AL- MASARRĀT CAVE TOMBS: PRELIMINARY OSTEOLOGICAL REPORT

Abdalla Jamil Nabulsi, Romel Gharib and Ahmad Lash

Introduction

al-Masarrāt (ash-Sharqiyyah) is a small village in az-Zarqā District, about 17km northeast and 20km north of the cities az-Zarqā and ʻAmmān respectively. It is located between the fertile Eastern Heights and the arid desert to the east. Between 2002 and 2006, a number of excavations were undertaken by a team from az-Zarqā office of the Department of Antiquities (DoA). They uncovered some architectural structures of settlement(s) dating from the Roman/Byzantine periods until present times. During the third season of excavations in 2004, eleven disturbed tombs were discovered; eight of which were cave tombs (**Fig. 1**). The cave tombs ("hypogea" were cut into the limestone hillsides, each with six to eight burial niches and some with multiple rooms. The tombs dated from the Roman to the Early Byzantine periods as indicated by associated archaeological material from these tombs, *e.g.* coins, pottery and glass (Gharib 2004:29). The cave tombs show similarities to a multitude of similarly dated tombs in different parts in and around Jordan (*e.g.* Harding 1950; Kritzeck and Nitowski 1980; Tal 2003; Badawi 2007; Daszewski 2008; Abu-Shmeis and Nabulsi 2009; Nassar 2012). A DoA rescue excavation was undertaken under difficult conditions, from June to August 2004 to recover the archaeological and skeletal material from the al-Masarrāt cave tombs. This report outlines the results of the osteological analyses that were carried out on the salvaged human skeletal remains from these tombs as well as further information about other related finds.

Sorting of the skeletal material lead to the exclusion of some remains, mostly from Tomb-4 and 6, that were obviously from recent burials, *i.e.* a few centuries old. These were excluded from analyses and properly re-buried [The authors share the opinion that as well as not being covered by the Antiquities law or guidelines, the handling (study) of recent human burials is not legally, hence scientifically, covered]. The remaining skeletal remains for analyses were from multiple *loci* associated with Tomb-1, 2, 3, 7, and 8. None came from the remaining six tombs. The material is strongly fragmented, although many small compact bones, *e.g.* tali and patellae, are in relatively good condition. A left ulna is the only intact long bone. There is an over-representation of the small hand and feet bones, which in some cases made up more than 25% of the available skeletal material from a single locus! Cranial, and bones from the upper body parts, including the vertebrae, are underrepresented or uninformative. For the analyses, material retrieved from the same locus on different days (pails) was treated as one but was separately examined and stored. The material was macroscopically examined for some demographic parameters, including estimating

1. Entrance to Tomb-1 (graphic: Lash [all other graphics by first author]).

age at death and sex determination, anatomic variations (according to Berry and Berry 1967; Fennigan 1978; Hauser and de Stefano 1989), and pathological features. Some osteometric measurements (Bräuer 1988) were carried out but are not included here.

Demography

The obtained skeletal material clearly indicates the incidence of multiple burials in each locus of the five excavated cave tombs at al-Masarrāt. The fragmentary state of the material restricted the allocations to specific individuals. Therefore, the count of the most frequent bone part of one side was applied to determine the minimum number of adult individuals in each locus. In some cases, this was confirmed by a second anatomical part, while in a few others divergent measurements (size) of the corresponding bone part from the opposite side were taken into consideration. The data presented here are based on accumulated observations of single bone parts and not individuals.

Determination of possible sex and age at death was restricted to the presence of more than one marked feature, primarily of the lower jaw (mandibular), cranial, pelvic, and long bones. Variable bone growth features were the most discriminant in determining the number and possible age of the sub-adult burials, but sex was less determinable for this group. This method of analyses might lack some accuracy, but it was the only possible for this material. The results presented at **Table 1** show the distribution in the age groups and the possible number of males and female burials in each group for each tomb. Adults were assigned to two age groups. The identifiable numbers of 18-40 year olds are associated with the population's fertility, while those above 40 years of age might reflect life expectancy within the community. The sub-adults groups reflect the differentiated child mortality within the population concerned. The resulting estimations suggest that at least 179 individuals were buried in the five tombs, 95 adults (35 males and 24 females) and 84 sub-adults (4 males and 9 females). About half of the adult burials remain of unknown sex or age at death. The estimated minimum number of burials varied from eight in Tomb-7 to 52 in Tomb-2. There were also variations relating to possible genders and child mortality ratios. The lower ratio of possible adult females was most likely related to the more robust and thus better preserved male bones. Most of the above 40 years age group were estimated to have survived beyond the age of 50 years. The total count of sub-adults was probably underestimated due to the method of determination and the fact that children's skeletal remains, infants in particular, are more vulnerable to deterioration than those of adults. The data revealed that the majority of child mortality was among those between one and ten years of age, but mostly

Table 1: Age and sex distributions obtained from the examined skeletal remains of the burials in the five al-Masarrāt cave tombs (M: male, F: female).

Age Group	Tomb 1	Tomb 2	Tomb 3	Tomb 7	Tomb 8	Total
Infant	7	5	3	0	0	15
1-10y	14 1 M/1 F	17	9 2 M/1 F	2 1 F	5 3 F	47 3 M/6 F
11-17y	5	6 2 F	6 1 M/1 F	0	5	22 1 M/3 F
All sub-adults	26 1 M/1 F	28 2 F	18 3 M/2 F	2 1 F	10 3 F	84 4 M/9 F
18-40y	2	1 1 M	5 2 F	2 2 M	5 3 M/1 F	15 6 M/3 F
>40y	5 4 M/1 F	10 5 M/3 F	8 4 M/3 F	1 1 M	6 5 M/1 F	30 19 M/8 F
Unknown age	17	13 2 M/3 F	9 2 M/1 F	3	8 2 M/1 F	50 6 M/5 F
Total adults	24 4 M/1 F	24 8 M/6 F	22 6 M/6 F	6 3 M	19 10 M/3 F	95 31 M/16 F
Totals	**50** **5 M/2 F**	**52** **8 M/8 F**	**40** **9 M/8 F**	**8** **3 M/1F**	**29** **10 M/6 F**	**179** **35 M/25 F**

among those who died before reaching the age of six years. It appears that if a child managed to survive past the first five or ten years, he or she would very likely live well beyond the age of 40 years.

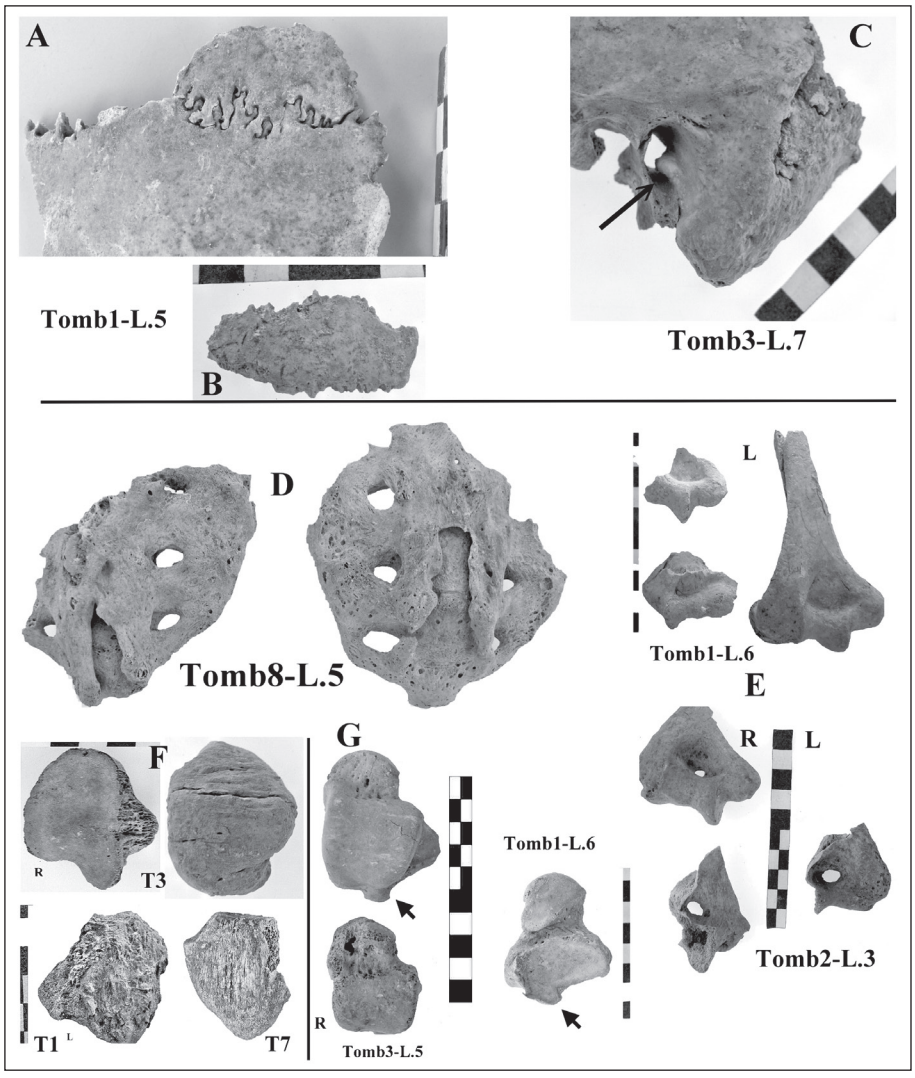
Biological Characteristics

Osteometric measurements were obtained from skeletal parts of unknown sex. Since they are known to display strong sexual dimorphism, they were only applied to differentiate between burials and are not considered further here. A number of epigenetic (normal anatomic) variants were documented. These traits are largely hereditary and tend to be evenly distributed with some exceptions among both sexes, (Hauser and de Stefano 1989; Czarnetzki 2001). The available skeletal material allowed for the documentation of some of these traits. Their presence or absence on the examined bones per tomb, regardless of body side, is listed at **Table 2**. Despite their limitations, the available data provide some significant observations.

In Locus-5 of Tomb-1, a relatively large elongated and nearly rectangular sagittal ossicle was part of the incomplete cranial parts of an adult and a two to five year old child (**Fig. 2a, b**). Both are almost of similar shape and size (adult 45x25mm; child 41x22mm). Anatomically, the ossicles appear to be part of the right parietal bone connected with the left one just above the lambda point. These features discriminate the two cases from those reported elsewhere in terms of position, size, and shape (*e.g.* Khan *et al.* 2011:293). Though the heritability of cranial ossicles was suggested to be low (Bennett 1965; Hauser and de Stefano 1989:84-87), the resemblance in shape and incidence of the sagittal ossicles in the same locus suggests that their bearers could be related. Auditory torus exostoses, bone outgrowths in the ear canal (**Fig. 2c**), were present in the temporal bones of at least two individuals from Tomb-1 and 3. The trait has been linked to cold water exposure in marine resources exploiting populations (*e.g.* Kennedy 1986; Mazza 2016:428). The cases from al-Masarrāt, located on the fringe of the arid eastern Jordan, contradict such a suggestion. Hence, the trait appears to be influenced by biological rather than environmental factors as earlier suggested (*e.g.* Hutchinson *et al.* 1997; Godde 2010:488). The third trait is spina bifida (SB), in which the sacral canal of the sacrum varies from pathologically complete open to normal closed. Amongst the nine examined sacral parts from al-Masarrāt, there were

Table 2: Normal anatomic (epigenetic) variants observed in the human skeletal material from the five al-Masarrāt cave tombs in absolute numbers (also **Fig. 2**). The table reflects the state of available skeletal material (v: the absolute number observed; n: total examined bone parts; ?: uncertain case).

Tomb Trait	Tomb 1 v/n	Tomb 2 v/n	Tomb 3 v/n	Tomb 7 v/n	Tomb 8 v/n	Totals v/n
Metopic suture	1/3	0/3	0/1	0/2	0/1	**1/10**
Suprameatal spine	2/3	7/9	3/4	0/1	2/2	**14/19**
Suprameatal depression	2/3	3/9	3/4	0/1	2/2	**10/19**
Auditory torus exostoses	1/3	1? /9	1/3	0/1	0/1	**2+1?/17**
Sagittal ossicle	2+1?					**2+ 1?**
Squamo-mastoide suture	1/3	3/8	3/4	1/1	2/2	**10/18**
Mastoid foramen	1/2	7/8	3/4		2/2	**13/16**
Lambdoid ossicle	1/1		1/1		1/2	**3/4**
Bilateral parietal foramen	1/3	2/4	0/1		3/4	**6/12**
Molar carabellis	1/19	4/94	1/41	1/13	1/25	**8/192**
Ponticolus atlantis	2/5	0/2			1/2	**3/9**
Divided atlas articulation	1/4		1/2		0/2	**2/8**
Cervical transvrs. foramen	10/14	1/5			1/5	**12/24**
Septal aperture	3/19	3/7	3/16	0/2	0/5	**9/49**
Stieda's process	5/11	6/13	16/22	1/1	2/5	**30/52**
Patellar variants	1/3	3/9	3/7	1/1	0/1	**8/21**
Spina Bifida	1/1	1/2	1/2		4/4	**7/9**



2. Most relevant examples of the normal anatomic (epigenetic) variants observed in the human bones from the al-Masarrāt cave tombs. |a-b: Sagittal ossicle of an adult and a child; |c: Auditory torus exostoses on the left cranial side (arrow); |d: Mild and medium spina bifida; |e: Absence (upper) and presence (lower) of the septal aperture on the distal end of the humerus; |f: Patellar variants from different tombs; |g: Stieda's process of the talus (arrow) (in all figures, scale in cm if present).

six mild and one medium cases of SB (closure reached the end or begin of the third sacral segment, **Fig. 2d**). Also of interest were patellar variants and stieda's process of the talus. These were obviously more frequent at al-Masarrāt (33.3% and 57% respectively) than reported elsewhere (comp. Scapenilli and Capasso 2000:29; Reddy 2015:60). These ratios appear to suggest gene fixation known to occur in small inbred populations (Corruccini 1974:438).

Though not detailed at (**Table 2**), the available data displayed concentrations of some significant traits in a single locus, as was the case in the sagittal ossicles, septal aperture of the humerus, and mild SB, while in others, *e.g.* patella, Stieda's process, they were distributed between the different *loci* of the five tombs (**Fig. 2d-g**). These observations can hardly be random. Hence, it might be possible to argue that burials in single *loci* belong to members of a nuclear family affiliated to an extended family or clan that used the tomb as a 'familial' burial place. Also, the different tombs could represent the different clans or lineages of a small interrelated, multi-lineal, and endogamic population at a given time. These assumptions, though highly speculative, might be considered to reflect a social organization that does not differ much from the one that prevailed regionally and locally in past (*e.g.* Joffe2002:454; van der Steen 2002:10-33, 81-86) and present times (*e.g.* Falah 1982:286; Nabulsi 1999). Nevertheless, more and better evidence is required to infer on this hypothesis.

Pathology

A total of 456 permanent and 15 deciduous teeth were retrieved from the excavated tombs. Most of these were detached from their sockets. Restricting observations to strong dental

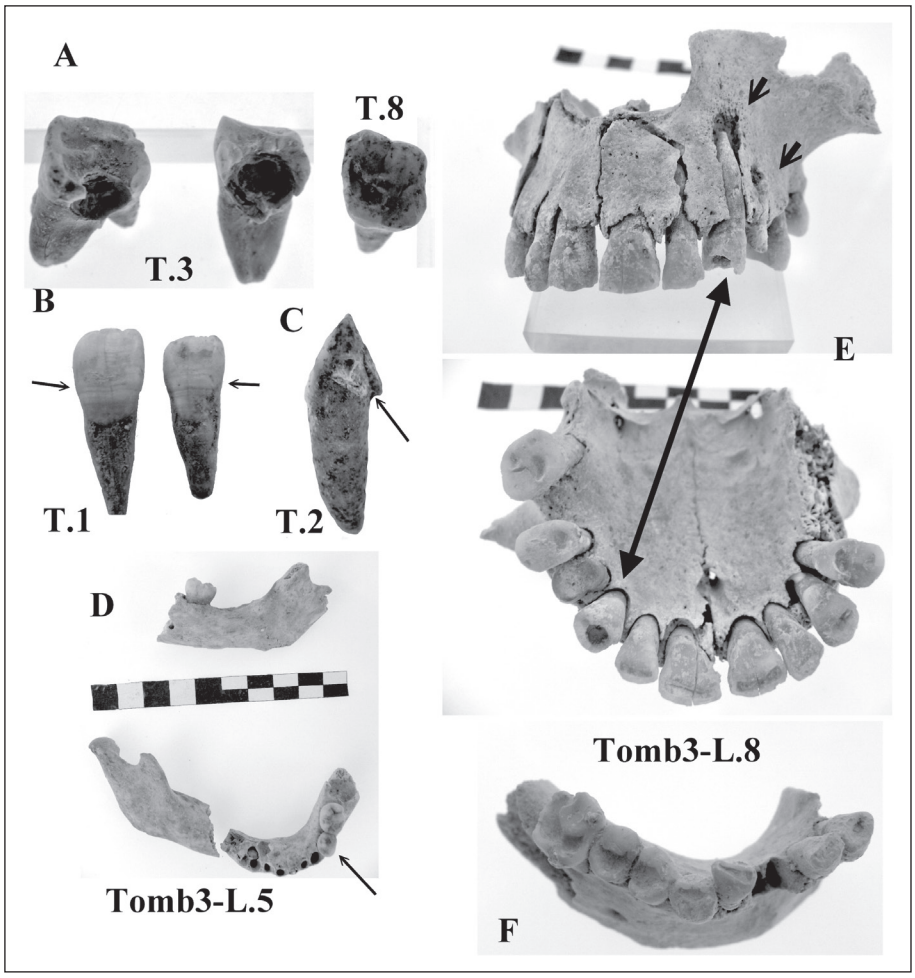
wear (grade 5 or higher) there were variations in the incidence ranging between 20 and 40% of the teeth in each tomb (**Table 3**). Dental wear in some teeth was manifested by cavitation of the chewing surfaces, mostly with no evident caries. Except for Tomb-1, carious lesions were observed in 20-35% of all molars and premolars, and in three canines from Tomb-2 and 3 (*ca.* 12% of all teeth) predominantly in adults. They were present on the chewing surface and/or neck of the infected teeth (**Fig. 3a**). The frequencies were within the reported values of local ancient populations (comp. Albashaireh and Al-Shorman 2010). The incidence of caries was suggested to be common amongst agricultural societies and is usually associated with rich carbohydrate diet, such as white bread, figs. and dates (Roberts and Manchester 1995: 48; Hillson 2001). Fragments from six of seven upper and 14 of 20 lower jaws indicated pre-mortem tooth loss, particularly of molars and premolars, mostly with healed sockets. In some cases apical abscesses were observed. In addition to pre-mortem molar tooth loss in one maxillary bone, there were two abscesses on the left side: at the canine with caries and at the neighbouring premolar, which was broken during lifetime. In both cases the alveolar channel was opened with free access of bacteria (**Fig. 3e, f**). It thus appears that pre-mortem tooth loss and abscesses were not always caries related. Paradontoses was found on some fragments from both jaws. Only few teeth revealed calculus. The incidence of enamel hypoplasia was comparatively low. It was present in only 3% of all available teeth from the al-Masarrāt tombs (*cf.* Griffin and Dolon 2007:216; Perry 2007; Weeler 2012:226). These included 4 canines and 10 incisors from the Tomb-1, 2 and 7. Enamel hypoplasia is usually associated with childhood stress conditions, *e.g.* illness (Hillson 2001:265).The multiple horizontal lines on the enamel of the 14 affected teeth (**Fig. 3b**) suggested multiple stress situations during the first six years of life, as classified by Grupe *et al.* (2015:353, Abb. 8.70).

There were many examples of inflammatory lesions in the sub-adult skeletal material, particularly in infants and children below five years of age (**Fig. 4**). They appeared to be proportionally distributed between the five tombs. The lesions were mostly in the form of new bone formation on the cranial inner surface (meningitis) or on the surfaces and joints of long bones, which is typical for non-specific generalized infection. In one extreme case, the bones were ensheathed with a woven bone layer (**Fig. 4c**). Inflammatory reactions are responses to chronic bacterial infections (Roberts and Manchester 1995: 125; Ortner 2003:179-226). Many childhoods infectious diseases develop within days and if fatal leave no trace on the skeleton. Nonetheless, they were most probably the main factor behind al-Masarrāt's child mortality.

The adult skeletal material provided evidence for at least 25 cases of inflammatory responses to chronic bacterial infections, whereof their incidence was lowest in Tomb-2 (**Table 3**). They included three parietal bones of the skull and 22 long bones, pectorals, and even a metatarsal

Table 3: Absolute numbers of pathological observations made on the skeletal material from al-Masarrāt cave tombs. (C: caries; H: enamel hypoplasia; W: strong tooth wear, n: number, d: deciduous teeth).

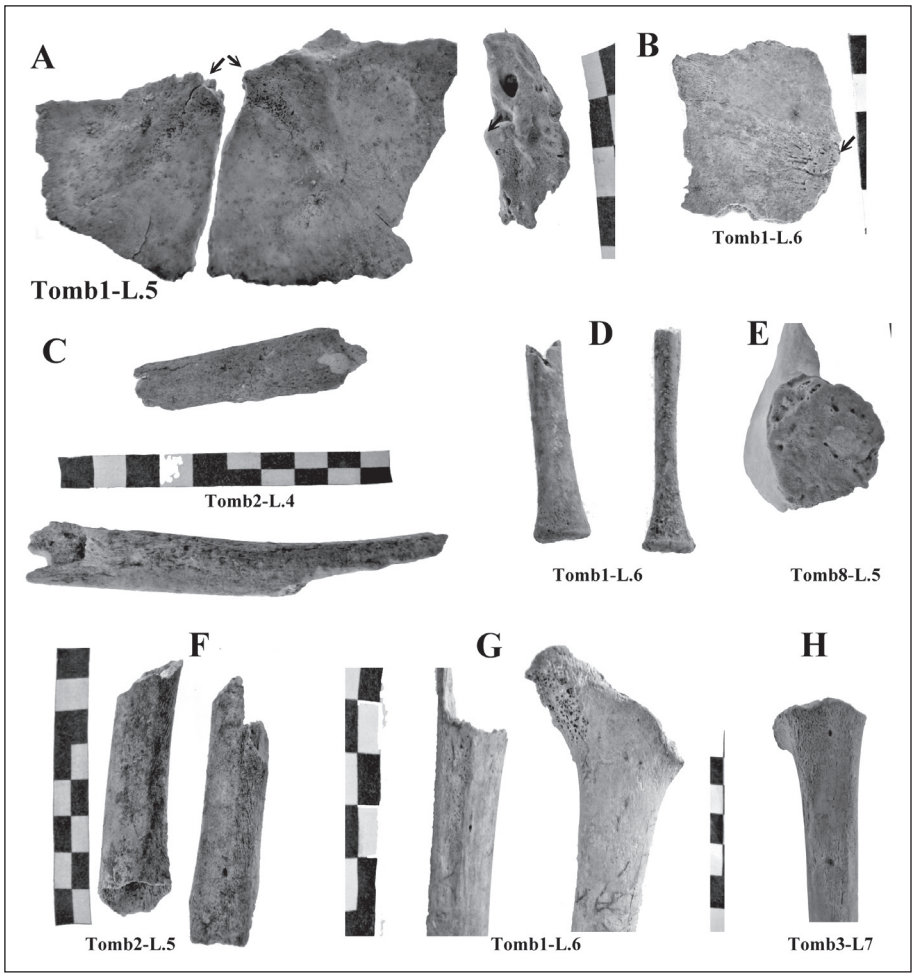
Tomb	**Tomb 1**	**Tomb 2**	**Tomb 3**	**Tomb 7**	**Tomb 8**
Teeth	C-H-W/n	C-H-W/n	C-H-W/n	C-H-W/n	C-H-W/n
Molars	1-0-2/19+3d	19-0-15/94+6d	9-0-7/41	5-0-2/13	5-0-5/25+2d
Premolars	0-0-2/11	9-0-12/54	4-0-13/21	1-0-2/3	0-0-1/6
Canines	0-1-4/14	1-2-14/44+1d	2-0-11/13	0-1-3/4	0-0-1/2
Incisors	0-5-5-/13+2d	0-4-3/42+1d	0-0-9/18	0-1-1/3	0-0-0/1
Totals	**1-6-13/62**	**29-5-44/242**	**15-0-40/93**	**6-2-8/23**	**5-0-7/36**
Traumatic injury	3		4		1
Cribra orbitalia and	2				
Cribra cranii				2	1
Tumour	1	1			
Osteochondroses d.	3	1	3		1
Inflammatory lesion	7	3	7	2	6



3. Dental pathology. |a: Two molars with caries lesions on the neck and a third on the chewing surface (occlusal); |b: Two incisors with enamel hypoplasia (arrows); |c: Tooth calculus on a canine; |d: Lower jaw of a five-year-old child with caries on one premolar (arrow); |e-f: Upper and lower jaws of >40-year-old male with caries and tooth loss. There are two abscesses on the left maxillary canine and 1st premolar (small arrows).

(**Fig. 5a-c**). Periostitis was observed on fibulae in at least nine different burials. In most cases they were localized on the median shaft surface near the proximal epiphyses (**Fig. 5c**). In addition, a juveniles' femoral shaft (Tomb-1) as well as two tibiae (Tomb-2) showed periostitic lesions similar to those found on the fibulae (**Fig. 4f-h**). The localization and distribution of the lesions is typical for treponemal disease (*cf.* Roberts and Manchester 1995:151-9; Ortner 2003:273-319). This was substantiated by two further observations. The surface of a right radius (Tomb-8) revealed a gummatous osteomyelitis in the form of multiple shallow, 3-5mm diameter cavities (**Fig. 5d**). Most of the external surfaces on parietal bones from two burials in Tomb-3 and 7 were covered by 1-2mm porous lesions (**Fig. 5a**) similar to those described by Hackett (1981) as "caries sicca sequence". The most probable form of treponematosis in this arid rural area is endemic syphilis, well known in this region since antiquitiy (Hackett, 1963).

Osteomyelitis was diagnosed on one rib and the mid-shaft of a tibia. In Tomb-1, Locus-14, there was an osteomyelitic lesion on a right humerus at the level of a lateral osteochondroma (benign tumour) and ventral periostitis on a possibly corresponding left humerus. Another osteochondroma was present near the distal end of a fibula from Tomb-2 (**Fig. 6a, b**). In Locus-6 of Tomb-1, a child's and an adult skull revealed an unhealed cribra orbitalia, while cribra cranii with thick cranial wall was observed on fragments from three *loci* of Tomb-7 and 8 (**Fig. 7**). These pathological conditions were often associated with nutritional irregularities and infectious diseases, though others including factors affecting blood circulation are more likely (*e.g.* Facchini *et al.* 2004; Wapler *et al.* 2004; McIlvaine 2015). Analyses of degenerative alterations were limited by the quantity and quality of available articulation (join) surfaces. When present, they were mild on the elbow joints, mostly medium to strong on the articulation surfaces of the shoulders, hip, knees and feet (**Fig. 8**). Degenerative changes were



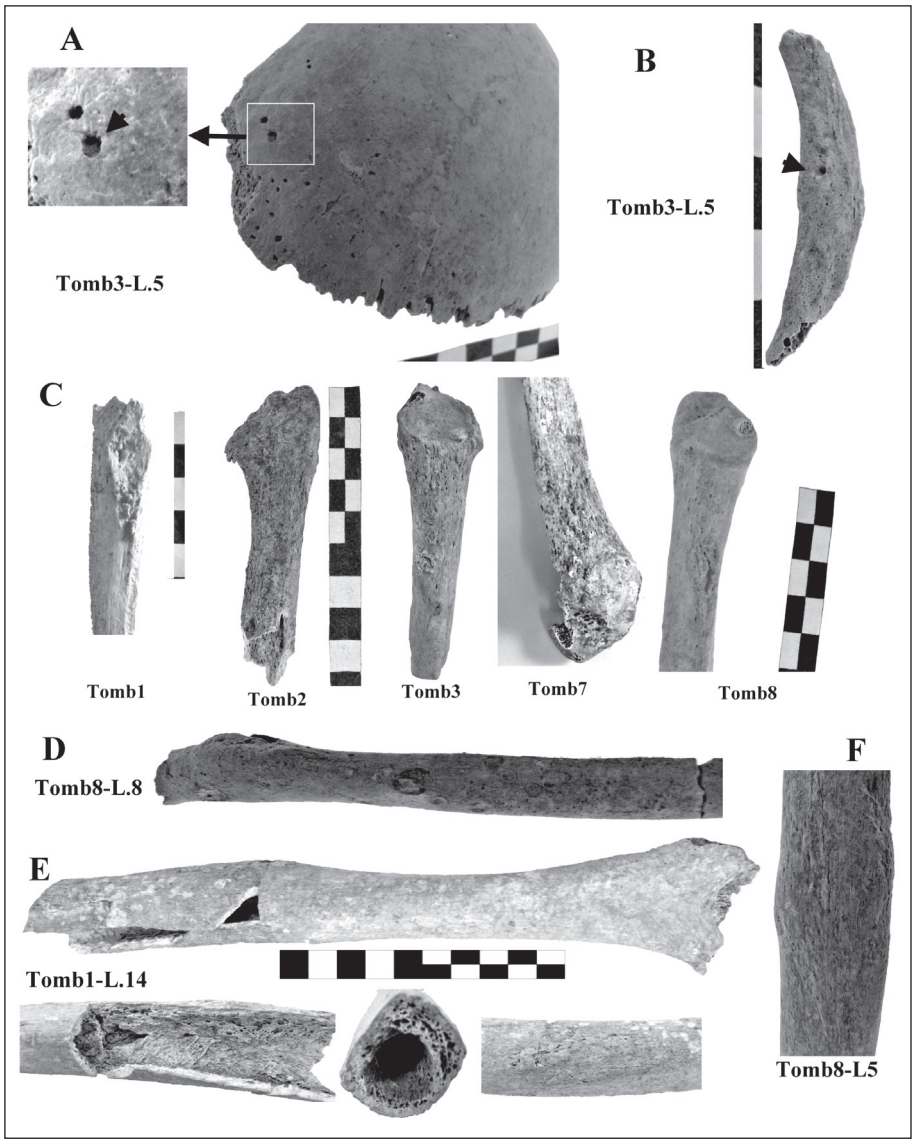
4. Pathological features observed in sub-adults: |a, b: Inflammatory lesions on inner cranial surfaces; |c: Long bones of a ca five-year-old child ensheathed with woven bone; |d: Inflammatory lesions on the long bones of an infant; |e: Inflammatory lesions on a pelvic part of a child <5 years of age; |f-h: Periostitis on the long bones of juveniles (12-17 years of age) from different tombs.

sporadic in the scanty vertebral material. They were strong in some of the first two vertebrae, atlas and axis, and mostly light to medium in the other cervical vertebrae. The thoracic and lumber vertebrae were mostly damaged, although there were two with strong osteophytic outgrowths and at least one with Schmorl's nodes (**Fig. 8a, c**). The observed degenerative alterations seem to indicate physical activity or stress, involving the shoulder and lower extremities in particular. This was substantiated by enthesopathies that formed on muscle insertions of different bones. In this material they were mostly present on ulnae and bones of the lower extremities (**Fig. 9a-c**). A vertebral body and a fragment of a female ilium were the only bone parts with signs of osteoporosis.

Osteochondroses dissecans (OD: pitting of articulation surfaces) excluded, there were a number of healed traumatic injuries, with one exception all from Tomb 3. They included two minor compression fractures on skulls, injuries on two fibulae, fractures of one proximal metatarsal, and near the distal end of a left ulna (**Fig. 6d**). The healing of the fourth metatarsal resulted in its fusion, medially, with the fifth (**Fig. 6e**). Also, a right scapular lateral margin suggests a possible shoulder dislocation. OD was observed on the joint surfaces of at least three patellae and three different feet bones (**Fig. 8g-j**). The surfaces of a number of bones often revealed multiple, short and deep double-line scratches that were probably caused by scavenging rodents (**Fig. 9d**). These are very different from the curved shallow grooves on the lateral surfaces of two tibiae (**Fig. 9e**). These are blood vessels grooves, usually associated with active terrestrial mobility (Sołtysiak 2015:350).

Cremation burials

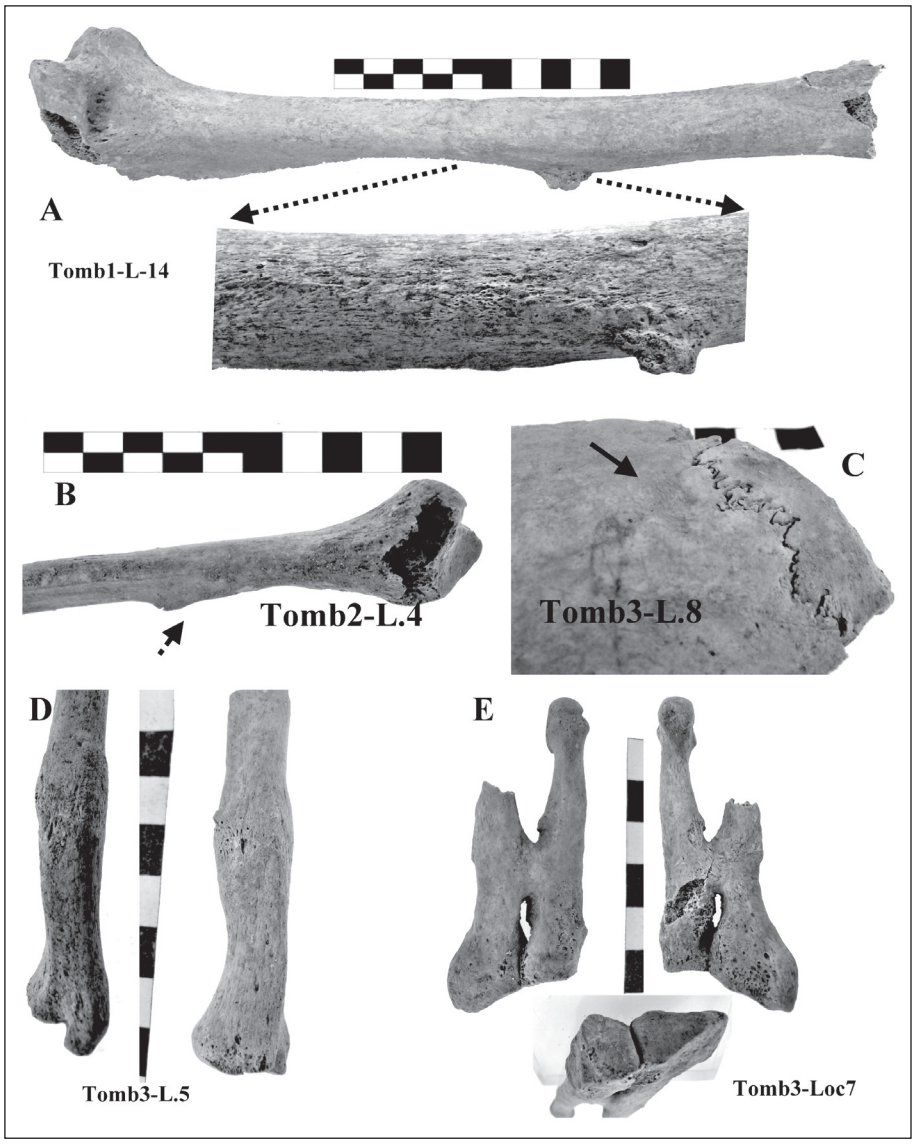
Among the examined human skeletal material there were a number of deformed bone fragments. These were coiled (inwardly bent) with longitudinal, horizontal, and circular cracks on their surfaces. They had a whitish or grey



5. Inflammatory lesions: |a: Caries sicca on the parietal bone with enlarged radiant pores; |b: Osteomyelitis in a rib with pus outlet (arrow); |c: Different fibulae with periostitis; |d: Gummatous osteomyelitis on a right radius; |e: Reconstructed right humerus with osteomyelitis; |f: Osteomyelitis on a tibia shaft fragment.

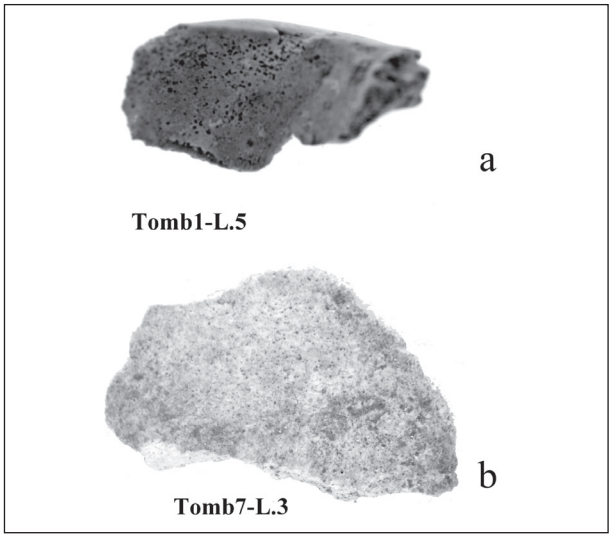
to light blue colour, while others were black or charred. Coiling and cracks in human bones are caused when the corpse is incinerated in temperatures of 700-1100 C° (Grupe *et al.* 215:125-9). It is evident that this was the case in these deformed bones from al-Masarrāt, though some fragments suggested burning temperatures in the lower part of the afore mentioned range. This could be attributed to inexperience and/or insufficient fuel (wood) or other random factors. The archaeological context and available evidence indicate that cremation was practiced by this local community during the Roman period. Cremated human bones were found in three al-Masarrāt tombs: Tomb-2 in six *loci* of 3 rooms, two *loci* of Tomb-3, and one locus of Tomb-8 (**Fig. 10**). This implies that these tombs were in use from at least the 2nd century AD, if not earlier, since the practice of cremation was abandoned in Rome by the end of that century (Toynbee 1971: 50; Morris 1992:31-34). The available cremated bones only allow for the assumption of single cremation burials in each locus, or at least one in each of the five burial rooms of the three tombs, given the disturbed state in which the tombs were found. Thus, the estimated minimum number of burials in the five al-Masarrāt tombs increases to 184 if not 188.

The incidence of Roman cremation burials in and around Jordan is suggested to be rare. So far, there are eight reported cremation burials from six different sites in Jordan. Beside Ibrahim and Gordon (1987:15-18, plate 6) and Al Muheisen and Tarrier (1996), Abu-Shmeis and Nabulsi (2009) reported on four further cases

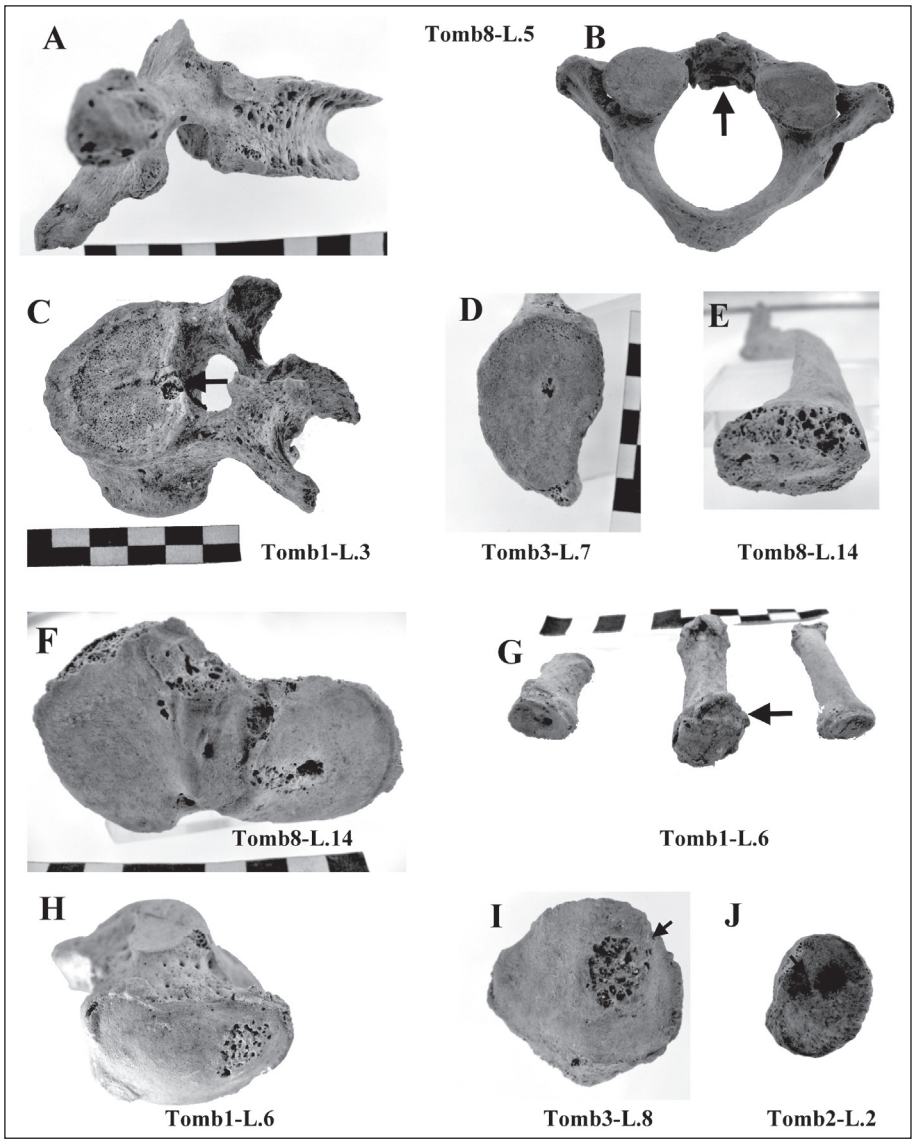


6. Tumours and traumatic injuries: |a: Osteochondroma on a left humerus with periostitis; |b: Left fibula with an osteochondroma (arrow); |c: Small traumatic injury on the left parietal bone; |d: Left ulna with a healed fracture; |e: Healed fourth metatarsal fracture led to fusion with the fifth.

alongside information on Roman cremations in and around Jordan. The majority of the cremated bones were of adults and those in Tomb-8 of a male (**Fig. 10d**). The four cremation burials from Umm as-Summāq al-Janūbī and the Ḥajarah cave tombs in Amman were also reported to be of adult males (Abu-Shmeis and Nabulsi 2009:520-522). These finds were the only cremation remains that were the subject of biological examination. It thus appears that Roman cremation burials in Jordan were restricted to adult males. All previously reported cases were urn cremations, in which pottery or leaden urns were used to store the incinerated human remains. Most of the cremated material from al-Masarrāt was muddy. The bones were obviously scattered on the floor of the burial beds. The original urns, if used, were possibly



7. |a: Cribra orbitale in the right orbita of a five-year-old child; |b: Cribra cranii on an adult's left parietal bone with thickening of the diploe.

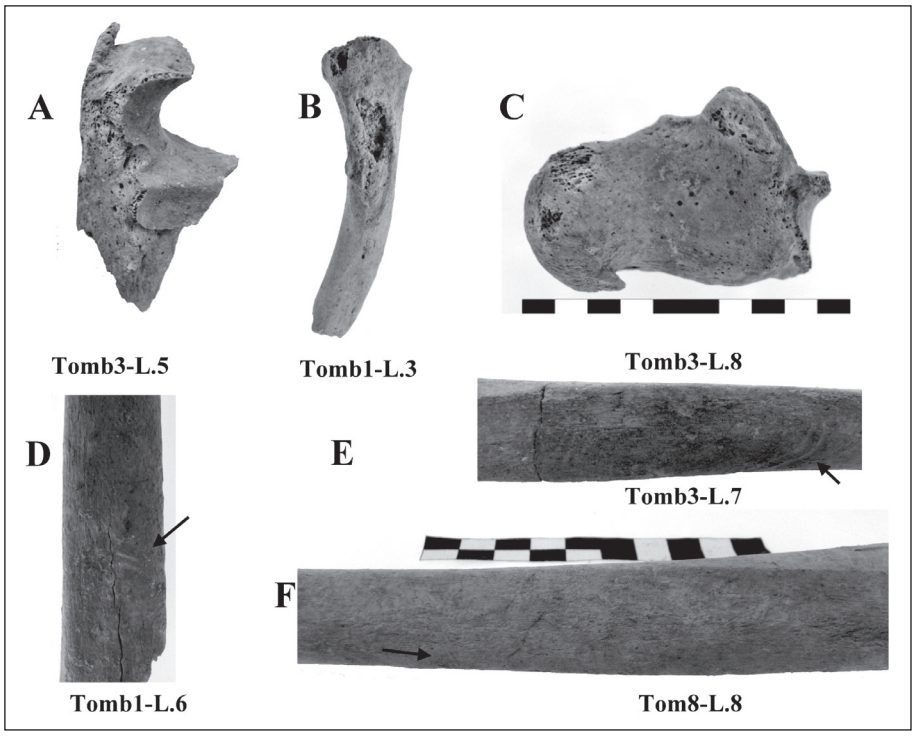


8. Degenerative alterations: |a: Lumbar vertebra with osteophytic outgrowths; |b: Caudal view revealing degenerative changes on the atlas's articulation facet with the axis's dens (arrow); |c: Schmorl's nodes (arrow) on a lumbar vertebra; |d: Glenoid cavity with arthrosis; |e: alterations on the sternal facet of a right clavicular; |f: Degenerative alteration on a right tibia's proximal (knee) articulation surface; |g: Metatarsals with osteochondrosis dissecans (left), healed intra-articular fracture (middle [arrow]) and degenerative features (right); |h: Left talus with arthrosis; |i, j: Osteochondrosis dissecans on a left patella and metatarsal.

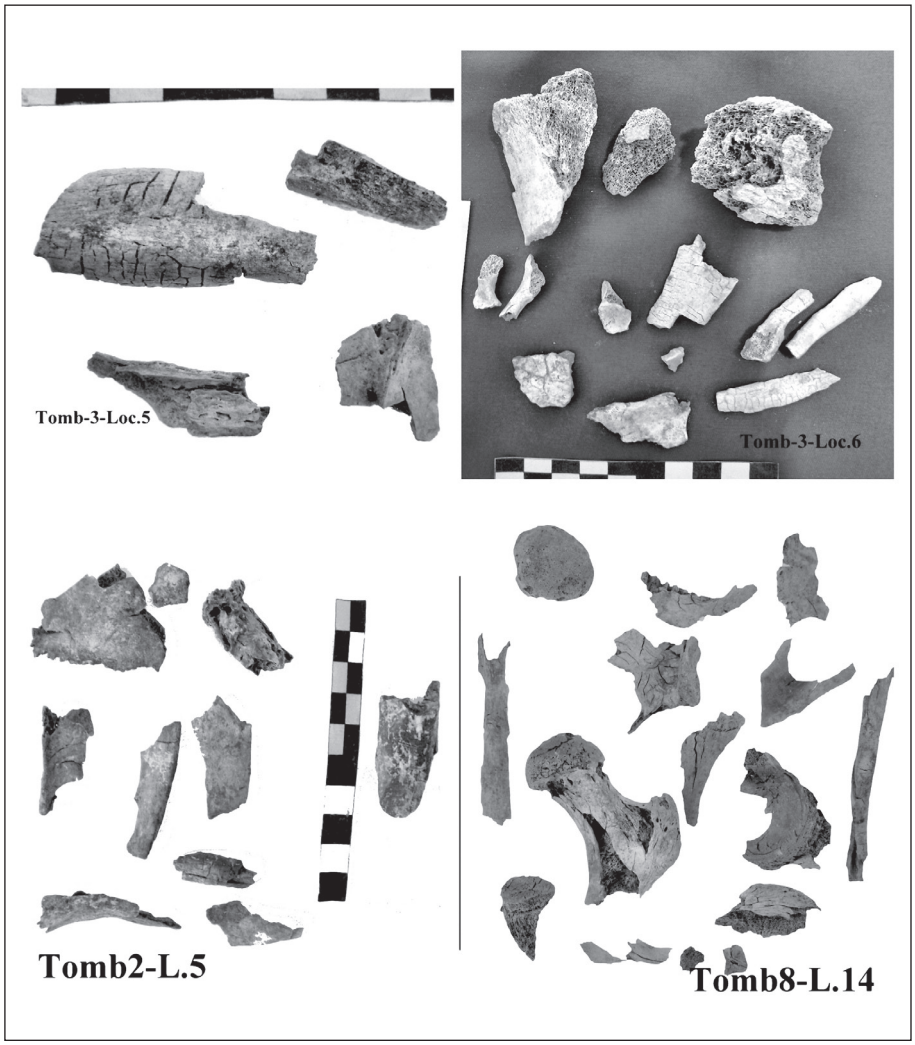
broken or damaged as indicated by multiple pottery fragments (see below) or even reused for other purposes in later times. The cremation evidence implies that some of al-Masarrāt's small agricultural community had the resources to practice this expensive funerary ritual. It can also be understood as an indication of cultural influence in the sense of practising this funerary rite like '*civi*'-lized Romans.

Animal Bone

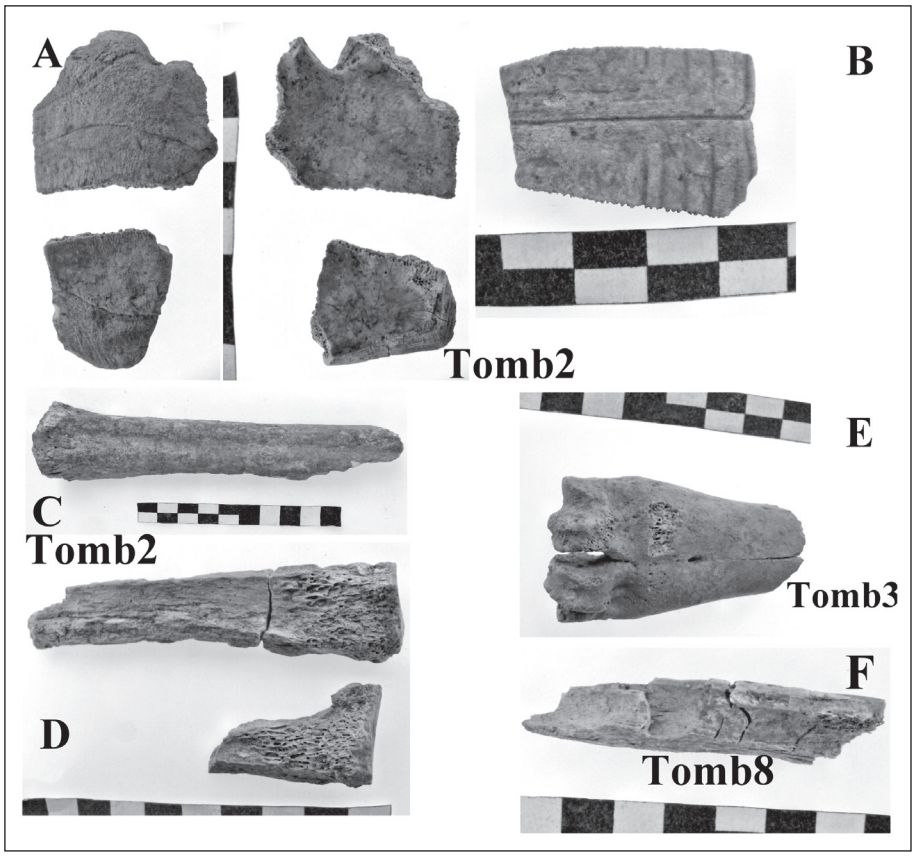
There were two types of animal bone deposits found in the al-Masarrāt tombs. The first included single fragments of sheep and/or goat foot bones found in multiple *loci* of Tomb-2 and 3. Some of these indicated possible cut or butchery marks (**Fig. 11c-e**). This kind of deposits is usually associated with funerary feastings, a practice with a long history in the burial customs of this region (*e.g.* Becker 2002; Al-Muheisen 2008; Al-Shorman and Khwaileh 2011; Beech 2012). A further fragment was found among the cremated bones from Tomb-8 (**Fig. 11f**). This suggests that feasting was also part of the cremation ritual that is known elsewhere, particularly in Roman Europe (Toynbee 1971; Pierce, 1998: Kunst and Doneus 2013:399). There are no similar finds in any of the reported Roman cremation burials from this region. Other animal bones found were accidental and appear not to have been burial related. These included some rodent bones, the presence of which is also evidenced by the aforementioned marks on many of the human bones. Multiple fragments identified as the shells (carapace) of freshwater turtles or tortoises were found among the bone



9. Non-pathological features: |a-c: Enthosopathies on different bones; |d: Rodent bite; |e, f: Blood-vessel impressions.



10. Cremated human bones found in different loci of Tomb-2 and 3; the material from Tomb 8 was of an adult male.

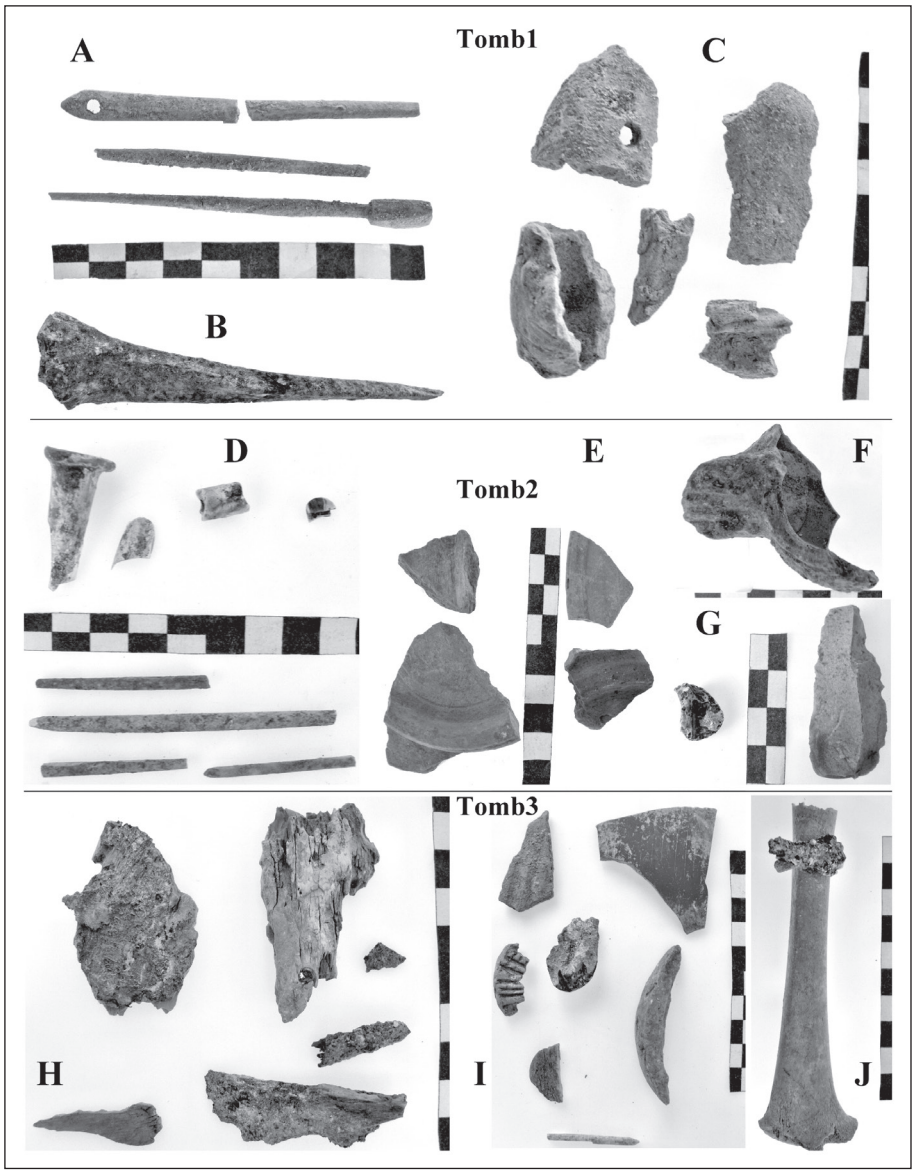


11. Animal bones found in the al-Masarrāt tombs: |a, b: Fragments of freshwater-turtle/ tortoise carapace; |c-e: Goat or sheep tarsal fragments with cut marks; |f: Cremated animal long-bone fragment.

material from Tomb-2 (**Fig. 11a, b**). Though the incidence of these reptiles has been confirmed in some archaeological reports (*e.g.* Simmons *et al.* 1988:38, Grosman *et al.* 2016), the preserved condition of this material suggest a much younger date than that of the human burials. Their presence is possibly related to a total or partial inundation of the tomb. Hence, the disturbances in this tomb at least may have been partially due to natural cause.

Other Objects

Beside the previously reported objects (Gharib 2004:29, 34) fragments of archaeological material were found comingled with the retrieved human remains from al-Masarrāt cave tombs. There were pottery fragments from Tomb-2 and 3, all most probably of Roman date. They included fragments of two red-brown oil lamps, one with a handle and discoid body, the bases of light brown platters and vessels, possibly of 15-25cm diameter, and a body sherd of a typical red Roman vessel (**Fig. 12e, i**). Also, fragments of a handmade earthen object of a yellowish colour were recovered from Tomb-1. This oval shaped object with rough surfaces was of about 9cm length and 4.5cm diameter. There was a 5mm perforation near the top of the narrow end (**Fig. 12c**). The function and date of this closed, obviously man made, spindle-shape object remains unknown. A palm wood fragment of *ca.* 35×50×5mm with a 'rusty' *ca.* 3mm nail perforation, a smaller second one with an iron-rust surface, and a much smaller third one was probably associated with a flat, right angle-bent iron fragment (*ca.* 6×2cm) and two 2mm thick, flat bronze fragments (largest *ca.* 3×1cm). The metal fragments revealed traces of wood on one surface suggesting that all were part of a wooden box, obviously not a coffin (**Fig. 12h**). Personal items found could be of either Roman or Byzantine date. These consisted of multiple bone or ebony needles fragments (perforated end), as well as long hairpins, iron rings and bracelets. Furthermore, there was a fragment of an anklet attached to the distal end of an infant's left tibia in Tomb-3 (**Fig. 12a, d** and **j**), as well as a 'knife' made of animal bone (**Fig. 12b**). Also present were two flints in Tomb-2, which could be evidence of much earlier human activity in this tomb and region (**Fig. 12f, g**), whereby contamination cannot



12. Objects found among the analyzed bones from Tomb-1, 2 and 3.

be excluded. The pottery and numismatics evidence presented previously (Gharib 2004) and here, as well as the evident practice of cremation indicate that the five al-Masarrāt tombs of this report were in continuous use as burial places from the 1st or 2nd century AD up to and not beyond the 4th century AD.

Summary and Conclusion

This report has presented information obtained primarily from human remains recovered from five excavated cave tombs in al-Masarrāt near az-Zarqā'. The fragmentary mix of incomplete skeletal material requires treating these results with caution. Still, the material provides some significant and informative points about the ancient local population under study. The five cave tombs are related to the small al-Masarrāt settlement nearby (Gharib 2004:25), and as noted above they were possibly in continuous use from the 1st to the late 4th centuries AD. The total number of burials in these tombs was estimated at between 184 and 188. Biological analyses of the skeletal material suggests that the community of that time consisted of multiple inter-related units or families with an estimated total population size of 50±10 individuals, excluding possible servants and slaves. The skeletal material reflects health conditions often found among agricultural communities. These include high child mortality, frequent caries and infectious lesions, strong degenerative alterations of the joint surfaces of the extremities, as well as the formation of

enthesopathies. There are sufficient observations suggesting that the community suffered from an endemic infectious illness, probably endemic syphilis. The observed relative low incidence of enamel hypoplasia may contradict the observed frequency of infectious lesions. These observations do not reflect socio-economic hardship but rather the hazards that confronted an agricultural community of that time. In Roman times, some members of this agricultural community had the resources to practice the expensive cremation funerary ritual, at least once in each of the three tombs. The material also provides evidence that feasting was part of the community's funerary rites. Low or no incidences of enamel hypoplasia, the presence of animal bones, as well as evidence of human cremation are findings restricted to Tomb-2, 3 and 8. It is unclear whether these observations are connected.

Abdalla J. Nabulsi
Universität Hamburg, Germany
fbga023@universität hamburg.de

Romel Gharib
Department Antiquities of the Jordan.

Ahmad Lash
Department Antiquities of the Jordan.

Bibliography

Abu-Shmeis, A. and Nabulsi, A.J.
2009 Cremation Burials in Amman, Jordan. *SHAJ* X: 513-525.

al-Muheissen, Z. and Tarrier, D.
1996 Les Fouilles de Yasileh (Jordanie du Nord): Le Site et la Nécropole dans Une Perspective Régionale. *Syria* 73: 185-196.

al-bashaireh, Z.S.M. and al-Shorman, A.A.
2010 The Frequency and Distribution of Dental Caries and Tooth Wear in a Byzantine Population of Sa'ad, Jordan. *Int. J. Osteoarchaeol.* 20: 205-213.

al-Muheisen, Z.
2008 Archaeological Excavations at the Yasileh Site in Northern Jordan: The Necropolis. *Syria* 85: 315-338.

al-Shorman, A. and Khwaileh, A.
2011 Burial Practices in Jordan from the Natufians to the Persians. *Estonian Journal of Archaeology* 15: 88-108.

Badawi, M.
2007 Huit Tombes Hellénistiques et Romaines à Jablé. *Syria* 84: 185-204.

Becker, C.
2002 Nothing to Do with Indigenous Domestication? Cattle from Late PPNB Basta. Pp.112-137 in H. Buitenhuis, A.M. Choyke, M. Mashkour and A.H. al-Shiyab (eds.), *Proceedings of the Fifth International Symposium on the Archaeozoology of Southwestern Asia and Adjacent Areas*, ARC-Publicaties 62: Groningen.

Beech, M.
2012 The Mammal Bones. Pp. 449-558 in K.D. Politis (ed.), *Sanctuary of Lot at Deir 'Ain 'Abata in Jordan. Excavations 1988-2003*. Jordan Distribution Agency: Amman.

Bennett, K.A.
1965 The Etiology and Genetics of Wormian Bones. *Am. J. Phys. Anthrop.* 23: 255-260.

Berry, A.C and Berry, R.J.
1967 Epigenetic Variation in the Human Cranium. *J. Anat.* 101: 361-379.

Bräuer, G.
1988 Anthropometrie. Pp. 160-285 in R. Knußmann (ed.), *Anthropologie*. Vol. I-1. Gustav Fischer Verlag: Stuttgart, Germany.

Corruccini, R.S.
1974 An Examination of the Meaning of Cranial Discrete Traits for Human Skeletal Biological Studies. *Am. J. Phys. Anthrop.* 40: 425-446.

Czarnetzki, A.
2011 Apologie. *Bulletin der Schweizerischen Gesellschaft für Anthropologie* 6: 1-88.

Daszewski, W.A.
2008 Graeco-Roman Town and Necropolis in Marina el-Alamein. *PAM Research2008,* 20: 421-456.

Facchini, F., Rastelli, E. and Brasili, P.
2004 Cribra Orbitalia and Cribra Cranii in Roman Skeletal Remains from the Ravenna Area and Rimini (I-IV Century AD). *Int. J. Osteoarchaeol.* 14: 126-136.

Falah, G.
1982 *The Processes and Patterns of Sedentarization of the Galilee Bedouin 1880-1982*. PhD thesis, Durham University.

Fennigan, M.
1978 Non-Metric Variation of the Infracranial Skeleton. *J. Anat* 125: 23-37.

Gharib, R.
2004 Preliminary Report on the Archaeological Excavations in al-'Ālūk and al-Masarrāt Site (East al-Masarrah) in the Seasons 2002/2003/2004 (Arabic). *ADAJ* 48: 23-35.

Godde, K.
2010 An Examination of Proposed Causes of Auditory Exostoses. *Int. J. Osteoarchaeol.* 20: 486-490.

Griffin, R.C. and Donlon, D.
2007 Dental Enamel Hypoplasia and Health Changes in the Middle Bronze Age - Early Iron Age Transition at Pella in Jordan. *Homo* 58: 211-220.

Grosman, L., Munro, N.D., Abadi, I., Boaretto, E., Shaham, D., Belfer-Cohen, A. and Bar-Yosef, O.
2016 Nahal Ein Gev II, a Late Natufian Community at the Sea of Galilee. *PLoS One* 11 (1): http://dx.doi.org/10.1371/journal.pone.0146647.

Grupe, G. Harbeck, M. and McGlynn, G.C.
2015 *Prähistorische Anthropologie*. Springer-Verlag Berlin Heidelberg: Stuttgart.

Hackett, C.J.
1963 On the Origin of the Human Treponematoses. *Bull. Wld. Hlth. Or.* 29: 7-41.
1981 Development of Caries Sicca in a Dry Calvaria. *Virchows. Arch. (Pathol. Anat.)* 391: 53-79.
Harding, G.L.
1950 A Roman Family Vault on Jebel Joffeh, 'Amman. *QDAP* 14: 81-94.
Hauser, G. and de Stefano, G.F.
1989 *Epigenetic Variants of the Human Skull*. Schweizerbart Verlag: Stuttgart.
Hillson, S.
2001 Recording Dental Caries in Archaeological Human Remains. *Int. J. Osteoarchaeol.* 11: 249-289.
Hutchinson, D.L., Denise, C.B., Daniel, H.J. and Kalmu, G.W.
1997 A Reevaluation of the Cold Water Etiology of External Auditory Exostoses. *Am. J. Phys. Anthrop.* 103: 417-422.
Ibrahim, M. and Gordon, R. L.
1987 *A Cemetery at Queen Alia International Airport*. Harrassowitz Verlag: Wiesbaden.
Joffe, A.E.
2002 The Rise of Secondary States in the Iron Age Levant. *JESHO* 54: 426-467.
Kennedy, G.E.
1986 The Relationship between Auditory Exostoses and Cold Water: A Latitudinal Analysis. *Am. J. Phys. Anthrop.* 71: 401-415.
Khan, A.A., Asari, M.A. and Hassan, A.
2011 Unusual Presence of Wormian (Sutural) Bones in Human Skulls. *Folia Morphol.* 70: 291-294.
Kritzeck, J.A. and Nitowski, E.L.
2015 The Rolling-Stone Tomb F1 at Tell Hesban. *Andrews University Seminar Studies* 18: 77-100.
Kunst, G.K. and Doneus, N.
2013 Roman Graves and Rural Rubbish. Animal Remains from the Roman Cemetery of Halbturn, Austria. *Anthropozoologica* 48: 391-408.
Mazza, B.
2016 Auditory Exostoses in Pre-Hispanic Populations of the Lower Paraná Wetlands, Argentina. *Int. J. Osteoarchaeol.* 26: 420-430.
McIlvaine, B.K.
2015 Implications of Reappraising the Iron-Deficiency Anemia Hypothesis. *Int. J. Osteoarchaeol.* 25: 997-1000.
Morris, I.
1992 *Death-Ritual and Social Structure in Classical Antiquity*. Cambridge University Press: Cambridge.
Nabulsi, A.J.
1999 Mating Patterns and Their Role in the Formation and Structure of the Abbad Tribe in Jordan. Pp. 201-207 in J.M.G. van der Dennen, D. Smilie and D.R. Wilson (eds.), *The Darwinian Heritage and Sociobiology*. Greenwood Publishing Group: Westport.
Nasser, J.
2014 *A New Necropolis Uncovered in Beirut: Analysis of the Funeral Space Management inside a Classical Hypogeum (Preliminary Report).* Pp. 575-590 in P. Bieliński, M. Gawlikowski, R. Koliński, D. Ławecka, A. Sołtysiak and Z. Wygnańska (eds.). 8th ICAANE, Warsaw. Harrassowitz Verlag. Wiesbaden,
Ortner, D.J.
2003 *Identification of Pathological Conditions in Human Skeletal Remains*. 2nd edition. Academic Press: San Diego.
Pearce, J.
1998 From Death to Deposition: The Sequence of Ritual in Cremation Burials of the Roman Period. Pp. 99-111 in C. Forcey, J. Hawthorne, R. Witcher and R. (eds.), *Proceedings of the 7th Annual Theoretical Roman Archaeology Conference, Nottingham 1997*. Oxbow Books: Oxford.
Perry, M.A.
2007 Is Bioarchaeology a Handmaiden to History? Developing a Historical Bioarchaeology. *J. Anth. Arch.* 26: 486-515.
Reddy, M.C.V.K.
2015 Os Trigonum Syndrome – A Case Report. *Int. J. Biomed. Adv. Res.* 6: 60-63.
Roberts, C. and Manchester, K.
1995 *The Archaeology of Disease*. 2nd edition. Cornell University Press, NY, Ithaca.
Scapenilli, R. and Capasso, L.,
2000 Partite and Emarginated Patellae in Victims of the 70AD Vesuvian Eruption. *J. Palaeopath.* 12: 27-35.
Simmons, A.H., Kohler-Rollefson, I., Rollefson, G.O., Mandel, R. and Kafafi, Z.
1988 'Ain Ghazal: A Major Neolithic Settlement in Central Jordan. *Science* 240: 35-39.
Sołtysiak, A.
2015 Vascular Grooves on Human Femora and Tibiae as a Potential Activity-Related Trait. *Int. J. Osteoarchaeol.* 25: 345-351.
Tal, O.
2003 On the Origin and Concept of the Loculi Tombs of Hellenistic Palestine. *East and West* 2: 288-307.
Toynbee, J.
1971 *Death and Burial in the Roman World*. Cornell University Press, NY, Ithaca.
van der Steen, E.J.
2002 *Tribes and Territories In Transition*. PhD Thesis, Groningen University.
Wapler, U., Crubézy, E. and Schultz, M.
2004 Is Cribra Orbitalia Synonymous with Anemia? Analysis and Interpretation of Cranial Pathology in Sudan. *Am. J. Phys. Anthrop.* 123: 333-339.
Weeler S.M.
2012 Nutritional and Disease Stress of Juveniles from the Dakhleh Oasis, Egypt. *Int. J. Osteoarchaeol.* 22: 219-234.