Dynamic Cadavers

A "Field-Anthropological" Analysis of the Skateholm II Burials

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Abstract

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This study presents the results of a new archaeological analysis of the burials from the Late Mesolithic cemetery of Skateholm II. The re-analysis is based on the methods of *anthropologie de terrain* (Field Anthropology) which combine highly detailed field observation with the cultural and natural factors that contribute to the decomposition of the human body and the disarticulation of the skeleton (Duday *et al.* 1990). *Anthropologie de terrain* utilizes taphonomic principles to infer the state of the human remains and the structure of the grave at the time of burial, thus offering a rigorous archaeological approach for reconstructing the original position of the human remains, the arrangement of clothing and grave goods, and the overall architecture of the grave. *Anthropologie de terrain* improves the documentation of the variability in mortuary ritual in the Late Mesolithic society represented at Skateholm II. The results provide strong support, in large part, for previous interpretations of Skateholm II mortuary practices. In some significant cases, however, the results include details about grave composition and therefore, about mortuary ritual, which were not previously recognized.

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Introduction

The archaeological study of mortuary practices has traditionally emphasized the reconstruction of past social systems (Binford 1972; Brown 1971, 1975; Goldstein 1981; O'Shea 1981, 1984, 1991; Peebles & Kus 1977; Saxe 1970; Tainter 1975, 1977, 1978). Recently there has been an increasing interest in relating mortuary ritual to philosophical-religious beliefs (Carr 1995), and the dynamics of cultural change within prehistoric societies (Lohof 1994). The applications all have in common that they relate the burial rituals devoted to an individual at death, to the state of this individual in life, and thus to the organization of society as a whole. These developments are important theoretically but they require concomitant methodological improvements. Mortuary features are often implicitly treated as intact, direct cultural manifestations. As archaeological remains, however, they have been subject to a range of taphonomic processes (O'Shea 1984, pp. 23 ff.). A systematic and methodological approach considering these factors is important if we want to obtain accuracy and detail as to the actual variability in mortuary practices in the past. Recent work in France has demonstrated that careful observation, documentation, and analysis of prehistoric burials can distinguish clearly between the natural results of decay and disturbance, on the one hand, and the cultural results of ritual behaviour, on the other (Duday *et al.* 1990; see also Binder *et al.* 1993; Duday *et al.* 1995). The French approach, known as *anthropologie de terrain*, is a taphonomically focused method which studies the burial feature as a dynamic whole in which the cadaver is the principal element. The aim of *anthropologie de terrain* is to reconstruct as completely as possible the burial at the moment of deposition. The original form and content of the grave is inferred mainly through a scientific understanding of the sequence of disarticulation of the skeleton as the cadaver decays. The method thus combines archaeological observation with biological knowledge of how a human body evolves during decomposition. *Anthropologie de terrain* allows the determination of a range of characteristics of the burial, from general to extremely specific. The degree of detail provided by this method can give us a view of ancient mortuary practice that is closer to the richness of ethnographically documented burial rituals (Ucko 1969; Thomas 1980). We obtain a more complete, more accurate view of variability as pattern in mortuary ritual in the past, which is necessary if we want to use these remains in our understanding of the living society that created them.

In this paper we apply the methods of *anthropologie de terrain* to the Mesolithic burials of Skateholm II. This remarkable site, which is part of a larger complex of sites on the south Swedish coast, has delivered an extensive settlement area and an adjacent grave-field with 22 burials. The majority of the burials are single, primary depositions but double graves and cremation occur at the site. The interred population numbers 22 humans and 5 dogs (two of whom have been interred individually). The graves from this site were very well excavated and documented. Thus, although not approached with the detailed taphonomic questions of the French methodology in mind, Skateholm II has already provided striking evidence of marked variation in mortuary ritual in this Mesolithic society. The research presented in this paper was carried out as a "Diplome d'Etudes Approfondies" under the direction of Dr. Henri Duday at Université Bordeaux I (Nilsson 1997). The results, based on analysis of drawings, photographs, and field notes, largely confirm the original interpretations concerning initial body position presented in previous publications (Larsson 1980; 1981; 1982; 1983; 1984; 1988a; 1988b). Yet they also add details about grave architecture and grave goods. Thus, this paper offers new, detailed knowledge about the mortuary practices at the oldest Mesolithic cemetery known in Sweden, providing a basis for further investigation of social and cultural change in late Mesolithic society.

The dynamic cadaver – principles and methods of *Anthropologie de terrain*

A cadaver is not static. From the moment of death onward, once the vital functions cease, the body undergoes processes of decay. As we will see, decomposition is a major taphonomic process that is important for archaeologists to consider. The process is highly dynamic and can cause important movements of the bones within the burial structure. The soft tissues progressively disappear, as bacteria and specialized predators actively consume the cadaver. The beginning of fermentation of the soft tissues produces a surplus of juices and gases which then help to transport the putrefying bacteria throughout the cadaver (post-mortem circulation) (Thomas 1980, pp. 13 ff.). The decomposition is intimately linked to the surrounding environment. In particular, the decay of the cadaver and the structure of the grave dynamically influence one another as empty spaces form and are filled in. Once the ligaments decompose, the bones of the skeleton are no longer directly connected to one another. When a bone becomes disarticulated, it will not typically come to rest on a perfectly horizontal surface and in a stable position. Bones can become precariously balanced because most soft tissues disappear quite early, leaving a number of significant empty spaces inside the initial volume of the body. Gravity will act at this time to pull unbalanced elements into a stable equilibrium position. It is the surrounding composition and shape of the grave that will determine where the bones will fall. Therefore, its orientation can provide information about the size and shape of the original grave structure. If the grave is filled in, skeletal elements will come to rest inside the empty spaces of the cadaver (e.g., ribs falling into the space where the viscera had been). Yet, if the body is surrounded by an empty space from a coffin or crypt, bones may also fall outward. The empty spaces, whether internal or external, will usually be replaced by sediment, which essentially stabilizes the position of the bones. The juices produced during soft tissue decomposition attract worms, which actively contribute to sediment infilling. In some cases the filling begins immediately, as the soft tissues disappear, they are progressively replaced by sediment before any considerable empty space has formed. Such progressive infilling is only possible when the corpse is in immediate contact with the surrounding sediment and when the sediment is adequately porous and fluid. When the body is not in immediate contact with the sediment, whether separated by clothing or by a coffin, infilling can be held off longer and the movements of the bones will be more marked. The final equilibrium position of an element will be determined not only by the pattern of sediment infilling, but also by its relationship to the limits of the grave structure or other elements in the structure. When such an element, external from the body, influences the position of a bone and stabilizes it in a position of disequilibrium, *anthropologie de terrain* recognizes the importance of the *effet de paroi* (wall effect). This indicates the presence of an element, sometimes of perishable matter and thus vanished at a later stage of decomposition, on which the bone elements were leaning as the body decomposed and the structure was filled with sediment. In the case of immediate infilling of the structure, the sediment itself can constitute this kind of support. The processes that move bones during decomposition and sedimentary infilling are predictable. Moreover, their effects are distinct from those of other post-depositional taphonomic factors such as rodent disturbance and solifluction. Thus the position of the bones at the moment of excavation allows us to identify the influence of empty spaces and *effets de paroi.* From this basis, we can reconstruct details of the grave feature that reflect intentional mortuary ritual. In this way, *anthropologie de terrain* offers a very systematic tool for the understanding of the taphonomic history of archaeological burial features.

Anthropologie de terrain is not only an analytical tool. It is also an excavation method. It is important to register as much relevant information as possible in the field. Even a slight rotation of a single bone can be very informative about, for instance, the chronology of disintegration of the ligaments relative to the infilling of an open space. It is therefore ideal to record all the bones with their face of appearance (medial, lateral, anterior, posterior, etc.), their dip, and their orientation. It is necessary to plot each element in three co-ordinates, cross-referenced on photographs and drawings. Even though the excavation of Skateholm II was not carried out with the detailed methods of *anthropologie de terrain*, the overall quality of the documentation is very high, and it has been possible to apply the methods of *anthropologie de terrain*, a posteriori. We have worked with drawings at a scale of 1:10 at an advanced stage in the excavation of each feature. We have also worked with black and white photographs. These documents reveal the exact position of most of the bones, as well as their spatial relationships. The limit to these documents is that the bones that were hidden under others or by the sediment do not appear. This introduces a degree of uncertainty in the analysis of some of the graves. Some of burials were more extensively documented, drawn at a scale of 1:5. These burial features include successive drawings which characterize bones that lie on top of each other. These graves exhibit almost ideal documentation for our analysis. For all information concerning the composition of the soil matrix of the grave features, we have consulted the publications and reports of the excavation (Larsson 1980, 1981, 1982, 1983, 1984). Variables such as temperature, degree of moisture and so on of the surrounding soil do affect the process of decomposition. It is not yet established, however, whether they would disturb the patterns of the chronology of the different anatomical elements except in extreme conditions such as natural mummification, and so on. These parameters have so far been little investigated within the framework of *Anthropologie de terrain*, and even though promising as a complementary source of information, they have not been taken into account in this study.

Primary burials

All but one of the Skateholm II grave features are primary burials (see Table 1). The single exception involves the internment of cremated remains, (and one grave, burial XII, where the documentation was not extensive enough to allow an interpretation). The term "primary" refers to the deposition and burial of a fresh cadaver in the mortuary structure. Burial "in multiple episodes", in contrast, denotes the deposition of human remains that have gone through a process of decomposition prior to the final burial (Duday *et al.* 1990, p. 31) – whether by decay, physical removal, cremation, etc. In the field, the positive identification of a primary burial is most reliably made when labile articulations are preserved. These are anatomical connections which undergo decomposition of connective soft tissues at a relatively early stage (ibid.). The most labile articulations are those of the phalanxes of both hands and feet as well as the connections between cervical vertebrae. In general, these connections have survived intact at Skateholm II, strongly suggesting that the individuals decayed *in situ* as primary burials. When these elements were not found in articulation, our analysis still shows that the dislocation was due to natural post-depositional agents during and after decomposition, rather than to the intentional gestures of mortuary ritual (Nilsson 1997, pp. 36 f.). In fact it is not uncommon for labile articulations to become dislocated naturally during the decomposition of the cadaver. Such movement can take place when a body part containing labile articulations rests on another part rich in soft tissue. When this tissue disappears, it can leave an empty space that catches the labile elements. In the case of the individual buried in grave II, we found some phalanxes of the left hand scattered on both sides of the femur. We know that this hand was originally placed on the left thigh, because the carpals as well as the metacarpal and phalanxes of the second finger were excavated in articulation, sitting on the upward-facing medial surface of the femur; the overall position of the bones of the left leg indicates that the entire limb was placed in this rotated position when the individual was buried. Thus, we can reconstruct that the decomposed muscles of the left thigh created an open space into which the labile phalanxes fell. We emphasize that for this individual the bones of the right hand, both feet, and the cervical vertebrae were found in almost perfect connection, demonstrating that the individual decomposed in place. We note that similar movement of the labile elements can be observed for the sitting individual in grave X, where the bones of the right hand were found dispersed in front of the right femur. In some cases at Skateholm II, we found that labile articulations were destroyed by post-depositional processes active after the decomposition of the cadaver. In the features where this occurred, we have established that the missing bones have been moved or destroyed by either bioturbation (V) or agricultural activity (VI, VII, XIV). These structures consist of shallow grave pits and have therefore been subject to relatively severe post-depositional disturbance. The spatial distribu-

Table 1. The nature of deposition of the burials at Skateholm II.

BURIAL	NATURE	ARGUMENTS
I	primary	The interphal. art. of the right foot are in connection. The disarticulation of the left foot-bones are due to in situ decomposition. The phalanxes of the hands are present.
II	primary	The interphal. art. of the right hand and both feet as well as the art. between the cervical vertebrae are in connection. The right hand has partially decomposed in situ.
III	primary	The interphal. art. are in connection.
IV	primary	The interphal. art. of the left hand are in connection. The position of the phal. indicate primary deposition.
V	primary	The interphal. art. of both hands are in connection. The absence of the phal. of the feet is due to secondary disturbance.
VI	primary	The interphal. art. of the left hand are in connection. Secondary disturbance has removed the phal. of the right hand and the feet.
VII	primary	The interphal. art. of the left hand are in connection. secondary disturbance has removed the phal. of the right hand and feet.
VIII	primary	The interphal. art of the left hand are in connection. The right hand has decomposed in situ.
IX	primary	The interphal. art are in connection.
X: supine	primary	The interphal. art. and the art. between the cervical vertebrae are in connection.
X: sitting	primary	The interphal. art. of the feet are in connection. The movements of the hand-bones are due to decomposition in situ.
XI	primary	The interphal. art. are in connection.
XII	?	Analysis impossible.
XIII	primary	Some interphal. art. are in connection.
XIV	primary	Some interphal. art are in connection. The movements can be explained by secondary disturbance.
XV	primary	The interphal. art. are in connection.
XVI	primary	The interphal. art. are in connection.
XVII	primary	The interphal. art. are in connection.
XVIII	secondary	Incineration.
XX	primary	The interphal. art. are in connection.
XXII	primary	The interphal. art. are in connection.

tions of bones in the Skateholm II graves reveal that the majority of the labile articulations were preserved. When this was not the case, it is because the bones fell into internal empty spaces that formed during decomposition, or they were removed by secondary natural disturbances. In all cases, it is evident that the earlier stages of decomposition occurred *in situ* in the grave features. This unambiguously rules out burial in multiple episodes as a Mesolithic cultural practice for the inhumations at this site.

Inhumation in filled spaces

Our analysis further establishes that all of the bodies decomposed in filled spaces, having been directly covered by sediment after deposition (Table 2). Criteria identifying this phenomenon have been outlined by several authors, who base their determination on the spatial relationships among the bones in the grave structure (Duday *et al.* 1990, pp. 34 ff.; Masset 1987, p.114). These criteria have been established through

Table 2. The space of decomposition of the burials at Skateholm II.

BURIAL	SPACE	ARGUMENTS
I	filled	The approached position of the coccal bones at the level of the pubic symphysis indicates that this articulation did not dislocate.
II	filled	The elevated position of the upper part of the body, the absence of dislocation of the pubic symphysis, the *effet de paroi* at the right patella, and the suspended position of objects.
III	filled	The position of the right patella indicates that the pubic symphysis did not dislocate. *Effet de paroi* at the left upper limb and the left patella.
IV	filled	The maintenance in art. of the pubic symphysis, the *effet de paroi* at the right humerus, the left patella, and deposited objects.
V	filled	The approached position of the coccal bones at the level of the pubic symphysis indicates that this articulation did not dislocate. *Effet de paroi* at the right humerus.
VI	filled + secondary empty	The maintenance in art. of the pubic symphysis, the maintenance in place of the patellae, and *effet de paroi* at the upper limbs. The collapse of the thoracic cage indicates a secondary empty space behind the upper part of the body.
VII	filled	The maintenance in art. of the pubic symphysis, *effet de paroi* at the left upper limb.
VIII	filled	The elevated position of the upper part of the body, the suspended position of objects and the maintenance of the pubic symphysis.
IX	filled + secondary empty	The maintenance in art. of the pubic symphysis and *effet de paroi* at the left upper limb. A secondary empty space behind the right hemi-thorax is indicated by the collapse of the thoracic cage
X: supine	filled	The approached position of the coccal bones at the level of the pubic symphysis, and the maintenance in position of the right patella, indicate that this articulation did not dislocate.
X: sitting	filled	The elevated position of the upper part of the body, the maintenance in art. of the pubic symphysis, the maintenance in place of the patella and the suspended position of objects.
XI	filled	The maintenance in art. of the pubic symphysis and the *effet de paroi* at the upper limbs.
XII (2 ind.)	filled	The maintenance of a sitting position
XIII	filled	The approached position of the coccal bones at the level of the pubic symphysis indicates that this articulation did not dislocate.
XIV	filled	The *effet de paroi* at the left patella.
XV	filled + secondary empty	The maintenance of the elevated position, the maintenance in art. of the pubic symphysis, the *effet de paroi* at the patellae, and the suspended position of objects. A secondary empty space is indicated at the right side of thoracic cage by its mode of decomposition.
XVI	filled	The approached position of the coccal bones at the level of the pubic symphysis indicates that this articulation did not dislocate. *Effet de paroi* at the upper limbs.
XVII	filled	The maintenance in art. of the pubic symphysis, the maintenance in position of the left patella and the *effet de paroi* at right patella.
XX	filled	The approached position of the coccal bones at the level of the pubic symphysis indicates that this articulation did not dislocate. *Effet de paroi* at patellae.
XXII	filled	The maintenance of the elevated position of the upper part of the body, and of the suspended position of the objects. *Effet de paroi* at patellae.

careful observation and analysis of excavated burials from periods with quite well known mortuary practices such as the Middle Ages. Most basically, they argue, if the body decomposes in an empty space, at least some bones (e.g., long-bones in a rotated position, patella etc.) will tend to fall outside of the initial volume of the body during decomposition. This will not be the case in a filled space. In a filled grave, sediment which surrounds the cadaver tends to replace the soft tissues progressively. As a result, even the most labile anatomical connections will be preserved when sedimentary infilling is gentle and constant. Such a pattern of progressive sedimentation in a filled grave is most clearly reflected in the remarkable *in situ* articulations of the metacarpals, metatarsals and phalanxes in the graves IX, Xa (supine), XV and XVII. The bones of the limbs also exhibit quite tight, unaltered articulations. The *effet de paroi* is diagnostic of a filled grave in these cases, where the sediment is practically in direct contact with the bone elements that are surrounded by little soft tissue. For example, we can see that when the upper arm was placed close to the chest and rotated inwards at burial, the *effet de paroi* maintained the humerus in place. In graves III, IV, V, VI, VII, IX, XI, XVI, we found that the humerus exposed itself with the antero-lateral side facing upward. If the upper limbs had decomposed in an empty space, the humeri would have rolled away somewhat in order to obtain equilibrium, and expose themselves with their anterior side. The *effet de paroi* has also, in other cases preserved the position of patella – a small, easily movable element after decomposition – in equilibrium on its medial (III, XIV) or lateral (XV, XVII, XX, XXIII) edge. This would never be possible if the bone did not lean immediately on the sediment during decomposition. The lower limbs offer much additional detailed evidence demonstrating burial in a filled space. With the decomposition of an extended supine cadaver in an empty space, we expect the iliac blades to fall laterally with the decay of the ligaments that bind the pubic symphysis and the sacro-iliac joints (Duday *et al.* 1990, p. 36). At the same time, the femora will rotate laterally as they fall, jarring the patellae from their articulations on the anterior face of the distal femoral epiphysis (*ibid.*). It is important to note that given the relatively large volume of soft tissue in the pelvic area, the bones in this region will usually move somewhat as empty spaces are created during decomposition. In a filled grave, however such movement of the pelvis should not be extensive enough to rotate the femora and displace the patellae. Thus, in graves X a (supine), XIII and XIV, the coccal bones at the level of the pubic symphysis are so close to one another that we can be sure that the iliac blade has not fallen laterally. We note that in some cases, partial chemical dissolution and bioturbation hindered the identification of the *effet de paroi* on the pelvis or femur (graves I, V, and XVI). For these individuals, we have been able to establish that decomposition took place in a filled space by identifying the *effet de paroi* on other skeletal articulations, summarized in table 2.

The bodies interred in a sitting position (II, VIII, Xb, XV and XXII) exhibit additional evidence for burial in a filled space. These grave features exhibit constant, progressive sedimentation of the large empty spaces of the thorax and abdomen. Many articulations are maintained which otherwise would be unstable if the head, neck and torso decomposed in an empty space. Most notably in these sitting burials, the ribs remain separated from one another (even in cases where the vertebral column has collapsed completely as in grave XV), having only moved slightly downward from their original anatomical position. These bodies only exhibit local, partial collapses, demonstrating the overall ubiquity of interment in filled grave structures at Skateholm II.

At Skateholm II there are two burials (IV and XX) in which chemical analysis has established traces of decomposed wood (Larsson 1982 p. 29, 1984 p. 68). On this basis, Larsson has suggested the hypothesis that these individuals might have been interred in coffins. The remains of wood in grave IV were identified along the limits and in the northern part of the structure, as well as in patches above and below the skeleton. In grave XX, the wood traces formed parallel lines, 0.1–0.3 m wide, running horizontally along the limits of the structure. The hypothesis that these wood remains represent coffins, at least in our usual sense of the word, must be rejected. The *effet de paroi* on the humeri and patellae in graves IV and XX demonstrates that these individuals decomposed in filled spaces (see Table 2). Furthermore, the find of delicately balanced grave goods (which were apparently bound by an organic tie or container; see below) in grave IV confirms the pattern of filled grave structures. If this burial was placed in a coffin, it must have been a structure that decayed or fell apart relatively fast, thus permitting the sediment to penetrate at an early stage of decomposition. The most likely suggestion is that the pits were elaborately prepared, having been lined with wood partially (burial IV), or entirely (burial XX) around the body before they were filled.

Since the bodies decomposed in filled spaces, they have moved very little. The position of the bodies at excavation is very similar to that at deposition (for more detailed descriptions we refer to the extensive publications by Larsson). Post-depositional movements of the bones occur, but they are partial, and mostly an exaggeration produced by the slope of the grave structures and the pressure of the sediment. The slight rotation that can be observed for many individuals interred in a supine position is more or less marked and coincides with the slope of the structure. This rotated position can only be considered unambiguously intentional in two cases; the supine individual in grave X and the individual in grave XVII where the rotation involves the entire body, and position is identical for the two individuals and also coincides with the emplacement of grave goods (Nilsson 1997, pp. 43 f.). This does not rule out an intentional rotation of the other individuals as well, even though it is less clear in their cases.

The effect of filled spaces on grave goods and bodily adornment

Objects in the grave, including bodily adornment, were also affected by their contact with the surrounding sediment of the filled structures. The most explicit example is found in grave IV, where a collection of items was placed at burial within a very small area near the skull. The intentional placement of an axe, two stone tablets, four flint blades, a spheroid stone and a bone needle is indicated not simply by their tight spatial arrangement. It is also the case that the uncovered tablets balanced on their edges and the blades were stacked on top of one another; the long axes of these artefacts had the same east–west orientation. Only the most careful intentional burial would have preserved this arrangement. Therefore, we argue that these artefacts were initially bound or enclosed by an organic rope or container. The preservation of this mortuary offering in grave IV again indicates gentle progressive infilling of sediment as perishable material decomposed. Grave XV, a sitting burial feature, provides equally dramatic results of progressive infilling. In this feature, sixteen perforated teeth of red deer were distributed on a parallel line over the parietal bones of the skull, which itself was found in an anatomically correct upright position (the head was tilted only slightly forward, and had been slightly affected by the general movement of the upper part of the body). The regular placement of the teeth indicates that they might have been sewn onto some perishable material. After this element disappeared, the teeth hardly moved. If the individual had decomposed in an empty space, the teeth almost certainly would have fallen to the bottom of the pit, producing a random distribution for the archaeologist. The sitting individuals found in graves II and X exhibit a similar preservation of personal adornment. A decorated bone object was recovered near the frontal bone of the individual in grave II. In grave X, a perforated object was encountered on the cranium. Again, if decomposition had taken place in an empty space, gravity would have dissociated these objects from their original positions. In other cases, our analysis reveals elements of embellishment that fell into internal empty spaces before sedimentary infilling was completed. A large number of boar and deer teeth together with fragments of three roe deer metacarpals, a boar tusk and a nodule of ferric material were found on various levels adjacent to the thoracic cage of the sitting individual in grave X. An isolated tooth-bead was also encountered behind the ribs. The position of these elements at the time of excavation indicates that the decomposed soft tissues of the neck and thorax were not immediately replaced by sediment, and that these empty spaces trapped what appear to be the remains of a necklace, or similar adornment, worn by the dead during the funeral ritual. The presence of a temporary empty space is also confirmed by the presence of what appears to be a calcified thyroid cartilage that had fallen into the upper part of the thoracic cage of the sitting individual in grave X. We emphasize, nevertheless, that the thorax of the sitting individual in grave X did fill rapidly, because the tooth pendants never reached the bottom of the pit. For other individuals, we found items of embellishment along the iliac crests. This is the case for the individuals in graves VIII, Xb (sitting) and XXII. The precarious position of these artefacts indicates that they were maintained in place by sediment that immediately penetrated the spaces liberated by the perishable material that held them together at burial.

The evidence for perishable grave goods: secondary empty spaces

The evidence described above establishes that decomposition took place in filled graves at Skateholm II. While surrounding sediment typically held skeletal articulations, as well as some bodily adornment in place, we can observe a few interesting anomalies. In some of the burials, articulations which should have been held in place by surrounding sediment have been displaced. This indicates the presence of external secondary empty spaces. A secondary empty space forms during decomposition, when objects of organic material decompose next to the corpse, and is detected by its effect on the spatial distribution and orientation of the skeletal elements in the grave. This was the case for the sitting individual in grave XV (Fig. 1). The thoracic cage collapsed, and the whole torso moved somewhat to the right, relative to the position of the skull and pelvis. With these two elements defining the medial axis of the body, most of the ribs were found between this axis and the right arm. The elements of the arm were correctly articulated, revealing that this limb was placed in an abducted and flexed position. These observations indicate that at one moment during decomposition, there was an empty space between the thoracic cage and the right arm into which the bones of the thoracic cage could slide. During excavation, a tool made of antler and a flint knife were recovered between the right arm and the thoracic cage, and we argue that these objects initially were wrapped in some organic matter or placed within a perishable container. As this organic matter decomposed, it formed a secondary empty space towards which the ribs moved. We emphasize that many of the vertebrae were recovered out of articulation, suggesting that the collapse of the upper part of the body was important. With so much unfilled space, the upright torso would have been quite unstable, leading to the rightward slide of the ribcage. We note also that this movement of the thoracic cage must have taken place at an early stage of decomposition. The vertebral articulations are labile in general, and the vertebrae would not have been so scattered in grave XV if sediment had already partially filled the internal space of the torso. Moreover, the right arm bones remain in articulation, demonstrating that this limb had not decomposed when the ribcage slid under it. Finally, as documented

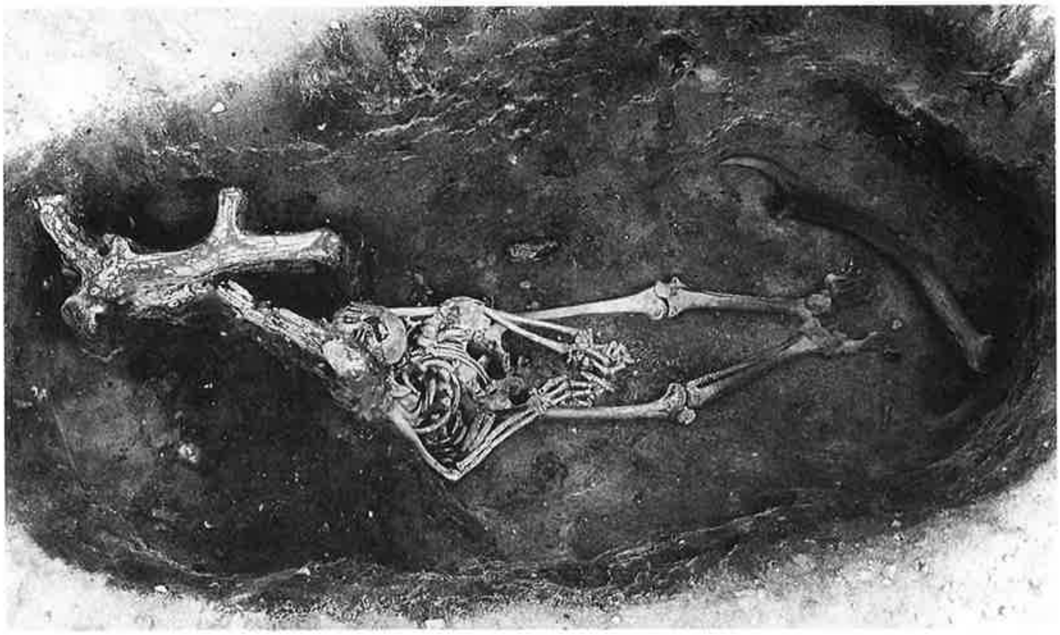

Fig. 1. Grave no. XV. During the process of decomposition the ribcage of this individual has slid under the right upper limb. In this area some kind of container with grave goods was probably placed at the time of burial. When this container decomposed, an empty space was created into which the bones of the thoracic cage could slide. The presence of this element of destabilization probably also contributed to the collapse of the vertebral column.

above, a band of red deer tooth beads was preserved on the skull of this individual. The slight movement of the skull caused by the collapse of the ribcage and vertebral column occurred before the hide or fibre on to which the beads were sewn had decomposed (the cranium did not move much, held in its upright position by the surrounding sediment and a deer antler placed at its right).

Two other cases, grave VI and IX, show another kind of disturbance that possibly can be explained by the existence of secondary empty spaces. These individuals in supine position show anomalies on the level of the thoracic cage. The costo-vertebral articulations are dislocated and the posterior parts of the ribs are partially projected towards the front. The anterior parts of the ribs expand, and occupy, almost horizontally, spaces outside of the initial volume of the body. For the individual in grave VI, this phenomenon is limited to the lower part of the ribcage, while it seems as if the upper part has decomposed in the regular way; the anterior part of the ribs shows an accelerated obliquity downwards and towards the medial axis. For the individual in grave IX (Fig. 2), the phenomenon is associated with a rotation to the right. This rotation seems to have accelerated the consequences. The ribs of the left hemi-thorax have expanded considerably, while many of the ribs of the right hemi-thorax were encountered completely out of anatomical position. The sediment has pressed the left upper limb towards the medial axis of the body. This pressure has influenced the ribs of the left ribcage that have been displaced towards the medial axis of the body. In both cases the cranium is lying on the neck, flexed forward. For both skeletons, the anomalies in the thoracic cage cannot be explained by either the rotation of the body, the pressure of the sediment or the slope of the structure. It is also highly unlikely that bioturbation or agricultural activity would produce these patterns. The bones are well preserved and their position is regular. It seems reasonable to believe that the movements of the bones took place during the process of decay of the body. We suggest that the pattern could be produced if the back of the individual was lying on top of some perishable material at the moment of deposition in the grave. This element holding the body up would decompose and leave an empty space behind the thoracic cage of the individual, affecting the process of collapse of the bones. This could thus be the traces of a special funerary treatment. It could also be coincidental, and be an effect of, for example, clothing. It is important to register anomalies of this kind in order to try to understand their frequency in prehistoric burial features.

Finally, we note that vanished organic material might not always influence bones by leaving a secondary empty space. In grave XVI, the thoracic cage collapsed inward, so that the anterior parts of the ribs exhibited an exaggerated orientation towards the medial axis of the body. Moreover, the upper limb elements reflected a strong *effet de paroi* in their tight articulations and placement against the thoracic cage itself. If these phenomena had been accompanied by the verticalization of the clavicles, it would indicate a forced projection of the shoulders due to tight wrapping of the body before burial. In the case of grave XVI, it is still possible that the individual was wrapped in some perishable material at the moment of deposition, but it is also possible that the slope of the floor of the grave structure contributed to the unusual medial orientation of the ribs in this feature. Grave XVI represents an example in which the photographs, drawings and notes allow us to observe the general sequence of decomposition and sedimentary infilling, but they do not provide enough data to resolve competing explanations for the pattern.

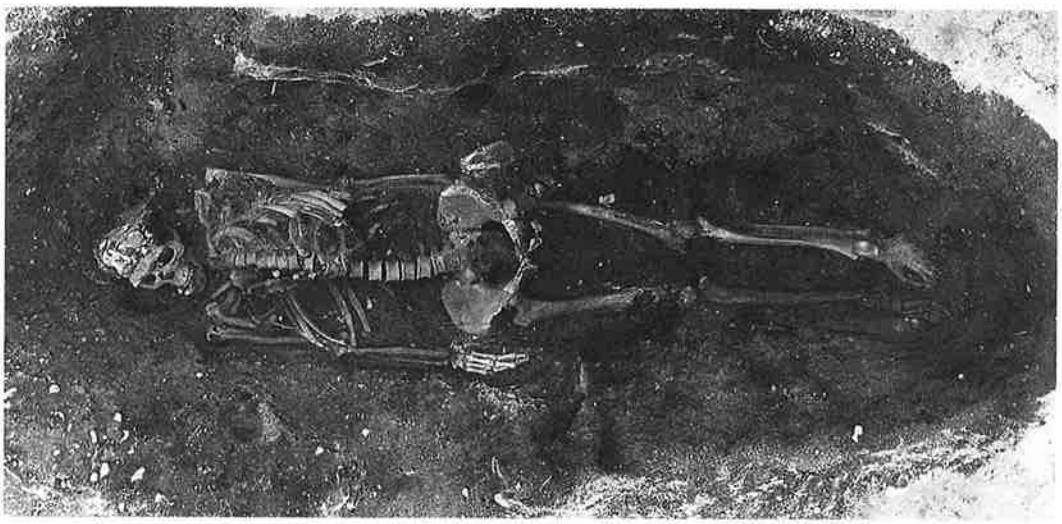

Fig. 2. Grave IX. The thoracic cage of this individual shows a very unusual pattern of decomposition. Instead of collapsing forward and downward, the anterior parts of the ribs of the right hemi-thorax have fallen outward and away from the medial axis of the body. The posterior parts of the ribs are projected forward. This could be explained by the presence, at one point during the process of decomposition, of an empty space behind the back of the individual. She might have been placed on top of something when she was deposited in the grave. The empty space was formed when the material of this arrangement decomposed.

Conclusion

This study has shown examples of the kind of information we are able to extract with the methods of *anthropologie de terrain*. The method offers a systematic approach to problems that are often addressed individually, such as primary burial and burial in multiple episodes. We are also able to see things that were not previously recognized, such as the volume of decomposition and the presence of perishable material. We consider this information fundamental in the theoretical discussion of mortuary practices since the detailed information and increased control helps us to reconstitute the ritual gestures with more accuracy. This provides a more stable ground for our discussion of the role and function of these gestures in the society in which they took place, and of the society as a whole. It is our wish that these methods of excavation, documentation and analysis should be applied to Swedish material in the future, so that it will be possible to recover the necessary information.

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References

Binder, D., Brocher, J.-E., Duday, H., Helmer, D., Marnival, P., Thiébault, S. & Wattez, J. 1993. L'Abri Pendimoun Castellar (Alpes Maritimes): Nouvelles données sur le complexe culturel de la céramique imprimée méditerranéenne dans son contexte stratigraphique. *Gallia Préhistoire* 35.

Binford, L. R. 1972. Mortuary practices: Their Study and Their Potential. In Binford, L. R. (ed.), *An Archaeological Perspective.* New York.

Brown, J. A. 1971. The Dimension of Status in the Burials at Spiro. In Brown, J. A. (ed.) *Approaches to the Social Dimensions of Mortuary Practices.* Memoirs of the Society for American Anthropology 25, American Antiquity 36:3.

– 1975. Spiro Art and Its Mortuary Contexts, In Benson, E. P. (ed.), *Death and the Afterlife in Pre-Columbian America.* Washington DC.

Carr, C. 1995. Mortuary Practices: Their Social, Philosophical-Religious, Circumstantial, and Physical Determinants. *Journal of Archaeological Method and Theory* 2:2.

Chapman, R. 1981. The emergence of formal disposal areas and the problem with megalithic tombs in prehistoric Europe. In Chapman, R., Kinnes, I. & Randsborg, K. (eds.), *The Archaeology of Death.* Cambridge.

Duday, H., Courtaud, P., Crubézy, E., Sellier, P. & Tillier, A.-M. 1990. L'Anthropologie "de terrain": reconnaisance et interpretation des gestes funéraires. *Bull. et Mém. de la Soc. d'Anthropologie de Paris,* n.s. 3–4.

Duday, H., Laubenheimer, F. & Tillier, A. -M. 1995 *Sallèles d'Aude. Nouveaux-nées et nourrissons gallo-romains.* Centre de Recherche d'Histoire Ancienne 144 Série Amphores 3, Paris.

Goldstein, L. 1981. One-dimensional archaeology and multi-dimensional people: spatial organisation and mortuary analysis. In Chapman, R., Kinnes, I. & Randsborg, K. (eds.), *The Archaeology of Death.* Cambridge.

Larsson, L. 1980. Stenåldersjägarnas boplats och gravar vid Skateholm. *Limhamniana* 1980.

– 1981. En 7000-årig sydkustboplats. Nytt och gammalt från Skateholm. *Limhamniana* 1981.

– 1982. Skateholmsprojektet. Nya gravar och ett nytt gravfält. *Limhamniana* 1982.

– 1983. Skateholmsprojektet. Jägare – fiskare – bönder. *Limhamniana* 1983.

– 1984. Skateholmsprojektet. På spåren efter gravsedsförändringar, ceremoniplatser och tama rävar. *Limhamniana* 1984.

– 1988a. Dödshus, djurkäkar och stenyxor. Några reflexioner kring senmesolitiskt gravskick. In Jennbert, K., Iregren, E. & Larsson, L. (eds.), *Gravskick och gravdata.* University of Lund, Institute of Archaeology, Report Series 32.

– 1988b (ed.) *The Skateholm Project I. Man and Environment.* Acta Regiae Societatis Humaniorum Litterarum Lundensis LXXIX. Stockholm.

Lohof, E. 1994. Tradition and change, Burial practices in the Late Neolithic and Bronze Age in the north-eastern Netherlands. *Archaeological Dialogues* 1994–2.

Masset, C. 1986. Le recrutement d'un ensemble funéraire. In Duday, H. & Masset, C. (eds.), *Anthropologie physique et Archéologie. Méthodes d'études de sépultures.* Paris.

Nilsson, L. 1997. *Les sépultures mésolithiques de Skateholm II, étude taphonomique et discussion sur les com-*

portements funéraires. Unpublished D E A thesis, Université Bordeaux I.
O'Shea, J. 1981. Social configurations and the archaeological study of mortuary practice: a case study. In Chapman, R., Kinnes. I. & Randsborg, K. (eds.), *The Archaeology of Death.* Cambridge.
– 1984. *Mortuary Variability: An Archaeological Investigation.* Orlando
– 1991. Mortuary Custom in the Bronze Age Southeastern Hungary: Diachronic and Synchronic Perspectives. *Papers presented at the annual meeting of the Society for American Archaeology.*
Saxe, A. A. 1970. *Social Dimensions of Mortuary Practices.* Ph.D. dissertation, University of Michigan, Ann Arbor. University Microfilms.
Tainter, J, A. 1975. Spatial inference and mortuary practices: an experiment in numerical classification. *World Archaeology* 7:1.
– 1977. Modelling change in prehistoric social systems. In: Binford, L. R. (ed.), *For Theory Building in Archaeology.* New York.
– 1978. Mortuary Practices and the Study of Prehistoric Social Systems. In Schiffer, M. B. (ed.), *Advances in Archaeological Method and Theory.* New York.
Thomas, L. V. 1980. *Le Cadavre: De la biologie à l'anthropologie.* Bruxelles.
Ucko, P. J. 1969. Ethnography and archaeological interpretation of funerary remains. *World Archaeology* 1.

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