New Perspectives on the Bronze Age

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edited by

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Cover illustration: Bronze Age mound *Store hög* at Hol, Sweden, taken by Emma Nordström, 2017

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Preface

I wish to express my sincere gratitude to all who participated in the 13th Nordic Bronze Age symposium. Thank you for attending the conference, for presenting excellent papers and for asking stimulating questions and sharing a wealth of specialist knowledge, all of which led to a successful, and memorable, conference. I am especially grateful to the session organisers for leading interesting sessions with lively discussions. I am also grateful to Johan Ling for organising the excursion to Tanum on the last day, and to Anna Wessman for leading the excursion to the so-called Bronze Age Strait. In addition, heartfelt thanks must also go to GAST, the student society, and to the student helpers who volunteered during the symposium.

A further round of thanks must go to the contributors to this volume, both for taking the time to write and revise the articles, and for having patience with the numerous small questions that always arise in finalising an edited volume. I would also like to thank my co-editor, Anna Wessman, who assisted until the start of her maternity leave in April 2016. Thanks are also due to Kristin Bornholdt Collins for assisting with matters of language and in the task of adopting the style guidelines of the publisher, and to Rich Potter for setting the volume. I am also grateful to Archaeopress for showing interest when I approached them about publishing the volume.

For generously sponsoring both the conference and this volume, I am profoundly grateful to *Lennart J Hägglunds Stiftelse för arkeologisk forskning och utbilding*.

Finally, I wish to thank my colleagues at the Department of Historical Studies at the University of Gothenburg for their support, from conference planning to production of this volume. Particular thanks go to Johan Ling, Peter Skoglund and Kristian Kristiansen for their input along the way. I hope that the authors are pleased with the final result, and that many will find the diverse collection of articles an interesting and inspiring read.

Gothenburg, March 2017

Sophie Bergerbrant

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Identifying commoners in the Early Bronze Age: burials outside barrows

Sophie Bergerbrant, Kristian Kristiansen, Morten E. Allentoft, Karin M. Frei, T. Douglas Price, Karl-Göran Sjögren and Anna Tornberg

Abstract

This article discusses the possibility of social division and the presence of commoners in south Scandinavia during the Early Bronze Age. The discussion is based on new scientific and archaeological data generated in the project Travels, transmissions and transformations in temperate northern Europe during the 3rd and 2nd millennium BC: The rise of Bronze Age societies. Based on a comprehensive radiocarbon dating program, we were able to re-assign many skeletons, previously assumed to be Late Neolithic, to the Bronze Age. This accounted for a significant proportion of non-elite burials (including those of children) that had previously been 'mysteriously' missing in the archaeological Bronze Age record. Moreover, strontium isotope analyses reveal that individuals seem to be mobile regardless of their wealth status and burial rituals. It suggests a society where workers and perhaps even non-free labourers were mobile, not only the elite segment.

Key-words: Late Neolithic, passage grave, gallery grave, flat grave, mound, Scania, southern Scandinavia, strontium isotopes.

Introduction

Recent research on the Bronze Age has increasingly moved towards estimating absolute numbers in both economy (timber use, metal consumption) and demography (Holst *et al.* 2013; Müller 2013). Through a combination of large regional datasets on burial mounds and small localised datasets from settlement surveys, it has been possible to estimate the number of people entitled to a barrow burial during the Danish Early Bronze Age (EBA, 1700–1100 BC) to a maximum of 20% of the living population (Holst *et al*. 2013). Two things are implied: firstly, that those buried under barrows were the local elites comprising free, cattle-owning farmers and household heads, and secondly that a large proportion of the non-elite population remains invisible in the archaeological record, or at least unaccounted for in terms of burial (Kristiansen 2013; Bunnefeld 2016; cf. Holst 2013a: 110–113 for a different view).

With recent results from *The Rise* project[1] we can now start to investigate this enigma, as it included, to date, the largest number of individuals investigated through a multi-disciplinary approach. Within *The Rise* project over 600 samples from skeletons from all over Europe have been analysed. This article deals with the 65 samples from southern Sweden,[2] from the Late Neolithic (LN, 2350-1700 BC) and Early Bronze Age (see Figure 1). In Appendix 1 we present the burial data from Scania employed in this article, and in appendix 2 we present in table form the radiocarbon dates, the osteological determinations and strontium values.

All skeletons in this project were analysed for ancient DNA (aDNA), strontium isotopes analysis, and were radiocarbon AMS-dated. A large number of burials were sampled from southern Sweden, and because most individuals were selected on the basis of having well-preserved teeth, suitable for aDNA analyses (see Hansen *et al*. 2017), many archaeologically 'less interesting' burials without clearly dated grave goods were also sampled. These included gallery graves and flat ground cemeteries, which are generally thought to belong to the LN (Stensköld 2004: 134–138; Strömberg 1975a, 1982). Our radiocarbon results showed, however, that a large number of these skeletons were from the Early Bronze Age and not the Late Neolithic. In addition to providing

[1] Travels, transmissions and transformations in temperate northern Europe during the 3rd and 2nd millennium BC: the rise of Bronze Age societies, funded by the European Research Council (FP/2007-2013, grant no. 269442, *The Rise*.

[2] All radiocarbon dates for *The Rise* have been conducted by Oxford University's Radiocarbon accelerator unit Research laboratory for archaeology and the history of art. Some of the samples have been double dated as a test measure by the laboratory; in these cases, the combined date has been used in this article (see appendix 2).

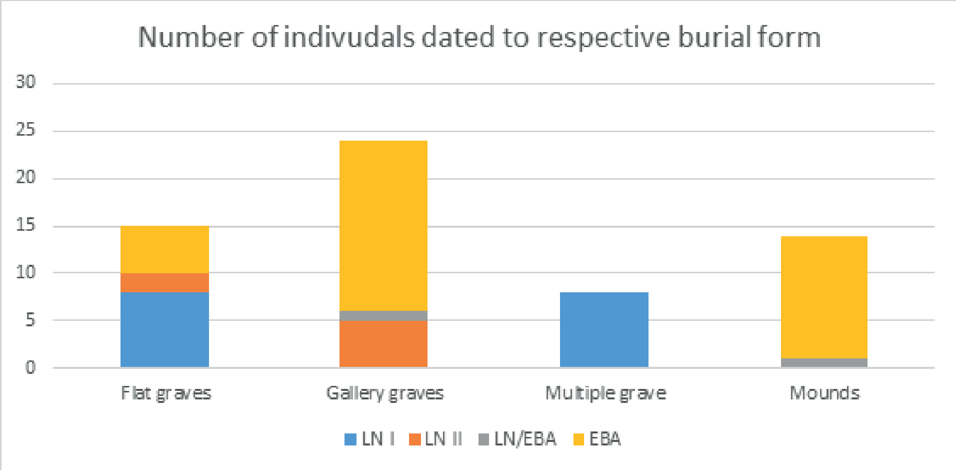

TABLE 1. THE DIFFERENT BURIAL FORMS OF THE 61 ANALYSED INDIVIDUALS. THE ANALYSED SAMPLES FROM THE SO-CALLED LATE NEOLITHIC LAYER AT THE ÖLLSJÖ PASSAGE GRAVE ARE ATTRIBUTED TO THE GALLERY GRAVES.

a likely explanation for the 'missing' non-elite in the Bronze Age, this result also offered a rare comparative opportunity. By comparing strontium isotopic values from individuals in the communal graves with those buried under barrows, we could directly compare the level of mobility in these two different social classes.

The aim of our article is to document and interpret the existence of alternative forms of non-elite /non-barrow burials during the Early Bronze Age, belonging to the invisible segment of the population that did not receive a burial in a mound or barrow.

Summary of the evidence[3]

We shall begin by summing up the dating evidence, and the distribution of the buried population according to burial type, age and gender, which is followed by a discussion of the implications of the results for our understanding of Bronze Age society.

Dating and burial types

A total of 16 of the 61 samples dated to LN I (2350–1950 BC) and seven to LN II (1950–1700 BC), while two samples were difficult to place and can be said to belong to the transition LN and first phase of the Bronze Age. The majority of the samples, 36 in total, are from Early Bronze Age contexts (1700–1100 BC).

Flat graves

We shall first consider flat graves without barrow and stone cist constructions. Of the 15 flat graves, including a double burial, the majority are from LN I (eight), only two date to LN II and five to the Early Bronze Age. All of the samples originate from cemeteries that seem to have been used for a long period of time from at least LN I well into the EBA.

Multiple graves

All of the probable multiple burials, including three or more individuals in one structure,[4] came from LN I (eight sampled individuals) and are from three different contexts. The multiple grave in Abbekås has been interpreted as the result of a probable clearing out of bones from the gallery grave (Hansen 1938: 65).

Passage graves and gallery graves

The eight samples from the so-called Late Neolithic layer in the passage grave in Öllsjö (Hommerberg 1944) include three individuals dating to the LN II, one from the transition LN II/EBA and four from the Early Bronze Age. The Ängamöllan gallery grave contained the remains of 14 individuals (Arbman 1945; Magnusson 1947), within *The Rise* project 13 of these were dated, all yielding an Early Bronze Age date. Of the three analysed skeletons in the Abbekås mound I gallery grave (Hansen 1938: 65–68), two dated to the LN II and one to Montelius Period IB.

[3] Of the 66 samples sent for radiocarbon dates one failed (RISE180), two samples produced questionable dates (RISE183, RISE232) and two had MN dates (RISE190, RISE202); these are not included in the discussion below, but they are all in the appendixes.

[4] Due to the placement and the date of the two oak-log boat graves from Kiaby 80:1 they are considered to have been constructed at the same time and are therefore seen as a multiple grave.

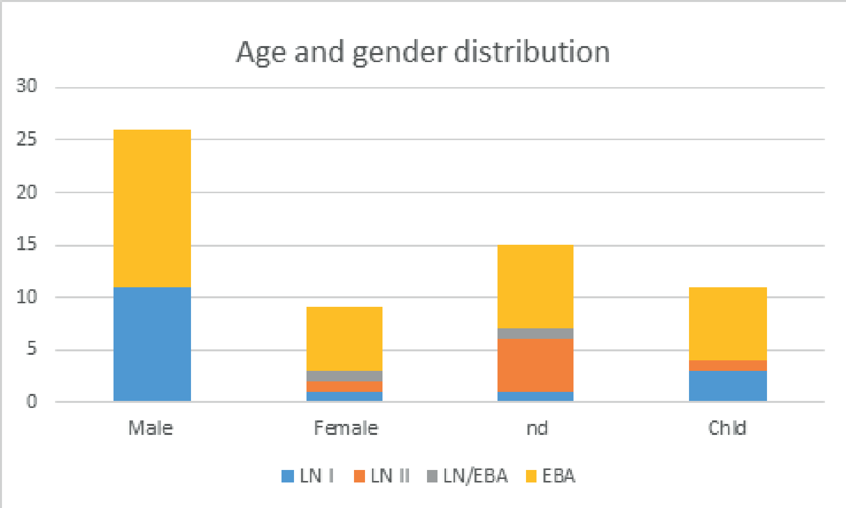

TABLE 2. AGE AND GENDER DISTRIBUTION PER PERIOD.

Of the total 16 dated skeletons from gallery graves, 14 belong to the Early Bronze Age and only two to the LN II. If we add the samples from Öllsjö gallery grave LN layer, then 18 of the 24 date to the Early Bronze Age, one to the transition LN II/EBA and five to LN II. It shows that, at least in eastern Scania, interment in gallery graves seems to have been a common burial form throughout the Early Bronze Age.

Mounds

All of the samples found in a cairn or a mound are from the Early Bronze Age, the oldest burial being from the transition period between LN II/EBA (RISE260). A total of twelve individuals were buried in mounds and one in a cairn. Most of the mounds covered earlier LN flat graves and thus seem to be a conscious result of sustained use of one burial ground.

Gender and age

Sex and approximate age identification was possible by physical anthropological analyses for the majority of the 61 individuals investigated in this study. Only 14 individuals (representing ~23%) were not determinable. However, aDNA analyses performed in one of these non-determinable individuals were able to yield information about the sex of the deceased as well showing that one of the osteologically determined males was identified as female according to the aDNA result (Allentoft *et al*. 2015: supplement). This leaves us with 47 analysed skeletons with information about age and/or sex. Of these, 23% are children, 2% undeterminable adult, 56% male and 19% female. The material for LN II and the transition from LN II to Early Bronze Age is too small to say anything about the periods. For the LN I 19% were children, 69% male and 6% female and 6% were undeterminable. For the Early Bronze Age the percentage is divided as follows: 24% children, 3% adult, 52% male and 21% female (out of 29 individuals).

Discussion

Gender and age

Children have been seen as underrepresented in the Bronze Age burial record (Holst 2013a: 88; Welinder 1998: 18). Drawing on the material in the 'Die Funde' volumes by Aner and Kersten, and the cemeteries Löderup and Ingelstorp in Scania, Bergerbrant (2007: 107–115) documented that children's graves are indeed rare during the Early Bronze Age, whereas they are more common in the Late Neolithic and the Late Bronze Age. Interestingly, our study demonstrates that for the Early Bronze Age many of the child burials are to be found outside the mounds, and they are generally without burial goods or just a few smaller objects. When we add the children's burials now dated to the Early Bronze Age that are not from barrows we reach similar figures as for the Late Bronze Age, where a larger part of the population seems to have been cremated (Holst 2013b). The number of child burials from the Early Bronze Age presented here is close to the 20–30% of children in the Late Bronze Age burial population as presented by Welinder (1998: 188).

Turning to gender relations, as represented in the bronze-rich mound burials, the number of females identified by artefacts is normally much lower compared to that of males (Bergerbrant 2007: 65–80; Holst 2013a: 85). This uneven gender balance shows regional and temporal variability (Asingh and Rasmussen 1989; Bergerbrant 2007: 89–90; Austvoll this volume). One might therefore expect that in our material there would be a more even balance, since the biological sex in the poorer non-mound burials was not identified through grave goods, but through anthropological analysis.

As demonstrated in Table 2 this is not the case, as male burials still dominate, even if women have a higher representation than in the bronze rich mound burials (see Asingh and Rasmussen 1989; Bergerbrant 2007: 65–80; Fabricius 1994:147–148), though it remains much lower than the visibility of women in relation to males in some parts of Norway (see Austvoll this volume). Nine of the sexed individuals came from the gallery grave Ängamöllan, and they cannot be directly connected to any artefacts in the grave. Seven of the male burials had objects that are traditionally associated with males, such as swords, razor and flint daggers (see Bergerbrant 2007: 8–9). Three of the male graves contained no objects, and two women (Rörbäck and Kiaby mosse) were buried with artefacts that are essentially unisex (see Bergerbrant 2007: 8–9).[5]

The explanation for the imbalance in the male:female ratio in the South Scandinavian Early Bronze Age burial record can either be real, a result of source-critical factors, or a mix of these two explanations. Thus, it has been suggested that woman in some regions adopted the cremation rite earlier than men, which would account for some of the discrepancies, but not all (Fabricius 1994:148–149; Bech and Rasmussen in print; see also Olsen 1992). The site with the most early cremations so far published is Sommaränge Skog in the Mälar Valley (Forsman and Victor 2007) but there are also a number of radiocarbon-dated cremation graves that have been shown to belong to Period II in Scania (e.g. Arcini and Svanberg 2005; Engström 2006; also Holst 2013a: 64; Håkansson 1985:84 for early cremation burials). And we do find a few Early Bronze Age cremation cemeteries, such as Lustrupholm that exhibit an inverted gender ratio where females dominate (Feveile and Bennike 2002). Once we start dating more cremations, both in mounds and elsewhere, we may find some of the missing female burials.

[5] The aDNA analysis conducted within *The Rise* (Allentoft *et al*. 2015: supplement) shows a large number of graves where the osteological determination and aDNA termination differs. Of the 105 individuals published in Allentoft *et al*. (2015), 15 of them (representing ~14% of the individuals studied) displayed disagreement between sex determined by osteological analysis and the aDNA determination. With seven osteological-determined females that were aDNA-determined as male, and eight examples of the reverse (Allentoft *et al*. 2015: supplement), the differences are neutral in relation to gender balance.

Burial form

Our samples are all from inhumation burials, which was dominant from LN to Period III of the Bronze Age, when cremation was introduced and gradually became dominant, with regional variations from 27% cremation burials in Thy, to around 40% on Bornholm (Bech and Rasmussen in print; Fabricius 1994). We have three inhumation burials dated to Period III from outside mounds and one from a mound (Ängamöllen). Two are from Öllsjö (passage grave), and the fourth from Ängamöllan has a radiocarbon date with a wide range, 1421–1262 BC, which could be early Period III or rather the transition between Period II and III. It should be noted that a cremation demanded access to good firewood, and in regions with a scarcity of wood, such as Thy, they employed bog turfs for firing (Bech *et al*. in press), and experienced a slower expansion of the cremation ritual. One may propose that access to firewood was also more difficult for commoners, who therefore continued the inhumation burial ritual to a larger extent than the elite burials in barrows. This hypothesis needs to be tested in the future.

In our material, burials in gallery graves are the most common. This is due to the fact that all 13 samples from Ängamöllan dated to the Bronze Age. Similar results have been reached by Tornberg (in press) in a study about Scania. However, a number of gallery graves, both in Denmark (Ebbesen 2007), and elsewhere in Scania (Håkansson 1985), contained objects that indicate an Early Bronze Age presence. Based on radiocarbon dates Bronze Age interred has also been shown in gallery graves in Falköping, Västergötland (see Blank this volume). The passage grave in Öllsjö did contain a Period II artefact (Hommerberg 1944), and our analysis confirmed that at least four Bronze Age individuals were buried there, continuing into Period III. Once again it demonstrates the need for more extensive radiocarbon datings for all burials in the megaliths. A place to start would be passage graves with Bronze Age objects, such as Øm, Glim parish (Aner and Kersten 1973:163), or sites where oak-log coffins have been buried in the mound around the tomb, such as Lødderup, Lødderup parish (Aner *et al.* 2001:175). The five individuals, dated to the Early Bronze Age, who were buried in flat ground graves were from two cemeteries, Västra Virestad and Kiaby mosse, both of which started in the LN, and for Västra Virestad possibly even in the Battle Axe Culture (BAC). On Bornholm 13% of all well-documented Early Bronze burials are flat graves (Fabricius 1994: 143). To this we may add the results from Märta Strömberg's systematic excavations in two micro regions in Löderup (Strömberg 1975a) and Ingelstorp (Strömberg 1984).

In a recent diet study of Late Neolithic to Early Bronze Age individuals from Scania it has been shown that no significant differences in diet existed between different burial types, though caries were slightly more prevalent in the mound burials compared to flat graves and gallery graves (Tornberg in press). It is suggested by Tornberg (in press) that this might have to do with a higher indigestion of honey for the people buried in the mounds. From the Bronze Age there is evidence of remains of a probable meadlike beverage containing honey from a few well-equipped mound burials in northern Europe (Koch 2001: 28–30). It may be that the need for access to wax for the production of bronze artefacts and honey for mead production (Koch 2001) was greater for the social groups that buried their dead in the mounds.

Based on these findings we suggest that Early Bronze Age flat grave cemeteries have been overlooked, and therefore represent a potentially more widespread burial practice of Early Bronze Age commoners. We also suggest, as a hypothesis, that commoner inhumation burials continued to predominate during Period III, as cremation demanded access to good firewood.

Artefacts

In the gallery graves and passage graves it is difficult to connect artefacts with individual skeletons. In Bornholm, 43% of flat graves had no artefacts, while it is typical for the rest to have smaller pieces of jewellery, such as arm-rings (Fabricius 1994: 145–146). No belt-plates or weapons were found in the 30 flat graves on Bornholm (Fabricius 1994: 146). In our samples three (60%) of the five flat graves contained arm-rings. In Scania a few rich flat graves are known, e.g. the female grave in Valleberg that contained a belt-plate, two spiral arm-rings and a large number of bronze tubes (Strömberg 1975b), and grave 42 at Ingelstorp 10 contains a bronze dagger and other objects (Strömberg 1982: 136–137).

Of the 13 burials from mounds or cairns in Scania, ten (77%) contained grave goods, though only six had bronze objects (see appendix 2). On Bornholm 65% of the mound burials had grave goods (Fabricius 1994: 145).

Our findings indicate that there existed differences in burial wealth between barrows, flat graves and gallery graves, which suggests that we are dealing with different social categories of people, even if there are exceptions to the pattern.

Mobility

The strontium isotope values from within Scania are at the moment difficult to interpret due to the limited amount of baseline values, hence our current interpretations must be seen as preliminary. In appendix 3 an overview of what we know so far is provided. In order to properly interpret human Sr isotope values, we need to build baselines of biologically available 87Sr/86Sr in various parts of the landscape (Frei and Frei 2011; Maurer *et al*. 2012; Price *et al*. 2002). At present, baseline values are mainly available for parts of south-western Scania, while few are available from Precambrian areas and from the horst and graben landscape.

From south-west Scania, baseline values from animal samples are available from sites like Lund, Uppåkra, Almhov and Skateholm (Arcini *et al*. 2016; Gron *et al*. 2016, Price 2013, Price *et al*. 2015a, 2015b). The values recorded here seem to be generally low (Gron *et al*. 2016, Price 2013, Price *et al*. 2015a, 2015b, Arcini *et al*. 2016), often overlapping or just above the upper baseline range reported from Denmark (87Sr/86Sr ~0.708-0.711) excluding the island of Bornholm (Frei and Frei 2011, 2013; Frei and Price 2012).

From the limestone area in north-east Scania, Sr isotope values seem to be somewhat higher than in south-western Scania. A faunal sample from Fjälkinge was measured at 0.7110, and Wilhelmsson and Ahlström (2016) suggest values around 0.7110 in this region. However, a surface water sample from the river Helgeån yielded a strontium isotope value of 0.71613, which may reflect input from Precambrian areas (Löfvendahl *et al*. 1990).

A general difference between the SW and the NE regions is supported by the values from human tooth enamel samples analysed within *The Rise* project (Table 3). The mean difference is *c*. 0.002.

From the Precambrian area in northern Scania, a faunal value of 0.716 is reported from Dannås (Price *et al*. 2015a).

In sum, the available baseline data are unevenly distributed and complementary data is needed. On the other hand, the data we have are also from the same regions where we have human samples, due to the better preservation of bone in these regions (Figure 1). It can also be said that the available baseline values conform rather well with expectations based on the local geology.

Scania's geology is complex due to tectonic displacements and faulting which have shaped the area. Consequently, these have led to the exposure of differently aged bedrocks and sediments. The north-eastern part of the Scania is dominated by Precambrian crystalline bedrock while the south-western part is dominated by younger Mesozoic and Cenozoic sediments similar to the ones found in Denmark. Furthermore, running parallel to the faults, Cambro-Silurian sediments are exposed in the central part of Scania. Finally, the landscape has been intruded by Carboniferous dolerites (diabase) dykes (Erlström *et al*. 1999; Loberg 1999; Lundqvist *et al*. 2011). As a

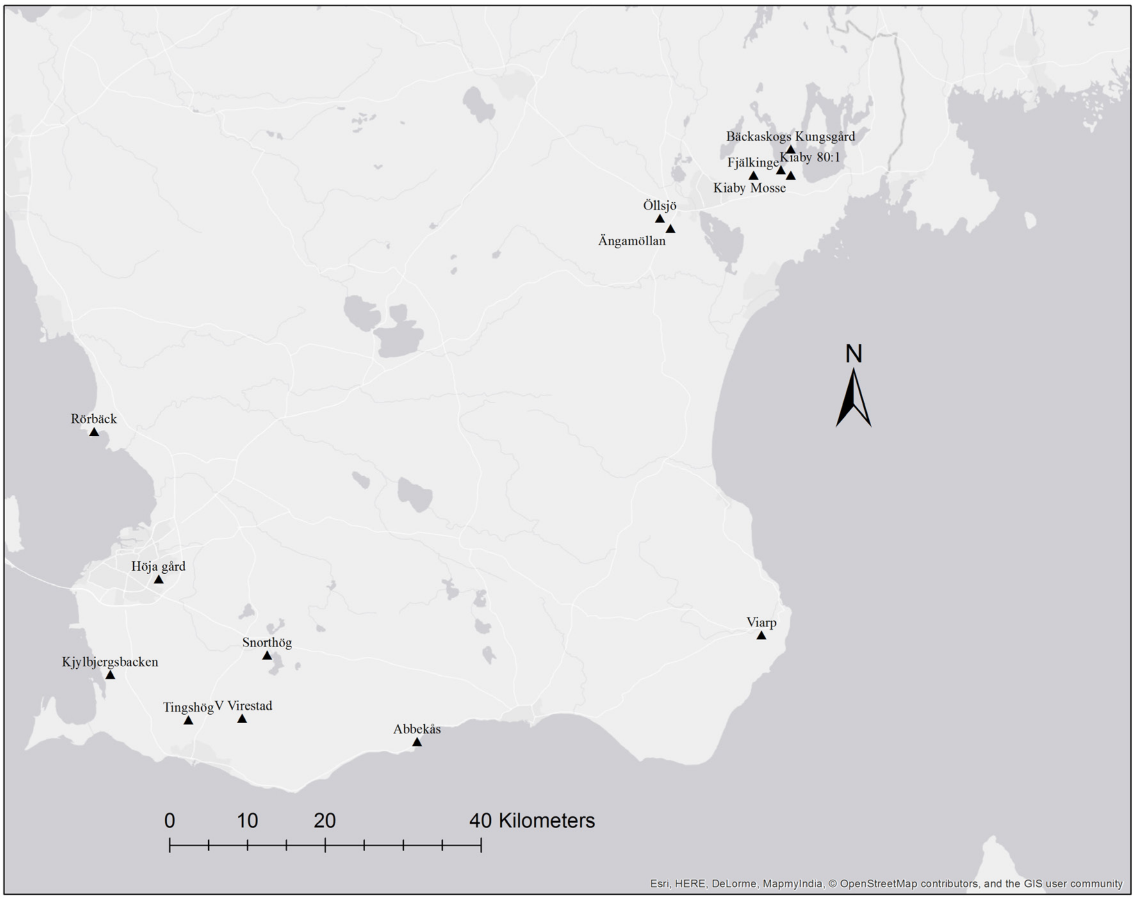

Figure 1. Map showing the sites. Image: by Sophie Bergerbrant.

Region	No	Mean	Std Dev	Min	Max
NE Skåne	40	0.71369	0.00383795	0.70934	0.72723
SW Skåne	52	0.71153	0.00278519	0.70880	0.72413

Table 3. Summary statistics of human ^{87}Sr/^{86}Sr values by region in Scania. The Rise project data, all samples.

consequence, one should expect a strontium isotope baseline between the lowest values of the dolerites and the highest from the crystalline Precambrian terrain. However, as dolerites have very low concentrations of strontium, their effect in the baseline is probably very small and most likely non-visible. Hence, theoretically, the lowest values should be dominated by the Mesozoic limestone *c*. 0.708. However, the local range in e.g. the Kristianstad area, which is surrounded by crystalline bedrock, is expected to have a higher Sr content, and we tentatively suggest that the Scania region will have a strontium isotope baseline range between ~0.708–0.713, which will have to be adjusted when more data are available.

Due to the limitations of present baselines, we may also proceed by looking at the internal variation of human values, defining those samples as non-local which fall clearly outside the range of, for example, two standard deviations at different sites. This, however, demands that more than just a few individuals per site are analysed. Hence the following interpretations must be considered as preliminary. From all of Scania, we have strontium values from 59 LN and BA samples, which we shall now analyse according to region and period, summarised in Table 4.

LN I and LN II

One of the males (RISE226) from one the boat graves in Kiaby from the Late Neolithic I is a probable non-local. From the Late Neolithic II, three individuals from gallery graves are probable non-locals. The three Late Neolithic II individuals from the passage grave in Öllsjö (RISE199, RISE200, RISE204) are probably non-locals, however, they may have come from other areas of Scania, though with the variation in their strontium isotope values they are most likely from different places.

Early Bronze Age

In the Early Bronze Age we sampled 28 individuals. Among them seven can be identified as possible non-locals. Four of them are from mound burials (RISE175; RISE181; RISE185; RISE224). The three from Abbekås are men: one with no artefacts (RISE181); one with a slate pendant and a flint scraper (RISE185); and one with a bronze razor (RISE175). The probable Period IB/II female (RISE224) with a dagger from Rörbäck nr 10 also seems to be a non-local. The tooth dated to Period IB (RISE232) from Västra Virestad is a non-local buried in a flat grave. Unfortunately, we do not know exactly which grave it came from (see Appendix 1). A non-sex determined adult (RISE211), and a female (RISE208) in the Ängamöllan gallery graves have strontium isotope values indicating that they are non-locals.

Three of the Early Bronze Age non-locals were men (RISE175; RISE181; RISE185), all of whom came from Abbekås. Two could not be sexed (RISE211, RISE232); they had been buried in a flat grave and a gallery grave. Two were women (RISE224, RISE208): one buried with artefacts in a mound and the other in a gallery grave.

Female mobility in the Early Bronze Age has been demonstrated on archaeological grounds, and our strontium evidence conforms to these results (see e.g. Bergerbrant 2007:118-124; Frei *et al*. 2015). Four of the possible Scanian outliers from LN/EBA and EBA have strontium isotope values ranging between 0.7235–0.7272, which could indicate contact between Bornholm (for Bornholm's strontium isotope ranges see Frei and Frei 2013) and Scania, or areas north of Scania with similar baseline ranges. However, the distribution of the so-called Bornholm fibula from Period III (Oldeberg 1933: 40–47) is relevant in this case as it connects south-eastern Scania and Bornholm. It also makes Bornholm a likely origin for the Period II male from Abbekås, as that burial falls within the geographical distribution of the Bornholm fibula. For the two individuals from Period II in Ängamöllan, there are other areas near Kristianstad that could have isotope ranges in the 0.7220s (Price 2013: 166). The woman dating to the transition between Period I and II from Rörbäck has a strontium isotope signature that could come from the area around Denmark (Frei and Frei 2011). While there are many other areas also within Scania that have similar strontium isotope baseline ranges (Price 2013:166), the site's geographical position on the west coast of Scania, with easy access to Zealand, most likely indicates close contacts between these two regions.

When we compare strontium isotope values among the sites with three or more samples, it is apparent that both adults and children share the same strontium values. During LN I there are only two men (RISE195 and RISE226) that have signatures that seem to fall outside the main strontium isotopic range at the burial ground. Due to the lack of age or sex information for the samples from Öllsjö 7 it is impossible to say anything about gender and sex in relation to strontium values for LN II. The individual in Öllsjö (RISE202) and the female individual in Bäckaskog Kungsgård (RISE260) with an LN/EBA transition date both have strontium isotope values that indicate possible non-local origins.

To summarise: In the Early Bronze Age four of the seven possible non-locals were buried in mounds. Three probable non-local males were buried in mound I in Abbekås, a burial site that has burials from the LN I and forward (Hansen 1938). All the earlier graves seem to have been locals, even if the artefacts in the child burial 4(2) (RISE255) in mound II (Hansen 1938) indicate long distance connections (Forssander 1936; Bergerbrant 2007, 2014), but this could not be seen in the strontium isotope values. Only two of the possible Early Bronze Age non-locals were buried with bronze artefacts (RISE175, RISE 224): most had no artefacts, or just stone or bone artefacts. It indicates that people of varying wealth migrated in the Bronze Age. However, due to the lack of a baseline for Scania, this interpretation can only be seen as preliminary.

Results from ancient DNA

The individuals RISE175, RISE179, RISE207 and RISE210 were part of the big genomic dataset published in Allentoft *et al*. (2015). Table 1 summarises several findings from that study in relation to these four individuals. Based on hundreds of thousands informative genomic positions (Single Nucleotide Polymorphisms — SNPs) it is possible to identify distinct ancestral genomic components in modern human populations of the world. Individuals with European ancestry generally display three overall components in their genomes (Lazaridis *et al*. 2014). (i) The *Mesolithic* genomic component is named so because it has been observed in the Mesolithic hunter-gatherers of Europe, where it constitutes close to 100% of their genomes (Lazaridis *et al*. 2014). Today, this component is common throughout Europe but is found in highest proportions in Finland, Russia and the Baltic countries. (ii) The *Neolithic* component was introduced into Europe during the Neolithisation when early farmers migrated into Europe from the Near East (e.g. Kilinc *et al*. 2016). In present times, this component is highest in southern European populations and is particularly high in Sardinia. (iii) The *Steppe* component was introduced into central and northern Europe around 3000 BC when the

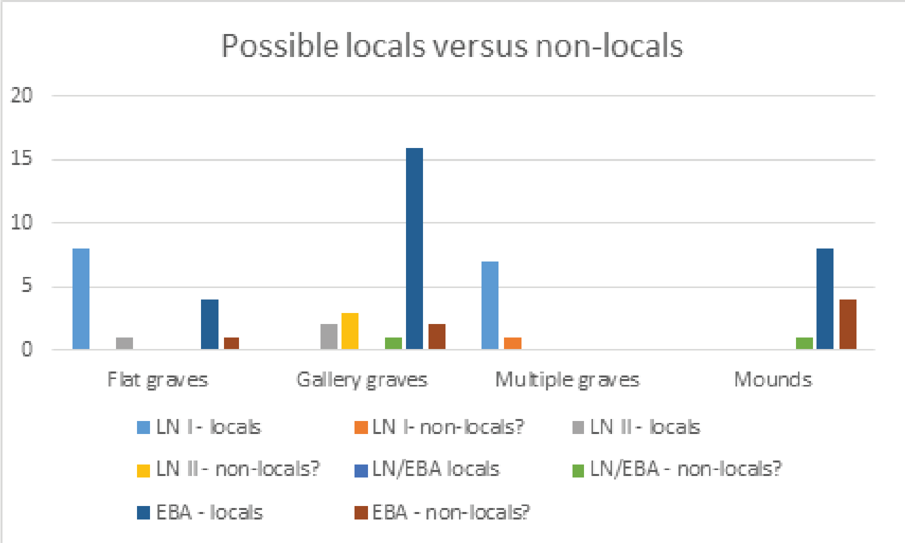

TABLE 4. RELATIONSHIP BETWEEN BURIAL FORM AND POSSIBLE LOCAL/NON-LOCAL ORIGIN, THOUGH THE LACK OF BASELINE MAKES THIS ONLY TENTATIVE. THIS IS BASED ON 59 SAMPLES.

nomadic Yamnaya people expanded both eastwards and westwards from the Pontic-Caspian Steppe (Allentoft *et al*. 2015; Haak *et al*. 2015). This component is today highest in individuals from northern and central Europe and is less pronounced in southern Europeans.

Three of the four individuals (RISE175, 179 and 210) display very typical Late Neolithic and Early Bronze Age European genomic profiles (Table 5). They have all three genomic components outlined above, but with the Neolithic component being markedly 'diluted'. This is typical for European skeletons sampled after 3000 BC because the incoming Steppe people did not carry this Neolithic component. RISE207 is somewhat atypical in the sense that it does not display any obvious ancestry from the Neolithic or the Steppe populations. It has a very large Mesolithic component, and then a mix of ancestries (13.9%) observed, for example, in present day Siberian populations. While this is an interesting observation, perhaps indicating that this person had a different genomic background, we emphasise that this should be interpreted with caution. This reason being that this individual is displaying the least amount of data with a genomic coverage of 0.02X (and less than 20,000 SNPs), implying that the admixture proportions in Table 4 may not be highly accurate.

It is important to note that observing a 'Mesolithic' component above 60% (Table 5) should not be interpreted as if these four individuals directly owe >60% of their ancestry to the Mesolithic peoples. Rather, it simply means that >60% of their ancestry is derived from a genomic component that was *also* very high in Europe during Mesolithic times. The Yamnaya display a large amount of this component (Allentoft *et al*. 2015; Haak *et al*. 2015), which is why the Late Neolithic and Early Bronze Age people in general are likely to have inherited a considerable fraction of this component through Yamnaya.

The mitochondrial DNA (mtDNA) profiles showed haplogroup variants of T, K and J which were common in Europe during the Neolithic and Bronze Age (Brandt *et al*. 2013). These largely replaced the U-variants observed among the earlier Mesolithic peoples.

Conclusion

Our evidence so far indicates that older traditions of burials in gallery graves and flat graves continued during the Early Bronze Age, which was then overlaid and supplemented by a new elite stratum that used the mound burials as their preferred burial place. How these new elites came about remains to be studied in more detail. However, there is much to suggest that their formation was a result of an intense exchange of people, goods and new traditions from the Tumulus Culture in south Germany and west central Europe (Bergerbrant 2007; Kristiansen and Suchowka-Ducke 2015).

These results thus allow, for the first time, the identification of some of the many missing burials of non-elites during this period, including children. The non-mound burials were often without grave goods, and therefore they represented another segment of the population, which we term 'commoners'. The model previously presented by Kristiansen of early Bronze Age society has thus found some confirmation (Figure 2; Kristiansen 2013: Fig. 13.7). This interpretation is tentative, as it is based for the moment only on evidence

			mtDNA	Admixture proportions			
	DOC	Sex ID	haplogroup	Mesolithic	Neolithic	Steppe	Other
RISE175	0.09X	M	T1a1	79.7%	3.5%	15.1%	1.7%
RISE179	0.04X	M	K1a3	60.5%	7.7%	28.4%	3.4%
RISE207	0.02X	M	J1c8a1	86.1%	0%	0%	13.9%
RISE210	0.06X	F	T2a1a	76.2%	9.5%	11.4%	2.9%

Table 5: DNA summary based on results from Allentoft et al. 2015. The table shows DNA sex determination (using the method of Skoglund et al. 2013), mtDNA haplogroup, and the approximate genomic composition for the four individuals. A DOC (depth of coverage) value of 0.09 implies that each position in the genome has been covered on average 0.09 times by the data (i.e. roughly 9% of the genome has been sequenced). The ancestral components were inferred using modern individuals only, and then projecting the ancient individuals onto the inferred components. The values here shown are from an analysis allowing for 16 different genomic components (K=16). The full spectrum of admixture analyses, for all individuals and all values of K can be found in the original paper (Allentoft et al. 2015, Supplement Figure S6). Other; sum of ancestry proportions for the remaining 13 components. From the site Abbekås; RISE 175 PIII mound burial with a bronze razor and RISE 179 LN burial in gallery grave. From the Ängamöllan gallery grave RISE207 and RISE210 both dating to PII.

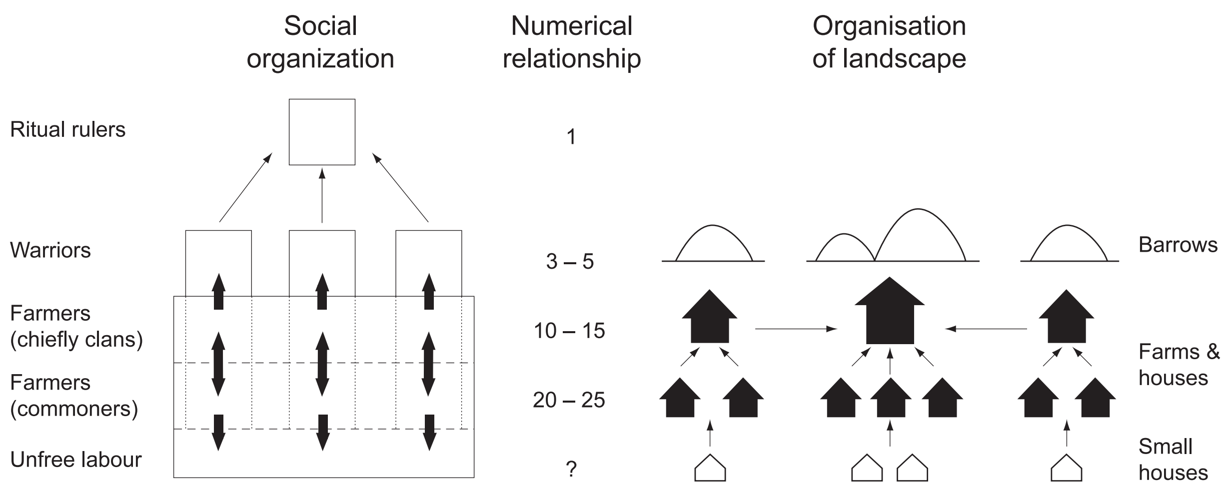

Figure 2. Model of Nordic Early Bronze Age society. From Kristiansen 2013: figure 13.7. © Kristian Kristiansen.

from Scania. Our results therefore demonstrate the need for more extensive series of radiocarbon dates on passage graves, gallery graves and flat ground cemeteries in southern Scandinavia in order to test if the Scania evidence has wider validity.

Future radiocarbon dating programs coupled with analyses of aDNA and strontium isotopes, will provide a better understanding of population dynamics and, not least, the social dynamics in different parts of Scandinavia during the Early Bronze Age. In our samples, we could thus document that individuals were mobile across different categories of wealth and burial rituals. It suggests a society where labour, and perhaps even non-free labourers, were mobile, not only the elite segment. The aDNA analysis confirmed that three of four individuals belonged to the common genetic stock in northern Europe, but interestingly one individual, belonging to the commoner group, had a different genetic profile. It could suggest that there was variability linked to the social and economic diversity of Early Bronze Age society. However, to test this hypothesis we would first need to confirm the atypical ancestry proportions in RISE207 by increasing the genomic coverage, and then we would need aDNA results from many more individuals of both social classes.

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Appendix 1: catalogue of burials

Western Scania

Rörbäck 10, Barsebäck parish

In 1932 Otto Rydberg led an excavation of a mound in Rörbäck (Forssander 1936; Oldeberg 1974: 7). Some flint artefacts were found in the cairn covering the graves (Forssander 1936). The mound contained three undisturbed graves, but stray human bones were found in the cairn. The graves contained: grave I, a sword; grave II, full metal-hilted dagger; and, grave III, no finds, except for the skeletal remains (Forssander 1936; Håkansson 1985:19; Oldeberg 1974:7). *The Rise* project has analysed all three graves. Grave I contained a male aged 18–25; grave II a female aged 40–60; and grave III a male aged 50–60. The radiocarbon dates for graves II and III belong to the transition between Periods I and II, whereas grave I is an early Period II burial. This is in accordance with the bronze objects.

The strontium isotope analysis indicates very similar values for the two men (0.7114 and 0.7118), whereas the woman has a slightly different signature (0.7098). It is possible that the two males reflect the local baseline range while the woman may have moved to the area from another part of Scania or Denmark.

Höja Gård, Västra Skrävlinge parish

A ploughed-out mound was excavated 1966 by C. Wahlöö (1967). The mound contained 17 graves of which four were dated to the LN, 10 to the Early Bronze Age, one Late Bronze Age (1100–500 BC), one to the Roman Iron (AD 1–400) burial and probably a much later burial (Wahlöö 1967; Håkansson 1985: 34). *The Rise* has analysed two of the graves, A22 and A23. Grave A23 contained no artefacts; grave A22 had a flint strike-a-light (Wahlöö 1967: 28–30; Håkansson 1985:34). It was not possible to obtain any osteological information about the human remains from grave A23. Grave A22 contains the remains of an adult, possibly male. The strontium isotope signatures are 0.7129 (A22) and 0.7111 (A23).

The radiocarbon dates for A22 is 1613–1491 BC, which is in accordance with the stratigraphic position, between grave A21 containing a belt hook dating to late Period I or early Period II as well as an unusually long skeleton probably over 2m and grave A20 with its dagger and razor dating to Period II (Wahlöö 1967: 28–30, fig. 7). Grave A23 dates to 1433–1294 BC, and is situated higher up in the mound next to cremation grave 15, which contains cremated bones and a fibula that is fragmentary and in too poor a state to date (Wahlöö 1967: 30).

Southern Scania

Abbekås, Skivarp parish

Within *The Rise* the remains of 11 individuals have been analysed. One (RISE183) produced a date that falls outside the range of the others. RISE183 produced a Mesolithic date, which does not seem logical based on its stratigraphical placement in the mound. Due to uncertainty regarding the date, the sample RISE183 has been omitted from the discussion here.

Four mounds were excavated by Folke Hansen (1938) during the 1920s, revealing a range of variously preserved graves. Some of the graves have been discussed in a number of places before (e.g. Forssander 1936; Bergerbrant 2007, 2014; Tornberg 2013). A couple of the graves have already been radiocarbon dated[1] (Tornberg 2013; Bergerbrant 2014). Some of the graves are double- or triple-dated, and some of Tornberg's (2013) dates are on skeletal material that is undated by *The Rise*. They are both consistent and inconsistent with the radiocarbon dates from the different laboratories. For example, the results from Abbekås mound I graves 11 and 15 differ by less than 50 BP years. Grave 6, however, has a time difference of over 500 BP years. As the Rise dates are coherent with the other results, and Tornberg's (2013) dates place the grave in Period V, *The Rise* dates are used in this article. Grave 14 has three different dates that fall slightly over 100 BP years; therefore, a combination of dates from all three results have been utilised in this article.

The area encompassing mound I contains a multiple burial, four skeletons that are placed on top of each other beside the gallery grave. The skeletons look like they were found in more or less anatomically correct order (Hansen 1938:65), indicating that if they had been removed from the gallery grave it would have been relatively close to their interment. One of the skeletons (RISE180) has the earliest BP date from the site, while the two dates from Tornberg (2013) are slightly later. Grave 1 has a BP date (Tornberg 2013) that is almost contemporary with RISE 180, both belonging to LN I. Based on the depth and placement of graves 2 and 3 (Hansen 1938: 58–60), they probably also belong to LN

[1] Abbekås mound I grave 14 Ua-34524 3100 BP ±35; Abbekås mound II grave 2/4 Ua-34525 3190 BP ±30; Abbekås mound II grave 3/5 Ua-34526 3220 BP ±35 (Bergerbrant 2014:527); Abbekås mound I grave 1 LuS 10618 3700 BP ±50; Abbekås mound I grave 4:1 LuS 10619 3600 BP ±50; Abbekås mound 1 grave 4:2 LuS 10620 3585 ±50; Abbekås mound I grave 6 UB_22839 2645 ±34; Abbekås mound I grave11 UB_22836 3197 BP ±21; Abbekås mound I grave 14 UB_22835 3144 ±49; Abbekås mound I grave 15 UB_22838 3111 BP ±35 (Tonberg 2013).

I. Grave 2 had practically been destroyed at the building of the gallery grave (Hansen 1938: 59–60). The oldest dated skeleton in the gallery grave (RISE179) dates to LN II and the most recent (RISE178) probably belongs to Period IB (1600–1500 BC). There is information that the farmers had removed a bronze dagger from the gallery graves and sold it to Arvid Kurck (Hansen 1938: 62–63). In Arvid Kurck's collection at SHM[2] a bronze dagger is recorded from Skivarp parish (SHM 9822:760), which typologically dates to late PIB or early PII, a date that works well with the radiocarbon date from the most recent dated skeleton in the gallery grave. The first phase of the mound seems to have been built sometime during PIB and the last dated burial (RISE175) belongs to Period III (1300–1100 BC). The mound contains a number of graves without any preserved grave goods, but based on *The Rise* dates and the position and depth of graves 9 and 10 those belong to Early Bronze Age. This leaves us with six individuals that are probably from LN I, and only two that can be safely dated to LN II and nine individuals probably dating to the Early Bronze Age.

Mound II contains 11 graves (Hansen 1938: 72–80). Only grave 2(4)[3] in mound II has been analysed within *The Rise*, producing a probable PI date. The child (6–8 years old) wore a bronze diadem and bronze arm-ring; the diadem indicates non-local connections (see Bergerbrant 2007, 2014) but the remains have a strontium range that seems to fit in with the local signature (see below and appendix 2).

Two samples have been run for complete haplogoup, RISE179 and RISE175 (Allentoft *et al*. 2015: supplement). The analysis shows that they do not share the same female line. The sex decided through aDNA is the same as ostologically determined for RISE175. For RISE179 no osteological sex could be determined, but the aDNA results show that it was a male (Allentoft *et al.* 2015: supplement).

In total 18 skeletons have been osteologically analysed from mounds I and II (Tornberg 2013, 2015: 109). Of these, five are under 12 years old and two could be determined as female, four could not be sexed and seven were determined as male (Tornberg 2013:12). Three of the individuals show evidence of skull trauma. Only one of the three, grave 7/9[4] in mound II, has an unhealed trauma, i.e. it was probably the cause of death. The older male in grave 15, 40–50 years old, had a large trepanation (Hansen 1938:68–71; Tornberg 2013:15); the deceased would have lived sometime after the injury as the edges showed some traces of healing (Tornberg 2013: 15). The deceased brought two weapons with him in the grave, a bronze dagger and a flint spearhead (Hansen 1938:68–71). The individual in grave 1, dated to LN I, shows signs of a blunt force trauma that had healed, but it is difficult to determine whether the injury occurred through violence or by accident (Tornberg 2013:15). This shows that trauma and violence existed in Abbekås both during the LN I and the Early Bronze Age. The health measured by the stature seems higher than in the Middle Neolithic, however, the presence of dental caries is also higher. The nutritional defects at the site are lower than the average MN site (Tornberg 2013:16).

There is a varied range in the strontium isotope signatures from 0.7093 to 0.7241, with seven of the ten samples ranging from 0.7093–0.7106. If we add the child buried in grave 10 (RISE183), all three children fall within this range, which most likely indicates the local strontium isotope range. Grave 14 is the youngest of the dated graves, a male between 25–30 years old with a horse head razor, and differs from the others by having higher strontium value of 0.7127. Grave 6, a probable male aged 40–50 years old buried with a slate pendant and a flint scraper, produced a strontium value of 0.7130, and grave 11, a male 35–45 years old with no grave goods, are also higher, with a signature of 0.7241. None of the Late Neolithic burials presumably have non-local signatures, whereas three of the seven Bronze Age burials have potentially non-local values. All of the probable non-locals are men (or potentially men), of which one contained no grave goods, while the others contained grave goods; one a slate pendant and flint scraper and one a bronze razor (see appendix 2). The male from grave 11 has a strontium isotope value that can be found, for example, in Bornholm (Frei and Frei 2013), indicating that the island might be his origin. For the two men we have haplogroups from do the strontium isotope values differs: RISE179 falls within the possible local range, while RISE175 has a probable non-local value.

Abbekås seems to have been used as a burial area for an extended period, with graves of flat ground burial from LN I, followed by a gallery grave in LN II and at some point, probably during PIB, construction of the mound began. The graves include both children and adults, indicating that it might be a family burial place; the strontium isotope values, however, demonstrate that not all grew up in the same place, and the aDNA reveals that the two were not related through the maternal line. The latter, however, does not exclude that they may have been related in some other way.

[2] The Swedish History Museum.

[3] Number varies in the report in ATA (and museum storage) and the 1938 publication by Hansen.

[4] Number varies in the report in ATA (and museum storage) and the 1938 publication by Hansen.

Kjylbjersbacken, Vellinge parish

Folke Hansen excavated a flat ground cemetery in Kjylbjersbacken in 1934–35 (Hansen 1934, 1935). In 1934 a cranium and some skeletal parts were exposed through erosion, which led to the excavation by Folke Hansen (1934). The remains of 18 or 19 individuals were found. The cemetery included both adults and children, and only four of the graves contained artefacts. A cultural layer was observed above grave 12, as indicated by a flint arrow head, flint flakes, bone awls and a Late Bronze Age tweezer (Hansen 1934, 1935; Oldeberg 1974: 132). Grave 5 contained a Period II tutulus (Olderberg 1974: 132). Some individuals had been placed in hocker position, while others were buried lying flat on their back (Hansen 1935).

Within *The Rise* project three graves have been analysed: grave 1, grave 7 and grave 8. Grave 1 is the remains of a woman (aged between 20–30 years old) in hocker position holding an infant in her arms (Hansen 1934). Grave 7 held the remains of a young individual aged 7 to 9, and grave 8 those of a 12- to 14-year-old, also placed in hocker position. Hocker position has been regarded as a trait of the BAC (e.g. Malmer 1962: 206–209). However, Sjögren (in press) has shown that individuals with Battle Axe Culture artefacts and placed in hocker position date to the period before 2200 BC, and the radiocarbon of a number of individuals in hocker position without artefacts generally date to after 2200 BC (see Sjögren in press for further discussion). Grave 1 dates to the transition between the Battle Axe Culture and Late Neolithic with its 2307–2136 BC date, while the other two graves belong to LN I.

Their strontium isotope signatures are very similar: 0.7092–0.7097. Without a local baseline it is difficult with certainty to say that they are local. However, the similarity in strontium isotope would indicate that they are local or at least grew up in the same place.

Kjylbjersbacken therefore seems to be a flat ground cemetery used over a protracted period, ranging from the LN into the Early Bronze Age. As there is no published complete osteological analysis of the graves, a complete understanding of the gender and age composition at the site is not possible, but it is apparent that individuals from infants to adults were included, with no fewer than seven of the deceased having been children (Hansen 1934, 1935). The majority of the graves contained no artefacts, and those that did had only small items such as bone needles, small flint artefacts or a tutulus, suggesting that this might be characterised as a modest burial place, used over an extended period, possibly for members of the same family who did not belong to the higher social strata.

Snorthög, Lilla Isie parish

The mound Snorthög in Västra Torp was excavated 1938 by B. M. Vifot (1939: 1). The mound contained at least two Bronze Age Period III graves and a number of Late Bronze Age urn burials (Vifot 1939: 3–6). The central parts of the mound had been dug before, probably by N. G. Bruzelius around the middle of the 19th century, and therefore contained no clear structures or artefacts (Vifot 1939: 1–2; Håkansson 1985: 41). An older flat ground cemetery was found under the mound. The flat ground cemetery contained ten graves in which most of the deceased had been placed in hocker position (Vifot 1939). *The Rise* has analysed six of the graves, nos I, II, IV, V VII and VIII.

The flat ground cemetery is regarded as having contained seven males, one female and one child, as well as two younger individuals and teeth from an older person in the double grave VI (Vifot 1939). According to Tornberg (2015: 110) there are two women among the deceased found at this cemetery, and they are noteworthy for their height, having the highest stature among all LN women analysed by Tornberg (2015), whereas the men have a slightly shorter mean stature.

The strontium isotope signatures vary from 0.7088 to 0.7108, indicating that grew up in the same place, or in close proximity to each other.

With the exception of grave VII, the radiocarbon dates all fall within 82 BP years. The date from grave VII is a problem, as it produced a date in the Early Neolithic,

Grave no.	**Artefacts**	**Source**	**Skeletal**	**87Sr/86Sr**	**Date**
I	None	Vifot 1939:7	M? adult	0.71079	Failed sample
II	Flint arrow head	Vifot 1939:7	M 18–25	0.71021	2205–2032 BC
IV	Flint dagger	Vifot 1939:8	M 30–40	0.70924	2201–2031 BC
V	Flint arrow head	Vifot 1939:8	M? 16–22	0.70880	2291–2132 BC
VII	none	Vifot 1939:9	F? 35–45	0.71057	3521–3366 BC
VIII	Flint dagger	Vifot 1939:9	M 30–40	0,71008	2339–2139 BC

and it seems most likely that this date is wrong and this sample needs to be re-dated before it can be included in any interpretations. The flat ground cemetery dates to the early part of the Late Neolithic, and seems to have had a time span of less than 100 years. More than 600 years later a mound was built over the flat ground graves. In contrast to Abbekås (see above) the mound does not seem to be part of the long term, continuous use of the area as a burial site.

Tingshög, Hammarlöv parish

Oscar Montelius excavated the Tingshög mound in 1894. The central grave contained a large number of artefacts, some of which were typologically dated to the transition from Period II to Period III (Randsborg 1969: 86–89). In addition to the remains of a skeleton, the grave contained a bronze sword, scabbard and chape, bronze knife, bronze tweezers, bronze fibula, bronze tutulus, two bronze double buttons, a flint strike-a-light, nine beads, a spiral tube and textile fragments (Montelius 1994[1917]; Håkansson 1985: 30; Oldeberg 1974: 38–39). The grave contained a male between 20–30 years old. The combined radiocarbon dates produced a result dating to the transition between Periods II and III, 1410–1281 BC. In other words, the radiocarbon date is in accordance with the typological determination of the grave. The strontium isotope value is 0.7166 which is a possible local value if one uses Zealand as probable proximity for the baseline for south-western Scania.

Viarp, Simris parish

The Rise has analysed grave 4 from a mound in Viarp excavated by Oscar Montelius (1896: 81) in 1885. The mound contained a small cairn with human remains from at least five individuals and two child graves (grave 3 and 4). Higher up in the mound two Period III graves were found, one inhumation and one cremation (Montelius 1896: 81; Håkansson 1985: 50). Grave 4 contained the skeletal remains of a child and a bone awl (Håkansson 1985: 50). The grave was probably found at the bottom of the mound. Lack of documentation of the stratigraphy, such as layers and plans (Håkansson 1985: 50), makes it difficult to securely determine whether the grave was a flat grave before the mound was built or if it was a grave in a mound. The former seems most likely in this case. The osteological examination showed that it contained the remains of a 12-year-old. The radiocarbon date produced a LN II date and the strontium isotope value from the individual is 0.7125.

Västra Virestad 19, Bösarp parish

Västra Virestad is a flat ground cemetery that was excavated by Otto Rydbeck (1912) in 1911. A farmer discovered the cemetery in 1911 when he partly ploughed up grave 1. The cemetery has been interpreted as containing 12 graves of which four were double graves. The graves span from the Neolithic to the Late Bronze Age (Rydbeck 1912). Within *The Rise* project five individuals have been analysed. Previously three skeletons had been analysed for C13 (Berntsson 2005: 117–121), and the remains of the collagen were radiocarbon dated and published by Bergerbrant[5] (2014: 525). The graves analysed comprise two children's burials graves I and II, and three adult burials in graves III, V and VI (see appendix).

The radiocarbon analysis of a tooth from grave VI indicates a Bronze Age date. The grave, however, seems to be a product of the BAC (Rydbeck 1912: 162; Malmer 1962: 916), indicated both by grave goods and burial in hocker position (Rydbeck 1912: 162). It therefore seems likely that a mistake occurred, perhaps in the handling of the material. The strontium isotope signal of the dated tooth is clearly different from the other four individuals that were investigated, indicating that this individual was non-local. However, it is impossible to say to which of the other non-analysed individuals from the cemetery the tooth belongs.

The dated graves range from LN II to Bronze Age Period IB. The oldest dated burial is grave II, which belongs to LN II. The child in grave I has been dated both by *The Rise* and in a previous study (Bergerbrant 2014: 525), but the BP date given differs by 207 BP years; the new *Rise* date is more in line with the previous date from the adult in the same burial (Bergerbrant 2014: 525). The earlier dating of the child in grave III only differs by 9 BP years from the by *The Rise*-dated adult in grave III, indicating that the individuals in the double burials (grave I and III) were interred at the same. This is in contrast to what has been argued earlier by Bergerbrant (2014: 525–526), i.e. that the individuals in grave I were buried at different times, based on the previous radiocarbon dates. The remaining three dated graves belong to Period I of the Bronze Age. The cemetery also includes five urn graves which have been seen as Late Bronze Age in date (Rydbeck 1912: 162). Rydbeck (1912: 165) interprets this as a cemetery that was in active use for over 2000 years and that it should be seen as 'the poor people's cemetery'. The site seems to have one Battle Axe grave (VI), and then appears not to have been used until the Late phases of the LN, with a main use with at least five individuals buried during Period I of the Bronze Age, albeit this includes four in two double burials (graves I and III). It would therefore be interesting to date the bones in the urn burials to see if they date to Late

[5] Ua-34529 -20.03 3040±35 BP Grave I child, Ua-34531 -20.18 3195±40 BP Grave I adult, Ua-34530 -20.29 3305±50 BP Grave III child (Bergerbrant 2014).

Bronze Age or to Period II and III of the Bronze Age. Dating cremated bones can be useful and well worth the effort, as seen for example in the Early Bronze Age urn cemetery Lustrupholm (Feveile and Bennike 2002).

All individuals except the unknown one (RISE232) have strontium isotope values that range between 0.7099–0.7108, indicating that the majority of the people buried at the cemetery might have been of local origin. RISE232 has a strontium isotope value of 0.7193, making the deceased a probable non-local. The only bronze objects are found in relation to the children buried at the cemetery (Rydbeck 1912).

The dates show that arm-rings must have been more common in Period I than previously believed. For a discussion of why the only bronze objects were placed in children's graves see Bergerbrant (2014).

Eastern Scania

Ängamöllan, Vä parish

The gallery grave in Ängamöllan contains 14 skeletons (Arbman 1945; Magnusson 1947), 13 of which have been analysed by *The Rise* project.[6] Six of these were osteologically determined as male, or probable males, and three as women, one as an adult, one juvenilis, one aged 11–12 and one around age four; in total, 10 adults and 3 children of varied age. Two of the samples produced good aDNA material, cranium VI and XII (Allentoft *et al*. 2015: supplement). The haplogroups show that they were not related on the maternal side (Allentoft *et al.* 2015). Cranium XII is that of a young individual of 11–12 years with no osteologically determined sex, but determined as male through the aDNA analysis (Allentoft *et al*. 2015). More interesting, however, is that cranium VI has been osteologically determined as a male aged 30–35, but was sexed to female through aDNA (Allentoft *et al.* 2015). Tornberg (2015:110) shows that the males are, based on measurements from four skeletons, 1cm taller than the average stature of men from four analysed LN and Early Bronze Age sites, whereas the women are 1cm shorter than the average. Considering the aDNA result for the sex of cranium VI the average stature might change.

The cranium regarded by the excavators as the last interred is cranium VIII (Magnusson 1947: 139), which accords with *The Rise* dates (RISE221) as it has the latest BP date. Before the final burial the coffin was reorganised and many body parts were moved to the corners of the gallery grave. The bones were placed in a way that indicates that some parts were probably still attached by their tendons or ligaments, indicating a short interval between the death of the last person and the burial before that (Magnusson 1947: 139–140). This is something the radiocarbon date results strengthen, with a span of only 132 BP years between the deceased individuals. The dates indicate two, possibly three times of interment. The skeletal material has been interpreted as having occurred in three layers, with level I as the top layer (Magnusson 1947: 140). Even though according to the radiocarbon dates the two latest craniums are found in layer I, no differences can be seen between the skeletons placed at the sides of layer I and the dates of the skeletons in layers II and III. Layer II only contains craniums from two individuals, IX and X. The bottom layer, layer III, contains four craniums, of which three are more or less in situ (Magnusson 1947: 140).

The strontium isotope values from the gallery grave ranges from 0.7110 to 0.7272, with the majority (7) within the range 0.7126–0.7146 and two most probable clear outliers with strontium isotopic values of 0.7235–0.7272. So far, there is no baseline for the region, which has produced a great variety of strontium isotope values (see below). Based on the close geographical relation to Öllsjö 7 (see Figure 1) and the majority of strontium isotope values there (see below), the possible local range here has been placed between 0.7110–0.7146. This leaves two potential outliers, and the strontium isotope values there could indicate that the deceased came from Bornholm, as these values have been recorded on Bornholm (Frei and Frei 2013), but they could also have originated elsewhere close to Scania or elsewhere in Sweden (Price 2013, Price *et al*. 2015a: 107–109).

Most of the artefacts found in the grave could not be related to any of the deceased, except possibly a bone pin and a flint dagger that might be associated with skeleton XIII (Magnusson 1947: 140). The artefacts (Magnusson 1947: 140–144) indicate that the gallery graves were used in the Late Neolithic, but none of the dated craniums produced a LN date. It is possible that the traces of LN skeletal material were cleaned out during the Early Bronze Age. As noted above, it is possible that the gallery grave was used during the LN, but it seems to have also been used in the Early Bronze Age for a group of people who grew up in various places.

Bäckaskogs kungsgård, Kiaby parish

A partly destroyed cairn in Kiaby parish was excavated by Folke Hansen (1937) in 1936. One-third of the carin had been damaged by agriculture work, during which a skeleton and a small flint spearhead had been found. The cairn contained four graves, two inhumations and two individuals whose bone had been burnt, though parts of the jaws could be pieced together (Hansen 1937: 203). One of the inhumations and one of individuals in the burnt bone layer have been analysed by *The Rise.*

[6] Cranium IX and X were crushed (Arbman 1945) and it was difficult to connect teeth to cranium X.

Large quantities of burnt bones were found within an area of about 3 x 1.5m length. Among the bones, it was possible to reconstruct most of two lower jaws, showing that the remains of two people had been placed in the grave (Hansen 1937: 204–205). One individual found in the area, grave 3, has been determined as a woman aged 50–70. Among the artefacts in the area of the burnt bones were a flint dagger, a flint sickle, two bone needles and one battle axe. The two flint objects had been burnt (Hansen 1937: 205–206). The battle axe would indicate a MN date, however the result came back with a LN and Early Bronze Age transition date (1777–1643). The other analysed graves, the first found inhumation, grave 1, contained a spearhead, covered by an oxidising layer indicating that it might have been used as flint strike-a-light, a small ring of bronze and a tutulus (Hansen 1937: 203–204). These are the remains of a male aged 30–40 years old. The radiocarbon date is in accordance with the typological date of the tutulus, placing it in the second half of Period II.

Strontium isotope analysis has been performed on one tooth and part of the skull for each individual. The M1 tooth from the woman provided a high strontium isotope signature 0.7211. The male M2 had a signature of 0.7148. Strontium isotope analysis has also been performed on the bone from the skull, the result of which will be discussed elsewhere (Price *et al*. in prep.).

Fjälkinge 163, Fjälkinge parish

In 1993, a multiple flat grave was excavated in the vicinity of four excavated mounds (Lilja 1994), of which two had finds dating them to the Bronze Age (Larsson 1976). Four adult individuals had been buried here, and the grave contained three arrowheads (Liljas 1994: 4). No traces of a violent end could be discerned on the four male skeletons (Liljas 1994: 4), but the find place of the arrowheads related to skeleton I (at the right elbow and just next to the pelvis) and skeleton IV (in the soil around a vertebra) (Liljas 1994:4) might indicate that the men met a violent death. It is only a minority of all cases of violent or traumatic events that leave a mark on the skeleton (Knüsel and Smith 2014: 14). The remains of an infant were found above the males, and was probably buried at a later occasion (Liljas 1994: 4). There are clear indications that the deceased were buried at the same time as each other (Liljas 1994: 4). The Rise dates have a span of less than 140 BP years, all within clear LN I date, slightly older than the radiocarbon date obtained in 1993 (Liljas 1994: 4).[7]

That the individuals died as a result of some form of violence can possibly be further detected through earlier trauma noted on skeleton II, a healed scar above the right eye, which was probably caused by a cut or impact of a sharp object, and skeleton I, which had an unhealed fracture of the foot (Arcini in Liljas 1994: appendix 4). The men ranged in age from 20–25 to 40–60. They display a number of health problem from traces of iron deficiency to irritation in muscle attachment on the right upper arm (Arcini in Liljas 1994: appendix 4).

The strontium isotope ranges are within a narrow range from 0.7103 to 0.7106 for skeleton I, II, and IV, while skeleton III differs with a value of 0.7119. At least three of the men seem to come from the same area; whether or not it is the local area is difficult to say due to the lack of a baseline for the area and the wide range of strontium isotope signatures around Kristianstad (see above and below).

Kiaby 80:1, Kiaby parish

In 1949, close to Lake Oppmanna in Kiaby parish, four skeletons were found. The site, which is situated close to the lake, was often waterlogged (Järbe 1950: 1). The four skeletons were laid out in pairs, foot to foot (skeletons I and III were one pair and skeletons II and IV the other) (Järbe 1950: 2, 7). The deceased pairs had been buried in oak-log boats, which had been covered by wood (Järbe 1950: 2–5). The remains of an infant were found 10cm above the stern of one of the boats (Järbe 1950: 6). *The Rise* has analysed three of the skeletons found in the oak-log boats (see appendix 2). The two individuals in the southern boat were determined as a male 40–60 years old and a child aged 8–9 years old, and the person from the northern boat was a male, 19–34 years old. This analysis does not correspond with the information published in 1950, where the remains of three of the individuals are determined as adult, skeleton II, III and IV and the fourth was from a younger individual (Järbe 1950: 5–6). However, in the osteological analysis published in 1951 the ages of the deceased more or less match our results (Hugoson 1951). The stature measurements given by Hugoson (1951) are lower than the average stature[8] for the LN calculated on four sites by Tornberg (2015:120). The average stature is more in line with that of the Middle Neolithic provided by Bennike (1985: 51).

The flint material dates the grave to LN I, which is in accordance with the radiocarbon dates. The radiocarbon dates from the southern boat produce a combined date of 3722 ±20 BP, 2199–2036 BC. As the date from skeleton 2 in the northern boat produced a similar date it is likely that the boats with their deceased were buried sometime

7 St-13651, 3610±60 BP (bone) (Liljas 1994:4, appendix 5).

8 Skeleton 1 175cm, skeleton II 164cm, skeleton IV 160cm if male 157cm if woman (Hugoson 1951), giving an average of 166cm for all three (if male) or 169 if only counting skeleton I and II.

during the first half of LN I. An early LN I date is strengthened by the low average stature (see above).

The strontium isotopes values range from 0.7096 to 0.7128. RISE227 and RISE228 with their similar values 0.7121 and 0.7128 indicate that the young child (RISE228) and the younger male (RISE227) possibly grew up in the same place, whereas the older man (RISE 226) is likely to have originated somewhere else. Without a proper baseline it is difficult to say whether either was local. However, in the light of the consistent strontium isotope values from the burials from Kiaby Mosse (see below), which differ from these, it seems plausible that these are the remains of travellers who died on their journey. What killed them is difficult to say, as they did not show any signs of severe skeletal changes or injuries (Järbe 1950:5). That they were buried with their tools and boats suggests that it is unlikely that they died in a hostile conflict.

Kiaby mosse, Kiaby parish

A number of flat graves were found during ploughing in 1916, and the site was examined by Knut Kjellmark (1940) later that year. The site contained three graves that were buried in a MN settlement site (Kjellmark 1940). Grave 1 contained an inhumation burial with three bone fish hooks, one flint blade and flint flake and possibly also remains of a pyrite. The excavator dated the grave from LN to Period II (Kjellmark 1940: 18–21). A 20- to 30-year-old male was interred in grave 1, and his remains have been radiocarbon dated to 2036–1893 BC. A farmer found a bronze arm-ring, a bronze awl and some bones nearby 15 years before the excavation. According to the farmer, these were found in the location where Kjellmark excavated the grave he numbered 2, and Kjellmark therefore argues that these artefacts belonged to grave 2. Unfortunately, the artefacts have been lost (Kjellmark 1940: 21). These are the remains of a probable adult woman, probably dating to PIB. Grave 3 contained no artefacts, only the remains of a 3- to 4-year-old child (Kjellmark 1940: 21–22), probably dating to PIB of the Bronze Age.

The strontium isotope values for the teeth that were analysed range between 87Sr/86Sr 0.7164–0.7167, indicating that all grew up in the same place and probably locally. Furthermore, considering the 300 year time span between the burials it seems more likely that the similarities in the strontium isotope values are due to them being of local origin. Strontium isotope analysis has been conducted on the skull bones of the two adults as well, and the results of these analyses will be discussed later by Price *et al*. (in prep.). It seems likely that this is a local flat ground cemetery used from the LN into the Bronze Age.

Öllsjö 7, Skepparslöv parish

Nine individuals have been sampled from the so-called Late Neolithic layer in the passage grave Öllsjö 7. According to the excavator Hommerberg (1944: 19–20), it represented the remains of a passage grave that at some point had been re-built to make gallery grave. It was placed *c*. 100m from another gallery grave (Hommerberg 1944: 14–18). The gallery grave contained a number of skeletons and one Funnel Beaker Culture (FBC) ceramic sherd, one flint dagger, two bone pins, a bronze disc, a flint strike-a-light, flint scrapers and flint knives (Hommerberg 1944: 19–20). Below what Hommerberg (1944: 20–21) called the LN layer, under a level of compact clay, there were more MN artefacts and more skeletons. Hommerberg (1944: 19) viewed the FBC sherd as the remains of a cleaning out of the grave before the LN reconstruction. The radiocarbon dates, however, indicate that at least one of the deceased died in the MN (RISE202). The other eight dated human remains reveal a continuing burial practice from LN II to Bronze Age Period III. That some of the skeletons belong to Period II is no surprise as the bronze disc dates to Period II (Hommerberg 1944: 19), but the burial practices continued into PIII (RISE196, RISE202).

The strontium isotope values range from 0.7093 to 0.7196 with five between 0.7111–0.7122. The results indicate that the people buried here were probably born locally. The so-called Late Neolithic layer contained at least 14 individuals; a considerable number of these were children (Hommerberg 1944). Unfortunately, the exact information is not given in the publication, and here it was not possible to connect the specific skeleton to The RISE number when she conducted the osteological analysis. Tornberg's (2015: 110) earlier analysis of stature, however, shows that the deceased (based on two males) are similar in height to the individuals recorded from other LN and EBA sites she has analysed.

Appendix 2 (Overleaf): Data

Site	Grave		Lab nr	C13	BP	±	Cal.2 sigma		Skeletal info	Artefacts	87Sr/86Sr	error (ppm)	Haplogroup	DNA sex	Source
Abbekås	Mound 1 grave 10	mound	OxA-29034	-19.38	5871	33	4832-4684	needs to be redated	nd 9-11 years old		0.71002	17			RISE183; Hansen 1938: 65-66, rapport ATA 1922
Abbekås	Mound 1 grave 5(4)	MG	OxA-29003	-20.12	3706	30	2154-2023		nd	grave containing 4 individuals; amber bead, flint spearhead, flint flakes, whetstone	0.70960	12			RISE180; Hansen 1938: 65-66, rapport ATA 1922
Abbekås	Mound 1 grave 4(5) # 1	GG	OxA-29193	-19.38	3556	28	1977-1870		nd	flint spearhead, earlier information about a bronze dagger, possibly SHM9822:760	0.71056	14	K1a3	M	RISE179; Hansen 1938:62-65; Allentoft et al. 2015
Abbekås	Mound 1 grave 4(5) # 2	GG	OxA-29000	-20.00	3445	29	1879-1685		nd	see RISE179	0.70967	15			RISE177 ; Hansen 1938:62-65
Abbekås	Mound 1 grave 4(5) # 3	GG	OxA-29001	-19.34	3264	29	1617-1496		nd	see RISE 179	0.71064	15			RISE178; Hansen 1938:62-65
Abbekås	Mound 2 grav 4(2)	mound	OxA-29843	-19.24	3309	28	1658-1510		6-8 years old	bronze diadem, bronze arm-ring	0.71056	11			RISE255; Hansen 1938:74-75
Abbekås	Mound 1 grave 11	mound	OxA-29003	-20.40	3246	28	1611-1448		M 35-45		0.72413	18			RISE181; Hansen 1938:67
Abbekås	Mound 1 grave 13	mound	OxA-29194	-19.17	3201	26	1531-1421		c 5. years old	antler pick, bone awl, bone plate	0.70937	20			RISE182; Hansen 1938:68

Abbekås	Mound 1 grave 6	mound	combined	-20.00 / -20.06	3173	20	1497-1416	OxA-29004 3158 ±27/ OxA-29005 3191 ±29	M? 40-50	slate pendant, flint scraper	0.71310	19			RISE185; Hansen 1938:66
Abbekås	Mound 1 grave 15	mound	OxA-28999	-19.12	3132	31	1501-1421		M 40-50	bronze dagger, flint spearhead	0.71042	12			RISE176; Hansen 1938:68-71
Abbekås	Mound 1 grave 14	mound	combined	-19.41	3073	21	1326-1192	OxA-28998 3025±30/ Ua-34524 3100 ±35/ UB_22835 3144 ±49	M 25-30	bronze razor	0.71277	14	T1a1	M	RISE175; Hansen 1938:68; Allentoft et al. 2015
Bäckaskogs Kungsgård	Grave 3 in the burnt bone layer	Cairn	OxA-29997	-20.32	3425	27	1777-1643		F 50-70	min 2 ind. burnt flint dagger, burnt flint sickle, 2 bone needles, stone axe	0.72122	8			RISE260; Hansen 1937
Bäckaskogs Kungsgård	Grave 1	Cairn	OxA-29998	-20.05	3105	26	1431-1295		M 30-40	flint spearhead, bronze spiral finger-ring	0.71479	13			RISE262; Hansen 1937
Fjälkinge 163	skeleton 2	MG	OxA-29645	-20.12	3778	31	2296-2131		M 40-60	3 Arrow heads,	0.71039	9			RISE193; Lilja 1994
Fjälkinge 163	skeleton 4	MG	OxA-29644	-20.85	3712	30	2201-2026		M 35-40	See RISE193	0.71057	9			RISE192; Lilja 1994
Fjälkinge 163	skeleton 1	MG	combined	-20.70	3705	20	2144-2031	OxA-29646 3720 ±28/ OxA-29647 3690 ±28	M 20-25	See RISE193	0.71067	14			RISE194; Lilja 1994
Fjälkinge 163	skelton 3	MG	OxA-X-2567-24	-20.53	3640	45	2137-1899		M 20-25	See RISE193	0.71200	17			RISE195; Lilja 1994
Höja Gård	A22	mound	OxA-29738	-19.06	3251	30	1613-1491		M? adult	flint strike-a-light	0.71289	16			RISE220; Håkansson 1985.34-35

HÖJA GÅRD	A23	MOUND	OxA-29661	-19.25	3101	27	1433-1294		NO INFO		0.71117	10			RISE219, HÅKANSSON 1985:34-35
KIABY 80:1	N BOAT SKELETON 2	MG	OxA-29705	-20.18	3737	28	2206-2036		M 19-34	FLINT DAGGER, FLINT STRIKE-A-LIGHT,IRON-PYRITE	0.71210	13			RISE227; JÄRBE 1950
KIABY 80:1	S BOAT SKELETON 1	MG	OxA-29704	-20.65	3733	27	2205-2036		M 40-60	FLINT SPEARHEAD, FLINT FLAKE	0.70962	16			RISE226; JÄRBE 1950
KIABY 80:1	S BOAT SKELETON 3	MG	OxA-29706	-20.29	3711	27	2151-2029		ND 8-9 YEARS OLD	FLINT BLADE	0.71285	19			RISE228; JÄRBE 1950
KIABY MOSSE	GRAVE 1	FG	OxA-29791	-20.26	3615	27	2036-1893		M 20-30	FLINT BLADE, 3 BONE FISH HOOK, FLINT FLAKES	0.71668	9			RISE266; KJELLMARK 1940
KIABY MOSSE	GRAVE 3	FG	OxA-29792	-19.99	3247	27	1621-1498		3-4 YEARS OLD		0.71767	12			RISE268; KJELLMARK 1940
KIABY MOSSE	GRAVE 2	FG	OxA-29999	-19.97	3307	26	1642-1510		F? ADULT	INFORMATION ABOUT EARLIER FINDS OF BRONZE ARM-RING, BRONZE AWL	0.71647	12			RISE264; KJELLMARK 1940
KJYLBJERSBACKEN	GRAVE 1	FG	OxA-29847	-20.20	3790	29	2307-2136		F 20-30	HOLDING AN INFANT	0.70974	12			RISE258; HANSEN 1934
KJYLBJERSBACKEN	GRAVE 8	FG	OxA-28997	-19.58	3733	31	2207-2033		ND 12-14 YEARS OLD		0.70915	13			RISE173; HANSEN 1935
KJYLBJERSBACKEN	GRAVE 7	FG	OxA-28996	-20.12	3699	29	2150-2017		ND 7-9 YEARS OLD		0.70943	16			RISE172; HANSEN 1935
RÖRBÄCK NR 10	GRAVE III	MOUND	OxA-29701	-20.47	3256	28	1614-1454		M 50-60		0.71177	16			RISE223; HÅKANSSON 1985:19
RÖRBÄCK NR 10	GRAVE II	MOUND	OxA-29702	-20.39	3249	28	1612-1451		F 40-60	BRONZE DAGGER	0.70981	15			RISE224; HÅKANSSON 1985:19
RÖRBÄCK NR 10	GRAVE I	MOUND	OxA-29703	-20.13	3166	26	1501-1403		M 16-18	BRONZE SWORD	0.71140	20			RISE225; HÅKANSSON 1985:19

Snorthög	Grave VII	FG	OxA-29642	-19.8	4668	30	3521-3366		F? 35-45		0.71057	16			RISE190; Vifot 1939
Snorthög	Grave VIII	FG	OxA-29643	-20.4	3800	30	2339-2139		M 30-40	flint dagger	0.71008	13			RISE191; Vifot 1939
Snorthög	Grave V	FG	OxA-29037	-20.03	3774	29	2291-2132		M? 16-22	flint arrow head	0.70880	13			RISE189; Vifot 1939
Snorthög	Grave II	FG	OxA-29035	-20.26	3727	30	2205-2032		M 18-25	flint arrow head	0.71021	21			RISE187; Vifot 1939
Snorthög	Grave IV	FG	OxA-29036	-20.12	3719	30	2201-2031		M 30-40	flint dagger	0.70924	17			RISE188; Vifot 1939
Snorthög	Grave I	FG	failed						M? adult		0.71079	19			RISE186; Vifot 1939
Tingshög	central grave	mound	combined	-20.52 / -20.35	3077	20	1410-1281	OxA-29844 3078±28 /OxA-29845 3076 ±26	M? 20-30	flint strike-a-light, bronze sword, bronze knife, bronze fibula, 2 bronze double buttons, 1 bronze tutulus, bronze twezeer, bronze spirals, textile fragments	0.71656	12			RISE256; Håkansson 1985:30; OL247
V. Virestad	grave II	FG	OxA-29710	-19.60	3484	28	1888-1741		F? 18-25		0.71038	10			RISE233; Håkansson 1985:24; Rydbeck 1912
V. Virestad	grave VI	FG	OxA-29709	-19.97	3347	27	1694-1600	probably a nmixed up samples from another grave	M 40-50	2 flint axes, flint blades	0.71932	9			RISE232; Håkansson 1985:24; Rydbeck 1912
V. Virestad	grave III, adult	FG	OxA-29708	-19.78	3316	27	1665-1516		M mature	double grave, 2 bronze arm rings on the child in the grave	0.71086	9			RISE231; Håkansson 1985:24; Rydbeck 1912

V. Virestad	grave V	FG	OxA-29711	-20.37	3307	27	1644-1509		nd	double grave	0.71042	7			RISE234; Håkansson 1985:24; Rydbeck 1912
V. Virestad	grave I child	FG	OxA-29707	-19.98	3295	27	1629-1506		nd 8-9 years old	2 bronze armrings, double grave	0.70999	10			RISE230; Håkansson 1985:24; Rydbeck 1912
Viarp	Grave 4	FG	OxA-29846	-20.61	3510	28	1912-1750		nd c. 12 years old	bone awl	0.71252	10			RISE257; Håkansson 1985:50; OL667
Ängamöllan	Cranium III	GG	OxA-29659	-19.68	3204	29	1527-1422		F 25-35	3 flint daggers, flint spearhead, flint scraper, 3 bone pins, bone pricker, sherds	0.71443	17			RISE215; Ardman 1945; Magnusson 1947
Ängamöllan	Cranium I	GG	OxA-29652	-19.70	3193	28	1509-1415		F adult	See RISE215	0.72723	12			RISE208; Ardman 1945; Magnusson 1947
Ängamöllan	Cranium XI	GG	OxA-29653	-20.09	3187	27	1504-1416		M 39-35	See RISE215	0.71328	15			RISE209; Ardman 1945; Magnusson 1947
Ängamöllan	Carnium II	GG	OxA-29649	-19.69	3179	28	1503-1412		F 20-30	See RISE215	0.71354	14			RISE205; Ardman 1945; Magnusson 1947
Ängamöllan	Cranium IX	GG	OxA-29650	-20.29	3174	27	1501-1410		M? adult	See RISE215	0.71465	15			RISE206; Ardman 1945; Magnusson 1947
Ängamöllan	Cranium V	GG	OxA-29655	-19.46	3150	27	1498-1388		nd adult	See RISE215	0.72354	11			RISE211; Ardman 1945; Magnusson 1947

Ängamöllan	Cranium XIV	GG	OxA-29660	-19.90	3131	27	1456-1373		M 18-25	See RISE215	0.71092	11			RISE222; Ardman 1945; Magnusson 1947
Ängamöllan	Cranium XII	GG	OxA-29651	-20.26	3130	27	1455-1373		nd 11-12 years old	See RISE215	0.71109	13	J1c8a1	M	RISE207; Ardman 1945; Magnusson 1947; Allentoft et al. 2015
Ängamöllan	Cranium VII	GG	combined	-20.29/ -20.42	3129	20	1446-1379	OxA-29657 3133 ±28/ OxA-29658 3144 ±27	M mature	See RISE215	0.71153	11			RISE213; Ardman 1945; Magnusson 1947
Ängamöllan	Cranium XIII	GG	OxA-29763	-19.85	3126	28	1453-1371		nd juvenilis	See RISE215	0.71188	18			RISE214; Ardman 1945; Magnusson 1947
Ängamöllan	Cranium VI	GG	OxA-29654	-20.35	3105	28	1432-1292		M 30-35	See RISE215	0.71268	11	T2a1a	F	RISE210; Ardman 1945; Magnusson 1947; Allentoft et al. 2015
Ängamöllan	Carnium IV	GG	OxA-29656	-19.74	3094	27	1425-1285		M? adult	See RISE215	0.71262	14			RISE212; Ardman 1945; Magnusson 1947
Ängamöllan	Cranium VIII	GG	OxA-29839	-19,9	3072	28	1421-1262		nd c. 4 years old	See RISE215	0.71449	13			RISE221; Ardman 1945; Magnusson 1947

Öllsjö no 7	LN layer	PG	OxA-29744	-20.10	4405	30	3102-2917		nd individuals	ceramic sherd, one flint dagger, two bone pins, bronze disc, flint strike-a-light, flint scrapers and flint knives	0.71113	11			RISE202; Håkansson 1985:51; Hommerberg 1944
Öllsjö no 7	LN layer	PG	OxA-29741	-20.68	3536	29	1978-1769		nd individuals	See RISE202	0.71765	8			RISE199
Öllsjö no 7	LN layer	PG	OxA-29746	-20.10	3502	28	1902-1745		nd individuals	See RISE202	0.71965	16			RISE204
Öllsjö no 7	LN layer	PG	OxA-29742	-20.00	3479	29	1887-1738		nd individuals	See RISE202	0.70935	13			RISE200
Öllsjö no 7	LN layer	PG	OxA-29739	-19.80	3383	28	1745-1621		nd individuals	See RISE202	0.71515	21			RISE197
Öllsjö no 7	LN layer	PG	OxA-29745	-20.00	3189	27	1505-1416		nd individuals	See RISE202	0.71225	17			RISE203
Öllsjö no 7	LN layer	PG	OxA-29740	-19.50	3112	27	1437-1296		nd individuals	See RISE202	0.71151	11			RISE198
Öllsjö no 7	LN layer	PG	OxA-29648	-20.18	3041	28	1396-1217		nd individuals	See RISE202	0.71187	13			RISE196
Öllsjö no 7	LN layer	PG	OxA-29743	-20.00	3025	26	1321-1135		nd individuals	See RISE202	0.71193	10			RISE201

Appendix 3. Geology of Scania

The geology of Scania is quite complex, and lithologies of very different age and formation history can be found in close proximity to each other (Erlström *et al.* 1999; Loberg 1999; Lundqvist *et al.* 2011). Seen broadly, the province can be divided into three major components. Bedrock in north-eastern Scania is dominated by Precambrian gneisses and granites, belonging to the Baltic shield, which extends through most of Sweden, Finland and adjoining parts of Russia. These are some of the oldest rocks in Europe, in Scania with dates in the range 1.7–1.6 Ga. Within this region is a limited area, the Kristianstad basin, where Cretaceous limestones cover the Precambrian rocks. The extent of this area is about 35 x 20km.

In south-western Scania, we find a series of sedimentary rocks: limestones, sandstones and slates, of much younger ages. The youngest of these are found in the south-west corner of Scania, around Malmö and Lund. Here bedrock consists of limestones of Tertiary age forming some of the youngest bedrock in Sweden. Further to the north-east of this region, we find a zone of sedimentary rocks of higher age, from the Cambrian, Ordovician and Silurian periods (Erlström et al. 1999; Loberg 1999; Lundqvist et al. 2011)

Between these two complexes, a transition zone, *c*. 50km wide, is found. This zone is called the Thornqvist zone and runs diagonally through the landscape in a NW–SE direction. In fact, this is part of a major division in European geology, as it runs from the North Sea to the Black Sea and separates the area of Precambrian rocks from younger formations. In Scania, the Tornqvist zone is characterised by a horst and graben landscape, with several NW–SE running ridges formed by Precambrian rocks (Erlström et al. 1999; Loberg 1999; Lundqvist et al. 2011).

Based on bedrock type and age, we might predict a general division of Sr isotope values in Scania with low values in the young, sedimentary regions and high or very high values in Precambrian regions. The matter is, however, complicated by two factors. First, material has been transported by ice movements and deposited as moraine, with a content that may well differ from the underlying bedrock. The effect of this transport is unpredictable since ice movements have occurred in different directions at various late glacial stages. Second, sea water with a low Sr isotope ratio (*c*. 0.7092) may affect terrestrial values in coastal areas due to so-called sea spray.

In order to properly interpret human Sr isotope values, we therefore need to build baselines of biologically available 87Sr/86Sr in various parts of the landscape. At present, such baseline values are mainly available for the sedimentary regions of Scania, while they are few from Precambrian areas and from the horst and graben landscape.