0.5-0.7 cm. In 1954, a similar tableware was discovered in the excavations of the №3 in burial ground Taigak I. The burial ground is periodization of BC II-I centuries.



Figure 25: Mound №3. The bowl

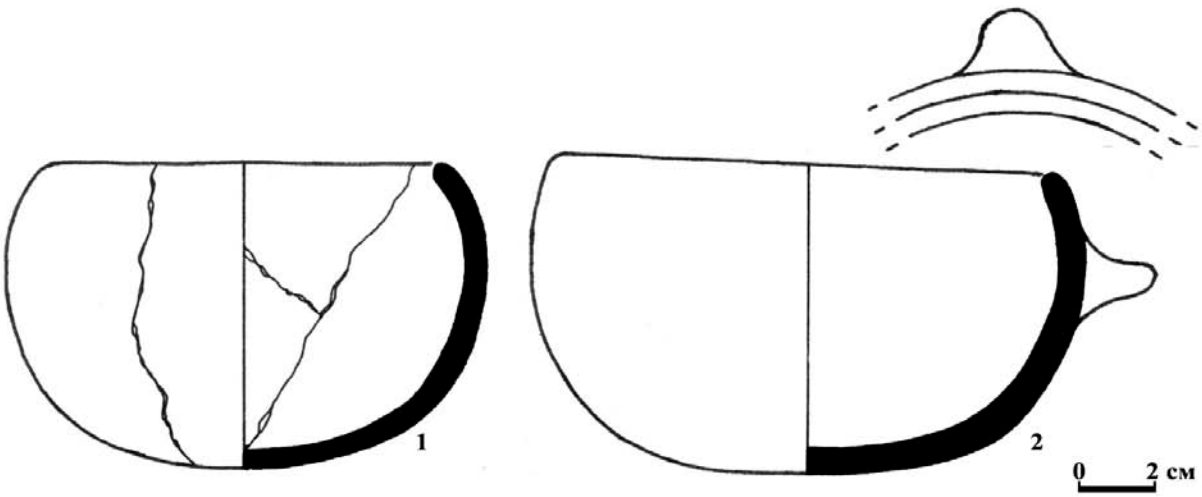

Figure 26: Rakhat cemetery. Mound №3. Bowls

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Rakhat settlement

Stratigraphic excavations at Rakhat settlement were conducted by dividing into quarries. During digging, a significant amount of ceramic vessels were found in the monument [7].

Squared - 4-D, tier -I. Several pieces of scrap were found on this square. It was possible to determine only one of them. The rest of the vessels are splinters.

Small dishes (Fig. 33.1). It was made from clay manually. The clay is not tight. The smoothing side is bent inwardly. Burns are uniform, color is light brown. The length diameter is about 7 cm and the wall thickness is 0.9 cm.

Squared - 2-B, tier-II. There are two big ones among the vessels found in this quarry.

Edge of the *koze* (It is like a vase). (Fig. 33.2). The fracture of the vessel, made by hand-sticking sand, mixed with mica. The lateral wall is bent forward and leaned outwardly. Density of clay and burnt are not uniform, the color is dark brown. The diameter of edge is 22.5 cm and the wall thickness is 1 cm. The outside was burnt.

The edge of koze (Fig. 33.3). The splinter of edge of tableware is composed of sand and organic materials which made from clay manually. The lateral wall is bent inward and curved outwardly, the surface is flattened. It is observed that the density of the substrate is increased by its solids. Clay is tight, burnt is not uniform, outer is dark brown, and inner side is brown. The diameter of edge is 30 cm, the thickness of the edge is 1.5 cm, the side diameter is about 32.5 cm, the wall thickness is 1-1.2 cm. The outside is completely burnt in the fire.

During the excavations a number of splinters were defined from the IV tier. Basically, most of them are spall of kitchen and utility vessels.

Square - I-A, tier-IV.

There is a big koze among these splinters of vessels in this square.

The edge of koze (Fig. 34.1). The splinters of edge of the vessel were made by hand-sealing of clay from the sand. The straight bent side curved from the side curved straight outward. Clay is solid, burnt is not uniform, the middle part inside is brown, outside is brown- red. The diameter of the edge is 26 cm, the diameter of the side is 33 cm, the wall thickness is 1.2 cm.

Square - 2-B, tier-IV.

The edge of crockery (Figure 34.2). The spall of edge of the vessel were made by hand-sealing of clay from the sand. The straight exit wall is drooped outward and the surface is flattened. The clay is dense, burning is not uniform, the inner side is dark gray, and the outer side is brown red. The edge thickness is 1.8 cm, wall thickness is 0.9-1.2 cm. The outside is burnt.

Squared - 5-D, tier-IV.

The edge of *koze* (Figure 34.3). The splinter of edge of the vessel were made by hand-sealing of clay from the sand. The wall that has been sprouted from the bottom is curved strightly and is bent free inward. At the same distance around the sloping side, there is a sloping hinge with a solid object. The clay is dense, burning is not uniform, the inner side is dark gray, the outer side is brown-red. The diameter of edge is 38 cm, the diameter of the side is 39 cm, the thickness of the wall is 0.8-1 cm.

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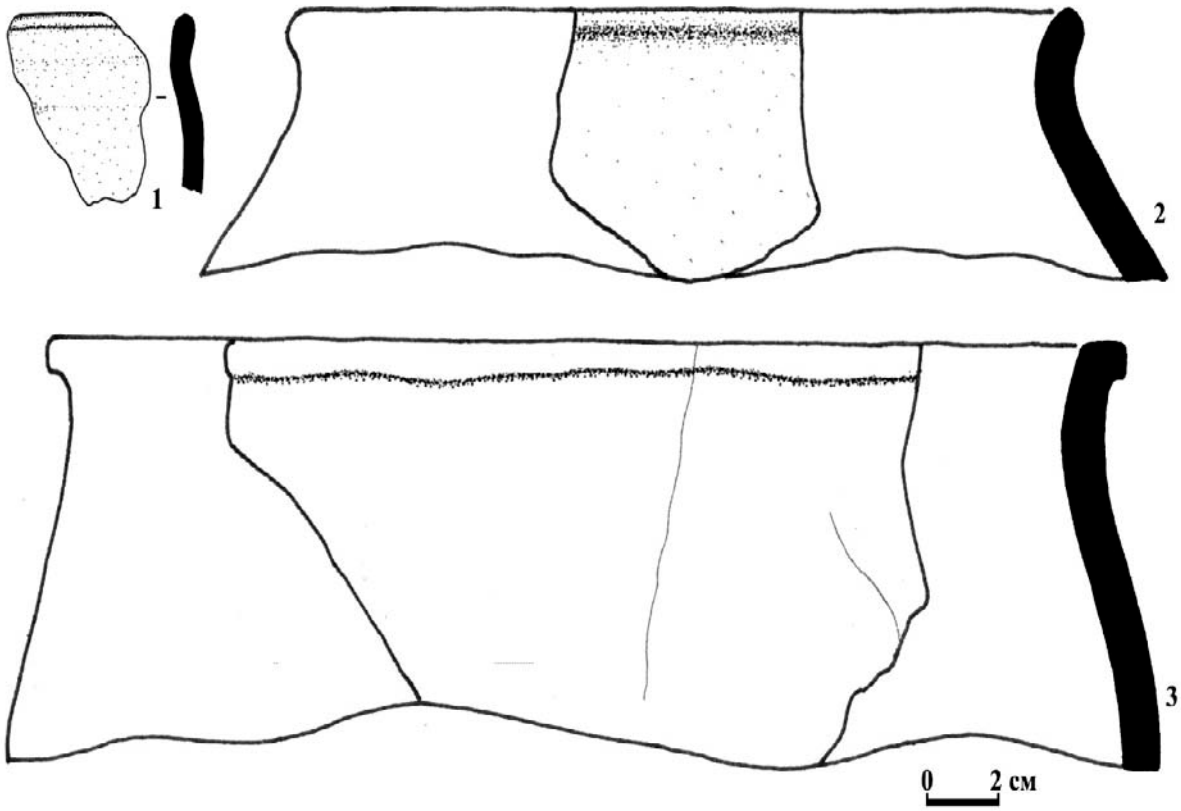

Figure 27: Rakhat settlement. Ceramic dishes

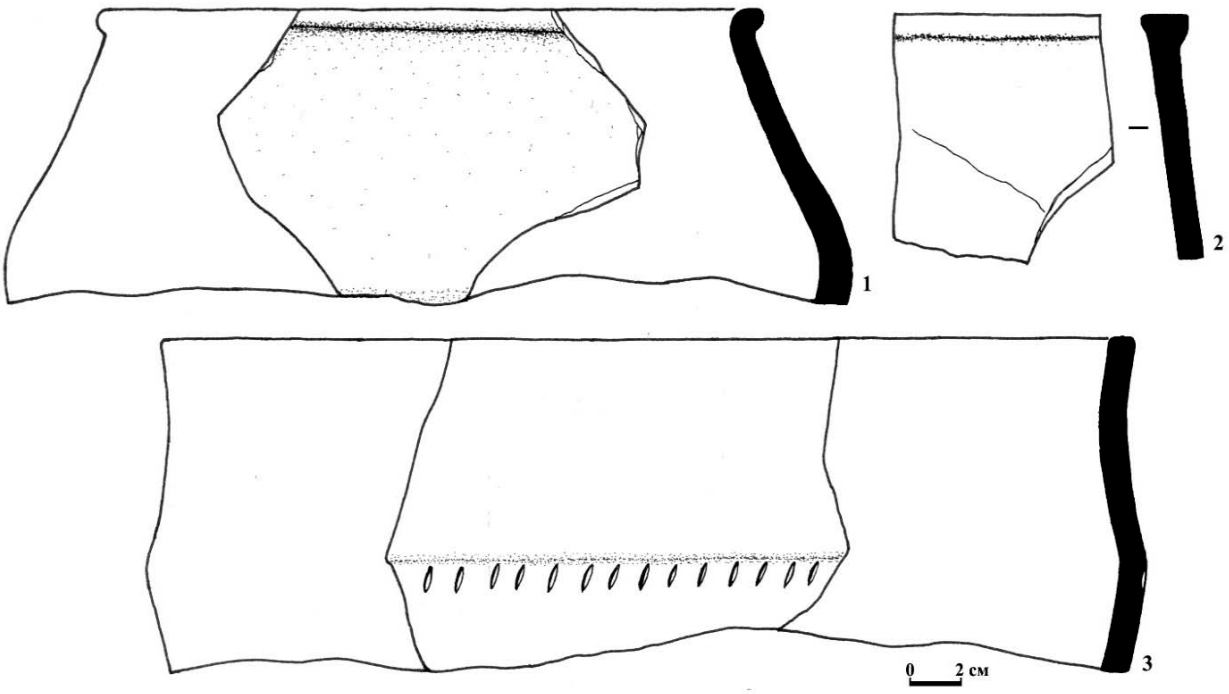

Figure 28: Rakhat settlement. Ceramic dishes

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IV. Discussion

a) Palynology of the Zhetycu and methods of research

One of the most informative methods for reconstructing the climate, landscape and the natural conditions in general is the palynological (spore-pollen) analysis.

Palynological analysis is used in great demand in world practice. The services of palinologists are appealed by geologists, physicians, environmentalists, botanists, geographers, but the most widespread use of palynology is found in archaeological practices.

The palynological method is based on the study of spores and pollen, produced annually by the plants in huge quantities. The ability of plants to produce spores and pollen, as well as its quality and quantityhavean expressed dependence on changes of climatic and landscape conditions.

Pollen of plants is a complex microscopic generative structure that carries the male gametophyte of plants. Due to the external high-strength sculptured shell - exine, spores and pollen grains are not destroyed under the influence of chemical, physical and enzymatic impact, which keeps them in the rock for many thousands and even millions of years, and also allows them to be extracted from the breed as a result of laboratory treatment. Practically, pollen and spores can be persisted in geological sediments independently from the facial conditions of the deposits [16].

The picture of the surface of exine, the location of the sprouting pores, apertures, furrows and all kinds of formations are an excellent diagnostic feature in determining taxonomic affiliation. The ability to compare fossil pollen, preserved in relatively young (Cenozoic) sediments, with the pollen of modern plants gives a clue to understand the history of the flora in the past.

Spores and pollen are scattered by wind, water, animals and cover the surface of land and water, the so-called “pollen rain”, buried in sedimentary deposits.

In this way, practically all sedimentary deposits retain fossilized spores and pollen in different numbers, from which the spore-pollen spectrum (SPS, palynospectrum[1]) of each horizon is formed. The palynological method is practically the only paleontological method that allows us to dismember the inexpressive Holocene strata (from 12,000 to the present) and determine the climate stratigraphic horizons.

Holocene deposits contain pollen and spores of the same plants practically that grow in the studied territory now.

Methods for interpreting palynological data on the arid zone are based on a study of changes in the composition of herbaceous shrub plants, although dominant families are often unchanged. According to the composition of the SPS dominate, it is possible to judge the background vegetation of the research area, and the accompanying and rare single pollen forms may indicate microecological conditions.

The natural environment is - a complex system where the relief, landscape, lithology, height of the territory above sea level and many other geological and geomorphological features, as well as plants, animals and climate (air temperature, moisture availability) are in close connection. One of the most sensitive components of the natural environment is flora. Minor climate changes affect the composition of vegetation, the redistribution of major plant associations. Thus, reconstruction of the vegetation of the past allows us to restore the main direction of development of the climate and the natural environment.

Superficial modern samples serve as a model and basis for further interpretation and carrying out of objective paleophytocenotic and paleogeographic reconstructions.

Reconstruction of the climate of the Holocene of the Zhetysu according to palynological data Eight biozons were obtained for the Zhetisu, (a detailed description of the biozones, the principles for their isolation are given in the article by S.A. Nigmatova - Problems of the stratigraphy of the Holocene of Southern Kazakhstan. // Bulletin of the National Academy of Sciences of the Republic of Kazakhstan, Ser. Geol., № 6. - 2004.-p.20-31), which permit us to distinguish climatostratigraphic intervals more fractional than in the standard scale of Blitt-Sernader-Khotinsky (Figure 20-21).

Analysis of palynological material from the Holocene sediments of various landscape areas of the Zhetisu let us conclude about the multidirectional features of the reaction of vegetation in the mountainous regions and the flat areas of the arid zone on climate change.

It was possible to dismember the Holocene deposits into 11 stages based on the materials of the palynological study (Preboreal, Boreal, Atlantic (A-I, A-II, A-III), Subboreal (SB-I, SB-II, SB-III) and Subatlantic (SA -I, SA-II, SA-III)), reflecting consistent shifts in the temperature-humidity regime, resulting in a change in the vegetation cover.

The most optimal climatic conditions for the Holocene were in the Atlantic century, when according to our data, the development of mesophilic vegetation in the steppe, semi-desert zone and foothills wereobserved on the territory of Kazakhstan and adjacent regions of western Siberia [5]. Most clearly stands out stage of the climatic optimum in the middle of the Holocene, an interval from 4500 to 8000 years ago. Precisely, this time is connected with the large lake stages of Balkhash, Alakol, Aral and Caspian seas. The climate of this stage is the most favorable ratio of moisture availability and heat in comparison with modern climate [16].

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Further, climatic conditions have a general tendency towards progressive aridization, but with periods of climate optimization. Subboreal century is characterized by relatively cool, but moistureconditions, which are well recovered on spore-pollen diagrams and reflected in climatic curves. Only at the end of the subboreal period was marked a period of warming and some desiccation, which later, the sub-Atlantic century is replaced by a gradual increase in moisture, the maximum of which is in the middle of the subatlantic. With the same time, the most clearly fixed cold and moisture stage are associated, both in the mountains and in the desert zone, which in some cases is marked by a small initial cryogenic structure found in the camps of Tamgaly, Sirektas, Bigash.

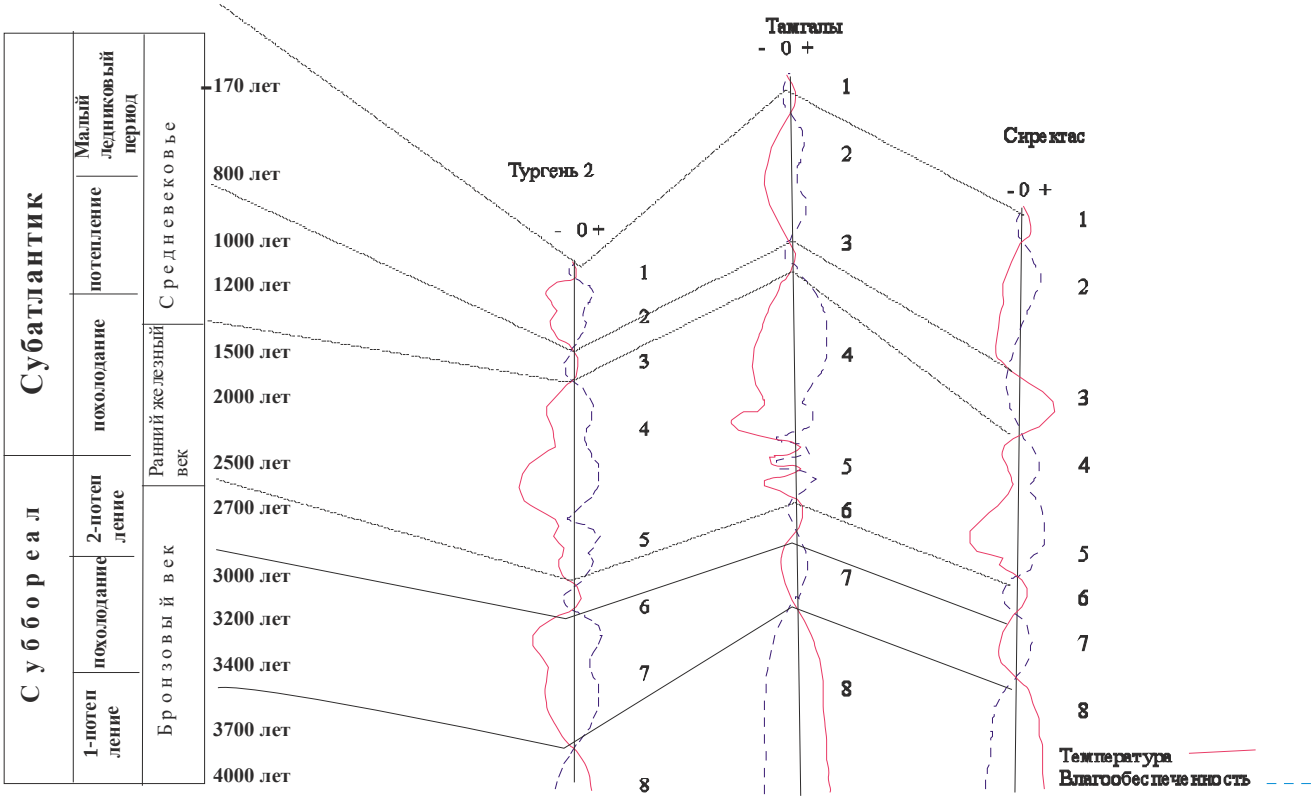

Figure 29: Scheme of correlation of climatic events in the Zhetysu

The Blitt-Sernander scheme, modernized by Khotinsky (1991)			The scheme worked out by B.Zh. Aubekerov, S.A. Nigmatova (2009)		
Periods	Year ago	Climate	Periods	Year ago	Climate
The Subatlantic (SA)	0 – 2100	Cool and wet	The Subatlantic SA - 3	800 – 170	Coldness (small ice age)
			SA- 2	1500- 800	warming
			SA- 1	2500- 1500	cold snap
Subboreal (SB)	2100 – 5000	Warm and dry	Subboreal SB - 3	3000-2500	warming
			SB - 2	3400-3000	cold snap
			SB – 1	4500-3400	Warming and aridization
Atlantic (AT)	5000 – 8000	Warm and humid	Atlantic AT - 3	4500 – 5500	Relatively cool and humid
			AT – 2	5500 - 7000	Warm and humid
			AT- 1	8000 - 7000	Warm and humid

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Boreal (BO)	8000 – 9500	At first cool and dry, then moderately warm	Boreal (BO)	8000 – 9500	Relatively warm
Preboreal (PB)	9500 – 10200		Preboreal (PB)	9500 – 10200	cool and dry,
Late Dryas (DR - 3)	10200 – 11 000	Cold	Late Dryas (DR - 3)	10200 – 11 000	Cold
Allered (AL)	from 11 000	Cold	Allered (AL)	from 11 000	Cold

Figure 30: Climatic characteristics of the Holocene periods

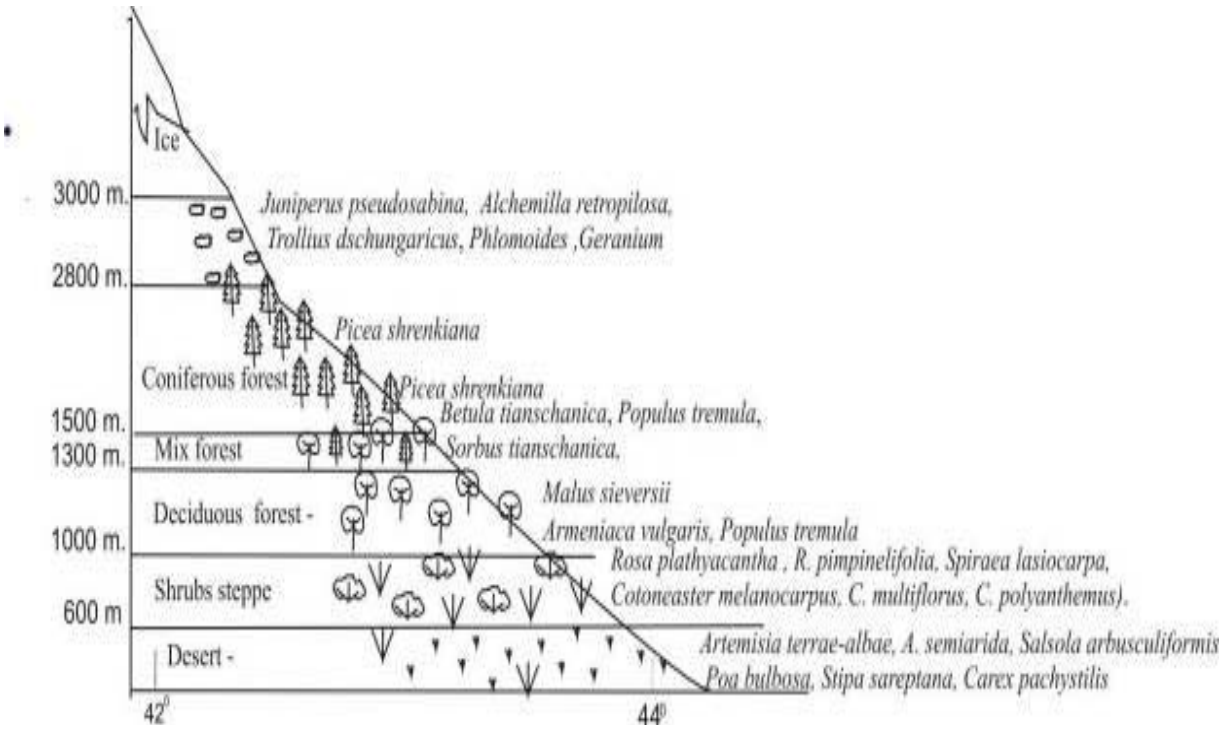

Figure 31: Scheme of distribution of vegetation along vertical zone Northern Tien -Shan

b) Geological and geomorphological description of the Rakhat gorge

Before proceeding with the description of the section, it is necessary to briefly review the features and methods of studying quaternary deposits which used in the field conditions. Many features of quaternary sediments, which distinguish them from older Paleozoic rocksdue to the short period of the Quaternary period and the fact that the formation of the Quaternary cover continue at the present time. Early life and surface occurrence are explained by the looseness of sedimentary quaternary deposits, the absence of any significant signs of diagenesis and metamorphism in them.

Observation of modern sedimentation processes makes it possible to determine quite confidently the genesis of the sediments under consideration. A very important feature of Quaternary sediments is explained by surface occurrence: their close connection with the modern relief. For example, many genetic types of Quaternary sediments form certain forms of relief (river terraces in river valleys, slope forms of the relay, eolian relief, etc.). Normal stratigraphic occurrence of Quaternary sediments, i.e. the occurrence of young sediments on older ones is observed only in areas of stable Pleistocene subsidence. In the same areas where the accumulation of Quaternary formations occurred during the dismemberment of the relief is widely developed the leaning of the relatively young sediments to older ones, occupying a higher hypsometric position. The leaning occurrence of alluvial deposits is expressed in the river valleys by the complexes of differently aged terraces, in the foothill zone - by complexes of different ages of cones of removal lying at different hypsometric levels [17].

The most important in the study of Quaternary sediments are geomorphological observations, allows directly determining the genesis in the field conditions, and sometimes the age of the deposits. The role of the geomorphological method is more worth than the study of pre-Quaternary formations. The geomorphological

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method is the leading one in the regions of predominance of Quaternary accumulative forms of relief: areas of fluvial and fluvioglacial accumulation, river valleys, foothills, eolian plains and others. In these areas, the geological structure of individual forms, the structure and texture of sediments, and their lithological composition can be very often judged by the features of the relief. So, for example, on the location of river terraces, you can confidently talk about the relative age of each of them.

The main object of the study of Quaternary sediments is the natural outcrops that occur along valleys of rivers, in foothill zones, on the coast of lakes and seas, and artificial - quarries, ditches, etc. A detailed study of outcrops allows one to obtain the most complete picture of the geological structure of the study area. When exposed, there are optimal conditions for a detailed study of all details of the geological structure, their description, sketching and photographing, as well as for sampling, monoliths, etc.

The outcrops are usually covered with landslides, screes and mudslides, requiring meticulous clearing. There are selected areas of outcrops with less powerful landslides and screes, where they dig vertical trenches. In one outcropwere made several clearings to obtain a complete incision of the studied thicknesses and to track the facial variability of individual horizons and layers.

Low power and rapid variability of quaternary deposits require a great deal of detail in the description of the incision. Even small incisions of power can often contain information on sedimentation conditions over relatively long intervals of the quaternary period.

The description of the incisions must be carried out in the following sequence: 1) the number and exact geographical snapping of the incision; 2) geomorphological position; 3) dimensions of the incision (length, height), stretch; 4) the general characteristic of the deposits, opened by incision; 5) layerwise description of the incision, including for each layer: a) definition of the rock; b) color of the rock; c) power, the nature of the boundaries of the layer - the sole and roofing, i.e, the relationship with the underlying and overlapping rocks, the presence of interlayers; e) the structure of the layer - the nature of the grit of sand grains, the granularity of clays, the presence of pellets and so on (using a magnifying glass); e) mineralogical composition; g) layer texture (rhythm of deposits, types of oblique lamination, sorting of grains in puffs indicating the thickness of puffs and packs, elements of their occurrence); h) the syngenetic and epigenetic texture of cryogenic, landslide, solifluction, glacial and other genesis, with a description of the morphological features and material composition of the constituent deposits; i) syngenetic and epigenetic mineral formations and inclusions; k) determination of the roundness of pebble and change in their orientation (for deposits of the aquatic genetic series); l) fossil organic remains; m) conclusion, reflecting the views of the researcher on the conditions of formation of the sedimentary section, their age and correlation with neighboring incisions [18].

The description of the incisions accompanies the compilation of stratigraphic columns, which is conducted from left to right in the corresponding graphs: 1) the stratigraphic index; 2) the number of the layer; 3) the depth of the layer; 4) thickness of the layer; 5) graphic image of the lithologic composition of sediments; 6) a brief description of the layer deposits; 7) numbers selected for analysis of samples with accurate fixation of the place of their collection. The stratigraphic column is carried out on a scale that provides a clear image of the features of the deposits of each layer. In addition, the incisions are sketched (usually in an arbitrary direction along the outline of the outcrop) and photographed.

Now, let's pay attention to a specific incision located on the right (eastern) slope of the Rakhat river valley at the exit of the river from the mountains. The outcrop is a vertical cliff, a relative height above the floodplain of the river is 10 m, composed mainly of loess rocks. The description of incision starts from the top down in the following sequence (Figure 3):

a) soil layer (horizon) with a thickness of 1.40 m;
b) loess loams of light gray color relatively hard to touch, thickness 0,10 m;
c) loessloams of relatively dark color, friable to the touch, thickness 0.40 m;
d) obliquely wave loams of dark-gray color, thickness 0.50 m;
e) loess rocks of pale yellow color, friable to the touch, porous, differ by columnar separation, visible thickness 10 m.

In general, the nature of the boundaries of the layers are - the soles and roofs i.e. their relationship with the underlying and overlapping rocks is not clear, sometimes characterized by a gradual transition.

Based on the analysis of considered outcrop, it is possible to come up the following conclusion on the conditions for the formation of deposits composing this incision.

In geomorphological relations, the quarry is exposed by the lower foothill stage (lower counters) located in the foothills of the Ile Alatau ridge on all its length, at an altitude of 900 - 1200 m above sea level. Most of the incision is formed by loess rocks which form the lower foothill stage. Age of loess rocks according to scientists is – middle Quaternary (M.Zh. Zhandayev, 1964). The genesis of loess deposits is predominantly eolian. Loess was formed in the Middle Quaternary epoch, when dry and cold glacial air dominated in the periglacial zone of the Southern Balkhash region, which facilitated the dispersion and transfer of dust particles to the foothill zones of Ile Alatau in the form of cover

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deposits. In subsequent epochs, loessic deposits became involved in neotectonic uplifts and underwent intensive erosion and dismemberment, forming the lower foothill stage - the lower counters. Exactly the same way in the early Quaternary era, the upper foothill stage was also formed - the upper counters, also located along the northern foothills of the Ile Alatau ridge at absolute heights of 1200 - 1700 meters. They are low mountains or ridges that extend from the main massif of the ridge in the northern direction with a flattened surface and smooth outlines [19].

Thus, loess rocks within the northern foothills of the Ile Alatau ridge are located at different hypsometric levels, including the lower and upper foothill stages. They are distributed and higher up to the upper boundary of the forest; to an altitude of 2600 - 2800 meters (B.A. Fedorovich, 1981). In the conditions of the foothills, which loess deposits are located, the dust brought from the Southern Balkhash and often precipitated together with the rain accumulates a comparatively thick stratum of loess with high porosity, carbonate and all other properties of typical loess.

The upper part of the described incision with a thickness of 2.4 meters is a deluvium, which is the product of flushing of fine earth from the overlying foothill stage (upper shelves). This is a loose product that occurs as a result of the accumulation of rain and thawed snowstorm washed from the overlying slopes. Deluvium accumulated on the surface of a gentle slope of the lower foothill stage in the form of a cover with a total thickness of 2.4 meters. In these deposits isobserved a thin stratification, parallel to the slope. Age of deluvial deposits is modern.

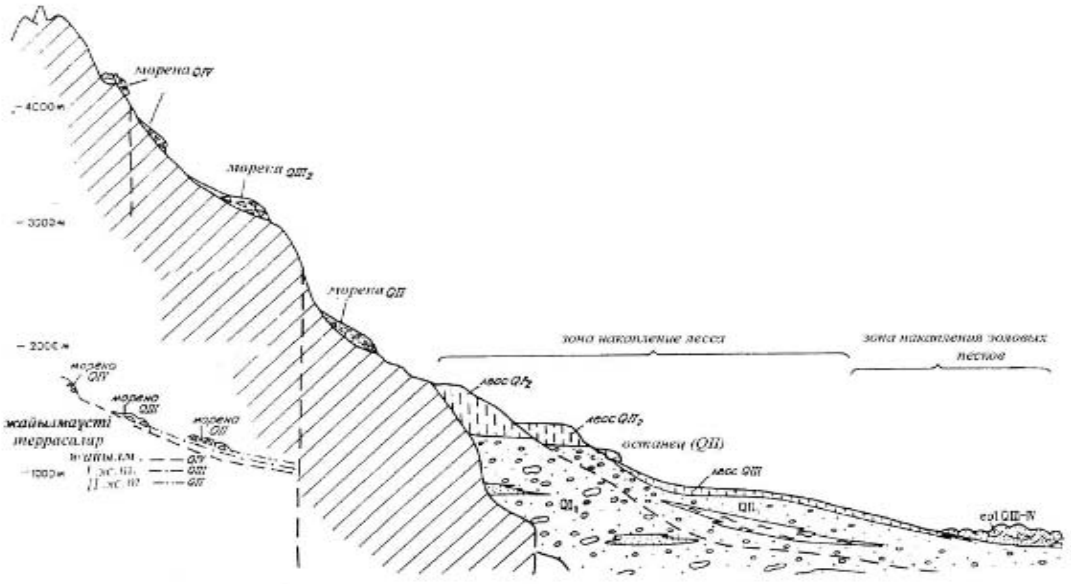

Figure 32: Scheme of the relationship of quaternary sediments of the northern slopes of the Zaiyl Alatau

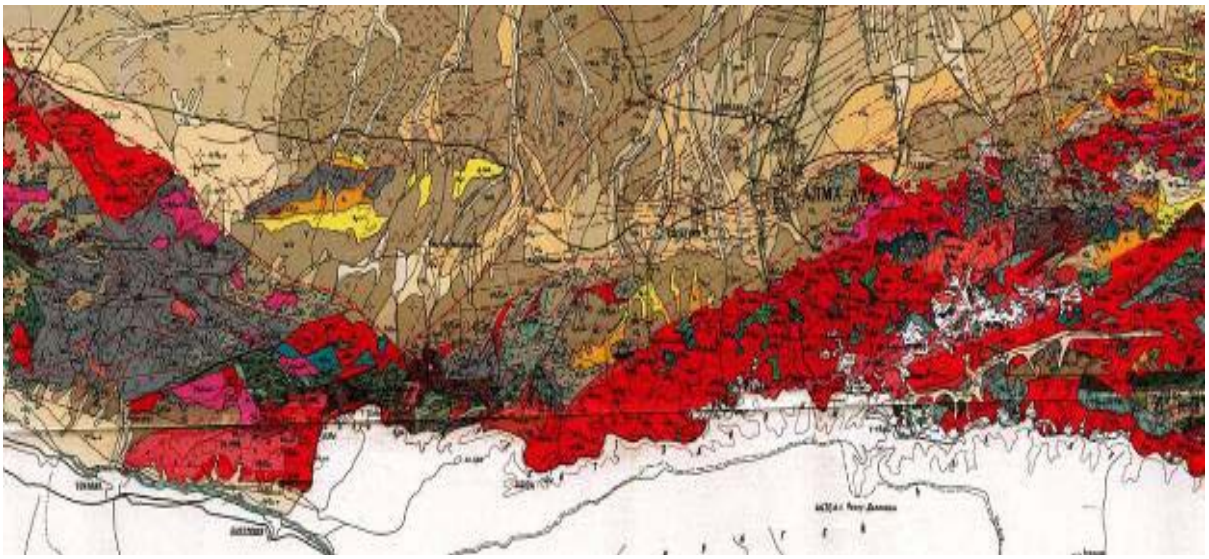

Figure 33: Geological map of the sheet K-43-B. Scale 1: 500.000

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Artifacts associated with the Bronze Age were found in the upper parts of the incision (quarry), in different layers of the deluvial deposits related to the age of the Holocene (Q_{IV}).

Geologo-geomorphological description of the Rakhat gorge was schemed by: Kusainov SeitkozhaAkhmeruly Professor, Doc.His.Sc. of the Department of Geography, land management and cadastre of al-Farabi Kazakh National University

0,1 m Loess loams of light color (Q_{IV})
0,4 м Loess loams of dark-grey color (Q_{IV})
0,5 м Wave and splay wave loess loams of dark-grey color (Q_{IV})
1.4 м Soil horizon (Q_{IV})
7,6 м Forests (Q_{IV})

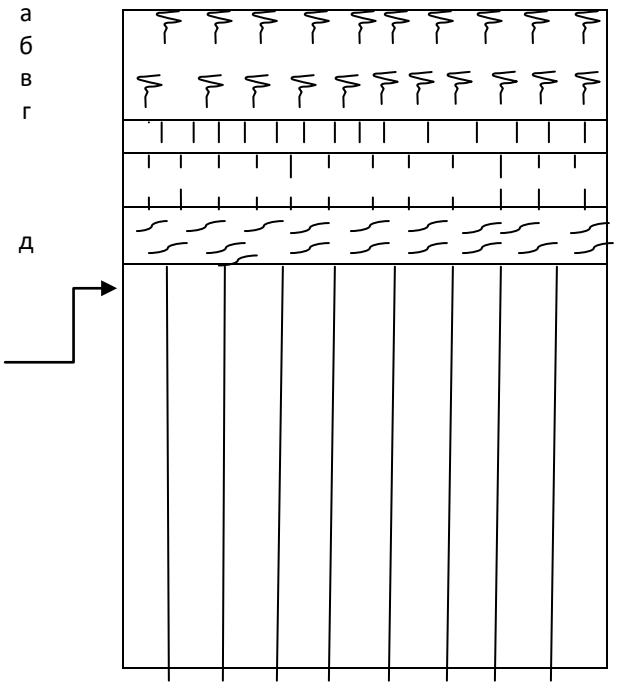

Figure 34: A lithologic stratigraphic column of the incision on the right bank of the Rakhat river valley at the outlet of the river from the mountain

V. Conclusion

The results of the laboratory analysis and artifacts allowed determining the cultural stages of the Rakhat camp. A deeper study of the complex of monuments in the framework of the State Program “The people in the flow of history” on the theme“The Research Program ofinternational scientific laboratory on archaeological dating of the artifacts”provideswith improvement of archeological degree at the universities of the republic, modeling of paintings from ancient epochs, restoration of the lives and ecological conditions of the first people.

At the same time, the goal of archaeological research works carried out on the basis of the international scientific-research laboratory “Geoarcheology” of al-Farabi Kazakh National University in the framework of the State Program “The people in the flow of history” on the theme “The Research Program of international scientific laboratory on archaeological dating of the artifacts” is to determine the historical significance. Most materials of the monuments, mounds, settlements and nomad camps located in the settlement Rakhat show that the region's historical roots are deep.

In the conclusion, the world's science has a great interest in the culture and art of the firstcommunity society. The success of natural sciences is widely used in the decision of a number of questions, and new technological possibilities help to consider and clarify some issues. At the same time, Kazakhstan archeologists have achieved many successes in the field of natural sciences (Paleobotanics, Paleogeology, Odontology, Chemistry and Physics, Genetics, Geomorphology, Palinology etc.). Its results are considered to be a significant success in the historiography of the world archeology.

In the future, resuming research in the settlement Rakhat is important for science. We can make a significant contribution to the history of Kazakhstan by defining the borders, cultural layers and the construction sites of the settlement. Further studying of the remains of the native culture of the vast area, provideswith valuable information on the political, socio-economic situation of the settlement.

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Science advances in the search of time and space for tasks and questions. Its branches as natural science, engineering, mathematics, and physics increase labor productivity and rises the wealth of the nation, indirectly promoting material production in the public-humanitarian sphere, and ultimately serves to extend the nation's lives. At the same time, the duty of archeology is the most responsible. The science of archeology sheds light on the nation, brings them up and forms its patriotism, by examining the nation's discovered and lost, the existence and the loss, teachings and experience of the past years.

In the era of totalitarianism, Kazakhstan's archeology failed to fulfill any of these tasks. That's why the chance is just appeared. In short, the future of our young state is connected with science, and the future of science is closely linked to the state policy. The leadership of Kazakhstan, aware of the fact that it does not engage in this relationship, will soon come to terms with raising its knowledge and science to a qualitatively new heights. Strategy of Kazakhstan's entry into the 50 most developed countries of the world is the creation of academic centers and educational institutions that conform to the highest international standards, modern education development, continuous improvement of qualification and retraining of personnel and further development of the culture of the people of Kazakhstan.

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