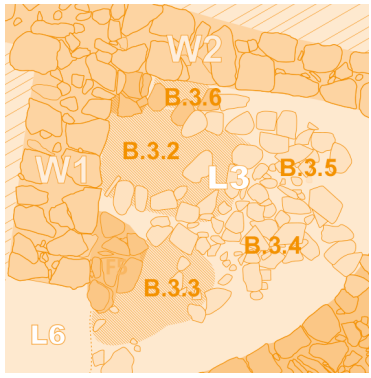
The skeletal remains from Umm an-Nar tomb QA 1-1: spatial distribution and anthropological analysis



Abstract: Collective aboveground circular tombs of stone are one of the main categories of mortuary structures from the Umm an-Nar period (2500–2000 BC) in the Oman peninsula. The tombs have been known since the late 1950s but various aspects of their functioning still await a full explanation. Most of them survived in poor condition, often empty, only a dozen or so actually yielding any human remains. Tomb QA 1-1, one of ten Umm an-Nar-type tombs at Wadi al-Fajj in northwestern Oman, apart from anything else, is promising for bioarchaeological research, yielding a substantial assemblage of human skeletal remains (estimated MNI 25) from two of the four burial chambers excavated between 2016 and 2018. While the excavation of the tomb should be continued, a presentation of the bone assemblage recovered to date, including a distribution analysis of the remains, deposition characteristic, and preliminary osteological analysis, adds to the existing source base of Early Bronze Age populations in the ancient land of Magan.

Keywords: Umm an-Nar, tomb, QA 1-1, Oman, collective grave, osteological examination, MNI, commingled bone deposits

In 2016–2018, a team from the Polish Centre of Mediterranean Archaeology University of Warsaw (PCMA UW), in a joint project with the Department of Excavations and Archaeological Studies, Ministry of Heritage and Culture, Sultanate of Oman, excavated the first

Łukasz Rutkowski[1]
Marta Parol[2]

[1] Polish Centre of Mediterranean Archaeology, University of Warsaw
[2] Independent researcher

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tomb from the QA 1 cemetery site. The site, located near the village of ʿAyn Banī Sāʿada in the mountainous Qumayrah microregion of northern Oman, consists of the relics of ten round tombs (coded QA 1-1 to QA 1-10). The tombs stand on a flat terrace at the foot of a mountain range on the western side of Wadi al-Fajj, opposite a multi-stage settlement located on the eastern side [*Fig. 1*]. The excavation targeted QA 1-1, one of the largest tombs at the site.

QA 1-1 measures 10.80 m in outer diameter, the walls rising to a maximum preserved height of approximately 0.90 m at the highest point in the center of the structure. The outer wall W3 rests on a plinth W4; inside, the chamber is intersected by two inner walls (W1 and W2), resembling a circumscribed cross in plan. Wall W2 (EEN–WWS) divides the interior into two non-communicating halves, each accessible through a separate entrance (not preserved today). Wall W1 (NNE–SSW), which does not reach the outer wall at either end (leaving narrow passages), divides each half into two pairs of communicating burial chambers. These passages probably served as vestibules, as the two presumed entrances to the tomb were opposite one another, most likely on the axis of wall W1. In summary, the tomb consists of four chambers, loci L1 and L2 in the northern half and L3 and L4 in the southern half, as well as two passages: loci L5 and L6. The same ground plan is known from other tombs of the Umm an-Nar type (e.g., Tomb V on Umm an-Nar Island; see Frifelt 1991).

By 2018, one half of the tomb had been excavated: the two opposite chambers, L1 in the northwestern quadrant and L3 in the southeastern quadrant, and both pas-

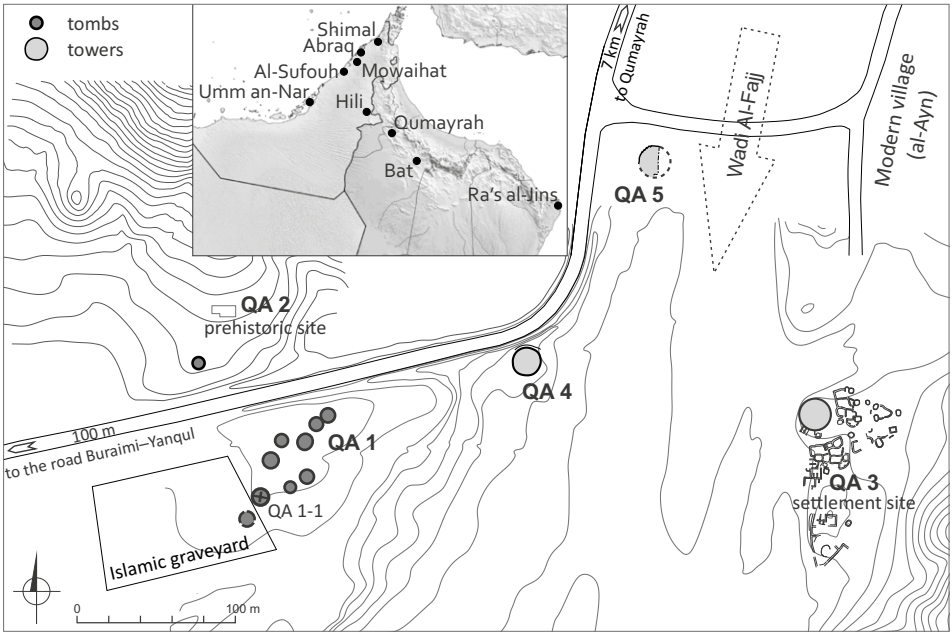


Fig. 1. Position of the QA 1 site in the study area and its location in Oman (PCMA UW | processing M. Antos, editing Ł. Rutkowski)

sages. The architecture of the tomb and its interior, its scenery, as well as the soft-stone vessels, one of the main categories of finds, have been presented elsewhere (Rutkowski 2017; 2020; 2021). The discussion of the human bone assemblage presented here contributes a missing element to the overall picture of this funerary structure and the results, despite the obviously incomplete nature of the dataset (further burials are after all to be expected in the unexplored two chambers), can be considered representative to some extent of the funerary structure as a whole.

HUMAN BONE DEPOSITS IN QA 1-1

The skeletal remains from QA 1-1 appear as scattered clusters, the bones having been commingled most likely already in antiquity. Singular examples of articulated bones have been noted, but so far no complete or even semi-articulated skeletons. Therefore, the term 'bone deposit' is used in this study to refer to groups of bones extracted from a given area (burial plot). Anthropological examination confirmed what could sometimes be observed already in the course of the exploration: these deposits usually included more than one person. So far, 13 such deposits have been distinguished in the tomb, six in L1 (B.1.1–B.1.6), six in L3 (B.3.1–B.3.6), and one in passage L5 (B.5.1) [*Fig. 2*].

Quite a few poorly preserved bones were recovered from the rubble filling chamber L1, from which the excavations began. These bones did not form any distinct clusters and were collected without discriminating among them (Rutkowski 2017). However, there is some indication of later burial activity in the upper part of the fill of this chamber, post-dating the Umm an-Nar period: a bronze arrowhead (with more parallels in subsequent periods), two pieces of iron objects with bronze rivets, several potsherds not fitting the repertoire of Umm an-Nar pottery, and animal bones, including equids (horses?), not consistent with biofacts typical of the Umm an-Nar period. The skeletal remains from this context (save for a certain share of animal bones) were too degraded for any certain identification of human bones. The evidence from chamber L3 was more conclusive in this respect. The fill yielded a bone deposit, B.1.3, close to today's surface, near the corner of walls W1 and W2. The associated collection of about 25 beads of one type indicated that this was indeed a burial and not a random group of bones. In addition, there was a bronze rivet of the same kind as those found in chamber L1. The stratigraphic position of this deposit indicated that the deposition must have occurred after the burial chamber had already filled to a considerable height. These finds from the upper part of the fill suggest that the tomb may have been reused, possibly in the Iron Age, when the Early Bronze Age structure had already fallen into disrepair. One should add, that the remains of a sizable Iron Age settlement are found on the other side of the wadi opposite site QA 1 (Pieńkowska 2020). So far, it has not been possible to locate a cemetery associated with this settlement and, moreover, the reuse of Umm an-Nar tombs during this period is well attested at Bat (see Döpper 2015).

The bulk of the bones came from the lowest part of the tomb, specifically from the part where there was no stone floor. The floor had probably covered the entire interior in the early phase of the use of the tomb. At some point, a significant section of the paving was removed and the depression left by the pavers was used for burial purposes (Rutkowski 2020). This burial niche of sorts is particularly evident in chamber L1, where a large section of the original floor (F1) remained intact in the front of the chamber, marking the northern extent of the niche. A second undismantled fragment of the tomb floor is a narrow section of paving adjoining wall W1 (F3). Only residual fragments of this floor were found in chamber L3 (F5), but one can safely assume that the burial space here was organized similarly to that in L1.

The burial niche was 0.20–0.30 m deep, which was the difference in level between the surface of the stone floor and the actual earthen bottom of the tomb; it corresponded at once to the thickness of the pavers and the height of the lowest course of stones in walls W1 and W2. The bones lay in an earthen fill, relatively loose in places, sometimes compacted into large lumps of dried silt, and mixed with stones and numerous frag-

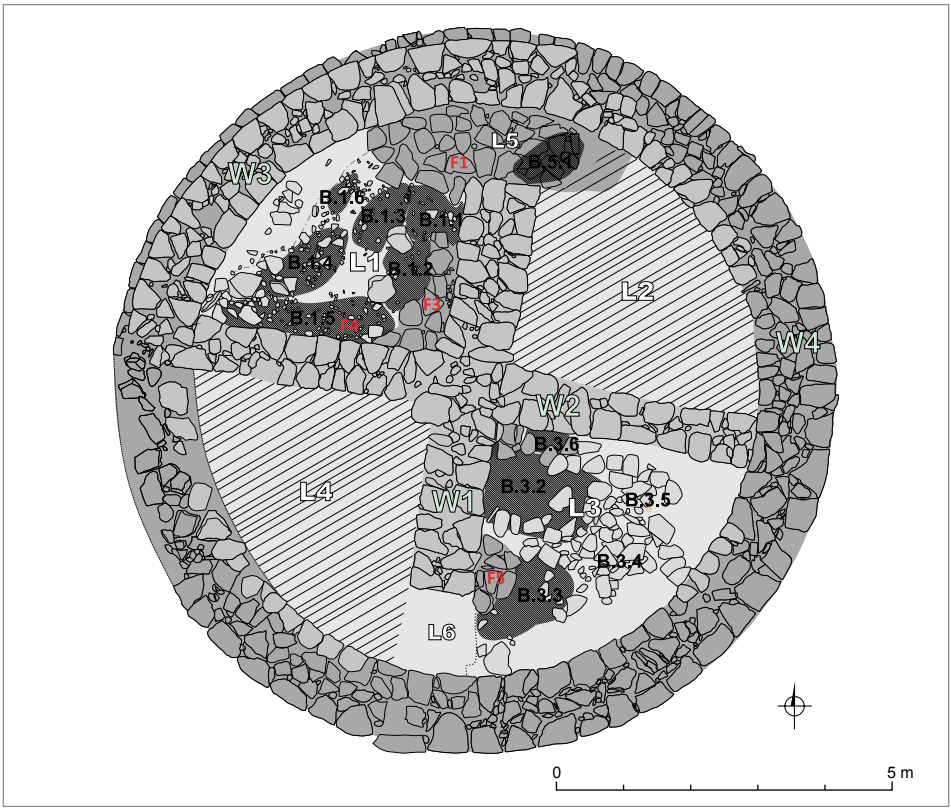


Fig. 2. Tomb QA 1-1: plan showing the distribution of human bone deposits within the excavated loci (PCMA UW | processing M. Antos, editing Ł. Rutkowski)

ments of ceramic and soft-stone vessels. Approximately 300 fragments of diagnostic pottery, including a dozen complete or reconstructible vessels, and 67 soft-stone specimens, including 13 complete or nearly complete vessels (Rutkowski 2021), were recovered from the excavated part of the tomb. Most of these came from the lower part of the tomb fill. Based on this material, the bone deposits in the burial niche can be securely dated to the Umm an-Nar period.

Marine mollusk shells accompanied almost every bone deposit, with several specimens in the largest deposits (B.1.1, B.1.2, B.3.2). There were about a score in total, counting only the large items. Half of these were specimens of gastropods of the species *Ficus subintermedia*, and half specimens of bivalves of the families *Cardiidae* or *Veneridae*. Animal bones were also recorded among the human bones. In addition to the equids mentioned above, dog, sheep and cattle bones were also present. Dog bones belonged to at least two individuals, with one of the diagnostic bones coming from deposit B.1.1 (burying dogs together with human remains is attested in the Umm an-Nar period, see Blau and Beech 1999). Completing the inventory of associated artifacts is a collection of ornaments (mostly microbeads and carnelian beads), a small set of metal jewellery (mainly of copper/bronze) and single specimens of ground stone tools.

The three richest bone deposits in chamber L.1—B.1.1, B.1.2, B.1.3—were located in the eastern part of the niche, occupying a wide strip adjacent to wall W1 [*Fig. 3*]. Similarly, the most numerous groups of bones in chamber L3—B.3.2, B.3.3, B.3.6—were also located in the strip adjacent to wall W1, this time on its western side [*Fig. 4*]. In both chambers, between their central parts and the outer wall of the tomb, the density of finds of bones clearly dropped, disappearing almost entirely in the zone immediately adjacent to it. This may have been, at least in part, because the intersecting inner walls of QA 1-1, which gave the tomb a sound internal framework, best protected its contents at the very center of the structure. Moreover, the burials in the inner sectors of the chambers had stone coverings that sealed them from above. Such covering was not detected in parts further from the center of the tomb. Besides, it seems likely that in later times, when the outer wall of the tomb was largely demolished (presumably in search of building material), the outer and middle parts of the chambers became more easily accessible and thus more susceptible to subsequent looting and weathering. It may have also contributed to the much smaller number of bones and associated finds recovered from these parts of the chambers compared to the innermost parts. The dismantling of the outer wall was particularly dramatic in the area of chamber L3, where only the bottommost layer of the plinth, below the level of the alleged stone floor in the tomb interior, survived. This opened the fill of the chamber to erosion, hence the smaller quantity of bone fragments recovered from this chamber compared to L1 (see below).

A good illustration of this are the two deposits from chamber L3 containing only loose bones (B.3.4 and B.3.5) [see *Fig. 4*]. Although discovered below the level of the presumed tomb floor, they were still part of

the sepulchral debris layer, scattered in the eroded and disturbed zone of the chamber, with few accompanying diagnostic finds. Thus, they are remains of deposits washed out either from their original location in the burial niche or from a higher position

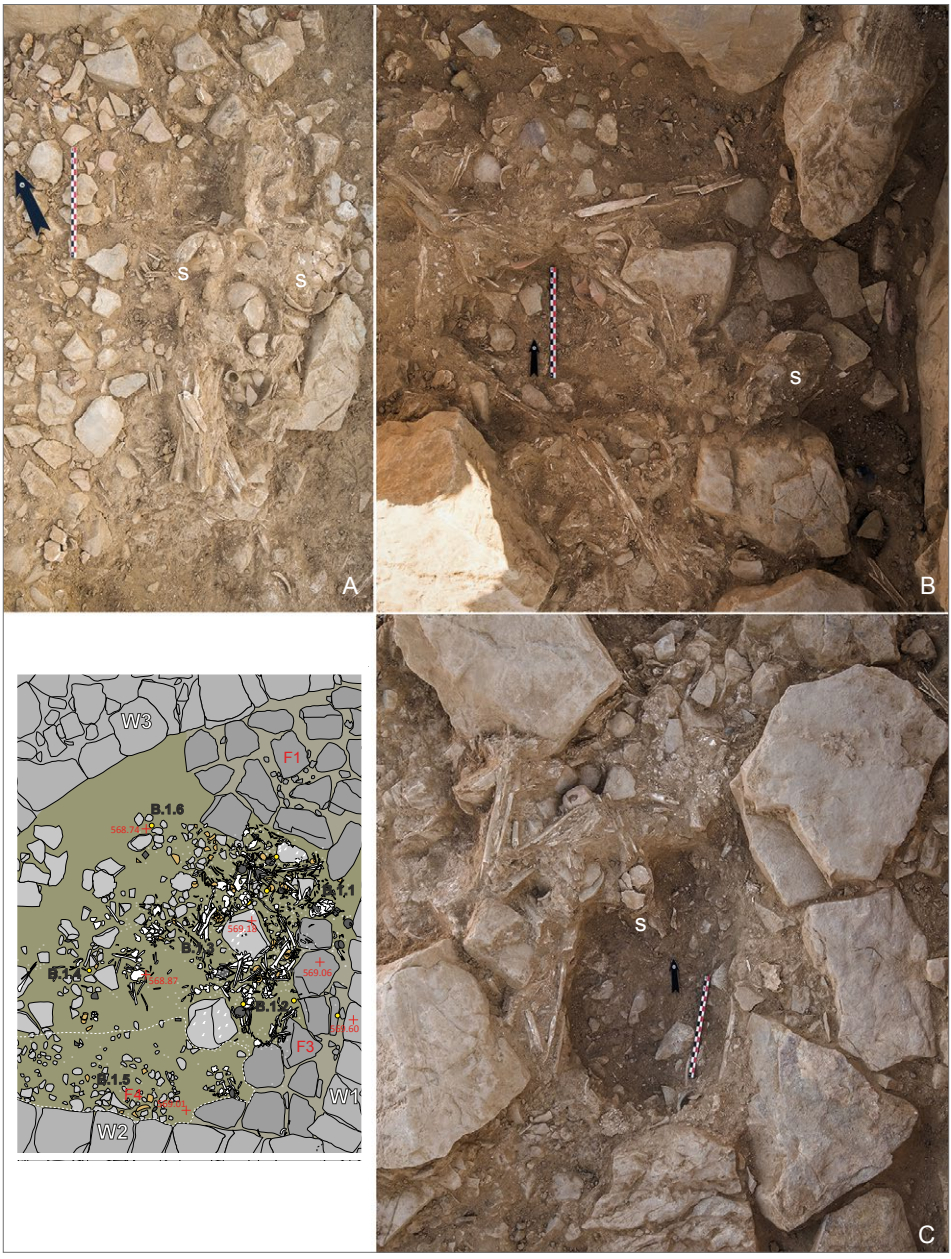


Fig. 3. Location of bone deposits in chamber L1 during excavation: A – B.1.3; B – B.1.1; C – B.1.2; S = skull remains (PCMA UW | photo A. Oleksiak)

in chamber L3 (as in the case of the above-described deposit B.3.1), or a combination of these two provenances. However, the almost complete absence of bones from the outer zone of chamber L1, where the outer wall of the tomb survived in better condition than in L3, could indicate the unsuitability for whatever reason of burying bones in this particular location.

The burial niche in chamber L1 and the remains of a similar depression in the floor of chamber L3 turned out to be further partitioned into burial sectors or quarters. Their boundaries were marked as follows:

1) remnants of the preserved stone floor, the inner walls of the tomb and the gaps between them, forming natural boundaries of the niches;

2) large stones, embedded in the bottom of the niche, forming significant barriers and marking the main divisions between individual deposits;

3) rows (or low walls) of loosely arranged stones forming partitions or closures.

Fig. 4. Location of bone deposits in chamber L3 during excavation (PCMA UW/photo A. Oleksiak)

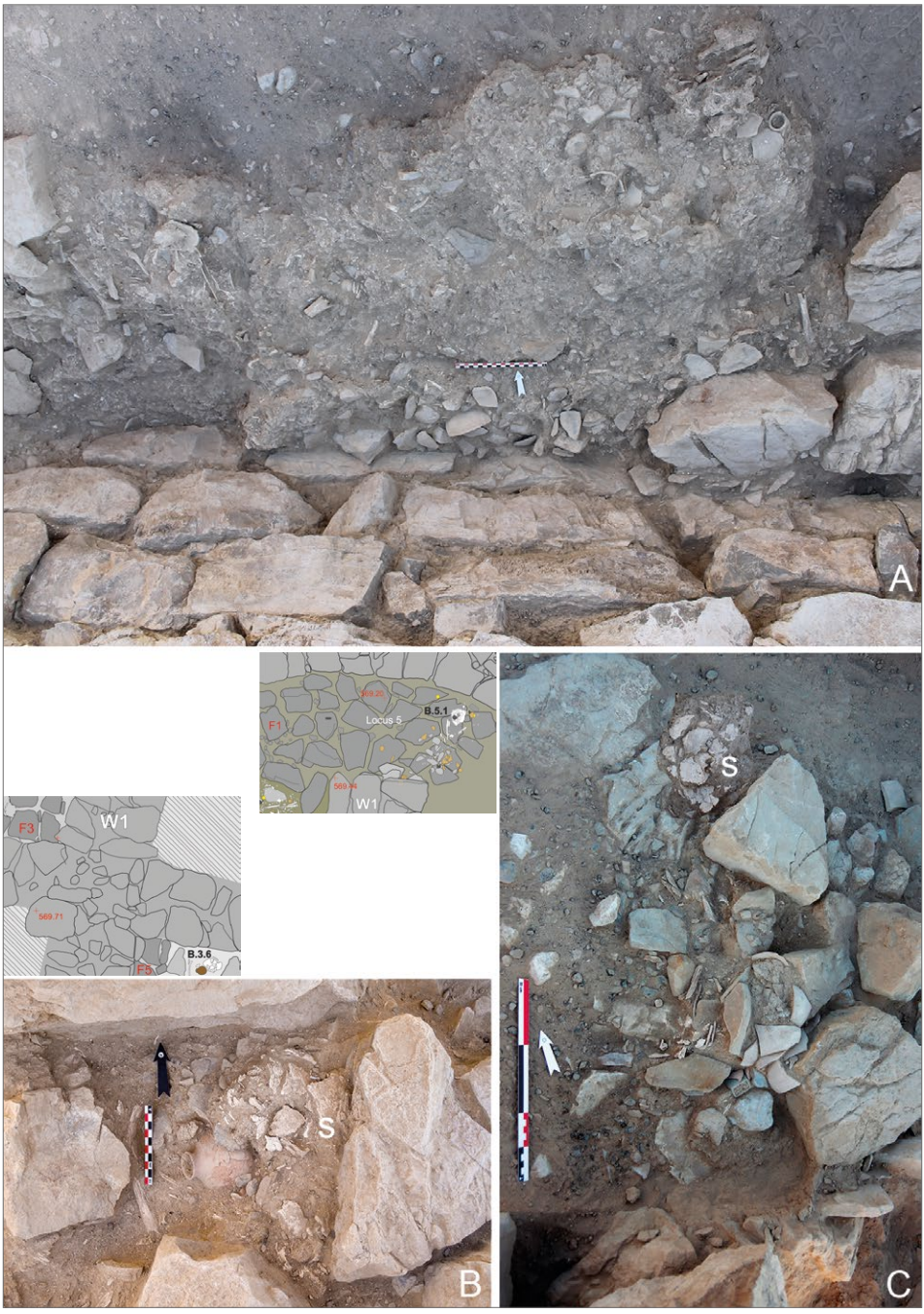


Fig. 5. Bone deposits during excavations: A – B.1.5 after removal of the paving F4; B – B.3.6; C – B.5.1 (PCMA UW/photo A. Oleksiak [b], B. Solarewicz [a, c])

Sectors thus segregated were recorded for deposits B.1.1, B.1.2, (partly B.1.3), B.3.2, (partly B.3.3) [see *Figs 3, 4*]. The smallest separate space was for deposit B.3.6, which was placed in a void left by a single stone removed from the floor [*Fig. 5:b*]. However, the boundaries between the burial plots became less clear with the progress of excavations. Bones were found also underneath the stones that formed the partitions. It cannot be ruled out that some of these divisions were quite accidental, when stones of the covering of directly adjacent burials were mistaken for such partitioning elements (e.g., the border between deposits B.1.1 and B.1.3).

The discovery of bones at the very bottom of the tomb, below the stones taken to be partitioning elements, could suggest that the original burials were made side by side, laying the bodies in the intended space without any permanent internal divisions. It is therefore possible that the boundaries began to form only later, as temporary partitions between subsequent burials interred in the same places. This line of reasoning leads to the conclusion that deposits were more commingled than initially thought. Hence, the MNI estimate for individual deposits presented in *Table 2* is only indicative, showing merely the intensity of use of a given area of the chamber. By contrast, the MNI estimates determined rigorously for whole burial chambers (see below, *Table 3*) should be by all means treated with confidence as 'absolute' MNI.

The specificity of the deposition context draws attention to two groups of bones: B.1.5 and B.5.1. The first consisted mainly of fragmentary or crushed bones compacted with soil and placed against the wall in the part of chamber L1 furthest from the entrance [*Fig. 5:a*]. Thus, it most probably contained the displaced remains of older burials. Deposit B.5.1, unlike all the others, was deposited directly on the stone floor of the tomb [*Fig. 5:c*], but in the passage between chambers L1 and L2, probably just inside the entrance to the tomb. It could imply a later burial episode in QA 1-1, but probably still in the Umm an-Nar period. A description of each deposit is presented below in *Table 2*, while *Table 1* shows their stratigraphic distribution.

At the time of discovery, the bones were generally in poor condition. In addition, they were brittle and splintered easily when picked up. Consequently, even if exposed in their entirety in the field, they were hardly ever collected without breaking. An anthropological examination of the bones was carried out in the third excavation season, after the bones had been in storage for some time, which could have contributed to their further deterioration.

Table 1. Stratigraphic distribution of bone deposits in the excavated loci

Burial context	L1	L3	L5
Bone deposits in the rubble filling the tomb above the level of the stone floor	Set of bones (animal bones identifiable)	B.3.1	–
Bone deposit on the stone floor of the tomb	–	–	B.5.1
Bone deposits in a burial niche (i.e., depression in the base of the tomb formed by dismantling a large patch of the floor)	B.1.1, B.1.2, B.1.3, B.1.4, B.1.5, B.1.6	B.3.2, B.3.3, B.3.4, B.3.5	–

Table 2. Description of deposits discovered inside tomb Q-A 1-1

Deposit	Description	Provisional MNI estimate
L1: B.1.1	Large deposit of non-articulated bones in the northeastern part of the chamber, the bulk of the deposit in a sizable gap between the remains of floor paving (i.e., between floor F1 to the north and paving F3 to the south), directly adjacent to wall W1 on the east [see ***Fig. 3:b***]. On the west, framed by a line of loose stones. One of these, noticeably larger than the others, marked the southern boundary, separating it from deposit B.1.2. Stone covering of thin flat stone slabs, densely stacked, and two large stone blocks recessed into the grave space (most likely paving stones from the original floor reinserted). In addition to numerous loosely scattered bones in the fill, there were three clusters of bones, one of which contained a fairly well preserved skull, while two others yielded bundles of long bones. A significant number of finds, including seven complete or nearly complete soft-stone vessels in the Umm an-Nar style, accompanied the bones. The boundaries between B.1.1 and adjacent deposits, B.1.2 and B.1.3, turned out to be quite blurred at the bottom of the burial plot, hence the high probability of bones being commingled between these three deposits.	MNI: 8 Adults: 4 Subadults: 4
L1: B.1.2	By far the largest deposit of human bones excavated from the tomb. It occupied the southeastern part of the burial niche in chamber L1. To the east and south, the burial space was bordered by paving F3, while to the west, two boulders (i.e., two large stones, roughly twice the size of the other stones exposed at the bottom of L1) formed a noticeable barrier separating it from the rest of the chamber [see ***Fig. 3:c***]. One of these, on the south, separated deposit B.1.2 from an earthen bench containing bone group B.1.5. The second boulder, to the north, was placed next to and opposite the two northernmost paving stones of F3. The narrowing formed between them marked the boundary with the sector containing deposit B.1.1. As this narrowing also contained bones, a reliable separation of human remains between B.1.1 and B.1.2 was not feasible and may have caused an overestimation of the MNI for both groups of bones. B.1.2 had a stone covering in the form of several stone slabs and a series of thin stone tiles, some of which were stacked one above the other in an overlapping manner. Among the remains from B.1.2, several (four to five) large fragments or clusters of cranial bones were found lying separately and therefore probably representing parts of the skulls of different individuals. There were also several bundles of non-articulated (or with doubtful articulation) long bones. One such bundle, resting obliquely on the northern boulder, was particularly abundant and appeared to have contained bones belonging to more than one individual. The remains came from different levels of the fill. The uppermost bones were noted just below the stone cover, then in the middle zone (e.g., bones leaning against the boulders) and at the bottom of the niche (including under the two boulders and in the gap between them). All this indicates that multiple burial episodes, at least three, had taken place in this sector. Finds point to a date in the Umm an-Nar period, possibly its late or terminal phase.	MNI: 8 Adults: 5 Subadults: 3

Deposit	Description	Provisional MNI estimate
L1: B.1.3	Deposit of skeletal remains in the central-northern part of the burial niche in chamber L1, with boundaries not as well-defined as in the case of deposits B.1.1 and B.1.2: floor F1 (a spacious section of the original tomb floor) to the north, a large boulder to the south (on the boundary with B.1.2) and a row of stones faintly separating B.1.3 from B.1.1 to the east. The bones lay directly on the chamber bottom, covered by dislodged stones (either from the tomb walls or displaced paving stones from the tomb floor). Two bone groups: a sizable cluster of mainly large, unarticulated bones, extending approximately NE–SW, and a loose and irregular scatter of bones or bone fragments north and west of this group [see ***Fig. 3:a***]. No sharp boundary between this scatter and the bones included as deposit B.1.4, hence the division between the two was somewhat arbitrary. The bones were densely packed: three large cranial fragments, two bundles of long bones, and a large pelvic fragment. The bones were accompanied mainly by pottery. All the finds pointed to the Umm an-Nar period.	MNI: 5 Adults: 4 Subadults: 1
L1: B.1.4	Scattered deposit of loose and unarticulated bones, lying at the bottom of the burial niche in the central and southwestern part of chamber L1. It contained several large fragments of skull, pelvic bones and bundles of long bones. As no evidence of closures was noted in this part of the chamber to divide the space into smaller units, B.1.4 had no clear boundaries. The bone spread descended gently southwest, resting on the earthen bench containing deposit B.1.5 to the south. There were no traces of a deliberate covering placed over the bones and indeed, the tumbled stones from the tomb wall in this section appear to have fallen directly onto the bones, or else the dismantled paving stones from the original tomb floor, were left to lie in disorder on the chamber bottom. The spread of the bones, especially in the southwesternmost part of the chamber, also suggested that they may have been moved by flowing water, as if the space in this part of the burial niche had once been open. The finds date to the Umm an-Nar period.	MNI: 5 Adults: 3 Subadults: 2
L1: B.1.5	Deposit of highly fragmented and crushed bones, mixed with earth, and compacted into a homogeneous mass, located in the southern strip of chamber L1 at the base of wall W2 [see ***Fig. 5:a***]. It took the form of a low and narrow bench (0.60–0.90 m wide), topped by paving F4 (a hard surface of tightly packed small stones and gravel, also containing pieces of bone). The bench extended for most of the length of W2, adjoining its lowest course, and was adjacent to the remains of the tomb floor (paving F3) on the east. It was easily distinguished from the rest of the fill of the burial niche by its hardness, high bone content and paving cover. The bench and the paving contained numerous fragments of pottery and soft-stone vessels of the Umm an-Nar period (one soft-stone bowl found in pieces on the surface and within the paving shows features of the Wadi Suq period style). The specific location and composition of this context indicate the secondary nature of the bone deposit, that is, the disintegrated skeletal remains must have been transferred from elsewhere and piled up against the inner wall of the chamber, perhaps during the reconstruction of its interior or cleaning work.	MNI: 4 Adults: 2 Subadults: 2

Deposit	Description	Provisional MNI estimate
L1: B.1.6	Sparse group of loose bones found in a small pit dug into the bottom of the burial niche in the northwestern part of chamber L1. Apart from its unusual location, this deposit was distinguished mainly by the finds. As the fragments of the accompanying vessels appeared to match other vessel fragments found elsewhere in L1, the distinctiveness of this bone group became highly questionable. It seems more reasonable that these remains must have accumulated naturally in the cavity, and the latter was the result of later penetration of the tomb.	MNI: 2 Adult: 1 Subadult: 1
L3: B.3.1	Small group of bones in the upper part of the tomb fill, near the northern corner of the chamber (stratigraphically above deposit B.3.2). The associated grave goods (including a set of tusk shells and a bronze rivet) appeared to not comply with the grave goods accompanying the other bone deposits in QA 1-1. As the burial probably took place after the partial collapse of the tomb, it must have postdated the Umm an-Nar period.	MNI: 1 Adult 1
L3: B.3.2	Largest bone deposit from the chamber, it occupied almost the entire northwestern part of L3, bounded by wall W1 on the west (extensive gap along this part of its length, between two sections of the original stone floor, F5), wall W2 on the north, plus the enclosure of deposit B.3.6, and two curving rows of loosely laid stones abutting the internal walls of the tomb, and separating it from the rest of the chamber [see ***Fig. 4***]. These two lines were disconnected (one enclosed more space than the other), which could imply different burial episodes during which the confined space had altered. B.3.2 had a stone covering of a mass of densely packed, small angular rock fragments, most probably deliberately gathered to seal the grave. Skeletal remains, mainly in the form of scattered bundles of disarticulated bones, were recovered from various levels of the burial fill, including the stone covering and, near the bottom of the burial plot, from under the stones forming its southwestern boundary. Mixed with the bones were numerous finds from the Umm an-Nar period, mainly beads and smashed pottery vessels, but one was intact.	MNI: 5 Adults: 3 Subadults: 2
L3: B.3.3	Bone deposit in a partly preserved burial sector in the western part of chamber L3 (south of deposit B.3.2), adjacent to paving F5 on the east, and bounded on the north by a row of loosely laid stones separating it from the surroundings of deposit B.3.2 [see ***Fig. 4***]. To the south and east, with no clear boundaries, the area is severely eroded, which has resulted in the dispersal of the fill containing the bones. In its preserved part, the nature of this context resembles B.3.2, also with associated finds from the Umm an-Nar period.	MNI: 2 Adult: 1 Subadult: 1
L3: B.3.4	Assemblage of loose bones scattered in an eroded and disturbed area east of deposit B.3.3, just under the surface but below the presumed stone floor (no trace of it in this part of chamber L3). The bones lay on and between the disordered stones covering the actual bottom of the chamber. The accompanying finds (mainly beads) do not provide certainty about the chronological attribution of this group of bones.	MNI: 3 Adults: 2 Subadult: 1

Deposit	Description	Provisional MNI estimate
L3: B.3.5	Assemblage of loose bones scattered in an eroded and disturbed area to the east of the stones surrounding deposit B.3.2. The nature of the context and find spot is the same as in the neighbouring B.3.4. The lack of clear boundaries between the two could have resulted in a greater mixing of the bones. Occasional intrusive potsherds postdating the Umm an-Nar period were noted just above B.3.5.	MNI: 2 Adult: 1 Subadult: 1
L3: B.3.6	Deposit of disarticulated bones in a small stone compartment, or stone box, in the northwestern part of chamber L3 [see ***Figs 4, 5:b***]. This box consisted of three or four evenly spaced large stones of equal height (probably belonging to the original stone floor of the chamber), arranged to form a rectangular enclosed space against wall W2. This space may have been created by removing one paving stone from the floor right beside the wall, leaving the others in place. The resulting box was easily distinguishable from the much larger sector containing deposit B.3.2. However, these two burial quarters may have shared a stone covering. The box contained mixed bones, loosely thrown rather than packed, cranial fragments included. As this small space also contained the bones of an adult individual, it was clear from the outset that B.3.6 was a secondary burial, i.e., moved from another site and reburied in a box that thus acted as an ossuary. Among the few finds accompanying the bones was a complete ceramic vessel from the Umm an-Nar period.	MNI: 2 Adult: 1 (female) Subadult: 1 (*juvenis*)
L5: B.5.1	Assemblage of bones found directly on the stone floor of the tomb (F1), located quite unusually in the passage between the two burial chambers, probably just inside the presumed northern entrance to the tomb. A poorly preserved bone cluster was distinguished just under the surface, extending from north to south, and a crushed skull lying to the north. Save for a few bones in somewhat better condition, the assemblage consisted of bones completely crushed by the stone blocks falling from the tomb walls, and some loosely scattered bone fragments between the stones [see ***Fig. 5:c***]. Assuming that this group of bones is not the result of accidental displacement from inside the chambers, B.5.1 may represent the disturbed remains of a deliberately deposited burial, as indicated by, among other things, a collection of potential grave gifts associated with it. These include an intact soft-stone box, several broken ceramic vessels (some clustered together in one place) and three marine shells; all the finds point to the Umm an-Nar period. Traces of a low stone enclosure were visible, surrounding at least part of the area with the bone scatter, and in the center of this was a cluster of stones that could have constitued part of the covering. Assuming that the skull was *in situ*, the bones of one of the arms seemed to lie in a likely correct anatomical position relative to it, although this could be just a coincidence.	MNI: 1 Adult: 1

OSTEOLOGICAL ANALYSIS

The osteological analysis by Marta Parol in 2018 was focused on a morphological identification of the human skeletal remains, an assessment of their state of preservation, and a determination of the minimum number of individuals (MNI) for each locus of the tomb. If possible, sex and age-at-death were determined. The bones were also examined for potential pathological changes.

METHODS

The bones were identified and described according to the standards presented by Brickley and McKinley (2004) and also Buikstra and Ubelaker (1994). Preservation was expressed on a five degree scale (0 = 0%, 1 >25%, 2 = 26–50%, 3 = 51–75%, 4 <75%). The MNI was estimated separately for adults and subadults, based on the most frequently occurring bone fragment from a given side of the body. All concentrations of bones (apart from two) were weighed after dividing them into identifiable and unidentifiable. Sex was determined from cranial morphological features, such as orbital margin, mastoid process, occipital eminence, glabella, mental eminence and mandible angle (Buikstra and Ubelaker 1994). As no pelvic bone fragment sufficient to determine sex has been preserved, pelvic features were not applicable. Age-at-death estimation for adult individuals was determined from bone development according to the fusion of the sternal end of the clavicle (Schaefer, Black, and Scheuer 2009) and morphology of the auricular surface (Lovejoy et al. 1985), and for subadults using bone and dental development methods (Smith 1991; Schaefer, Black, and Scheuer 2009). Age-at-death was expressed for the following age categories: *infans* I 0–6 yo., *infans* II 7–14 yo., *juvenis* 15–22 yo., *adultus* 23–35 yo., *maturus* 36–55 yo., *senilis* 55+ yo., or in unspecified age categories (subadult/adult). Pathological changes were diagnosed with the help of guidelines introduced by Ortner (2003), Waldron (2009), Hillson (2005), and Brickley and McKinley (2004).

STATE OF PRESERVATION

Most of the human remains from the tomb were in very poor condition. Bone structure and surfaces were in most cases damaged considerably due to weathering, making the bones very fragile and breakable. Most of the remains are small, unidentifiable fragments. The shafts of long bones were in the worst condition, severely fragmented and impossible to identify anatomically. The epiphyses were often separated from the long bones, most of their surfaces had cancellous bone exposed, and their anatomical attribution also was unclear. The same is true of carpals and tarsals. Other remains were either fragmentary or heavily fragmented. Damage and breakage also occurred to the teeth. Many times roots were separated from the crowns, while tooth enamel was easily breakable. To better illustrate the condition of the bones, since most of the fragments accounted for less than 50% of the whole bone part from which they came, the skeletal remains were weighed [*Fig. 7*].

The preservation of the bones was similar in all of the excavated loci (1, 3, 5). About 30% of the bones could be identified in each of them. 'Locus N' stands for

a small group of bone fragments found just outside the outer wall of the tomb (undoubtedly washed out of the burial chambers) and those collected during the initial cleaning of the tomb surface, without regard for the internal divisions. The overall identification rate was 31.78%. Weighing highlighted a marked difference in the number of bones found in the two explored burial chambers (L1 and L3), as shown in the graph below [*Fig. 6*].

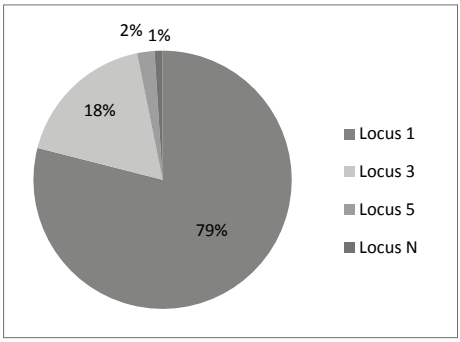
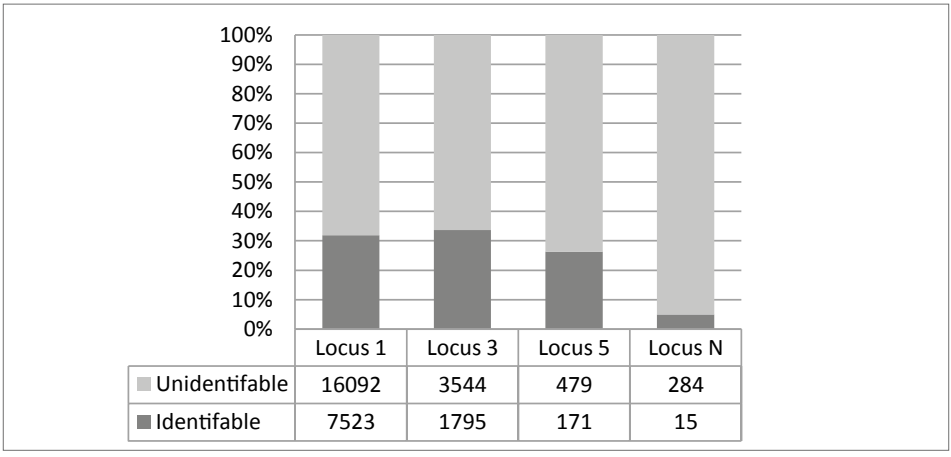


Fig. 6. Distribution of bones in the tomb according to weight values by loci (to date, the total weight of all bones excavated from QA 1-1 is 29,903 g, that is, almost 30 kg)

As much as 97% of all skeletal finds came from the two investigated burial chambers (L1 and L3), while only 3% of the bones came from the northern passage and unspecified areas (L5 and 'LN'). Significantly, more than 3/4 of the analysed bones were found in L1, while a much smaller bone mass was recorded in L3, occupying an area of the same size (each chamber represents nearly a quarter of the tomb). As the percentage of identifiable fragments in L1 and L3 was comparable [see *Fig. 7*], this apparent disproportion is not related to the condition of the bones. It must have been due to the smaller volume of fill preserved in L3 compared to L1 (see above).

The poor condition of the bones examined did not allow sex-related features to be observed in more than two cases. Measurements of most long bones, especially in the case of adult remains, were not feasible, making height/stature estimates unavailable. Pathological changes are also likely to be underestimated due to damage to bone surfaces and postmortal deformations of the shape of bone remains.



	Locus 1	Locus 3	Locus 5	Locus N
Unidentifable	16092	3544	479	284
Identifable	7523	1795	171	15

Fig. 7. State of preservation of the remains according to loci; weighed bone fragments divided into identifiable/unidentifiable; values in grams

MNI ESTIMATION

In the initial phase of the osteological analysis, bone groups were examined according to their assigned location in the tomb, that is, identified deposits. At this stage, the MNI was experimentally estimated for each deposit separately [see *Table 2*]. This procedure, however, did not take into account the fact that the bones, not being in anatomical order, could have been mixed across deposits, which may have been due to several reasons. First, the boundaries of the bone groups were not sharp enough to ensure that the bones had not been moved between adjacent areas in the past or erroneously assigned to another group during excavation. Second, these boundaries may have changed over time with successive burials. Third, the bone material collected from the burial site often included both remains from a clustered group of bones and loose bones from the fill, the latter not necessarily related to a given group.

Therefore, to make the estimates more reliable and to prevent double counting of individuals whose bones might have been dispersed and mixed in an area covering more than one deposit, a definitive MNI was determined for each locus separately, regardless of whether the remains were from a potential burial or were unrelated finds from the area of its vicinity. It should be said that the design of the tomb did not allow for bone migration between loci. The final MNI values were 15 individuals in L1, nine in L3, and one in L5, giving a minimum of 25 individuals buried in the two chambers constituting half of the tomb [*Table 3*]. However, if one were to assume that the mortuary contexts were less obscured, one might be tempted to pose a much higher estimate of the MNI.

Table 3. MNI estimates determined separately for each of the excavated loci

Locus	Total number of individuals	Number of adults	Number of subadults
L1 (NW chamber)	15	11	4
L3 (SE chamber)	9	6	3
L5 (passage between L1 and L2)	1	1	–
Total	**25**	**18**	**7**

AGE AND SEX ESTIMATION

Because of the poor preservation of the bones and the high degree of their commingling in the examined assemblages, most individuals were assigned to very general age categories: 'adult' and 'subadult'. Of all the adult remains, only two bone fragments could be assigned to more specific age categories. A left clavicle fragment, found in deposit B.3.2, had a preserved sternal end with no signs of the epiphyseal fusion, which placed this individual in the age group under 35, i.e., *adultus*. A left ilium fragment with a partly preserved auricular surface, found in deposit B.1.1, must have belonged to an individual aged 35–39 years (stage 4), i.e., *maturus*. The situation was slightly better for subadults. The stage of development of seven teeth and fragments of 13 bones allowed the age of 14 potential individuals to be estimated [*Table 4*]. It is clear that children from all life stages, including newborns, were buried in the tomb. In this respect, there were no differences between the two explored chambers.

Sex-related skeletal traits could be observed on only 16 adult bone fragments from all of the loci in the tomb [*Table 5*]. Most of the indications were female (9); the second most common was 'sex unknown' (5), and the third was male (2). For sex determination to be meaningful, it is necessary to be certain that bones belonging to a single individual are analysed, or at least it should be possible to distinguish bones from different individuals. Since none of the bones from the excavated half of the tomb were in an anatomical arrangement, it is only possible to observe the frequency of sex-related features on bone fragments, but drawing a reliable conclusion as to the sex ratio of the tomb population is not possible.

PATHOLOGICAL CHANGES

There were some pathological changes observed in the examined bone material. Porotic hyperostosis was found on one of the skulls. This type of lesion is usually explained by long term nutrient deficiencies occurring in the population, which can lead to anaemia, rickets or scurvy. Some articular surfaces of the bones showed degenerative changes, such as ma-

Table 4. Inventory of skeletal fragments with possible age estimation in the subadult category

Locus	Bone deposit	Bone	Side	Method	Age	Age category
L1	B.1.1	Long bone	–	Bone development	Newborn	*Infans* I
L1	B.1.1	Temporal	L	Bone development	Newborn	*Infans* I
L1	B.1.1	Vertebrae	–	Bone development	–	*Infans* I
L1	B.1.1	Mandible	–	Bone development	–	*Infans* I
L1	B.1.1	M?	–	Smith: Ri	13.2	*Infans* II
L1	B.1.2	Scapula	L	Bone development	–	*Infans* I/*Infans* II
L1	B.1.2	M2	L	Smith: Ri	7.6	*Infans* I/*Infans* II
L1	B.1.2	M1	L	Smith: R3/4	6.1	*Infans* I/*Infans* II
L1	B.1.2	M2/3	L	Smith: R1/4	9.8–14.8	*Infans* II
L1	B.1.2/1.5	Ulna	L	Bone development	Newborn	*Infans* I
L1	B.1.2/1.5	Fibula	?	Bone development	–	*Infans* I
L1	B.1.4	Clavicle	L	Bone development	–	*Infans* I
L1	B.1.4	Clavicle	R	Bone development	–	*Infans* I
L1	B.1.4	Ulna	R	Bone development	–	*Infans* I
L1	B.1.4	C1	R	Smith – Ri	5.2	*Infans* I
L1	B.1.5	Vertebrae	–	Bone development	–	*Infans* I
L3	B.3.2	M1	L	Smith: Cr3/4	1.9	*Infans* I
L3	B.3.6	Radius	R	Bone development	–	*Juvenis*
L3	B.3.6	M3	R?	Smith: R1/4	14.8	*Juvenis*

croporosity on one patella, degeneration and porosity on one cervical vertebra (on both articular processes and the body), and in one case bone lipping on the articulate surface of the odontoid process of the axis. These changes are probably related to ageing and mechanical loading. One possible fracture was found on the shaft of a metacarpal bone where the proximal end should have been. The bone in this area had irregular edges, probably as a result of poorly healed trauma.

Out of more than 200 teeth, only four cases of caries were found, three of these with large cavities penetrating the dentine. Severe dental defects could be found in connection with a possible trace of an abscess on a fragment of the maxilla. One deciduous molar showed significant attrition. No enamel hypoplasia or calculus was observed. However, the small number of pathological changes noted on both bones and teeth is probably due to the state of preservation.

Table 5. Inventory of bone fragments with identifiable sex markers

Locus	Burial (deposit)	Bone	Side	Part	Number of scale	Sex
L1	B.1.1	Temporal	R	Mastodoid process	2	F
L1	B.1.1	Frontal	–	Glabella	2	F
L1	B.1.1	Frontal	L	Orbital margin	2	F
L1	B.1.1	Mandible	–	Mandible angle	U	?
L1	B.1.1	Temporal	R	Mastodoid process	3/4	M
L1	B.1.2	Mandible	–	Mental eminence	3	?
L1	B.1.2	Frontal	R	Orbital margin	3	?
L1	B.1.3	Temporal	L	Mastodoid process	1	F
L1	B.1.3	Temporal	R	Mastodoid process	3	?
L1	B.1.3	Mandible	–	Mental eminence	2	F
L1	B.1.3	Occipital	–	Occipital eminence	2	F
L1	B.1.3	Occipital	–	Occipital eminence	2≤	F
L1	B.1.4	Frontal	R	Orbital margin	4	M
L3	B.3.2	Occipital	–	Occipital eminence	2	F
L3	B.3.6	Mandible	–	Mental eminence	3	?
L3	B.3.6	Mandible	–	Mental eminence	2	F

CONCLUDING REMARKS AND DISCUSSION

Most of the bone deposits excavated from QA 1-1 were found in large depressions in the bottom of the burial chambers, left by the removal of paving slabs from the original stone floor of the tomb. Some of these deposits, particularly the largest (B.1.1, B.1.2, B.3.2), appear to have been buried in separate burial quarters bounded by stone boundaries, although these boundaries were not necessarily permanent and may have changed in part. The bone deposits in the two chambers that were examined were concentrated in a wide band along the inner N–S wall (W1), leaving the area closer to the outer wall of the tomb not as intensively used for burial purposes—unless this is simply the result of erosion and subsequent human intervention.

Several deposits displayed deviations from the basic pattern of deposition. These include an accumulation of exceptionally fragmented bones (B.1.5), an isolated assemblage on the stone floor in passage L5 (B.5.1), a separate burial in a small stone compartment (B.3.6), a deposit lying higher up, presumably interred into the collapse layer, trace of reuse of QA 1-1 in later times (B.3.1).

Anthropological examination of these skeletal remains established the minimum number of individuals (MNI) buried in the structure at 25, including seven children. There was a marked difference in the quantity of bone material between the two excavated burial chambers, with 79% of the remains coming from L1 and only 18% from L3. The MNI estimation was also higher for the former, although the disparity was not as pronounced in this respect. The difference is probably due to the better preservation of L1 compared to L3. Adults and children (representing almost all age categories, from newborn to *maturus*) buried together in QA 1-1, demonstrate no preference regarding age and, presumably, sex in the composition of the group buried in each of the burial chambers. However, examination of the bones did not provide data to estimate the adult sex ratio of the dead in the tomb, and in addition, chamber L3 lacked any skeletal marker for identifying a male.

Given the commingled nature of the remains and the lack of anatomical order of the bones, the question arises as to whether the burial space was also a site of decomposing bodies (but heavily affected by postdepositional human intervention and taphonomic processes) or whether it was conceived from the outset as a repository for secondary burials, i.e., acting as an ossuary after the decomposition process had taken place elsewhere. Some of the deposits were undoubtedly secondary (B.1.5, B.3.6, and probably the largest bone cluster in B.1.3). The presumed last buried individual, whose remains should at least be in anatomical position, was not found, at least not in the excavated half of the tomb. Both of these arguments support the second assumption. On the other hand, a mixture of primary and secondary burials, an intermediate solution between the two previous ones, cannot be excluded.

The manner of disposition of the human remains that one can observe in QA 1-1 is not very different from other

tombs of the Umm an-Nar period. Most of the tombs where bones have survived (many were discovered empty) contained human remains in an undifferentiated, commingled mass, while articulated skeletons are unusually sporadic: one or two interments in only a few graves, sometimes among hundreds of unarticulated ones (e.g., Abraq Tomb, Unar 2; see Gregoricka, Ullinger, and Schrenk 2021). Tomb A at Hili North, which produced 31 complete skeletons arranged side by side in one of its four burial chambers, is an exception in this respect. However, it also contained ten times as many unarticulated depositions (Cleuziou and Tosi 2007: 129).

The process of final disposition of the body of the deceased observed in the Umm an-Nar period may have varied slightly in terms of the practice of handling the remains in individual tombs. This process quite often involved the presence of additional burial (ossuary) pits located outside the tomb, serving as a final resting place for remains transferred from the original repository. In these pits (in some cases also in the tombs themselves), traces of bone cremation are sometimes visible, as well as evidence of bones being grouped by category (Guy and Munoz 2007: 134; Döpper and Schmidt 2018: 377), or the arrangement of remains with particular attention to the positioning of the skull (Haerinck 1991: 9). Deliberate defleshing of bodies to accelerate their decay may have also occurred (Munoz 2019: 26). According to the model proposed by Munoz (2019), the mortuary sequence started with the primary deposition of bodies in a tomb. After their decomposition, the intervention on the remains took place, which led to reorganizing the burial space. In the most advanced form, it led to the emptying of the tomb and the transfer of the remains to an ossuary pit (if there was one next to it), giving rise to a new sequence of deposition in the space thus freed. Some tombs were not emptied (or were discovered not emptied yet), such as the Abraq Tomb, which contained the accumulation of skeletal remains preserved up to a height of 1.40 m (Potts 2000: 88).

The main difference between QA 1-1 and other Umm an-Nar tombs is the extensive use of the burial niche. And while in some other graves skeletal remains were found in parts where the floor was no longer present, for example, Grave I on Umm an-Nar island and Tomb I at al-Sufouh (see Frifelt 1991; Benton 1996), nowhere is this space as clearly demarcated as in the case of chamber L1. Nevertheless, it seems that the model solution involved depositing the dead on a stone floor, as best evidenced by the Abraq tomb. Thus, it is plausible to assume that the stone floor in QA 1-1 was originally (before it was dismantled) used as a place of deposition, but most probably for an earlier sequence of burials. The remains discovered in the niche may thus represent a later, if not the last, use of the tomb. And this also means that these earlier remains must have been taken somewhere else. Although it is almost certain that deposit B.1.5 contained fragmented older skeletal remains, it is impossible to assess from which deposition phase they came and what proportion of the pre-intervention remains they represented. No adjacent burial pits have been found in the vicinity of QA 1-1 so far. However, an ossuary

pit could have be located next to any of the other nine sepulchres on the site (one larger structure of this type may, after all, have served several of them). Without clearing the small eroded stone fragments blanketing the surface around all of the tombs it is impossible to survey this area.

The MNI estimate determined for one half of the tomb (25), even under the simple assumption that the two unexcavated chambers will yield a roughly similar number of burials, still places QA 1-1 in the group of tombs with fewer human remains [see *Table 6*].

As for the pit graves, most are undoubtedly ancillary to the adjacent stone tombs, but the graves at Hili and Mowaihat [see *Table 6*] are exceptional. They are both large, subterranean, stone-lined pits, one oval, the other rectangular. As suggested by Méry (2010), Tomb N at Hili became a self-contained tomb, used as a primary deposition site at the end of the Umm an-Nar period (2200/2100–2000 BC), when the aboveground tombs at Hili seem to have gone out of use. Tomb A at Mowaihat may have been a manifestation of the self-same change in burial customs.

A simple conclusion to be drawn from this presentation is that the highest number of buried individuals were found in the aboveground tombs with no nearby burial pits and in the subterranean graves, which survived intact thanks to concealment. The apparent differences in numbers could certainly be due to several factors such as the size

Table 6. Numbers of buried individuals in Umm an-Nar graves

MNI	Tomb	References
	Aboveground (a/g) tombs	
438	Unar 1 at Shimal	Blau 2001
431	Unar 2 at Shimal	Blau 2001
403	Tell Abraq tomb	Martin, Baustian, and Osterholtz 2019
300+	Tomb A at Hili North	Bondioli and Macchiarelli 2011
74+	Tomb I at Ra's Al-Jinz	Guy and Munoz 2007
49	Grave V on Umm an-Nar island	Kunter 1991
34	Grave II on Umm an-Nar island	Kunter 1991
21	Grave I on Umm an-Nar island	Kunter 1991
13	Tomb I at Al-Sufouh	Benton 1996
	Pit graves / ossuary pits / subterranean tombs	
625	Tomb N at Hili (near a/g Tomb E)	Méry 2010
160–180	Tomb B at Mowaihat (near a/g Tomb A)	Haerinck 1991
100+	Three pits near Tomb I at Ra's Al-Jinz	Guy and Munoz 2007
108 (57+ 48+3)	Three pits near Tomb I at Al-Sufouh	Benton 1996
20+	Pit Inst. 0006 near Tomb 154 at Bat	Schmidt and Döpper 2016
20+	Pit Inst. 0025 near Tomb 156 at Bat	Schmidt and Döpper 2016

of the population living in the area, the length of time the tomb was in operation, the state of its preservation to the present day, the issue of possible cyclical emptying. The latter explicitly means that the number of remains recorded is only a fraction of the total number of buried individuals. But it should also be taken into account that the mortuary practice may have been different in solitary (or at most paired) tombs serving as the only burial place for a given population (e.g., Abraq Tomb, the two Unar tombs), and cemeteries consisting of several tombs located in clusters as at the QA 1 site. In the latter case, burial activity may have been spread over several other structures.

When speaking of QA 1-1 in this context, an intriguing question is whether all four chambers were stripped of the floor. This stripping must be seen as an attempt to secure space for new burials, indicating that the human remains found so far in the two excavated chambers represent only a portion of their contents. The same is true of the assemblage of soft-stone vessels excavated from the tomb (Rutkowski 2021). The excavations in the two remaining chambers of QA 1-1 have to be completed before definitive conclusions are put forward. Further studies of other tombs on the site will provide a fuller picture of the mortuary practices and organization of sepulchral space in the cemetery as a whole.

Dr. Łukasz Rutkowski
https://orcid.org/0000-0002-0721-5392
University of Warsaw
Polish Centre of Mediterranean Archaeology
luka.rutkowski@uw.edu.pl

Marta Parol
Independent researcher
marta_parol@vp.pl

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