

**REPORT ON THE FAUNAL REMAINS FROM TRENCH K
(ROMAN PESSINUS, CENTRAL ANATOLIA)**

BEA DE CUPERE

I.U.A.P. 28 'Interdisciplinary Archacology'
Royal Museum of Central Africa, B-3080 Tervuren, Belgium

ABSTRACT: Archaeological excavations at the site of Pessinus (Central Anatolia, Turkey) yielded an assemblage of faunal remains dating to the Early and Late Roman period. The bulk of this assemblage was composed of consumption refuse, dominated by the bones of ovicaprines and cattle; pigs played a minor role in the provision of meat. Carcasses of horse, donkey, dog, and fox were present among the material. One hundred and nine astragali of sheep and goat were found, dating to the Early Roman period. Some of these bones showed evidence of working. Analysis of the remains belonging to domesticated animals elucidated the techniques of animal husbandry employed during Roman times. The presence (or the putative absence) of some animal species indicated the existence of an either open or else poorly wooded palaeoenvironment.

KEYWORDS: ARCHAEOZOOLOGY, NEAR EAST, TURKEY, ROMAN PERIOD

RESUMEN: Las excavaciones arqueológicas en el yacimiento de Pessinus (Anatolia Central, Turquía) proporcionaron unas muestras de materiales faunísticos procedentes de los periodos romanos inicial y tardío. La mayoría de estos conjuntos representaban restos de comida donde el vacuno y los ovicaprinos dominaban. El porcino desempeñó un papel secundario en la provisión de carne. Entre el material aparecieron esqueletos de caballos, asnos, perros y zorros. También se recuperaron 109 astrágalos de ovejas y cabras. Algunos huesos evidenciaron huellas de manipulación mientras que el análisis de los restos de la fauna doméstica puso de manifiesto las estrategias pecuarias empleadas durante este periodo. La presencia (o ausencia putativa) de determinadas especies indica la existencia de un paleoambiente abierto o escasamente forestal.

PALABRAS CLAVE: ARQUEOZOOLOGIA, PROXIMO ORIENTE, TURQUIA, EPOCA ROMANA

INTRODUCTION

The town of Pessinus originated in Phrygian times and knew a continuous occupation through Hellenistic, Roman and Byzantine times. The town was an independent religious centre when it became part of the Roman Empire. Pessinus increased in importance during the following centuries such that, at around AD 400, it was chosen as the capital of the province of Galatia Salutaris. A castle was built during Byzantine times making Pessinus a stronghold for the empire. The latest Byzantine finds on the site date to the third quarter of the 11th century AD. The town was conquered by the Seldjoudkids at a later, albeit unknown, date. Today, the village of Ballhisar covers the ruins of the antique town (Figure 1).

An initial series of excavations was carried out at the site of Pessinus from 1967 to 1973 by a Belgian team under the directorship of Prof. P. Lambrechts (University of Ghent, Belgium). Excavations were recommenced in 1987 by Prof. J. Devreker. The data on the faunal remains from trench K, presented in this report, were obtained during the 1993 campaign. Trench K is located just outside the village of Ballhisar, south of the graveyard, and was excavated in 1991 (Devreker & Vermeulen, 1993). The trench, with a surface of 20 x 5 m, lies in the most northerly habitation area of ancient Pessinus; here, houses were built from the first century BC onwards. This area was inhabited until the Early Byzantine era. The occupation traces comprised imprints of walls, due to

recuperation of building-stones; several floors and layers, resulting from destruction, occupation, and ground-raising were distinguished. The building and rebuilding of houses created a stratigraphy in which 5 different phases could be recognised, namely: Late Hellenistic/Early Roman, Early Roman, Middle Roman, Late Roman and Early Byzantine.

This report represents the second contribution to the archaeozoology of Pessinus; an earlier study was carried out on Byzantine material coming from the "acropolis" (Ervynck *et al.*, 1993).

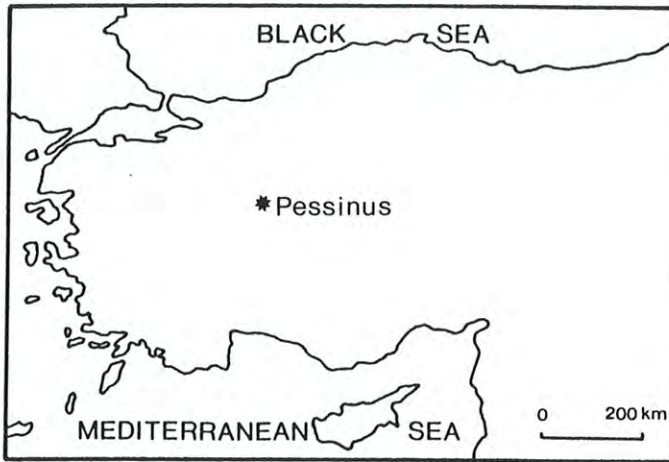


FIGURE 1. Map of Turkey with the location of Pessinus.

RESULTS AND DISCUSSION

Faunal composition

The preservation of faunal material was extremely variable, even within the same context: some bones were well preserved, others were very brittle. Identifications were carried out in the field, using the keys of Boessneck *et al.* (1964), Schmidt (1972) and Brown & Gustafson (1979). No reference collection was present and, therefore, some bones of birds, fish, and microfauna were brought to Belgium for further identification. The identified species and the numbers of their bones are listed in Table 1. Since the numbers of bones for each of the five phases mentioned above were rather low, the faunal material was grouped into two periods, viz., Early Roman (ER) and Late Roman (LR). One larger context contained material from both the Early and Late Roman periods. Therefore, it was listed apart under 'Roman.

The animal remains could be divided into four taphonomic groups, namely, remains of intrusives, consumption refuse, carcasses, and worked bone. These groups will be commented upon below.

Intrusives are animals that entered the archaeological layer without the interaction of man. In trench K they are represented by the shells of a large terrestrial gastropod (*Helix* sp.), two carapace fragments of the Moorish tortoise (*Testudo graeca*), and a mandible of the ground squirrel

(*Spermophilus citellus*). The squirrel species is common on the steppes of Central and East Anatolia (Kumerloev, 1975). The three animal species, mentioned above, normally dig burrows. Therefore, they are probably not contemporaneous with the archaeological context in which their remains were sampled.

	EARLY ROMAN	LATE ROMAN	ROMAN
<i>Helix</i> sp.	1	3	-
fresh-water mussel (<i>Unio</i> sp.) ?	-	2	-
heart-cockle (<i>Cardium</i> sp.) ?	-	1	-
wild carp (<i>Cyprinus carpio</i>)	8	13	-
cyprinid	1	7	1
catfish (<i>Siluris glanis</i>)	1	3	-
pike (<i>Esox lucius</i>)	-	-	1
fish indeterminata	1	2	2
Moorish tortoise (<i>Testudo graeca</i>)	2	-	-
goose (<i>Anser</i> spp.)	5	1	-
duck (<i>Anas</i> sp.)	3	-	-
chukar (<i>Alectoris chukar</i>)	2	2	-
chicken (<i>Gallus gallus</i> f. domestica)	65	59	13
bird indeterminata	13	16	10
ground squirrel (<i>Spermophilus citellus</i>)	-	1	-
hare (<i>Lepus capensis</i>)	24	21	5
fox (<i>Vulpes vulpes</i>)	-	1 ^a	-
roe deer (<i>Capreolus capreolus</i>)	-	-	1
fallow deer (<i>Dama dama</i>)	1	-	-
red deer (<i>Cervus elaphus</i>)	4	-	-
dog (<i>Canis lupus</i> f. familiaris)	20	11 ^b	3
horse (<i>Equus przewalskii</i> f. caballus)	59	19 ^c	4
donkey (<i>Equus africanus</i> f. asinus)	24	14 ^d	13
equid	12	9	4
pig (<i>Sus scrofa</i> f. domestica)	127	101	30
goat/sheep (<i>Capra aegagrus</i> f. hircus/ <i>Ovis ammon</i> f. aries)	925 ^e	666	350
cattle (<i>Bos primigenius</i> f. taurus)	482	247	125
mammal indeterminata	1613	1515	833

TABLE 1. Faunal list for trench K (Roman Pessinus).

Most of the material recovered in trench K is consumption refuse: it comprises the remains of molluscs, fish, birds, and mammals. The bones of the consumed animals showed butchery marks in several cases. Almost all fish bones belonged to the wild carp (*Cyprinus carpio*). Sizes of the bones indicated specimens with standard lengths of 30 to 60 cm. Bones of only two other fish species were collected, namely, the pike (*Esox lucius*) and the catfish (*Silurus glanis*). The shells of the molluscs could only be identified tentatively, as freshwater mussel (*Unio* sp.) and heart-cockle (*Cardium* sp.).

Birds remains belonged to both wild and domestic species. Three bones from a species of duck were found in the Early Roman contexts. The small size of the bones indicates that they might have belonged to the teal (*Anas crecca*) or the garganey (*Anas querquedula*). The teal breeds in Central and East Anatolia, while the garganey is more rarely observed (Kasperek, 1992). Five bones of geese were found among the Early Roman material. Judging from the bones' size four of them came from the domestic goose (*Anser anser* f. *domestica*). The fifth, a humerus, could not be measured, but was relatively small and corresponded in size to the humerus of the white-fronted goose (*Anser albifrons*). This species is common during winter times on the steppes of Central Anatolia (Kasperek, 1992). Another species of bird found in trench K was the chukar (*Alectoris chukar*), a type of partridge, which is widespread throughout most of Turkey (Hollom *et al.*, 1988). Most of the birds remains, however, belonged to the chicken (*Gallus gallus* f. *domestica*). Measurements on the bones of these chickens indicate that their size were similar to those of Roman Pergamon (Boessneck & von den Driesch, 1985; see Table 2).

Mammal remains were the most abundant items in the consumption refuse. Once again, both hunted and domestic animals were eaten. The bones of hunted mammals were dominated by the hare (*Lepus capensis*). This is the only leporid species living in Turkey. Bones of the three cervids that are living in Turkey, namely, red deer (*Cervus elaphus*), fallow deer (*Dama dama*) and roe deer (*Capreolus capreolus*), were recovered, albeit in small numbers. The present geographical distribution of these animals no longer includes the region around Pessinus (Kumerloeve, 1967). Measurements could only be taken on three bone fragments of red deer (Table 3). A study of bones of red deer from several sites in Turkey indicates that the animal's size has decreased over the course of time (Pietschmann, 1977). However, the dimensions of the bones recovered at Pessinus fall well within the range of dimensions given for the Chalcolithic and Bronze Ages.

The bulk of the consumption refuse consisted of bones of domestic live-stock: sheep (*Ovis ammon* f. *aries*)/goat (*Capra aegagrus* f. *hircus*), pig (*Sus srofa* f. *domestica*), and cattle (*Bos primigenius* f. *taurus*). Not all the bones of ovicaprines could be identified to species; nevertheless, it was clear that sheep remains were more abundant than goat remains (ratio approximately 3:1 during Early Roman times and 2:1 during Late Roman times). Nine first-phalanges and five second-phalanges of cattle showed a similar pathological feature of the proximal articular surface being more or less enlarged.

The slaughter-age of cattle, pig, and sheep/goat was determined on the basis of eruption and wear of mandibular teeth (Silver, 1969). In sheep and goats, 22% of the animals were slaughtered before having the third molar erupted or in wear: this occurs before the age of 3-4 years. The remaining 78% were slaughtered at a later age. The mandibles of cattle had all teeth heavily worn. Only the roots remained in the jaw in some cases, or the teeth had even completely disappeared and

the alveoles were closed. Only six mandibles of pigs could be used for ageing. They all belonged to animals which were young, less than 1¹/₂-2 years old when slaughtered. The long bones of pigs had their proximal and/or distal ends unfused in most cases. Slaughter-ages estimated from the bones varied between older-than-1-year and younger-than-3¹/₂-years.

coracoid	ER	ER	ER	ER	LR	LR	LR			
GL	52.0	51.6	56.8	57.1	49.1	55.9	47.6			
Lm	50.5	49.9	53.9	55.1	46.7	53.7	45.1			
BF	9.9	11.1	11.9	12.2	11.0	10.9	10.3			
Bb	-	13.6	14.7	15.2	12.5	12.5	12.6			
humerus	ER	ER	LR	LR	LR					
GL	71.1	69.4	68.1	61.6	69.0					
Bp	18.3	-	17.9	16.0	18.5					
SD	6.8	6.8	7.2	5.7	6.2					
Bd	15.8	14.6	14.4	12.8	14.5					
radius	ER	LR	LR	LR		carpome	ER	LR	LR	LR
GL	57.9	57.0	52.9	67.5		GL	40.1	36.0	35.6	40.2
Bp	5.1	5.1	4.4	6.0		Bp	12.7	10.4	11.8	11.5
SD	2.8	2.8	2.7	3.2		Bd	8.2	6.8	7.7	17.6
Bd	6.5	6.3	5.6	7.5						
ulna	ER	ER	ER	LR	LR	LR				
GL	67.3	72.7	68.2	83.7	61.3	63.0				
Bp	9.1	10.0	9.0	10.7	7.6	7.9				
Dip	12.7	13.8	13.3	16.1	11.2	11.7				
SD	4.5	4.5	3.9	5.0	3.7	3.7				
Did	9.5	10.0	9.8	11.3	8.5	8.8				
femur	ER	ER		tibiae	ER	ER	LR			
GL	73.2	67.9		GL	98.1	97.0	108.3			
Bp	14.2	14.0		Dip	17.2	17.6	18.5			
Dp	9.6	9.2		SD	5.4	5.5	6.2			
SD	6.1	5.8		Bd	10.2	9.9	11.0			
Bd	14.4	-		Dd	10.0	10.2	11.9			
Dd	12.2	-								
tarsomet	ER	ER	ER	LR	LR	LR	LR			
		♂	♂							
GL	67.3	80.1	80.2	61.2	70.0	66.8	63.9			
Bp	12.1	13.6	-	14.1	12.6	11.4	11.3			
SD	5.4	6.3	7.4	7.5	6.5	5.5	5.5			
Bd	11.6	13.1	-	15.0	11.7	11.2	10.9			

TABLE 2. Measurements on the bones of chicken.

radius	ER	ER	mt	ER	Ph2	ER
Bp	-	63.1	Bp	45.5	GL	46.6
BFp	-	58.3	Bd	47.0	Bp	25.3
Bd	58.7	-			SD	17.9
					Bd	22.1

TABLE 3. Measurements on the bones of red deer.

Withers heights could be calculated on long bones using the multiplication factors summarized by von den Driesch & Boessneck (1974). The mean value of the multiplication factors given for cows and bulls was taken in the case of cattle. Withers heights of sheep are 59 cm (ER) and 51, 59, 61, 62, 65 cm (LR); of goat, 70 cm (LR); of cattle, 126, 133, 135, 137, 140 cm (ER) and 134, 135, 137, 139, 139 cm (LR). No measurements were available for pigs because the more complete bones belonged to subadult individuals. Some measurements of cattle, sheep and goat are given in Tables 4, 5 and 6.

The relative importance of cattle, sheep/goat, and pig as a source of meat, based on the relative abundance of their bones, is given in Figure 2. Sheep and goats were the most frequently slaughtered live-stock, followed by cattle. Pigs, however, seem to have played a minor role in the provision of animal proteins. The techniques of animal husbandry employed in Roman Pessinus can be partially reconstructed using the information on slaughter-age and relative frequency of the species. Sheep and goats were bred not only to provide of meat: wool and milk were also important products. Cattle were probably used for hard labour on the land, as indicated by pathologies on the phalanges, which are currently found in draft animals (Bartosiewicz *et al.*, in prep.). These large bovids were slaughtered at an old age, when they could no longer perform as a means of haulage. Additionally, cows might have provided milk. Conversely, pigs were only kept for their meat and, therefore, slaughtered as soon as it became necessary to supply them with feeding during winter, or when they would no longer gain in weight.

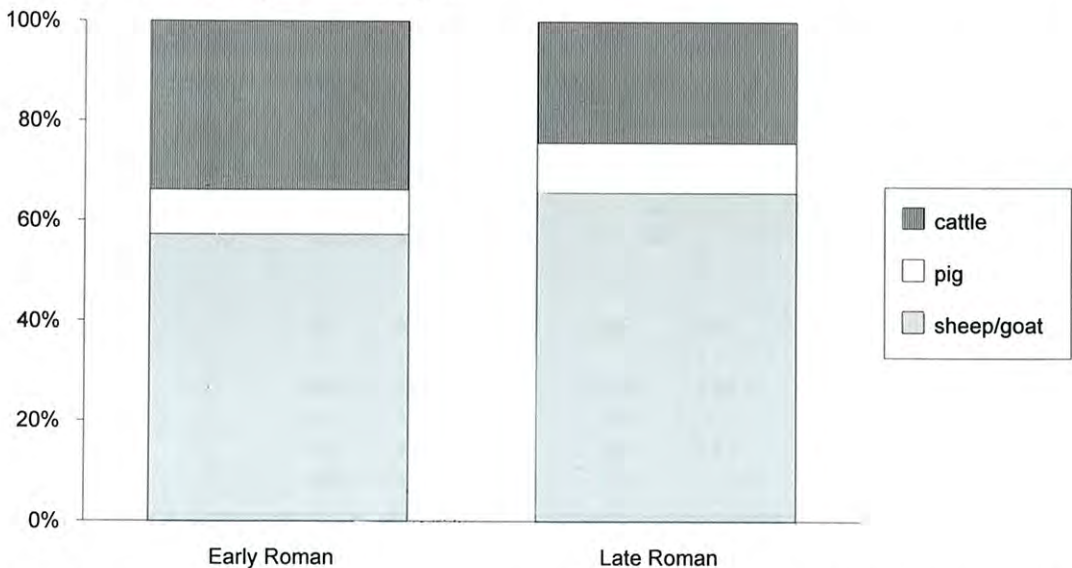


FIGURE 2. The relative distribution of sheep/goat, cattle and pig during the Early Roman and Late Roman Period in trench K.

FAUNAL REMAINS FROM TRENCH K

humerus	ER		radius	ER	ER	ER	ER						LR
BT	68.4		Bp	91.3	73.3	-	77.7		Bd	87.1			
			BFP	80.9	67.7	69.2	72.4						
tibia	ER	ER	ER	LR	LR	LR							
Bp	78.7	70.5	-	-	-	-							
Bd	-	-	53.7	64.0	57.9	69.6							
talus	ER				LR	LR	LR						
	min	max	n	x									
GLI	64.3	77.4	5	72.2	71.5	75.9	77.1						
GLm	60.0	73.1	5	65.8	-	71.0	69.4						
DI	37.3	44.5	5	40.1	42.3	41.2	44.4						
Dm	38.7	47.5	5	41.1	-	42.1	44.3						
Bd	42.2	51.8	5	47.0	-	50.2	44.9						
mc	ER	ER	ER	LR	LR	LR	LR		mt	ER	ER	LR	
GL	204.0	227.5	219.7	225.3	219.5	226.7	218.3		GL	243.7	251.1	251.	
Bp	61.9	70.9	60.3	85.5	57.1	61.3	57.0		Bp	49.0	-	48.8	
SD	35.4	41.4	30.9	39.2	32.0	36.4	32.0		SD	25.1	29.6	28.4	
Bd	67.1	-	59.7	67.1	57.9	61.4	57.2		Bd	56.2	57.7	55.6	
Ph1	ER	ER	ER	ER	ER	ER	ER	ER	ER	ER	ER	ER	ER
	a.e.	a.e.	a.e.	a.e.	a.e.	a.e.	a.e.	a.	p.i.	p.i.	p.i.	p.i.	p.i.
GLpe	71.0	66.2	67.4	64.0	60.9	58.6	66.4	69.3	69.5	62.3	59.4	63.4	
Bp	41.3	25.7	35.9	27.7	28.5	30.2	31.8	-	34.2	25.5	24.4	27.6	
SD	34.8	32.7	31.1	24.8	23.7	26.1	26.6	28.7	31.6	20.4	21.0	24.9	
Bd	36.3	30.8	37.1	27.6	27.1	28.1	20.9	33.3	34.5	25.0	24.2	27.6	
	-	-	-	+	-	-	-	-	+	-	-	-	-
Ph1	ER	ER	ER	ER	ER	ER	ER	ER	ER	LR	LR	LR	LR
	p.e.	p.e.	p.e.	p.e.	p.e.	p.e.	p.e.	p.e.	p.e.	a.i.	a.i.	a.i.	a.i.
GLpe	64.5	68.9	67.8	68.2	62.3	66.8	73.2	57.7	62.0	60.7	66.9	68.6	
Bp	28.9	34.2	35.0	25.3	30.2	33.7	34.1	24.7	27.0	34.6	33.3	44.0	
SD	24.2	34.2	29.8	22.5	25.5	29.4	29.4	20.9	24.1	29.0	27.2	32.1	
Bd	25.7	31.2	33.1	24.7	28.7	31.0	33.0	26.0	25.7	32.8	32.8	34.7	
	-	-	+	-	-	+	-	-	-	+	-	++	
Ph1	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR
	a.i.	a.i.	a.i.	a.e.	p.e.	p.e.	p.e.	p.e.	p.e.	p.e.	p.e.	p.e.	p.e.
GLpe	64.0	65.5	67.7	63.2	62.7	68.2	60.1	61.8	64.3	78.1	68.4	72.1	
Bp	32.5	36.2	41.2	37.1	26.6	34.3	28.3	32.1	30.1	32.1	33.4	34.2	
SD	27.3	32.5	32.6	31.5	24.8	29.0	24.3	26.4	24.4	27.0	27.2	39.3	
Bd	29.6	34.7	37.7	31.9	27.3	32.3	25.6	28.7	27.4	31.8	31.8	33.3	
	-	-	+	++	-	-	-	-	-	-	-	-	-
Ph1	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR
	p.e.	p.e.	p.e.	p.e.	p.i.	p.i.	p.i.	p.i.	p.i.	p.e.	p.e.	p.e.	p.e.
GLpe	61.5	61.9	64.0	61.8	66.7	64.5	57.7						
Bp	38.1	38.3	32.4	33.4	32.8	35.3	31.2						
SD	24.2	22.9	27.3	27.8	28.2	30.0	26.2						
Bd	26.2	25.3	29.9	32.1	33.0	30.3	30.8						
	-	-	-	-	-	-	+						
Ph2	ER	(ant)			ER	(post)							
	min	max	n	x	min	max	n	x					
GL	39.3	49.6	12	43.8	40.7	49.0	9	44.5					
Bp	30.7	42.7	11	35.2	28.6	40.7	11	32.6					
SD	23.3	34.7	11	28.5	21.2	31.5	11	25.8					
Bd	24.9	35.3	10	29.7	22.7	32.2	11	26.7					
Ph2	LR	(ant)			LR	(post)							
	min	max	n	x	min	max	n	x					
GL	39.3	47.1	8	42.2	38.2	47.2	8	42.3					
Bp	27.9	34.8	8	32.2	27.2	34.5	9	29.8					
SD	23.7	31.2	8	26.6	21.6	27.8	9	23.9					
Bd	24.9	31.8	8	28.6	23.5	28.7	8	25.3					

TABLE 4. Measurements on the bones of cattle (a.= anterior; p.=posterior; i.=internal; e.= external). The presence of an enlargement of the articular surface of the first phalanx is given by +, ++ and +++. Absence of this pathological feature is given by -.

humerus	ER				LR				
	min	max	n	x	min	max	n	x	
Bd	28.6	34.7	8	32.2	30.9	37.0	6	32.9	
BT	28.5	32.5	8	30.1	27.5	35.0	7	30.4	
radius	ER	ER	ER	LR	LR				
	Bp	29.4	32.9	-	-	26.4			
	Bfp	32.9	30.5	-	-	31.3			
	Bd	-	-	29.7	29.6	-			
femur	ER	ER	ER	LR	LR	LR			
	Bp	47.8	45.2	42.5	49.6	45.7	45.4		
	DC	21.5	21.0	22.0	22.8	-	-		
calcaneus	ER	ER	ER	LR	LR	LR	LR		
	GL	63.7	51.0	61.3	63.2	62.2	59.6	54.2	
	GB	21.5	18.8	21.4	20.5	20.8	21.6	20.4	
talus	ER				LR	LR	LR	LR	
	min	max	n	x					
	GLI	27.5	34.9	74	30.9	29.9	31.2	29.4	31.4
	GLm	25.8	32.7	76	29.3	28.3	29.2	28.0	29.9
	DI	15.4	20.2	75	17.1	16.5	17.3	16.3	17.6
Bd	17.5	23.3	74	20.2	20.2	20.4	20.4	20.2	
mc	LR	mt	ER	LR	LR	LR	LR	LR	
	GL	133.4	GL	129.1	133.7	112.3	137.2	129.6	
	Bp	25.4	Bp	20.6	21.3	-	21.3	20.9	
	SD	16.2	SD	11.2	11.6	14.4	12.6	12.8	
Bd	29.7	Bd	24.8	24.2	25.9	27.3	24.7		
Ph1	ER	ER	ER	LR					
	min	max	n	x					
GLpe	39.2	44.7	35.9	33.3	37.2	8	35.4		
Ph2	ER	ER	ER	ER	ER	LR			
	GL	23.3	22.1	22.0	23.2	21.9	22.1		

TABLE 5. Measurements on the bones of sheep.

Several species were not eaten when they died but their carcasses were thrown away or buried. Consequently, several bones, belonging to one individual, can be found together. During the Late Roman Period (ca. AD 300) the walls and floors of a house were destroyed and removed (Devreker & Vermeulen, 1993). The remaining cast of this house was filled with sediment in order to level the ground surface. The carcasses of several horses (*Equus przewalskii* f. *caballus*), and the almost complete skeletons of a dog (*Canis lupus* f. *familiaris*) and a fox (*Vulpes vulpes*) were retrieved from this infill. Foxes are burrowing animals, hence the remains of this species could come from a subsequent, intrusive animal. Nevertheless, it is assumed that, in this particular instance, we are dealing with the carcass of a hunted animal because it was found together with the other carcasses. Foxes were killed for their fur or chased for the harm that they did to domestic fowl. The skull of the skeleton was missing.

radius	ER	LR	LR	LR	LR	calcaneus	ER	LR	
Bp	-	-	-	30.5	32.2	GL	58.1	63.5	
BFp	-	-	-	27.5	31.0	GB	20.8	21.3	
Bd	29.1	32.2	30.9	-	-				
mc	LR		talus	ER			LR	LR	LR
GL	122.5			min	max	n	x		
Bp	25.4		GLI	25.9	34.2	17	29.5	30.9	32.1
SD	15.6		GLm	23.2	21.9	17	28.1	29.0	30.9
Bd	29.3		DI	14.2	18.2	16	16.0	16.8	17.1
			Bd	17.0	24.2	16	19.0	20.5	21.3
Ph1	ER	ER	ER	ER	LR	Ph2	LR	LR	LR
	min	max	n	x		GL	21.5	21.2	25.8
GLpe	35.5	44.9	6	39.6	46.5				

TABLE 6. Measurements on the bones of goat.

The skeleton of the dog belonged to a subadult individual. The skull was also missing from this individual; nevertheless, the long bones with unfused epiphyses indicated an age younger than 8-9 months (Silver, 1969). The right tibia, of which only the proximal half was present, showed a thickening of the shaft. The marrow cavity was completely filled with spongy bone. This pathology is considered to be an incompletely healed fracture. A second skeleton of a dog was recovered in a layer resulting from ground-raising which dated to the Late Roman period. This skeleton was less complete: only some vertebrae, ribs, the pelvic girdle, and both femurs were present. The withers height of this specimen was 41 cm. More dog remains were collected from other contexts. The length of three long bones could be used to calculate withers heights: two relatively small dogs (25 and 31 cm) and one large individual (63 cm) are present. Measurements are given in Table 7.

atlas	ER		radius	ER	ER	LR	
BFcr	39.3		GL	75.2	-	196.4	
BFcd	29.4		Bp	11.1	-	19.7	
LAd	17.6		SD	7.6	-	14.2	
H	28.4		Bd	-	17.8	25.9	
femur	ER	ER	LR	LR	tibia	ER	ER
GL	100.6	-	136.7	-	Bp	33.9	-
GLC	101.7	-	137.1	-	Bd	-	23.3
Bp	22.5	27.0	29.3	29.7			
DC	-	12.1	15.1	15.0	calcaneus		
SD	7.8	-	10.0	-	GL	32.2	
Bd	-	-	23.4	-	GB	34.8	

TABLE 7. Measurements on the bones of dog.

The carcass remains of horses, which were found in the raised level from the Late Roman period, consisted of four skulls, a mandible, one complete forelimb, and three complete hindlimbs. The limb bones and three of the skulls were badly preserved. Withers heights, calculated from the metacarpal and metatarsals, indicate animals of 136, 137, 137, and 144 cm. The age was estimated from teeth and epiphyseal fusion. One skull belonged to an animal of approximately four years, while the other three skulls and the mandible were from individuals older than 4¹/₂-5 years. All the limbs are from subadult individuals and, therefore, cannot correspond to any of the skulls. Two hindlimbs apparently belonged together (estimated age 3-3¹/₂ years). The forelimb corresponded with these two hindlimbs in terms of age and estimated withers heights. The third hindlimb belonged to an individual of approximately 20 months. Thus, there were at least six individuals in this context. Additional horse bones and teeth were collected from other contexts. Withers height could be calculated in two further instances, from a metacarpal (140 cm) and a metatarsal (144 cm) from an Early Roman context. Remains of the donkey (*Equus africanus* f. *asinus*), which is another species which was probably not consumed, were less frequent. Measurements of bones of horse and donkey are given in Tables 8 and 9.

The skeleton of a juvenile sheep or goat (estimated age approximately 6 months) was found in an Early Roman context. It is assumed that this young animal had not been eaten by men because its skeleton was rather complete. It probably died from a disease and, consequently, was discarded.

Astragali of sheep and goat

One hundred and nine astragali (knuckle-bones) of sheep and goats were found in an archaeological layer consisting of a floor and a layer of sediment above it, used to raise the ground-level; these astragali dated to the Late Hellenistic/Early Roman period (ca. 50 BC - AD 20). The bones were distributed in only one quadrant (approximately 4 m) of the house; the same layer continued in the neighbouring quadrant but only one astragalus was found there. The layer in the 4 m quadrant was, with the exception of the astragali, poor on animal bones: only nine identified and ten unidentified animal bones were sampled. Sixty-two of the knuckle-bones originated from sheep and 15 from goat; the others could not be identified to species. Some specimens showed evidence of working: the lateral and medial sides of the bones were partially abraded. A similarly worked astragalus was recovered from an occupation level of a later date (2nd - 3rd century AD). No traces of sawing were visible, therefore, these specimens must have been ground to obtain the flattened surfaces.

The presence of astragali among archaeozoological material, as part of the consumption refuse, is very common. However, in the case of trench K at Pessinus, their large number and the presence of worked specimens indicate that these bones were no ordinary refuse: they were gathered with a particular intention. It is known that the astragali from sheep and goats have often been used as toys. There existed (and still exists) a wide variation of games, played at least since the late 14th century BC in Egypt and mentioned by Homer (Reese, 1985). Greeks also used the bones for religious practises: the way the bones fell would indicate the divine will (Amandry, 1984). One cannot exclude the possibility that similar practises existed during Roman times. Therefore, the use of the astragali in trench K is still unknown: they could have served for both game and divination.

scapula	LR ³		radius	ER		tibia	LR _{2m}			
GLP	61.8		Bd	74.8		GL	(338)			
LG	40.0					Bp	-			
BG	33.4		calcaneus	LR ² (r)		SD	41.2			
SLC	42.3		GL	110.2		Bd	73.2			
						Dd	45.1			
mc	ER	LR ⁷		mt	ER	LR ¹	LR ² (r)	LR ² (l)		
GL	226.1	222.4		GL	-	-	267.1	265.3		
GLI	-	219.7		GLI	275.7	275.6	266.0	-		
LI	-	214.1		LI	-	-	256.3	-		
Bp	49.7	51.3		Bp	48.8	-	51.7	-		
Dp	-	33.0		Dp	-	-	43.2	-		
SD	32.8	34.2		SD	31.3	30.3	32.0	29.7		
Bd	50.2	49.7		Bd	48.8	-	48.7	49.9		
talus	LR ¹	LR ² (r)	LR ² (l)		Ph1	ER	LR ¹	LR ² (r)	LR ² (l)	LR ³
GH	57.2	57.4	55.4		GL	73.4	86.2	77.6	78.7	82.7
GB	62.6	62.0	64.3		Bp	53.3	52.9	53.6	55.2	54.1
BFd	50.9	50.7	53.0		BFp	48.2	50.2	49.4	50.3	49.4
LmT	59.6	52.9	55.3		Dp	38.2	39.5	-	37.0	35.4
					SD	35.3	32.5	34.9	35.0	36.4
					Bd	43.4	45.3	43.2	43.5	45.3
Ph2	ER	ER	LR ¹	LR ² (r)	LR ² (l)	LR ³				
GL	41.5	46.2	50.4	46.9	44.4	45.3				
Bp	44.2	44.8	48.5	51.6	50.9	51.7				
BFp	40.1	39.8	46.0	44.4	44.6	46.5				
Dp	-	-	33.4	31.4	-	31.6				
SD	37.2	37.6	40.8	43.0	43.1	46.6				
Bd	41.2	40.6	-	-	47.4	50.8				
Ph3	LR ¹	LR ² (r)	LR ² (l)	LR ³						
GL	-	-	61.4	-						
LF	26.0	30.1	30.2	29.0						
BF	42.3	-	46.3	47.0						
Ld	50.7	51.6	53.7	50.5						
HP	36.2	46.2	38.9	34.0						

TABLE 8. Measurements on the bones of horse (l=left; r=right; 1, 2, and 3 each represent bones of one individual).

Palaeoenvironment

The species composition of the faunal sample has enabled a rough reconstruction of the environment around Roman Pessinus. Remains of woodland animals were very rare (e.g. cervids) or even completely absent (e.g. wild boar and bear). Conversely, bones of hare, living in open landscapes, were commonplace. The ground squirrel, as inhabitant of steppes, was also represented. Thus, in Roman times the environment around Pessinus must have been open and poorly wooded.

scapula	LR	LR	LR	mc	ER	LR ²	tibia	LR	
GLP	61.8	-	-	GL	-	183.1	GL	278.7	
LG	40.0	-	-	Bp	-	37.8	BP	66.7	
BG	33.4	-	36.0	SD	-	25.0	SD	29.6	
SLC	42.3	43.6	44.6	Bd	35.8	35.1	Bd	54.6	
radius	ER	LR	LR ²	mt	ER	LR	LR ¹	LR	
GL	-	-	274.8	GL	217.0	221.2	216.0	227.0	
Bp	-	-	62.3	GLI	-	-	215.9	-	
BFp	-	-	57.1	Bp	38.2	35.1	35.7	43.6	
SD	-	-	30.9	SD	23.3	21.6	21.1	26.2	
Bd	59.0	51.6	55.3	Bd	33.2	33.1	32.4	39.0	
talus	LR	femur	ER						
GH	42.4	Bd	64.4						
LmT	42.9								
GB	44.4								
BFd	34.2								
Ph1	ER	ER	LR	LR ¹	Ph2	ER	ER	ER	LR ¹
GL	65.3	66.3	73.8	62.2	GL	32.4	-	-	33.3
Bp	36.7	36.0	37.9	35.8	Bp	35.4	44.8	-	33.9
BFp	35.4	34.1	36.4	33.0	BFp	-	39.8	-	31.7
Dp	-	-	28.2	26.3	SD	29.2	37.6	-	27.3
SD	21.4	22.6	23.8	20.9	Bd	-	40.6	36.7	26.2
Bd	-	32.5	33.9	30.1					
BFd	-	-	33.9	29.8					

TABLE 9. Measurements on the bones of donkey (1 and 2 each represent bones of the same individual).

The composition of the live-stock also indicates an open environment. The preponderance of sheep and cattle, which need meadows to graze, shows that large pasture fields must have existed in the area of Roman Pessinus. Goats can be easily kept on 'low quality' plants, such as shrubs, or poorly vegetated areas. The increased number of goats in Late Roman times might indicate that the lack of grass, probably caused by overgrazing during the preceding period, forced people to breed more goats instead of sheep and cattle.

During the Byzantine period some bones of wild boar were present in the collection, while all cervids were absent. Cattle bones strongly dominated the faunal remains. The relative abundance of cattle, sheep/goat and pig remains of this period were 61, 21 and 18 % respectively (Ervinck *et al.*, 1993). However, the Byzantine material was badly preserved, hence a quantitative comparison with the collection studied here is impossible. Nevertheless, the environment in Byzantine times must have been similar to that of the Early Roman period, namely, an open landscape with fields and pastures, and some areas with wooded vegetation.

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