Original Article

Anatomical Study and Determination of the Animal Bones and Teeth Samples of the Excavation of Qareh Tape Sagzabad (Qazvin Province, Iran) in 2018 (Iron Age II and III) and Making 3D Models

Omid Zehtabvar[1*], Mostafa Dehpahlavan[2], Hesameddin Akbarein[3], Majid Masoudifard[4], Marjan Mollabeirami,[5], **Zahra Hojjatzade[6], Mahdieh Jafari[7]**

1. Anatomy Sector, Department of Basic Sciences, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran.
2. Department of Archaeology, Faculty of Literature and Humanities, University of Tehran, Tehran, Iran.
3. Department of Food Hygiene and Quality Control, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran.
4. Department of Surgery and Radiology, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran.
5. Institute of Archaeology, University of Tehran, Tehran, Iran.
6. Graduated from the Faculty of Veterinary Medicinre, University of Tehran, Tehran, Iran.
7. Department of Archaeology, Faculty of Art and Architecture, Bu-Ali Sina University, Hamedan, Iran.

Use your device to scan and read the article online

How to Cite This Article Zehtabvar, O., Dehpahlavan, M., Akbarein, H., Masoudifard, M., Mollabeirami,, M., & Hojjatzade, Z., et al. (2024). Anatomical Study and Determination of the Animal Bones and Teeth Samples of the Excavation of Qareh Tape Sagzabad (Qazvin Province, Iran) in 2018 (Iron Age II and III) and Making 3D Models. *Iranian Journal of Veterinary Medicine*, *18*(1), 97-120. http://dx.doi.org/10.32598/ijvm.18.1.1005311

http://dx.doi.org/10.32598/ijvm.18.1.1005311

ABSTRACT

Background: Zooarchaeology shares close ties with Comparative Anatomy of Veterinary Medicine. This scientific discipline involves the study of the bones of various animals, using anatomical information to explore the place and role of these animal species in life and human survival, thereby enriching our knowledge about the interaction of humans and their ecosystems.

Objectives: Using available anatomical information, this study investigated the typology of bone remains and animal teeth in the area of Qareh Tepe, Segzabad (Qazvin Province, Iran). Another goal was to detect the abnormal effects created by humans or animals in bones, such as cuts, burns, or chewing effects by carnivorous animals. By extracting this information, it is possible to analyze the livelihood economy of that historical site correctly.

Methods: A total of 1110 bone and teeth samples excavated in 2017 were analyzed. The samples were transferred to the Osteology Lab of the Anatomy Department of the Faculty of Veterinary Medicine, University of Tehran, Tehran City, Iran. Anatomical studies were conducted in several stages based on the excavated samples.

Results: Among the detected animal samples, the highest percentage (30.09%) was related to sheep samples, and then the samples of small ruminants (26.94%) (which could not be separated). The percentages of gazelle, Asian water buffalo, wild boar, and chicken were trivial and less than 1%. In this study, abnormal symptoms were detected in the phalanges of the Caspian horse.

Conclusion: One of the remarkable points about the small ruminant samples separated at the species level in this study is that the number of sheep samples detected surpassed that of goats. It seems that the conditions for keeping sheep were more suitable. The number of Perissodactyla, especially horses, shows a significant increase compared to the Neolithic periods and the beginning of the complexity of Iron Age I technology. This finding indicates the use of horses and donkeys in agriculture and transportation activities.

Keywords: Anatomy, Zooarchaeology, Bones, 3D Modeling

Article info:
Received: 30 Jan 2023
Accepted: 17 Apr 2023
Publish: 01 Jan 2024

*** Corresponding Author:**
Omid Zehtabvar, Assistant Professor.
***Address:** Anatomy Sector, Department of Basic Sciences, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran.*
***Phone:** +98 (21) 61117114*
***E-mail:** ozehtabvar@ut.ac.ir*

Introduction

Zooarchaeology, a branch of biology, investigates and analyzes animal remains at ancient sites. It seeks to determine the position and role of animal species in relation to human survival and, in other words, to determine the interaction between humans and their environment. Examining the animal bones remains and classifying them into different species enables us to identify past climatic conditions, animal patterns, diversity, population size, subsistence economy, type of diet, and so on. Generally, various animal species adapt to different biological and living conditions; for example, the climatic conditions of an area require specific species in that region (Albarella, 2017). Zooarchaeology closely connects with comparative anatomy, utilizing it to identify the species of bone samples found in ancient excavations.

Another thing investigated in Zooarchaeology involves the identification of immature animal bone samples by examining the growth plates of the animal. The absence of finalized anatomical features in these bones, particularly in small ruminants, complicates their differentiation (Sisson & Grossman, 1975). In addition, detecting abnormal signs such as welded fractures, osteoporosis, and malformations holds significant importance. These abnormalities are detected and examined by imaging techniques used in veterinary science, such as radiography and CT scans. These techniques help us to extract more information and make more accurate diagnoses (Thrall Widmer, 2018). Also, detecting marks such as cuts (butchery), burns, and cooking in bone samples gives valuable insights (Donlon et al., 2020).

The study of societies in different parts of the Iranian plateau during the first millennium BC reveals some cultural and economic relationships, especially during the Iron II and III Ages. One of the most important sites of this era is Segzabad hillock, about 7 km north of Segzabad City, Boin Zahra County, within the Qazvin Plain. Recent research shows this hill has witnessed three distinct periods: The Copper Age, the late Bronze Age, and the Iron Age (Dehpahlavan & Jahed, 2021).

Excavations in this area have been focused on the Iron Age II and III layers. The objectives were to understand the reasons for the stagnation and end of the life of Qareh Tepe Segzabad, as well as to assess and recognize the cultural pattern during these periods. One of the essential findings of these excavations pertains to animal remains obtained from the residential, cemetery, and sedimentary layers. Based on the architectural spaces, pottery, ornaments, cylinder seals, weapons, and radiocarbon 14 results, the archaeological findings belong to the Iron II and Iron III periods (550-850 BC) (Fāzeli Nashli et al., 2011).

In the excavation project at Qareh Tepe of Segzabad, many questions are raised regarding the inhabitants' economic and cultural interactions with their neighboring sites during the concurrent presence of cultural areas in the north-central plateau and the northwest and west districts of Iran in the Iron Age II and III. Undoubtedly, a detailed examination of the animal remains found from the excavation of the Segzabad hillock can answer most of these questions.

One of the archaeological discoveries in Qareh Tepe of Segzabad pertains to cylinder seals found by Dehpahlavan and Alinezhad (2022). Their study posits that these cylinder seals can be evidence of administrative signs and applications. These cylinder seals were used in decorative necklaces and probably had a religious use in their period.

Trebicka et al. investigated the remains of human bones in the excavations of Qareh Tepe of Segzabad. Their research mentioned the low frequency of caries, as low as 4%. Based on the observed evidence and the high percentage of injuries caused by trauma to the bones, they concluded that the level of interpersonal violence was high (Trebicka et al., 2019).

In another exciting discovery, Dehpahlavan and Jahed (2021) found two tablet-like objects in this ancient site in their archaeological excavations and stated that the objects were used as counting games or game boards.

In addition to the mentioned instances, some anatomical studies have been conducted to help identify and separate the ancient bones of animals. In 2019, Chuang and Bonhomme conducted a study on the samples of domestic equids teeth discovered to distinguish the different species of this group of mammals. One of the things they mentioned is that mandibular molar teeth lack anatomical features that can be used to distinguish between species with high accuracy. Hanot and Bochaton (2018) conducted another study to separate donkey and horse bones. They pointed out their identification keys in their research and claimed that many bones of domestic equids could be identified, and their proportions could be determined within a collection. Salvagno and Albarella (2017) proposed a morphometric system for detecting and analyzing the samples. They noted that the efficiency of the new method will also be tested with discriminant analysis, providing an additional line of analysis to use in conjunction with other methods.

Despite the abundance of animal bones found in various ancient excavations, many of these excavated bones have not been studied and analyzed due to the lack of archeology experts in the country. As mentioned, a close relationship exists between the Comparative Anatomy of bones and Zooarchaeology. For this reason, this study was jointly designed and implemented by veterinary anatomy and archaeology experts. It should be noted that this form of cooperation between veterinary anatomy specialists and archeology collections has been undertaken before (Radmehr et al., 2003). Various studies have been carried out in the field of bone anatomy to identify and separate the bones of different species of animals (Shateri Amiri et al., 2020; Fatahian Dehkordi et al., 2022; Alizadeh et al., 2017; Yousefi, 2016).

In this study, by examining and typifying the remains of animal bones and teeth in the site of Qareh Tepe, Segzabad, and comparing them with the remains of previous eras, we try to explain and correctly analyze the subsistence economy of the site and answer the questions that arise in this context.

Materials and Methods

Bone and tooth samples

This study examined 1110 bone and teeth samples derived from the 2017 excavation in Segezabad hillock. First, each sample was washed with water, and after drying, primary classification and coding were done and placed separately in special zip kip packages. In addition to coding each sample, the required information was recorded on a sheet of paper and inserted into the corresponding package. The samples were transferred to the Osteology Lab of the Anatomy Department of the Faculty of Veterinary Medicine of the University of Tehran.

Anatomical study

Anatomical studies were done in several stages based on the samples. In the first stage, each specimen was assigned to its respective bone. Then, based on visible signs and structures, the taxonomic order to which the bone belonged in the animal classification was diagnosed. At this stage, the skeletal anatomy atlases available in the osteology laboratory and the collection of bones available in Anatomy Hall were used.

In the initial stage of sample separation, the samples were examined for the preliminary diagnosis of animal classification based on the information in "Sisson and Grossman's the anatomy of the domestic animals" book (Sisson & Grossman, 1975). During this stage, the bones and teeth were classified into the following animal groups: Large ruminants, small ruminants, odd-toed ungulates (Perissodactyla), boars, camels, carnivores, rodents, and birds. In the second stage of separation, taxonomic division to species identification was done based on the available anatomical sources that will be referred to. The taxonomic division of this stage is detailed below. In the results section of the article, the number of diagnosed samples in each group will be mentioned.

Among the samples of adult horse bones, despite their distinctive anatomical features from donkeys, some cases were so small that they were identified as Caspian horses (a small horse breed native to Northern Iran). As a reference, we used the Caspian horse skeleton available in the Anatomy Department of the Faculty of Veterinary Medicine of the University of Tehran (Figure 1). It should be noted that the Caspian horse samples with three phalanges (the first, second, and third phalanges of a horse) were related to abnormal symptoms related to some diseases. To complete the diagnosis of abnormal cases, radiography was performed, the description of which is given in the relevant section.

In addition to the mentioned references, "Human and Nonhuman Bone Identification: A color Atlas" was also used to identify different species of animals (France, 2008). Regarding the Rodentia order, we should mention that the investigation was done to separate the rodent samples from the Lagomorpha order. But no sample of Lagomorpha order was found. Frequently, the cases of this order are mistakenly considered as rodents. One of the sources used for species separation of Aves Class samples was the "A Manual for the Identification of Bird Bones From Archaeological Sites" book (Cohen & Serjeantson, 1996). To identify tooth samples better, we used the "Cambridge Manuals in Archaeology: Teeth" book (Hillson, 2005). Finally, to examine the anatomical abnormalities of the bones, which indicated some problems and diseases, we used the book "Palaeopathology, Cambridge Manuals in Archaeology" for better examination and conclusions (Waldron, 2009).

Table 1 presents some of the most essential sources of calcification of all types of samples, including bones and teeth.

Radiography findings

Radiographic images were prepared to complete the information obtained from examining some bone samples with abnormal symptoms. We used Toshiba, DC-12M radiography machine, and Carestream, Directview, Classic CR machine for this study stage.

Specifically, to examine the first, second, and third phalanges of the Caspian horse, which belonged to the same horse, a series of radiographs were prepared using the following projection modes: Lateral, lateral oblique (dorsolateral-palmaro-medial oblique), medial oblique (dorsomedial-palmaro-lateral oblique), dorsopalmar and upright pedal route.

Radiography was performed with horizontal rays and technical factors set at mAs4 and Kvp45.

3D modeling

The bones with minimal damage or special characteristics were selected in this stage. The samples were transferred to the Small Animal Radiology Department Hospital of the Faculty of Veterinary Medicine of the University of Tehran, where CT scans were conducted.

The Siemens Somatom Spirit II CT-Scan machine was employed to prepare images. The technical parameters for this imaging protocol were as follows: Rotation time, 1 s; slice thickness, 1 mm; reconstruction interval, 0.5-1 mm; pitch, 1; x-ray tube potential, 120 kV; and x-ray tube current, 130 mA.

To facilitate a comprehensive examination, appropriate Window width and Window level settings were selected for each section graph within the CT-scan image results. Bone windows were used to check the images.

For 3D modeling, first, the CT scan output of each sample was transferred to 3D Slicer 4.8.0 software in DICOM format to obtain a 3D sample with the .OBJ format featuring the bone pattern. Then, the .OBJ format file was transferred to the 3D Max 2018 software, where the Slicer software did the process of cleaning the wrongly detected items. The final editing was done in the 3D Coat 4.8.15 software, culminating in the 3D printing (Zehtabvar, 2022).

Statistical analysis

The collected data were entered into Microsoft Excel version 2013. Absolute frequency and percentage of relative frequency were used to describe the data.

Results

The specified orders in this study are as follows: Perissodactyla (Family: Equidae), Artiodactyla (Suborders: Ruminantia, Suidae, and Camelidae), Carnivora, Aves Class (Order: Galliformes) and Rodentia.

Table 1. The sources of classification of the samples, including bones and teeth

Samples	Classification Detection	Description	Reference
Teeth	Perissodactyla order, domestic equids (horses, donkeys, and mules)	In the case of the Perissodactyla order, to separate the samples of teeth of domestic equids (horses, donkeys, and mules), the study of Chuang & Bonhomme (2019) was used. Osteology Lab was also used, and it should be mentioned that the samples of goat and sheep bones available in the Osteology Lab were also used.	Chuang & Bonhomme, 2019
Bones	Donkey and horse	The study of Hanot and Bochaton (2018) was used to separate the bone samples of donkeys and horses.	Hanot & Bochaton, 2018
Bones	Artiodactyla order, sheep and goat	Regarding the Artiodactyla order, to separate the sheep and goat samples, we used the study of Salvagno and Albarella (2017). However, it should be noted that the goat and sheep bone samples available in the Osteology Lab were also used.	Salvagno & Albarella, 2017
Femur bone	Sheep and goat	The study of Zedda (2017) was used to separate sheep and goat femur bone samples.	Zedda et al., 2017
Tooth and mandible bone	Sheep and goat	To separate the tooth and mandible bone samples of sheep and goats, the study of Halstead et al. (2002) was used.	Halstead et al., 2002
Lumbar vertebrae	Sheep and deer	The study of Yang et al. (2015) was used to separate the samples of lumbar vertebrae in sheep and deer, although it should be noted that we used the samples of goat and sheep bones available in the Osteology Lab.	Yang et al., 2015
skull bones	Deer	The study of Marzban Abbasabadi et al. (2021) was used to separate the samples of skull bones in deer.	Marzban Abbasabadi et al., 2021
Bones	Cattle and Asian water buffalo	To separate Cattle and Asian water buffalo bone samples, the study of Balkwill and Cumbaa (1992) was also used.	Balkwill & Cumbaa, 1992
Tarsal bones	Cattle and Asian water buffalo	To separate Cattle and Asian water buffalo tarsal bone samples, the study of Noorinezhad et al. (2019) was used.	Noorinezhad et al., 2019

Table 2. Absolute and relative frequencies of animal bone samples of the exploration site by distinguishing the bones detected in each sample, including parts which cannot be separated

Samples \ Species	No. (%)											
	Goat	Sheep	Persian gazelle	Small ruminant (not differentiated)	Cattle	Asian water buffalo	Wild boar	Horse	Domestic dog	Rodent	Chicken	One-humped camel
Skull	2(2.56)	5(1.50)	1(100)	7(2.34)				1(0.68)	3(3.41)	5(9.62)		
Maxilla	3(3.85)	7(2.10)		23(7.69)	1(2.50)		1(50.00)	7(4.73)				1(9.09)
Hyoid apparatus				4(1.34)								
Tooth	20(25.64)	92(27.54)		9(3.01)	4(10.00)		1(50.00)	33(22.30)	20(22.73)			
Mandible	2(2.56)	8(2.40)		3(1.00)	1(2.50)			7(4.73)	2(2.27)	5(9.62)		
Cornual process	4(5.13)	2(0.60)			4(10.00)							
Rib				86(28.76)	12(30.00)			1(0.68)	15(17.05)			
Sternebrae				11(3.68)								
Atlas	1(1.28)	3(0.90)						1(0.68)	1(1.14)			
Axis		1(0.30)						1(0.68)	3(3.41)			
Cervical vertebrae				21(7.02)				10(6.76)	10(11.36)	4(7.69)		1(9.09)
Thoracic vertebrae				19(6.35)	1(2.50)			6(4.05)	2(2.27)	4(7.69)		
Lumbar vertebrae				25(8.36)				8(5.41)				3(27.27)
Sacrum				11(3.68)				2(1.35)				1(9.09)
Caudal vertebrae				21(7.02)					1(1.14)			
Scapula	1(1.28)	6(1.80)						3(2.03)		5(9.62)		
Humerus	2(2.56)	9(2.69)			2(5.00)			3(2.03)	4(4.55)	4(7.69)	1(50.00)	
Radius	3(3.85)	9(2.69)		2 (0.67)				9(6.08)				

Samples \ Species	No. (%)											
	Goat	Sheep	Persian gazelle	Small ruminant (not differentiated)	Cattle	Asian water buffalo	Wild boar	Horse	Domestic dog	Rodent	Chicken	One-humped camel
Ulna		5(1.50)			1(2.50)							
Carpal bones					1(2.50)			2(1.35)				
Metacarpal bones	5(6.41)	20(5.99)		4 (1.34)				4(2.70)	5(5.68)			1(9.09)
Femur	2 (2.56)	7(2.10)		2(0.67)	4(10.00)			3(2.03)	5(5.68)	6(11.54)	1(50.00)	
Tibia	2(2.56)	18(5.39)		2(0.67)	1(2.50)			1(0.68)	4(4.55)	6(11.54)		
Metatarsal bones	8(10.26)	22(6.59)		12(4.01)				6(4.05)	4(4.55)			1(9.09)
The first phalanx	10(12.82)	41(12.28)		10(3.34)	2(5.00)			4(2.70)	3(3.41)			2(18.18)
The second phalanx	6(7.69)	34(10.18)		6(2.01)	2(5.00)			3(2.03)	5(5.68)			1(9.09)
The third phalanx	3(3.85)	20(5.99)		2(0.67)	1(2.50)			7(4.73)	1(1.14)			
Proximal sesamoid								3(2.03)				
Distal sesamoid								1(0.68)				
Calcaneus	2(2.56)	10(2.99)		5(1.67)	1(2.50)			6(4.05)				
Talus	1(1.28)	12(3.59)		4(1.34)	2(5.00)	2(100.00)		7(4.73)				
Hip bone (ilium)	1(1.28)	3(0.90)		1(0.33)				1(0.68)		5(9.62)		
Hip bone (ischium)				7(2.34)				3(2.03)		4(7.69)		
Hip bone (pubis)				1(0.33)				1(0.68)		4(7.69)		
Hip bone (acetabulum)				1(0.33)				4(2.70)				
Total	78	334	1	299	40	2	2	148	88	52	2	11
Unknown	53											
The sum of all species	1110											

Table 3. Absolute frequency and percentage of relative frequency of animal bone samples of the exploration site, the total number of samples detected in each species

Parameters	Goat	Sheep	Persian gazelle	Small ruminant (not differentiated)	Cattle	Asian water buffalo	Wild boar	Horse	Domestic dog	Rodent	Chicken	One-humped camel	Unknown
Absolute frequency	78	334	1	299	40	2	2	148	88	52	2	11	53
Percentage of relative frequency	7.03	30.09	0.09	26.94	3.60	0.18	0.18	13.33	7.93	4.68	0.18	0.99	4.77

Regarding the order Perissodactyla, we should mention that the study samples were related to horses (*Equus ferus caballus*), and no donkey samples (*Equus asinus*) or Persian onager samples (*Equus hemionus onager*) were found among the samples. For this reason, the word "horse" has been used in the article's tables, figures, and text for the samples identified in this group.

Regarding the Artiodactyla order, we should mention that from the suborder Ruminantia in this study, the samples related to cattle (*Bos taurus*), sheep or domestic sheep (*Ovis aries*), goat or domestic goat (*Capra hircus*), Persian gazelle (*Gazella subgutturosa*), Asian water buffalo (*Bubalus bubalis*) were mentioned separately in the tables, figures, and the text. In addition, in the Artiodactyla order, Wild boar (*Sus scrofa*) from the Suidae family and one-humped camel (*Camelus dromedarius*) from the Camelidae family were also detected separately.

In the case of the Carnivora order, we should mention that from the Canidae family, samples related to the Canis genus were identified as domestic dog species (*Canis familiaris*).

Regarding the Rodentia order, it is to be noted that due to the lack of comparative anatomical sources for this order, the separation of different species of rodents was not done.

Regarding the Aves Class, we should mention that the samples were from the Galliformes order. However, the separation to the extent of species separation showed that all the samples were identified as chicken (Gallus domesticus).

In Tables 2 and 3, the absolute frequency and percentage of the relative frequency of animal bone samples from the exploration of Qareh Tape Sagzabad in 2018 were separately determined for each species. Then, the cumulative display of the samples diagnosed in each species is presented as total (Tables 2, 3)

Among the identified animal samples, the highest percentage of the relative frequency, with 30.09%, belonged to sheep samples. After that, samples of small ruminants with 26.94% could not be separated (goat, sheep, or Persian gazelle). After collecting small ruminants, the highest percentage of relative frequency, with 13.33%, was related to horses and domestic dogs, with 7.93%. After the domestic dog, the goats took 7.03%, then Rodentia at 4.68%. After Rodentia, cattle followed with a relative frequency of 3.60%. The relative frequency of one-humped camel was 0.99%. The percentage of the relative frequency of gazelle, Asian water buffalo, wild boar, and chicken was minimal and less than 1%.

In Table 4, the absolute and relative frequencies of immature animal bone samples from the exploration of Qareh Tape Sagzabad in 2018 are separated based on the detected bones in each species. Data are displayed for each species as a total of the detected samples. Among the detected immature animal samples, the highest percentage of the relative frequency, with 81.82%, pertained to small ruminant samples, followed by carnivore samples (most likely domestic dogs) with 9.92%. Immature samples of odd-toed ungulates (Perissodactyla) accounted for 6.61% of samples, and samples of large ruminants accounted for 1.65%. Apart from the mentioned species, no immature bones of other species were observed (Table 4). However, in the case of immature bones, the distinction between the species of ruminants was not very accurate. Therefore, in this Table, small ruminants, large ruminants, odd-toed ungulates (Perissodactyla), and carnivores are collectively presented.

Table 5 lists the absolute and relative frequencies of bones with traces of human intervention (such as butchery effects, etc.) from the exploration of Qareh Tape Sagzabad in 2018. They were displayed separately by the identified bones in each species and the total samples detected for each species (Table 5). Among the samples with traces of human intervention, the highest percent-

Table 4. Absolute frequency and percentage of relative frequency of immature animal bone samples of the exploration site, distinguishing the bones detected in each species

Species / Samples	No. (%)							
	Small ruminant (not differentiated)	Large ruminant (not differentiated)	Wild boar	Odd-toed ungulates (Perissodactyla)	Carnivores	Rodent	Chicken	One-humped camel
Skull	5(2.53)				2(8.33)			
Maxilla	15(7.58)							
Hyoid apparatus								
Tooth	3(1.52)				13(54.17)			
Mandible	2(1.01)				2(8.33)			
Cornual process								
Rib								
Sternebrae								
Atlas								
Axis								
Cervical vertebrae	15(7.58)			2(12.50)				
Thoracic vertebrae	10(5.05)			1(6.25)				
Lumbar vertebrae	13(6.57)			1(6.25)				
Sacrum	6(3.03)							
Caudal vertebrae								
Scapula	2(1.01)							
Humerus	5(2.53)	1(0.25)		1(6.25)	2(8.33)			
Radius	9(4.55)			2				
Ulna	2(1.01)							
Carpal bones								
Metacarpal bones	19(9.60)			2(12.50)				
Femur	5(2.53)	2(0.50)		1(6.25)	3(12.50)			
Tibia	12(6.06)				2(8.33)			
Metatarsal bones	21(10.61)			3(18.75)				
The first phalanx	28(14.14)	1(0.25)		2(12.50)				
The second phalanx	22(11.11)			1(6.25)				
The third phalanx	3(1.52)							
Proximal sesamoid								

Species / Samples	No. (%)							
	Small ruminant (not differentiated)	Large ruminant (not differentiated)	Wild boar	Odd-toed ungulates (Perissodactyla)	Carnivores	Rodent	Chicken	One-humped camel
Distal sesamoid								
Calcaneus								
Talus								
Hip bone (ilium)	1(0.51)							
Hip bone (ischium)								
Hip bone (pubis)								
Hip bone (acetabulum)								
Total	198 (81.82)	4 (1.65)	0	16 (6.61)	24 (9.92)	0	0	0
The sum of all species	242							

age of the relative frequency (41.53%) belonged to sheep samples, followed by small ruminants with 37.38%. Finally, there were goat samples with 7.03%, horse samples with 5.11%, and cattle samples with 2.56%. In other species, the effects of human intervention, such as butchery, etc., were not observed (Table 5).

In the following, we discuss representative samples with butchery marks. Among the samples with butchery marks, a small ruminant immature metatarsal bone had cut marks in the distal part of the body (Figure 2). Among these samples, there was a left talus bone related to sheep, which had cuts on the distal surface of the talus (Figure 3). A left-side immature humerus bone from the small ruminant, which had cut marks on the cranial surface of the distal part of the body and distal extremity, was also detected (Figure 4). A cornual process sample o a Persian gazelle was identified, which was cut into two pieces (Figure 5). A left-side immature metacarpal bone sample of a small ruminant was found with cuts and scratches on the cranial surface of the body and signs of being chewed by carnivore teeth (Figure 6). Another small ruminant immature metatarsal bone sample was identified with cuts and scratches on the cranial surface of the body (Figure 7). Moreover, a sample of a small ruminant's right immature metacarpal bone was found to have cuts and scratches on the cranial surface of the body, as well as signs of being chewed by carnivore teeth (Figure 8). Lastly, one talus bone and one left-side calcaneus bone of sheep were identified; these two bones belonged to the same animal. The talus bone on the dorsal surface and the calcaneus bone on the lateral surface of their distal part had cut marks (Figure 9).

Three phalanges (first to third) were identified among the samples related to a horse. Based on the structure and size of the bones, they were related to the limb of a horse. Although they were smaller than the usual norm of an adult horse, they did not belong to a donkey either. By matching with the existing bone samples from the Caspian horse, it was found that these three phalanges belonged to the forelimb of an adult Caspian horse (Figure 10). As mentioned, abnormal cases related to the disease were observed in these three phalanges, which were then investigated through radiography. The observed symptoms included mild side bone of the P3 (lateral and medial), mild new bone formation (high ringbone) of dorsomedial and dorsolateral proximal P2, and mild osteoarthrosis of the pastern joint (Figure 11). Also, among the horse samples, a right humerus bone sample with cutting marks on the caudal surface of the distal part was detected (Figure 12). Additionally, Figure 13 shows the bones from which the 3D reconstruction was performed, and the 3D printed samples have been shown. All the information mentioned in the tables about the number of different bones are displayed in Figures 14, 15 and 16.

Discussion

The collection of remains of animal bones from Qareh Tape Sagzabad (Qazvin Plain, Iran) in 2018 encompasses 11 species. Small ruminants had the highest per-

Table 5. Absolute frequency and percentage of relative frequency of immature animal bone samples with traces of human intervention (such as butchery effects, etc.) of the exploration site, distinguishing the bones detected in each species

Species / Samples	No. (%)											
	Goat	Sheep	Persian gazelle	Small ruminant (not differentiated)	Cattle	Asian water buffalo	Wild boar	Horse	Domestic dog	Rodent	Chicken	One-humped camel
Skull	1(4.54)	3(2.31)		3(2.56)								
Maxilla		2(1.54)		2(1.71)	1(12.50)							
Hyoid apparatus												
Tooth												
Mandible		4(3.08)		1(0.85)								
Cornual process	1(4.54)											
Rib				40(34.19)	3(37.50)							
Sternebrae												
Atlas	1(4.54)	2(1.54)										
Axis												
Cervical vertebrae				5(4.27)								
Thoracic vertebrae				6(5.13)								
Lumbar vertebrae				19(16.24)								
Sacrum				3(2.56)								
Caudal vertebrae												
Scapula												
Humerus	1(4.54)	3(2.31)						1(6.25)				
Radius	1(4.54)	5		1(0.85)				4(25.00)				
Ulna	1(4.54)	2(1.54)										
Carpal bones								1(6.25)				
Metacarpal bones	2(9.09)	10(7.69)		2(1.71)				2(12.50)				
Femur	1(4.54)	3(2.31)		1(0.85)	2(25.00)			1(6.25)				
Tibia	1(4.54)	9(6.92)		1(0.85)				1(6.25)				
Metatarsal bones	4(18.18)	12(9.23)		7(5.98)				2(12.50)				
The 1st phalanx	6(27.27)	25(19.23)		5(4.27)	1(12.50)							
The 2nd phalanx	1(4.54)	26(20.00)		2(1.71)								

Species / Samples	No. (%)											
	Goat	Sheep	Persian gazelle	Small ruminant (not differentiated	Cattle	Asian water buffalo	Wild boar	Horse	Domestic dog	Rodent	Chicken	One-humped camel
The 3rd phalanx		10(7.69)										
Proximal sesamoid												
Distal sesamoid												
Calcaneus		6(4.61)		5(4.27)				2(12.50)				
Talus	1(4.54)	7(5.38)		4(3.42)	1(12.50)			1(6.25)				
Hip bone (ilium)		10.77)		1(0.85)								
Hip bone (ischium)				7(5.98)				1(6.25)				
Hip bone (pubis)				1(0.85)								
Hip bone (acetabulum)				1(0.85)								
Total	22(7.03)	130(41.53)	0	117(37.38)	8(2.56)	0	0	16(5.11)	0	0	0	0
Unknown, Due to burning and fragmentation	20(6.39)											
The sum of all species	313											

centage, and then horse samples. The existence of this number of small ruminants, which need a suitable environment for grazing and feeding, indicates a suitable habitat for their breeding and feeding (Radmehr, 2012). Talai, (1983) have previously mentioned the favorable environmental conditions of this region. Therefore, in Qareh Tape Sagzabad in Iron Age II and III, small ruminants (sheep and goats) played an essential role in the subsistence economy.

One of the remarkable findings about the small ruminant samples separated at the species level in this study points to the higher number of sheep samples than goats. Goats can climb, stand on their hind legs, jump, and cross difficult areas to reach a safe area. Therefore, goat herds cover more distant areas than sheep when crossing pastures, and their control is more challenging (Zeder & Hesse, 2000). Goats have elongated limbs and thinner trunks than sheep. Such features have made the goat suffer less damage than the sheep in times of danger and sress. Goats can cleverly flee when faced with an unexpected threat, while sheep generally flee with their flock. Comparative analyses of feed consumption between goat and sheep reveal that goats have higher feed consumption. This difference is due to their higher net energy requirements for maintenance. Strong evidence supports that goats require more energy for maintenance than sheep, and goats' metabolic requirements per kilogram of body weight are more similar to those of cows. Therefore, it makes sense for goats to consume more food than sheep to maintain body weight (Pugh & Baird 2012; Zeder & Hesse 2000). Based on these facts, the conditions for keeping sheep seemed more suitable.

Since a small percentage of small ruminant bone samples were immature and the ossification centers of many bone samples were closed, they must be kept for a long time without being butchered to use their meat. Therefore, their primary reason for keeping them was to use their milk and wool in addition to meat. The same situation is observed for large ruminants, which may have been used for other purposes, such as carrying loads and working in the field (Reitz & Wing 2008).

In Qareh Tape Sagzabad, during Iron Age II and III, the number of odd-toed ungulates (Perissodactyla), es-

Figure 1. Adult Caspian horse skeleton, available in Anatomy Hall of Veterinary Medicine Faculty, University of Tehran

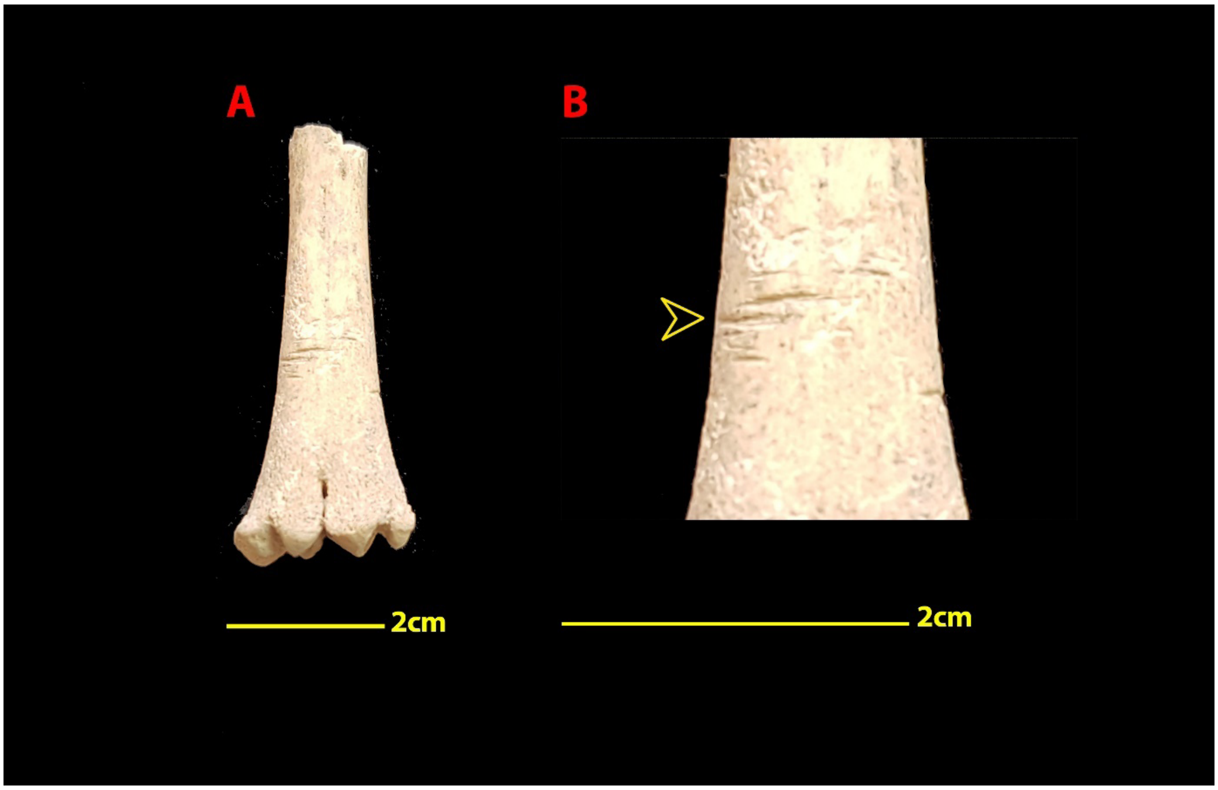

Figure 2. A) Cranial view of small immature ruminant metatarsal bone, B) Higher magnification of the same bone

The main cuts are marked in image B.

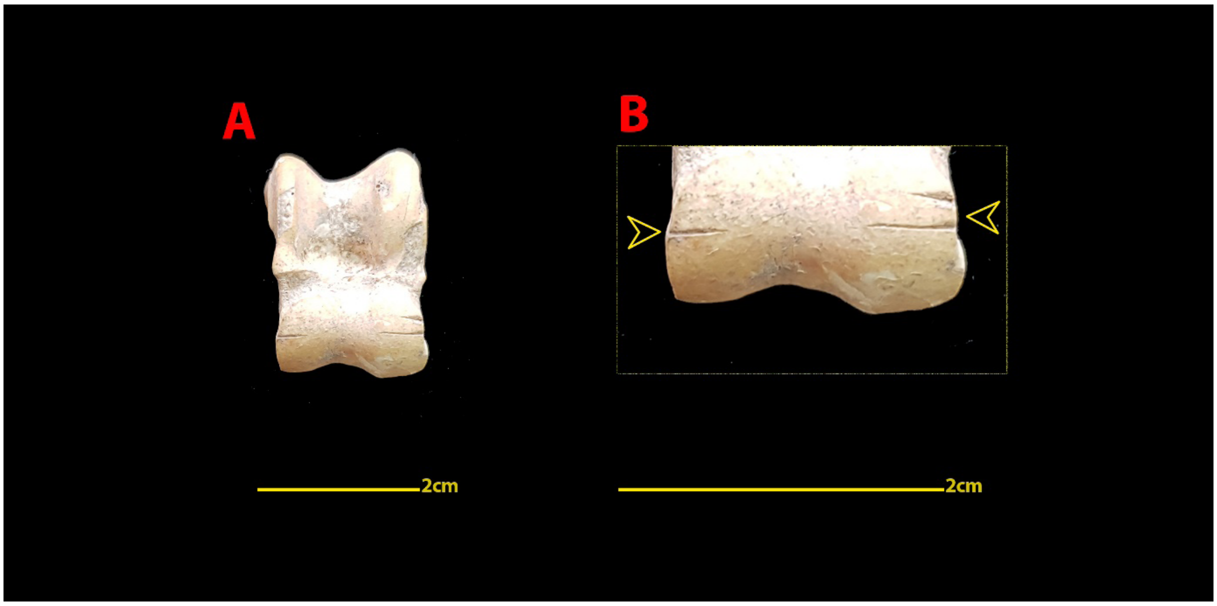

Figure 3. A) Dorsal view of sheep talus bone, B) Higher magnification of the same bone

Cutting marks are indicated in this image B.

Figure 4. A) Cranial view of a small ruminant immature humerus bone, B) Higher magnification of the same bone

The main cuts are highlighted in image B.

Figure 5. The cornual process of the Persian gazelle cut into two pieces

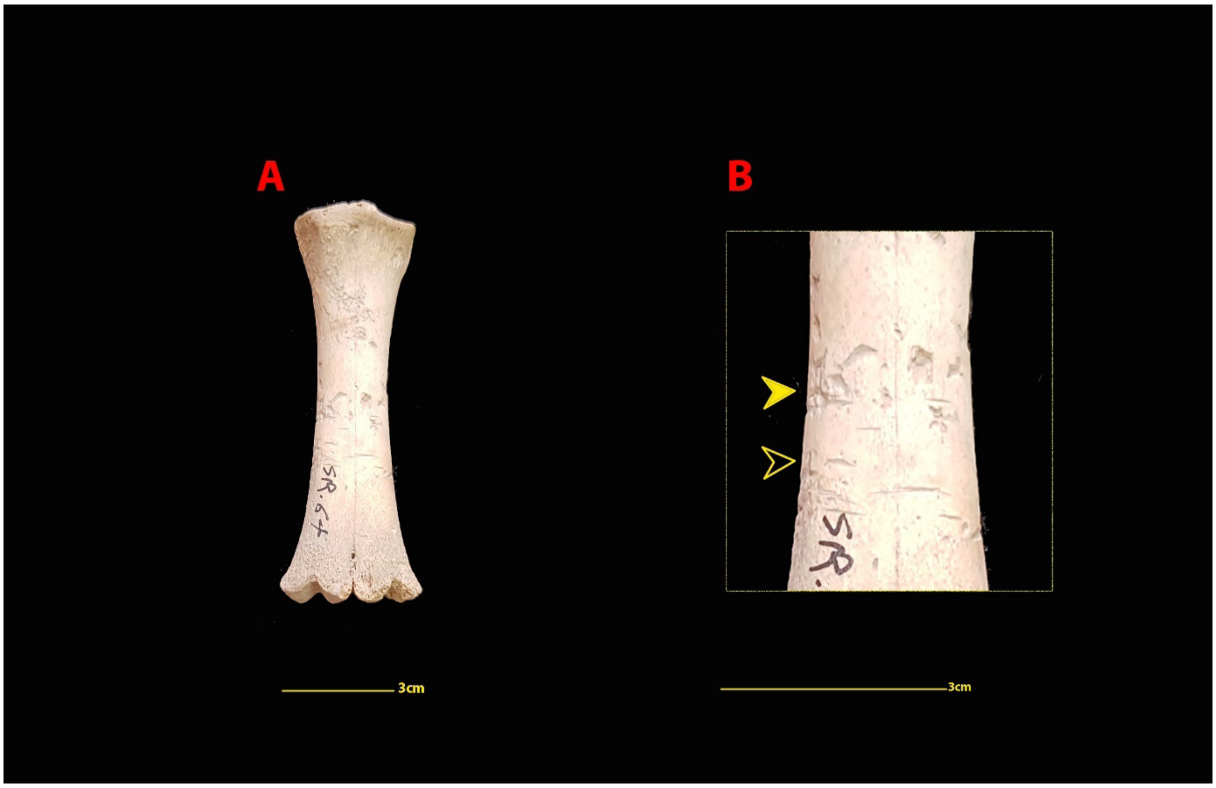

Figure 6. A) A dorsal view of the small ruminant immature metacarpal bone, B) Higher magnification of the same bone

The main traces of cutting are shown with a hollow arrow, and the main traces of chewing with the teeth of carnivores are marked in this image with a solid arrow.

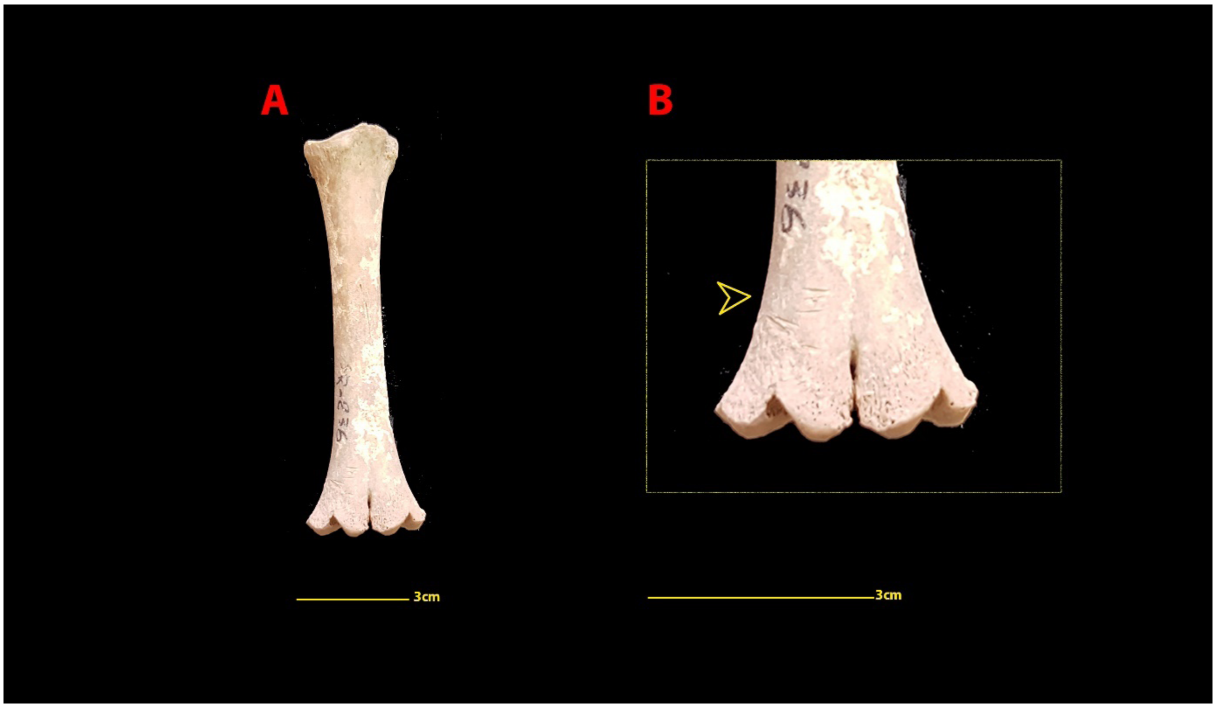

Figure 7. A) Dorsal view of small ruminant immature metatarsal bone, B) Higher magnification of the same bone arrows indicate major cuts

Figure 8. A) A dorsal view of the immature metacarpal bone of a small ruminant, B) A higher magnification of the same bone The main cutting marks with a hollow arrow and the main marks of chewing with carnivore teeth are marked in this image.

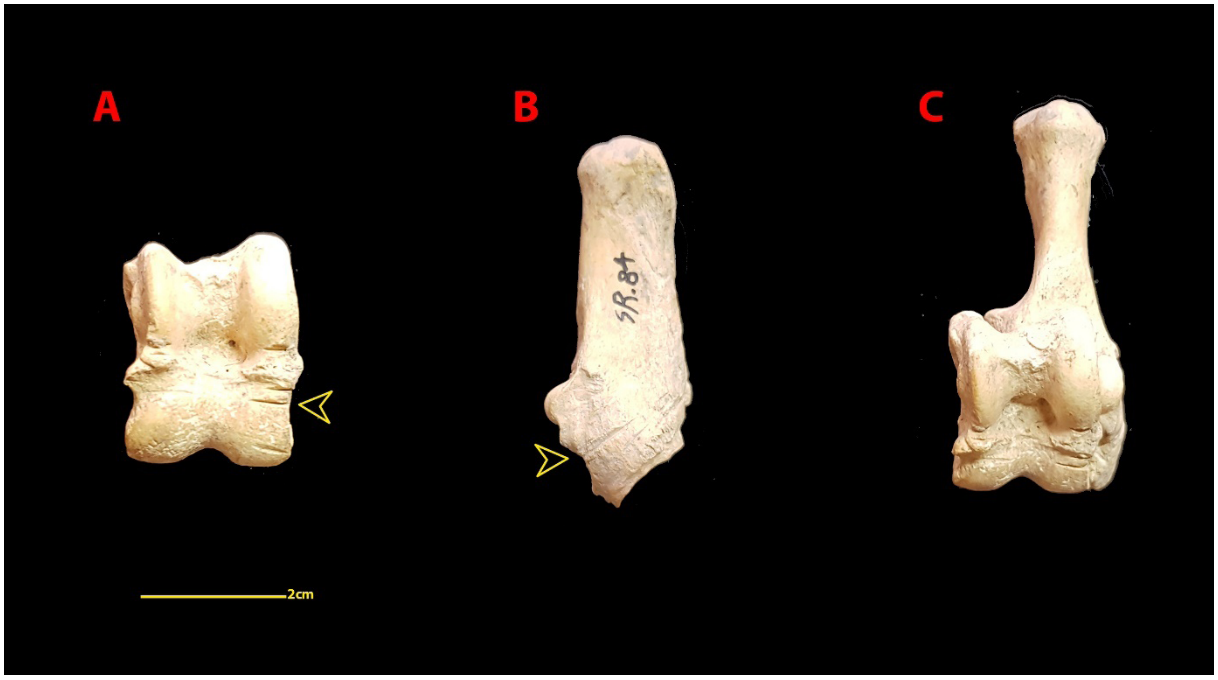

Figure 9. A) Dorsal view of talus bone of sheep, B) Lateral view of calcaneal bone of sheep, C) Longitudinal view of jointing and joining of these two bones

The main effects of cutting are marked with arrows in these images.

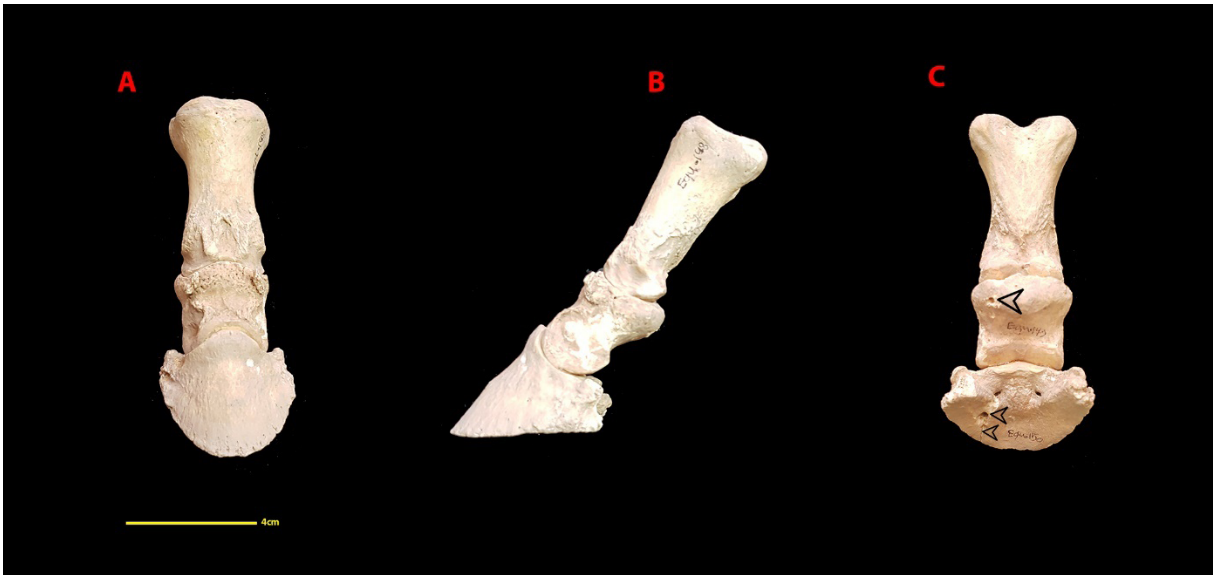

Figure 10. A) Dorsal view of the three first, second, and third toes of the Caspian horse, B) The lateral view, C) Palmar view

In the palmar view, part of the damage and fracture caused in the process of exploring the samples is marked with a black arrow; it should be noted that these three phalanges are connected using glue.

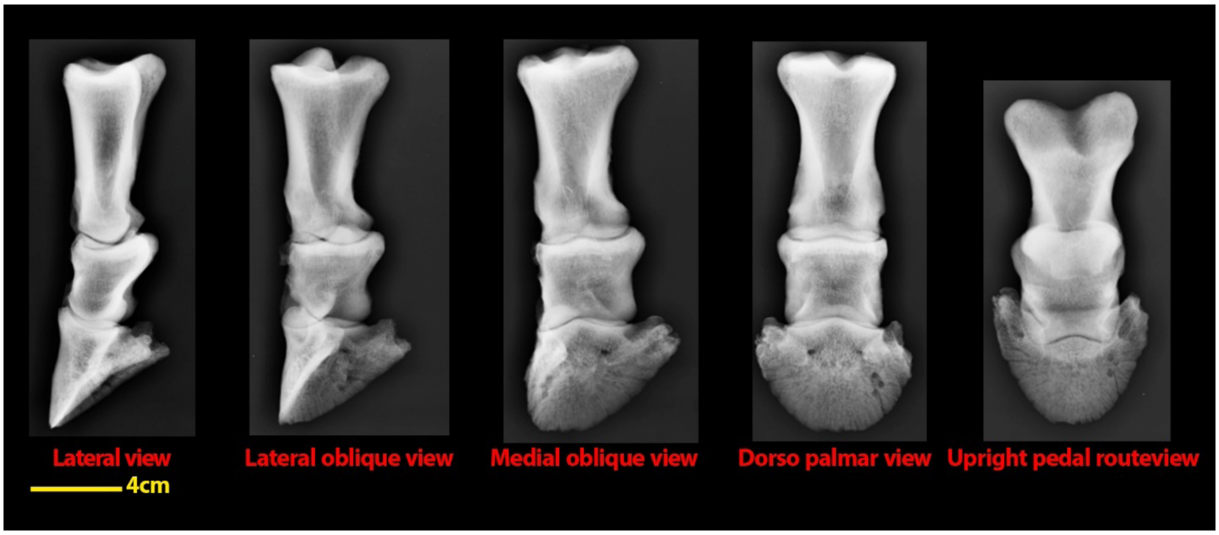

Figure 11. Radiographs with different views of the three phalanges of the Caspian horse

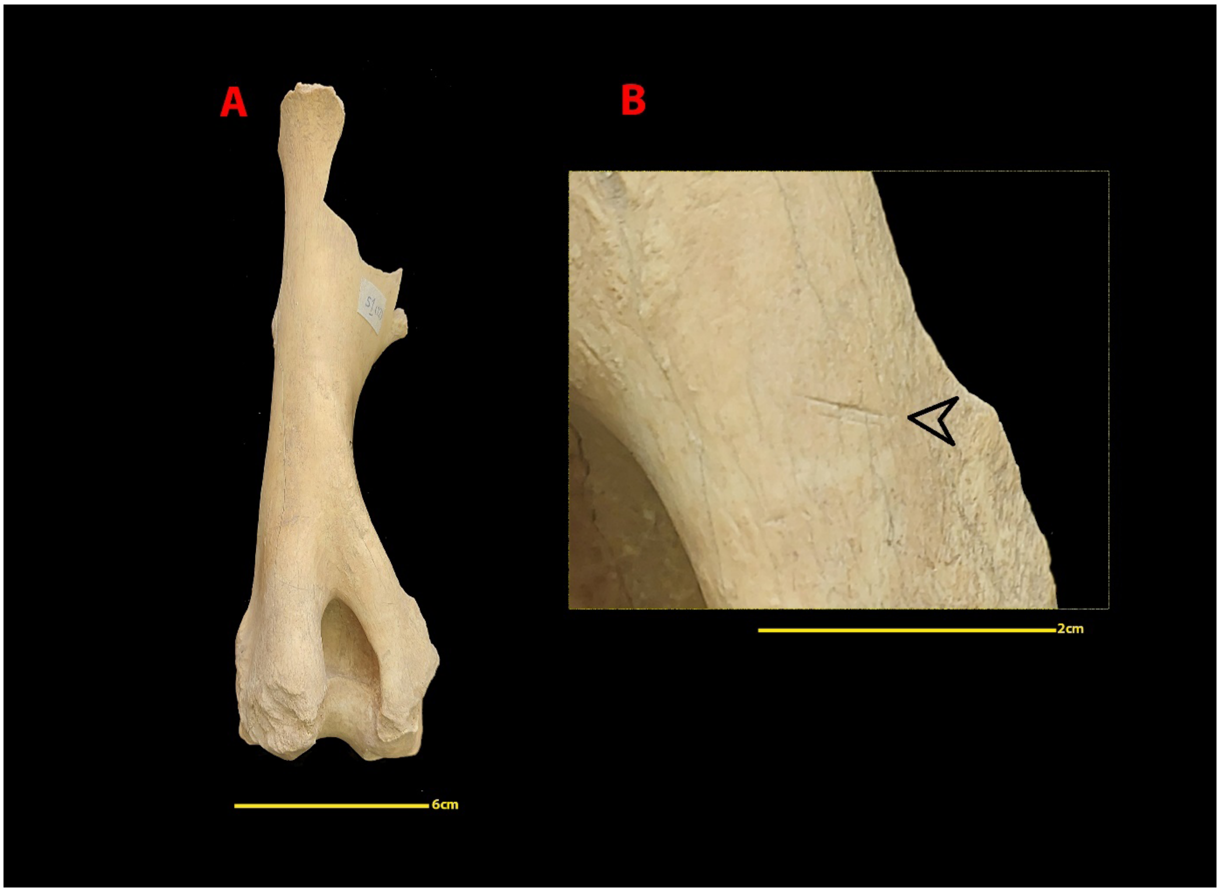

Figure 12. A) Caudal view of humerus bone of horse, B) Higher magnification of the same bone

The main cuts are indicated by arrows in image B.

Figure 13. A, B) The lateral view of the horse's scapula; C, D) The lateral view of the horse's radius and ulna; E, F) The dorsal view of the horse's metatarsal bone, (G, H) The dorsal view of the first and second metatarsal bones of the horse; (I, J) Caudal view of goat skull; (K, L) Lateral view of the third, fourth, fifth and sixth cervical vertebrae of horse

In this image, the indicative bones that have been possible for a 3D reconstruction due to the approximate completeness of the anatomical structure and the 3D print samples are displayed; in each set, the right figure is the original bone sample, and the left figure is the 3D print.

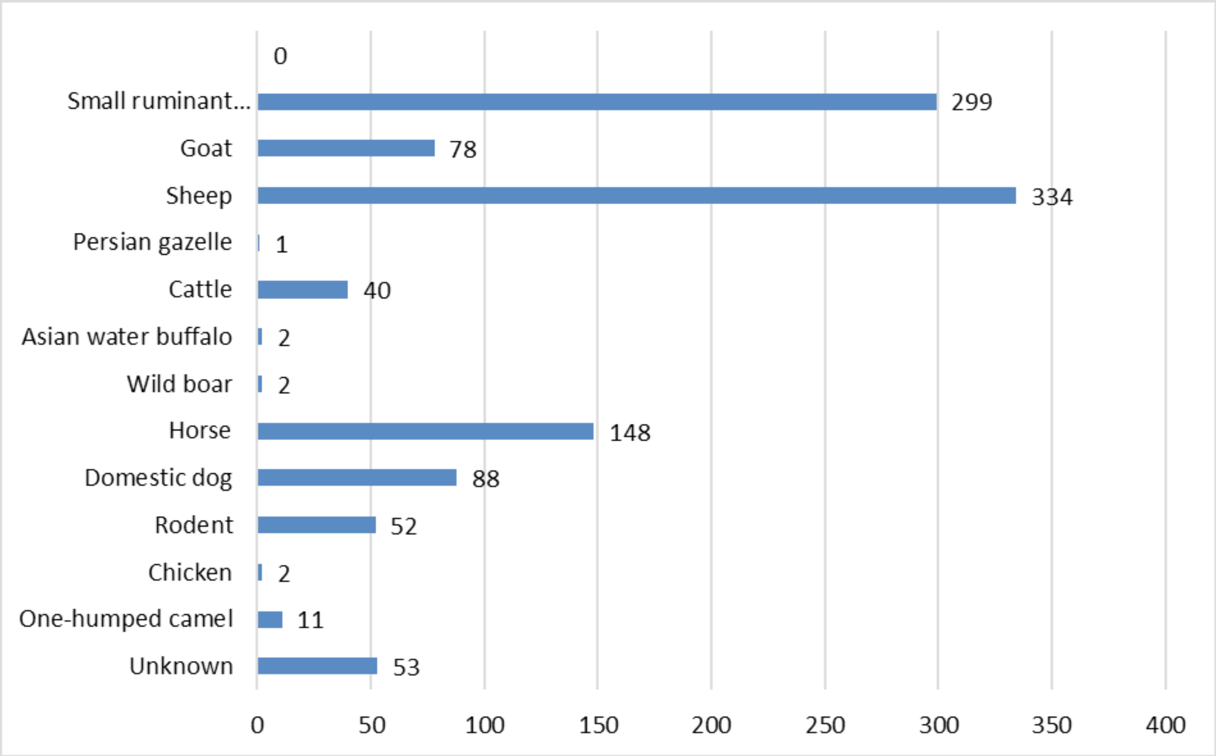

Figure 14. The absolute frequency of animal bone samples in the exploration of Qareh Tape Sagzabad in 2018

The chart also presents some of the bones related to small ruminants that could not be separated to the extent of species recognition.

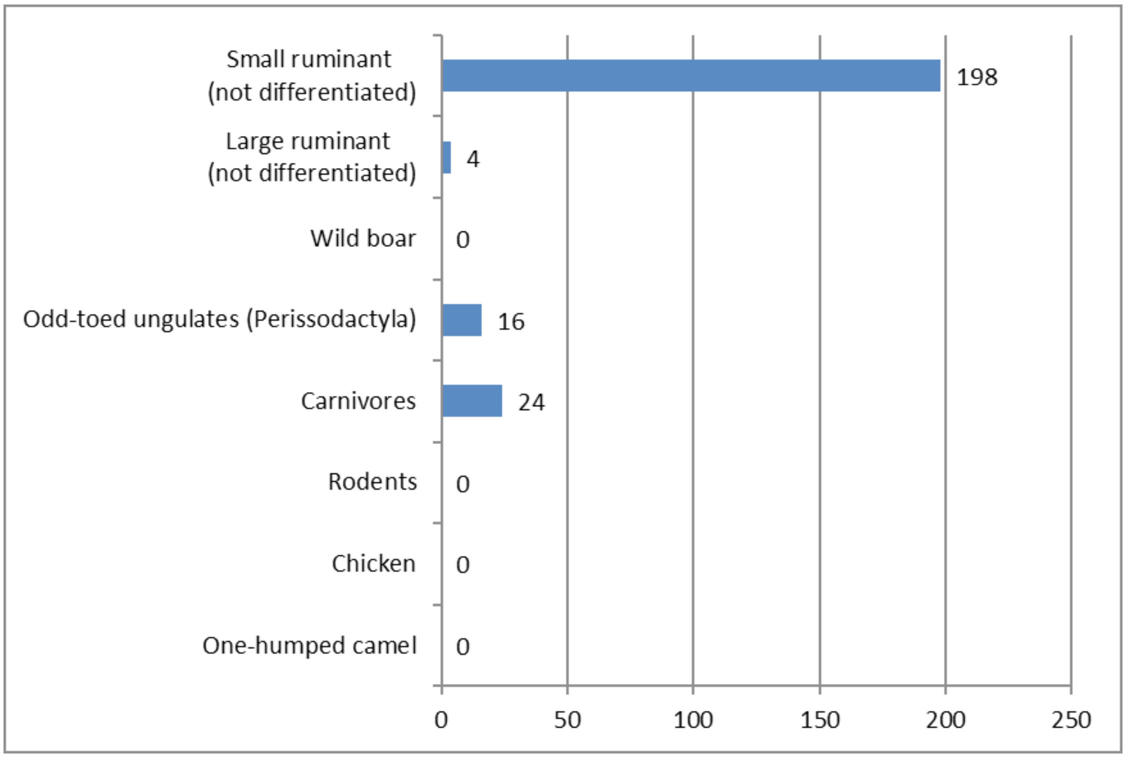

Figure 15. Absolute frequency of Immature animal bone samples of the exploration of Qareh Tape Sagzabad in 2018

Because in the case of immature bones, the separation between ruminant species is not very accurate, the chart generally presents small ruminants, large ruminants, Odd-toed ungulates (Perissodactyla), and carnivores.

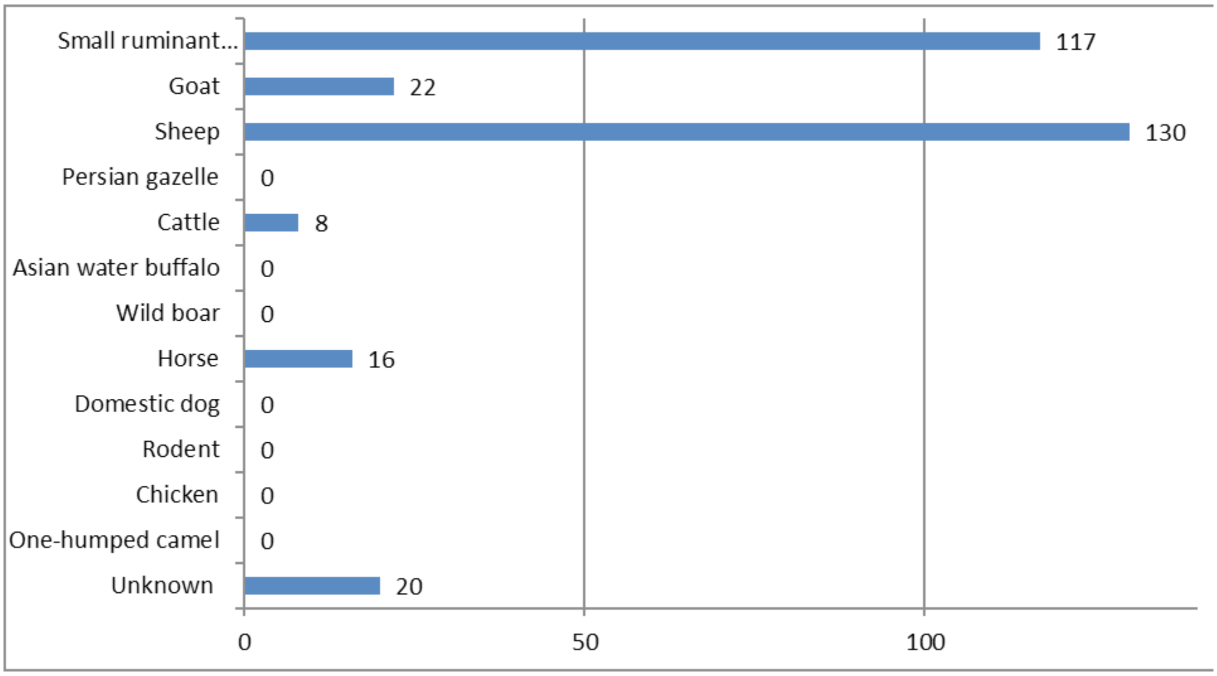

Figure 16. Absolute frequency of bones with traces of human interference (Butchery, Etc.) Bone samples of the exploration of Qareh Tape Sagzabad in 2018, according to the bones identified in each species

pecially horses, shows a significant increase compared to the Neolithic periods and the beginning of the complexity of Iron Age I technology. This shift was probably due to the use of horses and donkeys in agriculture and transportation (Talai, 1983).

Regarding the samples of Caspian horse phalanges, the observation of the abnormal cases and their radiographic confirmation suggests that side bone may result from factors such as hoof imbalance or limb imbalance as well as overweighting. It should also be mentioned about ringbone that this complication can be caused by repeated blunt trauma or repeated mild trauma. In the case of osteoarthrosis, it can also be caused by wear and tear (Thrall & Widmer, 2018). Considering the examined sample's maturity and the mentioned complications, it is plausible to infer that the examined Caspian horse may have suffered these complications due to years of carrying and riding, and it was probably removed for this reason.

In the samples examined in this study, after horses, most samples belonged to domestic dogs. Judging from the frequency of this species' samples, it seems that keeping domestic dogs with different purposes was common. Considering the abundance of examples pertaining to sheep that were kept in herds, using a domestic dog to protect the herd is an acceptable scenario. In addition, the bones that had cut marks and the signs of being chewed by a carnivorous animal were observed, indicating the food prepared by humans for these domestic dogs.

In this study, after domestic dogs, the highest frequency was related to domestic cows. With a lower percentage than in previous cultural periods (Neolithic and Iron Age), as well as the lack of remains of immature bones and butchery in this animal species, it is more logical to infer that this species was in the service of humans in farms and agriculture and not a source of animal protein. In addition, the presence of an Asian water buffalo hand bone indicates the possibility of wild ruminants in this area. Of course, we should note that in several parts of Iran, such as Azerbaijan, Mazandaran, and Khuzestan provinces, Asian water buffalo are domesticated and bred for various purposes (Nasserian & Saremi, 2007; Zhang et al., 2020). Considering the small number of bone samples of Asian water buffalo in this collection, the presence of this animal is not necessarily related to the life of this species in this region; instead one sample might be brought to this region by humans either as a living animal or as bone remains.

Rodents are considered invasive animals in this area, burrowing in the layers of the earth, and in some situations, they were probably buried there (Reitz & Wing 2008).

In the identified samples of this study, the bones of Persian gazelle, wild boar, and chicken were minimal. It should be noted that none of these bones had cuts or butchery marks. The presence of these samples seems unrelated to food consumption (Reitz & Wing 2008).

According to Talai, the Segzabad settlement formed due to the migration of "newcomers" without roots in the region. Talai considered favorable environmental conditions the most important factor for this migration. The presence of bones related to the one-humped camel among the samples of the studied bones, often associated with long-distance travel, can confirm the hypothesis of the migration of newcomers to this region or the prevalence of long-term travel (Talai, 1983).

In this study, the samples of immature bones of small ruminants, large ruminants, and odd-toed ungulates (Perissodactyla) were most likely from horses. The samples of carnivores were most likely domestic dogs, and no other animals were found. The presence of these immature bones can indicate their domestication and cultivation (Reitz & Wing 2008). The highest number of immature bones detected was related to small ruminants, followed by domestic dogs and horses, and the lowest number belonged to large ruminants.

Another aspect explored in this study involved the 3D prototyping the identified bones. In similar studies, efforts have been made to create archives of 3D images of bones from Zooarchaeology studies. This study used CT scan technology to make samples, but in most similar studies, 3D laser scanning or 360-degree photographs were used. The advantage of using methods such as CT scanning is that the mentioned methods record only bone surface information. However, bone depth and surface information in CT scans can be used in further studies (Betts et al., 2011).

Qazvin Plain is considered a semi-arid region because the area's annual rainfall fluctuates from 200 to 300 mm (Talai, 1983). This region is in the climatic division of the regions with severe semi-desert and cold, dry climates. In addition, in the statistics obtained in this article, species of animals such as goats and sheep that were domesticated show a higher percentage than other animal remains. Therefore, suitable conditions for keeping these animal species can be predicted considering the region's climatic conditions.

Ethical Considerations

Compliance with ethical guidelines

The all experimental procedures were approved by the Local Ethics Committee of Faculty of Veterinary Medicine, University of Tehran (No.: 30704.6.4).

Funding

This work was supported by the Faculty of Veterinary Medicine, University of Tehran.

Authors' contributions

Conceptualisation: Omid Zehtabvar; Methodology, data curation and resources: All authors; Formal analysis, funding acquisition, investigation, project administration, software, supervision, validation, visualisation, writing – original draft, review & editing: Omid Zehtabvar, Mostafa Dehpahlavan and Hesameddin Akbarein.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgments

The authors express their appreciation to everyone who assisted us in this study.

References

Albarella, U., Rizzetto, M., Russ, H., Vickers, K., & Viner-Daniels, S. (2017). *The oxford handbook of zooarchaeology (First)*. Oxford University Press. [Link]

Alizadeh, S., Veshkini, A., & Rezaei, M. (2017). Radiological and histological assessment of the ossification centers of pectoral limb in quail. *Iranian Journal of Veterinary Medicine, 11*(4), 345-352. [DOI:10.22059/IJVM.2017.224412.1004787]

Balkwill, D., Cumbaa, S. L. (1992). *A guide to the identification of postcranial bones of Bos taurus and Bison bison*. Ottawa: Canadian Museum of Nature. [DOI:10.5962/bhl.title.128454]

Betts, M.W., Maschner, H. D., Schou, C. D., Schlader, R., Holmes, J., & Clement, N., et al. (2011). Virtual zooarchaeology: Building a web-based reference collection of northern vertebrates for archaeofaunal research and education. *Journal of Archaeological Science, 38*(4), 755.e1-755.e9 [DOI:10.1016/j.jas.2010.06.021]

Chuang, R., & Bonhomme, V. (2019). Rethinking the dental morphological differences between domestic equids. *Journal of Archaeological Science, 101*, 140-148. [DOI:10.1016/j.jas.2018.02.020]

Cohen, A., & Serjeantson, D. (1996). *A manual for the identification of bird bones from archaeological sites (Rev.)*. London: Archetype Publications. [Link]

Dehpahlavan, M., & Jahed, M. (2021). [Some evidence of counting game in iron age II and III of Qara Tappeh Cemetery in Sagzabad (Persian)]. *Parseh Journal of Archaeological Studies, 5*(15), 115-134. [Link]

Dehpahlavan, M., & Alinezhad, Z. (2022). The cylinder seals of Qareh tepe in sagzabad, iron age II and III. *Iran: Journalofthe British Institute of Persian Studies*, 1-15. [Link]

Donlon, D., Croker, S., & Menzies, J. (2020). Non-human bones in forensic casework: Not such a trivial problem. *Forensic Science, Medicine, and Pathology, 16*(3), 442–449. [DOI:10.1007/s12024-020-00257-w] [PMID]

Fatahian Dehkordi, R. A., Torabi, A., Azimi, M. S., Mohammadi, H., & Norozi, K. (2022). Anatomical and morphometric study of middle ear ossicles in lori sheep and native cattle of Shahrekord Region. *Iranian Journal of Veterinary Medicine,* 16(1), 72-80. [DOI:10.22059/IJVM.2021.317645.1005154]

Fāzeli Nashli, H., Dārābi, H., Fallāhiyān, Y., Naseri, R. (2011). [Relative and absolute dating of TePe Sagzābad, Qazvin Plain (Persian)]. *Journal of Archaeological Studies, 3*(1), 133-158. [Link]

France, D. L. (2008). *Human and nonhuman bone identification: A color atlas*. Boca Raton: CRC Press. [DOI:10.1201/9781420062878]

Halstead, P., Collins, P., & Isaakidou, V. (2002). Sorting the sheep from the goats: Morphological distinctions between the mandibles and mandibular teeth of adultovis and capra. *Journal of Archaeological Science, 29*(5), 545-553. [DOI:10.1006/JASC.2001.0777]

Hanot, P., & Bochaton, C. (2018). New osteological criteria for the identification of domestic horses, donkeys and their hybrids in archaeological contexts. *Journal of Archaeological Science, 94*, 12-20. [DOI:10.1016/J.JAS.2018.03.012]

Hanot, P., Herrel, A., Guintard, C., & Cornette, R. (2019). Unravelling the hybrid vigor in domestic equids: The effect of hybridization on bone shape variation and covariation. *BMC Evolutionary Biology, 19*(1), 188. [DOI:10.1186/s12862-019-1520-2] [PMID] [PMCID]

Hillson, S. (2005). *Teeth*. Cambridge: Cambridge University. [Link]

Marzban Abbasabadi, B., Ghojoghi, F., Rahmati, S., & Hajian, O. (2021). [Morphological variations in the skulls of male and female persian fallow deer (Dama dama mesopotamica) (Persian)]. *Iranian Journal of Veterinary Medicine, 15*(2), 221-232. [DOI:10.22059/IJVM.2020.299875.1005075]

Naserian A. A., & Saremi, B. (2007) Water buffalo industry in Iran. *Italian Journal of Animal Science, 6*(sup2), 1404-1405. [DOI:10.4081/ijas.2007.s2.1404]

Noorinezhad, J., Moarabi, A., Mazaheri, Y., Karami, A. (2019). [Osteology and radiography of the normal tarsal joint in the khuzestan river buffalo (bubalus bubalis) (Persian)]. *Journal of Veterinary Research, 74*(2), 237-245. [DOI:10.22059/JVR.2019.231032.2610]

Pugh D. G. & Baird A. N. (2012). *Sheep and goat medicine.* Amsterdam: Elsevier/Saunders. [Link]

Radmer, B., Tohidipour, M. H., & Khoshnevis, Z. (2003). [Zooarchaeology of Qareh tapeeh of Qum city (Persian)]. *Journal of Veterinary Research, 58*(3),271-274. [Link]

Reitz, E. J., & Wing, E. S. (2008). *Zooarchaeology.* Cambridge: Cambridge University Press. [DOI:10.1017/CBO9780511841354]

Salvagno, L., & Albarella, U. (2017). A morphometric system to distinguish sheep and goat postcranial bones. *PloS one, 12*(6), e0178543. [DOI:10.1371/journal.pone.0178543] [PMID] [PMCID]

Shateri Amiri, B., Soroori, S., Zehtabvar, O., Rostami, A., & Soflaei, R. (2020). Computed tomographic and morphometric study of cervical vertebrae in healthy white new zealand rabbit (oryctolagus cuniculus). *Iranian Journal of Veterinary Medicine, 14*(4), 421-431. [DOI:10.22059/IJVM.2020.296790.1005060]

Sisson, S., & Grossman, J. D. (1975). Ruminant osteology. In: R. Getty (Ed.), *Sisson and Grossman's the anatomy of the domestic animals* (pp. 255- 349). Philadelphia: WB Saunders.

Talai, H. (1983). Late Bronze age and Iron age architecture in Sagzabad-Qazvin Plain- The Central Plateau of Iran". *Iranica Antiqua Leiden, 18,* 51-57. [Link]

Thrall, D. E., & Widmer, W. R. (2018). *Textbook of veterinary diagnostic radiology.* Louis, Missouri: Elsevier. [Link]

Thrall, D. E. (2017). *Textbook of veterinary diagnostic radiology*. Amsterdam: Elsevier. [Link]

Trebicka, J., Elham, F., Dehpahlavan, M., Alinezhad, Zahr., & Soltysiak, A. (2019). Human remains from Qareh Tepe, Iran, 2017-2018. *Bioarchaeology of the Near East, 13*(13), 126-135. [Link]

Waldron, T. (2009). *Palaeopathology.* Cambridge: Cambridge University Press. [Link]

Yang, W., Liu, T., Song, L., Zhang, Z., Li, Y., & Lu, L. (2015). Anatomical characteristics of deer and sheep lumbar spines: Comparison to the human lumbar spine. *International Journal of Morphology, 33*(1), 105-112. [DOI:10.4067/S0717-95022015000100018]

Yousefi, M. H. (2016). Anatomical study of the Iranian brown bear's skull (Ursus arctos): A case report. *Iranian Journal of Veterinary Medicine, 10*(3), 237-244. [DOI:10.22059/IJVM.2016.58686]

Zedda, M., Palombo, M. R., Brits, D., Carcupino, M., Sathé, V., & Cacchioli, A., et al. (2017). Differences in femoral morphology between sheep (Ovis aries) and goat (Capra hircus): Macroscopic and microscopic observations. *Zoomorphology, 136,* 145-158. [DOI:10.1007/s00435-016-0329-4]

Zeder, M. A., & Hesse, B. (2000). The initial domestication of goats (Capra hircus) in the Zagros mountains 10,000 years ago. *Science, 287*(5461), 2254–2257. [DOI:10.1126/science.287.5461.2254] [PMID]

Zehtabvar, O., Vajhi, A., Rostami, A., Ekim, O., Vosoogh-Afkhami, A., & Davudypoor, S., et al. (2022). Anatomical and normal 3D CT-scan study of the vertebral column and the shell of the European pond turtle (Emys orbicularis). *Iranian Journal of Veterinary Surgery, 17*(1), 33-43. [Link]

Zhang, Y., Colli, L., & Barker, J. (2020). Asian water buffalo: Domestication, history and genetics. *Animal Genetics, 51*(2), 177-191. [DOI:10.1111/age.12911] [PMID]

مطالعه پژوهشی

مطالعه آناتومیک و تشخیص استخوان‌ها و دندان‌های جانوری کاوش سال ۱۳۹۷ محوطه قره‌تپه سگزآباد (عصر آهن ۲ و ۳) و ساخت نمونه سه بعدی

*امید زهتاب‌ور[۱]، مصطفی ده‌پهلوان[۲]، حسام‌الدین اکبرین[۳]، مجید مسعودی فرد[۴]، مرجان ملابیرامی[۵]، زهرا حجت‌زاده[۶]، مهدیه جعفری[۷]

۱. بخش آناتومی، گروه علوم پایه، دانشکده دامپزشکی، دانشگاه تهران، تهران، ایران.
۲. گروه باستان‌شناسی، دانشکده ادبیات و علوم انسانی، دانشگاه تهران، تهران، ایران.
۳. گروه بهداشت مواد غذایی، دانشکده دامپزشکی، دانشگاه تهران، ایران.
۴. گروه جراحی و رادیولوژی، دانشکده دامپزشکی دانشگاه تهران، ایران.
۵. مؤسسه باستان شناسی، دانشگاه تهران، تهران،ایران.
۶. فارغ التحصیل دکترای عمومی دامپزشکی،دانشکده دامپزشکی دانشگاه تهران،تهران ،ایران
۷. گروه باستان‌شناسی، دانشکده هنر و معماری، دانشگاه بوعلی سینا، همدان، ایران.

Use your device to scan and read the article online

How to Cite This Article Zehtabvar, O., Dehpahlavan, M., Akbarein, H., Masoudifard, M., Mollabeirami, M., & Hojjatzade, Z., et al. (2024). Anatomical Study and Determination of the Animal Bones and Teeth Samples of the Excavation of Qareh Tape Sagzabad (Qazvin Province, Iran) in 2018 (Iron Age II and III) and Making 3D Models. *Iranian Journal of Veterinary Medicine, 18*(1), 97-120. http://dx.doi.org/10.32598/ijvm.18.1.1005311

doi http://dx.doi.org/10.32598/ijvm.18.1.1005311

تاریخ دریافت: ۱۰ بهمن ۱۴۰۱
تاریخ پذیرش: ۲۸ فروردین ۱۴۰۲
تاریخ انتشار: ۱۱ دی ۱۴۰۲

چکیده

زمینه مطالعه: باستان‌شناسی جانوری از علومی است که ارتباط تنگاتنگی با آناتومی تطبیقی دامپزشکی دارد. در این علم با استفاده از اطلاعات آناتومیک، نمونه استخوان‌های جانوران گوناگون مورد بررسی قرار می‌گیرد و از این طریق به جایگاه و نقش گونه‌های حیوانی در حیات، بقای انسان و به‌عبارتی تعامل انسان و زیست بوم دست می‌یابیم.

هدف: این مطالعه با هدف بررسی و گونه‌شناسی بقایای استخوانی و دندان‌های جانوری محوطه قره تپه سگزآباد با استفاده از اطلاعات آناتومیک موجود انجام شد. یکی دیگر از اهداف این مطالعه تشخیص آثار غیرطبیعی ایجادشده توسط انسان یا حیوانات در استخوان‌ها، مثل آثار برش، سوختگی‌ها و یا آثار جویدگی توسط حیوانات گوشتخوار است. با استخراج همه این اطلاعات می‌توان به تحلیلی صحیح از اقتصاد معیشتی آن محوطه تاریخی پرداخت.

روش کار: در این مطالعه تعداد ۱۱۱۰ نمونه استخوان و دندان مربوط به کاوش سال ۱۳۹۷ مورد مطالعه قرارگرفتند. نمونه‌ها به آزمایشگاه استخوان‌شناسی بخش آناتومی دانشکده دامپزشکی دانشگاه تهران منتقل شدند.

نتایج: بیشترین درصد فراوانی نسبی با ۳۰/۰۹ درصد مربوط به نمونه‌های گوسفند اهلی و بعد از آن به نمونه‌هایی از نشخوارکننده‌های کوچک (۲۶/۹۴ درصد) بود که قابل تفکیک نبودند (گوسفند و بز اهلی یا غزال ایرانی). درصد فراوانی نسبی غزال، گاومیش آبی آسیایی، گراز وحشی و ماکیان اهلی ناچیز و کمتر از ۱ درصد بود. در این مطالعه بندهای انگشت اسب کاسپی دارای موارد غیرطبیعی هم تشخیص داده شد.

نتیجه‌گیری نهایی: در این مطالعه یکی از نکات قابل توجه در مورد نمونه‌های نشخوارکننده‌های کوچک تفکیک‌شده در سطح گونه، این است که تعداد نمونه‌های گوسفند تشخیص داده‌شده از بز بیشتر است. به نظر می‌رسد شرایط برای نگهداری از گوسفند مناسب‌تر بوده است. تعداد تک‌سُم‌سانان به‌ویژه اسب نسبت به دوره‌های نوسنگی و ابتدای پیچیدگی‌های تکنولوژی عصر آهن افزایش چشمگیری را نشان می‌دهد. این امر احتمالاً به‌دلیل استفاده از اسب و الاغ در امر کشاورزی و باربری بوده است.

کلیدواژه‌ها: استخوان، باستان‌شناسی جانور، دندان، سگزآباد، کالبدشناسی

* نویسنده مسئول:
دکتر امید زهتاب‌ور
نشانی: تهران، دانشگاه تهران، دانشکده دامپزشکی، گروه علوم پایه، بخش آناتومی.
تلفن: ۶۱۱۱۷۱۱۴ (۲۱) ۹۸+
رایانامه: ozehtabvar@ut.ac.ir

This Page Intentionally Left Blank