8

Archeozoological Analysis of Large Mammal Fauna from Buran-Kaya III Layer B

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The sample of faunal material from Buran-Kaya III Layer B used in this study was drawn from the 1996 excavations and comprised 16,680 pieces. Of these, 16,671 bones are attributable to herbivores, or 99.9% of the total number of identifiable remains (Table 8-1). Since the excavated area of this particular sample was about 31 m^2, the average density per square meter was 539 bones. Of the total sample, 15,328 bones could not be identified, but their dimensions and thickness of the cortex allowed a cautious attribution to a species (Table 8-2).

The identifiable faunal remains are from at least 32 individuals: 29 herbivores (6 species) and three carnivores (3 species). The identified species are: *Equus*

TABLE 8-1
Large mammal fauna of Buran-Kaya III Layer B

	NR	*MNE*	*MNIf*	*MNIc*	*Age*
Equus hydruntinus	3	3	1	1	old
Bison cf priscus	18	>7	1	1	adult *sensu lato*
Coelodonta antiquitatis	4	3	1	1	young
Mammuthus primigenius	38	>7	1	1	very young
Mammuthus/Coelodonta	2	–	–	–	
Cervus elaphus	19	14	1	1	old male
Saiga tatarica	1,259	>747	19	24	
Artiodactyla†	15,328	–	–	–	
Total herbivores	16,671	>>781	24	29	
Canis lupus	1	1	1	1	young adult
Vulpes corsac/Alopex lagopus	4	4	1	1	old
Mustelidae (small)	2	2	1	1	adult *sensu lato*
Vulpes /Alopex /Mustelidae	2	2	–	–	
Total carnivores	9	9	3	3	
Total (NRT)	16,680	>>790	27	32	

†See table 8-2.

NR - number of remains, MNE - minimum number of skeletal elements, MNIf - minimum number of individual animals by frequency, MNIc - minimum number of individual animals by combination.

hydruntinus, *Bison* cf. *priscus*, *Coelodonta antiquitatis*, *Mammuthus primigenius*, *Cervus elaphus*, *Saiga tatarica*, *Canis lupus*, *Vulpes corsac/Alopex lagopus*, and a small Mustelidae. Some rodent and bird bones (including one large bird) were also discovered (Chapters 3 and 6 of this volume).

Saiga antelope is the dominant species among the herbivores, accounting for 93.7% of the total number of remains (NR) in the Layer B sample, 95.6% of the minimum number of elements (MNE), and 82.7% of the minimum number of individuals by combination (MNIc) (Table 8-1 and Figure 8-1). Among the carnivores, the remains of fox are the most abundant, accounting for 44.4% of the NR, 44.4% of the MNE, and 33.3% of the MNIc (Table 8-1 and Figure 8-2).

TABLE 8-2
Buran-Kaya III Layer B: anatomically indeterminate bones sorted by size

Artiodactyla	*Number of remains (NR)*
Size *Bison*	38
Size *Equus hydruntinus/Cervus*	310
Size *Cervus*	111
Size *Saiga*	14,869
Total	15,328

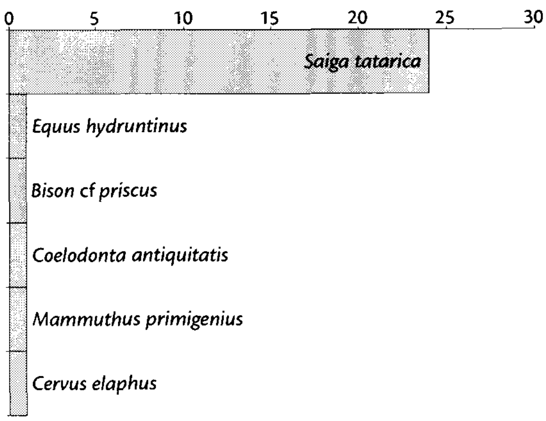

Figure 8-1—Herbivore species in minimum number of individuals by combination (MNIc).

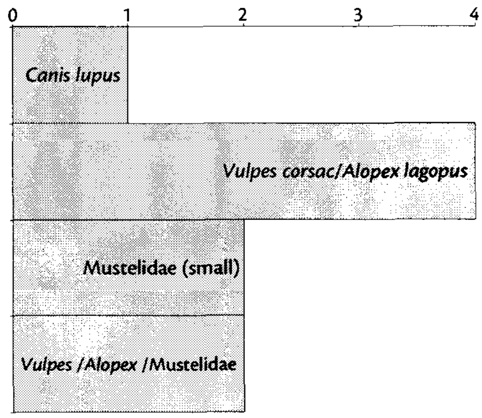

Figure 8-2—Carnivore species, number of remains (NR).

Paleoecology

Most of the herbivore species identified in Buran-Kaya III Layer B are well adapted to an open environment and dry climate (Table 8-1). Only *Cervus elaphus* and *Equus hydruntinus* provide a hint of a more temperate climate and a more wooded environment.

Saiga tatarica, or saiga antelope, is strongly affected by its biotope, which has resulted in its having several physical particularities. For example, its nostrils have voluminous cavities lined with a mucous membrane that warms incoming cold air during the winter and filters airborne dust during the summer. Its hooves are small and pointed, and are unsuited to snow-covered ground; the animal does not take well to permafrost.

Saiga antelope inhabit plains and avoid areas with uneven terrain. They are unaffected by altitude—they can live at sea level (the coast of the Caspian Sea) as well as up to 1,600 meters. Their predilection is towards arid steppe and semi-desertic environments and their geographical movements are determined by the available vegetation. Saiga populations undertake two major seasonal migrations for grazing grounds and sometimes smaller migrations if water holes or vegetation become rare. They consume more than one hundred different plants. During the spring, grasses and ephemerals are the mainstay of their diet, while during the summer, grasses and *Chenopodiaceae* are eaten. Water is essential in their choice of territory.

The landscape near the site of Buran-Kaya III likely corresponded then to a semi-arid steppe with a few wooded areas near streams or rivers. The climate would have been harsh, especially in the winter months, and, above all, dry.

Origin and History of the Bone Assemblage Attributed to Saiga Antelope

To understand the origin and the history of the bone assemblage of Buran-Kaya III Layer B, we have closely analyzed the bones attributable to saiga antelope, which is the dominant species in the assemblage. This analysis includes the preservation, fragmentation, and dispersal of the material, as well as extrinsic marks observed on individual bones.

Bone Preservation of Saiga Antelope

In this report, the basic indices of skeletal element and species abundance are used, including MAU (minimum animal units), which is the minimum number of elements (MNE) divided by the number of times the relevant skeletal element occurs in one animal (specific coefficient of each considered element for a given species: spQ); modified MAU (MAU ÷ the largest MAU); and in percentages of survival, which is calculated by the equation ((MNE × 100) ÷ (spQ × MNIc)). These survival rates of bones are reported in three ways: globally, for adults, and for juveniles. The counts for skeletal elements of saiga antelope are presented in Table 8-3.

Overall Preservation of Saiga Antelope

According to the indices derived from MNE ÷ MNIc and from the number of teeth ÷ number of bones × 100, which are 31.1% and 30.5% respectively, a dearth of saiga bones in Layer B seems apparent. Given, however, the high number of indeterminate remains (NRindet), which make up 92% of the assemblage (Figure 8-3) and which are mostly long bone fragments, this bone scarcity is not as severe as it initially appears. As a whole, the bone material is relatively well preserved.

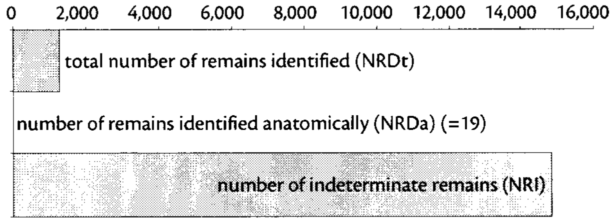

Figure 8-3—Buran-Kaya III Layer B: total number of *Saiga tatarica* remains.

Relative Preservation of Major Saiga Skeletal Units

The cranial parts of saiga antelope are well represented in the bone assemblage (Figure 8-4). As seen in Figure 8-5, other than the axial skeleton, all units are well preserved, especially the upper portion of the rear limbs and the cephalic skeleton.

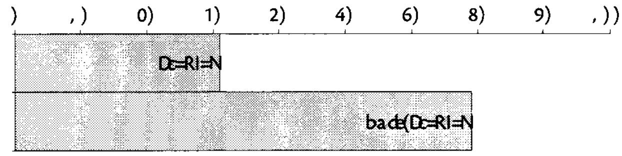

Figure 8-4—Relative percentages of cranial and post-cranial remains of *Saiga tatarica*.

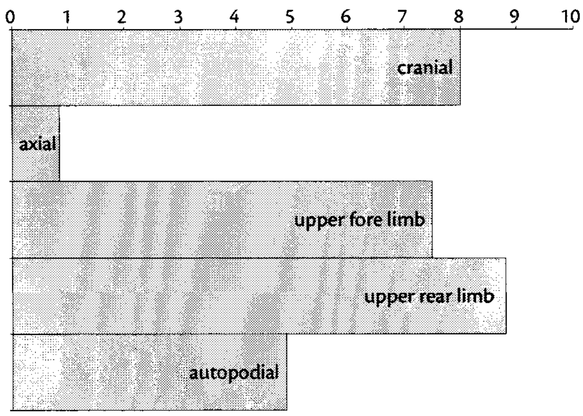

Figure 8-5—Preservation of major skeletal units in minimum animal units (MAU) of *Saiga tatarica*.

Relative Preservation of Saiga Anatomical Elements

CEPHALIC SKELETON

Taking into account the fragility of certain elements (skull bones, maxillae, hyoid bones), the cranial material is, overall, rather homogenous (each type of element yields the same number of individuals). The preservation of isolated teeth and of mandibles is good (Table 8-3). The most well preserved part of the mandible is the condyle. The labials are the best represented of the teeth (their MAU = 8; cheek teeth MAU = 4.9). The premolars, especially the lower ones, are decidedly more rare than the molars, probably because the premolars loosen before the molars do. For the same reason, the lower cheek teeth (MAU = 4.9) are more abundant than the upper ones (MAU = 3.4). This is also confirmed by the notable scarcity of maxillas (MAU = 1). Hyoid bones are present and further testify to the very good preservation of the *Saiga tatarica* cranial bone material.

TABLE 8-3
Buran-Kaya III Layer B: quantification of *Saiga tatarica* remains (MAU)

Element	*NR*	*MNE*	*MAU*	*MNIf*	*MNIc*	*Young*	*Adult*
Cranial bones	29	3	1.5	3	3	–	3
Maxilla	2	2	1.0	1	1	–	1
Upper teeth	41	41	3.4	10	17	3	14
Mandible	51	14	7.0	7	8	3	5
Lower teeth	150	123	8.0	14	16	1	15
Teeth indeterminate	111	–	–	–	–	–	–
Hyoid bone	4	3	–	1	1	–	1
Total cranial	388	>186	8.0	17	21	6	15
Pelvis	23	15	7.5	8	10	2	8
Vertebra	25	13	0.5	3	4	1	3
Rib	81	26	1.0	1	2	1	1
Costal cartilage	7	5	–	1	1	–	1
Sternum	1	1	0.16	1	1	–	1
Sacrum	1	1	0.2	1	1	1	–
Total axial	138	61	0.86	8	10	2	8
Scapula	16	8	4.0	5	6	–	6
Humerus	43	20	10.0	10	15	3	12
Radius	60	20	10.0	10	11	3	8
Ulna	43	12	6.0	7	8	4	4
Total upper fore limb	162	60	7.5	10	16	4	12
Femur	31	13	6.5	7	8	3	5
Tibia	46	26	13.0	13	15	4	11
Patella	20	20	10.0	10	10	3	7
Malleolus	12	12	6.0	9	9	–	9
Total upper hind limb	109	71	8.8	13	15	4	11
Carpal	85	85	7.0	10	12	4	8
Metacarpal	37	17	8.5	9	10	3	7
Tarsals	104	101	10.1	19	22	4	18
Metatarsal	49	20	10.0	10	11	2	9
Metapodial indeterminate	28	8	–	2	2	–	2
1st phalanx	85	65	8.1	9	9	1	8
2nd phalanx	42	42	5.2	6	6	2	4
3rd phalanx	31	30	3.7	4	4	2	2
Phalanx indeterminate	1	1	–	–	–	–	–
Large sesamoid	12	12	0.75	1	2	1	1
Small sesamoid	3	3	0.37	1	1	–	1
Total autopodium	462	369	4.9	19	22	4	18
Grand total	1,259	>747	5.02	19	24	6	18

NR - number of remains, MNE - minimum number of skeletal elements, MAU - minimum animal units, MNIf - minimum number of individual animals by frequency, MNIc - minimum number of individual animals by combination.

AXIAL SKELETON

All of the elements that make up the axial skeleton are present, even the very fragile bones such as the sternum and costal cartilage. The innominate bone is by far the most well preserved element, the other axial elements being very rare (Table 8-3 and Figure 8-6). For the innominate, the percentage of survival estimate (Table 8-4) is average, except for the juvenile innominates where it is poor (i.e., there is a lack of immature innominates).

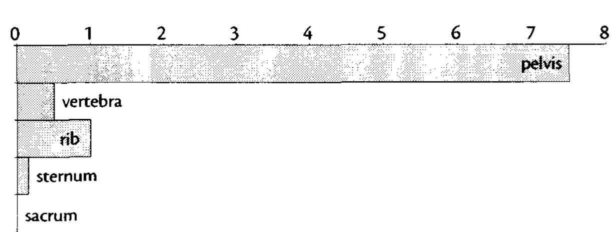

Figure 8-6—Preservation of axial skeletal elements (in MAU) of *Saiga tatarica*.

UPPER FORESKELETON

Saiga humeri and radii are well preserved, while scapulae, which are more fragile, are rarer (Table 8-3 and Figure 8-7). The percentages of survival for the upper foreskeleton elements (Table 8-4) shows that other than the scapulae, where the percentages are low (and null for juvenile bones), and the adult ulnae, the preservation rates are average.

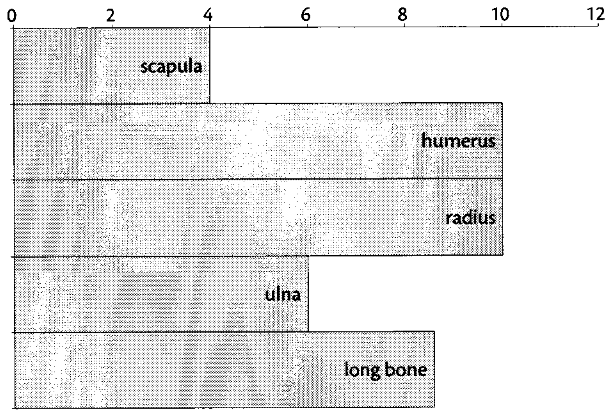

Figure 8-7—Preservation of upper fore limb elements (in MAU) of *Saiga tatarica*.

UPPER HINDSKELETON

The tibia is the most well represented element of the upper hindskeleton, while there is a relative lack of femora and malleolae (Table 8-3 and Figure 8-8). The percentages of survival indicate a good preservation for tibiae (global and adult) and of juvenile patellae, but an average survival rate for all other upper hind elements—except those for juvenile malleolae, which are null (Table 8-4).

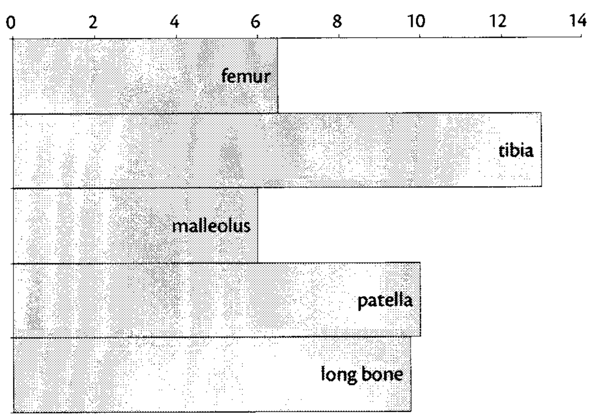

Figure 8-8—Preservation of upper hind limb elements (in MAU) of *Saiga tatarica*.

TABLE 8-4

Saiga tatarica: percentages of survival of post-cranial bones

Element	*Global*	*Adult*	*Young*
Scapula	16	22	–
Humerus	41	47	41
Radius	41	47	41
Ulna	25	19	25
Pelvis	29	38	8
Femur	27	27	25
Tibia	55	58	41
Patella	29	38	50
Malleolus	25	25	–
Carpal	29	29	30
Metacarpal	35	36	8
Tarsal	41	42	41
Metatarsal	42	50	5
Phalanx	23.9	28.7	9.7
Sesamoid	2.6	3.4	–

METAPODIA

The metatarsal bones are better preserved than are the metacarpals (Table 8-3 and Figure 8-9). The percentage of survival calculations show a good survival rate for adult metatarsals, an average survival rate for the metatarsals globally and for the metacarpals globally and for adults, but a poor survival rate for the juvenile bones of both of these (Table 8-4).

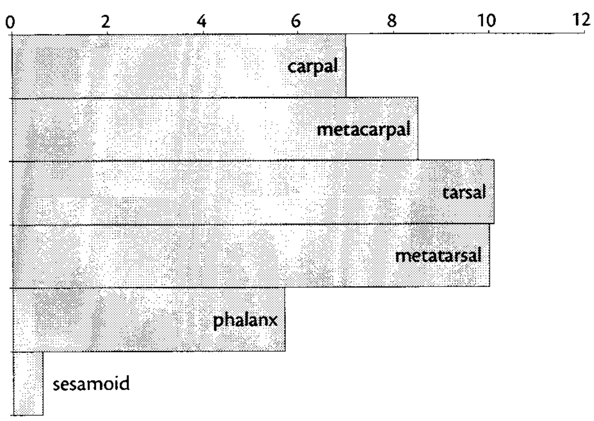

Figure 8-9—Preservation of autopodial elements (in MAU) of *Saiga tatarica*.

CARPAL AND TARSAL BONES

The carpal bones of *Saiga tatarica* are relatively well preserved (Table 8-3 and Figure 8-9). The capitate bone (belonging to the upper row of the carpal bones) is the best preserved of the carpals, and the lunate bone is the most poorly preserved (Table 8-5 and Figure 8-10). The bones in the lower carpal row are better preserved than those of the upper row (MAU

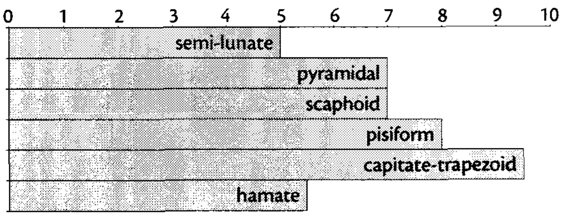

Figure 8-10—Preservation of carpal elements (in MAU) of *Saiga tatarica.*

TABLE 8-5
Quantification of *Saiga tatarica* carpal remains

Carpals	*NR*	*MNE*	*MAU*	*MNIf*	*MNIc*
Semi-lunate	10	10	5.0	7	8
Pyramidal	14	14	7.0	9	9
Scaphoid	14	14	7.0	8	8
Pisiform	16	16	8.0	8	8
Capitate-trapezoid	19	19	9.5	10	11
Hamate	11	11	5.5	6	6
Indeterminate	1	1	–	–	–
Total	85	85	7.0	10	12

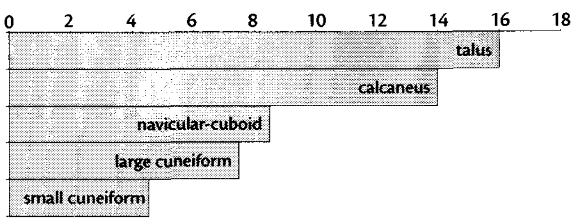

Figure 8-11—Preservation of tarsal elements (in MAU) of *Saiga tatarica.*

TABLE 8-6
Quantification of *Saiga tatarica* tarsal remains

Tarsals	*NR*	*MNE*	*MAU*	*MNIf*	*MNIc*
Talus	32	32	16.0	19	22
Calcaneus	31	28	14.0	14	16
Navicular-cuboid	17	17	8.5	12	14
Large cuneiform	15	15	7.5	8	8
Small cuneiform	9	9	4.5	5	5
Total	104	101	10.1	19	22

= 7.5 and 6.75, respectively), which is also the case for the carpal bones in the medial position with respect to those in the lateral position (MAU = 8.25 and 6.25, respectively). Overall, the survival rate for carpals is average (Table 8-4).

The tarsal bones are very well preserved (Table 8-3 and Figure 8-9), especially the astragalus and the calcaneum (Table 8-6 and Figure 8-11). The small cuneiform bone is present in the assemblage. The upper row of tarsal bones is better preserved than the lower row (MAU = 15 and 6.83, respectively), as are the lateral tarsal bones in comparison to the medial bones (MAU = 11.25 and 9.33, respectively). Globally, the survival rate for tarsals is middling.

SESAMOIDS AND PHALANGES

The preservation of saiga antelope sesamoids is poor (Table 8-3 and Figure 8-9). These are bones that are small in size and quickly lost when the hooves are disarticulated, especially the small sesamoids. Their survival rate is poor, and null for young saiga (Table 8-4).

Phalanges show a fairly good preservation (Table 8-3 and Figure 8-9). The proximal phalanx is the best represented, while the distal phalanx, which is intrinsically the most fragile, is rarer (Table 8-3 and Figure 8-9). The survival percentages show that globally the survival is poor for phalanges, except for adult phalanges (Table 8-4). The survival rate of the proximal phalanges is moderate, except for the juvenile saiga, where it is poor. The survival rate for the second phalanx is poor, except for the adults, where it is average. The survival rate for the distal phalanx is poor.

RELATIVE PRESERVATION OF THE POST-CEPHALIC SKELETON

The post-cranial skeletal elements of saiga antelope are fairly well preserved; taking into account the number of unidentifiable splinters, they amount to 33% of the bone assemblage in MNE and 5.76 in MAU. Long bones are well preserved, their MNE = 25.6% and MAU = 9.71. The analysis of the relative preservation of long bones shows a different preservation than that which is normally expected given the inherent properties of these bones (Figure 8-12). This is evidence of the human role in the preservation state of these bones. The bones of the pelvic and pectoral girdles (scapulae and innominates) represent 4.3% in MNE and 5.75 in MAU (Figure 8-12). The short bones represent 70% of the total post-cranial skeleton; their MAU = 5.01 (Figure 8-12).

The survival of these elements is, at the most, one-half of the total number of estimated individuals, and, at the least, one-quarter (with the exception of a few elements, Table 8-4 and Figure 8-13).

All of this evidence indicates that, for a bone assemblage deposited in a rockshelter, it is very well preserved.

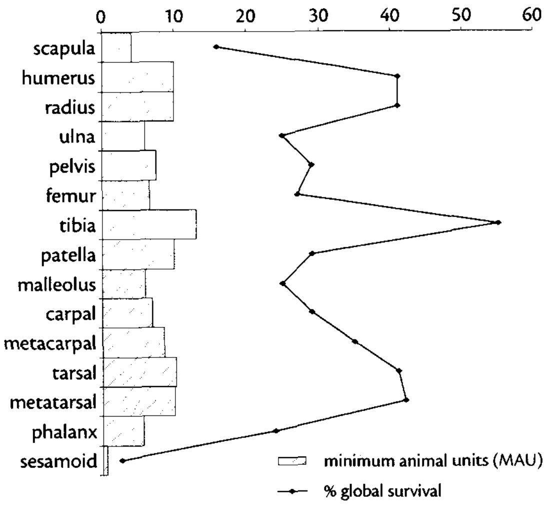

Figure 8-12—Comparison between the minimum animal units (MAU) and the global survival percentage of skeletal elements of *Saiga tatarica.*

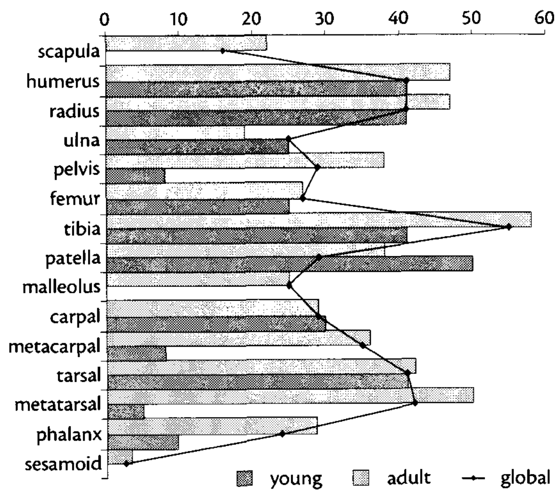

Figure 8-13—Comparison of the global, adult, and young survival percentages for various skeletal elements of *Saiga tatarica.*

Relative Preservation of the Different Units of the Post-Cephalic Saiga Skeleton

The glenoid on the scapula and the acetabulum on the innominate are the best preserved parts of these two elements (100%); they are also the most robust and most easily identifiable parts in any bone assemblage. Long bones are, overall, relatively well preserved (in MAU), with the exception of the distal extremity of the ulna (small and fragile), and the proximal extremities of the femur and tibia (Figure 8-14). This preservation, which is different from that expected given the inherent properties of these bones, is evidence of human action. For the upper part of the foreskeleton, the proximal extremities are more abundant than the distal extremities, and for the upper portion of the hindskeleton, the inverse is the case. For the other parts of the long bones (proximal, medial, and distal diaphyses), there is a global deficit (in MNE). These are, for the most part, among the unidentifiable splinters. Aside from the femur, where it is absent, the distal diaphysis is the dominant part of all diaphyses of the saiga assemblage.

The analysis of the preservation of the saiga antelope bone assemblage indicates (1) that the bone material is relatively well preserved, (2) that this rockshelter did not serve as a carnivore den (based on the percentage of the cranial elements—2.3% of the total including indeterminate splinters—and the presence of short bones and the extremities of the long bones), (3) that anthropic agency (at the carcass treatment stage) is preponderant (based on the preservation of the different skeletal units, the preservation of the post-cranial skeleton, and on the preservation of the different parts of these units).

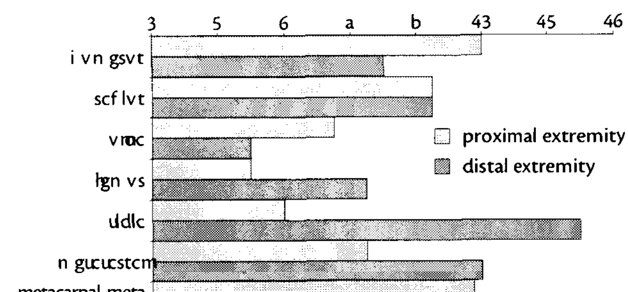

Figure 8-14—Buran-Kaya III Layer B: preservation of *Saiga tatarica* distal and proximal long bone extremities (MAU).

Bone Fragmentation of Saiga Antelope

Among the indeterminate splinters, at least 14,869 are from saiga antelope, based on the thickness of the cortex and their dimension (Table 8-2). During the quantification of these pieces, those that could not be attributed with certainty to saiga were separated out. The indeterminate splinters represent more than 92% of the faunal assemblage reported for this antelope (Figure 8-3). Among these indeterminate splinters, 19 correspond to cranial or vertebral elements and only 5 to the spongy parts of long bones. The indeterminate splinters are therefore mostly fragments of long bone shafts, and they have been divided into size classes (based on the largest dimension of the fragment); 97.8% belong to size class II (2–5 cm), of which 78% (of the total) are about 2 cm long.

Overall Fragmentation

Three indices were used to evaluate the degree of fragmentation of the bone material:

(1) The quotient of the total number of identifiable remains by the total number of remains, expressed as a percentage: NRDt ÷ NRT × 100, or 1,259 ÷ 16,128 × 100 = 7.81%;

(2) The index of fragmentation (IF) described by Richardson (1980:111), calculated as the quotient of the total number of identifiable remains by the minimum number of elements, or calculated as the quotient of the total number of remains by the minimum number of elements: IF = (NRDt ÷ MNE) or 1,259 ÷ >747 = <1.68. Alternatively, IF = NRT ÷ MNE or 16,128 ÷ >747 = <21.59;

(3) The total number of identifiable remains (NRDt), calculated as the quotient of the post cranial elements by the total number of remains minus the number of cranial remains, expressed as a percentage: NRDt bone = (NR bone ÷ NRT − NRT cranial bones) or 871 ÷ (16,128 − 388) × 100 = 5.53%.

These results indicate that there was a high degree of saiga bone fragmentation in Layer B.

Fragmentation of Skeletal Elements

The cranial skeletal elements, especially those of the upper part—skull bones and maxillae—are extremely fragmented based on their poor state of preservation (*cf. supra*). The same is true of the scapulae and innominate bones.

All of the short bones are complete, with the exception of 9.7% of the calcanei and 23.2% of the phalanges.

Among the long bones, none was recovered in a complete state. The ulna, metapodia, and femur appear to be the most fragmented, based on the NR ÷ MNE ratio (Table 8-3).

According to the presumed place of breakage (Figure 8-15) and the preservation of different parts of the long bones (*cf. supra* and Figure 8-14), for all of the bones other than the femur, tibia, and the metatarsal, breakage occurred on the proximal diaphysis (usually on the lateral face for the humerus and the radius and on the medial face for the metacarpals). For the femur, the blow was on the distal diaphysis. For the tibia and metatarsal, the blow was on the medial diaphysis (towards the distal diaphysis, usually the medial side for the tibia and lateral side for the metatarsal).

Most of the unidentifiable splinters belong to Class II (2–5 cm in length). No diaphyseal "cylinders" were found; the fragments retain more or less a quarter of their original diameter. These results are quite different from remains typically seen in a carnivore den. They do demonstrate that humans were mostly responsible for the fragmentary state of this material.

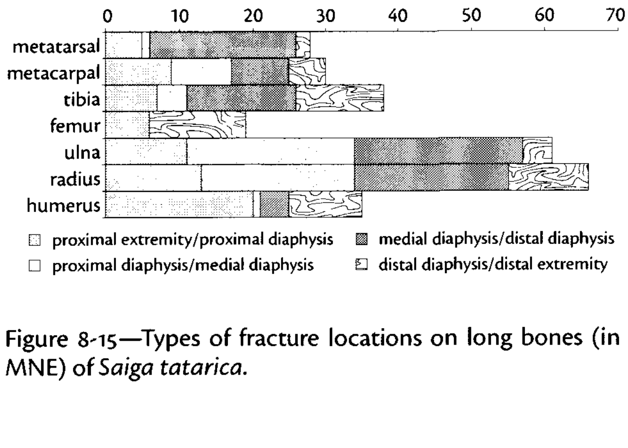

Figure 8-15—Types of fracture locations on long bones (in MNE) of *Saiga tatarica*.

Articular Reconstruction of Post-Cephalic Skeletal Elements of Saiga (Dispersal of Bone Materials)

The analysis of the potential articular reconstruction of the post-cranial skeleton provides a good portrait of the dispersal of the bone material. The articular reconstruction index (AR) used in this analysis is calculated as the quotient of the number of articulated bones and the total number of bones by element, expressed as a percentage (Table 8-7): AR = articulated bones × 100 ÷ number of bones by element.

The assemblage displays a significant articulation index, between 20.2% (radius/upper row of carpals) and 47% (metacarpals/proximal phalanges). This indicates a relatively weak dispersal rate. Globally, 244 articulated remains were found (AR = 48.1%). When the spatial distribution of these articulations is examined, it is evident that a great many were found within the same square (Table 8-7).

The relatively limited dispersal indicates that there was little post-depositional disturbance, and virtually none that can be attributed to carnivores.

Table 8-7
Articular reconstruction for *Saiga tatarica* remains

Elements	*AR*	*% AR/ MNE*	*AR in same square*
Scapula/humerus	8	28.5	7
Humerus/radius	14	35.0	10
Humerus/ulna	11	34.3	6
Radius/ulna	12	37.6	9
Radius/carpal	15	20.2	12
Carpal/metacarpal	17	36.1	15
Pelvis/femur	6	21.4	6
Femur/tibia	8	20.5	7
Tibia /patella	20	43.4	13
Tibia/malleolus	12	31.5	9
Tibia/tarsal	26	30.2	21
Tarsal/metatarsal	13	21.3	13
1st phalanx/2nd phalanx	42	39.2	33
2nd phalanx/3rd phalanx	30	41.6	23

Surficial Bone Damage

Marks were noted on some of the bones; they were the result of several different agencies: climato-edaphic, non-human biologic (plants and carnivores), and human. The following discussion pertains to the entire faunal assemblage, not just the saiga remains.

Climato-Edaphic Agencies

Longitudinal fissures, often associated with the exfoliation of the bone surface, as well as the presence of some frayed bone splinters, are evidence of weathering and the effects of climate. These were weak effects, only observed on 9 pieces (6 of which were saiga antelope). Since the site was a rockshelter, it is reasonable to assume that the material was protected from intemperate weather and that it was also probably rapidly covered by sediments. The absence of surficial damage from percolating water in the sediments suggests that after the material was deposited, a dry climate prevailed.

Damage by Plants

Only three bones (of which one is saiga) have vermiculation (traces formed by plant rootlets), or 0.02% of the material. This indicates that the material was deposited in a shelter where it was not possible for a substantial vegetational cover to develop—probably due to a dry climate.

Damage by Carnivores

Eleven indeterminate bone splinters (eight of which are from short bones), a humerus, a talus, and a proximal phalanx of saiga antelope, or 14 bones, have gnawing marks from a young hyæna or wolf. A scapula and a proximal saiga phalanx have fang marks from a wolf. A humerus and 7 short bones of saiga have teeth marks from small carnivores (fox or small Mustelid). All told, 24 bones (0.14% of the total number of remains) display damage by carnivores, particularly by Canids. Eighteen are autopodial bones, 1 corresponds to a fragment of flat bone, and 5 correspond to fragments of long bones.

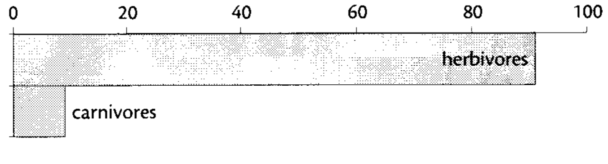

Figure 8-16—Buran-Kaya III Layer B: ratio of herbivore to carnivore remains (percentage of MNIc).

Carnivore action on this material was therefore modest. The weak representation of carnivore species within the faunal assemblage further confirms this (Table 8-1 and Figure 8-16).

Anthropic Modifications

Numerous bones display evidence of human activities: breakage, butchery, and burning (Table 8-8).

Breakage

Among the indeterminate splinters, 30 bone flakes resulting from percussive blows, 2 diaphyseal fragments with internal splintering, and 1 diaphyseal fragment with external splintering indicative of intentional fracture by percussion were identified. These splinters are from animals the size of deer (14), bison (2), either deer or *Equus hydruntinus* (16), and from mammoth (1). Among the identifiable bones, a medial diaphysis of a bison metatarsal has internal splintering on its frontal face, while a distal diaphysis of a deer right humerus has external splintering on its posterior face. Altogether, 35 bones have traces of percussion, or 0.22% of the faunal assemblage (Table 8-8).

Butchery

Eight indeterminate bone splinters from animals the size of saiga display striae resulting from defleshing.

A fragment from a hemi-mandibular ramus the size of deer or *Equus hydruntinus* has a groove resulting from the cranio-mandibular disarticulation.

A proximal extremity of a right fox ulna has a groove resulting from the disarticulation of the humerus and ulna.

Bones attributed to saiga antelope have the most butchery striae: 39. They correspond to the disarticulation of various anatomical elements (Table 8-8).

Altogether, 49 bones have "butchery" marks, or 0.30% of the bone assemblage. These striae were, for the most part (83.6%), produced during disarticulation.

Burning

Among the indeterminate splinters, 317 have traces of calcination. Based on their dimensions and the thickness of the cortex, 306 probably belong to saiga antelope, 8 to deer and/or *Equus hydruntinus*, and 3 to deer. The majority of these fragments belong to the class size I (0–2 cm). In addition, an indeterminate carpal, a G pyramidal, a proximal extremity of metapodial, a proximal extremity of a calcaneum, a proximal phalanx, and a vertebral fragment, all belonging to of saiga antelope show traces of burning.

Altogether, 323 pieces have traces of burning: 2% of the faunal assemblage (Table 8-8).

The faunal material with anthropic modification (407 bones) represents 2.52% of the total faunal assemblage. Burned bones are the most abundant (Figure 8-17). These are more frequent than bones with other anthropic marks (Figure 8-18) and confirm that humans are responsible for this material, and that their role was the most important in the history of the assemblage.

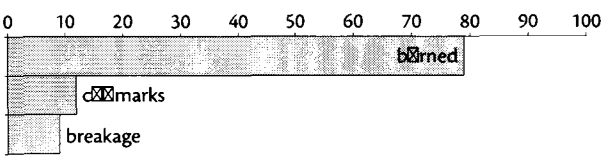

Figure 8-17—Relative percentages of anthropic damage to the faunal assemblage by burning, butchery, and fracture.

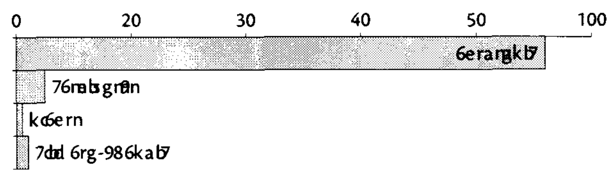

Figure 8-18—Relative percentages of types of taphonomic damage to the faunal assemblage: all human-caused modification combined, carnivores, plants, and climato-edaphic.

Table 8-8
Numbers and types of bones with anthropic modification

Element	*Breakage*	*Filleting*	*Disarticulation*	*Burned*
Long bone indeterminate	33	8	mandible	317
Metatarsal bison	1			
Humerus red deer	1			
Humerus saiga			humerus/radius	
Humerus saiga			humerus/radius	
Radius saiga			humerus/radius	
Radius saiga			radius/carpal	
Ulna saiga			humerus/ulna	
Ulna saiga			humerus/ulna	
Semi-lunate saiga			radius/carpal	
Pyramidal saiga			radius/carpal	
Capitate-trapezoid saiga			carpal/metacarpal	
Hamate saiga			carpal/metacarpal	
Hamate saiga			carpal/metacarpal	
Pisiform saiga			radius/carpal	
Metacarpal saiga			metacarpal/1st phalanx	
Metacarpal saiga			metacarpal/1st phalanx	
1st anterior phalanx saiga			metacarpal/1st phalanx	
Tibia saiga			tibia/tarsal	
Tibia saiga			tibia/tarsal	
Tibia saiga			tibia/tarsal	
3 Calcaneus saiga			3 tibia/tarsal	
16 Talus saiga			16 tibia/tarsal	
Greater cuneiform saiga			tarsal/metatarsal	
Metatarsal saiga			metatarsal/1st phalanx	
Vulpes/Alopex			humerus/ulna	
Carpal saiga				1
Pyramidal saiga				1
Metapodial saiga				1
Calcaneus saiga				1
First phalanx saiga				1
Vertebra saiga				1
Total	35	8	41	323

Acquisition and Processing of Saiga Antelope

Based on the preceding taphonomic analysis, we can assume that the presence of saiga antelope in Buran-Kaya III Layer B is the result of human actions. In addition, the taphonomic analysis enables a more detailed understanding of the subsistence behavior undertaken by the occupants of the rockshelter. The following section analyzes the techniques used by the prehistoric inhabitants of the site to acquire then treat this game.

Acquisition of Saiga Antelope

Saiga antelope was the preferred game species for the humans of Layer B. Based on the evidence for the faunal elements described above, it appears that complete animal carcasses were brought to the rock shelter. Based on the analysis of butchery marks and their prevalence, it appears that the animals were hunted. These interpretations are further confirmed by the indices for Bovids defined by R. Potts (1983). Index A (expressed in MNE) is calculated as the quotient of the axial skeleton and the upper part of the fore and hind skeletons. Index B (expressed in MNE) is calculated as the quotient of the upper part of the foreskeleton and the upper part of the hindskeleton. At Buran-Kaya III Layer B, these indices are: A = axial/upper appendages = 0.47 (< to 1.6) and B = upper foreskeleton/upper hindskeleton = 1.17 (> to 1.0). Both of these values are indicative of hunting, rather than scavenging.

No horn cores were discovered within the faunal assemblage, which would suggest that no male saiga antelope were slaughtered. On the other hand, among the post-cranial material, there are bones the robustness and dimensions of which suggest the presence of at least 2 saiga males.

The age of the antelopes that were slaughtered at Buran-Kaya III Layer B was estimated following Bannikov et al. (1967). The remains of six young antelopes are present in the faunal assemblage: at the time of death, two of these were around 11 months of age, one was 13–15 months, two were 18–24 months, and one was 25–29 months old (Figure 8-19). The remains of eighteen adults were also identified: at the time of death, seven of these were 3–4 years old, seven (of which one was male) were 4–7 years old, three (of which one was male) were 3–7 years old, and one was 8–10 years old (Figure 8-19). Adult saiga in the prime of life, then, are abundant in the assemblage, which confirms that their remains were the results of hunting, and not of scavenging.

In sum, the slaughtered saiga population obtained by the inhabitants of Buran-Kaya III Layer B was composed of 6 juveniles (25%), 2 adult males (11% of adults), and 16 adult females. The adult male to female sex ratio is therefore, at the most, 1 to 8.

Based on the estimated age for the juveniles, and the birthing period for saiga (end of April through the beginning of May, according to A. G. Bannikov et al. 1967), it appears that these saiga were hunted between the end of April and July, probably after the spring migration and calving. During this period—late spring and summer—the herds are small to medium in size and composed of females, young, and a few males (Bannikov et al. 1967). Since saiga antelope move across the landscape based on the available vegetation, their presence at Buran-Kaya III attests to good quality pasture and watering points in the vicinity of the rockshelter. The immediate environment of the site, then, served as a summer range for saiga antelope. The presence of these saiga herds here was most likely the impetus for the prehistoric inhabitants of Buran-Kaya III Layer B to visit this particular valley.

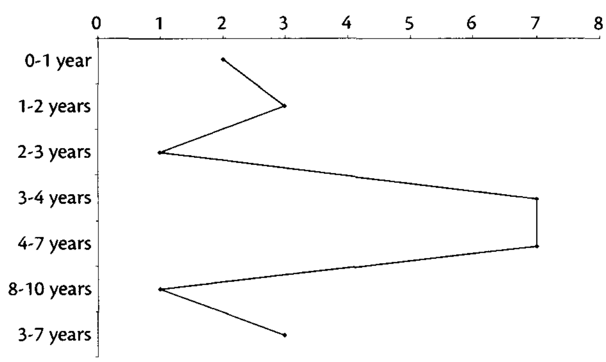

Figure 8-19—Buran-Kaya III Layer B: mortality profile of *Saiga tatarica*.

It is evident that the humans at the site practiced a specialized hunting of saiga antelope, which is easy to hunt, especially near water holes. During the summer period, the hominids were able to slaughter mainly females and youngsters from a herd that was small to medium in size.

Processing of Saiga Antelope

The preservation analysis (see above) indicated that all skeletal elements are present in Buran-Kaya III Layer B for saiga antelope. Animals that were killed, then, were brought intact to the site to be dismembered, probably just outside the rockshelter (based on the preservation of the skeletal units, Figure 8-3).

According to the cranial remains present in the analyzed sample, the skull was disarticulated and broken open to take out the brain—hence the rarity of skull bones and their significant fragmentation. Likewise, given the state of the hyoid bones, the tongue was removed. The presence of axial skeleton bones—of which sterna and costal cartilage are especially noteworthy—indicate that the thorax was dismembered in, and in close proximity to, the rockshelter.

The long bones, especially those that are meat-heavy, are well preserved (Figures 8-7 and 8-8). Based on their preservation and the "butchery" mark analysis (Table 8-8), part of the disarticulation phase for the limbs took place inside the rockshelter itself. This was also the case for the foot extremities, based on the high frequency of autopodial bones (Figure 8-5).

Since complete saiga carcasses were brought to the rockshelter, it is possible to estimate the weight of the meat that this game provided for the Layer B inhabitants. The data used for this calculation is derived from A. G. Bannikov concerning Russian saiga antelopes (Bannikov et al. 1967:156, tab. 32), which suggest that these saiga provided a total of 410 kilograms of meat.

The analysis of bone fragmentation discussed above suggests that the marrow in the mandibles, and especially that in the long bones, was systematically recovered by the inhabitants (Figure 8-15). On the other hand, marrow in the proximal and medial phalanges—elements that have relatively little marrow—was not recovered.

To better understand the nutrient strategies used by the prehistoric inhabitants of Layer B, curves were plotted for the ratio of minimum animal units deduced for each animal element (%MAU) to the percentages of the modified general utility index (%MGUI) defined for deer by Binford (1981). Although the gross values of MGUI are probably not the same for saiga antelope and deer, the ratio of elements for the two species is identical. It should be noted beforehand, that to verify our result, we have analyzed the relation between the preservation rate of anatomical elements and their density. Since the correlation is weak, at 0.261, we could carry out these calculations (Figure 8-20). The indices corresponding to the global nutritive strategy and to the meat-procuring strategy (Figures 8-21 and 8-22) reflect the "inverse bulk strategy," while the index for marrow procurement corresponds to the "bulk strategy" (Figure 8-23). These results confirm that the site during the formation of Layer B was both a butchery site—where the processing of game was complete—as well as a consumption site.

The modus operandi for saiga antelope processing in Layer B appears to have been complete and recurrent. The saiga antelope carcasses were cut up in, and in the immediate proximity of, the rockshelter (in front of the entry?).

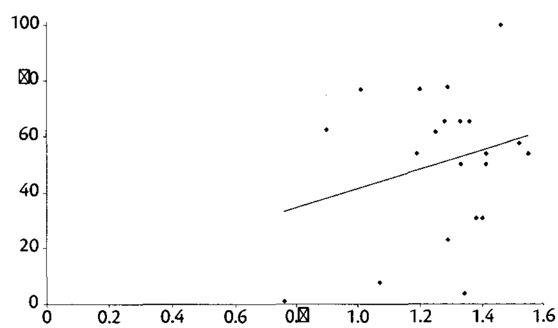

Figure 8-20—Density profile of *Saiga tatarica* bones.

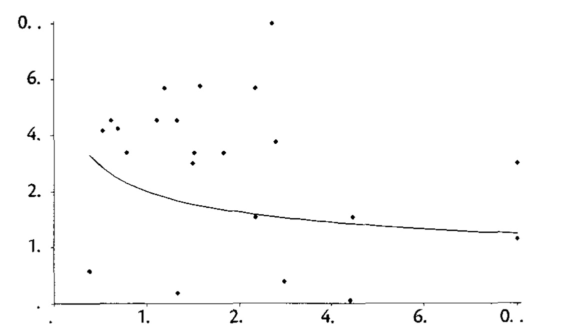

Figure 8-21—Modified general utility index (MGUI) profile of *Saiga tatarica*.

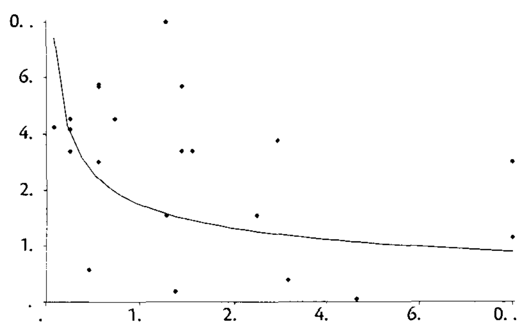

Figure 8-22—Meat index of *Saiga tatarica*.

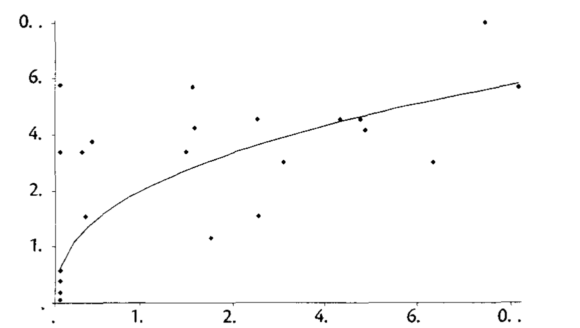

Figure 8-23—Marrow index of *Saiga tatarica*.

Analysis of Remains of Other Species

Aside from the saiga antelope that so dominates the identified species in Layer B, five other species of herbivores (mammoth, woolly rhinoceros, bison, *Equus hydruntinus*, and deer) and three species of carnivores (wolf, fox, Mustelid) were present in the bone assemblage (Table 8-1).

Mammoth

Among the 38 remains attributed to mammoth, 31 belong to the cranial skeleton. These include 11 tusk fragments, 19 tooth fragments, and 1 petrous bone; the ensemble could have belonged to a skull of a young mammoth carrying two tusks and two molars. In addition, an intermediate phalanx from a juvenile and 6 long bone diaphyseal fragments (perhaps metapodial) were identified. The prehistoric human inhabitants of the site therefore brought at least one skull and the end of one foot to the shelter. It is unclear whether the mode of acquisition for mammoths was hunting or scavenging.

Woolly Rhinoceros

Four tooth fragments corresponding to the upper deciduous teeth of a young woolly rhinoceros were discovered. By what means they came to be present on the site remains unexplained. As in the case of the mammoth remains, these might represent the import of the skull.

Bison

No bones from the cranial skeleton of bison were identified in the Layer B bone assemblage. On the other hand, 18 adult post-cranial bones were attributable to this species. These are: 17 long bone fragments (from one each of a humerus, ulna, tibia, and metacarpal and from two metatarsals) and a tarsal fragment (either the navicular-cuboid or the large cuneiform). Other than the last, these bones all correspond to those bison parts that are rich in meat and marrow. Furthermore, among the indeterminate fragments for this layer, 38 long bone diaphyseal fragments could correspond to this species as well (Table 8-2). The metatarsal fragment has internal splintering from a blow made by humans (Table 8-8). The Layer B prehistoric inhabitants brought quarters of an adult bison to Buran-Kaya III, probably after dismembering it at the kill site itself.

Equus hydruntinus

Three teeth, including a third incisor and a second molar, both lower, from an aged *Equus hydruntinus* were identified in the sample. As was the case for the rhinoceros, the presence of these teeth on the site is unexplained (import of skull?).

Deer

Seven cranial remains, corresponding to a skull and a mandible of an old deer, were identified. As no antler fragments were present, this individual was either a male without antlers or a female. Eleven bone fragments from one each of an innominate, humerus, radius, tibia, metatarsal, metacarpal, either a femur or a humerus, and a large sesamoid are also attributable to this species. For the most part, these are bones from meat- and marrow-rich parts of the deer. Among the assemblage's indeterminate splinters, more than 100 might belong to deer as well, based on their size (Table 8-2). The diaphyseal humerus fragment has external splintering that resulted from percussion of an anthropic origin (Table 8-8). The prehistoric humans of Layer B probably hunted an aged deer, and then transported it *in toto* to the rockshelter to dismember it.

Carnivores

Nine bones from three species of carnivores were identifiable among the Layer B material. These are: a dental bud of the upper first molar of a wolf, a premolar, a metapodial fragment, the humeral head and the ulnar proximal extremity of a fox (*Vulpes corsac* or *Alopex lagopus*), two distal extremities of a humerus and one of a tibia from a small mustelid, and 2 canine tooth fragments from either a fox or a small Mustelidae. The proximal end of the fox ulna has a groove from the disarticulation of the ulna and humerus (Table 8-8). The prehistoric peoples of this layer might have hunted and butchered this fox, perhaps in order to get its fur and meat.

The non-saiga bone assemblage of Buran-Kaya III Layer B demonstrates that the prehistoric inhabitants of the site did little hunting for these other herbivores and carnivores, which seem to play only a minor role as game. The hominids probably seized the opportunity during their routine movements to bring fresh sections of such carcasses back to their camp.

Analysis of Spatial Patterning

Since the bone assemblage from the 1996 excavations at Buran-Kaya III Layer B is relatively well-preserved and suffered little post-depositional degradation (see above), it is possible to study the horizontal distribution of the bones at the site. Not having the precise x, y coordinates of each bone, this analysis is based on the relative density of material in each excavated square meter.

In the central part of the 1996 excavated area of Layer B, in squares Г8, Д8, В8, Д7, Г7, and Е8, there is a significant concentration of bone material (Figure 8-24). For the most part, this high density is due to saiga antelope, the dominant species in the assemblage (Figure 8-25). Remains of the other species are principally concentrated in three squares: Д8, Г8, and Е8 (Figure 8-26). The only variation visible between the distribution of the saiga anatomically indeterminate remains (Figure 8-27) and the saiga identifiable remains (Figure 8-28) is a higher density of the former in square Г7, and of the latter in square Д9.

The analysis of the distribution of saiga antelope bones as a function of their major skeletal units shows little variation (Figures 8-29 to 8-33). All elements of the saiga skeleton are represented, more or less in significant numbers, in the squares Г8, Д8, and Д7. It is notable, however, that post-cranial elements—in

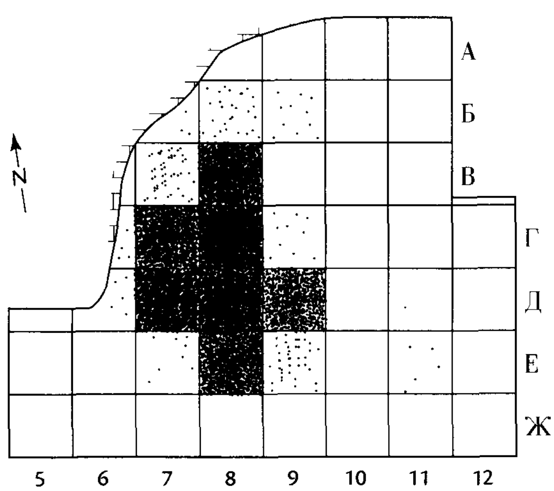

Figure 8-24—Buran-Kaya III Layer B: spatial distribution of all faunal remains.

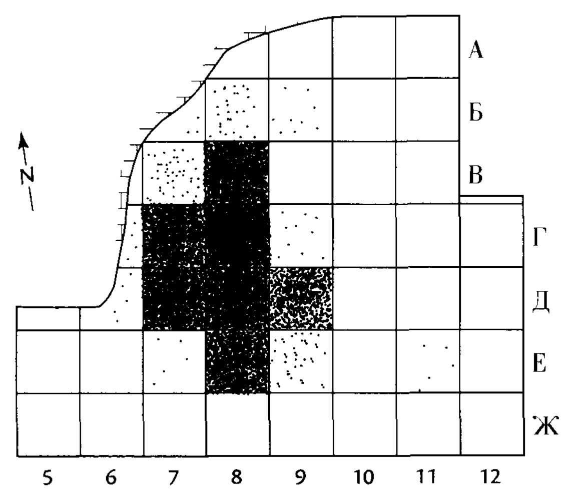

Figure 8-25—Distribution of *Saiga tatarica* remains.

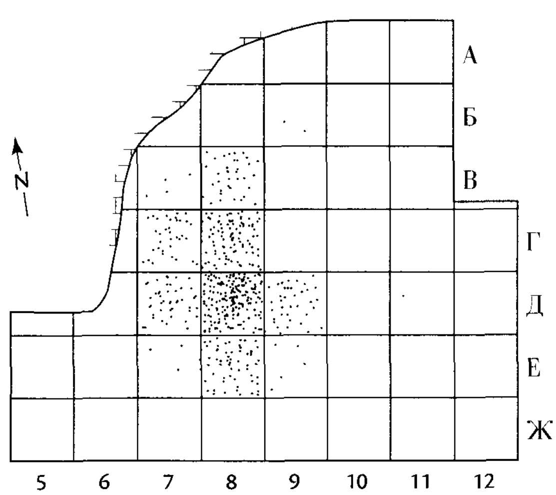

Figure 8-26—Distribution of the remains of other (non-saiga) species.

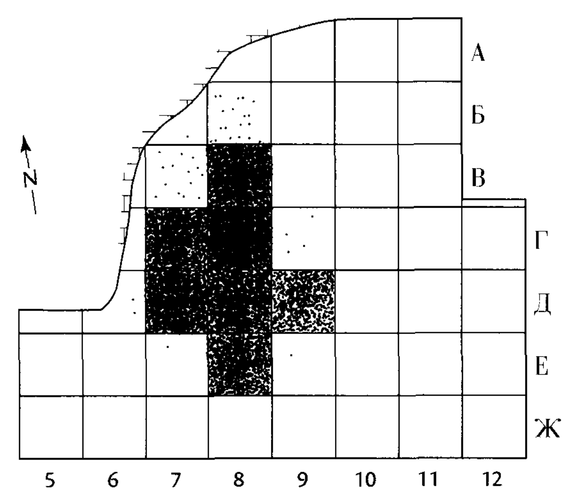

Figure 8-27—Distribution of *Saiga tatarica* anatomically indeterminate remains.

contrast to cranial elements—are quite abundant in square E8; that bones of the axial skeleton and of the upper part of the limbs have a similar distribution; and that the autopodial bones—in contrast to the other bones—are very abundant in square Г7. The spatial distribution of bones carrying butchery marks shows that there is a more significant density of these in three squares: Г8, Д8, and Д7 of the 1996 excavations (Figure 8-34).

Based on the spatial distribution analysis, and taking into account the results furnished by the bones showing unequivocal marks of disarticulation done by humans (Table 8-8), we can venture the hypothesis that there was a specific zone in the rockshelter around square Д8 (which also included squares E8, Г8, and Д7) that served as the center for butchery activities. Squares Д9, B8, E9, and Г7 correspond to toss zones for the waste that resulted from this butchery.

The frequency of burnt bones in Layer B was underlined in the preceding discussion. Their distribution, however, shows a markedly higher density in five of the squares in the sample—Д8, B8, Г7, Г8, and Д7—which represent a total of 72.6% of all burnt bone for this sample (Figure 8-35). This suggests the presence of one or more small hearths (unconstructed), which were correlated with the butchery activities.

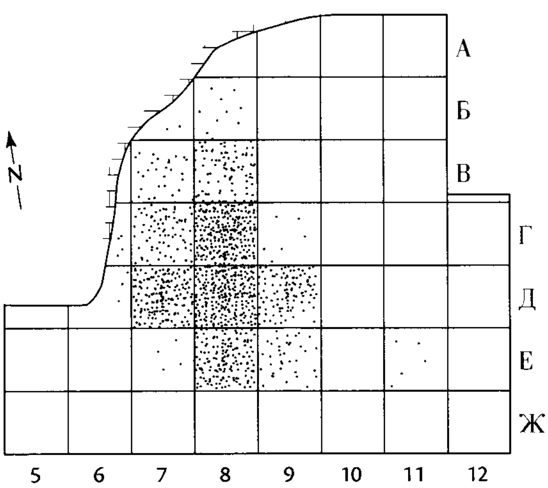

Figure 8-28—Distribution of *Saiga tatarica* anatomically identified remains.

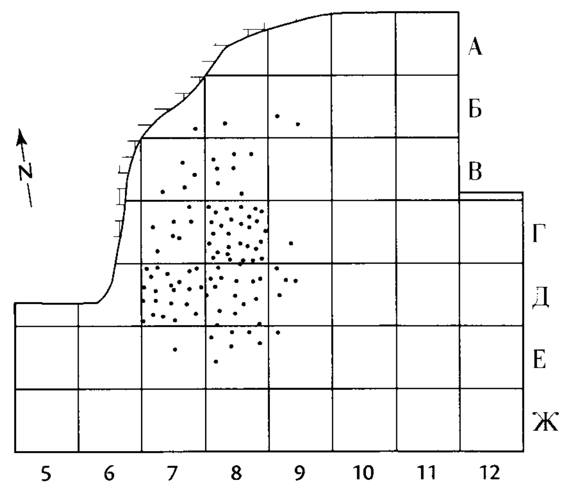

Figure 8-29—Distribution of *Saiga tatarica* cranial skeleton remains.

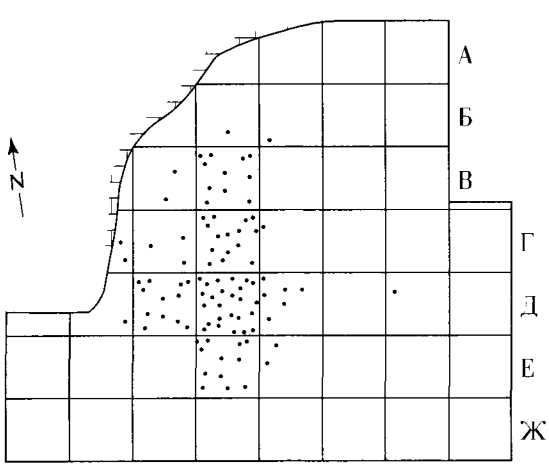

Figure 8-30—Distribution of *Saiga tatarica* axial skeleton remains.

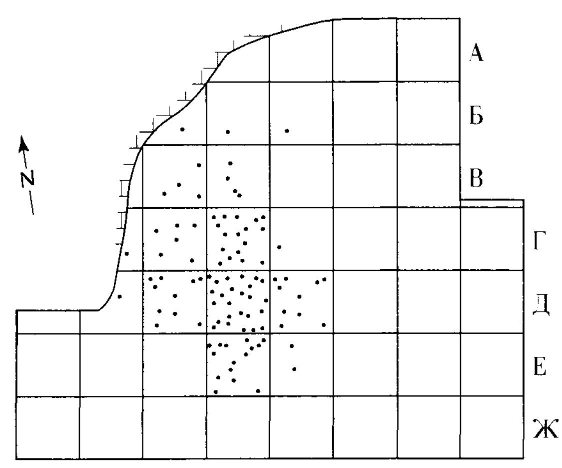

Figure 8-31—Distribution of *Saiga tatarica* upper fore limb remains.

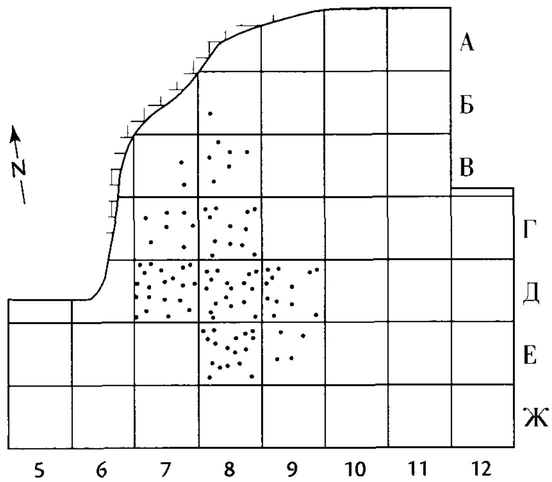

Figure 8-32—Distribution of *Saiga tatarica* upper hind limb remains.

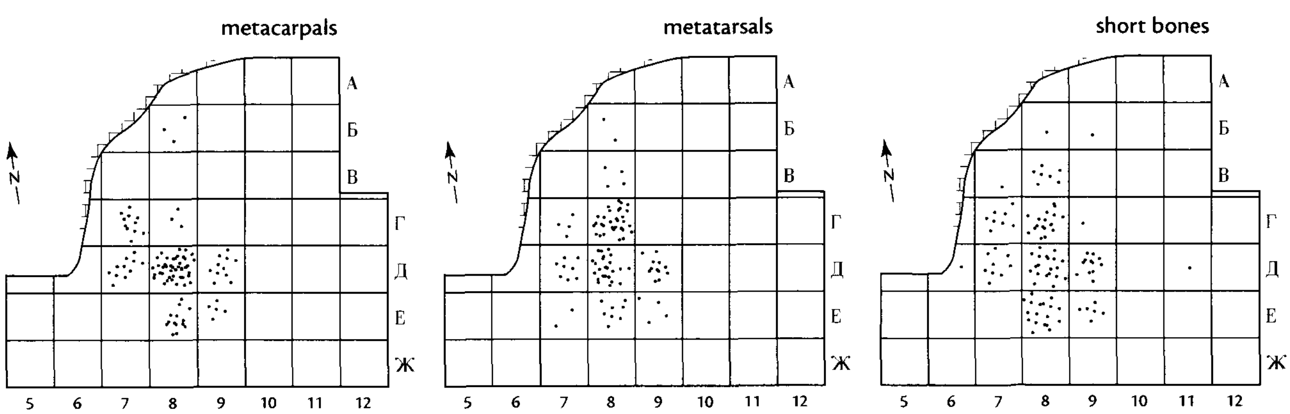

Figure 8-33—Relative spatial distributions of *Saiga tatarica* autopodial remains (metacarpals, metatarsals, and short bones).

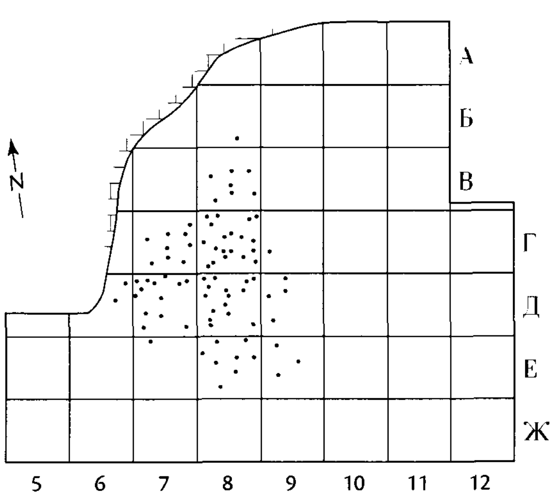

Figure 8-34—Distribution of bones with anthropic marks.

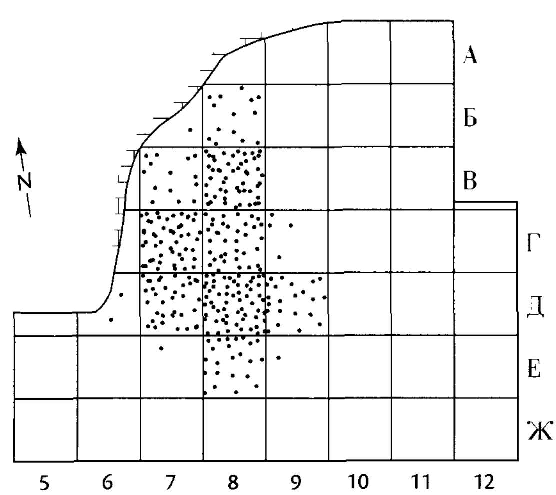

Figure 8-35—Distribution of burnt bones.

Discussion

The prehistoric inhabitants of Buran-Kaya III Layer B settled themselves in the rockshelter during a cold and dry climatic phase. In the neighborhood of the site, the environment was a semi-arid steppe with a few wooded areas near the river. The inhabitants practiced a specialized hunting for saiga antelope. Being well acquainted with the habits of this animal, especially during its migration periods, the hominids knew that the area served as a summer pasture for saiga. The presence of this species appears to have been the primary motivation for the humans to use the rockshelter as a camp. They essentially slaughtered females and youngsters from herds that were small to medium in size. They exploited this game completely, but not to an exaggerated extent, which suggests that the occupation did not take place during a period—or periods—of dietary stress. A significant part of the cutting up and culinary preparation of the animals occurred inside the rockshelter, within a circumscribed zone. Buran-Kaya III, during the occupation of Layer B, was a seasonal habitat, probably with recurrent occupations.

(*Translated, from the French, by Katherine Monigal.*)