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# Animal Bone Remains from the Middle Bronze Age Burial Cave at Beit Ṣafafa, Jerusalem

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A salvage excavation of a Middle Bronze Age II burial cave near Beit Ṣafafa (see Ben-Ari and Wiegmann, this volume) yielded a small assemblage of animal bones that had been deposited in the tomb. These bones provide another opportunity to study animal consumption associated with funerary events and the variability in mortuary ritual during this period. The damage sustained to the site by construction activities prohibited the detailed mapping of the finds inside the cave; therefore, the entire assemblage was studied as a single unit.

The main questions were: what animal species were represented by the bone fragments found in the cave, and how many individuals of each? Selection for body part, side of the body, age and sex of the animals consumed is common in ritual contexts (Lev Tov and McGeough 2001) and these aspects were therefore sought in the assemblage in hope of clarifying details of the mortuary rite. Bone surface modifications and preservation were studied to understand the butchery and food preparation practices used in the funerary ceremonies, and to separate the patterns in the data affected by taphonomic processes and those affected by human procedures.

## Materials and Methods

The faunal remains, packed in a single standard crate, were recovered by hand and from dry sieving of the excavated sediments using a 10 mm mesh sieve. The bones were washed in tap water to remove dust and adhering soil before analysis, and then dried in the shade. The bones were identified using the comparative collection of the Laboratory of Archaeozoology at the University of Haifa.

The aim of the bone counting method was to produce reliable estimates of the minimum number of individuals (MNI). Therefore, only bone epiphyses and mandibular teeth preserving more than half of the complete element portion were counted; this method prevents double counting the same bone (Watson 1979). The state of epiphyseal fusion, body side and standard measurements were recorded for each identified bone (Driesch 1976; Davis 1992). Mandibular tooth rows were assigned to wear stage following Payne (1973). Bone surface modifications, such as weathering (Behrensmeyer 1978), gnawing, and butchery marks, were recorded, as was fracture morphology (Villa and Mahieu 1991).

## RESULTS

The bones from the cave (N = 133; Table 1) represent the remains of at least nine sheep (*Ovis aries*) and goats (*Capra hircus*), based on the count of left-sided calcanei, with a single carpal bone of a small equid, probably a donkey (*Equus* cf. *asinus*; excluded from Table 1). I suggest that the donkey bone is intrusive since the small and durable carpal is not related to any other equid remains and would not have been brought into the cave detached from other forelimb bones. It was most likely washed into the cave at some point (see Lyman 1994:171–175).

Twelve of the caprine remains were identified as sheep and four as goats based on morphological characteristics (Zeder and Lapham 2010). Measurements of the distal metapodials were used to augment the morphological observations (see Table 2). The results, plotted in Fig. 1, support the morphological indications that sheep are more numerous in the sample than goats. The relatively small size of the single goat metapodial suggests that it belonged to a female as would appear to be the case for the smaller sheep metapodial to its left-hand side. The three other measurements clustered near the upper right corner of the chart, indicate the presence of larger sheep, presumably male. The presence of male sheep is also indicated by the morphology of two robust iliac fragments.

With regards to the age at death, the epiphyseal fusion data from Table 1 suggest that the animals in the cave were adults, probably in their third year of life. Most of the unfused elements belong to age Group E; these ossify at the age of 30–48 months (Zeder 2006). Tooth wear data in general support this observation: three lower third molars display yet-unworn posterior cusps, assigning them to Wear Stage E (2–3 years old; Payne 1973); one mandibular tooth row was scored as Wear Stage D (1–2 years old); and a single lower third molar showed a wear pattern consistent with either Wear Stage G or H, giving a broad range within the adult age class (4–8 years at death).

Skeletal element representation is displayed in Fig. 2, based on the data in Table 1. The hind limb is the best represented portion among the remains followed by head and forelimbs, occupying an intermediate frequency range; foot and trunk elements are rare. No preference for limb bone side (left or right) of the kind occurring in some symbolic contexts (Davis 2008) was observed. The proximal epiphyses of humeri and tibiae are somewhat

**Table 1. Bone Counts for the Caprine Remains**[i]

| Body Part | Element | Fusion | Left | Right |
|---|---|---|---|---|
| Head (MNI = 4) | dp2 | | | 1 |
| | M1/2 | | 5 | 5 |
| | M3 | | 4 | 4 |
| | P4 | | | 2 |
| | Posterior mandibles | | | 3 |

[i] F = Fused; U = Unfused, P = Proximal, D = Distal. Elements in bold (Fig. 2) were employed to calculate the MNI value for each body part.

**Table 1.** (cont.)

| Body Part | Element | Fusion | Left | Right |
|---|---|---|---|---|
| Forelimb and Girdle (MNI = 5) | Scapula | F | 1 | |
| | | U | | |
| | Humerus, P | F | | 1 |
| | | U | | |
| | Humerus, D | F | 3 | 2 |
| | | U | | |
| | Radius, P | F | 5 | 2 |
| | | U | | |
| | Radius, D | F | 4 | 4 |
| | | U | 1 | 1 |
| | Ulna | F | 2 | 1 |
| | | U | 1 | |
| | | ? | | 1 |
| | Carpal, radiale | | | 1 |
| | Metacarpus, P | F | 2 | 2 |
| | | U | | |
| | Metacarpus, D | F | 3 | |
| | | U | 1 | |
| Hind limb and Girdle (MNI = 9) | Pelvis | F | | 2 |
| | Femur, P | F | 1 | 1 |
| | | U | 2 | |
| | Femur, D | F | 1 | 1 |
| | | U | 2 | 1 |
| | Tibia, P | F | | 1 |
| | | U | 1 | |
| | Tibia, D | F | | 2 |
| | | U | | 1 |
| | Astragalus | F | 2 | 1 |
| | | U | 1 | |
| | Calcaneus | F | 3 | 1 |
| | | U | 1 | 3 |
| | | ? | 5 | |
| | Navicularcuboid | | 2 | |
| | Metatarsus, P | F | 3 | 1 |
| | | U | | |
| | Metatarsus, D | F | 6 | |
| Feet (MNI = 2) | Phalanx I | F | 11 | |
| | | U | 1 | |
| | Phalanx III | | 1 | |
| Axis (MNI = 2) | Vertebra, atlas | | 2 | |
| | Vertebra, cervical | | 3 | |
| | Vertebra, thoracic | | 3 | |
| | Vertebra, lumbar | | 5 | |

**Table 2. Bone Measurements (in mm) following Davis (1992) and Driesch (1976)[i]**

| Taxon | Element | Age | GL | L | w I | SD | Bp | Bd | BT | HTC | BFd | Glpe | GLl | Dd | DTrLt | DTrMed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Caprine | Astragalus | F | | | | | | 18.1 | | | | | 28.6 | 15.5 | | |
| | | U | | | | | | 17.1 | | | | | | | | |
| | Calcaneus | F | 51.6 | | | | | | | | | | | | | |
| | | F | 50.8 | | | | | | | | | | | | | |
| | Humerus | dF | | | | | | | 30.7 | 14.2 | | | | | | |
| | | dF | | | | | | | 27.4 | 13.6 | | | | | | |
| | M3 | E | | 22.1 | 8.1 | | | | | | | | | | | |
| | | E | | 22.7 | 8.2 | | | | | | | | | | | |
| | | G-H | | 21.0 | 8.3 | | | | | | | | | | | |
| | | G-H | | 21.3 | 8.1 | | | | | | | | | | | |
| | | H | | 21.8 | 8.4 | | | | | | | | | | | |
| | Metacarpus | dF | | | | | | 25.8 | | | | | | | | |
| | | dF | | | | | | 26.3 | | | | | | | | |
| | | dU | | | | | | 26.6 | | | | | | | | |
| | | dU | | | | | | 23.3 | | | | | | | | |
| | Metacarpus | | | | | | 20.7 | | | | | | | | | |
| | Metatarsus | dF | | | | | | 24.8 | | | | | | | | |
| | Phalanx 1 | F | | | | | 11.3 | | | | | | | | | |
| | | pF | | | | | 11.8 | | | | | | | | | |
| | | pF | | | | | 13.4 | | | | | | | | | |
| | | U | | | | | 13 | | | | | | | | | |
| | Radius | dF | | | | | | 25.8 | | | | | | | | |
| | | dF | | | | | | 27.4 | | | | | | | | |
| | | dF | | | | | | 28.9 | | | | | | | | |
| | | dF | | | | | | 28.5 | | | | | | | | |
| | | dF | | | | | | 23.1 | | | | | | | | |
| | | dF | | | | | | 28.8 | | | | | | | | |
| | | dF | | | | | | 27.9 | | | | | | | | |

[i] DTrLt = Depth of lateral part of metapodial distal trochlea; DTrMed = depth of medial part of metapodial distal trochlea (Zeder and Lapham 2010). d = distal; p = proximal; F = fused; U = unfused; E,G,H = mandibular wear stages (Payne 1973).

**Table 2.** (cont.)

| Taxon | Element | Age | GL | L | w I | SD | Bp | Bd | BT | HTC | BFd | Glpe | GLl | Dd | DTrLt | DTrMed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Caprine | Radius | dF | | | | | | 27.4 | | | | | | | | |
| | | pF | | | | | 28.7 | | | | | | | | | |
| | | pF | | | | | 30.8 | | | | | | | | | |
| | | pF | | | | | 32.6 | | | | | | | | | |
| | | pF | | | | | 31.8 | | | | | | | | | |
| | | pF | | | | | 30.9 | | | | | | | | | |
| | | pF | | | | | 27.3 | | | | | | | | | |
| | | pF | | | | | 27.3 | | | | | | | | | |
| | | pF | | | | | 28.7 | | | | | | | | | |
| | Tibia | dF | | | | | | 23.0 | | | | | | 18.1 | | |
| | | dF | | | | | | 23.1 | | | | | | 17.5 | | |
| | | dF | | | | | | 27.6 | | | | | | | | |
| | | dF | | | | | | 23.2 | | | | | | 19.4 | | |
| Goat | Metatarsus | dF | | | | | | 23.3 | | | 23.4 | | | | 9.1 | 14.6 |
| | Phalanx I | F | | | | | 12.7 | 11.4 | | | | 35.7 | | | | |
| | | F | | | | | 12 | 12.0 | | | | 34.2 | | | | |
| Sheep | Astragalus | F | | | | | | 17.6 | | | | | 27.2 | 15.8 | | |
| | Humerus | dF | | | | | | | 26.3 | 12.9 | | | | | | |
| | | dF | | | | | | | | 13.8 | | | | | | |
| | | dF | | | | | | | 27.5 | 14.1 | | | | | | |
| | Metacarpus | dF | | | | | | 21.0 | | | | | | | 8.4 | 12.4 |
| Sheep | Metatarsus | dF | | | | | | 22.3 | | | 23.3 | | | | 10.5 | 16.6 |
| | | dF | | | | | | 24.7 | | | 25 | | | 27.5 | 11.5 | 17.6 |
| | | dF | | | | | | 24.0 | | | | | | | 10.7 | 15.7 |
| | Phalanx I | F | | | | | 12.6 | 12.3 | | | | 35.9 | | | | |
| | | pF | | | | | 13.7 | 13.4 | | | | 39.1 | | | | |
| | | F | | | | | 13.5 | 13.7 | | | | 35.1 | | | | |
| | | F | | | | | 12.0 | 11.3 | | | | 38.3 | | | | |
| | | pF | | | | | 12.1 | 11.6 | | | | 35.8 | | | | |
| | | pF | | | | | | 12.8 | | | | | | | | |

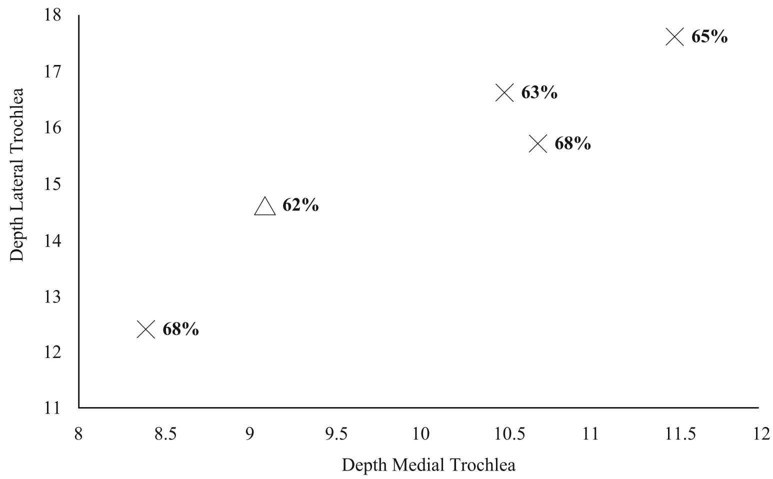


Fig. 1. The lateral depth against the medial depths of the metapodial condyle in five caprine specimens from the cave. Percentages mark the ratio of the lateral to medial depths: larger than 62% among sheep (marked by an ×) and equal to or smaller than 62% among goats (marked by a triangle; Zeder and Lapham 2010). Measurements are in mm.

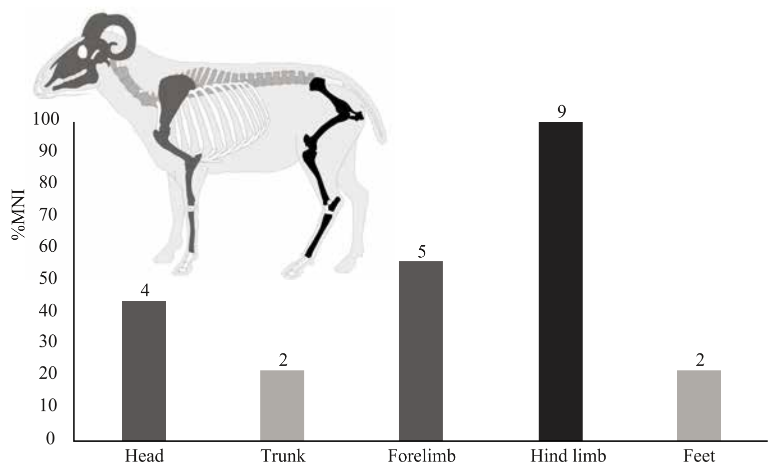


Fig. 2. Skeletal element frequencies in the assemblage expressed as percentages of the highest MNI count from Table 1 (MNI = 9 for the hind limb). Numbers above the columns represent the highest MNI count for elements included in that body portion. The different shades indicate frequency abundances, from the most represented (black) to the rarest portions (light gray). Sheep from Michel Coutureau and Vianney Forest (ArchéoZoo.org.).

underrepresented in comparison to the distal epiphyses of the same elements, but given the small sample size, I would hesitate to attribute this relatively weak observation to the effects of *in situ* density-mediated destruction of bone tissue (Binford 1981:71–72).

Thirty-one bones were described with respect to fracture morphology; all displayed a transverse, straight and frequently jagged appearance, suggesting that they were broken after nearly complete desiccation. This suggests that no intensive fragmentation was carried out to access within-bone nutrients, such as marrow. All specimens have a very weathered appearance, with extensive peeling and cracking of the bone cortex. Weathering may suggest prolonged exposure on the surface before burial, but in this specific case it seems unlikely because of the sheltered subterranean depositional context. Rather, I suspect that some other diagenetic process may have affected bone cortical preservation. No carnivore or rodent gnawing was observed on any of the bone fragments.

Butchery marks were observed on four bones: a proximal radius, just below the epiphysis; a distal humerus shaft, above the epiphysis; and two tarsal bones—an astragalus and a navicular-cuboid. The butchery marks were thin and straight, suggesting that they were made by a knife and indicating the disarticulation of the upper limb elements (Binford 1981). No use was made of heavier butchery instruments, which made their first appearance during this period (Greenfield 2013), and none of the bones were burned.

## Summary and Conclusions

The faunal sample from the MB II burial cave comprises the remains of at least nine different animals, mostly male sheep, although goats, as well as female caprines were also present. The animals were all adult at death. Butchery consisted of disarticulation using a fine blade (knife), with no fragmentation of long bone shafts to extract the marrow, a common practice in the Bronze Ages. The meat was probably prepared by boiling rather than by roasting, as suggested by the absence of burning damage.

The remains of the funerary deposit are typical of MB II in their exclusive emphasis on caprine offerings. The burial caves west of Tel Qasile (Sadeh 2006) contained a single caprine with each interment, usually in a bowl. Similar preference for caprines was practiced in the north of the country (Horwitz 1996; 1997). At Efrata (Horwitz 2001), 99% of the bones belonged to caprines, with a marked preference for sheep, of all ages. In Efrata Cave 1, the remains of at least five animals were found—the interred and trunk elements were rare, as in our sample.

The small assemblage from Beit Ṣafafa Cave I provides another case study that buttresses our growing understanding of the animal offerings that accompanied interments during the Middle Bronze Age in the country. This faunal assemblage exhibits in all its aspects typical sheep-dominated funerary donations, as those observed elsewhere in central and northern Israel.

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