

## 9. LARGE MAMMALIAN FAUNA

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### 9.1 LARGE MAMMALIAN FAUNAL ASSEMBLAGES

#### Introduction

In the present chapter, mammalian faunal remains recovered from Late Stone Age (LSA) deposits at the cave site of Grotte des Pigeons at Taforalt are presented. These finds were recovered during excavations in the cave between 2004 and 2015. They represent an important assemblage of faunal remains from an inland and upland site of this period in north-west Africa and are one of the few assemblages in the Maghreb region that have been analysed in detail from a zooarchaeological perspective. The aim of this report is to ascertain which animals were procured by LSA hunters at Taforalt and how they were processed and utilised. In particular, potential diachronic changes in faunal representation and utilisation were addressed, as the human use of the cave switched from intermittent occupations in the early LSA to more or less sedentary habitation during a later part of this period from c. 15,000 cal BP onwards (see **Chapter 4**) at Taforalt.

#### Methods

The assemblages examined here comprise finds recovered individually during excavation and those retrieved by dry sieving. In the main, they consist of three-dimensionally recorded finds. Objects collected as 'general finds' were examined, but only significant pieces from this find-category (e.g. identifiable remains) were recorded further and analysed. The information obtained was entered into an Excel spread-sheet for each sector of the site. The bulk of the finds was recorded in the field or at the *Institut National des Sciences de l'Archéologie et du Patrimoine* (INSAP) in Rabat. Since a comparative bone collection was not available, identifications to element, side of the body and taxon were made following descriptions in several standard works, including Schmid (1972), Barone (1986) and, with particular relevance for the African faunas, Walker (1985). In addition, the works of authors such as Gabler (1985), Helmer/Rochetau (1994), Peters (1986a; 1986b) and Peters/Van Meer/Plug (1997) proved to be useful. Small numbers of finds were taken on temporary loan to Germany, where they were compared with specimens in the extensive comparative collection of the Zooarchaeology Laboratory of the Monrepos Archaeological Research Centre and Museum for Human Behavioural Evolution in Neuwied.

Since the faunal remains from Taforalt were highly fragmentary, identification to species was not always possible and many remains could only be identified to a broader level, e.g. family. In cases where it was not possible to establish identification even down to a broader level, faunal remains were attributed to an animal-size group, based on a combination of the size of the find (length/breadth) and, where possible, thickness of the cortical bone. The following animal-size groups were established for less identifiable remains, giving examples of animals from the LSA fauna which correspond to each group:

- large size group = large equid, large bovines, rhinoceros
- medium-large size group = Barbary sheep (known locally as 'aoudad'), alcelaphines, small equid

- medium size group=gazelle, unidentified canid
- small size group=fox

Numbers of identified specimens (NISP) were recorded but minimum numbers of elements (MNE) were not calculated due to the fragmentary nature of the material. In cases where sample sizes were too small to be meaningful, counts of faunal remains from related units were combined together. This was the case in the S8-G5 series for example, where the total number of describable finds recovered from some of the individual units in this deposit was extremely low. Minimum numbers of individuals (MNI) were calculated, in particular for the larger assemblage from S10. In general, the MNI was calculated on duplicating dental elements, since teeth comprised the bulk of the faunal remains. Due to the small numbers of identifiable bones, individual skeletal elements were grouped into different anatomical regions of the skeleton in order to determine which parts of the carcass were present at the site. The following anatomical regions were utilised:

- head=teeth, mandibles, skull, horn core fragments
- axial=vertebrae, ribs, pelves
- fore limb=scapula, humerus, radius, ulna
- hind limb=femur, patella, tibia, fibula
- fore foot=metacarpus, carpals, sesamoids, phalanges
- hind foot=metatarsus, tarsals, sesamoids, phalanges
- limb=not further identifiable fragments of limb bones
- foot=not further identifiable fragments of foot bones
- limb/foot=not further identifiable fragments of limb or foot bones

The age-structure of the hunted prey was based on the analysis of eruption and wear stages of isolated teeth and teeth in mandibles and maxillae. The same techniques were employed to establish time of death of very young individuals as a contribution to the seasonal timing of the occupations at the site. Several sources were used to age the animals including Ogren (1965) for Barbary sheep. A collection of skeletons of modern Barbary sheep of known age at death in the Palaeoanatomy Section of the State Collection for Anthropology and Palaeoanatomy in Munich was also used for ageing the specimens from Taforalt. Studies on the age-structures of recent horses (Levine 1982) and gazelle (Munro/Bar-Oz/Stutz 2009) were referred to for these taxa.

Various modifications on the bones were recorded, including butchery marks (cut marks, impact notches, chopping marks), burning, and the use of bones as tools, along with traces of carnivore and rodent gnawing. These modifications were identified following descriptions given by Fisher (1975). Cut marks were observed using a hand-held 8x lens and, where applicable, were recorded using the coding system developed by Binford (1981). Different stages of burning on the bones (from 'not burnt' to 'fully calcined') were recorded, following Stiner (2005) and Stiner and others (1995), and long bone shaft circumferences, indicators of predominantly human or carnivore modification of the bones, were also noted, following Bunn (1983).

The faunal remains were photographed using a Nikon D2x and a Canon Eos 30 D, all fitted with 60mm Macro lens and a Digi Microscope USB from Reflecta. Osteological measurements were taken according to von den Driesch (1976), using Mitutoyo digital callipers and connecting cables. The finds were weighed using an electronic letter scale, produced by the firm Maul.

## The LSA Faunal Remains from Sector 8

### General Remarks

Faunal remains from units in the Grey Series and from Units Y1-Y4spit2 of the Yellow Series were analysed and recorded. The small size of the area excavated (see **Chapter 2**) meant that the total number of faunal remains individually recorded from this sector was relatively low ( $n=690$ ) (**tab. 9.1.1**), despite the great depth of the deposits investigated. Absolute dating has shown these deposits range between 20,882-21,436 and 13,853-14,788 for the units from the Yellow Series and between 14,734-14,970 to 12,611-12,725 for the Grey Series (dates are modelled ages cal BP; see **Chapter 4**).

Faunal preservation at Taforalt is excellent and this was also the case for the animal bones from all units in S8. The faunal remains ranged in colour from pale-yellow to brown. There was no demonstrable association of bones of a particular colour to a deposit or layer, although more bones of pale-yellow colour were recorded from S8-L15 to L29 than in the upper units of the GS.

Counts of finds from individual units in S8-GS varied radically and only three units produced proportionally larger quantities of remains: S8-L3, L6 and L29. Whether the higher number of remains in these units reflects phases of more persistent human activity, reflects episodes of sedimentation involving greater accumulations of finds, simply relates to thickness of unit, or represents uneven spatial distributions of faunal remains encountered in some of the units during excavation in a small area, is uncertain. In S8-YS, bulk sedimentation rate was very much slower (by a factor of about 10); those main excavation units to which larger numbers have been recorded, S8-Y1, Y2 and (upper)Y4, thus each represent more time than similarly-sized assemblages from the GS. Using the calculated sedimentation rate (**Chapter 2**), we can obtain a better estimate of the relative 'productivity' in large mammal bones between the YS and GS in S8; a 3.6-fold increase (**tab. 9.1.1** data) or a 3.2-fold increase (**tab. 9.1.2** data) can thus be calculated, probably large enough increases in average 'productivity' to be significant, despite the relatively low numbers overall.

Faunal remains allocated to the medium-large size group dominate not only in the individual units but also globally across the units, attaining 74.0% and 64.8% of the total number of finds in the S8-GS and S8-YS assemblages respectively. Medium sized animals are represented by a larger percentage in S8-GS than in S8-YS and a similar pattern of representation was observed for the large size group in these units, albeit by a much narrower margin. Small sized animals were represented in both the GS and YS units by very low percentages.

Traces of butchery (cut marks/fragmentation of bone during marrow procurement) were observed on finds from all levels, except Units S8-L9, L21, L25 and L27. Higher counts of butchery traces occur in S8-L3, L6, L29, and in S8-Y1 and Y2. However, these counts probably reflect the overall higher total number of faunal remains recovered from these units, rather than exhaustive human butchering activities during these particular phases of occupation. Burnt bones are represented in general by even lower counts and are absent in several units in S8-GS and S8-YS. Burnt bones comprise 12.9% and 6.9% of the total number of bones in the assemblages from the S8-GS and S8-YS respectively. From an overall total of 690 faunal remains in S8, 7.9% of the burnt bones were recovered from the GS deposits and 3.0% from the YS deposits. Considering the S8-GS deposits are characterised by masses of ash and contain several hearths, these results are rather surprising. A higher percentage of burnt bone in the younger deposits in this sector had been expected.

Traces of carnivore gnawing were also observed on the bones from S8. The counts indicate that carnivores appear to have interacted more with bones deposited in S8-YS (3.6%) than S8-GS (0.3%). The very low count of carnivore-gnawed bones from the GS deposits is probably an indication of the important role played by humans in the occupation of the site during the accumulation of these deposits. During these periods, carnivores

Sediment group	Unit	Number of finds recorded n / %	Weight in g.	Small size group	Medium size group	Medium-large size group	Large size group	Butchery traces	Bone tool	Burnt	Carnivore gnawing	Rodent gnawing
GS	L2	18*	115	-	3	14	1	4	-	5	-	-
	L3	47* / 12.1	439	1	5	32	9	13	-	9	-	1
	L4	-	-	-	-	-	-	-	-	-	-	-
	L5	11	79	-	1	10	-	1	-	1	1	-
	L6	45 / 11.6	490	2	4	36	3	13	-	5	-	-
	L7	12	150	-	1	11	-	5	-	-	-	-
	L8	13	136	-	-	13	-	5	-	2	-	-
	L9	1	5	-	-	1	-	-	-	-	-	-
	L10	-	-	-	-	-	-	-	-	-	-	-
	L11	8	70	-	-	8	-	4	-	2	-	-
	L12	7	74	-	-	7	-	2	-	1	-	-
	L13	11	131	-	1	10	-	4	-	7	-	2
	L14	6	72	-	1	5	-	1	-	-	-	-
	L15	27	287	-	6	17	4	10	-	3	-	-
	L16	19	230	-	2	13	4	2	-	1	-	-
	L17	17	146	-	-	15	2	2	-	-	-	2
	L18	3	69	-	-	2	1	1	2	-	-	-
	L19	13	170	-	-	11	2	2	7	-	-	-
	L20	24	229	1	1	17	5	9	9	-	5	1
	L21	4	38	-	-	4	-	-	-	1	-	-
	L22	3	9	-	-	3	-	-	1	-	-	-
	L23	8	67	-	4	4	-	-	1	1	-	-
	L24	19	190	1	5	10	3	4	4	-	-	-
	L25	2	56	-	-	1	1	-	-	-	-	-
	L26	8	146	-	2	4	2	3	3	1	-	-
	L27	1	24	-	-	1	-	-	-	-	-	-
	L28	13	250	-	-	11	2	2	4	1	1	-
	L29	46 / 11.9	527	-	9	26	11	11	14	-	5	-
	<b>Sub-totals</b>		<b>386</b>	<b>4199</b>	<b>5 / 1.2</b>	<b>45 / 11.6</b>	<b>286 / 74.0</b>	<b>50 / 12.9</b>	<b>111 / 28.7</b>	<b>0</b>	<b>50 / 12.9</b>	<b>1 / 0.3</b>
YS	Y1	91 / 29.9	1131	-	9	64	18	19	-	4	7	-
	Y2	161 / 52.9	1161	3	42	99	17	22	-	12	3	-
	Y3	11	89	-	3	7	1	1	-	1	-	-
	Y4	41 / 13.4	358	-	6	27	4	4	-	4	1	-
<b>Sub-totals</b>	<b>304</b>	<b>2739</b>	<b>3 / 0.9</b>	<b>60 / 19.7</b>	<b>197 / 64.8</b>	<b>40 / 13.1</b>	<b>46 / 15.1</b>	<b>0</b>	<b>21 / 6.9</b>	<b>11 / 3.6</b>	<b>0</b>	
<b>Totals</b>	<b>690</b>	<b>6938</b>	<b>8</b>	<b>95</b>	<b>483</b>	<b>90</b>	<b>157</b>	<b>0</b>	<b>70</b>	<b>12</b>	<b>6</b>	

	Unit	Barbary sheep	Gazelle	Large equid	Alcelaphines	Large bovine	Rhinoceros	Totals
GS	L2	2	-	-	-	-	-	2
	L3	9	2	-	-	2	-	13
	L5	5	-	-	-	-	-	5
	L6	8	3	-	-	-	-	11
	L7	8	1	-	-	-	-	9
	L8	8	-	-	-	-	-	8
	L9	1	-	-	-	-	-	1
	L11	2	-	-	-	-	-	2
	L12	3	-	-	1	-	-	4
	L13	3	1	-	1	-	-	5
	L14	3	-	-	-	-	-	3
	L15	5	4	2	1	-	-	12
	L16	2	-	1	-	-	-	3
	L17	8	-	-	1	-	-	9
	L18	1	-	1	-	-	-	2
	L19	3	-	-	-	-	-	3
	L20	4	-	-	-	-	-	4
	L21	2	-	-	-	-	-	2
	L22	1	-	-	-	-	-	1
	L23	1	1	-	1	-	-	3
L24	1	4	2	-	-	-	7	
L25	1	-	1	-	-	-	2	
L26	2	1	-	-	-	-	3	
L28	5	-	1	-	-	-	6	
L29	8	-	3	1	2	2	16	
<i>Sub-totals</i>		96	17	11	6	4	2	136
YS	Y1	24	1	8	4	3	1	41
	Y2	21	12	2	1	2	-	38
	Y3	1	-	-	-	-	-	1
	Y4	8	1	1	3	1	-	14
<i>Sub-totals</i>		54	14	11	8	6	1	94
<b>Totals</b>		<b>150</b>	<b>31</b>	<b>22</b>	<b>14</b>	<b>10</b>	<b>3</b>	<b>230</b>

**Tab. 9.1.2** Number of specimens (NISP) identified to an animal in S8 (units which produced no identifiable finds or no finds at all have been omitted).

would probably have avoided the cave. However, the very low total numbers ( $n=12 / 1.73\%$ ), of gnawed bones indicate a minor role for these agents in the history of bone deposition in S8 during the LSA. Traces of rodent gnawing were observed on only 1.5 % of bones from S8-GS and are absent on finds from S8-YS.

#### Palaeoenvironmental Indications

A range of animals was identified from the deposits in S8 and the number of identifiable specimens (NISP) is summarised in **table 9.1.2**. Barbary sheep is the dominant species and reflects the location of the cave in



**Tab. 9.1.1** Faunal data for individual units excavated in S8: GS = Grey Series; YS = Yellow Series; percentages in GS and YS reckoned from the respective sub-totals for these units; percentages in column 3 are only given in cases where they exceed 10%.

the Beni Snassen hills, surrounded by stony plateaus, steep valley slopes and coarse wadi bottoms, habitats favoured by this species (Kingdon 1997, 444). Gazelle also occurs infrequently throughout the deposits. Remains of Cuvier's gazelle (*Gazella cuvieri*) were recorded in S8-L6 and possibly the same species (cf. *Gazella cuvieri*) in S8-Y2. The remaining animals, a large equid, large members of the alcelaphines (including some finds identified as the kongoni or hartebeest [*Alcelaphus buselaphus*]), large bovines and rhinoceros are present in some of the units in S8-YS and in S8-L29. These animals indicate regionally open grassy plains or grassland steppe in association with some parkland, bushland, *maquis* scrub mosaics and thickets (Kingdon 1997).

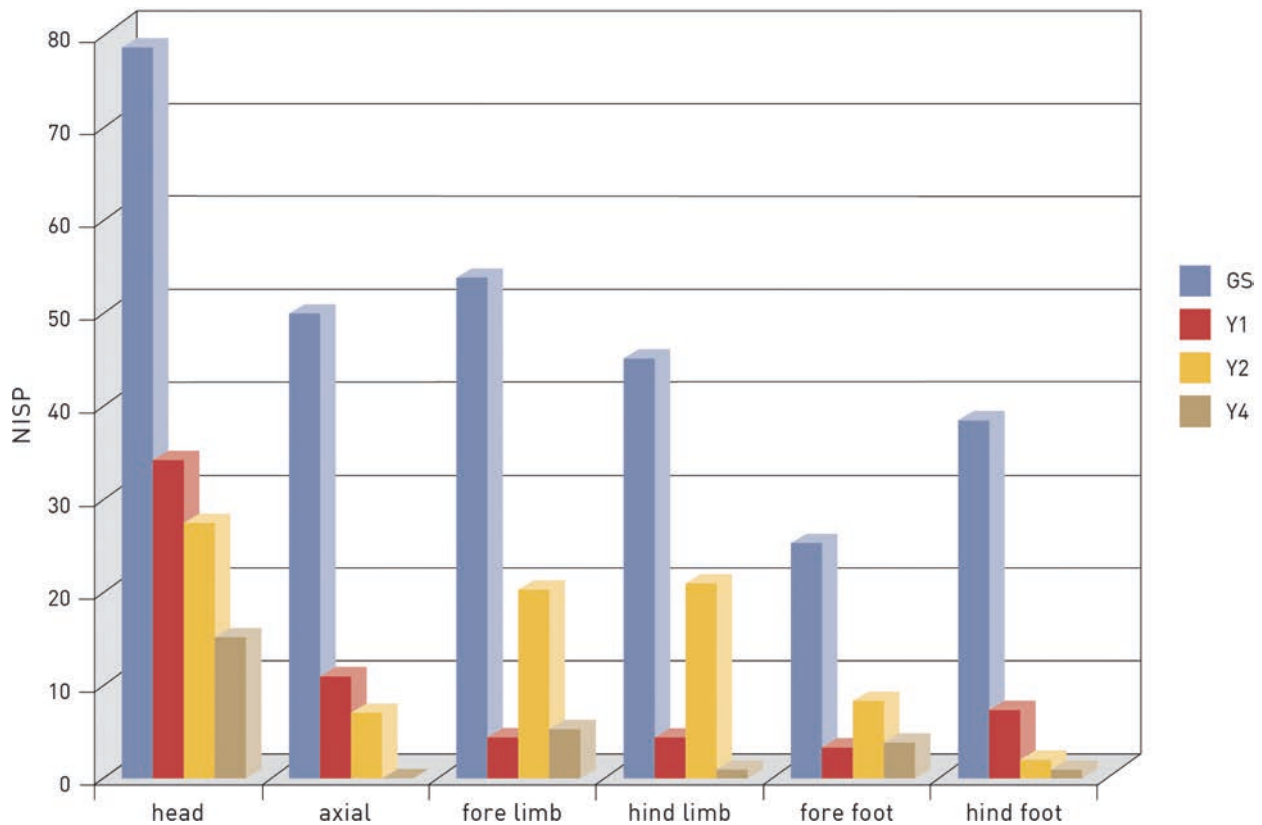
Despite a distinct shift in sedimentation type between the S8-YS and GS units at around 15,000 modelled cal BP, radical changes in faunal composition in the assemblages were not observed. With the exception of gazelle, which is present only in Y1, Barbary sheep, large equids, large alcelaphines and large bovines are present in the youngest of the S8-YS deposits (Y1) and in the oldest unit of S8-GS (L29). The remaining units of S8-GS (L28-L2) are characterised by a sporadic occurrence of these animals, except for Barbary sheep, which is present throughout. Returning, in passing, to the issue of 'productivity' change from the YS to the GS, it may be noted here that there is an average 4.4-fold increase in Barbary sheep and a 3.6-fold increase in fragments of the medium-large group, figures which are comparable to those derived from the entire bone assemblage (see above). This pattern of faunal representation may be due to fluctuating changes in climate and environment associated with regional occurrence/absence of some species, or may reflect an increasingly selective procurement of Barbary sheep by the human occupants of the cave. Either way, the low numbers of identifiable finds in each unit, combined with the possibility of random recovery in a small excavation sample, makes a definitive interpretation of faunal representation in many of the units from the S8-GS deposits difficult.

Minimum numbers of individuals (MNI) offered little additional information on the occurrence of animals in the S8 deposits. In S8-GS, two individuals of Barbary sheep were recorded on dental elements in L28 and in L29 respectively and two individuals of this species were also recorded on teeth from S8-Y1. The remaining units produced counts of just one individual for each of the animals identified, reflecting the low counts of finds in general.

### Bone Assemblage Formation and Skeletal Part Representation

Varying counts of a wide range of faunal skeletal elements were recovered from the deposits in S8. The composition of these bone assemblages may reflect hunting decisions by humans and the debris left behind after butchery, the results of various taphonomic processes, random occurrence in a small excavation area or any combination of these factors. Since the number of faunal remains which could be definitely identified was too small to be useful in a body-part analysis for each taxon, other methods had to be applied here to address skeletal representation. In such cases, a useful method is to assign skeletal elements to the anatomical regions described in the methods section. However, even after assignment, the numbers of elements in each anatomical region, particularly those from individual units in S8-GS, remained extremely low. In order to extract some information about the general representation of animal carcasses in these deposits, counts of elements in anatomical regions from each unit were combined, producing a single "assemblage" for the S8-GS deposits (**fig. 9.1.1**). In contrast, counts in S8-Y1, Y2 and (upper)Y4 were analysed as separate assemblages and S8-Y3 was omitted due to the very low total number of finds in this unit (**tab. 9.1.1**).

Some anatomical regions in the assemblages from S8 are clearly over-represented in comparison to others (**fig. 9.1.1**). The head, comprising almost exclusively dental elements, is dominant, a pattern commonly ob-

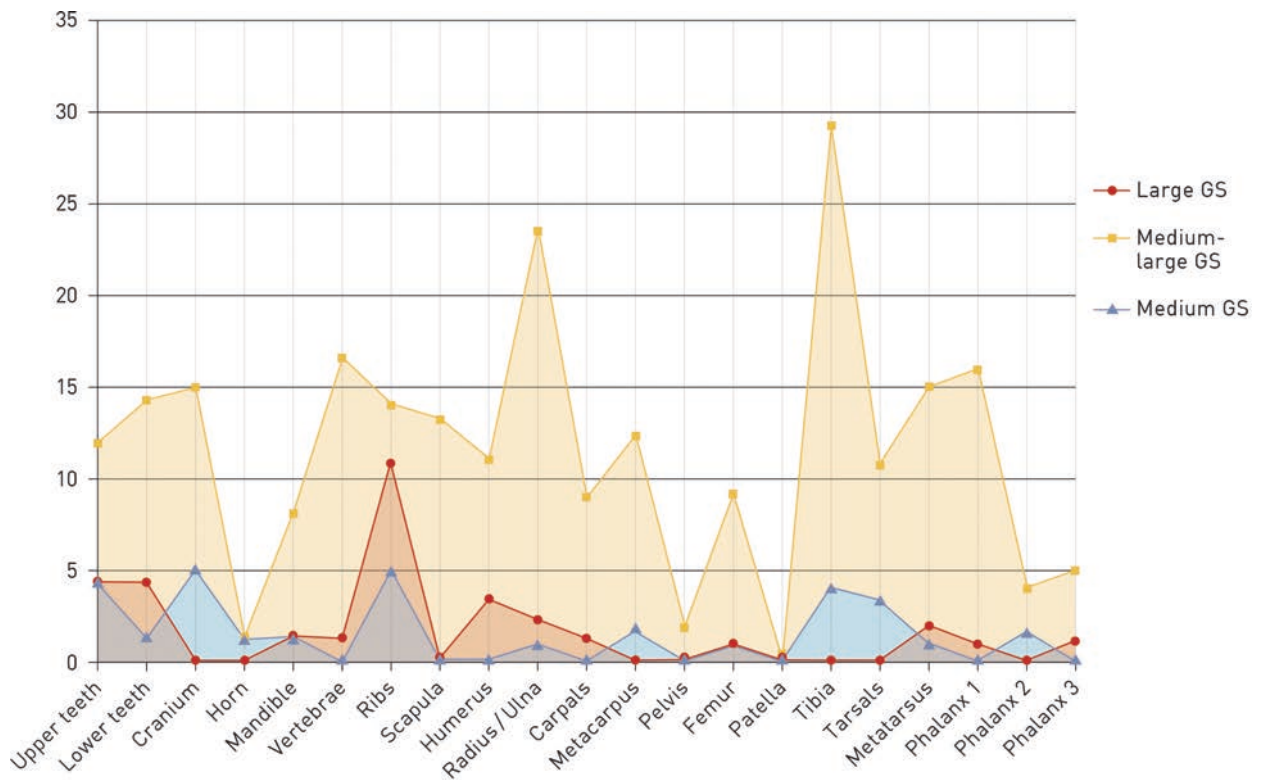


**Fig. 9.1.1** Representation of anatomical regions from lithostratigraphic units in GS and YS Y1-Y4spit2 of S8.

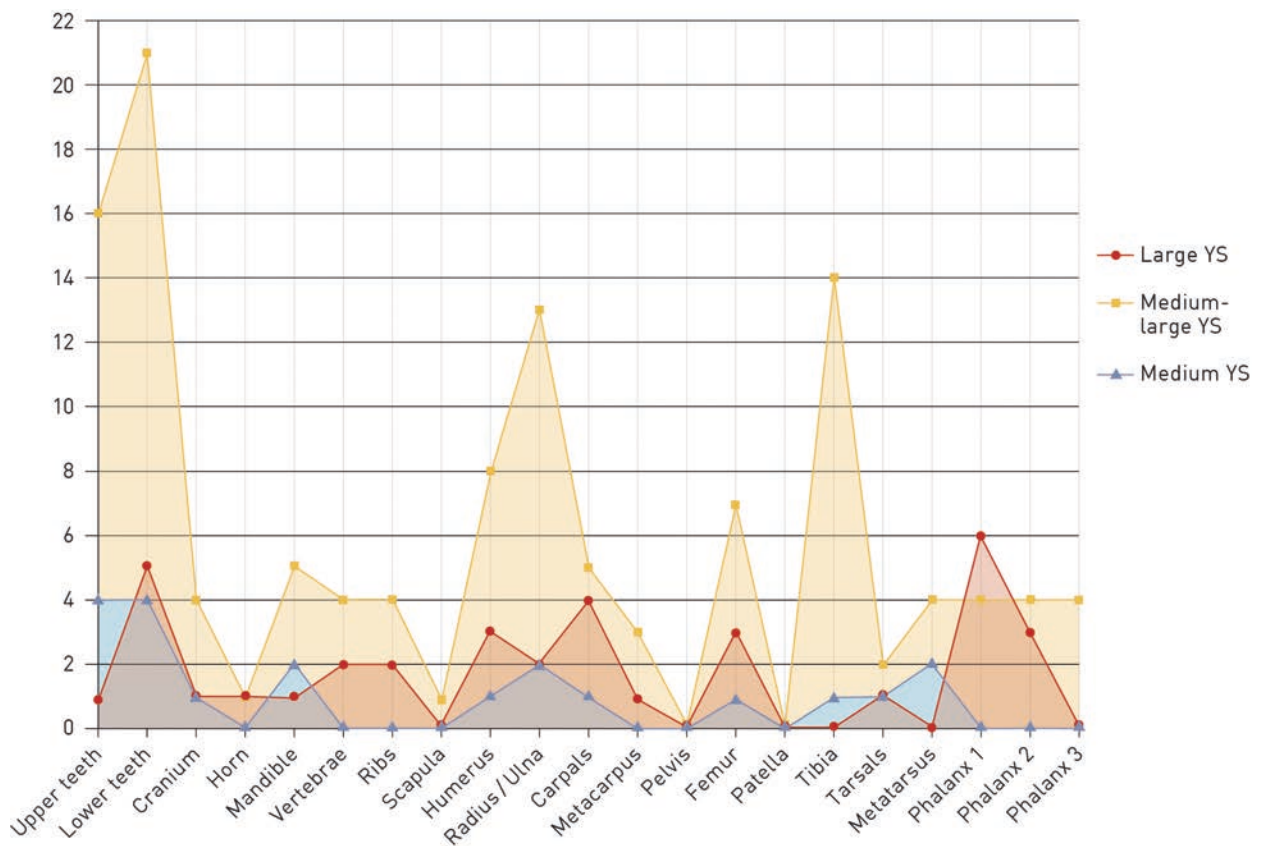
served in faunal assemblages since teeth are less susceptible to processes of bone weathering and destruction. The axial region is fairly well-represented in the assemblage from S8-GS, which is unusual since axial elements – particularly the vertebrae and, to some extent, the ribs – are vulnerable to attrition and loss. In contrast, axial elements are characteristically low in S8-Y1 and Y2, whilst (upper)Y4 produced no axial elements at all. The differential representation of axial elements may result at least in part from the different taphonomic contexts in the S8-YS and S8-GS deposits, where bone was probably exposed for longer periods at the surface during the slow accumulation of S8-YS units and had only to survive an initial destructive phase (fires and rocky substrates) for shorter periods during the much more rapid accumulation of S8-GS. Limbs and feet are also well-represented among the finds from S8-GS, but there is a strong differentiation in representation between fore limb and fore foot in this assemblage, with counts of fore foot elements being much lower, a pattern of representation not fully replicated between hind limb and hind foot elements. In S8-Y2, counts of fore and hind limb are more or less equal. On the whole, the data indicate that all parts of the carcass were recovered from the site, albeit in varying proportions, except for axial elements in (upper)Y4.

**Figures 9.1.2 and 9.1.3** depict comparative counts of individual skeletal elements from three of the animal-size groups – large, medium-large and medium. In these graphics, counts for faunal remains from the units in S8-YS have also been pooled to form a second ‘assemblage’ and counts for small sized animals are not shown, since only a few elements from both S8-GS and S8-YS could be attributed to this group.

In the S8-GS assemblage (**fig. 9.1.2**), the largest group, medium-large, produced a pattern with fairly high counts for teeth, metacarpus and first phalange, and particularly high counts for radius/ulna and tibia. High counts for these elements are not surprising, since they are all robust portions of the skeleton. Even so, it was unusual to observe fairly high counts for crania, vertebrae and ribs, elements which are normally

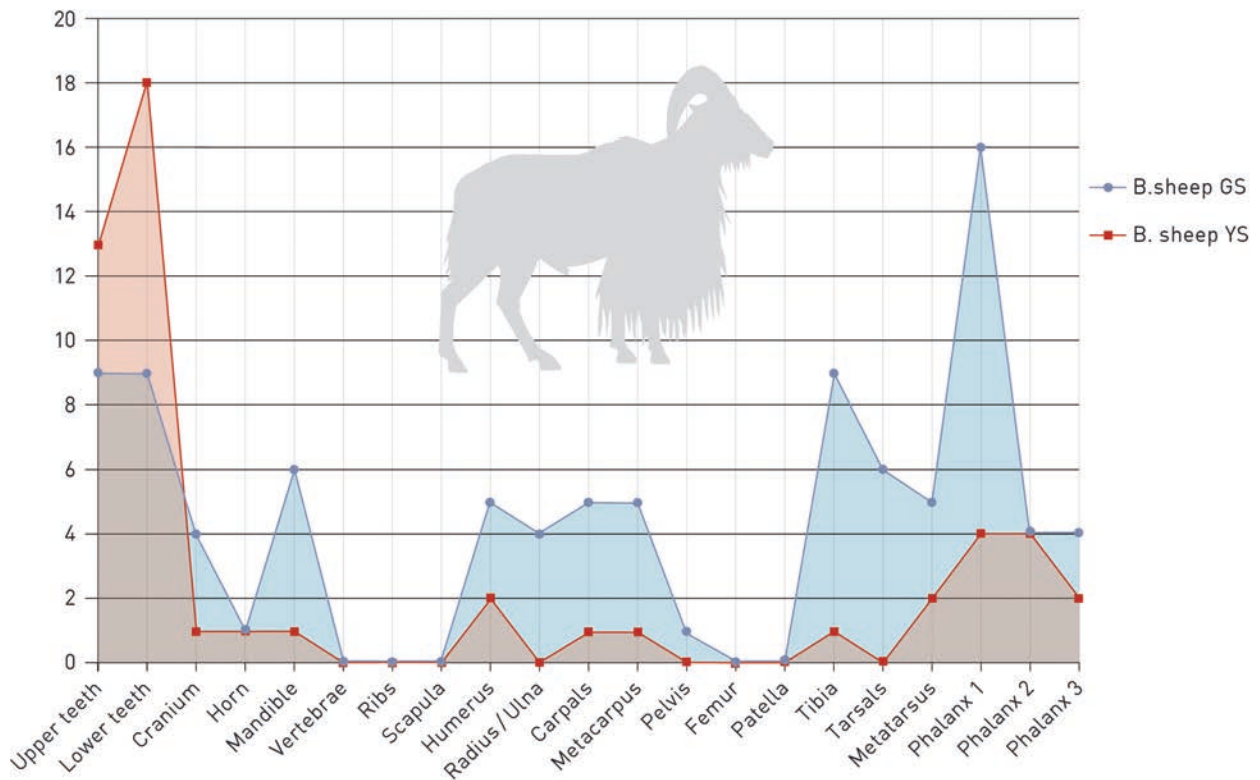


**Fig. 9.1.2** Comparative representation of skeletal elements of large, medium-large and medium animal-size groups from all units in S8-GS; all elements, including those identified to species, are included in the size groups.



**Fig. 9.1.3** Comparative representation of skeletal elements of large, medium-large and medium animal-size groups in YS Y1-Y4spit2 of S8; all elements, including those identified to species, are included in the size groups.



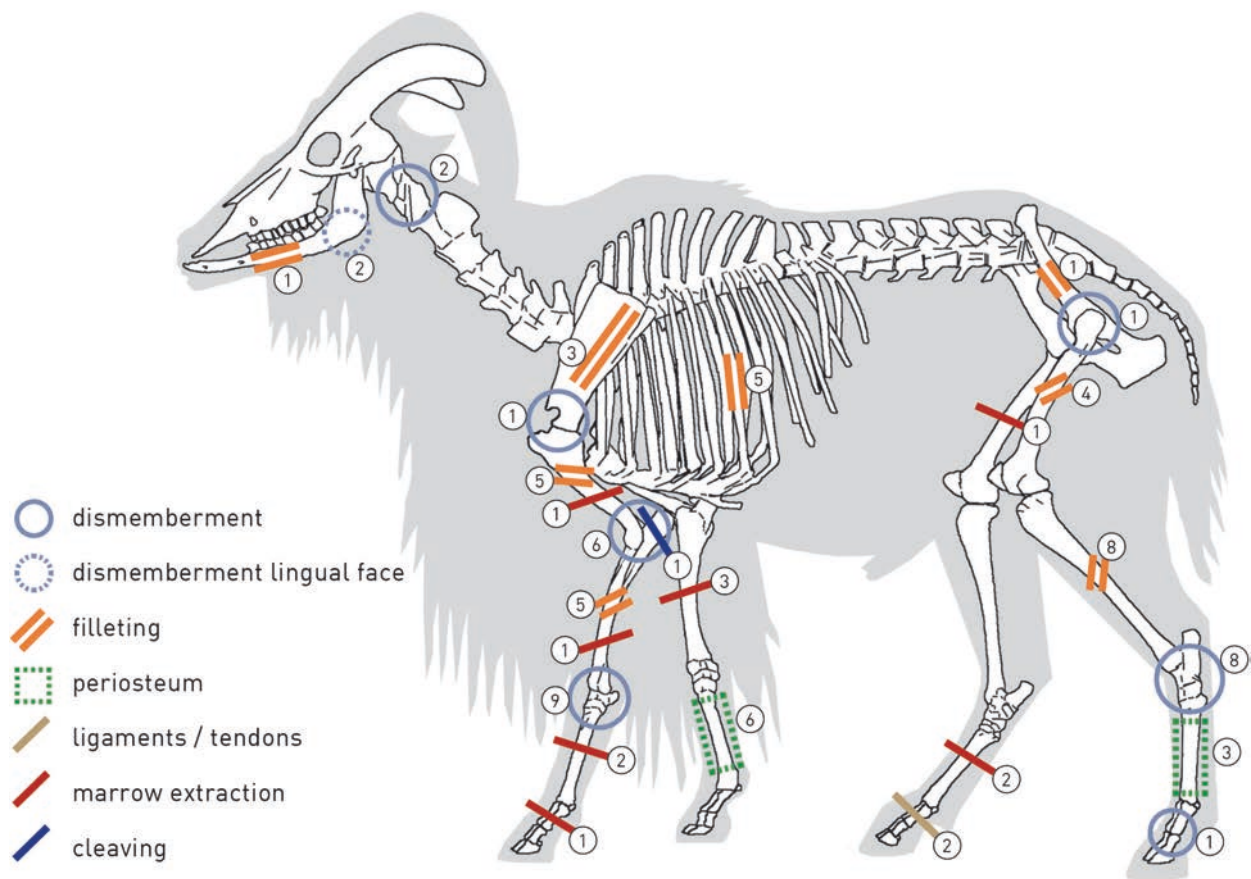


**Fig. 9.1.4** Comparative representation of skeletal elements of Barbary sheep from units in GS and from YS Y1-Y4spit2 of S8.

considered fragile. In the case of the vertebrae, counts were slightly higher than those for the upper and the lower teeth, usually the most persistent components in faunal assemblages. Similar patterns of representation were recorded for some elements of the medium-large group in the S8-YS assemblage (fig. 9.1.3); for example, high counts for radius/ulna and tibia. In contrast to the S8-GS assemblage (fig. 9.1.2), the one from S8-YS is characterised by very high counts of upper and lower teeth (fig. 9.1.3). Counts for vertebrae and ribs are higher in S8-GS than in S8-YS.

Remains attributed to the large and medium size groups in S8-YS are characterised by low counts in general and an absence of many elements, particularly in the large size group. Where higher counts were available for the medium group, they tended, at least in the S8-GS assemblage, to reflect the pattern recorded for medium-large animals, producing relatively high counts for cranium, ribs and tibia (fig. 9.1.2). In the S8-YS assemblage, a different pattern emerged for the medium size group with lower teeth, mandible, radius/ulna and metatarsus dominating (fig. 9.1.3). The strong over-representation of fragments of ribs in the large size group from S8-GS (fig. 9.1.2) is a pattern of element representation which differed appreciably from that observed in the other size groups. This may simply reflect the fact that large animals have a more robust bone structure in general, so that even elements with low survival potential, such as ribs, are recovered in proportionally larger quantities or could, again, reflect chance recovery of an accumulation of ribs from a large animal in a small excavation area.

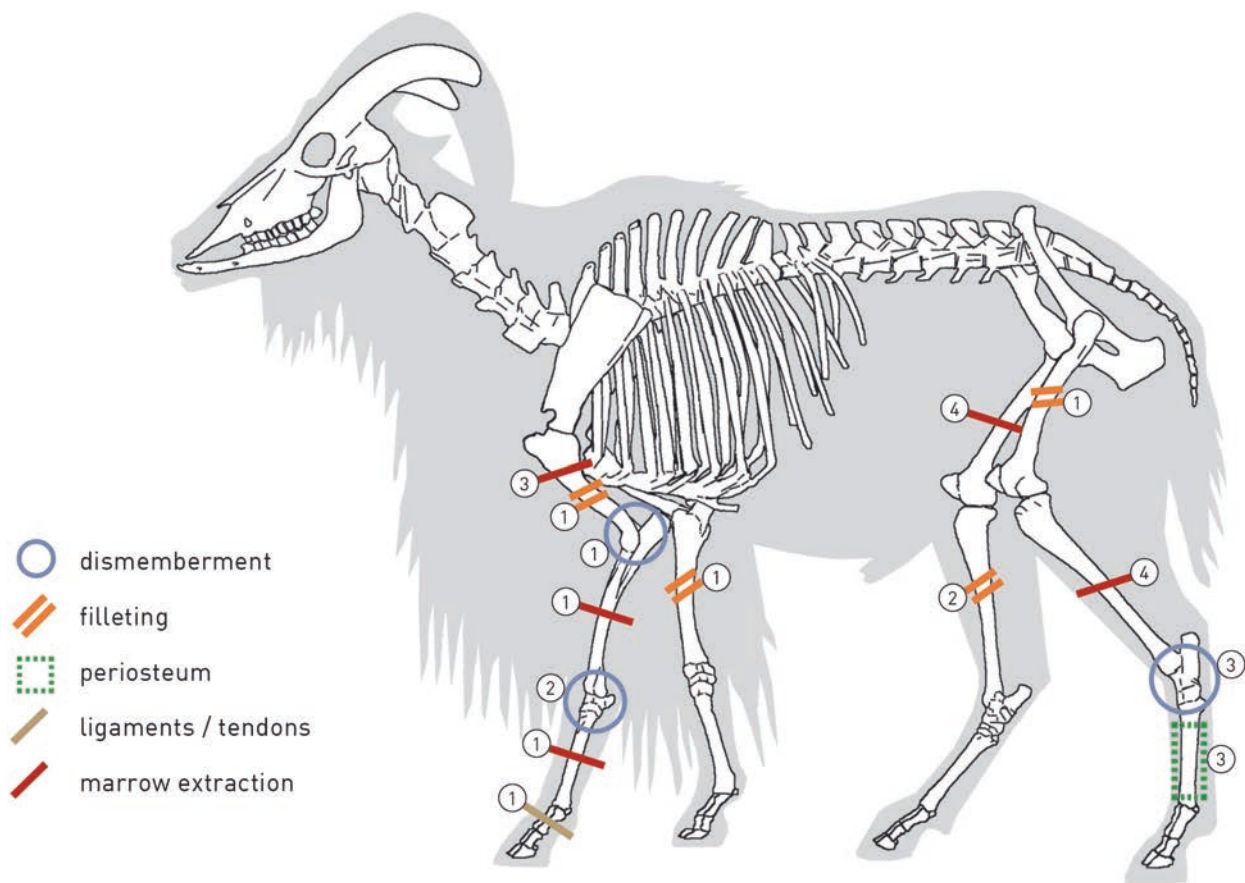
In an attempt to detect details relating to skeletal part occurrence not revealed in figures 9.1.1-9.1.3, counts of individual elements were depicted for the main game at Taforalt, Barbary sheep. Figure 9.1.4 compares the representation of elements of Barbary sheep in the S8-GS and S8-YS assemblages. Strong biases in element representation are apparent, relating, for the most part, to the robusticity or fragility of the bones. Thus, the absence of vertebra, rib, scapula and patella in both assemblages is consistent with a natural deterioration of these friable elements or parts of these elements, such as the blade of the scapula.



**Fig. 9.1.5** Schematic depiction of traces of butchery on the bones of Barbary sheep and animals of the medium-large size group from the GS assemblage of S8; numbers in circles indicate the number of times the butchery stage was recorded on a certain bone; note that the position of the traces on the bones does not necessarily reflect the exact position of the marks; unidentifiable shaft fragments ('long bones') not depicted.

Teeth, the dominant element in **figure 9.1.1**, are also well-represented in both Barbary sheep assemblages, though to a lesser extent in the one from S8-GS, which is dominated by first phalanges. First phalanges and other robust elements, such as mandibles, long bones of the fore limb and foot (humerus, radiocubitus and metacarpus) and rear limb and foot (tibia, metatarsus) are fairly well-represented in the S8-GS assemblage. Despite fewer finds in S8-YS, the pattern of element representation in this assemblage is similar to that of S8-GS. The skeletal representation of Barbary sheep suggests that all body parts were brought to the cave during the accumulation of both the GS and YS units and that the bones left behind in each assemblage were the products of various taphonomic processes, resulting in a loss of fragile elements and an over-representation of more robust finds.

On the whole, the presence of varying proportions of particular skeletal elements in the levels in S8 could mainly be attributable to differential bone survival, where fragile elements were under-represented and robust skeletal parts over-represented. There were some exceptions to this, namely the over-representation of ribs of large animals in the S8-GS assemblage, and the high counts of crania and counts of radius/ulna and tibia higher than those of teeth in the medium-large group in the S8-GS assemblages, suggesting that other factors were also instrumental in the representation of these elements. All body parts of the dominant taxon, Barbary sheep, seem to have been deposited in the cave, where taphonomic processes led to a loss of fragile elements.

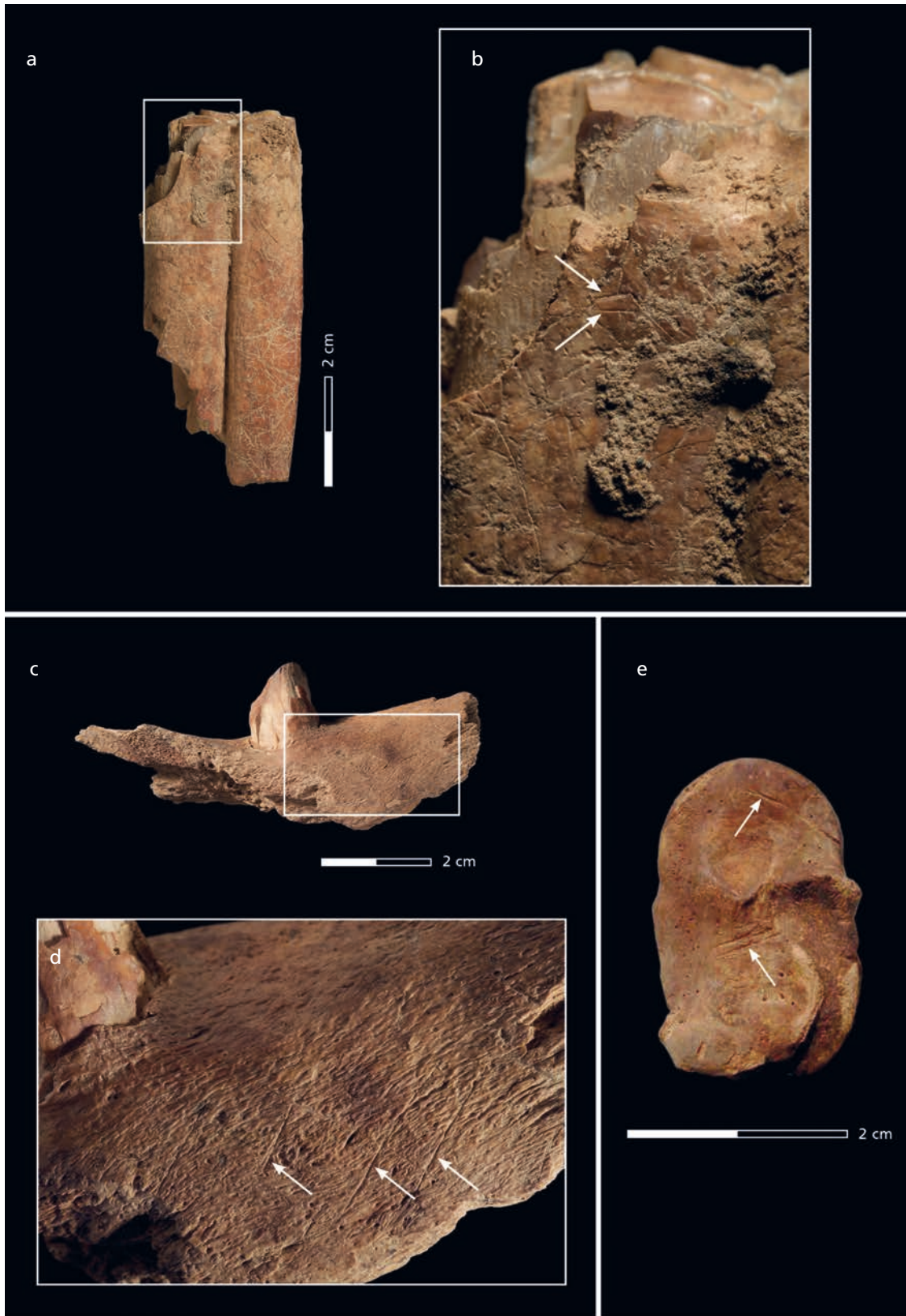


**Fig. 9.1.6** Schematic depiction of traces of butchery on the bones of Barbary sheep and animals of the medium-large size group from the YS assemblage of S8; numbers in circles indicate the number of times the butchery stage was recorded on a certain bone; note that the position of the traces on the bones does not necessarily reflect the exact position of the marks; unidentifiable shaft fragments ('long bones') not depicted.

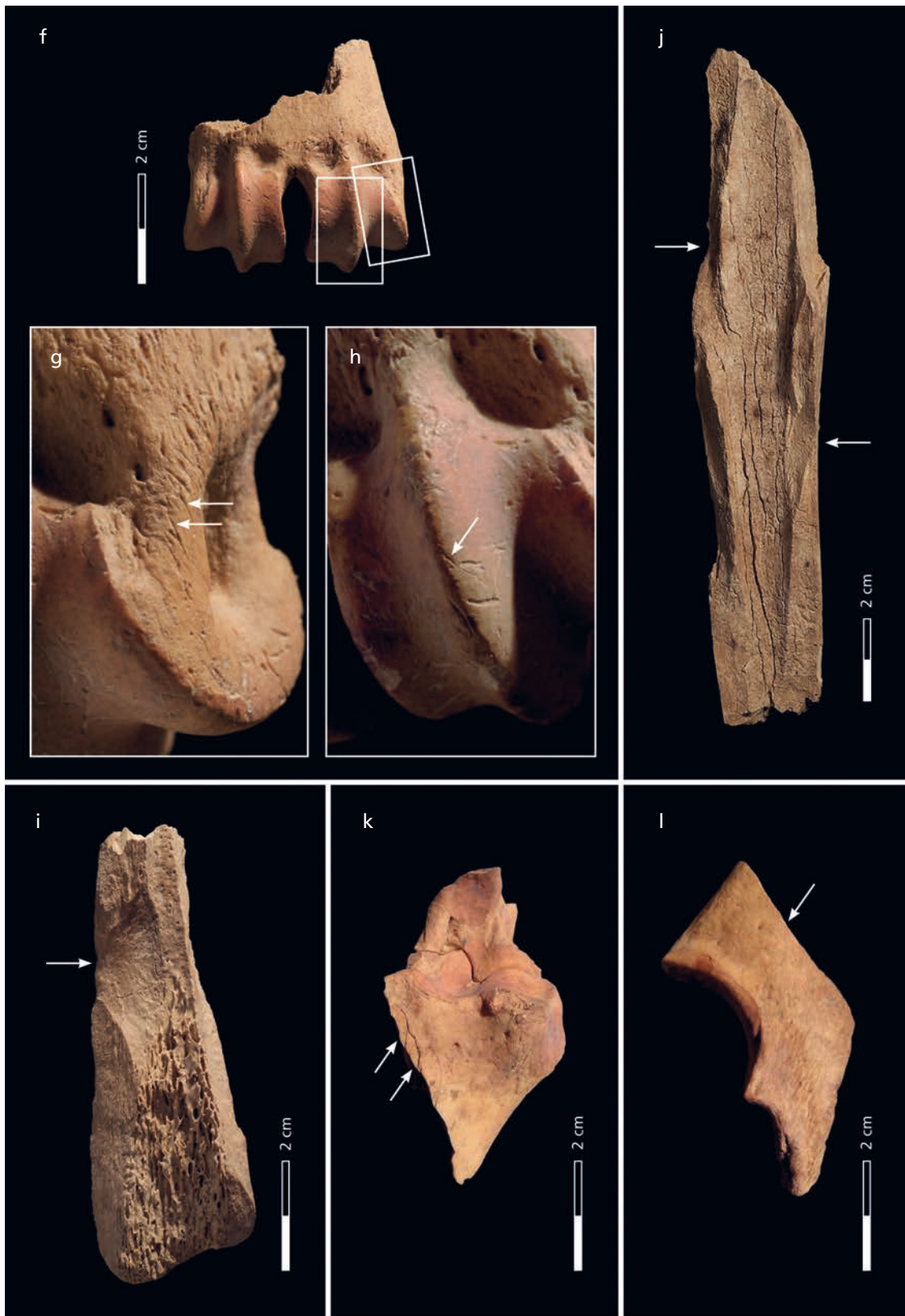
## Human Modification

Traces of butchery, such as cut marks resulting from the skinning, eviscerating, dismembering and filleting of animal carcasses, along with evidence of fracturing of bone to obtain marrow and grease, were observed on a total of 111 bones from S8-GS and 46 bones from S8-YS. The total percentage of butchery marks observed on the finds from the S8-GS assemblage (28.7%) was higher in comparison to that observed in the S8-YS assemblage (15.1%) (**tab. 9.1.1**). Since there was no association between lower and higher frequencies of marks and poor and good conditions of bone preservation – both assemblages are, in fact, very well-preserved – the higher percentages of butchery marks in the former assemblage probably reflects the more rigorous processing of animal carcasses during the accumulation of the GS deposits.

Summaries of butchery traces on bones identifiable to taxon in the S8-GS and S8-YS faunas are presented in **tables 9.1.3** and **9.1.5**, whereas **tables 9.1.4** and **9.1.6** summarise butchery marks on remains attributable to medium-large, medium and large sized animals from these assemblages. In the latter tables, the bulk of the specimens are from the medium-large animal-size group and it is highly likely that the overwhelming majority of these finds derive from the carcasses of Barbary sheep, even if the remains could not be unequivocally identified to this species. Therefore, these specimens are taken as augmenting butchery traces observed on the bones of identified Barbary sheep. The same argument can be applied to the medium size



**Fig. 9.1.7** Illustrations of butchery traces on faunal remains from the S8-YS and S8-GS assemblages: lower M2 of an equid (a) with cut marks on the crown of the tooth produced during removal of gingival tissues (b) <TAF10-10422>; mandible of an equid (c) with cut marks on lingual face of jaw (d) produced during removal of the tongue <TAF04-986>; astragalus of gazelle (e) with disarticulation marks on the medial face <TAF09-8916>; distal end of a metacarpus of Barbary sheep (f) showing disarticulation marks on the medial face (g) and



sagittal ridge (**h**) of the medial trochlea <TAF04-1124>; metacarpus or metatarsus of an equid (**i**) showing large conchoidal flake on inner part of shaft <TAF04-1123> produced during marrow procurement; opposing impact notches on the tibia of a large animal (**j**), indicating use of an anvil <TAF04-1903>; radiocubitus of Barbary sheep (**k**) with impact notches and incipient flakes (arrows) on the dorsal face of the proximal end of the bone <TAF10-9486>; chop mark (arrow) on the olecranon of an ulna of Barbary sheep (**l**) <TAF10-9197>.

Taxa	Units	Skinning	Dismemberment	Filleting	Periosteum	Ligaments/ tendons	Marrow extraction	Multiple traces	Totals	
Barbary sheep	L3		carpal (C-1)					metacarpus (dismemberment MCP-1 / longit.split)		
	L5		tarsal (TNC-1)							
	L6		humerus (Hd-1, Hd-2 and Hd-3?) radius (RCd-3) * astragalus (TA-2)	tibia				metacarpus (dismemberment MCP-1 / longit. split)		
	L7		tarsal (TE-1)	mandible *						
	L8			tibia tibia	metacarpus	phalange I (tendons)				
	L11									
	L12							humerus (dismemberment Hd-2 / oblique Hd-2 / filleting)		
	L15			carpal (C-1) tibia (Td-3) *		metacarpus/ metatarsus		metatarsus (dismemberment MTP-3 / longit.split)		
	L17									
	L19									
	L20			metatarsus (MTP-1)					phalange I (dismember- ment/tendons)	
	L26			mandible	tibia				radiocubitus (dismemberment RCp-5 / marrow/cleaved)	
	L28			astragalus (TA-2)	humerus				humerus (filleting/marrow)	
	L29			11	6	2	1	2	7	29
<i>Sub-totals</i>		0								
Gazelle	L3	cranium								
	L6		tarsal (TNC-1)							
	L13		astragalus (TA-2)							
	L15			tibia	metatarsus					
<i>Sub-totals</i>		1	2	1	1	0	0	0	5	

Taxa	Units	Skinning	Dismemberment	Filletting	Periosteum	Ligaments/ tendons	Marrow extraction	Multiple traces	Totals
Equid	L18			radiocubitus					
	L24			upper tooth					
	L29			lower tooth					
<i>Sub-totals</i>		0	0	3	0	0	0	0	3
Large bovine	L29			humerus					
<i>Sub-totals</i>		0	0	1	0	0	0	0	1
Alcelaphines	L12		astragalus (TA-2)						
	L13		carpal (C-1) *						
<i>Sub-totals</i>		0	2	0	0	0	0	0	2
<b>Totals</b>		1	15	11	3	1	2	7	40

**Tab. 9.1.3** Summary of butchery marks on bones of Barbary sheep, gazelle, horse, large bovid and members of the Alcelaphine group from S8-G5 (letters in parentheses e. g. (C-1) denote Binford's (1981) coding system for cut marks; \* indicates the bone or one of the bones is from a juvenile individual; longit. split = bone has been split longitudinally).

Animal size group	Units	Skinning	Dismemberment	Filletting	Periosteum	Ligaments/ tendons	Marrow extraction	Multiple traces	Totals
Medium-large	L2			femur tibia *					
	L3		ulna (RCp-2)	long bones humerus (Hd-6) radius (2) tibia *	metatarsus				
L6			atlas vertebra (CV-1)	long bone, flat bone scapula (S-3)			metatarsus (longit. split)	atlas vertebra (CV- 2) dismember- ment/cleaved radius (dismember- ment/longit. split)	
			astragalus (TA-2)*	humerus					
			carpal (C-1)	long bone*					
L7 L8 L11				rib humerus radius*					
				radiocubitus		phalange I			
			scapula						
L13									

**Tab. 9.1.4** Summary of butchery marks on bones of animals in the medium-large, medium and large size groups from S8-G5 (letters in parentheses e. g. (Hd-6) denote Binford's (1981) coding system for cut marks; \* indicates the bone or one of the bones is from a juvenile individual; longit. split = bone has been split longitudinally).

Animal size group	Units	Skinning	Dismemberment	Filleting	Periosteum	Ligaments/tendons	Marrow extraction	Multiple traces	Totals
	L15			femur*	metatarsus			ulna (Rcp-3) (dismemberment/cleaved) femur (Fp1 / Fp2) (dismemberment/cleaved)	
	L16			scapula (S-3)					
	L17			rib					
	L18			scapula (S-3)					
	L19		carpal (C-1)	tibia (Tp-3)	metacarpus (2)*			radius (filleting/marrow)	
	L20		ulna	pelvis femur flat bone	metacarpus				
	L22			flat bone					
	L24		carpal (C-1)	flat bone			tibia metatarsus		
	L26				metacarpus				
	L28			rib (RS-1)* femur			radius (longit. split)		
	L29		mandible (M-6)	rib (2) long bone (2)	metacarpus				
<i>Sub-totals</i>		0	9	31	6	1	4	5	56
Medium	L14	cranium							
	L20			rib	metacarpus				
	L23								
	L26			long bone (2)					
	L29	1	0	3	1	0	1	0	6
<i>Sub-totals</i>									
Large	L15			long bone			bone flake		
	L16			rib					
	L19			rib					
	L20			long bone; bone fragment					
	L29								
<i>Sub-totals</i>		0	0	5	0	0	1	0	6
<b>Totals</b>		1	9	39	7	1	6	5	68

Tab. 9.1.4 (continued)



group, where the bulk of the finds probably derive from gazelle. Schematical overviews of the butchery traces on remains of Barbary sheep and the medium-large animal-size group are given in **figures 9.1.5-9.1.6** and illustrations of these modifications in **figure 9.1.7**.

## Butchery in the Grey Series

### Barbary Sheep and Animals in the Medium-Large Size Group

Traces of different stages of butchery were observed on 40 bones identifiable to taxon from S8-GS and the bulk of these (n=29 / 72.5 %) are the remains of Barbary sheep, the main game animal at the site. A similar situation was recorded for the animal-size groups, for which butchery traces were observed on a total of 71 bones, with bones of medium-large sized animals forming the greater part (n=56 / 78.8 %).

#### – Dismemberment of the Carcass

The bulk of the butchery traces on Barbary sheep (n=11) are cut marks located around the joints of the bones, caused when the carcasses were dismembered (**tab. 9.1.3**). The opposite is the case in the medium-large group, where the bulk of the cut marks derive from filleting (n=31) (**tab. 9.1.4**). These differences are not indicative of a shift in butchery tactics but simply reflect the ease of identifying to species the proximal and distal ends of bones, where dismemberment marks are generally located, and the difficulties of identifying to species fragments of bone shafts, where the bulk of the filleting marks are found.

#### – Disarticulating Mandible and Neck

Two sets of scrape-like marks on the buccal face of a mandible of Barbary sheep from S8-L28 (**tab. 9.1.3**) might have resulted from disarticulation of the head and jaw. Cut marks across the masseteric fossa of a mandible (**tab. 9.1.4**, S8-L29, cf. M-6) were probably produced during stripping of the masseter muscle (Binford 1981, 109). Transverse cut marks on the cranial (CV-1) and caudal (CV-2) regions of the ventral surfaces of atlas vertebrae from S8-L6 (**tab. 9.1.4**) indicate the separation of the head from the neck (*ibid.*, 111).

#### – Disarticulation of the Fore Limb

Cut marks produced when separating the main portions of the fore limb and the foot were recorded on all major joints, including the shoulder, elbow and wrist. Separation of a shoulder blade from the upper part of a fore limb is clearly demonstrated by sets of short, transverse cuts located immediately above the glenoid cavity, on the caudal neck of a scapula (**tab. 9.1.4**, S8-L13).

Several sets of marks around the distal humerus and proximal radiocubitus attest to the separation of the proximal, meatier, section of the fore limb from its less meaty distal part. The distal ends of two humeri of Barbary sheep showed marks clearly produced when this bone was cut out of the deep notch formed by the proximal end of the radiocubitus (**tab. 9.1.3**, S8-L6 and L11). Oblique cuts across the medial faces of both specimens and a mark on the surface of the distal articulation of the bone from L6 are comparable with Hd-2 and Hd-1 respectively, which are commonly produced when this joint is disarticulated (Binford 1981, 124). A set of oblique cuts (oblique Hd-2), higher up on the condyle of the humerus from S8-L11, along with marks located towards the upper margin of the olecranon fossa (Hd-3) on the bone from S8-L6 (**tab. 9.1.3**), may indicate the butchering of flexed joints produced, according to Binford (1981, 126), when the carcass was stiff.

Cut marks were also observed on three proximal ulnas in positions relating to dismemberment of the elbow joint (**tab. 9.1.4**, S8-L3, RCp-2; S8-L15, RCp-3; and S8-L20).

Several cuts on a proximal radius of Barbary sheep (**tab. 9.1.3**, S8-L19, RCp-5) were probably produced during separation of this bone from the humerus. However, the position of the marks on the dorsal edge and on the inner surface of the articulation suggests they were inflicted when the joint had already been partially opened. A single, transverse, mark was observed just above the distal end of an unfused diaphysis of a radius of a juvenile Barbary sheep (**tab. 9.1.3**, S8-L6, RCd-3), and marks in a similar position were observed on the distal end of a radius from an adult animal of medium-large size (**tab. 9.1.4**, S8-L6). On the latter bone, the placement of the cut marks again suggests dismemberment when the joint was slightly open or when the joint was flexed. They may be equivalent to Binford's RCd-1, produced during separation of the distal radius from the proximal carpal row (*ibid.*, 126).

#### – Disarticulation of the Hind Limb

Similar patterns of carcass preparation were noted for the rear leg, with practically all major joints – pelvis, knee and ankle – bearing traces of marks produced during dismemberment.

Two sets of typical dismemberment marks were observed on the neck and on the head of a femur (**tab. 9.1.4**, S8-L15, Fp-1 and Fp-2). These marks are inflicted while severing connecting tissues after dislocation of the femur head from the pelvic socket (Binford 1981, 116).

By far the most common dismemberment mark on the distal tibia is produced by cutting across the dorsal (anterior) surface of the bone when the leg is straight or outstretched (*ibid.*, 119). Binford states that, if this action is carried out lower down on the bone, the marks may continue over the medial face of the joint, leaving cuts on the medial side of the astragalus and the medial distal tuberosity of the tibia. Marks similar to these were observed on three astragali (**tabs. 9.1.3**, S8-L6 and L29, TA-2; **9.1.4**, S8-L6, TA-2) and on the unfused distal epiphysis of a tibia from a young individual of Barbary sheep (**tab. 9.1.3**, S8-L15, Td-3).

According to Binford (1981, 119) an alternative method of separating the tibia from the foot is to cut between the tarsals and the proximal metatarsal. Application of this technique leaves behind transverse marks encircling the joint and cuts similar to these were found on a naviculo-cuboid (**tab. 9.1.3**, S8-L3, TNC-1), an internal cuneiform (**tab. 9.1.3**, S8-L7, TE-1), and on the proximal ends of the shafts of two metatarsals (**tab. 9.1.3**, S8-L20, MTp-1; S8-L15, MTp-3).

#### – Disarticulation of the Foot

Transverse cut marks on the dorsal or outer faces of carpal bones (**tab. 9.1.3**, S8-L3, C-1; S8-L12 cf. C-1; **tab. 9.1.4**, S8-L7 L19 and L22, cf. C-1) and proximal ends of metacarpals (**tab. 9.1.3**, S8-L3 and L5, MCp-1) also attest to the dismemberment of the foot from the lower fore limb (*ibid.*, 126).

Cut marks on the distal end of a first phalange (**tab. 9.1.3**, S8-L17) may attest to the separation of distal elements of the foot.

#### – Filleting

Filleting marks were visible on a fragment of a mandible of a juvenile Barbary sheep (**tab. 9.1.3**, S8-L7). The marks are longitudinal and located on the lingual face of the bone, just behind the second molar.

Cut marks on the shafts of seven long bones of Barbary sheep (**tab. 9.1.3**) and on 34 remains of medium-large sized animals (**tab. 9.1.4**) could be attributed to filleting.

Three scapulae (**tab. 9.1.4**, S8-L6, L16 and L18) bore traces of filleting of strips of meat from the blade. The specimen from S8-L16 had longitudinal cut marks on both the medial and lateral faces. The latter are comparable with Binford's S-3 marks (1981, 98). Oblique cuts were recorded on a scapula from S8-L6 and L18 but they were probably inflicted during filleting activities too. Binford writes that filleting the scapula is normally associated with meat drying activities (*ibid.*, 98).

Meat had been removed from a total of five ribs. One of these finds (**tab. 9.1.4**, S8-L28, RS-1) bore cut marks just lateral to the head of the rib, usually produced during removal of the tenderloin (*ibid.*, 113). A cut on a fragment of a pelvis (**tab. 9.1.4**, S8-L20) may also have been produced during the stripping of meat. The majority of the filleting marks were located on major bones of the limbs. These include six humeri, five radii or radiocubiti, four femora and eight tibiae. Filleting marks comparable to Binford's Hd-6 (*ibid.*, 131) were observed on one of the humeri (**tab. 9.1.4**, S8-L3) and oblique cut marks close to the *crista tibiae* on the tibia from S8-L19 (**tab. 9.1.4**) resembled Binford's Tp-3 marks (*ibid.*, 130). In addition, six pieces of not further identifiable long bones and three fragments of flat bones also bore marks which can probably be attributed to the removal of meat.

– Periosteum

Short, often oblique, cuts on the shafts of metacarpals and metatarsals may have been produced in conjunction with filleting activities in general but, on meatless metapodials, are more likely to be associated with the intentional stripping of the periosteum. Removal of this tough, fibrous membrane would have ensured a cleaner breakage of the bone during marrow procurement. Six metacarpals, two metatarsals and an unidentified metapodial bore these traces (**tabs 9.1.3-9.1.4**).

– Ligaments and Tendons

A set of short, transverse, scrape-like cuts is present mid-shaft on the dorsal face of a first phalange of Barbary sheep (**tab. 9.1.3**, S8-L7) and transverse cuts are also visible towards the distal end of the dorsal face of a first phalange from the medium-large group (**tab. 9.1.4**, S8-L11). The position of the cuts suggests they were produced when ligaments were severed (Parkin/Rowley-Conwy/Serjeantson 1986, 325).

– Marrow Procurement

Hammerstone-induced impact notches were observed on a metatarsus and a first phalange of Barbary sheep (**tab. 9.1.3**, S8-L8) and on a radius and a metatarsus from the medium-large sized group (**tab. 9.1.4**, S8-L24). Splitting bones open longitudinally and chopping through the joint also seemed to be options to obtain marrow or grease, and specimens with these characteristics were found throughout the units (**tabs 9.1.3-9.1.4**).

– Multiple Traces of Butchery

12 of the bones had undergone more than one stage of butchery (**tabs 9.1.3-9.1.4**). Some bore cut marks produced during dismembering and filleting; other marks were produced during filleting and removal of ligaments. Several showed cut marks and evidence of marrow fracturing, longitudinal splitting or chopping. One specimen, a radiocubitus of Barbary sheep (**tab. 9.1.3**, S8-L19), had been disarticulated from the carcass, opened to remove marrow and the proximal joint had been chopped, probably to obtain bone grease. Both adult and juvenile animals had been butchered and a total of eleven butchered bones was attributed to juveniles. Cut marks produced during dismemberment, filleting and removal of periosteum were recorded on 3 bones of juvenile Barbary sheep and eight bones of juveniles in the medium-large animal-size group.

Alcelaphines

A tarsal and a carpal bone from members of the alcelaphine group displayed cut marks (**tab. 9.1.3**). The astragalus in S8-L12 was identified on morphological grounds as *Alcelaphus buselaphus*. The carpal bone from S8-L13 is from a juvenile alcelaphine. Both bones showed marks associated with dismemberment: separation of the tibia-tarsal joint (TA-2) on the astragalus from S8-L12, and separation of the radius from the proximal carpal row in the case of the specimen from S8-L13 (*cf.* C-1).

### Gazelle and Animals in the Medium Size Group

Cut marks were observed on 5 bones of gazelle, attesting to skinning, dismemberment (**fig. 9.1.7e**), filleting and removal of the periosteum (**tab. 9.1.3**). None of the gazelle bones from the S8-GS assemblage showed any form of marrow extraction but traces of these activities were recorded on bones from medium sized animals, namely a tibia of a juvenile (**tab. 9.1.4**, S8-L15).

Gazelle was the only animal to produce bones which showed signs of skinning. A set of short, oblique cut marks was observed on the fragment of a cranium of gazelle (**tab. 9.1.3**, S8-L3). These cuts led away from the edge of the orbit and crossed the zygomaticus bone. They were probably produced when the head of the animal was skinned. Two cut marks on a fragment of a cranium of a medium-sized animal may also have been produced during skinning (**tab. 9.1.4**, S8-L14).

### Equids

Cut marks were present on one equid bone and on two teeth. Oblique marks on the shaft of a radius attest to the filleting of this bone (**tab. 9.1.3**, S8-L18). The cut marks on the teeth are located on the upper part of the crown at a level corresponding to the basal and dorsal edges of the maxilla and mandible respectively (**tab. 9.1.3**, S8-L24 and L29). Both sets of marks would have been produced while cutting parallel to the edges of these bones, when the gingival tissues were cut away. On the specimen from S8-L24 (upper M1/2), stone tools had nicked the anterior pillar (parastyle) on the buccal face and, on the specimen from S8-L29 (lower P3/4), had cut into the lingual face of the crown. The roots of the tooth had not closed on the latter specimen, indicating it was from a young adult. Cut marks in these positions on upper and lower molars of equids have been recorded in European contexts, where excellent examples are known from Late Glacial sites in particular (Turner 2002, 48; Street/Turner 2013, 99).

### Large Bovines and Animals in the Large Size Group

One bone of a large bovine, a humerus, showed cut marks (**tab. 9.1.3**, S8-L29). These are located on the shaft and were presumably produced during filleting.

In addition, two long bones, two ribs and a bone fragment from the large animal-size group showed cut marks which could be associated with filleting activities (**tab. 9.1.4**). A detached flake from the bone of a large animal was recovered in S8-L15 (**tab. 9.1.4**) and attests to marrow procurement in this group.

### Butchery in the Yellow Series

Evidence of butchery was observed on only eleven identifiable animal bones from the S8-YS assemblage and five (45.5 %) of these could be identified as Barbary sheep. A higher count of 34 bones was recorded for the animal-size groups, of which 25 (73.5 %) are from the medium-large size group.

### Barbary Sheep and Animals in the Medium-Large Size Group

#### – Dismemberment of the Carcass

Marks produced during dismemberment (**fig. 9.1.7f-h**) were prevalent among the Barbary sheep remains (**tab. 9.1.5**), but the larger proportion of cuts on remains from the medium-large group derived from filleting (**tab. 9.1.6**). A similar discrepancy was observed between dismemberment and filleting cut marks on Barbary sheep and medium-large animals in the GS assemblage and ascribed to biasing due to problems of identification to species of shafts of bones (see above).

	Unit	Skinning	Dismemberment	Filleting	Periosteum	Ligaments/tendons	Marrow extraction	Multiple traces	Totals
Barbary sheep	Y1			humerus		phalange I			
	Y2		tibia (Td-3) metacarpus (Mcd-2) metatarsus (MTp-3)						
<i>Sub-totals</i>		0	3	1	0	1	0		5
Equid	Y1			lower tooth (gingival tissue) mandible (re-moval tongue)					
	Y2				metacarpus/ metatarsus 2 or 4 metacarpus/ metatarsus 2 or 4		1 metacarpus/ metatarsus		
<i>Sub-totals</i>		0	0	2	2	0	1		5
Large bovine	Y2							metacarpus/metatarsus (periosteum/marrow)	
<i>Sub-totals</i>		0	0	0	0	0	0	1	1
<b>Totals</b>		<b>0</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>11</b>

**Tab. 9.1.5** Summary of butchery marks on bones of Barbary sheep, gazelle, horse, large bovid and members of the Alcelaphine group from S8-Y5 (letters in parentheses e.g. (Td-3) denote Binford's (1981) coding system for cut marks; \* indicates the bone or one of the bones is from a juvenile individual).

Animal-size group	Unit	Skinning	Dismemberment	Filleting	Periosteum	Ligaments/tendons	Marrow extraction	Multiple traces	Totals
Medium-large	Y1		tarsal (TE-1)	tibia long bone	metatarsus metacarpus/metatarsus		1 humerus 1 radius 1 metacarpus 1 long bone	radius (dismemberment RCP-1 / filleting)	
	Y2		long bone	long bone (2)			femur (2) tibia (3) long bone	femur (filleting/marrow) tibia (filleting/marrow)	
	Y4				metacarpus/metatarsus		humerus (2)		
<i>Sub-totals</i>		0	2	4	3	0	12	3	24
Medium	Y1		rib						
	Y2			long bone					
	Y4				metacarpus		femur (2)	metacarpus/metatarsus (dis- memberment/periosteum)	
<i>Sub-totals</i>		0	1	1	1	0	2	1	6
Large	Y1			long bone	metatarsus				
	Y2			humerus			tibia		
<i>Sub-totals</i>		0	0	2	1	0	1	0	4
<b>Totals</b>		<b>0</b>	<b>3</b>	<b>7</b>	<b>5</b>	<b>0</b>	<b>15</b>	<b>4</b>	<b>34</b>

**Tab. 9.1.6** Summary of butchery marks on bones of animals in the medium-large, medium and large size groups from 58-Y5 (letters in parentheses e. g. (TE-1) denote Binford's (1981) coding system for cut marks; \* indicates the bone or one of the bones is from a juvenile individual).

– Disarticulation of the Fore Limb and Foot

Dismemberment marks were recorded on the elbow and wrist joints. One set of short marks, located close to the proximal end of the shaft of a radius, is comparable with Binford's RCp-1 cuts, produced during separation of the elbow joint (**tab. 9.1.6**, S8-Y1).

Sets of short, oblique cut marks positioned on the posterior edges of a distal condyle and distal keel of a metacarpus (**tab. 9.1.5**, S8-Y2, MCd-2) were inflicted during dismemberment and indicate separation of the foot bone from the distal segment of the limb.

– Disarticulation of the Hind Limb and Foot

The location of two short, oblique cut marks across the face of the medial malleolus of a distal tibia (**tab. 9.1.5**, S8-Y2) of Barbary sheep correspond to Binford's Td-3 (1981, 119), a common mark produced during disarticulation of the tibia-tarsal joint. Transverse cut marks on the proximal end of a metatarsus (**tab. 9.1.5**, S8-Y2, MTp-3) and on a tarsal bone (**tab. 9.1.6**, S8-Y1, TE-1) attest to the removal of the foot bone from the tarsal row.

– Filleting

Cut marks which were probably produced during filleting were observed on several major limb bones, including a humerus of Barbary sheep from S8-Y1 (**tab. 9.1.5**), a radius, a femur and two tibiae (**tab. 9.1.6**, S8-Y1 and Y2). Fragments of three long bones, not identifiable to skeletal element (**tab. 9.1.6**, S8-Y1 and Y2), were placed into this category, although the cut marks on these finds could have been produced during removal of the periosteum.

– Periosteum

Three fragmentary metapodials (**tab. 9.1.6**) bore traces of cut marks on their shafts probably produced during removal of periosteal tissues.

– Ligaments and Tendons

Cut marks possibly produced during the removal of sinews were only observed on a single first phalange of Barbary sheep (**tab. 9.1.5**, S8-Y1). The marks are located on the lateral or medial face of the shaft and comprise at least two groups comprising several, short oblique cuts.

– Marrow Procurement

A total of 14 bones of medium-large sized animals bore impact notches resulting from marrow procurement (**tab. 9.1.6**). These comprise major limb bones of the fore leg (3 humeri; 1 radius; 1 metacarpus), the hind leg (3 femora; 3 tibiae) and two unidentifiable long bones. Impact notches were not observed on bones identifiable to Barbary sheep and evidence of longitudinal splitting and chopping was not found on bones of this species or on bones of medium-large sized animals.

Animals in the Medium Size Group

Evidence of butchery was observed on a total of only six bones in this size group (**tab. 9.1.6**). None of these finds could be definitely identified to a species. Transverse cuts on the shaft of a rib and a metacarpus or metatarsus (**tab. 9.1.6**, S8-Y1) derive from dismemberment. The remaining finds in this group bear cut marks resulting from filleting or removal of periosteum and marrow extraction. A metacarpus or metatarsus (**tab. 9.1.6**, S8-Y1) had been dismembered and periosteum had been removed from this bone at a later stage of butchery.

## Equids

Evidence of butchery was recorded on five remains identified to an equid (**tab. 9.1.5**). Stripping gingival tissues was also performed in S8-Y1, as indicated by a set of transverse cut marks on a lower M2 of an adult individual (**fig. 9.1.7a. b**). Several isolated, oblique cut marks positioned behind the canine on the lingual face of a mandible (**fig. 9.1.7c. d**), were caused as the muscles attaching the tongue to the symphysis were severed (Parkin/Rowley-Conwy/Serjeantson 1986, 321). Sets of long, oblique cuts on a second or fourth metacarpus or metatarsus (S8-Y1) and deep cuts on the lateral edge of a second auxiliary metacarpus or metatarsus in S8-Y2 were probably inflicted when the periosteal sheath was removed from the articulated bones of the foot. A third metacarpus or metatarsus had been opened for marrow (**fig. 9.1.7i**).

## Large Bovines and Animals in the Large Animal-Size Group

A long oblique cut mark was observed transversing the sulcus on a fragment of a metacarpus or metatarsus of a large bovine. This bone had been subsequently broken open to obtain marrow (**tab. 9.1.5**, S8-Y2). Four fragmentary bones with evidence of butchery were assigned to the large size group (**tab. 9.1.6**). Cut marks were observed indicating filleting and removal of periosteum in S8-Y1 and Y2. Opposing impact notches are present on the lateral face of a tibia (S8-Y2) (**fig. 9.1.7j**).

## Butchery – Summary of Results

Despite the differences in counts of bones bearing evidence of human butchery (with an average of about a six-fold increase in butchery marks between the YS and GS, once indexed by sedimentation rates) in the assemblages, the traces recorded during this analysis indicate that standard techniques of butchering were employed and, more importantly, maintained during the time-phase represented by the GS and YS deposits exposed in S8. For example, in Barbary sheep and animals of medium-large size, the separation of the fore and hind feet from the rest of the leg, illustrated by the C-1, MCp-1, MTP-1, TNC-1 and TE-1 marks, occurred on bones in many of the units in S8-GS and some of these marks were also present in the S8-YS assemblage. Meat was filleted from the bones, the periosteum was removed, a small number of first phalanges testify to the removal of ligaments from the foot, to obtain sinews, and several major limb and foot bones were opened to extract marrow and bone grease. Absent in the S8-YS assemblage are traces associated with the butchery of the head and axial regions of the body, but this may be due to the much lower numbers of axial elements in the YS assemblage in general. There was also no evidence of longitudinal splitting and chopping of bones in the YS assemblage. It is interesting that the same techniques of butchery were applied to animals of different sizes, as illustrated by the presence of C-1 and TA-2 cut marks on the bones of gazelle, Barbary sheep and members of the alcelaphine group in the S8-GS assemblage.

## Burning

Traces of burning were recorded on a total of 50 bones from the S8-GS assemblage and on 21 bones from the S8-YS assemblage (**tabs 8.1.1 and 8.7**), again, a 6-fold increase if indexed against sedimentation rates. These bones comprise remains of gazelle, Barbary sheep and equids and those of animals in the small, medium and medium-large size groups in the S8-GS assemblage. Burning was not recorded on bones identifiable to members of the alcelaphine group and the large bovines, and burnt equid bones are absent in the S8-YS assemblage.



Practically all parts of the skeleton were present amongst the burnt bones and burning was recorded on crania, mandibles and teeth, vertebrae, ribs, pelvis, major long bones of the limbs and feet, carpals, tarsals and phalanges.

As was to be expected, the bulk of the burned remains in the S8-GS assemblage (n=37), is from Barbary sheep and the medium-large animal-size group, reflecting the dominance of the remains of this animal and animals of comparable size in the assemblages as a whole. The same pattern is shown by counts of bones bearing traces of butchery and burning, where medium-large sized animals and Barbary sheep also produced the highest counts of finds (n=13) with these traces. The highest counts of burnt bones in the S8-YS assemblage (n=13) also derived from remains of Barbary sheep and the medium-large size group. A total of 15 bones from the S8-GS assemblage and only 2 from the S8-YS assemblage showed signs of butchery (cut marks; marrow smashing) and burning.

All burnt finds were recorded using Stiner's (2005, 45 tab. 3.3) categories of burning damage. Although the total numbers of burnt finds were hardly sufficient to provide a viable impression of the burning of bone in the assemblages, an indication of the different degrees of burning could be gained from some of the units. The bulk of the faunal remains in both S8-GS (n=336) and S8-YS (n=283) show no traces of burning. In the S8-GS assemblage, varying stages of burning were present from slightly burnt (Stiner's stage 1) to fully calcined (Stiner's stage 6) in S8-L3 (n=9), in S8-L13 (n=7), slightly burnt to more than half calcined (Stiner's stage 5). In contrast, the twelve burnt bones in S8-Y2 were more or less equally distributed through stages 1 – 3. Abundant calcined bones (stage 6), characteristic of the use of bone as a fuel (Costamagno/Théry-Parisot/Brugal/Guibert 2005), are not present in any of the units in S8. However, post-depositional taphonomic effects could account for the low numbers of calcined bone, since these are more susceptible to fragmentation and loss (Stiner/Kuhn/Weiner/Bar-Yosef 1995). Burning of bone could have taken place during the roasting of meat or the deliberate dumping or accidental incorporation of bone debris into one of the many fires lit in the cave during occupation.

### Age Structures of the Major Species of Game

Using tooth eruption and wear schedules, Stiner (1994) defined three major age-classes – juvenile, prime adult and old – for her assessments of mammalian mortality patterns. These are used here to assess which age-class or age-classes of game were mainly procured during the LSA at Taforalt. In accordance with Stiner's definitions, "juveniles" comprise animals from birth up till the age when the last taxon-dependent deciduous tooth is lost, "prime adult" is the breeding age and "old" are animals past their prime. Lyman (1994) additionally defined the juvenile and old classes as representing the first 20% and last 30% of the natural longevity of an animal.

#### Barbary Sheep

Although mortality ages using standard techniques of crown height measurements and eruption and wear schedules are well established for one of the taxa at Taforalt – the equids (Habermehl 1961; Levine 1979; 1982; 1983) – and can be successfully applied in establishing age-classes for this family (Turner 2002; Street/Turner 2013), major problems were encountered in assessing the mortality ages and age-classes of the dominant game at Taforalt, the Barbary sheep. These problems are related to the sparse information available on natural longevity and tooth eruption and wear schedules for this species.

Thus, it was necessary to establish a framework to assess the mortality patterns of Barbary sheep from Taforalt. For the youngest group, the juveniles, this was fairly straightforward and, following Stiner (1994),

	Sed. Group	Small	Medium	Medium-large	Large	Barbary sheep	Gazelle	Equid	Totals
Burnt	GS	2	1	24	4	13	5	1	50
	YS	1	2	11	4	2	1	0	21
Butchered and burnt	GS	0	0	9	0	4	2	0	15
	YS	0	0	2	0	0	0	0	2

**Tab. 9.1.7** Counts of burnt bones and butchered and burnt bones for different species and animal-size groups in the S8-GS and S8-YS assemblages.

Unit	ID-Number	P3	P4	M1	M2	M3
	LMUM 25	9.21	12.5	7.3	22.2	29.5
L3	7437					34.4
L14	9083		23.9			
L17	9366			18.1		
L20	9551			23.0		
L29	10361				28.4	
L29	708			17.4		
L29	717			17.1		

Unit	ID-Number	P3	P4	M1	M2	M3
	LMUM 25	9.21	12.5	7.3	22.2	29.5
Y1	10748			16.8		
Y1	924			9.9		
Y1	924		12.8			
Y2	6154	20.5				
Y4	1926			11.8		

**Tab. 9.1.8** Crown heights (mm) of lower permanent dentition of Barbary sheep from S8-GS (above) and S8-YS (below) (finds are listed according to unit, beginning with the youngest at the top; the two specimens designated 924 are from the same individual animal).

Unit	ID-Number	P3	P4	M1	M2	M3
L14	9061					23.8+
L22	9714	21.6				
L23	9835				30.9	

Unit	ID-Number	P3	P4	M1	M2	M3
Y1	1101			28.6		
Y1	10755			11.7		
Y1	1026					47.8
Y1	944					39.3
Y1	10387					29.9
Y2	1839				30.0	
Y2	6144					40.4

**Tab. 9.1.9** Crown heights (mm) of upper permanent dentition of Barbary sheep from S8-GS (above) and S8-YS (below) (finds are listed according to unit, beginning with the youngest at the top; + indicates the tooth was damaged on the occlusal surface and would have been slightly higher).

all deciduous teeth, including those from very young individuals described in the section on seasonality (see below), were placed into this group.

More difficult was the separation of the permanent dentition of adult Barbary sheep into the “prime” and “old” age-classes, since this assessment requires an approximate age of natural longevity. In captivity, Barbary sheep have been known to live for 20-24 years (Kingdon 1997; Ogren 1965; Weigl 2005) and the oldest specimen in the reference collection of aged zoo animals in Munich had attained 17 years. Natural longevity in the wild is, as far as it is known, much shorter: Gray and Simpson (1983) give an age of 10.5 years for free-ranging Barbary sheep in Texas, whilst Ogren (1965, tab. 6) considered Barbary sheep older than nine years as “very old”. In her analysis of cementum rings in the teeth of Barbary sheep from Taforalt, Wall-Scheffler (see **Chapter 9.2**) notes a specimen (an upper M3) from S8 with a mortality age of 12 years, which indicates that at least one individual of Barbary sheep at Taforalt reached a high age.

In the present analysis, the natural longevity of Barbary sheep was placed at 10 years. Thus the boundary between the prime adult and old age-classes can be assigned, according to Lyman’s calculation (1994), to about 7 years. Radiographs were taken of some of the mandibles of Barbary sheep from the Munich reference collection, so that heights of the crowns of the teeth could be measured, even though the teeth were embedded in the jaws. One of these mandibles was of an adult individual (LMUM 25) which had died at 6 years and 93 days. This individual is slightly younger than the seven years reckoned for the boundary between “prime” and “old” adults. All of its permanent teeth (P2 – M3) are fully in wear, including the third (posterior) lobe of the lower third molar. The lower M1 has only one infundibulum (one of two deep openings on the crowns of the lower molar teeth) remaining, suggesting a fairly advanced stage of wear. Ogren also describes mandibular teeth with this pattern of wear (1965, tab. 6, stage 12), from a Barbary sheep in his sample of approximately seven years old. Thus by using the crown-heights of the teeth of the Munich specimen as a “bench-mark”, crown-heights of permanent lower premolars of Barbary sheep from S8 and S10 could be compared and aged into groups younger and older than approximately 6 years (**tab. 9.1.8**).

The juvenile age-group is poorly represented in the assemblages from S8-GS and S8-YS, and only two maxillae with deciduous dentition and two isolated deciduous teeth were recovered from S8 (see below, on seasonality). Very low numbers of deciduous animal teeth are characteristic of fossil assemblages and have been attributed to the differential preservation of thin-walled milk teeth (Levine 1979). Thus, the rarity of deciduous teeth from juvenile Barbary sheep in these deposits is probably related to processes of deposition, burial, preservation or chance recovery in a small excavation area.

In **table 9.1.8**, the crown heights of isolated permanent lower premolars and molars from S8-GS and S8-YS are listed, together with the comparative recent specimen, LMUM 25. The crown-heights of the Taforalt finds are all higher than those of the Munich specimen, indicating animals younger than six years of age and in their prime adult years. Crown heights of the upper premolars and molars are shown in **table 9.1.9**. Since radiographs of the maxilla of LMUM 25 had not been taken, comparative crown heights of an aged individual for the upper teeth are not available. Even so, the bulk of the teeth in **table 9.1.9** appears to be high-crowned and probably belong to prime-adult individuals. An exception to this is the M3 from S8-L14 (ID-number 9061) which, in comparison to the other upper M3s in the sample from S8, is relatively worn down. Otherwise, very heavily worn teeth, indicative of animals past their prime, are not in evidence in the LSA deposits in S8. Barbary sheep form small family herds with a single male attending several females and their offspring (Kingdon 1997, 445). The ages indicated by the wear on the teeth of Barbary sheep from S8 suggests that herds were hunted, but that adults in their prime were preferred.

	Unit	ID-number	Element	Height	Age in years
S8 GS	L24	TAF 10023	M <sup>1/2</sup>	51.8	7-9½
	L29	TAF 364	P <sub>3/4</sub>	73.1	4½-6½
	L29	TAF 11086	P <sub>3/4</sub>	46.7	8¼-10¼
S8 YS	Y1	TAF 10708	p <sup>3/4</sup>	73.7+	3-6½
	Y1	TAF 426	M <sup>1/2</sup>	66.0	5½-8
	Y1	TAF 10422	M <sub>2</sub>	63.8+	6-7
	Y1	TAF 10811	P <sub>3/4</sub>	47.4	8¼-½

**Tab. 9.1.10** Crown heights (mm) of upper and lower dentition and ages of large equids from S8-GS and S8-YS.

### Equids

The crown heights of a small number of permanent teeth of equid from S8 (**tab. 9.1.10**) were measured and approximately aged by comparing them with crown measurements given by Levine (1982). By setting the natural longevity at 20 years (Klingel/Klingel 1966) and applying the system of age-classes defined by Stiner (1994) and Lyman (1994), it was possible to define the following groups for the equids: juveniles – between birth and the end of their third year; prime adults – between 4 and 12 years; and old adults – between 12 and 20 years of age. The finds from S8-Y1 have produced some information. There was only one deciduous tooth from this unit, indicating a very low number of juveniles. The crown height of this tooth, a lower dp4 <TAF04-985>, was measured and aged using a technique developed by Bignon (2006; 2008) which established a synthetic frame of reference of dental eruption/replacement based on crown heights using material from recent reference collections. Linear regressions of these data permit an accurate calculation of mortality age. According to Bignon's method, the age of this equid was reckoned at around 13 months at death. Studies (Klingel 1965; 1969a; 1969b) have shown that wild horses occur together in two different types of groups: family groups and bachelor groups. The family group consists mainly of females, accompanied by their young and a single stallion. This group can consist of all age-categories from very young foals to older adults. As its name suggests, the bachelor group comprises only males. Since young males leave the family group at around 2-4½ years of age to join the bachelor groups, the main difference between the groups is the presence of young individuals less than two years of age in the family group. At 13 months of age, the individual from S8-Y1 would probably have been living in a family group. The remaining teeth are all from adult individuals. Crown heights could be measured on only three teeth from S8-GS; these are from animals in their prime years.

### Gazelle

Little additional evidence could be derived from the few teeth of gazelle scattered through the units of S8-GS and S8-YS. A mandible with deciduous teeth was present in GS-L6 and an isolated upper dp4 in GS-L24. Permanent molars from adult animals were recovered in GS-L24 (an upper M2 and a lower and an upper M3) and an isolated upper M3 from GS-L23. A well worn lower M2 from an older adult was stratified in S8-Y1 and a small assemblage of deciduous and permanent teeth comprising a lower dp4 from a juvenile and a lower P2 and upper M3 from adult animals in S8-Y2.

The numbers of teeth of Barbary sheep, large equids and gazelle from the S8 deposits was relatively small and could only give a few indications of the age of animals – young, adult, old – hunted by the Iberomaurusians at Taforalt. All age-groups were present, even if represented by only one tooth. Teeth of adult individuals dominate; some are from prime adults.

## Seasonality

The age at death of an animal can sometimes be equated with seasonality. Remains of foetal or very young animals (neonate/infantile) play an important role here, since the time of death of young individuals can be pinned down more accurately in terms of months of a year. A prerequisite of seasonal analysis is the identification of the remains of young animals to species. Although foetal bones were recovered from Taforalt, it was difficult to identify these to species and there is a lack of comparative data for ageing foetal bones of Barbary sheep and gazelle. Studies have shown that wild equids in Africa give birth all year round, with a peak in parturition during the rainy season (Levine 1979). Since the age at death of these animals are therefore not particularly useful for defining seasonality, this part of the analysis focussed on stages of eruption and wear of the deciduous dentition of very young individuals of Barbary sheep and gazelle.

### The S8-GS Assemblage

Upper deciduous teeth of Barbary sheep from units in the S8-GS provided some information on seasonality. Portions of maxilla with deciduous upper teeth (dp2-dp4) in S8-L7 and S8-L9 respectively, could be identified to this species. On the first specimen <TAF09-8403>, the upper dp4 was still emerging through the jaw, on the second specimen <TAF09-8664>, all the deciduous dentition had emerged. The dentition of neither maxilla showed traces of wear. The upper dp4 of an individual in the Munich collection (LMUM 27) was also emerging from the jaw and the dentition showed no traces of wear. This animal was nine days old when it died, indicating a comparable age for the <8403> specimen. The <8664> individual was very slightly older, but probably less than one month of age at death. These animals probably died between April and May. An upper deciduous premolar (dp4) of Barbary sheep from an older juvenile was recovered in S8-L28 <TAF04-408>. The tooth shows full occlusal wear and exposure of dentine. A specimen from Munich (LMUM 28), aged at death at six months, had a comparative stage of wear on this tooth, suggesting time of death for the individual from Taforalt in the second half of the year, between August and October.

Two remains of gazelle from S8-GS could be approximately aged. They comprise a mandible with lower deciduous dentition (dp2-4) <TAF09-8230> from S8-L6 and a maxilla with upper deciduous dentition <TAF10-10029> from S8-L24. The deciduous teeth of both finds have erupted but are not in wear. In the mandible, wear begins on the dp4 in the first month of life (Munro/Bar-Oz/Stutz 2009, tab. 3) but can stay in this stage until three months of age (*ibid.*, tab. 2). Wear stages are not known for the upper teeth but are probably similar to those of the lower teeth, suggesting the same age for the individual from S8-L24. Both individuals would have died between April and August.

### The S8-YS Assemblage

An isolated upper deciduous premolar (dp4; <TAF04-2062>) of Barbary sheep from S8-Y4spit2, has slight traces of wear on the cusps. A young individual (LMUM 14) from the Munich reference collection, showed similar wear on an upper dp4 and had died at around four months of age. According to Kingdon (1997, 445), the rut in Barbary sheep is thought to take place after the autumn rains in October and the young are born following a gestation of 150-165 days, thus placing birth around March-April. The individual from S8-(upper)Y4 probably died between June and July.

First traces of wear on the anterior cusp of a lower deciduous premolar (dp4) of a gazelle indicate this individual from S8-Y2spit5 <TAF04-1568> died at a very early age. According to Munro and others, wear begins on the lower dp4 of mountain gazelle during the first month after birth (Munro/Bar-Oz/Stutz 2009, tab. 3) but the tooth can remain in this stage of wear (*ibid.*, tab. 2, Stage I) for up to three months. Since

birthing takes place in the spring (April/May) (Kingdon 1997, 413), the individual from Y2 probably died sometime between April-August.

In summary, evidence of seasonality could be estimated for faunal remains from some of the units in S8-GS and S8-YS. This evidence indicates death of young individuals of Barbary sheep and gazelle in both assemblages mainly from April to August extending into October.

#### Animal Modification

A tibia from S8-L5 (**tab. 9.1.1**) bears tooth furrows across the *crista tibiae*. This was the only find from the GS deposits with unambiguous traces of carnivore gnawing, suggesting very limited carnivore activity (0.3 %) in the formation of this assemblage. A slightly higher percentage was observed in the S8-YS assemblage where evidence of carnivore attrition was recorded on eleven bones (3.6 %). These modifications comprised tooth furrows mainly located on the shafts of long bones of the limb. A fragment of a long bone in S8-Y2spit3 also bore traces of tooth pits.

On the whole, carnivore modification of the bones was low in both assemblages. Degree of limb circumference was recorded on 180 bone shafts in the S8-GS assemblage. Bunn (1983) sees this as one of the criteria which can be used to differentiate between human-modified and carnivore-modified bone assemblages. Carnivores preferentially gnaw the proximal and distal ends of bones, leaving behind bone 'tubes' with whole tubular circumferences, whereas humans breaking open bones to obtain marrow tend to produce bone debris with less than half or greater than half of the original bone circumference. Some 15.5 % of the bones in the S8-GS assemblage are in Bunn's (1983) stage 3, where the whole tubular circumference is represented. Although this could be interpreted as indications of a stronger carnivore influence on the assemblage, the extremely low counts of visible traces of carnivore gnawing, coupled with the higher incidence of butchery marks, as evidence of human action, suggests this is probably not the case. In contrast, only 9.2 % of 151 bones in the S8-YS assemblage were allocated to stage 3.

Traces of rodent gnawing were recorded on six bones from S8-GS (**tab. 9.1.1**), representing 1.5 % of the assemblage. Rodent gnawing was observed on fragments of three leg bones (metacarpus, S8-L3; radius, S8-L17; tibia, S8-L20) and on three first phalanges (S8-L13 and L17). The metacarpus from S8-L3 also bore traces of cut marks and splitting the bone open to obtain marrow or grease. Rodent gnawing was not observed on any of the remains in the S8-YS assemblage.

### The LSA Faunal Remains from Sector 10

#### General Remarks

The excavation area at S10 is some  $2.5 \times 2.0 \times 0.8\text{m} = 4.8\text{m}^3$ , producing a total of 1,487 faunal finds (**tab. 9.1.11**). They represent the largest assemblage of faunal remains recovered during recent investigations at the Taforalt cave site. In comparison, the S8 aggregate excavated volume has been a little larger but the much greater stoniness (by a factor of perhaps 2-3, S. Collcutt, pers. comm.) means that the abundance of non-human bones in the two sectors is probably not significantly different. Six animal bones from S10 were sampled see **Chapters 4** and **15**) giving dates of 15,101-14,365 to 14,660-14,086 cal BP for the fauna (broadly comparable to the dates from the human bones from S10).

Assemblage	Number of finds recorded	Weight	Indet.	Small	Medium	Medium-large	Large	Butchery traces	Bone tool	Burnt	Carnivore gnawing	Rodent gnawing
Yellow-brown	1346	13835	15	26	165	910	231	232	2	170	11	8
Brown	141	1549	0	3	11	104	23	28	0	63	2	3
<b>Totals</b>	<b>1487</b>	<b>15384</b>	<b>15</b>	<b>29</b>	<b>176</b>	<b>1013</b>	<b>254</b>	<b>260</b>	<b>2</b>	<b>233</b>	<b>13</b>	<b>11</b>

**Tab. 9.1.11** Faunal data for the yellow-brown and brown assemblages from S10.

Assemblage	Barbary sheep	Equid (large)	Gazelle	Large bovine	Alcelaphines	Equid (small)	Red Fox	Jackal	Canid	Rhinos	Bear	Cheetah	Felid	Wild pig	Totals
Yellow-brown	409	74	74	45	12	5	4	1	2	1	1	1	1	1	631
Brown	24	11	4	3	6	1	0	0	0	0	0	0	0	0	49
<b>Totals</b>	<b>433</b>	<b>85</b>	<b>78</b>	<b>48</b>	<b>18</b>	<b>6</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>680</b>

**Tab. 9.1.12** Number of specimens (NISP) identified to an animal in the yellow-brown and brown assemblages in S10.

As generally observed at Taforalt, faunal preservation at S10 was excellent. In addition, the bones from this sector displayed distinctive patterns of colouration. The bulk of the bones (n=1,236) is yellow in colour, with patches of brown, giving them a somewhat “speckled” appearance. In addition, three bones from S10 had areas of white colouration, suggesting they had been exposed for some time before final burial. The colour of a further 107 bones could not be described, since the bulk of them (n=101) showed traces of burning. In this analysis, the yellow-brown bones, the white bones and bones where the colour could not be identified are classified as a single faunal assemblage, comprising a total of 1,346 finds. The remaining bones (n=141) are brown in colour. The brown bones are treated as a separate assemblage, since there is currently no evidence to indicate whether these finds were deposited at the same time as the rest of the fauna from S10 or otherwise.

As observed in the faunas from S8, remains from the medium-large animal-size group dominate in the yellow-brown assemblage from S10 by 67.5 %, followed by the large (17.1 %), medium (12.2 %) and small (1.9 %) animal-size groups. Exactly the same decreasing order of representation was observed in the brown assemblage, where the medium-large animal-size group dominates (73.7 %), followed by large (16.3 %), medium (7.8 %) and small (2.1 %) animal-size groups.

Butchery traces were observed on 232 bones from the yellow-brown assemblage, representing 17.2 % of these finds. Only two bones show modifications which could be interpreted as resulting from their use as a tool. Various stages of burning were observed on 170 bones (12.6 %). Tooth marks produced during gnawing by carnivores (0.8 %) or rodents (0.5 %) are present, but in very low quantities.

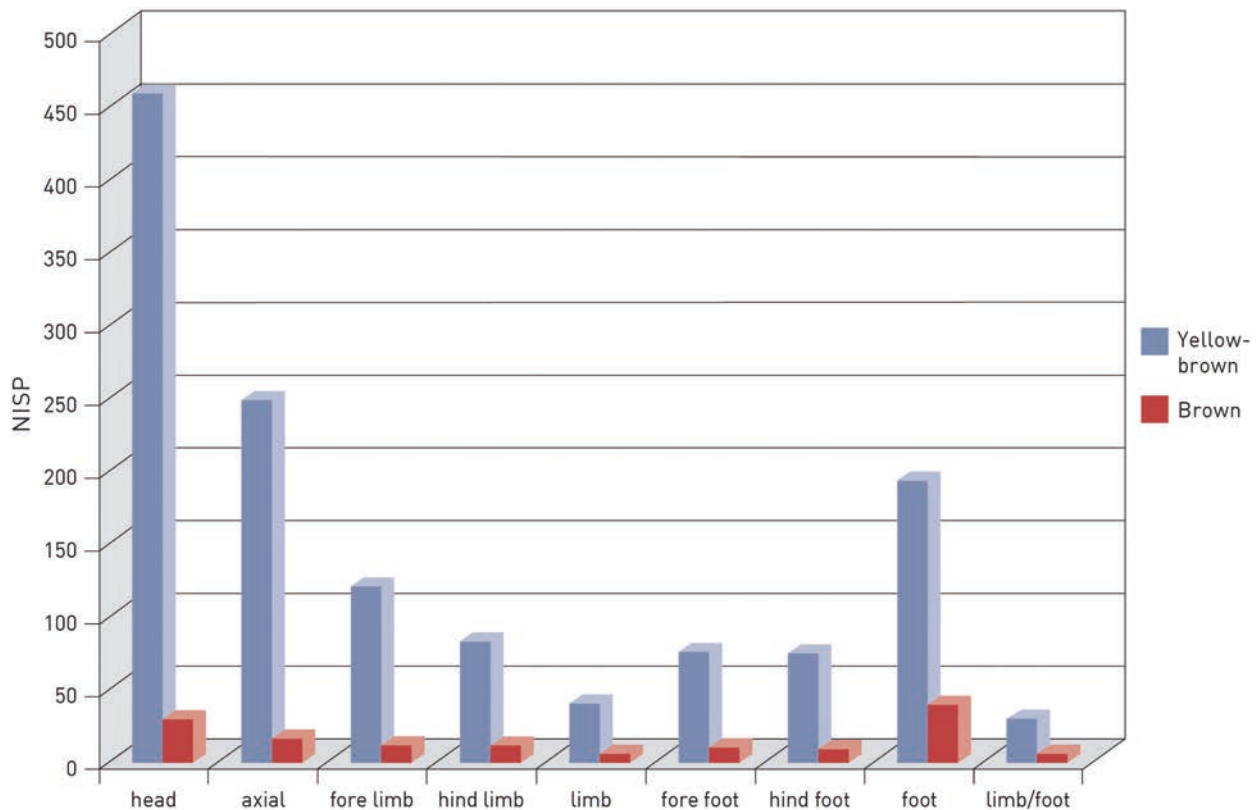
The bones in the brown assemblage also bear traces of butchery, burning and modifications by animals. The percentages show some similarities to those from the yellow-brown assemblage. For example, there is a fairly high percentage (19.8 %) of bones with marks resulting from butchery, but low percentages of carnivore (1.4 %) and rodent gnawing (2.1 %). In contrast to the yellow-brown assemblage, the percentage of burnt bones in the brown assemblage is higher (44.6 %). Bone tools were not identified in the brown assemblage.

#### Palaeoenvironmental Indications

The numbers of identifiable specimens (NISP) in the two assemblages from S10 are listed in **table 9.1.12**. The fauna in the yellow-brown assemblage from S10 is richer in composition than that from the LSA deposits in S8, and comprises faunal components already identified in S8 such as Barbary sheep, a large equid, Cuvier’s gazelle, large alcelaphines, including kongoni or hartebeest (*Alcelaphus buselaphus*) and a rhinoceros. Fragmentary horn cores of a large bovine may belong to either the aurochs (*Bos primigenius*) or the extinct giant buffalo (*Pelorovis antiquus*). In addition, remains of a small equid, probably the wild ass (*Equus africanus*), red fox (*Vulpes vulpes*), common or golden jackal (*Canis aureus*), a bear, cheetah (cf. *Acinonyx jubatus*), and a wild pig (possibly the wild boar, *Sus scrofa*, or bush pig, *Potamochoerus larvatus*), along with remains of a medium-sized canid and a medium-large sized felid are present. Despite this range of animals, the identified fauna is dominated once again by Barbary sheep (64.8 %), followed by the equids (total percentage: 12.5 %), gazelle (11.7 %), large bovines (7.1 %) and the alcelaphines (1.8 %). The remaining taxa are represented by very low counts of specimens (between 1 and 4 finds).

Faunal composition in the brown assemblage is similar to that of the yellow-brown assemblage, with dominant Barbary sheep (48.9 %) and equids (24.4 %), gazelle (8.1 %), large bovines (6.1 %) and large alcelaphines (12.2 %) well-represented. However, the absence of the other species does not suggest these animals were not present at Taforalt during the accumulation of the brown assemblage, but simply underlines the very low number of finds from these taxa which were deposited in the cave.





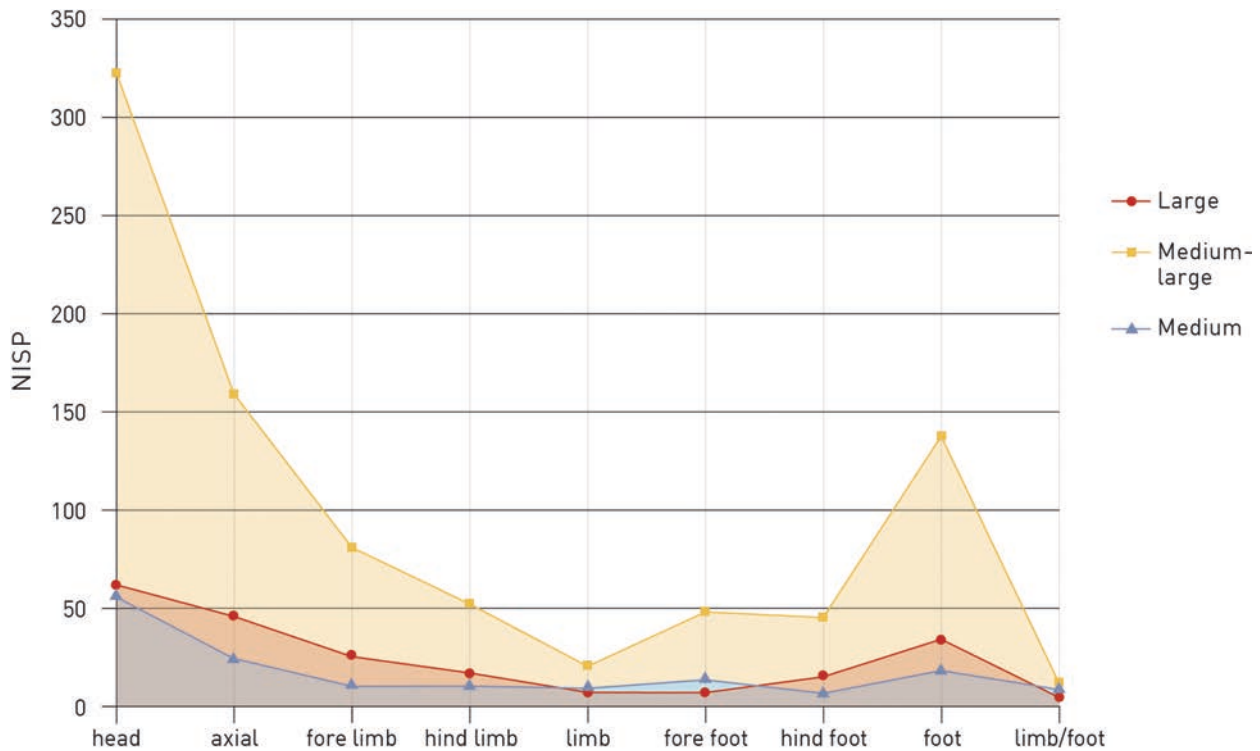
**Fig. 9.1.8** Comparative representation of counts of elements (NISP) in anatomical regions in the yellow-brown (n=1272) and brown assemblages (n=127) from S10.

Faunal composition in S10 once again suggests regionally open, grassy plains or grassland steppe with parkland, bushland and thickets and stony plateaus and valley slopes in the immediate vicinity of the cave. The presence of wild ass suggests some semi-desert grasslands (Kingdon 1997, 311). Wild boar is indicative of oakwoods, scrub and tamarisk groves (the latter usually on the margins of deserts) (ibid., 329) and bush pig inhabit forests and woodlands, preferring valley bottoms with dense vegetation (ibid., 339).

#### Bone Assemblage Formation and Skeletal Part Representation

**Figure 9.1.8** depicts counts (NISP) of skeletal elements in anatomical regions for the yellow-brown and brown assemblages respectively, thus providing a useful overview of the portions of the bodies of the animals which had accumulated in these assemblages in this part of the cave.

An over-representation of some anatomical regions was observed overall in the faunas from S8 and a similar over-representation is apparent in S10. Elements of the head unit dominate in the yellow-brown assemblage, with a total count of 455 finds. Isolated teeth form a large proportion of this part of the carcass (n=179; 39.3%), indicating the preferential survival of large numbers of more robust skeletal elements. However, the remaining 276 finds also comprise a high count of friable elements, such as horn cores and fragments of horn cores (n=103), suggesting that the differential survival of faunal remains due to attrition and loss was not as pronounced in aggregate as in S8. The axial unit is fairly well represented (n=241), followed by decreasing counts for bones of the fore (n=116) and hind limbs (n=77), fore (n=68) and hind feet (n=66), limb (n=36) and limb/foot (n=26). The comparatively high count of foot bones not identifi-

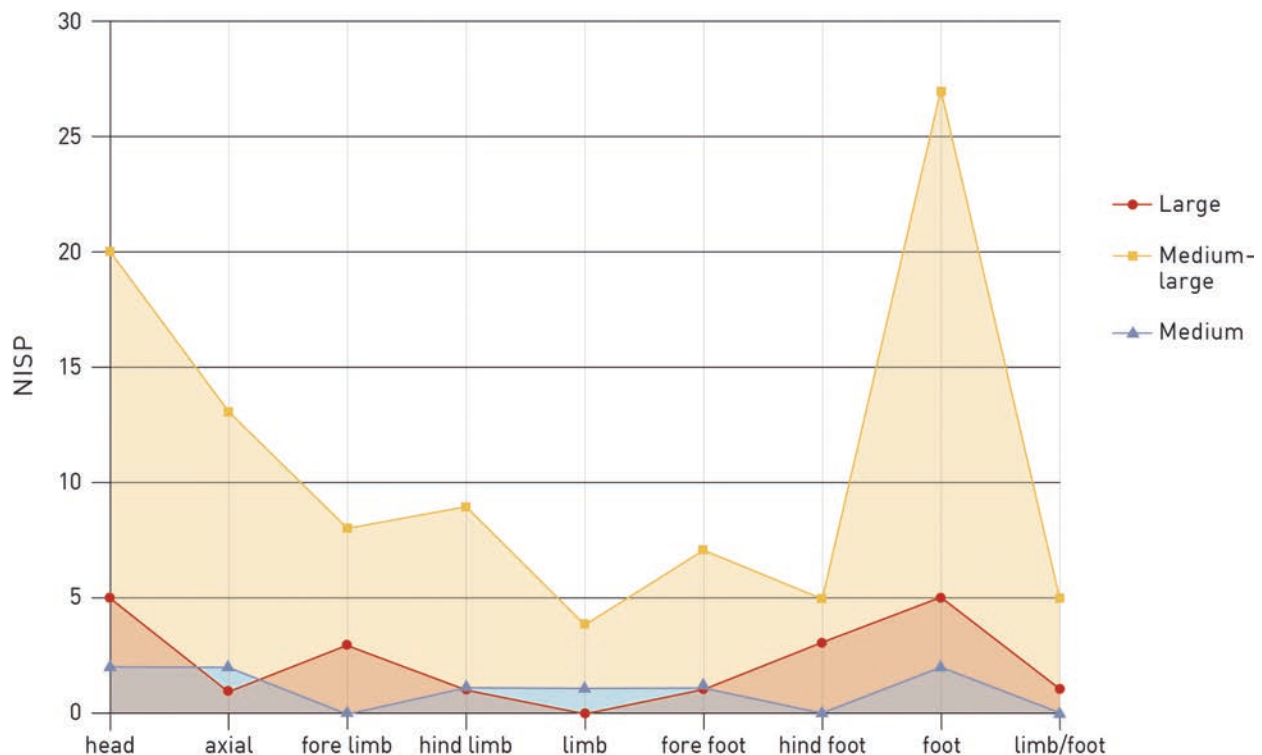


**Fig. 9.1.9** Comparative representation (NISP) of anatomical regions of large, medium-large and medium animal-size groups from the yellow-brown assemblage (n = 1242) of S10.

able to fore or to hind feet simply reflects the problems of identifying fragmentary pieces of these elements beyond 'indeterminate metacarpal or metatarsal' and 'indeterminate phalange'. The pattern of representation of anatomical regions was much the same in the brown assemblage, despite the low counts of elements from this assemblage in each part of the carcass.

In general, there was definite evidence of a differential representation of some carcass parts and skeletal elements, where robust elements such as teeth are over-represented. However, the presence of numerous fragments of friable elements, such as horn cores, indicates that conditions in S10 were, on the whole, conducive to good preservation of all types of bone. The general pattern of representation of the anatomical regions in the assemblages shows that both assemblages were subject to similar conditions of deposition and burial.

**Figures 9.1.9** and **9.1.10** depict comparative representations of anatomical regions for the large, medium-large and medium size groups in the assemblages. The small animal-size group produced very low overall counts of finds in both assemblages in S10, and is not shown in these figures. Although there are strong differences in terms of counts of elements in the individual carcass units, the pattern of representation of the anatomical regions for the individual animal-size groups is very similar. In the yellow-brown assemblage, the medium-large group has produced the largest counts of finds (**fig. 9.1.9**). The skeletal representation of this group follows the pattern observed for the whole assemblage very closely (cf. **fig. 9.1.8**). It is dominated by elements of the head; axial elements are well-represented and there are decreasing amounts of fore and hind limb bones. Counts of hind limb, fore and hind foot bones are almost equal and there is a second peak of not further identifiable elements of the foot. Counts of limb and limb/foot bones are very low. The representation of the carcass parts in the large and medium animal-size groups also follows this pattern to a certain degree with high peaks for the head and foot and lower counts in the remaining regions.



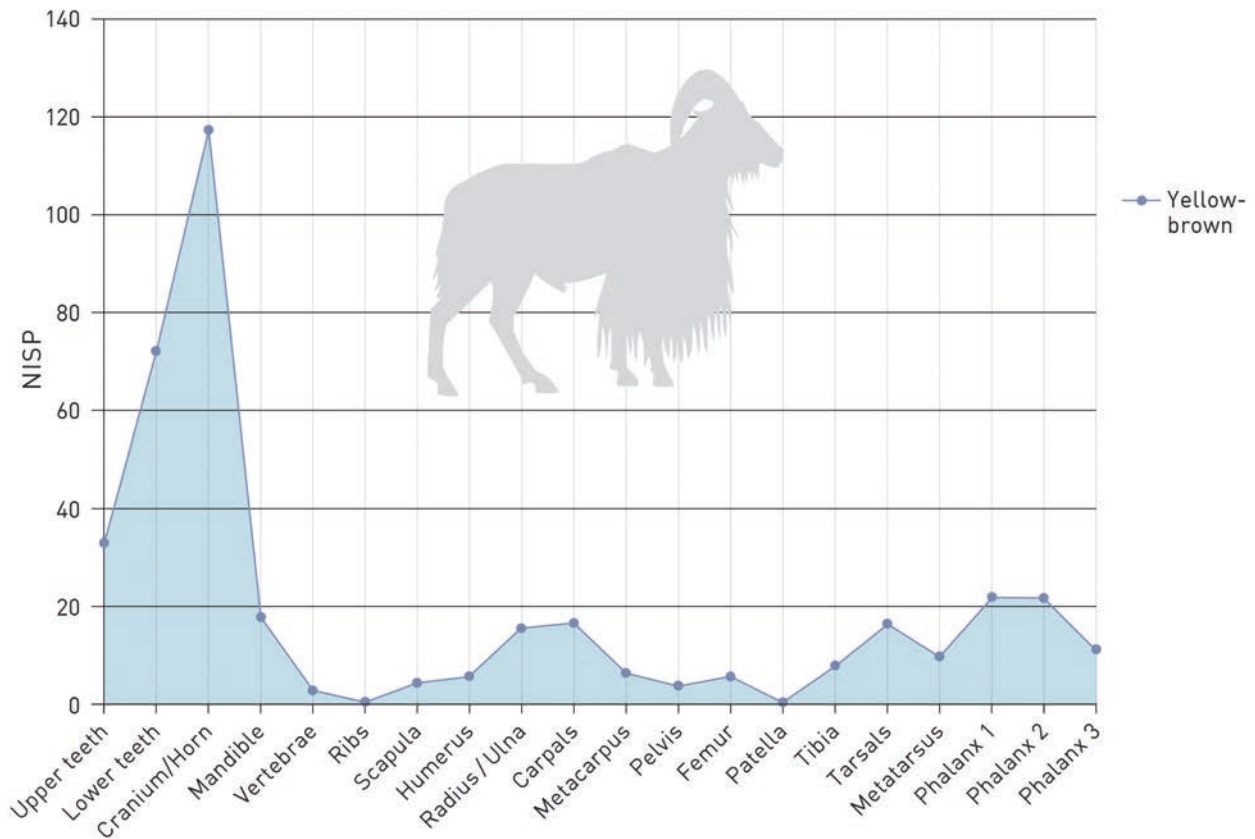
**Fig. 9.1.10** Comparative representation (NISP) of anatomical regions of large, medium-large and medium animal-size groups from the brown assemblage (n = 127) of S10.

On the whole, the representation of anatomical regions of the animal-size groups in the brown assemblage shows few differences when compared to that recorded for the yellow-brown assemblage. There is a high peak for the head and peaks for axial, limb and foot bones (fig. 9.1.10). Where differences in representation do occur in this assemblage, for example the higher peak for fore foot over the hind foot, a very high peak for the foot in the medium-large group, and a comparatively lower peak for the head in the medium animal-size group, these are probably more likely related to the low numbers of finds in general in each region in this assemblage.

#### Minimum Number of Individuals and Skeletal Part Representation of the Main Animals

At least twelve individuals of Barbary sheep are represented in the yellow-brown assemblage. This MNI count is based on five lower deciduous third premolars from the right side of the body, which produced the juvenile count, and seven upper second permanent molars from the right body-side, which provide the adult count.

The representation of individual skeletal elements of Barbary sheep (fig. 9.1.11) shows that all parts of the skeleton were present in the Sector, except for ribs – generally in a fragmentary state at Taforalt and thus difficult to identify to species – and the patella – a very fragile bone, which probably did not survive. The previous figures (figs 9.1.8-9.1.10) show that skeletal representation at Taforalt was dominated in general by elements of the head, mainly reflecting survival of robust skeletal elements, notably teeth. This representation is also apparent for the Barbary sheep, where not only upper and lower isolated teeth but other robust elements such as carpal and tarsal bones and first and second phalanges are well-represented. Unusual in this context, however, is the high count of fragments of crania and horn from this species (n = 118), exceeding that of the teeth. This pattern of representation could result from biasing due to counting large amounts of isolated fragments deriving from only a few horns and crania, be related to the good conditions of bone



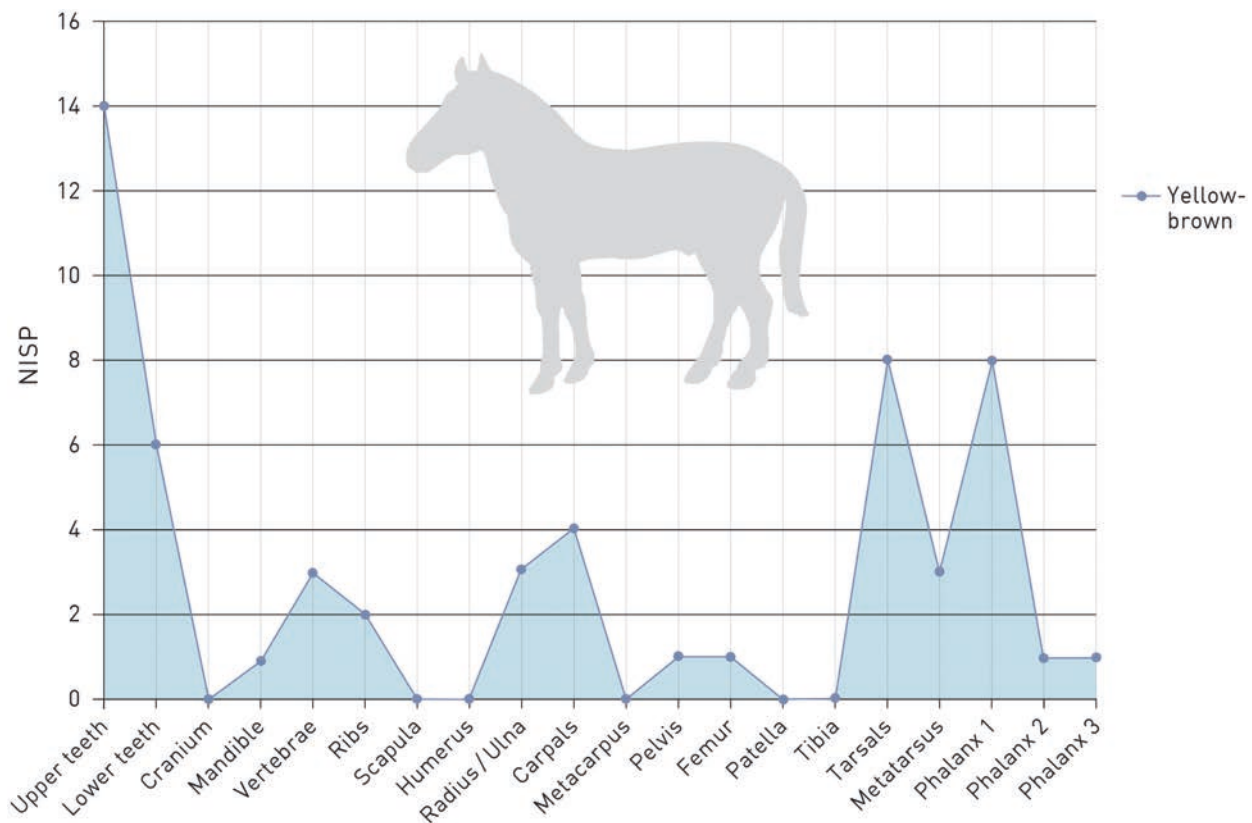
**Fig. 9.1.11** Comparative representation (NISP) of skeletal elements of Barbary sheep from the yellow-brown and brown assemblages of S10.

preservation in this part of the cave or reflect social decisions on the part of the human inhabitants of the cave (see below). Although two individuals of Barbary sheep are present in the brown assemblage (counted on two left tarsal bones), its skeletal representation (**fig. 9.1.11**) gives very little additional information, apart from the fact that some remains of this animal are present in this assemblage.

There is a minimum of four large equids in the yellow-brown assemblage. These counts are based on two upper dp2s and two tarsal bones (astragali) from the right side of the body, giving a juvenile and adult count of two individuals respectively. The general pattern of skeletal representation in S10 – high counts for elements of the head and feet – is also present in the representation of individual remains of large equid (**fig. 9.1.12**). Skeletal representation is characterised by high counts of upper teeth and lower counts of lower teeth; cranial bones are absent, but ribs are present. Radius/ulna and carpals are comparatively well-represented, along with tarsals and first phalanges. Scapula, humerus, metacarpus, patella and tibia are missing. Although the absence of scapula and patella can be explained by differential bone survival (these bones or parts of these bones – e. g. blade of the scapula – have low survival potential), there is also a complete absence of more robust long bones such as humerus, tibia and, in particular, metacarpus.

Only 11 bones could be identified to the large equid in the brown assemblage. These comprise limb and foot bones ( $n=6$ ), teeth ( $n=4$ ) and a single vertebra. One of the finds, a radius, is from a juvenile animal. The remaining bones and teeth demonstrate no more than one adult individual.

Three juvenile (represented by two left lower deciduous fourth premolars) and three adult gazelles (represented by three upper third molars from the left side of the body) are present in the yellow-brown assemblage. The basic pattern of skeletal representation for gazelle is similar to that of Barbary sheep; in particular the representation of elements of the head, where cranium and horn have produced higher counts than



**Fig. 9.1.12** Representation (NISP) of skeletal elements of large equid from the yellow-brown assemblage of S10.

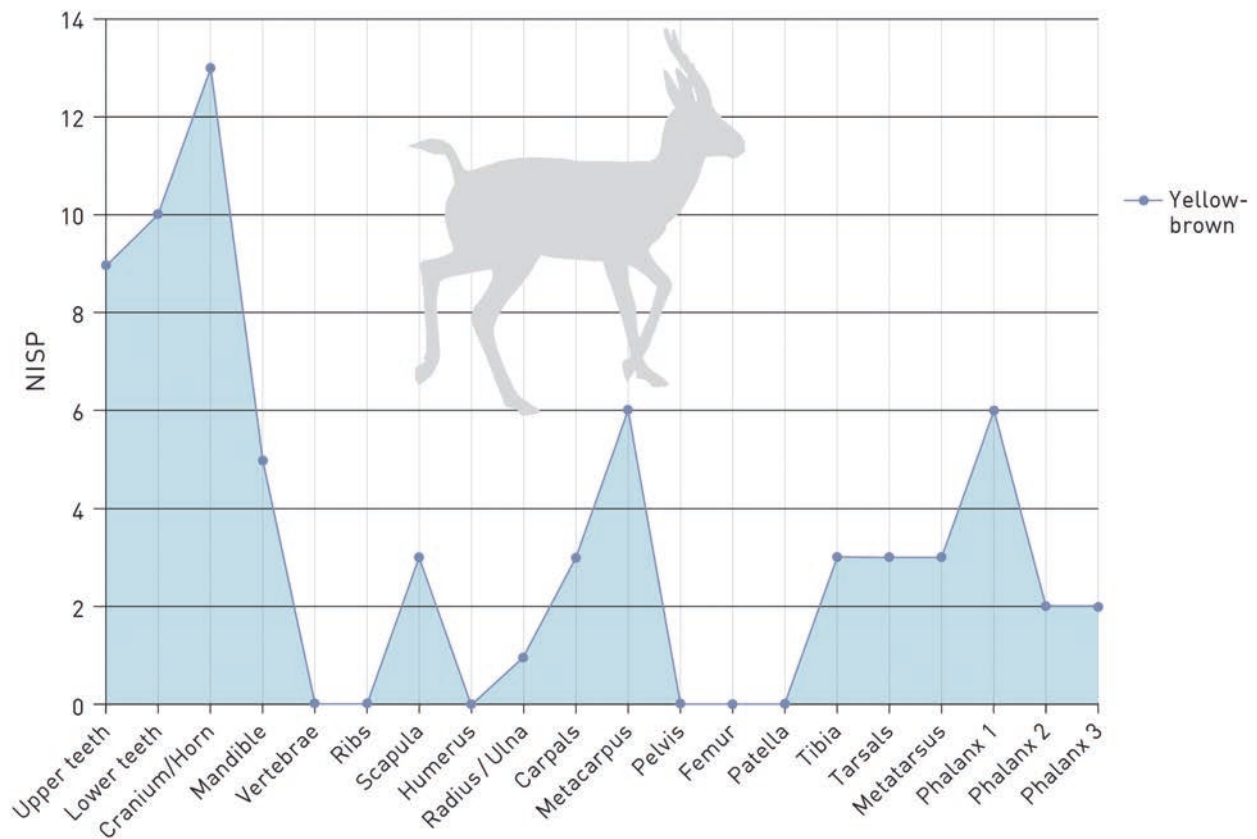
teeth (fig. 9.1.13). Friable elements such as vertebrae, ribs and patella are absent, as well as robust elements such as humerus, pelvis and femur. The metacarpus is, comparatively speaking, well-represented, as are the first phalanges. Only four elements in the brown assemblage could be identified to gazelle. They comprise two phalanges, a tooth and a fragment of a vertebra. These finds represent one adult individual.

At least two adult large bovines are present in the yellow-brown assemblage. These were counted on two lower third molars from the right side of the body. The skeletal representation of these animals (fig. 9.1.14) is comparable to that of Barbary sheep and gazelle, with counts of fragments of cranium and horn higher than counts of teeth. Missing elements show a combination of robust bones such as mandible, pelvis, metatarsus and second phalange and friable elements such as vertebrae, ribs and patella.

Of the four elements identified to large bovine in the brown assemblage, three are from limb and foot bones and there is one fragment of horn. These finds represent a minimum of one individual.

The remaining animals from both assemblages are characterised by low counts of remains (tab. 9.1.12) and minimum numbers of one individual. Only the alcelaphines, the medium sized canids and red fox produced a minimum of two individuals respectively.

Figures 9.1.8-9.1.13 show that skeletal representation in general in S10 was mainly determined by differential bone survival, where robust elements, such as teeth, consistently produced high counts and were over-represented, and less robust elements, such as the patella, were consistently under-represented or absent. There are exceptions to this, for example counts of cranial elements, including horn cores, were higher than counts of teeth in Barbary sheep, gazelle and large bovine. In contrast to the excellent state of preservation of animal bone at S10 in general, crania, and in particular horn cores, were comparatively poorly preserved. This is related to the structure of these elements. Thus, numerous fragments from a single



**Fig. 9.1.13** Representation (NISP) of skeletal elements of gazelle from the yellow-brown assemblage of S10.

horn and/or skull would probably account for the inflated numbers of these elements. Among the post-cranial remains, some bones also displayed a frequency not fully compatible with their structure or density.

### Human Modification

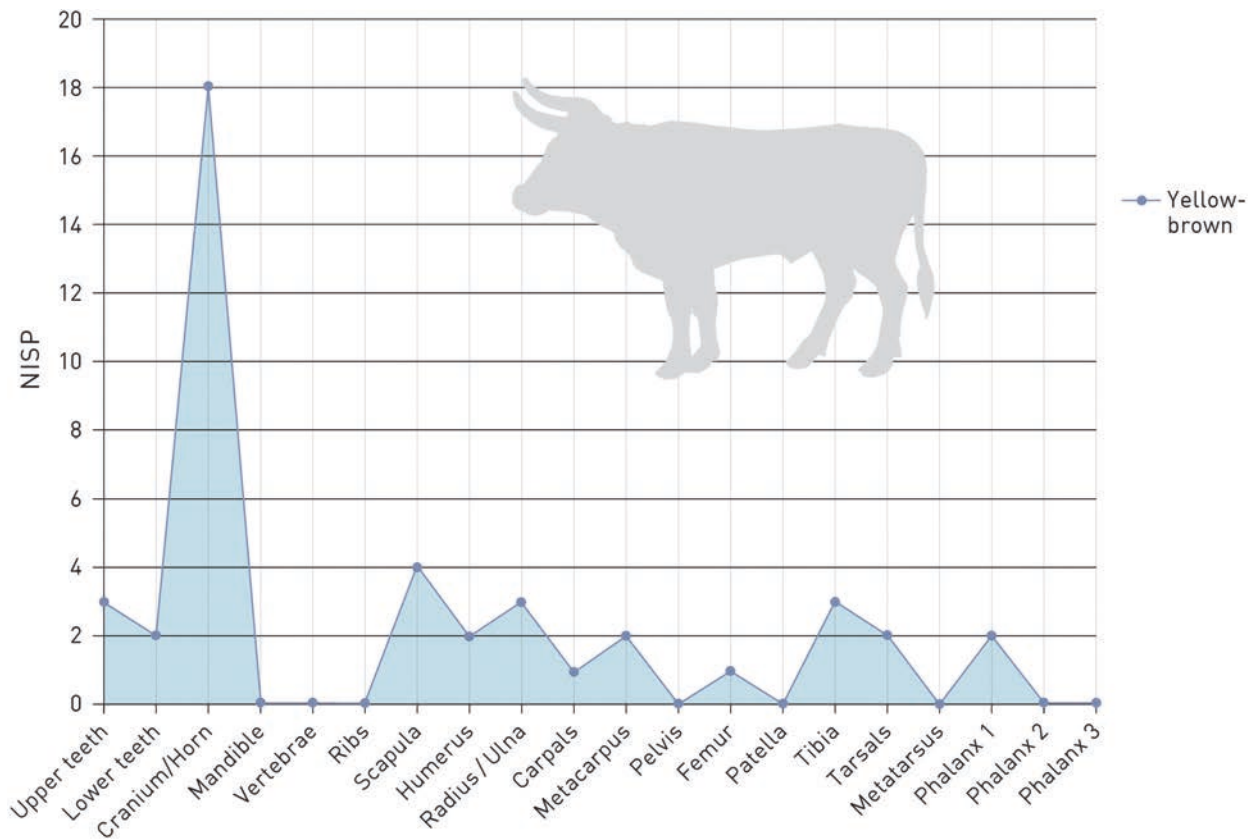
Marks produced during the butchering of animal carcasses were observed on 232 remains from the yellow-brown assemblage and 28 from the brown assemblage (**tab. 9.1.11**). They represent 17.2 % and 19.8 % of the yellow-brown and brown assemblages respectively.

Summaries of the butchery traces on remains identifiable to an animal or those attributed to an animal-size group are given in **tables 9.1.13** and **9.1.14** and illustrated for Barbary sheep and medium-large sized animals in **figure 9.1.15**. Illustrations of these modifications are shown in **figure 9.1.16**. As discussed for S8 (see above), it is likely that the bulk of the bones in the medium-large animal-size group belong to Barbary sheep and the bulk of the remains in the medium-size group belong to gazelle. Butchery marks on animals in the large size group are described together with the butchery marks on the remains of the large bovines.

### Butchery in the Yellow-Brown Assemblage

#### Barbary Sheep and Animals in the Medium-Large Size Group

Some 60 remains of Barbary sheep bore traces of a range of butchering activities, including cut marks deriving from skinning, dismemberment, filleting of meat, removal of periosteum, ligaments and tendons along



**Fig. 9.1.14** Representation (NISP) of skeletal elements of large bovine from the yellow-brown assemblage of S10.

with fracturing of the bones to extract the brain and obtain bone marrow and grease. A larger number of butchered bones, a total of 93 finds, was recorded in the medium-large animal-size group but cut marks indicating skinning have not been observed in this group so far (**tab. 9.1.13**).

– Skinning

Skinning marks were found on four bones from the head of Barbary sheep (**tab. 9.1.13**). One of these finds is the anterior portion of a mandible <TAF10-10672>, bearing short oblique cuts on its basal edge (type M-1, Binford 1981, tab. 4.04; Parkin/Rowley-Conwy/Serjeantson 1986), typically produced during skinning. A set of short cuts on the cranium just below the base of the horn core <TAF09-8697> is also typical of skinning marks. They are the equivalent of Binford's S-4 marks (1991, tab. 4.04) described on the skull of a reindeer, but here in the same position on the skull of Barbary sheep. One of the maxillae bears a set of wide, oblique marks immediately in front of the upper P2 which is, along with most of the upper dental row (the upper M3 is missing), still in the jaw <TAF06-4731>.

– Dismemberment of the Carcass

The bulk of the cut marks on the bones of Barbary sheep (n=18) was produced during the disarticulation of the carcass. Two sets of oblique cuts on the ventral face of the cranial process of an atlas vertebra <TAF09-8728a>, comparable to Binford's CV-1 (1981, tab. 4.04), indicate separation of the head from the neck. Cut marks on the fore limb were produced around the elbow joint (distal humerus and proximal radius) as this appendage was separated into its main anatomical portions, comprising the upper and lower leg. Numerous cut marks across the medial and lateral faces of the distal joint of a metacarpus and across the

	Skinning	Dismemberment	Filleting	Periosteum	Ligaments/ tendons	Brain/marrow extraction	Cleaving	Multiple traces	Totals
Barbary sheep	horn core (S-4) cranium & horn core maxilla mandible (M-1)	atlas vertebra (CV-1) distal humerus (Hd-2/Hd-4) (2) proximal radius (Rcp-6) carpal (C-1) proximal metacarpus (MCp-1) distal metacarpus (Mcd-2/ Mcd-3) pelvis (PS-9) proximal femur (Fp-2/Fp-3) (2)* distal tibia (Td-3) tarsal (2) astragalus (TA-2) (2) calcaneus (TC-3) proximal metatarsus (Mtp-1) phalange 1	upper P4 mandible (M-3) scapula (S-4) (2) humerus* proximal radius (Rcp- 6) radiocubitus (2) proximal tibia (Tp-3/ Tp-4)	metacarpus (2) metatarsus (5)*		crania (9) radius (2) radius (longit. split) radiocubitus (opp. notches) metatarsus (longit. split) phalange 1 phalange 1 (longit. split)*	distal humerus distal tibia phalange 2	maxilla (skinning /gingival tissue) mandible (filleting/cleaving) femur (filleting/marrow)	
<i>Sub-totals</i>	4	18	9	7	0	16	3	3	60
Large equid		pelvis (PS-7) astragalus (TA-2) (2) calcaneus (TC-3) (2)*	lower P2 upper P2 upper M2 radiocubitus (Rcp-6)	metatarsus	phalange 1 (tendons)	femur		rib (dismembering ribs/evisceration)	
<i>Sub-totals</i>	0	5	4	1	1	1	0	1	13
Gazelle	cranium & horn core mandible		radius distal metacarpus (Mcd-4) tibia (3)*	metacarpus (2) metatarsus	phalange 1 (ligaments) phalange 2 (ligaments)	cranium		distal scapula (dismemberment/filleting) (S-1 / S-4)	
<i>Sub-totals</i>	2	0	5	3	2	1	0	1	14
Large bovine	cranium	carpal (C-1) astragalus (TA-2) calcaneus (TC-1)	scapula humerus tibia (2)* long bone			phalange 1 (longit. split)	distal humerus		
<i>Sub-totals</i>	1	3	5	0	0	1	1	0	11
Small equid						phalange 1			
<i>Sub-totals</i>	0	0	0	0	0	1	0	0	1
Canid		mandible							
<i>Sub-totals</i>	0	1	0	0	0	0	0	0	1

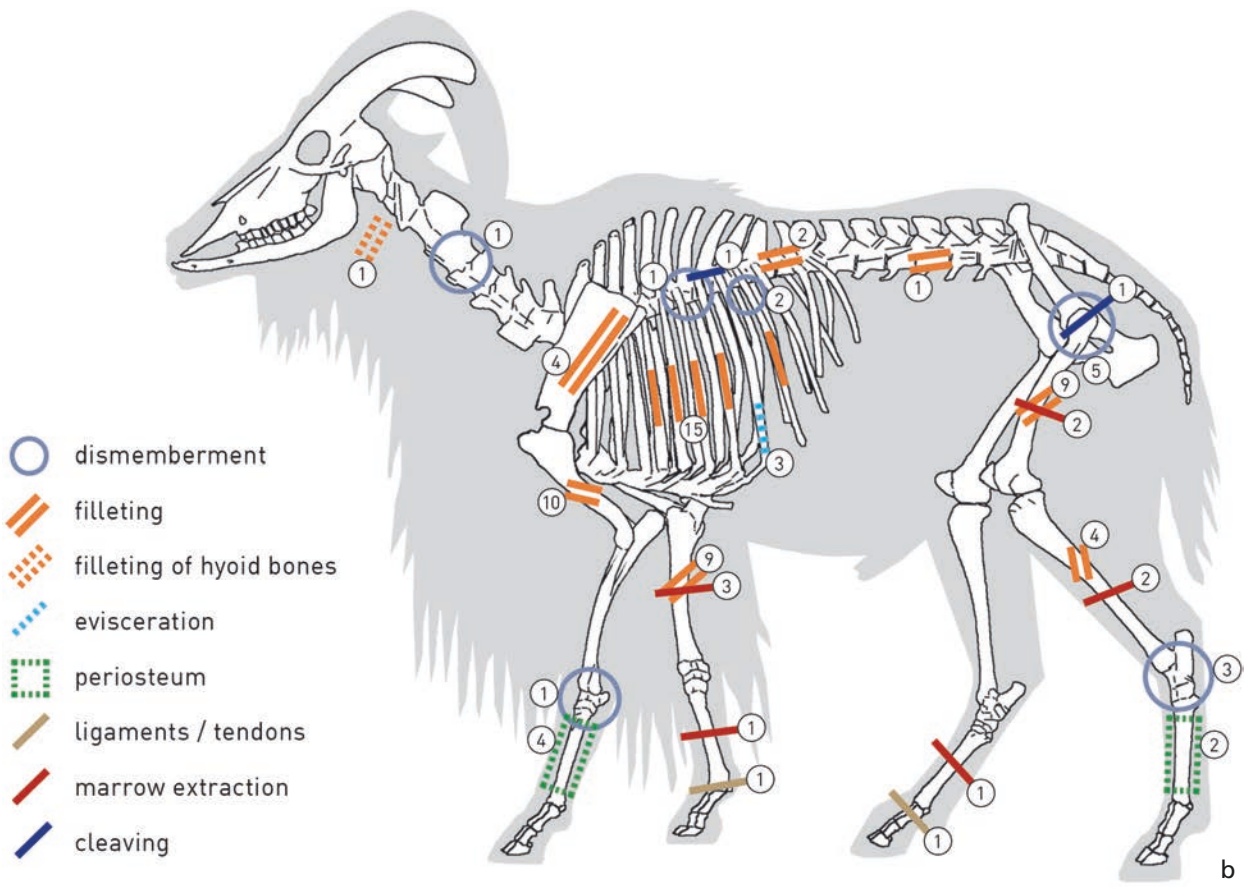
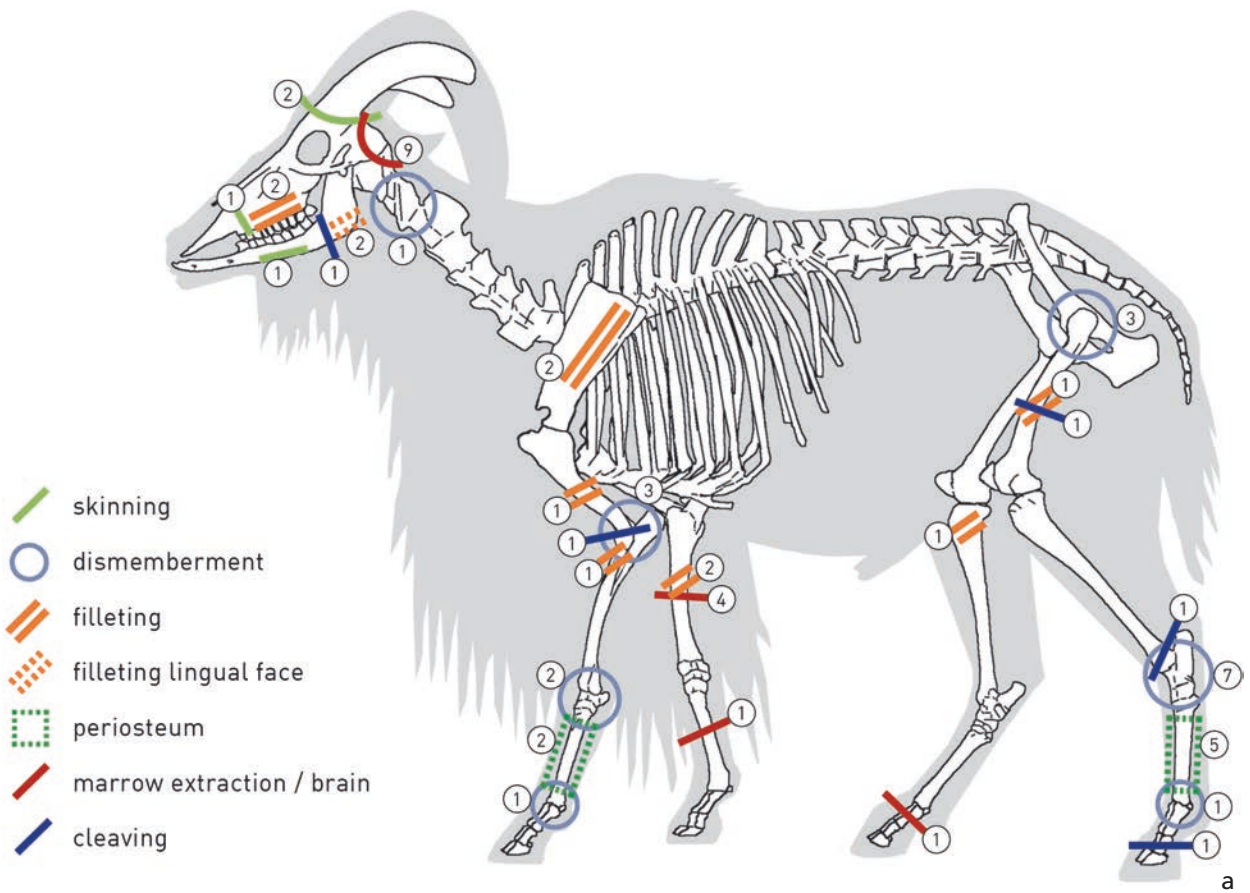


	Skinning	Dismemberment	Filletting	Periosteum	Ligaments/ tendons	Brain/marrow extraction	Cleaving	Multiple traces	Totals
Medium- large		cervical vertebra (CV-1/CV-2) thoracic vertebra (TV-5)* rib (RS-3) carpal pelvis (PS-7/PS-9) (4) femur (Fp-2) tarsal (TNC-1/TNE-1) (3)	hyoid (tongue/throat) vertebra vertebra (TV-2) (2) lumbar vertebra (removal of organs in abdomen) rib (2) (removal of organs in chest cavity) rib (14)* scapula (4)* humerus (9)* radius (8) femur (6) tibia (3) long bone (4)	metatarsus (2) metapodial (4)	sesamoid (ligaments) phalange 1 (tendon)	radius metacarpus femur tibia metatarsus	mandible* vertebra proximal radius	thoracic vertebra (rib dismemberment? / cleaving)* rib (evisceration/filetting) humerus (filletting/marrow) radius (filletting/marrow) femur (filletting/cleaved) femur (2) (filletting/marrow) (opp. notches) tibia (2) (filletting/marrow) long bone (filletting/marrow)*	
<i>Sub-totals</i>	0	12	55	6	2	5	3	10	93
Large	cranium maxilla or mandible	atlas? vertebra rib (RS-3)* distal humerus (Hd-2)* distal femur (Fd-5)	rib (RS-1)(5) rib (2) (removal of organs in chest cavity) scapula (S-4) humerus (2) radius femur (2)* proximal tibia long bone (2)	metacarpus (2) metapodial		tibia	proximal tibia	rib (evisceration/filetting/dismembering ribs) scapula (filletting/cleaving) long bone (filletting/marrow)	
<i>Sub-totals</i>	2	4	16	3	0	1	1	3	30
Medium			rib (2) tibia* long bone (3)				lumbar vertebra*	rib ( filletting/evisceration)	
<i>Sub-totals</i>	0	0	6	0	0	0	1	1	8
Small		pelvis	rib						
<i>Sub-totals</i>	0	1	1	0	0	0	0	0	2
<b>Totals</b>	<b>9</b>	<b>44</b>	<b>101</b>	<b>20</b>	<b>5</b>	<b>25</b>	<b>9</b>	<b>19</b>	<b>232</b>

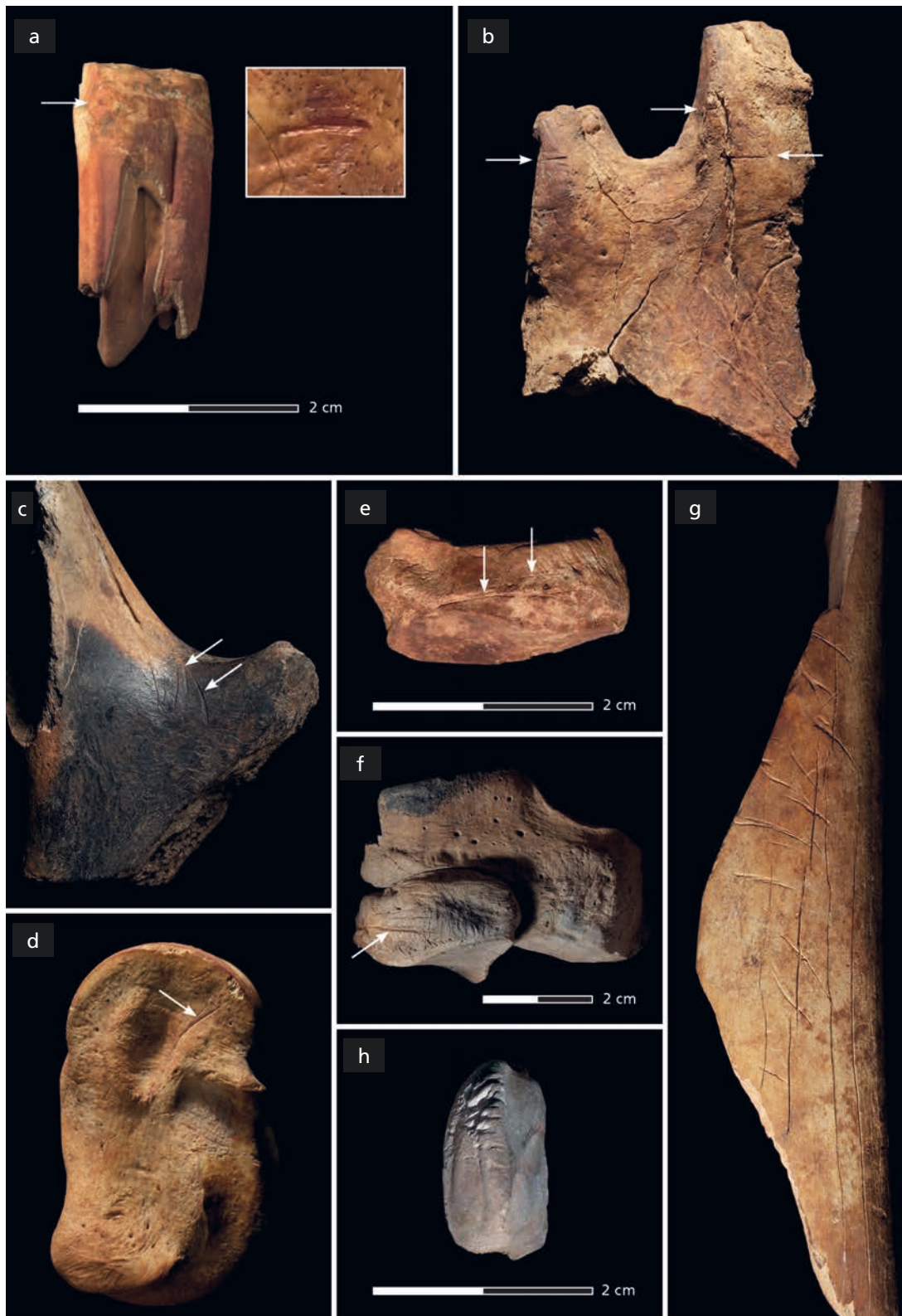
**Tab. 9.1.13** Summary of butchery marks on the animal bones from the yellow-brown assemblage in S10 (letters in parentheses e.g. (CV-1) denote Binford's (1981) coding system for cut marks; \* indicates the bone or one of the bones is from a juvenile individual; longit. split = bone has been split longitudinally; opp. notches = opposing impact notches on bone).

	Skinning	Dismemberment	Filleting	Periosteum	Ligaments/ tendons	Marrow extraction	Cleaving	Multiple traces	Totals
Barbary sheep		metacarpus (MCP-1)						phalange 1 (dismemberment/marrow)	
<i>Sub-totals</i>	0	1	0	0	0	0	0	1	2
Large equid		carpal (C-1) tarsal (TNC-1) astragalus (TA-2)	lower premolar or molar radius*						
<i>Sub-totals</i>	0	3	2	0	0	0	0	0	5
Gazelle					phalange 1 (ligament)				
<i>Sub-totals</i>	0	0	0	0	1	0	0	0	1
Hartebeest						phalange 1			
<i>Sub-totals</i>	0	0	0	0	0	1	0	0	1
Medium- large		vertebra (TV-3?)*	femur humerus radius (2) tibia long bone (2)*	metacarpus (2) metapodial (2)			thoracic vertebra		
<i>Sub-totals</i>	0	1	7	4	0	0	1	0	13
Large			long bone	metapodia		phalange 1		long bone (filleting/ marrow)	
<i>Sub-totals</i>	0	0	1	1	0	1	0	1	4
Medium			rib long bone						
<i>Sub-totals</i>	0	0	2	0	0	0	0	0	2
<b>Totals</b>	<b>0</b>	<b>5</b>	<b>12</b>	<b>5</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>28</b>

**Tab. 9.1.14** Summary of butchery marks on the animal bones from the brown assemblage in S10 (letters in parentheses e.g. (MCP-1) denote Binford's (1981) coding system for cut marks; \* indicates the bone or one of the bones is from a juvenile individual; longit. split = bone has been split longitudinally; opp. notches = opposing impact notches on bone).



**Fig. 9.1.15** Schematic depiction of traces of butchery on the bones of Barbary sheep (a) and animals of the medium-large size group (b) from the yellow-brown assemblage in S10; numbers in circles indicate the number of times the butchery stage was recorded on a certain bone; note that the position of the traces on the bones does not necessarily reflect the exact position of the marks; unidentifiable shaft fragments ('long bones') not depicted.



**Fig. 9.1.16** Illustrations of traces of butchery on faunal remains from the S10 assemblages: cut marks on the crown of a lower P2 of a large equid (a), produced during removal of gingival tissues <TAF06-4204>; dismemberment marks on the cranial fragment of an atlas vertebra (b) of a large animal <TAF10-11396>; cut marks produced during dismemberment and burning (c) on the pelvis of a medium-large-sized animal <TAF10-9992>; astragalus of Barbary sheep (d) displaying cuts on the medial face of the bone produced during dismemberment of the carcass <TAF10-11294>; transverse cut marks produced during dismemberment of the foot bones of medium-large animals (e-f) and burning on one find (f) (<TAF09-8876> and <TAF10- 9690>); filleting marks on the shaft of a radius (?) of a medium-



large sized animal (**g**) <TAF10-11287>; cut marks on a sesamoid of a medium-large sized animal produced during removal of ligaments (**h**) <TAF09-8638>; filleting marks and burning on the shaft of a humerus of Barbary sheep (**i**) <TAF10-9697>; filleting marks on the lateral face of the proximal end of a rib of medium-large sized animals (**j-k**) (<TAF08-6504> and <TAF10-10637>); radiocubitus of Barbary sheep showing opposing impact notches and conchoidal flakes on the shaft of the bone (**l**) <TAF08-6661>; impact notches and longitudinally split first phalange (**m**) <TAF10-11394> and intact articulating second phalange <TAF10-11318> of a small equid; thoracic vertebra of a medium-large sized animal showing cleaving of the transverse process and the centrum (**n-o**) <TAF10-10565>.

trochlea of this bone <TAF06-4153> indicate removal of distal elements of the fore foot (phalanges). A phalange <TAF04-4701> which could not be identified to either the fore or hind foot also bore transverse cut marks on the proximal end, produced during disarticulation of the distal elements of the foot.

Short, oblique cuts on the ventral edge of the acetabulum of a pelvis <TAF08-6174> and sets of cut marks on the head of a femur <TAF10-10621> and on the proximal end of a femur <TAF13-11899> attest to the removal of this bone from the pelvic girdle. Disarticulation marks were also observed around the ankle joint (distal tibia, tarsals and proximal metatarsus). Disarticulation marks on bones from the same side of the body (humerus, proximal femur, tarsal, astragalus (**fig. 9.1.16d**)) indicate that at least two carcasses of Barbary sheep were butchered. Disarticulation marks were also found on the proximal femur of a juvenile animal <TAF10-10621>.

Twelve bones in the medium-large animal-size group bore cut marks attributable to disarticulation. Cut marks at the caudal end of a cervical vertebra <TAF10-10608> were probably inflicted when the neck was cut into sections. Two well-defined cuts close to the caudal end of the centrum of a thoracic vertebra of a young individual <TAF10-10550> are in a similar location to ones described by Binford (1981, tab. 4.04), produced when the ribs are removed. A set of short, transverse cut marks on the ventral-caudal edge of the shaft of a rib, some 57 mm below the proximal head <TAF05-2578>, are the equivalent of Binford's RS-3 marks, also produced when the ribs are removed.

Marks produced when the rear leg was removed from the bony socket of the pelvis are present around the acetabulum and areas adjacent to the acetabulum (**fig. 9.1.16c**) on fragments from four pelves and on the proximal end of a femur. Transverse and oblique cut marks were observed on the external faces of tarsal bones, showing that the ankle had also been dismembered. Three of these bones were from the left side of the body, indicating that portions of at least three carcasses had been butchered. In contrast, only a single bone (a carpal bone) of the fore limb bore traces of cut marks.

#### – Filleting

Nine marks attributable to filleting are present on the remains of Barbary sheep. Cut marks are present on the buccal face of an isolated upper P4 <TAF09-9002>, produced during removal of gingival tissues. A single, long, transverse cut mark below the M3 on the lingual face of a mandible <TAF15-12921> is comparable to Binford's M-3 mark (1981, tab. 4.04), produced when muscles on the inside of the jaw are cut in order to remove the tongue (Parkin/Rowley-Conwy/Serjeantson 1986). Binford refers this mark to dismemberment, but it is classified here as filleting, since tissue is being removed from the bone. A set of oblique cut marks on the anterior face of the proximal end of a radius <TAF06-4882> and transverse marks on the proximal end of the diaphysis of a tibia <TAF06-3989> also derive from filleting activities. Other filleting marks are located on the blades of two scapulae, on the diaphysis of a humerus from a juvenile individual (**fig. 9.1.16i**) and on the diaphyses of two radiocubiti from adult Barbary sheep.

In contrast to Barbary sheep, where the bulk of the cut marks were produced during dismemberment, the bulk of the cut marks (n=55) on the bones of animals in the medium-large size group were produced by filleting. The discrepancy between the quantities of cut marks produced during dismemberment and during filleting has already been noted on bones from S8 (see above), where it has been argued that the differences between counts of dismemberment marks and counts of filleting marks on bones of Barbary sheep and the medium-large size group is biased by the location of filleting marks on many fragments of bone shafts undetermined to species (e. g. **fig. 9.1.16g**).

An interesting find from the medium-large size group is a fragment of a bone from the hyoid apparatus <TAF06-4535>, which bears two sets of transverse cut marks. The find was too fragmentary to be definitely identified to a particular hyoid bone. Therefore, these cuts could derive from filleting of the muscles

of the tongue or the throat. Cut marks on two vertebrae were produced when the tenderloin was removed (TV-2, Binford 1981, tab. 4.04). Cut marks on the ventral side of a lumbar vertebra and on the medial faces of two ribs were probably produced when major organs were removed from the cavities of the chest and the abdomen (evisceration). But the mass of the filleting marks are located on the lateral faces of ribs (**fig. 9.1.16j-k**), blades of scapulae and on the diaphyses of various long bones from adult and juvenile individuals.

#### – Periosteum, Ligaments and Tendons

The stripping of the tough, fibrous periosteal membrane and the removal of ligaments and tendons also belong to filleting activities. Two metacarpals and five metatarsals of Barbary sheep, including one from a juvenile individual, bore short, generally oblique, cut marks on their diaphyses, where the periosteum was cut in order to create an opening from which the membrane could be peeled or scraped off the bone. Similar marks were observed on six metapodials from the medium-large size group. Marks pertaining to the removal of ligaments and tendons were not observed on the Barbary sheep remains but were in evidence on bones of the medium-large size group. A series of very deep, oblique cut marks on the lateral edge of a sesamoid bone <TAF09-8638> (**fig. 9.1.16h**) was probably produced when the volar/plantar annular ligament was cut free to remove the flexor tendons (Parkin/Rowley-Conwy/Serjeantson 1986). Three, very deep, transverse cuts on the lateral edge of the plantar face of a first phalange <TAF05-2324>, probably derive from removal of tendons (*ibid.*).

#### – Extraction of the Brain, Bone Marrow and Grease

Nine crania or portions of crania of Barbary sheep had been fractured to extract the brain. A large, circular opening had been produced by removing most of the parietal bones at the rear of the skull (**fig. 9.1.21**). Through this opening, the brain could be removed. Crania of red deer from Mesolithic sites in Europe, such as Friesack (David/Casseyas/van der Sloot/Léotard 2016) and Hohen Viecheln (Wild 2019) in Germany also bear the same type of modification, which was probably associated with extraction of the brain. A more detailed description of some of the modified crania from S10 is given below (see funerary artefacts).

Seven bones of Barbary sheep showed marks associated with the fracture of these elements to expose the bone marrow. Impact notches were recorded on two radii and a phalange. Opposing, or reflected, impact notches were observed on the edges of a shaft of a radiocubitus <TAF08-6661>, indicating the bone had been broken open while lying on a hard support (**fig. 9.1.16l**). Three bones, including one from a juvenile animal, had been split open along the longitudinal axis.

A humerus <TAF09-8887>, a tibia <TAF09-8685> and a second phalange <TAF10-9692> are characterised by sharply-defined, straight edges through the distal joints, produced either by fracture of the bone or cleaving (chopping). Fracture of the joint may have been caused indirectly when the bone was broken to obtain marrow, whereas cleaving (chopping) was probably carried out deliberately to break up the joint to obtain bone grease. The lumbar vertebra of a juvenile, medium-large sized animal also appears to have been chopped through the centrum, whether this action was part of bone grease procurement or simply a method of portioning the carcass, is not clear.

#### – Multiple Butchery Traces

Three bones of Barbary sheep showed traces of carcass preparation which could be attributed to different stages of butchery – skinning, filleting and marrow procurement. A maxilla <TAF15-13069> bears traces of skinning marks and a set of cut marks on the buccal face of the upper P2 above the level of the gum, produced when gingival tissues were cut away. A mandible <TAF06-4790> has filleting marks on the lin-

gual face of the jaw below the M2 and M3 and the ramus has been cleaved or chopped through behind the M3.

Several bones (humerus, radius, femur, tibia and an unidentifiable long bone of a juvenile individual) from medium-large sized animals bore cut marks deriving from filleting and impact notches produced during the opening of the bone to procure marrow. One of the femora <TAF08-5544> has impact notches on both sides of the shaft, suggesting the bone had been laid on a hard support as it was broken to expose the marrow. Cut marks on a thoracic vertebra from a juvenile individual <TAF10-10550> may have been produced when the rib was removed from the backbone. This vertebra had also been cleaved, possibly in association with the removal of the rib, perhaps as part of a rack of meat. Multiple cut marks on both the medial and lateral faces of a rib <TAF10-10249> attest to the removal of large organs from the chest cavity and, presumably later, to the filleting of meat.

### Equids

A total of thirteen bones of the large equid bore traces of butchery, including dismemberment, filleting and procurement of bone marrow (**tab. 9.1.13**).

#### – Dismemberment of the Carcass

Dismemberment marks observed on five bones of the large equid, were produced when the hind limb was removed from the pelvic girdle and the hind foot from the lower leg. The two astragali are from the right side of the body, indicating that portions of at least two adult equids had been dismembered. One of the calcanei is from a juvenile equid.

#### – Filleting

A single deep, transverse cut mark across the ulna and lateral edge of a proximal radiocubitus, along with very well-preserved sets of short oblique cuts along the lateral portion of the shaft of the radius are similar to Binford's RCp-6 marks (1981, tab. 4.04), produced during filleting meat from the bone. Three cheek teeth have characteristic cut marks on their buccal faces, produced during the removal of gingival tissues at the line of the jaw.

Oblique cut marks on the shaft of a metatarsus were produced during stripping of the periosteum. This find <TAF06-4878> also bears a series of flake removals at one end, consistent with the use of the bone as a tool (see below). Sets of oblique cut marks on the posterior face and lateral edge of the distal joint of a first phalange <TAF08-5481> were produced as tendons were stripped from the bone (Parkin/Rowley-Conwy/Serjeantson 1986).

#### – Bone Marrow and Multiple Traces of Butchery

Only one bone, a femur, bore impact notches resulting from bone smashing to retrieve marrow. A rib bore cut marks on both the lateral and medial faces of the bone, consistent with dismemberment of the ribs and evisceration.

### Gazelle and Animals in the Medium Size Group

Some thirteen bones of gazelle bore traces relating to skinning, filleting, removal of periosteum and ligaments. Traces deriving from dismemberment and the procurement of bone marrow and grease were not observed. Eight bones from the medium size group had been filleted, bore traces of evisceration and had been cleaved (**tab. 9.1.13**).



– Skinning

Sets of longitudinal and transverse cut marks on the lateral side of the cranium at the base of a left horn core of gazelle <TAF15-13770> are comparable with Binford's S-4 marks (1981, tab. 4.04), produced during skinning of the head (**fig. 9.1.18**). The horn also showed distinctive traces of rodent gnawing (see below). Sets of oblique and transverse cut marks on the buccal face of a mandible <TAF10-9680> were also produced during skinning activities.

– Filleting

Five bones of gazelle had been filleted. In the main these were long bones bearing short cut marks on the shaft of the bone, produced as meat was removed from the carcasses of one juvenile and several adult individuals. Oblique cut marks are present above the distal end and on the shaft of a distal portion of a metacarpus <TAF09-8778>. The marks close to the distal joint are comparable with Binford's MCD-4 marks (1981, tab. 4.04), produced on this bone during filleting activities. Marks attributable to removal of the periosteum were located on three metapodials. Cut marks on a first and a second phalange of gazelle were placed in positions relating to the removal of ligaments. Altogether, six bones from the medium size group bore traces of filleting or evisceration.

– Extraction of the Brain

A portion of the cranium attached to a complete horn of gazelle <TAF15-13770> displayed traces of modification similar to those observed on the crania of Barbary sheep and deriving from the opening of the skull to extract the brain.

– Multiple Traces of Butchery

Only one bone, a scapula, had cut marks at the distal joint, deriving from dismemberment. This bone also bore filleting marks on the blade. One bone from the medium size group had been cleaved.

Large Bovine and Animals in the Large Size Group

Eleven bones of large bovines and thirty remains of animals in the large size group bore traces of butchery (**tab. 9.1.13**).

– Skinning

Longitudinal cut marks on the parietal bone of a large bovine <TAF06-4013>, placed some 80mm from the snout, attest to skinning of the skull. Long cut marks on a cranium and on a fragment of the maxilla or mandible of a large animal can also be referred to skinning activities.

– Dismemberment

Cut marks produced during disarticulation of the feet from the lower part of the limb were observed on a carpal bone and on two tarsal bones of a large bovine. Several sets of transverse and longitudinal cut marks on a vertebra (atlas?) (**fig. 9.1.16b**) <TAF10-11396>, of an animal in the large size group, are likely to have been produced during disarticulation of the neck, as are sets of transverse and oblique cuts just below the proximal end of a rib, on the cranial-ventral face <TAF05-2372>. Short oblique cut marks around the distal joints of the humerus (juvenile individual) and around the distal femur are characteristically produced during disarticulation of the upper and lower fore and rear-leg.

#### – Filleting

Filleting marks were recorded on the blade of a scapula and four long bones of large bovines. One of these, a tibia, was from a juvenile individual. Sixteen bones with cut marks attributable to filleting were observed in the large size group. The bulk of these are located on the lateral faces of ribs, equivalent to Binford's RS-1 marks (1981, tab. 4.04). Most of the remaining marks were located on the blade of a scapula and on the shafts of long bones, mainly from adult individuals. Two bones, a tibia of a large bovine and the shaft of a long bone from an animal in the large size group, are from juvenile individuals. Two ribs (<TAF05-2778> and <TAF10-9942>) have cut marks on the medial face, produced during clearing of the chest cavity.

Bones of large bovines bearing cut marks in positions relating to the removal of periosteum were not recovered, but three metapodials from animals in the large size group did bear cut marks produced during this activity. Bones with traces deriving from the removal of ligaments and tendons were not observed.

#### – Bone Marrow, Bone Grease and Multiple Traces of Butchery

Evidence for the procurement of bone marrow and grease is rare. The distal portion of a first phalange <TAF10-11283> of a large bovine had been split longitudinally and the distal joint of a humerus <TAF06-5098> had been cleaved. The large size group also produced two bones, both tibiae, which displayed impact notches and cleaving.

None of the bones identified to a large bovine showed multiple traces of butchery, which were recorded on only three bones from the large size group; they derive from dismemberment, evisceration, filleting, grease and marrow procurement.

#### Small Equid and Canid

Two impact notches on a first phalange of the small equid <TAF10-11394> derive from marrow procurement (**fig. 9.1.16m**) and are the only evidence of butchery on the few remains of this animal (**tab. 9.1.13**). The mandible of the medium-sized canid has two short cut marks on the ascending ramus, produced when the head was dismembered from the neck.

#### Butchery in the Brown Assemblage

##### Barbary Sheep and Animals in the Medium-Large Size Group

Only one bone in this assemblage, a proximal portion of a metacarpus <TAF10-10088>, could be definitely identified to Barbary sheep (**tab. 9.1.14**). A short, transverse cut on the lateral edge of the proximal end of this bone attests to disarticulation of the foot from the lower limb. A first phalange <TAF10-10795> of this species bore dismembering marks and had also been opened to expose the marrow.

A larger quantity of finds with butchery marks were found in the medium-large animal-size group. Oblique cuts across the body of a vertebra from a juvenile individual <TAF10-10795> could indicate dismemberment of the rib, if the vertebra is from the thoracic region of the body. Seven long bones bore filleting marks and four metapodials had traces produced during removal of the periosteum. The body of a second, thoracic, vertebra <TAF10-10565> (**fig. 9.1.16n-o**) had been cleaved.

##### Equids and Animals in the Large Size Group

Marks produced during dismemberment were recorded on three elements of a large equid, marking the separation of foot bones from both the fore and hind limb (**tab. 9.1.14**). Filleting marks were recorded on the radius of a juvenile animal and cut marks across a lower premolar or molar attest to the stripping of tissues from the jaw (**fig. 9.1.16a**).

Disarticulation marks were not observed on the bones of animals from the large size group. However, marks deriving from filleting and removal of the periosteum were present on two finds. A shaft of an unidentifiable long bone had filleting marks and had been opened to obtain bone marrow.

#### Gazelle and Animals in the Medium Size Group

The position of short cut marks on the lateral face of a first phalange corresponds to those produced during removal of ligaments (Parkin/Rowley-Conwy/Serjeantson 1986) (**tab. 9.1.14**). This was the only find in the brown assemblage definitely identified as gazelle. A rib and a fragment of the shaft of a long bone in the medium size group had been filleted.

#### Hartebeest

One of the rare traces of butchery on a bone definitely identified to hartebeest was preserved in this assemblage (**tab. 9.1.14**). The bone is the proximal portion of a first phalange <TAF06-4487>, which bears an impact notch in the centre of its lateral face and had been opened to obtain bone marrow.

#### Butchery – Summary of Results

Traces of butchery were observed on the bones of Barbary sheep, a large and a small equid, gazelle, large bovine and a canid in the yellow-brown assemblage and on remains of Barbary sheep, a large equid, gazelle and hartebeest from the brown assemblage in S10. Although a range of animals had been butchered, the bulk of these traces in both assemblages were recorded on the remains of Barbary sheep. There were no differences in the treatment of the carcasses of the different animals in the two assemblages and both assemblages produced remains of animals in different size groups with butchery traces, except for the small size group in the brown assemblage.

The location and form of the butchery marks show that the standard techniques of carcass processing identified on faunal remains from the S8-YS and S8-GS units were also employed in S10: carcasses were dismembered at major joints of the carcass and meat, bone marrow and bone grease were procured. Interesting, however, is the appearance of cut marks on animal crania in the S8-GS assemblage (L14) and, in particular, in the S10 assemblage, indicating skinning. Unique to the S10 yellow-brown assemblage is a deliberate opening of the rear of the crania to extract the brain, identified primarily on crania of Barbary sheep, but also on a cranium of gazelle. Whether this action was undertaken to procure the brain as a source of nourishment or as a medium in the tanning of hides, is uncertain. Skinning marks on crania from S10, attesting to the procurement of hides, suggest the latter was a possibility. Ligaments and tendons were removed from the feet and may have been used in a number of ways, as sewing thread for hides to make clothing or containers, but also for making snares, nooses for traps or even nets.

#### Burning

Counts of unburnt and burnt bones from the S10 assemblages are shown in **table 9.1.15** and illustrated in **figure 9.1.16**. The bulk of the faunal remains showed no traces of burning, and 87.6 % of the bones in the yellow-brown assemblage and 56.5 % in the brown assemblage had not been in contact with fire. Stages of burning were recorded (Stiner 2005; Stiner/Kuhn/Weiner/Bar-Yosef 1995) and show a continuous decline in numbers of bones in the brown assemblage from slightly burned to less than half calcined (stages 1-4)

and no heavily calcined bones (stages 5 and 6), which represent the most advanced phases of burning and, in the case of stage 6, are characteristic of the use of bone as a fuel (Costamagno/Théry-Parisot/Brugal/Guibert 2005). The counts observed here suggest bone was not used for purposes of combustion (but see above for discussion). A similar general decline in counts was observed for stages 1-4 recorded on the bones from the yellow-brown assemblage, but with a slight peak for fully black bones (stage 3) and low counts in stages 5 and 6.

Some 170 faunal remains from the yellow-brown assemblage and 63 from the brown assemblage had been burnt (**tab. 9.1.16**). Traces of burning were observed on the remains of several animals and animals in different size groups in both assemblages, but the bulk of the burnt bones are from Barbary sheep and the medium-large animal-size group. A similar pattern of representation is present in the counts of burnt and butchered finds in the yellow-brown assemblage (**tab. 9.1.16**), where the highest counts are from Barbary sheep and medium-large sized animals. There appears to have been no selection of particular skeletal elements for burning. For the Barbary sheep, burning was observed on practically all elements of the skeleton, including crania, horns, vertebrae and ribs, and long bones of the limb and foot. Burning was present on juvenile and adult bones.

In summary, the faunal remains from S10 seem to have had little contact with fire and where burning had occurred, it was not to a great degree. So far, the evidence indicates the burnt bones recovered in the S10 deposits were the results of chance occurrences, perhaps reflecting an *ad hoc* method of disposal of butchery debris or the accidental incorporation of bones into fires, rather than part of a deliberate food processing and cooking strategy.

#### Informal Bone Tools

A find from the yellow-brown assemblage bears traces of utilisation. It is a portion of the shaft of a third metacarpus of a large equid <TAF06-4847> (**fig. 9.1.17**). There are multiple oblique cut marks across the shaft, deriving from removal of the periosteum. One end of the bone bears a series of removals or hack-like marks, not consistent with either carnivore or rodent gnawing. These may have been produced as the end of the bone was chipped away to form a blunt point or as the bone was utilised.

A second find <TAF05-2568> from S10 also shows damage on the surface of the bone (**fig. 9.1.16**). The find is a shaft of a radius from a medium-large sized animal (probably Barbary sheep). The bone has sets of oblique cuts across the cranial face of the shaft, produced when meat was filleted from the carcass. The cranial face also bears a well-defined area of deep, irregularly-shaped, pit-like features. These pits do not resemble the damage typically left behind on bones used as retouchers to refine or reshape lithic artefacts. The damage may have occurred when the bone was used as a hammer or an anvil.

#### Age Structures of the Major Species of Game

##### Barbary Sheep

Only one tooth of Barbary sheep was present in the brown assemblage and assessments of the age-structure of this species therefore focussed solely on data derived from teeth recovered in the yellow-brown assemblage. A total of 17 remains could be designated to juveniles; they comprise six mandibles and one



**Fig. 9.1.17** Informal bone tools from the yellow-brown assemblage in S10: shaft of third metatarsus of horse <TAF06-4847> (a), with oblique cut marks and a series of removals or hack-like marks at the base of the find (b); radius of medium-large sized animal (c) displaying area of deep, irregular pit-like features (d).

Assemblage	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Totals
yellow-brown	1173	45	34	50	23	8	10	1343
brown	79	25	20	14	4	0	0	141

**Tab. 9.1.15** Counts of burnt and unburnt bones in the yellow-brown and brown assemblages from S10.

	Assemblage	Small	Medium	Medium-large	Large	Barbary sheep	Large equid
burnt	yellow-brown	1	12	70	10	50	13
	brown	2	4	24	5	15	6
butchered and burnt	yellow-brown	1	4	14	2	6	1
	brown	1	1	4	3	2	4

(continued)	Assemblage	Gazelle	Large bovine	Alcelaphines	Small equid	Rhinoceros	Totals
burnt	yellow-brown	7	3	2	1	1	170
	brown	2	1	3	1	0	63
butchered and burnt	yellow-brown	1	2	0	0	0	31
	brown	0	0	1	0	0	16

**Tab. 9.1.16** Counts of burnt and butchered and burnt bones from the yellow-brown and brown assemblages in S10 according to animal and animal-size groups (0 = not burnt; 1 = slightly burned (less than half); 2 = lightly burned (more than half); 3 = fully burned (black); 4 = less than half calcined; 5 = more than half calcined; 6 = fully calcined).

ID-Number	P3	P4	M1	M2	M3
LMUM 25	9.21	12.5	7.3	22.2	29.5
4212	16.4				
5624	12.2				
6718	11.7				
4054b	7.2				
8594	6.0				
11800			16.4		
10686				41.9	
4790b				28.5	
2816					34.9
4790a					38.3
13436					38.3
2543					32.3

**Tab. 9.1.17** Crown heights (mm) of lower permanent dentition of Barbary sheep from the yellow-brown assemblage in S10 (heights marked in grey are older than 6 years of age; specimens <4790a and b> are from the same individual).

ID-Number	P3	P4	M1	M2	M3
9002a		16.2			
4536			33.4		
12041			22.1		
13194			20.4		
13117			18.8		
2846			18.7		
12798			17.8		
12993			15.1		
4394			12.7		
4054a			11.9		
8686				43.8+	
5503				35.6+	
12913				31.5	
11757				31.3	
2846				18.7	
12448				16.3	
4014a				10.2	
11906					43.7
3004					41.9
5805					41.5
6177					37.2
10699					35.2
12547					27.2

**Tab. 9.1.18** Crown heights (mm) of upper permanent dentition of Barbary sheep from the yellow-brown assemblage in S10 (+ indicates the tooth was damaged at occlusal surface and could have originally been higher).

ID-Number	Element	Height	Age in years
4202	P <sub>2</sub>	56.8	4-5
12869	M <sup>2</sup>	75.4	5-6
6720	M <sup>3</sup>	65.3	6-7
12937	M <sup>2</sup>	72.1	6-7
10613	P <sup>2</sup>	17.4	13-14
12721	M <sub>3</sub>	24.2	15-16

**Tab. 9.1.19** Crown heights (mm) of upper and lower premolars and molars and age of the large equid from the yellow-brown assemblage in S10.

ID-Number	Element	Height
12797	M <sup>3</sup>	19.9
2649	M <sup>3</sup>	18.4
11388	M <sup>3</sup>	17.9
13218	M <sup>3</sup>	16.5
13421	M <sup>3</sup>	11.3
13263	M <sup>3</sup>	7.0

**Tab. 9.1.20** Crown heights (mm) of upper third molars of gazelle from the yellow-brown assemblage in S10.

maxilla with deciduous dentition and six lower and four upper isolated deciduous teeth. An MNI of five juveniles was counted on lower dp3s from the right side of the body.

A total of four mandibles, eight maxillae and 50 isolated upper and lower permanent premolars and molars in different stages of wear was identified. The MNI of seven adults was counted on seven upper M2s from the left side of the body. The crown-heights of 35 isolated upper and lower permanent teeth are listed in **tables 9.1.17** and **9.1.18**. The crown heights of ten of the lower teeth were higher than those of the specimen from Munich (LMUM 25) aged at just over six years at death, suggesting the specimens listed here are from adults younger than six years of age. Only two teeth, both third premolars, could be considered as deriving from animals older than six years of age. The range of crown heights measured on the upper M1, M2 and M3 was rather broad and in the absence of a comparative aged individual (from the Munich collection), difficult to assess. For example, heights taken on the upper M1 ranged between 33.4 and 11.9mm and incorporate specimens with teeth in the first stages of wear (e.g. ID number 4536) deriving from young adults, and worn teeth (e.g. ID number 4054a) from individuals probably well past their prime. Although crown heights of teeth in mandibles and maxillae could not be measured, two of the mandibles (<TAF10-9939>; <TAF10-9950>) and one maxilla <TAF10-9421> were described during recording as "old" due to the heavily worn state of the teeth.

## Equids

Eleven deciduous premolars present in the yellow-brown assemblage represent teeth from equids in the juvenile age-group. The MNI of two juvenile equids could be identified, based on two left upper dp2 and two left upper dp4. The crown heights of one lower and six upper deciduous teeth of the large equid were measured and, by applying Bignon's (2006) method, their mortality ages assessed. The youngest individual (upper dp2: <TAF10-9672>) was approximately one year old at death and the oldest juvenile, represented by two teeth (upper dp3 and 4: <TAF05-3559a> and <3559b>), had a mortality age of between 19-21 months. The remaining equids died around 14 months <TAF09-8881> and 16 months (<TAF05-3349>; <TAF10-11408>; <TAF13-12127>).

Seven permanent premolars and molars were identified and the crown heights of six of these teeth could be measured (**tab. 9.1.19**) and approximately aged according to tables given by Levine (1982). Although the dental elements gave an MNI of only one (the two upper M2's are from different sides of the body), it is clear from the crown height data in **table 9.1.19**, that more than one adult was present in the assemblage. Four of these elements are from young or 'prime' adult individuals, between 4-7 years, and two are from older adults, aged at between 13-14 and 15-16 years respectively.

## Gazelle

A maxilla and a mandible, both with incomplete deciduous dentition, and three lower and two upper isolated deciduous teeth could be attributed to juvenile gazelles. A total of two juvenile individuals could be reckoned on duplicating elements from the same body side in this group of finds. This count is relatively low (but see the section on seasonality for a slightly higher MNI count). Two mandibles and two maxillae with permanent dentition and fourteen isolated permanent upper and lower premolars and molars represent the remains of the adult gazelles. The MNI of three adults was counted on three left and three right upper M3s. Published data on the ageing of gazelle teeth has focussed on wear stages of lower teeth (Munro/Bar-



Oz/Stutz 2009) or crown heights of lower M3s (Davis 1983). An unworn lower third molar <TAF-12745> is probably from an animal less than 14 months in age according to Munro and others (ibid., tab. 3). A slightly worn lower M3 <TAF-4792>, with a crown height of 20.2 mm, was probably older than c. 15 months at death (Davis 1983). Comparative data on the ages of gazelle for upper teeth have not been published so far. However, in order to glean some information on adult gazelles, crown heights were measured on six upper third molars of this species from S10 (tab. 9.1.20). They comprise specimens with little wear <TAF-12797> to heavily worn teeth <TAF-13263>, representing a broad range of animals from young adults to old ones.

## Summary

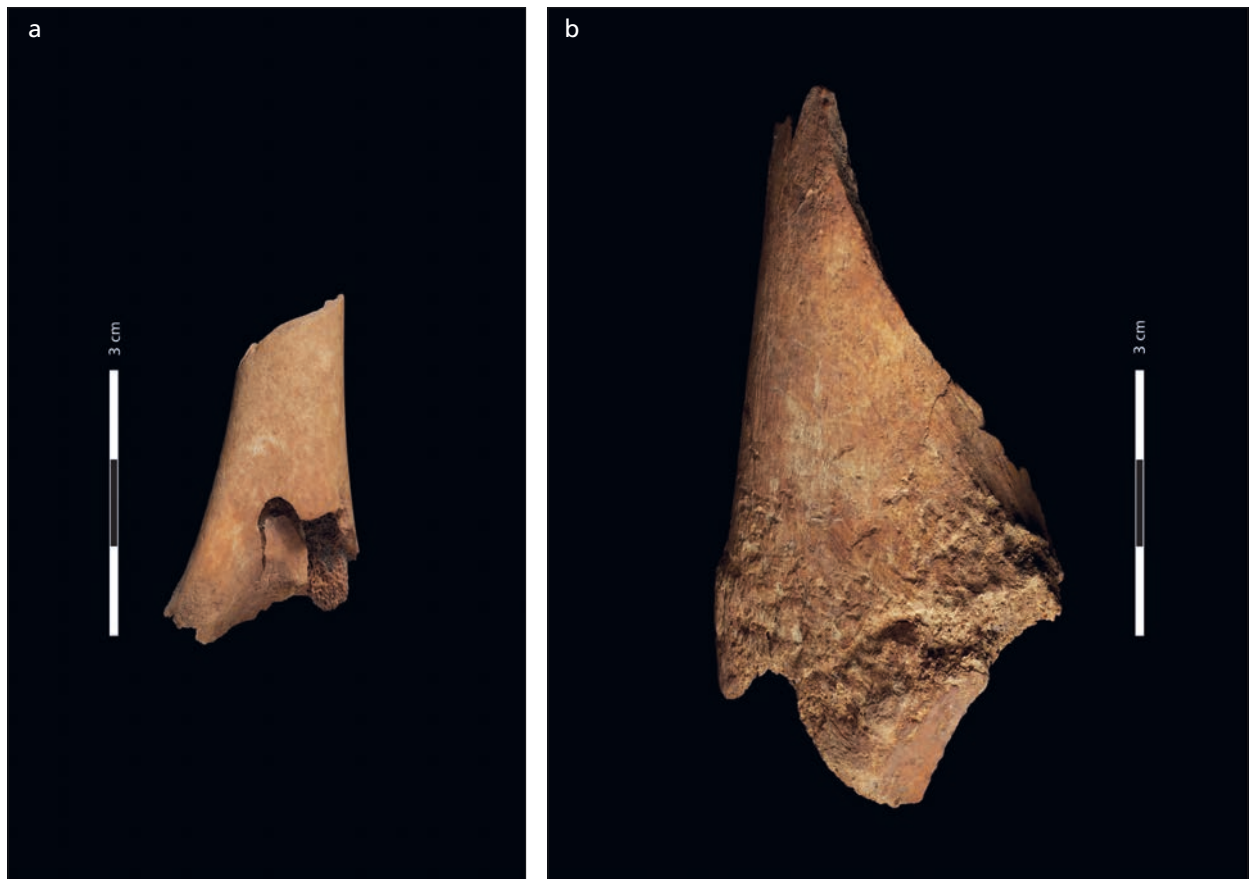
Individuals from all three age-groups of Barbary sheep are present in the yellow-brown assemblage. Adults form the dominant group, based on minimum number of individuals and basic counts of specimens, and the bulk of the adult teeth appears to be from younger adults rather than older ones. A similar pattern of representation of the age-groups, with teeth from juveniles, young adults in their prime and older individuals can also be discerned for the large equids and the gazelles.

## Seasonality

In contrast to the sparse evidence from S8, a larger number of finds from S10 was available for assessing seasonality. The finds described here are solely from the yellow-brown assemblage; the brown assemblage did not produce any material relevant to this aspect of the faunal analysis.

A series of mandibles and maxillae with deciduous dentition and isolated deciduous teeth of very young Barbary sheep were recovered from the yellow-brown assemblage in S10. The bulk of these teeth bears no traces or only the first traces of wear. As part of his study of the life history and ecology of a recently introduced game animal, Ogren (1965) devoted special effort to the age determination of Barbary sheep in New Mexico and adjoining States. Radiographs of mandibles of living specimens of Barbary sheep of known age were taken so that he could assess tooth development. He found that at three weeks of age, the deciduous mandibular dentition is complete and by three months, mandibular dp2-4 are fully erupted and wear is visible on dp3 and 4. In the Munich sample, the youngest specimen with traces of wear on lower dp3 and 4 had died at 2.5 months of age (LMUM 21) (Abigail Chipps Smith, pers. comm.; present author's observations), which compares well with Ogren's data.

The youngest individuals from S10 are represented by mandibles with dp2 emerging and no wear on the teeth (<TAF05-3718>; <TAF08-6993>). Using the ageing data described above, these animals appear to have died in the first weeks of life and probably before they reached one month in age. A group of six additional finds comprising isolated lower deciduous teeth (dp3: <TAF05-2458> and <2547>; <TAF08-5462>) and mandibles with deciduous teeth in the jaw (<TAF05-3539>; <TAF06-4054>; <TAF15-13029>) were identified. An upper dp3 <TAF05-2667> and a maxilla with dp2-4 <TAF09-8693> are also present. None of these teeth are in wear and, assuming similar patterns of eruption and wear on both lower and upper teeth of very young individuals, indicate a mortality age of between birth and 2.5 – 3 months for all of these animals. At least four individuals of Barbary sheep are represented in this group of finds by four lower dp3s from the right side of the body (<TAF05-2458> and <2547>; <TAF08-5462> and <6995>). The mortality ages deduced from these finds suggests time of death for several individuals of Barbary sheep in S10 between their birth in March/April and their death in June/July.



**Fig. 9.1.18** Traces of carnivore gnawing on animal bones from the yellow-brown assemblage in S10: tooth notch (a) on the distal portion of a diaphysis of a humerus of a juvenile medium-large sized animal, probably Barbary sheep <TAF05-3256>; calcaneus (b) of Barbary sheep with gnawing traces on the *processus anterior* <TAF10-10522>.

The gazelle remains considered here comprise two isolated left lower dp4; and a right mandible with lower dp3 and dp4 in the jaw. These finds represent at least three young individuals of gazelle with deciduous fourth premolars in different stages of wear: unworn <TAF 15 12849>, first traces of wear <TAF 15 12575> and full occlusal wear <TAF13-11550>. According to Munro and others, wear can begin on the mandibular dp4 during the first month after birth (Munro/Bar-Oz/Stutz 2009, tab. 2) and expands across the occlusal surface of this tooth up to three months of age (ibid., tab. 2), indicating time of death for the two youngest animals between April and June or July. The lower dp4 in the mandible is already in full occlusal wear, indicating death between 3-7 months of age (ibid., tab. 2) and between July and November for this individual.

In summary, evidence of seasonality for the S10 yellow-brown assemblage could be gleaned from the tooth eruption and wear of young individuals of Barbary sheep and gazelle. The data indicate death of these young animals mainly between March and July, but extending into November.

#### Animal Modification

Carnivore tooth scores and tooth furrowing were observed on a total of 11 bones in the yellow-brown assemblage (fig. 9.1.18). Remains of Barbary sheep, large bovine and gazelle are amongst those finds with carnivore gnawing which can be identified. Bones from juveniles and adults have been gnawed. Only two finds from the brown assemblage showed tooth scoring from a carnivore. One of these is a radius of a



**Fig. 9.1.19** Medial (a) and lateral (b) views of a horn of gazelle (*Gazella cuvieri*) <TAF15-13770> showing modification of the vault of the skull to remove the brain (a), cut marks on the cranium (b) and rodent gnawing on the horn (a and b); from S10.

horse, which shows scoring around the distal end of the bone. The very low counts of carnivore-ravaged bones in both assemblages suggests carnivores did not find the cave attractive for denning or scavenging activities, probably due to the strong and continuing human presence at Taforalt during the deposition of the Grey Series, and despite the presence of large quantities of bone debris.

Assessments of limb fragmentation showed that nine bones (21.4%) from the brown assemblage and sixty-six (20.6%) from the yellow-brown assemblage are in Bunn's (1983) stage 3, where the whole tubular circumference is represented. This may indicate a stronger carnivore influence on these assemblages than the visible evidence (carnivore tooth marks) suggests.

Four bones with rodent gnawing recorded in the brown assemblage comprise a tarsal bone of an equid and, from unidentifiable animals, a metacarpus or metatarsus, and fragments of a rib and an indeterminate bone. Typical rodent gnawing was recorded on eight bones from the yellow-brown assemblage. They comprise first and second phalanges of the large equid and Barbary sheep respectively, a metacarpus and scapula of gazelle, a rib and indeterminate fragments of long bones.

One of the most characteristic examples of rodent gnawing from S10 is the left, complete horn core of a gazelle with a portion of the cranium attached <TAF15-13770> (**fig. 9.1.19**). The relatively broad, flat bottomed, multiple grooves (Fisher 1995) encircle the horn some 30 mm above its base, terminating on the lateral face of the find. This find bears cut marks on the cranium, possibly deriving from skinning and shows signs of a deliberate opening of the skull in order to access the brain, as part of the butchery tactics of the human dwellers in the cave.

### The LSA Faunal Remains from Sectors 3 and 4 and the S8 Mollusc Column (MMC A23)

#### General Remarks

Small numbers of faunal remains were recorded and analysed from LSA deposits in two additional sectors (Sectors 3 and 4) and from a profile opened in Sector 8 for column sampling of molluscan remains (MMC in Square A23).

#### Sector 3

A total of 69 three-dimensionally recorded faunal remains were analysed from earlier LSA deposits (all Yellow Series) investigated in 2008 in this sector. **Table 9.1.21** gives the basic data for these finds (grouped by depths, as recorded in profile AOH 2009; see **Chapter 2**). The bulk of the finds from S3 are in the medium-large animal-size group (n=37). Some of these finds were identified to taxa, represented by the Barbary sheep (n=4), gazelle (n=3), a large equid (n=1) and a large bovine (n=1).

The four finds identified as Barbary sheep comprise a first phalange (0-1 cm spit, part of Unit S3-AOH09[5(above datum)-0]), fragments of an upper molar, the diaphysis of a radius (13-14 cm spit, part of Unit S3-AOH09[8-29]) and a fragment of the diaphysis of a tibia (26-28 cm spit, part of Unit S3-AOH09[8-29]). A small number of remains were identified to gazelle. They comprise two first phalanges (1-3 cm spit, part of Unit S3-AOH09[5(above datum)-0]; 5-7 cm spit, part of Unit S3-AOH09[0-8]) and a cervical vertebra (13-14 cm spit, part of Unit S3-AOH09[8-29]). An upper P3 or P4 of an equid was recovered in deposits between 26-28 cm spit, part of Unit S3-AOH09[8-29]. Only one find was identified as large bovine (26-28 cm spit, part of Unit S3-AOH09[8-29]). It is a fragment of the diaphysis of a bone of the foot (metacarpus or metatarsus).

Depth in cm (AOH 2009)	Number of finds recorded	Small size group	Medium size group	Medium-large size group	Large size group	Indet.	Butchery traces	Burnt	Carnivore gnawing	Rodent gnawing
0-1	1	-	-	1	-	-	-	-	-	-
1-3	4	-	1	3	-	-	-	1	-	-
3-5	3	-	1	2	-	-	2	1	-	-
5-7	5	-	1	4	-	-	-	1	-	-
7-9	6	1	1	4	-	-	1	1	-	-
11-13	3	1	1	1	-	-	-	-	-	-
13-14	9	1	3	4	1	-	-	-	-	-
14-16	1	-	-	1	-	-	-	-	-	-
18-19	1	1	-	-	-	-	-	-	-	-
19-21	4	1	-	-	3	-	-	-	-	-
21-22	5	1	-	3	-	1	-	2	-	-
22-24	5	-	-	4	1	-	1	-	-	-
24-26	3	-	-	3	-	-	-	-	-	-
26-28	12	2	2	6	2	-	2	-	-	-
28-30	6	1	3	-	1	-	-	-	-	-
30-32	1	-	-	1	-	-	-	-	-	-
<b>Totals</b>	<b>69</b>	<b>9</b>	<b>13</b>	<b>37</b>	<b>8</b>	<b>1</b>	<b>6</b>	<b>6</b>	<b>0</b>	<b>0</b>

**Tab. 9.1.21** Faunal data for Sector 3.

Traces of butchery were observed on the tibia of Barbary sheep. They comprise sets of oblique cuts on the diaphysis of the bone, produced during filleting activities. In addition the find has multiple impact notches resulting from marrow procurement. Two notches are opposing, indicating the bone may have been laid on a hard object as it was smashed. The equid tooth has an oblique cut mark on its buccal face, probably produced when gingival tissues were cut away. Cut marks deriving from filleting were also identified on long bone fragments on medium-sized and medium-large sized animals (3-5 cm spit, part of Unit S3-AOH09 [5( above datum)-0]; 7-9 cm spit, part of S3-AOH09[0-8]; 22-24 cm spit, part of S3-AOH09[8-29]). Traces of butchery were not observed on remains identified as gazelle and large bovine.

A total of six bones showed signs of burning and none of the remains had been gnawed by carnivores or rodents.

#### Sector 4

A single find was recorded from this sector in S4[47-57], a YS unit which dates from the early part of the LSA. The find comprises a set of articulating lower molars (M1-M3) of a large alcelaphine.

#### The S8 Mollusc Column (MMC in Square A23)

Eleven faunal remains, recovered from the Grey Series part of the column opened to obtain samples for the analysis of molluscs, were recorded. These finds comprise elements identifiable to Barbary sheep (n=3), a large equid (n=3), a large bovine (n=3) and a large alcelaphine (n=1). Remains of Barbary sheep were recovered in MMC21 (equivalent to part of S8-L6) and MMC48 (equivalent to a level within the series S8-L16 to S8-L20). They comprise a lower permanent molar (M2) and a tarsal bone (calcaneus) in MMC48 and a mandible with deciduous dentition (dp2-4) in MMC21. The deciduous dentition in the latter find is fully erupted, but not yet in wear, giving an approximate age at death for this individual at around 2-3 months, according to observations made by Ogren (1965) and own observations on mandibles of recent Barbary sheep.

The equid remains comprise an incisor tooth in MMC48 (equivalent to a level within the series S8-L16 to S8-L20) and two upper third or fourth permanent premolars in MMC83 (equivalent to part of Unit S8-L24). A second phalange (MMC48), a third phalange (MMC20, equivalent to part of Unit S8-L6) and a portion of a metacarpus (MMC48) were identified as large bovine.

A fragment of a long bone of an animal of medium-large size is the only find from the MMC column (the lower stony interval) which shows traces of butchery. Longitudinal cuts were observed on the diaphysis of this piece and may have been produced during filleting activities. Rodent gnawing was also observed on this find. The second phalange of the large bovine from MMC6 (equivalent to part of Unit S8-L3) is the only find from this column showing traces of carnivore gnawing.

### **Crania of Large Bovines, Barbary Sheep and Other Faunal Remains as Funerary Artefacts**

One of the most intriguing aspects of the faunal remains from the LSA deposits in S10 at Taforalt is the placement of crania and other faunal remains alongside the bodies of the deceased or surrounding their graves, indicating the use of these objects as funerary artefacts (Humphrey et al. 2012; Turner/Humphrey/Bouzouggar/Barton 2015) (see **Chapter 15**).

## The Grave of Individual 1

The incomplete horns of a large, adult bovine had been deliberately placed in the grave of a male individual. The finds are arranged on either side of the deceased, more or less parallel to each other. They comprise the proximal portions of the left and right horn core with a portion of the skull attached to each horn core. In **figure 15.6 (Chapter 15)**, the find <TAF06-3988> lay (before excavation) to the right of the deceased male and is some 400mm long and almost 150mm wide. It comprises the horn core, preserved to a length of approximately 320mm and a portion of the frontal bone. The find <TAF06-4617> still lying to the left of the deceased in **figure 15.6** (see also **fig. 9.1.20**) is some 410mm long, the horn core is 360mm in length and a portion of the parietal is attached. Both finds were highly fragmented and had been crushed *in situ* due to pressure of overlying graves, other finds and/or sediment and rocks.

The frontal bone of the skull on the <3988> find had been fractured in at least two places and both horn cores appear to have been deliberately broken so they would fit into the grave. The horn sheaths must have been removed prior to this action, to ensure the horn cores could be broken at the required length. The lower (proximal) portions of the horn cores were then placed in reverse positions in the grave: the horn on the left is laid with the portion of skull towards the back of the man and the horn on the right with the skull portion towards his feet.

Additional fragments of horn cores of a large bovine were recovered throughout the S10 deposits but two of these finds are of further interest. The finds comprise the middle section <TAF10-10261> of a horn core, located next to the feet of Individual 13, and the tip of a horn core <TAF10-10893>, located alongside the crania of Individuals 13 and 14 (see **Chapter 15**). The mid-section of horn core is 560mm long and 100mm wide (**fig. 9.1.20**). The tip of the horn core is preserved to approximately 350mm in length and is 25mm wide at the tip (**fig. 9.1.20**). Attempts to refit these finds could not be undertaken due to their very poor state of preservation. However, their close spatial association on site (they are practically laid on top of each other), suggests they may represent the upper portions of a single horn, measuring some 920mm long. Considering the massive size of all the horns described above, two fossil species of large bovine came into consideration, the aurochs (*Bos primigenius*) and the giant African buffalo (*Peilorovis antiquus*). However, the bovine horn cores from the grave of Individual 1 and close to the graves of Individuals 13 and 14 are fragmentary and show only a few morphological characteristics, so that a definite identification to species is currently not possible. The frontal bone on the <3988> find is smooth, but this is also found in both the giant African buffalo (Klein 1994) and the aurochs. Typical for the two species is the way in which the horn cores are carried – the horn cores of aurochs are borne wide apart at the summit of the crown and curve outwards, forwards and upwards (Cornwall 1956). In contrast, the horns of *P. antiquus* rising behind the orbits were placed transverse to the skull and spanned more than 3m from tip to tip (Klein 1994) (**fig. 9.1.20**). Unfortunately, the find <TAF06-3988> from the grave was too fragmentarily preserved to ascertain the exact position of the horn to the skull. The horn core of aurochs is massive and has a relatively stout tip. In contrast, the horn cores of *P. antiquus* are comparatively slender and the tip is relatively thin. The tip of the horn core of the large bovine described above is also rather slender.

A single tooth of a large equid was also recovered from the grave of Individual 1 <TAF06-4451>. The find is a left upper second incisor and was recovered in direct contact with the body of this individual. The tooth is in wear, the infundibulum (a deep opening found in the crowns of equid teeth) is long and oval in shape, a stage of wear on incisor teeth indicating a prime adult individual of around 7 years of age (Habermehl 1961, fig. 27). A right mandible of Barbary sheep <TAF06-4790> was also found directly below the pelvis of Individual 1. The mandible is incomplete, but the lower permanent molars (M1-3) are still in the jaw. The





teeth are in wear, and the mandible appears to be from a prime adult individual, younger than 6 years of age, according to the modern comparative material (**tab. 9.1.17**).

#### The Grave of Individual 5

Three fragmentarily preserved portions of crania of Barbary sheep, located close together, surround the grave of this female individual. The first find <TAF08-6676> comprises portions of the left frontal and right parietal bones of an adult sheep. The right horn core is still attached to the skull and preserved to a length of 200 mm. The second find <TAF08-6715>, is a well-preserved portion of a skull of a young adult Barbary sheep. The find comprises the frontal bone preserved down to the level of the orbits with the bases of both horn cores still attached to the skull. The uppermost edges of the horns have traces of recent breakage, indicating the horn cores were originally preserved to a greater length than shown in **figure 9.1.21**. Both finds <TAF08-6676> and <6715> show traces of deliberate modification at the back of the vault, resulting in a large opening, through which the brain could be removed (**tab. 9.1.13**). The third find comprises fragments of a horn core and a small portion of the skull (<TAF08 6681> and <6716>). The horn core is preserved to a length of 300 mm. This find and the cranium <6715> are located very close to each other and may have derived from the same skull. If this was the case, then the length of horn core originally attached to the skull would have been quite substantial.

#### The Grave of Individual 12

An equid tooth <TAF13-11617> had been placed in direct contact with the body of this baby. It is a permanent upper or lower incisor of an adult equid. The lateral end of the infundibulum is not fully closed indicating an age of approximately six and a half years at time of death for this individual, according to Habermehl (1961).

#### The Grave of Individual 14

Numerous faunal remains were associated with the partly disturbed grave of this individual (see **Chapter 15**). They comprise remains of taxa forming the main components of the S10 faunal assemblage (Barbary sheep, a large equid, a large bovine, hartebeest and a gazelle) but also rarer components, such as remains of the small equid, red fox and a medium-sized canid.

Several faunal remains were recovered from the undisturbed parts of this grave. Two of these, the mandible of a red fox and the mandible of a medium-sized canid, had been placed alongside the body of the deceased. The find from the fox comprises an incomplete left mandible of a young individual <TAF13-12421>, resting directly above the left ankle. The mandible contains some of the permanent dentition, including the



**Fig. 9.1.20** Cranium and horn cores of an adult large bovine from the grave of Individual 1 and from deposits surrounding the grave in S10: fragment of cranium (**a**) <TAF06-4617> with frontal bone and base of the horn core found in the grave; fragment of a horn core (**b**) <TAF10-10261> and tip of a horn core (**c**) <TAF10-10893> of large bovine recovered outside the grave of Individual 1; cranium and horn cores of the aurochs (*Bos primigenius*) (adapted from Cornwall 1965) (**d**) and giant African Buffalo (*Pelorovis antiquus*) (adapted from Pomel 1893) (**e**).

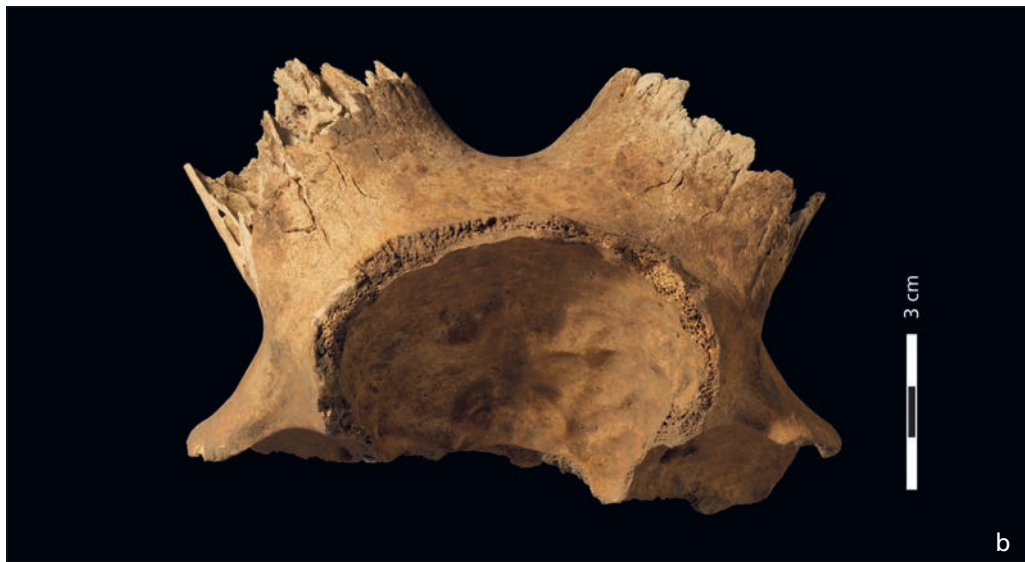
lower canine and premolars 1-4. The alveolae for the first and second molars are present, but the teeth have been lost after deposition and burial of the find. The mandible is broken in the region of the alveola of the third molar; this tooth is also missing. Since the replacement of the deciduous dentition by the permanent teeth in the red fox occurs over a short period of time from around two and a half months to six months (Habermehl 1961), fully developed permanent teeth, as in this specimen, should be present at six months of age, thus providing an approximate age at death for this animal.

The second mandible was located close to the hand and pelvis of the deceased. The find <TAF10-11398> comprises an incomplete left mandible of a medium-sized canid. The incisors are missing; the canine and most of the lower permanent dentition (P1-P4 and M1-2) are still in the jaw. The M3 was originally present, but loose, and was taken for sampling (O18 and Sr analysis, results pending). The teeth are all very worn, indicating an old individual. The upper portion of the ascending ramus has been broken recently and is missing. In contrast to the mandible of fox, which shows no traces of human modification, this canid mandible bears two sets of short, transverse cut marks across the ascending ramus. Cut marks in this position are consistent with removal of the jaw from the head. The taxonomic status of this specimen is unclear but still under study.

A fragment of a skull (os nasale) of a large animal, possibly a large bovine, was located close to the shoulder of Individual 14. Remains of Barbary sheep were also recovered in close association with the body of this individual. A cranium of Barbary sheep <TAF10-11286> was found next to the right knee. This find comprises a portion of the right frontal bone and the base of the horn core. Parts of the skull are still attached to the left horn core, which is preserved to a length of 120 mm. The horn cores are robust and derive from an adult (possibly male) individual. The cranium shows the same type of modification of the rear of the skull, described above on crania of Barbary sheep associated with grave 5. A fragment of a maxillary bone with upper M2 and M3 (12280) was laid next to the right elbow of Individual 14. The find is from an adult Barbary sheep, but bore no traces of human modification. Three fragmentary horn cores of this species (<TAF13-12183>, <TAF 15 13560>=HC1; <TAF13-11950>, <TAF13-11955>, <TAF15-13558>=HC2; <TAF13-12409>=HC3) were stacked above the left foot. The find <11950> had been burnt.

## Discussion

At Taforalt, mammalian remains were recovered in close spatial association with the graves of the Iberomaurusian (Humphrey et al. 2012; Turner/Humphrey/Bouzougar/Barton 2015). Crania or portions of crania played an important role and were probably specifically selected as funerary artefacts due to their size and or appearance. Regardless of whether the cranium of a large bovine in grave 1 is from aurochs or giant buffalo, both species have large, imposing skulls and horns. Close spatial associations of crania and fragments of the horns of Barbary sheep indicate the horn cores of this species were probably intact when the finds were deposited. The current state of preservation of Barbary sheep crania from the site gives little idea of how imposing these horns could have been at the time of their deposition close to the graves (fig. 9.1.21). Although two adult individuals of large bovine at S10 could be identified from duplicating dental elements, the fragmentary bovine horn cores currently give little additional information on numbers of individuals. In contrast, crania of Barbary sheep are in abundance, and in two instances, multiple crania of sheep were grouped together on the edges of the graves (graves of Individuals 5 and 14). There was also a large stack of at least seven horn cores of Barbary sheep associated with the grave of Individual 13 (see Chapter 15). The difference in the way crania of large bovines and Barbary sheep were utilised in their role as funerary artefacts may stem from the hunting tactics and economic activities of the Iberomaurusian. Barbary sheep



**Fig. 9.1.21** Crania and horn cores of Barbary sheep <TAF08-6715> from S10: frontal view, with bases of recently damaged horns (a); occipital view (b) showing evidence of a deliberate opening of the brain case; (c) modern specimen (LMUM 26).

would have inhabited the rocky slopes and valleys immediately surrounding the cave and the evidence from S8 and S10 shows that this animal was the species of game preferentially hunted by the Iberomaurusians, probably due to its local abundance. This is reflected in the large amounts of remains from all parts of the body of Barbary sheep, together with high numbers of individuals and intensive traces of butchery on sheep bones in the assemblages from S10.

Large bovines would not have inhabited the steep, rocky terrain near the cave, but would have been encountered in the plains below the cave. It would have been necessary to transport their remains from a kill-site, presumably some distance away. Long transportation distances coupled with economic decisions may account for the low counts of post-cranial remains from at least two individuals of large bovine in S10 and for a predominance of fore and rear limb and foot bones of large bovines, resulting from a selection at the kill-site of smaller portions of the meatier parts of the carcass for transportation. These results are even more interesting when one considers that the cranium of one large bovine was deemed important enough to be transported to the cave, despite its weight and cumbersome form. Although the cranium of a large bovine would provide some meat and the brain, the choice to transport this portion back to the cave seems to be a departure from a purely rational decision to produce maximal returns in terms of food consumption. It appears to underline the importance of this particular skull, perhaps the equivalent of a modern-day 'trophy'? The crania of Barbary sheep in S10 can be interpreted as the end-products of mundane hunting and butchery processing (extraction of the brain for consumption or for tanning hides), some of which had a secondary function as extraordinary artefacts commonly laid in or close to graves.

The remains of canids are rare elements in the Taforalt faunas, and the mandibles of the fox and the larger canid may also have been deliberately chosen because of the unusual form of the jaw and the sharp teeth. Cut marks across the ascending ramus of the mandible are consistent with removal of the jaw from the head but whether the mandible was deliberately separated from the head to be specifically laid in the grave or whether the cut marks were the result of more mundane butchery activities is uncertain.

## Conclusions

The mammalian remains described in this chapter derive from two different zones in the cave at Taforalt. The deposits in Sector 8 (including the MMC series and with the nearby exposures in Sectors 3 and 4) comprise many units spanning a range in time from 20,894-21,430 to 12,566-12,713 cal BP. They incorporate an important boundary at c. 15,000 cal BP, marked by a distinct change in sedimentation between the yellow cave loams of the Yellow Series and the grey, ashy deposits of the Grey Series. The animal remains from Sector 8 are potentially useful in identifying diachronic changes in faunal representation and utilisation, in particular immediately before and after the boundary between the YS and GS units. In contrast, the larger numbers of faunal remains from Sector 10 give more detailed insights into the procurement and utilisation of animals between 15,101-14,365 to 14,660-14,086 cal BP.

This analysis has revealed the remains of several taxa in the LSA cave deposits. In both zones the faunas are typified by the appearance of five 'main' taxa, Barbary sheep, a large equid, a large bovine, gazelle and large alcelaphines, of which Barbary sheep is by far the dominant species. This dominance is also reflected in the presence of large quantities of medium-large sized animals in both zones, which are considered to augment the remains of Barbary sheep. The dominance of Barbary sheep in the faunas is undoubtedly associated with the location of the cave in a region of stony plateaus and valley slopes, the favourite habitat of this species where they would have occurred in abundance, a situation that the Iberomaurusians at Taforalt fully exploited. Radical changes in faunal composition in the assemblages were not observed at around 15,000

cal BP and the main taxa are present in the youngest unit of S8-YS (Y1) and appear again in the oldest deposits of S8-GS (L29). Barbary sheep is present throughout the younger deposits of the Grey Series; the other animals occur sporadically. This pattern of faunal representation may be due to fluctuating changes in climate and environment associated with regional occurrence/absence of some species, may reflect an increasingly selective procurement of Barbary sheep by the human occupants of the cave or may simply be a reflection of decreasing numbers of faunal remains surviving in general in younger units of the Grey Series. On the whole, the presence of varying quantities of skeletal elements of taxa and animal-size groups in the assemblages in S8 and S10 could be mainly attributable to differential bone survival in the cave, where fragile skeletal elements did not survive and were under-represented and robust skeletal elements did survive and were over-represented. Against this background, the richer remains in the yellow-brown assemblage in S10 provided information on the parts of the carcasses of taxa transported to and deposited in the cave. Almost all elements of large equid, large bovine and gazelle had been brought to the cave, even if in very low quantities. Interesting is the representation of the large equid at S10. This is the only taxon in S10 which has produced remains of all elements of the axial region (vertebrae; ribs; pelvis) and, together with fragments of ribs of large sized animals in S8-GS, indicates that axial elements from large animals were occasionally transported back to the cave. This is, however, not the case for the large bovine in S10, where the axial portion of the carcass is absent and, in this aspect, the skeletal representation of the large bovine from S10 resembles that of the much smaller gazelle. In contrast, all body parts of Barbary sheep, except the ribs, seem to have been deposited in the cave, sometimes in high quantities, where taphonomic processes led to a loss of more fragile elements.

Marks produced during butchery were observed on the bones of Barbary sheep, large and small equids, large bovines, alcelaphines, including hartebeest, gazelle and a medium-sized canid, but the bulk of the butchery traces on bones from the LSA deposits in S8 and S10 were found on the remains of Barbary sheep and animals in the medium-large size group. Standardised techniques of butchering were employed on the remains of animals in the assemblages in both sectors and on animals of different size. Major differences in butchery techniques were not observed between bones in the S8-YS assemblages and in the S8-GS assemblage. In the main, carcasses were dismembered at major joints and meat, bone marrow, bone grease and sinews (ligaments and tendons) were procured. These techniques of carcass processing were present throughout most of the phases of the LSA represented by the S8 and S10 deposits.

In contrast, higher percentages of butchery marks in the assemblage from the S8-GS deposits appear to reflect a more thorough processing of animal carcasses during the accumulation of the GS unit. Indeed, after indexing with sedimentation rates, both butchery and burning show a doubling, on top of the tripling in simple numbers, when comparing the GS with the YS. Evidence of skinning is present on crania of Barbary sheep, gazelle, large bovine and unidentifiable large animals from S10 and on the cranium of a gazelle in S8-GS. A deliberate opening of the rear of the crania to extract the brain was observed primarily on crania of Barbary sheep, but also on a cranium of a gazelle in the yellow-brown assemblage from S10. The brain may have served as a source of nourishment or could have been used specifically as a medium in the tanning of hides or both. Skinning marks on crania from S10, attesting to the procurement of hides, suggest that hides were likely tanned at Taforalt. Ligaments and tendons, removed from the feet, may have been used in a number of ways, including thread to sew clothing or make containers out of hides. Sinews would also have been useful items in binding, making snares, nooses or even nets.

Two long bones, a metacarpus of a large equid and a radius, probably from a Barbary sheep, bore traces indicating these remains may have been used as informal tools. But perhaps the most intriguing aspect of the faunal remains from the LSA deposits in S10 at Taforalt is the placement of crania and other faunal remains alongside the bodies of the deceased or surrounding their graves, indicating the use of these objects

as funerary artefacts. Whereas the crania of Barbary sheep in S10 can be interpreted as the end-products of mundane hunting and butchery processing (extraction of the brain for consumption or for tanning hides), some of which had a secondary function as extraordinary artefacts commonly laid in or close to graves, the choice to transport the heavy, cumbersome cranium of an adult large bovine seems to underline the importance of this particular skull, perhaps the equivalent of a modern-day 'trophy'.

The bulk of the faunal remains in the S8-YS and GS units and in the assemblages from S10 showed no traces of burning, although there is still an appreciable increase in the GS. This result was rather surprising, since the S8-GS and S10 deposits are characterised by high quantities of ash and, in the former, the presence of several hearths. The bulk of the burnt bones are from Barbary sheep or animals in the medium-large size group. There was no apparent selection of particular skeletal elements and bones from both juvenile and adult animals had been burnt. Although low counts of calcined bones in the units in S8 and S10 suggest that bones were not used as fuel at Taforalt, the susceptibility of calcined bone to fragmentation and loss may have distorted these results. So far, the evidence from the LSA levels at Taforalt indicates that bones had little contact with fire and, where burning had taken place, had not taken place to a great degree. This does not appear to reflect a deliberate food processing and cooking strategy where bones were roasted over fires, but rather an *ad hoc* method of disposal of butchery refuse or the accidental incorporation of bone refuse into fires.

The age, or mortality, structures of three of the main species at Taforalt, Barbary sheep, equids and gazelle, gave insights into the hunting and procurement tactics of the Iberomaurusian. Only scanty information could be gleaned for gazelle in the S8-YS and GS deposits, where isolated teeth of juveniles, adults and one old adult were recovered. Teeth of mainly prime adult individuals of equid were also scattered through the same deposits, but in low numbers. The age-structure of Barbary sheep from S8 is characterised by very low numbers of deciduous teeth, several teeth of prime adult individuals and an isolated tooth from an older adult. More information was available from the yellow-brown assemblage in S10, where individuals of Barbary sheep from all three age-groups are present. Teeth of adult individuals form the dominant group and the bulk of these are from young, probably prime adults, rather than older ones. Similar patterns of age-group representation can be recognised for the large equids and gazelle in this assemblage, suggesting that, although the Iberomaurusians appear to have hunted all age-groups, young adults (prime adults) seem to have been preferentially taken.

Evidence of seasonality could be estimated for faunal remains from some of the units in S8-YS and S8-GS and indicate death of young individuals of Barbary sheep and gazelle in assemblages from this sector mainly between April to August and extending into October. Similar evidence was gleaned from young individuals of these species for the S10 yellow-brown assemblage. The data indicate death of these animals between March and July, but also extending into November. It was not possible to judge in this analysis when adult Barbary sheep and gazelle died due to the lack of comparative crown height data for permanent teeth (see **Chapter 9.2**).

Very low numbers of bones bearing gnawing marks in the assemblages in S8 and S10 suggest carnivores did not find the cave an attractive place to den or to scavenge, even though a stronger carnivore influence could perhaps be discerned in the results of limb fragmentation analyses. Rodent gnawing was only observed on a few bones. In particular, the lack of carnivore signatures on the faunal elements supports the idea of a strong human presence in the cave.

## 9.2 SEASONALITY OF SITE USE AND AGE STRUCTURE OF *AMMOTRAGUS LERVIA* FROM DENTAL CEMENTUM

### Introduction

A useful means of assessing the complexity of hominin behaviour comes from the reconstruction of subsistence strategies, including the patterns of use of seasonally available resources (Pike-Tay/Cosgrove 2002; Wall 2005; Wall/Wall 2006; Wall-Scheffler 2007; Wall-Scheffler/Foley 2008). The high resolution analysis of seasonality studies, such as those that use cementum banding patterns of prey (Burke 1995), isotopic analysis (Richards et al. 2008), or microwear patterns of hominin teeth (Henry/Brooks/Piperno 2014), offer the clues to what allows some populations to move into novel niches and out-compete resident groups, as well as the strategies some hominin populations might employ over long-term visits to the same site(s) (Lieberman/Shea 1994; Wall-Scheffler 2007). Here, we investigate the seasonal use of Taforalt, at a time when numerous other north African sites are also being populated (Close 1977; 1986; Close/Wendorf 1990; Barton et al. 2013), and when many of those sites share both technology (i. e. Iberomaurusian) and a dominant ungulate prey (i. e. Barbary sheep, *Ammotragus lervia*).

We consider *A. lervia* from Iberomaurusian layers of Sectors 8 and 10 that can be dated from roughly 21,000-14,600 cal BP (see **Chapter 4**). We compare our analysis with that of the seasonality of site use and age profiles of the LSA assemblage at Haua Fteah (Libya). A better understanding of the potential seasonality shifts in faunal use between the comparable LSA at Haua Fteah and Taforalt could provide a better understanding of *H. sapiens* dispersals and patterns of innovation in slightly different niches.

### Materials and Methods

*Ammotragus lervia* teeth from Sectors 8 and 10 were collected in order that an analysis of the luminance properties of dental cementum bands could be accomplished. Eighteen teeth (12 from S8 and 6 from S10) were chosen as potential specimens for cementum analysis. Five of these teeth were processed initially to test for diagenesis (see below). As none showed complete diagenesis, the rest of the sample was processed. Of the eighteen teeth, seven from S8 and five from S10 showed no damage to the outer edge after processing and are used in the analysis. The rest of the sample showed clear damage to the outer edge, so only gave a minimum possible age and no season of death (**tab. 9.2.1**).

#### Dental Cementum Preparation

Each tooth was embedded in resin, sliced longitudinally down the centre and each cut-face was polished. Each half was then adhered to a frosted slide with more of the same resin (Buehler Epo-thin epoxy) and left to dry overnight. Once dry, the remaining tooth was sliced off and the thin section ground down and polished to  $70\mu\text{m} \pm 10\mu\text{m}$  (for more details, see Wall 2004; Wall-Scheffler/Foley 2008).

Upon slide completion, each thin section was viewed using a polarising microscope. Polarising light microscopes which utilise transmitted light are regarded as superior to reflected light microscopes, as they allow

Age	Season	Sector	Specimen	Layer	
	Damaged Edge	8	10387		
	Damaged Edge	8	1635		
	Damaged Edge	8	1859		
>2	Outer edge damaged	8	1026	Y1	
>3	Outer edge damaged	8	2152	Y4spit2	Lowest Yellow
6	Winter	8	9061	L14	Grey Series
9	Winter	8	9835	base L23	
3	Winter	8	10361	L29	Lower Grey
1	Winter	8	717	L29 (G100)	
12	Late Summer	8	944	Y1	Upper Yellow
3	Winter	8	1101	Y1	
4	Winter	8	1839	Y2spit5	Lower Yellow
	Damaged Edge	10	6177		
2	Late Summer	10	5503		Contemporary with Lower Grey Series of Sector 8
4	Winter	10	8686		
9	Winter	10	10699		
2	Winter	10	10686		
7	Winter	10	4014		

**Tab. 9.2.1** The age and season of death of *A. lervia* from Taforalt, from dental cementum analysis.

finer histological details to be seen (Hillson 1986); in addition, previous researchers have had problems using a reflected light microscope for the analysis of dental cement (McCullough 1996). Reflected light reveals superficial detail whilst polarised light transmitted through the specimen is being scattered by the structural properties of the cementum, thus revealing more detail than the reflected light microscope (see further description in Burke 1993). Furthermore, a polarising set-up is crucial for Palaeolithic zooarchaeologists in assessing the appearance of diagenetic samples among faunal remains (Stutz 2002).

The microscope used for this research is a Leica DM EP with 10X and 20X objectives and a rotating stage that can be used to align the sample with the polarising lenses. The optical properties of cementum can vary depending upon the orientation of the sample to the polarisers (for a detailed explanation, see Stutz 2002). To create consistency in the optical properties of each sample, the protocol consisted of lining each sample up to one of the perpendicularly oriented polarisers, so the first cementum band after the layer of Tommes (adjacent root dentine) would appear as a high luminance (HL) band (Lieberman 1994). Under polarising microscopes, HL bands of this population represent summer, or fast-growth periods, while low luminance (LL) bands represent winter, or slow-growth periods. The entirety of cementum tissue on each tooth was assessed for areas of complete cementum (e.g. no damage to the outer edges) which also exhibited high contrast between HL and LL bands.

### Diagenesis Analysis

The use of dental cementum to assess the season of death of faunal remains has been shown to be successful in Palaeolithic archaeology, once a detailed analysis of the appearance of diagenetic samples (e.g. any effect of post-mortem chemical and physical changes that might alter banding patterns) has been accomplished (Stutz 2002). Following Stutz (2002), an analysis of diagenesis was undertaken; the samples used for this analysis and the appearance of unusable (due to the loss of the outer edge) individual teeth are listed in **table 9.2.1**.



## Age Analysis

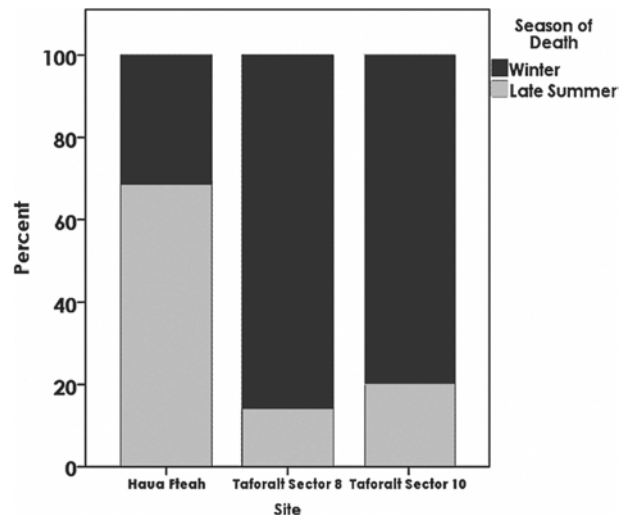
In order to look at patterns between assemblages and seasons, age cohorts will be utilised for some analyses. The age cohorts are defined similar to those in Cassinello (1997) and comprise Calves (0-11 months), Yearlings (12-23 months), Juveniles (2 years-2 years 11 months), Sub-adults (3 years-3 years 11 months), Prime/Adults (4 years-7 years 11 months) and Post-prime (greater than 8 years old). The cohort decisions from Cassinello (1997) are based on data from body size, horn size, teeth maturation and dominance relationships.

## Results

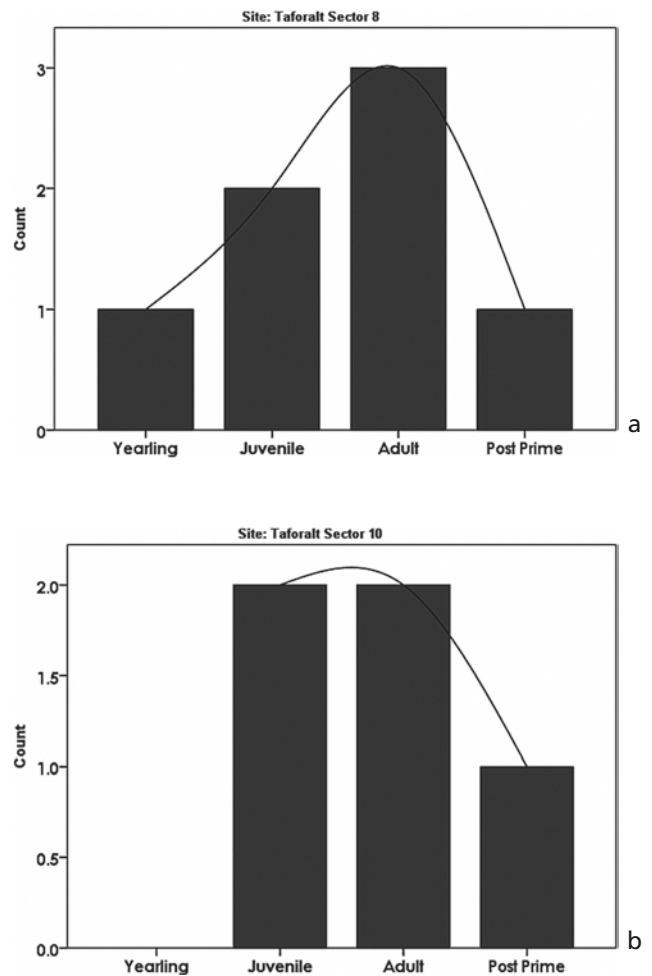
The results show that the majority of *A. lervia* specimens studied were taken during the winter months (83 % across the Iberomaurusian assemblages; **fig. 9.2.1**), and that these animals were generally in their prime (mean=4.3 years for Sector 8 and 5.5 years for Sector 10) (**fig. 9.2.2**). The individuals taken in the late summer were either old (12 years for Sector 8) or young (2 years for Sector 10).

## Discussion

Though the sample size used here for the dental cementum analysis is currently small, the striking pattern of winter deaths sets the Taforalt Iberomaurusian apart from the comparable LSA of Haua Fteah (Wall-Scheffler 2007, fig. 1), which was dominated by late summer usage of *A. lervia*. That being said, the *A. lervia* remains at the Haua also showed a much broader range of age-at-death among the summer months than winter months, which is clearly true of this limited dental cementum sample from Taforalt as well, given the young and old ages found in the summer deaths. Initially it was unclear if the increased summer age range at the Haua might simply be due to the larger number of individuals accumulated during the summer (given that most of the deaths at the Haua were from the summer



**Fig. 9.2.1** The percentage of summer versus winter deaths of *A. lervia* within Iberomaurusian assemblages at the Haua, and the two sectors of Taforalt, from dental cementum analysis.



**Fig. 9.2.2** The age profiles of Taforalt *A. lervia*, from dental cementum analysis; **a** Sector 8, **b** Sector 10.

months) but, given the findings from this Taforalt sample, it seems possible that use of *A. lervia* during the summer in the LSA did include a broader age range and represents a seasonally different strategy (Wall-Scheffler 2007). It should further be noted that the only post-prime individual found at the Haua came from the Holocene Libyco-Capsian assemblage, and not the Pleistocene LSA (Wall-Scheffler 2007), although Close (1977; 1986) has argued for a gradual shift between these two populations. Clearly, analysis of a larger *A. lervia* sample should be considered, in order to get a clearer understanding of how this prey species was used by the populations at Taforalt.