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**Exploitation of Animals at an Early  
Iron Age Site at Topaz Gala  
(Turkmenistan)**

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Światowit : rocznik poświęcony archeologii przeddziewowej i badaniom  
pierwotnej kultury polskiej i słowiańskiej 12 (53)/A, 9-24

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2014

Artykuł został opracowany do udostępnienia w internecie przez Muzeum Historii Polski w ramach prac podejmowanych na rzecz zapewnienia otwartego, powszechnego i trwałego dostępu do polskiego dorobku naukowego i kulturalnego. Artykuł jest umieszczony w kolekcji cyfrowej [bazhum.muzhp.pl](http://bazhum.muzhp.pl), gromadzącej zawartość polskich czasopism humanistycznych i społecznych.

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## EXPLOITATION OF ANIMALS AT AN EARLY IRON AGE SITE AT TOPAZ GALA (TURKMENISTAN)

**Keywords:** animal economy, Early Iron Age, hunting, husbandry, Serakhs Oasis

### Introduction

In 2009–2012, an archaeological mission of the Institute of Archaeology of the University of Warsaw, headed by M. Wagner, performed excavation works at Topaz Gala, located in the Serakhs Oasis, southern Turkmenistan (WAGNER 2011). The site is situated on a fairly small hill (55×75 m and a height of almost 3 m), on the eastern side of the road from the town of Serakhs to Mary (previously called Merv), at a distance of 12 km from the former one (Fig. 1). It is surrounded with irrigation channels in the north, west, and south. The channels constitute part of the main channel (Kiçi Aga yap) supplying the oasis with water. Relics of a building interpreted as the fire temple, dated to the Yaz II Period (900–550 BC) of the Early Iron Age (CATTANI, GENITO 1998: 75),<sup>1</sup> were discovered during the exploration of the site (Fig. 2). The

edifice consisted of four rooms (Nos. 1–4). The most important of them (No. 1), a rectangular one, was divided into smaller parts with three pairs of walls and pillars, and in its western compound four exploration/documentation areas were distinguished (1a–1d). One of them (No. 1b) contained relics of a round clay structure and a storage vessel which perhaps served for storing ashes. Three other rooms (Nos. 2–4) were located next to Room 1 on eastern side, and their functions are yet to be identified. The whole structure is surrounded with a passage (Nos. 7–8) which runs around the building between its walls and the external walls with fortified towers (WAGNER 2014). Outside of the building three other units were labelled, namely areas: No. 5 (a southern one), No. 6 (an eastern one), and No. 9 (a western one). Occupation layers connected with these structures contained fragments of pottery vessels, stone objects and animal bone remains. The aim of this work is to present the results of archaeozoological analysis of faunal remains and on that basis to reconstruct models of animal exploitation by the people of Topaz Gala in the Early Iron Age.



Fig. 1. Location of the site of Topaz Gala (Drawing E. Jaskulska).

Ryc. 1. Lokalizacja stanowiska Topaz Gala.

<sup>1</sup> Layers dated to the Yaz I Period (1400–900 BC) and the Islamic Period were also distinguished at the site. Remains recovered

from those layers will be the subject of a separate paper.

## Material and methods

The analysed faunal material only came from layers dated to the Early Iron Age.<sup>2</sup> It was recovered from different portions of the site. The largest assemblage came from three out of the four discovered rooms (Nos. 1–4), with the most fragments in the main Room 1 (n=1814). Lower numbers of bone remains were discovered in Rooms 2 (n=534) and 3 (n=202), with no remains recovered from Room. 4. That lack of bone material is probably a consequence of a limited range of works performed in that part of the site and also a noticeably worse state of preservation (in comparison with the other rooms) of architectural elements and pottery fragments (M. Wagner, personal communication). A portion of the bone material came from the passage (Nos. 7–8). Another faunal assemblage consisted of remains recovered in the areas covered by the excavation works but located outside the external walls of the supposed temple to the south (No. 5, n=734), the east (No. 6, n=128), and to the west (No. 9, n=583).

The animal remains belonged to two categories. One of them was an almost completely preserved skeleton of a dog. It was discovered in the third – counting from the entrance – unit (No. 1c) of the main chamber of the edifice, over a layer of ashes. The other category consisted of post-consumption remains. The post-consumption character of the remains is confirmed by their state of preservation in the form of flaky fragments as well as marks related to the preparation of meat for consumption noted on some bones. The faunal material was fairly well preserved, which is indicated by the percentage of fragments identified to the level of species and anatomical elements – nearly 61.4%. Many fragments featured at least part of the proximal and/or distal epiphysis preserved, which was very helpful for identification.

The identification of the bone material was based on features noted on the bone surfaces, and handbooks of comparative anatomy were used during the examination (KRYSIAK, ŚWIEŻYŃSKI 2006; KRYSIAK, KOBRYŃ, KOBRYŃCZUK 2007). Traits described by Z. Schramm (1967b), as well as by M. Zeder and H. Lapham (2010) for certain long bones of sheep and goat and by S. Payne (1985) and D. Helmer (2000) for teeth were taken into consideration when remains of the two species were distinguished. Bird bones were identified on the basis of the comparative collection from the Institute of Systematics and Evolution of Animals of the Polish Academy of

Sciences in Kraków and available references (BOCHEŃSKI, TOMEK 2009; TOMEK, BOCHEŃSKI 2009).

The bone material identified to the level of species was categorised according to the vertebrate divisions into mammals and birds. They were then divided into three groups: domestic, wild, and equids, and within each group into species. Percentages of bone fragments of livestock mammal species were calculated. Zoological identification was evaluated for the whole site as well as according to the division into the rooms, the passage, and the areas surrounding the building. The percentages of the most frequent remains were compared, firstly, for the four areas distinguished in the main chamber (No. 1, divided into parts a–d), secondly, for the remains which were discovered in the three rooms of the edifice (Nos. 1–3), and thirdly, for the bone remains found in the passage (Nos. 7 and 8) as well as in the areas outside the external walls (Nos. 5, 6, 9).

The faunal remains were identified to the level of the skeletal element which they belonged to. Analysis of anatomical distribution was performed for the most represented species – sheep and goat (jointly) and cattle. In order to do that, bone fragments were assigned to seven groups defining their perceived value for consumption. They are as follows: head (skull, horncores, mandible, teeth<sup>3</sup>), thorax (sternum, vertebrae, sacrum, and ribs), proximal part of the forelimb (scapula, humerus, radius and ulna), proximal part of the hind limb (pelvis, femur, patella, tibia, and fibula), distal part of the forelimb (carpal and metacarpal bones), distal part of the hind limb (tarsal and metatarsal bones), and phalanges (I–III). The head and distal parts are regarded as parts of low consumption value, the other ones as representing high consumption value. Percentages were calculated for each group and the results were compared with the model, i.e., anatomical distribution based on calculation for real skeletons (LASOTA-MOSKALEWSKA 2008: 238). On the basis of the results it was estimated whether phalanges were represented in the material and whether there was a balanced ratio of bones from the forelimb and hind limb.

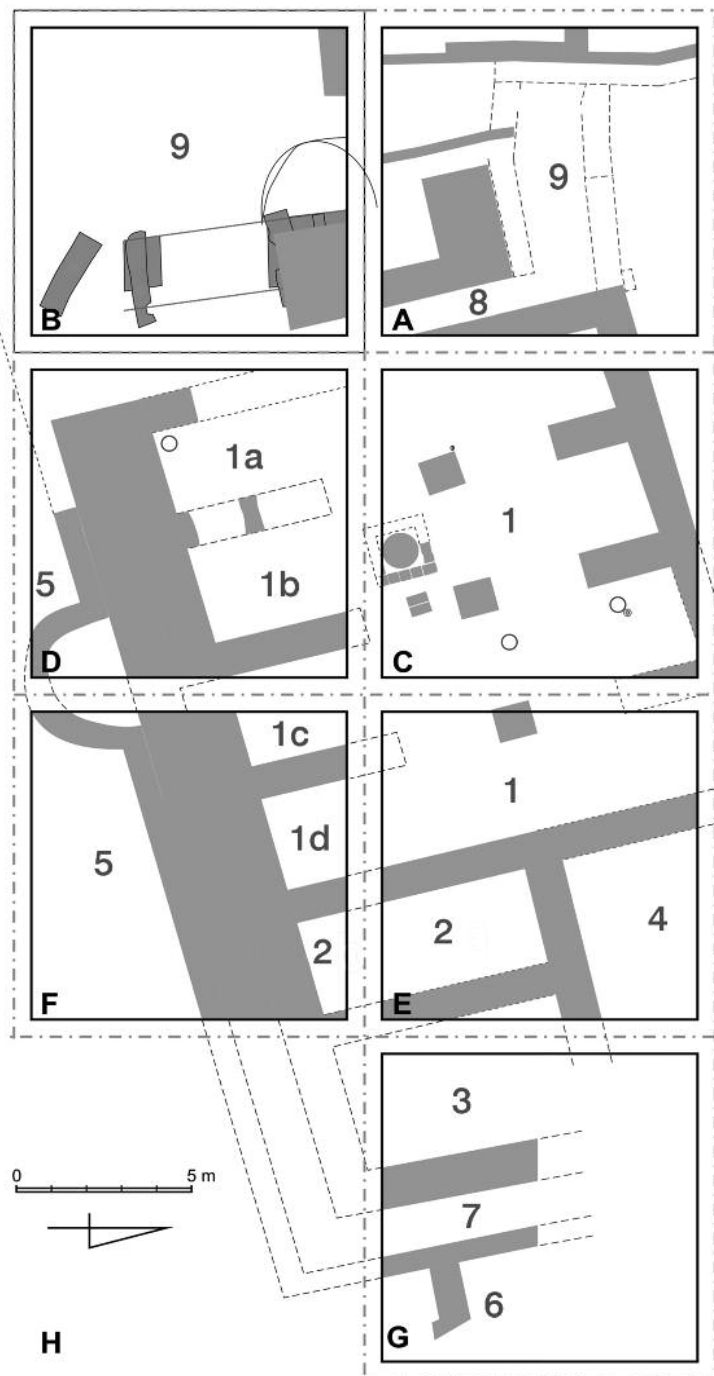
Age of death was estimated. The analysis was performed on the basis of attributes related to the stages of development of bones and teeth. Epiphyseal fusion was taken into consideration (KOLDA 1936) as well as the development of teeth of domestic animals (LUTNICKI 1972). Remains of morphologically immature individuals were distinguished on the basis of these observations and their percentages within particular species were calculated. Such

<sup>2</sup> Preliminary results of archaeozoological analysis of animal bone remains recovered at the temple were presented at the 1<sup>st</sup> Congress of Polish Archaeology which was held 19–21 Sept. 2013 in Warsaw (PIĄTKOWSKA-MAŁECKA, WAGNER forthcoming).

<sup>3</sup> Teeth are not part of the skeleton, but as they are preserved well and in significant numbers at archaeological sites, they are also subjected to archaeozoological analyses.

Fig. 2. Map of the site of Topaz Gala (Drawing M. Wagner). 1 – main room together with Areas a–d; 2–4 – rooms; 5 – area outside the building on the south; 6 – area outside the building on the east; 7 and 8 – passage; 9 – area outside the building on the west.

Ryc. 2. Plan stanowiska Topaz Gala. 1 – pomieszczenie główne z podziałem na obszary a–d; 2–4 – pomieszczenia; 5 – obszar poza budowlą od strony południowej; 6 – obszar poza budowlą od strony wschodniej; 7 i 8 – korytarz; 9 – obszar poza budowlą od strony zachodniej.



a procedure was performed for sheep and goat (jointly) as well as cattle. The share of young animals was calculated for the assemblages recovered on the whole examined portion of the site. In the case of small ruminants, the calculations were also made according to the place where their remains were recovered, for assemblages from the building and from the surrounding area.

The sex of domestic animals was estimated on the basis of the traits of skeleton related to the sexual dimorphism. In the case of the bone remains of sheep and goat, the diagnostic feature was the shape of the horncores, for cattle – proportions of metacarpal bones (CALKIN 1960),

and for pig – the shape of the cross-section of the canine (HABERMEHL 1975).

Osteometric examination of the remains was performed according to the methods described by A. von den Driesch (1976). Withers height of sheep and goat was calculated on the basis of the measurements of their long bones with the use of coefficients established by M. Teichert (1975) and Z. Schramm (1967a). In the case of the fragment of a goat horncore, its maximum length was transferred to a 100-point scale (LASOTA-MOSKALEWSKA, KOBRYŃ, ŚWIEŻYŃSKI 1991). Cattle and pig morphotypes were also estimated with the help of 100-point scales

(LASOTA-MOSKALEWSKA 1984; LASOTA-MOSKALEWSKA, KOBRYŃ, ŚWIEŻYŃSKI 1987). The measurements of the length and breadth of bone fragments were translated into relative values and transferred to the scale. Dog's withers height for the individual found in Room 1c was calculated according to the coefficients established by F. Koudelka (as cited by DRIESCH, BOESSNECK 1974).

Marks observed on the bone remains were recorded. They represented two categories: one was connected with marks left by the preparation of meat for consumption, the other was associated with the stage of disposal of the remains as refuse and the time of deposition on the surface of the soil.

## Results

### Zoological identification

4239 animal bone fragments were recovered at the site of Topaz Gala, and 2603 pieces were identified to the level of species and anatomical element, which accounts for 61.4% (Table 1). Mammal remains were a vast majority of the assemblage (99.7%), only nine fragments belonged to birds (0.3%) which included domestic chicken and crane.

Part of the mammal remains (116) came from rodents from the Squirrel family, represented by bones of ground squirrels, probably the speckled ground squirrel. They are a common species in open areas of Central Asia and are a secondary element, not connected with consumption, animal husbandry, or other aspects of animal

economy. For this reason they were excluded from the analysis. The remaining bone fragments belonged mainly to domestic mammals (98.0%), and in minor part to equids (1.7%), namely donkey. In the case of equids, it is not clear whether they represented the wild or domestic form as the skeletons of these animals lack diagnostic features which could help distinguish the two forms. There were also remains of wild mammals represented by bones of an unidentified species of gazelle (0.4%).

The post-consumption remains which belonged to domestic animals consisted of bones of species raised for meat (sheep, goat, cattle, and pig) as well as sparse dog bones. Remains of sheep and goat accounted for a significant majority of livestock mammal species (91.4%; Table 2), with more fragments of the former (74 fragments, while 51 pieces belonged to goat). They were followed by bones of cattle (6.5%) and pig remains were the least represented (2.1%).

The faunal remains were recovered from the rooms of the edifice interpreted as the fire temple, the surrounding passage, and the area situated outside the external walls with fortified towers. The bone remains were found in different parts of the main largest Room 1. There were noticeably fewer bones in Areas 1a–1d than in the central portion (Table 3, Fig. 2). A comparison of the zoological identification in different points of Room 1 showed similar patterns. Sparse bone fragments which belonged to birds – domestic chicken and crane – as well as wild mammals – gazelle – were found in both parts of Room 1. There were

Table 1. Animal bone remains from the site of Topaz Gala.

(R. – room; A. – area; P. – passage; in. – individual; N – north; S – south; E – east; W – west)

Tab. 1. Zestawienie zwierzęcych szczątków kostnych ze stanowiska Topaz Gala.

(R. – pomieszczenie; A. – obszar; P. – korytarz; in. – osobnik; N – północ; S – południe; E – wschód; W – zachód)

Trench	A	A	B	C	D	D	D	E	E	F	F	F	G	G	G	Total
Area	A. 9W	P. 8	A. 9W	R. 1	R. 1a	R. 1b	A. 5S	R. 2	R. 1N	A. 5S	R. 1d	R. 1c	R. 6E	P. 7	R. 3	
Unidentified	101	20	78	332	12	85	3	170	272	290	43	53	73	15	89	1636
Sheep/goat	214	26	159	332	10	110	1	298	313	351	53	47	47	47	84	2092
Sheep	2			4		6		12	15	11	8	4	3		9	74
Goat	2	1	2	7		2		10	5	14	4	2			2	51
Cattle	10	4	6	24		3	2	40	12	39	2	2	4	3	8	159
Pig	2	1		11						16	6	3	1	8	2	50
Dog	1					1						1 in.				2
Equids (donkey)	3		3	10	10	1			1	4				2	7	41
Gazelle		1		1		2		1		1	1	1			1	9
Rodent (ground squirrel)			1	1						17	4	8	9	10	66	116
Domestic chicken								2	1	2	2					7
Crane								1			1					2

Table 2. Zoological identification of animal bone remains from the site of Topaz Gala.

Tab. 2. Rozkład gatunkowy szczątków kostnych ze stanowiska Topaz Gala.

Zoological identification	n	%
Sheep/goat	2217	91.4
Cattle	159	6.5
Pig	50	2.1
Total of livestock mammals	2426	100.0
Dog	2	
Equids (donkey)	41	
Gazelle	9	
Total of mammals	2478	
Total of birds	9	

very few fragments of donkey and dog. Most animal remains belonged to small ruminants – sheep and goat, which reached 93.9% (southern part) and 93.5% (northern part). There were much fewer fragments of cattle (2.7% and 5.0% respectively) and of pig bones (3.4% and 1.5% respectively). Due to the absence of significant differences in the range of species, the material recovered from the main chamber should be treated as homogeneous in terms of the species represented by the bone remains.

A skeleton of a dog, arranged in anatomical order, was discovered in the south-eastern portion of Sector 1c. The animal lay on its left side, with its head towards west.<sup>4</sup> Nearly all skeletal elements were represented, with the exception of small tarsal and carpal bones as well as several phalanges. The remains belonged to an adult individual of average size, with withers height of approx. 37.5 cm. The baculum was not found, which suggests it was not a male.

Apart from the main chamber (Room 1), bone material was also found in Rooms 2 and 3, located on the east side of Room 1. The zoological identification was similar to the one from Room 1 (Table 3). Sparse fragments belonged to wild animals – gazelle and crane, domestic mammal remains were the majority. They were mainly remains of livestock species: sheep and goat (89.3%), followed by cattle (10.3%) and pig (0.4%). There were also a few fragments of domestic chicken skeleton. Very few bones represented equids. A comparison of the species distribution for Rooms 1, 2, and 3 indicates that in Rooms 2 and 3 there was a higher share of cattle remains (approx. 10%) and a lower share of pig remains (below 0.5%). However, these differences are not significant and all the assemblages recovered from the three rooms can be regarded as homogeneous in terms of species representation.

Bone fragments were also found in the passage (Nos. 7 and 8), as well as in the area surrounding the building from the west (No. 9), south (No. 5), and east (No. 6).

Table 3. Animal bone remains in the rooms (Nos. 1, 2, and 3) at the site of Topaz Gala.

Tab. 3. Zestawienie szczątków kostnych z poszczególnych pomieszczeń (nr 1, 2 i 3) ze stanowiska Topaz Gala.

Zoological identification	R. 1a	R. 1b	R. 1c	R. 1d	Total in S part	%	Total in N part	%	Total in R. 1	R. 2	R. 3	Total in R. 2-3	%	Total in R. 1-3	%
Sheep/goat	10	118	53	65	246	93.9	676	93.5	922	320	95	415	89.3	1337	92.2
Cattle		3	2	2	7	2.7	36	5.0	43	40	8	48	10.3	91	6.3
Pig			3	6	9	3.4	11	1.5	20		2	2	0.4	22	1.5
Total of livestock mammals	10	121	58	73	262	100.0	723	100.0	985	360	105	465	100.0	1450	100.0
Dog		1	1 in.		1				1					1	
Equids	10	1			11		11		22		7	7		29	
Gazelle		2	1	1	4		1		5	1	1	2		7	
Domestic chicken				2	2		1		3	2		2		5	
Crane				2	1				1	1		1		2	

<sup>4</sup> The information is based solely on description in the documentation that lacked photographs, which makes the interpretation of

the find significantly more difficult.

A low number of remains, below 100 identified fragments, was recovered from the passage (Table 4). They mostly belonged to sheep and goat, but some came from other species: cattle, pig, donkey and gazelle. Slightly more bone remains were discovered outside the external walls of the edifice, and the representation of species was comparable to the ones noted in the rooms.

Summing up the results of the analysis of the zoological identification represented by the faunal material recovered at the site of Topaz Gala it can be concluded that it was comparable everywhere, i.e., in the rooms of the building, the passage surrounding the building, and outside the external walls. All these places showed the highest representation of sheep and goat remains, with more sheep. The share of cattle bones was much lower, followed by even lower percentage of pig bones. Very few fragments belonged to dog, donkey, gazelle, and two species of birds – domestic chicken and crane.

### Anatomical distribution

The analysis of anatomical distribution was performed for the remains of sheep and goat (jointly) as well as cattle. In the case of small ruminants, it was done twice, first, for the bone material discovered in the three rooms, second, for the remains from the area outside the external walls (Table 5). Both assemblages were very similar to each other. All parts of skeleton were represented; most skeletal remains came from the head (approx. 25%), thorax (approx. 30%), and proximal parts of limbs, which have high value from the point of view of consumption (approx. 12–15% each). There were much fewer remains of parts of limbs which have low value in terms of consumption, including phalanges (approx. 5% each). In comparison with the model distribution, there is a slight surplus of the remains of the proximal parts of limbs. The other parts of carcass were found in shares comparable with the model distribution.

Table 4. Animal bone remains located in different parts of the site of Topaz Gala.

Tab. 4. Zestawienie szczątków kostnych zlokalizowanych w różnych częściach stanowiska Topaz Gala.

Zoological identification	Rooms (Nos. 1–3)		Passage (Nos. 7 and 8)		Area outside the external walls						
					West (No. 9)		South (No. 5)		East (No. 6)	Total	
	n	%	n	%	n	%	n	%	n	n	%
Sheep/goat	1337	92.2	74	82.2	379	95.5	377	86.9	50	806	91.0
Cattle	91	6.3	7	7.8	16	4.0	41	9.4	4	61	6.9
Pig	22	1.5	9	10.0	2	0.5	16	3.7	1	19	2.1
Total of live-stock mammals	1450	100.0	90	100.0	397	100.0	434	100.0	55	886	100.0
Dog	1				1		0		0	1	
Equids	29		2		6		4		0	10	
Gazelle	7		1				1			1	
Domestic chicken	5						2			2	
Crane	2										

Table 5. Anatomical distribution of sheep, goat, and cattle remains at the site of Topaz Gala.

Tab. 5. Rozkłady anatomiczne szczątków owcy, kozy i bydła ze stanowiska Topaz Gala.

Body part	Sheep/goat				Cattle		Model
	Rooms		Area outside the external walls				
	n	%	n	%	n	%	%
Head	264	19.7	282	35.0	16	10	20
Thorax	448	33.5	232	28.8	42	26.4	43
Proximal part of front limb	193	14.4	93	11.5	31	19.5	5
Distal part of front limb	76	5.7	32	4.0	7	4.4	8
Proximal part of hind limb	205	15.3	101	12.5	27	17.0	3
Distal part of hind limb	98	7.3	45	5.6	23	14.5	7
Phalanges	53	4.8	21	2.6	13	8.2	14
Total	1337	100.0	806	100.0	159	100.0	

In the case of cattle remains, due to their fairly low number, the analysis was performed for all the fragments discovered at the whole site, without division into sectors. The parts of carcass which are highly valued for consumption were most represented, namely the thorax (26.4%) and proximal parts of limbs (forelimb 19.5% and hind limb 17.0%). There were fewer bone fragments which belonged to parts of low value for consumption, i.e., distal parts of limbs (hind limb 14.5% and 4.4% forelimb), bones of the head (10.1%) and phalanges (8.2%). In comparison with the model distribution, there was a surplus of the proximal part of the forelimb as well as of the proximal and distal parts of the hind limb.

The skeleton of domestic chicken was represented by leg bones (femur and tibiotarsus). Apart from these, a tarsometatarsus of a male (rooster) was found, and the animal probably had had its spur cut off (Fig. 3). The preserved bone remains of crane represented fragments of humerus and radius, i.e., they came from the wing.

### Age and sex

Age analysis showed that young individuals accounted for 7.5% of sheep and goat remains. There was a difference in the share of young animals among the remains found in the three rooms of the building and the area outside. In the first case, the percentage was 5.5%, and a significantly higher, reaching 13.8% was discovered in the assemblage of bones deposited outside the building. The share of remains of cattle individuals killed at a young age was 3.2%. Several donkey teeth represented two individuals which were about 10 and 18 years old at death, as suggested by the remains. Bone fragments of birds belonged to adult individuals.

The data related to the sex of the animals are scarce. Rather sparse fragments of horncores of sheep and goat came from females. Two fragments of metacarpal bones of cattle and two pig canines also belonged to females. One domestic chicken bone represented a male.

### Morphology

Withers height of sheep was calculated on the basis of 16 different anatomical elements (Table 6). It fell within the range of 67.3–77.1 cm, with a majority measuring above 70 cm. It means the animals represented the large form. In the case of goat, withers height was calculated on the basis of two metacarpal bones and two radii, and it reached 56.3 cm (2×), 62.7 cm, and 68.7 cm respectively. Additionally, the length of the larger curve of one of the horncores was transferred to the 100-point scale, where it equalled 18 points. On that basis, it can be concluded that goats represented the small form, with withers height below 69 cm.

In the case of cattle, 16 breadth and length measurements were transferred to the 100-point scale. The resulting values were between 12 and 60 points, with a majority (13 measurements) within the range above 31 points.

This means that cattle belonged to the brachycerous type, of small and medium sizes and withers height not exceeding 130 cm. Two pig measurements were transferred to the 100-point scale and returned values of 24 and 30. It implies that the animals represented a completely domesticated form and were of a small size, with withers height of approx. 50 cm.

On the basis of the measurements of domestic chicken bones it can be concluded that they were only slightly larger than the equivalent bones of modern varieties of small domestic chickens and wild males of *Gallus gallus bankiva*, which is a supposed ancestor of domestic chicken.

### Marks on the bones

A variety of marks were noted on the bone fragments from the site of Topaz Gala. They were mostly connected with the preparation of meat for consumption and also represented the ones formed after disposing of the remains as refuse. The first category mainly included chopping and cutting marks. Some of them were most likely related to disarticulation, i.e., dividing the animals carcass at the joints. This procedure left marks in the form of fine and fairly shallow cuts concentrated on the articulation

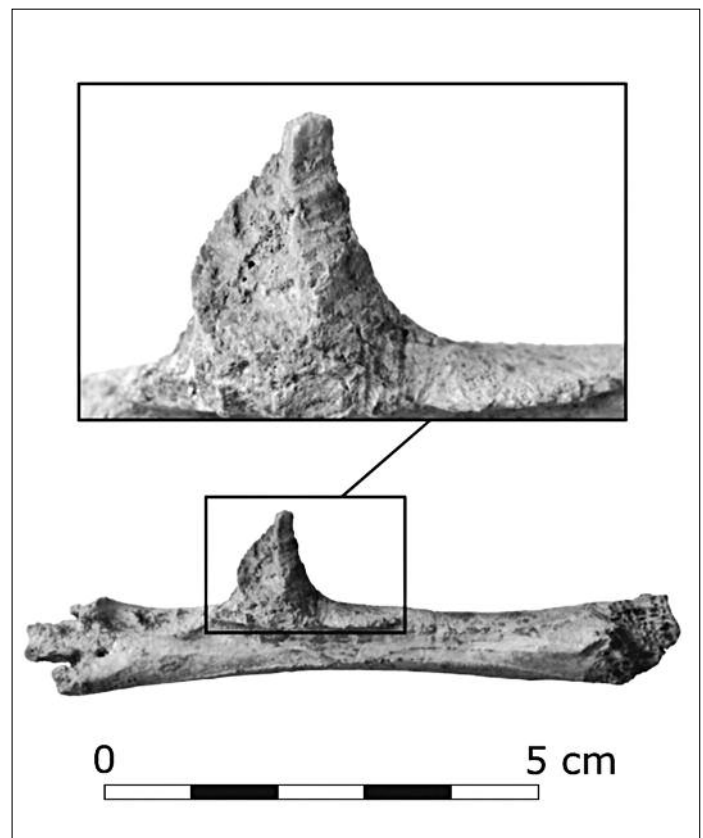


Fig. 3. Fragment of tarsometatarsus of a rooster with marks of cutting off the so-called spur and gnawing by rodents (Photo P. Wojtal).

Ryc. 3. Fragment kości skoku koguta ze śladami obcinania tzw. ostrogi i ogryzania przez gryzonia.



Table 6. Measurements of the animal bone remains from the site of Topaz Gala.

(SLC – smallest length of the Collum scapulae; GL – greatest length; GLC – greatest length from caput (head); Bd – greatest breadth of the distal end; Bp – greatest breadth of the proximal end; SD – smallest breadth of diaphysis; BT – greatest breadth of the trochlea; LA – length of the acetabulum including the lip; GLI – greatest length of the lateral half; GLm – greatest length of the medial half; Ld – length of the dorsal surface; DLS – greatest diagonal length of the sole; HP – height in the region of the extensor process; GB – greatest breadth over the wings; GH – greatest height (of the atlas); LCDe-H – greatest length in the region of the corpus including the dens; Id-goc – the most prominent median point of the oral border of the alveoli of the incisors – the most aboral point of the angle of the mandible; A-P – the most aboral point of the vertex of the cranium in the median plane – the median point of the line joining the most oral points of the premaxillae)

Tab. 6. Wymiary szczątków kostnych ze stanowiska Topaz Gala.

(SLC – najmniejsza długość szyjki łopatki; GL – największa długość; GLC – długość główkowa; Bd – największa szerokość końca dalszego; Bp – największa szerokość końca bliższego; SD – największa szerokość trzonu; BT – największa szerokość bloczka; LA – długość panewki; GLI – długość największa części bocznej; GLm – długość największa części przyśrodkowej; Ld – długość powierzchni grzbietowej; DLS – największa długość podeszwowa; HP – wysokość; GB – największa szerokość między skrzydłami atlasu; GH – największa długość atlasu; LCDe-H – największa długość trzonu wraz z zębem aksisu; Id-goc – najbardziej wystający punkt środkowy na przednim brzegu zębodołów siekaczy – najbardziej tylny punkt na kącie żuchwy; A-P – najbardziej tylny punkt na szczycie czaszki w płaszczyźnie strzałkowo-środkowej – środkowy punkt na linii łączącej najbardziej przednie punkty trzewioczaszki)

Species	Anatomical element	Measurement	mm	Points/withers height (cm)
Sheep	Atlas	GL	49	
	Scapula	SLC	28, 26, 23	
	Humerus	Bd-BT	37-36, 37-36, 34-33, 35-34, 35-31, 37-35, 34-32, 35-34	
	Radius	Bp	10; 33	
	Metacarpal bone	Bd	33	
	Pelvis	LA	32, 35, 30	
	Tibia	Bd	32, 34, 34, 34, 34, 25, 26, 30, 27	
	Talus	GLI-GLm-Bd	34-32-22, 34-32-23, 33-31-21, 33-32-19, 32-31-21, 32-30-21, 31-30-21, 31-29-21, 31-30-22, 32-31-22	WH=77.1(x2); 74.8(x2); 72.6(x3); 70.3(x3)
	Calcaneus	GL	59, 60, 63, 64, 67, 64	WH=67.3; 68.4; 71.8; 72.9(x2); 76.4
	Metatarsal bone	Bd	27, 26	
	Phalanx I	GL-Bp-Bd	46-16-16, 42-13-11, 42-13-11, 36-11-10, 42-12-12, 44-14-12, 36-11-10, 33-11-10, 43-13-12, 39-12-10	
Phalanx III	DLS-Ld-HP	28-26-17		
Goat	Horncore	circumference/length	90/118	18
	Scapula	SLC	23	
	Radius	GL-Bp-Bd-SD	158-26-24-16; 178-28-31-18/11	WH=62.9; 68.7
	Humerus	Bd-BT	37-35, 36-34, 34-32, 33-32, 35-33, 33-32	
	Metacarpal bone	GL-Bp-Bd-SD; Bp; Bd	98-20-25-14/10, 98-18-24-12/8; 26; 26	WH=56.3(x2)
	Pelvis	LA	34	
	Tibia	Bd	31, 31, 31, 31, 31	
	Calcaneus	GL	58	
	Talus	GLI-GLm-Bd	32-32-20, 31-29-21, 29-27-19, 31-28-20, 29-28-19, 33-31-22	
	Phalanx I	GL-Bp-Bd	38-14-12, 38-12-10, 40-12-12, 41-14-11	
Phalanx III	DLS-Ld-HP	32-22-16		

Species	Anatomical element	Measurement	mm	Points/withers height (cm)
Cattle	Metacarpal bone	Bd	48, 46	14; 12
	Talus	GLI-GLm-Bd; GLI-Bd; GLI	61-60-46, 66-60-42, 61-58-34, 67-63-44, 67-64-42; 65-42; 60, 61	37, 50, 37, 56, 56, 48, 35, 37
	Calcaneus	GL	124	60
	Metatarsal bone	Bd	54, 50	50, 38
	Phalanx I	GL-Bd-Bp; GL	64-33-31, 62-29-25; 51	60, 54, 28
	Phalanx II	GL	37, 36, 38	
	Phalanx III	DLS-Ld-HP; Ld-HP	67-51-43; 43-32, 49-32	
Pig	Tooth M3	Length	36	
	Talus	GLI-Bd	41-23, 38-25	30, 24/WH=48.8; 44.5
Donkey	Metacarpal bone	Bd	36	
	Metatarsal bone	Bp	34	
	Talus	GB-GH	57-46	
Dog (skeleton)	Cranium	A-P	138	
	Mandible	Id-Goc	116	
	Atlas	GB-GH	26-16	
	Axis	LCDe-H	40-19	
	Humerus	GLI-GLC-Bp-Bd-SD	120-118-23-20-17-8/9	WH=40.4
	Radius	GL-Bp-Bd-SD	111-10-13-6/4	WH=35.7
	Ulna	GL	129	WH=34.4
	Pelvis	LA	14	
	Femur	GLC-GL-Bp-Bd-SD	126-124-23-18-7/6	WH=37.9
	Tibia	GL-Bp-Bd-SD	136-19-13-7/9	WH=39.7
	Calcaneus	GL	29	
	Talus	GL	17	
Gazelle	Tibia	Bd	23	
	Talus	GLI-GLm-Bd; GLI-Bd	24-22-15, 25-24-15; 25-17	
Domestic chicken	Femur	Bp	>138	
	Tibiotarsus	Gl- Bd-KC	107.9; 11.4; 5.8-6.4	

surfaces of bones which connect with others by means of joints, e.g., talus (**Fig. 4**) and ulna (**Fig. 5**). Chopping is confirmed not solely by the presence of chopping marks but also by the state of preservation of the bones in the form of flaky fragments of significant sizes, frequently with one of the heads preserved. Chopping could have taken place after disarticulation or replaced it. In the case of material from Topaz Gala, probably both manners of dividing animals carcass were exploited. Long bones were more frequently chopped along the shaft, less frequently transversely. Marks left by disarticulation, chopping, and cutting can be seen on fragments of different anatomical elements of sheep, goat, and cattle. It appears that culinary preparation did not involve separating meat from bones, but they were together subjected to thermal processing, i.e., roasting. It is indicated by numerous marks of charring or

burning black of the fragments, with the absence of filleting marks.

Marks of the other category noted on the remains from Topaz Gala had been formed after the bones were discarded as refuse and deposited on the surface of the soil. Marks of gnawing by rodents were the most represented. They were detected on many fragments of bones of different species of mammals (**Fig. 6**) and domestic birds (**Fig. 3**). The marks consisted of a number of parallel grooves, frequently covering a significant portion of the surfaces of the preserved specimens. They were created as a result of activity of rodents, including ground squirrels. Marks of gnawing by dogs were less frequent, and they took form of fairly small depressions, mostly concentrated in the area of the head of long bones representing different species of livestock mammals.

## Discussion

An assemblage of post-consumption remains and a skeleton of a dog were discovered at the site of Topaz Gala, occupied in the Early Iron Age. The skeleton was found in the south-eastern corner of Room 1c. It belonged to an adult female of withers height of approx. 37 cm. It is difficult to explain this find unequivocally. Due to the place of discovery within the most important room of the building interpreted as the fire temple, in the place which was supposed to serve for storing ashes, the dog skeleton can be associated with the sacred zone and possible offering. However, this seems doubtful for several reasons. The most important one is the absence of features indicating that a certain ritual was performed when the animal was deposited in the soil. T. Węgrzynowicz (1982) distinguishes several features which should be present in order to recognise a bone assemblage as a burial. These are: uniqueness, qualities associated with intentional activity, absence of practical explanation, recurrence, and traits indicating ritual activity. Apart from uniqueness, no other feature is reflected at Topaz Gala. Moreover, the absence of photographic documentation and a rather superficial description make it impossible to study the discovery in detail. The only known facts are that it was found in a pit, but there is no evidence suggesting ritual practices. Assemblages of a comparable character are not known from other Early Iron Age sites located in Turkmenistan. All the arguments mentioned above and the fact that the dog bones were found surrounded by a numerous assemblage of post-consumption remains indicate that the skeleton did not come from an animal assigned for sacrifice. It is possible that the remains belong to an individual buried for hygienic reasons. On the other hand, the custom of offering sacrifice of dogs in places related to the sacred zone and in settlements was common in Asia and Europe in different chronological periods (ANDRAŁOJĆ 1993; BENECKE 1994; BECKER 2000; MAKIEWICZ 2003). It is believed that in the cases when remains of buried dogs were not found with human remains, sacrificed animals reflected the function which they fulfilled during their lives, i.e., guard animals. Nevertheless, it seems unlikely in the case of the skeleton discovered at Topaz Gala.

Apart from the dog skeleton, the other faunal remains discovered at the site of Topaz Gala were typical post-consumption remains. They were found in the building, in the passage surrounding the building, and outside the external walls. The bone remains reflect the practices related to meat consumption and economy. The post-consumption character of the material is indicated by: the presence in large numbers, the state of preservation, and marks noted on the surfaces of many fragments. They confirm that carcasses of livestock animals were divided into smaller parts and in this form subjected to further culinary processing which involved roasting pieces of meat with bones. An additional factor supporting the theory of division of car-

cass are the results of the analysis of anatomical distribution of sheep, goat, and cattle from the whole examined area, and in the case of small ruminants also with the area split into two parts: the rooms of the building and the area outside the external walls. The surplus of the remains of the proximal parts of the front and hind limbs of these species indicates intensive division of these parts of the carcass, highly valued for consumption, into smaller portions as well as consumption of meat from scapula and haunch. A similar model of distribution of post-consumption remains is detected at many archaeological sites, regardless of their location and chronology (LASOTA-MOSKALEWSKA unpublished). There were no significant disproportions in the number of bone fragments from the forelimb and the hind limb. One fact which draws attention is that the proximal part of the hind limb of cattle was more frequently divided into smaller portions than in the case of sheep and goat. The reasons for such a practice are unknown, but it might be the consequence of the difference in the size of the same anatomical elements of big and small ruminants. Apart from the surplus of the proximal parts of limbs there are no other disproportions in the shares of the remaining parts of the carcass. This implies that none of them was systematically and consistently taken out of the settled area or brought to it. It must also be emphasized that bones of the whole skeleton of sheep, goat, and cattle were represented in the assemblages from Topaz Gala, including the head and phalanges. It confirms that the butchery, division of carcass, and consumption took place in this area. The bone remains of domestic chicken mostly represented elements of high value for consumption, coming from the leg and thorax. Nevertheless, the number of fragments is insufficient for drawing any more detailed conclusions.

The zoological identification of the faunal remains recovered at Topaz Gala indicated that husbandry of domestic mammals and birds was the basis of the economy of the people who lived there in the Early Iron Age. Hunting of wild animals – gazelles (and possibly wild donkeys) was of marginal importance. Apart from sparse remains of wild mammals, a few bone fragments of crane were also found at the site. At present, these birds appear in the territory of Turkmenistan only during the spring and autumn migrations. They stay in the open spaces during these seasons – fields, meadows, and steppes (CRAMP, SIMMONS 1977: 107). It is possible that cranes nested in the region of the Serakhs Oasis in the past. While they currently nest up to the 48° N, the shift of the border, approx. 300–400 km towards the north, was noted within the last 150 years (KUROČKIN 1987: 271). The birds stay in a wetter environment during their nesting season, mostly in marsh areas, reed beds and near water reservoirs. If such habitats did not exist in the immediate vicinity of Topaz Gala, it should be supposed that the cranes were captured during their migration, i.e., in spring or autumn. It should also be mentioned that cranes could have been tamed and used for their secondary products. They were sometimes kept as

Fig. 4. Marks of division of carcass on sheep talus (Photo Z. Kowarska).

Ryc. 4. Ślady rozczłonkowania widoczne na kości skokowej owcy.



Fig. 5. Marks of fine cuts on the proximal end of goat ulna (Photo Z. Kowarska).

Ryc. 5. Ślady drobnych zacięć na nasadzie bliższej kości łokciowej kozy.

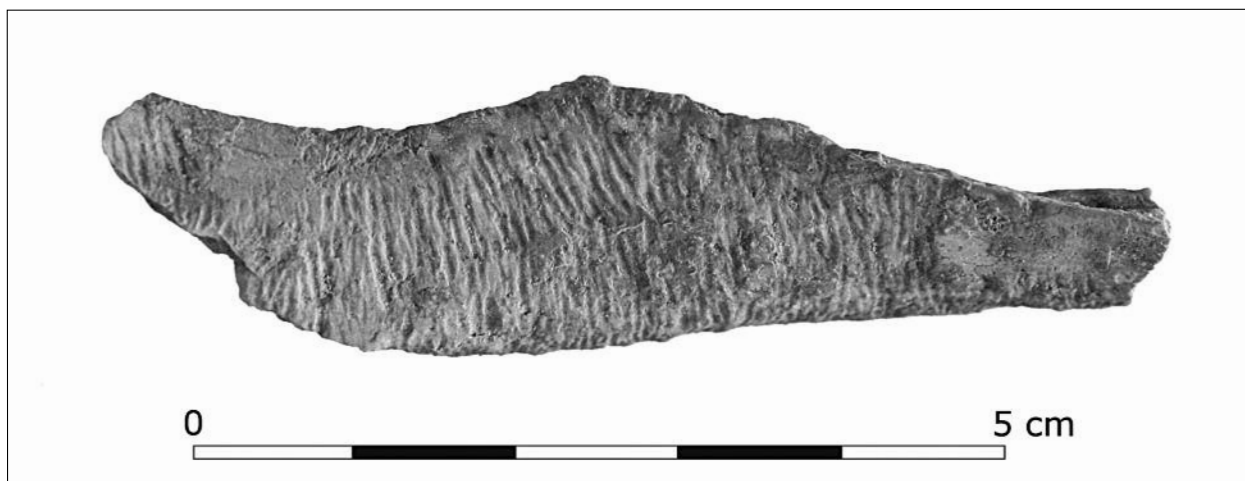


Fig. 6. Marks of gnawing by rodents on a fragment of a long bone of a small ruminant (Photo Z. Kowarska).

Ryc. 6. Ślady ogryzania przez gryzonie na fragmencie kości długiej małego przeżuwacza.

a source of meat or guard birds (LASOTA-MOSKALEWSKA 2005: 263–264). However, in the case of materials from Topaz Gala, there is no evidence for that.

Small ruminants were the most important animals in the husbandry, mainly sheep, and goat to a somewhat lower degree. Cattle and pig were exploited as a minor addition to the benefits taken from raising small ruminants. The insignificant number of domestic chicken remains also shows a small scale of raising poultry and a low share of that meat in the diet.

Regardless of the place where the remains were recovered, there were no differences in the range of species. It was homogeneous in all parts of the site – in the rooms of the building, in the surrounding passage, and outside its external walls. Bone remains of sheep and goat were most represented everywhere, there were fewer fragments of cattle and pig, and bones of other species (donkey, dog, gazelle, crane) were very rare. The significant share of small ruminants in animal husbandry on one hand indicates that the people adapted a pastoral type of economy, and on the other, helps to reconstruct the environment in the settled area. Pastoral type of economy is distinguished by the most important role of small ruminants, sometimes of cattle, with a low significance of pig and equids (LASOTA-MOSKALEWSKA, SZYMCAK 2012: 29). Such a scheme is reflected in the structure represented by the bone remains discovered at Topaz Gala. The open spaces were used as grazing land for small ruminants, which are well-adapted to difficult conditions. Sheep, whose remains were most represented, are particularly well-suited to walking in flat and open areas. Goats are slightly less adjusted to walking in flat areas and function better in mountainous regions. Both of these species can be grazed in environmentally difficult conditions and survive without water and food up to two days (LASOTA-MOSKALEWSKA, SZYMCAK 2012: 27).

Certain indirect conclusions concerning the environment can be drawn on the basis of the range of species represented by the remains. The high share of small ruminant remains as well as the presence of bone fragments of equids, gazelle, and crane indicate that it was of an open, steppe character, and was rather dry. Currently this territory is distinguished by a continental climate. In winter the area is quite cold with an average January temperature reaching minus 5°C. The air is significantly heated in summer and an average temperature in July reaches approx. 28°C. The high annual difference of temperatures is paired with a low level of precipitation of 10–25 mm per year. The area is covered by extensive steppes with grassy vegetation and bulbous plants. They are often killed by the heat in summer. The absence of biological studies makes it impossible to compare the present situation with the circumstances in the Early Iron Age. Nevertheless, it seems that even then the Serakhs Oasis was a fertile plain with a warm continental climate (ORAZOV 1973).

Sheep and goat were mostly raised as a source of meat. It is suggested by the percentage of animals killed at

a young age, before reaching morphological maturity. It amounted to 13.8% for the remains recovered outside the rooms of the edifice, possibly a type of area of economic application. A lower percentage, 5.5%, was noted for the rooms of the building. It seems that a certain selection was made, i.e., adult animals were chosen for consumption in the building. The rationale behind such a practice remains unknown. The data regarding sex of sheep and goat is insufficient for reconstruction of the ratio between the sexes and estimation of animal husbandry practices.

Sheep represented the large form, of an average withers height of 72.5 cm. It was a domesticated form, which was characterised by a robust skeletal structure and exceeded in height the small form, similar to mouflon, which reached 67 cm of withers height at most. It is believed that the large form emerged as a consequence of cross-breeding of domestic sheep with urial (*Ovis vignei*), which could have happened as early as in the Pre-Pottery Neolithic in South-Western Asia. Then it spread to other territories, among others, towards the east, to the northern coasts of the Black Sea and to the River Dniester, which is confirmed by the presence of that sheep at archaeological sites (LASOTA-MOSKALEWSKA, KOBRYŃ, ŚWIEŻYŃSKI 1998). Perhaps it also spread to the area of Central Asia.

Much fewer data can be used for reconstruction of the morphological type of goats raised at Topaz Gala. It is only known that the average withers height of these animals was 61 cm. On the basis of the preserved fragments of horncores it can be concluded that they were sabre-shaped and slightly curled. Therefore, goats represented the small form, common in Europe and Asia from the Neolithic (LASOTA-MOSKALEWSKA, KOBRYŃ, ŚWIEŻYŃSKI 1991). This form comes from the bezoar goat, which is an ancestor of the domestic goat. The absence of data from other Early Iron Age sites located in Turkmenistan prevents a more detailed morphological analysis of small ruminants raised there.

The benefits gained by keeping sheep and goat were supplemented to a minor extent with raising cattle and pig. Fragments of cattle bones accounted for 6.5% of the remains of domestic mammals. Age analysis showed that the animals were partially raised for meat, but above all, they were kept for secondary products, most likely for milk. While the ratio between the sexes is not precisely known, the remains for which sex was established belonged solely to adult females, which suggests husbandry aimed at milk production. Raising animals until maturity is also confirmed by the percentage of bones of individuals killed at a young age, before reaching morphological maturity. It was slightly more than 3% and was lower than at most archaeological sites, where it falls within the range of 5–8% (LASOTA-MOSKALEWSKA 2008: 250). Cattle represented the brachycerous, small type, and its withers height reached between 98 and 130 cm.

The share of pig remains in the bone material belonging to domestic mammals was very low and amounted

to slightly more than 2%. These animals played hardly any role in animal economy. Due to the low number of bones and limited information acquired on their basis, nothing can be stated about the age and sex of the animals, and consequently about the reasons for raising them. It is only known that they represented a completely domesticated form, of a small size and withers height of approx. 50 cm.

The material recovered at Topaz Gala also included some remains of the animals of the *Equidae* family. These fragments accounted for 1.7% of mammal bones and belonged to donkey. However, it is not known whether they represented the domesticated or wild form. Asiatic wild asses live in Central Asia and they include kulan, kiang, and onager. All apart from onager can be tamed and domesticated (LASOTA-MOSKALEWSKA 2005: 190–195). It is also possible that there were domesticated donkeys which came from wild forms from the African region. Nevertheless, they differed in size – Asian donkeys are taller and less robust in comparison with the domestic ones. The lack of length measurements makes it impossible to calculate withers height and estimate the morphotype of the animals whose remains were discovered at Topaz Gala. Solely data related to the age are available – they indicate that the individuals were adult and reached ages of 10 and 18 years. If it is assumed that they represented domestic forms, it could be supposed that they were kept for a long time and exploited for secondary products, most probably for traction, or possibly for riding.

Summing up, on the basis of archaeozoological analysis of the bone remains it can be concluded that domestic animals raised for meat and secondary products were the most significant species for the people of Topaz Gala. The fundamental part of their diet was meat of small ruminants (mostly lamb and mutton, less frequently goat meat), and it was supplemented with beef, pork, and poultry. Animal economy was of typical pastoral character. In the light of the archaeozoological analysis it seems that the bone remains do not reflect any potential practices connected with the role of animals in the sacred zone.

Almost total absence of archaeozoological analyses of materials from Early Iron Age sites located in Turkmenistan makes it impossible to estimate whether the situation at Topaz Gala was different or similar to the circumstances in other centres. General results of the archaeozoological analysis are only known for the site of Ulug Depe located at the foothills of the Kopet Dag mountain range (MAFTUR 2012). It was an important administrative centre of the region, settled since the Chalcolithic Period. Layers from the Yaz Periods I–III were also found there. The information related to the range of animal species represented by the remains recovered at the site is available. A definite majority of the bones belonged to small ruminants (approx. 70%). There were few fragments of cattle (approx. 5%) and pig (approx. 3%). The percentage of gazelle remains representing *Gazella subgutturosa* form reached approx. 4%. There were also equid bones in the material (approx. 17%) and sparse camel remains (approx. 1%). Generally, the range of species from Ulug Depe was similar to the one documented at Topaz Gala. The only differences concerned a lower share of small ruminants at the former, with a higher share of equids. The general tendency in animal economy seems to be similar and indicates the pastoral character of the activities of the people who occupied the steppe territory of southern Turkmenistan in the Early Iron Age.

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## UŻYTKOWANIE ZWIERZĄT NA STANOWISKU Z WCZESNEJ EPOKI ŻELAZA W TOPAZ GALA (TURKMENISTAN)

Praca przedstawia wyniki analizy archeozoologicznej szczątków kostnych pozyskanych podczas badań wykopaliskowych przeprowadzonych w latach 2009–2012 przez misję Instytutu Archeologii UW pod kierunkiem M. Wagnera na stanowisku Topaz Gala, położonym w oazie Serakhs, w południowym Turkmenistanie (**Ryc. 1**). Odkryto tam pozostałości budowli interpretowanej jako świątynia ognia, datowanej na wczesną epokę żelaza (okres Jaz II, 900–550 p.n.e.) (**Ryc. 2**).

Materiał osteologiczny pochodził z trzech spośród czterech odkrytych pomieszczeń budowli, otaczającego ją korytarza oraz obszaru znajdującego się poza murami zewnętrznymi (**Tab. 1**). W jednej z części głównego pomieszczenia budowli znajdował się zachowany w układzie anatomicznym szkielet dorosłego psa, o wzroście około 37 cm. Pozostałe fragmenty kostne stanowiły typowe resztki pokonsumpcyjne, co potwierdza stan ich zachowania oraz ślady zabiegów kulinarnych zaobserwowane na powierzchniach wielu z nich (**Ryc. 4, 5**). Szczątki kostne odzwierciedlają zachowania związane z zajęciami o charakterze gospodarczym.

Składy gatunkowe szczątków znalezionych w różnych miejscach stanowiska były jednorodne (**Tab. 3–5**). Fragmenty kostne należały przede wszystkim do udomo-

wionych ssaków i ptaków. Niewielka część reprezentowała zwierzęta dzikie – gazelę i żurawia, oraz zwierzęta z rodziny koniowatych – osła (**Tab. 2**). W przypadku tych ostatnich nie wiadomo, czy były to zwierzęta dzikie, oswojone czy udomowione. Wśród gatunków udomowionych zdecydowanie dominowały pozostałości owcy i kozy, z przewagą owcy. Na kolejnych miejscach znajdowały się fragmenty kostne bydła, świnia i kury domowej. Najmniej było kości psa.

Dominująca rola małych przeżuwaczy wskazuje na wybitnie pasterski charakter zajęć gospodarczych. Owce i kozy trzymano przede wszystkim jako źródło mięsa. Owce reprezentowały dużą formę, o wzroście około 72,5 cm, a kozy małą formę o wysokości w kłębie około 61 cm (**Tab. 6**). Nieznaczne uzupełnienie korzyści płynących z hodowli małych przeżuwaczy stanowiło bydło oraz, w dalszej kolejności, świnia. Bydło użytkowano głównie przyżyciowo jako źródło mleka, drugorzędne znaczenie miało uzyskanie mięsa do konsumpcji. Należało ono do typu brachycerycznego, niskorosłego, o wzroście od 98 do 130 cm. Świnie reprezentowały formę w pełni udomowioną, niskorosłą, o wzroście około 50 cm. Na niewielką skalę hodowano także drób. Ubój, rozbiór tuszy i konsumpcja mięsa zwierząt hodowlanych odbywały się na zasiedlonym obszarze.