

NEW APPROACHES TO A COLLECTIVE GRAVE FROM THE UMM AN-NAR PERIOD AT HILI (UAE)

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Abstract : *In the Oman peninsula, the Umm an-Nar circular tombs, easily seen in the landscape because of their monumental architecture, have usually been robbed for building stones and for their objects. This was not the case for a pit-grave discovered at Hili (United Arab Emirates) in 1984, which presented a stratigraphy nearly 2 meters deep, with 4 phases of main funerary deposits dating to the end of the Umm an-Nar period (ca 2 200-2 000 BC). Such a stratigraphic depth is unknown in the collective tombs of the Near East (or in France), where funerary deposits are never deeper than 50 cm.*

On the resumption of excavations in 1998, the main objective was to record local funerary practices, using the latest techniques for excavating collective tombs, never before applied in this part of the world. The grave contained the remains of a large number of individuals, easily exceeding 500, most of which were primary burials. The biological study has provided information on the composition and state of health of the buried population. The mortality profile corresponds to that of a so-called traditional population, in this case agricultural and village-dwelling. A parallel analysis of the economic and social structures of the population, based on the study of craft production, particularly pottery and funerary architecture, was also undertaken. The study of the pottery includes experimental reconstruction.

Résumé : *Dans la Péninsule d'Oman, les tombes circulaires de la période Umm an-Nar, facilement repérables dans le paysage car d'architecture monumentale, ont été le plus souvent pillées pour récupérer pierres de construction et objets. Ce n'est toutefois pas le cas d'une fosse funéraire découverte à Hili en 1984 (Émirats Arabes Unis) qui présente une stratigraphie de 1,70 m d'épaisseur, avec 4 phases de dépôts principales datant de la fin de la période (vers 2 200-2 000 av. J.-C.). Cette puissance stratigraphique est inédite au Moyen-Orient (mais aussi en France), où les dépôts funéraires n'excèdent jamais 50 cm d'épaisseur dans les sépultures collectives.*

La reprise de cette fouille en 1998 eut pour objectif de documenter les pratiques funéraires locales, les techniques actuelles de fouille de sépultures collectives n'ayant pas été encore appliquées dans cette région du monde. La fosse contient les restes d'individus très nombreux, avec un nombre excédant largement 500 ; il s'agit pour l'essentiel d'inhumations primaires. L'étude biologique a permis de préciser la composition et l'état sanitaire de la population inhumée, la mortalité correspondant à celle d'une population dite traditionnelle, en l'occurrence celle d'une population agricole et villageoise. Une analyse de la structure économique et sociale de cette population a été entreprise en parallèle, fondée sur l'étude des productions artisanales, notamment la poterie, mais aussi de l'architecture funéraire. L'étude de la poterie fait appel à des reconstitutions expérimentales.

Key-Words : *United Arab Emirates, Hili, Funerary practices, Field anthropology, Pottery technology, Craft specialization.*

Mots Clefs : *Émirats Arabes Unis, Hili, Pratiques funéraires, Anthropologie de terrain, technologie céramique, Spécialisation artisanale.*

INTRODUCTION

French participation in a long-term archaeological field program restarted at Hili (Eastern Province of Abu Dhabi, fig. 1) in 1998 after a break of 14 years, and focuses on the excavation of an Early Bronze Age collective pit-grave (Hili N) dating to the end of the 3rd Millennium BC, *i.e.*, the second part of the Early Bronze Age, or Umm an-Nar Period. This tomb is very different from the monumental circular tombs typical of the period. A sixth season of excavations by one of the teams of the French Archaeological Mission in the United Arab Emirates (*FAMU*), in collaboration with the Department of Antiquities and Tourism in Al Ain (*DATA*), was completed at Hili N last winter¹.

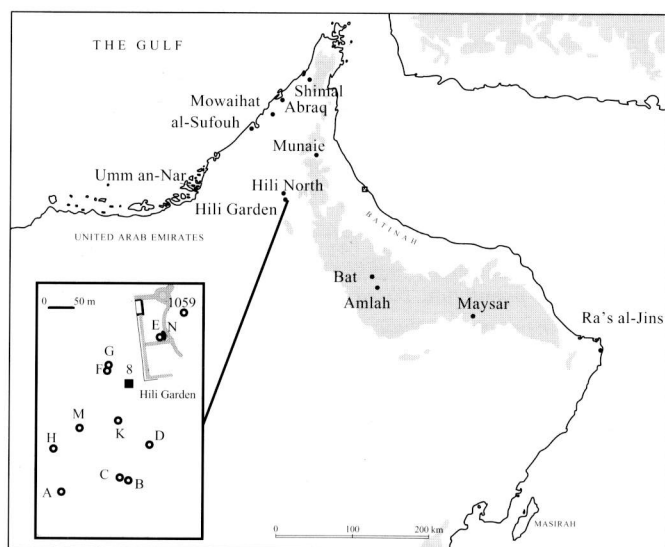


Fig. 1 : Archaeological sites including excavated Umm an-Nar graves in the UAE and the Sultanate of Oman (Drawing : H. DAVID) and the Umm an-Nar necropolis at Hili (Drawing : P. DUBOEUF, 2004).

1. The *FAMU* (Dir. S. Méry) carries out two distinct field operations with two different teams : at Hili (Emirate of Abu Dhabi) and at Bithnah (Emirate of Fujairah). The excavations at Bithnah are conducted by Dr A. Benoist (CNRS-UMR 5133 at Lyon). The team at Hili works for two months each year under the co-direction of Dr S. Méry and Dr W.Y. Al Tikriti, both archaeologists. The osteo-archaeological studies are under the direction of Dr K. McSweeney. In 2004, the Hili team included field anthropologists (Dr E. Gatto, S. Truffier), archaeologists (F. Leroy and D. Jiazon – *InRAP*/Institut de Recherche en Archéologie Préventive), geologists (Dr P. Barrier, C. Gagnaison and Dr D. Lemaire – *IGAL*/Institut Géologique A. de Lapparent at Cergy-Pontoise), a topographer (P. Duboeuf – CNRS-UMR 7041 at Nanterre) and a professional potter (J.-P. Bérubé – *Maison des Arts* at Quebec). Prof. S. Van Der Leeuw, archaeologist and ceramologist, joined the team in 2001 and 2002.

After its discovery in 1983, Hili N was excavated over 5 seasons by M. M. Haddu of the *DATA*, under the supervision of W.Y. Al Tikriti (fig. 2)². The grave was first interpreted as an ossuary, used to store the skeletal remains cleared from the monumental circular Umm an-Nar tomb (Tomb E) nearby, and the discovery in the pit of a huge amount of fragmented and apparently disarticulated bones³. At the end of the 1989 season, the central part of the contents of the tomb was left intact, in order to show the succession of accumulated levels of human remains in the 1.70 m depth of deposits. At the request of H.E. Saif Ali al Darmaki, Deputy Under Secretary, the *DATA* began in 1998 a new program of excavation, jointly with the *FAMU*. The main aim of the projects was to provide a greater insight into local funerary practices, which, were only partially understood.



Fig. 2 : The Hili N pit-grave is immediately adjacent to a circular monumental grave (Hili E). Most of the deposits in the pit-grave were probably primary burials. (Photo : *DATA* – Department of Antiquities and Tourism in Al Ain).

The pit-grave is part of the Hili Garden necropolis (fig. 1), which includes 12 monumental circular tombs⁴ and represents, together with the necropolis of the island of Umm an-Nar near Abu Dhabi, the main reference for the Umm an-Nar period (*i.e.* the second part of the early Bronze Age, about 2,600-2,000 BC) in the United Arab Emirates and the Sultanate of Oman. The circular tombs are compartmented stone tombs, faced with fine worked ashlar blocks. By the end of the Umm an-Nar period, their diameter could reach up to about 14

2. HADDU, 1989.

3. For details, see AL TIKRITI and MÉRY, 2000 : 208, fig. 3.

4. UR RAHMAN, 1975 ; AL TIKRITI, 1981 ; CLEUZIOW and VOGT, 1983, 1985 ; BONDIOLI *et al.*, 1998.

meters and the number of compartments could reach up to 12. Human remains are generally found in all compartments of this type of tomb but the thickness of the deposits is less than 40-50 cm.

The architectural features and internal organization of the pit-grave are very different (figs 3 and 4). It was dug near a circular grave (Tomb E, with a diameter of 9.25 m and six compartments), and covered with a roof of flat slabs of limestone which had collapsed inside the pit⁵. It is also characterized by a complex stratigraphy, with episodes of funerary deposits, intentional backfill and natural fill. The original shape of the pit was oval, with a length of 4.8 m, a maximum width of 2.2 m and a depth of 2.5 m (fig. 3). A small extension and access was dug at its southern end, thus making the total length of the pit 7 m. The upper part of the western and northern sides of the original pit was strengthened with a stone wall, but only the very top of the rest of the pit was constructed of stones. This wall was built using non-dressed stones together with a dozen ashlar blocks originating from the facing wall of Tomb E (the facing stones found all around Tomb E were identical in dimensions, shape and shaping and different from the ones associated to the other circular graves of the Hili necropolis)⁶. Their use indicates that the circular tomb was at least partly destroyed when the pit-grave was dug⁷.

METHODS OF THE NEW EXCAVATIONS

We are currently excavating the central portion of the deposit – representing a volume of *ca* 6 m³ of which the surface is reduced to 3 m² (fig. 5). The constraints of the *terrain* are thus important, but the potential in information from the funerary deposit, even truncated, is obvious, as the interior of

the tomb shows no trace of plundering. On the contrary, other tombs at Hili have all been pillaged as they are much more easily recognizable in the very flat environment of the piedmont zone.

Protohistoric funerary practices in eastern Arabia are still not well understood, but it is clear that by the end of the third millennium they had attained a high degree of complexity⁸. To improve our understanding of these practices, it was decided to apply to Hili N the methods and techniques used for the excavation and analysis of collective burials by specialists such as H. Duda, J. Leclerc and J. Masset⁹. The methodology and techniques of funerary field anthropology has been radically developed in the last 15 years and the benefit of these new methods has been crucial to our understanding of such an exceptional grave as Hili N. Very precise excavation and the detailed recording of osteological and archaeological data is yielding invaluable information on the treatment of the dead by the Bronze Age population and providing more accurate assessments of sex, age, stature, and disease¹⁰.

In the pit, the funerary deposits have accumulated to a thickness of 1.70 m with an extreme density and imbrication of the skeletal remains, which are the result as much of the conditions of inhumation as the functioning of the monument and the natural tamping down and displacements within the deposit. We were able to distinguish several distinct phases of deposit in the tomb, which is a first for the Oman peninsula for this period. The relative age of these different deposits is clear and it is at least partly possible to reconstruct the succession of funerary activities, some of which are represented on figure 6. However, the nature of the evidence from the first excavations of the *DATA* does not enable us to project the existence of these levels to the whole of the funerary deposit.

5. HADDU, 1989 : fig. 1 ; AL TIKRITI and MÉRY, 2000 : fig. 1 and 3.

6. One facing stone is sculpted in "*ronde-bosse*" (AL TIKRITI and MÉRY, 2000 : fig. 5) with a motif we may interpret as a dagger, which is very close to the bronze daggers with a pommel in the shape of a crescent found in the tumuli of Madinat Hamad in Bahrein at the end of the 3rd millennium BC (COLLECTIF, 1999 : fig. 55). This type of representation had never been found among Umm an-Nar facing stones, but it is well known in the rock art of Oman (PRESTON, 1976 : pl. 15 ; JÄCKLI, 1980 : 13, 60-63). The same daggers are represented in Mahra and Jawl regions (Yemen) on funerary steles dating from the end of the 3rd millennium and the early 2nd millennium BC (COLLECTIF, 1997 : 33).

7. Very few bones and Umm an-Nar pottery sherds were recovered from tomb E, which was excavated by the Pakistani archaeologist Saeed ur Rahman in the 1970's (AL TIKRITI, 1981).

8. See for example BONDIOLI *et al.*, 1998.

9. See for example DUDAY, 1995 and, for a review, COLLECTIF, 2003.

10. The new methodology was applied on the field by the anthropologists under the supervision of J. Rouquet (InRAP) until 2002, G. Basset in 2003 and Dr E. Gatto in 2004. Methods of field operation were as follows until 2003 : cleaning of a level ; series of photographs (a photograph of each 1/4 metre square and more detailed photographs) ; drawing at the scale 1:5 ; removal of artefacts and bones, each of which was assigned a detailed field registration number, and the recording of each registration number on the removal plan. The registration of bones, artefacts, and other items, which is done on the field, includes the identification of the *item* and its precise description ; its orientation ; its altitude ; the number of the square ; the number of object within the square ; the stratigraphic unit ; the date of removal. So far, 38 different layers have been excavated, most of them belonging to the top level. The collected sediment (with vacuums) was sieved in 1 mm mesh.

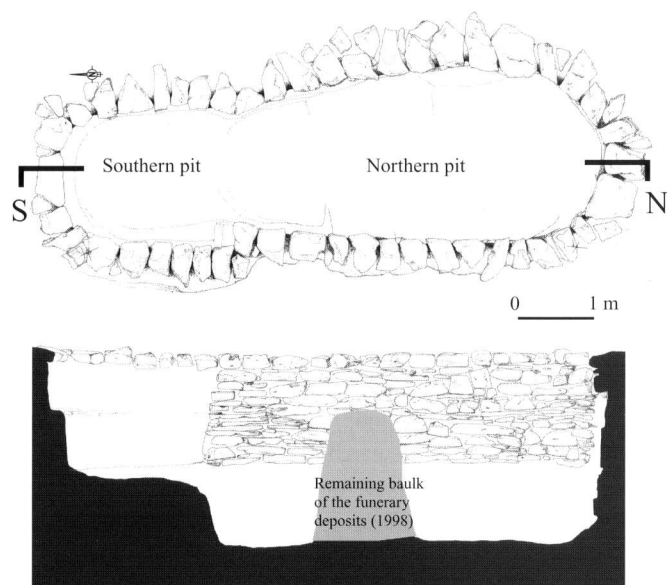


Fig. 3 : Plan and section of the pit-grave, after restoration of the monument. (Drawing : C. CHALUMEAUX).

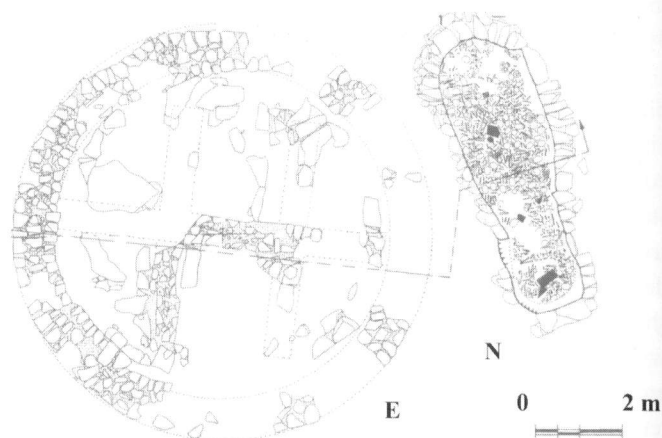
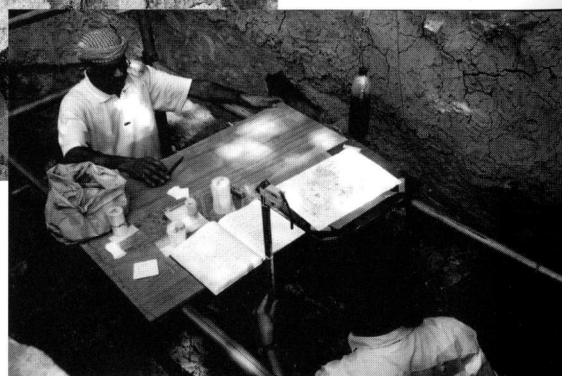


Fig. 4 : Plan of the pit-grave and the circular tomb, in the course of the 1984-1989 excavations. (Drawing : C.-U. JOHN).



Fig. 5 : The new excavations of the funerary deposits, 1.70 m thick and located in the centre of the grave, began in 1998. (Photo : FAMU).



STRATIGRAPHY

Our view of the stratigraphy of the funerary deposit rests firstly upon the north and south cuts. Based on these sections, it was possible to propose a stratigraphic division into 4 successive main phases of funerary deposits, numbered from 1 (the basal Level) to 4 (the last phase of funerary deposits and the first excavated).

The sequence of levels is as follows (fig. 6) :

- The *basal funerary deposits* (Level 1) consist of a very dense accumulation of well preserved, although fragmented, bones (the shafts of lower limb bones are very numerous) mixed with artefacts. It is also characterized by the rareness and the powdery quality of the yellow sediment which coats it. Only future excavations will show whether this level consists of primary inhumations or not (no groups of articulated bones are visible in the section). The upper limit of the basal level is slightly bowl shaped.

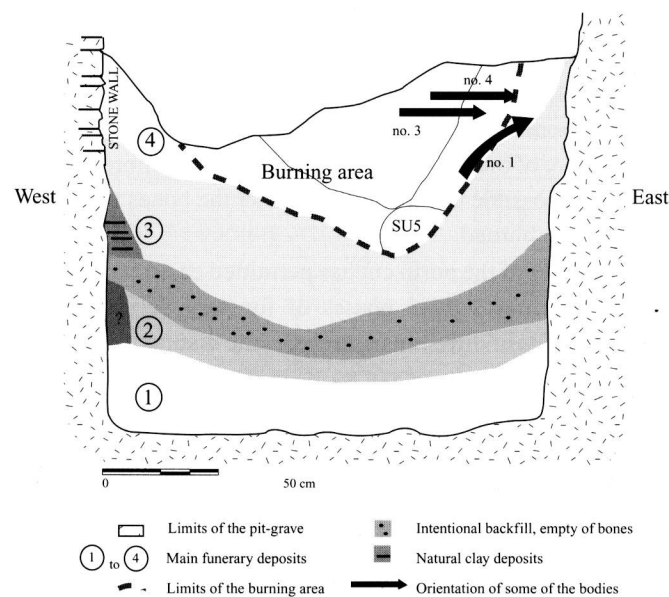


Fig. 6 : Four main funerary deposits were identified so far in the North section. (Drawing : S. MÉRY).

- The *second main funerary deposits*¹¹ (Level 2) consist of a very dense accumulation of bones, also well preserved, in the same type of sediment. It is also not known whether these are primary burials but the process of formation of the level seems to have been rapid and this was also the case for Level 1.

- Level 2 is covered by a *layer devoid of bones*, which is probably an intentional backfill of added earth. This layer is characterized by a sediment rich in rolled gravel. According to W.Y. al Tikriti this layer covered the whole surface of the northern pit.

- In section, at the level of contact with the eastern side of the grave, and only in this zone, we observed in 2004 that the following level of intermediate inhumation lying in an intentionally dug-out hollow in the *natural layered clay deposits* beneath. The latter resulted from stagnation of muddy water in the grave.

- The excavation of a third main *level of inhumation* (Level 3), which is still in progress, reveals the presence of primary inhumations (identified by the presence of groups of articulated bones bot in section and in the top first layers of the deposits). This consists of a dense accumulation of eroded and fragmented bones. In section, the level is bowl-shaped and characterized by a strong wall effect.

- The excavation of the *top level* (Level 4) is now finished. This contained mainly primary inhumations in an empty space and consisted of successive inhumations and the repeated reorganisation of the bones. We also observed intentional arrangements of bones, such as an alignment of skulls at the surface of the level, or long bones laid flat in a large *in situ* burnt area, located in the central part of the deposits¹². Apart from this burnt area, the level is bowl-shaped, built-up along the eastern and western sides of the pit. The erosion and fragmentation of the bones are more marked outside the burning area than inside, similar to the bones of Level 3.

11. A detailed study and a drawing (scale 1:1) of Section North was continued last season by E. Gatto with the help of C. Gagnaison and S. Méry. Subsequently the level called *level 1* previously (MÉRY *et al.*, 2001) is now subdivided in two different levels called Level 1 and Level 2. Levels 3 and 4 are unchanged.

12. MÉRY *et al.*, 2001 : figs 5 and 6.

DESCRIPTION OF THE EXCAVATED LEVEL 4 AND DISCUSSION

In the course of our excavations, more than 300 groups of bones, either in articulation or matching (*i.e.*, right and left) have been identified in Level 4 (fig. 7). Among these, body parts with very tenuous soft tissue connections, such as feet or hands, were numerous. Moreover, the partial skeletons of 24 different individuals, both males, females and children, have been distinguished (fig. 8). It has been possible to establish the original orientation of some of the bodies (figs 6 and 8) and, although their initial position was not always clear, in one case the arm of one adult was tucked up with a hand under the cheek (fig. 9), a classic posture in Umm an-Nar graves.

In Level 4, the deposits are stratigraphically homogenous, although consist of successive inhumations and the repeated rearrangement of the bones. Decomposition *in situ* is proved in numerous cases. Decomposition in free space is proved in two different cases and fully documented by J. Rouquet. An upper limb (humerus, radius and ulna, from layer 9) had not fully decomposed when deposited in the pit-grave. This was found without the hand, but it is possible that when the body was deposited, the arm was in a flexed position, with the radius and ulna over the humerus. This was not found in strict articulation, since radius and ulna were not in a normal anatomic position. Their position indicates several movements (mainly rotational) which would have occurred in the empty spaces liberated by the decomposition of the flesh¹³. Found partly below individual No. 3, a second group of bones in layer 9 includes a skull, mandible, and the first two cervical vertebrae. The mandible had moved laterally, and had toppled forwards. The axis vertebra had moved towards the original position of the cheek, and the atlas had shifted to the left and had turned 90° from its normal position. The skull had toppled forwards, lying on its right frontal bone. Such movements could only occur in free space.

The central area of Level 4 is burnt, although some bones were only partially burnt (some of these in full anatomical order), with a gradual change in color, depending on their initial position in the fire (fig. 10). This shows that the firing

occurred *in situ*. The bone color generally indicates temperatures of burning lower than 250 °C. The fire was intentionally constructed to facilitate combustion (as indicated by the presence of some branches of jujube wood¹⁴ at different levels within it and the recurrent horizontal, or slightly oblique but stable, orientation of long bones in the burnt area¹⁵).

This area of burning may correspond to two different firing events (after E. Gatto)¹⁶, the second occurring at the very end of the period of use of the grave and was thus possibly related to a ritual practice associated with the abandonment of the grave. The periphery of the fire was deliberately limited to the central part of the upper deposits, but had spread to the underlying deposits, at least in the lower part of the burnt area. Bodies (and/or part of bodies), which had not fully decomposed, and dry bones, were burned at the same time. Generally speaking, it is only possible to determine whether bones had been fresh when they were burned if the temperature of burning was high, and at Hili N, a temperature of 600-650 °C had been reached at the base of the burning area, as documented by a small pocket of grey-blue charred bones and white ashes (SU 5, fig. 6). The bones burned while fresh show a specific torsion and areas of micro-fissures, perpendicular to the longitudinal axis of the bones (torsion occurs as soon as the grey-blue stage is reached, but micro-fissures appear later, after the bone has become whitish)¹⁷. In the areas where the temperature of burning was not that high, it was more difficult or even impossible to determine whether the bones were fresh or dry when burned.

The study of the north cut has permitted easy characterization of the first 3 main phases of funerary deposits (clear edges and fills of different nature), but the distinction between Level 3 and Level 4 was not so clear. This is indicated in the cut by the presence of long bones laid flat and by complete vessels placed at the same level. The surfaces of levels 3 and 4 were not horizontal; their slopes descended a few degrees from the western edge towards the center of the deposit, then rose abruptly from the center to the eastern edge, forming an angle of about 30°. This strong relief explains the need to excavate the two levels at the same time. During the excavation, we looked for evidence of this break and were able to observe in 2002 a marked increase in pottery finds combined with a change in the state of preservation of the bones, phe-

13. During the process of decomposition the ulna toppled on to its anterior side, rotating about 270°. The radius followed, rotating about 180°, and ended up between the ulna and humerus. Such movements would not have been possible without free space around the bones. This indicates that the bodies were not intentionally covered with earth, and also confirms the observations made in the field, that the sediments in the grave are the result of natural processes, the gradual infiltration of either dust or mud.

14. We thank Dr M. Tengberg (University of Paris-I, UMR 7041-Nanterre) for this identification.

15. MÉRY *et al.*, 2001 : fig. 5.

16. For a detailed discussion see GATTO *et al.*, 2003 : 34.

17. *Ibid.*, 2003 : fig. 5-6.

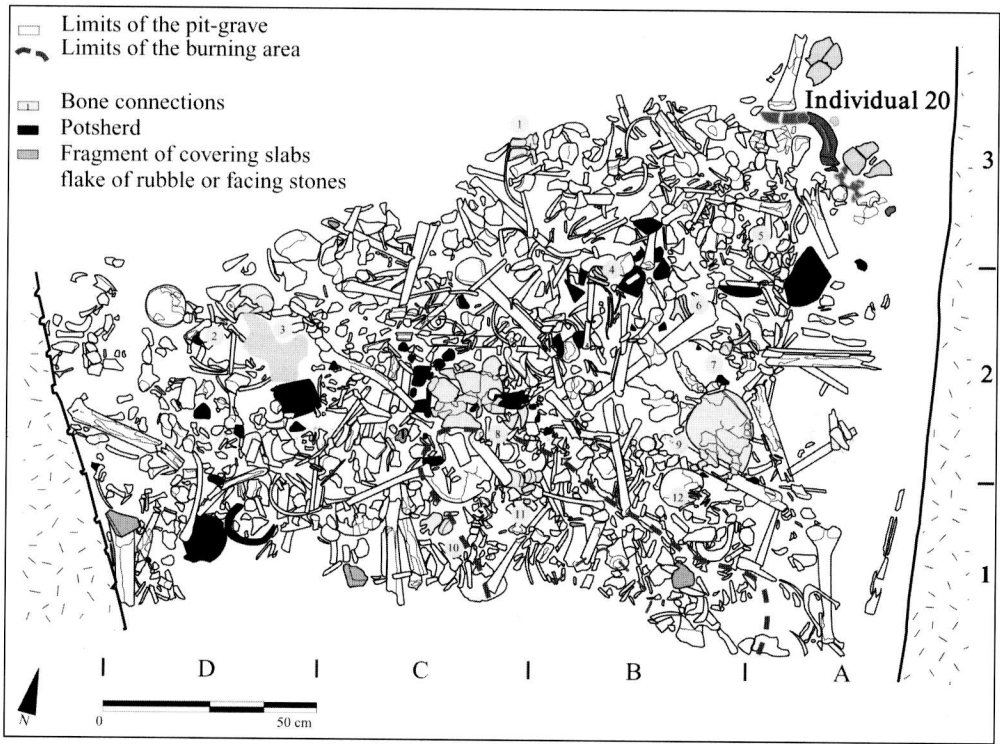


Fig. 7 : The number of disarticulated and fragmented bones mixed with pottery sherds and artefacts such as beads and rings is very high in the top level (Level 4), although many articulated body parts were identified in all excavated layers of that level. Among the latter, groups of bones with labile articulations which decompose very quickly had been preserved in strict anatomical order, indicating that the bodies must have been deposited soon after death. (Drawing : J. ROUQUET, G. BASSET).

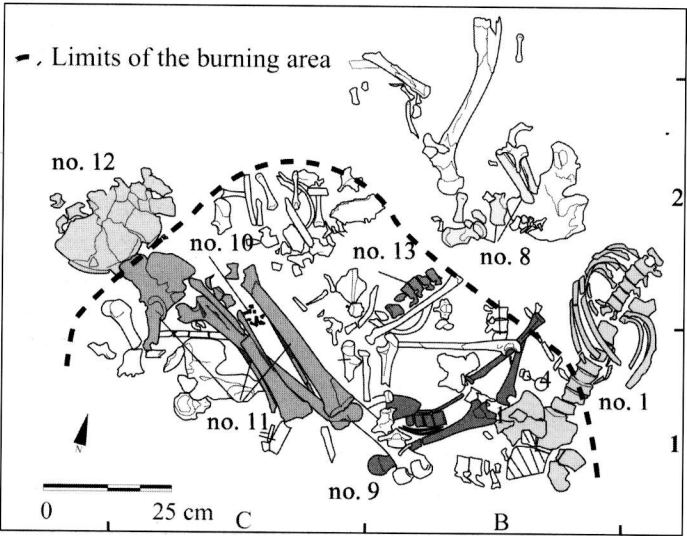


Fig. 8 : Thirty layers have been excavated since 1998 and fully recorded. We can ascertain the initial position of the best-preserved bodies and where decomposition has occurred in an empty space. Seven of the best-preserved bodies are visible in layer 14, at the top bone deposits. Individual n° 1 was burnt after the body had completely decomposed. According to the position of the left wrist, decomposition had occurred in situ. (Drawing : J. ROUQUET, G. BASSET).

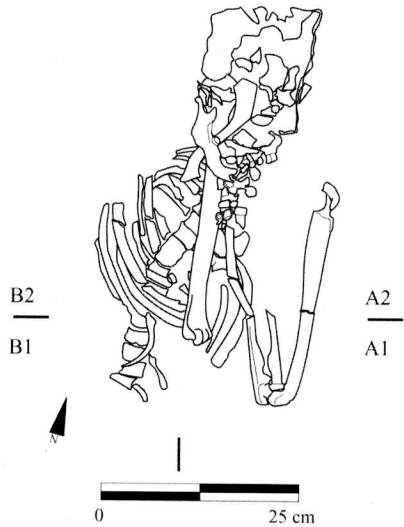


Fig. 9 : Individual n° 1. (Drawing : J. ROUQUET, G. BASSET).

nomena which are confirmed and extended to the whole surface of the excavation and which we interpret as indicating a transition between Levels 3 and 4.

The upper part of Level 3 is characterized by marked bone fragmentation, in contrast to the preceding level. Furthermore, the number of articulated body parts is much reduced and concern only a small number of bones, which is also in contrast to the preceding observations. These different characteristics recall those of the first clearing operations of Level 4, which we interpret as indications of an exposed and trampled surface, that is, the top of Level 3. The level is also characterized by the absence of large articulated body parts, attributable to one individual, and by the first two pottery deposits.

The assemblages known up until 2003 have been mainly groups of ornamental elements, which were not associated with a particular group of objects nor to a particular individual. This was the case for two beads associated with an engraved seal in layer 9¹⁸ and a dozen beads in connection in layer 10 (Level 4). Although intentional manipulations of the bodies have been identified several times in Tomb N, we have not yet been able to clearly identify in Level 4 those involving the deliberate arrangement of the objects by the gravediggers. We were able in 2003 to observe groups of several objects which were clearly set in place, in this case 3 or 4 complete or semi-complete pots : these groups are located in squares C1 and D1, at the edge of the cut, and mark the top of Level 3. A parallel exists with Mowaihat B pit-grave (Emirate of Ajman), as a published photo from that site shows a group of pots, and copper and chlorite objects set one against another¹⁹. We interpret these groups as funerary deposits because the objects are not only set against each other but are in a stable position, either upright or on their sides. However, it is not possible to determine whether these deposits are associated with one or more individuals, given the disturbances occurring during the use of the tomb. The pots could have been displaced by Bronze Age gravediggers.

MAIN RESULTS OF THE BIO-ANTHROPOLOGICAL STUDIES

The team is also responsible for the study and publication of the material recovered from the whole tomb. The analysis

of the human bones recovered from the 1980's excavations is now complete²⁰. The study of the objects, more than 850 pottery vessels, about 50 soft stone vessels, copper bronze objects and hundreds of beads, is in progress²¹.

BONES FROM THE ORIGINAL EXCAVATIONS

A total of 413 kilograms of human bone had been recovered before 1998. Over 130,000 fragments of bone were examined by K. McSweeney, 100,000 of these positively identified and recorded. The human remains were generally in a rather poor condition, with many bones reduced to small fragments. There were virtually no complete long bones, and only one skull was reasonably intact. Although the degree of fragmentation of the larger bones was high, many smaller bones, such as those of the hand and foot, patellae and vertebrae, and many immature bones, had survived intact. Dental remains were in poor condition. While mandibles, and to a lesser extent, maxillae had survived fairly well, most of the teeth, which had clearly been *in situ* at the time of death, had been lost *post mortem*, and the crowns of the few teeth that were still *in situ* in their sockets, had been largely fragmented. While a large number of loose teeth were found, these were far fewer than the number of empty sockets. There was some fortuitous matching of broken fragments of bones, which were subsequently repaired, and several clearly articulating or matching bones were noted, but, on the whole, the sheer volume of the material meant that the reconstruction of fragmentary bones, or the rebuilding of individual skeletons was not possible.

The osteological analysis of the human remains from the original excavations produced a minimum number of individuals (MNI) of 430 (to date, including the remains from the current excavations, more than 500 have been identified and it is estimated that Hili N contained in at least 600 individuals). The estimate of at least 430 individuals buried in the tomb was based on the most frequently occurring bone. Account was taken of right and left sided bones, and, where individual bones could not be sided, a count of one half of the total was used. This figure was refined where clear differences in size, age or sex were visible. The results show a

18. MÉRY *et al.*, 2001 : fig. 11.

19. HAERINCK, 1991 : pl. IIIB.

20. The results of the study of the bones from the original excavations are integrated into a PhD thesis, defended at the University of Edinburgh by K. McSweeney (2003).

21. Preliminary results are published in AL TIKRITI and MÉRY, 2000 ; DAVID, 2002.

marked variation in the minimum numbers obtained from various skeletal parts. By far the highest count was attained from the petrous part of the temporal bone (407), while much lower totals are obtained from all other bones. The next greatest counts were 264 from the spine (mostly based on the axis or atlas vertebrae), 252 from the feet, and 248 from the patella. The femur, ulna and mandible all gave similar results. The disparity between the various bones is considered to be due to their individual patterns of fragmentation. Generally speaking, the long bones of the body, which were clearly present in large numbers, were of little use in assessing minimum numbers because they had mostly been reduced to amorphous shaft, or even unidentifiable, fragments. (The moderately high MNI associated with the femur was largely based on detached femoral heads; the tibia on the other hand, was of little use because of the difficulty in recognizing key areas of the bone.)

The process for assessing age at death and sex of the Tomb N population was of necessity very different to that normally used with discrete inhumations, *i.e.*, one based on a consensus of different indicators. Because the reconstruction of individual skeletons was impossible, markers of age and sex have had to be assessed in isolation. This may have resulted in less accurate estimations than those based on full skeletons.

Age at death was tenuously assessed for 411 individuals. The results show that 43 % of the total number examined died before reaching adulthood, of which 58 % before the age of 5 years. Death during later childhood was also common, with 30 % of all children dying between the ages of 5 and 11 years, and 12 % during adolescence.

Although a high proportion of the dead were immature, the mortality pattern shows a lower number of infants than would be expected for such a population, possibly suggesting that all may not have been buried in the tomb²². However, rather than indicating the differential treatment of some infants, the deficit may, at least partly, be related to the generally poorer preservation of the human remains from the original excavations. This question may become clearer on completion of the osteological analysis from the current excavations.

In the assessment of adult age, in the majority of cases (87 %, of the total of 236 adults), all that could be said was that the individual had reached adulthood. However, in the absence of positive evidence for advanced adulthood, it is very likely that many adults did not live into old age.

Sex was assessed, albeit tentatively, for 144 of the 236 adults identified in the assessment of age at death. Bones with sexually diagnostic characteristics were assigned to one of five categories: Female, ? Female, Sexually indeterminate, ? Male and Male. The greatest number of individuals in any of the five categories were females followed by males. If the Female and ? Female results were added together, these would account for 44 % of the total; Male and ? Male accounted for 40 %, and 16 % of the total were sexually non-diagnostic, *i.e.*, their dimensions fell between the standard ranges for males and females. Although there was a slight disparity between Females/ ? Females and males/ ? Males, in view of the number of unsexed individuals, it can be said that among those individuals that could be sexed there was no clear evidence of a bias towards either males or females in the tomb.

The virtual absence of complete and measurable long bones made the assessment of stature problematic. In an attempt to overcome this difficulty, a method of stature calculation based on the metatarsal bone was utilized²³. The right first metatarsal was selected because this was the most frequently occurring bone. Stature could only be calculated for 46 adults (about 20 % of the estimated number of adults buried in the tomb). The results showed that average height for the whole population was 164.4 cm, with a range of 147.8 cm to 183.4 cm, and approximately 157.7 cm for females and 171.07 cm for males. In considering these figures, it should be borne in mind that stature calculations using the 1st metatarsal carry a standard error of 6.5 cm (compared with around 3.0 cm to 5.0 cm for calculations based on the more conventional long bone length method, depending on which bone is used).

Despite the fragmentary nature of the remains a fairly high proportion of pathological lesions were noted. The most common conditions were poor dental health and a prevalence of iron-deficiency anemia.

Approximately, 65 % of all adults at Hili N had lost teeth during life. Significant *ante mortem* loss of teeth has been reported from many prehistoric Gulf populations and has generally been explained by the development of caries due to the regular consumption of dates²⁴. Examination of the dental remains from the original excavations at Hili N demonstrated that the etiology of tooth loss was not simply the result of tooth decay, but that dental attrition and periodontal disease were also relevant factors. There is now more evidence from

23. BYERS *et al.*, 1989.

24. For example, see LITTLETON and FROHLICH, 1989; BONDIOLI *et al.*, 1998; HOJGAARD, 1983.

22. GATTO *et al.*, 2003 : 40.

the new excavations of the importance of both caries and advanced dental attrition in the incidence of tooth loss among the Hili population, confirming a multi-factorial etiology.

Traces of anemia, in the form of porotic hyperostosis of the external surface of crania (fig. 11) and *cribra orbitalia* of the orbits, probably caused by iron deficiency, were quite prevalent; in excess of 200 fragments of affected bones were recorded from the original material, and affected bones are still being recovered. It has been possible to show that both skull and orbital changes occurred simultaneously in some individuals. Anemia, often associated at Hili N with children or young adults, may have played an indirect role in the premature death of these people, although it is clear that many of those affected survived into adulthood. Traces of the condition of those who did survive can be seen in abnormally thickened skulls often with slight pitting of the external surface of the skull.

Although more evidence of trauma is now being identified when compared with the earlier results, the prevalence of traumatic lesions among the Hili N population appears to be relatively low, and more likely to be related to accidents of daily life than inter-personal violence²⁵.

FIRST RESULTS OF THE ANALYSIS OF THE BONES FROM THE 1998-2003 EXCAVATIONS

These have complemented and enhanced the information gained from that of the original excavations in various ways. The retrieval of complete limb bones and skulls along with articulated body parts and partial individuals has enabled a more precise assessment of minimum numbers to be made and also improved the accuracy of assessments of age at death. The sex of some individuals can now be more reliably determined thanks to better recovery of skulls and pelvic bones. The stature of the individuals from the new excavations can now be estimated on the basis of intact limb bones, rather than having to rely on the less accurate method using foot bones, and a relatively greater number of pathological lesions have been identified.

Based on a straight count of each anatomical area present, and disregarding for this purpose the identified individuals, the remains of at least 50 individuals were recovered during the first 4 seasons of the current excavations. The greatest

number came from femurs, followed by skulls (47) and tibia (40). Mandibles were also numerous (38). Smaller bones, such as those in the hands and feet are much less numerous. The pattern of relative numbers from various bones was thus very different to that established from the analysis of the bones from the original excavations. It is very likely, therefore, that the inability to use long bones in the assessment of minimum numbers from the previous excavations has resulted in a lower assessment of MNI than is actually the case, and this factor alone clearly demonstrates the benefits of our current methods of excavation.

Although the osteological analysis of the remains excavated since 1998 is ongoing, the results so far show that approximately one third of the bones from our first 4 seasons were from sub-adults, and, as suspected from the original osteological analysis but unconfirmed, it is now becoming clear that a large proportion of adults died in early adulthood.

STUDY OF ARTEFACTS AND TECHNIQUES

As in the case of other graves from the Umm an-Nar Period, the dead in the Hili pit-grave had been buried with some of their belongings²⁶. The pottery and artefacts are consistent with what was known previously from the funerary assemblage from the last third of the 3rd millennium BC, but show an evolution within the 100-200 years of use of the pit-grave, at the very end of the 3rd Millennium BC. Such an evolution had not been previously recorded elsewhere in the Oman Peninsula.

SMALL OBJECTS

The 45 soft-stone (fig. 12) and 15 alabaster (or gypsum or calcite) vessels, often well preserved or intact, were among the most significant finds, together with two soft-stone seals and a flat trapezoidal blade. Hundreds of individual ornaments such as carnelian beads (mostly imported from the Indus Valley, fig. 13) and some silver and lapis lazuli beads from Afghanistan were recovered, as well as fifty locally-made bronze rings. Typical *Ficus subintermedia* shells, possibly used to feed babies, as documented by ethnography in the United Arab Emirates²⁷, are well represented.

25. Signs of trauma were also rare among the population excavated in the circular monumental grave of Tell Abraq (POTTS, 2000 : 94). This tomb contemporaneous or slightly more recent than Hili N according to radiocarbon dates (POTTS and WEEKS, 1999 : 10 ; MÉRY *et al.*, in press : fig. 6).

26. HADDU, 1989 ; AL TIKRITI and MÉRY, 2000 ; DAVID, 2002.

27. See for example POTTS, 2000 : 64.

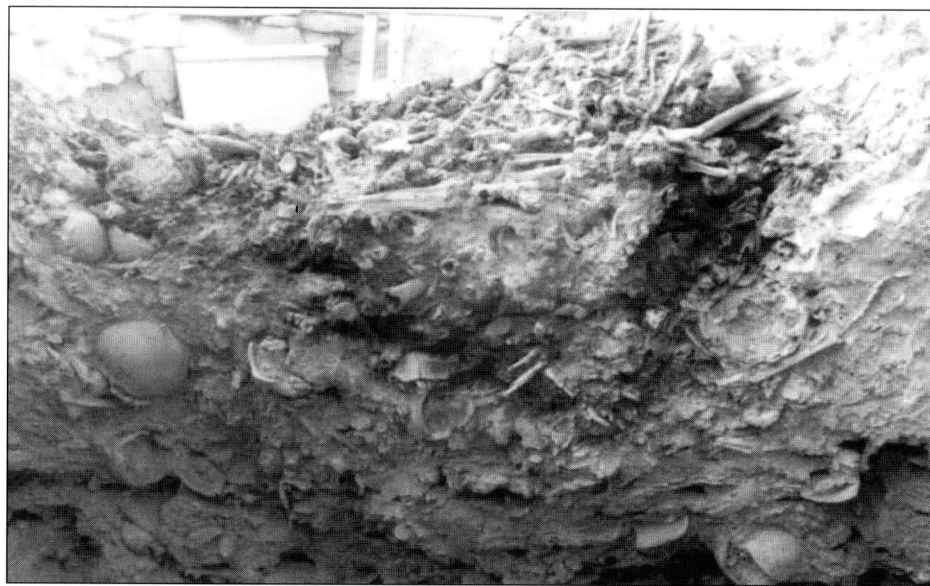


Fig. 10 : *Burnt area (North Section). the orientation of many long bones demonstrate intentional manipulation and possibly also maintenance of the fire as well. (Photo : FAMU).*

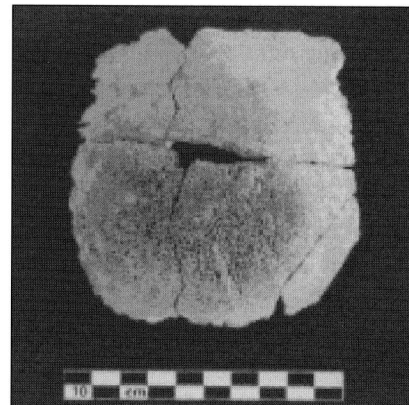


Fig. 11 : *Porotic hyperostosis on a parietal bone, Section 3 L. 4 (excavations 1984-89). (Photo : FAMU)*



Fig. 12 : *The three main types of Série Récente chlorite vessels are recovered from the pit-grave. Most of the vessels belong to this typical assemblage of the last third of the 3rd Millennium BC, but some features like the series of oblique traits on the goblet (left) announce the future development of the Wadi Suq style in the Oman Peninsula, as soon as 2000-1900 BC. (Photo : FAMU).*



Fig. 13 : *Five etched carnelian beads coming from the Indus Civilization workshops were recovered in the basal level of the pit-grave. (Photo : FAMU).*

POTTERY

Most of the 850 pottery vessels²⁸ recovered at Hili N had either been made locally (*ca* 80 % of the pots, or elsewhere in the UAE and the Sultanate of Oman (*ca* 10 %, fig. 14 : HN-100, HN-104). Other vessels found in the pit-grave had been imported from the Indus Valley, from Beluchistan, or from Makran (*ca* 10 %)²⁹. Indus vessels were only recovered in the basal level and possibly the lower intermediary level of the deposits. On the other hand, so far, only a single pot from Lower Mesopotamia has been found, but this comes from the top level of the deposits, which is statistically coherent with its stylistic attribution as it dates from the Akkadian Period³⁰. Figures 14 and 15 show a selection of these vessels.

EXPERIMENTAL STUDY OF THE POTTERY

The quantity, variety and good state of preservation of the pottery led to the development of a program of detailed experimentation by experienced potters³¹. The study includes the technological examination of all the vessels and sherds from

the pit-grave, as well as the “*chaîne opératoire*” used by the potters in the production of a particular vessel, identifiable through traces left on the pots (fig. 16). Experimentation with the replication of the shape and finish of the vessels, provides an understanding of the technology used by the potters from Hili and the Oman Peninsula and enables comparisons to be made with vessels imported from other parts of the Gulf and the northern part of the Indian ocean.

A reconstruction of the technology was proposed regarding the shaping and finishing of the vessels. The variety of techniques identified in the Hili N material correspond to those generally discovered in the Near and Middle East during the proto-historical periods : 1) hand-building without the use of rotation, 2) coil-building with the use of rotation for finishing, 3) coil-building, with the use of rotation during shaping, 4) centering of a small clay ball on the wheel and thrown coils, 5) actual throwing, that involves the centering of a clay ball on the wheel with hollowing and raising of the walls³².

The experiments were intended to test the different techniques identified from the archaeological material³³. The potters used a relatively simple potter's wheel, in conditions approaching, as much as possible, those of the Bronze Age. It could be demonstrated that a turntable (or other kind of rotating device) was used for the shaping of most of the vessels,

28. As a Minimum Number of Individuals. Half of the pottery vessels correspond to complete or semi-complete profile shapes.

29. AL TIKRITI and MÉRY, 2000 : fig. 9, n° 2-7.

30. *Ibid.* : fig. 9, n° 1.

31. The technological studies are carried out by S. Van der Leeuw and S. Méry, in collaboration with J.-P. Bérubé and F. Dessène.

32. VAN DER LEEUW in MÉRY (ed.), 2001 : 19.

33. The team also worked in 2002 with an accomplished Pakistani potter from Masafi in the UAE.

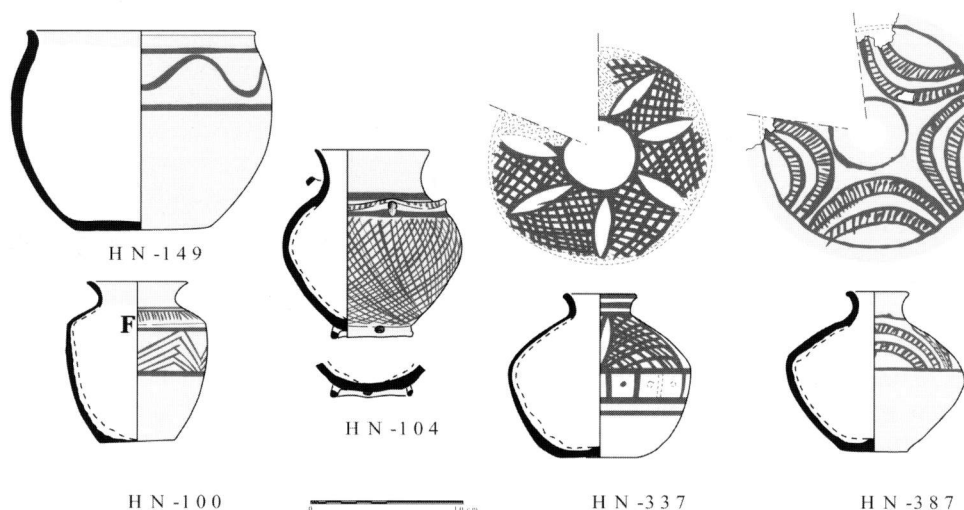


Fig. 14 : Some examples of local Hili Sandy Red Ware (HN-149) and regional Omani Fine Red Ware (HN-100, HN-104), as well as imported Indus (HN-337) and Iranian (HN-387) fine wares. Until now, pots coming from the Indus valley were not recovered in the 2 upper levels of the deposits. (Drawings : H. DAVID).

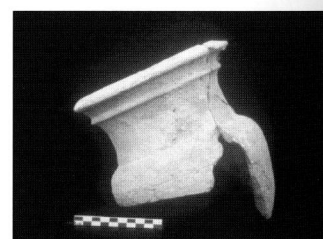


Fig. 15 : Among more than 850 pottery vessels in the grave, only one Mesopotamian pot was found in the upper part of the top level (excavations 1984-89). (Photo : FAMU).

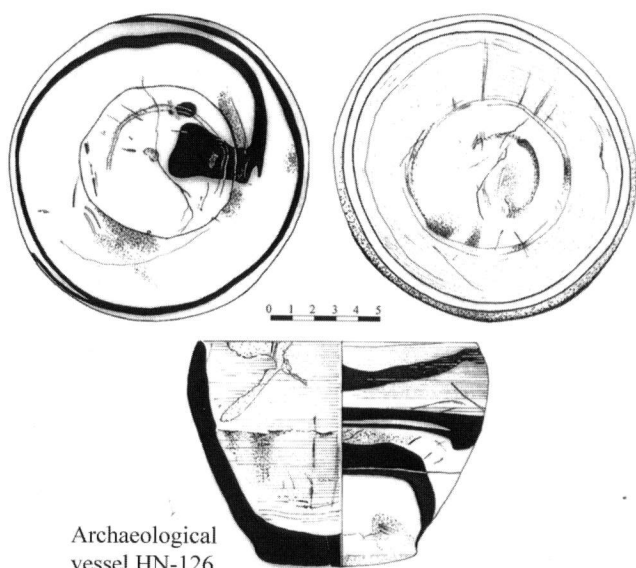


Fig. 16 : As demonstrated through experimental work, bowls of the local pottery (Hili Sandy Red Ware) were usually shaped using coil-building with rotation used in the finishing, or coil-building with rotation used during shaping. Here, the rotation was used during the shaping (technique 3). The drawing of the archaeological vessel (HN-126) shows the diagnostic macro-traces. (Photo : FAMU. Drawing : C. CHALUMEAUX).

techniques 3 and 4 being the most frequently encountered in the locally-made pottery (*Hili Sandy Red Ware*) and regional fabrication (*Omani Fine Red Ware*). There was a centering of the base of a significant proportion of the vessels associated with technique 4, bowls and goblets of Hili Sandy Red ware, and throwing *stricto sensu* (technique 5) appears to have been little employed and only for small or medium sized vessels, if at all.

The technical skills locally used by the Gulf and Omani potters were high but not equivalent to those used in the Indus Valley in the same period. A time-lag in the mastery of shaping or throwing pottery on the wheel is obvious among the vessels originating from the Indus Valley and those of the Oman peninsula that we recovered in the pit-grave of Hili. Certain pieces from the Indus valley had been thrown (in one piece, or in two pieces) and are evidence of a particularly accomplished mastery which is not encountered, to our knowledge, in the 3rd millennium in the Oman peninsula.

Generally speaking, the operating procedures involving rotation become more common in the 4th and 3rd millennia in the Middle East and tend to become more successful, this being related to the use of more efficient rotary devices. However, these innovations do not necessarily spread rapidly to all the workshops in a given zone. We observe such a process in our case, as different traditions of shaping coexisted at Hili during the last third of the 3rd millennium. This diversity indicates the existence of several distinct workshops with different levels of specialization, which were probably family workshops. The wide variety of technical options among the locally-made pottery also illustrates the fact that the integration of rotation techniques represents a process which was complex and non-linear.

STUDY OF THE STONES USED IN THE FUNERARY CONSTRUCTION

The precise origins (from different parts of Jabal Aqlah, east of Hili) and techniques of shaping the stones used in the construction of the Umm an-Nar graves at Hili have also been identified by P. Barrier and C. Gagnaison during the last two seasons of excavation³⁴, leading to a better understanding of the relative chronology of the twelve Umm an-Nar tombs in the Hili necropolis. Tomb M, previously considered one of the most ancient Umm an-Nar graves in the area, should, on the basis of the quality of the shaping, dressing and pecking techniques and the dimensions of the stones, be placed in the middle of the sequence. The earliest grave, Tomb Z, is located to the south of the necropolis of Hili Garden. Re-discovered last year by W.Y. Al Tikriti, it was excavated in the early 1970's prior to Tomb A by the Pakistani archaeologist Saeed Ur-Rahman, although not recorded or published. Tomb Z was severely damaged (fig. 17) and it would appear that very little material was recovered by the excavators. Together with the Hili N pit-

34. GAGNAISON, BARRIER and MÉRY in MÉRY (ed.), 2002 : 39-47.



Fig. 17 : Tomb Z, possibly with two compartments only, was re-discovered in 2003. Base on architectural features, it is the most ancient Umm an-Nar grave in the Hili Garden necropolis. The facing stones of Tomb Z are smaller than for all the other graves at Hili, and their technique of shaping is very simple. (Drawing : P. DUBOEUF).

grave, the largest circular grave, Tomb 1059, excavated by the Danish team in the 1960's, is the most recent tomb in the area. The evolution of the working of the facing stones during the last third of the 3rd millennium BC thus testifies to a clear advance in the technical expertise of the quarriers and stone cutters³⁵ as well as an increase in their degree of specialization.

CONCLUSION

Hili N was more or less contemporary with the last Umm an-Nar tombs constructed at Hili Garden (Tombs A, B and 1059), which are the only tombs known in the eastern part of the Arabian peninsula with facing stones bigger than 60 cm and with a very high quality of shaping, dressing and pecking. It would also be roughly contemporary to two other tombs of the same type situated at about 1.5 km to the northwest, Tombs A and B of Hili North.

Contrary to the accepted hypothesis, the new excavations at Hili N, as well as providing a reassessment of the findings from the previous excavations, demonstrate that the tomb

was a primary place of burial for at least a large proportion of the population³⁶. Until now, only one other large, deep, and partially constructed pit-grave with primary inhumations has been excavated – at Mowaihat in the Emirate of Ajman³⁷. The Hili N pit-grave type is thus clearly different from the pits excavated at al Sufouh and Ra's al-Jinz RJ-1, which were smaller and exclusively used for the reburial of bone from nearby circular monumental tombs³⁸.

In addition to establishing that burial in monumental circular tombs was not the only funerary method in use at the end of the Umm an-Nar period in the United Arab Emirates, we have been able to demonstrate that the primary use of Hili N could have covered a prolonged period, between 100 and 200 years, according to radiocarbon dates³⁹ and artefactual analyses (pottery and small objects). The large dimensions of the pit and the creation of an access in its southern part indicate that the tomb was intended to last. It cannot yet be established whether the appearance of pit-graves was a later development in the Umm an-Nar period, but it is clear that some circular monumental graves were in use at the same time as the pit-graves at Hili and Mowaihat at the very end of the 3rd millennium BC⁴⁰.

Hili, as a vast settlement site with three excavated mud-brick towers and associated necropolis, has already provided much information on the Early Bronze Age in the region. However, today, the use of a multidisciplinary approach, inte-

36. MÉRY *et al.*, 2001, in press ; GATTO *et al.*, 2003.

37. The Mowaihat B pit-grave was excavated in the 1980's. A semi-complete female skeleton was found (AL TIKRITI, 1989 : 93) as well as groups of articulated bones (*ibid.* ; HAERINCK, 1991 : pl. IIA, top). However, due to the absence of anthropologists during the excavation, the presence of primary inhumations of the grave was largely under-estimated and thus Mowaihat B was assumed to be an ossuary, as was the case for Hili N pit-grave (*ibid.* : 9-10, 20 ; POTTS, 1997 : 48).

38. BENTON, 1996 ; MONTCHABLON *et al.*, 2003.

39. Five radiocarbon dates were processed by Dr J.-F. Saliège (LODYC, University of Paris VI-Jussieu). Two types of material were analysed : charcoal (Pa 1844) and bone (all other samples). Only one sample from the basal level of Hili Tomb N (Level 1) was dated (Pa 1835). All other samples come from the top level. See MÉRY *et al.*, in press, for a detailed discussion of the results.

Sample	Radiocarbon Age BP	Calibrated age cal BC	Calibrated age cal BP	Method A 1 sigma BC	Method A 2 sigma BC
Pa 1835	3,800 ± 60	2200	4149	2,317-2,137	2,455-2,034
Pa 1840	3,760 ± 70	2178, 2166, 2143	4127, 4115, 4092	2,281-2,038	2,451-1,950
Pa 1844	3,730 ± 30	2135, 2071, 2063	4084, 4020, 4012	2,181-2,041	2,198-1,987
Pa 1978	3,745 ± 40	2188, 2182, 2141	4137, 4131, 4090	2,201-2,044	2,287-1,984
Pa 1979	3,755 ± 45	2195, 2172, 2143	4144, 4120, 4092	2,272-2,052	2,294-1,984

40. This was the case of the grave recovered at Tell Abraq, see POTTS, 2000 ; POTTS and WEEKS, 1999.

35. Pierre DUBOEUF, comm. pers.

grating field anthropology and the characterisation of the material culture through experimentation and archeometry, is new to the area. Combining different approaches on funerary data, we are providing a more precise and well-established documentation, which will eventually lead to a new interpretation of social organisation in an oasis at the end of the 3rd Millennium BC in the Oman peninsula.

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