The Hammerum Burial Site

Customs and Clothing in the Roman Iron Age

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Tinna Møbjerg,
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Museum Midtjylland

Jutland Archaeological Society

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5. Interdisciplinary analysis

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In 2008 Herning Museum/Museum Midtjylland began a collaboration around the Hammerum Burial Site with Lise Ræder Knudsen from Conservation Center Vejle and Ulla Mannering from the Danish National Research Foundation's Centre for Textile Research (CTR, DNRF64), University of Copenhagen. This collaboration resulted in an application for funding from the Danish Agency for Cultural Heritage (now the Agency for Culture and Palaces).

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Last, but not least, we are very grateful to the foundations that have enabled us to publish this book.

Preface

By Constanze Rassmann and Laura Liv Weikop

Some objects attain an important status in archaeology and in the public eye because of their tangibility; one of these is the 'Hammerum Girl' who, with her dress, scarf and intricately braided coiffure, brings prehistory to life for us. She was named after the small modern-day town of Hammerum where her grave was found in 1993. All that remained of her was her hair and dress, showing that she was buried on her back with her knees bent to her right. The grave is sensational since it contained the best-preserved Danish Iron Age textile ever found and therefore offers a unique opportunity to analyse material which, in most cases, has disappeared.

The Hammerum Girl's dress – with its red and white stripes – is both a familiar and a foreign item. It challenges the concept of bedraggled prehistoric people of the North wearing rags and it helps us to imagine a living, breathing, rather well-dressed, Iron Age girl. We can extract a lot of information from her clothes and hair and can construe meanings based on the perception that 'Clothes make the (wo)man'. It is, however, only with the help of scientific archaeological analyses that we really start to understand the burial site, the graves, the people and their time. While archaeologists usually interpret a person's status and identity on the basis of grave goods – which would in this case have led to a very 'poor' individual with only three potsherds and an organic pin – it is possible to analyse unusual facets of daily life thanks to the preservation of organic material.

The analysis tells us an extraordinarily nuanced archaeological story of daily life and of pan-European 'slow fashion': a dress used in everyday life, produced by carefully choosing fine fibres which, together with the coiffure, refers to a style recognizable throughout Europe and worn by a mobile, well-groomed, well-connected Iron Age female. Moreover, the preserved organic material permits us a rare glimpse of the grief of the bereaved. We can see how they carefully wrapped the Hammerum Girl in skin and put blueberry twigs under her head before laying her to rest – an act of compassion and mourning.

The book you are holding in your hands is the story of a burial site and the girl from Hammerum told by academics: a fascinating combination of different archaeological and scientific studies analysing an individual, an object and a context from different angles. This project also presents one of the rare approaches where the combination of data and archaeological experiments has reproduced an object, in this case an item of clothing, which has led to a deeper understanding of the processes and decisions behind its prehistoric production. Additionally, this book is a discussion of different dissemination approaches, such as the classic exhibition presentation and collaboration with design/textile students. Parts of the analyses have been published in recent years in various fora, but a thorough, internationally available compilation of all the analyses and a conclusion have been lacking – until now.

This book is also a tribute to the persistence of the main authors in never letting the goal out of their sight. In the course of the last 25 years they have raised money for a conservation project that has tested new approaches to textile preservation and dissemination and established a research team with expertise in a variety of scientific fields. They have collected all this knowledge in this book and have been able to handle the demanding publication project with patience, en-

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ergy and the utmost professional competence. Moreover, they have done so despite the fact that both Hans Rostholm and Tinna Møbjerg have retired.

We would therefore like to express our heartfelt thanks to the main authors and all those involved who have contributed to the success of this project. The participants to be thanked, of course, also include those who have made realization of the project possible through their financial support. We would like to thank the editor at the publishing house for his support in bringing this book to the market.

This book is a presentation of our current knowledge of the Hammerum site, burial customs and clothing in the Roman Iron Age and of the 'Hammerum Girl', her life and her death. Our wish is that it will ignite discussion and inspire future research.

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1. Introduction

By Tinna Møbjerg

At most museums in Denmark that have archaeological responsibility, the majority of archaeological excavations are conducted in response to building construction and public works, such as land development, new roads, woodland creation, reclamation of natural habitats etc. This has also been the case for Museum Midtjylland. These "rescue excavations" have considerable research potential if the investigation is organized with a proper strategy in mind. This has been demonstrated by many years of excavation in the Herning region which have given us stimulating insights into the prehistory of the area. In the past 20 years the investigation of Roman Iron Age graves in particular has given groundbreaking insights into the treatment of the dead, clothing and hairstyles. In this publication we place special emphasis on the finds of human hair and textiles from Hammerum, and also on finds from Tjørring, which, along with a much older find from Tornebuskehøj, differ in many respects from other Roman Iron Age textile finds in Denmark (H. Rostholm 2008; M.W. Olesen and H. Rostholm 2004, pp. 10-11; M.W. Olesen, in press).

As a rule, the budget of a "rescue excavation" only covers a report and a very small number of analyses. The museums must therefore often procure additional funding for costly conservation, dating, publication and exhibition, from government funds or private foundations. A consequence of this is that there are many interesting unpublished reports in the museums since it often takes a long time to procure sufficient funding for publication of the results.

Such was the case for Museum Midtjylland's investigation of a small Roman Iron Age burial site at Hammerum, located 5 km east of Herning. The museum investigated this site in 1993 when seven inhumation graves emerged within a small area, most of which turned out to be empty of finds. Three of the graves did, however, contain well preserved organic material that was removed as block samples in large wooden crates for later excavation.

Due to the absence of grave goods, it was at first assumed that the graves belonged to the early Christian era. In 1995 samples were taken from the coffin in Grave 83 for AMS dating (AAR-2014). This surprisingly provided a date in the Roman Iron Age. On this basis, and because the shape of the other graves resembled Grave 83, it was assumed that all the graves were from the same period.

A grant from the Danish Agency for Culture (the ENB fund) in 2009 permitted a collaboration with the Danish National Research Foundation's Centre for Textile Research (DNRF64) and Conservation Center Vejle. Excavation and analysis of the block samples from Hammerum were started at that time.

When the excavation of Grave 83 – the grave of the Hammerum Girl – began, it was possible to see several c. 80 cm long birch sticks with the bark still on them in the greyish, sandy top soil layer. Between the sticks it was also possible to see human hair, as well as a textile that seemed to cover large parts of the grave. Textiles are rarely preserved in graves except around metal objects, and in these cases they usually occur as small fragmented pieces in a mineralised condition. An X-ray study had shown that the grave contained no metal objects, so the unusual preservation condition of the textile had to be due to other fortunate circumstances. It therefore quickly became clear that this grave was unique in its content of organic materials, and it was decided to involve an interdisciplinary team for further investigation.

The interdisciplinary analyses had multiple aims. One of the goals was to achieve a better understanding of the surrounding landscape at the time when

the burial site was established, and through this to understand how the environment had influenced the preservation conditions before, during and after the burial. At the same time, it was important that these analyses were non-destructive where possible, and that the clothing and the coiffure were kept in their original position. Despite the paucity of grave goods, the study has demonstrated that the deceased was buried with great care. The analyses of the preserved clothing and coiffure have provided unique evidence about life and death some 2000 years ago.

Purpose and structure of the publication

Textile analyses and the various interdisciplinary analyses of the Hammerum burial site have provided a fascinating insight into the circumstances of life in the Roman Iron Age. The purpose of this publication is to pass this knowledge on to the international community within archeology, and also to researchers who have a special interest in textile production and related conservation techniques.

The publication is structured as follows:

Chapter 2 gives a description of the burial site with its discovery, topography and the contents of the individual graves. Although organic material was also preserved in Graves 8, 43 and 100, the main focus has been on Grave 83 – the grave of the Hammerum Girl. The chapter describes the complicated procedures that took place at Conservation Center Vejle where the final excavation was conducted. In this work it was necessary to employ new methods to document the clothing and the coiffure. A summary of the results of all the interdisciplinary analyses is provided and the dating procedures are outlined.

Chapter 3 presents the analyses of the different clothing parts from Grave 83. It reviews the weaving techniques, the sewing of the garment and the finishing of the edges and includes the wool and dye analyses. The many different types of cords and fringes are also described. Further details concerning the body are inferred from the arrangement of the dress and the coiffure.

Chapter 4 contains analyses of the coiffures in Graves 43, 83 and 100. At present this is the only burial site in Denmark from the Late Roman Iron Age where human hair has been preserved.

Chapter 5.1-13 gives a review of all the different interdisciplinary analyses of material, especially from Grave 83. This is the first time that many of these analyses have been attempted, and several results are unique. Unfortunately, in some cases the preservation of the samples was so poor that no results could be achieved. The results may consequently appear less consistent than intended, but for scientific purposes it was decided to include all reports.

Chapter 6 reviews the process of creating a reconstruction of Textile 1 – the dress of the Hammerum Girl. Thanks to this kind of experimental archaeology it has been possible to confirm several of the results gained from the textile-technological analyses presented in chapter 3.

Chapter 7 presents the dissemination of information about Grave 83 – the grave of the Hammerum Girl. The different kinds of outreach are described, including digital platforms, the exhibition at Herning Museum and Museum Midtjylland, and collaboration with volunteers and students from different design schools.

Chapter 8 presents an overview and conclusions based on analyses of the Hammerum burial site. It begins with a discussion of the relationship of the Hammerum burial site to other contemporary burials in the area. It then describes the clear Roman influence recorded in the area. Finally it explains how Graves 8, 43, 83 and 100 have been able to provide new knowledge about the care of the dead.

Chapter 9 gives a brief description of the researchers and authors involved in this publication.

Chapter 10 is a glossary of the technical terms used in the book relating to textiles. It also features illustrations of selected textile tools and techniques.

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2. The Hammerum burial site

By Hans Rostholm and Lise Ræder Knudsen

Find history

In March 1993, in connection with the construction of a new road – Ny Gjellerupvej – between Hammerum and Gjellerup, Herning Museum[1] conducted an archaeological investigation of a small area north-west of Hammerum, around 5 km east of Herning in Jutland (fig. 1). The excavation revealed a small burial site with seven inhumation graves from the Roman Iron Age, as well as traces of various other settlements.[2] Four of the graves were excavated in 1993. Three presumed finds were removed in small intact block samples from one of them (Grave 43). Organic material was preserved in the last three of these graves so only a limited investigation was carried out at the site, after which the graves were lifted out as block samples in large wooden crates (H. Rostholm 2010).

Fig. 1. Map of Denmark with the Hammerum burial site marked.

The lifted block samples were subjected to a minor investigation at the Conservation Centre in Gram in 1993. Later, in 2009-10, Graves 83 and 100 were fully excavated at the Conservation Center Vejle and samples were also taken for a large number of interdisciplinary analyses (A.-K. Kjerulff and L. Ræder Knudsen 2010; H. Rostholm 2011). The interdisciplinary analyses are described in detail in chapter 5. In 2017 Museum Midtjylland began work on an investigation of the last of the removed block samples – Grave 8. The presence of well-preserved textiles and animal skin/leather was noted, after which the work was suspended. This grave is in storage at the museum and has still not been fully excavated. The investigations of the graves from Ny Gjellerupvej have thus extended over 25 years and have not yet been completed.

Topography

The area investigated is situated on the easternmost part of Skovbjerg Bakkeø which lies between the rivers Storå and Skjern Å. Skovbjerg Bakkeø is the largest hill island in West Jutland. Hill islands represent old moraine deposits that are surrounded by melt water deposits from the last Ice Age. The area developed into heathland at an early stage. Pollen studies show that the heath spread as early as c. 5000 years ago and reached its maximum extent in the Early

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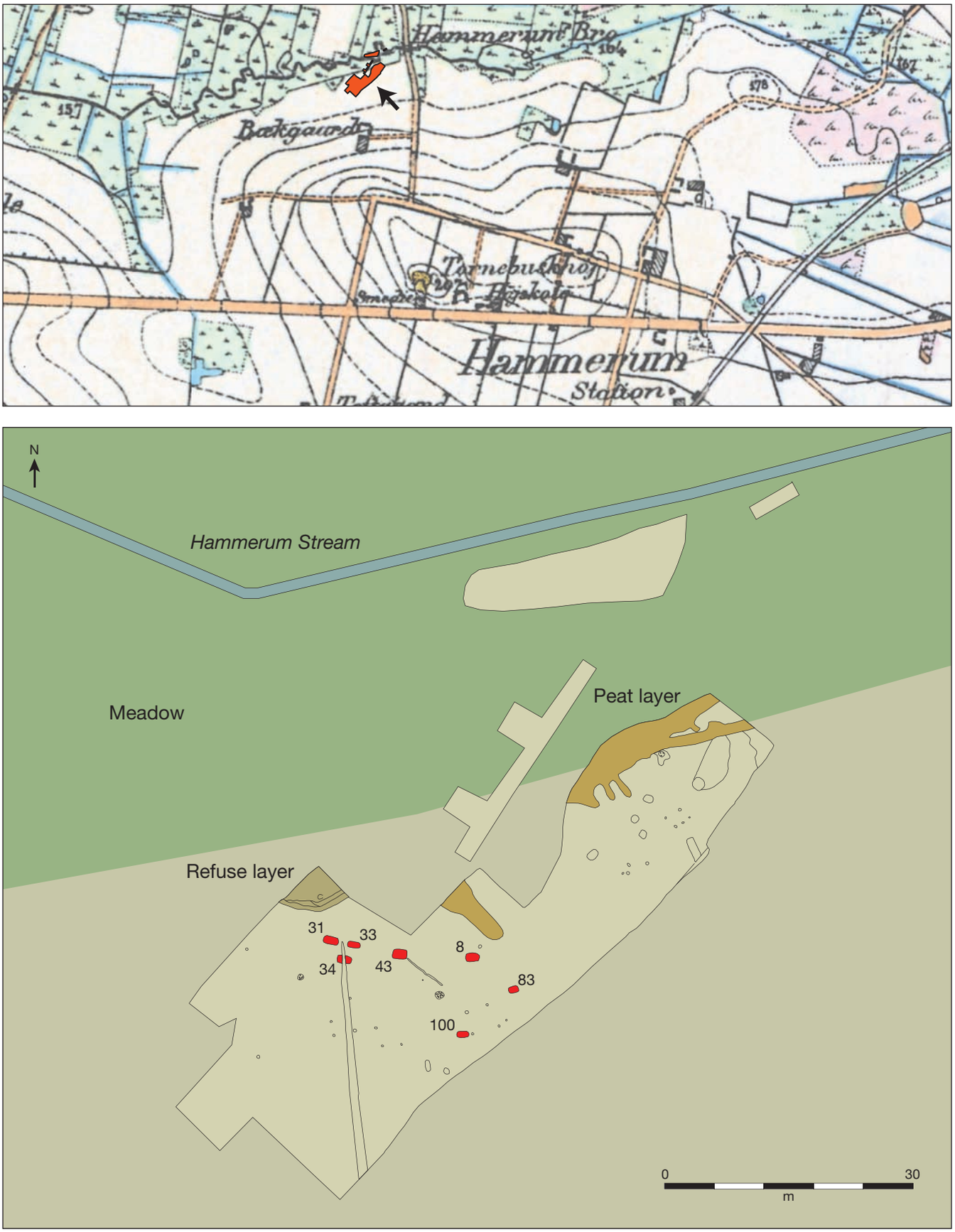

Fig. 2. The excavation field in the north-western part of Hammerum drawn on the ordnance map from 1872. A detailed plan of the excavation field with the burial site is shown below.

Iron Age and Viking Age (B.V. Odgaard 1985; B.V. Odgaard and H. Rostholm 1987).

The excavation was conducted in a small area immediately south of the stream Hammerum Bæk where the terrain slopes gently downwards to a broad meadowland area which extends approximately west-east between Hammerum and Gjellerup (fig. 2). The soil here consists of meltwater sand (N. Helt Nielsen, chap. 5.4 p. 109).

Pollen analyses of samples taken just below Grave 83 indicate that this was a semi-open landscape with scrub dominated by hazel on dry soil and common alder on moist soil, and the composition of herbs shows that the meadowlands were dry and that heathland was predominant in the open areas (R. Enevold, chap. 5.8 p. 141).

At the time of the excavation in 1993 the stream Hammerum Bæk had been regulated to a straight course, while on the map from 1872 it has a meandering course (fig. 2). A few years after the museum's excavation the meandering course of Hammerum Bæk had been restored.

The excavation

An up to 80 m long excavation field was uncovered with a south-west/north-east longitudinal orientation, comprising the actual road track and a large working area east of the road. Three smaller fields to the north were also dug up – but no traces of occupation were identified here. A total of c. 2000 m² was uncovered. Seven inhumation graves and a number of other settlement structures were registered in the large excavation field, distributed over a south-western and a north-eastern group (fig. 2).

To the north the terrain descended towards Hammerum Bæk, and the area was sandy with turf layers. At the edge of the track towards the north-west, part of a large refuse layer was investigated containing, amongst other things, small quantities of iron slag and fired clay, presumed to be the remains of a furnace or kiln. In the south-western part of the excavation field, in addition to the seven inhumation graves, two cooking pits were registered as well as a possible stretch of fencing, 15 post-holes and a couple of other small pits. There was also a north-south oriented modern gutter that intersected one of the graves. One cooking pit was found slightly west of the graves, and the other lay midway between the eastern graves. Both contained charcoal-like fill and fire-brittle stones. The cooking pits were 70 cm and 99 cm in diameter and 42 cm and 23 cm in depth respectively, calculated from the lower limit of the modern plough layer. In the middle of the area with graves there was a ditch or a possible fence that was oriented c. north-west/south-east near one of the graves. The ditch was up to 18 cm deep and of uncertain age. The post-holes were small and rather scattered. They did not appear to be part of any structure. A larger pit was found further to the south, c. 4.5 m from the southernmost grave. The pit was 130x50 cm and had a north-south longitudinal orientation. It was initially thought to be a grave, but investigation showed that this was not the case. The pit was 87 cm deep and contained modern fill.

A few post-holes and several pits were investigated, without providing indication of their age, in the north-eastern part of the excavation field. Amongst other items there were three shallow depressions which were interpreted as the remains of charcoal stacks. To the north a small cooking pit appeared which was 75 cm in diameter and 20 cm deep. A single pit to the south-west, measuring c. 150x100 cm and 17 cm deep, was at first identified as a grave. There were, however, no signs of a burial. The depression lay 18 m from the closest identified grave and was longitudinally oriented c. south-west/north-east.

The many different structures contained no date-providing finds. The fill in the pits and the occurrence of iron slag suggest the Iron Age, but the various pits are not necessarily from the same period and their ages in relation to the burial site cannot be ascertained.

The burial site

Seven inhumation graves were investigated, longitudinally oriented more or less west-east within an area of c. 25x10 m and probably originally located in a flat field (fig. 2). Three of the graves (31, 33 and 34) were found close together towards the west. Graves 31 and 33 form part of a west-east-oriented row that continues east with Graves 43 and 8. These four graves extend over a

total of 19 m. The two other graves to be investigated (83 and 100) were located furthest east and south.

Apart from the three westernmost structures the graves lie at intervals of 4-6 m. This distribution indicates that the graves were originally covered by small mounds, but excavation revealed no traces of mounds. It may be significant, however, that several examples of graves from this period covered by a mound are known in the Herning area. One such burial mound (Tophøj) with finds from the Roman Iron Age was registered only 125 m south of the burial site, and more mounds have been investigated near Tjørring, c. 7 km to the west (H. Rostholm 2008, p. 141f; M.W. Olesen and H. Rostholm 2004).

We cannot exclude the possibility that there were more graves outside the investigated area. It borders to the east on a residential area where no archaeological investigations have been conducted. From the easternmost graves there is only 3.5 m and 3.0 m to the eastern edge of the excavation field (fig. 2). A geomagnetic survey conducted in 2017 on a grassy area between the edge of the field and the residential area – up to c. 7 m east of the easternmost grave – gave no indication of further structures.

From the westernmost grave there is c. 7 m to the westernmost edge of the field. To the north the terrain slopes downwards with refuse and turf layers. It is not likely that there were more graves in that direction.

The burial site is situated on the lowest part of a large north-west-oriented hill on sloping terrain that descends slightly to the north-west. The graves are situated close to the edge of the meadow, and the burial site thus lies unusually low in the landscape (fig. 2).

None of the seven graves contained grave goods that could date the features. In the excavation of 1993 they were therefore interpreted as early Christian graves. The nature of the fill in the pits did not seem to suggest a particularly old age. It was not until ^{14}C-dating took place in 1995 that it become clear that Grave 83 is from the Roman Iron Age. It is reasonable to assume that all seven graves are from about the same time.

Graves 31, 33 and 34

The three graves to the west lay at intervals of only c. 1 m (fig. 2). Grave 31 consisted of a 185 cm long and 90 cm wide pit which was only preserved down to a depth of 11 cm, measured from the lower limit of the modern plough layer. Many small fragments of iron slag were found in the fill. Grave 33, which was situated just east of Grave 31, had a dug-out depression that was 155 cm long and 75 cm wide and was preserved to a depth of 9 cm. Grave 34 lay a little south of the two others and consisted of a c. 175 cm long and 100 cm wide depression which was 13 cm deep and intersected by a modern gutter.

Fig. 3. Grave 43 with coffin remains seen from the south. A small section balk was preserved in the middle of the grave during excavation. The measuring stick is 10 cm long. Photo: Jens Jørgen Kærgaard.

Common to the three graves was the fact that there were no coffin remains or traces of the deceased. Nor were any grave goods preserved. Cross sections through the graves showed that the bottom was flat or slightly rounded. These three graves are interpreted as part of the burial site on the basis of the fill, the size of the cavities and the close proximity to the four other graves. Unlike these, Graves 31, 33 and 34 are situated closer together, and no traces of organic material were identified. As the pits were not very deep, their shallow nature may have contributed to poorer preservation conditions than in the other graves, although the closest grave, 43, and the grave farthest away, 83, were only slightly deeper.

Grave 43

Grave 43 was found c. 4 m east of Grave 33 in the row of four graves. The grave consisted of a 175 cm long and 110 cm wide pit. The grave was excavated, apart from a c. 12 cm wide profile ridge across the middle. The fill contained some iron slag and there was a large piece of iron slag at the bottom of the burial pit. The partly excavated grave can be seen in fig. 3, and a plan of the grave is shown in fig. 4. Charcoal-containing fill was present at both ends of the grave about 15 cm above the base. This fill was located in vertical layers 1-2 cm thick. They have been interpreted as representing traces of planks in the end of a wooden coffin. The western end curved slightly inwards and was iden-

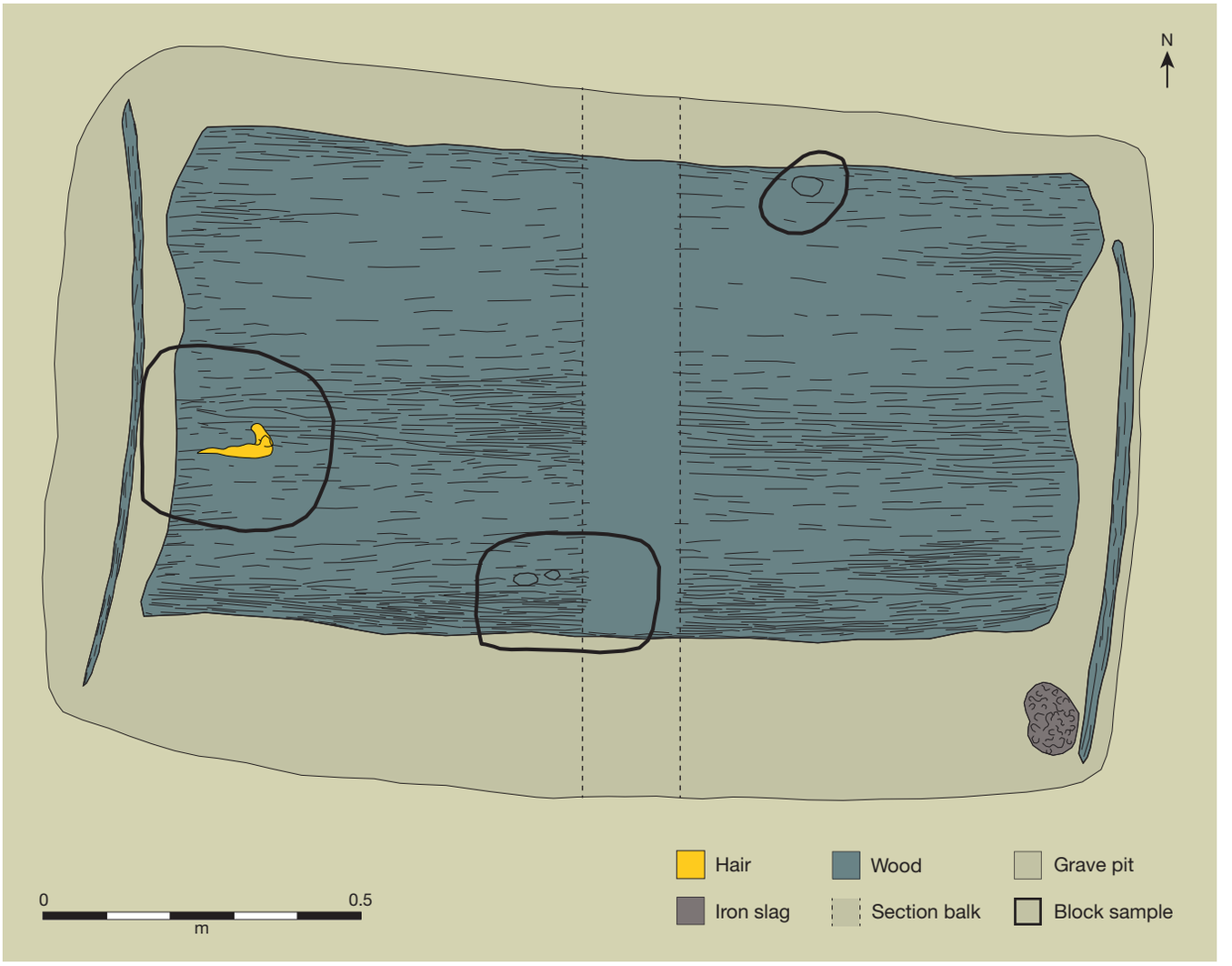

Fig. 4. Plan of Grave 43 with coffin remains. The light-coloured stripe in the middle of the grave is the section balk where the coffin remains were not drawn but excavated. In one corner there was some iron slag in the grave fill. Three small areas that were taken up as block samples are indicated. The block sample from the western end contained remains of hair. The other two only contained remains of wood.

tified c. 10 cm from the edge of the pit, whereas the eastern end appeared 1-3 cm from the edge of the pit. The placing of the ends suggests that the coffin had a length of c. 155 cm.

A few centimetres above the bottom of the pit there was a compact layer of charcoal and poorly preserved wood which has been interpreted as representing the remains of the collapsed coffin lid. The structure of the wood and charcoal showed that the planks lay lengthwise in the grave.

The coffin remains at the western end had a length of 92 cm, whereas at the eastern end they were registered over a length of c. 85 cm. No traces of the long sides of the coffin could be discerned. The width therefore cannot be stated with certainty, and it cannot be excluded that the end pieces of the coffin were wider than the coffin itself. The layer of wood and charcoal from the fallen-in coffin lid extended over a width of 75 cm. The width of the coffin was presumably a little larger, since the fallen-in coffin lid is unlikely to have reached all the way out to the sides of the coffin. At both ends there was thus c. 5 cm between the ends of the coffin and the charcoal layer representing the lid, as is evident from figs. 3 and 4.

The pit had a flat bottom and was preserved to a depth of 22 cm measured from the lower limit of the modern plough layer. The subsoil consisted of yellowish and pale brown sand. A section across the grave showed that in parts of the grave – beneath the layer of wood and charcoal from the fallen-in coffin lid – there was a thin black layer. This has been interpreted as representing the remains of the base of the coffin. In the cross section the layer could be traced all the way to the southern edge of the pit and to a width of 75 cm beneath the fallen-in coffin lid. The two layers could not be separated in the northernmost part of the section. At some points the fallen-in coffin lid lay in a curving or diagonal layer that was located slightly above the presumed coffin bottom. It was therefore clear that there were two different layers. The coffin base appears as a black layer that was thinner than the coffin lid and had no preserved wood. The remains of the coffin base suggest that the coffin was at least 75 cm wide – and probably slightly wider. It seemed that the long sides of the coffin, like the remains of the two ends, had stood close to the edge of the pit.

Remains of hair were found at the western end of the grave beneath the charcoal layer from the fallen-in coffin lid and c. 1 cm above the bottom of the pit. The conservator (Elmer Fabech from the Conservation Centre in Gram) removed the hair and the surrounding fill (Sample 49). He also collected small samples of the presumed remains of two decomposed iron objects which were located in the middle of the southern long side of the coffin and in the eastern part of the northern long side. The three samples are marked on the plan in fig. 4.

Investigation at the Conservation Centre in Gram

The three samples from Grave 43 were X-rayed and investigated at the Conservation Centre in Gram in 1993 and 1994. Unfortunately, the two small samples from the middle and eastern part of the grave contained no remains of iron, only wood from the coffin. In the

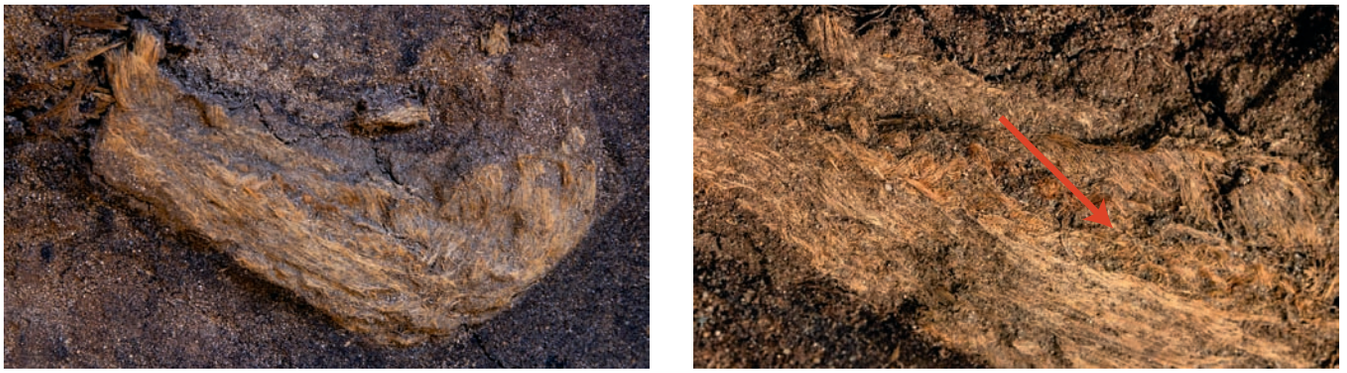

Fig. 5. Remains of the coiffure from the western end of Grave 43. A detail of the braiding can be seen marked by the red arrow on the right. Photo: Maja Theodoraki, Museum Midtjylland.

Fig. 6. Grave 8 with the top part of the wooden trough dug out in the western half of the grave. The very mixed nature of the grave fill is evident in the profile. The measuring stick is 10 cm long. Photo: Hans Rostholm.

sample from the middle part of the grave remains of both the coffin lid and its base could be discerned.

There were remains of human hair in Sample 49 (fig. 5). As seen in fig. 4 the remains of hair came from the western end of the burial site. This accords well with the normal orientation of the deceased with the head in the western part of the burial. It is evident from the conservation report that there were traces of the wooden coffin both above and below the hair.

The piece of a coiffure (12.5 cm long and 7.5 cm wide) was well preserved. It was oriented c. west-east in the grave with the widest part towards the east (fig. 4). Remains of braids can be seen in the middle part (fig. 5). This suggests that it may have been a complicated coiffure, as in Graves 83 and 100 (L. Ræder Knudsen and T. Møbjerg, chap. 4).

These remains of braided hair were the only remaining traces of the deceased. No grave goods were preserved in the grave. Judging from the hairdo it is assumed that the deceased was a female. The coffin, which was at least 155x75 cm, was large enough for an adult if the deceased was positioned with bent legs as in Graves 83 and 100.

Grave 8

The easternmost grave in the row of four was Grave 8 that was found around 7 m east of Grave 43 (fig. 2). Grave 8 lay in a 170x100 cm pit which contained a well-preserved wooden trough. The western part of the grave was investigated where the uppermost part of the wooden trough appeared at a depth of 22 cm, (fig. 6). The top part of the whole trough was excavated after this discovery (fig. 7).

The pit contained a rather mixed fill of greyish-brown sand and some lighter-coloured sand. Around the wooden trough the fill contained dark, turf-like blocks, probably representing heath turf. These blocks were harder than the other fill. At both the north-eastern and the south-eastern corners of the pit there were large blocks of turf that are marked on the plan in fig. 10. A large block of turf was also found in the south-western corner.

The wooden trough was placed bottom-up, but at some point the bottom of the trough had been pressed down into the grave. In the western part the wood lay in an oblique layer, whereas in the eastern part it was not uncovered by the excavation (fig. 7). The remains of the wooden trough lay as a continuous piece with its lower edge a few cm above the bottom of the pit. The wooden trough is c. 160 cm long, including a handle at each end, and it is up to 50 cm wide. The hole left by the collapsed bottom of the trough was up to 113 cm long and 37 cm wide. The upper edge of the collapsed bottom lay in the middle of the trough up to 23 cm beneath the highest part of the rest of the trough. At both ends of the trough one can see small wooden strips across the trough. These strips are 48

Fig. 7. Grave 8 with the whole wooden trough partly dug out, seen from the south. Part of the collapsed bottom of the trough can be seen inside the trough. The measuring stick is 50 cm long. Photo: Hans Rostholm.

Fig. 8. The western end of Grave 8 with part of the trough, two handles and a transverse wooden strip seen from the east. The measuring stick is 10 cm long. Photo: Hans Rostholm.