Appendix III

TAPHONOMICAL ASPECTS OF THE RECENT EXCAVATIONS AT EL-WAD

Rivka Rabinovich*

The study of the faunal remains at el-Wad encompasses squares I40-I42 from the NE part of Chamber III. Because of the restricted area involved and the small sample analysed, our discussion will concentrate on composition, taphonomic aspects and general palaeoenvironmental reconstructions. As with the other finds, the faunal remains will be discussed "en gros" and no finer sub-divisions will be attempted at this stage. Similarly, no spatial analyses can be carried out at this point.

There are three previous studies on the fauna of the site: Bate (1937), Garrard (1980) reexamining Bate's finds, and Valla et al. (1986). The carnivores were studied by Kurten (1965), Davis (1977), Dayan (1989, 1994) and Tchernov and Valla (1997). Because of the nature and limitations of both the old and current studies, it remains impossible to establish the contemporaneity of any of the assemblages we have and they are taken as "Natufian" merely for the sake of our general discussion.

Moreover, as the exact definition of species as well as data concerning species distribution during the Natufian in southern Levant differ from what was pertained in Garrod's days (Davis, 1981, 1983; Tchernov, 1991, 1993b), our discussion will limit itself to the genus level. When specific definitions are given they are based on Garrard's observations (Garrard, 1980; Table 5:C).

---

* Department of Evolution, Systematics and Ecology, The Hebrew University of Jerusalem, Jerusalem, Israel.

General Taphonomic Considerations

Fauna accumulated in cave sites can give us many clues as to complex depositional and post-depositional processes. Firstly, the various species that permanently, seasonally or even just occasionally use a cave for their living space, introduce their prey animals into the cave and thus into its deposits. Main bone depositors are birds of prey (mainly owls) and carnivores, each with its own distinct prey distribution in terms of species, body parts and breakage patterns (Andrews 1990; Lyman 1994). Secondly, there are various known processes that can influence the preservation of the deposited bones, which is often selective. All such factors have to be considered before we can start reconstructing human behaviour as reflected in faunal accumulation.

The faunal assemblage found at el-Wad poses a number of problems as to the origin and nature of the accumulated bones. Most of the excavated area contained recent material. It is easy to establish whether fresh-looking bones are recent or old, going for example by colour, weight and even smell, but this becomes more difficult when such criteria are missing, especially when smaller species are concerned such as insectivores, rodents and birds. Moreover, bones of species using the cave are naturally mixed with bones from older deposits. In other words, not only should the upper layers in any cave be very carefully examined but also post-depositional agents should be cautiously identified, and materials should be keenly separated from such features as pits. This is especially true for caves such as el-Wad, not only because the site has been used by people and animals for thousands of years but also because of previous excavations (Garrod and Bate, 1937; see above, Chapter 5, "Stratigraphy"). An encouraging sign was that we found three bone parts from the same specimen that could be joined together, because it suggests that only minor spatial displacement have taken place (canid mandible – I41b 153; I42d 134; I42d 129 – No. 381, one specimen).

Highly mixed material was found in square I40 (Fig. 31), with numerous bat elements that are recent, mostly fruit bat (*Rousettus aegyptiacus*). Fruit bats roost in caves, often in colonies of up to several thousand. In the pit likely to have been in this area (see above, Chapter 5, "Stratigraphy"), recent fragile bone elements of bats, rodents, and birds were had accumulated. In squares I41-I42 there was a smaller number of recent specimens. Because of the small sample only a general analysis could be performed on the small animals, but the composition of the sample fits in well with the detailed study of the terrace excavation (Tchernov in Valla et al., 1986) where they outnumber the rest of the fauna. Rodents include mandible, maxilla and post cranial elements of *Spalax ehrenbergi*, *Meriones tristrami*, *Sciurus anomalus*, *Rattus rattus*. Insectivores included elements of *Erinaceus europaeus*, and *Crocidura russula*.

Tortoise bones of *Testudo graeca* include mainly nuchal bones, carapace parts and a few post-cranials: caracoid, scapula and femur. The carapace bony plates were broken into small pieces of up to 2cm. This might be related to natural breakage common to carapace found in other sites as well.

Both large birds (falconiformes) and small birds (passeriforms) were present, and although their species could not be defined, body part distribution was noticed. Here too, it proved quite difficult to separate recent from ancient elements — many premaxilla parts look very fresh, while post-cranials seem ancient, suggestimg that in order to distinguish between old and recent bones we need to have more to go on than looks alone (weight, smell). The most common elements were proximal parts of humerus, unidentifiable shaft parts, tarso-metatarsus and coracoid. The accumulation of larger bird bones is probably due to humans as owls tend to introduce on the whole micromammals and passeriform birds.

A few fish vertebrae and scale parts were found (NISP- 20). In a previous study of the el-Wad terrace bone fragments of small marine fishes (20-100gr.) were identified (Desse in Valla et al., 1986).

Our macrofaunal sample taken from squares I40-I42, includes 2,044 identifiable bones (NISP). Species included: gazelle (*Gazella gazella* – 49%), hare (*Lepus capensis* – 34%), fallow deer (*Dama mesopotamica* –9%), red fox (*Vulpes vulpes* – 2%) with other species represented by less than one percent (Table 16). Bone fragments that could not be defined as to species (35% of the bones) were recorded only in body size groups, from A to E, i.e., BSGA–BSGE, but these, too, reflect the relative distribution of the species, with gazelle, (BSGD –73%) being the largest and most common group followed by, in descending order, hare size (BSGE – 13%), fallow deer size (BSGB – 12%), capra size (BSGC –4%), and red deer size (BSGA –2%). Since most of the elements in the different body size groups are ribs, vertebrae or long bone splinters, these groups are important in the way they reflect the mode of deposition and processing of the animals at the cave. There were thousands of bone fragments but these proved too shattered to allow definition.

Species Distribution

Carnivora

Family Ursidae

Ursus arctos?

A part of distal radius, broken and weathered but seemingly with most of the required characteristics.

Family Canidae

Canis lupus/familiaris

About 14 fragments of teeth and post-cranials were defined as canid, probably domesticated dog (Bate, 1937; Davis and Valla, 1978; Dayan, 1994; Tchernov and Valla, 1997). Bate (1937) defined a skull part as belonging to domesticated dog (the el-Wad B specimen), although no recent dog was found to resemble this Natufian one. Parts recorded were two mandibles, lower premolar, distal humerus, ulna, scapula and phalanges (Table 16). One of the mandibles is of a foetus, its proximal ulna still unfused (it fuses during the first year). Presence of a juvenile was recorded in a tomb at Eynan (Mallaha) by Davis and Valla (1978), where the connection between a human burial and the characteristic mandible suggests domestication (ibid.).

The measurable mandible (No. 381) is of an adult, but not of an aged, specimen, as very little erosion is present on M_1. It includes the proximal part of the mandible, the area of the molars, the mandibular condyle and notch, while the coronoid process is missing. As

Table 16: El-Wad species and body part distribution.

Species	Sus	Gaz	Cer. e*	Cerv.	Dama	Capre.	Capra		Canis	Vulpus	Ursus	Meles	Martes	Lepus	BSGA	BSGB	BSGC	BSGD	BSGE
skull	2	16			2									3		10	1	19	
horn core		49					1											5	
antler				6	4														
maxilla fragment		16											1	19				3	
maxillary teeth-isolated	1	73			7					3		1		3					
maxillary teeth		9			1	1													
maxilla+mandible																			
mandible fragment	1	22			5		1		2	8			3	16	1	6		6	
mandibular teeth-isolated	1	42			18				3	1				10					
mandibular teeth		7			2		1		1	1									
isolated teeth	2	7								2				11					
atlas		5		1	2								1			1		1	
axis		1			1				1				1					1	
sternum																			
vertebrae		5			1				1	1				10	4	14		62	29
sacrum		1								1				4		1			
ribs					2					1					1	20		74	15
scapula	1	20			8		1		1	2				32	2	6		11	
humerus		34			6		2		1					37	2	1	1	5	
radius		16	2		1					3	1			21		2		9	
ulna		13	1		3				1					18				1	
radius+ulna		3														1		3	
carpals		12	2		5													2	
metacarpal	1	8	1		4									22				1	
phalange																			
phalanx 1	1	45			7				2					14				1	4
phalanx 2	4	35			5				1					14		1			1
phalanx 3		29	4		3									3					
pelvis		24			7				1					44				6	
femur	1	35			2					1			1	29	1	3		12	
tibia		27			7	1				2				69	1	4		10	2
fibula																			

tarsals		20			5					1				3	1			4	
patella	1	8	1		1					1				1				3	
calcaneum		10	1							1		1		9				1	
astragalus		14			6									6					
metatarsal		31			3		1			3				46		2		1	
metapodial	2	6			1									1				1	
sesamoid		10			2													3	
long bone splinters		1			3									4	2	14	2	274	39
Total (2044)	**18**	**654**	**12**	**7**	**124**	**2**	**7**		**15**	**32**	**1**	**2**	**7**	**449**	**15**	**86**	**4**	**519**	**90**
% of NISP	**0**	**32**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**22**	**0**	**4**	**0**	**25**	**4**

Sus - *Sus scrofa*
Gaz - *Gazella gazella*
Cer. e* - *Cervus elaphus*
Cerv. - Cervid sp.
Dama - *Dama mesopotamica*
Capre. - *Capreolus capreolus*
Capra - *Capra aegagrus*
Canis - *Canis lupus/familliaries*
Vulpes - *Vulpes vulpes*
Ursus - *Ursus arctos*
Meles- *Meles meles*
Martes - *Martes foina*
Lepus - *Lepus capensis*
BSGA - body size group A - red deer size (150 - 250kg.)
BSGB - body size group B - fallow deer size (80 - 150 kg.)
BSGC - body size group C - capra size (40 -80 kg.)
BSGD - body size group D - gazelle size (15 - 40kg.)
BSGE - body size group E - hare size (2 - 7 kg.)

already mentioned, its three parts could easily be joined. To define it, we have used some of the measurable criteria described by Dayan (1994) and Tchernov and Valla (1997) (Table 17).

Table 17: Measurements of el-Wad canids.

Number	Body part		mm
381	**Mandible**		
	Lower M1		
		length	25.98
		width	9.86
		MH	24.04
		DR	22.26
		MR	41.08
558	**Axis**		
		LCDe	56.1
365	**Humerus distal**		
		Bd	30.15
		H	11.83
1146	**Scapula**		
		GLP	32.27
		LG	21.46
		BG	21.35
		HS	
			5
556	**Phalanx first**		
		GL	27.42
		BP	9.2
		Bd	7.71
873	**Phalanx first**		
		GL	28.28
		BP	9.4
		Bd	7.72

MH = Height of the mandible behind lower M1, measured at right angles to the basal border
DR = Depth of ramus under middle lower M1, measured at the alveoles
MR = Length of molar series
LCDe = Greatest length in the region of the corpus including the dens
Bd = Greatest width of distal end
H = Height of distal end
GLP = Greatest length of glenoid region
LG = Length of glenoid cavity
BG = Width of glenoid cavity
HS = Height along the spine
GL= Greatest length
BP = Greatest width of proximal end
Bd = Greatest width of distal end

The size of the lower carnassial (M_1) is closer in size to the Kebaran specimen from Neve David, and does not differ significantly from the recent Israeli wolves (Dayan, 1994, Table 2, Fig. 2). According to Tchernov and Valla (1997, Fig. 9) it falls within the range of recent wolves, similar to a wolf that weigh 23.2 kg. The height of the mandible, measured at two points (behind M_1 – MH; and under middle M_1 – HR), falls within the range of the Desert pallipes (*Canis lupus pallipes*) for the MH (Dayan, 1994, Table 1, Fig. 4) but is smaller than the mean of the Natufian dogs, and smaller too than the recent wolves (Tchernov and Valla, 1997, Table 1), while the length of the molar series (LM) resembles recent wolves (Tchernov and Valla ,1997, Table 1). That is, the el-Wad mandible shows a reduction in the depth of the mandible ramus but not in teeth size. Tchernov and Valla (1997) mentioned that, as to the depth of the ramus under M_1, there was no change in the thickness of Natufian dogs and the Saluki dog. They also mentioned the wide variability of M_1 within the Natufian population of dogs. Significant, too, is that the size of the upper teeth of a canid (M^1), found in the previous excavation (el-Wad B specimen), does not differ from the recent wolf population (H – Dayan, 1994).

Post-cranials could only be compared with two Natufian dogs from Hayonim Terrace (HT). El-Wad distal humerus resembles the specimens from HT in their slender dimensions (Tchernov and Valla, 1997, Fig. 18). The scapula's distal articulation — glenoid cavity — is longer and wider than in the HT specimens, but smaller than in the Saluki dog. No contemporaneous fossil material was available for comparison of the axis, found to be smaller than in the Saluki dog, but this may be because of sex difference, or other related specifications. If there were changes in the skull of the Natufian dogs, a change in their axis should also be expected, even if it occurred mainly in the snout part and less in the proximal part of the mandible.

An acetabulum fragment, broken, originates from a canid, a specimen smaller than the recent Saluki dog.

The canid foetal mandible is almost complete, but is difficult to assign to a specific canid species, since we have no other specimens to compare it with. As Tchernov and Valla (1997:93) pointed out: "The amount of similarity with wild wolves among these dogs possibly reflects the amount of gene flow between commensal and wild flock ... We argue that this kind of morphology is typical to unconscious selection; no interference of people is displayed in the morphology of the Natufian dogs. This also explains the marked differences between the dogs from the different sites."

The Natufian dogs present complex changes. Though small, the fossil material does reveal variability. The mandible from el-Wad is of interest for its very large M_1. The molar row is as large as in the range of recent wolves, but the ramus is less wide, more resembling the Eynan (Mallaha) specimen (4130-188) that also has a smaller M_1 (22.8; 8.59). The few post-cranials that could be measured are in the range of the two Natufian dogs from HT, with only the scapula glenoid cavity being larger.

As it proved impossible to relate all the finds to one particular specimen, it may be that what we have here are a wild wolf (represented by the mandible) and a "Natufian domesticated dog" specimen (represented by the post-cranials). Less likely, though also worth considering is the presence of variation between the mandible and post cranials in the HT dogs (Tchernov and Valla, 1997); we might have here evidence for local Natufian dogs at el-Wad. Variation in the mandible is mainly related to the shortening of the snout and less of the proximal part (molar area). As has been suggested, body size may have changed faster than tooth size in the evolving dogs (Tchernov and Valla, 1997). We find no crowding of the molars in these specimens, but the variability along the proximal part of the mandible shows how complex these processes are.

Vulpes vulpes

Fox remains include mandible fragments, maxilla and a few post cranials, among them a baby mandible and an unfused proximal femur and radius. None of these elements were measurable and it was impossible to define the size of this particular fox, though it is known to have been larger than the recent species (Davis 1977, Davis 1981; Dayan et al., 1989).

Family Mustelidae

Meles meles

Eurasian badger – Upper tooth and calcaneum.

Martes foina

Marbled polecat – A few teeth, atlas, axis and femur, and a mandible of a young specimen.

Lagomorpha

Lepus capensis

Many bone fragments from all parts of the body of this species were found. Twenty six percent of the bones were unfused, including two foetal bones (Fig. 98). The size of the hare is larger than the recent population (Table 18). Reduction in Lepus size has been traced by Ra'anan (1980) from the Kebaran (Ein Gev), through the Natufian (Hayonim Cave B) until recent, and may be explained as a reaction to climatic change, as in Bergmann's rule, where populations of one particular species from colder regions tend to be larger than those of warmer regions (ibid.).

Larger mammals are represented by wild boar, red deer, fallow deer, wild goat, gazelle and roe deer.

Artiodactyla

Family Suidae

Sus scrofa

A few elements of wild boar, including teeth, skull fragments, phalanx and limb bones, were recovered (Table 16). Two bones are from a one-year old boar and one of a foetal specimen. These remains are too sporadic to allow further examination (Table 19).

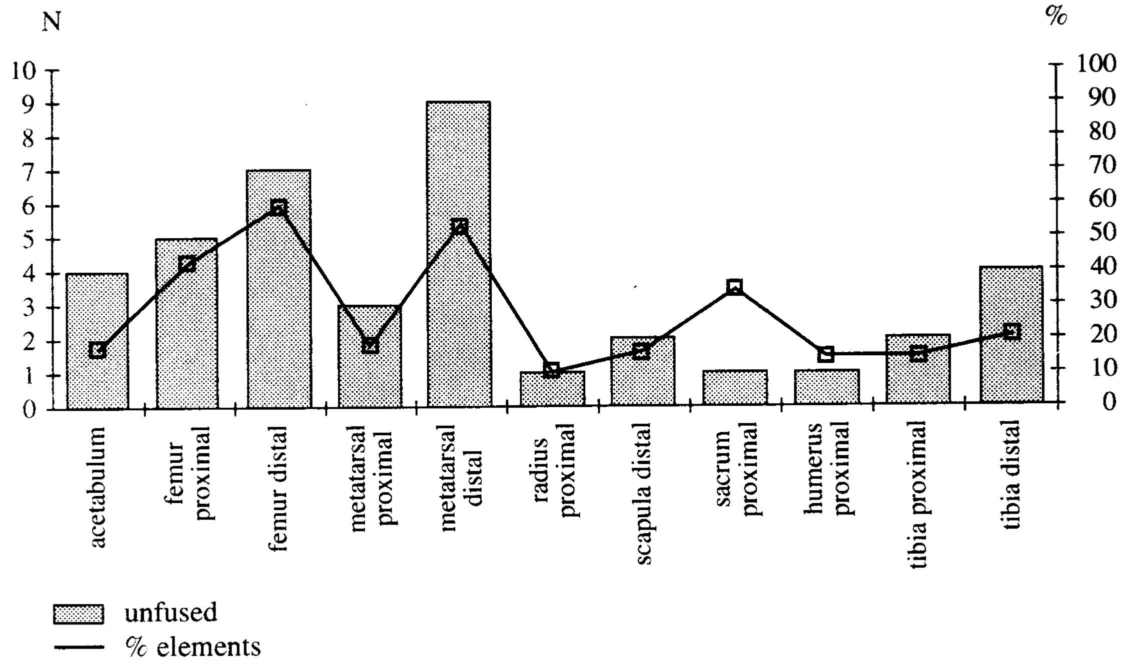


Fig. 98. El-Wad – Fusion of hare (*Lepus capensis*).

Family Cerdivae

Cervus elaphus

Several limb parts were defined on the basis of size (Table 16). Because of their fragmented nature the antler splinters were defined only as to cervid level.

Dama mesopotamica

Fallow deer are represented by various body parts: teeth, cranial and post cranials. Antlers' size suggests the presence of males, including one young male. A few unfused specimens (Table 19), including a newborn and two foetal elements were uncovered. There are only a few measurable bones which, according to the astragali, seem to originate from large specimens (cf. Davis, 1994; Rabinovich n.d.). As sex dimorphism is very pronounced in cervids, this may be related to the presence of males, although we cannot tell whether the size of fallow deer fluctuated during the Pleistocene (ibid.).

Capreolus capreolus

Only two bones of roe deer were recovered. This is not surprising since usually the smallest cervid, a solitary species, is very poorly represented in archaeological deposits.

Table 18: Measurements of el-Wad faunal material.

Number	**Body part**	**Side**		**Mears 1**	**Mears 2**	**Mears 3**	**Mears 4**
BSGA				**GL**	**GB**		
189	TAR4	R		4541	3950		
BSGD							
1014	PAT			2735	1970		
					BPC		
30	ULP				1407		
Cervus elaphus							
				Bd	**BDW**		
386	RDD	L		4481	2970		
Dama mesopotamica							
				GL	**D1**	**Bd**	
107	AS	R				2886	
475	AS	L		4428	2363	2665	
	AS	R		4342	2446	2606	
1143	AS	L		4758	2773	3101	
1362	AS	R		4227	2300	2579	
			max	4758	2773	3101	
			mean	4439	2471	2767	
			min	4227	2300	2579	
			stde	228	210	222	
			stdep	198	182	199	
				BT	**Bd**	**H**	
1384	HUMD	R		4375	4987	2318	
58	HUMD	R		4570	4916	2478	
1708	LM3	R		762	533		
				Bd	**SD**	**MCSC**	**MCLC**
61	MCD			3598	1673	1824	2344
1234	MCD			3463	1607	2349	1795
477	MTD			3430	1618	1679	2341
				GLP	**LG**	**BG**	
1782	SC	R		5186	4006	3479	
				Bd	**BW**		
1211	TBD	R		3625	3068		
Gazella gazella							
1245	UDP4	R		732	648		
276	UM1-UM3	L			3424		
1244	UM1-UM3	L		1240	1097		
440	UM3	L		856	773		
792	UM3	L		1669	1603		
1510	UM3	R		1465	1323		
379	UPR2-M3	L		1429	1351		

Number	**Body part**	**Side**		**Mears 1**	**Mears 2**	**Mears 3**	**Mears 4**
				GB	**Lad**		
1785	ATLAS				3163		
416	ATLAS			6010	5345		
148	ATLAS				2085		
448	ATLAS			5737	4945		
				Crh1*	**Crh2***		
69	DP4U	L		871	675		
550	DUP3-DUP4	R		322	398		
551	DUP4	R		412	279		
552	DUP4	L		323	299		
			min	322	279		
			mean	482	413		
			max	871	675		
			stde	263	182		
			stdep	228	158		
1340	LDP4-LM3	R		1598	1468		
380	LM2-LM3	R		1647	1602		
71	LM3	L		1927	1801		
153	LM3	R		626	471		
651	LM3	L		1229			
652	LM3	L		907	854		
1979	LM3	R		1261	1326		
555	LP4	L		800	633		
70	MANF	L		445	354		
				40*	**41***		
21	HC	R		3194	2556		
94	HC	L		2731	2210		
115	HC	R		3289	2395		
130	HC	R		2937	2235		
131	HC	R		3480	2597		
132	HC	R		3677	2602		
133	HC	L		3579	2594		
136	HC	R		3576	2688		
182	HC	L		3083	2092		
855	HC	L		3100	2066		
1756	HC	R		3067	2376		
1781	HC	R		3316	2434		
877	HCB	R		3659	2326		
1575	HCB	R		3464	2504		
			min	2731	2066		
			mean	3297	2405		
			max	3677	2688		
			stde	290	198		
			stdep	279	191		

Number	**Body part**	**Side**		**Mears 1**	**Mears 2**	**Mears 3**	**Mears 4**
				GLP	**LG**	**BG**	
117	SC	R		2899	2179		
145	SC	R		3019	2395	2104	
977	SC	L		2900	2246		
1636	SC	L		2784	2245	1847	
1638	SCD	R			2308	1967	
			min	2784	2179	1847	
			mean	2901	2275	1973	
			max	3019	2395	2104	
			stde	96	81	129	
			stdep	83	73	105	
				BT	**Bd**	**H**	
749	HD	R		2674	2515	1423	
1150	HD	R		2545	2384	1274	
1151	HD	R		2640	2420	1335	
1218	HD	L		2675	2453	1404	
1219	HD	R		2551	2391	1278	
1400	HD	L		2323	2514	1333	
1878	HD	L		2700	2600	1495	
1984	HD	L		2371		1293	
1985	HD	L		2279	2444	1248	
120	HDD	R		2418	2602	1357	
325	HDD	R		2431	2625	1334	
643	HDD	R		2370	2538	1371	
1025	HDD	R		2697	2565	1305	
			min	2279	2384	1248	
			mean	2513	2504	1342	
			max	2700	2625	1495	
			stde	155	85	69	
			stdep	149	81	66	
				BD			
267	RDD	R		2317			
38	ULP				1546		
1641	ULP	L		1363			
				Bd			
119	FDD	L		3757			
146	FDD	R		3569			
				BD	**BW**		
422	TBD	L		2440	2083		
975	TBD	R		2340	1879		
1160	TBD	R		2481	1897		
1203	TBD	R		2447	2017		
1271	TBD	L		2143	1703		
1853	TBD	R		2168	1776		
2028	TBD	L		2297	1858		
			min	2143	1703		
			mean	2331	1888		
			max	2481	2083		
			stde	136	131		
			stdep	126	121		

Number	Body part	Side		Mears 1	Mears 2	Mears 3	Mears 4
				GB	**GL**		
16	TAR4			1936	1773		
1637	TAR4	L		2215	2087		
1758	TAR4	R		2074	2144		
1977	TAR4	L		2244	1998		
			min	1936	1773		
			mean	2117	2001		
			max	2215	2144		
			stde	142	163		
			stdep	123	141		
				GL	**D1**	**Bd**	
452	AS	R		2637	1453	1600	
453	AS	L				1826	
751	AS	R		2640	1482	1584	
944	AS	L		2805	1562	1748	
1351	AS	L		2993	1762	1872	
1406	AS	R		2661	1409	1432	
1757	AS	L		2953	1565	1626	
1859	AS	L		2851	1573	1700	
2005	AS	L		2721	1532	1617	
			min	2637	1409	1432	
			mean	2783	1542	1667	
			max	2993	1762	1872	
			stde	141	56	135	
			stdep	132	100	127	
				Bd	**SD**	**MCSC**	**MCLC**
1112	MCD			1923	853	1099	1430
1399	MCD			2265	1003	1651	1150
1523	MCDH				974	153	1211
			min	1923	853	153	1150
			mean	2094	943	968	1264
			max	2265	1003	1651	1430
			stde	242	80	758	147
			stdep	171	65	619	120
1520	MPDDH				941	1542	1197
				Bd	**SD**	**MCSC**	**MCLC**
421	MTD			2193	971	1261	1622
6	MTDDH				890	1123	1510
7	MTDDH				778	818	1209
463	MTDH				837	1088	1432
1310	MTDH				1075	1680	
1189	MTP	R		2123	2140		
974	MTPDH				960	1149	1493
			min	2123	778	818	1209
			mean	2158	1093	1187	1453
			max	2193	2140	1680	1622
			stde	49	472	283	153
			stdep	35	437	258	137

Number	**Body part**	**Side**		**Mears 1**	**Mears 2**	**Mears 3**	**Mears 4**
				GL	**Bd**	**BP**	
102	PH1			3846	916	1196	
152	PH1			3833	890	1149	
4	PH1D				887		
103	PH1D				904		
540	PH1P				1162		
			min	3833	887	1149	
			mean	3840	952	1173	
			max	3846	1162	1196	
			stde	9	118	33	
			stdep	7	106	24	
				GL	**Bd**	**BP**	
23	PH2			2123	778	896	
65	PH2			2306	825	963	
142	PH2			2089	778	924	
143	PH2			2083	723	845	
493	PH2			2085	916	772	
24	PH2P					871	
			min	2083	723	772	
			mean	2137	804	879	
			max	2306	916	963	
			stde	96	72	66	
			stdep	86	65	61	
				Ld	**BP**	**Ld1**	
1	PH3			2363		2361	
2	PH3			2043	1688	2047	
22	PH3			2510	1820	2944	
3	PH3P				1776		
			min	2043	1688	2047	
			mean	2305	1761	2451	
			max	2510	1820	2944	
			stde	239	67	455	
			stdep	195	55	372	
Lepus capensis							
				BT	**Bd**	**H**	
470	HD	L		924	1237		
578	HD	L		642	1073		
579	HD	R		599	1224		
678	HD	L		903	1144		
813	HD	L		925	1137	653	
814	HD	L		773	1059	587	
815	HD	R		968	1065	610	
925	HD	L		724	1069	600	
1693	HD	L		884	1156	638	
1694	HD	L		947	1175	653	
1814	HD	R		900	1150	581	
1946	HD	L		929	1148	624	
1947	HD	L		901	1095	581	
1319	HDD	L		964	1197	640	

Number	**Body part**	**Side**		**Mears 1**	**Mears 2**	**Mears 3**	**Mears 4**
1378	HDD	R		965	1100	656	
1584	HDD	R		993	1170	694	
1922	HDD	L		1064	1232	659	
1929	HDD	R		946	1133	597	
859	HDP	R			2980	2390	
			min	599	1059	581	
			mean	886	1239	744	
			max	1064	2980	2390	
			stde	123	425	457	
			stdep	119	414	441	
				RDW	**RDL**		
498	RDD	L		614	981		
1071	RDD	R		483	852		
				OLH	**OLW**		
803	ULP	L		1063	1207		
1067	ULP	L		915	1080		
				GL	**GB**		
683	AS	L		1436	722		
721	AS	L		1557	852		
1326	AS	R		1689	1165		
1921	AS	L		1460	822		
			min	1436	722		
			mean	1536	890		
			max	1689	1165		
			stde	115	191		
			stdep	100	166		
				GL	**GB**		
1821	CA	R		2768	1065		
173	CAL			3066	1233		
580	CAL	R		3188	1283		
682	CAL	L		2874	1183		
1000	CAL	R		2804	1172		
1596	CAL	R		2805	1188		
500	CALC	L		3040	1096		
			min	2768	1065		
			mean	2935	1174		
			max	3188	1283		
			stde	162	75		
			stdep	150	69		
				TDW	**TDL**		
1375	TB	R		1403	986		
497	TBD	L		1477	882		
680	TBD	L		1390	866		
998	TBD	R		1364	833		
1065	TBD	L		1428	881		
1317	TBD	R		1409	856		
1376	TBD	R		1408	871		
1553	TBD	R		1360	882		
1670	TBD	L		1352	858		

Number	**Body part**	**Side**		**Mears 1**	**Mears 2**	**Mears 3**	**Mears 4**
			min	1352	833		
			mean	1399	879		
			max	1477	986		
			stde	39	43		
			stdep	966	471		
Sus scrofa				**GL**	**GB**		
367	MC2			7359	1425		
Vulpes vulpes				**GL**	**GB**		
924	CAL	R		2540	1154		
627	CARN	R		1462			

Table 19: El-Wad – Fusion and ageing.

Fallow deer (Dama mesopotamica)	
ulna proximal	foetal
femur proximal	foetal
humerus	new born
antler	young - male
phalanx first proximal	12-14 months
femur proximal	22-24 months
metapodial distal	24 month
Teeth	
LDP2-LDP3	ca. 2 years
UDP4-UM1	ca. 2 years
4D - wear stage	3-4 years
Wild capra (Capra aegagrus)	
LDP3	<3 months
Wild boar (Sus scrofa)	
metapodial proximal	foetal
scapula distal	12 months
phalanx second	12 months
femur proximal	3-4 years
Fox (Vulpes vulpes)	
mandible	foetal
femur proximal	
radius proximal	
Canis (Canis lupus/ familiaries)	
mandible	foetal
ulna proximal	7-12 months

Family Bovidae

Capra aegagrus

Sporadic elements of wild goat were found in the assemblage, including a horn fragment.

Gazella gazella

Mountain gazelle is the most prolific species found in many south Levantine sites. According to fusion information, 37% of the bones belong to young animals (less then 18 months). There is a relatively high percentage of foetal bones (12%; Fig. 99). Most of the unfused specimens derived from bones that fuse late in the life of the animal, c. 10-18 months (Fig. 99). According to teeth eruption and wear c. one-third of the specimens are of young animals up to 1-11/2 years old (Figs. 99-101).

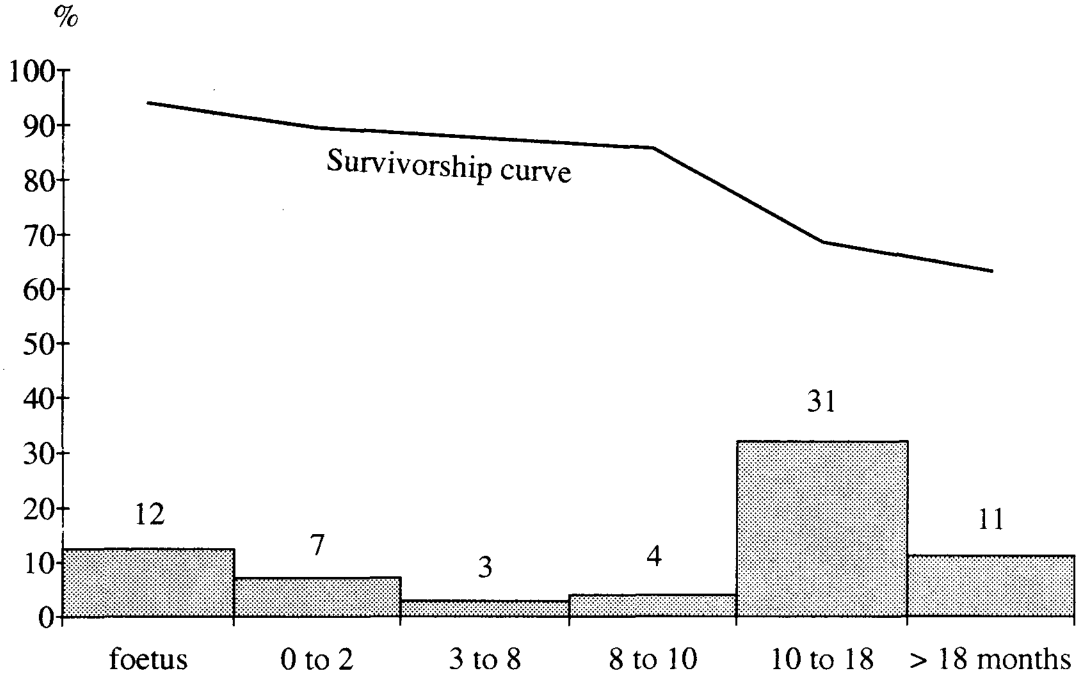


Fig. 99. El-Wad – Mortality pattern of gazelle based on epiphysis fusion.

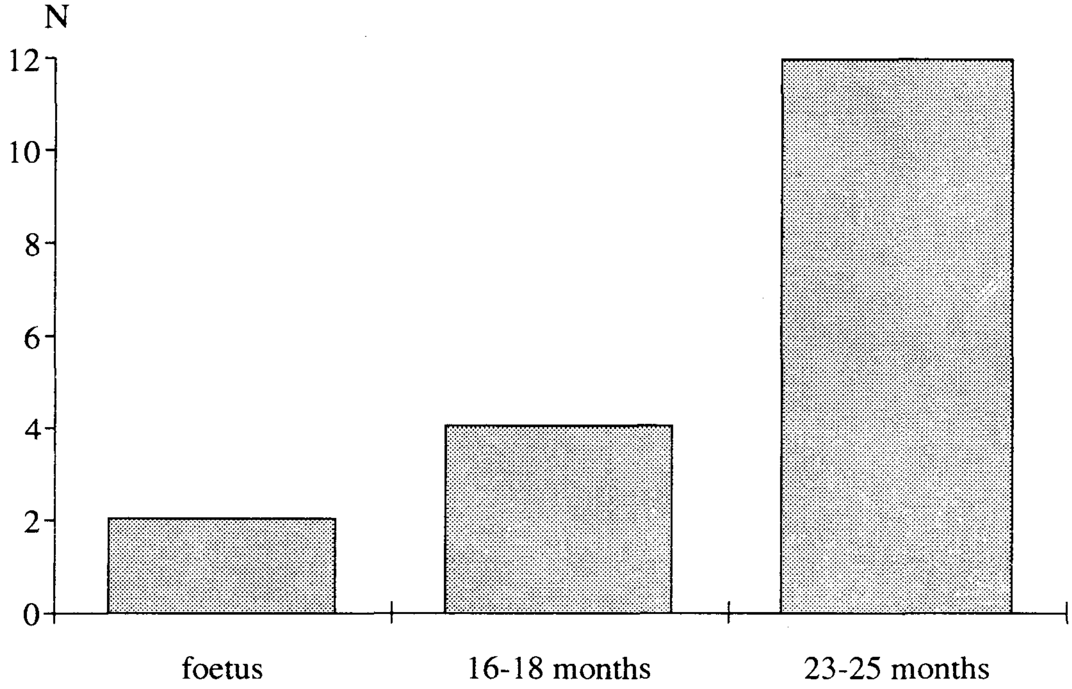


Fig. 100. El-Wad – Gazelle ageing based on teeth eruption.

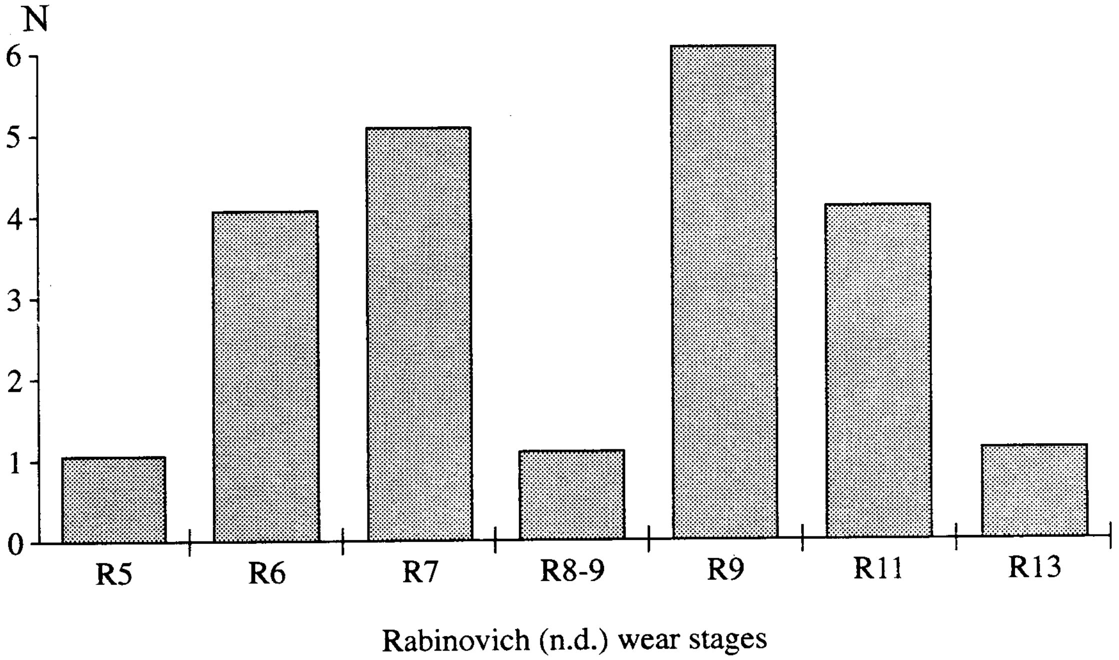


Fig. 101. El-Wad – Gazelle ageing based on wear stages (Rabinovitch, n.d.).

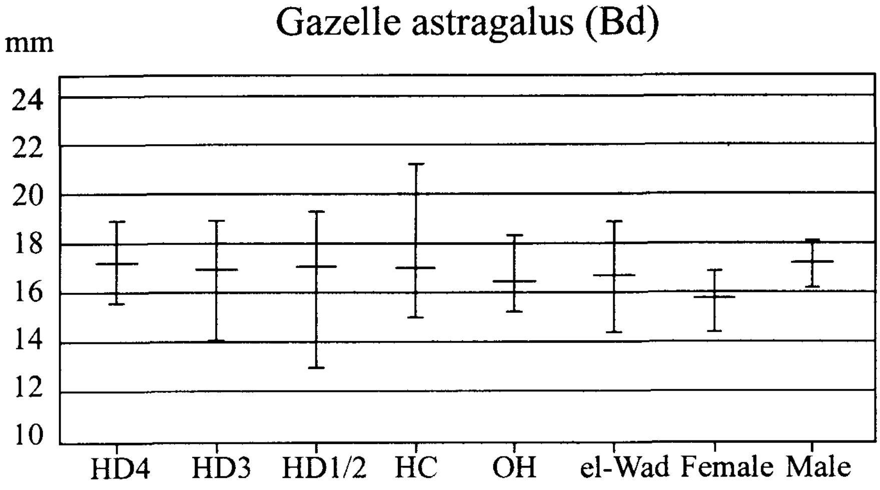
According to the distribution of measured bones, in comparison with the recent fauna (Horwitz et al., 1990), the distribution of male and female seems to have been equal (Table 18). The mean of the measurements is not very different from Upper Palaeolithic and Epipalaeolithic assemblages in the area (Fig. 102).

While examining the distribution of body parts, it was noticed that upper and lower limbs of both fore and hind limb are very homogeneously represented. Metacarpal are missing and may have been broken and included in the long bone splinters of BSGD. Vertebrae and ribs are also part of this body size group.

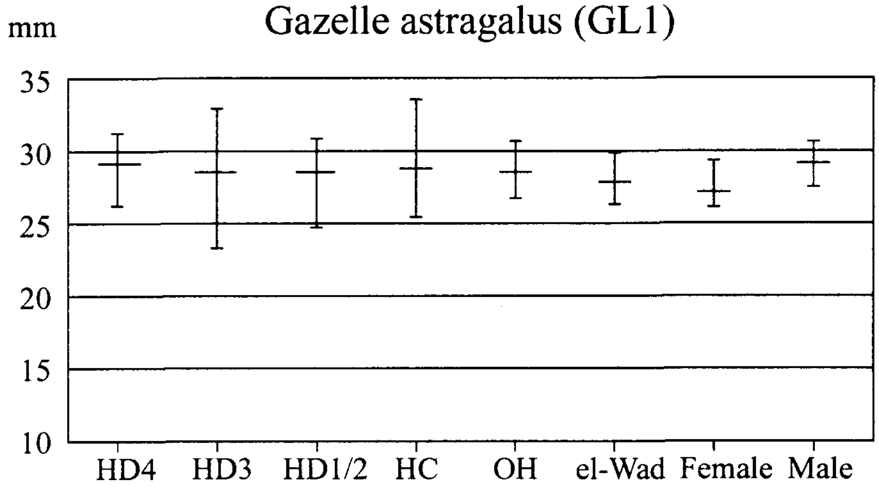
Modifications

Carnivore modifications are reflected in various aspects: relative species abundance, sex and age profile, body part distribution (e.g., head versus limbs), part of element present (proximal, shaft, distal) and surface modifications (gnawed, digested, scratches and tooth pits). In these assemblage several bones were modified by carnivores (15 – > 1%), a few bones were gnawed (3) and one had tooth pit and was burnt (Table 20), suggesting a minimal carnivore interference in the accumulation of the faunal remains.

Gazelle astragalus (Bd)



Gazelle astragalus (GL1)



Gazelle metacarpal (Bd)

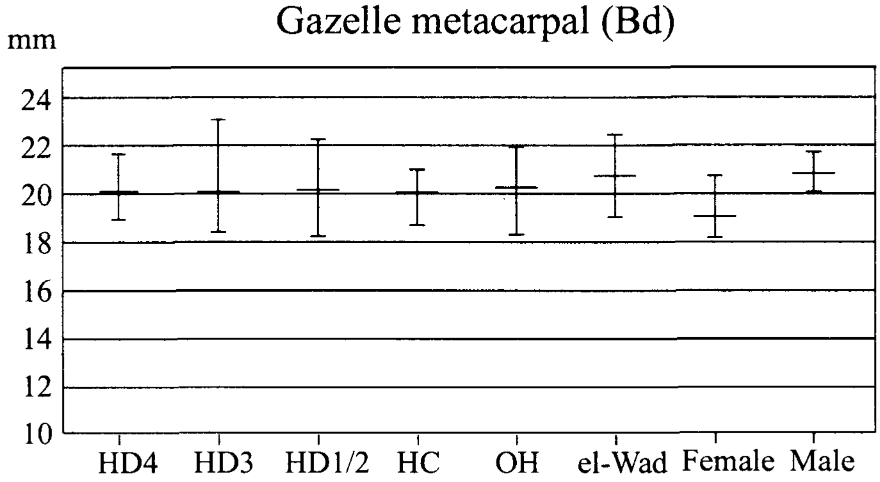


Fig. 102. Gazelle measurements (maximum, minimum and mean) of selected bones from Palaeolithic sites and recent samples. HD Hayonim D, HC Hayonim C, OH Ohalo II; data on recent gazelles from Horwitz et al., 1990.

Table 20: El-Wad – Carnivore modifications.

Species	Body part	Digested	Gnawed
Gazella gazella	astragalus	4	
	carpal	1	
	tarsal	2	
	humerus distal	1	1
	metatarsal distal	2	
	first phalanx	1	
	second phalanx	1	
	third phalanx	2	
Lepus capensis	calcaneum	1	
	Total digested	15	
Dama mesopotamica	patella		1
	first phalanx		1
BSGD	rib shaft		tooth pit

This raises the question whether any of the carnivores present at el-Wad were typical cave dwellers and bone collectors. Bears do dwell in caves but their occurrence here is doubtful and, as they are rare in the assemblage, we may exclude them as major agents. Badgers spend the day and the entire winter in burrow systems and although 75% of their diet consists of plant material, they also feed on live and dead animals. Red fox might occasionally use a den. Wolf can den in crevices that they often use year after year. If a cave was used as a den by a species we tend to find this reflected in their over-representation in the fauna. Looking at the relative distribution of the carnivore species, none of them seems to have been a typical bone collector or cave dweller.

Human modification of the fauna is reflected in the same way as carnivores modification: relative species abundance, sex and age profile, body part distribution (e.g., head versus limbs), part of element present (proximal, shaft, distal) and surface modifications (butchery marks, cut marks, extraction of marrow, hammer stone percussion), ideally leaving distinguishable patterns. Cut marks were visible on a few bones only (N=5), on long bones and scapula of gazelles and on a shaft of a long bone BSGE (probably a hare bone). Burnt elements were present on 4% (N=80 bones/specimens) of the defined fauna. A large number of identifiable burnt splinters were not included in our analysis.

The relative distribution of teeth and skull fragments was examined as against post cranials showing a distinct distribution per species (Fig. 103). A correlation is expected between the body part representation and the size of the animal. Smaller animals are easy to be brought in intact, while larger ones will be selectively introduced. Weight of Pleistocene hares can reach up to 6kg., and are therefore expected to be found complete (Yellen, 1991a, 1991b). Their cranial parts are less represented, but this may be because the skull of hares is fragile. Fallow deer and gazelle have a similar distribution of cranials and post-cranials suggesting that entire animals were brought into the cave (Fig. 103).

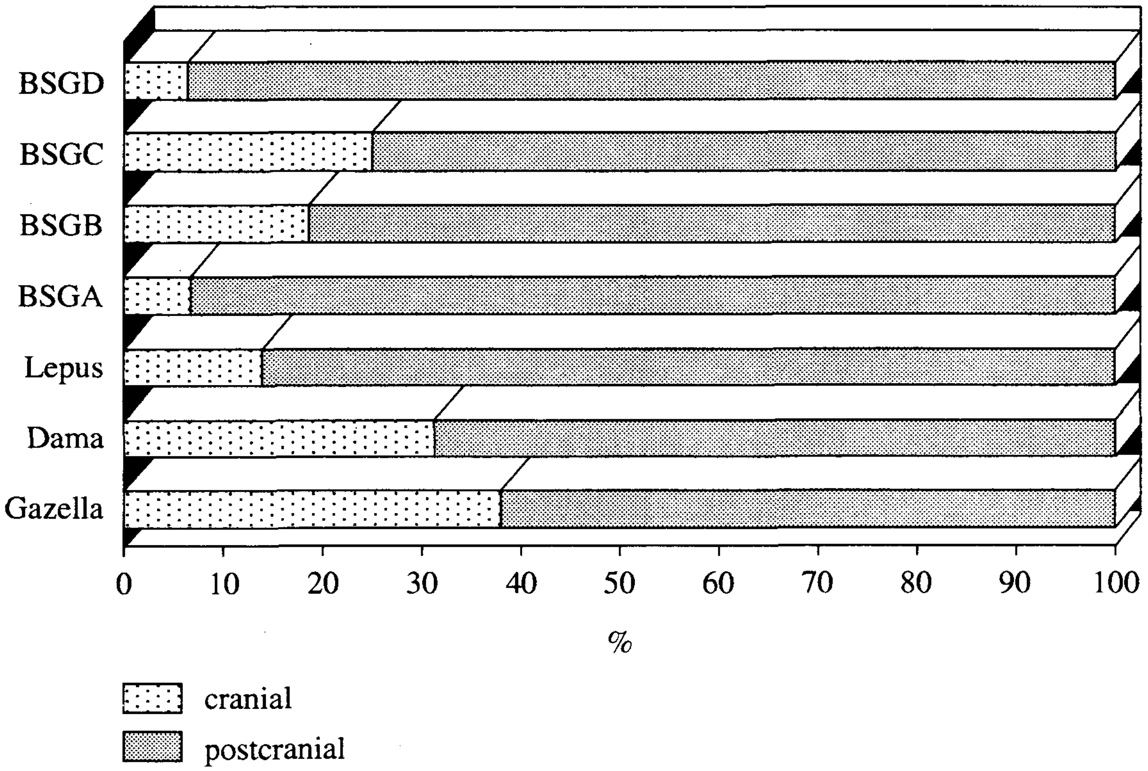


Fig. 103. El-Wad – Cranial versus post-cranial parts.

Checking relative distribution of proximal part versus distal part is another method for testing destruction mode. If both ends are similarly distributed it follows that there was very little destruction. When the two most prolific species (hare and gazelle) are examined the dominance of the distal part of most limb bones becomes clear. A difference between proximal and distal parts in the hare limbs profile is less pronounced. Proximal part of hare's radius and ulna outnumber the distal. The major contrast is noticed in the tibia part distribution, where distal ends are in the majority. As many complete hare metapodials are present, a discussion of their proximal versus distal appearance is meaningless. In all gazelle limb bones, except for metapodials, distal parts are more numerous than proximal parts (Fig. 104).

In most mammalian, proximal limb bones are more fragile than the distal ends, and since they contain more marrow, are easier to consume for carnivores and humans. In these assemblage we might assume that humans and natural weathering were the principal destructive forces (Fig. 104). Hare bones tend to remain complete after human usage or to disappear completely from an assemblage, while the robust parts of gazelles tend to be preserved. Hare bones are likely to disappear in a carnivore den due to gnawing and chewing (Andrews, 1990).

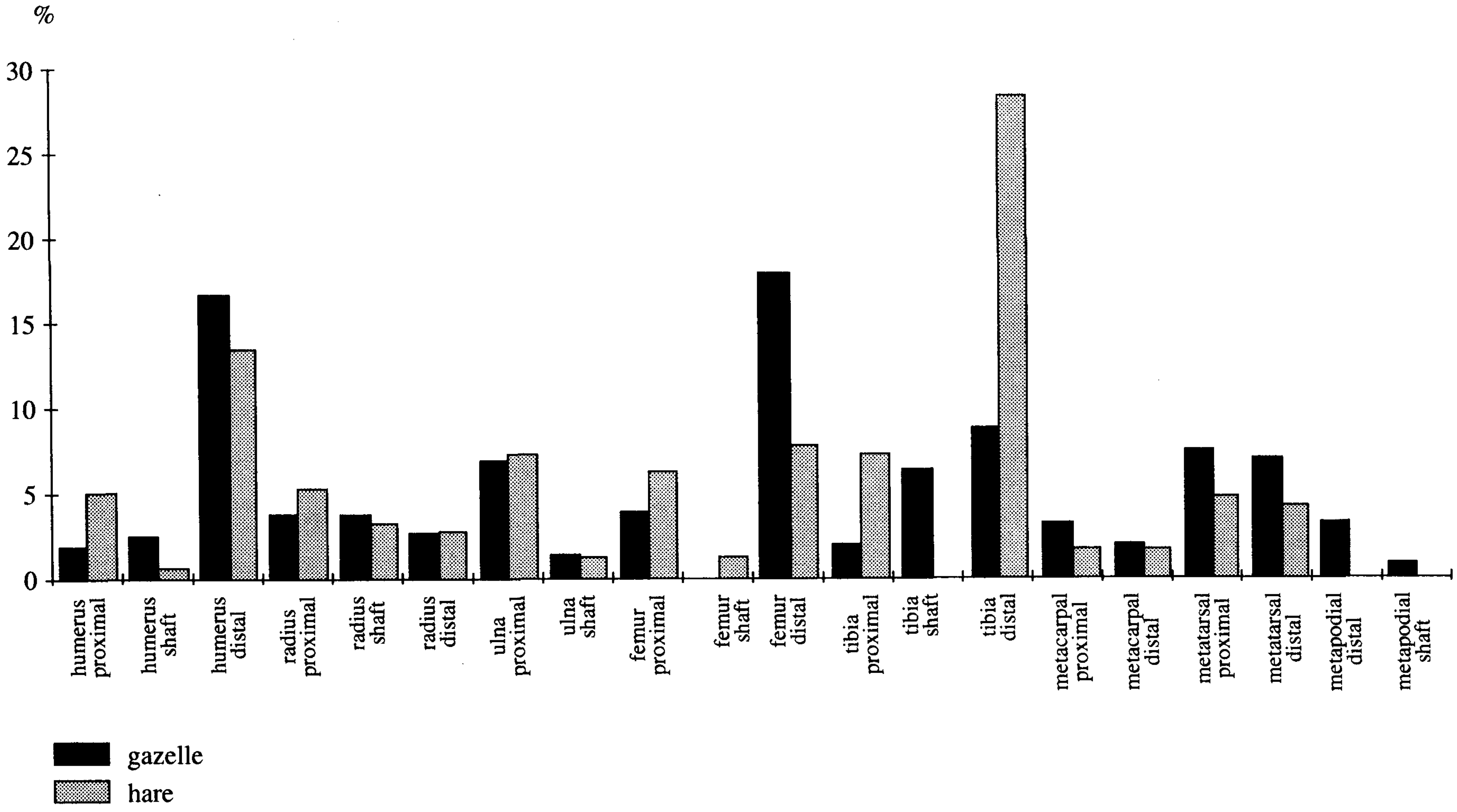


Fig. 104. El-Wad – Proximal versus distal parts of gazelle and hare.

Seasonality

Using species ageing to determine seasonality is valid mainly when a large enough sample is available to enable reconstructing an age profile. When seasonality is examined, it is essential to know the number of birth peaks per year. In the el-Wad assemblage bones exist for all mammalian species. Although the sample size per species is quite foetal small, the presence of juveniles might reflect usage of the cave by man at least during the spring (March-May), the time many mammals reproduce in the Mediterranean zone. For example, carnivores today tend to reproduce in the end of winter/beginning of spring; while the season of reproduction for foxes is late February – April; the marbled polecat reproduces in January – March. If the canids found are domesticated dogs, our clue may be the reproduction season of recent wolves, which is late February – April. It remains hard to determine to what extent these pattern could have changed during domestication.

Gazelle age distribution seems to indicate a year-round usage of the cave, as more than a third of the assemblage consists of young animals (less then 18 months). This does not necessarily mean that use of the cave was equally intensive during all seasons, also because the gazelle may have had a flexible cycle of reproduction (more than one young per year), as can be observed today (Baharav, 1974, 1983). There is a relatively high percentage of foetal bones (Fig. 99), but it remains hard to see which season they reflect.

Fallow deer age profile include a few unfused specimens (Table 19), a newborn and two foetal elements, again pointing towards spring usage of the site. The female gives birth in May – June. The females and their young move in large herds, the males gather in smaller groups.

Hares are very interesting in this respect since while they bread all year round, their cycle of reproduction is indicative of the season. Twenty six percent of the bones were unfused, including two foetal bones. A certain peak of reproduction is known from related species (Lee and Speth, n.d.), indicating an annual cycle in age distribution, including variation in foetal and young specimens. The usage of unselective hunting methods (trap, net, drive) would have led to a catastrophic age profile, including all age cohort, as in live populations. But if other methods of hunting were suggested, targeting larger specimens, it is more likely that young-adults/adults will be preferred when dealing with small mammals.

Summary

The most prolific animal in the faunal assemblage of Chamber III is the gazelle, followed by hare and fallow deer. Together they formed the main meat source for the human diet. Undoubtedly these species were introduced to the cave by people, as they do not seek out caves to live in and no carnivore behavioural pattern was observed to suggest that they were part of their prey. In other words, carnivores' relative frequency, their distribution and the characteristic bone modifications are not enough to suggest that they formed the major bone collector.

Interestingly, the three major species were processed at the site, while the sporadic nature of the other species might indicate selective introduction into the cave deposit. The same was suggested by Garrard (1980), element representation of gazelle and fallow deer in similar proportions to their preservation potential making it likely that whole carcasses were brought back to the site.

Carnivore bones were not abundant either in previous studies, nor has any proliferation been observed of one carnivore species with a varied age profile. This is largely explained by hyena and panther being rare as large species and possible bone collectors, while other species (e.g. mustelidae, canidae) are not very abundant. *Panthera pardus* is absent from the recent excavation, and is not very common in the original report (Bate, 1937, altogether two or three fragments). No hyena bones were found during the recent excavations and only two fragmentary specimens were reported from the old ones (ibid.). Hyena bones were common in the Lower Aurignacian levels of the cave (Levels E and F). Ursus is probably present in the new excavations, represented only by a part of a radius. From the Aurignacian layer three bones were defined to *U. arctos*, while a few foot bones from layers E and B were believed to be of a smaller bear (*Ursus cf. mediterraneus*) (ibid.).

The faunal assemblage of Chamber III accords rather well with that of previous studies (Bate, 1937; Garrard, 1982; Valla et al., 1986). Still, while during the old excavations several specimens of two equid species were found (a single horse tooth and several bones of *Equus hemionus*; Bate, 1937:119-220), no equid bones were recovered in the recent assemblage. Similarly, hare were not abundant in Bate's collection, and their bones fragmentary (ibid.), unlike our finds from Chamber III.

Similar to Bate's analysis and to the picture emerging from Garrard's reinterpretation, based on a sample of 1,530 bones of large mammals from el-Wad layer B (with MNI=121; Garrard, 1980, Fig. 5.4), gazelle dominates the large mammals assemblage, comprising 49% of the identified bones in Chamber III and 85% in the old studies.

Introduced by humans on a regular basis are those species that are hunted in a method which targets young adults and adults. Presence of foetal bones from most species as well as young specimens points towards the occupation of the site in the spring (March – May). Still, they are under-represented in comparison to the relative live distribution in nature during the breading season. A taphonomical process distracting the more fragile bones is possible, and happens either by humans processing foetal animals or by natural weathering. Significantly, based on the ratio between deciduous first to third molars and permanent second to fourth premolars teeth, 27% of gazelle were juveniles (Garrard, 1980), the majority of them killed when they were at an age of two months old. Several adults, killed at an advanced age, were also found. Wild boar also includes several juveniles. Sex distribution indicated roughly equal proportions of males and females in both gazelles and fallow deer remains. Both age and sex distributions according to Garrard (1980) are similar to the recent study where, even though presence of horn core (N= 20) may indicate a male bias, when other measurements are concerned the observed ranges can represent both sexes. A similar pattern was observed in most Natufian sites, where, 20-30% of the gazelles are immature (Davis, 1991). This situation changes in the Neolithic (ibid.). A larger sample is required before the possibility of a year-round accumulation can be ascertained. Significantly, however, Lieberman (1993b), based on cementum increments, suggested multiseasonal occupation for el-Wad as well as other Natufian sites.

The natural habitat reflected in the assemblage includes both open land species — gazelles, capra, hares, marbled polecat — and, not surprising given the surrounding of the site, woodlands species — fallow deer, red deer, Eurasian badger. Also found are species typical of thick woodland in mountainous regions and in low-land, like roe deer, and species of scrub and forest habitats, like wild boar.

Similar to other Natufian sites, the el-Wad faunal record is different from the previous cultural phases of the Epi Paleolithic. Although gazelle remains continue to outnumber all other ungulates, the Natufian assemblages exhibit higher proportions of juveniles (Davis, 1982, 1983, 1991), changes in body size (Cope 1993; Davis, 1983), a broadening of the faunal spectrum with animals ranging from small lizards, through turtles, to hares (Tchernov, 1991, 1993b), increase in bird remains suggesting seasonal culling (Pichon, 1991), and proliferation of commensal species during the Natufian due to longer occupation periods (Tchernov, 1984, 1993b).

The change in gazelle size at the end of the Pleistocene is, according to Davis (1981), due to climatic fluctuations but seen by Cope (1991) as a result of culling selection (but see Dayan and Simberloff, 1995). Unfortunately, the recent sample size is too small to allow for adequate testing of any of these suggestions.

Domestication of dog, another very crucial issue when it comes to the Natufian, was already observed by Bate (1937). A complex picture is revealed in the recent assemblage — while the teeth are large, the mandible is slender suggesting that body size had changed faster than the teeth in the evolving dogs. Still, the presence of canid juvenile (or foetal) in Natufian context may hint towards a domesticated species, even though, unlike at Eynan or Hayonim Terrace, it was not found in a human burial.

The Natufian period introduced new taphonomical aspects resulting from sedentism and domestication of dog. Such factors as commensal species, presence of dogs, and mode of discard are likely to change in a prolonged usage of a site. Both dogs and rodents can cause damage to bones on a very different scale. They will probably affect the "kitchen midden", the area of discard, more than any other agent, as in Hatoula were digested bones were suggested to represent dog presence (Davis, 1985).

The many standing issues regarding the extent of the faunal diversity in the Natufian, the presence of commensal species, and the proposed differential culling of gazelle, require adequate quantitative methods showing the exact distribution of species, age and sex, but surprisingly: "Very few quantitative studies have been done until now in order to show, precisely and in detail, the significant temporal augmentation in using a much larger variety of species, and the rapid increase of efforts to retrieve certain animal species of smaller sizes. Many of the Natufian sites are not yet fully and thoroughly studied qualitatively and quantitatively" (Tchernov, 1993b:191).

One of the major changes during the Natufian may have been hunting strategies as lately the occurrence of communal hunting was suggested (Campana and Crabtree, 1990), complementing other methods, such as traps or desert kites (Legge and Rowley-Conwy, 1987).

Many of the small animals (and also plants) were probably collected near the site; not requiring much time away from camp, this was probably done by females (Kelly, 1995). The noticed changes in the diet as reflected in the archaeological record during the Natufian should be reexamined in the light of changes in the gender roles in their society, often not to the advantage of the female roles.

The sample from the recent excavations at el-Wad, though small, provides us with an opportunity to examine again aspects of faunal accumulation during a period of great importance and change like the Natufian in the southern Levant and, in spite of taphonomical constrains, valuable information could be gathered regarding the mode of bone accumulation and damage. As its faunal remains point toward intensive usage but not necessarily sedentism, the role of sedentism at the site should be further examined.