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Osteometric Examination of Skeletal Remains of Sheep Uncovered in Excavations Performed in Ancient City of Kibyra[#]

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ABSTRACT

The aim of the study was to investigate the osteometric investigation of the remains of sheep skeleton from archaeological excavations in Kibyra Antique City located in Golhisar district of Burdur. In the study, the remains of the totally measurable 370 bones revealed in the archaeological excavations of Bouleuterion-Odeion, Stadion, Agora and Facade of the ancient city of Kibyra were used. The osteometric measuraments were obtained from these bones. Moreover, the shoulder height and dimensions were estimated by using obtained data. According to this, the average of shoulder height of Kibyra sheep was determined as 59.8 cm. As a result, it was thought that the numerical data obtained in the study will contribute to the limited number zooarcaeological researches in our country.

Keywords: Kibyra, Osteometric, Sheep

Kibyra Antik Kenti Kazılarında Ortaya Çıkarılan Koyun İskeleti Kalıntılarının Osteometrik Olarak İncelenmesi

ÖZ

Çalışmada Burdur'un Gölhisar ilçesinde bulunan Kibyra Antik Kentindeki arkeolojik kazılardan ortaya çıkarılan koyun iskeleti kalıntılarının osteometrik olarak incelenmesi amaçlanmıştır. Çalışmada Kibyra Antik Kenti'nin Bouleuterion-Odeion, Stadion, Agora ve Dış Cephe arkeolojik kazılarında ortaya çıkarılan ölçü alınabilir nitelikte toplam 370 adet kemik kalıntısı kullanıldı. Bu kemiklerden osteometrik ölçüler alındı. Ayrıca elde edilen veriler kullanılarak koyunların cidago yüksekliği ve ebatları ile ilgili tahminde bulunuldu. Buna göre Kibyra koyunlarının ortalama cidago yüksekliği 59.8 cm olarak tespit edildi. Sonuç olarak çalışmada elde edilen sayısal verilerin Ülkemizde sınırlı sayıdaki zooarkeolojik çalışmalara katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Kibyra, Koyun, Osteometri

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INTRODUCTION

The Ancient City of Kibyra is located on three hills at the altitude of 1100-1300 meters on the piedmonts of the mount Akdag in the west of Gölhisar township on southwestern part of the province of Burdur (Aksu, 1998). The city is located on the junction point of Lycia, Phrygia, Karia, and Pisidia regions (Ekinci et al., 2007). The region known as Kabalia/Kabalis in early periods (Ökmen, 2004) was started to be named as "Kibyratis" as the city got stronger in Hellenistic Age and during domination of Rome (Hall and Milner, 1998, Milner, 1998). Ancient sources indicate that Kibyra was ruled by a tyran named Moagetes in the first half of Century II B.C. and he established a Tetrapolis by interconnecting three cities around Kibyra (Shuckburgh, 1889; cited by Özüdoğru, 2014). Kibyra, whose name is written on Stadiasmus Patarensis (Patara Road) (Işık et al., 2001), was reconstructed by Tiberius after the earthquake occurring in 23 AD. The city was named as Caesarea Cibyra following the renovation. However, the city could not recover after the earthquake in 417 (Karabacak et al., 2009). Kibyra which was exposed to assaults by Goth and Arabs in this period was abandoned after 6th century (Bayburtluoğlu, 2004).

From past to present, bovine and ovine-caprine animals have been the most important resources of animal food. Animals from the family ruminantia are primary for meeting socio-economical needs thanks to yields of meat, milk, wool, skin, and fat (bone-organ). Skeletal remains of animals that are such involved in the daily life are comprised of the materials frequently found in archaeological excavations. Besides, these remains allow for comments about nourishment, economic and social life of their community and also lead us to do various estimations about morphological traits of the animals in that period of time (Onar et al., 2010). These estimations can be ranged as height at withers, body weight, gender, and age. Information obtained from archaeological bone material are also important for determination of fauna and comparisons with other historical processes, as well as estimations for morphological traits of the animals (Clark, 1995; Guintard and Lallemand, 2003; Harcourt, 1974; Onar, 2005).

Onar et al., (2013a) evaluated approximately 21000 remains of animal skeleton uncovered as a result of excavations of Yenikapı Metro and Marmaray starting in 2004. It was stated in the study that skeletal remains obtained belonged to about 54 species. Pazvant et al., (2015) investigated metapodial bones from sheep and goat uncovered in the same excavation site. In conclusion, sheep of Byzantine Age were determined to be similar to Iron Age sheep in terms of shoulder height and to resemble Tuj sheep from modern sheep. Guintard and Lallemand (2003) suggested that data obtained from the study on 215 metapodia of sheep could provide an insight to history for domestication of sheep. In the study by Davis (1996) 42 different measurements were took from leg bones of Shetland Sheep and findings were compared with data of sheep uncovered in archaeological excavations.

Above-mentioned literature information has shown that the number of studies on archaeological remains of animal skeleton is very limited in Turkey. The aim of the present study was to perform an osteometric examination on skeletal remains of sheep uncovered during archaeological excavations performed in Ancient City of Kibyra between 2006 and 2014.

MATERIALS and METHODS

Necessary permission was received from Department of Excavation of Ancient City of Kibyra to examine skeletal remains of various animals such as horse, cattle, sheep, goat, pig, cat, and dog were revealed during archaeological excavations performed in Ancient City of Kibyra between 2006 and 2014. For the method of the study, the study by Onar et al., (2010) was taken as the reference. Accordingly, skeletal remains uncovered from the excavation site were recorded considering grid depth and date. The skeletal remains were stored inside plastic cases in the excavation site. The skeletal remains that were kept in plastic cases in the excavation storage were transferred to the osteology laboratory. A total of 370 measurable skeletal remains uncovered in archaeological excavations performed in Bouleuterion / Odeion, Stadion, Agora, and Exterior Facade of Ancient City of Kibyra between 2006 and 2014 were examined in the present study. The codes of measurement for osteometric sizes were stated below. Osteometric measurements were recorded in the Microsoft Office Excel 2007 programme. Mean and standard deviation were calculated using Statistical Package for the Social Sciences (IBM, SPSS 20.0) packaged software.

Driesch (1976) was taken as reference for osteometric measurements. The "Teichert's multipliers" (Teichert, 2005) were utilised to calculate height at withers for sheep of Kibyra. In addition, Bp/GL*100, SD/GL*100, and Bd/GL*100 indices were calculated using osteometric measurements for metapodia of sheep in the study (Berteux and Guintard, 1995; Guintard and Lallemand, 2003; Davis, 1996).

While "Nomina Anatomica Veterinaria (2012)" was mainly based to write anatomic terms in the study, commonly used literature was based for some osteoarcheological terms.

General Measurement Codes
GL: Maximum length, GB: Maximum width, Bd: Maximum width of distal end, Bp: Maximum width of proximal end, SD: Minimum width of diaphysis, Dd: Maximum depth of distal end.

Measurement Codes of Mandibula
LA: Length of angulus, L3: Aboral edge length of gonion caudale and 3rd molar tooth, LHR: Length of corpus mandibulae, L5: Oral edge length of gonion caudale and 1st premolar tooth, GCM: Length between gonion caudale and foramen mentale, LCR: Length of arch of cheek teeth, LMR: Length of molar teeth, LPR: Length of premolar teeth, LM_3: Length of 3rd molar tooth, BM_3: width of 3rd molar tooth, LD: Length of diastema, $HRcd_1$: 1st condylar height of ramus of mandible, $HRcd_2$: 2nd condylar height of ramus of mandible, HRcr: Processus coronoideus height of ramus of mandible, AHVR: Aboral height of ramus of mandible, MHVR: Molar height of ramus of mandible, OHVR: Oral height of ramus of mandible.

Measurement Codes of Vertebrae
BFcr: Width of facies articularis cranialis, BFcd: Width of facies articularis caudalis, GLF: Distance between facies articularis cranialis et caudalis, H: Height, GLPa: Distance between processus articularis cranialis et caudalis, BPacr: Width of processus articularis cranialis, BPacd: Width of processus articularis cranialis, PL: Length of corpus, HFcr: Height of facies terminalis cranialis, HFcd: Height of facies terminalis caudalis, SBV: Minimum width of vertebra, LCDe: Length of corpus as from dens, LAPa: Length of arcus.

Measurement Codes of Scapula
SLC: Minimum length of collum scapulae, GLP: Maximum length of processus articularis, LG: Length of cavitas glenoidalis, BG: Width of cavitas glenoidalis.

Measurement Codes of Humerus
BT: Maximum width of trochlea humeri.

Measurement Codes of Radius
BFd: Maximum width of facies articularis distalis.

Measurement Codes of Ulna
LO: Length of olecranon, DPA: Depth of processus anconaeus, SDO: Minimum depth of olecranon, BPC: Width of processus coronoideus.

Measurement Codes of Os coxae
LA: Length of Acetabulum, SH: Minimum height of corpus ossis ilium, SB: Minimum width of corpus ossis ilium.

Measurement Codes of Femur
DC: Maximum depth of caput femoris.

Measurement Codes of Talus
GLI: Maximum length of lateral half, GLm: Maximum length of medial half, Dl: Maximum depth of lateral half, Dm: Maximum depth of medial half.

Measurement Codes of Metapodium
d: Medial corpus width of diaphysis, e: Medial corpus depth of diaphysis, DD: Minimum depth of diaphysis, Be: Maximum width of metaphysis, De: Maximum depth of metaphysis, DIM: Dorsopalmar/plantar diameter of internal trochlea of condylus medialis, DEM: Dorsopalmar/plantar diameter of external trochlea of condylus medialis, DIL: Dorsopalmar/plantar diameter of internal trochlea of condylus lateralis, DEL: Dorsopalmar/plantar diameter of external trochlea of condylus lateralis, WCM: Medio-lateral width of condylus medialis, WCL: Medio-lateral width of Condylus lateralis.

Measurement Codes of Phalanx proximalis et media
GLPe: Maximum length of periferal (abaxial) half.

RESULTS

Table 1-7 shows osteometric values of sheep bones remains examined in the present study.
Table 6 shows the data calculated using maximum lengths of talus (astragalus), calcaneus (os calcis), os metacarpale III et IV, and os metatarsale III et IV for height at withers. Accordingly, mean height at withers was determined as 59.8 cm for sheep.

Bp/GL*100, SD/GL*100 and Bd/GL*100 indices were calculated using osteometric measurements for metapodia of sheep in the study. Table 7 shows index results of metapodia.

Table 1. Osteometric measurements of mandibula in Kibyra sheep (The values are mm.)

Measurement	N	Minimum	Maximum	Mean	SD
LA	2	149.2	181.2	165.2	22.6
L3	3	46.1	53.6	49.8	3.8
LHR	2	104.8	128.4	116.6	16.7
L5	1	110.1	110.1	110.1	
GCM	2	125.1	146.6	135.9	15.2
LCR	7	49.4	76.6	69.0	9.7
LMR	8	29.7	91.5	44.5	19.4
LPR	11	20.4	45.7	32.4	6.7
LM_3	6	20.8	37.7	25.5	6.2
BM_3	6	7.0	13.5	9.6	2.2
LD	11	26.7	41.8	31.5	4.2
$HRcd_1$	3	73.1	89.5	79.4	8.8
$HRcd_2$	3	64.7	81.2	72.1	8.4
HRcr	1	107.8	107.8	107.8	
AHVR	10	35.4	71.5	42.3	10.5
MHVR	8	13.7	28.4	23.0	4.5
OHVR	21	9.3	18.6	14.6	2.4

Table 2. Osteometric measurements of vertebrae in Kibyra sheep (The values are mm.)

Measurement	N	Minimum	Maximum	Mean	SD
		Atlas			
GL	1	42.9	42.9	42.9	
BFcd	1	37.7	37.7	37.7	
GLF	1	37.5	37.5	37.5	
GB	1	55.7	55.7	55.7	
H	3	30.4	31.3	30.7	0.5
		Axis			
BFcd	1	21.5	21.5	21.5	
BFcr	1	38.1	38.1	38.1	
SBV	1	22.6	22.6	22.6	
LCDe	1	54.8	54.8	54.8	
LAPa	1	41.4	41.4	41.4	
H	1	38.0	38.0	38.0	
		Vertebrae cervicalis			
GLPa	2	35.6	36.5	36.1	0.6
BPacr	1	31.1	31.1	31.1	
BPacd	2	31.7	33.4	32.6	1.2
PL	1	36.5	36.5	36.5	
HFcr	1	15.2	15.2	15.2	
HFCcd	1	17.4	17.4	17.4	
H	1	30.9	30.9	30.9	
		Vertebrae lumbalis			
PL	5	25.4	32.1	29.0	2.7
BFcr	4	20.4	23.3	21.4	1.4
BFcd	4	20.7	27.3	24.4	2.7
HFcr	4	13.1	14.5	13.9	0.6
HFcd	4	11.3	13.6	12.6	1.2
H	1	39.8	39.8	39.8	

Table 3. Osteometric measurements of fore-limb bones in Kibyra sheep (the values are mm.)

Measurement	N	Minimum	Maximum	Mean	SD
		Scapula			
SLC	6	18.7	24.8	22.0	2.1
GLP	9	28.7	39.7	33.8	3.2
LG	9	21.4	31.2	26.4	2.9
BG	9	18.5	27.8	22.8	3.0
		Humerus			
BT	21	24.1	31.8	27.2	2.2
Bd	22	26.5	34.6	29.8	2.2
		Radius			
SD	11	13.7	18.0	15.9	1.7
Bd	11	25.7	34.5	28.7	3.0
BFd	11	20.1	26.2	23.3	2.1
Bp	14	22.5	35.3	29.7	3.6
		Ulna			
DPA	6	29.5	32.6	31.1	2.2
BPC	6	17.2	19.0	18.1	1.3
SDO	4	20.4	23.3	21.9	2.1
LO	2	34.5	41.8	38.2	5.2
		Metacarpus			
GL	3	119.1	126.2	121.5	4.1
Bp	28	20.4	29.4	24.2	1.9
d	20	11.4	18.3	15.4	2.1
e	20	9.1	12.2	10.8	0.8
SD	8	12.5	16.8	14.9	1.5
DD	8	8.8	11.8	9.9	1.1
Bd	9	22.6	28.1	25.3	2.1
Dd	9	14.1	18.2	15.8	1.4
Be	12	2.8	30.9	24.3	7.1
De	12	11.4	16.3	13.6	1.4
DIM	2	13.7	15.8	14.8	1.5
DEM	2	10.8	11.3	11.1	0.4
DIL	3	14.1	15.1	14.7	0.5
DEL	3	10.6	11.6	11.0	0.6
WCM	2	11.8	13.3	12.6	1.1
WCL	3	11.0	14.0	12.6	1.5

Table 4. Osteometric measurements of hind-limb bones in Kibyra sheep (The values are mm.)

Measurement	N	Minimum	Maximum	Mean	SD
		Os coxae			
LA	14	23.1	31.6	26.4	2.3
SB	2	6.8	9.6	8.2	2.0
SH	2	12.3	13.9	13.1	1.1
		Femur			
DC	1	19.1	19.1	19.1	
Bp	1	39.9	39.9	39.9	
Bd	2	36.1	37.8	37.0	1.2
		Tibia			
Bd	27	22.1	32.4	25.8	2.5
Dd	27	17.0	24.8	19.5	1.8
SD	11	10.6	18.2	12.3	2.1
		Calcaneus			
GL	15	51.0	62.7	54.9	3.5
GB	20	13.9	22.4	16.9	2.1
		Talus			
GLm	18	24.0	38.5	27.2	3.2
GLl	19	25.6	40.8	29.2	3.2
Bd	18	16.7	23.8	18.6	1.5
Dm	17	13.4	21.9	16.1	1.9
Dl	18	14.1	22.1	15.7	1.7
		Metatarsus			
GL	5	110.3	126.6	118.9	6.1
Bp	37	17.7	25.0	20.7	1.6
d	14	9.5	16.2	12.3	1.7
e	14	8.1	14.0	11.3	1.5
SD	13	9.3	16.1	11.9	1.9
DD	12	8.0	12.1	9.9	1.0
Bd	9	23.6	27.2	24.7	1.1
Dd	8	14.6	17.2	15.7	0.9
Be	11	22.0	27.0	23.4	1.7
De	11	12.5	14.5	13.3	0.5
DIM	5	12.1	14.2	13.3	0.8
DEM	5	9.2	10.6	9.8	0.6
DIL	4	12.3	14.1	13.4	0.8
DEL	4	8.5	11.4	10.0	1.2
WCM	5	10.4	11.2	10.9	0.3
WCL	4	10.5	12.3	11.1	0.8

Table 5. Osteometric measurements of phalanx and metapodials in Kibyra sheep (The values are mm.)

Measurement	N	Minimum	Maximum	Mean	SD
Metacarpus-Metatarsus					
Be	2	22.6	24.2	23.4	1.1
De	2	12.9	13.4	13.2	0.4
Dd	2	15.3	16.7	16.0	1.0
Bd	2	23.3	25.9	24.6	1.8
Phalanx proximalis					
GLPe	17	27.3	46.0	36.9	5.2
SD	19	8.8	13.1	11.1	1.0
Bp	19	11.1	15.0	13.5	1.1
Bd	17	9.9	15.1	13.3	1.6
Phalanx media					
GL	4	27.3	29.6	28.5	1.1
Bp	4	14.2	15.1	14.5	0.4
SD	4	9.6	10.2	9.9	0.3
Bd	4	11.0	11.6	11.3	0.3

Table 6. The data of shoulder height of Kibyra sheep (The values are cm.)

Bone	N	Minimum	Maximum	Mean	SD
Metacarpus	6	50.1	62.2	55.4	4.2
Metatarsus	7	48.8	61.7	55.2	4.8
Talus	19	58.1	92.5	66.2	7.3
Calcaneus	15	58.1	71.5	62.6	4.0

Table 7. Index values of metapodials of Kibyra sheep

Bone	Index	N	Minimum	Maximum	Mean	SD
Metacarpus	Bp/GL*100	6	19.7	22.4	21.2	1.1
	SD/GL*100	6	10.4	13.1	12.1	0.9
	Bd/GL*100	6	0.0	25.5	19.5	9.7
Metatarsus	Bp/GL*100	5	16.5	18.4	17.5	0.7
	SD/GL*100	5	9.2	11.2	10.0	0.8
	Bd/GL*100	5	0.0	21.7	16.9	9.5

DISCUSSION and CONCLUSION

Zooarcheological studies mentioned about sheep in 2 types of sizes in Europe (Bogolubski, 1968; Bökönyi, 1983). Adametz (1925) defined especially small sheep of Neolithic Europe as "Ovis palustris" with height at withers lower than 60 cm. Furthermore, "Ovis musimon" occurring in the Copper Age, which was 10 cm higher than the first type, was mentioned as the second type (Lasota-

Moskalewska et al., 1998). Lasota-Moskalewska et al., (1998) classified sheep as follows; small sized sheep having a height at withers of up to 59.9 cm, medium sized sheep having a height at withers of 60-69.9 cm, and large sized sheep having a height at withers of 70 cm and higher. In addition, Lasota-Moskalewska et al., (1998) stated in their study that the height at withers calculated from bone remains excavated in southern Turkey was 67.2 (n: 12), 66.2 (n: 16), 62.2 (n: 11), and 62.6 cm (n: 32) in average for periods I and IV (2000 B.C. –500 A.D.), respectively. It was determined that these values were compatible with calculations of talus and calcaneus obtained in the present study but, they were not compatible with metapodia.

Pazvant et al., (2015) examined metapodia of sheep and goat uncovered from excavation site of Yenikapı Metro and Marmaray (Istanbul). In conclusion, it was determined that sheep of Byzantine age and Iron age were similar in shoulder height and were similar to Tuj sheep from sheep of modern age. Additionally, the coefficient of variation for (CV%) data of metapodia of Kibyra, Morkaraman and Tuj sheep were also presented in Tables 8, 9, 10, and 11 by adding into information given in this study (Pazvant et al., 2015).

Piatkowska-Malecka and Mogorzewska (2009) investigated 2381 mammalian bones uncovered in archaeological excavations executed in Tell Arbid (Syria) and classified 1272 of them. Osteometric data of sheep bones in this study and the present study are comparatively given in Table 12. According to this, it was shown that the GL1 value of talus of sheep from Kibyra was lower.

Mulville and Powell (1997) examined 1527 bone remains uncovered in excavations performed in Segsbury and reported that 49 (NISP%:22) of these bone remains were cattle, 11 (NISP%:4) were sheep, 166 (NISP%:74) were sheep-goat. In this study also osteometric values for some bones were calculated. The data of the study (Mulville and Powell, 1997) and the project are represented in Table 13 comparatively. Accordingly, it was observed that the Bd and BT values of humerus of sheep from Kibyra was higher.

In conclusion, skeletal remains of sheep uncovered in archaeological excavations executed in Ancient City of Kibyra were examined osteometrically in the present study. It is a fact that bones of animals consumed need to be evaluated as a zooarcheological material with specific terminology rather than being an ordinary relict. Owing to numeric and metric data, the present study is thought to contribute to limited number of zooarcheological studies in Turkey.

Table 8. Comparison of the coefficient of variation of osteometric measurements of metacarpus with modern and archeological data of Kibyra sheep

Kibyra		Yenikapı-Marmaray (Pazvant ve ark., 2015)		Morkaraman (Demiraslan ve ark., 2015)				Tuj (Demiraslan ve ark., 2015)				Kıvırcık (Bacınoğlu, 2006)			
				Female		Male		Female		Male		Female		Male	
Order	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**
GL	3.4	**DD**	12.03	**Bd**	12.93	**De**	9.71	**Be**	11.67	**DIL**	14.22	**SD**	7.77	**SD**	8.2
Bp	8.0	**SD**	11.92	**Dd**	9.17	**WCM**	4.49	**De**	10.89	**De**	9.72	**DEM**	7.33	**e**	7.92
D	13.4	**DEL**	10.7	**De**	8.17	**DD**	4.01	**Dd**	8.13	**WCL**	7.26	**Dd**	7.23	**DD**	7.84
E	7.2	**DEM**	10.52	**DD**	7.33	**DEL**	3.92	**SD**	6.33	**WCM**	7	**d**	7.07	**d**	7.68
SD	9.9	**d**	10.32	**SD**	5.36	**SD**	3.64	**GL**	5.35	**DEM**	5.51	**De**	7.03	**Be**	6.27
DD	11.1	**e**	10.25	**e**	4.37	**Be**	3.63	**DIL**	5.23	**SD**	5.12	**DIL**	7.01	**DIL**	5.51
Bd	8.1	**De**	10.03	**DEM**	4.35	**Dd**	3.61	**DEL**	5.21	**DD**	5.08	**DEL**	6.91	**De**	5.48
Dd	8.8	**Bp**	10	**Be**	4.23	**e**	3.43	**e**	5.2	**Be**	4.87	**DIM**	6.82	**DIM**	5.34
Be	29.2	**WCL**	9.87	**d**	3.64	**DIM**	3.42	**d**	5.19	**Bp**	4.85	**Bp**	6.63	**DEL**	5.15
De	9.9	**WCM**	9.55	**WCL**	3.22	**DIL**	2.85	**Bp**	5.1	**GL**	4.63	**WCM**	6.48	**WCL**	5
DIM	10.1	**DIL**	9.4	**DEL**	3.08	**DEM**	2.66	**Bd**	4.9	**Dd**	4.14	**WCL**	6.17	**WCM**	4.97
DEM	3.2	**Bd**	9.31	**WCM**	2.99	**GL**	2.61	**WCL**	4.8	**d**	4.1	**Be**	6.04	**DEM**	4.96
DIL	3.6	**DIM**	9.06	**GL**	2.56	**WCL**	2.59	**DIM**	4.51	**Bd**	3.98	**DD**	6.02	**Bp**	4.92
DEL	5.0	**Be**	8.93	**DIM**	2.47	**Bp**	2.56	**DEM**	4.15	**DEL**	3.97	**Bd**	6	**Bd**	4.73
WCM	8.5	**GL**	8.84	**Bp**	2.2	**d**	2.42	**WCM**	3.85	**DIM**	3.85	**e**	5.66	**Dd**	4.59
WCL	12.0	**Dd**	8.69	**DIL**	2.06	**Bd**	2.03	**DD**	2.91	**e**	3.16	**GL**	5.34	**GL**	3.97
		Dp	8.4												

Table 9. Comparison of the coefficient of variation of osteometric measurements of metacarpus with modern and archeological data of Kibyra sheep (Continuation of Table 8)

Lallemand, 2002				Guintard ve Lallemand, 2003				Davis, 1996		Anzaf Kalesi (Onar ve ark.,2008)	
Female		Male		Female		Male		Female			
Order	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**
d	15.04	**d**	19.61	**d**	15.04	**d**	19.61	**DEM**	5.8	**De**	7.84
SD	14.52	**SD**	18.85	**SD**	14.52	**SD**	18.85	**DEL**	5.4	**DD**	7.34
Bp	10.79	**e**	15.24	**Bp**	10.79	**e**	15.24	**SD**	5	**SD**	6.92
GL	9.56	**DD**	14.32	**GL**	9.56	**DD**	14.32	**DIL**	4.9	**e**	6.74
e	9.55	**Bp**	13.76	**e**	9.55	**Bp**	13.76	**DIM**	4.7	**Dd**	6.38
DD	9.37	**Dp**	13.32	**DD**	9.37	**Dp**	13.32	**Bp**	3.9	**GL**	6.36
Be	9.07	**WCL**	13.09	**Be**	9.07	**WCL**	13.09	**GL**	3.8	**Be**	5.64
Dp	8.56	**Be**	12.98	**Dp**	8.56	**Be**	12.98	**WCM**	3.6	**Bp**	5.61
WCM	8.42	**DEL**	12.75	**WCM**	8.42	**DEL**	12.72	**WCL**	3.6	**Dp**	5.21
DEL	8.32	**WCM**	12.69	**DEL**	8.32	**WCM**	12.69	**Bd**	3	**Bd**	4.13
De	8.21	**DEM**	12.32	**De**	8.21	**DEM**	12.32				
DEM	8.14	**Bd**	11.96	**DEM**	8.14	**Bd**	11.96				
WCL	8.04	**DIM**	11.75	**WCL**	8.04	**DIM**	11.75				
Bd	7.79	**DIL**	11.74	**Bd**	7.97	**DIL**	11.74				
Dd	7.73	**GL**	11.58	**Dd**	7.73	**GL**	11.58				
DIL	7.36	**De**	11.24	**DIL**	7.36	**De**	11.24				
DIM	7.18	**Dd**	9.97	**DIM**	7.18	**Dd**	9.97				

Table 10. Comparison of the coefficient of variation of osteometric measurements of metatarsus with modern and archeological data of Kibyra sheep

Kibyra		Yenikapı-Marmaray (Pazvant ve ark., 2015)		Morkaraman (Demiraslan ve ark., 2015)				Tuj (Demiraslan ve ark., 2015)				Kıvırcık (Bacınoğlu, 2006)			
				Female		Male		Female		Male		Female		Male	
Order	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**
GL	5.1	**DD**	8.49	**Be**	14.81	**De**	6.5	**WCM**	11.69	**DEM**	9.3	**DEM**	8.88	**e**	8.58
Bp	7.7	**d**	8.33	**De**	10.13	**e**	4.66	**Dd**	8.08	**WCM**	5.86	**d**	7.84	**d**	7.69
d	14.2	**De**	8.2	**d**	7.48	**DEL**	3.81	**GL**	6.12	**DIM**	4.98	**DIM**	7.73	**DD**	7.47
e	13.1	**SD**	8.05	**Dd**	7.33	**DIL**	3.73	**d**	6.11	**De**	4.81	**De**	7.67	**SD**	7.39
SD	16.2	**GL**	7.89	**SD**	6.76	**WCL**	3.72	**De**	5.98	**DEL**	4.47	**SD**	7.52	**De**	6.67
DD	10.1	**e**	7.86	**DEM**	6.08	**Dd**	3.57	**SD**	5.27	**DIL**	4.35	**WCL**	7.25	**Be**	5.86
Bd	4.6	**DEM**	7.47	**DEL**	6.01	**Be**	3.26	**Bp**	5.1	**e**	4	**Dd**	7.09	**DEL**	5.82
Dd	5.9	**DEL**	7.38	**e**	5.92	**DD**	2.95	**DIL**	5.1	**GL**	3.99	**DEL**	6.97	**DIL**	5.6
Be	7.2	**Dd**	7.1	**DD**	5.46	**d**	2.91	**DIM**	5.02	**Dd**	3.9	**DIL**	6.88	**Dd**	5.36
De	4.0	**Dp**	6.98	**WCL**	4.91	**Bp**	2.88	**DD**	4.95	**Bd**	3.86	**WCM**	6.63	**DEM**	5.33
DIM	6.1	**Bp**	6.78	**Bd**	4.16	**Bd**	2.62	**WCL**	4.94	**Be**	3.73	**Bp**	6.5	**DIM**	5.32
DEM	5.9	**Be**	6.64	**WCM**	3.83	**WCM**	2.2	**Bd**	4.88	**WCL**	3.64	**DD**	6.38	**WCL**	5.19
DIL	5.8	**DIL**	6.57	**Bp**	3.39	**GL**	2.06	**Be**	4.8	**d**	3.07	**Be**	6.23	**Bp**	5.03
DEL	12.2	**DIM**	6.57	**GL**	3.38	**DEM**	1.69	**DEL**	4.58	**SD**	2.57	**e**	6.11	**Bd**	5.01
WCM	3.2	**WCM**	6.33	**DIM**	3.28	**DIM**	1.47	**e**	4.23	**DD**	2.49	**Bd**	6.06	**WCM**	4.85
WCL	7.2	**WCL**	6.05	**DIL**	2.28	**SD**	1.27	**DEM**	4.13	**Bp**	2.31	**GL**	5.55	**GL**	4.11
		Bd	5.91												

Table 11. Comparison of the coefficient of variation of osteometric measurements of metatarsus with modern and archeological data of Kibyra sheep (Continuation of Table 10)

Lallemand, 2002				Guintard ve Lallemand, 2003				Davis, 1996		Anzaf Kalesi (Onar ve ark.,2008)	
Female		Male		Female		Male		Female			
Order	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**	**Order**	**%CV**
d	13.73	**d**	18.54	**d**	13.73	**d**	18.54	**SD**	5.1	**DD**	9.36
SD	12.66	**SD**	17.68	**SD**	12.66	**SD**	17.68	**DIL**	4.9	**SD**	8.32
e	11.49	**DEM**	16.83	**e**	11.49	**DEM**	16.83	**DIM**	4.4	**e**	8.29
GL	10.41	**e**	16.64	**GL**	10.41	**e**	16.64	**GL**	4.1	**Dp**	8.04
DEM	10.2	**DEL**	16.3	**DEL**	10.2	**DEL**	16.3	**Bd**	3.2	**De**	7.86
DEL	10.2	**DD**	16.14	**DEM**	10.2	**DD**	16.14			**GL**	7.71
DD	10.18	**Bp**	15.3	**DD**	10.18	**Bp**	15.3			**Be**	7.26
Dp	10.04	**Dp**	15.16	**Dp**	10.04	**Dp**	15.16			**Bp**	5.95
WCM	9.99	**DIL**	14.82	**WCM**	9.9	**DIL**	14.82			**Dd**	5.81
WCL	9.96	**GL**	14.55	**WCL**	9.96	**GL**	14.55			**Bd**	5.45
Bp	9.95	**WCL**	14.47	**Bp**	9.95	**WCL**	14.47				
Be	9.52	**DIM**	14.45	**Be**	9.52	**DIM**	14.45				
Dd	9.44	**De**	14.39	**Dd**	9.44	**De**	14.39				
De	9.17	**Be**	14.23	**De**	9.17	**Be**	14.23				
Bd	8.95	**WCM**	14.23	**Bd**	8.95	**WCM**	14.23				
DIL	8.5	**Bd**	13.71	**DIL**	8.5	**Bd**	13.71				
DIM	8.25	**Dd**	12.91	**DIM**	8.25	**Dd**	12.91				

Table 12. Osteometric data of bone remains of ruminantia in Tell Abrid (VIIC; Early Jazeera, VIIB; Early Dynastic, VIIA; Akkadian, VI; PostAkkadian, M: Modern, K: Kibyra. The values are mm.)

Kemik	Order	VIIC	VIIC/VIIB	VIIB	VIIA/VI	M	K
Talus	**GLl**	31	32	29		29	27.2
	Bp	20	20	18		21	
Humerus	**Bd**				32		29.8

Table 13. Comparison of osteometric data of bone remains in Segsbury and Kibyra (The values are mm.)

	Bd		BT	
Humerus	**Kibyra**	**Segsbury**	**Kibyra**	**Segsbury**
	29.8	28.4	27.2	27
	Bp		**BFp**	
Radius	**Kibyra**	**Segsbury**	**Kibyra**	**Segsbury**
	29.7	25.2		23.7

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