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Taphonomic 'chronicles': the case-study of Zaskalnaya VI site (layer III)

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This paper presents the contextual taphonomic analysis of faunal remains from the Middle Paleolithic archaeological site of Zaskalnaya VI (layer III). Due to the mixed structure of the cultural layer and to topographical specificities, it is complicated to reconstruct subsistence episodes at the site. However, faunal remains are characterized by different degrees of preservation that could be explained by the influence of different taphonomic agents.

There were at least three subsistence episodes, based on taphonomic analysis of faunal remains from layer III at Zaskalnaya VI. The first settlement episode was probably associated with mammoth remains. It is hard to assess whether the animals were scavenged or hunted. Despite the recovery of several bone fragments with splitting marks and evidence for their use as retouchers, most of the splitting marks are not convincing. Another episode of occupation at the site is associated with finds of *Equus latipes* bones. These bones presented splitting marks for marrow extraction, as well as cut marks and impact marks. The third episode is represented by remains of saiga (*Saiga tatarica* L., 1766) and *Cervidae*. Clear traces of anthropogenic modifications on these bones were not detected, although marks of modification by other carnivores were observed.

This study shows that taphonomic analysis of faunal remains is productive in modelling subsistence practices at Zaskalnaya VI site.

Olena Fedorchenko

„Cronicile” taphonomice: studiul de caz al sitului Zaskalnaya VI (stratul III)

Această lucrare prezintă rezultatele analizei taphonomice a rămășițelor faunei din paleoliticul mijlociu, și anume din situl arheologic Zaskalnaya VI (stratul III). Din cauza structurii mixte a stratului cultural și a particularităților topografice, reconstituirea episoadelor de subzistență la locul respectiv este complicată. Cu toate acestea, rămășițele faunistice sunt caracterizate de grade diferite de conservare care pot fi explicate prin influența diferiților agenți taphonomici.

Au existat cel puțin trei episoade de subzistență, bazate pe analiza taphonomică a rămășițelor faunistice din stratul III de la Zaskalnaya VI. Primul episod de decontare a fost, probabil, asociat cu rămășițele mamutului. Este greu de evaluat dacă animalele au fost sacrificate sau vâdate. În ciuda recuperării mai multor fragmente osoase cu semne de divizare și dovezi pentru utilizarea lor ca retouchere, majoritatea mărcilor de despicare nu sunt convingătoare. Un alt episod de ocupație la locul respectiv este asociat cu descoperiri de oase *Equus latipes*. Aceste oase au prezentat urme de despicare pentru extragerea măduvei, precum și semne de tranșare și urme de impact. Al treilea episod este reprezentat de resturi de saiga (*Saiga tatarica* L., 1766) și de *Cervidae*. Nu s-au detectat urme clare ale modificărilor antropogene asupra acestor oase, deși s-au observat urme de modificare de către prădători.

Acest studiu arată că analiza taphonomică a rămășițelor faunistice este productivă în modelarea practicilor de subzistență în situl Zaskalnaya VI.

Елена Федорченко

Тафономическая «летопись»: на примере изучения III слоя стоянки Заскальная VI

В статье представлен контекстуальный тафономический анализ фаунистической коллекции среднепалеолитической стоянки Заскальная VI (слой III). Из-за специфики культурного слоя и топографических особенностей довольно сложно реконструировать эпизоды заселения на стоянке. Но выявленная разная степень сохранности фаунистических остатков, возможно, свидетельствует о влиянии различных тафономических факторов и процессов на формирование данной коллекции.

Можно предположить, как минимум, три эпизода обитания на стоянке Заскальная VI (III слой). Один эпизод поселения, вероятно, был связан с обнаруженными фаунистическими находками мамонта. Сложно определить, появились ли они на стоянке в результате успешной охоты древних обитателей или хищников, а затем были частично принесены. Несмотря на наличие нескольких фрагментов костей со следами раскалывания и использования их в качестве ретушеров, большинство предполагаемых следов расщепления выглядят неубедительными. Другой эпизод обитания на стоянке связан с находками костей *Equus latipes*. На них зафиксированы четкие следы от раскалывания, с целью извлечения костного мозга, а также нарезки(?) и сколы. Третий эпизод представлен находками костей сайги (*Saiga tatarica* L., 1766) и представителей из семейства *Cervidae*. Кроме следов модификации хищниками, четких следов антропогенных модификаций на этих костях обнаружить не удалось.

Studying the taphonomic history of an archaeological site is known to enable establishing the existence and finding out the extent of natural and anthropogenic factors that influenced on the process of accumulation of faunal remains in the cultural layer [see definition of 'taphonomy' in: Efremov 1940; 1954]. In its turn, the characteristic of natural (abiotic and biotic) taphonomic agents (atmospheric, geological and soil processes, modification by other animals, acid corrosion, etc.) can become a valuable source of information about climate conditions in the ancient time when animals died. The analysis of anthropogenic factors allows to understand the way of life of ancient inhabitants [see Binford 1985; Bar-Oz, Adler 2005, 185-186; Lyman 2005, 859].

Growth of taphonomic studies in zooarchaeology caused the crystallization of two analytical frameworks – depositional and contextual taphonomy. Depositional taphonomy is concentrated on the general study of depositional and post-depositional factors that transformed the animal skeleton and defined the particular type of burial. Contextual taphonomy is connected with specific analyses of "macroscopic changes detectable on the bones surface as a result of the interaction between the remains and environmental components" [Borrini et al. 2011, 217]. The further perspective research should be focused on the development of particular methods within each of these frameworks.

Current research is dedicated to the contextual taphonomic analysis of multitudinous faunal remains from layer III of Zaskalnaya VI archaeological site. Zaskalnaya VI is the Middle Paleolithic multilayer rockshelter site in Eastern Crimea, was discovered by Yu.G. Kolosov in 1969 [see review in: Stepanchuk et al. 2008, 42]. Layers IIIa, III and II are of particular interest in the scientific community due to the presence of anthropological re-

mains. Faunal materials from them were explored by K.V. Kapelist, E.I. Danilova, O.P. Zhuravlev and V.N. Logvinenko [Stepanchuk et al. 2008, 42]. There were series of animal bone fragments with usage marks from IIIa and III layers (based on the use-wear analysis) [Sapozhnikova 2008, 52].

Methods of the research

Investigation of the faunal assemblage was made in three stages.

At the first stage, identification (specimen – element – part of skeleton and species definition) was carried out together with detailed description of each bone specimen with the indication of preservation degree, existence of taphonomic features (biotic, abiotic and anthropogenic), damage traces during excavation/storage, etc. The degree of the burned bones was specified as percentage (from small spots – 3-5% to completely charred and calcined – 100%). A considerable number of bone specimens (\approx more than 85%) was with a calcareous crust. However, complete cleaning, removal of this crust, was not made for a number of reasons. Firstly, most part of the specimens with a calcareous crust was relegated to unidentifiable fragments, and generally they were of small sizes (length from 3 to 30 mm). For the purpose of species identification, these fragments are uninformative, but on the contrary, they turn out to be very useful for restoration of the complete picture of taphonomic factors impact on the faunal assemblage. Therefore, all specimen with a calcareous crust, which presumably contained modification marks by animals or anthropogenic impact, were saved for later purification and more detailed investigation. Secondly, on some fragments of bones, the calcareous crust was quite thin, which sometimes allowed to examine damages on the bones.

At the second stage, all selected bone specimens (133) were cleaned from the calcareous crust. For this purpose acetic acid solution 9% diluted with water (1:2) was used. After the specimen processing in this solution, all of them were washed out in water alone and dried up. Then each specimen of the cleaned bone was identified, described, measured and photographed.

Measurements of not only the identified specimens of bones were carried out, but in certain cases of unidentifiable ones having damages of natural or anthropogenic character as well. Since the extent of fragmentation of the faunal assemblage is extremely high (99,4%), species classification by some series of fragments (generally fragments of long bones) initially was determined according to animal Body Size Class (BSC)¹. Such a classification has certainly got imperfections and is quite conventional. To minimize the probability of inaccurate definitions, systematic measurement of a compact layer was conducted only for the long bones and in certain cases for large fragments of unidentifiable bones. Thus, other skeleton bones with the compact layer thickness varying within larger limits were excluded from the statistics. Besides this, it is necessary to take into consideration that the thickness of the compact layer of long bones belonging to one species of animals can vary for various age groups. That is why definition of the class of animals by body size was carried out only in some cases. For example, if the thickness of the compact layer reaches 25-28 mm, it is difficult to imagine that this bone specimen could belong to a carnivore (BSC 2) or to small ungulates (BSC 3). It should also be noted that, despite the existence of definable bones of a mammoth and the teeth of a woolly rhinoceros classified as BSC 5 in this work they were united in the same group with an ancient horse (BSC 4) because sometimes it was difficult to accurately correlate small fragments of long bones either to BSC 5, or to BSC 4.

Despite all difficulties with the usage of the applied technique for the identification of animals by animal Body Size Class, it nevertheless allows to compare the extent of fragmentation and traces of damages, connected either with a concrete species of animals, or with the group of animals united by

BSC. This turns out to be especially important when examining intensively fragmented faunal materials, typical of many Paleolithic assemblages.

At the third stage, standard work on the calculation of the Number of Identified Specimens (NISP)² and the Minimum Number of Individuals of each type (MNI)³ was carried out [Grayson 1984].

Results

Totally, 5314 specimens of animal bones were analyzed, unidentifiable specimens among them constituting 3753 items, that makes 70,6%. Identified specimens of bones respectively being 1561 (29,4%). The degree of fragmentation of the faunal assemblage is rather high 99,4% which is typical precisely for sites. The color of bones purged off the calcareous crust varies from lactic-beige to reddish-yellow and sand colors.

Determination of Number of Identified Specimens (NISP) and the Minimum Number of Individuals (MNI) are major methods of the quantitative analysis of a faunal assemblage. As any method, they have a number of restrictions repeatedly mentioned in literature [Klein, Cruz-Urbe 1984, 25]. As stated above, at the initial stage of specimen definition BSC was used. However, along with doubtful fragments, accurately identified specimens together with whole elements of bones are represented in the assemblage.

While calculation of the Minimum Number of Individuals (MNI) not only the quantity of bone elements, right or left side was taken into account, but also their sizes. Based on the fact, that in the materials there are two first phalanges of an ancient horse, according to formal approach they are to be treated as remains of one animal. However, considering their sizes, they, most likely, belonged to two different individuals. Besides, the second phalanges (4 specimens) and the third phalanges (2 specimens) coincided (were found in one square as well) with the first ones and differed in the sizes. It would certainly be wrong while calculation of the minimum number of ancient horse individuals to rely solely on distinction of the sizes of the lower extremities as they could well belong to one animal, since anterior extremities of horses can be bigger because of

1. Method of animal species definition is used according to the size of an animal body – Animal Body Size Class (from 1 to 5, where class 5 - includes animals of the sizes of a mammoth, for example).

2. Standard method of calculating number of identified specimens (NISP).

3. Standard method of calculating Minimum Number of Individuals.

greater body weight distribution [see explanation in: Kuz'mina 1997, 59-60]. However, discovery of two fragments of the left femur and two fragments of the right mandible with premolars allow to assume the presence of, at least, two individuals of an ancient horse (*Equus latipes* † V.Gromova, 1949).

Determination of the minimum number of mammoth individuals was much more complicated (*Mammuthus primigenius* † Blumenbach, 1799). Despite the fact that 156 fragments of teeth and enamel plates were discovered, only a few mammoth bones were determined as identified. Therefore, it is reasonable to assume the existence of at least one adult individual of a mammoth. Finding fragments of woolly rhinoceros teeth (5) should especially be noted (*Coelodonta antiquitatis* † Blumenbach, 1799).

A rather insignificant number of identified bones – 180 was related to BSC 3. On the other hand, it was estimated that they belong to, at least, three individuals of two families: one – to the Bovidae family (considering the found teeth it is a saiga – *Saiga tatarica* L., 1766), and two individuals – to the Cervidae family.

Presumably, 8 specimens of BSC 2 were revealed, definable being only 4. They possibly belonged to one individual from carnivores group (*Carnivora* Bowdich, 1821). Besides, a bone fragment of a rodent (probably) was found⁴.

Thus, the minimum number of individuals according to the results of analysing the identified bone specimens is 9, 4 of them (1 woolly rhinoceros, 1 mammoth, 2 ancient horses) refer to BSC 5-4, 3 of them (saiga and two individuals from cervine family) refer to BSC3, 1 (carnivore) – to BSC2 and 1- (perhaps, a rodent). Moreover, BSC 4 animals are better presented, either by fragments of elements, or by whole elements of skeleton bones, BSC 3 animals only by fragments of bones of anterior and posterior extremities, ribs, cranial bones and teeth, and animal remains of BSC 2 and 1 are the most fragmentary.

Taphonomic observations

All specimens (both identified and unidentified) were thoroughly studied as to presence of various marks of damage of both natural (biotic and abiotic) and anthropogenic character.

1. Preservation degree and effect of atmospheric factors

Interesting regularities are traced concerning bones preservation. On the one hand, thanks to their bedding in the cave deposits composed by products of nummulite limestones disruption as well as to the calcareous crust formed on bones, which turned out to be a peculiar 'preservative' for the bones, many available specimens are well preserved and are rather solid. On the other hand, there are also poorly preserved bones: friable, porous, crumbly the compact layer of which stratified. Among such bones are ribs, flat bones, some skull bones. In general, such situation with the bone material safety is quite typical of cultural layers of other Zaskalnaya sites.

However, in the process of analyzing bones preservation according to each BSC separately, particular distinctions can be determined. Thus, the bones classified as BSC 2 and 3, except for ribs and fragments of a skull from BSC 3, in general appeared to be well preserved, though not all examined specimens were with a calcareous crust. At the same time the bones preservation from BSC 4 is not homogeneous. It transpired, for example, that the bones of a mammoth (a calcaneus, a mandible fragment, a fragment of a neural arch of the first cervical vertebra, etc.) have inferior preservation, than bones fragments of an ancient horse despite the fact that all these fragments were covered by a calcareous crust with different intensity. It is quite possible that the mammoth bones were exposed to intensive impact of atmospheric processes for longer period of time, than the bones of the ancient horse. Among other things, it means that the moments of death of these animals are definitely separated from each other by a considerable time interval.

Signs of longer exposure of the mammoth bones, in comparison to the bones of the horse, can testify to different degree of their 'freshness' at the time of their getting into the layer. In other words, intended transportation to the site as non-hunting or collecting trophy, but exactly as bones cannot be excluded.

Another possible explanation for this can be various speed of sediment accumulation on different points at the rockshelter. The difference is in the spatial distribution of faunal remains on the site (at the entrance to the rock-shelter or in

4. Further detailed analysis of both specimens of the rodent and the carnivore must be carried out.

depth). For example, one of the parts of BSC4 rib fragment (75x36x15 mm) consisting of two scraps appeared to be rather solid, while another one was cracked and friable. Exposed to atmospheric processes, the bone eroded and cracked. The compact layer of the damaged/softened bone was thus subsequently easily altered by roots or bugs.

Thus, preservation of faunal assemblage in general and within each class, in particular BSC 4, varied. Impact of atmospheric factors, such as eolian processes and atmospheric precipitation is a probable cause of poor preservation of part of BSC 4 bones (generally, mammoth bones). Besides, it was established that BSC 4 bones, cleared from the calcareous crust, were also slightly cracked, with the stratified compact layer, which might demonstrate relatively long exposure to the influence of the same atmospheric factors.

2. Geological and soil processes

A calcareous crust, which unevenly covered faunal remains, is the most apparent result of geological processes impact.

It is necessary to notice that bones without a calcareous crust were unevenly covered with black spots of various degree of saturation (from several grayish to densely covered black). On some specimens, these spots deeply ingrained into the compact layer. After separate selection of bones with estimated traces of damages was cleaned from a calcareous crust, the same blackish spots were also found on them. The exception, perhaps, are the mammoth bones, on which they were not traced legibly. The outlines of these spots were different; sometimes the center of the spot was blacker in comparison with its edges.

One of possible explanation of the origin of these black-colored spots is chemical influence of soil components (mineral impregnation or could be manganese impregnation). Another hypothetical explanation would be some micromycetes fungi activity, which often settle in caves, grottoes and other rockshelters. It is known that optimal conditions are necessary for fungi development and growth: organic material availability [Khizhniak 2009, 29], humidity and rather warm season (April – October) [Antropova et al. 2002, 42]. However, the last factor is not determining for the growth of some types of micromycetes. Some types of fungi (for example, from the sort of *Cladosporium*) can actively breed at rather low temperatures (5°C and

12°C) [Ivanushkina et al. 2002, 56]. Surely, only further research of these black-colored spots can provide convincing answer to this question.

3. Effects of heat and fire

In the faunal assemblage 2,258 burned specimens were revealed (approximately 42,5%). A priori it can be assumed that the bones could burn as a result of natural factors (the natural fire), but also as a result of anthropogenic factors (use of bones as fuel). The surfaces of fragments are burned in a degree varying from 5 to 100%. Major part of the burned bones are unidentifiable (2,109 which makes 56,2%). Identification became frequently impossible because the investigated specimens had been in fire, which facilitated their further disintegration.

Nevertheless, due to the presence of quite representative series of the identifiable fragments, for each BSC the ratio of the burned and unburned bone fragments was established. Thus, for BSC 4 the number of the burned bones reaches 9,2%, for BSC 3-2,8%. Unluckily, for BSC 2 the burned bones were not found. The different share representation of the burned bones in BSC 4 and BSC 3 groups and their total absence in BSC 2 have little coordination with the version of natural fire. On the contrary, the dominance of big mammal skeleton fragments among the burned bones can explain natural preference given to larger bones being used as fuel. It seems curious that along with the long bones as fuel, possibly also other bones of BSC 4 were used. Therefore, burned fragments of teeth and teeth enamel (a molar tooth of an ancient horse and 7 fragments of mammoth teeth) were found. It should also be noted that vertebrae of animals were scarcely found as compared to quite large number of rib fragments (especially BSC 4). It cannot be excluded that these bones were used as fuel, as well as fragments of skulls together with teeth. Such practice was merely widespread in the Upper Paleolithic period: A.A. Chubur reports on usage of vertebrae, ribs and distal parts of mammoths' extremities as fuel on the Upper Paleolithic site in Hotylevo 2 [Chubur 2002].

In general, it seems most probable that the great bulk of burned bones, most likely, were used as fuel. At the same time, probability of impact of natural factors (casual short-term fires) should not be completely excluded.

4. Roots traces/Vegetation

Various traces from roots and activity of living organisms (probably insects) on bones were classi-

fied as soil processes. Marks from roots on bones can conditionally be divided into two groups: 'prints' of roots and small pits ($\approx 2-4$ mm in diameter) on the bones damaged by roots (fig. 1). Outlines of such pits and in some cases holes, were quite distinct and exact, which could make an inexperienced observer doubt the natural character of these holes (fig. 1). However, findings of dried roots fragments in some holes on the bones validate the natural origin of these damages.



Fig. 1. Specimens with traces from plant roots: A – the root cut through a compact layer of the long bone fragment; B – caudal vertebra with two holes from plant roots.

Specific marks were fixed on the several BSC 4 specimens. These marks could be explained as traces from roots, but also, most likely, from the activity of skin-beetles (*Dermestidae* Latreille, 1807). For any other saprofags holes and sinuous cavities are typical (fig. 2) [compare pictures in article: Britt et al. 2008]. It is certainly necessary to conduct comparative analysis with other faunal assemblages with similar damages on bones to exclude doubts of their origin. In any archaeological research data on the ecology of these insects are very useful for reconstructing climatic conditions during animals' death on the site. According to research carried out by entomologists [Zhantiev 1976, 26] representatives of this family are classified as xerophiles, i.e. adapted for life in arid regions. Required minimal temperature for development of skin-beetles ranges between 10 to 20°C [Zhantiev 1976, 27]. It is interesting that representatives of necrobiotic skin-beetles occur in a steppe zone with arid and windy climate more



Fig 2. Fragment of a long bone with traces from activity of skin-beetles(?) or plant roots(?) and 'breakage mark'.

often, than in wet, almost windless forest regions [Zhantiev 1976, 29].

It is quite difficult to calculate the precise quantity of bone specimens with traces of roots and damages caused by skin-beetles as only 133 specimens were actually cleaned from a calcareous crust on them with traces of roots among them being 26 ($\approx 19,5\%$), with damages caused by skin-beetles – 13 ($\approx 9,8\%$ (?)).

5. Modifications by animals

Modification marks by animals are divided into two groups – damages as a result of activity of rodents and carnivores. Given that a calcareous crust was removed only from 133 specimens, it is quite possible to assume that the total amount of specimens with modification marks by animals for all faunal assemblage will be higher.

Quite remarkable is that the areas of modification by rodents sometimes differ in color. Generally ($\approx 92\%$) of bite traces on bones are the same color as the bone, but on some of them (8%) – the area of bites is lighter. Apparently these damages appeared on bones later. It should also be noted that the greatest number of bones with traces of bites ($\approx 84\%$) belong to BSC 4 animals (see Table 1). Also specimens with minor damages (caused by small rodents) and larger damages are found.

Marks from canines, specific traces of smoothness and marks from acid corrosion are classified as modification marks caused by carnivores. Based on the sizes of traces from bites through (canines) on some bones, they could well belong to small and average sized carnivores. Distribution of bone fragments with signs of modification by carnivores for each BSC is as follows (see Table 1): BSC 4 ($\approx 46,7\%$), BSC 3 ($\approx 37,8\%$), BSC 2 (only one strongly smoothened/polished bone exemplar found \approx

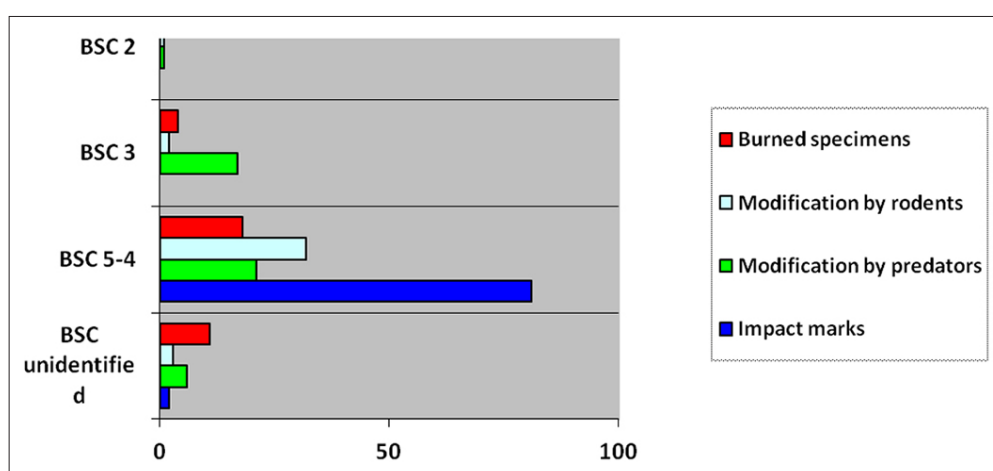


Table 1. Correlation of Taphonomic Agents on the long bones for each animal BSC (low scale – number of specimens).

2,2%), BSC is not identified (13,3%). However, if on specimens of BSC 4 these marks sometimes look doubtful, on BSC 3 long bones these traces are more distinct.

The third traceable kind of modification by carnivores is presented by bone fragments with signs of acid corrosion [see Enloe et al. 2000, 316-319; Derevianko et al. 2003] formed on bones as a result of destructive influence of carnivore gastric juice, when meat was swallowed together with bone fragments. Marks of acid corrosion were successfully found only on the specimens with previously removed calcareous crust, which makes ($\approx 0,8\%$ of total bones specimens or 24,8% selected). The extent of acid corrosion was various – from small spots before complete deformation of a bone specimen with completely destroyed spongy substance (fig. 3). 5 out of 41 bone specimens with marks of acid corrosion were heavily deformed (fig. 4). Basically these were fragments of long bones. The maximal length of such fragments did not exceed 83 mm, and width reaching 41 mm.



Fig. 3. Fragment of long bone with traces from acid corrosion and from usage as a *retoucher*.

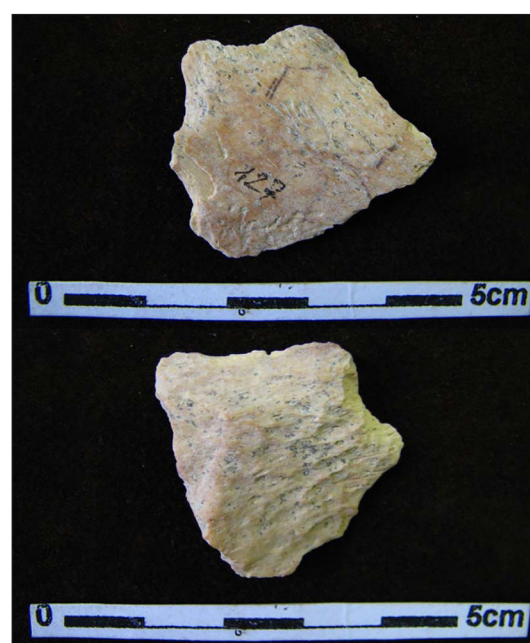


Fig. 4. Specimen with modification marks by carnivores: marks from canines and acid corrosion (as shown in the photo, the spongy bone was completely deformed).

At the same time separate spots of acid corrosion were found on some fragments of long bones with their length considerably exceeding 100 mm. For example, a fragment (151x38x15 mm) was found with spots of acid corrosion. However, it is difficult to imagine that even a big cave hyena could have possibly swallowed a bone 15 cm long (!). A question arises: why on some specimens only separate spots are found if these bones were completely subject to effect of gastric juice of a carnivore. Most likely some other natural factors influenced the de-

formation of the bones surfaces. Perhaps, such spots could have formed as a result of biogenic corrosion as a result of activity of fungi micromycetes some types of which can emit acid [Kuz'mina, Cherviatsova 2007]. It is only an assumption. However, if as a result of further research of this faunal assemblage, it will be confirmed, only 5 specimens, cleaned from a calcareous crust, can be explained as influenced by carnivores gastric juice.

6. Anthropogenic factors

Anthropogenic factors mean the activity of a human both ancient and modern as a result of which bones were damaged. Recent damages on bones appeared during excavation ($\approx 5\%$).

Damages on bones incurred in the result of the activity of ancient inhabitants on the site are of the greatest interest. As a result of studying the faunal assemblage from Zaskalnaya VI site (layer III) there were found specimens with splitting marks (for the purpose of getting marrow), and usage as bone retouchers.

In the first case - marrow was taken from a 'green' bone of a recently killed animal, therefore, on such bones typical impact marks with a conchoidal and spiral break [Ono 2006, 38-39] are found (fig. 5). In the second case - the bone could not necessarily be 'green', but definitely strong.

Totally, 120 specimens ($\approx 2,3\%$) with splitting marks were found. These are bones with either visible places of striking blows, or 'negatives' of the previous chips, or so-called, bone 'flakes'⁵ (fig. 6).

Herewith 25 out of 29 specimens showed both splitting marks and traces of subsequent use as bone retouchers. Basically marks from usage as a retoucher (MUR) were located on one end of the specimen, but on two of the 29 these traces were located on both ends. Major part of bone specimens with MUR presumably belonged to BSC 5-4 animals, most likely, to an ancient horse, judging by the preservation degree, color and width of the compact layer of long bones (not exceeding 16 mm) on which fragments of these marks were discovered. On bones with more potent compact layer (exceeding 19 mm) marks from usage as a retoucher (MUR) were not revealed and splitting marks often looked doubtful. However, 6 specimens were revealed (two of them being rib fragments) with splitting marks and MUR



Fig. 5. Specimen of long bone with impact mark and marks from usage as a retoucher.



Fig. 6. Bone 'flakes'.

which belonged to a bigger animal (a mammoth or a woolly rhinoceros).

On 9 out of 29 bones specimens with marks of usage as retouchers groups of scrapes ('scratches') were found (fig. 7) which, perhaps, could form as a result of intended scraping of a 'green' bone at the stage of the bone-retoucher preparation. In most cases such 'scratches' did not cover the whole surface of a bone. Furthermore, on two fragments of ribs, three fragments of long bones, two fragments of cranial bones and one fragment of an unidentifiable specimen the same 'scratches' were found.



Fig. 7. Specimen with usage marks as a bone retoucher and with marks of 'scratches'.

5. In this case a bone 'flake' is a small fragment of bone broken as a result of striking a strong blow on it (more often on long bone).

A separate group of specimens with specific marks should be distinguished among them being a rib fragment with two cut-marks (fig. 8,A), a bone fragment with splitting marks (fig. 8,C), a bone fragment with the end pointed (fig. 8,B), a fragment of the Mammoth long bone (polisher?) (fig. 9) and a specimen with the smoothed traces from removal (breaks?) of spongy bone (fig. 8,D).

Thus, it can be assumed that on Zaskalnaya VI site (layer III) utilization of bone material took place in two stages. At the first stage, the inhabitants of the site extracted marrow from bones of killed animals, simultaneously mainly splitting long bones of BSC 5-4 animals. Then, the formed fragments of bones were used as fuel and raw materials for manufacturing tools. Since detailed study of bone splitting technology on Zaskalnaya VI site was not actually conducted, let's confine only to these preliminary remarks.

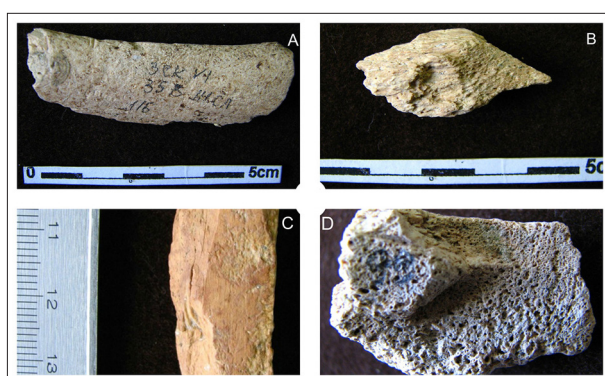


Fig. 8. Specimens with specific marks: A – fragment of rib with two cut-marks(?); B – bone fragment with a pointed end; C – bone fragments with impact marks; D – specimen with the smoothed traces from removal (breaks?) of spongy bone.



Fig. 9. Polisher(?) from Mammoth long bone.

Discussion and interpretation of results

Rockshelters and caves were hideaways not only for ancient inhabitants, but also for various animals. For this reason, the cultural layer from such archaeological sites represents a composite interlacing of various episodes of saturated 'life' in the ancient time. Therefore, identification of faunal remains, which could be bound to the activity of the ancient inhabitants of the site, is the first step in studying their way of life.

The current faunal complex was formed mainly as a result of human activity. At the same time, influence of small and average size carnivores in forming the faunal assemblage cannot be excluded. In general, based on results of the taphonomic research Zaskalnaya VI site (layer III), a hypothetical taphonomic history of the faunal assemblage can be represented as follows.

One of the episodes of the site occupation is likely to be associated with mammoth bones remains, considering their rather inferior preservation. It is difficult to establish whether the parts of the skeleton (or separate bones) were brought to the site from the place of the animal's natural death or from a place of successful hunting. Despite finding several fragments of bones with splitting marks and their use as bone retouchers, the majority of estimated marks from splitting the mammoth bones look unconvincing.

Another episode of human activity on the site is associated with the discovery of an ancient horse bones. With them, traces of splitting 'green' bones for the purpose of extracting marrow are generally associated. Taking into account, that bones of anterior and posterior extremities, ribs (including a rib with two cut-marks), skull fragments (teeth of the upper jaw and fragments with mandible teeth), etc. were found, it is possible to assume that inhabitants of the site had access to all parts of the animal skeleton. However, based on modification marks on bones, carnivores became 'competitors' on the site of the inhabitants at some point.

Discovery of a big series of bone retouchers (29), undoubtedly indicates that ancient inhabitants knew well the properties of bones and used them for manufacturing tools, as fuel and, perhaps, when processing skins of animals (finding of polisher(?)). Possibly, any big fragments of solid bones (generally long bones) of BSC 5-4 animals,

which were at hand, could be used as bone material for retouchers (and polishers?). These are fragments of bones of both ancient horse, and mammoth (or woolly rhinoceros).

Legible traces of anthropogenic impact on BSC 3 bones (remains of saiga and two animals from cervine family) could not be found. However, some of them contained modification marks by carnivores. Thus, events, related to accumulation of BSC 3 animal bones could occur both with the assistance of ancient inhabitants, and without them (as result of carnivores hunting).

The preliminary results of contextual taphonomic analysis allowed making some indirect assumptions regarding environmental conditions in the ancient period. Nevertheless, the persuasive-

ness of these observations can be confirmed only by further study of the nature of the influence of taphonomic factors (soil, microorganisms in ancient times).

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