

New photographic evidence on the 1954 excavations at Moita do Sebastião, Muge, Portugal.

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Abstract

Four enlargements of previously unpublished photographs provide a great deal of additional information on a Muge Mesolithic site. We show that these images are of Moita do Sebastião and were taken during the 1954 field season. The four skeletons in the photographs are identified using details from contemporary field notes and inventories of bones made during excavation and in the 1960s. Additional information comes from examination of the skeletons themselves. Our limited prior knowledge of these four skeletons means that the photographs are of great importance.

The newly discovered photographs are used in conjunction with published materials to provide background for a discussion of the nature of the Moita sediments and mortuary ritual. We propose that the majority of the individuals excavated in the 1950s were buried with knees flexed up within cranio-caudally constricted shallow pits. Fill must have been placed immediately within the graves and built up into mounds, so that the flexed position of the legs was to some extent maintained, despite movements resulting from decomposition.

Introduction

In 2004 several photographic enlargements were discovered in the Museu Geológico of INETI (Instituto Nacional de Engenharia, Tecnologia e Inovação), Lisbon. They had been set aside to be discarded since they were unlabelled and the image surfaces had been damaged by insects.

Four images were found, each measuring 23.5 cm by 17.5 cm and showing the excavation of an archaeological site containing human skeletons. One of the images showed the skeletons indistinctly in the background. An archaeological trench was in the foreground and a building, agricultural machinery and a car could be seen beyond the skeletons.

Although these images have never been published before, and there is no published photograph of any of the skeletons shown, we can identify the photographs to site, to year of excavation and to the identity of the skeletons. The images provide us with new knowledge of the site, of the skeletons and of the history and circumstances of the excavation. Since the site is significant to European archaeology of the late Mesolithic, it is important that these images not be lost if we are to accurately reconstruct burial rituals at the Muge sites.

The photographs

We assume that the photographs were prepared for use in a display at the Museu Geológico on burials from a Muge Mesolithic site by O. Veiga Ferreira (1917-1997) who was working for the Serviços Geológicos de Portugal in the 1950s and 1960s. During this period, in association with Abbé Jean Roche, he excavated at three Mesolithic sites, Moita do Sebastião, Cabeço da Arruda and Cabeço da Amoreira.

Figure 1: Photograph 1 shows two burials in the background, close to a shed storing agricultural machinery.



Figure 1 provides evidence that the site must be Moita do Sebastião, because there is no other Portuguese Mesolithic site with skeletons upon which agricultural structures had been built. The other two Muge Mesolithic sites excavated during this period are quite different. The top of the mound at Moita had been bulldozed for construction of these buildings during the winter of 1951-52, providing a plane surface for the excavations of 1952-1954. The present situation at the Muge sites still shows the clear contrast between the plane denuded surface and now ruined building at Moita and the deep excavations into the vegetation covered mounds at Amoreira and Arruda.

The building at Moita was under construction at the same time as the excavation there, that is, from 1952 to 1954. We have evidence from published photographs and from sketch maps (see e.g. Cardoso and Rolão 1999/2000, figures 25, 31, 32; Roche 1972a plate 7.2) that the excavations had to be undertaken in close proximity to the buildings. The machine shown under the shelter of the building is some sort of combine harvester/thresher. This was not a fixed machine: it had large wheels at each end. Since the adjacent Muge valley fields had been developed for rice cultivation, and the building was intended to serve as a rice processing plant, we conclude that the combine was used in rice cultivation. Veiga Ferreira wrote on 13/5/1954 of features beside the *debulhadora* (thresher) (Cardoso and Rolão 1999/2000:192).

The date of the photograph can be tied down by reference to the car, which is an Opel Olympia Rekord, first released in March 1953. The photograph thus dates to the 1953 or the 1954 excavations: there were no excavations at Moita after June 1954. The car also gives us a rough estimate of scale, since the width of an Opel Olympia Rekord was 1.63 metres. From diagrams, aerial photographs and a survey of the ruins undertaken by Alvim, we know that the width of the building shown here was close to 7 metres to the far side of the pillar.

These four new images date to 1954, when excavations around the already erected pillars took place in the northern part of the Moita site (Roche 1972a:30, figure 5). The footprint of the building (Jackes and Alvim 2006:25, figure 7B) transected only one trench of any depth and that was along the northern face of the excavation, where the 1880s archaeological trench was re-excavated in 1954. We know from the north-south section of the excavation (Roche 1972a:32 figure 6) that the deepest excavation in that portion of the site was the re-opening of the 1880s trench and that it was at least 30 cm deep. Photographs from June 1954 (Cardoso and Rolão 1999/2000 figures 31 and 32) show that both the re-excavation and the new excavation extended under the northern wing of the new building. In May and June 1954 Veiga Ferreira expressed irritation that the pillars of the building damaged archaeological features and stated that they were excavating beside the pillars (e.g. 14/5/1954 and 10/6/1954) (Cardoso and Rolão 1999/2000:194-195).

The combination of a trench and a building indicates that we see the northern part of the Moita site in 1954. The view is from a trench over an excavated area which is flat and featureless and the camera records two skulls lying close together (a further shape, apparently a third skull, can just be discerned beyond these to the left when the image is enlarged). From these clues, we know that our viewpoint is neither from the west towards the building, nor from the south. We can only be looking from the north towards the western wing of the building. In the background, an excavator leaning on his shovel appears at the extreme upper right of Figure 1. He must be beside the consistently plotted hole number 66 (Roche 1972a:98 figure 25) which is also shown in a photograph (Roche 1972a plate 8.2), beside the pillar on the right. Further evidence for the identity of the photograph is the pit which had previously been dug into the trench wall on the left side of the image: a test pit (*sondage*) was dug at that point in 1953 (Roche 1972a:30 figure 5).

Figure 1 can provide us with more information. The size of the pick can be estimated from the fact that an identical tool was photographed and published (Cardoso and Rolão 1999/2000 figure 39: note that the labels for this figure are reversed). The pick in that photograph lies beside Skeleton 12 and at the same angle as MT V. We have an idea of the mean size of Moita MT V in the Lisbon collection: the rounded mean physiological length is 58 mm (sd 2.9, n 12 adults). Ferembach (1974:121), who considered Moita 12 to be female, gives the mean overall length of female MT V as 56.3 mm. Based on these figures, the picks used at Moita were 30-40 cms long. Similar picks used in an excavation in western central Spain in 2010 consistently measured 33 cms. The 1885 trench shown here (see Jackes and Alvim 2006) was probably redug to slightly more than 40 cm.

Note that one skeleton – to the left – is oriented generally west to east. The other skeleton appears to have the back of the skull pointing straight to the north towards the camera position in Figure 1. Two skeletons lying in close proximity to each other and adjacent to an already erected building can only be those given the identifying numbers 30 and 32 (Roche 1972a figure 29). A further skeleton in close proximity would be Skeleton 33, a supposition supported by the fact that the skulls of 33 and 32 both lay directly towards magnetic north (Roche 1972a figure 30).

Figure 2 is a close-up of the two skeletons shown in the background in Figure 1. Photographs of these have never been published before, and the only information we have on them comes from sketches by Veiga Ferreira (Cardoso and Rolão 1999/2000) and inventories published by Roche (1972a) and Ferembach (1974). There is a problem, however: the numbers have been reversed in some sources.

It appears that on 15/5/1954 and 18/5/1954 Veiga Ferreira mistakenly changed 30 to 32 and 32 to 30 in his notebook (Cardoso and Rolão 1999/2000:205 figure 43). The evidence presented below confirms that the numbers used by Roche (1972a 116: figure 29) are also reversed.

Figure 2: Photograph 2 shows a close up of the two skeletons that lay close to the agricultural machinery storage shed. Skeleton 30 is on the right and Skeleton 32 is on the left.



Roche (1972a:126 referring to *Sépulture XXX*) recorded notes on the skeleton identified in the caption for Figure 2 as 30, and we summarize his observations as follows:

Orientation north-west – south-east. The frontal is staved in, the nasal and orbital region crushed. Maxilla is complete. Complete vertebral column with remarkably well-preserved lumbar. Both arms lying straight by body, left hand missing, the bones of the right hand are slightly turned in. Innominates in good condition, the pubes are absent. No long bone shafts. The proximal femora are retained. The feet are almost intact.

Ferembach's description (1974:30) of Skeleton 30 seems to agree – e.g., vertebrae present, all forearm bones present in reasonable shape, right and left tarsals present. The discrepancy is only: Roche – Skeleton 30 sternum absent; Ferembach – Skeleton 30 sternum present. Thus, the information from Roche and Ferembach correctly describes the skeleton on the right identified in the caption to Figure 2 as 30.

Skeleton 32 (according with the caption for Figure 2) was recorded (Roche 1972a:127-8 referring to *Sépulture XXXII*) in the following summarized notes:

Skeleton has north-south orientation. The incisors lost, the clavicles displaced. The forearms are folded in slightly, with the hands on the pubis. The vertebral column is incomplete, with no lumbar. The innominates are badly damaged. A few fragments of feet only.

Roche is clearly describing the skeleton identified as 32 in Figure 2, as is Ferembach (1974:30), although her inventory provides less detail. Nevertheless, she says the right fibula only is present, and that both forearms exist but are badly damaged. She makes no mention of vertebrae and describes only the left calcaneus. Thus, the information from both Roche and Ferembach is consistent with the photograph of the skeleton identified as 32 in the Figure 2 caption.

In 1984 Jackes visited the Museu de Antropologia e Pré-História Mendes Corrêa in Porto, where A. Huet Bacelar Gonçalves helped in an attempt to relocate Muge material that had been dispersed because of a fire 10 years previously. In 2010 Jackes revisited the museum and was able to see further material relocated since 1984. In 1984 it was recorded that lumbar vertebrae were complete only in Porto Moita Skeletons 3, 4, 10, 12, 13, 30 and in an unnumbered specimen *en bloc* which had no skull and the hands crossed over L.5. Jackes suggested that this was Skeleton 5 (whose skull is kept in Lisbon). So what was labelled 30 in 1984 (but mixed up with 31, as described below) had complete lumbar vertebrae and both forearms present. The arms were complete enough to allow description of a traumatic abnormality of the right elbow. The skeleton with the complete vertebrae was 30 for Roche, and also for Ferembach and was still labelled 30 in Porto in 1984. As we shall see later, Skeleton 33 also has lumbar vertebrae, but these are fragmented.

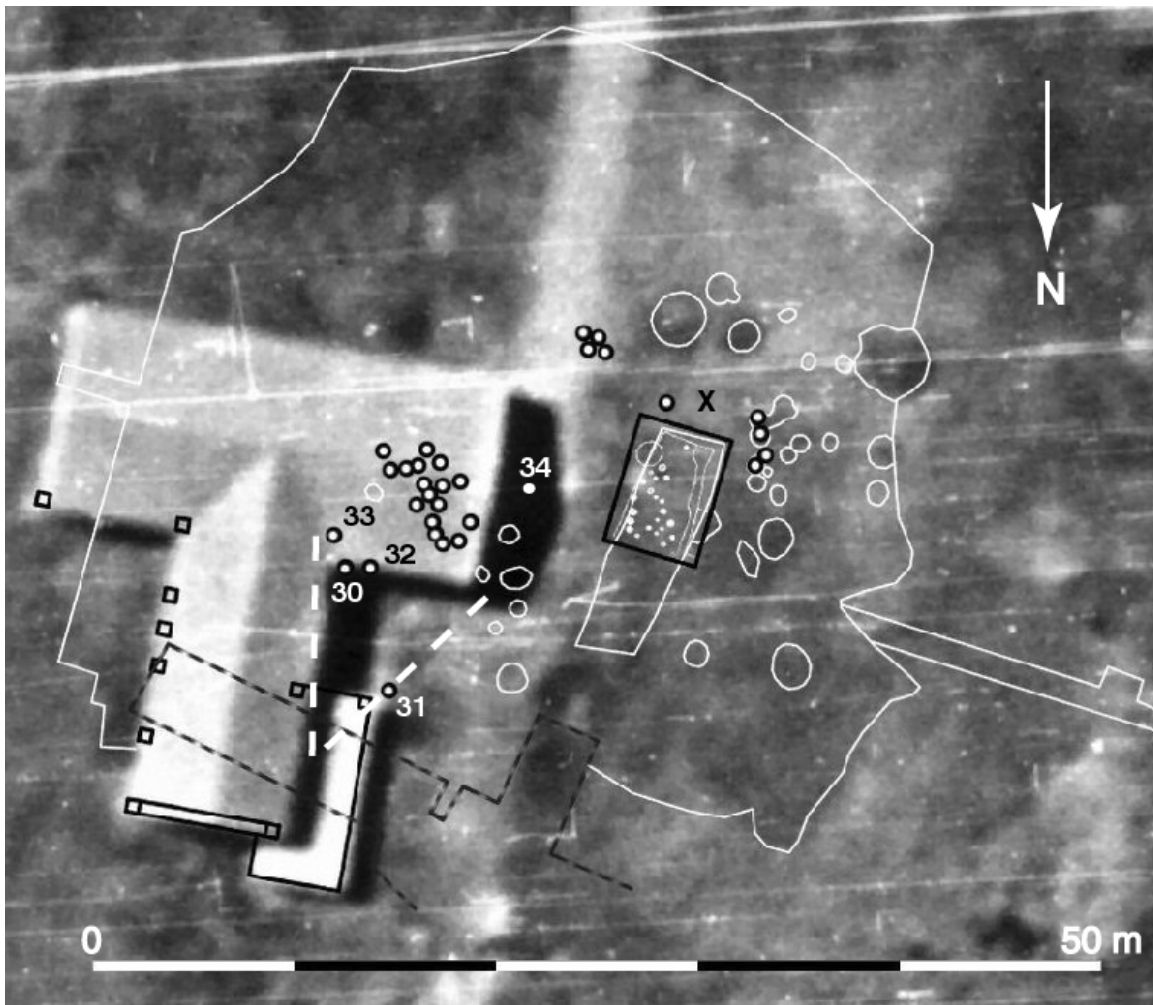
Veiga Ferreira's original sketch of 30 (with the number wrongly changed to 32), when compared with the new photograph, accords perfectly with the description by Roche (1972a) and with the skeleton present in Porto in 1984. Additional confirmation of the identity of 30 comes from Ferembach's (1974:99) description of the mandible of 30 as possibly having an abscess and caries of the left first molar and perhaps of the left P4. Jackes in 1984 described the left M1as having two huge interproximal lesions and the left P4 as reduced to the roots by a large carious lesion accompanied by an abscess. The dentition of Skeleton 30 can still be clearly identified and the unusual flattening across the anterior maxillary teeth, seen in Figure 2, is evident.

What was the reason for this confusion? On 13/5/1954 Veiga Ferreira recorded the discovery of two skeletons which were said to be virtually destroyed. They would have been the first numbered skeletons of the 1954 season, Veiga Ferreira having recorded that 27 skeletons were found up to the end of the 1953 excavation period (Cardoso and Rolão 1999/2000:192). However, no numbers were originally assigned to them and they were later described only as being indeterminable bone debris by Ferembach (1974:30). Roche (1972b:99 figure 24) labelled them only with question marks, although he had in a publication of the same year (1972a 116: figure 29) noted them as 28 and 29.

On 15/5/1954 Veiga Ferreira wrote that new skeletons were found belonging to group 1, that is, the group of skeletons from previous excavations in the area which by 1954 was underneath the harvester in photograph 1 (see Figure 3). On the same day, when he drew the two skeletons whose numbers he changed between 30 and 32, he actually called them 28 and 30. On 17/5/1954, he again referred to 28 and 30 and the next day (18/5/1954) he recorded finding a new skeleton near the "first two of this year" as though no other skeletons had been found. He thus ignored the "bone debris" skeletons. He sketched this new skeleton (33) together with the other in closest proximity to it (actually 30) and he labelled them 33 and 30 altered to 32 (actually, of course, 33 and 30). On 19/5/1954 he drew a skeleton which he labelled 31, but – in writing of it – he called it skeleton 29. It is clearly identifiable since he mentioned damage to the skull from a spade and he noted that it was found at the extreme end of the 1952 trench. It is the skeleton that came to be called 31.

Thus, the material called 28 and 29 was not originally given those numbers: it seems they were just indeterminate bones and there is no evidence that they were human. There was no material with those numbers in the Porto Museu de Antropologia e Pré-História Mendes Corrêa in 1984 and there is none now. The number 28 was originally given to Skeleton 32 and the number 29

Figure 3: Aerial photograph (Jacks and Alvim 2006: 25 figure 7) showing the angle of sight for Figure 1. The camera angle is indicated by the dashed white lines. The position of the “bone debris” is marked by X. Approximate cartographic north is indicated.



was given to Skeleton 31. Apparently there was continuing doubt over whether 28 and 29 were human skeletons and the sketches were given numbers that were altered and/or different from the numbers recorded in notes.

Comparison of the skeletons in photographs 1 and 2 is difficult, but Skeleton 30 as seen in Figure 1 can be reversed and enlarged to compare details such as the flattened innominates and the missing left hand. Moreover, the unusual configuration of the metatarsal/tarsal region and the absence of femora and tibiae appear to confirm the identity of the skeleton seen in Figure 1. The 1984 Jacks inventory of Skeleton 30 records that the femora were represented by proximal fragments only with “no sign of shafts” and the tibiae only by a left distal fragment. There can be little doubt of the identity of the skeletons shown in Figures 1 and 2.

Figure 3 shows the relationship of Skeletons 30 and 32 to Skeleton 33 and to the overall situation at the site. Skeletons are here represented by black circles filled with white. The location of Skeletons 28 and 29, the “bone debris”, is indicated by an X in the upper centre of the image. The angle of sight of the camera (the heavy dashed white lines) for photograph 1 is estimated on an unrectified 1:10 000 aerial photograph (Figure 3) taken in 1956, with the building on the left and Skeleton 31 just beyond the photograph 1 right frame.

Figure 4: Photograph 3 Moita Skeleton 31.



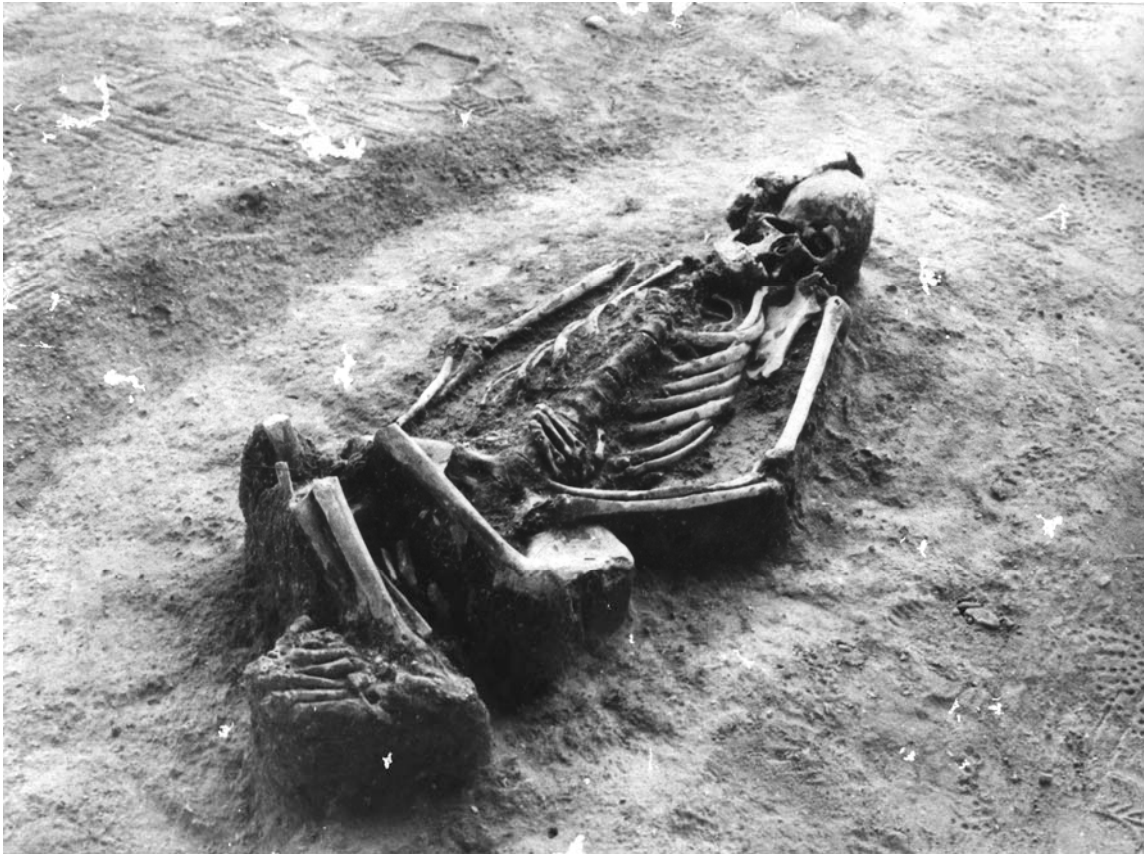
Photograph 3 (Figure 4) shows a skeleton with very specific characteristics, a skull in which the left side has been sheared off and legs have collapsed to the right side. On 19/5/1954 Veiga Ferreira described Skeleton 31 (which he called 29) as having the skull cut in half. He illustrated it (Cardoso and Rolão 1999/2000:205, figure 43) with the skull cross-hatched, indicating breakage. Roche (1972a:127) clearly described the curve formed by the cervical vertebrae – there can be no doubt that this is Skeleton 31. Roche noted that the face was missing, and his further observations can be summarized:

The right arm is along the body and the humeral head is missing. The forearm is placed across the stomach, with the hand over the left forearm. The left hand is disturbed but lies over the pubic area. The legs are strongly flexed and lie to the right side. The feet are crossed.

All such details, and more, confirm that Figure 4 shows Skeleton 31 from the 1954 Moita excavations. However, once again there is a discrepancy between Roche and Ferembach over whether or not there is a sternum.

The individual who seemed to be Skeleton 31 in 1984 is still recorded as Skeleton 31, with the crown of the right second mandibular molar lost to caries and the first molar on the left lost premortem. The mandible recorded by Ferembach in the 1960s is clearly the same as the Skeleton 31 mandible described by Jackes in 1984: Ferembach's description of the mandibular pathology of Skeleton 31 (right M_2 reduced to the roots, left M_1 lost premortem and alveolus resorbed (1974:100)) is entirely consistent.

Figure 5: Photograph 4 Moita Skeleton 33.



Roche (1972a:128) said that the mandible of Skeleton 33 lay over the maxilla, the damaged skull turned to the left. His notes can be summarized by the following:

The left shoulder region complete but the right very fragmentary. The left arm complete and slightly away from the side of the body. The hand is open over the lumbar vertebrae with the thumb separated from the fingers. The right ulna is crossed over the radius. Upper femora and distal tibiae and fibulae only (knees gone) leaning slightly to the left with the right leg raised slightly. The fibula is displaced behind. Feet are crossed, with the left over the right.

There can be no doubt that Figure 5 represents Skeleton 33 from the 1954 Moita excavation, although in 1984 the label 33 was associated with no more than a few ribs in the museum. In 2010, however, Skeleton 33 was represented by bones as shown in Figure 5. It is to be noted that the femoral and tibial breaks are fresh, confirming that the knees were probably damaged by the bulldozer before excavation. The surviving skull is without doubt that shown in Figure 5.

Unfortunately, there is no photographic image of Moita Skeleton 34 from 1954, although we do have a reasonable idea of it from Veiga Ferreira's sketch (Cardoso and Rolão 1999/2000:205 figure 43). This was a quite old individual who was extremely large, larger than the others. The transverse width of the right humeral head (53 mm) is 4 mm broader than in the next largest male, Moita 17, described in 1984 as "extremely large". Veiga Ferreira (Cardoso and Rolão 1999/2000:195) recorded that his legs were forced into hyperflexion and had become dislocated. The sketch indicates that the left leg was strongly flexed, while the right femur had fallen to one side and the tibia and fibula had separated from the femur, falling straight down distal to the pelvis. Roche (1972a:129) confirmed that the right knee was tightly flexed and that the left femur

had fallen to one side. The feet appear to have been placed very close to the trunk. The skull was partially burned and the individual was crushed. Skeletal elements labelled 34 survive in the Porto collection where they show extreme brecciation with a rather unusual coarse sand encrustation, and the medullary canals are completely filled with white sediment. The sketch and the descriptions provided by Veiga Ferreira and by Roche (1972a:129) make it very clear that 34 could not be confused with Skeletons 30, 31, 32 and 33. For this reason we can be absolutely sure of our identifications of the skeletons in the four photographs as 30, 31, 32 and 33.

What the photographs tell us about burial patterns and grave fill

The new photographs provide us with information on burial details. In the absence of extremely detailed plotting and description of burials at the time of excavation, it is essential to have good photographs (Nilsson 1998:6) taken from as many angles as possible in order to carry out what is called *anthropologie de terrain* (Duday *et al.* 1990) or, more recently, archaeoanthatology (Duday 2009), i.e., a study of the characteristics of burial. The structure of the grave and the nature of the surrounding sediments interact with the processes of decomposition and the final outcome may lead us to a greater understanding of burial practices. For this, the new photographs are vital.

The photographs make it clear that the burials were in hollows dug into the sterile sands underlying the midden deposits. Analyses have shown that Moita breccia, adherent matrix on bone and deposits within the medullary canal¹ of a femur contain sand. We therefore have to take into account the particular qualities of sand as grave fill, considering also that the sand would have been intermittently humid. Roche (1989: 613, fn 1) noted that the Moita sands had a higher clay content than the other Muge sites, perhaps explaining the development of broad areas of brecciated material at Moita in contrast to the isolated nodules typical of Arruda and Amoreira. Our analyses show the presence of aluminium silicates at Moita (but also at Arruda). From still adherent matrix we know that the grave fill also contained comminuted shells, ash and charcoal. The area of the burials excavated at Moita during the 1950s was, however, specified by the excavators (e.g. Cardoso and Rolão 1999/2000:183 figure 25) as having breccia directly overlying sand. Nevertheless, it is unlikely that the bodies were surrounded by sand alone. Since sand is very fine-grained sediment, it would infiltrate body cavities coincident with soft tissue decomposition. As the soft tissues decomposed, progressive (Roksandic 2002; Duday 2009:54) and continuous infilling by fine-grained sediments into the body cavities would lead to the thoracic cage and pelvic girdle maintaining their original form, and this has not happened with the Moita skeletons. Rather, as we shall see, the ribs have been depressed downwards (slumped), and the pelvis were splayed. Both suggest sudden collapse of structures no longer supported by the soft tissues. If sand were indeed the main (or exclusive) sediment covering the body, one possible explanation is that the body was covered with a hide, preventing continuous infilling as decomposition progressed. Alternatively, the sand could have been mixed with crushed shell, ash and charcoal in such quantity as to reduce its capacity to flow. This would limit erosion from a mound built above the burial and reduce the capacity of the sand for continuous infilling of the body cavities. Our interpretation is that the grave fill was in fact firm and stable and this is supported by the evidence that sediments were securely in place immediately surrounding the cadavers, maintaining limbs in their original burial postures to some extent. It is clear that the sands around the bodies did not simply erode away, exposing the skeletons to the risk of disarticulation and dispersal, despite what appear to be very shallow graves (Roche 1972a:1118, 121-2, 127, 131 mentions shallow cavities hollowed out of the sand in relation to burials 3, 5, 12, 14 and 31; he also states that the children were buried in small holes in the sand). In addition,

¹ The dominant features within this deposit were shown to have up to 93% normalized weight Si (S-2700 Hitachi PGT IMIX EDX) according to analyses conducted in association with Christina Barker, Chemical and Materials Engineering, University of Alberta, Canada. Goodness of fit for the two specific 1 micron point analyses with 93% Si: 1.32 and 1.15. The bone analyzed is labelled "diverse burials" from the 19th century excavations, not from those under discussion here.

there must have been strong downward pressure on cadavers, leading to common, if partial, crushing and deformation of the skulls, so we can envisage immediate infilling, with mounds built over the burials, compacting the sediments and adding to the weight of the deposits (especially when wet) over the skeletons. Duday (2009:54) distinguished progressive and “staggered” filling of spaces, and it is clear that the Moita skeletons were subject to staggered, discontinuous collapse and filling of voids created by the decreased volume of the cadaver.

Several unknown factors mediate the final outcome, leading to variability: the possible use of some covering (perhaps hides) over the cadavers, the purity of the sand, and the season of the year determining the water content of the sediments. Examination of Moita 1 from the 1950s excavation showed that the matrix was particularly hard and since the skulls of both Moita 1 and 20 were varnished without being fully cleaned, it can be seen that both were surrounded by sand which contained a good deal of fragmented shell. The facial orifices are likely to have retained such fragments differentially, no doubt skewing our idea of the nature of the sediments.

Figure 6A: The breccia within the cranial vault of Skull 17 exhibits small pebbles and shell fragments within the grave fill. Photo: D. Lubell.

Figure 6B: despite the exigencies of nearly 60 years post-excavation, the area beneath the left femur head of Moita 5 indicates that grave fill (the upper darker sediment) contained pebbles and shell fragments. Photo: D. Lubell.

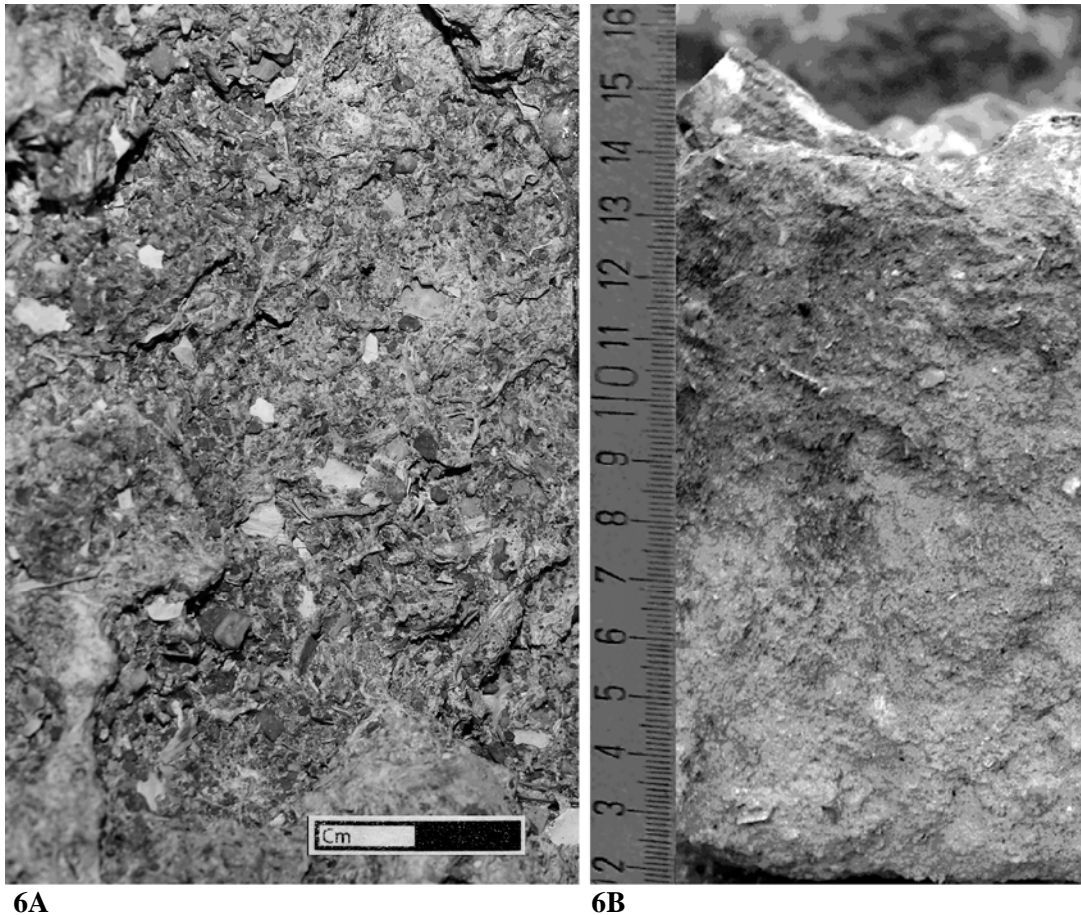


Figure 6A suggests that fine grained deposits may have been washed away from those skeletal elements which could have caught and retained moisture filtering through the deposits, while Figure 6B makes it clear that fill generally contained a variety of constituents, shell, charcoal and pebbles, which would indeed be selectively deposited in skeletal cavities. The lack of a clearly defined lower margin of the fill is to be expected as a result of liquid filtering through deposits

and the activities of, e.g., earthworms (Duday 2009:54-55), as well as the circumstances of excavation and curation.

Other examples, maintained *en bloc* in the museum in Porto give us a very clear indication that fill could be heavily charged with charcoal, pebbles and shell, to such an extent that it seems likely that anthropogenic fill was packed around the skeletons and in some cases served to keep selected skeletal elements in place despite the tendency of joints to slide apart after the disintegration of ligaments. We will discuss Skeleton 19 below, providing a particularly clear indication that compacted grave fill, rather than the shallow hollows within the sterile sands, provided support allowing some joints to remain in articulation.

Further evidence that there was preparation of the grave surface, before the body was laid down, comes from Roche's description of Skeleton 3 (Roche 1972a 118) as lying on a bed of unopened *Tapes decussates* and surrounded by charcoal and some ochre. Skeleton 33 had crushed *Scrobicularia plana* to a thickness of 5 cm beside it, particularly around the skull and left shoulder. Skeleton 12 was buried with a large number of *Helix pisana* (land snails are recognized as a common accompaniment of burials in the circum-Mediterranean Mesolithic, Lubell pers. comm.). Other skeletons were buried with pierced *Neretina fluviatilis* shells, most dramatically Skeleton 25, a child mislabelled already in the early 1960s as 27 (Ferembach 1974:30).

Moita 30 was no doubt buried with the knees flexed so that the femora were perpendicular to the body axis. Although the leg bones have disappeared, it is clear from the fixed position of the feet, flat on the ground and undisturbed, that the legs bones also remained in place. The now broken left femoral diaphysis must have been retained in an upright position, but Figure 2 allows us to see that the broken right femoral shaft had collapsed outwards. The skull is slightly inclined towards the thorax, indicating that the head was placed on a downward slope and there seems to have been some shoulder constriction in that the right humerus is slightly rotated medially, while the radius, ulna and hand lie flat on the ground surface. It is likely that the left side of the body followed the same pattern. Because there is no lateral splaying of the ribs, but rather slumping of the ribs in a caudal direction, along with the clavicles, there is further evidence of restricted space around the thorax. In general, the evidence is of downward compacting, but not continuously infilling grave deposits. The mandible has stayed pressed against the chest and the face has been compressed inwards. The evidence indicates that a mound was built over the body while Figure 2 shows that the body was buried on a flat bed of anthropogenic sediment, dark with ashes and charcoal. The position of the cranium and the legs indicates a cranio-caudally constricted oval grave. As indicated by the fully splayed iliac blades there was no lateral constriction and the bottom there was flat, although it is likely that compacted fill held the head slightly raised, the shoulders pushed in and up to some extent and the left leg flexed up.

Moita 31 lay in dorsal decubitus (lying on the back) with the arms crossed over the abdomen. In this case, it is obvious that the knees were not upright, since the position of the feet indicates that the individual was buried with his legs folded tightly and lying to the right. The skull was apparently not held firmly in position, since it has fallen away from the cervical vertebrae, perhaps from the third cervical vertebra, towards the right shoulder. The photograph (Figure 4) appears to indicate sand, rather than anthropogenic grave fill to the left of the skull. Since fill did not constrict movement of the head and shoulder, it is unlikely to have been closely pressed against the upper body. The ribs have slumped, rather than splayed, except at the level of the left shoulder. The left clavicle is displaced, with its medial end moved cranially, indicating that the cranium and shoulder probably moved at the same time, the head movement pulling the clavicle. This medial to cranial clavicular movement is not replicated among the other 1954 Moita skeletons. The iliac blades are splayed, but fill can clearly be seen under the left ilium and the lack of complete splaying suggests that the grave floor is most likely to have been concave. Once again, a cranio-caudally restricted grave is indicated, but with evidence of lateral space and less compacted fill: however, the right knee, especially, was held in place, presumably by fill. There

is no indication of large spaces left, as would be the case if the body was loosely covered with a perishable material such as hides: immediate infilling of the grave with no barrier between the sediment and the body is suggested.

It is noteworthy that 31 was buried away from the main areas of overlying breccia recorded by the excavators. The medullary canals of the bones broken since excavation do not contain sediment and although there was breccia conserved on the mandible, it was apparently less heavily encrusted and difficult to clean than others from the site. In fact, the bones in general seem less brecciated and damaged by the cleaning which Mendes Correa requested be done in Porto (Roche 1972a: 115).

Moita 32 had been extensively disturbed: nevertheless it is possible to gain some impression of the burial position as dorsal decubitus with hands on the pelvis and knees flexed up. The burial must have been partially constricted on the right side at the level of the shoulder but the lower ribs are laterally splayed indicating less constraint around the trunk. The medial end of the right clavicle has moved caudally and the right humerus has rotated in. The “effect of the wall” (Duday *et al.* 1990; Roksandic 2002) explains the features of the right shoulder; here we refer to support from compacted grave fill rather than to any specific constraining feature or structure. The “verticalization of the clavicle” (Nilsson Stutz 2006) together with the right first rib and the extreme inward rotation of the humerus is indicative of constriction: Duday (2009:46) notes that clavicular verticalization can take place only when the shoulders are pushed up and forward. We do not argue for a tight wrapping of the body because of a number of features, particularly on the left side on the body. The skull has moved to the right and has fallen forward onto the mandible which is slightly dislocated to the left. While the left arm could have been disturbed during excavation, Figure 2 in fact indicates that the left humerus and clavicle are less constricted than those on the right. The position of the scapulae, maintaining a curve, suggests a concave grave floor in the region of the thorax and it is possible that the ilia were also able to resist complete splaying. Again the feet seem to have been drawn in towards the body, so that the knees must originally have been flexed and it is evident that the broken left femoral shaft was positioned up and medially. Ferembach (1974) noted that it is the right fibula which is present, although the fibula at present with Skeleton 32 is a left: the surviving talus and calcaneus are also left.

We therefore have an indication of a grave with sediments pressed against the back of the skull and the upper body, but less so in the lower body region. Empty spaces certainly allowed movement during the process of decomposition. Pressure from above, for example, the settling of the sediment of a mound sometime after decomposition was well underway, could account for the downward movement of the head and the collapse of the legs. The skeletal elements now in the museum collection show evidence of heavy brecciation with ash, sand, charcoal and shell adhering so closely to the surfaces that the breccia defied effective cleaning. Both excavation and cleaning damage, as well as abandonment of attempts at development from the matrix, are present as well as medullary canal infill with very hard material.

We have no explanation for the state of Skeleton 32 overall, but it must have been an ancient disturbance. While we cannot forget that the site had been worked over with heavy machinery before excavation, Roche’s description of the crushed face, the damaged incisor area and the disturbance to the lower abdominal, pelvic and leg regions would surely have included a comment if he considered the damage to have been modern. Certainly, Veiga Ferreira was so angered by the damage to the site (e.g. Cardoso and Rolão 1999/2000:194 where he calls the building work “a truly monstrous thing”) that he would have stated it very clearly had he felt the damage had been perpetrated by contemporary building activities.

Moita 33 is again lying in dorsal decubitus with knees flexed and no doubt originally perpendicular to the body. Figure 5 shows us that the body is thickly underlain by anthropogenic grave fill, particularly around the legs which are held partially upright by sediment. The material

in the museum collection is heavily brecciated and the sediment, with ash, sand, pebbles, charcoal and shell, has resisted cleaning, or has unfortunately led to damage, for example to the mandibular dentition. The skull is completely filled with matrix.

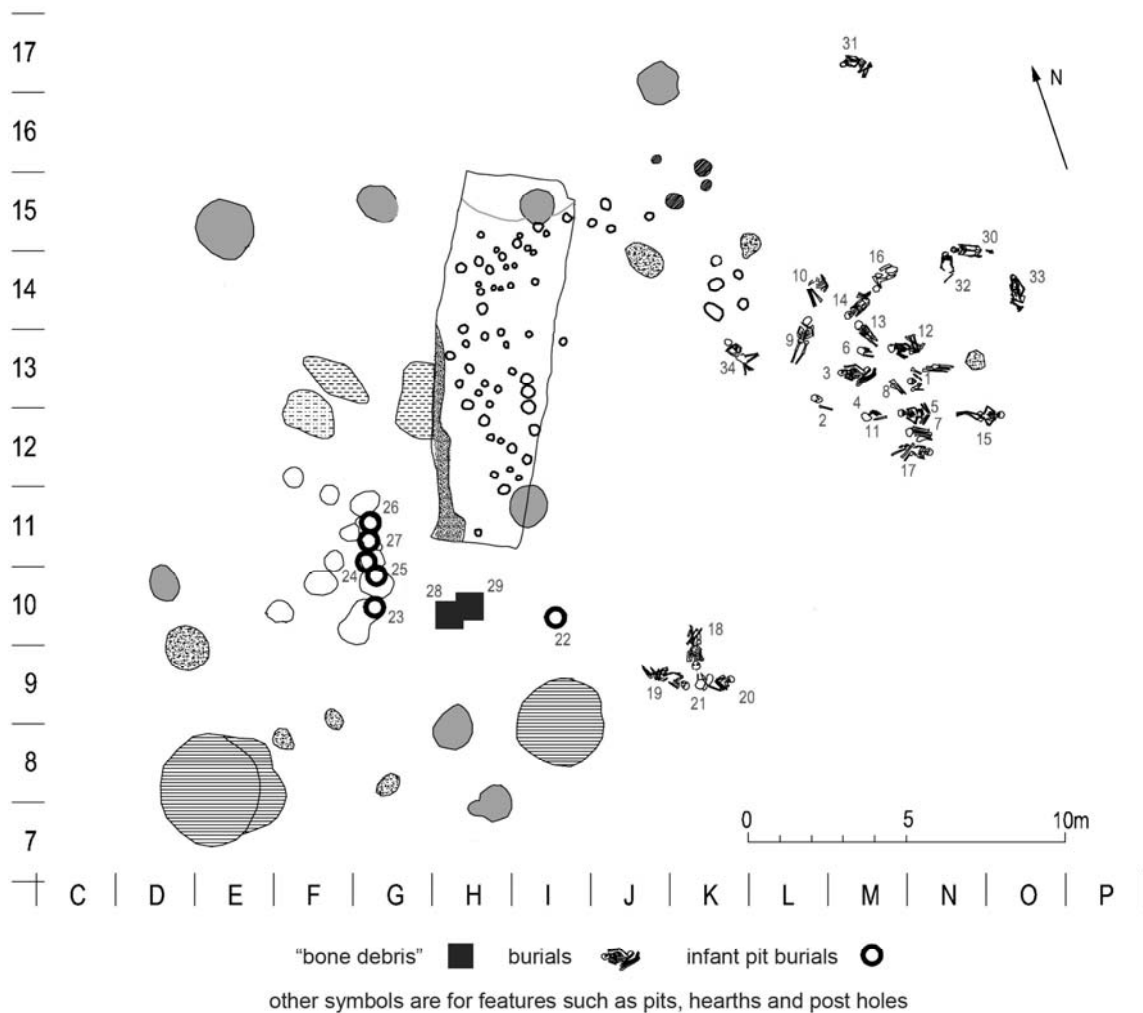
The left humerus does not appear to have rotated away from its original position, suggesting that it had lateral support and in fact the completely vertical clavicles indicate that the shoulders had originally been tightly constricted. The left hand lies over the abdomen: it seems that the forearm had rotated away from the wrist and fallen caudally, explained by the space created as a consequence of the decomposition of the abdomen. We can see from the left scapula that the grave floor is unlikely to have been flat. The skull was slightly inclined towards the thorax and had been elevated (Roche 1972a:123). There was obviously post-depositional movement and fracturing of the cranial vault relative to the upper upper facial bones. The ribs have slumped caudally and there is complete splaying of the pelvis, so at that level there was space provided by decomposition and less compact fill. The feet were parallel and flat on the ground close to the pelvis. Immediate infilling with compaction in some areas is indicated by the relative lack of movement of the legs to the side. In general, we have again an oval, cranio-caudally constricted grave, restriction in the area of the shoulder girdle, with a mound covering the body.

The skeletons excavated in 1954 suggest that the modal burial position for Moita is for the body to be placed in a shallow oval pit with the knees flexed up and the feet close to the pelvis: based on Veiga Ferreira's description (Cardoso and Rolão 1999/2000:195), Moita 34 was probably consistent with this. Only Moita 31, with the knees and feet to the right, contradicts this pattern.

The importance of these new images becomes evident when we understand that photographs of only eight Moita skeletons have been previously published in sufficient detail to indicate burial posture: these eight are broadly distributed through the main concentration of burials and should provide a representative sample (Figure 7).

Although in a glass case (now with Skull 18 – the correct skull is in Lisbon) it is possible to see that **Moita 3** (Figure 8) has the right arm across the chest, the left hand across the fifth lumbar vertebra and the right leg tightly flexed at the knee, with the left foot crossed over the right foot. The individual is in dorsal decubitus and according to the published photographs the skull and mandible were in connection (Roche and Veiga 1967:35 have Moita 12 which has open jaws inaccurately identified as Moita 3; Ferembach 1974 plate 1 is correctly labelled Moita 3). The indication of the grave shape or fill is provided by contrasting the completely flat left ilium with the scapulae (their lateral margins are identifiable) which tightly embrace the rib cage. The shoulders are hunched with the clavicles still in place (Roche 1972a, plate 4.2), articulated with the manubrium and oriented medio-caudally. The rib cage shows minimal distortion and only caudal slumping. It would seem that the grave bottom curved up underneath the skull and was also tight against the shoulders and the rib cage, thus keeping everything in good alignment. In fact, Roche (1972a:117) states that the head lay on a little mound of sand. The arms and the hands support this interpretation of constriction. Complete splaying of the left ilium can occur because of the large volume of the soft tissue decomposing in the area: this can create sufficient space for outward movement in the pelvic girdle, but there must be a flat bottom to the grave in the pelvic area for such splaying to occur. The knees have been positioned perpendicular to the body with the feet relatively close to the pelvis. While the knees are still upright, there was some collapse, especially of the left leg, associated with the splaying of the left ilium. We see a cranio-caudally constricted oval grave with a slight upward curvature at the skull and feet. The lateral constriction in the thorax area is more relaxed around the hip and the knees, but with sufficient pressure from surrounding sediments to hold the right leg up and the vertebral column in aligned articulation. The details all suggest a shallow pit – as noted by Roche – with immediate infilling and the creation of a mound. The sediment retained *en bloc* and in the nasal aperture suggests that the sand was accompanied by fragmented shell.

Figure 7: Reworking by P. Alvim of the available evidence on Moita features exposed by the 1950s excavations. Burials are numbered and other features are shown in order to provide context.



The skeleton of **Moita 5** had apparently lost its label already by 1969 (Meiklejohn inventory) and was without a label *en bloc* on the floor of the Museu de Antropologia e Pré-História Mendes Corrêa in 1984 when it was tentatively identified on the basis of previous publications. Confirmatory details were listed: the right and left hands were both on the fifth lumbar, the right over the left; the feet were crossed and the knees raised. The skull has fallen inwards very slightly with reference to the mandible and was obviously placed on a sloped surface with a slight inclination to the right, possibly as a result of decompositional movement. There is constriction around the shoulders, with some verticalization of the right clavicle clearly seen in the photographs (especially Cardoso and Rolão 1999/2000:201 figure 39 (top, not lower, photo)). The left humerus was completely rotated in, according to the excavation photographs. The forearm was pronated across the body, but the ulna had fallen away, perhaps in association with post-burial movement of the humerus. Only the lower ribs slumped caudally and laterally, indicating that the constriction was tighter in the head and shoulder region. One photograph (Roche 1952 plate 1, figure 1: not identified as Skeleton 5) suggests that the head and shoulders were in fact lifted. Published photographs show that while the pelvic bones are splayed flat, the knees remained completely upright, with very little lateral inclination (Ferembach 1974 plate 3; Roche 1952 plates 1.1. and 1.2.; Roche 1972a plates 3.2 and 4.1, Cardoso and Rolão 1999/2000:201 figure 39 (top, not lower, photo); figure 40 (top, not middle, photo)). The broadly

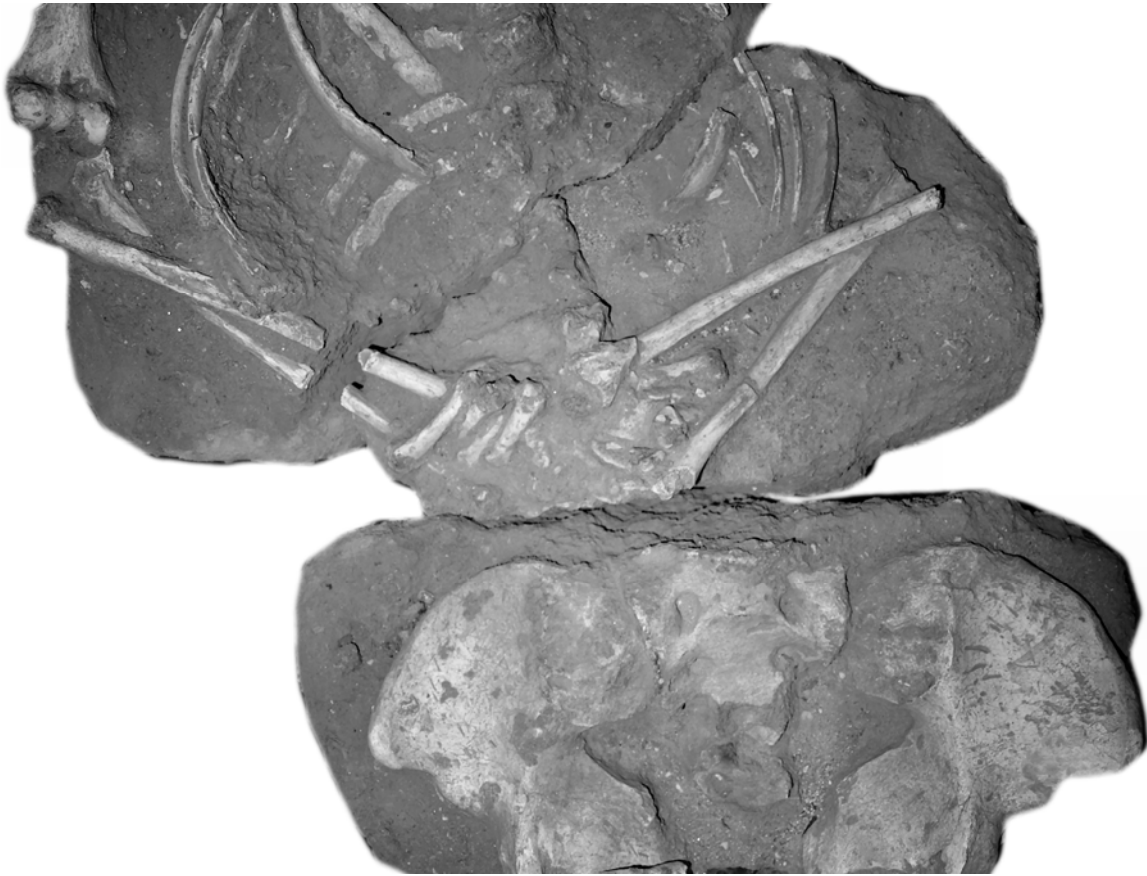
Figure 8: Moita 3 shows vertical orientation of the clavicles resulting from hunched shoulders (especially on the left side of the body), slumping of ribs, differential movement of right and left scapulae (the left is tighter) and left forearm and hand separation. Photo: P. Alvim.



splayed ilia (Figure 9) indicate a flat bottom to the grave in that area. We again have cranial and caudal curvature of the grave, with constriction around the uppermost body and immediate infilling. The facial orifices do not indicate that the sediment was heavily charged with shell.

In 2010 it was possible to confirm the identity of Moita 5, now separated into four sections (Figures 6B, 9 and 10). The upright femora evident in the field photographs (1972a plates ii.2, iii.2, iv.1), with the right femur already fallen soon after exposure (Roche 1952 plate i.1), have now been mislaid, as have the left clavicle and humerus. The skull and mandible are in Lisbon. An interesting observation can now be made regarding the right shoulder region (Figure 10). The clavicle suggests only that the right shoulder region was raised proximally, while the scapula has fallen away from the ribs. The right humerus has rotated slightly outwards, with the proximal radius moving away from the distal humerus. In other words, extreme verticalization suggested by the multiple photographs of the right clavicle (with the important exception of Cardoso and Rolão 1999/2000:201 figure 39 (top, not lower, photo)) may give a misleading impression of constriction at the shoulder. Photographs taken from an angle should be treated with caution.

Figure 9: Surviving elements of the torso of Moita 5 illustrate that the iliac blades fell laterally, the left ulna slipped caudally away from the hand and the right proximal radius moved from the immediate area of the elbow. Photo: D. Lubell.



| Skeletal element | Depth of fill below skeletal element |
|--------------------------------|--------------------------------------|
| Right ala and left ala | 4 cm |
| Right ischium and left ischium | 2 cm |
| Right anterior iliac crest | 1 cm |
| Left anterior iliac crest | 6 cm |
| Right talus | 5 cm |
| Left metacarpals | 6 cm |
| Left distal ulna | 4 cm |
| Right acromion | 7 cm |
| Right humerus head | 10 cm |
| Right distal humerus | 11 cm |
| Ribs on the left at T.4 level | 4 cm |

Table 1: Depths of grey fill below specific observable skeletal elements in Moita 5, preserved partly en bloc.

Examination of the preserved *en bloc* sediments with Moita 5, in locations where the grey fill was clearly separate from the light coloured basal sands, shows that fill lay unevenly below the bones (Table 1). From this we can suggest that the hollow in the sands was generally flat, but that the

upper body was slightly lifted with grave fill before a mound was built over the corpse. This suggestion was initially derived from photographs and was found to be valid when the actual specimen was examined.

Figure 10: The right shoulder of Moita 5 shows that the scapula has fallen laterally and the humerus has rotated outwards, despite the fact that the clavicle is relatively vertical. The shoulder was hunched up, but clearly not constricted against the ribs. Photo: D. Lubell.



Moita 9 was the only fully extended burial, in dorsal decubitus (Roche 1952 figure 2; 1972a plates 2.2, 3.1 and 5.2; Cardoso and Rolão figure 38 top and middle photos (note that this is wrongly labelled Moita 5)). This is a most unusual burial, since the others appear to have a curved grave, with the head and feet on slightly rising surfaces. Yet it is possible to discern an “effect of the wall”, meaning that there was indeed support obvious from the continued alignment of all the bones. For example, the knees have rotated outwards and yet the patellae are still in place, a clear indication that they were maintained in that position in some way (Duday 2009:35). The pelvic bones are not completely splayed, but have fallen away at the sacro-iliac joints. There was slight forward movement of the mandible and, as noted by Roche (1972a:119), the right radius and ulna, which lie across the upper chest, have moved out of anatomical connection. In general, we

can deduce a narrow grave holding the skeleton together, but with a slight concavity at the bottom. The mound covering this grave, being long and narrow, might have provided a slightly different environment from the other graves, for it was probably less high and less effective in providing firmly compacted grave fill. And yet we have the indication, especially from the patellae, of a grave covering that allowed movement (there was thus not continuous infilling with very fine sediment), but which limited slipping as articulations relaxed. One possibility is wrapping of the corpse. Since the skull and dentition are very well preserved with apparently little brecciation – there is even a hyoid, and the sacrum and vertebrae are in good condition – we could suggest less sediment pressure. Medullary canals are filled with fine white sediment which has apparently swollen and burst the humeral diaphysis with spiral fracturing, perhaps because of rain during the excavation (Cardoso and Rolão 1999/2000:184) or because of cleaning methods (there are other indications that the breccia dissolved and rehardened, but no notes on cleaning methods survive). Moita 9 is therefore unusual in several ways.

For **Moita 10** there is one not very clear published photograph (Roche 1972a plate 3.1) and the brief description by Veiga Ferreira (Cardoso and Rolão 1999/2000:184) which states that the body lay on its side in a disarticulated state. In fact, Roche (1972a:120) says that the skeleton gave the impression of a burial which had been disturbed after inhumation. However, the positions of the ribs make it very improbable that this body lay in dorsal decubitus. It is likely, then, that this is one skeleton in which the pit was wider than usual to accommodate the lateral posture, with flexed legs folded to the right. The skull appears to have been crushed.

With **Moita 12** we return to burials with good published photographs (Cardoso and Rolão 1999/2000:200 figure 38 top; 201 figure 39 (the lower photo is, in fact, Moita 12); Roche 1952 plate 1.2; Roche 1972a plates 2.2, 3.2, 6.1). Again we have dorsal decubitus and indications of a shallow oval pit. Nevertheless there are differences from the burials previously described since the grave was of more generous proportions than usual, especially on the upper right side. While the left hand lies in the pelvis, the right arm is in an unusual position, removed from the side of the body, flexed and with the hand on the right shoulder. Although the skull shows more substantial movement and is now positioned on its left side with the mandible fallen open, it seems likely that the left shoulder was maintained in position by a support that also served to keep the left leg flexed upright even though the right leg fell against it. Maintenance of the right arm in tight flexion and the perpendicular left femur indicate immediate infilling which must have pressed tightly against the right lower body. Skeleton 12 is maintained partially *en bloc* in the museum and we can see that the left innominate had fallen flat but that the right innominate has almost maintained its *in vivo* orientation (visible in Cardoso and Rolão 1999/2000: 201 figure 39, bottom image). The orbits and nasal aperture are remarkably free from shell, suggesting fine grained sediments in the immediate grave fill, and this is supported by the fact that the retained *en bloc* material is not heavily charged with charcoal, shell and pebbles. It is not possible, of course, to specify what went into the construction of a mound, but it is clear that a mound was built and helped to maintain the legs in their flexed position, despite the caudal slipping indicated by Roche (1972a: 121) for the right lower leg, and also for the left hand bones, and slight movement of the lumbar vertebrae to the right during the process of decomposition.

Moita 14 appears to have lost the skull. The skeleton was sketched by Veiga Ferreira 30/4/1953 (Cardoso and Rolão 1999/2000:202 figure 40) with a skull, but the photograph (Roche 1972a plate 3.1) shows no skull and Roche (1972a:122) says that there was no skull. Roche was of the opinion that the body had been buried with the legs tightly flexed on the trunk (and indeed the feet, which are crossed, with the left over the right, do not appear to have been placed flat). He states (1972a:122) that the legs had then slid to the right. Roche's opinion was that the burial was placed within a small cavity excavated out of the sand and the photograph (Roche 1972a plate 3.1) certainly shows that the excavators had outlined a pit.

With regard to Moita 14 we can say only that there is no evidence that the legs had ever been upright and Roche may well have been wrong in his assessment. There are two possibilities that need to be considered. In the first scenario, the individual was in dorsal decubitus, legs flexed so that the knees were drawn up. The legs collapsed, after the decomposition, to one side. In this case the grave could not have been immediately covered by sediment, contradicting the evidence from the other Moita burials. In fact, it is likely that the body was quite tightly constrained around the shoulders which seem hunched. In the second scenario the individual was laid with legs flexed and knees placed to the left side of the body. In this second scenario, the sediment would have been pushed in immediately after the body was put into the grave. The position of the feet and the fact that the bones are neatly aligned argues strongly against the first scenario and Skeleton 14 should be considered as a deviation from the modal burial position.

Roche's interpretation, the legs drawn up onto the trunk, is improbable given the position of the feet which are below the pelvis to the left side and apparently in good anatomical position. It is likely that the right tibia and fibula and the knees are also well placed anatomically. Such good positioning would be an unlikely outcome if a large amount of empty space had been created by the decomposition of the cadaver.

Several photographs are available for **Moita 15** (Roche 1952 plate 1.2; 1972a plate 6.2) showing that the burial was in dorsal decubitus, almost extended but with the legs slightly flexed. There was immediate infilling, evident because the right knee stayed upright and the left knee leans against it. Furthermore, since the feet and legs have maintained their position, it is likely that a mound was also present. The pelvic bones have splayed out and the arms are akimbo with the hand on the hips. The right radius has fallen out of articulation and the skull has moved slightly downwards and to the right so that the maxilla is no longer in contact with the mandible. Any type of shallow pit must have been more generous than usual since no lateral constriction is evident. The skull is on display in a glass case in Porto and this is one of the very few examples of more or less complete skulls from the site, and the only one kept in Porto. As with Moita 9, which has the facial region preserved, it appears that an extended burial allowed for a mound which exerted less weight on the skeleton.

From the photograph of **Moita 17** (Roche 1972a plate 4.1) we can see that the individual lay in dorsal decubitus. There was a marked constriction of the shoulders with the left elbow placed on the thorax and the left arm across the abdomen. The skull is drawn towards the chest indicating strong cranio-caudal constriction. The slumping of the thoracic cage and the caudal movement of the medial clavicle confirm this interpretation. The alignment of the bones on the left side of the body suggests that the body filled a very narrow and restricted grave with the underlying fill thicker in the area of the skull and thorax. Splaying of the pelvis is complete and the left leg collapsed across the body. The position of the femur – seen from the posterior view – in relation to the tibia and the fibula, both with the lateral aspect visible, is significant in this respect. Their normal anatomical connection was fairly closely preserved in this burial. Therefore Roche's (1972a:123) interpretation that the legs were initially flexed and drawn up onto the trunk seems justified. Given immediate covering of the body with sediment, the initial volume of the legs and the abdomen would create sufficient space to allow the observed movement of the tibia and fibula. Furthermore, there is nothing to suggest that the feet were on the ground. Rather, while the photograph does not provide clear evidence of the position of the feet, the one bone that can be cautiously identified as a left calcaneus, in medio-plantar aspect, suggests that at least one foot fell close to the pelvis after the decomposition of the soft tissue. This is consistent with the feet not touching the ground: if the knees were on the chest, the feet would not reach the ground. Roche's statement that the body was disrupted by nearby later burials (i.e., Moita 5 and 7) is not supported. The photograph (Roche 1972a plate 4.1), which also shows Moita 5, gives us no reason to think that the burial was disturbed by Moita 5.

Figure 11: The lateral surface of the right ilium of Moita 19 remains oriented almost as in vivo. It is evident that fill containing comminuted shell and a good deal of charcoal was closely packed against it. Photo: P. Alvim



Roche (1972a plate vii.1) published a photograph of **Moita 19** which matches the sketch of the burial (Cardoso and Rolão 1999/2000:204 figure 42) and the skeleton now displayed in Porto. The skeleton is partly *en bloc* although the right tibia and the feet are no longer present. The photograph shows that the body is in dorsal decubitus with the feet drawn to the pelvis, firmly on the ground and slightly caudal to the pelvis, as would be expected given the muscle volume of the thighs and calves. The right shoulder, ribs and ilium do not display the splaying to be expected if there was space created by decomposition. The right iliac blade was surrounded by sediment heavily charged with charcoal and shell (Figure 11), and this fill continued under the right ischium and femur. The right arm is extended, the humerus perfectly aligned with the ribs and the clavicle was apparently more or less verticalized. The scapula cannot be seen, but the humerus does not show any rotation and the hand was placed over the lower abdomen. There was no post-depositional movement of the radius and ulna, but the hand must have separated from the forearm prior to the decomposition of the radio-ulnar joint, otherwise it would probably have caused some dislocation of the radius. An immediate infill between the right arm and the thorax is obvious as there was no movement of the ribs.

Roche (1972a:124) described the left arm as folded up upon itself, and the position of a fragment of an ulna and the left hand on the shoulder confirm this. The left clavicle is only semi-vertical, although the shoulder is constricted. In contrast with the constricted right side of the body, without splaying of the ribs, the position of the left arm and scapula flat on the ground indicates that additional space would have been available on the left for the slight splaying of the ribs. While the left radius and ulna are not preserved, the alignment of their remaining proximal fragments with the hand bones indicates the outline of the fill on the left side of the body.

The left femur is fully upright, with the knee region broken off. The right femur, with the femoral head in the acetabulum, was also initially in an upright position, as indicated by the upright right tibia and fibula in the available photograph (Roche 1972a plate vii.1). However, the right femur slid down the posterior surface of the left femur during decomposition and must have pushed the left tibia and fibula away. If the body was placed with the right hip firmly against compacted sediment - as indicated by the position of the ilium - this would be a logical consequence of decomposition as soon as the knee joints loosened (relatively early in the sequence). The upright position of the right tibia and fibula, the position of the left femur, and of the foot, imply that the body was immediately covered by a mound that prevented extensive movement of many of the bones. The coarse fill - a mixture of crushed shell, sediment and charcoal - would not have flowed progressively; instead, it allowed the creation of empty space during decomposition, and the movement of the right femur into that space.

In sum, the burial is best described as dorsal decubitus in a shallow, restrictive grave with feet on the ground drawn towards pelvis and knees upright, surrounded by grave fill, and covered with a mound of sediment mixed with crushed shell and charcoal.

We have then eight skeletons for which we have clear enough previously published photographs to gain some idea of the burial disposition and the nature of the graves. To this we can add knowledge gained from the materials retained *en bloc* in the museum in Porto: elements of Moita 3, 12 and 19 and some skeletal parts identified as Moita 5.

| Moita skeleton | Position | Knees | Direction of movement |
|----------------|----------|----------------------------|--------------------------|
| 3 | modal | Knees upright | Partial collapse to left |
| 5 | modal | Knees upright | |
| 9 | extended | Knees straight | |
| 10 | lateral | Knees folded to the left | |
| 12 | modal | Knees upright | Slight collapse to left |
| 14 | dorsal | Knees folded to right | |
| 15 | extended | Knees slightly raised | |
| 17 | dorsal | Knees hyperflexed on trunk | Collapse to right |
| 19 | modal | Knees upright | Partial collapse to left |
| 30 | modal | Knees upright | (Legs removed) |
| 31 | dorsal | Knees folded to right | |
| 32 | modal | Knees upright | (Legs partially removed) |
| 33 | modal | Knees upright | Slight collapse to right |

Table 2: Summary of burial disposition with regard to legs.

Beyond the actual specimens, there are details from the field notes (now available thanks to Cardoso and Rolão 1999/2000) and descriptions by Roche (1972a), but it is obvious that Roche did not take decompositional movement of bones into full consideration when describing the skeletons. Added to this, the field sketches are rough and published photographic evidence is limited and often of poor quality. The new photographs, representing four individuals, therefore

Figure 12: The skull of Moita18 provides an example of downward sediment pressures collapsing and moving skeletal elements. Here the skull vault has collapsed and the face has slid so that the anterior dentition is at the level of the upper thoracic vertebrae. The mandible must have fallen away to the right, since it is complete and less heavily brecciated. Photo: MJ Cunha.



add considerably to our knowledge of Moita mortuary practices and allow us to make firmer statements about the Moita burial posture as defined by the 1950s skeletons (Table 2). The evidence available, prior to the discovery of these new photographs, was that Moita 3, 5, 12 and 19 probably illustrated the modal posture for burial, with the knees perpendicular to the body axis, i.e., flexed upright. But there was heterogeneity, since Moita 9 was buried fully extended and Moita 10 was a lateral burial, while Moita 15 had the legs only very slightly bent at the knees. By contrast, Roche saw Moita 17 as having the knees flexed onto the trunk². This is an interpretation which we support and, in fact, Moita 17 perhaps echoed Amoreira burials with legs hyperflexed on the trunk (Roksandic *et al.* this volume), but with a different outcome. On the other hand, our interpretation is that Roche was probably wrong in thinking that the thighs of Moita 14 lay on the trunk: we interpret the position as knees initially flexed and placed to the right.

Thus, previously, “modal” applied to no more than 56% (5/9) of burials, i.e., 3, 5, 12 and 19 and perhaps, 17. Adding Moita 30, 32 and 33 now gives us eight modal burials (if Moita 17 should be regarded as simply an extreme form of the modal practice) and five deviant burials. We can say with a great deal more confidence now that the burials from the 1950s excavations were generally flexed up within cranio-caudally constricted shallow pits and must have had fill placed immediately on and around them, built up in the form of mounds, such that the flexure of the knees was to some extent maintained, despite decompositional movement. This description now holds for 62% (8/13) of individuals.

A wrapping with hides might have permitted some unstable elements, especially patellae, to remain in place, but this suggestion is convincing for only one individual (Moita 9). A possible explanation for bone stability would be that the grave fill, heavy with ash and taking up all available humidity, would have fallen immediately into the decompositional voids and

² Roche’s suggestion of a ligature seems unwarranted. Indeed, his opinion obviously wavered between suggesting that it was unlikely (1972a:131) to saying that it is a reasonable assumption (1972b:100).

maintained joints in their place. Skeleton 19, just described, shows that heavy grave fill did not keep all bones in position. Perhaps we should propose that the bodies were covered with material like hides which would have kept bones in articulation in some areas of the body, but have allowed the development of empty spaces in others, because the hides decomposed more slowly than human soft tissues and inhibited infilling with sediment.

However, we can argue against the use of hides: empty spaces created by decomposition are sufficient explanation for the bone movement we observe, and we can cite evidence (e.g. Figure 12) of sudden collapse of bones, as well as sliding of elements because of putrefaction (Duday 2009:34). These effects would result from the direct weight of the mound. The sliding effect would probably have been impeded by a closely adhering covering which might mould itself to the underlying form of the face. The best, and most parsimonious, argument therefore seems to be that no coverings were placed over the bodies, and that the grave fill and subsiding mounds filled the voids slowly and at intervals, depending on particular circumstances, the season of the year, drainage and slight variations in the fill and mound construction.

The four new photographs give us much information

The importance of these new images lies in several facts:

1. The curatorial history at the Museu de Antropologia e Pré-História Mendes Corrêa in Porto has meant that the 1954 skeletons have at times been mixed or could no longer be identified with absolute certainty because of loss of labels and dispersion of skeletal material. Any collateral information is of great importance to further study of these skeletons. These photographs enable anthropologists to verify many details.
2. There was uncertainty over “skeletons” 28 and 29. In some of Roche’s publications these are referred to and in others they are ignored or questioned. Veiga Ferreira’s changes in his notes and on his diagrams make it clear that the cause of all the problems was what to do about “skeletons” 28 and 29. Since Ferembach eventually described them as no more than indeterminable debris, our new knowledge of the 1954 excavations has a bearing on our attempts to arrive at the number of individuals, a basic question in palaeodemographic studies (Jackes and Alvim 2006, Jackes and Meiklejohn 2004, Jackes and Meiklejohn 2008).
3. The constant changing of the numbering during the period of excavation resulted in contradictions between Veiga Ferreira’s field notes and Roche and Ferembach’s publications (1972a and 1974). The resolution of this problem is an important clarification of the contradiction and provides an interesting historical note on the excavations.
4. Since there is some question about the scaling of the diagrams in Roche’s publications (Alvim and Jackes in prep.), and Veiga Ferreira’s diagram (Cardoso and Rolão 1999/2000:183 figure 25) does not pinpoint the locations of skeletons 30, 31, 32 and 33, the new photographs provide important evidence of their exact locations.
5. The new photographs provide important additional evidence on mortuary archaeology. Published photographs on the more complete skeletons excavated in 1952 and 1953 give us detailed information on only eight individuals: the observations that can be made on four further skeletons is of great interest. We can now summarize what we know on body posture at burial at Moita.
6. Evidence from the new photographs gives us information, not only of the disposition of bodies at the time of burial, but of subsequent movement of bones. This provides an important clue as to the nature of the grave fill.

The Moita skeletons excavated from the central part of the mound, after the top had been bulldozed away, lay on a plane surface in what were apparently shallow constricted pits. The graves were prepared with fill derived from anthropogenic sediment, charged with ash, charcoal and comminuted shell. The constricted grave space allowed for mounds to be built up over the dead, which maintained the bodies in a general cranio-caudally constrained posture during and after decomposition. This allows us to think of Moita as a gathering place, with shallow graves at the same level as a series of posts which seem to form some type of “monument”. A rough U-shape of posts, with the graves in a broader U in front of them (as proposed in Jackes and Alvim 2006), marked by mounds, can be envisaged. In general, the grave mounds allowed burials to be located, but in some cases the mounds must have eroded down – especially since basically sandy sediments must have been the used – explaining why in some cases one burial disturbed another. But the general location of graves was obviously known. The mounding of deposits over the shallow graves would have been necessary in order to protect the cadavers and to make the area available for activities such as ceremonial memorials and feasting, without discomfort. Whether or not a covering of hides helped to reduce the discomfort cannot be stated with certainty, but it appears to be generally unlikely.

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Bibliography

Alvim P. & Jackes M. in prep. Reconstructing Moita do Sebastião, the second step.

Cardoso J.L. & Rolão J.M. 1999/2000 Prospeções e escavações nos concheiros mesolíticos de Muge e de Magos (Salvaterra de Magos): contribuição para a história dos trabalhos arqueológicos efectuados. Câmara Municipal de Oeiras. Estudos Arqueológicos de Oeiras 8:83-240.

Duday, H., P. Courtaud, E. Crubezy, P. Sellier, and AM Tillier 1990 L'anthropologie de "terrain": reconnaissance et interpretation des gestes funéraires'. Bulletin et Memoires de la Societe d'Anthropologie de Paris, ns, tome 2, 3-4, 29-50.

Duday, H. 2009 The Archaeology of the Dead Lectures in archaeoethanatology. Oxford: Oxbow Books.

Ferembach D. 1974 Le gisement mésolithique de Moita do Sebastião, Muge, Portugal. II. Anthropologie. Lisbon: Direção-Geral do Assuntos Culturais.

Jackes M. & Alvim P. 2006 Reconstructing Moita do Sebastião, the first step. pp. 13-25 in Rolão J. (ed.) O Complexo Mesolítico de Muge: Passado, Presente et Futuro. Proceedings of the IV Congresso de Arqueologia Peninsular. Faro: Universidade do Algarve.

- Jackes M. & Meiklejohn C. 2004 Building a method for the study of the Mesolithic-Neolithic Transition in Portugal. pp. 89-111 in Budja M. (ed.) *The Neolithization of Eurasia – paradigms, models and concepts involved*. Ljubljana: Neolithic Studies 11, Documenta Praehistorica XXXI.
- Jackes M. & Meiklejohn C. 2008 *The Palaeodemography of Central Portugal and the Mesolithic-Neolithic transition*. pp. 209-258 in Bocquet-Appel J.P. (ed.) *New advances in Palaeodemography: Techniques, Data and Patterns*. Dordecht: Springer Verlag.
- Nilsson, L. 1998 *Dynamic Cadavers. A field-anthropological analysis of the Skateholm II burials*. Lund Archaeological Review, 1998, 5-17.
- Nilsson Stutz, L. 2006 *Unwrapping the Dead. Searching for evidence of wrappings in the mortuary practices at Zvejnieki*. pp. 217-233 in Lars Larsson & Ilga Zagorska (eds.) *Back to the Origin. New research in the Mesolithic-Neolithic Zvejnieki cemetery and environment, northern Latvia (Acta Archaeologica Lundensia Series in 8^o, No. 52)* Almquist & Wiksell International
- Roche J. 1952 *Les fouilles des amas coquilliers de Muge*. Boletim da Sociedade Geológica de Portugal X:145-150.
- Roche J. 1972a *Le gisement mésolithique de Moita do Sebastião, Muge, Portugal. I*. Archéologie. Lisbon: Instituto de Alta Cultura.
- Roche J. 1972b *Les amas coquilliers (concheiros) mésolithique de Muge (Portugal). Die Anfänge des Neolithikums vom Orient bis Nordeuropa Westliches Mittelmeergebiet und Britische Inseln*. Fundamenta 8:72-107.
- Roche, J. 1989 *Spatial organization in the Mesolithic sites of Muge, Portugal*. pp. 607-613 in Bonsall, C. (ed.) *The Mesolithic in Europe. Papers presented at the third International Symposium*. Edinburgh: John Donald.
- Roche J. and Ferreira, O. da Veiga 1967 *Les fouilles récentes dans les amas coquilliers mésolithiques de Muge (1962-1965)*. O Arqueólogo Português 1:19-41.
- Roksandic M. 2002 *Position of Skeletal Remains as a Key to Understanding Mortuary Behavior*. pp. 95-113 in William D. Haglund and Marcella H. Sorg (eds.) *Advances in Forensic Taphonomy: Method, Theory and Archaeological Perspectives*. Boca Raton Florida: CRC Press.