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An interdisciplinary study of Neolithic and Early Bronze Age megalithic populations of southwestern Sweden

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The Firse sten passage grave in Falbygden. Photo by Falbygdens museum, Hans-Göran Johnson.

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I would like to thank all my co-authors, but especially Anna Tornberg, Corina Knipper, and Hege Hollund. Thanks, Corina Knipper, for your immense knowledge, commitment and excellent comments. You are so professional, and I am happy that you wanted to work with me. Thank you, Anna Tornberg, for always helping me out when I am in a need of an osteologist and for fun collaborations. Hege Hollund, who wrote an article related to this thesis, it was a pleasure to work with you. I would gladly collaborate with all of you in future projects.

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Since I began this journey in 2013, I have learned quite a bit, forgotten a whole lot, participated in some really interesting projects, met some really talented people, made some friends and came across a few jerks. Now, in autumn 2021, my hair has begun to turn grey, and I realize that it is time to move on. I look very much forward to new projects and challenges.

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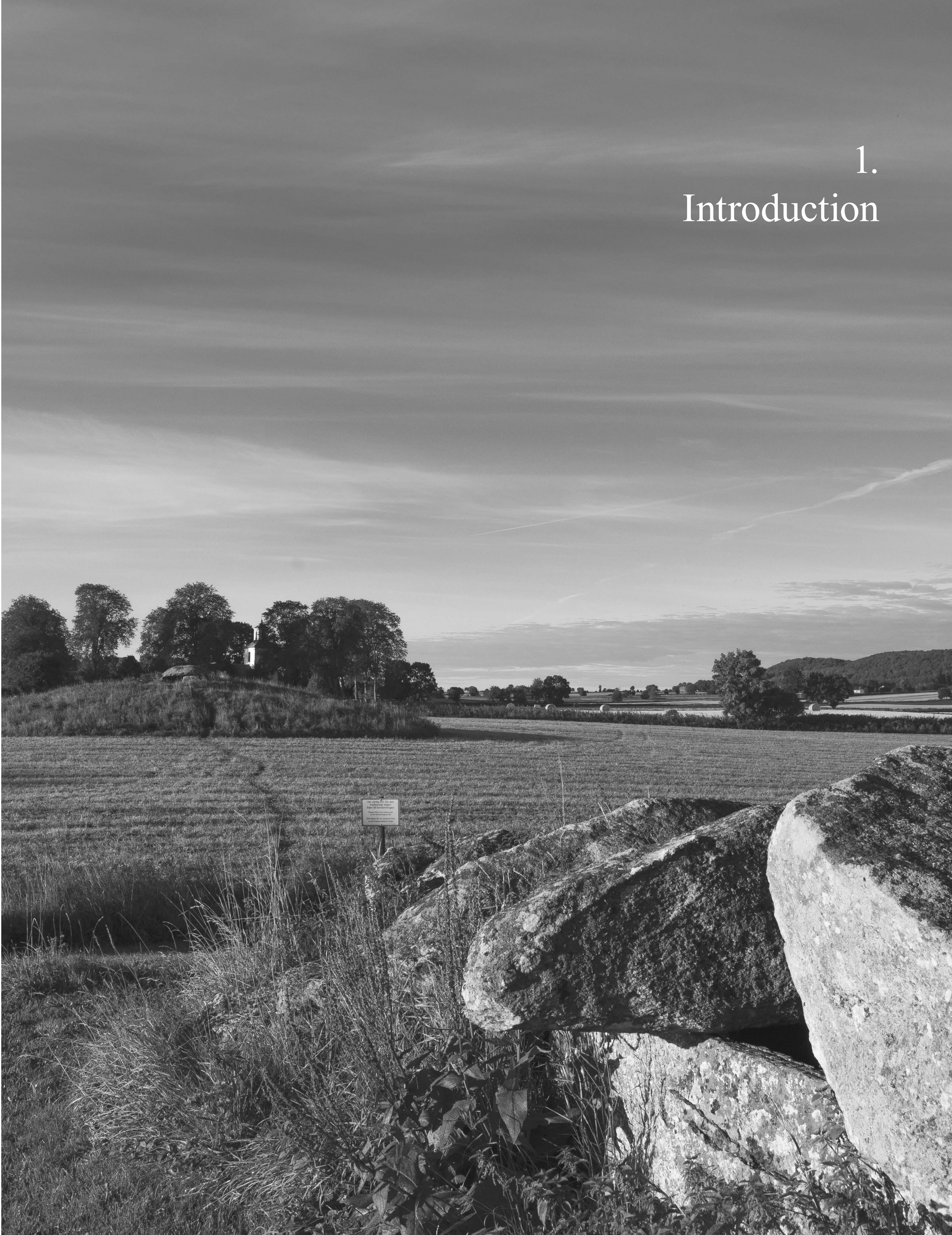
1. Introduction



The Ragnvalds grav and Klövagården passage graves in Karleby, Falbygden. Photo and graphics by Richard Blank.

1.1 Point of departure

What can we know about people who lived several thousand years ago? In most cases only small fragments from these societies have been preserved for us to study. This is of course one of the many challenges of archaeology, and part of what makes this discipline so thrilling. Given this condition, it is important to make the most of the remains we have and to make effective use of the methods at our disposal.

My starting point for this thesis was my fascination with the Late Neolithic period (2200-1700 cal BC). Denmark and Scania are often in the focus of research on the Late Neolithic and Early Bronze Age (1700-1100 cal BC) of Scandinavia. My interest is in the less researched areas outside of southern Scandinavia. Falbygden, in the inland of southwestern Sweden, is an area, of special interest because of its impressive number of Middle Neolithic (3350-2200 cal BC) megalithic graves, indicating that this was an extraordinary area at that time, although still placed at the margin of the wider European megalithic grave phenomenon. Furthermore, the many studies of skeletal remains from Middle Neolithic megalithic graves provide robust datasets that can be compared with results from Late Neolithic research, offering a very unusual opportunity to look at long-term changes in health, demography and other population biological aspects that can be gleaned from human skeletal material, even as we can look at simultaneous changes in burial practices and the societies that carried them out. The Late Neolithic period in Falbygden, unlike the previous period, is poorly studied, even though a large number of megalithic graves have been typologically dated to this period. The original aim of this thesis was to fill this gap of knowledge. My intention was to address questions about the Late Neolithic societies in Falbygden by investigating the remains from the megalithic graves.

During my research I had the opportunity to cooperate with the ATLAS project, at Uppsala and Stockholm University. This collaboration resulted in extensive isotope and biomolecular datasets. I ended up with a lot of new data from the Late Neolithic, but also from the Early and Middle Neolithic and the Early Bronze Age. Most of my data span from the last part of the Early Neolithic to the end of the Early Bronze Age (ca. 3500-1100 cal BC), with a few additional results from the Late Bronze Age and the Iron Age. Thus, the thesis ended up encompassing a time interval ranging from the transition between the Early and the Middle Neolithic to the end of the Early Bronze Age, but still with an emphasis on the Late Neolithic period.

The Scandinavian Neolithic and Early Bronze Age were times of significant cultural transformations and human migrations. In the Early Neolithic and in the late Middle Neolithic, new groups moved into southern Scandinavia from continental Europe, bringing with them their traditions and ways of life (see background). Some of the most important changes were agriculture introduced by Funnelbeaker/Trichterbecher Culture (TRB) groups ca. 4000 cal BC, the immigration of Corded Ware groups ca. 2800-2600 cal BC and growing long distance exchange networks that facilitated imports of metal objects in the Late Neolithic (see background). The time span also includes the emergence and use of megalithic graves.

The focus of this research is on the skeletal remains in the megalithic graves, although the construction and shape of graves and the artefacts recovered from them have also been studied. Other burial types and contexts such as stray finds and other depositions are only touched upon. The geographical choice of the study makes possible investigations of well-preserved prehistoric human remains, which are scarce in many other Scandinavian regions. However, the geographical delimitation also restricts the study to megalithic graves, as other excavated archaeological sites dated to the Neolithic periods are rare.

This thesis is a comparative study of the two megalithic phases that appeared in Falbygden and in many other regions in Scandinavia, although the chronology of the various graves remains unclear. The comparisons of different aspects of the societies using and constructing these graves are of significance for our understanding of the megalithic phenomenon (see background).

The human bones and the megalithic graves are used to gain knowledge about the living societies. Even though this is seemingly a limited material, quite literally constituted by the dead, my intention is to demonstrate, by applying an interdisciplinary approach exploiting a range of recent methodological developments, that these materials are valuable sources for understanding individual life stories as well as living societies. The bioarchaeological approach to the skeletal remains enables studies on an individual level as well as on a more general level of society. The recent progress of isotopic and ancient DNA (aDNA) methodologies and the development of statistical models enable us to study the prehistoric individuals and societies from new perspectives.

1.2 Aims and questions

1.2.1 Overarching aim

The main objective of this thesis is to gain new knowledge of the Neolithic and Early Bronze Age societies that used megalithic graves in inland southwestern Sweden, by applying an interdisciplinary approach to the human remains and the grave inventories.

This overarching purpose encompasses four themes: the use-time of megalithic graves, mobility and networks, diet and subsistence practices, and mortuary practices. These themes include several aims and questions addressed in the articles and the discussion section.

1.2.2 Burial sequences

The purpose regarding the use-time of the megalithic graves was to investigate the chronological span of the main burial sequences in the conventional megalithic grave types of southern Sweden, with special focus on gallery graves. The aim was addressed through radiocarbon analyses of human and animal remains and typological dating of artefacts. The main questions asked are:

- Can possible continuities or discontinuities in the use of the megalithic graves during the Neolithic and Early Bronze Age be confirmed?
- Can any internal chronological patterns of the Västergötland gallery graves be discerned?
- Are there any regional and chronological variations in the use and reuse of the megalithic graves in southern Sweden?

1.2.3 Mobility and networks

The mobility and network theme is mainly based on data acquired from strontium (Sr) isotope analysis of human remains, although artefacts and characterization of grave constructions and mitochondrial aDNA (mtDNA) haplogroups were also considered. Therefore, an investigation of the isotope ratios of the bioavailable Sr in inland southwestern Sweden was conducted (paper III). The aim of this specific study was to construct a Sr isotope baseline of southwestern Sweden to provide a foundation for archaeological studies of human and animal mobility.

Based on this background study, the aim was to investigate different levels of human mobility and population dynamics of the Neolithic and Early Bronze Age megalithic societies in Falbygden. This was approached both on a temporal and on a spatial scale by applying Sr isotope analysis combined with archaeological and bioarchaeological data, including genetic sex assessment and mtDNA haplogroups (paper IV). Some of the questions asked are:

- Do mobility patterns vary over time and in relation to age, biological sex and kinship?
- Can the mobility patterns be connected to general migration trends and cultural transformations in the Middle Neolithic, Late Neolithic or Early Bronze Age?
- What are the possible social factors affecting mobility patterns?

1.2.4 Diet and subsistence

The diet and subsistence theme is mainly based on stable isotope data from human and animal remains recovered from the megalithic graves. The aim was to trace patterns and changes in the diet of the people buried in megalithic graves in inland southwestern Sweden during the Neolithic and Early Bronze Age, in order to get a better understanding of the economy and modes of livelihood of these societies. Some of the specific questions addressed are:

- Is there evidence for changes in diet, livestock utilization and/or cultivation strategies in the Late Neolithic-Early Bronze Age compared to the Early-Middle Neolithic?
- Can dietary patterns be related to age, biological sex, social stratification and/or mobility?
- Do the results from the Falbygden area correspond to the general pattern observed for southern Scandinavian Neolithic and Early Bronze Age?

1.2.5 Mortuary practices

The last theme, mortuary practices, is touched upon in several of the articles (II, IV and VI) and in the discussion section. The key purpose of this theme was to identify mortuary practices within the megalithic graves of inland southwestern Sweden. More specific questions discussed regarding mortuary practices are:

- What are the similarities and dissimilarities of mortuary practices between the two main megalithic phases?
- Are there any traces of secondary burials or deposits of relics/old bones?
- Can we confirm any Neolithic or Early Bronze Age burnt human bones in the megalithic graves and if so, is there any chronological pattern or variation to the burning practices or placement of the bones?

1.2.6 To sum up

My intention is to fill gaps in current archaeological knowledge, considering uneven information about the Middle Neolithic and Late Neolithic period in Falbygden, in particular, and the lack of research on key regions in the Scandinavian Late Neolithic and Early Bronze Age. I intend to compare and study possible relations and differences between megalithic societies in the study area.

1.3 Outline

This work is a compilation thesis that comprises six peer-reviewed research articles and a synthesis (kappa). The articles can be arranged under the four main themes (see above), and can be considered as substudies, but they can also function as independent research papers. The first article is a case study of the Fredriksberg gallery grave and touches upon all four themes. The second publication focuses on the construction and use-time of megalithic graves, but also discusses mortuary practices. The third and fourth articles deal with the topic of mobility and Sr isotopes, while the fifth mainly examines diet and subsistence of the megalithic groups. The last publication treats the theme of mortuary practices. In addition, the investigation also adds new knowledge to the use-time of the megalithic graves.

The kappa presents an introduction including aims and questions followed by a background chapter that gives an overview of the relevant research, a general archaeological background of the study area and of the Neolithic and Early Bronze Age in broader context. Thereafter, methodological and theoretical approaches are discussed, and the study material itself is introduced. In the following "results" chapter, a short summary of the most important results of the individual papers are outlined. Then there is a discussion of the results from all articles followed by conclusions related to the general aims and questions. The kappa also includes some final reflections and a Swedish summary.

1.4 Papers and author contributions

Paper I: Blank M, Tornberg A, Knipper C (2018) New Perspectives on the Late Neolithic of South western Sweden. An interdisciplinary investigation of the Gallery Grave Falköping stad 5. Open Archaeology 4: 1–35.

This paper is co-written with Anna Tornberg, department of archaeology and ancient history, Lund University, and Corina Knipper, Curt-Engelhorn-Center for Archaeometry in Mannheim, Germany.

Malou Blank: statistical analyses of isotopes and radiocarbon dates, production of sections related to biochemistry, statistical analysis and archaeology (methods and results), production of the archaeological background and acquisition of funding.

Anna Tornberg: osteological analysis, production of sections related to osteology (methods and results).

Blank and Tornberg joint work: sampling for biochemical analyses, production of introductory, discussion and conclusion section.

Corina Knipper: production of text regarding the sample preparation and analysis of strontium isotopes and carbon isotopes of bioapatite (method section), and manuscript commenting.

Paper II: Blank M, Sjögren K-G, Storå J (2020) Old bones or early graves? Megalithic burial sequences in southern Sweden based on 14C datings. Archaeological and Anthropological Sciences 12: 89.

This paper is co-written with Karl-Göran Sjögren, department of historical studies, University of Gothenburg and Jan Storå, Department of Archaeology and Classical studies, Stockholm University.

Malou Blank: conceptualization, visualization, material preparation, data collection and analysis, production of manuscript, and acquisition of funding.

Karl-Göran Sjögren: supervision and revisions of the manuscript.

Jan Storå: manuscript commenting and acquisition of funding.

Blank and Storå joint work: sampling for radiocarbon dating.

Paper III: Blank M, Sjögren K-G, Knipper C, Frei KM, Storå J (2018) Isotope values of the bioavailable strontium in inland southwestern Sweden—A baseline for mobility studies. PLoS ONE 13(10): e0204649.

This paper is co-written with Karl-Göran Sjögren, University of Gothenburg, Corina Knipper, Curt-Engelhorn-Center for Archaeometry in Mannheim, Germany, Karin M Frei, Environmental Archaeology and Materials Science, The National Museum of Denmark, Brede, Denmark, and Jan Storå, Department of Archaeology and Classical studies, Stockholm University.

Malou Blank: conceptualization, visualization, material preparation, data collection and analysis, production of manuscript, and sampling.

Karl-Göran Sjögren: conceptualization, supervision, and revisions of the manuscript.

Corina Knipper: production of text regarding the strontium isotope methodology, supervision of strontium isotope analyses, and revisions of the manuscript.

Karin M Frei: manuscript commenting.

Jan Storå: manuscript commenting and acquisition of funding.

Paper IV: Blank M, Sjögren K-G, Knipper C, Frei KM, Malmström H, Fraser M, Svensson E, Günther T, Yngve H, Jakobsson M, Götherström A, Storå J (2021) Mobility patterns in inland southwestern Sweden during the Neolithic and Early Bronze Age. Archaeological and Anthropological Sciences 13: 64.

This paper is co-written with Karl-Göran Sjögren, department of historical studies, University of Gothenburg, Corina Knipper, Curt-Engelhorn-Center for Archaeometry in Mannheim, Germany, Karin M Frei, Environmental Archaeology and Materials Science, The National Museum of Denmark, Frederiksholms, Copenhagen K, Denmark, Helena Malmström, Magdalena Fraser, Emma M. Svensson, Torsten Günther, Hannes Yngve, Mattias Jakobsson, Human Evolution, Department of Organismal Biology, Uppsala University, Anders Götherström, Centre for Palaeogenetics, Department of Archaeology and Classical Studies, Stockholm University and Jan Storå, Osteoarchaeological Research Laboratory, Department of Archaeology and Classical Studies, Stockholm University.

Malou Blank: conceptualization, visualization, material preparation, data collection and data analysis, and manuscript writing.

Karl-Göran Sjögren: supervision, and revisions of the manuscript.

Corina Knipper: production of text regarding the analytic method of the strontium isotope analysis (appendix 3), supervision of the strontium isotopic analyses, revisions of the manuscript.

Karin M. Frei: manuscript commenting.

Helena Malmström: production of text regarding the analytic method of the sex assessment and mtDNA analyses (appendix 3), commenting the manuscript.

Magdalena Fraser: commenting the manuscript.

Malmström, Fraser and Svensson joint work: supervision and performance of the aDNA laboratory analyses and the genetic analyses.

Jakobsson, Malmström, Fraser and Günther joint work: supervision and performance of the population genetic analyses.

Hannes Yngve: performance of genetic analyses.

Jan Storå: production of text regarding the osteological methodology (appendix 3), performance of osteological analyses and commenting the manuscript.

Blank, Storå and Svensson joint work: sampling for isotope and aDNA analyses.

Jakobsson, Götherström and Storå joint work: acquisition of funding.

Paper V: Blank M, Sjögren K-G, Knipper C, Storå J, Samantha Presslee (submitted to Archaeological and Anthropological Sciences) Diet and subsistence in the Neolithic and Early Bronze Age. An isotopic study of human remains in the megalithic graves of southwestern Sweden.

This paper is co-written with Karl-Göran Sjögren, department of historical studies, University of Gothenburg, Corina Knipper, Curt-Engelhorn-Center for Archaeometry in Mannheim, Germany, Jan Storå, Osteoarchaeological Research Laboratory, Department of Archaeology and Classical Studies, Stockholm University and Samantha Presslee, BioArCh, Department of archaeology, University of York.

Malou Blank: conceptualization, visualization, material preparation, data collection and data analysis, manuscript writing and acquisition of funding.

Karl-Göran Sjögren: supervision, and revisions of the manuscript.

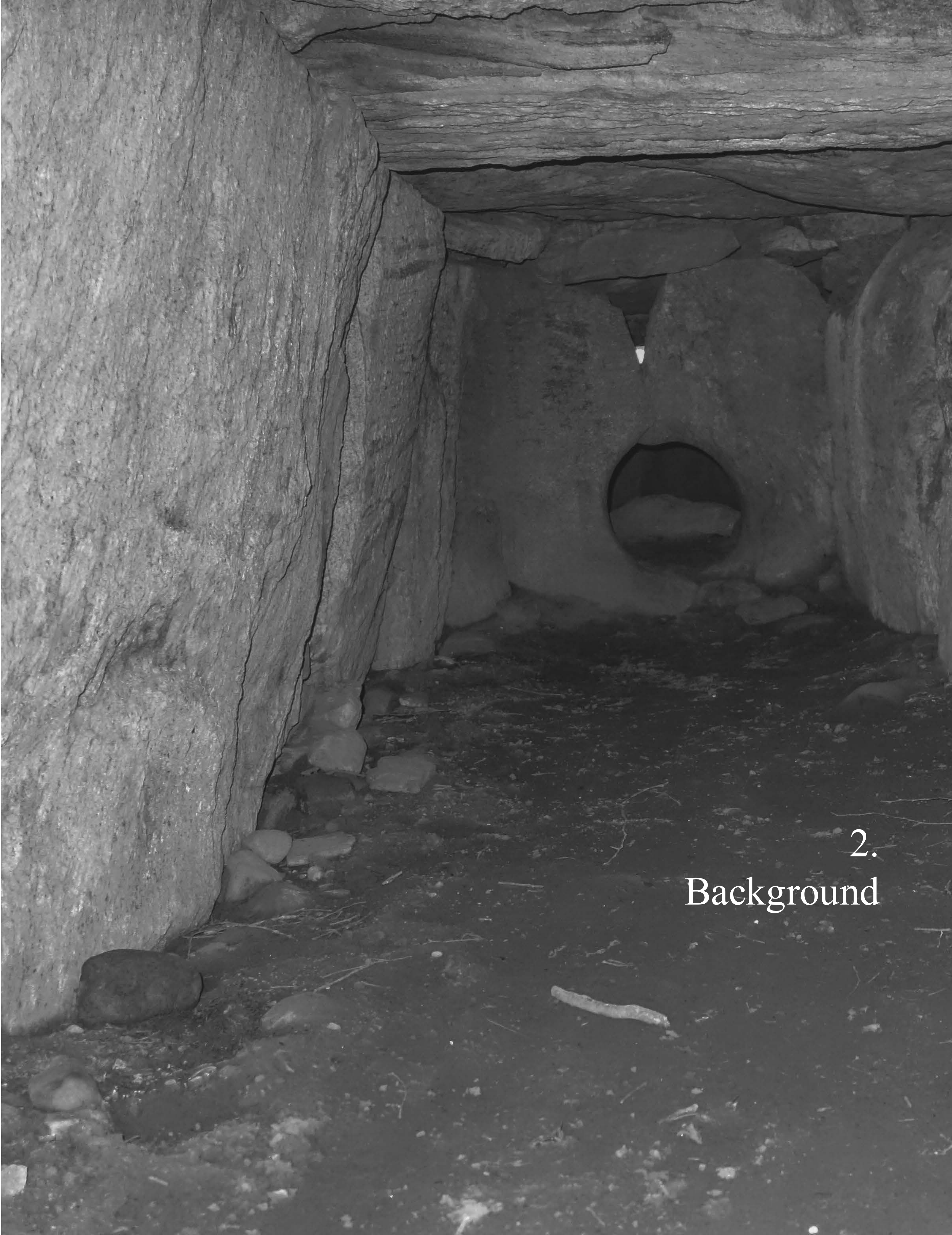
Corina Knipper: production of text regarding the carbon bioapatite analysis methodology, commenting the manuscript.

Jan Storå: commenting the manuscript and acquisition of funding.

Samantha Presslee: performance of ZooMS analyses and production of text regarding the ZooMS methodology.

Paper VI: Blank M (2021) Burning the dead: Human bones subjected to fire in southwestern Swedish megalithic graves. JNA 23: 29 – 60.

This paper is written without a co-author.



2. Background

The Skogsbo gallery grave,
photo by Malou Blank, graphics Richard Blank.

2.1 Introduction

The purpose of this chapter is to position this thesis in time and space; to give an overview of the study area and a more general framework for the Neolithic and Early Bronze Age settings and the megalithic phenomenon. Furthermore, this chapter presents the rationale for working on the selected region, especially in light of the potential shown by previous research, along with broader gaps of knowledge in the area.

2.2 Cultural settings- a Swedish perspective

This thesis is set between the last part of the Early Neolithic and the end of Early Bronze Age (Fig. 1). During the Middle Neolithic period several different archaeological cultures characterized by different types of artefacts and burial practices appear, while these differences during the Late Neolithic and Early Bronze Age are considered as regional or social variations within the same cultural complex.

At the onset of the Early Neolithic, ca. 4000 cal BC, TRB rapidly spread in southern Scandinavia. The TRB complex is linked to the introduction of agriculture, causewayed and palisade enclosures, and ritual depositions in wetlands. A new set of artefacts, such as TRB pottery and polished flint axes appear. The burial constructions consist of flat graves, non-megalithic long barrows and the first megalithic graves (Kossian 2005; Midgley 2008; Sjögren 2003). TRB remains have been found across southern Scandinavia, up to and including eastern central Sweden and southern Norway (e.g., Hallgren 2008; Malmer 2002). According to recent aDNA research, migration was an important factor for the spread of the TRB complex (e.g., Linderholm 2008; Malmström et al. 2015; Skoglund et al. 2012, 2014).

In the Middle Neolithic A, the Pitted ware complex (PWC) appeared mainly at eastern Swedish coastal sites, Öland, Gotland, Bornholm, northern Denmark and Åland (e.g., Becker 1951; Malmer 2002). Recent research suggests that the TRB and PWC were partly contemporaneous groups (Fig. 1) that coexisted in certain areas, each maintaining distinctive burial practices and subsistence strategies (Eriksson et al. 2008; Fornander 2011; Fraser et al. 2018). The TRB complex practiced farming and animal husbandry, while PWC groups were reliant on a marine

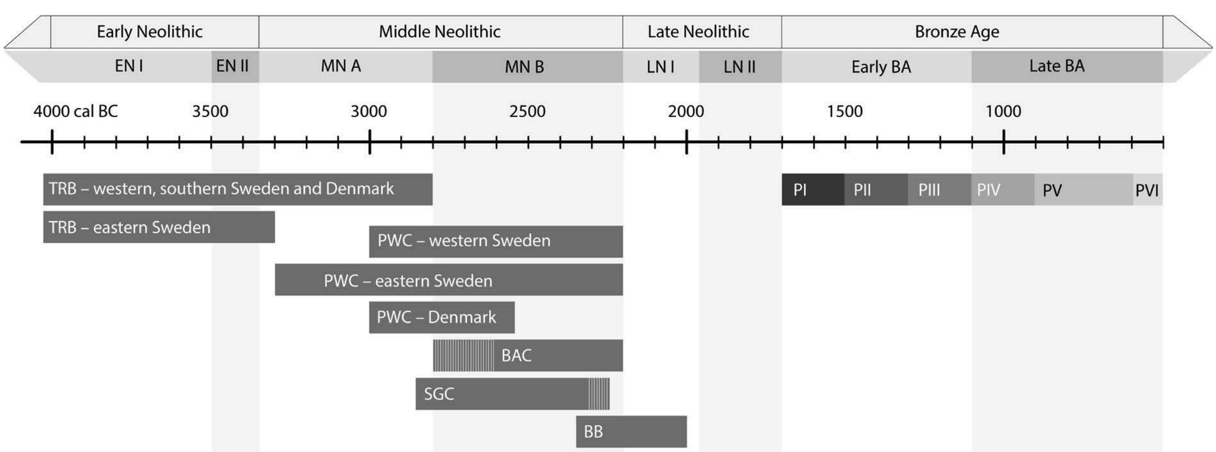


Figure 1 Chronology for southern Sweden and Denmark. TRB: Trichterbecher/ Funnelbeaker, PWC: Pitted Ware Culture, BAC: Battle Axe Culture, SGC: Single Grave Culture, BB: Bell Beaker.

economy, although agriculture was practiced to some extent (Eriksson et al. 2008; Fraser 2018; Klassen 2020; Sjögren 2017; Sjögren et al. 2019; Vanhanen et al. 2019). PWC burials usually contain single individuals buried in supine position in large flat grave cemeteries and the majority of the graves have been found on the limestone rich islands of Gotland and Öland (Janzon 1974; Larsson 2009; Malmer 2002). It has been suggested that retrieval, sorting and secondary disposal of human remains was part of PWC mortuary practices (Larsson 2009). Some of the specific artefacts associated with this cultural complex, especially in the eastern parts, are pottery, stone axes, bone spears, harpoons and fishhooks, worked boar tusks, animal tooth pendants and bone beads. The west Swedish PWC is primarily characterized by its flint technology, with cylindrical blade cores for making long straight blades for manufacturing tanged arrowheads, blade scrapers and other tools. The PWC pottery also differs between the eastern and western regions (Larsson 2009; Malmer 2002; Papmehl-Dufay 2006; Strinnholm 2001). PWC artefacts and pottery are sometimes found in the megalithic graves (Becker 1951; Blank 2016; Klassen 2020; Sjögren 2003).

The Battle axe culture (BAC), or Boat axe culture, appears in Sweden during the Middle Neolithic B (Fig. 1) and is, like the Danish Single grave culture (SGC), considered a regional group of the European Corded Ware Culture (CWC) complex. It is characterized by flat grave burials with one or two individuals placed in flexed positions, accompanied by battle axes and beakers (e.g., Edenmo 2008; Malmer 1962, 2002). The BAC pottery is relatively similar in the different regions, while TRB and PWC pottery varies between regions. The majority of the roughly 250 known BAC burials are found in Scania (Malmer 1962, 1975). Limited BAC reuse of megalithic graves also occurs (Blank 2016; Sjögren 2003). It has been suggested that Pitted Ware and Battle Axe Culture were two aspects of the same social group (von Hackwitz 2009). However, recent aDNA studies indicate that people buried in PWC and BAC contexts, respectively, showed consistent patterns of significant genetic distance (Malmström et al. 2015). The BAC appears to chronologically follow TRB which has led to suggestions of internal development and local transformation (Malmer 1962). However, recent aDNA studies have demonstrated a genetic ancestry from the Yamnaya on the western steppes, supporting the model of migration of these groups into Europe. Furthermore, individuals from BAC and SGC contexts exhibit genetic ancestry from European CW groups that migrated into Scandinavia but also somewhat mixed with farmers (Allentoft et al. 2015; Egfjord et al. 2021; Haak et al. 2015; Malmström et al. 2019). According to pottery analyses (Holmqvist et al. 2018), BAC/CWC groups migrated into Sweden mainly from the east.

The Scandinavian Late Neolithic (Fig. 1) is often viewed as a time of increased social complexity, growing population density, cultural blending and stronger reliance on agriculture (Apel 2001; Artursson 2009; Feeser et al. 2019; Iversen 2015; Kristiansen and Larsen 2005; Lekberg 2002; Prescott 2005; Vandkilde 1996). The period is characterized by complex bifacial flint-working techniques, the continued development of long-house construction, an intensified import of gold and copper artefacts, and increased long distance trading networks (Apel 2001; Artursson 2009; Kristiansen and Larsen 2005; Ling et al. 2014; Melheim 2012; Prescott 2005; Simonsen 2017; Vandkilde 1996). In the more southern areas, including the Swedish regions of Scania and Halland, long-houses with sunken floors were constructed. These features were suggested to have been used for storage and craft activities (Simonsen 2017). Furthermore, several researchers have argued for the emergence of a male warrior ideal and social stratification during the Scandinavian BAC and Late Neolithic, which became even more pronounced in the Early Bronze Age (Apel 2001; Lekberg 2002; Kristiansen 1982, 1987; Vandkilde 1996; Weiler 1994). An increase of violence and warfare in the south Scandinavian Late Neolithic and Bronze Age has been suggested based on osteological and archaeological studies (Bennike 1985, 2003; Fibiger et al. 2013; Schulting 2006; Tornberg 2018).

In this thesis a starting point of the Late Neolithic (2200 cal BC) was chosen in the Swedish context, due to the dating of the previous BAC and PWC and the radiocarbon dates of human remains in Late Neolithic Swedish contexts (Bergerbrant et al. 2017; Tornberg 2018; paper II). The first part (2200–1950 cal BC) of the Scandinavian Late Neolithic was influenced by Corded Ware and Bell Beaker (BB) traditions, and the second part (1950–1700 cal BC) largely by the Ûnetice culture of central Europe (Apel 2001; Prescott and Glørstad 2015; Sarauw 2006, 2007; Vandkilde 1996; Vandkilde et al. 2017). Late Neolithic II is characterized by an increased import of metal objects (Apel 2001; Iversen 2015; Prescott 2005; Vandkilde 1996, 2014). According to Shennan (1982), Kristiansen (1987), Rasmussen (1990) and Vandkilde (1996), previous Middle Neolithic networks dissolve and new alliances appear in the Late Neolithic, based on the production and exchange of metal instead of flint.

In Scandinavia, significant population increases have been suggested to occur between 2000 and 1500 cal BC (Feeser et al. 2019; Müller 2015; Nielsen et al. 2019). The Late Neolithic settlements developed from village-like agglomerations of smaller long-houses during Late Neolithic I to settlements with contemporary houses of various sizes during Late Neolithic II. The large and more varied sizes of houses have been interpreted as the emergence of a more hierarchical society in the Late Neolithic II and Early Bronze Age (e.g., Artursson 2009; Brink 2013; Nielsen and Nielsen 1985; Sarauw 2006;). However, other reasons for these changed patterns related to variations in marriage systems, including the organization of extended families, and variation depending on house function are also possible.

The Late Neolithic is also known as "the period of hällkistor" (translated to English as gallery graves). However, gallery graves are not the only type of Late Neolithic graves in southern Sweden. Besides successive burials in gallery graves, reuse of dolmens and passage graves, cremations, individual and collective inhumations in flat graves occur (Blank 2017; Forsman 2007; Papmehl-Dufay 2010; Stensköld 2004; Weiler 1994). Late Neolithic flat graves are mainly found in Scania. In Västergötland only one has been verified (Djurfeldt 1967). The Late Neolithic in Sweden has been contradictorily described as a period of homogenous and heterogenous cultural and social expressions (Apel 2001; Becker 1964; Holm et al. 1997; Stensköld 2004). Considering the grave types, regional variations have been emphasized (Lomborg 1973; Kaelas 1962; Holm et al. 1997), while uniformity of artefacts over large areas has been pointed out (Becker 1964; Holm et al. 1997).

The Scandinavian Late Neolithic is often perceived as a transitional period between the Stone and Bronze ages. It has long been described as a period when a shift between a collective-ancestry-based ideology and a more individualized society took place. Some researchers have emphasized the similarities between the Late Neolithic and the Bronze age (Burenhult 1991; Kristiansen 1987; Vandkilde 1996; Weiler 1994), while other have stressed the resemblances to the previous Neolithic societies (e.g., Anderbjörk 1932; Lomborg 1959; Malmer 1975). Becker (1964: 123) and Hallgren (1996: 91) have suggested that Late Neolithic society was a blend of the (archaeologically defined) culture groups that appeared in the previous period. This ambiguous position of the period is probably one of the reasons why the Late Neolithic has received so little attention, both in Neolithic studies as well as in Bronze Age research. Some Late Neolithic and Early Bronze Age artefacts, such as slate pendants, bifacial flint arrowheads with concave bases, bifacial flint spearheads, flint sickles and pottery etc., are sometimes difficult to separate between the periods, which may also explain why the Late Neolithic and Early Bronze Age in many cases are lumped together.

The Early Bronze Age, 1700-1100 cal BC, is characterized by hierarchically structured societies reliant on agriculture and husbandry, an increased importance of metal, and long-distance networks connecting southern Scandinavia to several parts of continental Europe and beyond (Kaul and Varberg 2017; Kristiansen 1987, 2018; Kristiansen and Larsen 2005; Ling et al. 2014; Vandkilde 1996; Weiler 1994). From 1600 cal BC and onward southern Scandinavia became more closely linked to European trade networks (Vandkilde 2014, 2016). During the Late Neolithic and Early Bronze Age figurative rock carvings appear with concentrations in the coastal areas but also in some inland regions (e.g., Janson et al. 1989; Ling 2008; Ling et al. 2018). Rock carvings and metal trade are two of the most frequent themes in Nordic Bronze Age research. Furthermore, there is substantial archaeological interest in warfare, spectacularly documented by increasing numbers of bronze weapons in the Early Bronze Age (Fyllingen 2003; Horn and Kristiansen 2018; Jantzen et al. 2014, 2015; Vandkilde 2013). Increased mobility and travelling have also been recurring themes based on imported goods and isotopic studies (e.g., Bergerbrant 2007; Kristiansen 2018; Frei et al. 2019).

In the Early Bronze Age, gallery graves continue to be used, earlier megalithic graves are reused, and mounds/barrows, cairns, oak log coffins and flat graves are constructed (Blank 2016; Harding 2000; Holst 2013; Weiler 1994). Regional variation of grave types and other categories of material culture may be observed (Bergerbrant 2007; Holst 2013). A considerable number of monumental mounds/barrows were constructed in Denmark, Scania and southern Halland (Holst et al. 2013). According to Tornberg (2018: 123) burial complexity in Scania increases from the Late Neolithic I to the Early Bronze Age, interpreted as an expansion in social diversity. In Sweden outside Scania and southern Halland, the grave constructions mainly consist of cairns and stone settings, with concentrations in Småland and on Gotland (Hyenstrand 1979). Inhumations are mainly practiced, although cremation burials also occur (Arcini and Svanberg 2005; Feville and Bennike 2002; Holst 2013; Olsen et al. 2008).

2.3 Falbygden

2.3.1 An overview

The main geographic area investigated in this thesis is Falbygden. Falbygden is located in the southwestern Swedish region of Västergötland between the two big lakes Vänern and Vättern (Fig. 2). The bedrock geology is characterized by sedimentary rocks, with table mountains shaping the regional topography (further described in paper III). The term Falbygden is here used in an expanded manner to include the whole sedimentary area (Fig. 2). The landscape consists of three limestone plateaus, which form a 50 x 30 km large triangle. Between the plateaus there are depressions with some wetlands (Fig. 2). This delimitation was chosen considering the concentration of megalithic graves and the geologically younger Cambro-Silurian sedimentary rocks compared to the surrounding Precambrian

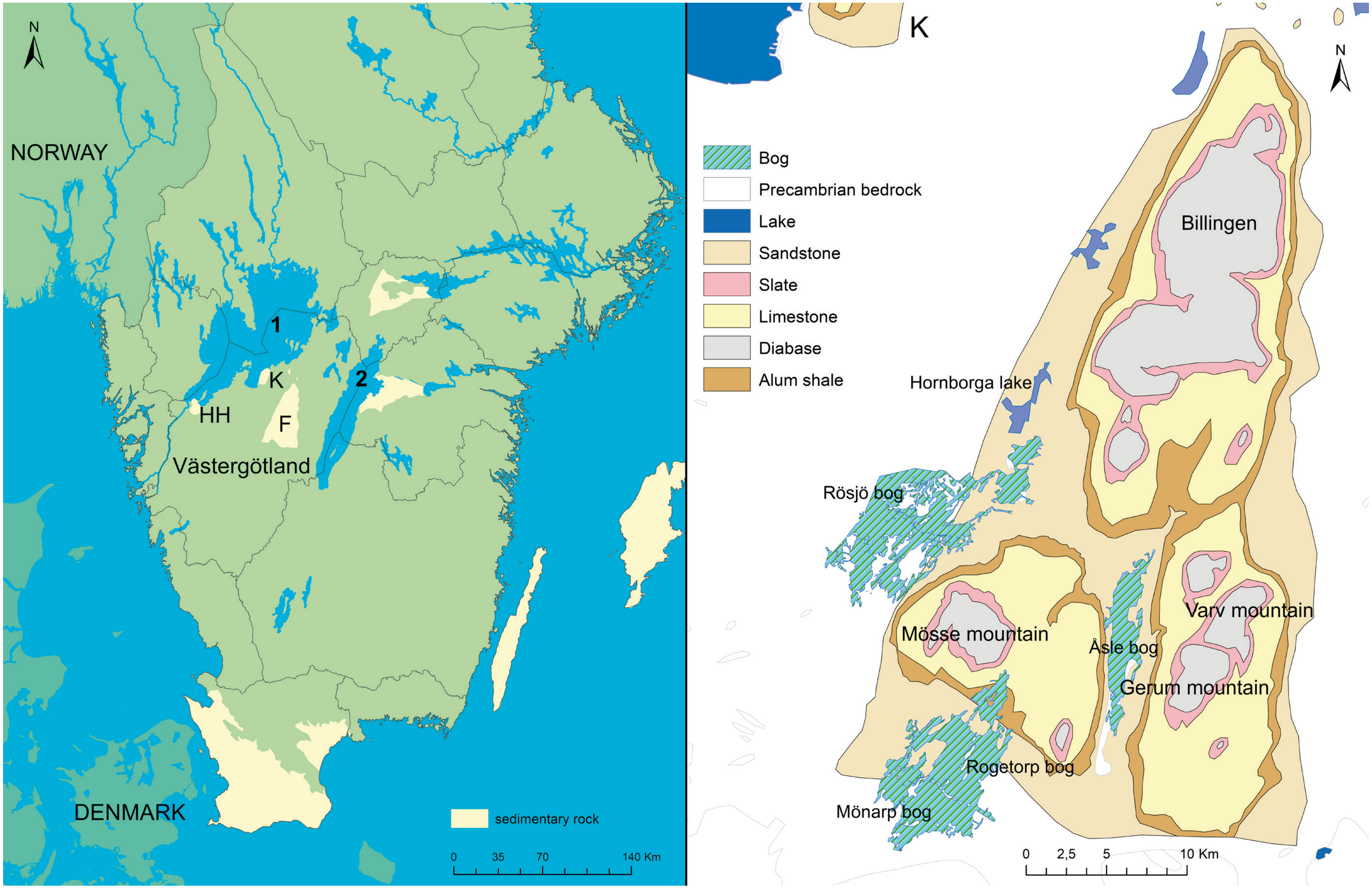


FIGURE 2 Overview of southern Sweden (left) and Falbygden (right). F: Falbygden, K: Kinnekulle, HH: Halle and Hunne mountains, 1: lake Vänern and 2: lake Vättern.

granites and gneisses. The calcareous soils have promoted favourable conditions for bone preservation. The clear spatial structure of the geology and the well-preserved human and animal bone material makes Falbygden an unusually fruitful study area for investigations combining bioarchaeological and archaeological data to understand prehistoric economy and society.

The strategic location between the two lakes and the connections by river systems especially to more southern regions have been pointed out by Weiler (1994: 98). Weiler described Falbygden as an important link between lake Vänern and Vättern and suggested that waterways were important for exchange networks during the Late Neolithic and Early Bronze Age (Weiler 1994: 111). The importance of water for settlements and agriculture in Neolithic societies has also been highlighted. The supply of water in Falbygden during the Neolithic and Early Bronze Age was rich (Schnell 1966; Sjögren 2003). Numerous potable springs seep out between the layers today (Schnell 1966). During the Neolithic and Early Bronze Age some of today's larger wetlands and lakes in the outskirts of Falbygden, Hornborga lake, Rösjö bog and Mönarp bog (Fig. 2), probably formed shallow lakes (Sandegren 1916; Sjögren 2003: 58). Furthermore, the calcareous soils are/were favourable for agriculture. The bedrock is also rich in phosphates, which makes the area particularly fertile. The landscape is divided into drier plateaus and more humid slopes. The edge zones of the limestone plateaus are suggested as the most favourable for settlement and cultivation (Persson and Sjögren 2001; Sjögren 2003: 58).

The Mid-Holocene begins around 6200 cal BC and covers the Late Mesolithic and the Early and the Middle Neolithic. It was characterized by a relatively dry and warm continental climate with comparatively stable temperatures (Butruille et al. 2017; Kleijne et al. 2020; Seppä et al. 2005). During this period in southwestern Sweden dry conditions with mean annual temperatures ca. 2.5°C higher than at present have been proposed (Antonsson and Seppä 2007; Hammarlund et al. 2003; Seppä et al. 2005). The Late Holocene starts at the onset of the Late Neolithic and coincides with the so called 4.2 ka BP climatic event, which actually encompasses ca. 2450-1900 cal BC (Kleijne et al. 2020). This event caused an abrupt change towards a more unstable climate in Europe, although with regional variations (Butruille et al. 2017; Kleijne et al. 2020; Seppä et al. 2005). According to oxygen isotope (^{18}O) studies (Hammarlund et al. 2003; Seppä et al. 2005) from inland southwestern Sweden, a change toward a more unstable and humid climate with cooler temperatures occurred about 2000 cal BC.

According to pollen studies the vegetation in Falbygden during the Neolithic consisted of a dense mixed broadleaf forest (Axelström and Persson 1998; Fries 1958: 11–12). A recent pollen study from Åsle bog in Falbygden supports an introduction of cultivation ca. 4000 cal BC. In the Late Neolithic, there was a general development of increasingly open landscapes in Scandinavia (e.g., Berglund 2003). This trend agrees with pollen data from Åsle bog (Enevold 2019) suggesting a more open landscape and increased farmland in the Late Neolithic than in the earlier period, with a further rise in agriculture during the Bronze Age.

2.3.2 Stone and Early Bronze Age

Falbygden has been an influential area for much of prehistory, in a regional western Swedish perspective and, at times, even in a Scandinavian perspective (Blomqvist/Bägerfeldt 2009: 38; Sahlström 1940; Weiler 1994: 12). The first human traces date to the Mesolithic period and consists of stray finds, human remains, dog burials and settlement remains (Kindgren 1991, 1996; Sjögren 2003: 220; Sjögren et al. 2017). The most prominent Mesolithic environment in the area is Hornborga lake in the western outskirts of Falbygden, where settlement remains and dog burials have been found (Kindgren 1991, 1996). Close by at Hanaskede, north of Hornborga lake, a wetland deposit consisting of a human skull dated to the Mesolithic was recovered (Sjögren and Ahlström 2016; Sjögren et al. 2017; Vretemark 1996). Furthermore, cremated human remains found at Klövagården settlement, Karleby, were dated to the same period (Sjögren personal communication).

For the Early Neolithic pollen data from the area indicate the introduction of cultivation and husbandry (Enevold 2019; Fries 1958), but the archaeological material is largely limited to finds of axes, in most cases without contextual information. Only a few of the megalithic graves have at present been classified as the conventional earliest type, dolmen (Blomqvist/Bägerfeldt 1989a; Sjögren 2003). Nevertheless, dating and classification of the megalithic graves is still debated (see paper II). Furthermore, wetland finds of Early Neolithic human remains have been found at Härlingtorp, north of Hornborga lake and in Rogetorp bog in the southern outskirts of Falbygden (Sjögren et al. 2017). Concentrations of Early and Middle Neolithic axes and significant numbers of large flint axes suggest that Falbygden was relatively densely populated during these periods, with access to south Scandinavian flint (Blomqvist/Bägerfeltd 1990; Sjögren 2003: 216; Sørensen 2014). One of the most spectacular Early Neolithic finds is an imported copper axe[1] recovered from Vartofta-Åsaka, in the southern part of Falbygden.

In Falbygden one of northern Europe's largest concentrations of passage graves is found (see distribution of megalithic graves). According to radiocarbon dates the passage graves were built over a rather short period at the transition between the Early and the Middle Neolithic periods, in the cultural setting of the TRB (Persson and Sjögren 1995; Sjögren 2003; Sjögren 2011). Common artefacts of flint and amber indicate systematic exchange networks with southern Sweden and Denmark (Anderbjörk 1932; Axelsson et al. 2015; Sjögren 2003). The Middle Neolithic remains have been the focus of a number of isotopic investigations (Sjögren 2017; Sjögren et al. 2009; Sjögren and Price 2013a, b). Through these studies, the population in Falbygden has been shown to be reliant on cultivation and husbandry and part of a much larger system of exchange/alliances with surrounding (isotopically distinctive Precambrian) regions, involving mobility of humans and cattle (Sjögren and Price 2013a).

In addition to the rich Middle Neolithic stray finds (Blomqvist/Bägerfeldt 1989b, 1990; Sjögren 2003), several settlements have been found and partly excavated (Sjögren 2003; Sjögren et al. 2019). At one of the settlements in Karleby, round and long house structures have been revealed (Sjögren et al. 2019). The settlements are contemporary with the burials in the passage graves and located nearby (Sjögren et al. 2019). Stray finds of PWC character have also been recovered from the megalithic graves, and in the area (Blank 2016; Blomqvist/Bägerfeldt 1990; Sjögren 2003; Persson and Sjögren 2001). A PWC settlement occurs close to lake Östen, north of Falbygden (Haugene 1997, Nilson 1991). The BAC presence in Falbygden is mainly indicated by abundant finds of axes and some pottery (Sahlström 1932; Blomqvist/Bägerfeldt 1990; Malmer 1962; Sjögren 2003). No Neolithic flat graves have yet been confirmed in Falbygden. However, Sahlström (1932: 32f) documented a few flat graves, which most likely can be ascribed to the BAC.

A high frequency of flint daggers has also been documented in Falbygden (Apel 2001; Blomqvist/Bägerfeltd 1990). The numerous gallery graves, along with the many stray finds of flint daggers and shaft-hole axes in Falbygden, when

1 SHM 18812

compared with the surrounding regions, suggest a relatively dense population (Sahlström 1940: 16). Unlike Scania, where Late Neolithic flat graves are quite common, no such graves have been found in Falbygden and only one has been verified in Västergötland (Djurfeldt 1967). However, some of the finds of shaft-hole axes and daggers may originate from destroyed flat graves (Lekberg 2002). Furthermore, flat graves without any stone constructions would be difficult to identify in agricultural areas such as Falbygden, where large scale excavations are limited.

Confirmed Late Neolithic settlements are also scarce in Västergötland[2] and in Falbygden only stray finds have been found (Weiler 1994: 55, 84). In Ulricehamn ca. 40 km south of Falbygden a long-house dated to the Late Neolithic/Early Bronze Age was excavated. It resembles contemporary long-houses in Denmark and Scania (Andersson 2018). About 80 km west of Falbygden, by Göta älv, four Late Neolithic/Early Bronze Age long-houses have been documented[3] (von der Luft et al. 2012).

There are no known depositions of human remains in wetlands from this period in Falbygden. However, a Late Neolithic wetland find (a human skull) was found at Nossamaden, some 35 km to the west of Falbygden (Hellgren 2007; Sjögren et al 2017; paper V). Many of the previous megalithic graves in Falbygden were reused for burials in the Late Neolithic and the passage of Firse sten passage grave was rebuilt into a gallery grave in the Late Neolithic (Blank 2016; Jankavs 2014; Sjögren 2003).

Recently published pollen data (Enevold 2019) indicate a more open landscape and increasing farmlands in the Late Neolithic. Furthermore, imprints of cereal grains in pottery vessels from several gallery graves (Hjelmqvist 1955: 37; Weiler 1994: 61) confirm the practice of cultivation. Flint daggers, bifacial arrowheads and spearheads have been suggested to originate from Scania and/or Denmark, indicating direct or indirect exchange networks with these regions (Apel 2001; Weiler 1994). The numerous finds of different kinds of bone needles and buttons in the gallery graves also suggest a new way of dressing (Appendix 2). According to Weiler (1994: 81), the relatively dense population and the strategic placement of Falbygden may have resulted in more frequent conflicts coinciding with the transition between the Late Neolithic and Early Bronze Age. The broken bronze arrowhead from the Utbogården gallery grave and the documented skull traumas in several gallery graves are examples of possible violence (Appendix 2; Fibiger et al. 2013; Fürst 1924; Retzius 1899; Sahlström 1915a, see discussion).

In Västergötland, some bronze artefacts have been typologically dated to the Late Neolithic II (Vandkilde et al. 2017), although bronze objects become much more common in the Early Bronze Age. According to Vandkilde (1996; Vandkilde et al. 2017: 230), a flanged axe[4] found in Åsle indicates that bronze appeared in Falbygden already during the Late Neolithic II. In Västergötland, Bronze Age metal artefacts are concentrated to Falbygden (Bergström 1980: 50). For example, the area is rich in bronze spearheads and early bronze axes (Sahlström 1940; Weiler 1994: 70, 96). Concentrations of gallery graves occur in Falköping, Gökhem and Torbjörntorp parish in Falbygden. From several of these graves bronze and gold jewellery/dress accessories dated to the Early Bronze Age were recovered (Appendix 2; Weiler 1994). In Falköping[5] and in Gökhem[6] Fårdrup axes in copper alloys dated to the Bronze

2 For example, Väne-Åsaka 18, an excavated LN/EBA settlement (Schützler 1984).

3 Fors 125, Trollhättan

4 SHM 10797 (Store Heddinge type)

5 SHM 14414

6 SHM 19344

Age period I have been found. Thus, Falbygden appears to be a region with exchange network systems reaching beyond southern Scandinavia in the Early Bronze Age and throughout the Bronze Age.

Instead of the monumental barrows and cairns that are characteristic of the Early Bronze Age in Denmark and Scania (Harding 2000: 95; Holst et al. 2013), the Bronze Age burials in Falbygden consist of relatively low profiled cairns and stone settings. These consist of small stone cists for one to two individuals covered by stones and soil (Sahlström 1940: 20; Bergström 1980: 148; Weiler 1994: 167). Furthermore, the gallery graves continued to be used and passage graves were to some extent reused in the Early Bronze Age (Blank 2016, 2017; Sjögren 2003).

2.3.3 Previous research

In this section a short summary of some of the previous archaeological research in Falbygden is presented with a focus on the latest studies. For a more detailed history of research in the area, see Ahlström 2009, Axelsson 2010, Persson and Sjögren 2001, Sjögren 2003.

The most intense focus of interest in archaeological research in Falbygden has been the Middle Neolithic passage graves. These graves have been systematically studied since the middle of the 19th century (Blomqvist/Bägerfeldt 1989a; Cullberg 1963; Hildebrand 1864; Montelius 1873; Persson and Sjögren 2001; Retzius 1899; Sahlström 1932; Sjögren 2003; Werner 1870, 1873). Several excavations of megalithic graves, mainly passage graves, but also a few gallery graves, were conducted by Hildebrand (1864), Montelius (1877, 1905) and Retzius (1899). At this time, emphasis was put on measuring skulls and discussing the origin of the buried individuals. During the 20th century a series of surveys, restorations and a few excavations of megalithic graves were carried out, including classic studies by Sahlström (1915a, 1927, 1932, 1947, 1949, 1951) and Svensson (1928, 1929, 1933, 1936, 1940). Sahlström also contributed with several important publications on prehistory of Falbygden and Västergötland (1915b, 1928, 1932, 1939, 1940). The early excavations were reviewed by Anderbjörk (1932). In 1962, Cullberg fully excavated and restored the Rössberga passage grave and the adjoining gallery grave. In the late 20th century Blomqvist/Bägerfeldt (1989a) studied the passage graves focusing on the architecture of the graves. He also contributed with other works summarizing the Neolithic of Falbygden (Blomqvist/Bägerfeldt 1989b, 1990).

The Falbygden passage graves have attracted attention outside of western Sweden and played an important role in megalithic research (Ahlström 2009; Midgley 2008; Scarre 2010; Shanks and Tilley 1982; Sjögren 2003; Tilley 1994). Tilley discussed the passage graves of Falbygden in several of his works (e.g., 1994, 1996, 1999), where he stressed regional characteristics and symbolic aspects of the graves reflecting the society and the landscape (see below 2.4).

In the last decades, several investigations have involved the Middle Neolithic passage graves and aspects of the society related to them. Several projects have been carried out by the University of Gothenburg. Between 1985 and 1994, several passage graves were partly excavated (Persson and Sjögren 2001). Furthermore, an excavation of a severely damaged passage grave at Frälsegården was conducted between 1999 and 2001 (Sjögren 2008, 2015a). Human remains from megalithic graves have been included in several osteological studies (Ahlström 2001, 2009; Tornberg 2018; Wilhelmson 2003). In 2010, Axelsson published his thesis discussing the visual and spatial relationships between the passage graves and the surrounding landscape.

The development of new methods, such as aDNA analysis and radiocarbon calibration analysis, and the proliferation of stable isotope studies has, along with the osteological and archaeological work, resulted in an increased knowledge of the megalithic Middle Neolithic society, concerning chronological issues, diet and subsistence, health, demography and mobility (Lidén 1995; Linderholm 2008; Malmström et al. 2019; Fornander 2011; Persson and Sjögren 1995; Rascovan et al. 2019; Sjögren 2011, 2017; Sjögren et al. 2009; Sjögren and Price 2013a, b; Skoglund et al. 2014).

Several excavations of Middle Neolithic settlements nearby some of the large passage graves in Karleby were conducted by the University of Gothenburg between 1989 and 1992, and from 2012 to 2017. These excavations are an important source to the ongoing project, Neolithic lifeways, investigating different aspects of the Middle Neolithic societies in Falbygden (Sjögren et al. 2019, 2021). Thus, the Middle Neolithic period in Falbygden may be regarded as comparatively well studied.

The gallery graves and the Late Neolithic period, on the other hand, have been studied to a much lesser extent (Algotsson 1996; Blank 2016, 2017; Stensköld 2004; Weiler 1994) and only a few studies of the Bronze Age have been carried out (Blank 2017; Blomqvist/Bägerfeldt 2009; Bergström 1980; Weiler 1994), although the period was summarized in the earlier works of Sahlström (1932, 1939, 1940) and Retzius (1899). From the investigated gallery graves a significant number of human remains have been recovered suitable for various isotope and bioarchaeological analyses. At present, however, only a couple of isotope studies have been published (Blank 2019; Blank and Knipper 2021).

2.4 Megalithic graves- a Scandinavian point of view

2.4.1 Definitions

Definitions of megalithic graves as well as the division into various types differ depending on region and researcher (e.g., Ebbesen 2007, 2011; Laporte et al. 2011; Sjögren 2003; Weiler 1994). This will of course complicate comparison and discussion of megalithic graves. Here, megalithic graves are defined as graves constructed with large boulders. Megaliths in Scandinavia are constructed with stone blocks, while chambers built of dry walling are not known. Menhirs are not common, although recent investigations of Neolithic sites in Scania have shown the existence of free-standing stones and façades (Andersson 2017a, b; Andersson and Artursson 2017; Andersson and Wallebom 2013). Standing stones are normally dated to the Iron Age, but in Västergötland several examples placed close to gallery graves have been

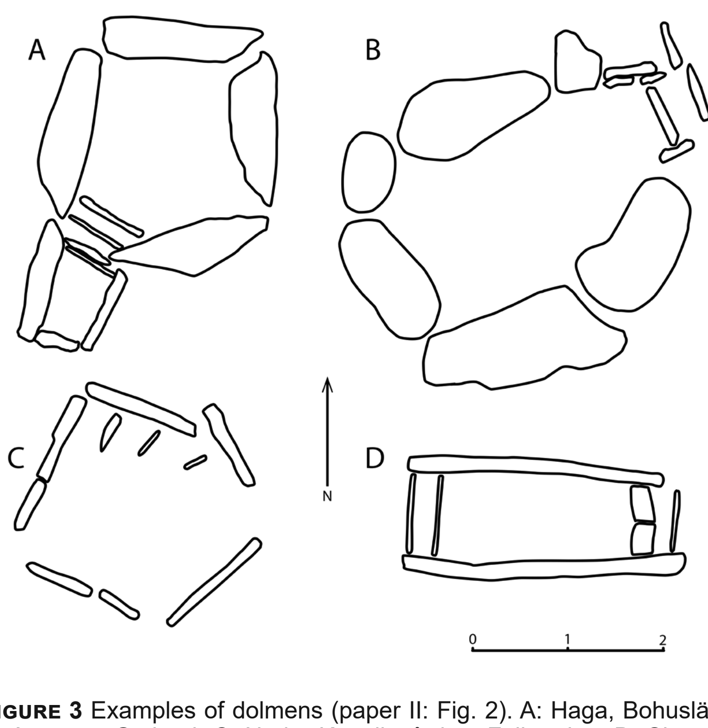


Figure 3 Examples of dolmens (paper II: Fig. 2). A: Haga, Bohuslän. B: Ansarve, Gotland. C: Nedre Kapellsgården, Falbygden. D: Slutarp, Falbygden.

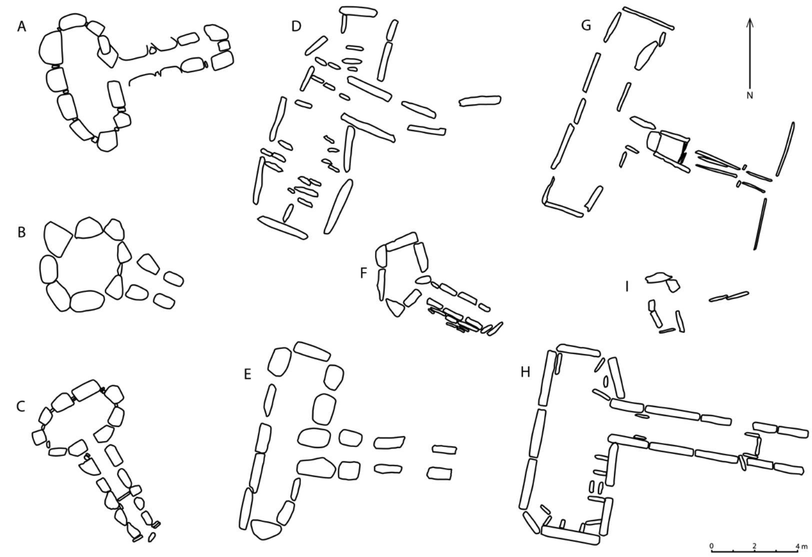


FIGURE 4 Examples of passage graves (paper II: Fig. 3). A: Carlshögen, Scania. B: Ingelstorp, Scanina. C: Mysinge, Öland. D: Rössberga, Falbygden. E: Kyrkerör, Falbygden. F: Tossene, Bohuslän. G: Firse sten, Falbygden. H: Klövagården, Falbygden. I: Landbogård, Falbygden.

noticed (Weiler 1994). The Scandinavian megalithic graves are divided into three main types: dolmens, passage graves and gallery graves.

In this study, the definitions of dolmens, passage graves and gallery graves are primarily based on Sjögren (2003). According to Sjögren (2003: 80) dolmens are defined as polygonal or rectangular chambers at most three m long, without or with a passage less than 1.5 m and with only one roof slab (Fig. 3).

Passage graves are characterized by chambers with passages longer than 1.5 m, usually perpendicular to the chamber, normally in an eastern or southeastern direction (Fig. 4). Both dolmens and passage graves are constructed above ground and are surrounded or covered by mounds or cairns (Sjögren 2003: 80).

Gallery graves are common burial structures in the Scandinavian Late Neolithic. They exhibit a variety of designs and sizes. In this study the term gallery grave encompasses the Late Neolithic graves usually referred to as hällkistor (slab cists) and stenkistor (stone cists). The term “stone cist” is also used for graves from the Bronze and Iron Ages, whereas “gallery grave” denotes graves for successive burials (Ebbesen 2007: 9). In this

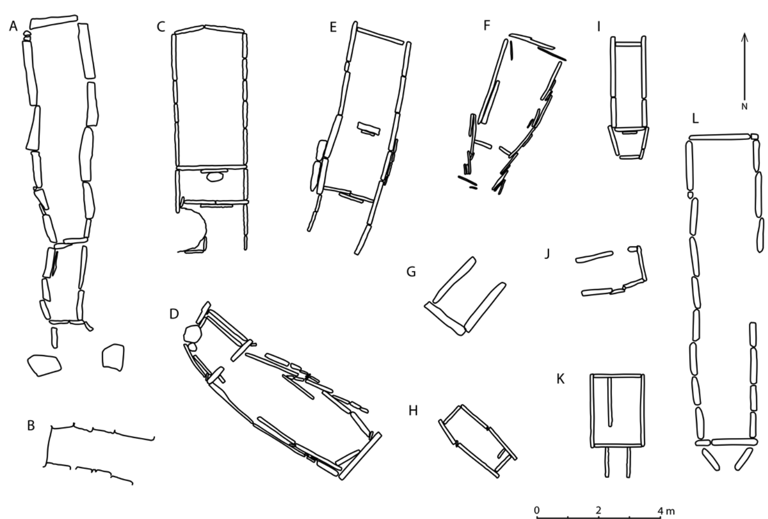


FIGURE 5 Examples of gallery graves (paper II: Fig. 4). A: Skogsbo, Västergötland. B: Ängamöllan, Scania. C: Utbogård, Falbygden. D: Helles, Kinnekulle. E: Lilla Balltorp, Falbygden. F: Fredriksberg, Falbygden. G: Ranten, Falbygden. H: Kapellgatan, Falbygden. I: Backa, Falbygden. J: Häffinds, Gotland. K: Carlsgården, Kinnekulle. L: Prästgården, Herrljunga.

study we use Weiler's (1994: 56) and Sjögren's (2003: 80) definition of gallery graves: four sided chambers of stone slabs, at least about two m long. They are recognized by construction details such as ante-chambers/passages in the gable ends, port-holes, trapezoid chambers, portal stones and multi-roomed chambers (Fig. 5). They were constructed above ground or dug into flat ground or low natural rises, usually covered or surrounded by low mounds or low cairns (Sjögren 2003: 80; Weiler 1994: 56).

The classifications of dolmens and gallery graves overlap in the two-to-three m interval, which leads to difficulties in classifying certain megalithic graves. In addition, some construction details—such as niches in chambers, dry walling, kerbstones in circles or squares around the graves/mounds and paved stone floors—occur in several of the main types of megalithic graves. However, passage grave chambers were usually divided into several niches by small slabs, while only single niche slabs appear in a few gallery graves.

2.4.2 Geographical distribution of megalithic graves

In Scandinavia we first and foremost associate the term megalithic graves with passage graves and dolmens, which usually have a more visible placement in the landscape than the gallery graves (Sjögren 2003). Most of the dolmens and passage graves occur in Denmark and northern Germany (Midgley 2008; Müller 2019). In Denmark, about 7300 dolmens, and ca. 700 passage graves are registered. In Scandinavia and the northern European plain there are about 20 000 reported megalithic graves. Müller (2019: 34) proposed that ca. 75 000 originally constructed megalithic graves occurred in this area. In Norway, on the other hand, megalithic graves are scarce with only three to four dolmens located by the Oslo fjord (Østmo 2013: 303). In Sweden, dolmens and passage graves are mainly found in the coastal areas of Bohuslän, Halland and Scania, with Falbygden being an important inland exception (Fig. 6). Only a few dolmens and passage graves are known from the eastern regions: one, possibly two, on Gotland, four in a restricted cluster on Öland, one in Östergötland and one in Västmanland (Hallgren 2008: 110; Sjögren 2003; Tilley 1999). Of the more than 600 known dolmens and passage graves in Sweden, 253 passage graves and four dolmens are found in the 50 X 30 km area of Falbygden. Furthermore, about 80 megalithic graves of unknown type have been registered there (Persson and Sjögren 2001: 6). TRB occupation has been recognized by stray finds, settlements and pollen studies between these regions, where no dolmens or passage graves are known.

In contrast to passage graves and dolmens, which only occur in certain areas, gallery graves are more extensively spread within the middle and southern Swedish landscape. A large majority of the known Scandinavian gallery graves, at least 2000, are located in Sweden while only about 20 are known from Norway (Østmo 2011). The numbers of identified gallery graves in Denmark slightly vary between researchers (Ebbesen 2007: Fig. 19; Lomborg 1973: Fig. 75; Müller and Vandkilde 2020: Fig. 2.7). According to Ebbesen (2007), 119 gallery graves have been found in Denmark, mostly concentrated to Zealand and northern Jutland. There are other Late Neolithic graves constructed by stone slabs in Denmark. These stone cists are closed and interpreted to have been constructed for single burials. They are concentrated to the western Limfjord area. According to Fund og fortidsminder (https://www.kulturarv.dk/fundogfortidsminder/) 330 Late Neolithic stone cists (including the gallery graves) are registered in Denmark. In Sweden, they are distributed all over the southern regions, with a high density in parts of Småland and Västergötland (Fig. 7). Only a couple of graves have been identified in the more northern landscapes of Västerbotten, Medelpad and Ångermanland. The rather modest number of gallery

FIGURE 6 Map of the regions and distribution of dolmens (red dots) and passage graves (green dots) in Sweden. Data from Kulturmiljöregistret (Historic Environment Record)- Riksantikvarieämbetet (https://app.raa.se/open/fornsok/). 1: lake Vänern, 2: lake Vättern.

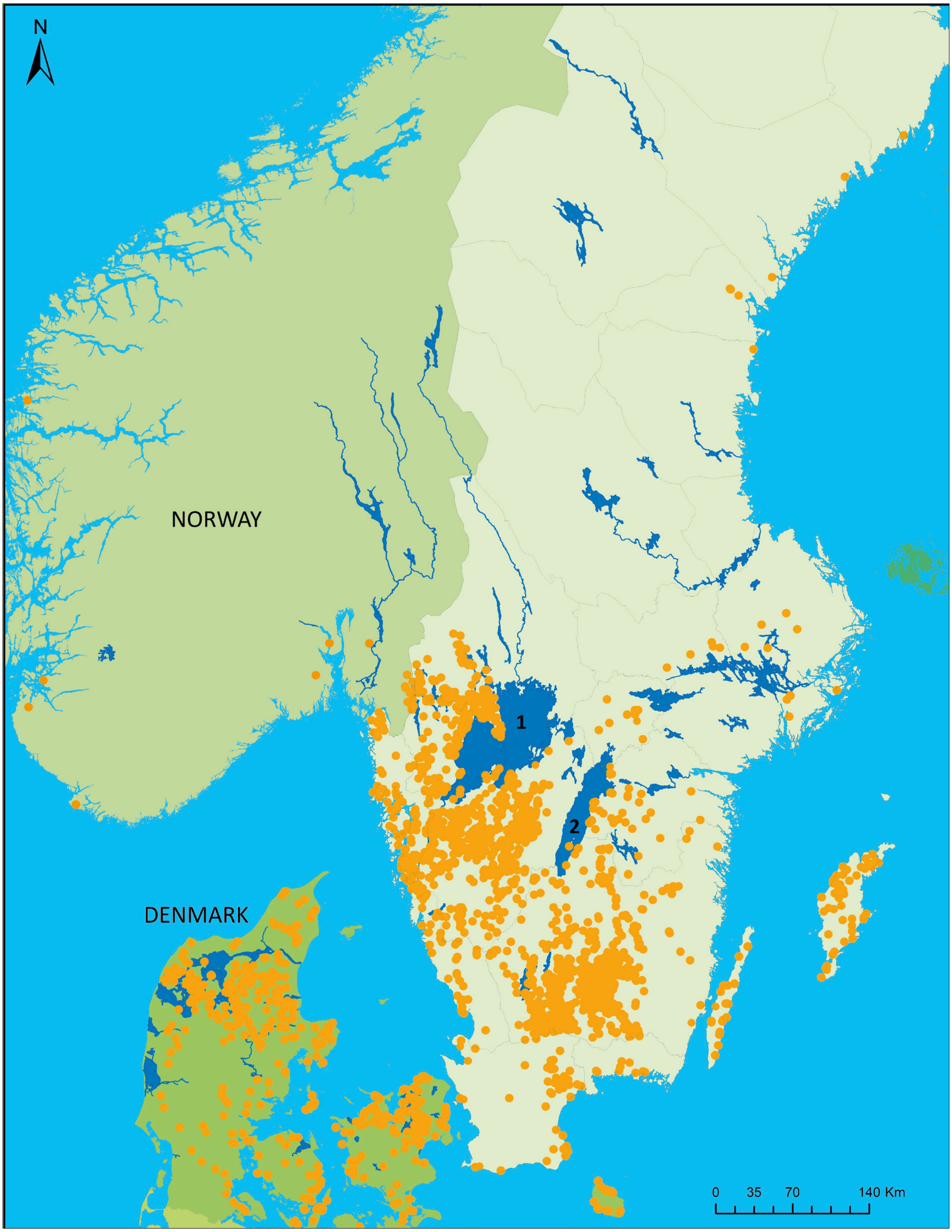


Figure 7 Distribution of gallery graves in Sweden, Norway and Denmark (yellow dots). 1: lake Vänern, 2: lake Vättern. Data from Kulturmiljöregistret, Fund og fortidsminder and Unimus (https://www.uib.no/universitetsmuseet/66541/unimusno). The Danish gallery graves also include the Late Neolithic stone cists, and the Middle Neolithic Musse and Bøstrup cists.

graves in Scania might be explained by Bronze Age mounds covering some of the gallery graves, although later grave constructions covering gallery graves are also suspected in other parts of the country. In Falbygden about 125 gallery graves have been identified (Blank 2016: Table 1; Sjögren 2003: 81), and some of the unclassified megalithic graves are likely to be gallery graves.

In many regions, including Falbygden, many gallery graves, as well as other types of megalithic graves, have been destroyed by construction and agriculture (Andersson et al. 2016; Apel 2001; Sjögren 2003). Recently, several megalithic graves have been indirectly documented by the identification of deposits and other features that persist, even after the stone slabs are removed (Andersson 2017a, b; Andersson and Artursson 2017; Andersson and Wallebom 2013). In Falbygden the distribution of isolated flint daggers or flint dagger caches might indicate removed gallery graves. They might even indicate destroyed Late Neolithic flat graves, although these have not yet been verified as present in the Falbygden area.

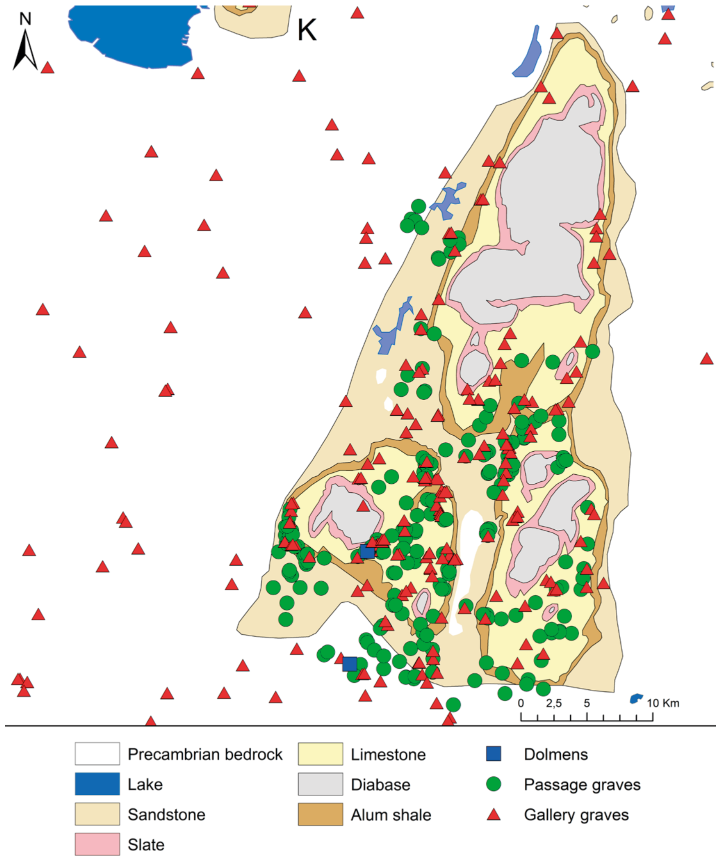


Figure 8 Distribution of megalithic graves in Falbygden, with classifications according to Kulturmiljöregistret. K: Kinnekulle.

The passage graves and dolmens in Falbygden are concentrated in clusters and lines, often placed near low ridges in the intermediate level of the landscape. The gallery graves are located close to the earlier megalithic graves, but also tend to have a greater topographic dispersal and are more often found on slopes and ledges (Sjögren 2003: 264, 268; Fig. 8). Sahlström (1935) presented the idea that the passage graves were placed along roads. Sjögren (2003: 344) on the other hand has proposed that physical landscape characteristics best predict the location of passage graves, which appear to form lines along the edges of the limestone plateaus where the conditions for settlement were favourable (see above).

2.4.3 Regional traits

The Scandinavian megalithic graves share many similarities but are also characterized by regional traits. The passage graves in Falbygden are rather homogenous with rectangular chambers and often symmetrically placed passages (Sjögren 2003: 18). They are more similar to megalithic graves in Halland and Scania than to the graves in Bohuslän and Jutland. Compared to Bohuslän the passage grave chambers are generally larger in Falbygden, where some of the largest chambers in Scandinavia can be found (Sjögren 2003: 18).

The Danish gallery graves, like the Scanian and east Swedish graves, are generally two to three

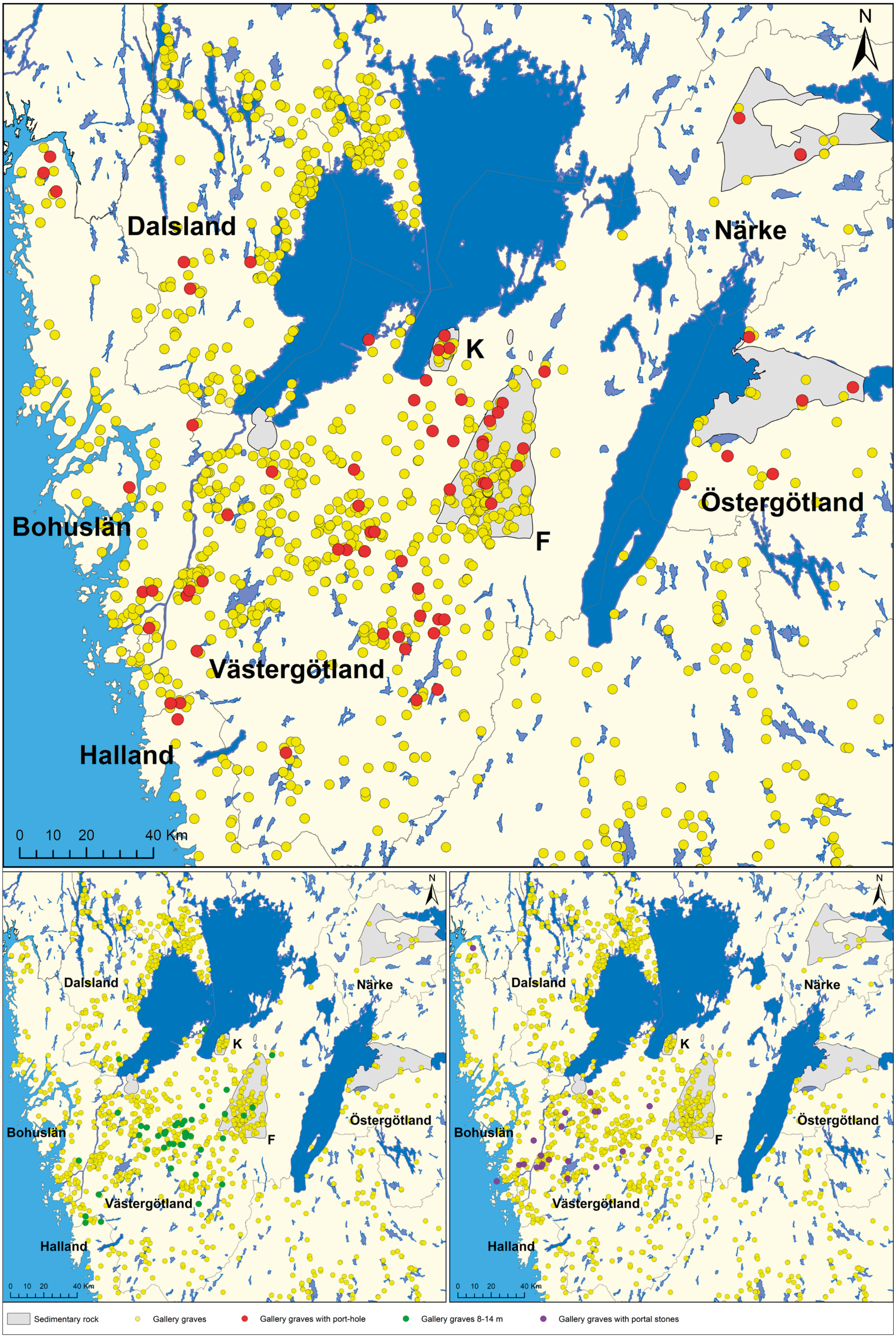


FIGURE 9 Distribution of large gallery graves, gallery graves with portal stones and gallery graves with port-holes.

m long while most of the graves in southwestern Sweden are between five and seven m long (Ebbesen 2007; Weiler 1994: 56). Furthermore, large gallery graves measuring eight to 14 m are restricted to southwestern Sweden with, concentrations in central Västergötland. The large southwestern Swedish gallery graves have often been described as a local phenomenon, more similar to passage graves than to the smaller single-roomed gallery graves with fewer burials, as found in Scania and Denmark (Anderbjörk 1932; Ebbesen 2007; Weiler 1994). Resemblances between the southwestern gallery graves and the early Danish Bøstrup cists in northern Jutland, and similarities between the smaller gallery graves in Scania and eastern Denmark have also been pointed out (Ebbesen 1985; Forssander 1936; Iversen 2015). The Swedish gallery graves have been proposed to culturally be derived from the Danish gallery grave tradition, which in turn has been interpreted as a continuation of the earlier individual SGC wooden coffins or as a locally new tradition influenced by Western Europe (Anderbjörk 1932: 27; Forssander 1936: 108,142,145; Iversen 2015: 124; Lomborg 1973: 121).

Architectural similarities between the southwestern Swedish gallery graves and the allées couvertes/sépulcrales of northwestern France and the Paris basin, Seine-Oise-Marne (SOM) culture and Wartberg culture galeriegräber in Westphalia and Hesse, have long been recognized (Janson 1938; Johansson 1961; Kaelas 1967). Large gallery graves above and below ground, port-holes and openings at the long side are some of the common features.

In Scandinavia, port-hole gallery graves occur exclusively in a belt from northern Halland and Bohuslän, on the west coast, across Dalsland and Västergötland, into Östergötland and Närke. Only a few occur in Östergötland and Närke, while the majority are found in Västergötland (Fig. 9). Most of the multi-roomed gallery graves as well as the gallery graves with portal stones are found in the same areas as the port-hole graves.

2.4.4 Problems addressed in megalithic research

Megalithic graves and other megalithic structures are known from all over the world and appear in many different regions, cultures and time periods (e.g., Andersen 1997; Bloch 1982, 1994; Ebbesen 2007; Furholt and Müller 2011; Hoskins 1986; Hutton 1921; Joussaume 1985; Midgley 2008; Montelius 1905; Parker Pearson 1992; Sjögren 2003; Weiler 1994; Wunderlich 2019a, b; Wunderlich et al. 2021). In Europe, megalithic graves are dated to the Neolithic and Copper Age (e.g., Montelius 1905; Scarre 2007; Scarre et al. 2008; Schulz Paulsson 2017; Sjögren 2003; Soulier 1998).

One of the key issues debated in research on megalithic graves is the emergence and spread of the megalithic phenomenon. Other recurrent questions are, who constructed these graves, for whom were they intended, how were they built, what do they represent, and which mortuary practices were present. In this thesis these topics are going to be touched upon, from a Falbygden perspective, and at a slightly wider scale, from a Swedish viewpoint. My focus is ultimately on the people using these graves, while less attention is given the megalithic graves per se.

2.4.5 The emergence and spread of megalithic graves

The idea of a single source of megalithic graves was prevalent until the 1970's. The idea was combined with diffusion theories based on the typology of the different graves. According to Montelius (1905), the megalithic graves originated from the Orient and spread through ideas rather than migration movements. Childe (1925, 1950) on the other hand, suggested that the megalithic graves spread by missionaries or prospectors who settled along the coasts over the sea route. Daniel (1960) proposed that the spread occurred by migration, specifically tied to prospection for copper ore. Clark (1977) suggested that the megalithic graves were spread by seafaring people on the pursuit of fish.

Montelius (1905) claimed that the concept of port-hole gallery graves was brought in from Britain to the Swedish west coast, spreading along the Göta river estuary and further into Västergötland by waterways. Other suggestions of the origin of the large gallery graves and the graves with port-holes in Västergötland have been northern France, Belgium and central Germany (Janson 1938; Johansson 1961; Kaelas 1967). Kaelas (1967) stressed the resemblances between the Västergötland gallery graves and the allées sépulcrales dug into the ground from the Paris Basin and to the graves above ground in Brittany. She suggested immigrations of small groups from these areas with different building traditions into Västergötland, which resulted in the observed grave variation.

Questions concerning the origin of gallery graves, as well as whether they are a continuation of the first wave of megalithic tradition in Scandinavia or a later independent phenomenon, are still unresolved (Anderbjörk 1932; Ebbesen 1985; Forssander 1936; Iversen 2015; Jansson 1938; Johansson 1961; Montelius 1905). Furthermore, there is no consensus on the internal chronology of the graves defined as gallery graves or stone cists, although several attempts have been made (Anderbjörk 1932; Forssander 1936; Jansson 1938; Johansson 1961; Montelius 1905; Nordman 1935).

From the beginning of the 1970's, when radiocarbon dating became more widespread and processualist theories of cultures adapting to social and natural environments became influential, independent regional developments of megalithic graves became the predominant explanation. Renfrew (1973) suggested four or five possible core areas in Europe with independent developments of megalithic graves, based on radiocarbon dates and grave typology. The social significance of the emergence of megalithic graves was a key research focus, as population migrations were not considered plausible or likely. According to Renfrew (1973, 1976), the megalithic graves emerged as territorial markers in times of increased population pressure within Early Neolithic segmentary societies. Fleming (1973) proposed that the megalithic graves functioned as a means to uphold the social organization and the power and status of leaders. Chapman (1981) suggested that megalithic graves corresponded to lineage groups and appeared in periods of imbalance between society and resources.

Hodder (1984) suggested that the background of megalithic graves can be found in older Neolithic contexts in Central Europe. He emphasized the similarities between house constructions and long barrows. Bradley (1996) stressed the megalithic graves as metaphors for houses and proposed that the introduction of these graves marked a new way of relating to ancestors. Tilley (1994, 1996) emphasized the megalithic graves as part of a symbolic and ideological system. He suggested that the megalithic graves arose in societies characterized by social competition. Furthermore, he claimed that the passage graves in Falbygden symbolized the surrounding table mountains (ibid).

Kristiansen defined the megalithic societies in Scandinavia as territorial chiefdoms (1984). According to Randsborg (1975), megalithic graves are constructed in the more densely populated areas with more hierarchical social organization than that found in the less densely populated areas.

The relation between monuments and memory has been an influential theme in megalithic research. By accentuating megalithic graves as monuments and memories of the ancestors, the emergence of these graves has been associated with a new way of relating to time (e.g., Bradley 1998; Tilley 1996). According to Tilley (1996), access to the interior of the megalithic graves can be transformed into ideological legitimacy of social authority in a society where the identity of the individual is directly connected to the ancestors.

Strategies of control over the landscape through the manifestation of ancestral links is a recurring idea in the discussion of use and reuse of megalithic graves (e.g., Bradley 2002; Hingley 1996; Holtorf 1998; Olausson 2014; Thomas 1996; Tilley 1996). Gosden and Lock (1998: 4 ff.) have discussed social memory based on the coexistence of genealogical and mythical history; the genealogical history is linked to the past through known ancestors and goes back a few generations, while the mythical history can go back several centuries and involves a recreation of the past where the landscape and monuments may play a significant role. A continuous use of a monument/megalithic grave is often associated with genealogical history whereas reuse links to mythical history (Gosden and Lock 1998). This implies that the memory of mythical ancestors can be socially produced, even though no genealogical relations exist. Those who establish the connection between older graves and expressions of mythological ancestry can be understood to have legitimized their local political power or strengthened local group identity (Arwill-Nordbladh 2013; Tilley 1994). According to Tilley (1994) and Bradley (2002), the reuse of megalithic graves can be explained as the legitimation and control of locations by manifesting an ancestral link with past dwellers. New political authority defends its future by reinventing tradition (Hobsbawm 1983), claiming genealogical ties with long-gone ancestral groups by commemorating them (Whitley 1995). In this way, the reuse and rebuilding of megalithic graves, the covering of Late Neolithic gallery graves by Early Bronze Age mounds and the second wave of megalithic building in the Late Neolithic can be better understood. Furthermore, the abandonment and destruction of monuments have been debated in terms of social memory as "remembering by forgetting" (Bradley 2002; Leclerc and Masset 1980).

Social significance of megalithic graves and the revival of ethnographic parallels are also notable in current megalithic research (Jeunesse and Denaire 2018; Parker Pearson and Regnier 2018; Wunderlich 2019a, b, 2020). Megalithic graves are a result of collective activities. The social processes of megalithic building in bringing people together—aggregation being required to mobilise the necessary labour—is also discussed in archaeological research (e.g., Artursson et al. 2016; Cummings and Richards 2015: 51; Sjögren 2020). In Indonesia the mobilisation of labour for constructing megalithic graves is described as a competition for personal prestige (Hoskins 1986). Furholt and Müller (2011) suggest that the building of megalithic structures involves collective activities that create a deeper shared identity. The construction of megaliths and monuments have been interpreted as an important aspect to create stable communities in growing populations (see above). It has also been claimed to be an important aspect of creating political power in low population density societies (Artursson et al. 2016). Considering ethnographic examples, the building of megalithic graves and structures occurs in societies ranging from relatively egalitarian to highly hierarchical (e.g., Bloch 1982; Hoskin 1984; Jamir 2019; Jeunesse 2016; Wunderlich et al. 2021). According to Wunderlich et al. (2021) megalithic building has filled different functions in different communities. Wunderlich (2020, 2019a) concludes in her study of megalithic populations in northern India and Indonesia, that the erection of megalithic monuments is a suitable strategy to establish and uphold social networks and social ties within and between groups and that megalith building serves as a materialization of a collective and individual memory. She highlights the feasting activities connected to the construction of megaliths and how competition for social prestige is practiced through feasting activities, yet, at the same time, how feasting activities serve as a redistribution of wealth.

The comparative aspect of the two megalithic phases touched on in this thesis—the Middle Neolithic and the Late Neolithic—may be seen as valuable, in light of the ongoing debate regarding social organization and economy in megalithic societies. Do the social organization and economy appear similar in the Middle and Late Neolithic societies that built and used the megalithic graves in Falbygden (paper IV and V)? Can the ethnographic examples be fruitful for understanding the megalithic populations of Falbygden?

The emergence and spread of megalithic graves are still widely debated. The recent refinement of radiocarbon methodology has resulted in several studies of the introduction and initial use of megalithic graves in different regions (Müller 1998; Persson and Sjögren 1995; Scarre 2010; Schulz Paulsson 2010, 2017; Sjögren 2011). Instead of a gradual process of emergence of megalithic graves in Europe, Scarre (2010) proposed a more dynamic model of regional developments of primary use, continuous use and reuse of these graves. He also emphasizes social practices, mortuary beliefs and interregional connections for the emergence of what he suggests are rather tightly defined phases of constructing megalithic graves. Müller (1998) proposed two or three centres of origin for European megaliths: Northwest France, the Western Iberian Peninsula and possibly Ireland with passage graves and dolmens in these specific regions from 5000 BC onwards, based on radiocarbon dates. Laporte (2011, 2012, 2015) stressed the variation and diversity of megalithic graves and advocated two independent developments of megalithic graves in France, based on grave morphology and radiocarbon dates. Schulz Paulsson (2017) suggested that the origin of European megaliths is found in northwestern France, from which they spread by sea to other regions by migrations or transfer of ideas.

Many of the megalithic graves are multi-phased structures which were rebuilt and reused over several centuries (Bailey 2007; Laporte 2011, 2012; Salanova et al. 2011, 2017; Scarre 2010; Schulz Paulsson 2017). This, of course, complicates the possibility of dating the original construction and earliest phase of use. The practice of clearing out earlier burials has also been stressed by researchers, highlighting a particularly challenging issue in trying to date the initial use of a megalithic grave (Aranda Jiménez et al. 2020; Blank 2016; Chambon 2003; Persson and Sjögren 2001; Strömberg 1971b).

In addition, new interest in migration movements have appeared in the wake of the developments of Sr isotope and aDNA analysis. For example, according to aDNA data, migration was an important factor for the spread of the TRB complex and agriculture into Scandinavia (e.g., Linderholm 2008; Malmström et al. 2015; Skoglund et al. 2012, 2014). Furthermore, the appearance of Corded Ware groups (SGC and BAC) in Scandinavia was part of the population expansion that swept across the European continent in the 3rd millennium BC, resulting in various degrees of genetic replacement and admixture processes with previous Neolithic populations (Egfjord et al. 2021; Allentoft et al. 2015; Haak et al. 2015; Malmström et al. 2019).

2.4.6 Who was buried here?

There is still no consensus about who was buried in these graves. This question is related to the social organization of the groups constructing and using them (see above).

In Falbygden inhumations of up to 130 individuals in one passage grave (Ahlström 2009) and up to 80 in one gallery grave (Lennblad 2015; Retzius 1899) have been confirmed. In some of the megalithic graves only a few individuals have been found, although bones from between 20 and 60 individuals are common (Appendix 2). Men and women of all ages have been buried in the megalithic graves and the mix of ages and sex corresponds to a cross-section of a population. However, the burials in megalithic graves only represent a part of the expected population (Ahlström 2009; Sjögren 2003: 225-233).

Sjöbeck (1951) suggested that Falbygden was an important ritual centre where people from the surrounding areas came to bury some of their dead. Thus, the social groups were spread over larger geographical areas in southwestern Sweden and attached to certain megalithic graves. This hypothesis is partly rejected by Sjögren (2003: 220; Sjögren et al. 2009). Furthermore, the theory is unlikely at least concerning the gallery graves, as these are found in most parts of inland southern Sweden.

Sjögren (2003: 232) proposed that a segment of the population—perhaps of a certain social rank and/or from certain lineages or other corporate groups—were buried in the megalithic graves, or that the same group used several graves at the same time. Tilley (1996) suggested that one group built a series of graves over a limited period. In such a case, the total population of a local group may be buried in a cluster of graves. In this interpretation, lineage groups in Falbygden would have competed with each other in successively building larger and larger graves. This would, according to Tilley (1996), explain why both small and large graves are included in the same grave group. According to Ahlström (2009: 135-137), a number of families most probably joined together in the construction and use of the Falbygden passage graves.

Considering the Late Neolithic gallery graves, it has been proposed that they were intended for the ruling elite (Artursson 2009; Andersson 2001: 8). Others (Holm et al. 1997; Weiler 1994) regard gallery graves as family graves for the local population. In a recent study of the Early Bronze Age in Scania, Bergerbrant et al. (2017) argue that commoners were deposited in gallery graves and flat graves while elites were buried in mounds.

The application of Sr isotope and aDNA analyses has allowed new approaches to this topic. For example, whether the buried individual spent their childhood in the vicinity of the graves or not has been studied, and whether kinship between individuals in the same grave or in different graves occur has been discussed (e.g., Alt et al. 2016; Cassidy et al. 2020; Fraser 2018; Sánchez-Quinto et al. 2019; Sjögren et al. 2009). I attempt to approach the question of who they were by applying isotope and aDNA analysis and evaluate possible changes over time (paper IV).

That only part of the population is supposed to have been buried in megalithic graves in Falbygden has implications for my thesis, as these individuals may not be representative for the whole population. Therefore, it is important to clarify that this work deals with the part of the population that was deposited in megalithic graves.

2.4.7 Mortuary practices

The treatment of the dead deposited in megalithic graves varies in time and between regions. In some places megalithic graves contained primary burials and in other areas they were part of complex and sometimes lengthy burial practices (Bloch 1988; Chambon 2003; Jeunesse et Denaire 2018). The number of burials differ, and in some regions and periods, cremation was prevalent while in other areas inhumation was the predominant practice (e.g., Ahlström 2009; Chambon 2003; Hoskins 1986; Joussaume 1985; Midgley 2008; Parker Pearson and Regnier 2018; Thomas 1990).

In Scandinavia, the burial practices in megalithic graves have been the subject of a long-lasting debate. Here, megaliths have been suggested to have functioned as ossuaries where skeletonised remains were deposited, and arrangement of bones was practiced (Bruzelius 1822; Hildebrand 1864; Midgley 2008; Shanks and Tilley 1982; Stensköld 2004). Other researchers have argued that the megaliths predominantly were used for primary burials (Ahlström 2009; Lindqvist 1911; Sjögren 2003; Strömberg 1971a; Weiler 1994). The primary burials have then been submitted to manipulations in order to leave room for new burials, such as moving, rearranging and possibly emptying the graves, resulting in commingled and often fragmented human remains (Ahlström 2009; Sjögren 2003; Strömberg 1971a; Weiler 1994). Ahlström (2009: 49) argued that taphonomic loss had been misinterpreted as cultural behaviour, a mistake that led to incorrect hypotheses about ossuaries. Furthermore, articulated and partly articulated skeletons are known from excavations of both gallery and passage graves (ibid.).

According to the most recent research, the megalithic graves in Sweden were mainly used for successive inhumations of whole bodies, although cremations sometimes occurred and some variation of the treatment of dead bodies have been proposed (Ahlström 2009; Hollund et al. 2018; Sjögren 2015a, b; Strömberg 1968; Tornberg 2018; Weiler 1994). Recent osteological studies have shown that the bone assemblies also include small bone elements, which points to successive primary burials (Ahlström 2009; Gejvall 1963; Weiler 1977). Furthermore, indications of greater disarticulation of the oldest bones within the passage graves have also been observed (Sjögren 2015a). Several examples of gallery graves with commingled skeletons where the skeletons in the top layer were found more or less articulated in supine positions have been documented (Ebbesen 2007: 31; Fagerlund and Hamilton 1995: 74; Gejvall 1963: Fig. 1). Even though the radiocarbon dates of these skeletons are not accurate enough, it is reasonable to assume that they represent the latest burials in these graves. However, in the Danish Kyndeløse passage grave and Klokkehøj dolmen articulated skeletons were not the latest burials according to radiocarbon dating (Frei et al. 2019; Thorsen 1981).

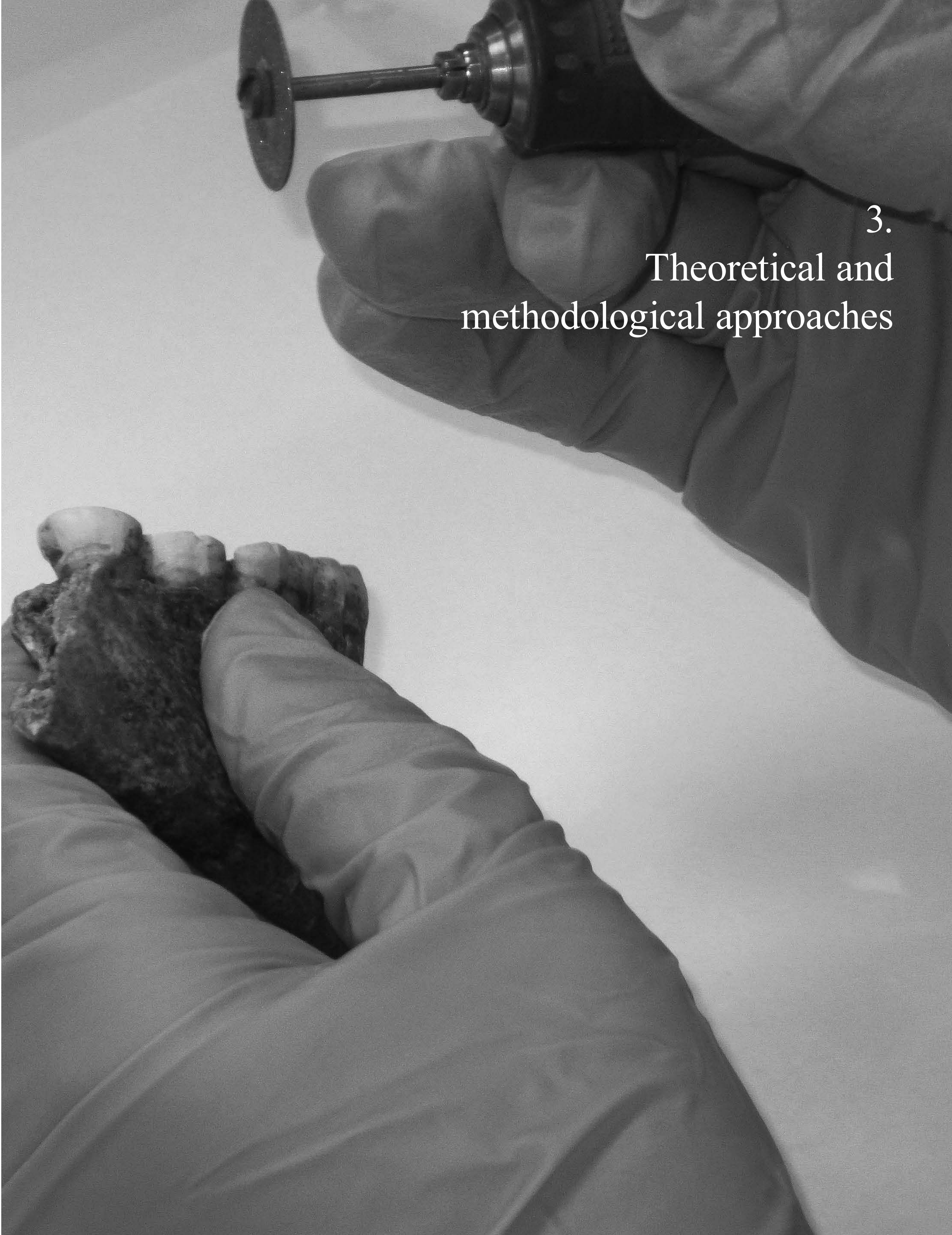
Temporal change and regional variation in burial practices have both been noted in megalithic graves (Hollund et al. 2018; Sjögren 2015a). Cremated and burnt bones in passage graves and gallery graves are traditionally interpreted as later depositions. However, there are examples of cremations from Scania which seem to be related to the Neolithic period (Burenhult 1973: 103; Kaelas 1967: 289, 305; Persson and Sjögren 2001: 219-222; Strömberg 1968, 1971a). Burnt human bones are also found in several passage graves and gallery graves in Falbygden (Blank 2016; Sjögren 2015b; Weiler 1994).

In this thesis the treatment of the dead deposited in the megalithic graves in Falbygden is addressed and compared between the different periods and grave types.

2.5 To sum up

This thesis is set in a broad time frame of significant social and cultural transformations, where broadly similar but still regionally distinct manifestations prevailed. Exchange networks related to different materials and the construction of megalithic graves appear in what seems to be two different waves. Falbygden has proved to be an important area for research of the megalithic phenomenon, because of the geological characteristics and the significant number of megalith graves. The limestone rich bedrock in Falbygden has provided a large collection of well-preserved human remains. Here, the area's delimited sedimentary geology is also particularly favourable for mobility studies based on isotopic analyses. This thesis intends to fill gaps in our knowledge about the Late Neolithic and Early Bronze Age megalithic populations. The previous research in this area contributes with dense datasets from the Middle Neolithic period, further enabling comparative analyses of different aspects of the Neolithic and Early Bronze societies. Furthermore, as shown above, many questions concerning the megalithic phenomenon remain unanswered, and hopefully, the work presented in this thesis can contribute to the megalithic research on a more general level.

3. Theoretical and methodological approaches



Enamel sampling of multiple molar teeth at the Danish Center for Isotope Geology, University of Copenhagen.
Photo by Sophie Bergerbrant, graphics by Richard Blank.

3.1 Introduction

My intention is to present probabilities and to exclude improbabilities by applying an interdisciplinary approach. I believe in the accumulation of different kinds of data sets within an archaeological framework, in order to arrive at plausible scenarios of the past and to exclude less probable interpretations. At present, most researchers agree that a more integrated archaeological approach, where settlement and burial contexts, along with wider environmental conditions, must be considered in addressing different aspects of prehistoric communities. In Falbygden we lack Late Neolithic settlements. The archaeological record is limited to megalithic graves and stray finds. Therefore, my study primarily studies traces from the megalithic graves to investigate the Neolithic and Early Bronze Age societies in Falbygden.

3.2 Theoretical considerations

3.2.1 Introduction

Different theoretical perspectives were touched upon in the background chapter and are here mainly discussed regarding burial archaeology. My objective is not to affirm a particular theory in which the answers are already given. Instead, this study emphasizes empirical data and considers various explanatory models through a combination of different methods. This does not mean that I believe in a totally independent and objective knowledge. I consider knowledge and interpretations of the past to be historically situated (Shanks and Tilley 1982) and that my research is influenced by my preconceptions.

In this section, I consider the challenges and potentials of working with archaeological source material, from a theoretical and methodological perspective.

3.2.2 Archaeology and ethnography

The appropriateness of ethnographic analogies in archaeological interpretation has been up for debate over the years, although their use is deeply rooted in the discipline (e.g., Chapman 1987; Hodder 1978; Orme 1974; Sahlins 1974; Ucko 1969). Ethnographic examples have been important for investigating and debating pottery production, the construction of megalithic monuments, husbandry, farming and hunting strategies and ritual practices in prehistoric societies. According to Currie (2016) the use of comparative data from anthropology to reconstruct past human societies is a legitimate method. However, several scholars have pointed out that similar stimuli do not always produce similar responses, and prehistoric societies do not necessarily have ethnographic comparisons (Crawford 1982; Fahlander 2004; Orme 1974; Ucko 1969). For example, Ucko (1969) identified diverse ethnographic examples that contradicted those ethnographic analogies used by archaeologists at the time (see Graves as an archaeological source). Archaeologists can fall into the trap of using the same ethnographic examples, instead of embracing the multitude of available cases. Some anthropological studies often referred to have later been criticized for putting forward misinterpretations or simplifications (e.g., Bhabha 1994; Gellner 1995; Leach 1989; Mosko 2017). Analogies must be used with caution, if used at all (Ascher 1961; London 2000; Tilley 1996). These arguments are important to bear in mind when dealing with Neolithic and Early Bronze Age burial practices and megalithic graves. I believe that ethnographic parallels can provoke questions and broaden our horizons but not provide answers (Binford 1967; Crawford 1982; Fahlander 2004; Hayter 1994). In my opinion ethnographic examples are an important source for understanding the variety of human behaviour and cultures. In this thesis ethnographic examples are used to discuss different possible interpretations. In the following text the ethnographic influences on archaeology are apparent.

3.2.3 Culture and society

The concept of culture has been debated, defined and used in many ways, in different times and in various disciplines (Eriksen 2000). In the archaeological discipline culture has been used, among other ways, for defining sets of material remains. The relationships between people and material have long been questioned and debated. The use of archaeological cultural groups is based on simplifications and generalizations. At the very least, these cultural complexes do not correspond to closed groups of people or biological populations (e.g., Eriksen 2000; Furholt 2019). Nevertheless, we need to categorize and generalize to be able to communicate, and therefore, archaeologically defined cultural groups are used in this work.

Humans are social beings and social relations are necessary for the survival of the individual and for the group. Thus, social networks and mobility are significant in all societies. In this thesis I use the term social organization as the systematic regulation of social relations within a social system. Social structure refers to the pattern of social relationships in a society. Like Giddens (1987), I believe that social life is both dynamic and ordered. Furthermore, structure is not something which exists outside of the individual, but patterns of unconscious and conscious practices. Structures are internal and internalized, but they are constructed in a social context. As practices change so does structure, and the other way around (Giddens 1987). Post-processualism has emphasized the importance of material culture as both functional and symbolic, as well as its role for the formation of social structures and social practices (e.g., Fahlander and Oestigaard 2008; Hodder 1984; Latour 1993). Material culture also includes landscapes, bodies (dead and alive) and grave monuments (e.g., Fahlander 2003; Latour 1993; Sofaer 2006; Tilley 1994). However, as pointed out by Nilsson Stutz (2008), the human body is not only a social and cultural product but also a biological reality. Death does not only result in the loss of a community member and a new ancestor but also in a dead body to deal with (cf. Nilsson Stutz 2003).

3.2.4 Mortuary practices, burial practices, and rituals

Burial practices, unlike mortuary practices, are directly related to the burial. Mortuary practices, according to Chapman (1987: 198), are a set of cultural practices involving an individual, from around the time of their dying or death, persisting sometime after, in some cultural contexts, up to several years. In many cultures the perception of death is as a long and transformative process, reflected and practically constructed by prolonged mortuary practices involving a number of stages (Bloch 1988; Dournes 1975; Hertz 1960/1907; Hutton 1921). This has also been treated in van Genneps influential work ”Les rites de passage”, first published in 1909 (van Gennep 1960), where the ritual is separated into three different phases: separation from society, a period of liminality, and reintegration into the society with a new status. According to van Gennep (1960), these transformative passage rites are important in all kinds of societies and include various events in the life cycle such as birth, entering adulthood and death.

My focus is on the living society and their practices, including the treatment of the dead. However, religion and concepts of the afterlife are not addressed. The concept of ritual is of less importance in this thesis and is therefore not elaborated on. Leach (1968) defines ritual as an aspect of culturally standardized practices. In this thesis the term ritual simply refers to a practice with a common idea which is re-enacted recurrently.

3.2.5 Graves as an archaeological source

This thesis deals with burial contexts associated with megalithic graves. Megalithic graves are distinct constructions, when still standing, where human remains were deposited along with artefacts (some which have been preserved) and sometimes animal remains.

Megalithic graves are the only confirmed burial sites in Falbygden dating to the Neolithic. A few wetland deposits are known. Some possible flat graves have been reported (see 2.3). Prehistoric burials may have included practices that do not always leave obvious archaeological traces, such as open-air burials, cremations spread in different places and depositions of human remains in settlement contexts. All these mortuary practices can be found in ethnographic examples and are important sources for expanding our perceptions of prehistoric societies (Kroeber 1927; Ucko 1969). We need to consider the possibility of other ways of burying people not yet found or not traceable in the archaeological record. However, this study only covers the part of the population that was deposited in megalithic graves.

Megalithic graves often contain successive burials of several individuals and these graves have been subjected to extensive reuse in prehistoric, historic and modern times (see above). Thus, the graves cannot be considered as closed contexts, and later activities are not always linked to mortuary practices. In most cases, as the bones mostly are commingled, distinct stratigraphy and artefacts belonging to specific individuals are difficult to identify. All these aspects must be considered when the bones and artefacts in the graves are studied.

The focus of interest within the research of prehistoric graves has varied over time and there is an ongoing debate in archaeology about what burial contexts actually can tell us (e.g., Binford 1972; Fahlander 2009; Nilsson Stutz 2016; O'Shea 1984; Parker Pearson 1999). Studies of burials have been used to trace cultural belonging, social stratification, cosmology and practices related to death. Grave constructions, artefacts, position in and of the graves, and the treatment of dead bodies are notions that have been used to interpret the buried individuals in the graves, different aspects of the societies and beliefs concerning the afterlife. Kroeber argued that burial practices changed independently of social structure and belief (1927: 308-315). Artelius (2000: 27) suggested that burial is a synthesis of all beliefs about death and life. Furthermore, it is important to keep the practical aspects of mortuary practices in mind. In my opinion, it is possible to gain insights into the everyday life of the living societies by studying prehistoric burials, although this must be done with an open mind.

Discussions about social differentiation and hierarchical structures are often based on burial archaeology. The degree of elaborated grave constructions, the investment of labour or variation of artefact material and/or different treatments of the body are considered to reflect differentiation in wealth or power. Saxe and Binford argued that the burials reflect the general social organisation of the living (Binford 1971, 1972). They based their work on ethnographic data and argued that the grave goods as well as other aspects of the grave reflected the buried individual's social identity as well as the social organisation of the living society (Binford 1972: 232-233). The Binford – Saxe approach used categories such as age, sex, social affiliation and social position when interpreting the grave material. However, in ethnographic research it has been argued that the social differentiations observed in the graves do not necessarily reflect the social position of the living (Ucko 1969; Leach 1979). Ucko (1969) questioned the relationship between the variability in graves and social organization, and how we can separate a poor grave from a rich grave. Bloch (1982: 218) and Shanks and Tilley (1982) even argued for the opposite: that burial practices could be used by elites to mask inequalities in societies.

Different types of grave constructions and how much effort was put in the grave and how large work force can be amassed, are in some cultures related to the status of the dead (Jeunesse and Denaire 2018). In the research on the Late Neolithic and Early Bronze Age periods, the variations in burial types and different placements in the grave constructions have commonly been interpretated as reflections of social position in the living society (Kristiansen and Larsen 2005; Tornberg 2018; Bergerbrant et al. 2017). However, ethnographic examples can also show that different types of grave constructions may also reflect different stages in the mortuary practices. For example, various types of single graves can be used in a first stage before the remains are moved to collective kinship graves (Jeunesse and Denaire 2018; Trigger 1969; Huntington and Metcalf 1991).

The orientation of graves is an important aspect when different periods, culture groups and regional variation are discussed (e.g., BB graves, gallery graves and passage graves). In many cases, the direction of the grave as well as the orientation of the buried individuals are considered to reflect ideological beliefs connected to location of the world of the dead (e.g., Ahlström 2009; Dournes 1975)

Different types of treatment of dead bodies can be linked to beliefs and taboos that, in turn, may be related to ethnicity and group identity (Jeunesse and Denaire 2018). Large variations in the handling of dead bodies may indicate a society founded on small groups, less regulation regarding these practices or differentiated practices for specific groups of individuals. Variation of grave types, orientation and/or treatment of the dead may also reflect a heterogenous community, where individuals bringing their traditions from different regions may have resided.

However, the variation may also represent perceptions that different types of deaths require different kinds of treatment (Trigger 1969; Dournes 1975; Jouin 1949; Hutton 1927). Deceased may be treated and buried differently depending on how the individual died: e.g., by accident, by disease, in war or by wild animals (ibid.). Variation in the treatment of dead bodies is sometimes related to religion, ethnicity, gender, age, or other status categories, whereas in other cases they are not (Oestigaard 2013). Thus, the treatment of dead bodies, as encountered by the archaeologist, is a complex and challenging phenomenon, not only due to difficulties to trace possible different stages in the burial practices, but also as a result of intricate cultural, social, and functional factors.

Artefacts found in the grave have been interpreted as useful things for dead to possess in the afterlife. For example, ritual destruction of artefacts, in order for them to be functional in the afterlife, has been described in ethnographic record (e.g., Dournes 1975). This practice has also been discussed in archaeology (Burenhult 1973; Chapman 2000; Holten 1994; Larsson 2000; Persson and Sjögren 2001: 46; Strömberg 1968). Furthermore, some material in the grave has been interpreted as tools used for the preparations of the grave and/or the dead, which were left in the grave, as they would then be considered polluted for the living (Douglas 1966; Bloch 1982: 215; Dournes 1975; Stensköld 2004). Belongings may also be put in the grave because there is no one to inherit them. The grave may be reopened and rearranged, for example, by adding or removing gifts/belongings, when the dead seems unhappy (Dournes 1975). Furthermore, objects that accompany the dead in the grave might be inalienable possessions that must not be given or exchanged (Weiner 1992). Some of the artefacts, such as pottery, may have been vessels for food or drink that was given to the dead. According to ethnographic observations (e.g., Dournes 1975; Jouin 1949), offerings of food for the dead could continue for several years before the individual was considered to have passed to the world of the dead.

Furthermore, artefacts can be gifts reflecting the giver rather than the receiver. Parker Pearson (1999: 3) argued that, as it is living individuals who are burying the dead, the burials therefore might also reflect those persons. Gansum (2002: 252) underlined that we need to consider that most of the burials are in fact collective events. If the artefacts were part of the dress or personal accessories, they probably belonged to the buried individual. In this case they might represent what the person used to wear or what was used exclusively for burials. In successive collective burials these kinds of considerations are even more complex. What a grave and its contents actually represent and how variation should be interpreted is difficult to know. Like Parker Pearson (1999), I argue that it is not possible to assume any general rule that is valid for all places and times, but each given case must be considered in its own context.

In this thesis the artefacts found in the grave are considered to be important for discussing chronological aspects, similarities to artefacts from regions further away and possible origins of raw material and objects. Can the artefacts provide evidence that may be interpreted in terms of shared ideologies, direct or indirect networks or mobility?

In the graves there are other attributes which are not visible, but which may be important for understanding both the treatment of the dead and the living societies. These attributes include microscopic and isotopic data. It has become more and more common to include osteological data and stable isotopes to describe the life of the buried individual and as a source for the living prehistoric society. According to Zuckerman and Armelagos (2011: 20), bioarchaeology is a direct reflection of life, unlike burial practices, which may not be a direct reflection of social relations (see above). Thus, various analyses of human remains can be used to analyse socio-economic variation and change. For example, the variation of stable isotopes and caries frequencies have been interpreted as a plausible result of social differentiation (Knipper et al. 2014, Sjögren and Price 2013b; Tornberg 2018). Furthermore, thin section analyses of bones have been applied to better understand the treatment of the dead (Booth and Brück 2020; Hollund et al. 2018; Parker Pearson et al. 2005).

My intention is to use the grave as a source for discussions of the Neolithic and Early Bronze Age societies, first and foremost, by investigating what the bones of the dead can reveal about their lives. I include visible aspects such as grave shape, construction details and orientation of the grave, artefacts in the grave and osteological analyses of the human remains. But the focus is on the invisible aspects of the human bones (isotope data), recovered from the grave. Once available, the isotope results could be considered along with characteristics of the grave, as well as osteological/bioarchaeological determinations, in order to find possible patterns that could be interpreted in terms of social and cultural variation or change.

3.3 Methods

3.3.1 Introduction

In this thesis comparative analyses are performed. Several statistical analyses are employed, and in case of too few observations to achieve significance, trends and tendencies are discussed. The data are produced by the implementation of several different methods (see below). Contextual analyses are also conducted on several different levels. The data are compared and complemented by discussions of the related artefacts, considered in archaeological context. The thesis also encompasses literature and archive studies. Both archaeological and ethnographic examples are used to demonstrate the wide range of possible interpretations. The osteological analyses were performed by several specialists and based on methods described in the individual papers.

The megalithic graves were used for numerous successive burials, thus resulting in most skeletons becoming disarticulated and fragmented when bodies were moved to create space for subsequent interments. The commingled and fragmented skeletons make it difficult to identify the whole skeleton of specific individuals. Furthermore, this results in anonymous artefacts, which cannot be related to any unique individual. Consequently, typological dating is limited to the entire burial complex. In addition, most megalithic graves have been exposed to extensive reuse in later periods (Blank 2016; Sjögren 2003). For these reasons, and for investigating the use-time of the various types of megalithic graves, all the samples were radiocarbon dated.

3.3.2 Interdisciplinarity

The favourable conditions for bone preservation (previously discussed) enable several methodological approaches for analysing the remains of the dead, in order to address questions about the living. The human remains can give us pieces of information about individual life stories and about prehistoric communities, testimonies of ancient ways of treating the dead, and indications of the biological processes connected to the specific milieu at the location of the decaying bodies.

Archaeology has a long history of integrating different fields into the discipline (geology, sociology, social anthropology etc.). Thus, the incorporation of new methods and theories from natural sciences, social sciences and humanities is ongoing in the archaeological discipline. My intention is to combine knowledge and methods from different disciplines into an integrated perspective. Cross-disciplinary, interdisciplinary, multidisciplinary are terms that frequently appear in archaeological studies that include data from research collaborators in other disciplines. Multidisciplinary is defined as people from different disciplines working together, each drawing on their disciplinary knowledge. My approach has been to understand as much as possible of the different disciplines and to cooperate closely with different specialists, but also to emphasize the archaeological aspects, and what the analysed material represent. Interdisciplinarity blends the practices and assumptions of each discipline involved by integrating knowledge and methods from different disciplines (Choi and Pak 2006). This approach implies that the research questions are formulated on a basis of a shared interdisciplinary understanding.

Large-scale interdisciplinary studies combining archaeology, osteology, and biochemical analyses have become more common in recent years (e.g., Carlie et al. 2014; Knipper et al. 2012, 2017; Pearson and Meskell 2015; Scorrano et al. 2014). These projects may achieve large sample sizes by combining observations from many sites over extensive study areas. However, the sample size from each site is generally low, thus risking overly generalized results. This thesis focuses on a restricted geographic area (Falbygden), from which most of the sites studied involve multiple chemical and bioarchaeological observations on large numbers of individuals. In addition, this thesis illustrates the potential for carrying out a detailed case study of one single grave.

3.3.3 Radiocarbon dating

Radiocarbon dating is a groundbreaking method of dating dead organic material, which has had a major impact of our understanding of prehistory.

Living plants and animals take up carbon directly from the atmosphere or through food. Thus, they will have the same small proportion of isotopic ^{14}C as the atmosphere, or in the case of aquatic animals or plants, as the surrounding water. Once an organism dies, the carbon is no longer replaced, and because the ^{14}C is radioactive, it will start to decay. The proportion of radiocarbon to stable carbon will decline according to the exponential decay law, and therefore ^{14}C can be used to determine how long it has been since a specific sample was part of a living organism exchanging carbon with its surroundings. The older the sample, the less ^{14}C will be left (Greene 2000).

The radiocarbon date is not a true calendar age, as the proportion of radiocarbon in the atmosphere has varied by a few percent over time—due to fluctuations in solar radiation—and because the true half-life of radiocarbon is 5730 years and not the originally measured value of 5568 years, which is still used in calculations (Libby 1965; Godwin 1962). Both these sources of error are corrected for by calibration.

By radiocarbon dating tree-ring sequences from multiple overlapping trees (dendrochronology), researchers now have constructed a sequence of annual rings extending back over the last 14 000 years. With this reference database, the atmospheric concentration of ^{14}C in a particular year or decade can be measured, and conversely, radiocarbon determination on an archaeological sample can be converted into a true age[7]. Tree ring widths vary from year to year with changing weather conditions. It is possible to compare the tree rings in a dead tree to those in a tree that is still growing in the same region. By using dead trees of different but overlapping ages, libraries of tree rings of different calendar ages can be constructed[8]. Other carbon-containing samples of independently measurable age—including speleothems[9], marine corals and samples from sedimentary records—can also be used (van der Plecht et al. 2020).

Thus, the calibration of radiocarbon determinations is in theory very simple. By comparing the proportion of ^{14}C to stable ^{12}C in a radiocarbon measurement on a sample with tree rings, you can get the age of the sample, as the calendar age of the tree rings is known. However, the measurements on both the tree rings and the samples have a limited precision. Therefore, there will be a range of possible calendar years in the result, and as the atmospheric radiocarbon concentration has varied, there might be several possible ranges.

Radiocarbon assays are reported as radiocarbon ages, measured on the radiocarbon timescale in units BP, for example 3000±30 BP. Once calibrated, a radiocarbon date should be expressed in terms of cal BC, cal AD or cal BP[10]. The cal prefix indicates that the dates are the result of radiocarbon calibration using tree ring data. These values should correspond to normal historical years BC and AD.

Complications may also occur, such as contamination[11]. It is important that only the ^{14}C that was part of the organism when it died is measured. Therefore, chemical pre-treatment to remove any extraneous carbon that has entered the sample since death is needed.

Furthermore, reservoir effects may occur when some of the carbon reaches the sample via the

7 For example, in a 500 year old tree, the radiocarbon in the 500 rings can be measured to see what radiocarbon concentration corresponds to each calendar year.

8 e.g., Bristlecone Pines in the USA, and waterlogged Oaks in Ireland and Germany, and Kauri in New Zealand

9 mineral deposits that accumulate in caves

10 The term cal BP means the number of years before 1950 AD.

11 The contamination usually derives from the soil but can also result from inappropriate packaging or conservation procedures.

ocean (marine effect)[12]. The carbon consumed by organisms in the ocean is older than that consumed by organisms on land. Thus, samples from marine life and from organisms that consumed a lot of sea-based foods may appear older than they are when analysed (Siegenthaler et al. 1980). Stable isotope measurements can be used to see if this effect is present since the stable isotope concentration of the oceans is also different.

The so-called hard water effect occurs in freshwater if the carbon in the water partly is acquired from aged carbon from rocks, such as limestone, which is mostly composed of calcium carbonate (Philippsen 2013). Furthermore, humus can produce similar results, but can also reduce the apparent age if it is of more recent origin than the sample. These effects are also present in soft water lakes (Björck and Wohlfarth 2001; Björck et al. 1998). The reservoir offset both concerning freshwater (FRE) and marine water (MRE) is complicated to determine, because it varies geographically and over time. Thus, there is no general offset (e.g., no simple correction of 500 years) that can be applied (Lougheed et al. 2013; Philippsen 2013). Instead, additional research is usually needed around the particular site to determine the size of the offset (Bowman 1995). Temporal changes in catchment areas and in climate can also influence the local FRE.

In addition to these reservoir effects, the northern and southern hemispheres have atmospheric circulation systems that are sufficiently independent of each other that there is a noticeable time lag in mixing between the two. In this study the terrestrial calibration curve for the midlatitude northern hemisphere (IntCal13; Reimer et al. 2013) is used. A recent calibration curve, IntCal20, is now available but was only used in paper VI as most of the remaining articles were published before this curve was available (Reimer et al. 2020). The calibrations of these two curves differs in the scope of ca. ± 5 years for the Neolithic dates and only slightly more for the Early Bronze Age dates.

In bone, both collagen and apatite can be radiocarbon dated. Radiocarbon analysis of apatite in calcined bones is regarded as a reliable alternative to date skeletal remains when no collagen remains (Lanting et al. 2001). An exchange of carbon can occur between bone and charcoal when burnt together. The old wood effect might alter the radiocarbon dates of calcined bone (Hüls et al. 2010; Rose et al. 2020; Snoeck et al. 2014, 2016; Zazzo et al. 2012, 2013). Nevertheless, reliable results can be obtained if one can assume that the wood used in the pyre was approximately contemporary with the deceased, within a few decades (Hornstrup et al. 2012; Lanting et al. 2001; Olsen et al. 2008, 2011).

Until the mid-1980s, all radiocarbon dating was undertaken using conventional radioactive decay counting techniques[13]. While conventional dating methods can be extremely precise and accurate, they require large samples (ca. 200g of bone), and they usually require long processing and counting times. Today, accelerator mass spectrometry (AMS) is used for measuring the amount of radiocarbon in samples. This allows much smaller samples to be analysed, about 0.10 to 0.30 g of bone (Knowles et al. 2019). Using this method, the sample is combusted to carbon dioxide and then converted to graphite. This is pressed into a cathode (target) which is loaded into the accelerator. In the AMS the carbon atoms are given a series of electric charges and accelerated to very high speeds, which allows the ^{14}C to be isolated on the basis of weight using a series of powerful magnets. Details of the methods used for combustion, graphitization, and dating vary according to both the equipment available and the laboratory conducting the analysis.

12 As the radiocarbon composition of the oceans differs of that of the atmosphere

13 Which count the decay of ^{14}C atoms using either gas proportional counting or liquid scintillation spectrometry

The calibrations, plots and models presented in this study were conducted by using the OxCal online software version 4.3.2 (Bronk Ramsey 2017) based on the IntCal13 atmospheric curve (Reimers et al. 2013) and in paper VI the OxCal online software version 4.4.2 based on the IntCal20 (Reimer et al. 2020). The two-sigma probability interval (95.4%), recommended by Millard (2014), was used when discussing the radiocarbon results, and the one-sigma probability interval (68.2%) was also added in the figures.

The majority of the radiocarbon dates presented in this thesis were conducted at ^{14}Chrono Centre at Queens University in Belfast. A few samples were radiocarbon dated at Ångström Laboratory, Uppsala University, Bristol Radiocarbon Accelerator Mass Spectrometry facility (BRAMS), University of Bristol, Oxford Radiocarbon Accelerator Unit, University of Oxford and at Beta Analytic Inc. laboratory in Florida, USA. For further information considering the analytical procedures see method sections in paper I, II, IV and VI.

3.3.4 Stable isotope analysis

In this thesis stable isotope analysis of ^{15}N and ^{13}C in collagen and of ^{13}C in apatite from human and a few animal remains has been conducted, in order to discuss subsistence and dietary patterns.

Analyses of ^{15}N and ^{13}C isotopes in human bone collagen is a widely used method in archaeological research to study prehistoric nutrition (Eriksson et al. 2008; Fornander 2011; Lidén 1995; Sealy 1986, 2001; Sjögren 2017; Sjögren and Price 2013b; Tornberg 2013). Analyses of δ^{13}C can be used to distinguish terrestrial from marine diets, as marine organisms exhibit higher δ^{13}C values (Sealy 1986). In the Atlantic/North Sea region, terrestrial mammals have δ^{13}C end values in bone collagen ranging from -20‰ to -21‰, whereas the marine end value is about -10‰ (e.g., Barrett et al. 2011; Fischer et al. 2007). Intermediate δ^{13}C would thus reflect a combination of marine and terrestrial proteins. The δ^{15}N values increase along the food web, although different fractional levels have been suggested ranging between 3 and 6‰ per trophic level (e.g., Ambrose 2000; Bocherens and Drucker 2003; DeNiro and Epstein 1981; O'Connell et al. 2012; Hedges and Reynard 2007). Consumers of fresh water and marine fish have elevated δ^{15}N values of up to 15 to 20‰ as aquatic food webs have generally longer food chains than land-based webs (Schoeninger et al. 1983: 130). In this study, biplots of δ^{15}N and δ^{13}C values, and of stable isotope values combined with radiocarbon dates were produced. The plots and analyses were grouped by variables such as the biological of sex and age of the sampled individuals, and by temporal periods and regional provenance, to identify possible dietary patterns.

Recent research has shown that enrichment of the isotopes through the food chain is complex and that many different components can affect the stable isotopic content measured in an individual (animal or human) (O'Connell et al. 2012; Fraser et al. 2011; Hedges and Reynard 2007; Hedges and Van Klinken 2002; Schoeller 1999). A trophic level enrichment of ca. 1‰ δ^{13}C values in food chains can be expected. Furthermore, water availability, topography and density of vegetation cover contribute to δ^{13}C variation in the ecosystem (Bonafini et al. 2013). Climate and environmental factors such as temperature, aridity, and altitude have been found to influence the δ^{15}N values of plants. Breastfeeding and the consumption of juvenile herbivores can elevate the δ^{15}N values, as these young individuals are one trophic level above their mothers (Fuller et al. 2003). Physiological stress, famine and the intake of manured crops are other factors that can affect δ^{15}N values in human as well as domestic animal bones (Fraser et al. 2011; Hedges and Van Klinken 2002). δ^{15}N ranges also vary between species and even exhibit notable intraspecific differences between individuals due to variations in diet composition and physiological and genetic variation (Hedges and Reynard 2007).

Different bone tissues reflect different components of the diet. Bone collagen mainly reflects protein intake, while enamel carbonate (apatite) mirrors the overall dietary components: protein, carbohydrates, and fats (Ambrose and Norr 1993: 121–55). To include $\delta^{13}C$ values from other sources than protein, I include comparative analyses of $\delta^{13}C$ values in apatite and of collagen-apatite spacing. The $\delta^{13}C$ difference between apatite and collagen (the collagen-apatite spacing) observed in carnivores is smaller than in herbivores. An experiment conducted on hens (O'Connell and Hedges 2017) confirmed that differences in diet composition affects the collagen-apatite spacing. The proposed collagen-apatite spacings are: 6.8±1.4‰ for herbivores, 5.2±0.8‰ for omnivores, and 4.3±1.0‰ for carnivores (Hedges and Van Klinken 2002; Lee-Thorp et al. 1989; O'Connell and Hedges 2017).

Quantitative dietary modelling accounting for isotope levels in contemporary nutritional sources have become more and more common in current research (Fernandes et al. 2014, 2015; Tõrv and Meadows 2015; Sjögren 2017). These reconstructions, often based on several different parameters, enable more detailed dietary investigations, where different food groups can be analysed based on the overall diet components.

Paper V presents quantitative dietary models using the FRUITS (Food Reconstruction Using Isotopic Transferred Signals) software (Fernandes et al. 2014), which is a mixing model based on Bayesian statistics (see statistical analysis).

Stable isotopes and FRUITS are further discussed in paper I and V, where the analytical procedures also are described. Stable isotope and radiocarbon analyses were conducted on the same samples.

Most of the stable isotope analyses were performed by the ^{14}Chrono Centre at Queens University in Belfast, and a few analyses were conducted at other laboratories (see radiocarbon dating). The stable carbon isotope samples of bioapatite were prepared at the Curt Engelhorn Center for Archaeometry in Mannheim, Germany and analysed at the Institute of Geosciences, Department of Applied and Analytical Palaeontology, University of Mainz, Germany.

3.3.5 Strontium isotope analysis

Biologically available Sr originates mainly from weathering rock minerals. Strontium has four naturally occurring stable isotopes, and the ratio between ^{87}Sr and ^{86}Sr is used in provenance research. The isotope ratio of the bioavailable Sr largely reflects the local geology and depends on the type and age of bedrock (Faure 1986), although overlying soil deposits, sea spray, heavy rain and atmospheric dust also contribute (Bentley 2006; Faure 1986; Montgomery 2010). The Sr passes through soils and water into the biosphere, enters the food chain and the human skeleton with minimal isotope fractionation (Bentley 2006). Sr isotope ratios of human and animal teeth average the bioavailable $^{87}Sr/^{86}Sr$ ratios of the home range of the respective individuals in their early life (Bentley 2006). Using Sr isotopes to identify non-local individuals assumes that drinking water and food were procured locally (Montgomery 2010: 325). As the Sr concentrations are higher in plants than in animals, plant-based food is the main contributor to Sr uptake in humans, while meat contributes less (Bentley 2006: 154). Watts and Howe (2010) reported that the typical adult human body content of Sr is 0.3–0.4 g, of which 99% is stored in the skeleton, and the primary sources are grains, leafy vegetables, drinking water and dairy products.

Strontium isotope analysis has become a standard method for studying human and animal mobility, providing insights into prehistoric socio-dynamics (Gron et al. 2015, 2016; Evans et al. 2019; Fraser et al. 2018; Frei et al. 2015, 2019; Knipper 2011; Knipper et al. 2014, 2017; Montgomery and Evans 2006; Oelze et al. 2012; Price et al. 2004; Sealy et al. 1995; Sjögren and Price 2013a; Snoeck et al. 2020). Strontium isotope analysis can only trace the first generation of settlers and other categories of people that were buried in a place with a different bedrock geology than where they grew up (see below). Samples only reflect a specific period of the individual's life span, depending on the type of sample, bone or enamel from different teeth (Montgomery 2010: 326). According to Bentley (2006), in cases where considerable proportions of marine food have been consumed, a shift in the isotopic ratio towards the seawater ratio (0.7092) can be expected. However, Lewis et al. (2017) and Ahlström and Price (2021) did not observe such relation. Moreover, it should be kept in mind that mobility can only be detected if the Sr isotope ratios differ between the areas where the movement took place. Thus, residential changes between Falbygden and other areas with similar Sr isotope ratios cannot be detected. The effectiveness of the method depends on the geological conditions of the study areas as well as the questions asked. Geological information and baseline or comparative data are required to evaluate the results.

Analyses of Sr isotopes were conducted at the Curt Engelhorn Center Archaeometry, Mannheim, Germany. Furthermore, a blind was analysed at the Danish Center for Isotope Geology, University of Copenhagen. The procedures for sample preparation and analysis are presented in paper I, III and IV.

3.3.6 ZooMS

In osteological investigations morphological characteristics of animal bones are used to determine species. However, when the bone is worked, for instance in tools and accessories, the species may be difficult or impossible to recognize. Furthermore, weathering, processing for food and chemical aspects of the depositional environment can degrade archaeological bones, making them difficult to identify by morphological assessment. In addition, within species or between closely related species, animals may display significant overlap in size and morphology of their skeletal elements (Hillson 1992). For example, it is not always easy to separate sheep from goat bones.

In these cases, when osteological determinations of species are uncertain, ZooMS (Zooarchaeology by Mass Spectrometry) can be used. The method identifies species from the peptide mass fingerprint of extracted collagen, which is the principal protein of bone, ivory, dentine and leather. ZooMS has become increasingly popular within archaeology as it is a fast and simple method, that requires only small sample sizes (10-30 mg of bone) or even non-destructive sampling (Brandt et al. 2018). The results from the mass spectrometer are then compared with a reference database to determine the species.

The zooMS analyses were conducted at BioArCh, University of York, United Kingdom. For more detailed information about the laboratory procedures see paper V.

3.3.7 aDNA analysis

DNA is a helix formed molecule[14] that carries genetic instructions for the development, growth, functioning, and reproduction of all known organisms and many viruses. In humans there are two kinds of DNA: chromosomal DNA/nuclear DNA, which is found in the cell nucleus, and mitochondrial DNA (mtDNA), which is found outside the nucleus in the mitochondria. Human nuclear DNA consists of 46 chromosomes, 22 pairs of autosomal chromosomes and one pair of sexual chromosomes. The two possible combinations of sexual chromosomes are XX (female)

14 Composed of two polynuceotide chains

and XY (male). The Y chromosome can only be inherited from males to sons. The mtDNA can only be passed on by the mother to an offspring and can be used to establish relatedness on the matrilineal side. Nuclear DNA is transmitted from both parents and thus represents the individual's ancestors bilaterally. Haplotypes are a combination of sequence variants derived via mutations from an ancestral sequence. Haplogroups are clusters of haplotypes which can form a phylogeny. Human Y chromosomal and mtDNA haplogroups can tell us about inheritance on a personal level, and as these groups are unequally distributed around the globe, they can also be used for investigating population dynamics in the past (Bramanti 2013).

Ancient DNA is DNA isolated from ancient specimens and is more degraded in comparison with contemporary genetic material. Nuclear DNA degrades at least twice as fast as mtDNA. Therefore, these analyses involve methodological challenges. In the last 30 years the development of extracting and amplifying aDNA has become an important and recognized method of investigating certain archaeological questions. Ancient DNA from human remains can provide us with information concerning biological sex, genetic inheritance, family relations, population history and diseases. A large number of recent research, based on prehistoric human remains have, applied human aDNA analysis to address questions related to biological sex (e.g., Hedenstierna-Jonson et al. 2017), kinship and social organization (Cassidy et al. 2020; Sánchez-Quinto et al. 2019; Schroeder et al. 2019; Sjögren et al. 2020), diseases (e.g., Rascovan et al. 2019), mobility and demographic developments (Allentoft et al. 2015; Haak et al. 2015; Malmström et al. 2019; Skoglund et al. 2012, 2014).

In this study, mtDNA and sex determination of human remains were included to investigate possible isotopic associations with biological sex, and to discuss kinship and population dynamics (paper IV). The analyses were conducted at Uppsala University and the sample preparation and analyses are described in paper IV.

3.3.8 Statistical analysis

Statistical analyses were conducted using IBM SPSS version 23 and PAST (PAleontological STatistics) version 3.25. The data evaluation included descriptive statistics, significance tests, and diversity measures. Normal distribution could not be demonstrated in all cases. Therefore, the non-parametric Mann-Whitney U-test was used throughout this work to examine whether the observed differences were statistically significant at the 5% level.

The variation and distribution of mtDNA were investigated by diversity tests (paper IV). Diversity encompasses two aspects: richness and evenness. We used Menhinick D index to investigate the richness of mtDNA haplogroups. Since the larger the sample, the more haplogroups are expected to be found, the number of haplogroups is divided by the square root of the number of individuals in the sample: $D = s$ (haplogroups)/$\sqrt{N}$ (individuals). Furthermore, evenness (Shannon H index) was also calculated. This index measures the dominance or evenness of haplogroups in relation to one another taking the number of samples into account. The lower the H index, the more uneven distribution of the haplogroups.

In paper III ArcGis 10.1 was used to plot the isotopic values at the sampled locations, using various methods of classifications and numbers of classes depending on scale. ArcGis was also used to interpolate the Sr isotopic ranges in the study area. An interpolated surface was produced by a standard circular Empirical Bayesian Kriging method. The Empirical Bayesian Kriging is an interpolation method that accounts for the error in estimating the underlying semi-variogram through repeated simulations. This method permits accurate predictions of moderately non-stationary data and is more precise than other kriging methods for small datasets (Pilz and Spöck 2007). For more details of the interpolated models see paper III.

In paper II we used several different Bayesian models in Oxcal. We also plotted the distribution of dates by using the non-parametric method of kernel density estimation (KDE, Parzen 1962; Rosenblatt 1956). This is a widely used frequentist method with no formal priors for the distribution. The advantage of this method compared with the sum function is that the noise from the calibration procedure is reduced (Bronk Ramsey 2017: 1817). Bayesian statistical approaches for chronological modelling were developed in the late 1980's and early 1990's (e.g., Buck et al. 1991, 1992; Naylor and Smith 1988) and have since become common in archaeological research (e.g., Darvill et al. 2012; Müller 2009; Parker Pearson et al. 2016; Schulz Paulsson 2017; Whittle et al. 2011). For further technical details and thorough discussion of Bayesian methodology see Bayliss and Bronk Ramsey (2004), Bayliss (2009), Bronk Ramsey (2009). The concept of Bayesian modelling was summarized by Bayliss (2009: 127) as the following: Standardized likelihoods ("the dates") X Prior beliefs ("the archaeology") = Posterior beliefs ("the answer"). The Bayesian statistical approach combines radiocarbon results, archaeological information, and the high precision curve into one calibration procedure (Bronk Ramsey 2009). To do so you need stratigraphic or other relational information to be able to identify sequences of the events/ burials. For more discussion concerning this method see paper II. Instead, when dealing with data lacking reliable prior information, Bronk Ramsey (2017) recommends KDE modelling. KDE modelling can be described as a mixture of the Bayesian and frequentist methods, where the KDE distribution is used as prior in the Bayesian model (Bronk Ramsey 2017: 1818).

In paper V, another model based on Bayesian statistics was used, FRUITS (Food Reconstruction Using Isotopic Transferred Signals). The Bayesian mixing model, FRUITS, provides estimates of the contributions of multiple sources towards a target, in which sources and target are characterized by quantitative signals, such as isotopic and elemental values (Fernandes et al. 2014). FRUITS is a flexible model allowing the user to design models well fitted to specific mixing problems. The models used in this thesis are described more in detail in paper V.

3.4 To sum up

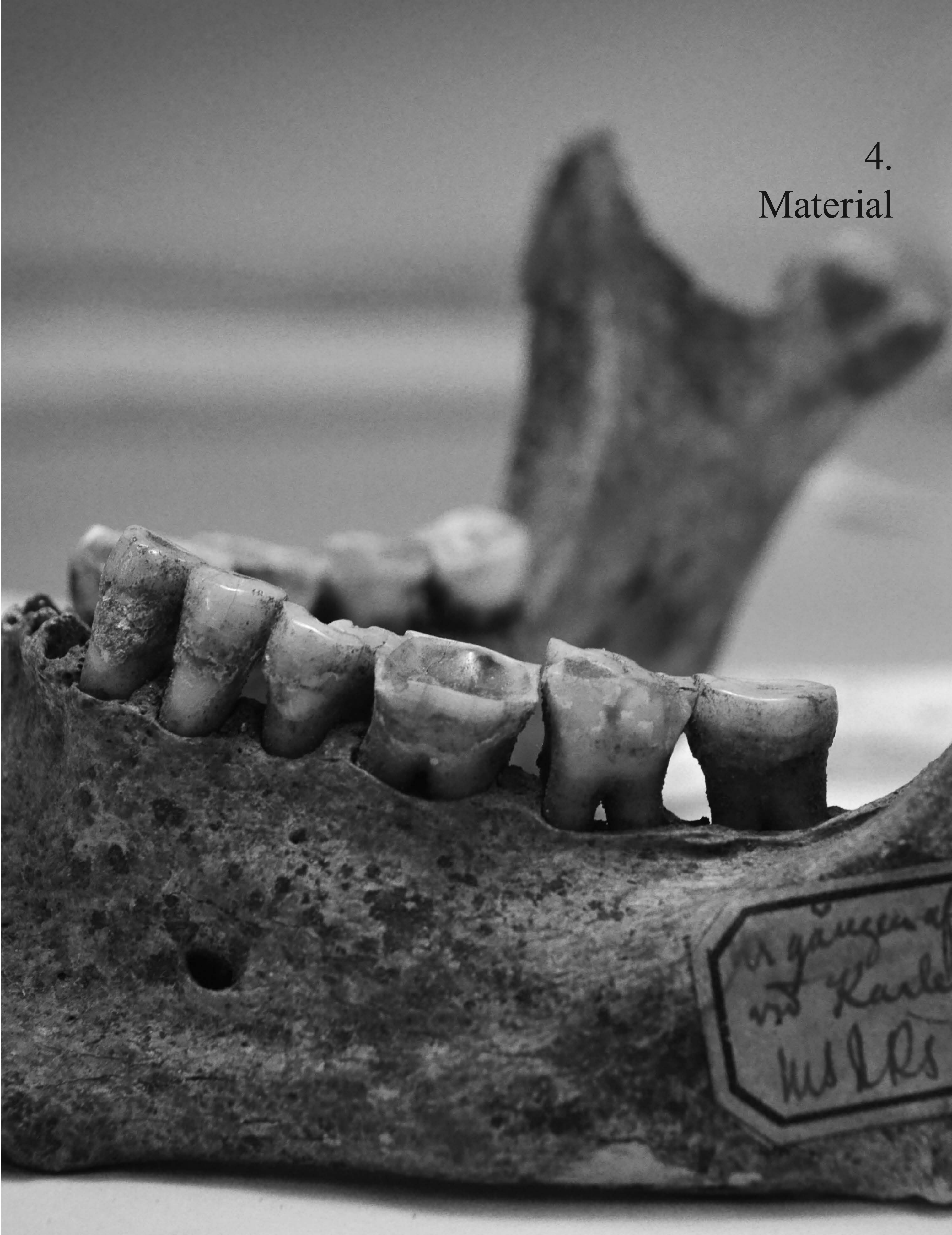
The grave as an archaeological source is important for understanding past lives, societies and environments, yet they are complex. Prehistoric graves, especially megalithic graves, are seldom closed contexts. When discussing graves and burial practices, we often turn to ethnographic examples, which are important for emphasizing the broad variations of different cultural expressions. Whether the grave and its inventories represent the living society or are manifestations of beliefs about the afterlife and perceptions of death have been debated. Grave goods can be part of burial practices, in the form of used tools for preparing the corpse and the tomb, or they may be remains after ritual meals/feasting. Furthermore, the finds in the grave can be personal objects, but might likewise be gifts from other members in the group or in some cases unintentional waste from the filling. Some of the objects might also have been part of the clothing and garment of the dead which might have mirrored commonly used outfits or a traditional clothing exclusively for the dead. They could represent things that need to be brought to the afterlife. In some societies the notion of that the dead might be unhappy in the grave can result in the opening and removing or adding of objects.

The social status of individuals has been inferred based on measures and characteristics of grave goods, including the number of objects, the number of find categories, and the presence of exotic finds. Furthermore, the type of grave and the position in a burial complex such as a barrow has also been proposed to represent different social strata. However, objects of great importance might be long gone, due to degradation processes and looting etc. Furthermore, how and where the dead is deposited may be a result of many different factors linked to cultural conceptions. For example, incest rules that affect where the dead can be buried, where and how dying and death took place.

Instead of focusing on the perception of death and afterlife, I have focused on what the burials can tell us about the lives of the people buried in the megalithic graves. In the megalithic graves, the skeletons are mainly found in a fragmented and commingled state mixed with the finds that have been preserved. Thus, most of the time we cannot connect the finds to a specific individual. Less attention is given to what the artefacts within the grave and the different aspects of the burial represent. The finds are instead seen as part of the artefacts preserved in graves that were present at that time, without reflecting on the purpose or significance of the objects. The provenience of the objects might be traceable in some cases, which can help us to understand prehistoric networks. Similarities and dissimilarities of the of design of pottery, axes and daggers, and of burial structures might also give us some clues about networks and shared ideologies.

This thesis encompasses archaeological, osteological and bioarchaeological data. The bioarchaeological record consists of radiocarbon dates, stable isotope result (for diet reconstruction), and aDNA data (mtDNA and sex assessments), and ZooMS results. The discussions also include pollen data and isotope data from sediments, enabling climatic and environmental reconstructions. My intention in using an interdisciplinary approach is to retrieve as much information possible from the buried individuals in the megalithic graves, while also considering information from analyses of traces of the penecontemporary environment. For example, as no settlements or other remains indicating subsistence strategies dating to the Late Neolithic have been found, we can instead try to discuss diet and subsistence by studying the stable isotopes in the human and animal remains. Furthermore, a thorough radiocarbon dating of the human bones will help us to understand when the megalithic graves were used and reused for depositions of burnt and unburnt human remains. The osteological data enables us to better understand who was buried in the megalithic graves. Furthermore, aDNA is useful for estimation of biological sex, as most of the skeletal remains are commingled and fragmented, which makes osteological estimations difficult. Thus, by combining the bioarchaeological data with the archaeological sources and by identifying as many parameters as possible from the buried individuals we can better understand the megalithic societies of inland southwestern Sweden.

4.
Material



Mandible (M15) from the Utbogård gallery grave.
Photo by Malou Blank, graphics Richard Blank.

4.1 Introduction

This thesis encompasses a broad variety of materials. The analyses are based on published and unpublished written sources, artefacts recovered from megalithic graves, water samples, and skeletal remains from animals and humans. In this chapter a summary of the various materials is presented. For more details, see the included papers.

4.2 Written sources and documentation

The written sources and documentation date from the mid-19th century to the present (see references). A substantial part of this work is built on and contrasted against previous research. I included recent and forthcoming publications with the intention of incorporating new results and findings. Furthermore, the unpublished documentation, mainly consisting of descriptions of excavations and investigations of megalithic graves, photos and figures of graves and artefacts, have been essential for the interpretations presented in this thesis. The drawings of graves have been important complements to the excavation reports. The unpublished records derive from archives at Statens Historiska Museum (ATA), Västergötlands Museum (VGM) and Falköpings Museum (FM).

4.3 Artefacts

In addition to information obtained from studying excavation reports and literature focusing on artefacts, renewed examinations of collected artefacts from megalithic graves were conducted. The investigations focused on identifying objects not yet registered, re-classifying artefacts described in an old-fashioned way, typologically dating some of the artefacts, and looking for certain details such as exposure to fire, specific locations in the grave, etc. These examinations were conducted at the depositories at the Swedish History Museum (Statens Historiska Museum: SHM), VGM, FM, and at Alingsås Museum (AM). I re-examined artefacts recovered from gallery graves, and objects from some passage graves were also reviewed. The artefacts consist of objects made of various types of stone, flint, slate, bone, antler, clay, pottery and amber. The objects consisted of flint daggers, flint arrow heads, flint spearheads, stone and flint axes, bone awls, bone and antler needles, slate pendants, amber beads and pendants, and animal tooth pendants etc. The results are presented in appendix 2 and were used to complement the radiocarbon dates, discuss networks, to trace the use of fire and examine mortuary practices.

4.4 Baseline samples

4.4.1 Introduction

Two different baselines were produced in this thesis: an Sr isotope baseline for mobility studies and a baseline for estimating the Late Neolithic/Early Bronze Age diet. The baselines are established by analyses conducted on animal remains and water samples.

4.4.2 Strontium isotope baseline

A baseline of the bioavailable Sr isotope values in southwestern Sweden was produced for this thesis (paper III). We sampled 61 water sources and five archaeological animal remains and combined the data with previous measurements of two water and 21 non-domestic faunal samples. The sample selection and procedures are described in paper III. The samples derived from streams, creeks, springs, and lakes from locations with different geological characteristics (Fig. 10). The animal remains originate from teeth of small animals recovered from prehistoric contexts, which were sampled at the depository at VGM. More detailed information of these samples is found in paper III, appendix 1.

4.4.3 Dietary baseline

Middle Neolithic and Late Neolithic-Early Bronze Age baselines were produced and included in paper V. The Middle Neolithic one was based on a previously published baseline (Sjögren 2017), with some minor changes and complimentary data from recent publications (Boethius 2018; Eriksson et al. 2018) and a new sample (paper V).

In the Late Neolithic-Early Bronze Age baseline the Middle Neolithic animal samples were replaced by Late Neolithic-Early Bronze Age samples (paper V). As no Late Neolithic or Early Bronze Age settlements are known in Falbygden and no cereals have been dated to this period, the

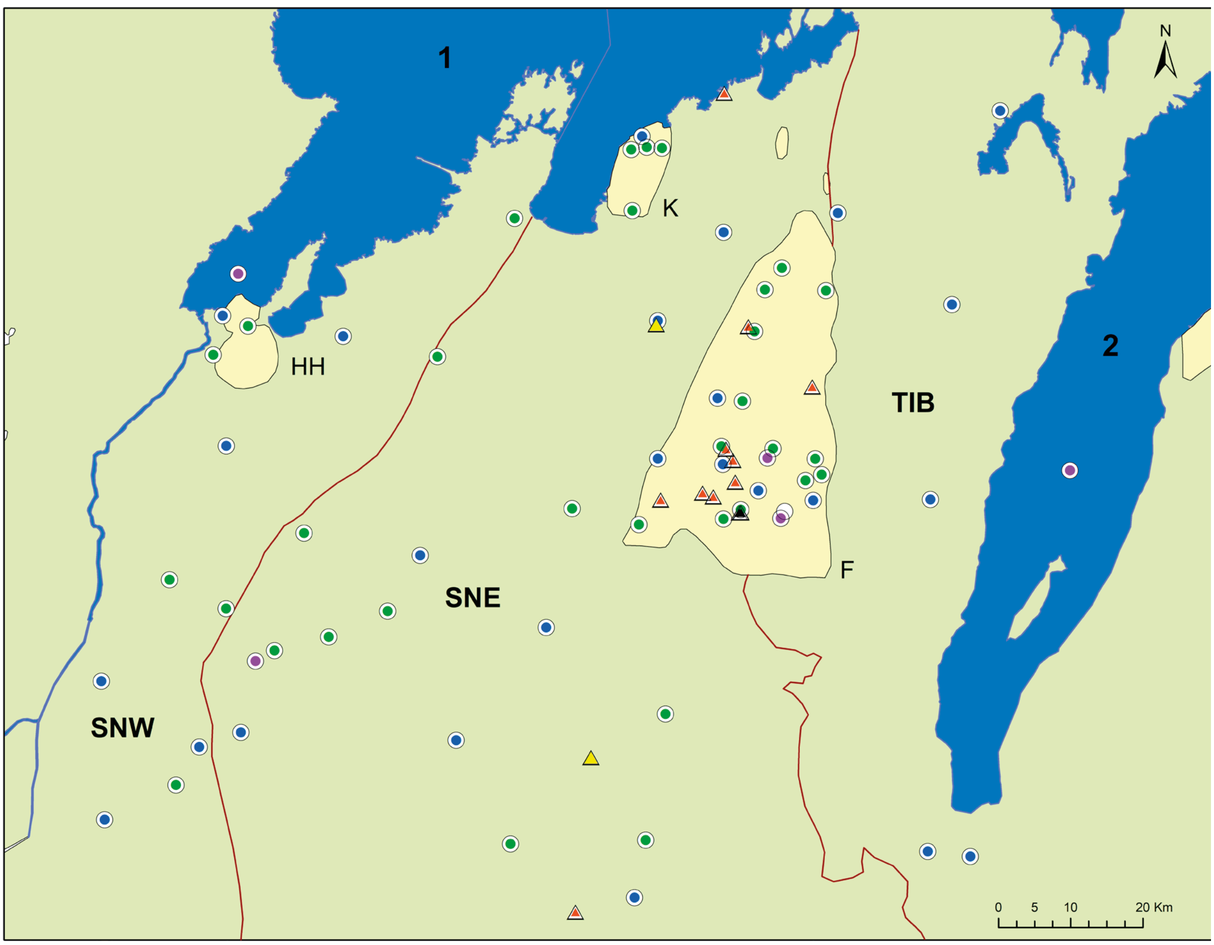


FIGURE 10 Distribution of the Sr isotope baseline samples. SNW: Sveconorwegian west, SNE: Sveconorwegian east, TIB: Transscandinavian granite-porphyry belt. 1: lake Vänern, 2: Lake Vättern, HH: Halle and Hunne mountains, K: Kinnekulle, F: Falbygden. Triangles: fauna, circles: water. Yellow: fish, black: snail, red: small terrestrial mammals, purple: lake/pond, blue: stream/creek, green: spring.

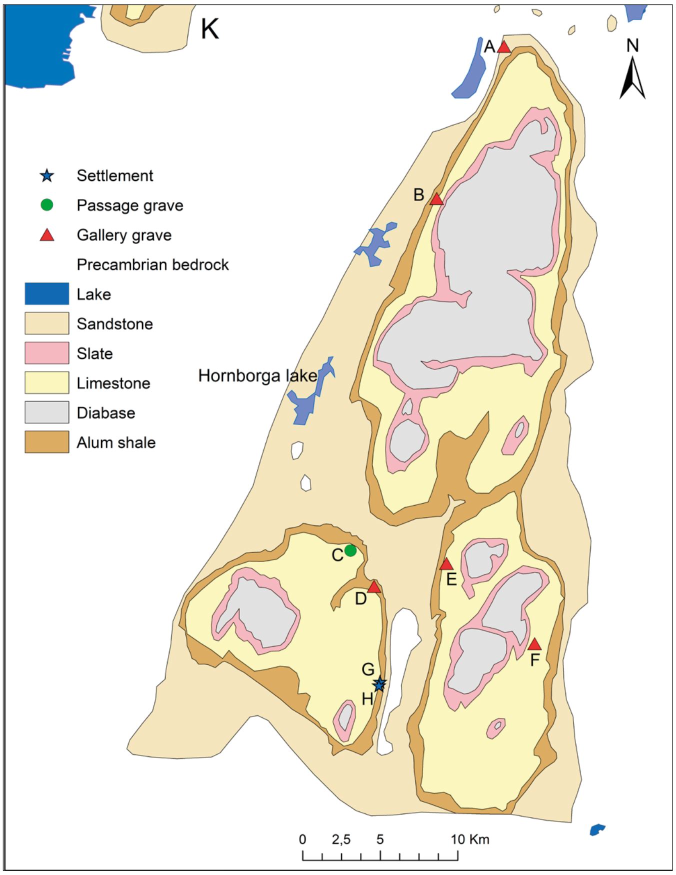


Figure 11 Distribution of domestic animal sample used in the dietary baseline. Fish samples from Hornborga lake (Boethius 2018; Eriksson et al. 2018) and crop samples from the settlements (Sjögren 2017) were also included. Further information of the samples can be found in paper V, appendix 2. A: Timmersdala skolhus, B: Måns-Nilsgården, C: Rössberga, D: Berga, E: Olof Ingemarsgården, F: Gästgivaregården, G: Logården, H: Klövagården, K: Kinnekulle.

Middle Neolithic plant data was also used for this period. Domestic animal remains from gallery graves of Falbygden were sampled (Fig. 11). Unfortunately, animal bones in gallery graves are rare and most of the bones were dated to later periods (appendix 1). However, one pig phalanx, one goat bone and one cattle bone could be dated to the Late Neolithic. These three animal samples were complemented by one bone bead/cylinder, two bone needles and one bone awl, which were radiocarbon dated, analysed for stable isotopes and subjected to ZooMS. The species of the Late Neolithic bone artefacts are distributed as follows (Table 1). In total, six domestic animal samples were included in the Late Neolithic baseline.

Table 1 Count results of animal species determinations on bone artefacts, according to ZooMS.

	Awl	Bead	Needle
Sheep	1		
Goat		1	
Cattle			2

4.5 Human remains

4.5.1 Sample selection and representativity

About 20% of the megalithic graves in Falbygden have been excavated, to different extents and according to varying archaeological standards (Blank 2016; Sjögren 2003; Weiler 1994). The analysed human remains derive from excavations conducted between 1863 and 2014 (Appendix 2). The osteological information for the sampled individuals is limited, as the bones were typically found commingled and in a fragmentary state (Ahlström 2001, 2009; Retzius 1899). Moreover, in the older excavations the bones were not always collected but left, discarded, or reburied. In some cases, only parts of the skeletons were collected, for example only skulls (e.g., Retzius 1899). All these factors have affected the sampling potential and the quality of knowledge about the buried individuals. Furthermore, many of the megalithic graves were exposed to later activities and disturbances including reuse and robbery (Blank 2016; Sjögren 2003). Clearing out older skeletons from the megalithic graves might also have occurred in the Neolithic and Early Bronze Age (Andersson and Hjärthner-Holdar 1989: 211; Blank 2016: 53; Persson and Sjögren 2001: 46; Strömberg 1971b). Thus, the available human remains may only represent part of the original burials in the megalithic graves.

To prevent sampling from mixed contexts and uncertain origins, the available excavation documentation was thoroughly investigated, and bones with doubtful origins were avoided. Most of the sampled bones had already been marked up during excavation by experienced archaeologists. The number of samples per grave ranges from one to 34 (Appendix 1 and 2).

In a first phase skeletal remains, primarily teeth, were selected from as many individuals (children and adults) as possible in graves with well-preserved human bones. We sampled a specific bone element or tooth type from each grave, to insure that as many unique individuals as possible were included. Teeth were favoured to minimize the destructive intervention on the human remains, as multiple analyses were conducted on the same individuals, where both collagen and enamel were needed. Additional sampling from graves with fewer bone remains were conducted to include as many different types of megalithic graves as possible, from various locations. Postcranial elements were also targeted to complement the teeth sampled in some of the graves (paper II). In these cases, multiple samples from the same individual might occur.

The different bone elements represent different ages of the individuals, as the rate of chemical and structural turnover varies. Isotopic signals in tooth dentine, as well as in the petrous bone (part of the temporal bone) originate from childhood and early youth. The collagen in other bone elements reflect an average of isotope values from a number of years prior to death. To be able to investigate adult diet, jaw bones related to some of the teeth were sampled to complement the previously sampled bones. In paper VI, all contexts with available burnt bone were sampled. Sample selections in the different studies are further described in the method sections of the articles.

The sampling was conducted on several different occasions at the University of Gothenburg (GU), VGM, FM, SHM, Lund University (LU) and Uppsala University (UU), with the help of Leena Drenzel, SHM, Johnny Karlsson, SHM, Anna Tornberg, LU, Torbjörn Ahlström, LU, Jan Storå SU, Astrid Lennblad, BM, Aija Macane, GU, and Maria Vretemark, VGM.

4.5.2 Samples and sites- an overview

The main part of the material consists of human skeletal remains recovered from megalithic graves from Falbygden and Västergötland (VG). These remains have been kept for different lengths of time at depositories in Tumba (SHM), Skara (VGM), Falköping (FM), Alingsås (AM) and in Gothenburg (GU). Most samples consist of unburnt teeth, but other bone elements were also included (see above). A minor part of the samples comprises burnt human bones. In addition to the results from the human remains sampled for this thesis, data from previously analysed bones were included, which are described in appendix 1 in paper II, IV and V. The skeletal remains analysed within the scope of this thesis derive from 46 localities (Fig. 12). Of these sites, 39 are located on Cambro-Silurian sedimentary terrains, while seven are located on Precambrian crystalline rocks. In addition to the sites presented below (Table 2, Fig. 12), one tooth from the Kavlanda gallery grave, Bohuslän, was also sampled for radiocarbon dating and stable isotope analysis (paper II and V).

Both collagen and enamel were sampled from the human remains. All the individuals/bones were radiocarbon dated. In most cases the same bone/individual was sampled for a number of different analyses (Fig. 13, appendix 1). Some bone elements were sampled twice and sent for radiocarbon dating at different laboratories

Table 2 Number of different sites sampled for human remains.

		Dolmens	Passage graves	Gallery graves	Dolmens/Gallery graves	Passage/Gallery graves	Megalithic grave of unknown type	Bog finds	Total
Västergötland Cambro-Silurian	Fal-bygden	2	14	16	2	1	1	-	36
	Kinne-kulle	-	-	3	-	-	-	-	3
Västergötland Pre-cambrian		1	-	5	-	-	-	1	7
Total		3	14	24	2	1	1	1	46

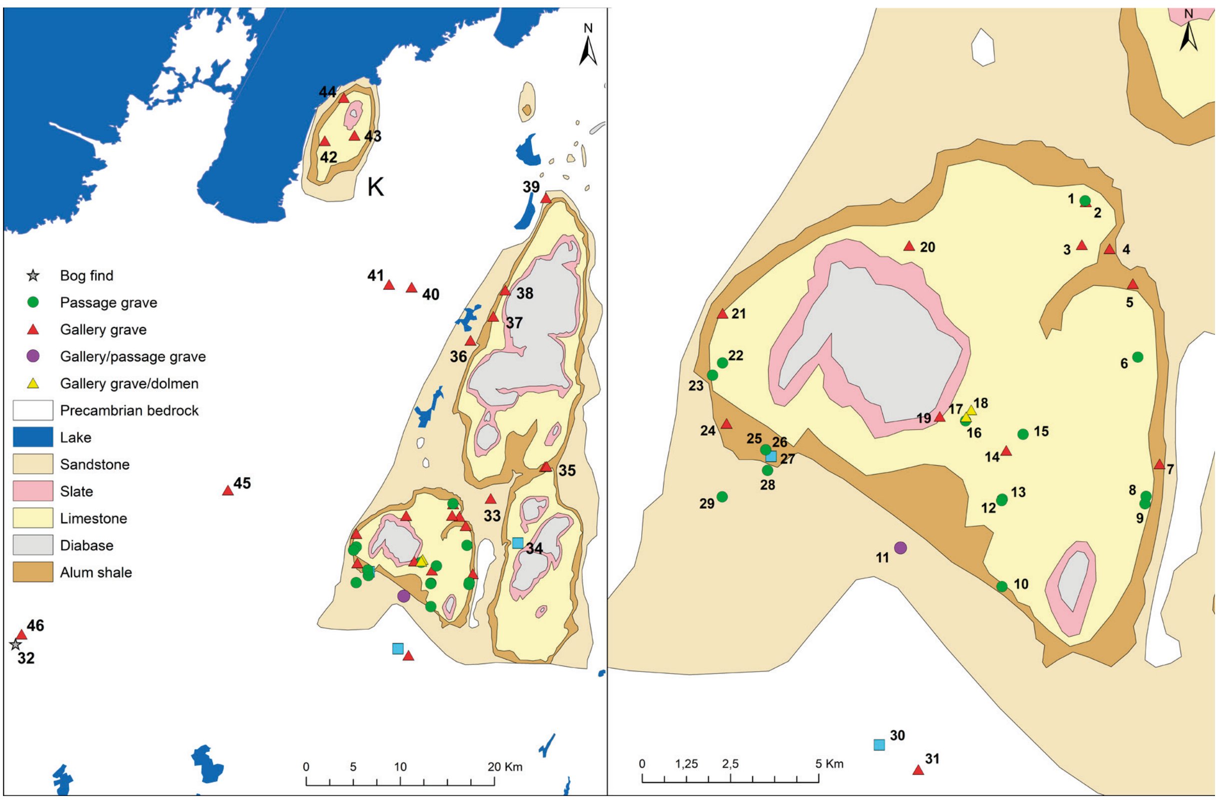


Figure 12 Distribution of sites sampled for human remains. Megalithic classifications according to paper II. Site numbers are found in appendix 1. K: Kinnekulle.

(paper II). In some cases, several teeth from the same individual were analysed for Sr isotopes (Fig. 13; paper IV). The number of samples are presented in table 3, and for more detailed information of the samples see appendix 1. For the exact number of analyses from each grave see appendix 2. In total 221 skeletal remains (199 unburnt and 22 burnt), most of them belonging to unique individuals, were sampled for this study (Table 3, appendix 1). Of these, 201 samples

(196 collagen and 15 apatite samples) were successfully radiocarbon dated. The number of stable isotope and Sr isotope samples in table 3, represent the ones that yielded data. Of the 91 individuals that was sampled for aDNA, 52 could be assigned to biological sex and mtDNA could be determined in 40 cases. In addition to the analyses presented in table 3, 133 of the teeth from 92 individuals were sampled for ^{18}O isotope analysis, which are presented in a forthcoming study.

Table 3 Number of samples used for different analyses. Numbers in parentheses are samples conducted for this study that were published in other studies (Blank 2017, 2019; Blank and Knipper 2021; Hollund et al. 2018; Malmström et al. 2019).

Analysis	Material	Teeth	Long bones	Skull fragments	Mandibles	Other bones	Total
^{14}C	Collagen	140 (5)	29 (21)	16 (3)	11	3 (1)	199 (30)
	Apatite	-	10 (1)	9	1	-	20 (1)
^{13}C	Collagen	112 (29)	31 (20)	13 (9)	13	3 (1)	161 (59)
	Apatite	77	-	-	-	-	77
^{15}N	Collagen	112 (29)	31 (20)	13 (9)	13	3 (1)	161 (59)
$^{87}Sr/^{86}Sr$	Enamel	145 (31)	-	-	-	-	145 (31)
aDNA	Cementum	89 (2)	-	-	-	2	91 (2)

4.6 To sum up

This thesis is based on a vast material, mainly human bones, from a large number of megalithic graves of different types and from a few other contexts. The material mainly derives from Falbygden, although some locations in the surrounding area also were included. The analysis of the material has resulted in large datasets which are discussed in the individual articles (see below).

FIGURE 13 Sampling of teeth for multiple analyses. Left: photo of mandibula from MJ18, Lilla Balltorp gallery grave, University of Gothenburg, by Malou Blank. Right: photo of mandibula from MM7, Hellekis gallery grave, Lund University, by Malou Blank.

5.
Summary results of the articles

Photo of the work done when the Berga gallery grave was moved in 1928, by Hilding Svensson (photo no. 15.6), ATA, Riksantikvarieämbetet under a Public Domain license. Graphics Richard Blank.

5.1 Introduction

In this chapter summaries of the individual articles are presented. The emphasis is put on the main results of the different studies. The appendices of the individual papers are found online (see digital links in the papers).

5.2 Paper I

New Perspectives on the Late Neolithic of South western Sweden. An interdisciplinary investigation of the Gallery Grave Falköping stad 5 (2018).

This paper is an interdisciplinary study based on a combination of archaeology, osteology and various isotope analyses of human remains from a single gallery grave. The purpose of the study was to gain new knowledge of the Late Neolithic population in Falbygden by conducting in depth archaeological and multipronged bioarchaeological investigations of one single locality. The aim was addressed through analyses of the time of use of Fredriksberg gallery grave, as well as the health, paleodemography, diet and subsistence, and mobility of the individuals buried there. Furthermore, these results were compared with previously published data on the Late and Middle Neolithic megalithic population in Falbygden and from other south Scandinavian regions.

The human remains consisted of a minimum of 28 inhumation burials. Of these, 21 were radiocarbon dated and analysed for ^{13}C (collagen and apatite), ^{15}N and Sr isotopes. The grave displayed a high child mortality rate, with one third of the skeletons representing individuals who did not reach an adult age. The demographic analyses may suggest a relatively high population density and a possible population increase over time. Stature seems to have been similar to Late Neolithic populations in southern Sweden in general. The frequency of enamel hypoplasia was relatively high (28.6%) in relation to he Late Neolithic-Early Bronze Age localities of Scania, but lower than in Middle and Late Neolithic Denmark. It is probable that the high child mortality, high mortality among females of reproductive age, and the frequency of enamel hypoplasia reflect a population at high risk for infectious disease due to a relatively high population density, and possibly also due to close contact with animals.

According to the radiocarbon dates and the artefacts recovered from the grave, it was already in use during the first part of the Late Neolithic and used into the second part of the period (2200 to 1650 cal BC), and thus, it can be considered to be relatively early. Most of the dates were concentrated to about 2000 cal BC. The burials most probably consisted of successive inhumations and the radiocarbon dates suggested that the grave was used for roughly 100 to 550 years. The gallery grave appears to have been continuously used, although use in two or three different phases in close succession is also possible. Three of the individuals may have a later date than the majority of the burials, although they overlap at the 95.4% probability interval.

In addition, the three chronologically youngest burials had significantly higher Sr isotope ratios than the rest of the individuals (Fig. 14). Two of them shared very similar Sr isotope ratios as well as $\delta^{15}N$ values, which could indicate that they came from the same territory. A plausible scenario is that these three individuals belonged to a later burial phase, related to the reuse of the grave by a non-local group or non-local individuals settling in the area.

The stable isotopes of the buried individuals indicate a terrestrial diet with a rather high intake of plant foods. A subsistence based on plant cultivation and animal husbandry with limited elements of hunting and fishing can be expected. The variation of $\delta^{15}N$ values of the human remains from the gallery grave is greater than during the Middle Neolithic, which agrees with observations in other Late Neolithic human samples from Falbygden. The variation in these values could reflect specialization and variation in subsistence strategies but could also depend on social stratification and increased mobility. Tendencies for higher $\delta^{15}N$ values and lower collagen-apatite spacing were observed in the earlier Late Neolithic burials in the Fredriksberg material, which might be a result from a greater consumption of protein from higher trophic levels and a lower intake of plant food than in the later part of the Late Neolithic. In addition, lower $\delta^{15}N$ values during the Late Neolithic compared to the Middle Neolithic period were observed, which may indicate a decrease in the intake of animal-derived foodstuffs, such as meat or dairy products, or an increased consumption of protein from a lower trophic level, such as plant food. This interpretation is however contradicted by the fact that the plant food intake does not seem to increase according to the collagen-apatite spacing. The observed caries frequency was slightly higher in the Fredriksberg gallery grave than in contemporary Scania and substantially higher than in Middle Neolithic Falbygden. The caries frequency may result from an increased reliance on carbohydrates but could also depend on hereditary factors or different oral health.

Analyses of dental calculus from several of the individuals demonstrated consumption of dairy products. It is possible that the lack of cribra orbitalia[15] among the sampled individuals is connected to milk consumption and a higher availability of vitamin D. One hypothesis is that those buried in the grave generally had a heavier reliance on cattle and goats than on pigs, which in turn could explain the decreased $\delta^{15}N$ values in the Late Neolithic than in the previous period. However, the baseline data from domestic animal were too few to confirm this assumption. The

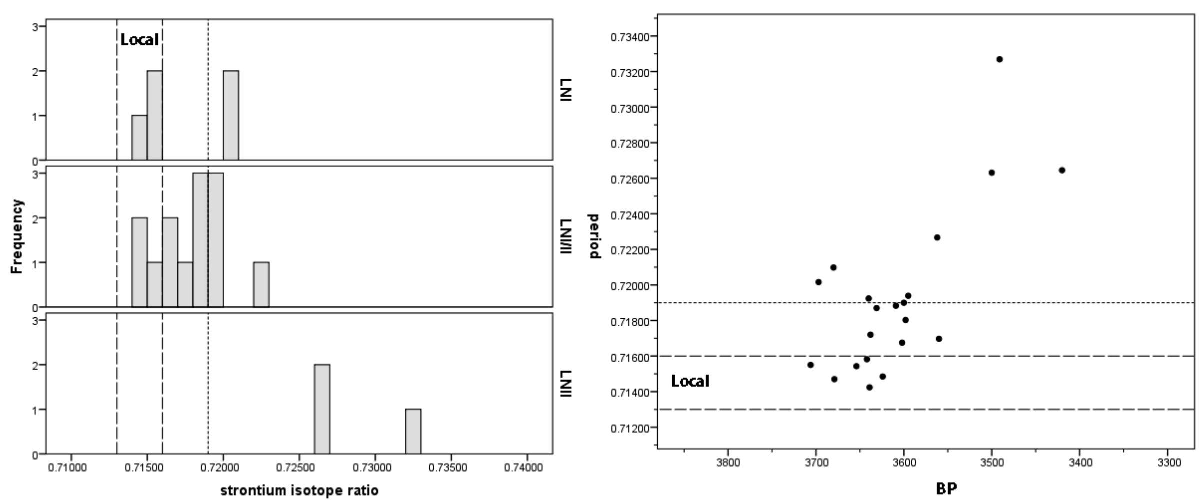


FIGURE 14 Histogram and scatter plot of Sr isotope ratios of the buried individuals in Fredriksberg gallery grave in a chronological order (Paper I: Fig. 11). A: Local $^{87}Sr/^{86}Sr$ ratios, B: non-local/mixed $^{87}Sr/^{86}Sr$ ratios, C: non-local $^{87}Sr/^{86}Sr$ ratios, see text above. The local and non-local signals of Falbygden are based on earlier and ongoing research. LNI: Late Neolithic I, LNII: Late Neolithic II.

15 A pathological condition observed as small cavities in the eye socket

levels of $\delta^{15}N$ may also be affected by differences in agropastoral strategies as the isotope values of the animals can change depending on how they are held and fed. Furthermore, the $\delta^{15}N$ values of crops can fluctuate depending on if and how the fields are manured and used. Less use of manure in the Late Neolithic may result in lower $\delta^{15}N$ values than in the previous period.

The majority (71%) of the buried individuals in Fredriksberg gallery grave had Sr isotope ratios that are not present in Falbygden. Most of the individuals with non-local ratios probably spent part of their childhood in the outskirts of Falbygden or in the surrounding Precambrian area. Some of the Sr isotope ratios might be a result of repeated movements in and out of Falbygden, perhaps related to herding. However, this must be confirmed by multiple analyses of teeth from the same individuals. The three individuals with the youngest radiocarbon dates had very high Sr isotope ratios and most likely spent part of their childhood years in eastern or more north-eastern parts of Sweden. Non-local ratios were suggested to represent people who moved into the area in their younger years and settled for different reasons, including exogamous marriage alliances between local groups and groups from outside of Falbygden. Compared to Sr isotope data from the previous Middle Neolithic period, an increased human mobility in the Late Neolithic was observed.

The results revealed changing population dynamics in the Late Neolithic Falbygden, with increased human mobility, variability in subsistence strategies, and growing population density.

5.3 Paper II
Old bones or early graves? Megalithic burial sequences in southern Sweden based on ^{14}C datings (2020).

Megalithic tombs have since long been a focus of debate within the archaeological research field, not least regarding their emergence and the various bursts of building activity in different regions and periods. The introduction and primary use of the megalithic graves is a complex issue, due to the general lack or insecure contexts of preserved datable material. The radical increase of available radiocarbon dates on human remains—obtained over the last decade, thanks to the advancement of radiocarbon methodology—has now enabled a compilation of radiocarbon dates of good quality. The study was based on 374 radiocarbon dates on human bones and teeth, selected from 66 megalithic graves. We have high confidence that each date came from a separate individual. Of the 374 included radiocarbon dates, 158 new dates were published within this study. The aim of this paper was to investigate the temporal span of the main burial sequences in the conventional megalithic grave types of southern Sweden, with special focus on the less studied gallery graves. The form, layout and dating of the different types of tombs were examined, in order to investigate regional and chronological variation in the use of megaliths. By comparing sum plots, KDE models, individual ^{14}C dates and typology of artefacts, the existing chronologies were evaluated.

The new radiocarbon dates from dolmens and passage graves more or less agreed with the conventional chronology, but the presence of early skeletons in gallery graves was unexpected (Fig. 15). The results suggest that megalithic graves were first used around 3500–3300 cal BC and appeared approximately simultaneously in southern Sweden, even though the very earliest dates are from Falbygden and Alvastra. The dolmens and passage graves were used contem-

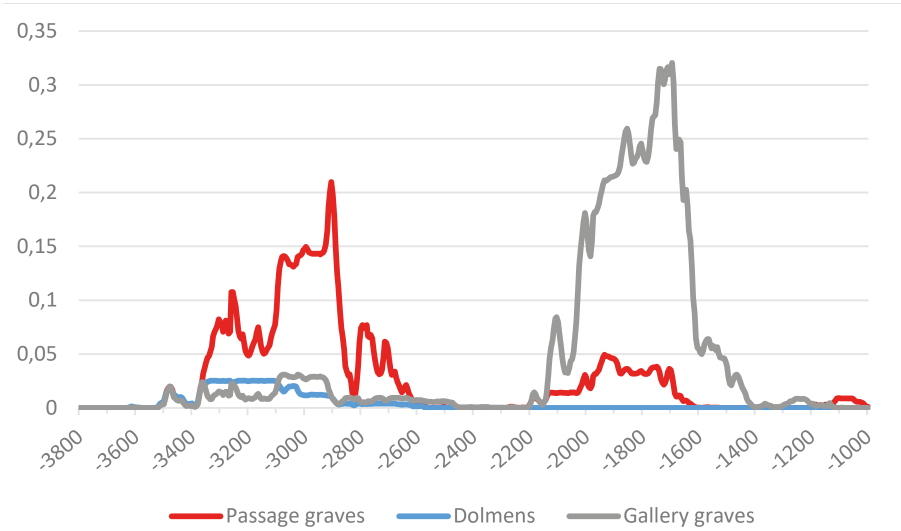


Figure 15 A sum plot of ^{14}C dates from megalithic graves in Västergötland (cal BC, 95.4%, paper II: Fig. 14). Passage graves (N=78), dolmens (N=12) and gallery graves (N=125).

poraneously, but the proportion of early dates supports a slightly earlier start for the dolmens.

The conventional typology should be used with caution and regional variations should be considered. In Västergötland, four single-roomed gallery graves of various sizes and two multi-roomed gallery graves with port-holes contained skeletal remains dated to the Early Neolithic and Middle Neolithic A. Furthermore, Early-Middle Neolithic artefacts appeared in ten out of 23 sampled gallery graves in Västergötland. Single-roomed graves were most likely constructed and used at the same time as the dolmens and passage graves. Thus, Middle Neolithic megalithic graves were more varied in size and appearance than the conventional typology of megalithic graves proposes. Consequently, this opens a possibility for a wider geographical distribution of Middle Neolithic megalithic graves in Sweden than currently recognized. Middle Neolithic artefacts and animal bones in Västergötland gallery graves, as well as graves with ante-chambers dated to the last part of the Middle Neolithic on Öland, favour a Middle Neolithic use of some of the multi-roomed gallery graves in Västergötland, although reburial of old bones cannot be ruled out.

Considering the Late Neolithic gallery graves in Västergötland, smaller single-roomed graves with a limited number of inhumations mainly date to the early phase of the Late Neolithic and long multi-roomed graves with a large number of successive burials date to the Late Neolithic II and Early Bronze Age.

In most regions apart from Öland, the megalithic graves were used in two separate phases, with intensive use ca. 3200 to 2800 cal BC and ca. 2000 to 1600 cal BC. Continued use for successive burials throughout the Early Bronze Age is observed. We proposed that the radiocarbon dates of buried individuals partly reflect the demographic situation with a population decline in the Middle Neolithic B and the first part of Late Neolithic I. However, changed burial practices must also affect this result.

5.4 Paper III

Isotope values of the bioavailable strontium in inland southwestern Sweden—A baseline for mobility studies (2018).

One important aspect of the south Scandinavian Neolithic and of this thesis concerns human mobility and its relation to social networks and to circulation of objects. The further development of Sr isotope analysis has demonstrated a significant potential for investigating prehistoric mobility patterns. In order to be able to evaluate Sr isotope data from human and animal remains, baseline databases are crucial. The clear delimitation of Cambro-Silurian sedimentary rocks in Falbygden, surrounded by older Precambrian igneous/metamorphic rocks, constitutes an ideal setting for mobility studies based on isotopic analysis. Previous Sr isotope studies in the region leave several issues regarding the background isotope variation unresolved, due to a rather low number of sample sites. The aim of this paper was to construct a Sr isotope baseline of southwestern Sweden to provide a foundation for archaeological studies of human and animal mobility.

In this paper we presented the most extensive Sr isotope baseline yet published for Sweden, covering an area of 120 x 130 km of the southwestern inland. We analysed a total of 61 water and five animal samples, which were combined with previous data from two water samples and 21 samples from non-domestic small fauna, to obtain as high-resolution mapping as possible.

Several areas with different baseline ranges were distinguished, although with overlaps between some areas. Questions regarding the construction of baselines were addressed and our statistical analyses showed that small non-domestic mammals and water samples were compatible. We confirmed that the Sr isotope data largely reflect the underlying bedrock geology of the area, with the highest ratios measured in samples from the oldest geological provinces, and the lowest ratios measured in samples from the areas consisting of the youngest bedrock in the study area. Furthermore, we could demonstrate that there is a significant difference between the isotope ratios of the bioavailable Sr of the Paleozoic sedimentary and intrusive rock terrains and the Precambrian granitoid-gneiss areas.

The isotope ratios in samples from the Precambrian regions show substantial internal variation. The relatively wide range of isotope ratios in these terrains was suggested to result from the complex geology, with metamorphic events and glacial deposits that also characterize the area. The statistical evaluations showed a significant difference between Sr isotope ratios of samples in the most western segment Sveconorwegian west, and the easternmost province Transscandinavian granite-porphyry belt, with the highest ratios in samples from the easternmost part. In the Precambrian area south of Falbygden, there are locations with lower ratios than expected, probably due to soil deposits by glaciers and the presence of younger intrusive rocks.

The samples from the Paleozoic sedimentary areas measured significantly lower and less variable Sr isotope ratios than the ones from the Precambrian terrains. The lowest variation of Sr isotope ratios was found in Falbygden, where most of the samples were collected. We suggested that the narrow Sr isotope range of this area could be explained by effective mixing and averaging out of various components, such as Paleozoic sedimentary rocks, Precambrian material and Devonian diabase by glaciogenic processes and the deposition of these thoroughly mixed tills on top of the Cambro-Silurian bedrock. The lowest isotope ratios were measured in samples from locations dominated by the youngest intrusive rock in the area (diabase).

Furthermore, Sr isotope ratios in samples from the sedimentary area of Falbygden were shown to be significantly lower than in samples from the sedimentary area of Kinnekulle. We proposed a tentative explanation, based on differences in the proportions of sedimentary rocks, diabase and Precambrian-derived moraine deposits.

We also produced interpolated surface models to predict the isotopic ranges of the bioavailable Sr in the study area. The models agreed with the other results and demonstrated the influence of the glacial movements in the region, in addition to bedrock substrate (Fig. 16).

The background data set presented in this paper allows for more nuanced and detailed interpretations of human and animal mobility in the region, in particular by recognition of subregions with differing Sr isotope ratios within the Precambrian province. In addition, the results enable identification of long-distance mobility with greater confidence.

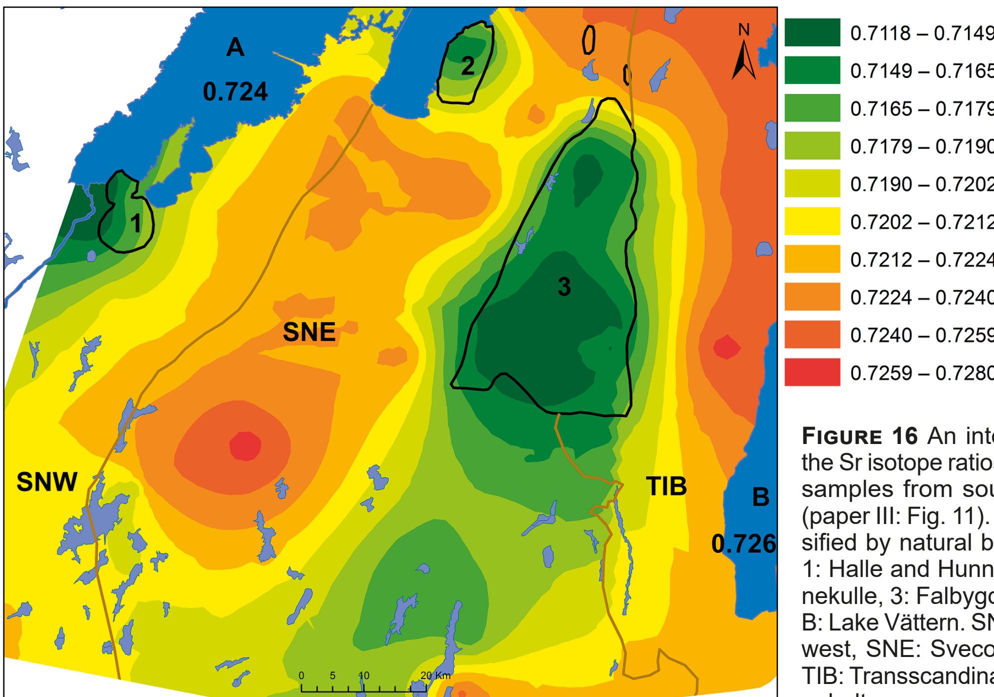


FIGURE 16 An interpolated surface of the Sr isotope ratios of water and animal samples from southwestern Sweden (paper III: Fig. 11). The ranges are classified by natural breaks in ten groups. 1: Halle and Hunne mountains, 2: Kinnekulle, 3: Falbygden. A: Lake Vänern, B: Lake Vättern. SNW: Sveconorwegian west, SNE: Sveconorwegian east and TIB: Transscandinavian granite-porphyry belt.

5.5 Paper IV
Mobility patterns in inland southwestern Sweden during the Neolithic and Early Bronze Age (2021).

In this paper human mobility patterns in Falbygden were investigated by employing Sr isotope analysis, combined with archaeological and bioarchaeological data, including mtDNA and sex assessment. The study was based on data from 141 individuals recovered from 21 megalithic graves, along with other archaeological and anthropological records. The aim was to investigate population dynamics in the Scandinavian Neolithic and Early Bronze Age in southwestern Sweden. We discussed the temporal and spatial scale of individual movement, mobility patterns of specific categories of people and possible social drivers behind them.

Based on our data we concluded that there was a significant increase of human mobility and a greater variation of mobility patterns among the Late Neolithic megalithic population of Falbygden, compared to the Early Neolithic-Middle Neolithic phase (Fig. 17). The Sr isotope data indicated individuals moving both into and away from Falbygden. Our analyses demonstrated that individuals with new mtDNA haplogroups and Sr isotope ratios previously not found in the area appear in the Late Neolithic. We suggested that the greater variation of isotope ratios and mtDNA haplogroups and evidence of movements both in and out of Falbygden resulted from more people moving into Falbygden from further away, but also from a generally increased mobility of the megalithic populations in the landscape over larger regions in the Late Neolithic-Early Bronze Age phase. Indeed, the increased mobility in the Late Neolithic seems to be a very broad geographic trend that characterizes other regions of Sweden.

The Sr isotope measurements demonstrated a low number of individuals with site local ratios. We suggested that this might result from high mobility within Falbygden and/or from use of much larger economic areas around the sites than expected and of exogamous marriages and other types of movements within Falbygden. Furthermore, the number of individuals with a semi-local ratio was greater during the Early Neolithic-Middle Neolithic (35%) than in the Late Neolithic-Early Bronze Age (15%). According to the baseline, the semi-local range may result from residing in locations found in the peripheries of the sedimentary area or south of Falbygden, but it could likewise represent a mixture of Sr from Falbygden and the surrounding Precambrian areas.

The greater proportion of semi-local ratios in the Middle Neolithic than in the Late Neolithic might be related to livestock management, but also to movements between settlements belonging to networks in a larger region. According to the multiple sampled teeth, we claimed that

FIGURE 17 Strontium isotopes over time (paper IV: Fig. 9). L: local to Falbygden, S-L: semi-local, N-L VG: non-local to Falbygden found within Västergötland, N-L outside VG: non-local range to Falbygden found outside of Västergötland.

it was likely that some of the semi-local ratios reflect actual locations of residence. Hence, the higher amount of semi-local ratios in the Middle Neolithic could also result from more intense migrations from locations in the peripheral parts and close to the sedimentary area, while the higher number of non-locals in Late Neolithic and Early Bronze Age might reflect migrations from locations further away from Falbygden. For resolving these questions, we advocated further micro-sampling of the teeth.

Most of the non-local ratios reported in this study can be traced to the surrounding Precambrian terrains of inland southwestern Sweden, according to the baseline data. Despite the many archaeological indications of networks with the west coast, Denmark and Scania during the Neolithic and Early Bronze Age, Sr isotope ratios suggesting a possible origin from these regions only occur in a few individuals dated to the latter part of Middle Neolithic. Ratios found east and northeast of Falbygden only appear in the Late Neolithic. Thus, changing mobility patterns and contact networks can be assumed.

We observed changes in mobility patterns between the Early Neolithic-Middle Neolithic and Late Neolithic-Early Bronze Age. During the earlier phase, the Sr isotope results indicated that adults migrated into Falbygden or were brought there to be buried. Based on the Sr isotope results from the later phase, we suggested that individuals and family groups migrated into Falbygden, then residing there prior to burial. During both periods females and males were part of the human movements taking place. In the Late Neolithic II/Early Bronze Age, unlike in earlier periods, the difference in non-local Sr isotope ratios between sexes was significant. This indicates a change in mobility pattern in the Late Neolithic II, where females and males partly migrated from different areas or moved in different manners. Other chronological patterns and variations in Sr isotope ratios related to the reuse of passage graves and the placement of the burials within the different megalithic graves were also addressed in this article.

The mtDNA data from the study individuals revealed that different maternal lineage groups were buried in specific compartments in the Rössberga passage graves during the Early Neolithic-Middle Neolithic phase. Partly different mtDNA lineages were also observed in between gallery graves in the Late Neolithic-Early Bronze Age. Therefore, we proposed that the megalithic graves in Falbygden were mainly used by kin groups, although supplementary investigations are necessary.

In Falbygden, the greater variation of Sr isotope ratios, mtDNA haplogroups, $\delta^{15}N$ values and the greater variation of megalithic grave constructions in the Late Neolithic-Early Bronze Age, compared to the Early Neolithic-Middle Neolithic, point to a more diverse society involving different groups who came from—or maintained connections to—various locations outside the immediate region. Based on radiocarbon and typological grounds, we proposed a distinct change in mobility at the onset of Late Neolithic II. We explored potentially connections to a climate change, a shift in economic and social structures, and an expansion of exchange networks and to a generally increased population.

5.6 Paper V

Diet and subsistence in the Neolithic and Early Bronze Age. An isotopic study of human remains in the megalithic graves of southwestern Sweden (submitted August 2021).

The geographical focus of this study was Falbygden. The calcareous soils in Falbygden have contributed to an important assemblage of well-preserved animal and human remains. Isotopic and archaeological studies of the Middle Neolithic animal and human remains have allowed for a relatively reliable reconstruction of diet and subsistence at this time. In contrast, much less work has focused on the bioarchaeology and biochemistry of human remains in the Late Neolithic and Early Bronze Age. In addition, a few sites were included that lie just outside the Falbygden sedimentary area.

The aim of this paper was to investigate patterns in the diet of the people buried in megalithic graves in inland southwestern Sweden, to get a better understanding of the economy and modes of livelihood of these societies. The study was based on analyses of stable isotopes of nitrogen and carbon in 174 human samples from 31 megalithic graves. $\delta^{15}N$ and $\delta^{13}C$ values in collagen, which are mainly influenced by protein intake, were investigated. Furthermore, the $\delta^{13}C$ values of enamel apatite were included to also investigate the carbohydrate and fat contribution to the diet. These analyses were complemented by quantitative diet reconstructions, in order to estimate the caloric contribution of plants, terrestrial animals, and fresh-water fish in the diet. We compared the data between the two main periods of megalithic use—Early-Middle Neolithic and Late Neolithic-Early Bronze Age. Looking at variations in stable isotope values over time, we discussed the underlying drivers of the dietary patterns such as subsistence strategies, social stratifications, and mobility.

We demonstrated that the megalithic populations of Falbygden were more reliant on plant food (protein from lower trophic levels) than megalithic populations from several other regions in eastern Sweden during both the Early-Middle Neolithic and the Late Neolithic-Early Bronze Age, but especially during the earlier phase. We proposed that this is a result of the inland position of Falbygden, and clearly reveals a heavy reliance on agriculture. Game and freshwater fish in the Falbygden diets were of less significance while in some of the other regions, for instance, marine resources were important dietary components.

The stable isotope values of the megalithic population in Falbygden/Västergötland indicated a fairly consistent diet based on terrestrial resources with a substantial proportion of plant food throughout the Neolithic and into the Early Bronze Age, with some minor but interesting changes. These changes involve increased $\delta^{13}C$ values, slightly decreased $\delta^{15}N$ values and, overall, more varied stable isotope values in the later phase, when compared to the earlier one.

We suggested that a shift in climate at the onset of the Late Neolithic II may have contributed to changes in the local environment, which in turn triggered modifications of subsistence strategies. Pollen data indicate a more open landscape and expanded farmlands in the Late Neolithic-Early Bronze Age, compared to the earlier period. The expansion of farmland and the slightly lower $\delta^{15}N$ values in skeletal remains in the later period indicate an increased importance of plants. However, the collagen-apatite spacing as well as the statistical FRUITS models do not support a greater intake of plant food in the Late Neolithic-Early Bronze Age than in the earlier phase (Fig. 18). Instead, the lower $\delta^{15}N$ and higher $\delta^{13}C$ values might be explained by less manuring and more extensive cultivation practices in the Late Neolithic-Early Bronze Age. Furthermore, the δ^{13}C values as well as the FRUITS models suggest more varied dietary patterns, possibly related to more diverse cultivation and husbandry strategies, in the Late Neolithic-Early Bronze Age than in the Early-Middle Neolithic.

Larger variations in dietary patterns observed in the Late Neolithic-Early Bronze Age with significant differences in isotope values between childhood and adult samples, and more varied stable isotopes within the non-local Sr isotope group are consistent with increased human mobility, with people moving into Falbygden from different locations associated with divergent dietary baselines or traditions. The data do not support any difference in the dietary pattern between females and males at any time during the investigated phases. However, slight differences between burial sites seem to occur.

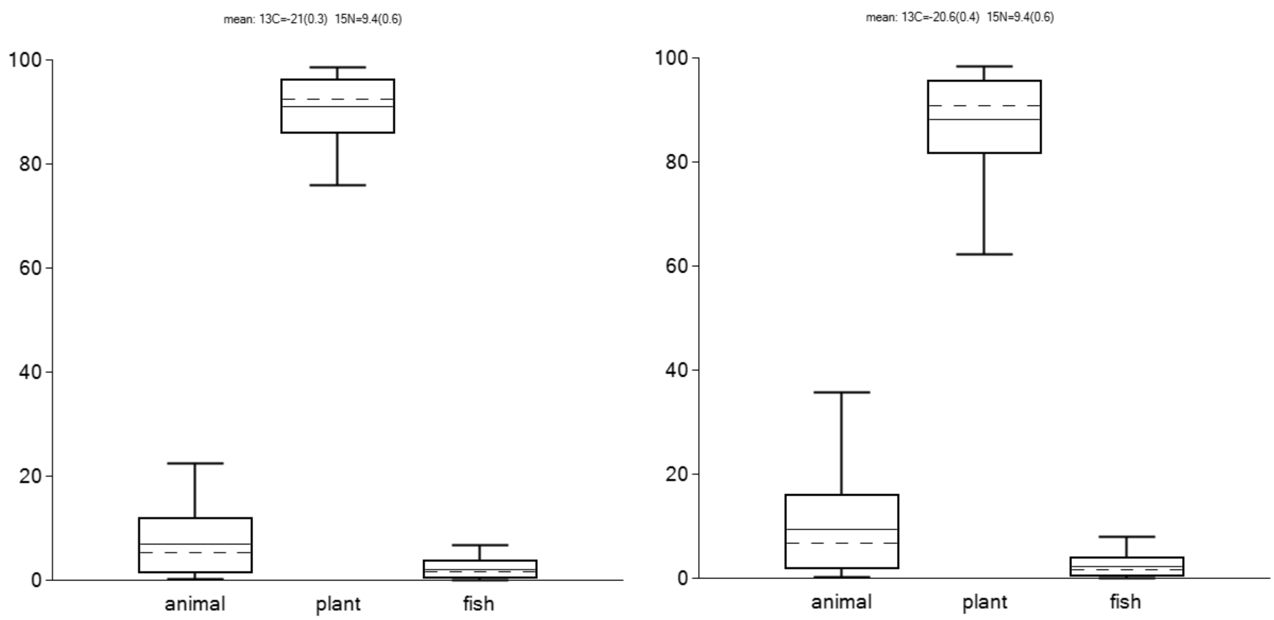


Figure 18 Boxplot of the proportion (%) of the food groups in the EN-MN (left) and the LN-EBA (right), based on isotopic mean values from adult bone (paper V: Fig. 26).

5.7 Paper VI
Burning the dead. Human bones subjected to fire in southwestern Swedish megalithic graves (2021).

In this paper, a series of new radiocarbon dates on burnt human bones recovered from megalithic graves in inland southwestern Sweden are reported. The aim was to explore diachronic trends and synchronic (within-period) variations in the practices of exposing human remains to fire. Both the location of the bones within the grave and the burning practices are discussed. The megalithic graves in the study area were mainly used for successive inhumations but were later extensively reused. Burnt human bones have therefore been assumed to originate from later periods, when cremation was the dominant burial practice, although Neolithic cremations have been documented elsewhere. Some of the questions addressed in this study were as follows. Are there any Neolithic or Early Bronze Age burnt human bones in the megalithic graves in inland southwestern Sweden? If so, were these dry or fresh bones, or bodies exposed to fire? Are there any signs of burning inside the graves or were they burnt elsewhere? Is there any chronological pattern or other significant variation in the burning practices or placement of the bones? How do our results fit in a more general framework of cremation practices and use of megalithic graves?

Twenty-two burnt human bones from 16 megalithic graves were sampled for radiocarbon analysis and of these, 17 were successfully dated. The limited number of samples do not allow for any statistical analyses, and thus, tendencies are discussed. According to the dates most of the burnt bones derived from later reuse of the graves during the Late Bronze Age and Iron Age, concentrating to ca. 900-750 cal BC and to ca. 300-200 cal BC. During these periods, cremations were the dominant burial practice. However, several depositions also dated to the Neolithic and Early Bronze age, confirming parallel practices of inhumation and cremation during these periods. Furthermore, for the first time, depositions of cremated bones were identified as dating to the Middle Neolithic A. In this instance, four burned bones recovered from the entrance area of passage graves could be confirmed. Cremated human remains in an Early Neolithic/Middle Neolithic TRB settlement context were also found. The radiocarbon dates also uncovered a Late Neolithic individual exposed to fire, and depositions of Early Bronze Age cremated remains in the chambers of two gallery graves. In addition, indications of a systematic use of fire, as a complementary mortuary practice, as well as part of rituals of burning in gallery graves during the Late Neolithic/Early Bronze Age were demonstrated.

The results suggest that the placement of the burnt bones and the treatment of the human bodies varied over time (Fig. 19). Based on the context and the scattering of the Middle Neolithic burnt bones, a tentative interpretation

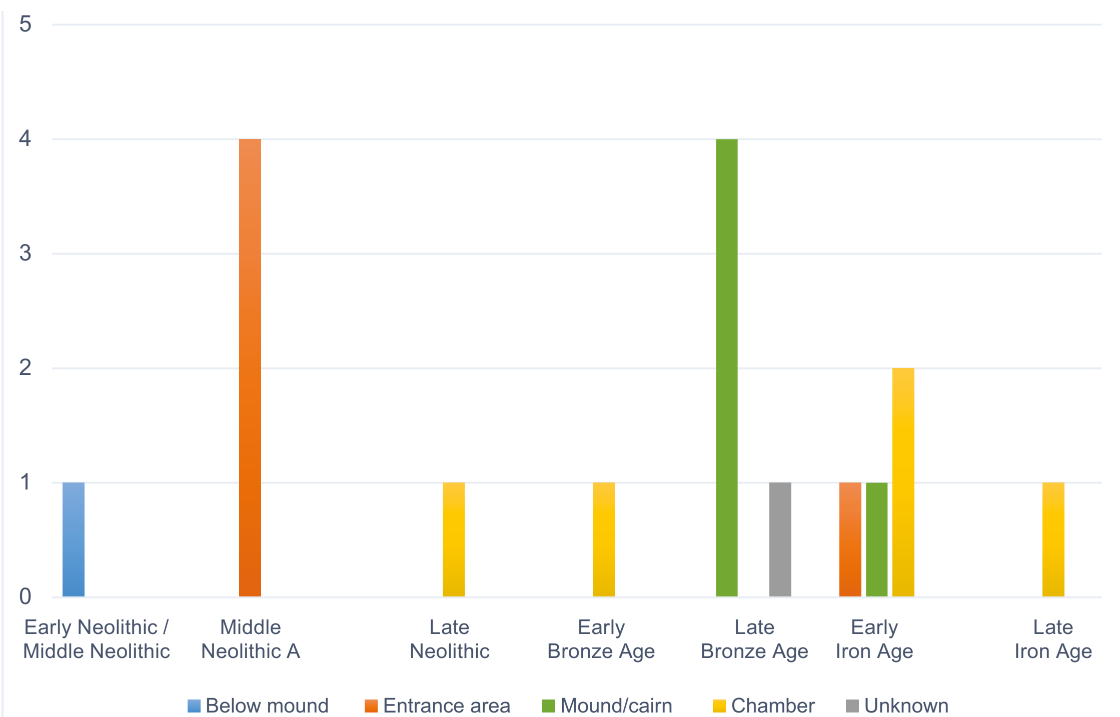


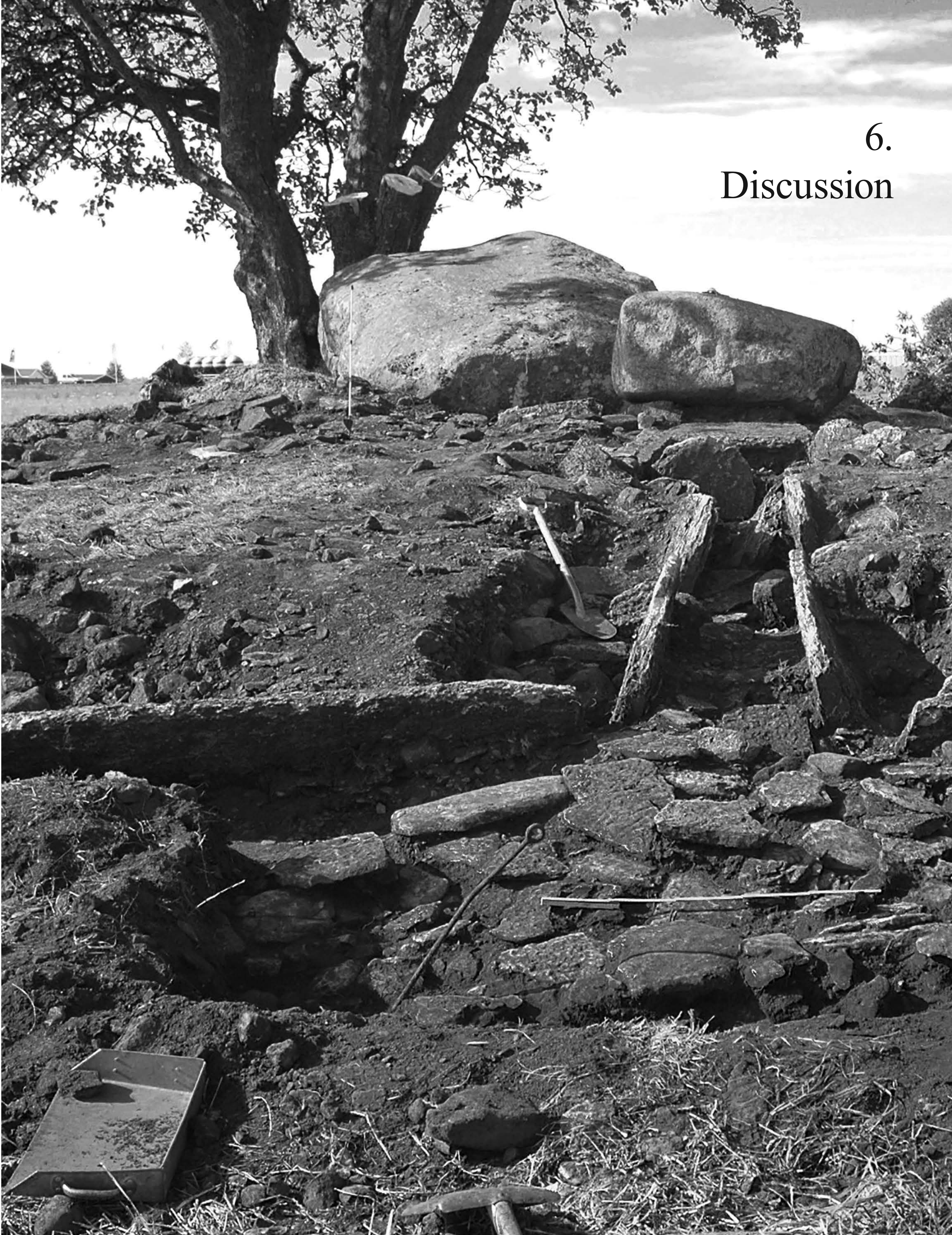
FIGURE 19 Number of dated cremated human bones by context and period (paper VI: Fig 6).

could be put forward, that cremated human bones were part of ritual practices such as feasting and offerings related to burials in front of the megalithic graves during the Middle Neolithic. The calcined bones dated to ca. 3300 to 2900 cal BC were fresh and possibly fleshed when burnt and were deposited in the entrance areas of the passage graves.

In the Late Neolithic-Early Bronze Age, specific individuals appear to have been burnt. I suggested that burning bodies or the graves were sometimes part of the initial stage of use and/or when the grave was abandoned. The use of fire can also be observed on stone and flint objects, on animal bones, as well as on the structure itself in some gallery graves. One Late Neolithic skeleton indicates that the entire body was burnt at a relatively low temperature elsewhere before it was placed in the grave. Other indications of Late Neolithic human bones burnt at low temperatures also occur. In the Late Neolithic and Early Bronze Age, burnt human remains were buried in the chambers.

The cremated bones dated to the Late Bronze Age and Iron Age mostly consisted of graves or burial depositions of cremated bones from single individuals, although one Late Bronze Age bone originates from an assemblage of burnt human bones from three individuals. In two Early Iron Age cases single or a few cremated skull fragments had been placed in the chambers of megalithic graves. In the Late Bronze Age, cremation burials were placed in mounds/cairns of megalithic graves, while in the Iron Age, different parts of the graves were used for depositions of cremated human remains. Most of the Late Bronze Age and Iron Age bones indicate cremations of fresh and even fleshed bones.

6. Discussion



The Firse sten passage grave during excavation.
Photo by Tony Axelsson, graphics Richard Blank.

6.1 Introduction

In this section I will discuss some of the results from the individual papers. The chapter is structured by the four themes—the use-time of megalithic graves, mobility and exchange networks, diet and subsistence practices, and mortuary practices—and addresses the various issues included in my overarching aim and more specific questions. Thereafter, the different themes are brought together in order to extract even more knowledge about the Neolithic and Early Bronze Age societies that constructed and used megalithic graves in inland southwestern Sweden.

One of the notable results has to do with time-of-construction and use of the megalithic graves. I will show that there are grave types in the Middle Neolithic which are similar to Late Neolithic gallery graves. This result is important, as it entails that archaeologists need to be careful when using old terminologies, especially regarding megalith graves with no dated material. By discussing the radiocarbon dates I will demonstrate that megalithic graves were constructed and used in two separate phases with a marked period of disuse in the Middle Neolithic B. Based on the results from the individual articles, I argue that Late Neolithic society in Falbygden was characterised by increased mobility and population diversity compared to earlier periods. Furthermore, subsistence practices and mortuary practices were similar in the two phases, although important differences can be observed indicating a less regulated and ritualised society in the Late Neolithic compared to the Middle Neolithic.

6.2 Chronology of megalithic grave construction and burials

6.2.1 Introduction

Time and chronology are most pertinent in archaeology. Chronological data and resulting empirically based temporal frameworks allow investigations of penecontemporary and diachronic processes and events. Archaeologists have always struggled with the determination of age and the reconstruction of sequences of archaeological remains. On top of that, the evaluation of hypotheses about temporal change in past populations, societies, practices, and wider environments present a further challenge. Methods and theories have been developed to overcome this problem, such as typologies, stratigraphic methods, and scientific methods of dating archaeological remains. These methods have often not been sufficiently precise, and therefore, archaeological research has often been working with vague and/or long time spans. This thesis demonstrates how increasing numbers of more precise radiocarbon dates can both challenge and strengthen our archaeological interpretations. At the same time, this casts light on problems and possibilities with statistical methods that have become more and more common in recent archaeological research.

As discussed in paper II, dating of the first use of the megalithic graves is challenging in several ways. First, most megalithic graves have been used for successive burials and have also been reused for burials (inhumations and cremations) and other activities in later periods (Blank 2016; paper VI). Successive use of the graves has resulted in commingling and fragmentation of the skeletons and the degree of disarticulation has been suggested to be higher in the earliest bones (Sjögren 2015a). Most of the bones sampled and studied in this thesis originate from older excavations, during which retrieval of the human remains often would have been incomplete. Thus, in some cases the earliest disarticulated as well as the most fragmented bones might have been left or discarded by the excavators. However, in other cases substantial bone materials have been recovered, and consequently, the use-time of some of the graves has been ascertained reliably and accurately.

In this thesis most of the studied human remains consist of teeth sitting in jaw bones rather than loose ones, although other bone elements were targeted for addressing problems surrounding the clearing out of earlier remains, as well as the possible reburial of old relics or bones recovered from older graves. Possible clearing out of earlier burial remains might complicate the dating of the first depositions (paper II). In a recent publication of bone remains from a Spanish megalithic grave, a discrepancy between radiocarbon dates from loose teeth and larger bone elements was noticed. This was interpreted as clearing out burials from earlier phases of use, only leaving behind smaller bones such as teeth while the larger bones represent a later phase of use (Aranda Jiménez et al. 2020).

In this subchapter the radiocarbon dates from the megalithic graves are discussed along with artefacts and other isotopic and bioarchaeological data. My intention is to demonstrate that the megalithic graves in Västergötland were intensely constructed and used in the Middle Neolithic A and in the Late Neolithic II. Furthermore, as noted above, it is emphasized that, based on the results reported in this thesis, conventional megalithic grave terminology should be used with caution. I also discuss the possibility of an early introduction of some of the multi-roomed gallery graves, as well as reburial of old bones in these graves.

6.2.2 Early graves or old bones

In several gallery graves single human bones were unexpectedly dated to the Middle Neolithic, contemporaneous with the use of passage graves and dolmens. Furthermore, artefacts in several gallery graves, and an animal bone in one grave, were also dated to the Middle Neolithic. These dates cannot be explained by a simplistic model. Instead, several explanations must be considered, as these instances probably also differ from case to case. Some of these graves may have been constructed and used simultaneously as the passage graves and dolmens. They might have been used in the same manner as the other Middle Neolithic megalithic graves, or they might have been used as complements to passage graves for burying other categories of individuals and in some cases to deposit earlier burials which were cleared out of the passage graves (for further discussion see paper II).

The smaller gallery graves with early dates may in fact be dolmens that do not fit the current definition of this type, which is based on Danish dolmens. Regional variation in dolmen form should be accounted for, but this has not been extensively considered in earlier research. Passage graves have shown to vary regionally, with specific characteristics setting them apart in Falbygden (e.g., Blomqvist/Bägerfeldt 1989a; Sjögren 2003). Thus, this might also be the case for dolmens. The availability of different types of stone (flat limestones and rounded gneiss and granites) in various regions may be an important factor in the variation of appearance. Furthermore, very few dolmens have been confirmed in Falbygden, compared with other regions where Middle Neolithic megalithic graves occur (Blomqvist/Bägerfeldt 1989a; Sjögren 2003; paper II). The great variation in size and shape of the graves categorized as gallery graves also complicates the separation between dolmens and gallery graves.

The two multi-chambered port-hole gallery graves with bones dated to the Middle Neolithic, on the other hand, are more puzzling. The introduction of some of these graves already in the Middle Neolithic is supported empirically by Middle Neolithic artefacts documented in one of the graves, as well as in several similar graves in other parts of Västergötland (paper II). A sheep tooth recovered from another multi-chambered port-hole grave, was radiocarbon dated to the Middle Neolithic. Overall, the multi-chamber port-hole form is similar to German and French gallery graves dated to this period. It is seemingly difficult to avoid the conclusion that this grave form was already being constructed in the Middle Neolithic. However, the Middle Neolithic dates are in the minority, with most associated dates falling within the Late Neolithic. Moreover, many ethnographic examples point to depositions of relics or bones from past graves (paper II). Tilley (1999), amongst others, proposed that human bones have been removed from the passage graves for ritual use (see paper II). Depositions of relics may function as a way to link the grave and the burials to the ancestors. To take bones out of older graves and place them in a gallery grave may have been a means to reinvent tradition and to claim genealogical ties with long-gone ancestral groups (see Whitley 1995). This behaviour of relating to ancestors and old traditions can also explain the high degree of Late Neolithic reuse of passage graves in Falbygden (Blank 2016). In addition, many Late Neolithic gallery graves have been built adjacent to passage graves that also have evidence of Late Neolithic reuse. The location of many gallery graves close to passage graves might also have been an active choice to relate to older traditions and mythical or genealogical ancestors. Vandkilde et al. (2017) suggested that the Late Neolithic building and use of gallery graves was a reinvention of the Middle Neolithic megalithic tradition. The mythical history can go back several centuries and involves a recreation of the past where landscape and monuments in it may play a significant role (Gosden and Lock 1998). Thus, the early dates in the multi-roomed gallery graves may be reburied bones and artefacts originating from Middle Neolithic graves, generating a meaningful connection between the Late Neolithic gallery grave tradition and the older passage grave megalithic tradition.

One of the multi-chambered gallery graves with a Middle Neolithic skull (Utbogården) is located nearby several large passage graves that were reused in the Late Neolithic. This suggests possible differences between individuals deposited in gallery and passage graves. The other large gallery grave (Högebo) containing an Early/Middle Neolithic skull was found at Kinnekulle, where no Middle Neolithic megalithic or flat graves are known. Thus, if this is a deposition of an old bone, it was probably brought from somewhere else and used to manifest ancestral links to the burials in the grave. To approach these issues, we can compare the available isotopic signals and mtDNA haplogroups of the individuals from the different contexts (see below).

6.2.3 Isotope and mtDNA data from Early-Middle Neolithic bones

According to the stable isotopes no significant difference can be observed between the remains deposited in the smaller gallery graves with Early-Middle Neolithic burials (here referred to as gallery graves/dolmens and gallery/passage graves) and the bones placed in dolmens and passage graves. There is a slight tendency for more varied $\delta^{15}N$ values in the remains recovered from passage graves than in the dolmens and gallery graves/dolmens, which might simply be explained by the larger number of samples from passage graves (Fig. 20; paper V).

Regarding the Middle Neolithic bone recovered from the multi-chambered Utbogården gallery grave, the stable isotopes showed similar values to the human remains in nearby graves dated both to the Middle and Late Neolithic (Fig. 20; paper V). Thus, no indications of special diet can be observed for any of these individuals.

The bone from the Utbogården gallery grave was not sampled for aDNA or Sr isotopes, as it con-

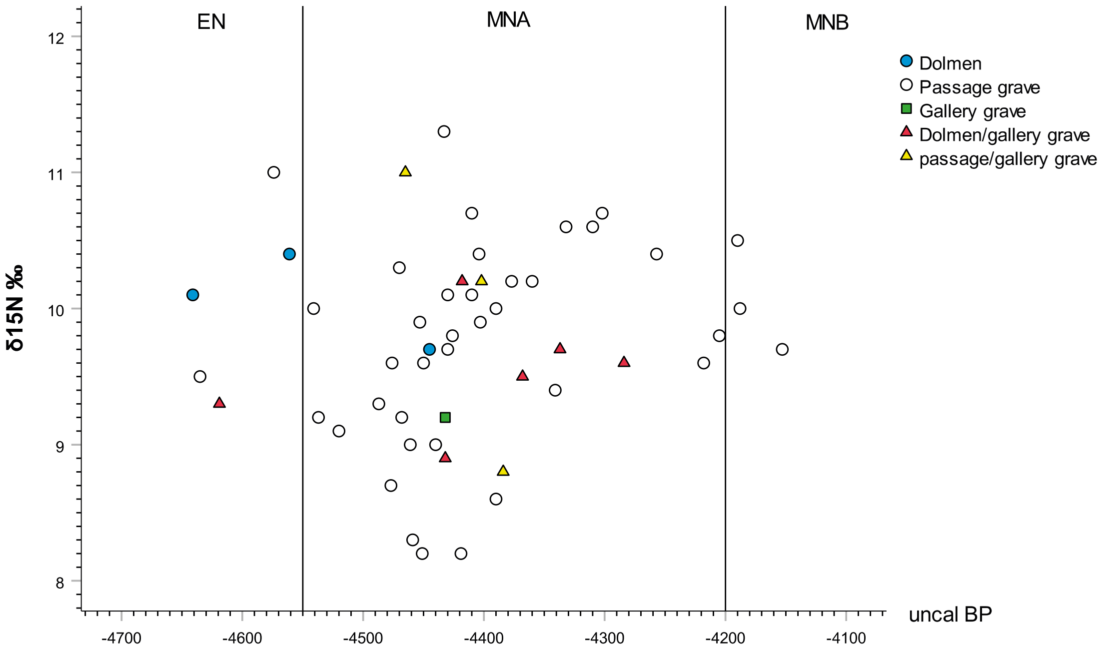


FIGURE 20 $\delta^{15}N$ values of individuals deposited in megalithic graves by radiocarbon date and grave type. Only individuals dated to the Early Neolithic (EN) and the Middle Neolithic (MN) >4100 uncal BP.

sisted of a skull fragment. Teeth from two of the four small gallery graves with early dates were sampled for Sr isotope analyses. Unfortunately, none of these graves was sampled for aDNA. The Sr isotope ratios of the Middle Neolithic A individuals in these graves are less varied than the ratios of the individuals deposited in passage graves. The ratios fall within the local and semi-local ranges, which might imply a lower mobility of the Middle Neolithic A individuals deposited in these smaller and less visible graves than in the passage graves (Fig. 21).

In Järnvägens/Rantens grave, here classified as dolmen/gallery grave (type E in paper II), five individuals were analysed for Sr isotope ratios. Two of them were dated to Middle Neolithic B, a period when burials in megalithic graves were rare, and three to the Middle Neolithic A. The Sr isotope ratios of the two Middle Neolithic B individuals indicate that they spent at least part of their childhood outside of Västergötland, possibly at the Swedish west coast, Scania, or Denmark. According to the radiocarbon dates, these are not the first burials within this grave. The non-local ratios cannot be related to the construction of the grave, and thus, there is currently no empirical basis to suggest that the grave type is connected to the ethnic identity of an outside group. Instead, these individuals' Sr isotope ratios more likely reflect migration/network patterns during the Middle Neolithic B. The remaining three individuals with earlier dates fall within the local and semi-local Sr isotope range between 0.714 and 0.717, where most of the Middle Neolithic A ratios are concentrated (Fig. 21).

The adult male dated to the Early/Middle Neolithic from the multi-chambered Högebo gallery grave at Kinnekulle yielding carbon and nitrogen stable isotope values similar to those of the Late Neolithic-Early Bronze Age remains. However, the Sr isotope ratio was significantly different from the Late Neolithic-Early Bronze Age individuals. The childhood Sr isotope ratio of this man was low (0.711), while the remaining individuals showed relatively high Sr isotope ratios (Blank et al. forthcoming). These individuals did not spend their childhood in the same

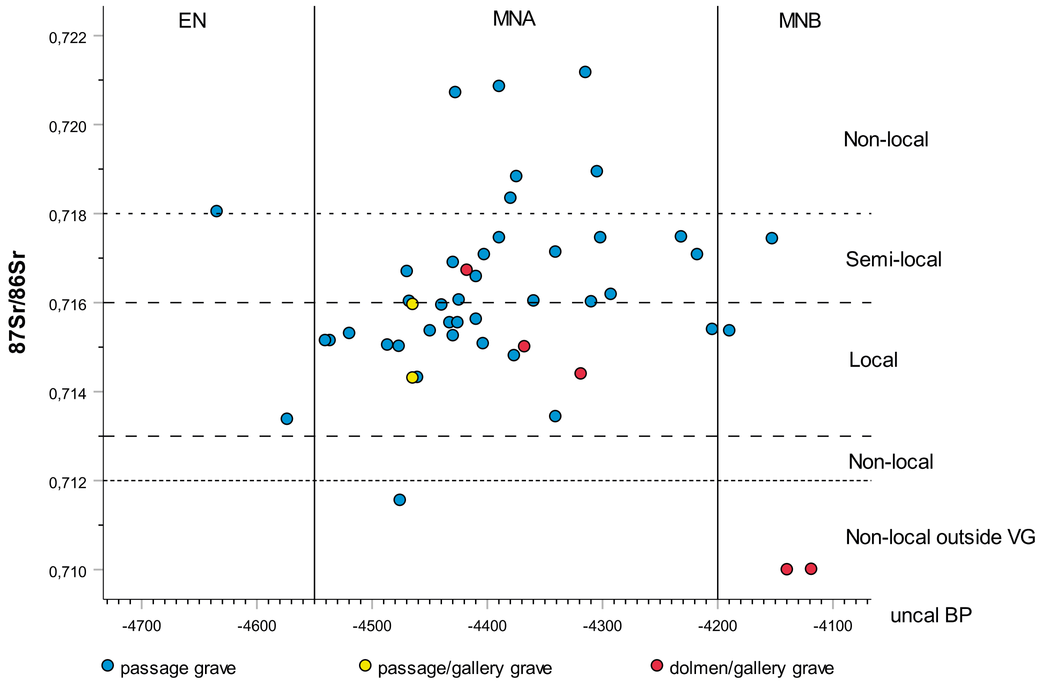


FIGURE 21 Strontium isotope ratios and radiocarbon dates from Early Neolithic (EN) and Middle Neolithic (MN) individuals deposited in megalithic graves. Only individuals dated >4100 uncal BP. Figure 21 Strontium isotope ratios and radiocarbon dates from Early Neolithic (EN) and Middle Neolithic (MN) individuals deposited in megalithic graves. Only individuals dated >4100 uncal BP.

areas, nor do the ratios concur with the measures of bioavailable Sr isotopes at Kinnekulle or in Falbygden. The Early/Middle Neolithic man is more likely to originate from the Swedish west coast or Scania. This specific case will be further discussed in an upcoming publication.

6.2.4 Isotope and mtDNA data from Late Neolithic and Early Bronze Age remains

The $\delta^{13}C$, $\delta^{15}N$ and $^{87}Sr/^{86}Sr$ values of Late Neolithic-Early Bronze Age human remains deposited in passage graves did not diverge from the values of the ones placed in gallery graves (paper V). However, some interesting tendencies can be observed (Fig. 22). In the initial part of the Late Neolithic, before 3600 uncal BP, individuals with non-local childhood Sr ratios were buried in both gallery and passage graves, while the individuals with ratios falling within the local and semi-local ranges only appear in gallery graves. From the transition between the Late Neolithic I and Late Neolithic II, as well as throughout the Late Neolithic II, the individuals deposited in passage graves exhibit local and semi-local ratios, while the non-locals only were buried in gallery graves (Fig. 22; paper II: Fig. 9). Unfortunately, the samples are too few to draw any secure conclusion.

Nevertheless, a tentative hypothesis is that, in the first part of the Late Neolithic, when the construction of gallery graves begins, reintroducing the megalithic tradition, the reuse of passage graves might have been a way of claiming ancestral links to the previous megalithic people in the area. From the onset of the Late Neolithic II and onward, there is a significant increase in non-local ratios, especially the ones surpassing 0.721. The variation in Sr isotope ratios also increases at this time (paper IV). In the Late Neolithic, adults and children appear to have moved into the area from other regions. Migrations into Falbygden of family groups, but also later by male and females from different areas were suggested (paper IV). The Sr isotope evidence, then, would imply that migration by groups/families

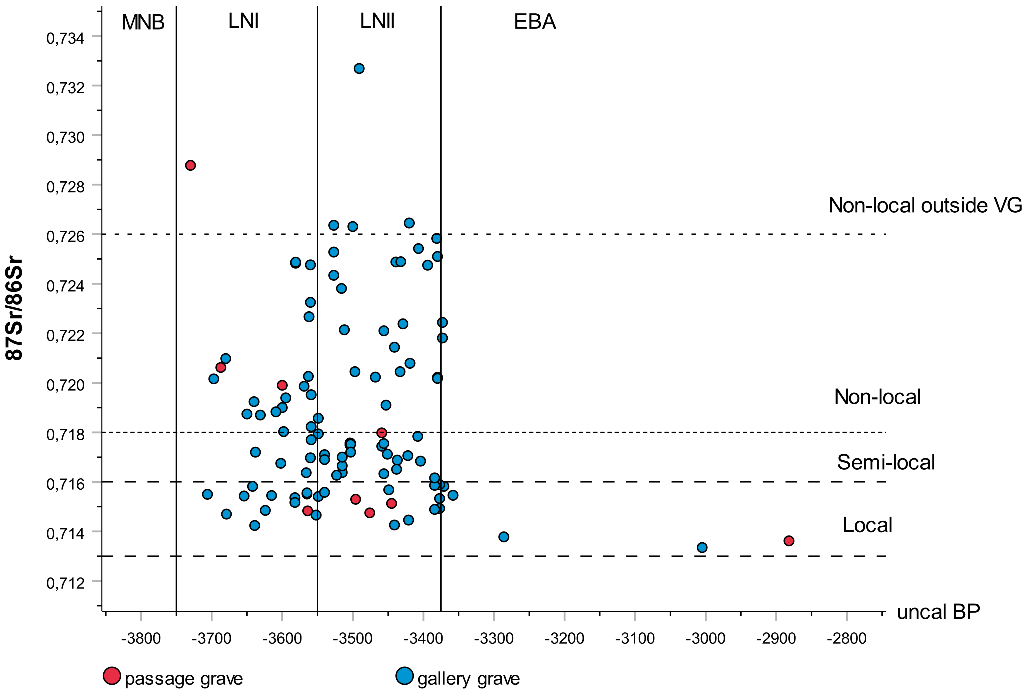


FIGURE 22 Strontium isotope ratios of buried individuals by grave type and radiocarbon date. Only individuals dated <3800 uncal BP. MNB: Middle Neolithic B, LNI/II: Late Neolithic I/II, and EBA: Early Bronze Age.

involved bringing their own building traditions of gallery graves into Falbygden, while the locals and semi-local emphasised their relation to the ancestors and the area by reusing passage graves. However, it is important to stress that the Sr isotopes only trace the first generation of migrants (Montgomery 2010: 326). One of the Late Neolithic II dates in a passage grave (Knaggården) belongs to a young female with a peri-mortem injury to the skull assigned to the mtDNA haplogroup I4a (paper IV). This haplogroup has previously not been observed in Scandinavia during these or earlier periods. Thus, the deposition in passage graves may also reflect burials of different or not completely accepted individuals and/or deaths (see paper VI for further discussions and references).

6.2.5 Primary use and burial sequences

The optimal situation for dating the establishment and primary use of various types of megalithic graves would be if we had datable material from the construction itself. In Danish passage graves preserved birch bark between slabs of dry walling has successfully been radiocarbon dated and can be considered to reflect the construction phase (Dehn and Hansen 2006). No similar finds of bark have yet been published from Swedish megalithic graves. Thus, for now, we must settle for bones.

Another difficulty in dating the first use of megalithic graves is the probability span of radiocarbon dates which remains relatively large and, in several cases exceeds 200 years (95.4%). A general problem is that the calibration curves have irregularities, with notable “plateaux” at 3300 to 3000 and 2800 to 2600 BC, having the effect of extending the calibrated probability intervals in time. A more and more common method to reduce radiocarbon dates calibration probabilities is to use archaeologically informed sequence models based on Bayesian statistics. However, megalithic graves are not optimal for these types of statistical analysis, as you need stratigraphic or other relational information to be able to identify sequences of the events/burials. If this information is not available, the distribution of events must be postulated. Furthermore, the distribution patterns of dates in the specific graves can be difficult to identify when only part of the original burials are dated and if these dates overlap (paper II). In paper II, sum plots and different statistical models were compared. Slight differences were noted, although some shared patterns appeared.

In passage graves and gallery graves with numerous available radiocarbon dates on human remains, the most intense phase of use occurred in the middle of the burial sequence. For passage graves this is ca. 3000 cal BC and for gallery graves ca. 1900 to 1800 cal BC (paper II; Sjögren 2011). Considering the passage graves and dolmens these patterns may result from fewer burials in the earliest and latest phase than in the period around 3000 cal BC. It could reflect change in the selection of individuals who were buried in passage graves. It could also reflect demographic development or, alternatively, the possibility that some of the earliest skeletons have been cleared out. The decrease after ca. 2900 cal BC indicates a social change and new burial practices, although population decrease is also likely (paper II; Feeser et al. 2019; Hinz et al. 2012; Müller 2015; Nielsen et al. 2019). The concentration of radiocarbon dates in gallery graves at ca. 1900 cal BC, on the other hand, probably reflects an increase of gallery graves constructed and used in the Late Neolithic II, and possibly also a population increase at this stage (paper II; Feeser et al. 2019; Hinz et al. 2012; Müller 2015; Nielsen et al. 2019). From the onset of the Early Bronze Age, there seems to be a decrease in the use of gallery graves, which most probably indicates a gradual change of burial practices. However, many gallery graves appear to have been regularly used for burials until the Bronze Age period II and, later, more sporadically in period III and IV (paper II).

The first burial sequence of megalithic graves, referred to as the Early phase, covers a time span from 3500 to 2600 cal BC, with most samples concentrated to 600 years in the Middle Neolithic A (3400-2800 cal BC). Based on sum plots and KDE models of radiocarbon dates, I conclude that the megalithic graves were first used in the last part of the Early Neolithic around 3500 to 3300 cal BC. The initiation of the megalithic burial tradition appears roughly at the same time in southern Sweden, with some of the earliest dates documented in Falbygden and Alvastra. This might result from the large number of samples and the favourable conditions for bone preservation in these regions. The radiocarbon dates confirmed that dolmens and passage graves were constructed and used simultaneously (paper II). Considering the proportion of early dates in dolmens and passage graves, it is probable that dolmens were introduced slightly earlier than passage graves. The radiocarbon dates from Falbygden, and from southern Sweden more broadly, also fit the radiocarbon dates from bark samples recovered from eight Danish passage graves (Dehn and Hansen 2006). Thus, the first use is likely to capture the construction of these megalithic graves in Sweden. If the earliest radiocarbon dates in the individual graves are compared[16], passage graves and dolmens can be estimated to have been built until ca. 3000 cal BC, and the gallery graves until about 1700 cal BC (paper II: Fig. 9, 10).

Regarding the gallery graves, Early/Middle and Middle Neolithic human and animal remains were found in Falbygden and at Kinnekulle (see above; paper II), while Early and Middle Neolithic artefacts were found in several gallery graves in Västergötland. These dates indicate that the variation of megalithic grave morphology was greater in the Early/Middle Neolithic than previously thought, although the variation of chamber shapes is still greater in the Late Neolithic-Early Bronze Age. Consequently, the

16 Not counting the graves with only few radiocarbon dates.

early dates open up a possibility for a wider geographical distribution of Middle Neolithic megalithic graves than what is currently known.

In Västergötland, and in southern Sweden in general, the Late Neolithic gallery graves were used from ca. 2200 to 1100 cal BC, with the majority of the samples falling within a 400-year span between 2000 and 1600 cal BC. This second burial sequence is referred to as the Late phase. The use-span of gallery graves further corresponds to the most intense period of passage grave reuse.

Some chronological differences regarding the first use of various types of gallery graves in Västergötland could be observed, although with overlaps. Rectangular and hexagonal single-roomed graves with few burials contain Late Neolithic I burials, while in the multi-roomed graves the Late Neolithic burial sequence starts later, dating to ca. 2000 to 1100 cal BC. This might suggest that the early Late Neolithic gallery graves were intended for fewer individuals than the later ones (see above). This might indicate an increased emphasis of the megalithic and collective ideal in the Late Neolithic II. In more southerly regions, a later peak (Early Bronze Age) in the use of gallery graves is seen, which might be related to an increased population in the Early Bronze Age or to a general later use of gallery graves in these regions. As previously mentioned, the greater number of burials and larger graves in the later phase of the Late Neolithic most probably reflect an increased population in Falbygden, along with an increase in human mobility (see below).

According to the radiocarbon dates there are two construction and use phases of megalithic graves (with the exception of Öland). These phases are separated by about 300 years, during which no burials occur in megaliths. There is an even larger gap of about 500 years between the earliest burials (potential time of construction) in the graves. This corresponds to ten to 17 generations. Thus, a continuous megalithic tradition is unlikely, and other mechanisms based on social and ideological aspects, involving reinvention of old traditions are more likely. The gap in megalithic grave use corresponds to the BAC period, which apparently meant major sociocultural changes in the region. Even though no burials could be confirmed during this period, limited BAC reuse of megalithic graves occurs, according to diagnostic artefacts recovered mainly in the entrance area of passage graves (Blank 2016; Sjögren 2003).

6.3 Mobility and exchange networks

6.3.1 Introduction

The Neolithic and Early Bronze Age in Scandinavia are characterized by cultural and social transformations and human migrations. Recent aDNA studies have confirmed that migration was an important factor for the spread of the TRB complex and of agriculture, and for the emergence of Corded Ware groups in Scandinavia (Egfjord et al. 2021; Linderholm 2008; Malmström et al. 2015, 2019; Mittnik et al. 2018; Skoglund et al. 2012, 2014). The general trend toward extended networks in southern Scandinavia during the Late Neolithic and Early Bronze Age can also be anticipated in Falbygden, considering the increasing number of non-local and more varied and higher isotope ratios yielded from Late Neolithic individuals. In Denmark, growing mobility and long-distance travel have been claimed for the onset of the Early Bronze Age, based on imported goods and isotope studies (Bergerbrant 2007; Kristiansen 2018; Frei et al. 2019). In Falbygden a distinct peak in non-local Sr isotope ratios was instead observed at the transition between the Late Neolithic I and Late Neolithic II and throughout the Late Neolithic II (paper IV). Isotopic studies in other Swedish regions have also suggested increased mobility in the Late Neolithic (Bergerbrant et al. 2017; Fraser et al. 2018; Linderholm et al. 2014). Thus, in Sweden increased human mobility in the Late Neolithic appears to be a general phenomenon.

In this subchapter I address both exchange networks and mobility patterns by discussing the artefacts recovered from the graves, as well as the isotopic and mtDNA datasets included in the individual papers. I will show evidence for an increase in human mobility and population diversity, with a stronger eastward connection in Falbygden's Late Neolithic, when compared to earlier periods. Yet, movements of artefacts, cattle and humans probably consisted of only partly overlapping contact spheres.

6.3.2 Exchange networks

In Falbygden regional networks and contacts with southern Scandinavia and indirectly with continental Europe, can be attested to by building traditions, burial practices, pottery styles and imported goods (Apel 2001; Sjögren 2003; Weiler 1994; see background chapter). Similar artefacts and grave types distributed over a large area, both during the Middle and Late Neolithic, indicate the presence of networks and mobility extending over this area, connecting groups characterized by regional traditions. According to several scholars (e.g., Kristiansen 1987; Rasmussen 1990; Shennan 1982), Middle Neolithic networks based on flint decreased in the Late Neolithic and were replaced by new exchange practices where metal played a significant role. Can similar patterns be observed in the artefacts recovered from the megalithic graves of inland southwestern Sweden? What kinds of artefacts were placed in these graves and which artefacts may reflect interregional contacts for this area at the Middle and Late Neolithic? Where did these objects come from?

The Middle Neolithic artefacts in the megalithic graves mostly consist of flint tools and debris, amber beads and pendants, tooth pendants and animal bones. The flint mostly consists of south Scandinavian types which most probably originate from Scania or Denmark. The large, polished axes found in the area were imported from Scania or Denmark, where primary flint sources occur. Material from Middle Neolithic settlements demonstrate that, in addition to imported flint, local stones were also used for tools and that the pottery was locally produced (Sjögren et al. 2019; Blank and Bakunic Fridén work in progress). Another material suggested to have been imported from Scania or Denmark is amber (Axelsson et al. 2015), although the south Baltic coast may be a possibility. Not only artefacts but also exchanges involving cattle have been suggested, based on Sr isotope data, while other domestic animals mostly seem to be local (Sjögren and Price 2013a, see mobility section).

Flint daggers, arrowheads and spearheads are common objects in the Late Neolithic gallery graves. They are also documented as stray finds. Some of these artefacts may have been made from reused flint tools and a few of them of Kinnekulle flint. However, most of the daggers were imported from southern Scania or Denmark (Apel 2001). According to Apel (2001), the daggers were distributed through exchange networks controlled by regional and/or local elites. As mentioned in the background chapter, concentrations of daggers appear in Falbygden and in parts of Västergötland to the west and southwest. Weiler (1994: 79) has pointed out that these concentrations occur where rivers have their source areas, indicating that river valleys were important routes for contact networks. In Falbygden numerous and skilfully knapped daggers have been found in the Utbogården gallery grave, Karleby and the nearby Lilla Balltorp gallery grave, Torbjörntorp (Appendix 2). Both graves are placed in areas with high concentrations of megalithic graves. Furthermore, both contained metal objects (bronze and gold). Thus, these specific locations seem to have had good access to flint daggers and, later, to metal artefacts.

Bronze artefacts, mainly consisting of fragmented jewellery and/or dress accessories, have been recovered from both gallery and passage graves (Appendix 2; Blank in press; Weiler 1994). Located some 20 km southwest of Falbygden, three large gallery graves contained bronze and gold items. In a multi-chambered gallery grave[17] in Bohuslän, a gold thread was found (Blank in press). The distribution of these early metal objects indicates that these locations were part of an extended exchange network. These metal objects have been dated to the Early Bronze Age (Blank 2017). A possible origin of the raw material[18] of these Early Bronze Age artefacts is the British Isles (Blank and Knipper 2021; Melheim et al 2018; Nørgaard et al. 2021). Bronze axes and swords appear as single finds or in hoards in Västergötland (Weiler 1994).

In the Late Neolithic, flint axes become less common and, instead, shaft-hole axes manufactured with local stones appear. In a few cases arrowheads made of Cambrian flint from Kinnekulle occur in the Västergötland gallery graves. Such arrowheads have been found in a gallery grave in Falbygden, at Kinnekulle and in Rångedala ca. 50 km southwest of Falbygden (Appendix 2; Weiler 1994: 44). Thus, networks or mobility from Kinnekulle extending to Falbygden and further into Västergötland can be assumed during the Late Neolithic. Kindgren (1991) demonstrated that Cambrian flint could be found at Mesolithic settlements in Närke and in the central parts of Västergötland. It should not be surprising that long-distance social connections were already maintained during the Mesolithic period.

The amber artefacts in the graves decline in frequency over the course of the Late Neolithic (Anderbjörk 1932; Blank in press). Slate pendants[19] are common in the gallery graves of Scandinavia (Appendix 2; Ebbesen 1995; Østmo 2011). They are most frequent in Sweden (Ebbesen 1995) and mostly appear during Late Neolithic II (Blank in press). Apart from slate pendants, slate artefacts are rare in Västergötland. Slate artefacts are relatively common in the more northerly regions in Sweden and Norway, where slate sources are rich (Taffinder 1998). However, slate is also available in Västergötland and Dalsland (Weiler 1994: 64), where concentrations of large gallery graves appear. Taffinder (1998: 118) mapped slate sources in Sweden and demonstrated that these exist in Västergötland and in the neighbouring regions[20]. However, it is unlikely that the slate from Västergötland could have been used for pendants. Furthermore, unworked and worked debitage of slate has been found in Bohuslän, Dalsland, and Närke (Taffinder 1998: 124). Even though Taffinder's (1998) attempts to analyse the elemental composition of slate artefacts proved to be inconclusive, more recent methodological developments may allow for successful tracing the provenance of slate pendants. From the Lilla Balltorp gallery grave a piece of a pendant was recovered, and based on its shovel shape, a Norwegian origin may be postulated on stylistic grounds (Appendix 2; Helleve 2010). The slate from the gallery graves in Västergötland can be assumed to originate

17 Kareby 88 (GAM 6629)

18 Gold and bronze (copper and tin)

19 Slate pendants have been interpreted as neck or head ornamentation, polishing stones, amulets, expressions of an ax cult, and touchstones for assessing the metal quality in objects (Ahlberg et al. 1976; Ebbesen 1995; Prescott 1991; Strömberg 1971a: 47).

20 They occur in Falköping, Mellerud in Dalsland, Garphyttan, Närke and Grythyttan in Västmanland, Visingsö in Östergötland and Rörtången in Bohuslän and at several localities in Scania.

from neighbouring regions such as Dalsland and Närke, although further investigation is needed.

Considering the slate sources and the distribution of large multi-chambered gallery graves and graves with port-holes (Fig. 9), I propose intense contacts in a belt stretching from the west coast to Närke during the Late Neolithic. These networks were in turn connected to Scania and Denmark. At the onset of the Early Bronze Age, they were extended to continental Europe.

A change in the imported artefacts can be observed, where flint axes are replaced by flint daggers, while amber imports decreased during the Late Neolithic. Both in the Middle and Late Neolithic exchange networks with the surrounding areas and with southern Scania and/or Denmark can be assumed. In Falbygden the import of metal was not as common as in Scania and Denmark (Vandkilde et al. 2017; Weiler 1994). Exchange networks involving bronze artefacts do not become apparent until the Early Bronze Age in Falbygden. Nevertheless, one axe from Falbygden and some bronze artefacts found in Västergötland have been suggested to date to the Late Neolithic II (Vandkilde et al. 2017). Furthermore, a copper axe dated to the Early Neolithic was found in Falbygden (background) and can be assumed to originate from southeastern Europe (Nørgaard et al. 2021).

6.3.3 Mobility

Mobility is and has always been an important part of human societies. Humans are social beings and to be social is, by definition, to be in relation with others. Societies are based on interaction between groups, while isolation is the exception. Furthermore, movements of things and ideas required movement of people. Human mobility includes a variety of different movements over various distances, for different lengths of time (Anthony 1990; Burmeister 2000; Tilley 1978). Migration might be voluntary or involuntary and include longer and shorter distances. It might involve one-way or return migration of individuals or groups. It might be related to economic and environmental factors, natural catastrophes, population pressure, marriage and fostering practices, subsistence strategies, war, exploration and prospection, repression, slavery, pandemics and infectious diseases, or long-distance exchange (Anthony 1990; Burmeister 2000; Cassel 2000). According to Anthony (1990), migrants are not likely to move to unknown areas, but rather, they go to places where there is already an established contact. Other types of mobility are shorter trips and everyday movement (Tilley 1978: 50), which might be connected to subsistence strategies, social networks, apprentice systems and so on.

Marriage alliances have been suggested to be important for the spread of technologies and styles of pottery and flint between prehistoric groups. Like other human mobility practices, marriage exchanges must be considered as crucial for transfer of cultural expressions and ideas. Larsson (2009: 344) proposed that BAC potters moved into new communities by marriage and brought their specialist know-how. In archaeology child fostering has been proposed, especially regarding Late Neolithic and Bronze Age societies (Bergerbrant 2019, Sjögren et al. 2020, Kristiansen and Larsson 2005). Exchange of foster children is attested to in historical and ethnographic sources (Bremmer 1976, Olsen 2019, Crawford 1999, Smith 1992, Parks 2006). Child fostering has been practiced to uphold alliances between groups (as marriage exchanges), but also to gain an education or learn a skill. Sjögren et al. (2020) suggested that alliances based on marriages and fostering linked groups in different areas and formed political entities that were important in turbulent times or periods of expansion. Furthermore, exchange networks involving slaves have been suggested in Early Bronze Age Scandinavia, mainly based on the architecture of Danish long-houses (Mikkelsen 2020; Kristiansen 2018).

In archaeology individuals buried with exotic artefacts, or bodies which have been accorded deviating funerary rituals have repeatedly been interpreted as outsiders or non-locals (e.g., Arcini 2009; Kroeber 1927). Osteological analyses have also been used to trace non-locals by physical traits which differ from those of other individuals (e.g., Gejvall 1963; Retzius 1899), although this has been criticized, as the variability within a population can be substantial (Montgomery 2010: 326). In this section results from Sr isotope analyses, which enable direct studies of human mobility, are discussed. As already mentioned, this method can only trace movement between areas with diverging ratios of bioavailable Sr (see method). It cannot normally detect short-term mobility and can only trace the Sr isotope ratios during childhood and youth (depending on which tooth is sampled). Furthermore, in this study we cannot trace the people who moved out of Falbygden and did not return.

A clear chronological pattern was demonstrated, indicating that the characteristics and intensity of human mobility changed over time (paper IV). First, I will discuss the mobility during the Middle Neolithic and, thereafter, the human movements during the Late Neolithic and Early Bronze Age. I also address some mtDNA data, which can reveal long time-scale demographic developments and mobility, and other relevant results from the stable isotope analyses.

The lifetime movement of individuals during the Middle Neolithic A seems to be restricted to a smaller area than during the Late Neolithic. The Sr isotope ratios indicate that the mobility during this early period might have consisted of movements between the surrounding west Swedish area and Falbygden, but also of movements within Falbygden.

The Sr isotope data indicate that children buried in the Falbygden graves were more stationary than adults during this period. No children yielded non-local ratios. Thus, we can assume that the non-local Sr ratios reflect single individuals, young adults and adults, moving into Falbygden rather than whole families. However, more analyses of teeth representing different ages are necessary to confirm this assumption.

The individuals with non-local ratios spent at least part of their childhood in the surrounding areas of Falbygden. They may have been part of marriage alliances, or other interchanges with groups living outside Falbygden. Both men and women exhibited ratios falling within the non-local range. Consequently, no indication of patri- or matrilocal marriage system could be confirmed. Moreover, we cannot exclude that dead persons were brought from the surrounding areas into Falbygden only to be buried (see Sjöbeck 1951; Sjögren et al. 2009). At the very least, the non-local Sr ratios indicate that persistent social networks extending outside of Falbygden existed.

Local and semi-local ratios occurred among all age categories and indicate movements over more restricted distances than the non-local ratios do. This mobility might be explained by herding animals, or by other activities that did not necessarily involve permanent migration. The stable isotopes of the individuals exhibiting semi-local Sr isotope ratios were similar to the stable isotopes of the individuals with local ratios. However, slightly higher $\delta^{15}N$ values were observed in the semi-local group than in the Falbygden-local and non-local groups. Furthermore, the collagen-apatite spacing of the two semi-local individuals are lower than the spacing of the four Falbygden-local individuals (paper V). Hence, there is a possibility of a higher intake of animal-based food, maybe even more reliance on husbandry and milk products, in the semi-local category. If this is the case the semi-local group during the Middle Neolithic may have consisted of people moving between Falbygden and the surrounding areas with their livestock, but this remains speculative until further data are available.

Cattle were important for the TRB economy and ideology (e.g., Brink and Larsson 2017; Gron et al. 2016; Sjögren and Price 2013a). Movements of cattle have been indicated by isotope data already in the Early Neolithic at Almhov, Scania (Gron et al. 2016). According to an Sr isotope study of Middle Neolithic domestic animals from Falbygden, several non-local ratios were observed among the cattle (Sjögren and Price 2013a). Sjögren and Price (2013a) demonstrated that the Sr isotope ratios among humans only partly overlapped with the ratios of the cattle, indicating different movements of these two categories. The same pattern can be observed when the Sr isotope data from paper IV is added (Fig. 23). Thus, some of the movements of humans and cattle may be explained by herding. However, a few of the cattle exhibited ratios above 0.722, not present among humans (Fig. 23). Thus, it seems that domestic animals, humans and artefacts circulated in different spheres (see below). The exchange of cattle may have been important to avoid inbreeding and retain a healthy livestock. Cattle may also have been an important part of feasting activities, as observed in ethnographic examples from some megalithic and agropastoral societies (e.g., Dournes 1975; Wunderlich 2019b). In a recent isotope study of animal teeth from the Neolithic Durrington Walls[21], cattle exhibited a diversity of Sr isotope ratios not local to the site. It was proposed that these imported animals played a significant role in feasting activities that took place there. Furthermore, that cattle were part of prevailing long-distance networks (Evans et al. 2019).

To sum up, mobility during the Early phase[22] consisted of movements within and in the proximity of Falbygden, which may be related to herding and to social relations with neighbouring settlements. Movements between Falbygden and settlements in other parts of Västergötland can also be assumed. These movements possibly

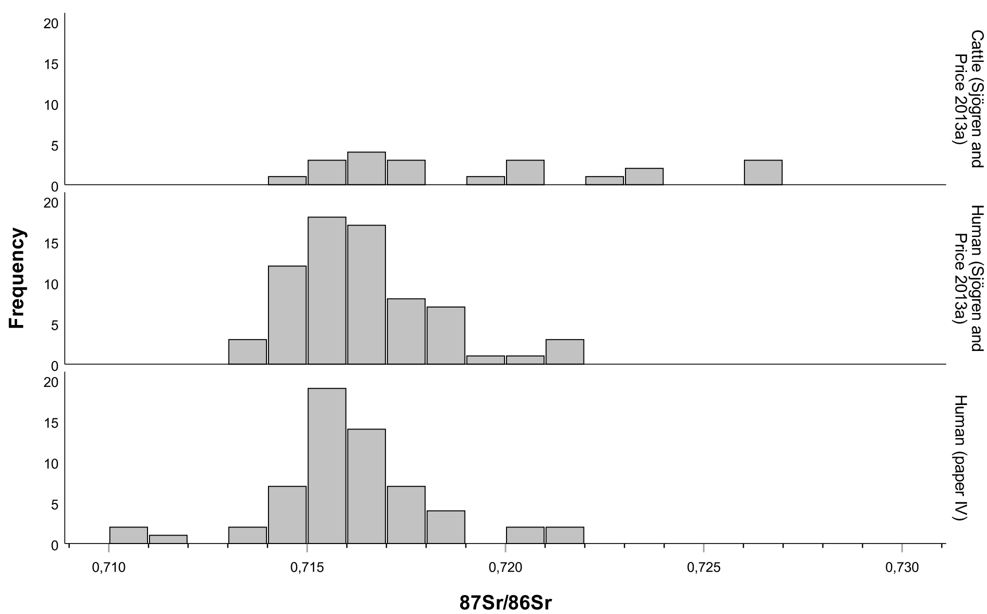


Figure 23 Histogram of Sr isotope ratios from Early-Middle Neolithic human and cattle. Data from Sjögren and Price 2013a and paper IV.

21 The largest henge monument in Britain, dating to ca. 2500-2400 cal BC.

22 Early-Middle Neolithic phase

reflect migrations of adult individuals and/or other kinds of social and cultural networks. At this time, exchange networks extending outside west Sweden included cattle, amber and flint.

Mobility in the second part of the Middle Neolithic is difficult to address, as only a few individuals were dated to this period. However, two individuals exhibited low Sr isotope ratios that are found along the west coast (Klassen et al. 2020), in Scania (Arcini et al. 2016; Bergerbrant et al. 2017; Ladegaard-Pedersen et al. 2021) and in Denmark (Frei and Frei 2011; Frei and Price 2012). A similar ratio was measured in a tooth from a young woman dated to the Early Neolithic found in a bog in the southern part of Falbygden (Sjögren et al. 2017). These ratios indicate direct contacts or rather, human movements from the above-mentioned regions to Falbygden.

Human mobility and networks in other south Scandinavian regions have been observed in the last part of the Middle Neolithic. In a recent study of Pitted Ware sites in eastern Jutland, Denmark and the Swedish west coast, Sr and lead isotopes of animal bones indicate contacts across the Kattegatt during the Middle Neolithic (Price et al. 2021). Ancient DNA studies suggest that the Scandinavian BAC and SGC groups originated from European Corded ware groups that migrated into Scandinavia (Egfjord et al. 2021; Malmström et al. 2019). How the mobility of the BAC groups looked at a smaller timescale in connection to Falbygden cannot be answered at this time, given the absence of human remains from this period (see above). Intensified connections between eastern middle Sweden and Finland have been proposed during the last part of the Middle Neolithic (Larsson 2009).

In the Late phase[23], a much higher proportion of individuals exhibits non-local ratios than in the Early phase (paper IV). A lower proportion of the Late Neolithic-Early Bronze Age individuals displays semi-local ratios than in the earlier period. Semi-local ratios may reflect regular movements in and out of Falbygden (see above) but may also be actual migrations from locations with these bioavailable Sr isotope ratios. These ratios probably have several different explanations and might have varied over time.

The human movements observed in the Late Neolithic involve both adults and children, according to the age at death and the multiple teeth sampled from several individuals (paper IV). I suggest that this reflects migrations of family groups into Falbygden (paper IV), although single adults also seem to have moved into the area (see below). There is a larger variation in dietary patterns, with significant differences in isotope values between childhood and adult samples, as well as more varied stable isotopes within the non-local Sr isotope group. This supports an increased human mobility, with people moving into Falbygden from different locations with divergent dietary baselines or traditions (paper V). These movements do not all necessarily involve migrations of family groups but could also have been the result of alliances through marriages or child fostering, or other types of mobility.

At the transition between the Late Neolithic I and II, a distinct increase in mobility was demonstrated, with high ratios not observed in the earlier phase (paper IV). Some of the higher ratios may be found in the northeastern part of Västergötland or adjacent areas to the east. However, the ratios above 0.728 appearing in the Late Neolithic II and the Late Neolithic/Early Bronze Age most probably derive from regions even further to the east or northeast (paper IV).

In the last part of the Late Neolithic II significant differences in Sr isotope ratios between non-local males and females were observed. Hence, at this time men and women seem to have migrated from different areas or moved in different manners, and not as families (paper IV). Still, more generally, in contrast to other European regions

23 Late Neolithic- Early Bronze Age phase

(e.g., Goldberg et al. 2017; Knipper et al. 2017), biological sex does not appear to be a determining factor regarding human movement, as both men and women showed evidence of mobility in the Early- Middle Neolithic and Late Neolithic-Early Bronze Age.

Even though the import of bronze may have been introduced already in the Late Neolithic II, it is unlikely that the metal exchange, involving networks transporting bronze and gold artefacts, was directly related to this increased mobility. Interestingly, the increase of non-local and high Sr ratios concurs with the increase of flint daggers, slate pendants (Appendix 2; Blank in press; Fig. 24) and multi-chambered gallery graves (see paper II). I suggest that the distribution of the large gallery graves and the graves with port-holes could have constituted a sphere in which humans moved for different reasons. This area (Fig. 9) would encompass most, but not all, of the Sr isotope ratios measured in the Late Neolithic-Early Bronze Age remains (see Sr isotope ratios in Eriksson et al. 2018; Klassen et al. 2020; paper III).

As already mentioned, a climate shift took place in western Sweden ca. 2000 cal BC, with a change toward a more humid, cooler and less stable climate (Hammarlund et al. 2003; Seppä et al. 2005). This probably had implications for migration movements, subsistence strategies and land use (paper IV and V). Other factors that might have favoured human movements include a general population growth in middle and southern Sweden (Apel 2001; Artursson 2009; Berglund 2003; Lekberg 2002; Weiler 1994). Thus, the increased mobility in the Late Neolithic may be related to several different factors, such as a generally higher population density, climate changes and expanded exchange networks (paper IV). In addition, migrations into Falbygden may have resulted in a relatively high population estimated in the area during the Late Neolithic (paper I; chapter 6) and the expansion of farmland (Enevold 2019). However, we cannot know the number of people moving out of Falbygden.

No distinct correlation between megalithic grave types or grave sizes in the Late phase, and Sr isotope ratios in the human remains could be observed (Fig. 17, 25). Nevertheless, the Sr isotope ratios of teeth recovered from gallery graves without port-holes were significantly higher than the ratios of the ones found in graves with port-holes. This might indicate that the groups using these graves had different networks and/or that groups

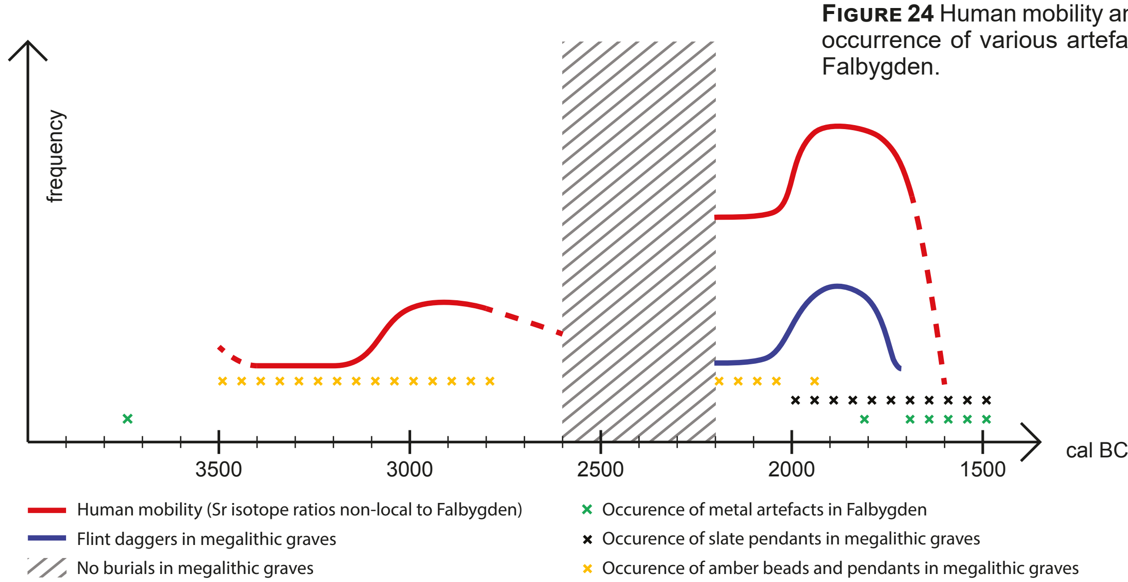


Figure 24 Human mobility and the occurrence of various artefacts in Falbygden.

migrating from different locations had different traditions of building gallery graves.

Contacts with southern Scandinavia, which could be demonstrated by flint and amber artefacts found in Falbygden (see above), may be suggested by Sr isotope analysis in only a few cases: a bog body from Early Neolithic and three individuals deposited in megalithic graves (one dated to the Middle Neolithic A and two to the Middle Neolithic B). These artefacts may thus have been part of indirect exchange networks consisting of several nodes within a larger distribution system (see Apel 2001)[24]. However, as pointed out in paper IV movements between southern Scandinavia and Falbygden cannot be ruled out, as short-term mobility is difficult to trace using Sr isotope analysis and return migration in adulthood leaves no signal in teeth.

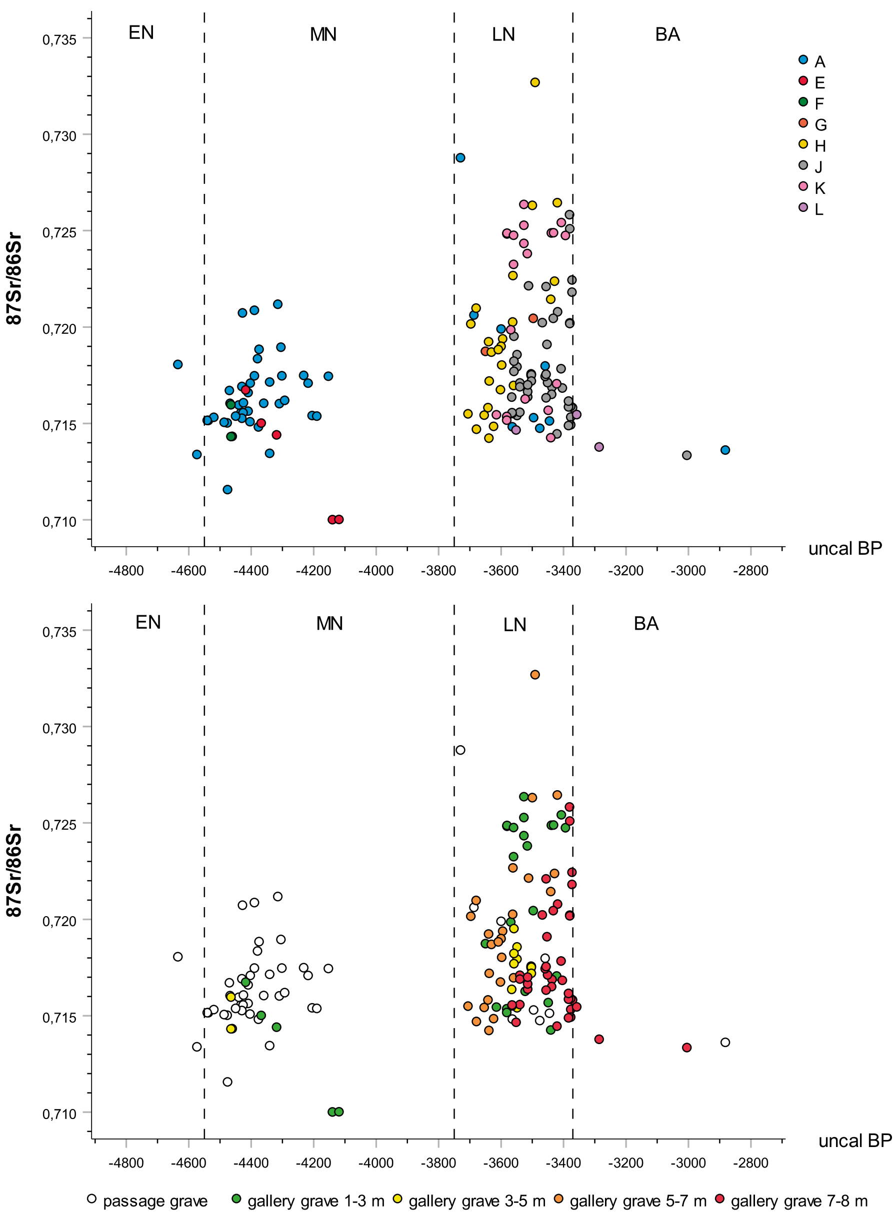


Figure 25 Sr isotope ratios from individuals buried in megalithic graves by radiocarbon dates. Top: Letters represent different types of graves defined in paper II. Bottom: Passage graves and gallery graves of different sizes. Gallery graves also include gallery graves/dolmens and gallery/passage graves. EN: Early Neolithic, MN: Middle Neolithic, LN: Late Neolithic and BA: Bronze Age.

24 The intensified import of flint daggers involving migrations of people between such nodes may explain part of the increased mobility at the onset of the Late Neolithic II.

6.4.1 Introduction

Diet is dependent on available edible resources and the society's prevailing subsistence strategies. Calories and nutrients in the diet are necessary for survival and health, but food is also important for identity and cultural belonging. Diet may be regulated by taboos and cultural perceptions of which foods are edible and what the proper ways are of preparing and consuming food. Subsistence strategies also affect how we relate to the landscape and to other species.

The adoption and spread of agriculture led to new types of cooperation in societies but also to increased violence (e.g., Weitzel et al. 2020; Fibiger et al. 2013; Schulting 2006). The relatively sedentary lifestyle involved cultivation of land and the holding of livestock, in some circumstances leading to territorial defence of suitable land. Cooperation is important especially during harvest time and other key moments in the seasonal cycle when a lot of work must be carried out in a limited time. Likewise, cooperation between settlement groups would have been needed for the construction of megalithic graves and other monumental structures (see below). In southern Scandinavia the introduction of agriculture around 4000 cal BC led to social and cultural changes, including the establishment of permanent inland farming settlements, new burial practices, megalithic constructions, changes in lithic and pottery technology (see background).

This section discusses available food resources and nutrition groups from various trophic levels and isotope data from the megalithic burials to address questions about diet and subsistence. I will demonstrate evidence for an economy mainly based on cultivation and animal husbandry, both in the Early-Middle Neolithic phase and in the Late Neolithic-Early Bronze Age phase, although with changed agropastoral strategies, more extensive cultivation practices and more varied diets in the latter period.

6.4.2 Dietary similarities, changes and variations

During the Middle Neolithic A, the subsistence economy in Falbygden was fully dependent on cultivation and husbandry (Sjögren 2003, 2017; Sjögren et al. 2019). Focused on floral and faunal remains recovered at settlements, as well as isotopic analyses of human remains, the above-mentioned studies have argued for a significant importance of plants/cereals, while other scholars (Lidén 1995; Hinders 2011) proposed a marginal role of plant foods.

In the Late Neolithic and Early Bronze Age, the general assumption is an intensification of agriculture and growing farmland (background). Our stable isotope results (paper I and V) confirm a rather similar diet based on terrestrial resources, with a substantial proportion of plant food throughout the Neolithic and into the Early Bronze Age, although with some minor but still noteworthy variations. Instead, of an intensification of agriculture our results point to more extensive farming practices and more varied agropastoral strategies in the Late Neolithic-Early Bronze Age, compared to the earlier phase.

The results presented in paper V demonstrated that the megalithic population of Falbygden was more reliant on plant food/ protein from lower trophic levels than megalithic populations from several other regions in eastern Sweden. This was the case for both investigated phases, but especially during the Early-Middle Neolithic. This may be explained by the inland position of Falbygden and a heavy reliance on agriculture compared to some of the other regions, including coastal areas where marine resources were important dietary components.

The isotope data in both paper I and V broadly confirm the patterns seen in earlier isotope studies of Neolithic and Early Bronze Age Falbygden, pointing toward lower $\delta^{15}N$ values in the second part of the Late Neolithic but similar collagen-apatite spacings in the Late Neolithic-Early Bronze Age as in the Early-Middle Neolithic (Blank 2019; Sjögren and Price 2013b).

The large dataset presented in paper V demonstrated significantly higher $\delta^{15}N$ values in the childhood samples, and slightly higher values in the adult bones during the Early phase compared to the Late phase. This tendency is confirmed by the similar and even higher mean $\delta^{15}N$ values measured in both teeth and bone of about 20 Middle Neolithic A individuals buried in the Frälsegården passage grave (Sjögren 2017). The slight decrease in the $\delta^{15}N$ values between the two periods can be explained by an increased intake of protein from a lower trophic level in the Late phase, that is a higher proportion of plant vs. animal protein (meat, blood, milk) in the diet. However, the collagen-apatite spacing and the FRUITS models do not support an increased intake of plant foods during the Late Neolithic-Early Bronze Age (paper V). Instead, the collagen-apatite spacing indicates a similar intake of plant-derived foods in both periods, although with a slightly higher variation in the Late phase (paper I and V; Blank 2019). Unfortunately, our study only comprises collagen-apatite spacing from a few (six) Early-Middle Neolithic samples. But our result is in accordance with a number of Middle Neolithic A individuals analysed in two previous stable isotope papers (Sjögren and Price 2013b, Sjögren 2017). The lower $\delta^{15}N$ values may actually be best explained by more extensive farming and lower level of manuring (paper V; further discussed in cultivation section).

According to paper V, significant changes occurred in childhood diet, from the Early-Middle Neolithic to the Late Neolithic-Early Bronze Age phases, according to $\delta^{15}N$ values. This change, however, is not observed for the adult diet. This result might be related to the increased migration in the later period, with children moving into Falbygden with family groups coming from different locations, then adopting to Falbygden's local dietary pattern (see paper IV and V).

More varied stable isotope values were also observed in the Late phase compared to the Early phase, especially apparent from ca. 1900 cal BC, which might reflect more individual dietary variation in this period (paper V). Possible reasons for the increased variation in the Late Neolithic-Early Bronze Age diet could be a general social differentiation, which has been suggested for Scania and Denmark (e.g., Bergerbrant et al. 2017; Tornberg 2018). However, this does not explain the higher variation in the childhood diets observed in Falbygden. Instead, I argue that at least some of this pattern can be explained by increased interregional migration (see above). Slightly lower $\delta^{15}N$ values can be observed among the individuals exhibiting non-local Sr isotope ratios than the ones with local ratios, although no significant statistical difference can be demonstrated (paper V).

According to studies of caries frequencies (Ahlström 2003; Tornberg 2013, 2017; paper I), substantially higher frequencies are found in the Late Neolithic-Early Bronze Age than in Middle Neolithic Falbygden. The more numerous finds of caries have been suggested to result from an increased reliance on carbohydrates in the Late phase (Ahlström 2003; Tornberg 2017). Yet, as already mentioned, the collagen-apatite spacing as well as the FRUITS models do not support this assumption. Alternative explanations of the increased caries frequencies are changed food preparation techniques, hereditary factors and/or different oral health (paper V).

During both periods, we observed variations in stable isotope values between some of the graves. This must reflect slightly different consumption patterns and/or subsistence strategies between the groups using the different graves, and/or local environmental differences (paper V). Stable isotope variation between sites within Falbygden have also been indicated in previous studies of Middle Neolithic populations (Sjögren 2017, Sjögren and Price 2013b).

In several studies of Middle Neolithic and Late Neolithic-Early Bronze Age Falbygden, including paper I, tendencies for differences in stable isotopes between biological sex have been suggested to reflect differentiated diets between women and men (Sjögren 2017; Blank 2019). However, the larger dataset in paper IV, including more individuals determined to biological sex primarily based on genetic sexing, did not confirm these tendencies (paper V).

Significantly higher $\delta^{13}C$ values in collagen were detected in both the adult and childhood bones in the Late phase, compared to those of the Early phase. Interestingly, the values from Late Neolithic I individuals appear to be more similar to the values from the individuals of the Early phase than to the ones dated to the Late Neolithic II (paper V). The increasing $\delta^{13}C$ values may result from environmental changes to a more open landscape in the Late Neolithic (Enevold 2019), as the difference is most significant for those individuals exhibiting Sr isotope ratios local to Falbygden (paper V). This would support an environmental change, rather than increased migration, as the main factor affecting $\delta^{13}C$ values (see below).

6.4.3 Climate and environmental changes

As emphasized above, pollen data from the region (Enevold 2019) confirm a more open landscape, with increased farmland in the Late Neolithic and Early Bronze Age compared to the Middle Neolithic. As mentioned in the background section, a high frequency of shaft-hole axes was documented in Falbygden, consistent with intensive forest clearance in the Late Neolithic and Early Bronze Age. Furthermore, a change toward a more unstable and humid climate with cooler temperatures started about 2000 cal BC (Hammarlund et al. 2003; Seppä et al. 2005), which correlates with the 4.2 ka BP event (Butruille et al. 2017; Kleijne et al. 2020). The regional climate shift occurred at the same time as the observed change in $\delta^{13}C$ isotope values towards higher and more varied values. The climate would not have had a direct effect on the stable isotopes. Nevertheless, the climate change might have triggered adaptations, such as more extensive farming and more varied subsistence strategies, for example increased specialization and/or exploitation of new niches for cultivation and livestock. These adaptations might have resulted in increased variation of stable isotopes (paper V). Forest density affects $\delta^{13}C$ values. The opening of the landscape could have caused higher $\delta^{13}C$ values in the Late Neolithic-Early Bronze Age ecosystem and also in the population. Furthermore, different values in the animals would be expected if the domestic animals were grazing close to the settlements than in the forests.

6.4.4 Cultivation

In Falbygden we have macrofossils from Middle Neolithic A settlements close to megalithic graves, and these include cereals (Sjögren 2017; Sjögren et al. 2019). According to these archaeobotanical data, naked barley dominated crop cultivation (Sjögren et al. 2019; Sjögren 2017). The dominance of naked barley seems to be a general trend throughout the Neolithic in southern Scandinavia (Brink and Larsson 2017; Göransson 1995; Robinson 2003; Høyem Andreasen 2009). Other potential important plants for the Middle Neolithic A diet in Falbygden, based on remains recovered from the Alvastra pile dwelling located on the eastern side of Late Vättern, are hazelnuts, apples, raspberries, beans and peas (Browall 2011; Göransson 1995; Kirleis et al. 2012; Kirleis and Fisher 2014; Sjögren 2017).

As already discussed, no Late Neolithic or Early Bronze Age settlements have been excavated in Falbygden and no crop or plants from inland southwestern Sweden dated to this period are known. Abundant finds of flint sickles indicate that cultivation was practiced. Furthermore, some imprints of cereal grains in pottery vessels from gallery graves have been documented in the area. Most of the grains were identified as barley[25]. In two cases the grains were identified as wheat[26] (Hjelmqvist 1955: 37; Weiler 1994: 61). This suggests similar crop cultivation as in the previous period. A continued dominance of naked barley throughout the Late Neolithic has been demonstrated in south Scandinavian records (Kirleis and Fischer 2014; Simonsen 2017; Robinson 2003). In Scania crops dated to the Late Neolithic are too few to follow any development of cereal use during this time (Brink and Larsson 2017; Regnell and Sjögren 2006).

The practice of manuring has been argued for, based on isotope analysis of cereals, already in the Early Neolithic TRB in Sweden (Gron et al. 2017, 2021). In Falbygden the use of manure has been suggested for the Middle Neolithic period based on isotope analyses of cereals (Sjögren 2017). The practice of manuring has also been proposed for other Neolithic south Scandinavian contexts (Bogaard 2012; Gron et al. 2021; Kanstrup et al. 2014; Kirleis and Fischer 2014). Evidence for manuring indicates relatively stable cultivation practices, which would explain the high consumption of plant foods in the Neolithic and Early Bronze Age in Falbygden. A trend of decreasing $\delta^{15}N$ values in the Late Neolithic cereals was reported from Danish sites (Gron et al. 2021), indicating less manuring and more extensive cultivation practices than in the previous period. In Falbygden decreasing $\delta^{15}N$ values were observed in the human samples. As no cereals dated to the Late Neolithic-Early Bronze Age are available in the archaeological record we cannot know if and to what extent manure was used. Thus, the assumption of decreased manuring intensity related to lower $\delta^{15}N$ values in the Late Neolithic-Early Bronze Age human remains cannot be confirmed at present.

6.4.5 Livestock

The animal remains from the above-mentioned Middle Neolithic A settlements (Sjögren 2017; Sjögren et al. 2019) were dominated by domestic animals, while wild fauna and fish merely represented a marginal proportion of the bones. Among the fish bones pike was the most common. The most frequent domestic animals were pigs, followed by cattle, sheep/goats and dogs. At this point, only sheep and no goats have been confirmed (Sjögren personal communication). The dogs exhibited cutmarks, possibly indicating that the fur was used and/or that they were part of the diet (Sjögren et al. 2019). The few bones found inside the passage graves, on the other hand, are often wild animals and include tooth pendants, although dog tooth pendants also occur (Persson and Sjögren 2001).

Lacking settlement material for the Late Neolithic and Early Bronze Age, only the few animal bones and teeth recovered from the gallery graves can be discussed. How representative these bones are of subsistence can be debated, considering the animal remains recovered from passage graves. The animal bone material in gallery graves is scarce. In the Lilla Balltorp gallery grave wild cat bones and beaver remains were found, and in the Fredriksberg gallery grave a pike bone was documented that probably can be related to Late Neolithic activities (Appendix 2). Even though a few fishhooks were recovered from both passage and gallery graves, fish seem to have been a marginal part of the Middle and

25 Ten to naked and one to hulled

26 emmer and einkorn

Late Neolithic diets (paper V). In addition, pig, cattle, sheep and goat have been identified and dated to the Late Neolithic among the bones recovered from gallery graves (paper V). However, the sample size is too small to say anything about the frequencies of different domestic animals.

Besides providing meat, blood, milk and hide, cattle could also have been used for traction/transporting loads, while bones and ligaments could have been used to produce tools. As implied above, cattle would also have been a source of manure. Based on the assumption that cattle have lower $\delta^{15}N$ values than pigs, and the lower $\delta^{15}N$ values found in the Late Neolithic-Early Bronze Age population compared to the Early-Middle Neolithic human remains, we proposed that cattle became more common than pigs in the Late Neolithic (paper I). However, according to our results, the $\delta^{15}N$ values measured in domestic animals do not support such a difference between cattle and pigs in any of the investigated phases (paper V; Sjögren 2017).

The $\delta^{15}N$ values in humans may also have been affected by the slaughter patterns of the animals, which may have differed between the two periods. According to Sjögren et al. (2019), the pigs were slaughtered at a young age in Middle Neolithic Falbygden. The cattle and sheep/goats were killed at a later age. This is at least partly explained by exploitation for secondary products, such as milk. According to a recent study (Robson et al. 2021), dairy was part of the economy already at the onset of TRB in Denmark. Based on isotope data from Early Neolithic cattle in Scania, manipulation of calving and lactation has been proposed (Gron et al. 2015), indicating that milk products were an important part of the Early Neolithic TRB subsistence. Furthermore, lipids from milk products in pottery from several Swedish TRB sites have been confirmed (Isaksson and Hallgren 2012; Andersson et al. 2016), including pottery from Falbygden (Kaldhussæter Lindboe 2014). Protein in human calculus from burials in megalithic graves in Falbygden have confirmed the consumption of dairy products both during the Middle and Late Neolithic (Fotakis et al. in preparation). Thus, protein in dental calculus of Late Neolithic individuals suggest consumption of milk from cattle and goat, indicating a generally similar slaughter pattern of these animals as in the earlier period. A different composition of sheep and goats between the two periods might also have affected the $\delta^{15}N$ values observed in the sheep/goat category, and possibly also in the humans (paper V). Considering the importance of dairy products in the Late Neolithic, we suggested that the lack of cribra orbitalia in the Fredriksberg gallery grave was connected to regular milk consumption and an adequate availability of vitamin D (paper I).

6.5 Mortuary practices

6.5.1 Introduction

As previously shown, the Falbygden megalithic graves were used in two phases, between ca. 3500 and 2600 and between ca. 2200 and 1100 cal BC. In both phases, successive inhumation burials dominated the burial practices. Continuous use of a grave does not necessarily imply a static relation to ancestry nor a continuity of burial practice. At a first glance, the human bones in the Early-Middle Neolithic and Late Neolithic-Early Bronze Age megalithic graves appear rather similar. But is that really the case?

The dead bodies have been variably exposed to mortuary treatments before they were buried, after which they would have undergone natural degradation processes, as well as later disturbances caused by humans and animals. The mortuary practices may have been extended over several years and encompassed different stages which in some cases might have included secondary treatment affecting the skeletal preservation and archaeological distribution. All these aspects must be considered when trying to identify the original position and treatment of the dead.

The documentation from earlier excavations is often insufficiently detailed, especially regarding the bone material. Even though burial practices are difficult to trace, especially in megalithic graves, some information can be achieved by studying documentation from excavations, by radiocarbon dating human remains, by thin secion analyses and osteological observations of the skeletons.

In this section, I address questions concerning chronological differences and similarities in mortuary practices of the megalithic graves. I will demonstrate that burial practices in the megalithic graves during both these periods were more varied than previously proposed. Also, I argue that the Late Neolithic and Early Bronze Age practices were less regulated and ritualised than in the TRB period.

6.5.2 Construction

The construction of megalithic graves required cooperation and ability to mobilise and coordinate a relatively large group of people. Sjögren (2020) proposed that a workforce of about 75 people would have been required to transport the largest blocks in constructing the passage graves in Falbygden. According to Sjögren (2020), the local settlement did not have enough labour power. Thus, collaboration with other groups would have been necessary. Similar collaboration would be expected in the construction of some of the gallery graves in the area, even though the blocks in the gallery graves are generally not as large and heavy as the ones found in many passage graves. This cooperation does not necessarily demand stratified societies with strong leaders but might likewise be possible in a system with reciprocity and obligation-based social networks. The importance of creating networks between the people who participated in the activities of building megalithic structures has also been discussed for Danish causewayed enclosures (Andersen 2011). Ethnographic examples have confirmed that larger-scale cooperation may be involved in raising large stones and constructing graves, with such ritualised labour mobilisation occurring in societies ranging from relatively egalitarian to highly hierarchical (e.g., Bloch 1982; Hoskin 1984; Jamir 2019; Jeunesse 2016). Nevertheless, as already mentioned, megalith building might have been important to establish and uphold social networks and social ties within and between groups and to serve as a materialization of collective and individual memory (e.g., Furholt and Müller 2011; Müller 2011; Wunderlich 2020, 2019a).

In Falbygden local stones have been used for constructing passage graves (Sjögren 2003, 2020). The same seems to be the case for the gallery graves, which are constructed mainly of local limestone and sometimes, locally available sandstone slabs. However, it looks as if the different stones used for passage graves were depending not only on accessibility, but also on conscious choices (Sjögren 2020). For example, it has been noted that red limestone has been used in similar ways in mound constructions of the Holma, Mörkagården and Firse sten passage graves (Axelsson 2013; Jankavs 2014). Furthermore, red limestone slabs have been used specifically for chamber slabs in the Holma and Firse sten passage graves (Axelsson 2013) and for niche slabs in the Frugården passage grave (Appendix 2). No systematic research has yet been done on this topic. Nevertheless, the remaining wall slabs in the Rössberga gallery grave are red limestones. In the Kappellgatan gallery grave the roof was constructed of small red limestone slabs, while the wall slabs were made of white limestone (Appendix 2).

There are many resemblances between the passage grave and the gallery grave chambers of Falbygden. There are passage graves with chambers from 2.7 to 17 m long and gallery graves from 1.5 to 14 m long. The most common size both of the passage grave chambers and gallery graves is five to seven m (Anderbjörk 1932; Blomqvist/Bägerfeldt 1989a; Sjögren 2003; Weiler 1994). An NNE-SSW orientation of the gallery graves and of the passage grave chambers is the most common in Falbygden. The orientation of gallery graves is more varied than the passage grave chambers (Sjögren 2003). Most of the passage grave chambers and gallery graves included in this study are/were oriented ca. NE-SW. The three dolmens, on the other hand, are roughly oriented ENE-WSW (Appendix 2). The orientation of graves has been related to beliefs concerning afterlife, but also to characteristics of the landscape. Sjögren (2003: 295f) suggested that variation in the orientation of the passage grave chambers formed local clusters that may be connected to different clans with specific traditions within Falbygden.

Niches have been noted in both passage and gallery graves in Falbygden, although they are less common in gallery graves. Unlike in passage graves, only single niches seem to occur in gallery graves. In some gallery graves[27], standing stone slabs also appear in the middle of the large chambers. In the Lilla Balltorp gallery grave a standing stone reaching above the wall slabs had been placed[28] on top of most of the burials (Ullenius 1948). In the Berga and Kapellgatan gallery graves the niche slabs were too low to function as support for the roof slabs. Instead, they may have been used to highlight or delimit something or someone. In the passage graves the small slabs divide the grave chamber into different niches where individuals were deposited, in sitting or contracted positions (Ahlström 2009; Lindqvist 1911; Sjögren 2003). In paper IV, based on Sr isotope and mtDNA data, we proposed that different kinship groups used different niches in the Rössberga passage graves. This might indicate that the passage graves could have been used by several families. Concerning the gallery graves, we observed tendencies for variation in both Sr ratios and mtDNA haplogroups between graves. This may result from more restricted groups in terms of kinship using these graves. In the Fredriksberg gallery grave we also observed variations in Sr isotope ratios between the individuals dated to the early and the late phase of use, which may indicate that the grave was reused by a different group in the later phase (paper I). The large variation of gallery graves indicates that there was no strict common idea about how to build a gallery grave and/or that different groups had their own style.

In Falbygden and in other Swedish regions, it was common to use natural features, such as natural rocks and cracks, when constructing gallery graves (e.g., Appendix 2; Andersson and Hjärthner-Holdar 1989). Thus, less effort was demanded when natural features were incorporated in the grave structures. To my knowledge, no passage graves were constructed in this manner. In general, less energy or rather a higher variation of effort were put into the constructions of gallery graves, when compared to passage graves (see above). The variation might be a result of a larger part of the population, including groups/families of varying status and influence being buried in the different gallery graves. But it might also result from using the available resources in the immediate surrounding to a higher degree during the Late Neolithic than in the earlier period. Details such as stones placed outside the gallery grave chambers and doubled walls indicate different solutions for supporting and reenforcing grave constructions. My impression is that the building of gallery graves was not as regulated as the construction of passage graves.

27 for example Lilla Balltorp and Östergården (Jällby 16:1).

28 descended barely to the find bearing layer

The passage graves may have been based on more specialized knowledge which was learned, while the construction of gallery graves may have been based on a more flexible concept which could be adapted to different conditions and preferences.

Depositions of pottery sherds, animal bones and flint, often burnt, commonly occur outside the entrance of the passage graves in Falbygden (Cullberg 1963; Persson and Sjögren 2001; Sjögren 2003). Similar entrance depositions are frequent in passage graves in Scania and Denmark (Bagge and Kaelas 1950-152; Strömberg 1971a), although here, cremated human bones, rather than animal bones, appear to be more frequent (Persson and Sjögren 2001). The depositions in the entrance area were probably deliberately fragmented or destroyed, partly by fire (Burenhult 1973; Larsson 2000; Persson and Sjögren 2001: 46; Strömberg 1968). Intentional fragmentation of artefacts has been discussed in other Neolithic contexts (e.g., Chapman 2000). Similar depositions have been found in other TRB megalithic structures in Scandinavia (Andersen 2011; Artursson et al. 2016) and have been suggested to be of ritual character (Holten 1994; Sjögren 2003). The importance of the ritual aspects of the early TRB megalithic structures in southern Scandinavia has also been emphasized by Artursson et al. (2016).

In some cultures destruction of objects is important in order for the objects to be functional in the afterlife, and in other cases destruction and discarding of utensils used in the burial procedures may be required (Douglas 1966; Dournes 1975). The finds outside the entrance area might also be linked to continued offerings of food for the dead (Dournes 1975), or to feasting activities during the construction of the megalithic graves and in relation to burials. According to ethnographic studies (Wunderlich 2020, 2019a, b; Wunderlich et al. 2021), feasting activities are significant in megalithic societies and constitute a platform for competition for social prestige but also serve as redistribution of wealth.

In the gallery graves pottery vessels and flint are found in the chambers, although a few exceptions are known (Weiler 1994). The flint items mainly consist of used flint daggers and flint arrowheads, which may have been part of the deceased individual's personal equipment. The placement of vessels inside the graves may emphasize the offering of food or drink to the deceased only at the time they were placed in the grave. Furthermore, the ante-chambers of the Falbygden gallery graves are mostly empty and do not display any traces of activities (Appendix 2). Outside the gallery graves ritual activity has not been traced to the same extent and thus might not have been as important. However, PWC pottery sherds and flint were recovered outside the Björkön gallery grave in Dalsland (Stjernquist 1950). Most excavations of gallery graves have concentrated on the chambers and not the direct surroundings. Nevertheless, in general, distinct public surfaces in the entrance areas are associated only with passage graves. Systematic burning of animal bones and flint is confirmed by the depositions in front of the passage graves but also in other Middle Neolithic contexts (paper VI). In gallery graves single burnt Late Neolithic artefacts have been recovered along with burnt human remains, indicating single individuals being exposed to fire (paper VI). These differences between passage and gallery graves indicate that feasting activities and rituals connected to the construction of megalithic graves declined —or at least involved fewer people—in the Late Neolithic and Early Bronze Age communities, when compared with Early and Middle Neolithic society.

According to paper II, the Early-Middle Neolithic megalithic grave architecture in inland southwestern Sweden may have been more varied than previously thought. Furthermore, the Late Neolithic megalithic graves in inland southwestern Sweden are characterized by a large variation of shapes and sizes, but also by different construction details and construction strategies. In Falbygden, the collective aspect of successive burials seems to have been important in the Early/Middle Neolithic and Middle Neolithic A, as well as in the Late Neolithic and throughout the Early Bronze Age, regarding the use and reuse of megalithic graves. The collective aspect may also be related to the mobilisation of labour and cooperation needed for constructing these graves and to facilitate certain aspects of cultivation. Furthermore, the successive burials in megalithic graves also suggest that genealogical and mythical ancestral links were significant aspects of these communities.

6.5.3 Old bones

Here, I will return to the discussion of Middle Neolithic dates of human bones recovered from multi-chambered gallery graves. As already discussed, this may be explained by the deposition of bones from old graves or from relics (section 6.2.2). Practices of this kind and similar manipulations of skeletal remains are known from ethnographic sources and have also been suggested for European Neolithic and Early Bronze Age contexts (e.g., Bloch 1982; Booth and Brück 2020; Brozio 2016; Fowler 2010; Hutton 1921; Jamir 2004; Jeunesse and Denaire 2018; Parker Pearson and Regnier 2018; Parker Pearson et al. 2005, 2007; Richards 1988; Thomas 1996).

Deposition of skeletal remains of ancestors might have been practiced when a new grave was constructed or when people first settled in a new area. Among the Merina in Madagascar, the empty grave is considered dangerous and therefore bones from ancestors must be put in the grave before it can be used for new burials (Bloch 1982: 213). Bones from older graves placed in new graves could have been a strategy for claiming a connection to former groups in a certain area. A similar interpretation of the extensive reuse of passage graves during the Late Neolithic is possible. Furthermore, the deposition of old artefacts and human remains in some of the gallery graves may have been ritually carried out to maintain care for genealogical or mythical ancestors.

6.5.4 Positioning and treating the dead

The megalithic graves in Falbygden mostly contain commingled and fragmented skeletal remains. In some passage and gallery graves several layers of human remains separated by flat stones have been documented (Appendix 2), indicating several burial sequences.

In Falbygden both passage and gallery graves contain partially articulated and disarticulated bones (Appendix 2; Sjögren 2003, 2015; Weiler 1994). Articulated skeletons have been observed in gallery graves with single or few individuals (Appendix 2; Sahlström 1947; Svensson 1930). Descriptions of supine, contracted and sitting positions of the dead appear in documentations from dolmens, passage and gallery graves, and different positions are often described within the same graves (Ahlström 2009; Appendix 2; Retzius 1899; Sjögren 2003; Werner 1873). Sitting and supine positions have also been suggested in megalithic graves from other Swedish regions (Cnattingius 1927; Strömberg 1971a). In gallery graves supine positions are common (Appendix 2). Even though supine positions have been noted in passage graves (Appendix 2), no skeletons in this position have been dated to the Middle Neolithic. For example, in the Landbogården passage grave, Gökhem, a skeleton placed in a supine position was found across the passage (Fig. 26). However, this individual was dated to the Iron Age (Blomqvist/Bägerfeldt 1987). In addition, no supine positions have been observed in the Falbygden dolmens. However, in the Klokkehøj dolmen in Denmark an articulated skeleton placed in a supine position was dated to the Early/Middle Neolithic (Thorsen 1981). Furthermore, supine positions are common in Early Neolithic burials in southern Scandinavia

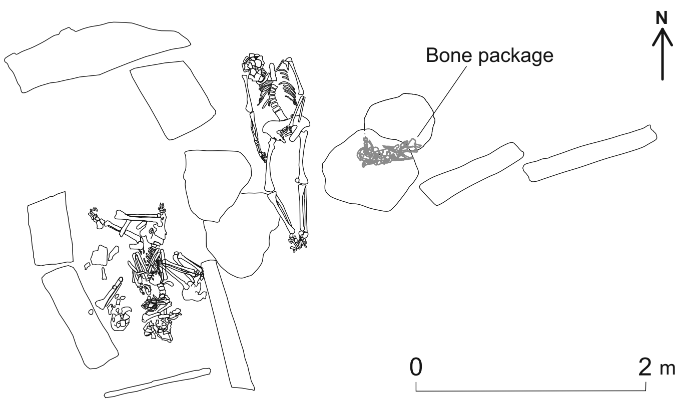


Figure 26 Plan of the Landbogården passage grave, Gökhem, Falbygden, redrawn after Blomqvist/Bägerfeldt (1987) and Persson and Sjögren (2001).

Figure 27 Left: Contracted position of a skeleton in the chamber of the Landbogården passage grave, Blomqvist/Bägerfeldt 1987. Right: Supine position of skeleton in the Lilla Balltorp gallery grave, Ullenius 1948, CC BY-NC-ND (VGM).

(Eriksen and Andersen 2014; Kossian 2005). Thus, a preference for placing the dead in contracted positions in the Middle Neolithic, at least in passage graves, and for supine positions in Late Neolithic is proposed for Falbygden (Fig. 27).

The main burial practice in the megalithic graves was primary inhumation. However, secondary burial practices can be difficult to discover (Larsson 2009: chap. 12). Stensköld (2004) suggested that flint daggers were used for mechanical skeletonization of bodies deposited in Late Neolithic gallery graves, although there is no osteological confirmation of this claim. No cutmarks on the skeletal material have been observed in any of the bone material recovered from the Falbygden megalithic graves (Ahlström 2009; Alfsdotter 2014; Lennblad 2015; Retzius 1899)[29]. Nevertheless, skeletonization by other means (open-air burials, heat or fire) or intentional regulation of the decomposition cannot be ruled out (paper VI). There are a few examples of assemblies of specific bone elements found in megalithic graves that might indicate secondary burials. For instance, in the Frälsegården and

29 A healed injury (cutmark) was identified in an elbow bone found in the Lilla Balltorp gallery grave. The placement of the injury suggests that it was a parrying trauma (Lennblad 2015: 58f).

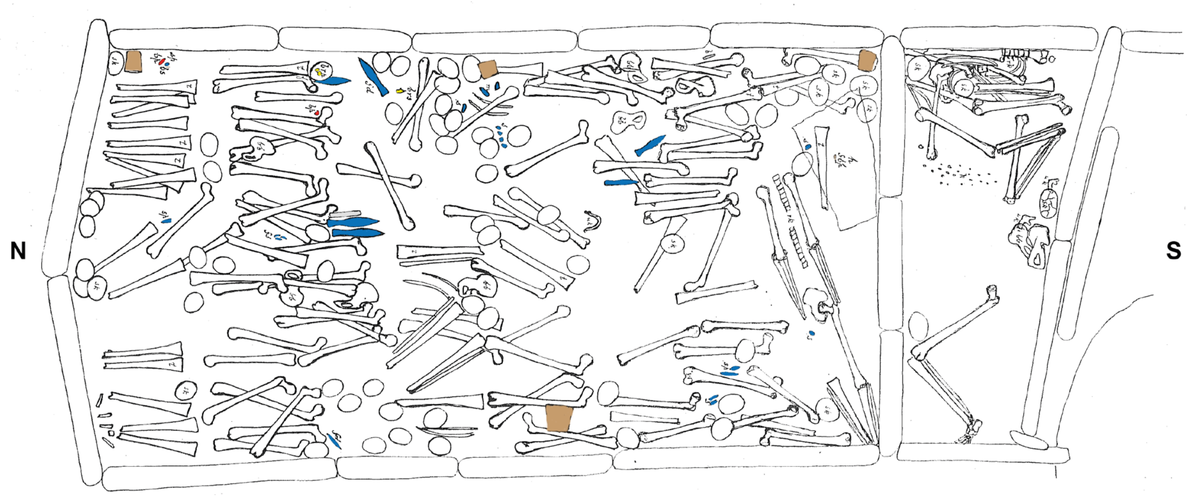


Figure 28 Plan of the Utbogården gallery grave, Retzius (1899). Brown: pottery vessels, blue: flint, yellow: bronze, red: amber.

Landbogården passage graves (Sjögren 2017; Blomqvist/Bägerfeldt 1987; Fig. 26), bone packages were found. Furthermore, rearrangements of bones have been proposed in the Utbogården gallery grave (Ahlström 2009). However, in the documentation, rows of different bone elements in the Utbogården gallery grave rather suggest skeletons placed in supine positions side by side (Fig. 28).

Ahlström (2009: 96) has suggested that the finds of mainly phalanx bones of pigs in some megalithic graves could derive from skins which were used to wrap dead bodies. In Late Neolithic graves in Denmark, finds of cattle hides have been interpreted as wrappings for the dead (Fabech 1988; Weiler 1994: 105). Furthermore, in a Corded Ware Culture grave in Finland, remains from goat skin were identified (Ahola

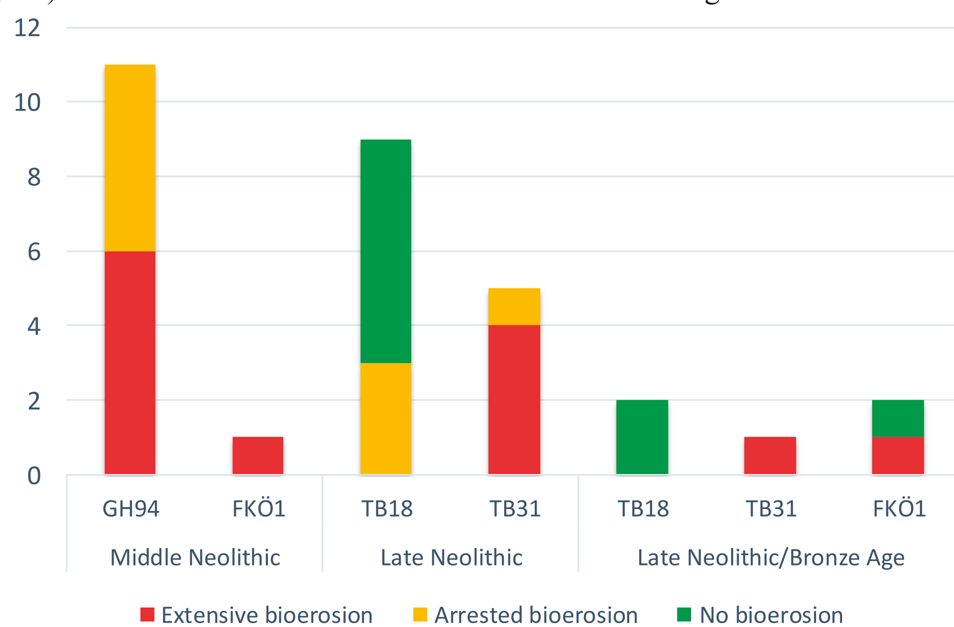


Figure 29 Degree of bioerosion distributed among number of human long bones from different periods. Based on data from Hollund et al. (2018). GH94: Frälsegården passage grave, FKÖ1: Firse sten passage grave, TB18: Lilla Balltorp gallery grave, TB31: Berga gallery grave.

et al. 2018). In a histological study thin sections of human bones recovered from megalithic graves in Falbygden were analysed (Hollund et al. 2018). The results demonstrated more variation in the extent of bioerosion (from extensive to none) in the Late Neolithic than in the Middle Neolithic bones (Fig. 29; Hollund et al. 2018). The variation was independent of the specific grave and may therefore be related to mortuary practices, such as wrapping and positioning, and possible conservation treatment of dead bodies. Absence of bioerosion was present in several bones dated to the Late Neolithic/Early Bronze Age from two different gallery graves and may be a result of natural or artificial mummification. Histologically based inferences of mummification have been made for British Chalcolithic and Bronze Age contexts (Parker Pearson et al. 2005, 2007; Smith et al. 2016). However, more histological analysis of human and animal remains, as well as chemical data on the environment in the megalithic graves, are needed to explain the variations observed in the bones from Falbygden.

6.5.5 Burnt human bones

Burnt human bones were recovered from several megalithic graves in Falbygden. It is unknown how prevalent burned human bones may have been in older excavations with incomplete recovery.

In paper VI 17 burnt human bones from various megalithic graves were successfully radiocarbon dated. The results demonstrated that ten of these bones derived from reuse in the Late Bronze Age and Iron Age. However, the remaining bones dated to the Neolithic and Early Bronze Age periods. The earliest bone was proposed to originate from an earlier settlement layer, while the remaining bones were deposited in the megalithic grave structures (paper VI). Thus, burning of human bodies/remains and inhumations were practiced contemporaneously and included in the megalithic grave contexts at these times.

Burnt human remains dating to the Late Bronze and Iron Age seem to be a general phenomenon in Swedish megalithic graves (Andersson 1971; Arne 1909; Burenhult 1986; Strömberg 1971b), while late Middle Neolithic cremated human remains have been suggested in passage graves from Scania (Burenhult 1973: 103; Persson and Sjögren 2001: 222; Strömberg 1968, 1971a). Furthermore, the burning of human remains was widely spread in other contexts in the south Scandinavian Neolithic and Early Bronze Age (see paper VI).

In paper VI cremated human bones dated to the Middle Neolithic could be confirmed for the first time in the megalithic graves of Falbygden and for the first time to the early part of the Middle Neolithic in a Swedish megalithic grave. Even though only one lightly burnt bone from an individual which had been unevenly burnt could possibly be dated to the Late Neolithic, indications of similar depositions were observed in several other gallery graves (paper VI). These bones were burnt elsewhere and then deposited in the graves. However, traces of burning in a few gallery graves in Västergötland, Dalsland and Uppland have been observed (paper VI; Andersson and Hjärthner-Holdar 1989: 210; Stjernquist 1950: 14; Weiler 1994: 160). Destruction and burning of megalithic graves in relation to the abandonment of the graves are known from several European regions (Chambon 2003: 205; Guillot and Le Goff 1995; Leclerc and Masset 1980).

In Västergötland the burning of fresh or even fleshed bones can be verified during the Middle Neolithic, Late Neolithic and Early Bronze Age (paper VI). The bones may still be fresh, even partially retaining surrounding soft tissue, some time after death, especially if bodies were wrapped (Ahlström 2009; Hollund et al. 2018; Larsson 2009: 302; Sjögren 2008). The Middle Neolithic and Early Bronze Age bones were fully cremated, while the Late Neolithic bones were only scorched. Furthermore, unevenly burnt and scorched bones in several gallery graves were found next to burnt Late Neolithic artefacts. The Middle Neolithic bones seemed to be fragmented and spread in the entrance area, while the Late Neolithic and Early Bronze Age bones most probably derived from whole individuals placed in the chambers (paper VI).

There is a multitude of ethnographic examples of how and why fire has been used in mortuary practicies (e.g., Århem 1988; Conklin 1995; Kaliff and Østigård 2013; Larsson 2009: ch. 12; Larsson and Nilsson Stutz 2014; Oestigaard 2013, 2015). Burial practices are often considered to be tightly connected to identity. Thus, individuals from diverse locations and/or from various groups within the society may have had their specific way of treating dead bodies. In the Neolithic and Early Bronze Age of Scandinavia, burning human bones can be considered a non-normative or, at most, a complementary burial practice to primary inhumation. A non-normative practice may be a manifestation of the person's social position, high or low, or that the person is an outcast or stranger (e.g., Dournes 1977: 267-268; Nilsson Stutz 2003; Oestigaard 2015; Ucko 1969). The subjection to fire can be a method to shorten the liminal and dangerous phase of transforming a body into bones (Hertz 1960/1907; van Gennep 1960), which may have been required for specific individuals or bodies (e.g., Dournes 1975; Hutton 1927). In many cultures death by accident or sickness is considered dangerous, and often attributed to magic or supernatural cause (Dournes 1975; Jouin 1949: 120).

I have suggested that the burnt bones dated to the Middle Neolithic A derived from cremations of bodies or fresh bones, as part of the rituals taking place in the passage grave entrance area, or/and that they originated from individuals who required a different treatment than the ones placed inside the graves (paper VI). Furthermore, as fully cremated human bones from other Late Neolithic and Early Bronze Age contexts are known, there is a possibility that the Late Neolithic bones from the Lilla Balltorp gallery grave were not supposed to be fully cremated and resulted from an intentional treatment of a specific body/individual. These types of treatments may have been used for the first burial deposited in the gallery grave, as indicated by the radiocarbon dates from the Lilla Balltorp grave. The traces of fire in some other gallery graves may have been a result of practices related to the abandoning of the graves. Thus, a tentative hypothesis is that fire may have been used in the initiation and abandonment of the gallery graves.

6.6 Megalithic populations of inland southwestern Sweden

6.6.1 Introduction

In this subchapter the results from the four main themes— the use-time of megalithic graves, mobility and networks, diet and subsistence practices, and mortuary practices —are considered together. The societies in the successive main phases, Early-Middle Neolithic and Late Neolithic-Early Bronze age, are compared. In addition, the megalithic communities of southwestern Sweden are placed in a broader geographical framework. I will show that there are many similarities regarding economy and burial practices between the two phases of megalithic use in Falbygden. I will also demonstrate that the megalithic society in the Early phase was more homogeneous and characterized by more regulated and ritualised cultural expressions than the more heterogenous communities of the Late phase. Parallel trends can be observed in other Scandinavia areas, with major transformation taking place around 2000 cal BC. Falbygden was characterized by regional traits, but at the same time, it persistently remained connected to a much larger sphere.

6.6.2 Who was buried in megalithic graves?

Both in the Early phase and the Late phase we can assume that only parts of the populations were buried in megalithic graves. The proportion buried in megalithic graves may have differed during the two periods and over time in general. The mix of ages and sex recovered from the megalithic graves during both periods generally corresponds to a cross-section of a population. Those interred in the megaliths may represent a segment of the population, a certain hierarchical level of society and/or certain families or groups. The criteria for who was deposited in these graves may also have differed over time and/or between groups. We cannot be sure that the individuals buried in the megalithic graves are representative for the entire Neolithic and Early Bronze Age population. The relatively high mobility observed for the group studied in this thesis might suggest that these individuals were more mobile than the remaining part of the population. High mobility may have been related to people with higher status, or at least with access to various kinds of exchange networks, perhaps constituted by interregional marriage alliances or child fostering. Still, numerous individuals exhibit local Sr isotope ratios, revealing that they grew up in Falbygden. These people would have had a strong link to the local landscape and to local ancestors. Those growing up and remaining in Falbygden may have accumulated a different kind of symbolic capital that conferred relatively high status, with access to various interregional networks. To address these questions, further comparative data from other types of burial contexts are needed.

Certain individuals or families from a larger geographical area (that is, extending outside of Falbygden) may have buried their dead in the megalithic graves of Falbygden (Sjöbeck 1951; Sjögren et al. 2009). This would explain some of the non-local Sr isotope ratios measured in human teeth recovered from the graves. This is more probable during the Early-Middle Neolithic, when megalithic graves are absent or rare in the areas surrounding Falbygden (paper II). For those individuals dating to the Late Neolithic, movement into Falbygden during the course of life could be confirmed (paper IV). Furthermore, relatively large Middle Neolithic settlements were occupied penecontemporaneously with the use of nearby megalithic graves (Sjögren 2003; Sjögren et al. 2019). It is likely that at least some people residing in the settlements also buried their dead in these graves.

In both periods, average differences in stable isotope values between the individuals buried in different graves may be explained by slight variations in subsistence strategies or, alternatively, environmental conditions differing between settlements using separate graves. Slight inter-grave variations in non-local Sr isotope ratios and mtDNA haplogroup frequencies might indicate that the settlements or groups using the graves were part of different networks.

In the Rössberga passage grave the mtDNA haplogroups indicate that particular kinship groups used specific niches in the chamber. In the Lilla Balltorp gallery grave several individuals with rotated teeth were observed, which may be a genetic characteristic (appendix 1). Thus, close genealogical affinity between some of the buried individuals is possible. Further aDNA investigations will be able to give us more information about the relatedness between the buried individuals in the megalithic graves.

6.6.3 The EN-MN and LN-EBA megalithic societies in Falbygden

The results presented in this thesis indicate that the chronologically separate societies, dating to the Early-Middle Neolithic and the Late Neolithic-Early Bronze Age, respectively, shared much in terms of diet and subsistence, but interregional mobility and exchange networks transform substantially over time, highlighting that this was a dynamic time for human communities across southern Scandinavia. In general, communities of the Early phase were more homogeneous than in the Late phase.

Terrestrial diets with a substantial intake of plant food were estimated during both periods based on stable isotopes. Furthermore, osteological studies, ZooMS and protein from dental calculus confirmed husbandry of pigs, sheep and cattle during both periods, although goats could only be confirmed in the later period. The proportion between these animals could not be compared as the sample size of the Late Neolithic and Early Bronze Age animals was too small. The stable isotopes also indicated higher individual variation of diets, possibly pointing to more diverse subsistence practices in the Late phase than during the Early phase. Considering Sr isotope data, migrations of individuals into Falbygden from the surrounding regions may also partly have caused the increased dietary variation. Slightly lower δ^{15}N values may have been related to different agropastoral strategies, such as a reduction in manuring in the Late phase, compared with the Early phase.

The mobility patterns and exchange networks during the two periods also differ. Imported amber and flint indicate direct and/or indirect exchange networks with Scania and/or Denmark in both periods, although involving different types of artefacts. In the Late Neolithic, slate pendants indicate possible contacts with regions to the west, such as Norway and Dalsland, and/or to Närke in the east. Regarding human mobility, a distinct increase in Sr isotope ratios, with greater overall Sr isotope variability is observed for the Late Neolithic. Thus, permanent human movements were more geographically limited in the Early phase than in the Late phase. According to Sr isotope data, humans and cattle took part in somewhat separate circulation systems in the Middle Neolithic. Furthermore, interregional migration or mobility patterns, as recorded in the Sr isotopes in human teeth from Falbygden, do not correspond with archaeologically documented exchange networks linking Falbygden to Scania and Denmark. This is the case for the Middle and Late Neolithic, alike. Instead, different—likely partially overlapping—exchange networks were at play, involving objects, cattle and humans (Fig. 30). It may be observed that extended social networks, involving contacts with new areas, emerged in the Late Neolithic. The higher Sr isotope ratios for this period indicate contacts with areas to the east and northeast of Falbygden. In the Late phase the non-local Sr isotope ratios probably reflects an increase in migration into the Falbygden area. This interpretation is consistent with the greater variation stable isotope values seen in the Late Neolithic-Early Bronze Age. The migrations into Falbygden seem to involve adult and young adult individuals in the Early phase, while in the Late phase, non-local Sr isotope ratios are found in individuals across the entire observed range of age-at-death. The human mobility in the Early phase was at an individual level, while in the Late phase it occurred, to a greater extent, at a group level. There is some evidence that sex-based differences in mobility appear in the latest part of the study period.

Even though regional variation of megalithic architecture, subsistence and pottery production is visible in the TRB communities in southern Scandinavia, general similarities stand out. As already mentioned (background - regional traits), Early-Middle Neolithic megalithic graves in Falbygden are more similar to graves in Halland and Scania than to the ones in Bohuslän and Jutland. In the Late Neolithic, gallery graves of different sizes and shapes appear in Falbygden including large multi-chambered graves and graves with port-holes. The concentration of large multi-chambered and port-hole graves in central Västergötland—further extending to Bohuslän and Halland in the west and to Närke in the east—reveals a different interregional spread of shared traditions of grave architecture in the Late Neolithic-Early Bronze Age compared to the Early-Middle Neolithic. In the Early phase, the overall contact pattern appears to be oriented in a south-north direction, while in the Late phase, a west-east direction dominates (Fig. 30).

The importance of ritual practices in south Scandinavian Neolithic societies has been emphasized, based on the construction and use of megalithic graves and ceremonial centres, such as causewayed and palisade enclosures (e.g., Artursson et al. 2016; Madsen 1988; Sjögren 2003). According to Sjögren (2003: 14), ceremonial phenomena peak in frequency during the Middle Neolithic A, in the TRB tradition. In Falbygden and inland southwestern Sweden no enclosures have yet been documented, but other practices of ritual character have been observed. Depositions of humans in wetlands in Falbygden and in other parts of inland southwestern Sweden have been dated to the Early Neolithic, Middle Neolithic A and Late Neolithic (paper V; Sjögren et al. 2017). Similar to the burials in megalithic graves, the radiocarbon dates on the wetland finds display a gap between 3000 and 2000 cal BC, which seems to be a general trend in southern Scandinavia (Sjögren et al. 2017). In the Early phase, the ritual practice of depositing human remains was contemporaneous with depositing animals, pottery and flint/stone tools in wetlands. According to the Danish records, the depositions of artefacts occurred less frequently in the Late Neolithic and Early Bronze Age than in the Early Neolithic and Middle Neolithic A (Iversen 2015). Both phases, in Falbygden and southern Scandinavia, were marked by extensive ritual practices, but the archaeological evidence suggests that they were of a different kind and more prominent in the Early and Middle Neolithic.

The lower variation in chamber shape and orientation in Falbygden's Early-Middle Neolithic record, compared with the Late Neolithic-Early Bronze Age, might reflect a more culturally regulated way of constructing megalithic graves, one characterized by more specialized knowl-

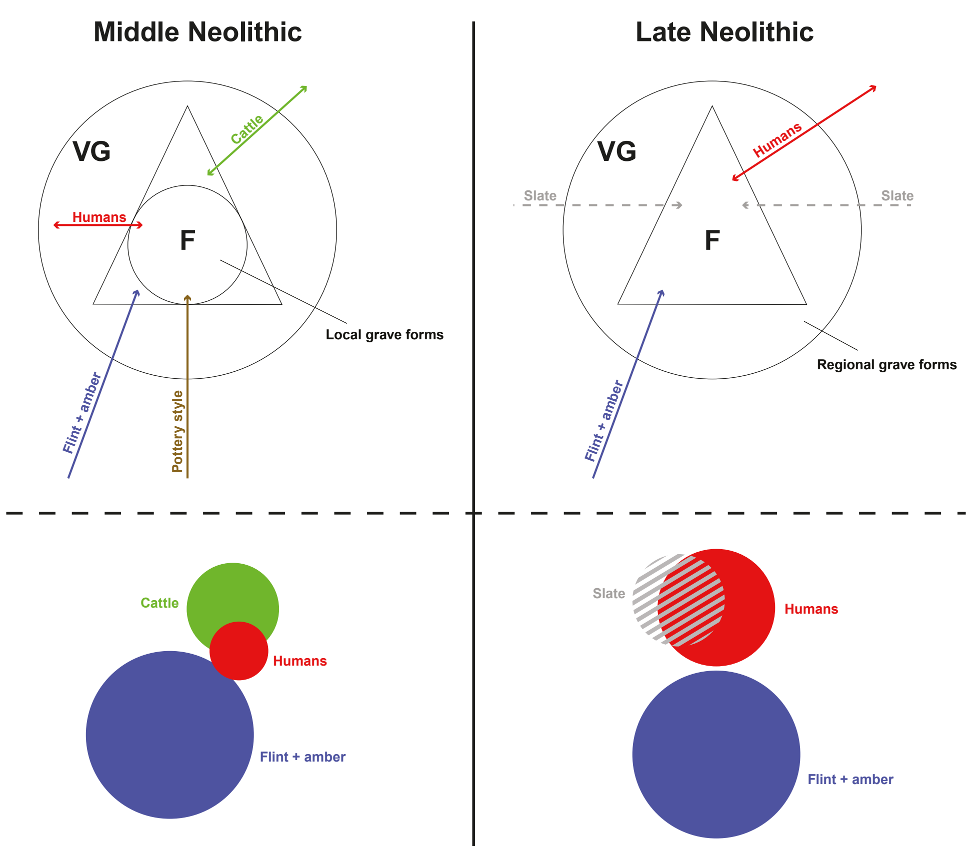


Figure 30 Top: movements of different objects, animals and humans during the Middle and Late Neolithic. F: Falbygden, VG: Västergötland. Bottom: spheres of exchange networks involving animals, different raw materials/objects and humans.

edge. A more regulated ideology and more homogeneous society may also explain the less varied bioerosion, presuming this reflects the treatment of the dead, of the Middle Neolithic human remains. Furthermore, studies of TRB pottery from Falbygden and other regions indicate a relatively proscribed technological process regarding the choice of clay and recipes (Blank and Bakunic Fridén forthcoming; Blank et al. 2020). The presence of entrance depositions in the passage graves, sometimes including burnt human remains, sheds light on the communal ritual practices outside the main grave chamber, perhaps involving repeated feasting activities. In contrast, in the Late phase, vessels and personal equipment were deposited along with the dead at the time of the burial, while ritual activities in other parts of the gallery graves were rare.

As already discussed, the megalithic tradition has been explained by prevailing social organization and economic conditions. For example, prestige competition between groups in societies based on a feasting/ritual economy mobilising surplus production have been brought forward (Jeunesse and Denaire 2017; Wunderlich 2019a, b). Furthermore, the importance of megalithic building for the integration of individuals into social networks has also been emphasized (Wunderlich et al. 2021). In a study integrating archaeological research with ethnographic work in Madagascar, Parker Pearson and Reigner (2018: 59) suggested that the megalithic tradition in the European Neolithic ceased because of the change from cereal cultivation to economies more focused on pastoralism, with greater everyday mobility. However, as the ethnographic examples have demonstrated, megalithic building occurs in diverse societies with very different social organization and economy.

The reappearance of megalithic building and use in the Late Neolithic, following a substantial gap of several centuries, could be interpreted as an attempt to recreate older traditions, and to relate to mythical ancestry. Thus, local groups and the increasing influx of people from outside the area during the Late Neolithic (Blank and Knipper 2021) could claim the right to various locations but also reinforce group identity in times of change. This could explain the high degree of Late Neolithic reuse of megalithic graves (Blank 2016). The reinvention of old traditions can be inspired by older monuments in the immediate area or further away, but it may directly reflect a migration from other regions (Parker Pearson et al. 2021). Contacts with or migrations from areas further away might explain the port-hole graves that appear in inland southwestern Sweden, although a regional origin of these graves is also possible. According to Müller and Vandkilde (2020) the power strategy of using ancient tradition to maintain authority may have been important especially during phases of transformation in prehistory. The peak of gallery grave construction, as well as the peak of reuse of earlier megalithic graves, appears ca. 2000 cal BC. This is the time when geographic mobility increases and diet—with associated subsistence strategies—become more variable. In a period of social instability, materialized references to past megalithic graves and mythical ancestors may have been an effective strategy for local communities in Falbygden.

6.6.4 Mobility and subsistence changes ca. 2000 cal BC

The stable and Sr isotope data in this study indicate that social transformation took place at the onset of the Late Neolithic II in Falbygden. A cultural change around 2000 cal BC has also been proposed for regions to the south (Iversen 2017; Tornberg 2018). According to these studies, the societies dated before 2000 cal BC had more in common with BAC traditions, and those thereafter were more similar to the Early Bronze Age culture complex. This dynamic period may have been influenced by the 4.2 ka BP climate event, recorded in southern Scandinavian ca.

2000 cal BC (Butruille et al. 2017; Hammarlund et al. 2003; Kleijne et al. 2020; Seppä et al. 2005). According to Kleijne et al. (2020), this event had regionally variable manifestations across northwestern Europe, differentially affecting local societies and their practices.

I suggest that the climate shift towards colder, more unstable temperatures and increased humidity triggered migrations into Falbygden, where favourable conditions for cultivation occurred. I also suggest that, as a result, agropastoral strategies within Falbygden became more variable. The increased migration into Falbygden may also have resulted in the mixing of groups with different traditions of constructing gallery graves and with partly separate social networks.

6.6.5 Falbygden, a regional centre at the margins of the European megalithic phenomenon

The results obtained in this thesis demonstrate that Falbygden shares many traits with southern Scandinavia, regarding subsistence, mobility and mortuary practices. Nevertheless, in Falbygden as well as in Västergötland, regional distinctions in megalithic grave constructions are present. Falbygden seems to have been an important area in inland southwestern Sweden, with connections extending to south Scandinavian regions, from the Middle Neolithic to the Early Bronze Age. In a regional perspective, high concentrations of imported artefacts such as flint axes, flint daggers and bronze artefacts characterize Falbygden (Blomqvist/Bägerfeldt 1990; Bergström 1980: 50, 134; Weiler 1994: 70, 96; Sahlström 1940).

Falbygden is situated at the margin of the European megalithic grave phenomenon. The area has a high concentration of megalithic graves dated to ca. 3500 to 2600 cal BC and ca. 2200 to 1100 cal BC. Both the passage and the gallery graves are generally larger than in other regions in Scandinavia. As already mentioned, the passage graves are characterized by local forms and features. Regional traits regarding size and construction details can be observed in the gallery graves (background; appendix 2; Fig. 30).

A general increase in human geographic mobility has been observed in several regions in southern Scandinavia during the Late Neolithic (Bergerbrant et al. 2017; Frei et al. 2019; Fraser 2018). However, the higher mobility in Falbygden's Late Neolithic record appears more accentuated, and it occurs slightly earlier than in other regions. Furthermore, subsistence and diet seem to follow the same patterns as in many other south Scandinavian areas. The data from Falbygden stand out regarding the substantial reliance on plant foods during both periods. A general intensification of agriculture has been proposed in other Scandinavian regions during the Late Neolithic, based on pollen data and the distribution of gallery graves (background). The results from Falbygden support instead a picture of more extensive cultivation, with more varied agropastoral strategies.

Relatively high population density is indicated by the numerous megalithic graves and stray finds recovered from the area. Tornberg (2018) also suggests that a high child mortality, especially present in Late Neolithic Falbygden, is indicative of a reasonably large population, as the spread of infections is greater in densely populated areas. Dating to the Middle Neolithic A, several individuals with Yersinia pestis bacteria (the cause of bubonic plague infection) have been identified in the Frälsegården passage grave (Rascovan et al. 2019), which might indicate a relatively high population density. Moreover, the burial frequency in the megalithic graves with peaks in the Middle Neolithic A and Late Neolithic II, agrees with proxies for human population dynamics in Denmark and northern Germany (Feeser et al. 2019; Hinz et al. 2012). In Falbygden a population increase in the Late Neolithic is indicated by the constructions of megalithic graves expanding into new areas and pollen data demonstrating an increased opening of the landscape (Enevold 2019; Fries 1958). Both trends are described in other regions in Late Neolithic Scandinavia (Apel 2001; Artursson 2009; Berglund 2003; Lekberg 2002; Kleijne et al. 2020; Feeser et al. 2019). However, according to the frequency of axes, the population increase seems to have been more accentuated in Precambrian areas of western Sweden than in Falbygden (Sjögren 2003: 219). Regarding the Early Bronze Age in Falbygden, a relatively high population density can be inferred jointly from pollen data, from the many Bronze Age graves and from the relatively high frequency of bronze sickles, axes and spearheads (Bergström 1980: 126-132, 136; Enevold 2019; Sahlström 1940; Weiler 1994: 70).

In southern Norway, radiocarbon dates indicate a population decrease at the end of the Middle Neolithic (Nielsen et al. 2019). Nielsen et al. (2019: 88f) suggest that the decrease can be related to a rise of interpersonal violence and the appearance of Yersinia pestis in Europe. In Falbygden an abandonment of TRB settlements at the transition between Middle Neolithic A and B is suggested, which can be exemplified by the Karleby settlements (Sjögren et al. 2019). This might result from changed settlement patterns or actual depopulation of the area. High concentrations of BAC axes suggest continued activities in Falbygden (Blomqvist/Bägerfeldt 1990). Nevertheless, as no settlements dated to the Middle Neolithic B and Late Neolithic or graves from the Middle Neolithic B are known in the area, the population development cannot be properly evaluated. However, relatively high population density both during the Middle Neolithic A and the Late Neolithic II can be assumed.

Evidence for increased conflict and violence in the Late Neolithic has been been brought forward. It has been explained as the result of a growing population, resulting in competition for arable land and pasture (background). According to Weiler (1994: 81), this development can also be observed in Falbygden. A few cases indicating traumas were observed in the bone material from the megalithic graves in Falbygden. In the Lilla Balltorp gallery grave a healed fracture in the arm indicated that it most likely had been splinted. A broken bronze arrowhead in the Utbogården gallery grave is most probably related to a violent event. The documented skull traumas from megalithic graves all date to the Late Neolithic (Table 4). Furthermore, a Late Neolithic/Early Bronze Age skull from the Hellekis gallery grave, Kinnekulle, displays a peri-mortem fracture to the left parietal bone (Fibiger et al. 2013). Von Düben describes a calvaria found in the Lockegården[30] passage grave; it has a hole that he interpreted as a force-trauma from a weapon blow (Retzius 1899: 59). This individual has not been further investigated or dated, but both Middle and Late Neolithic artefacts have been documented in this grave. There are other signs of traumas, some of which probably resulted from violence.

Trepanations have been documented in Falbygden in two cases, which probably date to the Late Neolithic (Table 4, Fig. 31). Various (not necessarily mutually exclusive) explanations for prehistoric trepanations have been presented: treating injuries and headaches, releasing spirits causing disease, initiation rituals for shamans etc. (Bennike 2003; Hansen 1917; Fürst 1924; Strassburg 2000: 406; Stensköld 2004: 234). The results presented above are in accordance with studies showing an increase of violence in the Late Neolithic and Bronze Age (see background - cultural settings), but not at the end of MNA as suggested by Nielsen et al. 2019.

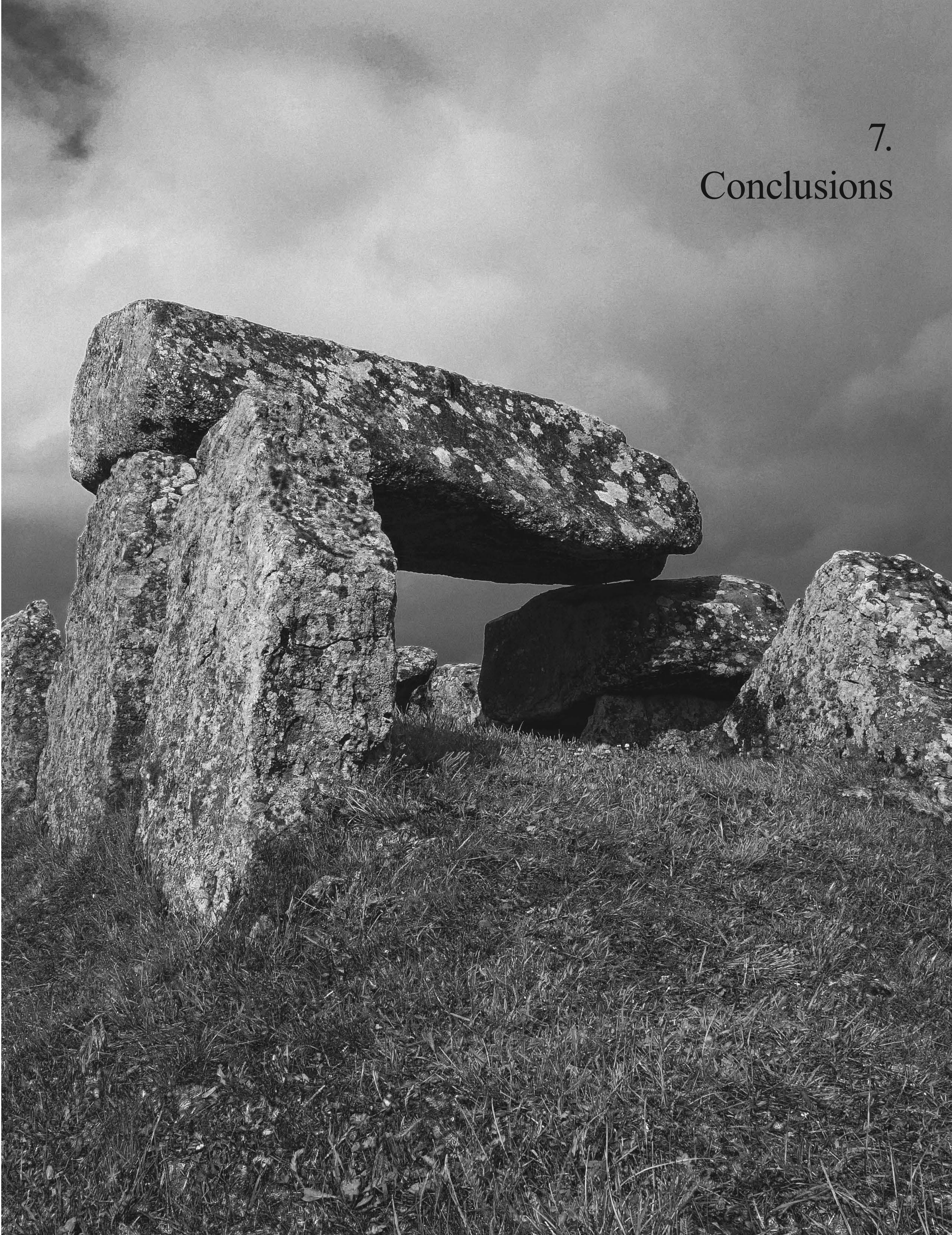
30 Slöta Raä 24

Table 4 Trepanations and violence- related traumas from the megalithic graves in Falbygden. F: female, M: male, n.d: not determined.

Context	Inventory no.	Injury	Surgery	Biological sex	Date
Lilla Källegården gallery grave	SHM 21851		Trepanation	n.d	LN?
Backa gallery grave	SHM 17709		Healed trepanation	n.d	LN?
Logårds kulle passage grave	SHM 5386b-22-M16	Ante-mortem fracture to mandible		M	3600±30 BP, LNII
Luttra passage grave	SHM 3165: 10351-3	Peri-mortem injury to L parietal-skull		F?	3583±29 BP, LNII
Luttra passage grave	SHM 3165: 10352-3-M19	Peri-mortem injury to R parietal-skull		n.d	3459±32 BP, LNII
Utbogården gallery grave	SHM 5386a-71	Ante-mortem dep fract, L parietal- skull		F?	3393±29 BP, LNII/BAPI
Utbogården gallery grave	SHM 5386a-M41	Ante-mortem injury-skull		n.d	3214±46 BP, BAPI/PII
Utbogården gallery grave	SHM 5386a	Broken spearhead		n.d	BA PIII
Lilla Balltorp gallery grave	VGM 88966	Ante-mortem injury.-elbow bone-parrying fracture?		n.d	LN/EBA
Lockegården passage grave	SHM 3166	Skull injury		n.d	MN/ LN?

Figure 31 Trepanation of a skull recovered in the Backa gallery grave (SHM 17709). Photo by Johnny Karlsson, SHM.

7. Conclusions



A passage grave in Luttra (Raä 15 :1), photo by Malou Blank, graphics Richard Blank.

This thesis has provided several new insights to the Neolithic and Early Bronze Age megalithic populations of inland southwestern Sweden. The most important results are that the megalithic chamber forms are more varied than previously thought and that in some cases Late Neolithic gallery graves can be difficult to separate from TRB megalithic graves. The construction and burial use of the megalithic graves appear in two phases separated by a time of disuse, which corresponds to the BAC period. Furthermore, the data acquired within this thesis demonstrate a distinctly increased human mobility and population diversity in the Late phase compared to the Early phase. The mobility in the Early phase seems to be dominated by adults moving into the area, while in the later phase migrations of groups, possibly families also appear. Biological sex was not a determining factor, regarding neither mobility, dietary patterns, nor the use of megalithic graves. No clear indications of a more stratified society or intensified agriculture could be observed in the Late Neolithic material from Falbygden. Instead, the results point to a less regulated and ritualised society, with more extensive farming and varied agropastoral strategies in the Late Neolithic-Early Bronze Age than during the earlier phase.

The results obtained within this work demonstrated that Falbygden shares many traits with Neolithic southern Scandinavia, regarding subsistence, mobility and mortuary practices. Falbygden, with relatively high population density, seems to have been an important part of regional and interregional TRB and Late Neolithic networks.

The analyses of the radiocarbon-dated human bones demonstrated that the megalithic graves were first used in the last part of the Early Neolithic around 3500 to 3300 cal BC. The initiation of the megalithic burial tradition seems to appear penecontemporaneously in southern Sweden, but some of the earliest dates come from Falbygden and Alvastra. The dolmens and passage graves were used contemporaneously, although the dolmens seem to have been introduced slightly earlier than the passage graves.

The first main period of burial use in the megalithic graves of Falbygden covers a time span from 3500 to 2600 cal BC. Most of the dates are concentrated to 600 years in the Middle Neolithic A (3400-2800 cal BC). The second period of megalithic use spans from ca. 2200 to 1100 cal BC. Within this period, the majority of samples fall in a 400-year-long interval between 2000 and 1600 cal BC. The use-span of gallery graves corresponds to the reuse of passage graves.

In Falbygden, the two main periods of use are separated by about 300 years with no burials, and by an even larger gap of about 500 years between the first burials (potential time of construction) in the graves. Thus, a continuous megalithic tradition is unlikely, and other mechanisms based on social and ideological aspects, involving the reinvention of old traditions, are more likely.

The conventional megalithic grave terminology should be used with caution. The four single-roomed gallery graves with Early-Middle Neolithic dates indicate that the chambers were more varied in size and shape than previously thought. A possible consequence of this result is that megalithic graves of the Early phase may have a wider geographical distribution than currently recognized. The two multi-roomed gallery graves with port-holes containing skeletal remains dated to the Middle Neolithic A might suggest an early introduction of some of these graves, although reburial of old bones cannot be ruled out.

Some chronological differences between various types of gallery graves in Västergötland could be discerned. Rectangular and hexagonal single-roomed graves with few burials contain Late Neolithic I burials, while in the multi-roomed graves the Late Neolithic burial sequence starts later, at the transition between Late Neolithic I and II. However, the wide variation of contemporary gallery graves indicates that there was no strict common idea of how to build a gallery grave. Alternatively, it is possible that different groups building gallery graves in Late Neolithic Falbygden had their own styles.

The isotope data—in association with other archaeological information—revealed somewhat changed mobility patterns and contact networks for Falbygden, from the Early phase to the Late phase. The greater variation of Sr isotope ratios and mtDNA haplogroups as well as evidence of human movements both in and out of Falbygden suggest more people moving into Falbygden from further away, but also a generally increased mobility of the megalithic population over larger regions in the Late phase than in the Early phase. The Sr isotope ratio data presented in this thesis suggest that, for the Early phase, people shifted area of residence within Falbygden as well as between Falbygden and the surrounding areas in Västergötland. In the Late Neolithic, higher non-local Sr isotope ratios prevail, indicating human movements from locations further to the east and northeast. Besides larger-scale migrations, exogamous marriage for upholding alliances within and outside of Falbygden, and also movements related to herding can be assumed.

Exchange networks connecting Falbygden to Scania and/or Denmark have been demonstrated for both phases, based on finds of flint and amber artefacts. These artefacts may have been part of indirect exchange networks, consisting of several nodes within a larger distribution system. Only three individuals, one from the Middle Neolithic A and two from the Middle Neolithic B, displayed Sr isotope ratios that correspond to the bioavailable ratios of Scania and Denmark. However, direct contacts cannot be ruled out, as short-term movements are difficult to trace using Sr isotope analysis. Furthermore, the inconsistency between the origin of the imported artefacts, the movement of humans, and the movement of cattle suggests that multiple, partly overlapping networks were at play.

Biological sex was not a determining factor regarding human mobility in general. However, the Sr isotope results indicated changes in mobility patterns over time, relating to the age and sex. During the Early phase, among the individuals displaying non-local ratios, only adults and young adults could be confirmed, indicating that only adults migrated into Falbygden or were brought there to be buried. During the Late phase, the non-locals included both children and adults, perhaps suggesting that families or close kin migrated together into Falbygden. In the Late Neolithic II-Early Bronze Age, toward the end of the study sequence, the difference in non-local Sr isotope ratios between sexes became significant, unlike in earlier periods. This result indicates that, over time, men and women began to migrate to Falbygden from distinctive areas, characterized by different geology.

This thesis demonstrates a distinct change in mobility at the onset of Late Neolithic II, potentially connected to climate change, but involving a shift in economic and social structures, an expansion of exchange networks, and a generally increasing population.

The stable isotope data confirm a rather consistent diet based on terrestrial resources, with a substantial proportion of plant food. This pattern lasts throughout the Neolithic and into the Early Bronze Age. There is no evidence for a shift towards a greater reliance on plant foods, which would reflect an increase of farming in the Late Neolithic-Early Bronze Age. However, the isotope data suggest possible changes in agropastoral strategies between the two periods. More extensive cultivation and more diverse farming and husbandry strategies in the Late phase than in the Early phase are proposed.

No differences in diet based on sex were observed in any of the investigated phases. No convincing evidence in the dietary pattern regarding a growing social stratification in the Late Neolithic-Early Bronze Age populations could be demonstrated.

However, greater variation in diet was observed in the Late phase than during the Early phase. Significant differences in stable isotope values between the Late Neolithic-Early Bronze Age children and adults were observed. Furthermore, the non-local Sr isotope group was shown to have more varied stable isotopes, when compared with the local and semi-local groups. Thus, I suggest an increased human mobility with people moving into Falbygden from different locations with divergent dietary baselines or traditions. Furthermore, a tendency for different stable isotopes between graves during both periods may result from slight variations in subsistence strategies or environments between different settlements using the graves.

A general climate change towards cooler and more unstable temperatures and increased humidity ca. 2000 cal BC, corresponding to the 4.2 ka BP event, may have triggered some of the increased mobility and migrations. Furthermore, the shift in climate most probably contributed to changes in the local environment, which in turn triggered modifications of subsistence strategies and, thus, changed stable isotopes in humans. Pollen data indicate a more open landscape in the Late phase, which may have caused higher $\delta^{13}C$ values among the Late Neolithic-Early Bronze Age individuals compared to the Early-Middle Neolithic individuals.

The diet and subsistence of the megalithic populations in Falbygden seem to correspond to the general pattern observed for the Scandinavian Neolithic and Early Bronze Age. However, the isotope data demonstrate that the megalithic population of Falbygden were more reliant on plant food/protein from lower trophic levels than megalithic populations from some regions in eastern Sweden during both investigated phases, but especially during the Early phase. This most probably results from the inland position of Falbygden, as well as a heavy reliance on agriculture in Falbygden compared to regions in the Baltic where marine resources were important dietary components.

Only part of the population was buried in megalithic graves during both phases, although the proportion seems to have varied over time. The mix of ages and sex present among the individuals deposited in the megalithic graves broadly corresponds to a cross-section of a population. However, they may actually represent a segment of the population, such as families or groups of a certain status within the society. Slight variation in Sr isotope ratios and in the proportion of mtDNA haplogroups between some graves, indicate that the settlements or groups using the graves had somewhat separate networks from one another. In the Rössberga passage grave the mtDNA haplogroups indicated that specific kinship groups used certain niches in the chamber.

Regarding the megalithic grave constructions in Falbygden/Västergötland, the sizes during both phases were relatively large compared with other areas in Scandinavia. The Early-Middle Neolithic graves were in general more monumental than the Late Neolithic-Early Bronze Age ones, which sometimes partially consist of natural features and often demanded less effort to construct. The different solutions and variations of gallery constructions suggest less regulated and specialized building practices in the Late Neolithic than in the earlier phase.

Successive inhumation burial was the dominant burial practice within the megalithic graves, during both phases. Original contracted positions seem to have been the most common among Middle Neolithic individuals in passage graves, while supine positions dominated among the Late Neolithic burials in gallery graves. However, a few examples of assemblies of specific bone elements might indicate secondary burials or re-arrangements of bones. Variation in bioerosion of the skeletal remains may be related to mortuary practices, such as wrapping and positioning, and possible conservation treatment, of dead bodies.

Arrested bioerosion was only observed in the Late Neolithic-Early Bronze Age material.

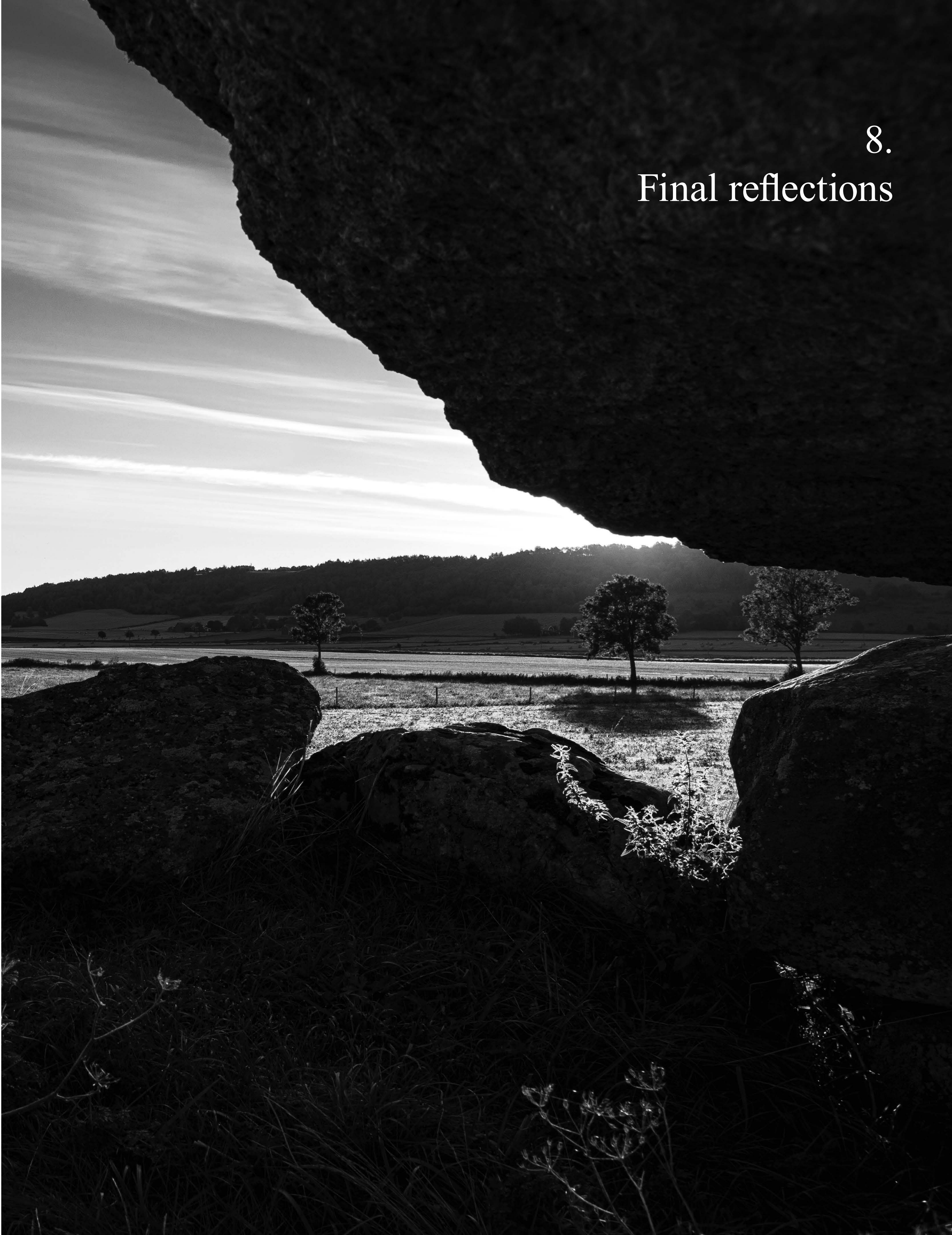
Neolithic and Early Bronze Age burnt human bones were also confirmed in the megalithic graves. The bones resulted from intentional burning and were most probably burnt elsewhere. The Middle Neolithic bones were fragmented and scattered in the entrance area while the Late Neolithic and Early Bronze Age bones were placed in the grave chambers, and at least in the Late Neolithic case, they derived from more or less a whole body. Depositions of burnt and fragmented flint and animal bones and fragmented pottery are also common in the entrance area of passage graves. This may indicate recurrent practices in front of the megalithic graves, including feasting activities during the Early phase. In the Late phase, whole objects or offerings were deposited along with the dead inside the grave chamber.

The collective aspect of these societies was important. It can be observed in the successive burial practices and in the mobilisation of labour and cooperation needed for constructing these graves. These cooperative practices would have mirrored the cooperation required for managing some cultivation practices. Furthermore, the successive burials in megalithic graves also suggest that genealogical and mythical ancestors were significant among these communities. However, the ritual aspects of the megalithic graves were less emphasized in the Late Neolithic compared to the Early- Middle Neolithic considering the lack of entrance deposits in the generally less monumental gallery graves.

In Falbygden the variation of Sr and stable isotope values, mtDNA haplogroups and megalithic grave constructions is greater in the Late phase than in the Early phase. I argue that, for the later phase, this reflects a more heterogeneous society with less regulated ritual practices and less proscribed cultural expression, which could be described as a melting pot of different groups from various locations.

In this thesis I have demonstrated the importance of interdisciplinary approaches in prehistoric research. Only looking at landscapes, site distributions, objects, isotopes, or aDNA in isolation will give us a skewed picture of past societies. By combining datasets from different disciplines, a picture of complex Neolithic and Early Bronze Age societies has emerged.

8. Final reflections



The Knaggården passage grave (Luttra Raä 15 :1) in Falbygden.
Photo and graphics by Richard Blank.

This thesis has added new insights into megalithic communities of the Neolithic and Early Bronze Age. The results attained in this study demonstrate complex patterns that give us new knowledge considering the use-time of megalithic graves, the subsistence and mortuary practices, and human mobility of the people buried within these structures. This thesis has also demonstrated the potential for future work by pointing to different research areas where data are lacking, by raising new questions and by opening up for new approaches to confront these issues.

For example, studies of the Late Neolithic and Early Bronze age artefacts—including more thorough analysis of slate pendants, flint artefacts and pottery—could contribute to more detailed chronologies and more insight into exchange networks. Information about chronologies might be achieved by analysing different assemblies of artefacts in relation to radiocarbon and typologically datable material, and by radiocarbon dating residues in pottery vessels. I conducted a first attempt to discuss the typo-chronology of flint daggers and related artefacts in gallery graves of inland southwestern Sweden by comparing the frequencies of these artefacts with radiocarbon dates from human remains (Blank in press). Provenience studies may be approached by microscopic studies and elemental analysis of flint and slate artefacts, as well of pottery sherds.

Additional radiocarbon dating of various bone elements from human skeletons in different types of megalithic graves may also result in a better understanding of when the megalithic graves were used. Thin-section, isotope and aDNA analyses of the Middle Neolithic bones occurring in the gallery graves could be a means of understanding these depositions. More systematic thin-section analysis might also confirm or reject hypotheses put forward to explain bioerosion patterns, which could reflect variation in the treatment of dead bodies. This thesis also demonstrates the need for more systematic radiocarbon dating and osteological analyses of cremated bones in megalithic graves, as well as in other Neolithic and Early Bronze Age contexts, in order to better understand the use and reuse of megalithic graves and the complex mortuary and ritual practices of these periods.

It is my hope that new sites will be found in Falbygden. Excavations of Middle Neolithic B, Late Neolithic and Early Bronze Age settlements would contribute important data that could be related to this study and to the substantial data sets from the Middle Neolithic A settlements. Settlement remains would help us to better understand the subsistence of the Late Neolithic communities and to produce a more robust dietary baseline. Lipid analyses of Late Neolithic pottery vessels and additional analyses of calculus might also be an important supplement to the dietary studies. Furthermore, identifying and excavating Neolithic flat burials, including BAC graves, would give us the possibility of comparing the individuals buried in flat and megalithic graves and to fill the information gap for the Middle Neolithic B.

More detailed studies of the distribution of stray finds are also needed to better understand the social transformations taking place in the Neolithic and Early Bronze Age of Falbygden. Investigations of pollen diagrams and artefact density over time could be a way to approach questions concerning population density within Falbygden. These data could then be discussed with the radiocarbon dates presented in this thesis and other data regarding diseases and climate shifts.

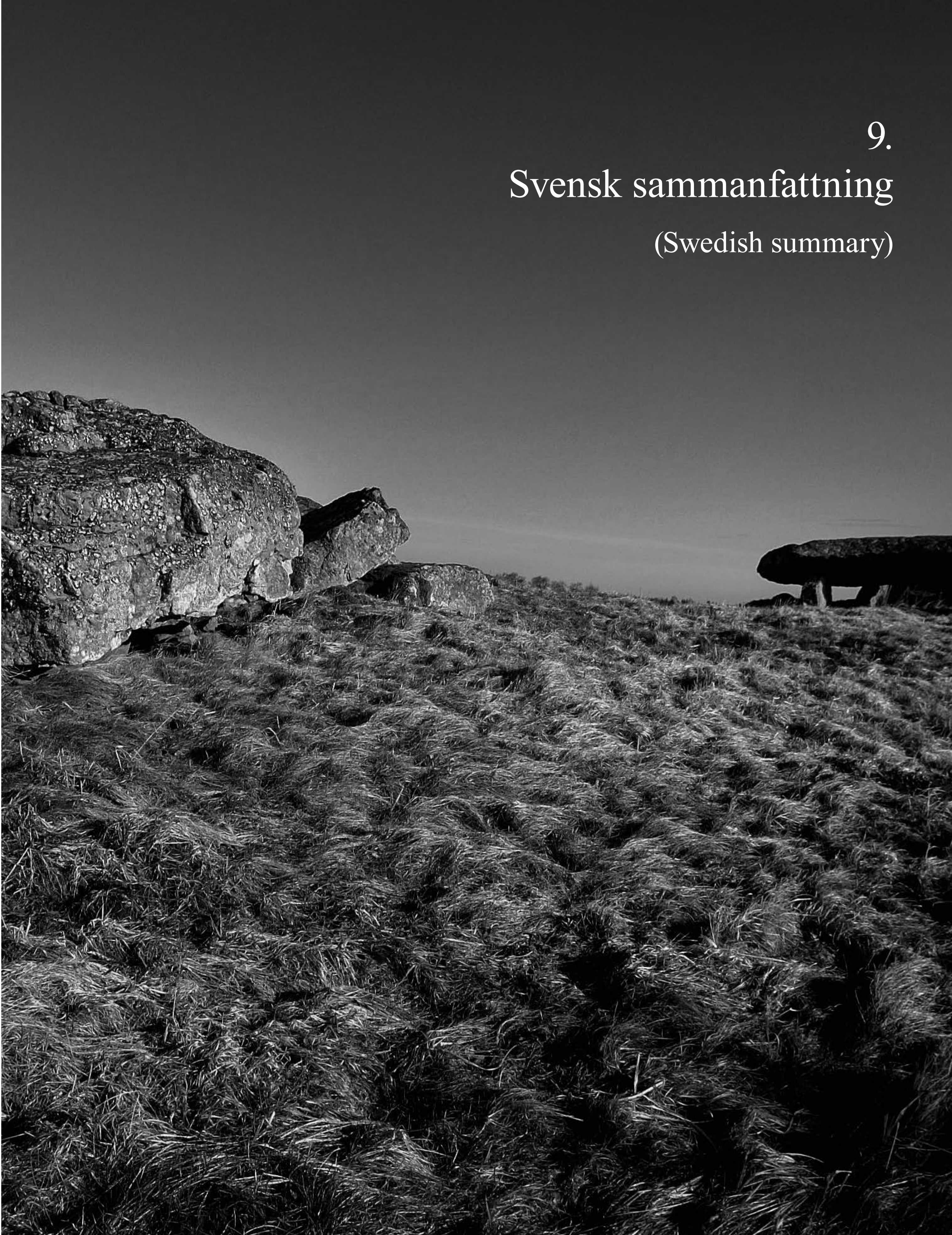
Different aspects of the Middle Neolithic societies will be presented in forthcoming publications, as part of two projects at the University of Gothenburg, Neolithic Lifeways (Karl-Göran Sjögren, Tony Axelsson) and Anonymous Ancestors (Karl-Göran Sjögren and Torbjörn Ahlström), based on several settlements in Karleby and the Frälsegården passage grave in Gökhem, Falbygden.

Further samples, especially in the areas surrounding Falbygden, would complement the Sr isotope baseline of inland southwestern Sweden and strengthen future mobility studies. Additional Sr isotope sampling of several teeth—and perhaps micro-sampling from the same teeth—would be required to answer some of the questions related to the human mobility, especially regarding individuals exhibiting ratios within the semi-local range. Hopefully, the forthcoming aDNA and oxygen isotope study can add complementary data to those presented in this thesis. Ancient DNA has a potential, not only for studying long term migrations and kinship relations in and between the megalithic graves, but also for investigating the evolution of lactase persistence (milk digestion), the occurrence of various infectious diseases and broader interregional demographic trends.

Additional studies of the Neolithic and Early Bronze Age period in inland southwestern Swedish areas outside of Falbygden could also give some perspective on regional socio-economic variations and networks. There are already some known gallery graves with preserved bone material that could provide valuable data. In two ongoing studies the subsistence, health and mobility of those buried in gallery graves at Kinnekulle, northwest of Falbygden, and at Timmersdala, on the northern fringe of Falbygden are investigated by combining bioarchaeology, archaeology and isotope analyses.

This thesis has also demonstrated the potential of the available material in our museum collections and the rich scientific benefits of interdisciplinary investigations.

9.
Svensk sammanfattning
(Swedish summary)



Two passage graves in Vårkumla, Falbygden. Photo by Falbygdens museum, Hans-Göran Johnson, graphics Richard Blank.

Denna avhandling behandlar material från neolitikum och tidig bronsålder som återfunnits i Västsveriges, främst Falbygdens, megalitgravar. Studien fokuserar på frågor kring mänsklig mobilitet, försörjning och behandling av de döda, och vad detta säger om de bakomliggande samhällena. Avhandlingen utgår från ett interdisciplinärt förhållningsätt, där kunskap och metoder från olika discipliner integreras. Naturvetenskapliga analyser, vilka kan ge insikter i människors levnadsätt som annars inte är möjliga, har varit väsentliga för detta projekt. Genom att kombinera data från ^{14}C-dateringar, stabila isotoper, strontiumisotoper, aDNA-analyser och genetiska könsbedömningar med arkeologiska och osteologiska resultat, presenteras en fördjupad och komplex bild av de berörda samhällena.

Det övergripande syftet är att bidra med ny kunskap om de neolitiska och tidiga bronsålderssamhällena i Sveriges sydvästra inland. Forskningen fokuserar i huvudsak på skelettmaterialet från megalitgravarna, men även gravarkitekturen och gravfynden ingår i analyserna. Gravarna och resterna som återfunnits däri används således som en källa för att studera individuella livshistorier såväl som levande samhällen.

Avhandlingen är uppdelad i fyra teman: användningstiden av megalitgravar, mänsklig mobilitet och utbytesnätverk, diet och försörjning, och begravningspraktiker. Temana diskuteras i kappan, och behandlas i de sex artiklar som ingår i avhandlingen. Det övergripande syftet innefattar delmål fördelade på var sitt tema:

- att undersöka de kronologiska intervallen för begravningar i de konventionella megalitiska gravtyperna i Västergötland, med särskilt fokus på hällkistorna.
- att undersöka olika nivåer av mänsklig mobilitet och befolkningsdynamik hos de neolitiska och tidiga bronsåldermänniskorna, som begravts i Falbygdens/Västergötlands megalitgravar.
- att spåra mönster och förändringar i dieten hos de neolitiska och tidiga bronsålder människorna som begravts i megalitiska gravar i Falbygden/Västergötland. Vilket vidare leder till att vi kan få en bättre uppfattning om ekonomierna och försörjningssätten under dessa perioder.
- att identifiera och jämföra gravpraktiker i megalitgravarna under neolitikum och äldre bronsålder i Västergötland/Falbygden.

Falbygden i Västergötland är ett viktigt område för forskning om neolitiska megalitiska gravar. Här har en av norra Europas största koncentrationer av gånggrifter och ett stort antal hällkistor påträffats. I Falbygden finns några av de stösta gånggriftskamrarna, och i Västergötland några av de längsta hällkistorna i Norden. I Västergötland finns stora ansamlingar av hällkistor som är betydligt större än i andra områden. Många av hällkistorna i denna region är också indelade i flera rum som ibland är utrustade med gavelhål och/eller portstenar. Kunskap om Falbygdens megalitsamhällen kan bidra till megalitforskningen i stort, och till en ökad förståelse av de neolitiska perioderna och tidig bronsålder i ett vidare geografiskt sammanhang.

Falbygdens sedimentära berggrund omges av betydligt äldre urbergsområden. Den tydligt avgränsade geologiska strukturen och det välbevarade benmaterialet från människor och djur gör Falbygden till ett ovanligt fruktbart studieområde för undersökningar som kombinerar bioarkaeologiska och arkeologiska data. Från Falbygden finns ett stort men hittills nästan obeforskat material av människoben från hällkistor, medan områdets gånggrifter varit föremål för en lång rad studier. Det relativt stora datamängderna från det tidigare beforskade mellenneolitiska materialet utgör ett viktigt jämförelseunderlag till de nya data som har producerats inom ramen för denna avhandling.

Materialet som utgör grunden till detta arbete är omfattande och består av skriftliga källor, annan dokumentation (figurer, foton etc.), artefakter, skelettrester av människa och djur, och vattenprover. Inom ramen för detta projekt analyserades 61 olika vattendrag och fem små däggdjur från olika delar av Västergötland för strontiumisotoper. Dessa utgör tillsammans med tidigare strontiumisotopdata grunden till en karta med bakgrundsvärden. Referenskartan producerades för att möjliggöra fortsatta mobilitetsstudier. Nio ben från domesticerade djur hittade i fem megalitgravar och på en boplats ^{14}C-daterades och analyserades för stabila isotoper och ZooMS. Syftet med dessa analyser var att komplettera de referensdata som ingår i diet- och försörjningstemat. Vidare provtogs 221 mänskliga benrester, i huvudsak från olika individer, från 47 megalitgravar och ett våtmarksfynd för en rad olika isotopanalyser, varav några även analyserades för aDNA och genetiskt kön.

Avhandlingen har resulterat i nya insikter om de samhällen som begravt sina döda i megalitgravar. De viktigaste slutsaterna är att de megalitiska kammarformerna är mer varierade än vad man tidigare trott, och i vissa fall kan senneolitiska hällkistor vara svåra att skilja från tidig-/mellanneolitiska megalitgravar. Vidare att megalitgravar konstruerades och användes i två huvudfaser, vilka åtskiljdes av en period då gravarna inte användes. Denna period sammanfaller med tiden för stridsyxekulturen. Dessutom visar resultaten en tydlig ökning av mänsklig rörlighet och befolkningsdiversitet under senneolitikum och tidig bronsålder jämfört med tidig-mellanneolitikum. Mobiliteten verkar också ha förändrats över tid gällande karaktär, och vilka som flyttar in i området. Biologiskt kön var inte avgörande för varken mobilitet, dietmönster eller vilka som begravdes i megalitgravar. Resultaten pekar på ett mindre reglerat och ritualiserat samhälle med ett mer extensivt jordbruk och mer varierade agropastorala strategier under senneolitikum-tidig bronsålder än under den tidigare fasen.

Falbygden har många likheter med sydskandinavien, både under mellan- och senneolitisk tid, när det gäller försörjning, mobilitet och begravningspraktiker. De sammantagna data pekar på att Falbygden var relativt tätbefolkat, och utgjorde en viktig del i regionala och interregionala kontaktnätverk under neolitikum och tidig bronsålder.

^{14}C-dateringar av människoben visar att megalitgravarna började användas i slutet av tidigneolitikum, runt 3500 till 3300 kal BC. Megalitgravarna verkar ha introducerats mer eller mindre samtidigt i södra Sverige. Några av de tidigaste dateringarna kommer från ben som hittats i Falbygden och i Alvastra. Dösar och gånggrifter har använts parallellt men dösarna började antagligen tas i bruk något tidigare än gånggrifterna.

Den första huvudfasen av begravningar i Falbygdens megalitgravar sträcker sig ifrån ca 3500 till 2600 kal BC. De flesta gravläggningarna är koncentrerade till 600 år under mellanneolitikum A (ca 3400 till 2800 kal BC). Den andra huvudfasen påbörjas ca. 2200 och avslutas omkring 1100 kal BC. Majoriteten av dateringarna från denna fas infaller under 400 år mellan 2000 och 1600 kal BC (övergången till senneolitikum II och in i första perioden av bronsåldern). Under den senare fasen återanvänds tidigare dösar och gånggrifter, och nya megalitgravar konstrueras.

I Falbygden separeras dessa två huvudfaser av 300 år, då inga begravningar lagts ner i megaliterna. Det är alltså osannolikt att de två faserna utgör en kontinuerlig megalittradition. Istället måste andra mekanismer baserade på sociala och ideologiska aspekter, och revitalisering av gamla traditioner beaktas.

Den konventionella megalitgravsterminologin bör användas med försiktighet. Fyra av de enrummiga hällkistorna visade sig innehålla tidig-/mellanneolitiska människoben, vilket här tolkas som att megalitgravarna under denna tid var mer varierade i storlek och form än vad man tidigare ansett. Detta innebär att megalitgravarna under den tidiga fasen skulle kunna ha en större geografisk spridning än den rådande uppfattningen antagit. Skelettrester från den tidiga fasen återfanns även i två av de flerrummiga hällkistorna med gavelhål. Detta skulle kunna tolkas som att några av dessa hällkistor byggdes samtidigt som gånggrifter och dösar. Men återbegravningar av äldre ben är också en möjlig förklaringsmodell.

Vissa kronologiska skillnader mellan olika typer av hällkistor kunde påvisas, även om gravarna till stor del brukades parallellt. Rektangulära och hexagonala enrummiga hällkistor med få begravningar innehöll människoben daterade till senneolitikum I, medan de flerrummiga hällkistorna ser ut att ha börjat användas först i övergången till senneolitikum II.

Trots att de mellanneolitiska kammarformerna var varierade, så är Falbygdens gånggrifter relativt homogena i sin utformning. De senneolitiska hällkistorna, å andra sidan, särskilt de som nyttjades under den andra halvan av perioden, varierar en hel del i storlek, form och konstruktionsdetaljer. Detta föreslås bero på att det, till skillnad från den mellanneolitiska perioden, inte fanns något strikt gemensamt koncept om hur hällkistorna skulle utformas, eller på att olika grupper hade sina egna byggnadstraditioner.

Isotopdata från de som gravlagts i megalitgravar, såväl som arkeologiska resultat från Falbygden, påvisar förändrade mönster i hur människor förflyttats mellan tidig-mellanneolitikum och senneolitikum-tidig bronsålder. Den större variationen av Sr-isotopvärden och mtDNA-haplogrupper tyder på att fler flyttar in till Falbygden från platser längre bort under senneolitikum och tidig bronsålder jämfört med den tidigare fasen. Sr-isotopdata indikerar att den mänsklig mobiliteten bestod av rörelser inom Falbygden liksom mellan Falbygden och de omgivande områdena i Västergötland under tidig-mellanneolitikum. Under senneolitikum pekar Sr-isotopresultaten på mänskliga rörelser också från mer avlägsna platser åt öst och nordöst än tidigare. Dessa rörelser föreslås ha bestått av bl.a. migrationer, exogama äktenskap i syfte att upprätthålla allianser inom och utanför Falbygden, samt eventuellt mobilitet relaterade till vallning av djur.

Sydskandinavisk flinta och bärnsten i Falbygden visar att utbytesnätverk med södra Skåne och/eller Danmark förekom under neolitikum. Trots detta uppvisade endast tre individer, en från mellanneolitikum A och två från mellanneolitikum B, Sr-isotopvärden som matchar södra Skånes och Danmarks geologi. De importerade artefakterna/materialen kan således ha varit del av indirekta utbytesnätverk bestående av flera noder inom ett större distributionssytem. Direkta kontakter kan dock inte uteslutas, eftersom kortvariga rörelser är svåra att spåra med hjälp av Sr-isotopanalys. Skillnader mellan ursprunget för de importerade artefakterna, rörelserna av människor och förflyttningar av boskap tyder på att flera och delvis överlappande utbytesnätverk förekom parallellt.

Biologiskt kön var inte avgörande för människornas mobilitet. Däremot indikerar Sr-isotopdata en del förändringar av förflyttningsmönster över tid beträffande ålder och kön. Under tidig-mellanneolitikum kunde endast vuxna och unga vuxna bekräftas bland individer som visade icke-lokala signaler. Detta tyder på att vuxna individer flyttade in till Falbygden eller fördes hit för att begravas. Under den senneolitiska-tidiga bronsåldersperioden representerades de icke-lokala individerna av både barn och vuxna. Detta pekar på att det delvis var grupper, eventuellt bestående av familjer, som migrerade till Falbygden. Under den senare delen av senneolitikum II och övergången till tidig bronsålder, var skillnaden i Sr-isotopsignalerna mellan könen signifikant, till motsats från tidigare perioder där denna skillnad inte observerades. Detta resultat indikerar att ett annat flyttningsmönster också förekom, där män och kvinnor inte flyttade som del av familjegrupper utan kom ifrån skilda områden med olika geologi.

Resultaten visar att en tydlig förändring av den mänskliga mobiliteten inträffade i början av senneolitikum II. Förändringen i människors rörelser är troligtvis är kopplad till en rad faktorer, som t.ex. en klimatförändring, en förändring av ekonomiska och sociala strukturer, en utvidgning av utbytesnätverk och en generell befolkningsökning.

De stabila isotoperna från människoben bekräftar en liknande diet baserad på terrestriska resurser med en betydande andel vegetabilier under hela neolitikum och in i tidig bronsålder. Trots detta förekommer några mindre men ändå viktiga variationer. Det finns inga bevis för dietförändringar i riktning mot ett större beroende av vegetabilier, vilket skulle tyda på en intensifiering av jordbruket under senneolitikum. Istället indikerar isotopdata andra möjliga förändringar i agropastorala strategier mellan de två perioderna, med mer extensiv odling och mer varierade jordbrukspraktiker under den senare fasen.

Inga skillnader i dieten baserat på kön observerades under någon del av neolitikum och tidig bronsålder. Resultaten kunde inte heller bekräfta någon växande social stratifiering i de senneolitiska-tidiga bronsålderssamhällena. Emellertid uppvisade dieten under denna fas en större individuell variation än under den tidigare fasen. I benmaterialet daterat till senneolitikum och tidig bronsålder påvisades signifikanta skillnader i isotopvärden mellan barndoms- och vuxenproverna. Under samma period observerades mer varierade stabila isotoper inom den icke-lokala Sr-isotopgruppen än de övriga Sr-isotopgrupperna. Jag föreslår därför en ökad mänsklig mobilitet med människor som flyttade in i Falbygden från olika platser med avvikande bakgrundsvärden eller olika försörjningsstrategier. Dessutom kan en tendens till varierande stabila isotopvärden mellan olika gravar under båda perioderna påvisas, vilket kan bero på små skillnader i försörjningsstrategier eller miljö mellan olika bosättningar som har använt gravarna.

En klimatförändring mot svalare och mer instabila temperaturer och ökad nederbörd ca 2000 kal BC kan ha utlöst en del av den ökade mänskliga mobiliteten. Dessutom bidrog klimatförändringen troligen till förändringar i den lokala miljön, vilket i sin tur utlöste anpassningar av försörjningsstrategier som avspeglas i de stabila isotoperna. Pollendata indikerar ett mer öppet landskap under senneolitikum-tidig bronsålder än under tidigare perioder. Detta kan ha orsakat högre $\delta^{13}C$-värden bland individerna från den sena fasen jämfört med individerna från den tidiga användnings fasen.

Diet och försörjning bland Falbygdens megalitbefolkning tycks motsvara det allmänna mönster som observerats i Skandinavien. Likväl visar de stabila isotopdata att Falbygdens människor var mer beroende av vegetabilier/ protein från lägre trofinivåer än människor begravda i östra Sveriges megalitgravar. Skilnaden kan observeras under båda faserna, men är särskilt påtaglig under tidig-mellanneolitikum. Detta beror troligen på Falbygdens inlandsläge men även på att jordbruket var viktigt i Falbygden jämfört med Östersjöregionen, där marina resurser var betydande komponenter i kosten.

Endast en del av befolkningen begravdes i megalitgravar under båda perioderna, trots att andelen troligen varierat över tid. De som placerats i dessa gravar motsvarar ett tvärsnitt av en befolkning, gällande ålder och kön. Troligtvis representerar de gravlagda ett segment av befolkningen, såsom familjer eller grupper av en viss hierarkisk nivå i samhället. Variation i Sr-isotopvärden, såväl som andelen mtDNA-haplogrupper i vissa gravar, indikerar att bosättningarna eller grupperna som använder gravarna hade olika nätverk. I Rössberga gångriften tydde mtDNA-haplogrupperna på att specifika släktgrupper använde vissa nischer i kammaren.

Megalitgravarna i Västsveriges inland var relativt stora i jämförelse med andra områden i Skandinavien. Gravarna från den tidigare fasen var generellt sett mer monumentala än de från den senare fasen. Under senneolitikum-tidig bronsålder utnyttjades även naturliga sprickor och stenformationer när hällkistor byggdes. De olika konstruktionslösningarna och de ofta mindre hällarna, indikerar att byggandet av hällkistor i de flesta fall krävde mindre ansträngning och mindre arbetskraft än gånggrifterna. De olika sätten att konstruera hällkistor och variationen i storlek och form antyder också mindre specialiserade och reglerade praktiker under senneolitikum jämfört med den tidigare perioden.

Succesiva begravningar av hela kroppar var den dominerande gravpraktiken i megalitgravarna under neolitikum och tidig bronsålder. De flesta kroppar verkar ursprungligen ha placerats i sammandragen ställning på sidan i gånggrifterna, medan utsträckt ryggläge var vanligt bland de som begravts i hällkistorna. Några exempel på eventuella sekundärbegravningar och/eller bensortering har föreslagits. Avstannad bioerosion har påvisats i material daterat till senneolitikum/tidig bronsålder och skulle kunna tyda på någon typ av konserverande behandling av döda kroppar.

Brända människoben daterade till neolitikum och tidig bronsålder kunde också bekräftas bland materialet från Falbygdens megalitgravar. Benen härrör från avsiktliga kremeringar av kroppar eller färska ben, som brändes någon annanstans innan de placerades i gravarna. De mellanneolitiska benen var fragmenterade och utspridda i mynningsområdet av en gånggrift, medan benen från senneolitikum och tidig bronsålder var placerade i kamrarna. I det senneolitiska fallet tillhörde benet ett mer eller mindre komplett skelett. Fragmenterad och bränd flinta och djurben, och fragmenterad keramik, är vanliga fynd i gånggrifternas mynningsområden. Detta kan vara tecken på återkommande praktiker framför megalitgravarna som t.ex. festaktiviteter i samband med bla. gravläggningar. Under senneolitikum deponerades i stället hela föremål tillsammans med de döda i gravkammaren.

Gravläggningarna men också själva byggandet av megalitgravarna, samt vissa moment av jordbruket var kollektiva händelser som var betydelsefulla för upprätthållandet av sociokulturella nätverk. De successiva begravningspraktikerna pekar också på att genetiska och mytologiska förfäder var viktiga bland dessa grupper. De rituella aspekter som kan förknippas med megalitgravarna var mindre betonade under senneolitikum-tidig bronsålder jämfört med tidig-mellanneolitikum.

Under den senare fasen vittnar den större variationen av Sr- och stabila isotopvärden, mtDNA-haplogrupper, de mer varierade megalitiska gravkonstruktionerna och de mindre reglerade kulturyttringarna, jämfört med tidig-mellanneolitikum, om ett mer heterogent samhälle som kan beskrivas som en smältdegel av grupper och influenser från olika platser.

Avhandlingen har visat den potential som finns i det tillgängliga materialet i våra museisamlingar och fördelarna med interdisciplinära studier. Genom att kombinera metoder, kunskaper och data från olika discipliner, har en mångfacetterad bild av neolitiska och tidiga bronsålderssamhällen presenterats. Dessutom har avhandlingen bidragit med möjliga öppningar för framtida forskning om dessa komplexa samhällen. Resultaten har bidragit med nya insikter till forskningen om megalitsamhällen, och om neolitiska och tidiga bronsålderssamhällen.

EN: Early Neolithic

MN: Middle Neolithic, **MNA**: Middle Neolithic A, **MNB**: Middle Neolithic B

LN: Late Neolithic

BA: Bronze Age, **EBA**: Early Bronze Age, **LBA**: Late Bronze Age

IA: Iron Age, **EIA**: Early Iron Age, **LIA**: Late Iron Age

TRB: Trichterbecher/ Funnelbeaker

PWC: Pitted Ware Culture

BAC: Battle Axe Culture

SGC: Single Grave Culture

BB: Bell beaker

GU: University of Gothenburg

LU: Lund University

UU: Uppsala University

VGM: Västergötlands museum

SHM: Statens Historiska Museum/ The Swedish History Museum- The National Historical Museums

FM: Falbygdens Museum

AM: Alingsås Museum

MNI: Minimum number of individuals

MLNI: Most likely number of individuals

CI: Crystalline index

DNA: deoxyribonucleic acid, **aDNA**: ancient DNA, **mtDNA:** mitochondrial DNA

BP: before present (1950), **BC**: before Christ, **AD**: after Christ, **cal**: calibrated

AMS: Accelerator Mass Spectrometry

FRUITS: Food Reconstruction Using Isotopic Transferred Signals

C: carbon, **N**: nitrogen, **O**: oxygen, **S**: sulphur, **Sr**: strontium

SNW: Sveconorwegian west, **SNE**: Sveconorwegian east, **TIB**: Transscandinavian granite-porphyry belt.

RAÄ: Riksantivarieämbetet/Swedish National Heritage Board

ATA: Antikvarisk-topografiska arkivet at RAÄ

KVHAA: Kungliga vitterhets- historie och antikvitets akademien/ Royal Swedish Academy of Letters, History, and Antiquities

BAR: British Archaeological Reports

Ahlberg M, Akselsson R, Forkman B, Rausing G (1976) Gold traces on wedgeshaped Artefacts from the Late Neolithic of southern Scandinavia analysed by proton induced X-ray emission spectroscopy. Archaeometry, 18(1): 39-49.

Ahlström T (2001) Det döda kollektivet. Bioantropologisk analys av skelettmaterialet från Rössbergagånggriften. In Persson P and Sjögren K-G (eds.) Falbygdens gånggrifter. Undersökningar 1985–1998, Gotarc series C, no. 34. University of Gothenburg, Gothenburg, pp 301–362.

— (2003) Caries or Pottery? – On the reduction in tooth size in the Neolithic Age. In Iregren E and Larsson L (eds.) A tooth for a tooth. Seminar for odontologists, osteologist and archaeologists, May 28th, 1998. University of Lund, Lund 2003, pp 47–65.

— (2009) Underjordiska dödsriken—humanosteologiska studier av neolitiska kollektivgravar. University of Gothenburg, Gothenburg.

Ahlström T and Price TD (2021) Mobile or stationary? An analysis of strontium and carbon isotopes from Västerbjers, Gotland, Sweden. Journal of Archaeological Science: Reports 36: 102902. https://doi.org/10.1016/j.jasrep.2021.102902

Ahola M, Kirkinen T, Vajanto K, Ruokolainen J (2018) On the scent of an animal skin: New evidence on Corded Ware mortuary practices in Northern Europe. Antiquity 92(361): 118-131. DOI: 10.15184/aqy.2017.188

Alfsdotter C (2014) Osteologisk rapport. Osteologisk analys av fornlämningen Torbjörntorp 30:1, Torbjörntorp, Västergötland. Unpublished report.

Algotsson Å (1996) En mellanneolitisk hällkista? Borttagning av hällkista, fornlämning 26, Falköping stad, Västergötland. SLM rapport 1996:10. Skara museum, Skara.

Allentoft ME, Sikora M, Sjögren K-G, Rasmussen S, Rasmussen M, Stenderup J, et al. (2015) Population genomics of Bronze Age Eurasia. Nature 522: 167–172. doi:10.1038/nature14507PMID: 26062507

Alt KW, Zesch S, Garrido-Pena R, Knipper C, Szécsényi-Nagy A, Roth C, et al. (2016) A Community in Life and Death: The Late Neolithic Megalithic Tomb at Alto de Reinoso (Burgos, Spain). PLoS ONE 11(1): e0146176. https://doi.org/10.1371/journal.pone.0146176

Ambrose SH (2000) Controlled diet and climate experiments on nitrogen isotope ratios of rats. In Ambrose SH and Katzenberg MA (eds.) Biochemical approaches to paleodietary analyses. Kluwer Academic/Plenum, New York, pp 243-259.

Ambrose SH and Norr L (1993) Experimental Evidence for the relationship of the Carbon Isotope Ratios of Whole Diet and Dietary protein to Those of Bone Collagen and Carbonate. In Lambert JG and Grupe G (eds.) Prehistoric Human Bone – Archaeology at the Molecular Level. Springer, Berlin/ New York, pp 1 – 38.

Anderbjörk JE (1932) Västergötlands megalitgravar. Västergötlands Fornminnesförenings Tidskrift IV(5–6): 5–38.

Andersen NH (1997) The Sarup Enclosures. The Funnel Beaker Culture of the Sarup site including two causewayed camps compared to the contemporary settlements in the area and other European enclosures. Jutland Archaeological Society Publications 33:1, Århus.

— (2011) Causewayed enclosures and megalithic monuments as media for shaping Neolithic identities. In Furholt M, Lüth F, Müller J (eds.) Megaliths and Identities. Early Monuments and Neolithic Societies from the Atlantic to the Baltic. Frühe Monumentalität und soziale Differenzierung 1. Dr. Rudolf Habelt GmbH, Bonn, pp 143-154.

Andersson J (2018) Boplatsspår i Ätrans dalgång neolitikum och järnålder i Ubbarp. Rapport 2018:39. Arkeologisk undersökning Västra Götalands län, Västergötland, Ulricehamns kommun och socken, Ubbarp 8:20, Ulricehamn 264 och 266. Arkeologerna, Statens historiska museer, Stockholm.

Andersson K and Hjärthner-Holdar E (1989) Annelund: ett senneolitiskt bebyggelsekomplex i sydvästra Uppland. Fornvännen 83: 209-215.

Andersson M (2017a) Truls Hoj En gånggrift med anslutande monument. Rapport 2017:110. Arkeologisk förundersökning och undersökning 2016. Skåne, Kävlinge kommun, Barsebäcks socken, Barsebäck 19:2–3, fornlämning Barsebäck 15:1 och 104:1. Arkeologerna, Statens historiska museer, Stockholm.

— (2017b) Truls Hoj – A Passage Grave and Related Monuments. Journal of Neolithic Archeaology 19: 23–114. doi 10.12766/jna.2017.2

Andersson M and Artursson M (2017) De tidigneolitiska lämningarna vid Östra Odarslöv. In Brink K and Larsson S (eds.) Östra Odarslöv 13:5, ESS-området. Forntid möter framtid. Skåne, Odarslöv socken, Lunds kommun, RAÄ nr 46, 49, 51, 52 i Odarslöv socken. Vol. 1 – Bakgrund, genomförande, tolkning och utvärdering, Lund. Arkeologerna rapport 2017:11, Sydsvensk Arkeologi rapport 2015:16, Kulturmiljö Halland rapport 2015:4, Museiarkeologi

Sydost rapport 2015:9. Arkeologisk undersökning 2013, Lund.
Andersson M, Artursson M, Brink K (2016) Early Neolithic landscape and society in South-West Scania–new results and perspectives. Journal of Neolithic Archaeology 18: 23–114. http://dx.doi.org/10.12766/jna.v18i0.1
Andersson M and Wallebom B (2013) Döserygg and Skegrie. Megalithic centres in south-west Scania, southern Sweden. In Fontin D, Louwen AJ, van der Vaart S, Wentink K (eds.) Beyond Barrows. Current Research on the Structuration and Perception of the Prehistoric Landscape through Monuments. Sidestone press, Leiden, pp 115–139.
Andersson S (1971) Rapport över undersökning av hällkistan vid Svensby. FYND rapporter 1971, Göteborgs stads museum, Gothenburg.
Antonsson K and Seppä H (2007) Holocene temperatures in Bohuslän, southwest Sweden: a quantitative reconstruction from fossil pollen data. Boreas, 36: 400-410.
Anthony DW (1990) The baby in the bathwater. American Anthropologist, New series, 92(4): 895-914.
Apel J (2001) Daggers, knowledge & power. Dissertation, Acta Universitatis Upsaliensis. Coast to coast books no. 3. Department of Archaeology and Ancient History, Uppsala University, Uppsala.
Aranda Jiménez G, Díaz-Zorita Bonilla M, Hamilton D, Milesi L, and Sánchez Romero M (2020) A radiocarbon dating approach to the deposition and removal of human bone remains in megalithic monuments. Radiocarbon, 62(5): 1147-1162. DOI: 10.1017/RDC.2020.67
Arcini C (2009) Buried face down. Current Archaeology, 231: 30-35.
Arcini C and Svanberg F (2005) Den yngre bronsålderns brandgravsmiljöer. In Lagerås P and Strömberg B (eds.) Bronsåldersbygd. 2300-500 f.Kr. Skånska spår. Riksantikvarieämbetet, Lund, pp 284-362.
Arcini C, Price TD, Cinthio M, Drenzel L, Andersson M, Persson B, et al. (2016) Living conditions in times of plague. In Lagerås P (ed.) Environment, Society and the Black Death: An interdisciplinary approach to the late-medieval crisis in Sweden. Oxbow books, Oxford, pp 104-141.
Århem K (1988) Into the Realm of the Sacred: an Interpretation of Khasi Funerary Ritual. In Cederroth S, Corlin C, Lindström J (eds.) On the Meaning of Death. Essays on Mortuary Rituals and Eschatological Beliefs, Uppsala Studies in Cultural Anthropology 8. Almqvist & Wiksell International, pp 257-299.
Artelius T (2000) Bortglömda föreställningar: begravningsritual och begravningsplats i halländsk yngre järnålder. Dissertation, Department of Archaeology, University of Gothenburg, Gothenburg.
Artursson M (2009) Bebyggelse och samhällsstruktur. Södra och mellersta Skandinavien under senneolitikum och bronsålder 2300–500 f. Kr. Gotarc series B, no. 52. Dissertation, Department of Archaeology, University of Gothenburg, Gothenburg. Riksantikvarieämbetet, Arkeologiska undersökningar. Skrifter no. 73, Stockholm.
Artursson M, Earle, TK, Brown J (2016) The construction of monumental landscapes in low-density societies: New evidence from the Early Neolithic of Southern Scandinavia (4000–3300 BC) in comparative perspective. Journal of Anthropological Archaeology 41: 1–18
Arwill-Nordbladh E (2013) Golden Nodes. Linking Memory to Time. In Bergerbrant S and Sabatini S (eds.) Counterpoint. Essays in Archaeology and Heritage Studies in Honour of Professor Kristian Kristiansen. BAR International Series 2508, Oxford, pp 411-420.
Ascher R (1961) "Analogy in Archaeological Interpretation". Southwestern Journal of Anthropology, 17(4): 317–325. doi:10.1086/soutjanth.17.4.3628943.
Axelsson T (2010) Landskap – Visuella & rumsliga relationer i Falbygdens neolitikum. Dissertation, Coast to coast books no. 19. Department of archaeology, Gothenburg University, Gothenburg.
— (2013) Local Logic, Passage Graves and the Neolithic Landscape of Falbygden. In Bergerbrant S, Sabatini S (eds.) Counterpoint: Essays in Archaeology and Heritage Studies in Honour of Professor Kristian Kristiansen. Archaeopress, Oxford, pp 295-299.
Axelsson T, Ramstad M, Strinnholm A (2015) Amber. In Fowler C, Harding J, Hofmann D (eds.) The oxford handbook of Neolithic Europe. Oxford University Press, Oxford, pp 651-571.
Axelström K and Persson P (1998) Pollenanalys av en lagerföljd från Hulesjön utanför Falköping. Gotarc series D. Archaeological reports no. 44. University of Gothenburg, Gothenburg.

Bagge A and Kaelas L (1950-1952) Die Funde aus Dolmen und Ganggräbern in Schonen, Schweden 1–2. Kungliga vitterhets- historie och antikvitets akademiens, Stockholm.
Bailey G (2007) Time perspectives, palimpsests and the archaeology of time. Journal of Anthropological Archaeology 26: 198–223.
Bayliss A (2009) Rolling out Revolution: using Radiocarbon dating in Archeology. Radiocarbon, 51(1): 123-147.

Bayliss A and Bronk Ramsey C (2004) Pragmatic Bayesians: a decade integrating radiocarbon dates into chronological models. In Buck CE, Millard AR (eds.) Tools for Constructing Chronologies: Tools for Crossing Disciplinary Boundaries. Springer, London, pp 25–41.

Barrett JH, Orton D, Johnstone C, Harland J, Van Neer W, Ervynck A, Roberts C, Locker A, Amundsen C, Enghoff IB, Hamilton-Dyer S, Heinrich D, Hufthammer AK, Jones KG, Jonsson L, Makowiecki D, Pope P, O'Connell TC, de Roo T, Richards M (2011) Interpreting the expansion of sea fishing in medieval Europe using stable isotope analysis of archaeological cod bones. Journal Archaeological Science 38(7): 1516–1524

Bentley RA (2006) Strontium isotopes from the earth to the archaeological skeleton: A review. Journal of Archaeological Method and theory, 13: 135–187.

Becker CJ (1951) Den grubekeramiske kultur. Aarbøger for Nordisk Oldkyndighed og Historie 1951: 153–274.

— (1964) Sen-neolitikum i Norden: Aktuelle problemer. TOR, 10: 121-134.

Bennike P (1985) Palaeopathology of Danish skeletons: a comparative study of demography, disease and injury. Akademisk Forlag, Copenhagen.

— (2003) Ancient Trepanations and Differential Diagnosis: A Re-Evaluation of Skeletal Remains from Denmark. In Arnott R, Finger S, Smith CUM (eds.) Trepanation. History- Discovery- Theory. Swets & Zeitlinger Publishers, Lisse, pp 95-116.

Bergerbrant S (2007) Bronze Age Identities: Costume, Conflict and Contact in Northern Europe 1600–1300 BC. Dissertation, Department of Archaeology and Classical studies, Stockholm University, Stockholm. Bricoleur Press, Lindome.

— (2019) Transcultural fostering in the Bronze Age? In Ljung C, Andreasson Sjögren A, Berg I, Engström E, Hållans Stenholm A-M, Jonsson K, Klevnäs A, Qviström L, Zachrisson T (eds.) Tidens landskap. En vänbok till Anders Andrén. Nordic Academic Press, Lund, pp 62-65.

Bergerbrant S, Kristiansen K, Allentoft ME, Frei KM, Price TD, Sjögren K-G, et al. (2017) Identifying commoners in the Early Bronze Age: burials outside barrows. In Bergerbrant S, Wessman A (eds.) New Perspectives on the Bronze Age: Proceedings from the 13th Nordic Bronze Age Symposium held in Gothenburg 9th June 2015. Archaeopress, Oxford, pp 37–64.

Berglund BE (2003) Human impact and climate changes-synchronous events and a causal link? Quaternary International, 105: 7-12.

Bergström E (1980) Produktion och samhällsförändring. Bronsålder och äldre järnålder. Ett västsvenskt exempel. Dissertation, Department of Archaeology, University of Gothenburg, Gothenburg.

Bhabha H (1994) The Location of Culture. Routledge, London.

Binford LR (1967) Smudge pits and hide smoking: The use of analogy in archaeological reasoning. Am. Antiquity 32: 1-12.

— (1971) Mortuary practices. Their study and potential. Mémoirs of the society of American Archaeology, Approaches to the social dimensions of mortuary practice, 25: 6-29.

— (1972) An Archaeological Perspective. Seminar Press, New York.

Björck S, Bennike O, Possnert G, Wohlfarth B, Digerfeldt G (1998) A high-resolution 14C dated sediment sequence from southwest Sweden: age comparisons between different components of the sediment. Journal of Quaternary Science, 13: 85–89.

Björck S and Wohlfarth B (2001) 14C chronostratigraphic techniques in paleolimnology. In Last WM and Smol JP (eds.) Tracking Environmental Change Using Lake Sediments, Vol 1. Kluwer Academic Publishers, Dordrecht, pp 205-245.

Blank M (2016) Prehistoric Activities in Megalithic Graves in Falbygden, Sweden. Lund Archaeological Review 21: 49-70.

— (2017) Bronze Age burials in megalithic graves in Falbygden. In Bergenbrant S and Wessman A (eds.) New perspectives on the Bronze Age: Proceedings from the 13th Nordic Bronze Age Symposium held in Gothenburg 9th June 2015. Archaeopress, Oxford, pp 19–36.

— (2019) Tracing dietary change of the megalithic population in Southwestern Sweden. In Müller J, Hinz M, Wunderlich M (eds.) Megaliths- Societies- Landsacapes. Early monumentality and social differentiations in Northern Europe, Vol. 3. Proceedings of the international the conference "Megaliths, Societies, Landscape, Early Monumentality and Social Differentiation in Neolithic Europe", 16th-20th June 2015 in Kiel. Verlag Dr. Rudolf Habelt GmbH, Bonn, pp 691-704.

Blank M, Brorsson T, Bakunic Fridén I (2020) Provenancing Neolithic pottery. An investigation of the elemental composition of Pitted Ware and Funnel Beaker pottery from Djursland and adjacent regions. In Klassen L (ed.) The Pitted Ware Culture on Djursland: Supra-regional significance and contacts in the Middle Neolithic of southern Scandinavia East Jutland Museum Publications 5. Århus University Press, Århus, pp 385-407.

Blank M and Knipper C (2021) Neolithic mobility in western Sweden: interpretations of strontium isotope ratios of the megalithic population in Falbygden. In Gibson C, Frieman C, Cleary K (eds.) Making Journeys. Archaeologies of Mobility. Oxbow books, Oxford, pp 135-151.

Bloch M (1982) Death, Women and Power. In Bloch M and Parry J (eds.) Death & the Regeneration of Life. Cambridge University Press, Cambridge.

— (1988) Death and the Concept of Person. In Cederroth S, Corlin C, Lindström J (eds.) On the Meaning of Death. Almqvist & Wiksell International, Stockholm, pp 11-29.

— (1994) Placing the Dead. Tombs, Ancestral Villages, and Kinship Organization in Madagascar. Prospect Heights, Waveland press, Illinois.

Blomqvist/Bägerfeldt L (1987) Undersökningsrapport. Västergötland, Gökhem sn, Landbogården 11:1, Raä 17. Undersökningen av en gånggrift 1987. Stockholm University, Stockholm.

— (1989a) Megalitgravarna i Sverige. Typ, tid, rum och social miljö. Dissertation, Department of Archaeology and Classical studies, Stockholm University, Stockholm.

— (1989b) Neolitikum: typindelningar, tid, rum och social miljö: en studie med inriktning på västra Götaland. Norders Bokhandel, Falköping.

— (1990) Neolitisk Atlas över västra Götaland. Norders Bokhandel, Falköping.

— (2009) Falbygdens forntid. Norders Bokhandel, Falköping.

Bocherens H and Drucker DG (2003) Trophic level isotopic enrichment of carbon and nitrogen in bone collagen: case studies from recent and ancient terrestrial ecosystems. International Journal of Osteoarchaeology, 13: 46–53.

Boethius A (2018) Fishing for ways to thrive. Integrating zooarchaeology to understand subsistence strategies and their implications among Early and Middle Mesolithic southern Scandinavian foragers. Dissertation, Department of archaeology and ancient history, Lund University. Acta Archaeologica Lundensia, series altera in vol. 8, no 70, Lund.

Bogaard A (2012) Middening and manuring in Neolithic Europe: issues of plausibility, intensity and archaeological method. In Jones R (ed.) Manure Matters: Historical, Archaeological and Ethnographic Perspectives. Ashgate, Farnham, pp 25–39.

Bonafini M, Pellegrini M, Ditchfield P, Pollard AM (2013) Investigation of the 'canopy effect' in the isotope ecology of temperate woodlands. Journal of Archaeological Science 40: 3926-3935.

Booth TJ and Brück J (2020) Death is not the end: radiocarbon and histo-taphonomic evidence for the curation and excarnation of human remains in Bronze Age Britain. Antiquity 94(377): 1186-1203.

Bowman S (1995) [1990]. Radiocarbon Dating. British Museum Press, London.

Bradley R (1996) Excavations at Clava. Current Archaeology, 13(4): 136-141.

— (1998) The Significance of Monuments. On the Shaping of Human Experiences in Neolithic and Bronze Age Europe. Routledge, London and New York.

— (2002) The Past in Prehistoric Societies. Routledge, London.

Bramanti B (2013) The use of DNA analysis in the archaeology of death and burial. In Tarlow S and Nilsson Stutz L (eds.) The Oxford Handbook of The Archaeology of Death and Burial. Oxford University Press, Oxford, pp 99-122.

Brandt LØ, Haase K, Collins MJ (2018) Species identification using ZooMS, with reference to the exploitation of animal resources in the medieval town of Odense. Danish Journal of Archaeology, 7(2): 139-153. DOI: 10.1080/21662282.2018.1468154

Bremmer JN (1976) Avunculate and Fosterage. Journal of Indo-European Studies, 4: 65-78.

Brink K (2013) Houses and Hierarchies: Economic and Social Relations in the Late Neolithic and Early bronze Age of Southernmost Scandinavia. European Journal of Archaeology 16(3): 433-458. DOI: https://doi.org/10.1179/1461957113Y.0000000033

Brink K and Larsson S (2017) Östra Odarslöv 13:5, ESS-området Forntid möter framtid – volym 3 Arkeologerna rapport 2017:11 Sydsvensk Arkeologi rapport 2015:16 Kulturmiljö Halland rapport 2015:4 Museiarkeologi Sydost rapport 2015:9 Arkeologisk undersökning 2013 Skåne, Odarslövs socken, Lunds kommun, fornlämning Odarslöv 46, 49, 51, och 52 Dnr 5.1.1-230-2015 Volym 3 – Analyser och bilagor. Statens historiska museer, Stockholm.

Bronk Ramsey C (2009) Bayesian Analysis of Radiocarbon Dates. Radiocarbon, 51: 337-360.

— (2017) Methods for Summarizing Radiocarbon Datasets. Radiocarbon, 59(2): 1809-1833.

Browall H (2011) Alvastra pålbyggnad. 1909–1930 års undersökningar. KVHAA Handlingar, Antikvariska serien 48. Kungliga vitterhets- historie och antikvitets akademien, Stockholm.

Brozio JP (2016) Megalithanlagen und Siedlungsmuster im trichterbecher zeitlichen Ostholstein. Frühe Monumentalität und soziale Differenzierung, Band 9. Verlag Dr. Rudolf Habelt GmbH, Bonn.

Bruzelius M (1822) Nordiska Fornlemningar från Skåne. Iduna IX: 285–333.

Buck C, Litton CD, Smith AFM (1992) Calibration of radiocarbon results pertaining to related archaeological events. Journal of Archaeological Science 19: 497-512.

Buck C, Kenworthy LC, Litton CD, Smith AFM (1991) Combining archaeological and radiocarbon information: a Bayesian approach to calibration. Antiquity 65: 808-821.

Burenhult G (1973) En långdös vid Hindby mosse, Malmö. Mamöfynd 2. Malmö museum, Malmö.

— (1986) Speglingar av det förflutna. Bra bok, Höganäs.

— (1991) Arkeologi I Sverige 2. Bönder och bronsgjutare. Wiken, Höganäs.

Burmeister S (2000) Archaeology and Migration. Approaches to an Archaeological Proof of Migration. Current Anthropology, 41(4): 539- 567.

Butruille C, Krossa VR, Schwab C, Weinelt M (2017) Reconstruction of mid-to late-Holocene winter temperatures in the Skagerrak region using benthic foraminiferal Mg/Ca and δ18O. Holocene 27: 63-72.

Carlie A, Arcini C, Druid H, Risberg J (2014) Archaeology, forensics and the death of a child in Late Neolithic Sweden. Antiquity 88: 1148–1163

Cassel K (2000) Where are we going?: attitudes towards migrations in archaeological thought. Current Swedish Archaeology, 8: 33-49.

Cassidy LM, Maoldúin RO, Kador T, Lynch A, Jones C, Woodman PC, Murphy E, Ramsey G, Dowd M, Noonan A, Campbell C, Jones ER, Mattiangeli V, Bradley DG (2020) A dynastic elite in monumental Neolithic society. Nature 582: 384-388. https://doi.org/10.1038/s41586-020-2378-6

Chambon P (2003) Les morts dans les sépultures collectives néolithiques en France. Du cadavre aux restes ultimes. CNRS, Paris.

Chapman J (2000) Fragmentation in archaeology: people, places, and broken objects in the prehistory of south-eastern Europe. Routledge, London.

— (1981) The emergence of formal disposal areas and the 'problem' of megalithic tombs in Europe. In Chapman R, Kinnes I, Randsborg K (eds.) The Archaeology of death. Cambridge University Press, Cambridge, pp 71-82.

— (1987) Mortuary practices: society, theory building and archaeology. In Boddington, Garland and Janaway (eds.) Death, decay and reconstruction: approaches to archaeology and forensic science. Manchester University Press, Manchester, pp 198-213.

Childe VG (1925) The Dawn of European Civilisation. Kegan Paul, London and Edinburgh.

— (1950) Prehistoric Migrations in Europe. Aschehaug, Oslo.

Choi BC and Pak AW (2006) Multidisciplinarity, interdisciplinarity and transdisciplinarity in health research, services, education and policy: 1. Definitions, objectives, and evidence of effectiveness. Clinical Invest Medica, 29(6): 351-364.

Clark G (1977) The Economic Context of Dolmens and Passage graves in Sweden. In Marcotic (ed.) Ancient Europe and the Mediterranean. Aris & Phillips, Warminster, pp 35–47.

Cnattingius B (1927) Bårstads Vågagård, Rogslösa, Östergötland. Dnr: 3794/27, ATA, Stockholm. Unpublished excavation report.

Conklin B (1995) Thus Are Our Bodies Thus was Our Custom: Mortuary Cannibalism in an Amazonian Society. American Ethnologist 22(1): 75-101.

Crawford HEW (1982) Analogies, anomalies and research strategy. Paléorient, 8(1): 5-9. doi : https://doi.org/10.3406/paleo.1982.4306

Crawford S (1999) Fosterage, God-parents and Adoption. In Crawford (ed.) Childhood in Anglo-Saxon England. Sutton Publishing, Stroud, pp 122-38.

Cullberg C (1963) Megalitgraven i Rössberga. Riksantikvarieämbetet, Stockholm.

Cummings V and Richards C (2015) A monumental task: building the dolmens of Britain and Ireland. In Laporte L and Scarre C (eds.) The megalithic architecture of Europe. Oxbow, Oxford, pp 49-58.

Currie A (2016) Ethnographic analogy, the comparative method, and archaeological special pleading. Stud Hist Philos Sci., 55:84-94. doi: 10.1016/j.shpsa.2015.08.010. Epub 2015 Sep 3.

Daniel G (1960) The prehistoric Chamber Tombs of France: a geographical, morphological and chronological survey. Thames and Hudson, London.

Darvill T, Marshall P, Parker Pearson M, Wainwright G (2012) Stonehenge remodeled. Antiquity 86(334): 1021-1040.

Dehn T and Hansen IS (2006) Birch bark in Danish passage graves. Journal of Danish Archaeology, 14(1): 23-44.

DeNiro MJ and Epstein S (1981) Influence of diet on the distribution of nitrogen isotopes in animals. Geochim Cosmochim Act., 45: 341-351.

Djurfeldt M (1967) Rapport över undersökning av boplatsområdet söknummer 32, Stora Önnered, Göteborgs stad. Unpublished report in Göteborgs

stadsmuseums archives (no. 32: Västra Frölunda 337).
Douglas M (1966) Purity and Danger. An analysis of the concepts of pollution and taboo. Routledge, New York.
Dournes J (1975) Le mort c'est l'autre, la geste comparée des vivants et des défunts Jörai. Objets et mondes: La revue du Musée de l'homme 15(4): 351–384.
— (1977) Pötao. Une théorie du pouvoir chez les indochinois Jörai. Flammarion, Paris.

Ebbesen K (1985) Nordjyske gravkister med indgang. Bøstrup-kisterne. Aarbøger for Nordisk Oldkyndighed og Historie, 1983: 5-56.
— (1995) Spätneolithishische Schmuckmode. Acta Archaeologica, 66: 215-279.
— (2007) Danske hellekister fra stenalderen. Aarbøger for Nordisk Oldkyndighed og Historie, 2004: 7–62.
— (2011) Danmarks megalitgrave. Bind 1,1. Attika, Copenhagen.
Edenmo R (2008) Prestigeekonomi under yngre stenåldern: gåvoutbyten och regionala identiteter i den svenska båtyxekulturen. Dissertation, Occasional papers in archaeology OPIA 43, Department of Archaeology and Classical studies, University of Uppsala, Uppsala.
Egfjord AF-H, Margaryan A, Fischer A, Sjögren K-G, Price TD, Johannsen NN, et al. (2021) Genomic Steppe ancestry in skeletons from the Neolithic Single Grave Culture in Denmark. PLoS ONE 16(1): e0244872. https://doi.org/10.1371/journal.pone.0244872
Enevold R (2019) Åsle Mosse (FHM 4296/2669). A quantitative study of a Holocene vegetation record – pollen analysis of a 6.5-meter peat core from Åsle Mosse, south-central Sweden and an estimation of vegetation land cover changes during almost 10.000 years using REVEALS modelling. Report no. 49, Afdelning for Konservering og Naturvidenskab, Moesgaard Museum, Aarhus.
Eriksen TH (2000) Små platser – stora frågor, en introduktion till socialantropologi. Nya Doxa, Nora.
Eriksen P and Andersen NH (2014) Stendysser- Arkitektur og funktion. Ringkøbing-Skjern Museum, Moesgard Museum. Jysk Arkæologisk Selskabs Skrifter 85, Aarhus.
Eriksson G, Frei KM, Howcroft R, Gummesson S, Molin F, Lidén K, Frei R, Hallgren F (2018) Diet and mobility among Mesolithic hunter-gatherers in Motala (Sweden) – The isotope perspective. Journal of Archaeological Science: Reports, 17: 904-918. http://dx.doi.org/10.1016/j.jasrep.2016.05.052
Eriksson G, Linderholm A, Fornander E, Kanstrup M, Schoultz P, Olofsson H, Lidén K (2008) Same island, different diet: Cultural evolution of food practice on Öland, Sweden, from the Mesolithic to the Roman Period. Journal of Anthropological Archaeology 27: 520-543.
Evans J, Parker Pearson M, Madgwick R, Sloane H, Albarella U (2019) Strontium and oxygen isotope evidence for the origin and movement of cattle at Late Neolithic Durrington Walls, UK. Archaeological and Anthropological Sciences 11: 5181–5197. https://doi.org/10.1007/s12520-019-00849-w

Fabech C (1988) Storstenskisten fra Blaere. KUML 1986: 45-75.
Fagerlund D and Hamilton J (1995) Annelund- en hällkista och bebyggelse från senneolitikum och bronsålder. RAÄ 17 och 84, Stenvreten 8:22 och 8:3, Enköpings stad, Uppland. UV-Uppsala rapport 1995:13. Riksantikvarieämbetet, Stockholm.
Fahlander F (2003) The materiality of serial practice. A microarchaeology of burial. Gotarc series B, no. 23. Dissertation, department of archaeology, University of Gothenburg, Gothenburg.
— (2004) Archaeology and anthropology – brothers in arms? On analogies in 21st-century archaeology. In Fahlander F and Oestigaard T (eds.) Material Culture and Other Things. University of Gothenburg, Gothenburg, pp 185–211.
— (2009) Livet efter döden. Hanteringen av döda. In Back Danielsson I-M, Gustin I, Larsson A, Myrberg N, Thedéen S (eds.) Döda personers sällskap – gravmaterialens identiteter och kulturella uttryck. Stockholm University, Stockholm, pp 35-55.
Fahlander F and Oestigaard, T (2008) The materiality of death: Bodies, burials, beliefs. In Fahlander F and Oestigaard T (eds.) The Materiality of Death: Bodies, Burials, Beliefs. Archaeopress, Oxford, pp 1-19.
Faure G (1986) Principles of isotope geology (2nd ed.). Wiley, New York.
Feeser I, Dörfler W, Kneisel J, Hinz M, Dreibrodts S (2019) Human impact and population dynamics in Neolithic and Bronze Age: Multi-proxy evidence from north-western Central Europe. The Holocene, 29: 1596-1606.
Fernandes R, Grootes P, Nadeau M-J, Nehlich O (2015) Quantitative Reconstruction of a Neolithic Population using a Bayesian Mixing Model (FRUITS): The Case Study of Ostorf (Germany). American

Journal of Physical Anthropology, 158: 325–340. doi: 10.1002/ajpa.22788.

Fernandes R, Millard AM, Brabec M, Nadeau M-J, Grootes P (2014) Food Reconstruction Using Isotopic Transferred Signals (FRUITS): A Bayesian Model for Diet Reconstruction. PLoS ONE 9(2): e87436.

Feville C and Bennike P (2002) Lustrupholm – Et brandgravfelt fra ældre bronzealder under flad mark. KUML, Årbog for Jysk Arkæologisk Selskab. Aarhus Universitetsforlag, Aarhus, pp 109-141.

Fibiger L, Ahlström T, Bennike P, Schulting R (2013) Patterns of Violence-Related Skull Trauma in Neolithic Southern Scandinavia. American Journal of Physical Anthropology 150(2): 190-202.

Fischer A, Olsen J, Richards M, Bennike P (2007) Coast-inland mobility and diet in the Danish Mesolithic and Neolithic: Evidence from stable isotope values of humans and dogs. Journal of Archaeological Science 34(12): 2125-2150

Fleming A (1973) Tombs for the living. Man 8: 177–193.

Fornander E (2011) Consuming and communicating identities. Dietary diversity and interaction in Middle Neolithic Sweden. Dissertation, Department of Archaeology and Classical Studies, Stockholm University, Stockholm.

Forsman C (2007) Eld, död och ritual vid Sommaränge Skog. En essä om senneolitiskt kremeringsskick. In Notelid M (ed.) Att nå den andra sidan. Om begravningar och ritual i Uppland. Arkeologi E4 Uppland – studier, Vol. 2. Societas Archaeologica Upsaliensis, Uppsala, pp389-419.

Forssander JE (1936) Der Ostskandinavische Norden Während der Ältesten Metallzeit Europas. Acta Regiae Societatis humaniorum litterarum Lundensis, Lund.

Fotakis AK, Rakownikow R, Christensen J, Blank M, Tornberg A, Mackie M, Götherström A, Storå J, Olsen JV, Sjögren K-G, Cappellini E (In preparation) Unravelling the dairying habits of Neolithic Swedes using shotgun proteomics.

Fowler C (2010) Pattern and diversity in the Early Neolithic mortuary practices of Britain and Ireland: contextualising the treatment of the dead. Documenta Praehistorica XXXVII. DOI: 10.4312/dp.37.1

Fraser M (2018) People of the Dolmens and Stone cists. An archaeogenetic investigation of megalithic graves from the Neolithic period on Gotland. Dissertation, Department of Archaeology and Ancient History, Uppsala University, Uppsala.

Fraser M, Sjödin P, Sánchez-Quinto F, Evans J, Svedjemo G, Knutsson K, Götherström A, Jakobsson M, Wallin P, Storå J (2018) The Stone Cist Conundrum. A multidisciplinary approach to investigate Late Neolithic/Early Bronze Age population demography on the Island of Gotland. Journal of Archeological Science: Reports, 20: 324-337.

Fraser RA, Bogaard A, Heaton T, Charles M, Jones G, Christensen BT, Halsteead P, Merbach, I, Poulton PR, Sparkes D, Styring AK (2011) Manuring and stable nitrogen isotope ratios in cereals and pulses: towards a new archaeobotanical approach to the inference of land use and dietary practices. In Journal of Archaeological Science 38(10): 2790- 2804.

Frei K M, Bergerbrant S, Sjögren K-G, Jørkov M L, Lynnerup N, Harvig L, Allentoft M E, Sikora M, Price T D, Frei R, Kristiansen K (2019) Mapping human mobility during the third and second millennia BC in present-day Denmark. PLoS ONE 14(8): e0219850. https://doi.org/10.1371/journal.pone.0219850

Frei KM and Frei R (2011) The geographic distribution of strontium isotopes in Danish surface waters—A base for provenance studies in archaeology, hydrology and agriculture. Applied Geochemistry 26: 326–340.

Frei KM, Mannering U, Kristiansen K, Allentoft ME, Wilson AS, Skals I, Tridico S, Nosch ML, Willerslev E, Clarke L, Frei R (2015) Tracing the life story of a Bronze Age girl with high societal status. Nature Scientific Report 5: 10431.

Frei KM and Price TD (2012) Strontium isotopes and human mobility in prehistoric Denmark. Journal of Anthropological and Archaeological Sciences 4: 103–114.

Fries M (1958) Vegetationsutveckling och odlingshistoria i Varnhemstrakten. Acta Phytogeographica Suecica Nr 39. Almqvist & Wiksells AB, Uppsala.

Fuller BT, Richards MP, Mays SA (2003) Stable carbon and nitrogen isotope variation in tooth dentine serial sections from Wharram Percy. Journal of Archaeological Science 30: 1673-1684.

Fürst CM (1924) Tvenne nya fall av trepanation i vårt land, ett från stenåldern och ett från bronsåldern. Fornvännen 19: 81-89.

Furholt M (2019) Re-integrating Archaeology: A Contribution to aDNA Studies and the Migration Discourse on the 3rd Millennium BC in Europe. Proceedings of the Prehistoric Society 85: 115–129. doi:10.1017/ppr.2019.4

Furholt M and Müller J (2011) The earliest monuments in Europe - architecture and social structures (5000-3000 cal BC). In Furholt M, Lüth F, Müller J (eds.), Megaliths and Identities. Early Monuments and Neolithic Societies from the Atlantic to the Baltic. Frühe Monumentalität und soziale Differenzierung 1. Dr. Rudolf Habelt GmbH, Bonn, pp 15-32.

Fyllingen H (2003) Society and Violence in the Early Bronze Age: An Analysis of Human Skeletons from Nord-Trøndelag, Norway. Norweigan Archaeological Review 36(1): 27-43.

Gansum T (2002) Fra jord til handling. In Jennbert K, Andrén A, Raudvere C (eds.) Plats och praxis: studier av nordisk förkristen ritual. Nordic Academic Press, Lund, pp 249-286.

Gejvall NG (1963) Skelettmaterialet från Dragby hällkista. TOR, IX: 85-122.

Gellner E (1995) Anthropology and Politics. Revolutions in the Sacred Grove. Blackwell, Oxford.

Giddens A (1987) Structuralism, Post-structuralism and the Production of Culture. In Giddens A and Turner J (eds.) Social Theory Today. Polity Press, Cambridge, pp 195–223.

Godwin H (1962) Half-life of Radiocarbon. Nature, 195(4845): 984. doi:10.1038/195984a0.

Goldberg A, Günther T, Rosenberg NA, Jakobsson M (2017) Ancient X chromosomes reveal contrasting sex bias in Neolithic and Bronze Age Eurasian migrations. Proceedings of the National Academy of Sciences, 114 (10): 2657-2662. doi:10.1073/pnas.1616392114

Gosden C and Lock G (1998) Prehistoric Histories. World Archaeology 30(1): 2-12.

Göransson H (1995) Alvastra Pile Dwelling – Palaeoethnobotanical Studies. Theses and Papers in Archaeology N.S. A 6. Lund University press, Lund.

Greene K (2000) Archaeology. An introduction (3rd edition). Routledge, London.

Gron KJ, Gröcke DR, Larsson M, Sørensen L, Larsson L, Rowley-Conwy P, Church MJ (2017) Nitrogen isotope evidence for manuring of early Neolithic Funnel Beaker Culture cereals from Stensborg, Sweden. Journal of Archaeological Science: Reports, 14: 575–579.

Gron KJ, Larsson M, Gröcke DR, Andersen NH, Andreasen MH, Bech J-H, Steen Henriksen P, Hilton RG, Dengsø Jesse M, Møller NA, Nielsen FO, Nielsen PO, Pihl A, Sørensen L, Westphal J, Rowley-Conwy P, Church MJ (2021) Archaeological cereals as an isotope record of long-term soil health and anthropogenic amendment in southern Scandinavia Quaternary Science Reviews, 253: 106762. https://doi.org/10.1016/j.quascirev.2020.106762

Gron KJ, Montgomery J, Nielsen PO, Nowell GM, Peterkin JL, Sørensen L et al. (2016) Strontium isotope evidence of early Funnel Beaker Culture movement of cattle. Journal of Archaeological Science: Reports, 6: 248–251.

Gron KJ, Montgomery J, Rowley-Conwy P (2015) Cattle management for dairying in Scandinavia's earliest Neolithic. PLoS ONE, 10(7): e0131267. https://doi.org/10.1371/journal.pone.0131267 PMID: 26146989

Guillot H and Le Goff I (1995) Les usages du feu. In Masset C and Soulier P (eds.) Allées couvertes et autres monuments funéraires du Néolithique dans la France du nord-ouest. Allées sans retour. Musée archéologique départemental du Val-d'Oise, Editions Errance, Paris, pp 112-115.

Haak W, Lazaridis I, Patterson P, Rohland N, Mallick S, Llamas B, et al. (2015) Massive migration from the steppe was a source for Indo-European languages in Europe. Nature, 522: 207–211. doi: 10.1038/nature14317 PMID: 25731166

Hallgren F (1996) Etnisk dualism under mellanneolitikum. In Bratt P (ed.) Stenålder i Stockholms län. Två seminarier vid Stockholms läns museum. Stockholms läns museum, Stockholm, pp 87-100.

— (2008) Identitet i praktik: lokala, regionala och överregionala sociala sammanhang inom nordlig trattbägarkultur. Dissertation, Department of Archaeology and Ancient History, Uppsala University, Uppsala.

Hammarlund D, Björck S, Buchardt B, Israelson C, Thomsen, CT (2003) Rapid hydrological changes during the Holocene revealed by stable isotope records of lacustrine carbonates from Lake Igelsjön, southern Sweden. Quaternary Science Reviews 22: 353–370

Harding AF (2000) European Societies in the Bronze Age. Cambridge World Archaeology. Cambridge University Press, Cambridge.

Haugene H (1997) Kambrisk flinta och gropkeramisk kultur. Några synpunkter utifrån fynden vid sjön Östen i Västergötland. Seminar paper autumn 1997, department of archaeology, University of Gothenburg.

Hayter H (1994) Hunter-gatherers and the Ethnographic Analogy: Theoretical Perspectives. Totem: The University of Western Ontario Journal of Anthropology, 1(1):8.

Helleve Å (2010) Meiselforma og spadeforma skifferheng i Norge. Masteroppgåve I arkeologi, spring 2010, Archaeological department, University of Bergen (unpublished Master thesis).

Hedenstierna-Jonson C, Kjellström A, Zachrisson T, Krzewińska M, Sobrado V, Price N, Günther T, Jakobsson M, Götherström A (2017) A female Viking warrior confirmed by genomics. American

Journal of Physical Anthropology, 164 (4): 853–860. doi:10.1002/ajpa.23308.

Hedges REM, Housley RA, Bronk CR, Van Klink GJ (1992) Radiocarbon dates from the oxford AMS system: Archaeometry Datelist 14. Archaeometry 34(1): 141- 159.

Hedges REM and Reynard L M (2007) Nitrogen isotopes and the trophic level of humans in archaeology. Journal of Archaeological Science, 34: 1240-51.

Hedges REM and Van Klinken GJ (2002) "Consider a Spherical Cow□"—on Modeling and Diet. In Ambrose SH and Katzenberg MA (eds.) Biogeochemical approaches to paleodietary analysis, Springer, pp 211-41.

Hellgren M (2007) Arkeologisk efterundersökning Längs del av Nossan i Södra Härene socken, Vårgårda kommun, Västergötland. Rapport 2007:35, Lödöse museum, Lödöse.

Hertz R (1960/1907) Death and the Right Hand. Cohen & West, London.

Hinders J (2011) Dödsrikets livshistorier. Benkemiska isotopanalyser på artikulerade och disartikulerade individer I Frälsegårdens gånggrift. University of Stockholm (unpublished Master thesis).

Hildebrand BE (1864) Berättelser om antiqvariska undersökningar i Vestergötland år 1863. Antiqvarisk tidskrift för Sverige I: 255-283.

Hillson S (1992) Mammal bones and teeth, institute of archaeology. Taylor & Francis Ltd, London.

Hingley R (1996) Ancestors and Identity in the Later Prehistory of Atlantic Scotland. The Reuse and Reinvention of Neolithic Monuments and Material culture. World Archaeology, 28(2): 231-243.

Hinz M, Feeser E, Sjögren K-G, Müller J (2012) Demography and the intensity of cultural activities: an evaluation of Funnel Beaker Societies (4200-2800 cal BC). Journal of Archaeological Science, 39: 3331-3340.

Hjelmqvist H (1955) Die älteste Geschichte der Kulturpflanzen in Schweden. Opera Botanica, 1(3): 1-186.

Hobsbawm E (1983) 'Introduction: Inventing Traditions'. In Hobsbawm E and Ranger T (eds.) The Invention of Tradition. Cambridge University Press, Cambridge, pp 1–14.

Hodder I (1978) The maintenance of group identities in the Baringo district, western Kenya. In Green D, Haselgrove C, Spriggs M (eds.) Social organisation and settlement. B.A.R. International series S47 part I, British Archaeological Reports, pp 47-75.

— (1984) Burials, houses, women and men in the European Neolithic. In Miller D and Tilley C (eds.) Ideology, Power and Prehistory. Cambridge University Press, Cambridge, pp 51-68.

Hollund H, Blank M, Sjögren K-G (2018) Dead and buried? Variation in post-mortem histories revealed through histotaphonomic characterisation of human bone from megalithic graves in Sweden. PLoS ONE 13(10): e0204662. https://doi.org/10.1371/journal.pone.0204662

Holm J, Olsson E, Weiler E (1997) Kontinuitet och förändring i senneolitikum. In Larsson M, Olsson E (eds.) Regionalt och interregionalt. Stenåldersundersökningar i Syd- och Mellansverige. Riksantikvarieämbetet. Arkeologiska undersökningar. Skrifter no. 23. Stockholm, pp 215-264.

Holmqvist E, Larsson ÅM, Kriiska A, Palonen V, Pesonen P, Mizohata K, Kouki P, Räisänen J (2018) Tracing grog and pots to reveal Neolithic Corded Ware Culture contacts in the Baltic Sea region (SEM-EDS, PIXE). Journal of Archaeological Science, 91: 77-91. https://doi.org/10.1016/j.jas.2017.12.009.

Holst MK (2013) Burials. In Fokkens H and Harding A (eds.) The Oxford Handbook of the European Bronze Age. Oxford University press, Oxford, pp 102–120.

Holst MK, Rasmussen M, Kristiansen K, Bech J-H (2013) Bronze Age 'Herostrats': Ritual, Political, and Domestic Economies in Early Bronze Age Denmark. Proceedings of the Prehistoric Society, 79: 265-296. https://doi.org/10.1017/ppr.2013.14

Holtorf C (1998) The Life-histories of Megaliths in Mecklenburg-Vorpommern (Germany). World Archaeology 30(1): 23-38.

Holten L (1994) Religøs praksis. Kaos eller organiseret uorden? Dødekult i trattbægerkultur belyst udfra megalitgrave. Department of archaeology and ethnology, University of Copenhagen, Copenhagen (Unpublished thesis).

Horn C and Kristiansen K (2018) Warfare in Bronze Age Society. Cambridge University Press, Cambridge.

Hornstrup KM, Olsen J, Heinemeier J, Thrane H, Bennike P (2012) A new absolute Danish Bronze Age chronology as based on radiocarbon dating of cremated bone samples from burials. Acta Archaeologica 83: 9–53.

Hoskins JA (1986) So my name shall live: stone dragging and grave-building in Kodi, West Sumba. Bijdragen tot de Taal-, Land-en Volkenkunde 142: 31-51.

Høyem Andreasen M (2009) Agerbruget i enkeltgravskultur. Senneolitikum og ældre bronzealder i Jylland belyst ud fra plantemakrofossiler. In Laursen J and Nielsen I (eds.) KUML 2009 Årbog for Jysk

Arkæologisk Selskab. Aarhus Universitetsforlag, Aarhus, pp 9-55.
Hüls CM, Erlenkeuser H, Nadeau MJ, Grootes PM, Andersen N (2010) Experimental study on the origin of cremated bone apatite carbon. Radiocarbon. 52(2): 587-599.
Huntington R and Metcalf P (1991) Celebrations of Death. The Anthropology of Mortuary Ritual. Cambridge University Press, Cambridge.
Hutton JH (1921) The Angami Nagas: with some notes on neighbouring tribes. Macmillan and Co., Ltd., London.
— (1927) The Disposal of the Dead at Wakching. Man 27: 61-64.
Hyenstrand Å (1979) Ancient monuments and prehistoric societies. Riksantikvarieämbetet. Dokumentationsbyrån Arbetshandlingar, Stockholm.

Isaksson S and Hallgren F (2012) Lipid residue analyses of early Neolithic Funnel-Beaker pottery from Skogsmossen, eastern central Sweden, and the earliest evidence of dairying in Sweden. Journal of Archaeological Science, 39: 3600–3609. doi:10.1016/j.jas.2012.06.018
Iversen R (2015) The Transformation of Neolithic Societies. An Eastern Danish Perspective on the 3rd Millennium BC. Dissertation, Aarhus University press, Aarhus.
— (2017) Big-men and Small Chiefs: The creation of Bronze Age Societies. Open Archaeology, 3: 361-375.

Jamir T (2004) Megaliths of Nagaland: Reflections of Material Milieu and Social Values. In Momin M, Mawlong C (eds.) Society and Economy in Northeast India Vol. 1. Regency Publicaton, New Delhi, pp 105 – 117.
— (2019) Monumentality, Social Memories and the Idea of Landscape in Naga Megalithic Tradition. In Marak Q (ed.) Megalithic Traditions of North East India. Concept Publishing Company Pvt. Ltd., New Delhi, pp 121–14.
Jankavs P (2014) Vem var Firse? In Alexandersson H, Andreeff A, Bünz A (eds.) Med hjärta och hjärna. En vänbok till professor Elisabeth Arwill-Nordbladh. Gotarc series A, Gothenburg Archaeological Studies no. 5. University of Gothenburg, Gothenburg, pp 185-198.
Janson S (1938) Västsvenska och västeuropeiska stenkammargravar med gavelhål. Fornvännen 33: 321–342.
Janson S, Lundberg EB, Bertilsson U (1989) Hällristningar och hällmålningar i Sverige. Forum, Stockholm.
Janzon GO (1974) Gotlands mellanneolitiska gravar, Acta Universitatis Stockholmiensis. Studies in North-European Archaeology, 6. Almqvist & Wiksell, Stockholm.
Jantzen D, Brinker U, Orschiedt J, Heinemeier J, Piek J, Hauenstein K et al. (2015) A Bronze Age battle field? Weapons and trauma in the Tollense Valley, north-eastern Germany. Antiquity 85: 417-433.
Jantzen D, Orschiedt J, Piek J, Terberger T (2014) Tod im Tollensetal: Forschungen zu den Hinterlassenschaften eines bronzezeitlichen Gewaltkonfliktes in Mecklenburg-Vorpommern (Schwerin, Beiträge zur Ur- und Frühgeschichte Mecklenburg-Vorpommerns 50). Landesamt für Kultur und Denkmalpflege, Schwerin.
Jeunesse C (2016) A propos des conditions de formation des assemblages osseux archéologiques dans les sociétés pré-littéraires disparues européennes (Néolithique et Protohistoire). Une analyse ethnoarchéologique dans deux sociétés vivantes de l'Asie du Sud-Est. Journal of Neolithic Archaeology 18 : 115–156.
Jeunesse C and Denaire A (2017) Origine des animaux sur pied, circuit de la viande. La formation des assemblages osseux dans le contexte d'une fête traditionnelle à Sumba (Indonésie) Une enquête ethnoarchéologique. Bulletin de la Société préhistorique française 114(1): 115-136.
— (2018) Current Collective Graves in the Austronesian World. A few Remarks about Sumba and Sulawesi (Indonesia). In Schmitt A, Déderix S, Crevecoeur I (eds.) Gathered in death. Presses universitaire de Louvain, Louvain, pp 85-107.
Johansson BOH (1961) Stenåldershällkistor från svensk-norska gränslandskap. TOR, XII: 5-52.
Jouin BY (1949) La mort et la tombe. L'abondon de la tombe. Les cérémonies, prières et sacrifices se rapportant à ces très importantes manifestations de la vie des autochtones du Darlac. Institut d'ethnologie, Musée de l'Homme, Paris Université, Paris.
Joussaume R (1985) Les dolmens pour les morts: les mégalithismes à travers le monde. Hachette, Paris.

Kaelas L (1962) Stenkammargravar i Sverige och deras europeiska bakgrund. En orienteringsskiss. Proxima Thule. Sverige och Europa under forntid och medeltid. Hyllningsskrift till H M Konungen den 11 november 1962. Svenska Arkeologiska Samfundet, Stockholm, pp 26-40.

— (1967) Megalithic tombs in south Scandinavia—migration or cultural influence? Paleohistoria, 12: 287-322.

Kaldhussæter Lindboe K (2014) Arkeologi på molekylnivå: Lipidanalyser av 8 keramikkskår fra Logården. Stockholm University, Stockholm (thesis).

Kaliff A and Østigård T (2013) Kremation och kosmologi: en komparativ arkeologisk introduktion. Department of Archaeology and Ancient History, Uppsala University, Uppsala.

Kanstrup M, Holst MK, Jensen PM, Thomsen IK, Christensen BT (2014) Searching for long-term trends in prehistoric manuring practice. δ15N analyses of charred cereal grains from the 4th to the 1st millennium BC. Journal of Archaeological Science, 51: 115-125. https://doi.org/10.1016/j.jas.2013.04.018.

Kaul F and Varberg J (2017) Danish beads of Egyptian and Mesopotamian glass in context, and the amber connection. In Bergerbrant S and Wessman A (eds.) New Perspectives on the Bronze Age. Proceedings of the 13th Nordic Bronze Age Symposium held in Gothenburg 9th to 13th June 2015. Archaeopress Archaeology, Oxford, pp 375-386.

Kindgren H (1991) Kambrisk flinta och etniska grupper i Västergötlands senmesolitikum. In Browall H, Persson P, Sjögren K-G (eds.) Västsvenska stenåldersstudier. Gotarc series C, no. 8. University of Gothenburg, Gothenburg, pp 33–70.

— (1996) Stenålder vid Hornborgasjön. Västergötlands Fornminnesförenings Tidskrift 1995–96: 215–223.

Kirleis W and Fischer E (2014) Neolithic cultivation of tetraploid free threshing wheatin Denmark and Northern Germany: implications for cropdiversity and societal dynamics of the Funnel Beaker Culture. Vegetation History and Archaeobotany 23 (Suppl 1): S81–S96. DOI 10.1007/s00334-0140440-8

Kirleis W, Klooß S, Kroll H, Müller J (2012) Crop growing and gathering in the northern German Neolithic: a review supplemented by new results. Veget Hist Archaeobot 21: 221–242. DOI 10.1007/s00334-011-0328-9

Klassen L (2020) The Pitted Ware Culture on Djursland: Supra-regional significance and contacts in the Middle Neolithic of southern Scandinavia. East Jutland Museum Publications vol. 5. Aarhus University Press, Aarhus.

Klassen L, Price TD, Sjögrlen K-G, Wincentz L, Philippsen B (2020) Strontium and lead isotope studies of faunal and human remains from Kainsbakke and Kirial Bro. In Klassen L (ed.) The Pitted Ware Culture on Djursland: Supra-regional significance and contacts in the Middle Neolithic of southern Scandinavia. East Jutland Museum Publications vol. 5. Aarhus University Press, Aarhus, pp 407-447.

Kleijne J, Weinelt M, Müller J (2020) Late Neolithic and Chalcolithic maritime resilience? The 4.2 ka BP event and its implications for environments and societies in Northwest Europe. Environmental Research Letters 15: 125003. https://doi.org/10.1088/1748-9326/aba3d6

Knipper C (2011) Die räumliche Organisation der linearbandkeramischen Rinderhaltung Naturwissenschaftliche und archäologische Untersuchungen. BAR International Series 2305. Archaeopress, Oxford.

Knipper C, Maurer A-F, Peters D, Meyer C, Brauns M, Galer SG, von Freeden U, Schöne B, Meller H, Alt KW (2012) Mobility in Thuringia or mobile Thuringians: a strontium isotope study from early Medieval central Germany. In Kaiser E, Burger J, Schier W (eds.) Migrations in Prehistory and Early History. Stable Isotopes and Population Genetics. De Gruyter, Berlin, pp 293-317.

Knipper C, Meyer C, Jacobi F, Roth C, Fecher M, Schatz K, Stephan E, Hansen L, Posluschny AG, Pare CFE, Alt KW (2014) Social differentiation and land use at an Early Iron Age "princely seat": Bioarchaeological investigations at the Glauberg (Germany). Journal of Archaeological Science, 41: 818-835.

Knipper C, Mittnik A, Massy K, Kociumaka C, Kucukkalipci I, Maus M, Wittenborn F, Metz S, Staskiewicz A, Krause J, Stockhammer PW (2017) Female exogamy and gene pool diversification at the transition from the Final Neolithic to the Early Bronze Age in central Europe, Proceedings of the National Academy of Sciences 114: 10083-10088. www.pnas.org/cgi/doi/10.1073/pnas.1706355114

Kristiansen K (1982) The formation of tribal systems in later European prehistory. Northern Europe, 4000-5000 B.C. In Renfrew C, Rowlands M, Seagraves BP (eds.) Theory and Explanation in Archaeology. Academic press, London, pp 241-280.

— (1984) Ideology and material culture: an archaeological perspective. In Spriggs (ed.) Marxist perspectives in archaeology. Cambridge University Press, London, pp 72-100.

— (1987) From stone to bronze. The evolution of social complexity in Northern Europe, 2300-1200 BC. In Brumfiel EM, Earle T (eds.) Specialization, Exchange, and Complex Societies. Cambridge University Press, Cambridge, pp 30-51.

— (2018) The Rise of Bronze Age Peripheries and the Expansion of International Trade 1950-1100 BC. In Kristiansen K, Lindkvist T, Myrdal J (eds.) Trade and civilization: economic networks and cultural ties, from prehistory to the early modern era. Cambridge University Press, Cambridge, pp 87-112. https://doi.org/10.1017/9781108340946.005

Kristiansen K and Larsson TB (2005) The rise of Bronze Age society. Travels, Transmissions and Transformations. Cambridge University Press, Cambridge.

Kroeber AL (1927) Disposal of the dead. American Anthropologist, 29: 308-317.

Knowles TDJ, Monaghan PS, Evershed RP (2019) Radiocarbon Sample Preparation Procedures and the First Status Report from the Bristol Radiocarbon AMS (BRAMS) Facility. Radiocarbon, 61(5): 1541-1550. DOI:10.1017/RDC.2019.28

Kossian R (2005) Nichtmegalitische Grabanlagen der Trichterbecherkultur in Deutschland und den Niederlanden. Veröffentlichungen des Landesamtes für Denkmalpflege und Archäologie Sachsen-Anhalt, Halle. Landesmuseum für Vorgeschichte, Halle (Saale).

Ladegaard-Pedersen P, Sabatini S, Frei R, Kristiansen K, Frei KM (2021) Testing Late Bronze Age mobility in southern Sweden in the light of anew multi-proxy strontium isotope baseline of Scania. PLoSONE 16(4): e0250279. https://doi.org/10.1371/journal.pone.0250279

Lanting JN, Aerts-Bijma, AT, van der Plicht J (2001) Dating of cremated bone. Radiocarbon 43(2A): 249–54.

Laporte L (2011) Innate and/or expressed identities: their conceptualization through monumentality, funerary practices and grave goods? Some examples from the megalithic tradition of Western France. In Furholt M, Luth F, Müller J (eds.) Megaliths and Identities, Fruhe Monumentalität und soziale differenzierung 1. Dr. Rudolf Habelt GmbH, Bonn, pp 199–224.

— (2012) Depots de mobilier, architectures et pratiques funeraires dans l'ouest de la France, au cours du Neolithique recent et final. In Sohn M and Vaquer J (eds.) Sépultures collectives et mobiliers funéraires de la fin du Néolithique en Europe occidentale, Actes de la Table-ronde de Carcassonne, 2008, ed. Archives d'Ecologie Prehistorique, Toulouse, pp 113–145.

— (2015) Le mégalithisme atlantique : une illusoire tentative de domestication du temps et de l'espace? In Rocha L, Bueno-Ramirez P, Branco G (eds.) - Death as Archaeology of transition: Thoughts and Materials. Actes du colloque international d'Evora (Portugal), May 2013. BAR International Series 2708. Archaeopress, Oxford, pp 35-51.

Laporte L, Jallot L, Sohn M (2011) – Mégalithismes en France : nouveaux acquis et nouvelles perspectives de recherche. Gallia préhistoire, 53: 289-338.

Larsson L (2000) The passage of axes: fire transformation of flint objects in the Neolithic of southern Sweden. Antiquity 74: 602-610.

Larsson ÅM (2009) Breaking and making bodies and pots: material and ritual practices in Sweden in the third millennium BC. Dissertation, Department of Archaeology and Ancient History, Uppsala University, Uppsala.

Larsson ÅM and Nilsson Stutz L (2014) Reconcilable Differences. Cremation, Fragmentation, and Inhumation in Mesolithic and Neolithic Sweden. In Kuijt I, Quinn CP, Cooney G (eds.) Cremation, Fragmentation, and Inhumation in Mesolithic and Neolithic Sweden. In Transformation by Fire. The Archaeology of Cremation in Cultural Context. University of Arizona Press, Arizona, pp 47- 66.

Latour B (1993) We Have Never Been Modern. Harvester Wheatsheaf, New York.

Leach E (1968) Ritual. Encyclopedia of the Social Sciences. Free Press, New York.

— (1979) Discussion. In Burnham BC and Kingsbury J (eds.) Space, hierarchy and society: interdisciplinary studies in social area analysis. BAR International series, no 59, Oxford, pp 119-24.

— (1989) Tribal ethnography: Past, present, future. In Tonkin E, McDonald M, Chapman M (eds.) History and Ethnicity. Routledge, London & New York, pp 34-47.

Leclerc J and Masset C (1980) Construction, remaniements et condamnation d'une sépulture collective néolithique: La Chaussée-Tirancourt (Somme). Bulletin de la Société préhistorique française, 77(2): 57-64.

Lee-Thorp JA, Sealy JC, van der Merwe NJ (1989) Stable Carbon Isotope Ratio Differences Between Bone Collagen and Bone Apatite, and their Relationship to Diet. Journal of Archaeological Science, 16: 585 – 599.

Lekberg P (2002) Yxors liv, människors landskap: en studie av kulturlandskap och samhälle i Mellansveriges senneolitikum. Dissertation, Coast to coast books no. 5, Department of Archaeology and Ancient History, Uppsala University, Uppsala.

Lennblad A (2015) Döden i hällkistan. En material och litteraturstudie kring senneolitikums hällkistegravar. Department of historical studies, University of Gothenburg (Unpublished master thesis).

Lewis J, Pike AWG, Coath CD, Evershed RP (2017) Strontium concentration, radiogenic (87 Sr/86 Sr) and stable (δ88 Sr) strontium isotope systematics in a controlled feeding study. STAR: Sci. Technol. Archaeol. Res. 3(1): 45–57. https:// doi.org/10.1080/20548923.2017.1303124.

Libby WF (1965) [1952]. Radiocarbon Dating (2nd ed.). University of Chicago Press, Chicago.
Lidén K (1995) Megaliths, agriculture and social complexity: A diet study of two Swedish Megalith populations. Journal of Anthropology and Archaeology 14: 404–417.
Linderholm A (2008) Migration in prehistory: DNA and stable isotope analyses of Swedish skeletal material. Dissertation, Stockholm University, Stockholm.
Linderholm A, Fornader E, Eriksson G, Mörth C-M and Lidén K (2014) Increasing Mobility at the Neolithic/Bronze Age Transition - sulphur isotope evidence from Öland, Sweden. 'Human Exploitation of Aquatic Landscapes' special issue (Fernandes R, Meadows J eds.), Internet Archaeology, 37. http://dx.doi.org/10.11141/ia.37.10
Lindqvist S (1911) Två västgötska grafbyggnader från stenåldern II. Dös vid Slutarp, Kinneveds sn, Frökinds hd. Fornvännen 6: 130– 140
Ling J (2008) Elevated rock art. Towards a maritime understanding of Bronze Age rock art in northern Bohuslän, Sweden. Dissertation, department of Archaeology, University of Gothenburg, Gothenburg.
Ling J, Chacon R, Chacon Y (2018) Rock Art, Secret Societies, Long-Distance Exchange and Warfare in Bronze Age Scandinavia. In Dolfini A, Crellin RJ, Horn C, Uckelmann M (eds.) Prehistoric warfare and violence. Quantitative and Qualitative Approaches. Springer International Publishing, pp 149-174. DOI:10.1007/978-3-319-78828-9
Ling J, Stos-Gale Z, Hjärtner- Holdar E, Grandin L, Billström K, Persson P (2014) Moving metals II: provenancing Scandinavian Bronze Age artefacts by lead isotope and elemental analyses. Journal of Archaeological Science, 41: 106–132.
Lougheed BC, Filipsson HL, Snowball I (2013) Large spatial variations in coastal 14C reservoir age - a case study from the Baltic Sea. Clim. Past 9: 1015–1028. https://doi.org/10.5194/cp-9-1015-2013
Lomborg E (1959) Fladehuggede flintredskaber i gravfund fra ældre bronzealder. Aarbøger for Nordisk Oldkyndighed og Historie, 1959: 146-183.
— (1973) Die Flintdolche Dänemarks. Studien über Chronologie und Kulturbeziehungen des südskandinavischen Spätneolithikums. Nordiske Fortidsminder, Serie B, 1. Det Konglige Nordiske Oldskriftselskab, Copenhagen.
London G (2000) Ethnoarchaeology and interpretation. Near Eastern Archaeology 63: 2-8.

Madsen T (1988) Causewayed Enclosures in south Scandinavia. In Burgess C, Topping P, Mordant C, Maddison M (eds.) Enclosures and Defences in the Neolithic of Western Europe. BAR International Ser 403, Oxford, pp 301–336.
Malmer MP (1962) Jungneolitische Studien. Acta Archaeologica Lundensia, series 8o, Vol. 2. CWK Gleerups Förlag, Lund.
— (1975) Stridsyxekulturen i Sverige och Norge. Liber Läromedel, Lund.
— (2002) The Neolithic of south Sweden: TRB, GRK, and STR. KVHAA: Distributed by Almquist & Wiksell International, Stockholm.
Malmström H, Günter T, Svensson EM, Juras A, Fraser M, Munters AR, Prospieszny L, Tõrv M, Lindström J, Götherström A, Storå J (2019) The genomic ancestry of the Scandinavian Battle Axe Culture people and their relation to the broader Corded Ware horizon. Proc. R. Soc. B 286: 20191528. http://dx.doi.org/10.1098/rspb.2019.1528
Malmström H, Linderholm A, Skoglund P, Storå J, Sjödin P, Gilbert MTP, Holmlund G, Willerslev E, Jakobsson M, Lidén K, Götherström A (2015) Ancient mitochondrial DNA from the northern fringe of the Neolithic farming expansion in Europe sheds light on the dispersion process. Philos. Trans. R. Soc. B Biol. Sci. 370: 20130373–20130373. https://doi.org/10.1098/rstb.2013.0373
Mikkelsen M (2020) Slaves in Bronze Age Southern Scandinavia? Acta Archaeologica 91(1): 147-190.
Millard AR (2014) Conventions for reporting radiocarbon determinations. Radiocarbon 56(2): 555–559. https://doi.org/10.2458/56. 17455
Mittnik A, Wang C-C, Pfrengle S, Daubaras M, Zarina G, Hallgren F, Allmäe R, Khartanovich V, Moiseyev V, Tõrv M et al. (2018) The genetic prehistory of the Baltic Sea region. Nature Communications 9: 442.
Montelius O (1873) Undersökning av en gånggrift vid Karleby k:a i Västergötland. Kungliga Vitterhets-Historie och Antiqvitets Akademiens månadsblad 2: 10-13.
— (1877) Grafundersökningar i Vestergötland 2. Hällkista vid Karleby Utbogården i Vartofta härad. Kungliga Vitterhets Historie och Antiqvitets Akademiens Månadsblad 6: 425–433.
— (1905) Orienten och Europa. Antiqvarisk Tidskrift för Sverige XIII: 1–252.
Montgomery J (2010) Passports from the past. Investigating human dispersals using Strontium isotope analysis of tooth enamel. Annals of Human Biology 37: 325–346. doi: 10.3109/03014461003649297 PMID: 20367186
Montgomery J and Evans JA (2006) Immigrants on the Isle of Lewis - combining traditional funerary and modern isotope evidence to investigate social differentiation, migration and dietary change in

the Outer Hebrides of Scotland. In Gowland R and Knusel C (eds.) The Social Archaeology of Funerary Remains. Oxbow Books, Oxford, pp 122–142.

Melheim L (2012) Recycling Ideas: Bronze Age Metal Production in Southern Norway. Dissertation, Department of archaeology, University of Oslo.

Melheim L, Grandin L, Persson PO, Billström K, Stos-Galed Z, Ling J, Williams J, Angelini I, Canovaro C, Hjärthner-Holdar E, Kristiansen K (2018) Moving metals III: Possible origins for copper in Bronze Age Denmark based on lead isotopes and geochemistry. Journal of Archaeological Science, 96: 85-105. https://doi.org/10.1016/j.jas.2018.04.003.

Midgley M (2008) The Megaliths of Northern Europe. Routledge, London and New York.

Mosko MS (2017) Ways of baloma: rethinking magic and kinship from the Trobriands. Chicago University Press, Chicago.

Müller J (1998) Zur absolutchronologischen Datierung der europäischen Megalithen. In Fritsch B, Maute M, Matuschik I, Müller J, Wolf C (eds.) Tradition und Innovation. Prähistorische Archäologie als historische Wissenschaft. Festschrift für Christian Strahm. Rhaden-Westf., Leidorf, pp 63-109.

— (2009) Dating the Neolithic: Methodological premises and absolute chronology. Radiocarbon, 51(2): 721-736.

— (2011) Ritual cooperation and ritual collectivity. The social structure of the middle and younger Funnel Beaker North Group (3500–2800 BC). In Furholt M, Lüth F, Müller J (eds.) Megaliths and Identities. Early Monuments and Neolithic Societies from the Atlantic to the Baltic. 3rd European Megalithic Studies Group Meeting [13–15 May 2010 Kiel]. Frühe Monumentalität und soziale Differenzierung 1. Dr. Rudolf Habelt GmbH, Bonn, pp 273–84.

— (2015) Eight million Neolithic Europeans: Social demography and social archaeology on the scope of change—from the Near East to Scandinavia. In Kristiansen K, Smedja L, Turek J (eds.) Paradigm found. Archaeological theory: Present, past and future. Essays in honour of Evžen Neustupný. Oxbow Books, Oxford, pp 200–21.

— (2019) Boom and bust, hierarchy and balance: From landscape to social meaning – Megaliths and societies in Northern Central Europe. In Müller J, Hinz M, Wunderlich M (eds.) Megaliths – Societies – Landscapes. Early monumentality and social differentiation in Neolithic Europe. Dr. Rudolf Habelt GmbH, Bonn, pp 29-74.

Müller J and Vandkilde H (2020) The Nordic Bronze Age Rose from Copper Age Diversity Contrasts in the Cimbrian Peninsula. In Austvoll KI, Eriksen HM, Fredriksen PD, Melheim L, Prøsch-Danielsen L, Skogstrand L (eds.) Contrasts of the Nordic Bronze Age. Essays in Honour of Christopher Prescott, TANE 1. Brepols, Turnhout, pp 29–48.

Naylor J and Smith A (1988) An archaeological inference problem. Journal of the American Statistical Association 83: 588-95.

Nielsen FO and Nielsen PO (1985) Middle and Late Neolithic Houses at Limensgård, Bornholm. Journal of Danish Archaeology 4: 101-114.

Nielsen SV, Persson P, Solheim S (2019) De-Neolithisation in southern Norway inferred from statistical modelling of radiocarbon dates. Journal of Anthropological Archaeology 53: 82–91.

Nilson Y (1991) Hägnen 1:3, Odensåkers socken, Mariestad kommun Västergötland. Skaraborgs länsmuseum Rapport 1991:18, Skara.

Nilsson Stutz L (2003) Embodied Rituals and Ritualized Bodies. Tracing Ritual Practices in Late Mesolithic Burials. Dissertation, Department of archaeology and ancient history, Lund University, Lund.

— (2008) More than Metaphor: Approaching the Human cadaver in Archaeology. In Fahlander F and Oestigaard (eds.) The Materiality of Death: bodies, burials, beliefs. Archaeopress, Oxford, pp 19-28.

— (2016) Building bridges between burial archaeology and the archaeology of death. Where is the archaeological study of the dead going? Current Swedish Archaeology, 24: 13-35.

Nordman CA (1935) The megalithic culture of Northern Europe. Finska fornminnesföreningens tidskrift 39(3): 1-137.

Nørgaard HW, Pernicka E, Vandkilde H (2021) Shifting networks and mixing metals: Changing metal trade routes to Scandinavia correlate with Neolithic and Bronze Age transformations. PLoS ONE 16(6): e0252376. https://doi.org/10.1371/journal.pone.0252376

O'Connell TC and Hedges REM (2017) Chicken and egg: testing the carbon isotopic effects of carnivory and herbivory. Archaeometery 59(2): 302-315. Doi:10.1111/arcm.12253

O'Connell TC, Kneale C J, Tasevska N, Kuhnle GGC (2012) The diet-body offset in human nitrogen isotopic values: A controlled dietary study. American Journal of Physical Anthropology 149: 426-34.

Oelze VM, Nehlich O, Richards MP (2012) 'There is no place like home'—No isotopic evidence for mobility at the Early Bronze Age Cemetery of Singen, Germany. Archaeometry 54(4): 752–778.

Oestigaard T (2013) Cremations in culture and cosmology. In Tarlow S and Nilsson Stutz L (eds.) The oxford handbook of The Archaeology of Death & Burial. Oxford University Press, Oxford, pp 497-510.

— (2015) Cremating Corpses – Destroying, defying or Deifying Death? In Hackwitz KW and Peyroteo-Stjerna R (eds.) Ancient Death Ways. Proceedings of the workshop on archaeology and mortuary practices, Uppsala, May 2013. OPIA 59. Department of Archaeology and Classical studies, Uppsala, pp 65-83.

Olausson D (2014) The “Mental” in Monumental. Battle Axe Culture in Megalithic Tombs in Southern Sweden. In Furholt M, Hinz M, Mischka D, Noble, G, Olausson D (eds.) Landscapes, Histories and Societies in the Northern European Neolithic. Frühe Monumentalität und soziale Differensierung 4. Institut für Ur- und Frühgeschichte der CAU Kiel / Habelt, Kiel, pp 261-274.

Olsen BA (2019) Aspects of family structure among the Indo-Europeans. In Olsen BA, Olander T, Kristiansen K (eds.) Tracing the Indo-Europeans. Oxbow Books, Oxford, pp 145–164.

Olsen J, Heinemeier J, Bennike P, Krause C, Hornstrup KM, Thrane H (2008) Characterisation and blind testing of radiocarbon dating of cremated bone. Journal of Archaeological Science, 35(3): 791-800.

Olsen J, Hornstrup KM, Heinemeier J, Bennike P, Thrane H (2011) Chronology of the Danish Bronze Age based on C-14 dating of cremated bone remains. Radiocarbon 53: 261-275.

Orme B (1974) Twentieth century prehistorians and the idea of ethnographic parallels. Man 9(2): 199-212.

O’Shea JM (1984) Mortuary Variability. An archaeological investigation. Academic press, inc., Orlando, Florida.

Østmo E (2011) Krigergraver. En dokumentarisk studie av hellekister i Norge. Kulturhistorisk museum, Oslo University, Oslo.

— (2013) Towards a border- traces of Megalithic ritual in the Norwegian fjord country. In Bergerbrant S and Sabatini S (eds.) Counterpoints: Essay in archaeology and heritage studies in honour of Kristian Kristiansen. Archaeopress, Oxford, pp 301-308.

Papmehl-Dufay L (2006) Shaping an identity: Pitted Ware pottery and potters in southeast Sweden. Dissertation, Department of Archaeology and Classical studies, Stockholm University, Stockholm.

Papmehl-Dufay L (2010) Late Neolithic burial practice on the Island of Öland, southeast Sweden. Gotland University press 5: 111-130.

Parker Pearson M (1992) Tombs and monumentality in southern Madagascar: preliminary results of the central Androy survey. Antiquity, 66(253): 941-948.

— (1999) The Archaeology of Death and Burial. Stroud, Sutton.

Parker Pearson M, Chamberlain A, Collins M, Cox C, Craig G, Craig O, et al. (2007) Further evidence for mummification in Bronze Age Britain. Antiquity, 81: 312–22.

Parker Pearson M, Chamberlain A, Craig O, Marshall P, Mulville J, Smith H, et al. (2005) Evidence for mummification in Bronze Age Britain. Antiquity, 79: 529–46.

Parker Pearson M, Chamberlain A, Jay M, Richards M, Sheridan A, Curtis N, Evans J, Gibson A, Hutchison M et al. (2016) Beaker people in Britain: migration, mobility and diet. Antiquity 90: 620-637. doi:10.15184/aqy.2016.72

Parker Pearson M, Pollard J, Richards C, Welham K, Kinnaird T, Shaw D, Simmons E, Stanford A, Bevins R, Ixer R, Ruggles C, Rylatt J, Edinborough K (2021) The original Stonehenge? A dismantled stone circle in the Preseli Hills of west Wales. Antiquity 95(379): 85-103. https://doi.org/10.15184/aqy.2020.239

Parker Pearson M and Regnier D (2018) Collective and single burials in Madagascar. In Schmitt A, Déderix S, Crevecoeur I (eds.) Gathered in death. Presses universitaire de Louvain, Louvain, pp 41-43.

Parks P (2006) Celtic Fosterage: Adoptive Kinship and Clientage in Northwest Europe. Comparative Studies in Society and History 48(2): 359-395. https://www.jstor.org/stable/3879355

Parzen E (1962) On estimation of a probability density function and mode. Ann. Math. Statist 33(3): 1065–76.

Pearson J and Meskell L (2015) Isotopes and images: fleshing out bodies at Çatalhöyük. Journal of Archaeological Method and Theory 22: 461–482.

Persson P and Sjögren K-G (1995) Radiocarbon and the chronology of Scandinavian megalithic graves. Journal of European Archaeology 3: 59–88.

— (2001) Falbygdens gånggrifter. Undersökningar 1985–1998. Gotarc series C, no. 34. University of Gothenburg, Gothenburg.

Philippsen B (2013) The freshwater reservoir effect in radiocarbon dating. Herit. Sci. 1: 24. https://doi.org/10.1186/2050-7445-1-24

Pilz J and Spöck G (2007) “Why Do We Need and How Should We Implement Bayesian Kriging Methods.” Stochastic Environmental Research and Risk Assessment, 22(5): 621–632.

Prescott C (1991) Kulturhistoriske undersøkelser i Skrivarhellaren. Arkeologiske rapporter no. 14. University of Bergen, Bergen.

— (2005) Settlement and Economy in the Late Neolithic and Bronze Age of Southern Norway: Some Points and Premises. AmS-Varia 43: 127-136.

Prescott C and Glørstad H (2015) 'Expanding 3rd Millennium Transformations: Norway'. In Pilar Prieto Martínez M and Salanova L (eds.) The Bell Beaker Transition in Europe: Mobility and Local Evolution During the 3rd Millennium bc. Oxbow, Oxford, pp 77–87.

Price TD, Klassen L, Sjögren K-G (2021) Pitted ware culture: Isotopic evidence for contact between Sweden and Denmark across the Kattegat in the Middle Neolithic, ca. 3000 BC. Journal of Anthropological Archaeology 61: 101254.

Price TD, Knipper C, Grupe G, Smrcka V (2004) Strontium isotopes and prehistoric human migration: The Bell Beaker Period in Central Europe. European Journal of Archaeology 7(1): 9–40.

Randsborg K (1975) Social Dimensions of Early Neolithic Denmark. Proceedings of the Prehistoric Society 41: 105–118.

Rascovan N, Sjögren K-G, Kristiansen K, Nielsen R, Willerslev E, et al. (2019) Emergence and Spread of Basal Lineages of Yersinia pestis during the Neolithic Decline. Cell, 176(1): 295-305.

Rasmussen LW (1990) Dolkproduktion og -distribution i senneolitikum. Hikuin, 16: 31-42.

Regnell M and Sjögren K-G (2006) Introduction and development of agriculture. In Sjögren K-G (ed.), Ecology and Economy in Stone Age and Bronze Age Scania. Skånska spår –arkeologi längs Västkustbanan. Riksantivarieämbetet, Lund, pp 106–170.

Reimer P, Austin W, Bard E, Bayliss A, Blackwell P, Bronk Ramsey C, et al. (2020) The IntCal20 Northern Hemisphere Radiocarbon Age Calibration Curve (0–55 cal kBP). Radiocarbon, 62(4): 725-757. doi:10.1017/RDC.2020.41

Reimer PJ, Bard E, Bayliss A, Beck JW, Blackwell PG, Ramsey CB, et al. (2013) IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0–50,000 Years cal BP. Radiocarbon, 55(4): 1869–87.

Renfrew C (1973) Before Civilisation. The Radiocarbon Revolution and Prehistoric Europe. Penguin, London.

— (1976) Megaliths, territories and populations. In de Laet SJ (ed.) Acculturation and Continuity in Atlantic Europe. De Tempel, Brugge, pp 45-58.

Retzius G (1899) Crania Suecica Antiqua: beskrifning av svenska mennisko-kranier från stenåldern, bronsåldern och järnåldern jämte en blick på forskningen öfver de europeiska folkens ras-karaktärer. Stockholm.

Robinson DE (2003) Neolithic and Bronze Age agriculture in southern Scandinavia-recent archaeobotanical evidence from Denmark. Environ. Archaeol. 8: 145–165.

Robson HK, Saul H, Steele VJ, Meadows J, Nielsen PO, Fischer A, Heron CP, Craig OP (2021) Organic residue analysis of Early Neolithic 'bog pots' from Denmark demonstrates the processing of wild and domestic foodstuffs. Journal of Archaeological Science: Reports, 36: 102829. https://doi.org/10.1016/j.jasrep.2021.102829

Rose HA, Meadows J, Henriksen MB (2020) Bayesian modeling of wood-age offsets in cremated bone. Radiocarbon, 62(2): 379–401. DOI:10.1017/RDC.2020.3

Rosenblatt M (1956) Remarks on some nonparametric estimates of a density function. Ann. Math. Statist 27(3): 832–7.

Sahlins M (1974) Stone age economics. Tavistock Publications, London.

Sahlström KE (1915a) Förteckning över Skaraborgs läns stenåldersgravar. Västergötlands Forn- minnesförenings Tidskrift III: 1–92.

Sahlström KE (1915b) Om Västergötlands stenåldersbebyggelse. Nordstedt och söner, Stockholm.

— (1927) Undersökning av Berga hällkista, Torbjörntorp sn, VG. Dnr 3678/1927, ATA, Stockholm. Unpublished excavation report.

— (1928) Kåkinds härads fornminnen. Skövdeortens Hembygds- och Fornminnesförenings skriftserie 2, Skövde.

— (1932) Gudhems härads fornminnen. Skövdeortens Hembygds- och Fornminnesförenings skriftserie nr. 3. Skövdeortens Hembygds- och Fornminnesförenings skriftserie 3, Skövde.

— (1935) Väglederna inom den västgötska gånggriftsbygden. Västergötlands Forn- minnesförenings Tidskrift IV:5–31.

— (1939) Valle härads fornminnen. Skövdeortens Hembygds- och Fornminnesförenings skriftserie 4, Skövde.

— (1940) Falbygdens förhistoria. Falbygden genom tiderna, Falköping.

— (1947) Torsagården, Gökhem sn, VG. Dnr: 3022/47, ATA, Stockholm. Unpublished excavation report.

— (1949) Mikaelsgården, Östra Tunhem sn, VG. Dnr: 4554/49, ATA, Stockholm. Unpublished excavation report.

— (1951) Hällkista vid Falköpings järnvägsstation, Falköping stad sn, VG. Dnr: 4423/1951, ATA, Stockholm. Unpublished report.

Salanova L, Brunet P, Cottiaux R, Hamon T, Langry-François F, Martineau R, Polloni A, Renard C, Sohn M (2011) Du Néolithique récent a l'Âge du Bronze dans le Centre-Nord de la France: les étapes de l'évolution chrono-culturelle. In Bostyn F, Martial E, Praud I (eds.) Le Néolithique du Nord de la France dans son contexte européen: habitat et économie aux 4e et 3e millénaires avant notre ère Actes du 29e colloque interrégional sur le Néolithique Villeneuve-d'Ascq 2-3 octobre, pp 77–101. halshs-00638321

Salanova L, Chambon P, Pariat J-G, Marçais A-S, Valentin F (2017) From one ritual to another: the long-term sequence from the Bury gallery grave (northern France, 4th–2nd millennia BC). Antiquity 91: 57–73.

Sánchez-Quinto F, Malmströma H, Fraser M, Girdland-Flin L, Svensson E M, Simões L G, George R, Hollfelder N, Burenhult G, Noble G, Britton K, Talamo S, Curtis N, Brzobohat H, Sumberov R, Götherström A, Storå J and Jakobsson M (2019) Megalithic tombs in western and northern Neolithic Europe were linked to a kindred society. Proc Natl Acad Sci U S A 116(19): 9469–74.

Sandegren R (1916) Hornborgasjön. Sveriges Geologiska Undersökning Ser Ca Nr 14. Kungliga boktryckeriet P. A. Nordstedt & Söner, Stockholm.

Sarauw T (2006) Bejsebakken. Late Neolithic Houses and Settlement Structure. Kongelige Nordiske Oldskriftselskab, Copenhagen.

— (2007) 'Male Symbols or Warrior Identities? The "Archery Burials" of the Danish Bell Beaker Culture', Journal of Anthropological Archaeology, 26: 65–87.

Scarre C (2007) The megalithic monuments of Britain and Ireland. Thames Hudson Ltd., London.

— (2010) 'Rocks of ages: tempo and time in megalithic monuments.' European Journal of Archaeology, 13(2): 175-193.

Scarre C, Garcia Sanjuan L, Wheatley D (2008) Exploring Time and Matter in Prehistoric Monuments: Absolute Chronology and Rare Rocks in European Megaliths. Menga: Journal of Andalusian Prehistory, Monograph no 1. Junta de Andalucia, Seville.

Schnell J-B (1966) Vatten och fornfynd. Bebyggelsehistoriska studier på Västergötlands kambrosilurområde. Dissertation, Department of Archaeology, University of Gothenburg, Gothenburg.

Schoeller DA (1999) Isotope Fractionation: Why Aren't We What We Eat? Journal of Archaeological Science, 26: 667–673

Schoeninger MJ, DeNiro MJ, Tauber H (1983) Stable nitrogen isotope ratios of bone collagen reflect marine and terrestrial components of prehistoric human diet. Science 220(4604): 1381 – 1383.

Schroeder H, Margaryan A, Szmyt M, Theulot B, Wlodarczak P, Rasmussen S et al. (2019) Unraveling ancestry, kinship, and violence in a Late Neolithic mass grave. Proceedings of the National Academy of Sciences 116 (22): 10705-10710. http://dx.doi.org/10.1073/pnas.1820210116

Schulting R (2006) Skeletal evidence and context of violence in the European Mesolithic and Neolithic. In Gowland R and Knüsel C (eds.) Social Archaeology of Funerary Remains. Oxbow, Oxford, pp 224-237.

Schulz Paulsson B (2010) Scandinavian models: radiocarbon dates and the origin and spreading of passage graves in Sweden and Denmark. Radiocarbon, 52(2-3): 1002–1017.

— (2017) Time and stone: the emergence and development of megaliths and megalithic societies in Europe. Dissertation, Archaeopress, Oxford.

Schützler L (1984) Kunskapskällan på skolgården. Fornlämning 18, Väne-Åsaka socken, Västergötland. Riksantikvarieämbetet Rapport UV 1984:18. Arkeologisk undersökning 1981. Riksantikvarieämbetet and SHM, Stockholm.

Scorrano G, Brilli M, Martínez-Labarga C, Giustini F, Pacciani E, Chilleri F, Scaldaferri F, Gasbarrini A, Gasbarrini G, Rickards O (2014) Palaeodiet reconstruction in a woman with probable celiac disease: A stable isotope analysis of bone remains from the archaeological site of Cosa (Italy). American Journal of Physical Anthropology 154: 349–356.

Sealy JC (1986) Stable carbon isotopes and prehistoric diets in the south – western Cape Province, South Africa. Cambridge Monographs in African Archaeology 15, BAR International Series 293, Oxford.

— (2001) Body Tissue Chemistry and Paleodiet. In Brothwell DR and Pollard AM (eds.) Handbook of Archaeological Sciences. Wiley, Chichester, pp 269 – 279.

Sealy JC, Armstrong R, Schrine C (1995) Beyond lifetime averages: Tracing life histories through isotopic analysis of different calcified tissues from archaeological human skeletons. Antiquity 69: 290-300.

Seppä H, Hammerlund D, Antonsson K (2005) Low-frequency and high-frequency changes in temperature and effective humidity during the Holocene in south-central Sweden: implications for atmospheric and oceanic forcings of climate. Climate Dynamics 25: 285-297.

Shanks M and Tilley C (1982) Ideology, symbolic power and ritual communication: a reinterpretation of Neolithic mortuary practices. In Hodder I (ed.) Symbolic and structural archaeology. Cambridge University Press, Cambridge, pp 129-154.

Shennan SJ (1982) Ideology, change and the European early bronze age. In Hodder I (ed.) Symbolic and structural archaeology. Cambridge University Press, Cambridge, pp 155-161.

Siegenthaler U, Heimann M, Oeschger H (1980) 14C Variations Caused by Changes in the Global Carbon Cycle. Radiocarbon, 22: 177–191.

Simonsen J (2017) Daily Life at the Turn of the Neolithic. A comparative study of longhouses with sunken floors at Resengaard and nine other settlements in the Limfjord region, South Scandinavia. Dissertation, Aarhus universitetsforlag, Aarhus.

Sjöbeck M (1951) Västgötabondens storverk. Swanberg PO and Curry-Lindahl K (eds.) Natur i Västergötland. Svensk natur, Stockholm.

Sjögren K-G (2003) "Mångfalldige uhrminnes grafvar…" Megalitgravar och samhälle i Västsverige. Gotarc series B, no. 27, Coast to Coast books no. 9. Dissertation, Department of Archaeology, University of Gothenburg, Gothenburg.

— (2008) Fragment av ordning. Undersökning av överplöjda megalitgravar vid Frälsegården, Gökhems socken, Västergötland, 1999-2001. Gotarc series D. Archaeological reports no. 62. University of Gothenburg, Gothenburg.

— (2011) C-14 chronology of Scandinavian megalithic tombs. Menga: Revista de prehistoria de Andalucía: 103–120.

— (2015a) News from Frälsegården. Aspects of Neolithic burial practices. In Brink K, Hydén S, Jennbert K, Larsson L, Olausson D (eds.) Neolithic Diversities Perspectives from a conference in Lund, Sweden. Acta Archaeologica Lundensia, Series in 8o. 65. Lund University, Lund, pp 200–10.

— (2015b) Mortuary practices, bodies and persons in Northern Europe. In Fowler C, Harding J, Hofmann D (eds.) The Oxford Handbook of Neolithic Europe. Oxford University Press, Oxford, pp 1005–22.

— (2017) Modeling middle Neolithic funnel beaker diet on Falbygden, Sweden. Journal of Archaeological Science: Reports, 12: 295–306.

— (2020) Raw material and work force in Falbygden passage graves. Identity, competition and social dynamic. In Boaventura R, Mataloto R, Pereira A (eds.) Megaliths and Geology (Megálitos e Geologia) MEGA-TALKS 219-20 November 2015 (Redondo, Portugal). Archaeopress Publishing Ltd, Oxford, pp 171-186.

Sjögren K-G and Ahlström T (2016) Early Mesolithic burials from Bohuslän, western Sweden. In Grünberg JM, Gramsch B, Larsson L, Orschiedt J, Meller H (eds.) Mesolithic burials – Rites, symbols and social organisation of early postglacial communities. International Conference in Halle (Saale), Germany, 18th–21st September 2013. Tagungen des Landesmuseums für Vorgeschichte Halle, Halle (Saale), pp 125-143.

Sjögren K-G, Ahlström T, Blank M, Price TD, Frei KM, Hollund HI (2017) Early Neolithic human bog finds from Falbygden, western Sweden. New isotopic, osteological and histological investigations. Journal of Neolithic Archaeology, 19: 97–124

Sjögren K-G, Axelsson T, Vretemark M (2019) Middle Neolithic economy in Falbygden, Sweden. Preliminary results from Karleby Logården. In Müller J, Hinz M, Wunderlich M (eds.) Megaliths- Societies- Landsacapes. Early monumentality and social differentiations in Northern Europe, Vol. 3. Proceedings of the international the conference "Megaliths, Societies, Landscape, Early Monumentality and Social Differentiation in Neolithic Europe", 16th-20th June 2015 in Kiel. Dr. Rudolf Habelt GmbH, Bonn, pp 705-718.

Sjögren K-G, Axelsson T, Vretemark M, Meiggs D, Price TD, Pike A (2021) Complex cattle exchange in the Scandinavian Funnel Beaker Culture. The case of Falbygden, Sweden. In Ninimäki and Salmi (eds.) Animals on the Move. Themes in European Archaeology, Springer, pp 73-85.

Sjögren K-G, Olalde I, Carver S, Allentoft ME, Knowles T, Kroonen G, et al. (2020) Kinship and social organization in Copper Age Europe. Across-disciplinary analysis of archaeology, DNA, isotopes, and anthropology from two Bell Beaker cemeteries. PLoSONE 15(11): e0241278.

Sjögren K-G and Price T D (2013a) A complex Neolithic economy: isotope evidence for the circulation of cattle and sheep in the TRB of western Sweden. Journal of Archaeological Science, 40: 690–704.

— (2013b) Vegetarians or meat eaters? Enamel δ13C and Neolithic diet at the Frälsegården passage tomb, central Sweden. In Bergerbrant S and Sabatini S (eds.) Counterpoint: Essays in Archaeology and Heritage Studies in Honour of Professor Kristian Kristiansen. Archaeopress, Oxford, pp 690–704.

Sjögren KG Price TD, Ahlström T (2009) Megaliths and Mobility in South-western Sweden. Investigating Relations between a Local Society and its

Neighbours Using Strontium Isotopes. Journal of Anthropological Archaeology 28: 85–101.
Sjögren K-G, Price D, Kristiansen K (2016) Diet and mobility in the corded ware of central Europe. PLoS ONE 11(5): e0155083. https://doi.org/10.1371/journal.pone.0155083
Skoglund P, Malmström H, Omrak A, Raghavan M, Valdiosera C, Gunther T, et al. (2014) Genomic diversity and admixture differs for Stone-Age Scandinavian foragers and farmers. Science, 344(6185): 747–750. https://doi.org/10.1126/science.1253448 PMID: 24762536
Skoglund P, Malmström H, Raghavan M, Storå J, Hall P, Willerslev E, et al. (2012) Origins and Genetic Legacy of Neolithic Farmers and Hunter-Gatherers in Europe. Science, 336(6080): 466–469. https://doi.org/10.1126/science.1216304 PMID: 22539720 17.
Smith LB (1992) Fosterage, Adoption and God-Parenthood: Ritual and Kinship in Medieval Wales. Welsh History Review 16: 1-35.
Smith MJ, Allen MJ, Delbarre G, Booth T, Cheetham P, Bailey P et al. (2016) Holding on to the past: Southern British evidence for mummification and retention of the dead in the Chalcolithic and Bronze Age. Journal of Archaeological Science: Reports, 10: 744-756. DOI: 10.1016/j.jasrep.2016.05.034.
Snoeck C, Brock F, Schulting R J (2014) Carbon exchanges between bone apatite and fuels during cremation: impact on radiocarbon dates. Radiocarbon 56(2): 591–602.
Snoeck C, Jones C, Pouncett J, Goderis S, Claeys P, Mattielli N, Zazzo A, Reimer PJ, Lee-Thorp JA, Schulting RJ (2020) Isotopic evidence for changing mobility and landscape use patterns between the Neolithic and Early Bronze Age in western Ireland. Journal of Archaeological Science: Reports, 30: 102214. https://doi.org/10.1016/j.jasrep.2020.102214
Snoeck C, Schulting RJ, Lee-Thorp JA, Lebon M, Zazzo A (2016) Impact of heating conditions on the carbon and oxygen isotope composition of calcined bone. Journal of Archaeological Science, 65: 32–43.
Sofaer JR (2006) The body as material culture: a theoretical osteoarchaeology. Cambridge University Press, Cambridge.
Sørensen L (2014) From Hunter to Farmer in Northern Europe. Migration and Adaptation during the Neolithic and Bronze Age. Acta Archaeologica Supplementa. Wiley, Oxford.
Soulier P (1998) La France de dolmen et des sépultures collectives (4500-2000 avant J.-C.). Éditions Errance, Paris.
Stensköld E (2004) Att berätta en senneolitisk historia: sten och metall i södra Sverige 2350 - 1700 f. Kr. Dissertation, Department of Archaeology and Classical studies, Stockholm University, Stockholm.
Stjernquist B (1950) En hällkista på Björkön, Skålleruds socken, Dalsland. Hembygden- Färgelanda: Dalslands fornminnes- och hembygdsförbund 1950: 5-38.
Strinnholm A (2001) Bland säljägare och fårfarmare. Struktur och förändring i Västsveriges mellanneolitikum. Coast to coast-book 4. Dissertation, Department of Archaeology and Ancient History, Uppsala University, Uppsala.
Strömberg M (1968) Der Dolmen Trollasten in St Köpinge, Schonen. Acta Archaeologica Lundesia Series In 8 no. 7. Rudolf Habelt Verlag GmbH/ CWK Gleerups Förlag, Bonn/Lund.
— (1971a) Die Megalithgräber von Hagestad - Zur Problematik von Grabbauten und Grabriten. Acta Archaeologica Lundesia Series In 8o, No. 9. Rudolf Habelt Verlag GmbH/CWK Gleerups Förlag, Bonn/Lund.
— (1971b) Gånggriften i Tågarp, Ö. Tommarp. Österlens museum, Simrishamn.
Svensson H (1928) Berättelser förande flyttaning av hällkista samt därvid gjorda iakttagelser, Berga kalkbrott, Torbjörntorp sn, VG. Dnr: 2863/1928, ATA, Stockholm. Unpublished excavation report.
— (1929) Backagården, Tiarp sn, VG, July 3rd. Dnr: 2715/29, ATA, Stockholm. Unpublished excavation report.
— (1930) Kapellgatan, västra nolgården, Falköping stad sn, VG. Dnr: 2083/30, 2498/30, ATA, Stockholm. Unpublished excavation report.
— (1933) Blinningsberg, Falköping stad sn, VG. Dnr: 1019/1933, 918/1933, ATA, Stockholm. Unpublished excavation report.
— (1936) Ledsgården, Gökhem sn, VG. Dnr: 1419/36, ATA, Stockholm. Unpublished report.
— (1940) Skattegården, Vilske-Kleva sn, VG. Dnr: 2616/40, 3271/40, 3409/40, ATA, Stockholm. Unpublished excavation report.

Taffinder J (1998) The Allure of the Exotic. The social use of non-local raw materials during the Stone Age in Sweden. Aun 25. Dissertation, Department of Archaeology and Ancient History, Uppsala University, Uppsala.
Thomas J (1990) Monuments from the inside: The case of the Irish megalithic tombs. World Archaeology 22: 168-178.

— (1996) Time, Culture and Identity. An Interpretative Archaeology. Routledge, London.

Thorsen S (1981) ”Klokkehöj” ved Böjden. Et sydvestfynsk dyssekammer med bevaret primærgrav. KUML 1980: 105–146.

Tilley C (1978) Migration in Modern European History. In McNeil WH and Adams R (eds.) Human Migration: Patterns and Policies. Indiana University Press, Bloomington, pp 48-72.

— (1994) A Phenomenology of Landscape. Places, Paths, and Monuments.Berg, Oxford.

— (1996) An Ethnography of the Neolithic. Early prehistoric Societies in Southern Scandinavia. Cambridge University Press, Cambridge.

— (1999) The Dolmens and Passage graves of Sweden. An introduction and guide. Institute of Archaeology. Institute of Archaeology, University College, London.

Tornberg A (2013) Diet, Health and Agriculture. The Late Neolithic-Early Bronze Age Example of Abbekås, Southern Sweden. Lund Archaeological Review, 19: 7-18.

— (2017) Diet toothache and burial diversity. Tracing social status through bioarchaeological methods in Late Neolithic-Early Bronze Age Scania. Lund Archaeological Review, 22: 21–36.

— (2018) Health, cattle and ploughs: Bioarchaeological consequences of the Secondary Products Revolution in southern Sweden, 2300-1100 BCE. Dissertation, Department of archaeology and ancient history, Lund University, Lund.

Tõrv M and Meadows J (2015) Radiocarbon dates and stable isotope data from the early bronze age burials in Riigiküla I and Kivisaare settlement sites, Estonia. Radiocarbon 57(4): 645-656. DOI: 10.2458/azu_rc.57.18459.

Trigger BG (1969) The Huron. Farmers of the North. Holt, Rinehart & Winston, New York.

Ucko P (1969) Ethnography and archaeological interpretation of funerary remains. World Archaeology 1: 262-280.

Ullenius G (1948) Grävningsberättelser över undersökning av en hällkista samt en kvarstående rest av ett flatröse vid Måns Larsgården, Lilla Balltorp, Torbjörntorp sn, VG, November 27th. Dnr: 5220/1948, ATA, Stockholm. Unpublished excavation report.

van der Plecht J, Bronck Ramsey C, Heaton TJ, Scott EM, Talamo S (2020) Recent Developments in Calibration for Archaeological and Environmental Samples Radiocarbon 62(4):1095–1117. doi:10.1017/RDC.2020.22.

van Gennep A (1960/1909). Les rites de passage. E. Noury, Paris.

Vanhanen S, Gustafsson S, Ranheden H, Björck N, Kemell M, Heyd V (2019) Maritime Hunter-Gatherers Adopt Cultivation at the Farming Extreme of Northern Europe 5000 Years Ago. Scientific Reports, 9: 4756. https://www.nature.com/articles/s41598-019-41293-z

Vandkilde H (1996) From Stone to Bronze. The Metalwork of the Late Neolithic and Earliest Bronze Age in Denmark. Dissertation, Aarhus University, Jutland Archaeological Society. Aarhus University Press, Aarhus.

— (2013) Warfare in northern European Bronze Age societies. Twentieth-Century presentations and recent archaeological research inquiries. In Ralph S (ed.) The Archaeology of Violence: Interdisciplinary Approaches. Albany, New York, pp 37–62.

— (2014) Breakthrough of the Nordic Bronze Age: Transcultural warriorhood and a Carpathian crossroad in the 16th century BC. European Journal of Archaeology, 17(4): 602-633.

— (2016) Bronzization: the Bronze Age as pre-modern globalization. Praehistorische Zeitschrift 91: 103–223.

Vandkilde H, Becker K, Northover P, Stos-Gale Z (2017) The metal hoard from Pile in Scania, Sweden: place, things, time, metals, and worlds around 2000 BCE. Aarhus Universitetsforlag/The Swedish History Museum, Aarhus/Stockholm.

von der Luft M, Nyqvist R, Wennberg T (2012) Bortom Älven. Arkeologiska undersökningar utmed E45:ans nya sträckning, delsträckan Torpa–Stenröse. Kulturhistoriska rapporter 131, Rio kulturkooperativ. Nordbloms Trycksaker AB, Hamburgsund.

von Hackwitz K (2009) Längs med Hjälmarens stränder och förbi : relationen mellan den gropkeramiska kulturen och båtyxekulturen. Dissertation, Department of Archaeology and Classical studies, Stockholm University, Stockholm.

Vretemark M (1996) Kraniet från Hanaskede – vår äldste skaraborgare. Västergötlands Fornminnesförenings Tidskrift 1995-96(1996): 212-214.

Watts P and Howe P (2010) Strontium and strontium compounds. Concise International Chemical Assessment Document. 77. World Health Organization (WHO), Geneva, Switzerland, pp 1-67.

Weiler E (1977) Fornlämning 5, hällkista. Raä och SHM Rapport UV 1977:18. Riksantikvarieämbetet, Stockholm.

— (1994) Innovationsmiljöer i bronsålderns samhälle och idévärld: kring ny teknologi och begravningsritual i Västergötland. Dissertation, Umeå Universitet, Umeå.

Weiner A (1992) Inalienable Possessions: The paradox of keeping-while-giving. University of California Press, Berkley.

Werner H (1870) Antiquariska berättelser afgifna till Westergötlands fornminnesförening. Norrtälje.

— (1873) Antiquariska berättelser afgifna till Westergötlands fornminnesförening II. Stockholm.

Weitzel EM, Codding BF, Carmody SB, Zeanah DW (2020) Food Production and Domestication Produced Both Cooperative and Competitive Social Dynamics in Eastern North America. Environmental Archaeology. DOI: 10.1080/14614103.2020.1737394

Whitley J (1995) 'Tomb Cult and Hero Cult. The Uses of the Past in Archaic Greece', in Time, Tradition and Society in Greek Archaeology. Bridging the 'Great Divide', ed. by Nigel Spencer Routledge, London, pp 43–63.

Whittle A, Healy F, Bayliss A (2011) Gathering Time: Dating the Early Neolithic Enclosures of Southern Britain and Ireland. Oxbow, Oxford and Oakville.

Wilhelmson H (2003) Hjelmarsrör, en jämförande studie av ett återuppgrävt gånggriftsmaterial från Falbygden. Department of archaeology and ancient history, Lund University, Lund. Unpublished paper (C-uppsats).

Wunderlich M (2019a) Social implications of megalithic construction. A case study from Nagaland and Northern Germany. In Müller J, Hinz M, Wunderlich M (eds.) Megaliths- Societies- Landscapes. Early monumentality and social differentiations in Northern Europe, Vol. 3. Proceedings of the international the conference "Megaliths, Societies, Landscape, Early Monumentality and Social Differentiation in Neolithic Europe", 16th-20th June 2015 in Kiel. Verlag Dr. Rudolf Habelt GmbH, Bonn, pp 1133-1152.

— (2019b) Megalithic Monuments and Social Structures. Comparative Studies on Recent and Funnel Beaker Societies. Dissertation, Scales of Transformation 5. Sidestone, Leiden.

— (2020) Celebrating stones – megalith building traditions among Angami-Naga, northeast India. In Gebauer AB, Sørensen L, Teather A, Valera AC (eds.) Monumentalising life in the Neolithic narratives of change and continuity. Oxbow, Oxford and Philadelphia, pp 139-150.

Wunderlich M, Jamir T, Müller J, Rassman K, Vasa D (2021) Societies in balance: Monumentality and feasting activities among southern Naga communities, Northeast India. PLoSONE 16(3): e0246966. https://doi.org/10.1371/journal.pone.0246966

Zazzo A, Lebon M, Chiotti L, Comby C, Delque-Količ E, Nespoulet R, Reiche I (2013) Can we use calcined bone for 14C dating the Paleolithic? Radiocarbon 55(2–3): 1409–1421.

Zazzo A, Saliège J-F, Lebon M, Lepetz S, Moreau C (2012) Radiocarbon dating of calcined bones: Insights from combustion experiments under natural conditions. Radiocarbon 54(3-4): 855–66.

Zuckerman MK and Armelagos GJ (2011) The origins of biocultural dimensions. In Agarwal SC and Glencross BA (eds.) Social bioarchaeology. Wiley-Blackwell, Chichester.

Appendix 1.
Isotopic and bioarchaeological data

The sampled skull M10, recovered from the Knaggården passage grave. Photo by Malou Blank, graphics Richard Blank.

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, $\delta^{13}C$, $\delta^{15}N$ collagen	Uncal BP	±	Cal BC/AD, 95.4%
	Bohuslän	Bokenäs	72:1	Kavlanda	GG	BoBo1	In chamber	Human	M2, dexter, mand.	UBA-33498	3507	40	1937-1700
35	VG-Falbygden	Borgunda	106:1	Brunnsgården	GG	B1	In chamber/ante-chamber	Human	PM2, sin, mand.	UBA-37923	3429	36	1877-1639
35	VG-Falbygden	Borgunda	106:1	Brunnsgården	GG	B2	In chamber/ante-chamber	Human	PM2, sin, mand.	UBA-37924	3563	43	2027-1771
35	VG-Falbygden	Borgunda	106:1	Brunnsgården	GG	B3	In chamber	Human	C, dexter, mand.	UBA-37925	3441	35	1880-1663
F	VG-Falbygden	Dimbo	18:2	Gästgivaregården	GG	Dim1	In chamber	Bos taurus^	Bone needle	BRAMS-4216	3662	27	2137-1952
F	VG-Falbygden	Dimbo	18:2	Gästgivaregården	GG	Dim2	In chamber/ante-chamber	Bos taurus^	Bone needle	BRAMS-4217	3611	27	2110-1889
11	VG-Falbygden	Falköping		Blinningsberg	GG	FB3	Northwestern part of chamber	Human	Humerus, sin	UBA-36819	4402	45	3326-2908
11	VG-Falbygden	Falköping		Blinningsberg	GG	FB2	Northwestern part of chamber	Human	Humerus, sin	UBA-36820	4384	64	3331-2892
11	VG-Falbygden	Falköping		Blinningsberg	GG	FB1	Northwestern part of chamber	Human	PM1, sin, mand.	UBA-28119	4465	32	3339-3023
11	VG-Falbygden	Falköping		Blinningsberg	GG	FB1	Northwestern part of chamber	Human					
19	VG-Falbygden	Falköping		Kapellgatan	GG	KAP1	In chamber	Human	M2, sin, mand.	UBA-37921	3650	35	2137-1930
15	VG-Falbygden	Falköping	3:1	Hjälmarsrör	PG	FS3:2/ F517	(A1) in mound outside chamber wall	Human (burnt)	Humerus	UBA-29930	2583	29	811-592
15	VG-Falbygden	Falköping	3:1	Hjälmarsrör	PG	FS3:1/ F521	(A2) in mound outside chamber wall	Human (burnt)	Calvaria	UBA-29928	2601	26	811-771
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F134	Layer 3, southern part of chamber	Human	M1, sin, mand.	UBA-30735	3631	42	2135-1891
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F132VI:3	Layer 3, southern part of chamber	Human	M2, sin, mand.	UBA-30737	3639	35	2134-1911
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F69	Upper part, southern part of chamber	Human	M2, dexter, mand.	UBA-30742	3642	32	2134-1921
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F147VI:4	Layer 4, southern part of chamber	Human	M2, dexter, mand.	UBA-30745	3624	31	2121-1896
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F121	Layer 3, southern part of chamber	Human	M2, dexter, mand.	UBA-30749	3595	33	2110-1880
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F88	Ante-chamber	Human	DPM2, dexter, mand.	UBA-30753	3609	41	2132-1880
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F90	Upper part, northern part of chamber	Human	DPM2, dexter, mand.	UBA-30758	3500	31	1910-1704
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F129V2:2	Layer 2, under roof slab, western part of chamber	Human	M1, dexter, mand.	UBA-30762	3697	37	2201-1975
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F115II:2	Layer 2, southern part of chamber	Human	M2, dexter, mand.	UBA-30763	3654	34	2137-1940
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F139VII:2	Layer 2, northern part of chamber	Human	M2, dexter, mand.	UBA-30764	3598	31	2031-1886

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
3,2	-21,1	9,8	n.a		n.a	n.a		n.d.	Adult			n.a				paper II and V
3,16	-20,9	10,4	PM2, sin, mand.	MA-197108	n.a	0,72238	0,00001	n.d.	20-40 y		Aija Macane, GU	PM2, sin, mand.	med027	XX	T2b5	paperII, IV and V
3,16	-21	10,3	PM2, sin, mand.	MA-197109	n.a	0,72026	0,00002	n.d.	20-40 y		Aija Macane, GU	PM2, sin, mand.	med028	n.d.	n.d.	paperII, IV and V
3,19	-21,1	9,1	C, dexter, mand.	MA-197110	n.a	0,72144	0,00006	n.d.	20-40 y		Aija Macane, GU	C, dexter, mand.	med029	XX	T2b+ 16362	paperII, IV and V
3,4	-21,86	5,5														paper V
3,3	-21,17	5,49														paper V
3,18	-20,7	10,2						n.d.	Adult		Aija Macane, GU					paper II and V
3,17	-21,1	8,8						n.d.	Adult		Aija Macane, GU					paper II and V
3,16	-21	11	M1, dex-ter, mand.	MA-150313	-14,1	0,71432	0,00002	n.d.	13-19 y		Jan Storå, SU	Tooth root	med025	XX	H2a	paper II, IV, V and Blank and Knipper 2021
			M2, dex-ter, mand.	MA-150314	-14,4	0,71597	0,00002									paper IV and V
3,14	-21,2	9,5	M2, sin, mand.	MA-197107	n.a	0,71874	0,00002	Male	20-40 y		Aija Macane, GU	M2, sin, mand.	med031	XY	n.d.	paper II, IV and V
								n.d.	40-60 y	>700°	Leena Drenzel, SHM, Åsa M Larsson, RAÄ					paper VI
								n.d.	30-50 y	>700°	Leena Drenzel, SHM, Åsa M Larsson, RAÄ					paper VI
3,23	-20,4	9,3	M1, sin, mand.	MA-155615	-15,4	0,7187	0,00004	n.d.	12-20 y		Anna Tornberg, LU					paper I
3,22	-20,7	8,9	M2, sin, mand.	MA-155602	-13,57	0,71424	0,00001	Male	25-35 y		Anna Tornberg, LU					paper I
3,18	-20,5	9,1	M2, dexter , mand.	MA-155607	-14,44	0,71582	0,00002	Male	20-30 y		Anna Tornberg, LU					paper I
3,21	-20,6	8,4	M2, dex-ter, mand.	MA-155599	-14,26	0,71485	0,00001	Male	20-30 y		Anna Tornberg, LU					paper I
3,17	-20,8	9,3	M2, dex-ter, mand.	MA-155604	-14,36	0,71939	0,00001	Fe-male	>35 y		Anna Tornberg, LU	PM2, sin, mand.				paper I and ongoing study by GeoGenetics Centre, Copenhagen.
3,22	-21,4	10,5	DPM2, dexter, mand.	MA-155614	-15,59	0,71883	0,00001	n.d.	4-5 y		Anna Tornberg, LU					paper I
3,24	-20	10,8	DPM2, dexter, mand.	MA-155612	-13,94	0,72631	0,00001	n.d.	3-4 y		Anna Tornberg, LU	DC, dexter, mand.				paper I and ongoing study by GeoGenetics Centre, Copenhagen.
3,2	-21,1	9,5	M1,dexter, mand.	MA-155603	-15,7	0,72016	0,00001	Male?	>40 y		Anna Tornberg, LU					paper I
3,16	-20,6	8,9	M2, dex-ter, mand.	MA-155609	-13,96	0,71543	0,00002	Male	15-20 y		Anna Tornberg, LU	PM1, dexter, mand.				paper paper I and ongoing study by GeoGenetics Centre, openhagen.
3,18	-21,1	9,1	M2, dex-ter, mand.	MA-155611	-14,89	0,71803	0,00002	n.d.	25-35 y		Anna Tornberg, LU					paper I

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, $\delta^{13}C$, $\delta^{15}N$ collagen	Uncal BP	±	Cal BC/AD, 95.4%
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F122	Layer 4, southern part of chamber	Human	M2, dexter, mand.	UBA-30765	3602	33	2112-1883
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F117	Layer 4, northern part of chamber	Human	M2, dexter, mand.	UBA-30766	3679	32	2190-1961
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F108IV:3	Layer 3, northern part of chamber	Human	M2, dexter, mand.	UBA-30767	3562	49	2030-1756
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F123	Upper layer	Human	M2, dexter, mand.	UBA-30768	3491	33	1902-1697
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F118	Layer 3, northern part of chamber	Human	M1, dexter, mand.	UBA-30769	3560	33	2018-1774
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F83III:1	Layer 1, northern part of chamber	Human	M2, sin, mand.	UBA-30770	3420	33	1974-1630
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F119	Layer 3, northern part of chamber	Human	DM2, dexter, mand.	UBA-30771	3638	35	2134-1910
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F120	Layer 3, southern part of chamber	Human	M1, dexter, mand.	UBA-30772	3706	36	2202-1980
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F128	Layer 3, northern part of chamber	Human	M3, dexter, mand.	UBA-30773	3680	33	2192-1960
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F98	Layer 2, northern part of chamber	Human	DM2, dexter, mand.	UBA-30774	3640	33	2134-1916
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F124	Layer 3, northern part of chamber	Human	M2, dexter, mand.	UBA-30775	3600	33	2112-1882
14	VG-Falbygden	Falköping	5:2	Fredriksberg	GG	F135VI-II:2	Layer 2, southern part of chamber	Human	Femur	UBA-34564	3619	31	2119-1892
13	VG-Falbygden	Falköping	7:1	Frugården	PG	FS7:1	In chamber, nische C	Human (burnt)	Cranium frag.	UBA-29935	2215	26	380-197
16	VG-Falbygden	Falköping	19:1	Lusthushögen	PG	FS19:1	In chamber	Human (burnt)	Occipitale frag.	UBA-29934	failed		
17	VG-Falbygden	Falköping	22:1	Rantens torgplats	GG/D	F6593:1	In chamber	Human	Radius	UBA-39578	4432	39	3331-2923
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	M1	B38, in chamber	Human	I2, dexter, mand.	Ua-48040	4140	32	2875-2620
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	M2	B12, in chamber	Human	C, sin, mand.	Ua-48039	4456	55	3346-2931
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	M2	B12, in chamber	Human	C, sin, mand.	UBA-26334	4319	68	3322-2700
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	M3	B3, in chamber	Human	M2	Ua-48036	4256	43	3010-2679
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	M3	B3, in chamber	Human	M2	UBA-28507	4368	32	3089-2906
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	M4	B5, in chamber	Human	M2, sin, max.	Ua-48037	4343	63	3325-2875
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	M4	B5, in chamber	Human	M2, sin, max.	UBA-28508	4418	42	3329-2916

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
3,17	-20,8	8,3	M2, dexter, mand.	MA-155605	-11,7	0,71675	0,00002	Male?	40-50 y		Anna Tornberg, LU	C, sin, mand.				paper I and ongoing study by GeoGenetics Centre, Copenhagen.
3,16	-20,5	9,1	M2, dexter, mand.	MA-155601	-14,81	0,7147	0,00002	Female?	ca 20 y		Anna Tornberg, LU					paper I
3,15	-21	10,7	M2, dexter, mand.	MA-155616	-14,4	0,72267	0,00002	Male?	45-55 y		Anna Tornberg, LU	PM1, dexter, mand.				paper I and ongoing study by GeoGenetics Centre, Copenhagen.
3,15	-21,1	8,5	M2, dexter, mand.	MA-155610	-14,71	0,73269	0,00003	Female?	>40 y		Anna Tornberg, LU	PM2, dexter, mand.				paper I and ongoing study by GeoGenetics Centre, Copenhagen.
3,15	-21	8,6	M1, dexter, mand.	MA-155619	-14,83	0,71697	0,00003	Male	13-15 y		Anna Tornberg, LU					paper I
3,18	-20,9	10,6	M2, sin, mand.	MA-155600	-14,28	0,72645	0,00001	Male?	>30 y		Anna Tornberg, LU	Canine, sin , mand.				paper I and ongoing study by GeoGenetics Centre, Copenhagen.
3,21	-20,4	10,4	DPM2, dexter, mand.	MA-155613	-15,1	0,7172	0,00003	n.d.	ca 6 y		Anna Tornberg, LU					paper I
3,21	-20,5	10,8	M2, dexter, mand.	MA-155617	-14,03	0,7155	0,00001	Female	>40 y		Anna Tornberg, LU					paper I
3,19	-21,6	9,9	M3, dexter, mand.	MA-155618	-16,06	0,72098	0,00002	Female	20-40 y		Anna Tornberg, LU					paper I
3,22	-20,8	9,9	DPM2, dexter, mand.	MA-155606	-14,83	0,71924	0,00003	n.d.	3 y		Anna Tornberg, LU	DPM1, dexter, mand.				paper I and ongoing study by GeoGenetics Centre, Copenhagen.
3,21	-21,4	9,9	M2, dexter, mand.	MA-155608	-15,45	0,719	0,00002	Male	>45 y		Anna Tornberg, LU					paper I
3,19	-20,8	8,7	n.a	n.a	n.a	n.a		n.d.	Adult		Anna Tornberg, LU					paper II and V
								n.d.	n.d.	>700°	Leena Drenzel, SHM, Åsa M Larsson, RAÄ					paper VI
								n.d.	n.d.	Lightly burned, halfcarbonized	Leena Drenzel, SHM					paper VI
3,24	-21	8,9						n.d.	Adult		Johnny Karlsson, SHM					paper II and V
n.d.	-21,7	n.d.	I2, dexter, mand.	MA-151002	n.a	0,71001	0,00001	n.d.	20-40 y		Maria Vretemark, VGM	n.a				paper II and Blank and Knipper 2021
n.d.	-21,8	n.d.			n.a			n.d.	30-50 y		Maria Vretemark, VGM	n.a				paper II
n.d.	n.d.	n.d.	PM	MA-151003	n.a	0,71441	0,00001	n.d.	30-50 y		Maria Vretemark, VGM	n.a				paper II and Blank and Knipper 2021
n.d.	-22	n.d.			n.a			n.d.	20-30 y		Maria Vretemark, VGM	n.a				paper II
3,16	-20,6	9,5	M2	MA-151004	n.a	0,71502	0,00002	n.d.	20-30 y		Maria Vretemark, VGM	n.a				paper II, Blank 2019 and Blank and Knipper 2021
n.d.	-20,8	n.d.						n.d.	20-30 y		Maria Vretemark, VGM	n.a				paper II
3,13	-21,2	10,2	M2, sin, max.	MA-151005	n.a	0,71674	0,00002	n.d.	20-30 y		Maria Vretemark, VGM	n.a				paper II, Blank 2019 and Blank and Knipper 2021

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, δ13C, δ15N collagen	Uncal BP	±	Cal BC/AD, 95.4%
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	M5	B5, in chamber	Human	PM, sin, max.	Ua-48038	4119	52	2877-2504
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	F26:B1	B39, in chamber	Human	Radius	UBA-36488	4284	55	2924-2627
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	F26:B2	B22, in chamber	Human	Humerus	UBA-36489	4337	45	3090-2887
18	VG-Falbygden	Falköping	26:1	Järnvägens/Ran-tens	GG/D	B20/ M23	In cairn	Human (burnt)	Tibia	UBA-25677	2628	36	897-769
12	VG-Falbygden	Falköping östra	1:1	Firse sten	PG	M20	F22, in the rebuilt passage, northern part	Human	M2, max.	UBA-25388	3564	32	2021-1776
12	VG-Falbygden	Falköping östra	1:1	Firse sten	PG	M21	F23, in the en-trance area	Human	M3, max.	UBA-25893	4377	34	3091-2910
12	VG-Falbygden	Falköping östra	1:1	Firse sten	PG	M22	F33, northeastern part of the chamber	Human	M2, sin, max.	UBA-25390	4302	31	3011-2881
12	VG-Falbygden	Falköping östra	1:1	Firse sten	PG	M29	F28, in surround-ing mound	Human	C, mand.	UBA-25683	2882	32	1193-940
12	VG-Falbygden	Falköping östra	1:1	Firse sten	PG	TSFÖ1B	F34, in surround-ing mound	Human	Femur	UBA-34281	2921	36	1221-1010
12	VG-Falbygden	Falköping östra	1:1	Firse sten	PG	TSFÖ1A	F43, nortwestern part of chamber	Human	Femur	UBA-34280	4332	39	3083-2889
12	VG-Falbygden	Falköping östra	1:1	Firse sten	PG	TSFÖ1C	F40, in rebuilt passage	Human	Ulna	UBA-34282	3428	55	1887-1616
24	VG-Falbygden	Gökhem		Torsagården	GG	GHTors:1	In chamber	Human	M3, dexter, mand.	UBA-29931	3509	32	1922-1746
24	VG-Falbygden	Gökhem		Torsagården	GG	TOG2	In chamber	Human	Pars petrosa	UBA-37920	3569	42	2031-1772
24	VG-Falbygden	Gökhem		Torsagården	GG	GHTors:2	In chamber/cairn	Human (burnt)	Cranium frag.	UBA-29932	2445	29	751-411
22	VG-Falbygden	Gökhem	24:1	Ledsgården	PG	GHLeds:1	In mound	Human (burnt)	Long bone	UBA-29933	2480	26	771-482
23	VG-Falbygden	Gökhem	31:1	Nästegården	PG	GH31:4	F13, C4c, in entrance cairn	Human	M1	UBA-33497	4257	47	3011-2679
23	VG-Falbygden	Gökhem	31:1	Nästegården	PG	M27	In entrance area: trench II D1a	Human (burnt)	Long bone	UBA-25681	4458	30	3338-3017
23	VG-Falbygden	Gökhem	31:1	Nästegården	PG	GH31:3	In entrance area: trench II:E3b 30-	Human (burnt)	Long bone	UBA-29925	4402	26	3261-2917
23	VG-Falbygden	Gökhem	31:1	Nästegården	PG	GH31:2	In entrance area: D4a-20-30	Human (burnt)	Long bone	UBA-29924	4350	27	3073-2901
23	VG-Falbygden	Gökhem	31:1	Nästegården	PG	GH31:1/ F13	In entrance area: C4c	Human (burnt)	Long bone	UBA-29923	4515	54	3370-3026
28	VG-Falbygden	Gökhem	71:1	Hovmansgården	PG	M28	In mound behind the chamber, trench I: 3,10-0,85	Human (burnt)	Cranium frag.	UBA-25682	4584	38	3508-3103

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
n.d.	-21,6	n.d.	PM, sin, max.	MA-151006	n.a	0,71002	0,00002	n.d.	20-30 y		Maria Vretemark, VGM	n.a				paper II and Blank and Knipper 2021
3,23	-21,1	9,6						n.d.	Adult		Maria Vretemark, VGM					paper II and V
3,21	-21,1	9,7						n.d.	Adult		Maria Vretemark, VGM					paper II and V
								Female	Adult	>700°	Maria Vretemark, VGM, Åsa M Larsson, RAÄ					Blank 2017
3,16	-20,5	10,3	M2, max.	MA-141166	-15,94	0,71483	0,00001	n.d.	13-19 y		Maria Vretemark, VGM					paper II, Blank 2019 and Blank and Knipper 2021
3,19	-20,2	10,2	M3, dexter, max.	MA-141167	-14,07	0,71482	0,00001	n.d.	20-35 y		Maria Vretemark, VGM					paper II, Blank 2019 and Blank and Knipper 2021
3,22	-20,2	10,7	M2, sin, max.	MA-141168	-13,98	0,71747	0,00001	Female	17-20 y		Maria Vretemark, VGM					paper II, Blank 2019 and Blank and Knipper 2021
3,17	-20	10,2	C, mand.	MA-145303	-13,38	0,71362	0,00001	Male	20-40 y	Same individual as F34, TSFÖ1B	Maria Vretemark, VGM	M				paper IV, V, Blank 2017 and ongoing study by Geogenetics Centre, Copenhagen.
3,17	-19,8	9,4						n.d.	n.d.	Same individual as F28	Maria Vretemark, VGM					Hollund et al. 2018
3,19	-20,4	10,6						n.d.	n.d.		Maria Vretemark, VGM					Hollund et al. 2018
3,15	-21,9	9,7						n.d.	n.d.		Maria Vretemark, VGM					Hollund et al. 2018
3,17	-20,8	9,4						n.d.	Adult		Astrid Lennblad, BM					paper II and Blank 2019
3,19	-21,9	10,8						n.d.	juvenile		Aija Macane, GU					paper II and V
								n.d.	n.d.	Fully calcined/ >700°	Aija Macane, GU, Åsa M Larsson, RAÄ					paper VI
								n.d.	n.d.	C. 800°C	Leena Drenzel, SHM, Åsa M Larsson, RAÄ					Blank 2017
3,2	-21	10,4						n.d.	n.d.		Maria Vretemark, VGM					paper II and V
								n.d.	n.d.	At least 700 to 800°C	Maria Vretemark, VGM, Åsa Larsson, RAÄ					paper VI
								n.d.	n.d.	At least 700 to 800°C	Maria Vretemark, VGM, Åsa Larsson, RAÄ					paper VI
								n.d.	n.d.	C. 800°C	Maria Vretemark, VGM, Åsa Larsson, RAÄ					paper VI
								n.d.	n.d.	At least 700 to 800°C	Maria Vretemark, VGM, Åsa Larsson, RAÄ					paper VI
								n.d.	n.d.	>700°C	Maria Vretemark, VGM, Åsa Larsson, RAÄ					paper VI

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, $\delta^{13}C$, $\delta^{15}N$ collagen	Uncal BP	±	Cal BC/AD, 95.4%
28	VG-Falbygden	Gökhem	71:1	Hovmansgården	PG	GH71:1/ A4b	In mound in front of entrance, trench II-0,5	Human (burnt)	Long bone	UBA-29922	2244	49	397-178
29	VG-Falbygden	Gökhem	78:1	Ormarör	PG	M24	In mound, trench I: 0,8-1,3 m	Human (burnt)	Femur/tibia	UBA-25678	2233	29	388-201
25	VG-Falbygden	Gökhem	94:1	Frälsegården	PG	GH94A, F74	Plough layer, x99y112,	Human	Femur	UBA-29929	4188	45	2896-2631
26	VG-Falbygden	Gökhem	94:2	Frälsegården	MG	M6	Plough layer	Human	M1, dexter, mand.	Ua-48041	4371	37	3091-2906
27	VG-Falbygden	Gökhem	164:1	Frälsegården	D	G164:1	In chamber	Human	M1, max.	UBA-39579	4445	36	3335-2931
E	VG-Falbygden	Högstena	45:1	Olof Ingemars-gården	GG	Hog1	In chamber	Ovis^	Bone awl	BRAMS-4214	3801	27	2341-2141
9	VG-Falbygden	Karleby	57:1	Klövatomten	PG	M42	Chamber/passage	Human	PM1, max.	UBA-25800	4433	36	3330-2925
9	VG-Falbygden	Karleby	57:1	Klövatomten	PG	M43	Chamber/passage	Human	PM1, max.	UBA-25801	4410	34	3317-2916
8	VG-Falbygden	Karleby	59:1	Logårds kulle	PG	M11	In chamber, no:25, Rno:24	Human	M2, sin, max.	UBA-25377	3496	37	1920-1697
8	VG-Falbygden	Karleby	59:1	Logårds kulle	PG	M12	In passage, no:31	Human	C, sin, max.	UBA-25378	3445	32	1880-1683
8	VG-Falbygden	Karleby	59:1	Logårds kulle	PG	M13	In passage, no:26, Lidén shm 33	Human	M2, sin, mand.	UBA-25379	4404	42	3324-2910
8	VG-Falbygden	Karleby	59:1	Logårds kulle	PG	M16, 5386b-22	In chamber, no:20, Rno:21, Lidén shm 36	Human	Cranium frag.	OxA-22002	3600	30	2031-1888
8	VG-Falbygden	Karleby	59:1	Logårds kulle	PG	K59:2	Bottom of the chamber	Human (burnt)	Tibia	UBA-29927	1218	33	683-890
8	VG-Falbygden	Karleby	59:1	Logårds kulle	PG	K59:1	Bottom of the chamber	Human (burnt)	mand.	UBA-29926	failed		
7	VG-Falbygden	Karleby	71:1	Utbogården	GG	M14	In small chamber, 78	Human	M2, sin, mand.	UBA-25380	3552	40	2018-1766
7	VG-Falbygden	Karleby	71:1	Utbogården	GG	M15	In small chamber, 78	Human	M2, sin, mand.	UBA-25381	3286	34	1643-1463
7	VG-Falbygden	Karleby	71:1	Utbogården	GG	M17	In large chamber, 70(45)	Human	M2,dexter, max.	UBA-25382	3358	35	1743-1533
7	VG-Falbygden	Karleby	71:1	Utbogården	GG	M46	In large chamber, 49(74)	Human	Cranium frag.	UBA-25894	3486	39	1912-1693
7	VG-Falbygden	Karleby	71:1	Utbogården	GG	M57	In large chamber, 48(73)	Human	Cranium frag.	UBA-26165	3335	50	1742-1504
7	VG-Falbygden	Karleby	71:1	Utbogården	GG	M58	In large chamber	Human	Cranium frag.	UBA-26166	4432	37	3330-2924

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
								n.d.	n.d.	c. 800°C	Maria Vretemark, VGM, Åsa Lars-son, RAÄ					paper VI
								Fe-male	30-50	>700°C	Maria Vretemark, VGM, Åsa M Larsson, RAÄ					paper VI
3,17	-20,8	10						n.d.	n.d.		Torbjörn Ahl-ström, LU					Hollund et al. 2018
n.d.	-20,9							n.d.	Adult		Torbjörn Ahl-ström, LU					paper II
3,19	-21	9,7						Male	Adult		Svensson 1934b					paper II and V
3,3	-21,03	4,21														paper V
3,23	-20,8	11,3	PM1, max.	MA-151007	n.a	0,71556	0,00002	n.d.	n.d.		Leena Drenzel, SHM					paper II, Blank 2019 and Blank and Knipper 2021
3,23	-20,6	10,7	PM1, max.	MA-151008	n.a	0,71564	0,00001	n.d.	n.d.		Leena Drenzel, SHM					paper II, Blank 2019 and Blank and Knipper 2021
3,12	-20,2	9,1	M2, sin, max.	MA-140451	-14,48	0,7153	0,00001	Fe-male	>20 y		Retzius 1899, Rno 24					paper II, Blank 2019 and Blank and Knipper 2021
3,12	-20,3	10,7	C, sin, max.	MA-140452	-13,58	0,71513	0,00001	Male?	>20 y		Retzius 1899, no 31					paper II, Blank 2019 and Blank and Knipper 2021
3,14	-20,4	10,4	M2, sin, mand.	MA-140453	-13,79	0,71509	0,00001	Male	>20 y		Retzius 1899, no 26					paper II, Blank 2019 and Blank and Knipper 2021
3,3	-21,1	8,4	M3, sin, max.	MA-140456	-15,59	0,7199	0,00001	Male	>20 y	An-te-mor-tem fracture to mandi-ble, lost teeth-healed	Fibiger et al. 2013, Anna Torn-berg, LU					paper V, Fibiger et al. 2013 and Blank and Knipper 2021
								n.d.	Adult	600-800°C	Leena Drenzel, SHM, Åsa Lars-son, RAÄ					paper VI
								n.d.	Adult	<600°C	Leena Drenzel, SHM					paper VI
3,1	-20,4	9,4	M2, sin, mand.	MA-140454	-13,34	0,71466	0,00001	n.d.	<18 y		Anna Tornberg, LU, Retziuz 1899	n.a				paper II, Blank 2019 and Blank and Knipper 2021
3,14	-19,7	11,3	M2, sin, mand.	MA-140455	-14,02	0,71378	0,00001	Male	20-40 y		Anna Tornberg, LU, Retziuz 1899	n.a				paper IV, Blank 2017 and Blank 2019
3,13	-20	10,8	M2, dex-ter, max.	MA-140457	-14,72	0,71546	0,00001	Fe-male	20-40 y		Anna Tornberg, LU, Retziuz 1899	n.a				Blank 2017, Blank 2019 and Blank and Knipper 2021
3,26	-20,8	10,9	n.a	n.a	n.a	n.a		Male	Adult		Anna Tornberg, LU, Retziuz 1899					paper II and Blank 2019
3,31	-20,9	9	n.a	n.a	n.a	n.a		Male	Adult		Anna Tornberg, LU, Retziuz 1899					Blank 2017 and Blank 2019
3,18	-21,2	9,2	n.a	n.a	n.a	n.a		n.d.	Adult		Anna Tornberg, LU, Retziuz 1899					paper II and Blank 2019

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, $\delta^{13}C$, $\delta^{15}N$ collagen	Uncal BP	±	Cal BC/AD, 95.4%
7	VG-Falbygden	Karleby	71:1	Utbogården	GG	M59	In large chamber	Human	Cranium frag.	UBA-26167	3214	46	1611-1413
7	VG-Falbygden	Karleby	71:1	Utbogården	GG	M60	In large chamber, 47	Human	Cranium frag.	UBA-26335	3548	43	2017-1753
7	VG-Falbygden	Karleby	71:1	Utbogården	GG	K71A	In large chamber, S20	Human	Cranium frag.	UBA-28504	3527	41	1965-1743
7	VG-Falbygden	Karleby	71:1	Utbogården	GG	M71KO	In large chamber	Bos taurus	Long bone	UBA-30776	1405	33	585-669
H	VG-Falbygden	Karleby	94:1	Klövagården	S	F1523		Bos taurus	Scapula	UBA-36405	3598	31	2031-1886
6	VG-Falbygden	Karleby	105:1	Holma	PG	MK105:1	Fno. 29, in chamber	Human	M1, dexter, mand.	UBA-28506	4218	33	2905-2679
6	VG-Falbygden	Karleby	105:1	Holma	PG	MK105:2	Fno. 34, in chamber	Human	PM	UBA-28505	3730	31	2270-2031
30	VG-Falbygden	Kinneved	21:1	Slutarp	D	MKIN1	In chamber	Human	Pars petrosa	UBA-29919	4561	40	3492-3103
31	VG-Falbygden	Kinneved	73:1	Fastarp mossgård	GG	Kin1	In chamber	Human	Metacarpe	UBA-36813	3432	31	1877-1646
31	VG-Falbygden	Kinneved	73:1	Fastarp mossgård	GG	Kin2	In chamber	Human	DC	UBA-36814	3497	33	1911-1700
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	M7	In chamber/passage	Human	M2, dexter, max.	UBA-25892	4574	34	3496-3107
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	M7	In chamber/passage	Human	M2, dexter, max.	Ua-48068	4664	34	3620-3364
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	M8	In chamber/passage	Human	M2, sin, max.	UBA-31649	3687	30	2196-1974
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	M8	In chamber/passage	Human	M2, sin, max.	Ua-48069	3687	31	2196-1972
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	M18/M9	In chamber/passage	Human	PM1, dexter, max.	UBA-31651	3476	40	1895-1690
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	M18/M9	In chamber/passage	Human	PM1, dexter, max.	Ua-48070	3705	34	2201-1981
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	M10	In chamber/passage	Human	M1, sin, max.	UBA-31650	4403	33	3308-2913
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	M10	In chamber/passage	Human	M1, sin, max.	Ua-48071	4603	35	3514-3126
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	M19, 10352-3	In chamber/passage	Human	Cranium frag.	OxA-22005	3459	32	1881-1691
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	ML16:1	In chamber/passage	Human	Cranium frag.	UBA-28509	3536	40	1973-1749
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	ML16:2	In chamber/passage	Human	Cranium frag.	UBA-28510	3420	36	1876-1627
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	ML16:3	In chamber/passage	Human	Cranium frag.	UBA-28511	3569	37	2026-1776

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
3,23	-20,8	8,9	n.a	n.a	n.a	n.a		n.d.	Adult	Ante-mortem fracture	Anna Tornberg, LU, Retzius 1899					Blank 2017 and Blank 2019
n.d.	n.d.	n.d.	n.a	n.a	n.a	n.a		n.d.	Adult		Anna Tornberg, LU, Retzius 1899					paper II
3,19	-20,8	9,6	n.a	n.a	n.a	n.a		n.d.	Adult		Anna Tornberg, LU, Retzius 1899					paper II and Blank 2019
3,18	-22,3	4,7	n.a	n.a	n.a						Anna Tornberg, LU					paper II and this publication
3,27	-21,2	4,2									Maria Vretemark, VGM					paper V
3,15	-21,3	9,6	M1, dexter, mand.	MA-151009	n.a	0,71709	0,00002	n.d.	Adult	Worn teeth	Maria Vretemark, VGM					paper II, Blank 2019 and Blank and Knipper 2021
3,13	-20,5	9,4	PM	MA-151010	n.a	0,72878	0,00002	n.d.	Young adult	Not worn	Maria Vretemark, VGM					paper II, Blank 2019 and Blank and Knipper 2021
3,22	-20,8	10,4	n.a		n.a	n.a		n.d.	Adult		Jan Storå, SU	Pars petrosa	med024	XX	n.d.	paper II, IV and V
3,18	-21,1	9,2						n.d.	Adult		Aija Macane, GU					paper II and V
3,19	-20,8	9,7	DC	MA-197105	n.a	0,72045	0,00002	n.d.	3-12 y		Aija Macane, GU					paper II, IV and V
3,21	-19,9	11	M2, dexter, max.	MA-140448	-13,89	0,71339	0,00001	Male	>20 y	Post mortem oval defect 42 mm	Retzius 1899, no. 12, XVII	Tooth root	med021	XY	n.d.	paper II, IV, Blank 2019 and Blank and Knipper 2021
n.a	-20															paper II
3,19	-21,1	9,4	M2, sin, max.	MA-140449	-15,12	0,72062	0,00001	Female?	>20 y		Retzius 1899, no. 15	Tooth root	med022	XX	n.d.	paper II, IV, Blank 2019 and Blank and Knipper 2021
n.a	-20,1															paper II
3,16	-20,3	10,2	M2, dexter, max.	MA-140458	-13,18	0,71475	0,00001	Female	c. 12 y	Caries	Retzius 1899, no. 14, XVI	Tooth root	med023	XY	K1a4a1a2a	paper II, IV, Blank 2019 and Blank and Knipper 2021
n.a	-20,3															paper II
3,21	-20,7	9,9	M1, sin, max.	MA-140450	-14,87	0,71709	0,00001	Male	>20 y	One lost molar-healed, worn teeth	Retzius 1899, no. 9, XIII, XIV					paper II, Blank 2019 and Blank and Knipper 2021
n.a	-20,9															paper II
3,2	-20,3	9,5	M3, sin, max.	MA-140459	-14,2	0,71798	0,00001	n.d.	>20 y	Peri-mortem injury to R parietal	Fibiger et al. 2013	Tooth root	med020	XX	I4a	paper IV, V, Blank and Knipper 2021 and Fibiger et al. 2013
3,24	-21,1	9,2						n.d.	Adult		Leena Drenzel, SHM					paper II and Blank 2019
3,15	-20,6	9,6						n.d.	Adult		Leena Drenzel, SHM					Blank 2017 and Blank 2019
3,15	-20,4	8,9						n.d.	Adult		Leena Drenzel, SHM					paper II and Blank 2019

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, $\delta^{13}C$, $\delta^{15}N$ collagen	Uncal BP	±	Cal BC/AD, 95.4%
10	VG-Falbygden	Luttra	16:1	Knaggården	PG	10351-3	In chamber/pas-sage	Human	Cranium frag.	OxA-22004	3583	29	2027-1881
36	VG-Falbygden	Norra Lundby	110:1	Ökull	GG	NoLu2	In chamber	Human	Cranium, occipital	UBA-36826	744	29	1223-1289
33	VG-Falbygden	Segerstad	176:1	Prästbolet	GG	Seg1	In chamber	Human	Ulna, dexter	UBA-36824	3526	34	1943-1752
34	VG-Falbygden	Tiarp	26:1	Backgården	D	T26:1	In chamber	Human	Costae	UBA-33496	4641	37	3520-3355
39, A	VG-Falbygden	Timmerdala	5:1	Timmersdala skolhus	GG	T5FG	Inner chamber	Capra^	Metacarpal bone	UBA-34013	3430	43	1879-1635
39, A	VG-Falbygden	Timmerdala	5:1	Timmersdala skolhus	GG	T5:10	Inner chamber: upper layer in pottery vessel	Human (burnt)	Cranium frag.	UBA-34012	1784	39	170-401
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:1	In chamber	Human	DPM	UBA-27918	3566	39	2026-1774
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:2	In chamber	Human	Mand., sin	UBA-27917	3549	38	2014-1763
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:2	In chamber	Human					
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:2	In chamber	Human					
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:3, M56	In chamber	Human	M1, max., sin	UBA-26020	3504	45	1943-1695
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:3, M56	In chamber	Human					
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:4	In chamber	Human	M2, dexter, mand.	UBA-27919	3559	39	2022-1772
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:4	In chamber	Human					
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:4	In chamber	Human					
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:5	In chamber	Human	PM1, sin, mand.	UBA-27916	3503	31	1915-1744
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:5	In chamber	Human					
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:5	In chamber	Human					
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	TB16:6	In chamber	Human	M1	UBA-40406	3619	32	2121-1891
3	VG-Falbygden	Torbjörntorp	16:3	Tomtens kalkbrott	GG	MT16:G	In chamber	Sus domes-ticus	Phalanx	UBA-28502	1701	27	255-403
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M50, MJ5	In chamber, S4	Human	M3, dexter, mand.	UBA-26014	3408	35	1871-1621
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M51, MJ8	In chamber, S24	Human	M2, dexter, mand.	UBA-26015	3437	36	1880-1658
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M52, MJ16	In chamber, S19	Human	M3, dexter, mand.	UBA-26850	3540	37	1972-1753
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M52, MJ16	In chamber, S19	Human					

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
3,2	-20,8	8,2						Female	Adult	Peri-mortem injury to L parietal	Fibiger et al. 2013					Fibiger et al. 2013
3,17	-20,5	10,6						n.d.	Adult		Johnny Karlsson, SHM					paper II and this publication
3,17	-20,6	8,6						n.d.	Adult		Aija Macane, GU					paper II and V
3,19	-20,5	10,1						n.d.	n.d.		Maria Vretemark, VGM					paper II and V
3,19	-20,7	4,8									Anna Tornberg, LU					paper V
								n.d.	Adult	>700°	Anna Tornberg, LU					paper VI
3,29	-20,6	10,7	DPM	MA-148268	-15	0,71637	0,00001	n.d.	5 y		Lennblad 2014, Jan Storå SU	Tooth root	tor037	n.d.	n.d.	paper II, IV and V
3,27	-21	9,2	M3, sin, mand.	MA-148272	-13,88	0,71541	0,00001	n.d.	40-50 y		Lennblad 2014, Jan Storå SU	Tooth root	tor038	XX	HV0a	paper II, IV and V
			M2, sin, mand.	MA-148271	n.d.	0,71794	0,00001				Jan Storå, SU					paper IV
			MI, sin, mand.	MA-148270	-16,21	0,71857	0,00001				Jan Storå, SU					paper IV and V
3,25	-20,6	9,6	M2, sin, max.	MA-145302	-13,88	0,71757	0,00001	n.d.	>20 y		Lennblad 2014, Jan Storå SU	Tooth root	tor039	XY?	n.d.	paper II, IV, Blank 2019 and Blank and Knipper 2021
			M3, sin, max.	MA-148273	-13,35	0,71749	0,00001				Jan Storå, SU					paper IV and V
3,22	-20,6	9,1	M2, sin, mand.	MA-148276	-13,84	0,71823	0,00001	Male	30-35 y		Lennblad 2014, Jan Storå SU	Tooth root	tor040	XY	H1f +16093	paper II, IV and V
			M1, sin, mand.	MA-148275	-14,89	0,7177	0,00001				Jan Storå, SU					paper IV and V
			M3, sin, mand.	MA-148277	-14,46	0,71952	0,00001				Jan Storå, SU					paper IV and V
3,26	-20,7	9,1	M1, sin, mand.	MA-148279	-14,72	0,71756	0,00001	n.d.	24-30 y		Lennblad 2014, Jan Storå SU	Tooth root	tor041	XY?	n.d.	paper II, IV and V
			M2, sin, mand.	MA-148280	-14,3	0,71752	0,00001				Jan Storå, SU					paper IV and V
			M3, sin, mand.	MA-148281	-14,59	0,7172	0,00001				Jan Storå, SU					paper IV and V
3,19	-20,3	9,5	n.a	n.a	n.a	n.a	n.a	n.d.	Adult		Jan Storå, SU	n.a	n.a	n.a	n.a	paper II and V
3,19	-22,1	7,8	n.a	n.a	n.a	n.a	n.a				Lennblad 2014,					paper II and this publication
3,21	-20,7	9,8	M2, dexter, mand.	MA-145296	-14,05	0,71784	0,00002	Female	40-55 y		Jan Storå, SU	PM, dexter, mand.	tor005	XX	K1a4a 1a2a	paper II, IV, Blank 2019 and Blank and Knipper 2021
3,21	-20,1	10,5	M2, dexter, mand.	MA-145297	-13,4	0,71688	0,00001	Female	>20 y		Jan Storå, SU	Tooth root	tor008	XX	H4a1a1a	paper II, IV, Blank 2019 and Blank and Knipper 2021
3,2	-20,2	10,3	M3, dexter, mand.	MA-145298	-13,35	0,71558	0,00002	Female	35-50 y		Jan Storå, SU	Tooth root	tor016	n.d.	n.d.	paper II, IV, Blank 2019 and Blank and Knipper 2021
			M1, dexter, mand.	MA-147666	-14,42	0,7171	0,00001				Jan Storå, SU					paper IV and V

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, $\delta^{13}C$, $\delta^{15}N$ collagen	Uncal BP	±	Cal BC/AD, 95.4%
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M52, MJ16	In chamber, S19	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ1	In chamber, S40	Human	M1, dexter, mand.	UBA-27311	3468	47	1905-1664
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ2	In chamber, S38	Human	M2, dexter, mand.	UBA-27312	3451	40	1884-1665
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ3	In chamber, H11, S31	Human	I, mand.	UBA-27313	3438	39	1880-1646
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ4	In chamber, S36	Human	M1, dexter, mand.	UBA-27314	3381	42	1863-1534
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ6	In chamber, S24	Human	M2,sin, mand.	UBA-27315	3459	52	1901-1641
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ7	In chamber, S24	Human	M1, sin, mand.	UBA-27316	3371	38	1751-1534
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ9	In chamber, S24	Human	I2, dexter, mand.	UBA-27317	3419	47	1880-1622
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ10	In chamber, H5	Human	I, dexter, max.	UBA-27318	3380	61	1877-1521
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ10	In chamber, H5	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ10	In chamber, H5	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ11	In chamber, H5	Human	DPM1/DPM2, dexter mand.	UBA-27319	3373	49	1868-1527
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ11	In chamber, H5	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ12	In chamber, H8	Human	PM2, dexter, mand.	UBA-27320	3456	38	1886-1668
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ12	In chamber, H8	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ12	In chamber, H8	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ13	In chamber, H4	Human	DPM2, sin, mand.	UBA-27641	3565	54	2113-1749
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ13	In chamber, H4	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ14	In chamber, H4	Human	C, sin, mand.	UBA-27321	3377	47	1867-1530
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ14	In chamber, H4	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ14	In chamber, H4	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ15	In chamber, H4	Human	PM2, dexter, mand.	UBA-27322	3384	51	1873-1531
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ15	In chamber, H4	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ15	In chamber, H4	Human					

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
			M2, dexter, mand.	MA-147667	-13,56	0,7169	0,00001				Jan Storå, SU					paper IV and V
3,21	-20,7	9	M1, dexter, mand.	MA-147361	-15,37	0,72023	0,00001	Female	>20 y		Jan Storå, SU	Tooth root	tor001	XX	U4a2	paper II, IV and V
3,21	-20,6	10,5	M2, dexter, mand.	MA-147362	-14,21	0,71712	0,00001	Female	>40 y		Jan Storå, SU	Tooth root	tor002	XX	n.d.	paper II, IV and V
3,2	-20,2	9,5	M1, dexter, mand.	MA-147363	-14,86	0,71651	0,00001	n.d.	n.d.	Oblique canini, oblique mand.	Jan Storå, SU	Tooth root	tor003	XY?	n.d.	paper II, IV and V
3,21	-20,7	9,2	M1, dexter, mand.	MA-147364	-14,5	0,72583	0,00001	Male	>20 y	Calculus	Jan Storå, SU	Tooth root	tor004	XY?	n.d.	paper II, IV, V and Blank and Knipper 2021
3,2	-20,7	8,8	M2, sin, mand.	MA-147365	-14,37	0,71744	0,00001	Female	>20 y		Jan Storå, SU	Tooth root	tor006	XX	T2b+152	paper II, IV and V
3,17	-20,4	10,1	M1, sin, mand.	MA-147366	-13,63	0,71582	0,00001	Female	>20 y		Jan Storå, SU	Tooth root	tor007	XX	U4a2	paper II, IV and V
3,2	-20,8	8,5	I2, dexter, mand.	MA-162688	-14,76	0,72079	0,00001	Female	>60 y		Jan Storå, SU	Tooth root	tor009	XX	n.d.	paper II, IV and V
3,19	-20,9	9,6	M1, dexter, max.	MA-147652	-14,81	0,7251	0,00001	Female	>20 y	Oblique teeth, calculus	Jan Storå, SU	Tooth root	tor010	XX	n.d.	paper II, IV and V
			M2, dexter, max.	MA-147653	-14,29	0,72022	0,00001									paper IV and V
			M3, dexter, max.	MA-147654	-14,27	0,72018	0,00001									paper IV and V
3,22	-20,7	11,3	DPM2, dexter, mand.	MA-147655	-14,99	0,72181	0,00001	n.d.	4-5 y		Jan Storå, SU	Tooth root	tor011	n.d.	n.d.	paper II, IV and V
			DPM1, dexter, mand.	MA-147656	-14,73	0,72244	0,00001									paper IV and V
3,21	-20,6	9,2	M1, dexter, mand.	MA-147657	-15,27	0,71633	0,00002	Female	>20 y		Jan Storå, SU	Tooth root	tor012	XX	U4c1	paper II, IV and V
			M2, dexter, mand.	MA-147658	-14,47	0,71755	0,00001									paper IV and V
			M3, dexter, mand.	MA-147659	-14,18	0,7221	0,00002									paper IV and V
3,2	-20,1	11,6	DPM2, sin, mand.	MA-147711	-14,34	0,71556	0,00001	n.d.	3-12 y		Jan Storå, SU	Tooth root	tor013	XX	U5a1b	paper II, IV and V
			DPM1, sin, mand.	MA-147710	-13,91	0,71551	0,00001									paper IV and V
3,17	-20,4	9,3	M1, sin, mand.	MA-147660	-14,76	0,71589	0,00001	Male?	>20 y	Hypoplasia	Jan Storå, SU	Tooth root	tor014	n.d.	n.d.	paper II, IV and V
			M2, sin, mand.	MA-147661	-13,55	0,71533	0,00002									paper IV and V
			M3, sin, mand.	MA-147662	-13,54	0,71493	0,00001									paper IV and V
3,22	-20,3	10,4	M1, dexter, mand.	MA-147663	-14,81	0,71489	0,00001	n.d.	>20 y		Jan Storå, SU	Tooth root	tor015	n.d.	n.d.	paper II, IV and V
			M2, dexter, mand.	MA-147664	-13,66	0,71586	0,00001									paper IV and V
			M3, dexter, mand.	MA-147665	-14,13	0,71616	0,00003									paper IV and V

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, $\delta^{13}C$, $\delta^{15}N$ collagen	Uncal BP	±	Cal BC/AD, 95.4%
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ17	In chamber, S23	Human	PM2,dexter, mand.	UBA-27323	3433	59	1906-1612
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ18	In chamber, S6	Human	M3, dexter, mand.	UBA-30519	3453	37	1885-1669
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ19	In chamber, H10	Human	C, sin, max.	UBA-27324	3515	48	1964-1695
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ19	In chamber, H10	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ19	In chamber, H10	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ20	In chamber, S3	Human	M3, dexter, mand.	UBA-31318	3404	63	1884-1534
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ20	In chamber, S3	Human					
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MJ21	In chamber, H9	Human	M1, dexter, max.	UBA-27325	3421	35	1876-1628
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MTB18:1	In chamber, H3	Human	M2, mand.	UBA-29918	3005	33	1384-1126
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	MT18:22	In upper layer of chamber, S34	Human	M3, dexter, max.	UBA-33494	3339	44	1740-1511
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M25	In chamber, H4	Human (burnt)	Femur	UBA-25679	3624	29	2125-1894
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M30	In chamber, S24	Human	Femur, sin	UBA-25756	3396	40	1873-1566
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M31	In chamber, H8	Human	Femur, sin	UBA-25757	3479	38	1896-1692
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M33	In chamber, S24	Human	Femur, sin	UBA-25759	3412	39	1876-1619
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M34	In chamber, TMG	Human	Femur, sin	UBA-25760	3590	36	2112-1782
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M35	In chamber, TMG	Human	Femur, sin	UBA-25761	3461	32	1882-1692
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M36	In chamber, H10-11	Human	Femur, sin	UBA-25762	3467	36	1886-1691
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M37	In chamber, H7	Human	Femur, sin	UBA-25763	3464	29	1882-1693
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M38	In chamber, H4	Human	Femur, sin	UBA-25764	3519	31	1930-1751
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M48	In chamber, H5	Human	Femur, sin	UBA-26012	3497	39	1925-1696
4	VG-Falbygden	Torbjörntorp	18:1	Lilla Balltorp	GG	M49	In chamber, S27	Human	Femur, sin	UBA-26013	3516	39	1946-1703
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:1, CA 222	In chamber	Human	M2, sin, max.	UBA-27920	3523	38	1949-1746
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:2, CA 229	In chamber	Human	DPM2, sin, max.	UBA-27921	3582	38	2035-1777
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:2, CA 229	In chamber	Human					
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:3, CA 228	In chamber	Human	M2, dexter, max.	UBA-27922	3560	38	2023-1772

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
3,17	-20,6	11,7	PM2, dexter, mand.	MA-147374	-15,05	0,72045	0,00001	n.d.	20- 24 y	Calculus	Jan Storå, SU	Tooth root	tor017	XX	T	paper II, IV and V
3,15	-20,3	9,4	M3, dex-ter, mand.	MA-147712	-14,07	0,7191	0,00001	Male	20- 30/ 30-50 y	Calculus	Jan Storå, SU	Tooth root	tor018	XY	T2b	paper II, IV and V
3,17	-20,6	9,3	M1, dex-ter, max.	MA-147668	-14,22	0,71638	0,00001	n.d.	>20 y	Heavily worn teeth	Jan Storå, SU	Tooth root	tor019	n.d.	n.d.	paper II, IV and V
			M2, dex-ter, max.	MA-147669	-14,25	0,71665	0,00002									paper IV and V
			M3, dex-ter, max.	MA-147670	-14,29	0,717	0,00001									paper IV and V
3,17	-20,4	9,4	M3, dex-ter, mand.	MA-147713	-13,79	0,71684	0,00002	n.d.	>20 y		Jan Storå, SU	Tooth root	tor020	n.d.	n.d.	paper II, IV and V
			M3, dex-ter, mand.	KF 753		0,71676	27ppm									paper IV
3,21	-19,9	9,7	M1, dex-ter, max.	MA-147376	-14,2	0,71446	0,00001	n.d.	40-50 y	Calculus	Jan Storå, SU	Tooth root	tor021	n.d.	n.d.	paper II, IV and V
3,24	-20,6	8,4	M2, mand.	MA-155598	n.a	0,71335	0,00001	n.d.	n.d.			Tooth root	tor036	n.d.	n.d.	paper IV, Blank 2017 and Blank 2019
3,19	-20,3	9,7	n.a	n.a	n.a	n.a		n.d.	25-35 y		Jan Storå, SU	n.a	n.a	n.a	n.a	paper II and V
								n.d.	Adult	Ca. 500˚C, with soft tissue.	Astrid Lennblad, BM, Åsa Larsson, RAÄ					paper VI
3,45	-20,4	9,7						n.d.	Adult		Astrid Lennblad, BM					Hollund et al. 2018
3,16	-20,8	8,6						n.d.	Adult		Astrid Lennblad, BM					Hollund et al. 2018
3,21	-20	10,2						n.d.	Adult		Astrid Lennblad, BM					Hollund et al. 2018
3,17	-20,1	9,2						n.d.	Adult		Astrid Lennblad, BM					Hollund et al. 2018
3,2	-20,1	10,2						n.d.	Adult		Astrid Lennblad, BM					Hollund et al. 2018
3,21	-20,3	10,1						n.d.	Adult		Astrid Lennblad, BM					Hollund et al. 2018
3,22	-20,1	10,2						n.d.	Adult		Astrid Lennblad, BM					Hollund et al. 2018
3,15	-20,1	9,6						n.d.	Adult		Astrid Lennblad, BM					Hollund et al. 2018
3,18	-20,4	9,8						n.d.	Adult		Astrid Lennblad, BM					Hollund et al. 2018
3,19	-20,5	8,5						n.d.	Adult		Astrid Lennblad, BM					Hollund et al. 2018
3,26	-20	9	M2, sin, max.	MA-148253	-13,75	0,71627	0,00002	n.d.	20-40 y	Calculus	Alfsdotter 2014	Tooth root	tor031	n.d.	n.d.	paper II, IV and V
3,23	-20,7	9,5	DPM2, sin, max.	MA-148256	-15,3	0,71517	0,00002	n.d.	3-6 y		Alfsdotter 2014	Tooth root	tor035	XY	T2b +16362	paper II, IV and V
			DPM1, sin, max.	MA-148255	-14,57	0,71536	0,00003									paper IV and V
3,22	-20,6	10	M2, sin, max.	MA-148259	-14,58	0,72325	0,00002	n.d.	20-40 y		Alfsdotter 2014					paper II, IV and V

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, δ13C, δ15N collagen	Uncal BP	±	Cal BC/AD, 95.4%
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:3, CA 228	In chamber	Human					
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	M54, MT31:4, CA 225	In chamber	Human	M1, dexter, max.	UBA-26018	3527	36	1947-1750
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	M54, MT31:4, CA 225	In chamber	Human					
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	M54, MT31:4, CA 225	In chamber	Human					
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	M55, MT31:5, CA 220	In chamber	Human	PM1, dexter, max.	UBA-26019	3581	37	2033-1779
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	M55, MT31:5, CA 220	In chamber	Human					
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	M55, MT31:5, CA 220	In chamber	Human					
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:6	In chamber	Human	M1,dexter, max.	UBA-31054	3394	36	1867-1612
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:7	In chamber	Human	M1, dexter, max.	UBA-31055	3516	43	1951-1699
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:8	Entrance	Human	M1, dexter, max.	UBA-31056	3441	37	1880-1662
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:9	Eastern part of the chamber, lower layer	Human	M1, dexter, max.	UBA-31057	3615	43	2134-1882
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:10	Southern part of chamber, lower layer	Human	M1, dexter, max.	UBA-31058	3569	42	2031-1772
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:11	In chamber	Human	M1, dexter, max.	UBA-29916	3407	33	1869-1622
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:12	In chamber	Human	M1, dexter, max.	UBA-31059	3422	41	1878-1627
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:13, CA 251	In chamber	Human	M1, dexter, max.	UBA-31060	3439	33	1879-1662
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:14, CA 256	In chamber	Human	DPM1, dexter, max.	UBA-31061	3432	33	1878-1644
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31:15, CA 240	In chamber, southern part bottom layer	Human	C, sin, max.	UBA-29917	3449	33	1881-1685
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	M53	In chamber	Human	M2, dexter, max.	UBA-26849	1525	37	426-608
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	TB31: id.165	In chamber, bottom layer	Human	Cranium frag.	UBA-42347	failed		
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	TB31:B	Entrance	Human	Femur, dexter	UBA-30517	3379	40	1770-1534
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	TB31:A	Southern part of chamber, lower layer	Human	Femur, dexter	UBA-34358	3618	32	2119-1891
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	TB31:C	Southwestern corner of chamber	Human	Femur, dexter	UBA-34595	3514	35	1935-1746

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
			M1, sin, max.	MA-148258	-15,64	0,72476	0,00001									paper IV and V
3,23	-20,5	9,2	M1, dex-ter, max.	MA-145300	-14,73	0,72434	0,00002	n.d.	20-40 y	Abcess in max.	Alfsdotter 2014	Tooth root	tor032	n.d.	n.d.	paper II, IV and Blank 2019
			M2, dex-ter, max.	MA-148261	-14,29	0,72528	0,00001									paper IV and V
			M3, dex-ter, max.	MA-148262	-14,95	0,72636	0,00001									paper V and Blank and Knipper 2021
3,24	-20,3	11	PM1, dex-ter, max.	MA-145301	-14,62	0,72485	0,00002	n.d.	20-40 y		Alfsdotter 2014	Tooth root	tor034	XX	J1c2	paper II, IV, Blank 2019 and Blank and Knipper 2021
			M1, max.	MA-148264	-15,34	0,72483	0,00001									paper IV and V
			M2, max.	MA-148265	-14,91	0,72487	0,00001									paper IV and V
3,19	-20,1	9,5	M1, dex-ter, max.	MA-160113	-14,4	0,72475	0,00001	n.d.	20-40 y		Anna Tornberg, LU	Tooth root	tor022	XY	U5b2a4	paper II, IV and V
3,19	-21,1	11,1	M1, dex-ter, max.	MA-160114	-13,67	0,72381	0,00002	n.d.	20-40 y		Anna Tornberg, LU	Tooth root	tor023	XX	U5b2a4	paper II, IV and V
3,19	-20,5	10	M1, dex-ter, max.	MA-160115	-13,61	0,71426	0,00003	n.d.	20-40 y		Anna Tornberg, LU	Tooth root	tor024	XX	J1c7	paper II, IV and V
3,22	-20	10,3	M1, dex-ter, max.	MA-160116	-13,9	0,71545	0,00003	n.d.	13-19 y		Anna Tornberg, LU	Tooth root	tor025	XX	n.d.	paper II, IV and V
3,19	-20,6	9,5	M1, dex-ter, max.	MA-160117	-14,57	0,71986	0,00002	n.d.	20-40 y		Anna Tornberg, LU	Tooth root	tor026	XY	U5a1b1	paper II, IV and V
3,18	-20,2	8,9	M1, dex-ter, max.	MA-153241	n.d.	0,72542	0,00003	n.d.	20-40 y		Anna Tornberg, LU	Tooth root	tor027	XY?	U5b3	paper II, IV and V
3,17	-19,9	10,1	M1, dex-ter, max.	MA-160118	-13,76	0,71706	0,00001	n.d.	20-40 y		Anna Tornberg, LU	Tooth root	tor028	n.d.	n.d.	paper II, IV and V
3,18	-20,1	9,8	M1, dex-ter, max.	MA-160119	-14,33	0,72488	0,00001	n.d.	9-11 y		Alfsdotter 2014	Tooth root	tor029	XY	U5b3b	paper II, IV and V
3,27	-20,2	10,3	DPM1, dexter, max.	MA-160120	-14,52	0,72489	0,00002	n.d.	9-6 y		Alfsdotter 2014	Tooth root	tor030	XY	U5b3b	paper II, IV and V
3,17	-19,8	9	C, sin, mand.	MA-155597	n.d.	0,71568	0,00001	n.d.	20-40 y	Hypo-plasia	Alfsdotter 2014					paper II, IV and V
3,2								n.d.	11-18 y		Alfsdotter 2014					paper II
								n.d.	n.d.	Lightly burned, half car-bonized	Alfsdotter 2014					paper VI
3,18	-20,6	9,4						Fe-male	Adult		Anna Tornberg, LU					Hollund et al. 2018
3,14	-21,1	8,6						n.d.	Adult		Anna Tornberg, LU					Hollund et al. 2018
3,16	-20,9	8,7						n.d.	Adult		Anna Tornberg, LU					Hollund et al. 2018

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, δ13C, δ15N collagen	Uncal BP	±	Cal BC/AD, 95.4%
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	TB31:D	Northern part of the chamber, upper layer	Human	Femur, dex	UBA-34360	3501	32	1914-1704
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	TB31:E	In chamber	Human	Femur, dex	UBA-34361	3463	31	1882-1693
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	TB31:F	In chamber	Human	Femur, dex	UBA-34362	3561	43	2025-1771
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31F	in chamber	Capra^	Bone bead	UBA-33495	3566	35	2024-1776
5, D	VG-Falbygden	Torbjörntorp	31:1	Berga	GG	MT31G	in chamber	Sus domes-ticus	Phalanx	UBA-28503	3524	31	1935-1755
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros001	In chamber, Be 1	Human	Tooth	446188	4430	30	3326-2926
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros002	In chamber, Be 1	Human	Tooth	446189	4470	30	3339-3026
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros003	In chamber, Be 1	Human	Bone	423311	4440	30	3331-2931
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros004	In chamber, Be 1	Human	Tooth	423312	4410	30	3309-2917
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros005	In chamber, Be 1	Human	Tooth	423313	4390	30	3092-2918
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros006	In chamber, Be 3	Human	Tooth	446190	4310	30	3013-2886
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros007	In chamber, Be 3	Human	Tooth	446191	4430	30	3326-2926
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros008	In chamber, Be 4	Human	Tooth	446192	4390	30	3092-2918
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros009	In chamber, Be 9	Human	Tooth	446193	4360	30	3085-2904
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros10	In chamber, Be 9	Human	Tooth	UBA-36811	4635	33	3517-3355
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros011	In chamber, Be 13	Human	Tooth	446194	4450	30	3336-2945
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros012	In chamber, Be 13	Human	Tooth	446195	4190	30	2891-2671
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros013	In chamber, Be 13	Human	Bone	446196	4520	30	3356-3101
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros014	In passage, G 6-7:1	Human	Mand.	Ua-66072	4419	29	3316-2921
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros016	In passage, G 6-7	Human	Mand.	UBA-36305	4341	35	3082-2894
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros018	In chamber Be 11	Human	Mand.	UBA-36306	4477	35	3342-3028
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros021	In chamber Be 11	Human	Mand.	UBA-36307	4487	34	3347-3033
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros023	In chamber, B11:6	Human	Mand.	Ua-66073	4451	29	3336-3012
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros024	In chamber Be 11	Human	Mand.	UBA-36308	4426	41	3331-2920
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros025	In chamber, B11:8	Human	M1, dexter	Ua-66074	4459	30	3336-3021

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
3,16	-20,5	9,6						n.d.	Adult		Anna Tornberg, LU					Hollund et al. 2018
3,15	-21	9,5						n.d.	Adult		Anna Tornberg, LU					Hollund et al. 2018
3,15	-20,7	9						n.d.	Adult		Anna Tornberg, LU					Hollund et al. 2018
3,18	-20,9	4,7									Alfsdotter 2014					paper V
3,15	-22,2	5,5									Alfsdotter 2014					paper V
3,2	-20,7	10,1	M1, dex-ter, mand.	F3137	n.a	0,716915	n.d.	n.d.	7-8 y		Ahlström, T in Sjögren et al. 2009	Tooth root	ros001	XY	X2b+226	paper II, IV, V and Sjögren et al. 2009
3,2	-21,4	10,3	DPM2, dexter, mand.	MA-180447	n.a	0,71671	0,00002	n.d.	4-6 y		Jan Storå, SU	Tooth root	ros002	XY	X2b+226	paper II, IV and V
	-21,6	9	M	MA-180465	n.a	0,71596	0,00001	n.d.	20+ y		Jan Storå, SU	Tooth root	ros003	XX	K1b1a1	paper IV and Malm-ström et al. 2019.
	-20,8	10,1	M1, dex-ter, mand.	MA-180448	n.a	0,7166	0,00001	n.d.	n.d.		Jan Storå, SU	Tooth root	ros004	n.d.	n.d.	paper II, IV and V
	-20,9	10	M2,dexter, mand.	MA-180450	n.a	0,71747	0,00002	n.d.	20+ y		Jan Storå, SU	Tooth root	ros005	XY	J1c5	paper IV and Malm-ström et al. 2019.
3,2	-21,1	10,6	M1, dex-ter, mand.	MA-180449	n.a	0,71603	0,00001	n.d.	20-35 y		Jan Storå, SU	Tooth root	ros006	n.d.	n.d.	paper II, IV and V
3,2	-20,8	9,7	M2, dex-ter, mand.	MA-180451	n.a	0,71527	0,00001	n.d.	20+ y		Jan Storå, SU	Tooth root	ros007	XY	H	paper II, IV and V
3,2	-20,6	8,6	M2, dex-ter, mand.	MA-180452	n.a	0,72087	0,00001	n.d.	35+ y		Jan Storå, SU	Tooth root	ros008	XX	H24	paper II, IV and V
3,2	-20,6	10,2	M1, dex-ter, mand.	F3142	n.a	0,71605	n.d.	Fe-male	18-20 y		Ahlström, T in Sjögren et al. 2009	Tooth root	ros009	XY	n.d.	paper II, IV, V and Sjögren et al. 2009
3,18	-21	9,5	M1, dex-ter, mand.	F3143	n.a	0,718058	n.d.	Male	20-40 y/20-35 y		Ahlström, T in Sjögren et al. 2009; Jan Storå, SU	Tooth root	ros010	n.d.	n.d.	paper II, IV, V and Sjögren et al. 2010
3,2	-21,1	9,6	M1, dex-ter, mand.	MA-180453	n.a	0,71538	0,00002	n.d.	35+ y		Jan Storå, SU	Tooth root	ros011	XX	n.d.	paper II, IV and V
3,2	-20,5	10,5	M1, dex-ter, mand.	MA-180466	n.a	0,71538	0,00001	n.d.	13-24 y		Jan Storå, SU	Tooth root	ros012	n.d.	n.d.	paper II, IV and V
3,2	-20,5	9,1	DPM2, dexter, mand.	MA-180467	n.a	0,71532	0,00001	n.d.	4-6 y		Jan Storå, SU	Tooth root	ros013	XY	n.d.	paper II, IV and V
3,2	-21,1	8,2	n.a	n.a	n.a	n.a		n.d.	8-10 y		Jan Storå, SU	Tooth root	ros014	XX	T2b	paper IV and V
3,18	-21	9,4	PM2, sin, mand.	MA-180455	n.a	0,71345	0,00003	n.d.	35+ y		Jan Storå, SU	Tooth root	ros016	XX	K1e	paper II, IV and V
3,18	-21,3	8,7	M1, dex-ter, mand.	MA-180456	n.a	0,71503	0,00002	n.d.	20-35 y		Jan Storå, SU	Tooth root	ros018	XX	U5b3	paper II, IV and V
3,16	-21,3	9,3	M1, dex-ter, mand.	MA-180457	n.a	0,71506	0,00001	n.d.	13-24 y		Jan Storå, SU	Tooth root	ros021	XX	U5b3	paper II, IV and V
3,2	-20,8	8,2	n.a	n.a	n.a	n.a		n.d.	35+ y		Jan Storå, SU	Tooth root	ros023	XX	K1e	paper IV and V
3,21	-21,1	9,8	M1	MA-180458	n.a	0,71556	0,00002	n.d.	35+ y		Jan Storå, SU	Tooth root	ros024	XY	U5b3	paper II, IV and V
3,2	-20,8	8,3	n.a	n.a	n.a	n.a		n.d.	20-35 y		Jan Storå, SU	Tooth root	ros025	XY	K1e	paper IV and V

Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, $\delta^{13}C$, $\delta^{15}N$ collagen	Uncal BP	±	Cal BC/AD, 95.4%
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros026	In chamber Be 11	Human	Mand.	UBA-36309	4205	45	2904-2636
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros027	In chamber Be 11	Human	Mand.	UBA-36310	4153	33	2878-2627
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros029	In chamber Be 11	Human	Mand.	UBA-36311	4537	35	3365-3102
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros033	In chamber, Be 17	Human	Mand.	UBA-36312	4476	47	3356-3015
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros036	In chamber, Be 17	Human	Mand.	UBA-36313	4461	41	3347-2945
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros038	In passage, K100	Human	Mand.	UBA-36314	4468	35	3340-3024
1, C	VG-Falbygden	Valtorp	2:1	Rössberga	PG	ros039	In passage, K102	Human	Tooth	UBA-36812	4541	31	3365-3104
2	VG-Falbygden	Valtorp	2:2	Rössberga	GG	V2:2B	In chamber	Human	M1, mand.	UBA-39577	4619	40	3520-3137
2	VG-Falbygden	Valtorp	2:2	Rössberga	GG	HKRos1/ F11	In chamber	Human (burnt)	Cranium frag.	UBA-36821	3124	27	1492-1298
37	VG-Falbygden	Varnhem	116:1	Backa	GG	M45	In chamber	Human	I2, sin, mand.	UBA-25803	3459	31	1881-1692
37	VG-Falbygden	Varnhem	116:1	Backa	GG	MV:A	In chamber	Human	Cranium frag.	UBA-28501	3429	32	1876-1641
37	VG-Falbygden	Varnhem	116:1	Backa	GG	M44	In chamber	Human	M3, dexter, mand.	UBA-25802	1035	27	905-1033
21	VG-Falbygden	Vilske-Kleva	26:2	Skattegården	GG	Vils1	In porte-hole	Human	I, mand.	UBA-36818	3512	28	1915-1751
38, B	VG-Falbygden	Öglunda	23:1	Måns-Nilsgården	GG	ÖG1	In chamber	Human	Ulna	UBA-36823	3488	40	1917-1693
38, B	VG-Falbygden	Öglunda	23:1	Måns-Nilsgården	GG	Ög2	In chamber	Ovis^	Tooth	UBA-37919	4337	42	3088-2888
20	VG-Falbygden	Östra thun-hem	22:1	Mikaelsgården	GG	ÖT1	In chamber	Human	Femur	UBA-36815	3571	40	2030-1774
42	VG-Kinnekulle	Medelplana	18:1	Carlsgården	GG	KM1	In chamber	Human	M1, max.	UBA-37922	3476	52	1927-1664
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM1	In chamber	Human	PM1, sin, mand.	UBA-27642	3384	38	1862-1560
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM2	In chamber	Human	I2, sin, mand.	UBA-27643	3256	42	1623-1440
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM3	In chamber	Human	PM1, sin, mand.	UBA-27644	3364	54	1865-1508
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM4	In chamber	Human	PM1	UBA-27645	3250	36	1615-1445
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM5	In chamber	Human	PM1	UBA-27646	3330	48	1740-1503
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM6	In chamber	Human	M2, sin, mand.	UBA-31319	3379	41	1859-1534
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM7	In chamber	Human	PM1	UBA-27647	3223	39	1611-1422
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM8	In chamber	Human	M3, sin, mand.	UBA-27923	3397	41	1874-1565
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM9	In chamber	Human	Mand., sin	UBA-28212	3483	30	1889-1698
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM10	In chamber	Human	Mand., sin	UBA-28213	3395	37	1870-1612

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
3,17	-21,1	9,8	M1, dexter, mand.	MA-180459	n.a	0,71541	0,00002	n.d.	35+ y		Jan Storå, SU	Tooth root	ros026	XY	U5a2	paper II, IV and V
3,17	-21,2	9,7	M1, sin, mand.	MA-180460	n.a	0,71745	0,00002	n.d.	35+ y		Jan Storå, SU	Tooth root	ros027	XX	K1e1	paper II, IV and V
3,18	-21,1	9,2	M2, sin, mand.	MA-180461	n.a	0,71516	0,00002	n.d.	4-5 y		Jan Storå, SU	Tooth root	ros029	XY	X2b+226	paper II, IV and V
3,19	-21	9,6	M3	MA-180462	n.a	0,71157	0,00001	n.d.	35++ y		Jan Storå, SU	Tooth root	ros033	XX	K1a+195	paper II, IV and V
3,18	-21,4	9	M1, dexter, mand.	MA-180463	n.a	0,71433	0,00002	n.d.	35++ y		Jan Storå, SU	Tooth root	ros036	XX	n.d.	paper II, IV and V
3,17	-21,2	9,2	M1	MA-180464	n.a	0,71604	0,00002	n.d.	35+ y		Jan Storå, SU	Tooth root	ros038	XY	n.d.	paper II, IV and V
3,19	-21,1	10	M1, dexter, mand.	MA-180454	n.a	0,71516	0,00001	n.d.	35+ y		Jan Storå, SU	Tooth root	ros039	XY	n.d.	paper II, IV and V
3,23	-21,6	9,3						n.d.	Adult		Johnny Karlsson, SHM					paper II and V
								n.d.	Adult	>700°	Johnny Karlsson, SHM, Åsa M Larsson, RAÄ					paper VI
3,22	-20,3	9,4						Female?	Adult		Retzius 1899, Astrid Lennblad, BM					paper II and Blank 2019
3,21	-19,7	9,7						n.d.	>25		Retzius 1899, Astrid Lennblad, BM					paper II and Blank 2019
3,33	-12,3	16,3						n.d.	<20 y		Retzius 1899, Leena Drenzel SHM					paper II
3,2	-20,9	10	I, mand.	MA-197104	n.a	0,72214	0,00002	n.d.	n.d.		Aija Macane, GU					paper II, IV and V
3,2	-20,9	10,3						n.d.	Adult		Aija Macane, GU					paper II and V
3,19	-21,6	9,3									Anna Tornberg, LU, Aija Macane, GU					paper II and V
3,2	-20,9	10,4						Male?	Young adult		Nils-Gustaf Gejvall, Aija Macane, GU, Anna Tornberg, LU					paper II and V
3,16																paper II
3,22																paper II
3,26																paper II
3,23																paper II
3,19																paper II
3,19																paper II
3,17																paper II
3,17																paper II
3,23																paper II
3,28																paper II
3,28																paper II

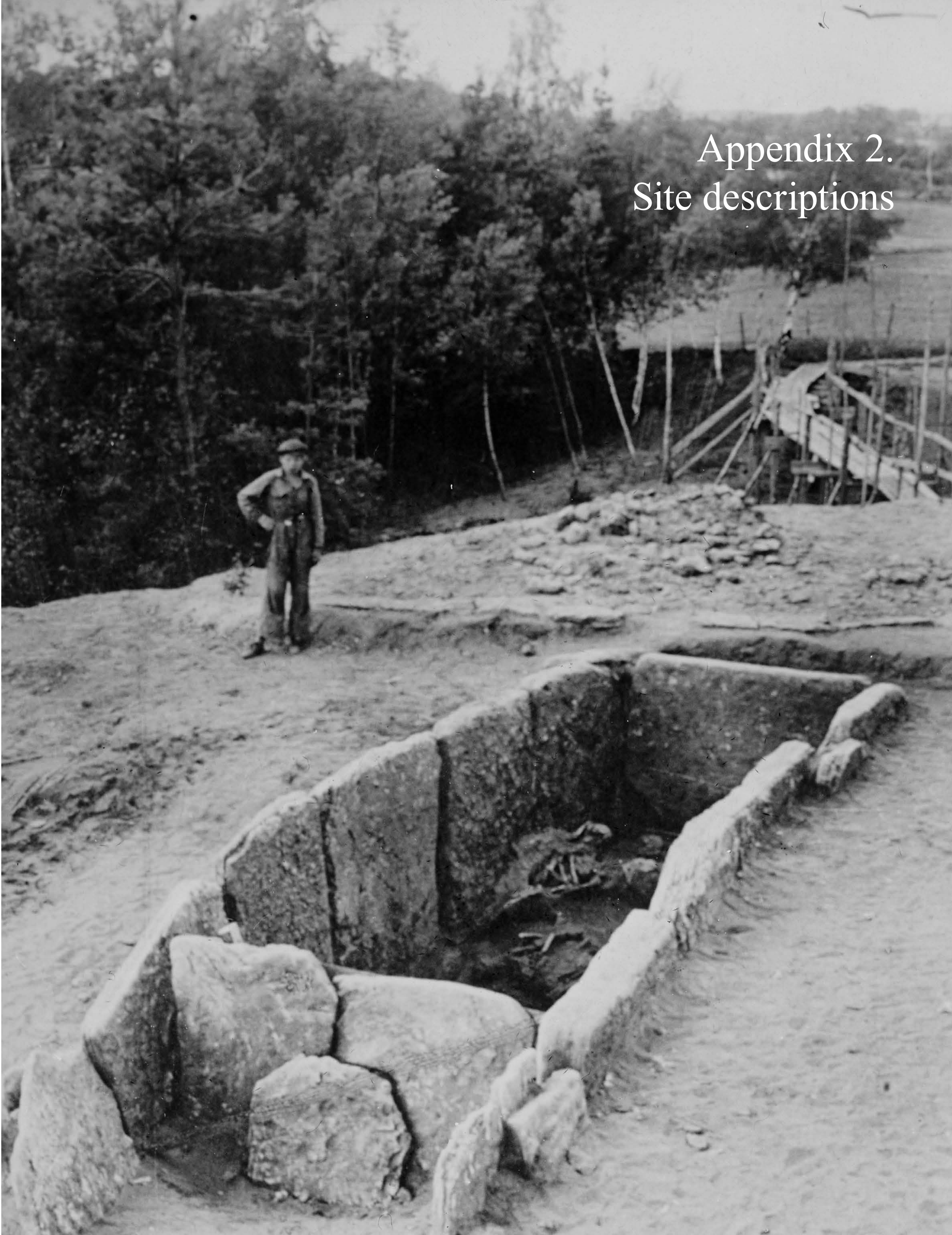
Site no.	Region	Parish	Raä no.	Site name	Site type	Sample name/ individual	Context	Species	Element Collagen	Lab. no. 14C, $\delta^{13}C$, $\delta^{15}N$ collagen	Uncal BP	±	Cal BC/AD, 95.4%
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM11	In chamber	Human	M3, sin, mand.	UBA-28214	3410	45	1878-1615
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM12	In chamber	Human	M1, sin, mand.	UBA-28215	3414	29	1867-1630
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	MM13	In chamber	Human	PM2, sin, mand.	UBA-28216	3475	29	1886-1696
44	VG-Kinnekulle	Medelplana	54:1	Hellekis	GG	10368-1	In chamber/ante-chamber	Human	Cranium frag.	OxA- 22003	3403	31	1861-1623
43	VG-Kinnekulle	Österplana	27:1	Högebo	GG	MP1	In chamber/ante-chamber	Human	Mand., sin	UBA-28122	3441	31	1879-1665
43	VG-Kinnekulle	Österplana	27:1	Högebo	GG	MP2	In chamber/ante-chamber	Human	PM1, sin, mand.	UBA-28121	3449	40	1884-1664
43	VG-Kinnekulle	Österplana	27:1	Högebo	GG	MP3	In chamber/ante-chamber	Human	M1, dexter, mand.	UBA-28120	4583	36	3500-3109
40	VG- Skara	Skåning åsaka	7:1	Munstorp	GG	SA7:1	In chamber	Human	M1/2, max.	UBA-36491	3366	29	1744-1564
40	VG- Skara	Skåning åsaka	7:1	Munstorp	GG	SA7:2	In chamber	Human	Humerus	UBA-36492	3468	31	1885-1693
41	VG- Skara	Skåning åsaka	13:1	Övre Sanna	GG	SA13:1	In chamber	Human	Occipital	UBA-36493	3388	29	1748-1622
45	VG-Vara	Edsvära	19:1	Kleakulle	GG	Ed1	In chamber	Human (burnt)	Cranium frag.	UBA-36817	failed		
46	VG-Vårgårda	Södra härene	73:1	Ingmarstorp	GG	SÖ73:1	Pit in southern part of chamber	Human (burnt)	Cranium frag.	UBA-39582	failed		
32	VG-Vårgårda	Södra härene	81:1	Nossamaden	BF	SH1	In bog	Human	PM	UBA-33800	3635	36	2133-1900

*Blind: same tooth analysed in to different laboratories (Mannheim and Copenhagen)
^Subjected to ZooMS analysis (York University)
OxCal v. 4.3.2 Bronk Ramsey (2017) r5IntCal atmosheric curve (Reimers et al. 2013)
Marked in blue indicates δ13C values measured from the AMS reported with the 14C dates
n.d.: not determined
I: Insisive, C: Canini, M: Molar, PM: Premolar, DPM: Deciduous premolar, DM: Deciduous molar, DC: Deciduous Canini, frag.: frag., mand.: mand., max.: max.
BM: Bohusläns Museum, GU: University of Gothenburg, LU: Lund University, RAÄ: Riksantikvarie ämbetet, SHM: Statens Historiska Museum, SU: Stockholm University, VGM: Västergötlands Museum
ref.: references, mol.:molecular, ost.: osteological, lab.: laboratory

The recommended values for C:N atomic values reported here are between 2.9-3.5 (van Klinken 1999; Ramsey et al. 2004)

C:N	δ13C Collagen (VPDB) ‰	δ15N Collagen (AIR) ‰	Element, Enamel	Lab. No. δ13C Enamel	δ13C Enamel (VPDB) ‰	87Sr/86Sr	Analytical error ± 2 SD	Ost. Sex	Age	Comment ost.	Osteology	Element, aDNA	aDNA Lab. no.	Mol. sex	mtDNA haplogroup	Ref., isotopes and aDNA
3,31																paper II
3,27																paper II
3,22																paper II
3,2										Peri-mor-tem fractur to l parietal	Fibiger et al. 2013					Fibiger et al. 2013
3,19																paper II
3,14																paper II
3,15																paper II
3,19	-20,5	10,5	n.a		n.a	n.a		n.d.	Adult		Maria Vretemark, VGM	n.a				paper II and V
3,21	-20,8	9,5	n.a		n.a	n.a		n.d.	Juvenile		Maria Vretemark, VGM	n.a				paper II and V
3,2	-20,7	9,9	n.a		n.a	n.a		n.d.	Adult		Maria Vretemark, VGM	n.a				paper II and V
								n.d.	Adult	Lightly, unevenly burned	Johnny Karlsson, SHM, Aija Macane, GU, Åsa M Larsson, RAÄ					paper VI
								n.d.	Adult	Half calcined	Torbjörn Ahl-ström, LU					paper VI
3,19	-21,2	10,3				0,722887	n.d.	Fe-male	30-40		Maria Vretemark, VGM					paper V and Sjögren et al. 2009

Appendix 2. Site descriptions



The Lilla Balltorp gallery grave, photo by Västergötlands
museum under a CC BY-NC-ND 4.0 license, graphics Richard Blank.

This thesis includes most of the excavated megalithic graves in Falbygden and Kinnekulle, and some of the investigated gallery graves in the rest of Västergötland. A number of samples (new and already published) from a few other sites, including a gallery grave in Bohuslän and settlements and bog finds in Västergötland are also accounted for. Furthermore, I include previously published data on bone material from megalithic graves in other regions. This appendix presents only the megalithic graves where new bone samples were collected, and new data were obtained. For further information about the remaining sites discussed, see the individual papers' appendices (no. 2). In addition, this section also encompasses the results of the re-examination of artefacts from the graves, some of which were previously published in appendix 2 of paper II. The described materials are stored at SHM (Statens Historiska Museum/ National Historical Museum), FM (Falbygdens Museum), and VGM (Västergötlands Museum), and AM (Alingsås Museum).

Borgunda 106:1, Brunnsgården gallery grave

— WGS84 coordinates: Lat. 58.26703, Long. 13.77404
— Inventory no: SHM 6846, 7591:100, 135, 136

The gallery grave was excavated and removed by Troili in 1881. The 5 x 1 m slightly trapezoid-shaped grave was constructed with limestone slabs. This E-W oriented grave consisted of a chamber and an ante-chamber divided by a slab with a port-hole (Fig. A2:1; Montelius 1905: 195; Sahlström 1932: 138; Troili 1881). There was a floor made of small limestone cobbles in the large chamber (Troili 1881). During the excavation, commingled unburnt human bones were recovered, as well as a strike-a-light[1], a flint dagger[2], a bifacial arrowhead roughout, a shaft-hole axe and a flint chisel (Sahlström 1932: 138; Troili 1881; the present study).

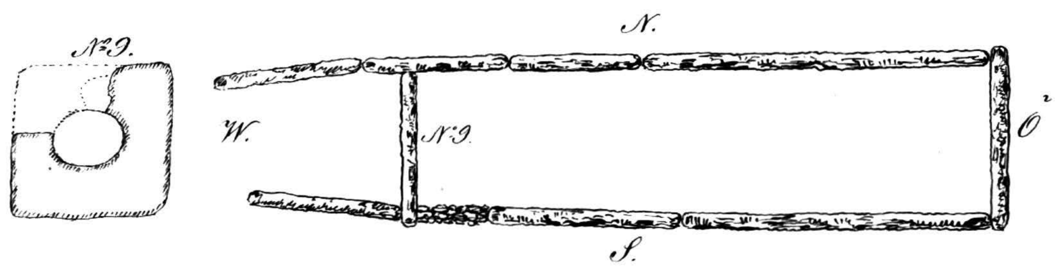


FIGURE A2:1 Drawing of the Brunnsgården gallery grave from Troili 1881.

We sampled teeth from three inhumed adults for radiocarbon dating (paper II), stable isotopes (paper V), and aDNA (paper IV). Enamel from the same teeth was analysed for Sr isotopes (paper IV).

Edsvära 19:1, Kleakulle gallery grave

— WGS84 coordinates: Lat. 58.23787 Long. 13.20110
— Inventory no: SHM 19136

Sahlström excavated this grave in 1929. The grave measured 11 x 2 m in size and was placed in the centre of a mound one m in height. The grave was oriented N-S and open at the southern end with possible portal stones (Fig. A2:2; Sahlström 1929). During the 1929 excavation, 19 flint daggers[3], seven bifacial flint arrow heads[4], flint scrapers, flint blades, slate pendants, amber beads and pendants[5], and pottery vessels were recovered, along with unburnt and burnt human bones and charcoal (Anderbjörk (1932: 25; Sahlström 1929). According to Sahlström (1929), the grave contained a 20 cm thick layer of burnt bones and charcoal. A fire-damaged flint dagger was also found in this layer, accompanied by some cremated human bones.

1 Lomborg type III
2 Lomborg type I
3 Lomborg type III-V
4 With concave bases
5 One club-shaped and three pea-shaped

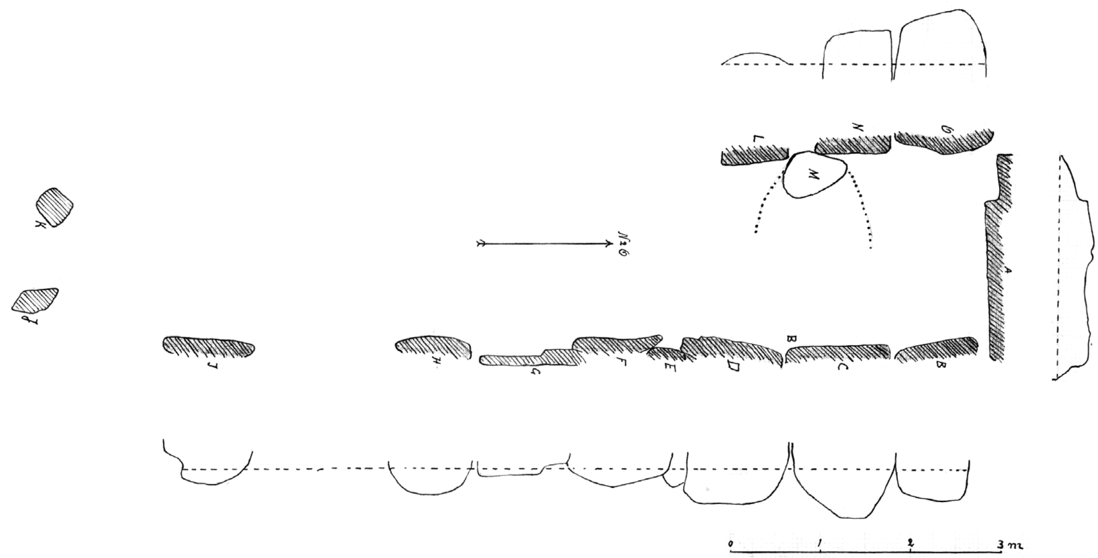


FIGURE A2:2 Plan of the Kleakulle gallery grave based on a field drawing by Sahlström 1929.

A cremated skull fragment and an unburnt long bone found in this grave were sampled and sent for radiocarbon analysis (paper VI).

Falköping without no., Blinningsberg gallery grave/passage grave

— WGS84 coordinates: Lat. 58.14038, Long. 13.52058
— Inventory no: SHM 20317

The grave was partially excavated and restored by Svensson, in 1933. Svensson (1933) estimated the damaged chamber to be 5.0 x 1.3 m in size (Fig. A2:3). The excavated part contained commingled unburnt human bones from five to seven individuals, ten amber beads, an Iron Age pottery sherd, and a cremated skull fragment (the present study; Svensson 1933).

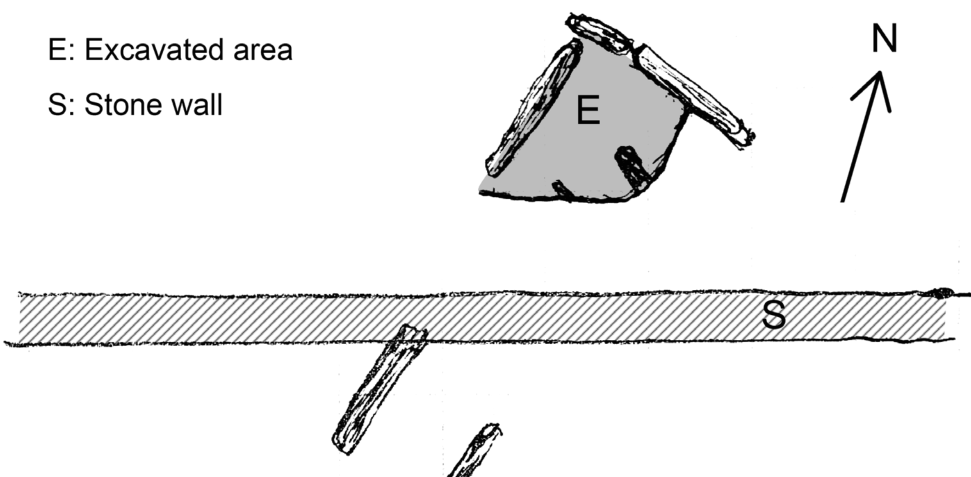


FIGURE A2:3 Field drawing of the Blinningsberg grave by Svensson (1933).

Two molar teeth from one juvenile and two long bones from two adults were sampled. Collagen samples from the three individuals were analysed for radiocarbon dating (paper II) and stable isotope analysis (paper V).

Enamel from both molar teeth of the juvenile was analysed for Sr and ^{18}O isotopes (Blank and Knipper 2021; paper IV). This individual was also sampled for aDNA (paper IV).

Falköping without no., Kapellgatan gallery grave

— WGS84 coordinates: Lat. 58.17435, Long. 13.54088
— Inventory no: SHM 19409
Svensson excavated and removed this gallery grave in 1930 (Fig. A2:4). The top of the grave was found 0.6 m below flat ground. The chamber was constructed of six limestone slabs: two on each long side and one on each gable end. Outside the chamber walls, a few stones had been placed to support the slabs. This 2.4 x 0.8 m large grave was oriented NW-SE. It consisted of a closed hexagonal chamber with a stone-paved floor. The roof rested directly on soil that filled the inside of the grave and was constructed of small red limestone slabs. The wall slabs of this grave were made of white limestone and were found leaning slightly inward. Small limestone chips had been placed between the slabs to seal the chamber. One red limestone slab was found inside, perpendicular to the long side, and forming a kind of niche (Svensson 1930). Svensson (1930) described the skeleton of an adult male in a contracted or possibly sitting position, although the documentation of the bone does not confirm this. An amber bead and some flint flakes accompanied the skeleton.

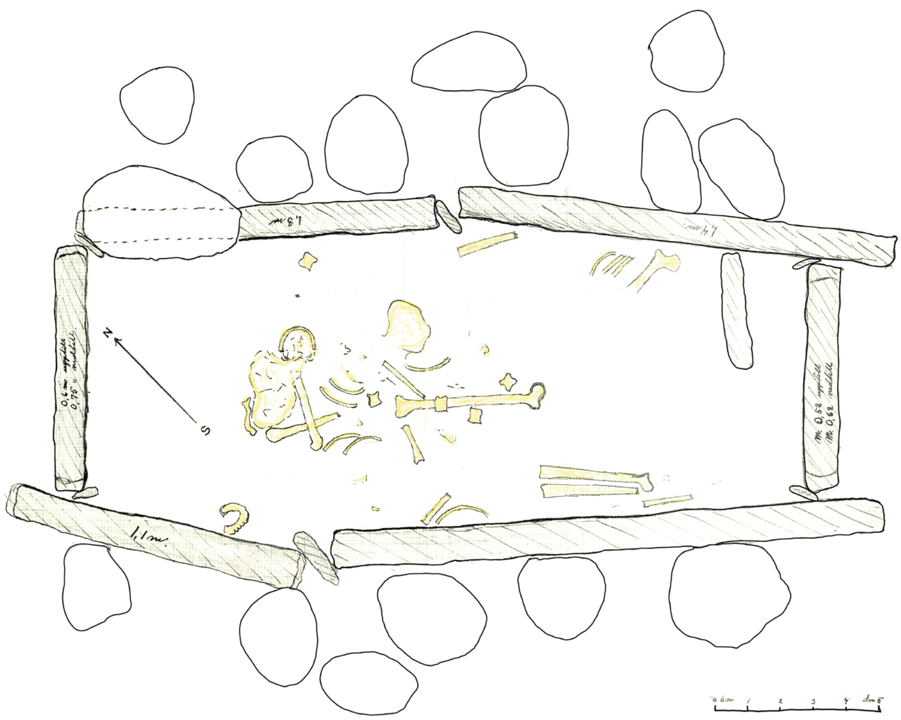


Figure A2:4 Plan of the Kapellgatan gallery grave, redrawn after Svensson (1930).

A molar tooth from the buried man was radiocarbon dated (paper II) and sampled for stable isotopes (paper V). The same tooth was also analysed for Sr isotopes and aDNA (paper IV).

Falköping 3:1, Hjälmarsrör passage grave

— WGS84 coordinates: Lat. 58.16982, Long. 13.57805
— Inventory no: SHM 4032, 3510, 35151, 35152
Hildebrand partially excavated the Hjälmarsrör passage grave in 1868. The grave was surrounded by a mound (24 m in diameter) and measured 5.6 x 2.5 m (Fig. A2:5). During the excavation, a large number of unburnt human bones were found. These bones were accompanied by animal bones, numerous amber beads, flint blades and flint flakes. Most of the skeletons were shovelled back into the chamber. In 1994, 1995, and 1998, the grave was investigated by staff at the University of Gothenburg in collaboration with VGM (Axelsson and

Persson 1995, 1999; Strinnholm 1996). In 1994 the entrance area and parts of the mound were excavated. In the mound, four secondary graves were recovered (Strinnholm 1996). TRB pottery sherds, flint, fragments from ground axes, a bifacial flint arrowhead[6], and a stone chisel were found in the entrance cairn. From the upper layer of the entrance cairn, a bronze tweezer[7] was recovered (Strinnholm 1996). In 1995, the northern half of the chamber was dug out, and a large number of human bones were found along with some pottery sherds, amber beads, a tanged blade arrowhead[8], some flint flakes, and flint blades (Axelsson and Persson 1995).

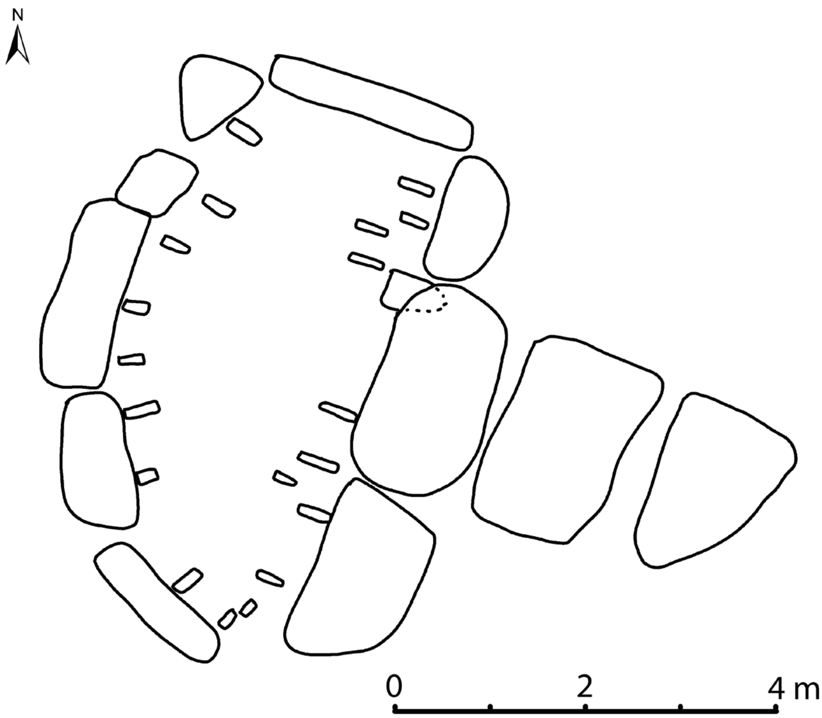


Figure A2:5 Plan of the Hjälmarsrör passage grave, redrawn after Strinnholm (1996).

In 1998, the southern half of the chamber was excavated and some pottery sherds, amber beads, flint flakes and a fragment of a tanged blade flint arrowhead[9], and burnt and inhumed human bones were recovered (Axelsson and Persson 1999; Persson and Sjögren 2001). Two pottery vessels[10] were found in the chamber, and three stones with cupmarks were recovered from the mound. The grave chamber was separated into several niches by small slabs (Fig. A2:5).

The skeletal remains were investigated by Wilhelmson (2003). The minimum number of individuals (MNI) was 26, comprising individuals of different ages. A relatively high proportion of them were women. Eight individuals, who were found in the northern part of the chamber, were radiocarbon dated to a time-period spanning between the Early/Middle Neolithic and the Middle Neolithic A/B (Axelsson and Persson 1999: 29; Persson and Sjögren 2001).

We sampled two cremated human bones (a skull fragment and a humerus bone) from two of the graves in the mound (A1 and A2, paper VI).

Falköping 5:2, Fredriksberg gallery grave

— WGS84 coordinates: Lat. 58.16607, Long. 13.57324
— Inventory no: SHM 32384

6 with a concave base
7 EBA p. III
8 type A
9 type B
10 one TRB and one PWC

The gallery grave was excavated and restored in 1973. This 5.3 × 2.0 m large grave was constructed with a chamber and ante-chamber. The chambers were separated by two limestone slabs (Weiler 1977; Fig. A2:6). The grave contained commingled human bones, some animal bones, a decorated pottery sherd[11], a flint dagger[12], flint flakes, amber pendants, a slate whetter, a tiny flat and round bone bead, bone needles, a bone awl, and a bone cylinder (the present study; Weiler 1977). Iregren (Weiler 1977) estimated an MNI of thirty, while Tornberg (paper I) calculated the MNI to 28 (including men, women, and children).

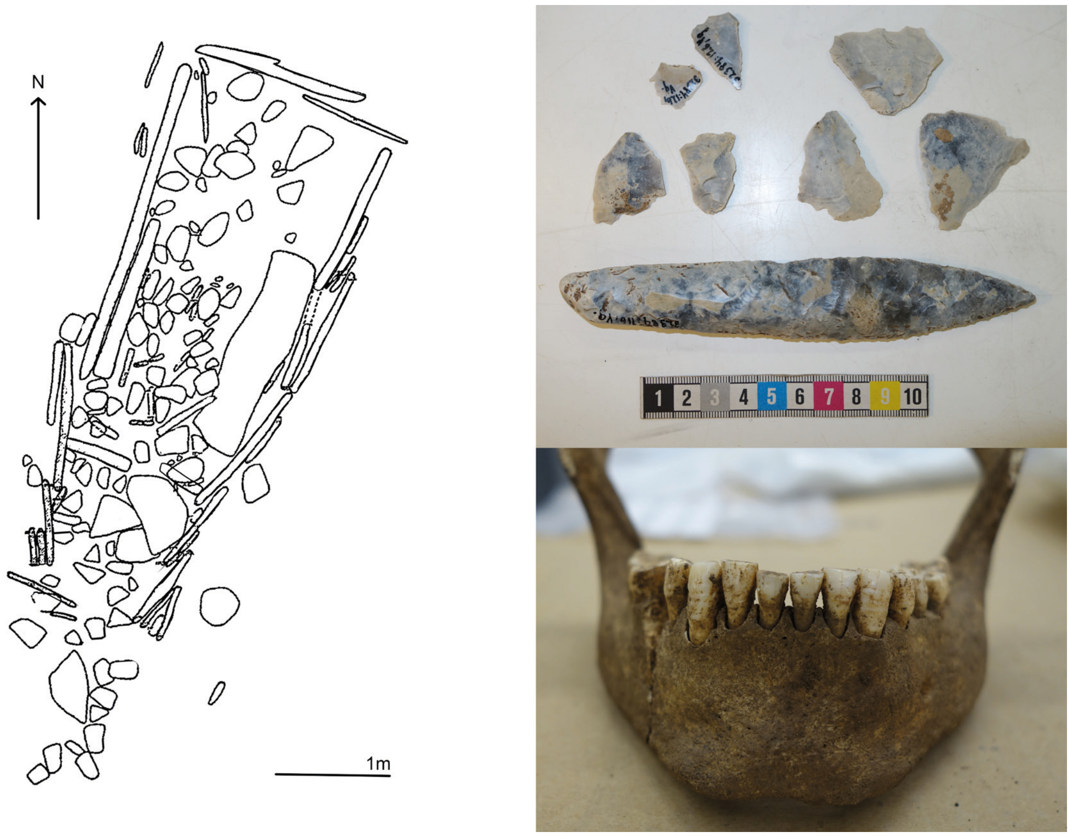


Figure A2:6 Left: Plan of the Fredriksberg gallery grave redrawn after Weiler (1977). Right top: Photo of a flint dagger and flint flakes recovered from the graves, by Malou Blank, CC BY. Right bottom: Photo of a sampled mandibula (F147), by Malou Blank.

Five individuals from this grave were previously radiocarbon dated by conventional method (Weiler 1977: 23). In the present study, 21 teeth and a thighbone from unique individuals were sampled for radiocarbon dating (Fig. A2:6; paper I, II). Dentine from the same teeth was sampled for stable isotopes (paper I, and V). Furthermore, enamel from these teeth was sampled for Sr isotopes (paper I, IV), ^{18}O isotopes (forthcoming article), and ^{13}C isotopes (paper V). Several of the teeth were also sampled for aDNA in an ongoing study at the Lundbeck Foundation GeoGenetics Centre, Copenhagen.

Falköping 7:1, Frugården passage grave

— WGS84 coordinates: Lat. 58.15341, Long. 13.56878
— Inventory no: SHM 4840:76
In 1870, an excavation of the passage grave was conducted (Werner 1873). The grave chamber was rectangular (5.3 x 2.3 m) with pointed gables. A passage was situated at the northern part of the long side. The stone construction was surrounded by a mound. The chamber was divided by small red limestone slabs into

11 A rim sherd decorated by uneven rows of small, pointed impressions

12 Lomborg type IIB

18 niches (Fig. A2:7). Unburnt human bones were recovered from the chamber and passage. The skeletal remains indicated sitting positions, according to Werner (1873). Animal bones, animal tooth pendants, amber beads, bone awls, and flint were also found. A cremated skull fragment was recovered from niche C inside the chamber (Fig. A2:7; Werner 1873).

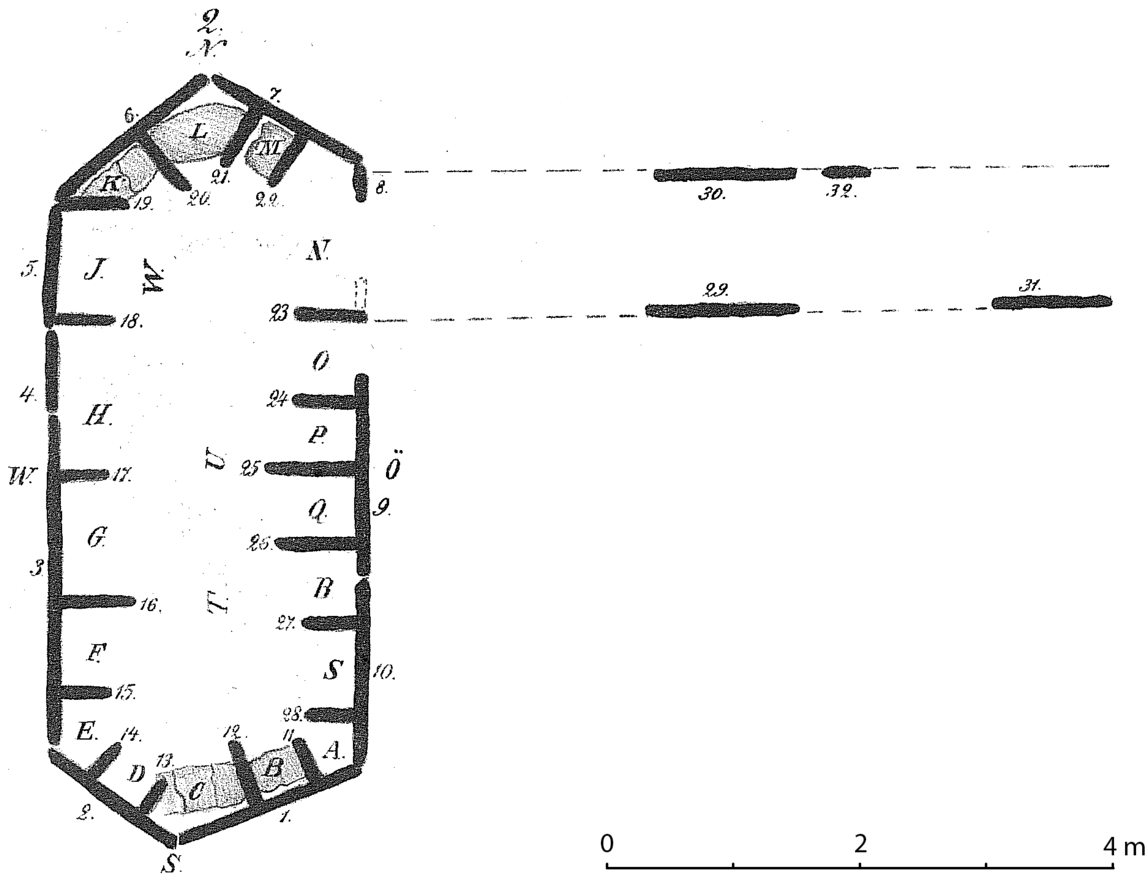


Figure A2:7 Drawing of the Frugården passage grave from Werner (1873).

The skull fragment, which was calcined white and thus burnt at an estimated temperature of 700°C or higher, was sampled and dated to the Preroman period, EIA (380-197 cal AD, 95,4%) in the present study.

Falköping 19:1, Lusthushögen passage grave

— WGS84 coordinates: Lat. 58.17303, Long. 13.55042
— Inventory no: SHM 4840:11-12, 4034b
This passage grave consists of an approximately 6 x 2 m large chamber with a passage placed centrally at the eastern wall. The whole construction was surrounded by a mound. The grave was partly excavated by Hildebrand 1868 (Werner 1870). Bone needles, bones awls, a flint spearhead[13], four bifacial flint arrowheads[14], eight flint daggers[15], six flint scrapers, one shaft-hole axe, two slate pendants, sherds from Late Neolithic pottery vessels[16], an amber pendant, a skull fragment, and three burnt human bones were recovered (Fig. A2:8).

13 bifacial with a concave base

14 with concave bases

15 Lomborg types I-VI

16 decorated with barbed wire and impressions

Figure A2:8 Artefacts recovered from the Lusthushögen passage grave, photos from ATA, SHM 4034b.

A burnt human skull fragment was sent for radiocarbon dating (paper VI).

Falköping 22:1, Rantens torgplats gallery grave/dolmen

— WGS84 coordinates: Lat. 58.17390, Long. 13.55092
— Inventory no: SHM 6593

Troili excavated and removed this damaged grave in 1880. The estimated size of the grave was 3.0 x 1.5 m (Sahlström 1932: 166; Troili 1880). It was oriented NE-SW and was partly covered by a low cairn/mound about 10 m in diameter. Human unburnt skeletal remains, animal bones, and an axe-shaped amber bead were recovered from the chamber. Furthermore, a small bronze plate was found outside the grave (the present study; Sahlström 1932: 166). The number of buried individuals in this grave is unknown.

From the human remains collected from this grave, we sampled a radius bone from an adult individual for radiocarbon dating (paper II) and for stable isotopes (paper V).

Falköping 26:1, Järnvägens/Rantens gallery grave/dolmen

— WGS84 coordinates: Lat. 58.17595, Long. 13.55334
— Inventory no: VGM 1M16-104782

This grave was excavated and removed in 1995 (Algotsson 1996; Fig. A2:9). Prior to this, in 1951, Sahlström and Magnusson had restored the grave (Sahlström 1951). It consisted of a 2.6 x 1.8 m large chamber which was covered by a low stone setting. The chamber was open and constructed by three limestone slabs. An axe-shaped amber bead and a flint flake were recovered from the grave, along with commingled inhumed skeletons. Two flint flakes were found outside of the chamber in the stone packing (Algotsson 1996). Furthermore, a burial of a cremated woman was found in the covering stone setting. The number of inhumed individuals recovered from the grave was estimated to seven (Algotsson 1996; paper II: appendix 2).

Figure A2:9 Photo of the 1995 excavation, by Curry Heiman, Falbygdens museum (CC BY NC-ND 4.0).

The cremated female was radiocarbon dated to the Late Bronze Age (Blank 2017). Additional osteological analyses were conducted and discussed in paper VI. Furthermore, unburnt teeth from six individuals (one child and five adults) were sampled for radiocarbon dating. Three of these samples were redated at a second laboratory (paper II). Two unburnt long bones from the grave were also sampled for radiocarbon dating (paper II). Stable isotope analyses were conducted on two of the teeth (Blank 2019) and the two long bones (paper V). The enamel of five of the teeth was sampled for Sr isotopes (Blank and Knipper 2021; paper IV).

Falköping östra 1:1, Firse sten passage grave

— WGS84 coordinates: Lat. 58.15302, Long. 13.56865
— Inventory no: VGM 1M16-107079.
This T-shaped passage grave is located in a mound and consists of an 8.0 x 2.5 m large chamber and an 8 m long passage. In the 1950s, it underwent minor restoration. In 2008, it was partly excavated by VGM. Parts of the passage had been rebuilt into a gallery grave during the Late Neolithic, and in this passage section, at least three individuals (two adults and one child) were recovered (Fig. A2:10). The skeletons seemed to be articulated. One of the skeletons lay in a supine position. Furthermore, an inhumation burial of an adult man was found in the surrounding mound along with six bronze artefacts dated to the Bronze Age period III/IV[17]. The bones in the mound were commingled, probably due to secondary disturbance, since more recent remains were also found in the same context. On the stone floor of the entrance area, TRB pottery sherds, burnt and unburnt flint blades, and unburnt human bone were found. The northern part of the chamber was also excavated. In the bottom layer of the north-eastern corner of the chamber, a teenage female was placed in a contracted position on her side (Blank 2017; Jankavs 2014). Since only smaller parts of the grave were

17 dagger, fibula, razor, pommel, buckle and a tweezer

excavated, the number of buried individuals is unknown. The recovered remains merely represent a small part of the original burials.

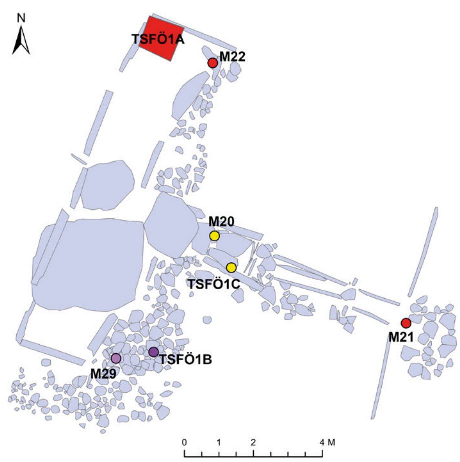


Figure A2:10 Left: Plan of the Firse sten passage grave with the distribution of human samples, by Malou Blank based on data from Tony Axelsson (see appendix 1). Red: MN individuals, Yellow: LN individuals, Purple: BA individual. Right: Photo of the grave during its excavation in 2008, by Tony Axelsson.

Thin sections of three radiocarbon-dated long bones from different parts of the grave demonstrated extensive bioerosion to no bioerosion (Hollund et al. 2018). The radiocarbon dates are included in paper II, and the stable isotopic data in paper V. Six additional teeth from different individuals were radiocarbon dated (Blank 2017; paper II). Four of these teeth were sampled for stable isotopes (Blank 2019; paper V). A molar tooth beloning to the man buried in the mound was also sampled for aDNA in an ongoing study at the Lundbeck Foundation GeoGenetics Centre, Copenhagen.

Gökhem wihout no., Torsagården gallery grave

— WGS84 coordinates: Lat. 58.17141, Long. 13.43822
— Inventory no: SHM 23802
Only three limestone slabs located below the ground level remained when this grave was excavated in 1947 (Sahlström 1947). The grave was originally constructed as a closed chamber, approximately 1.7 x 0.4 m in size. The chamber was oriented N-S. A skeleton of an adult male in a supine position was found inside the chamber (Fig. A2:11). A flint dagger[18] and a bone awl had been placed on the hip of the skeleton. Underneath the feet of the man, bones from one or two children were recovered (Sahlström 1947; the present study). A few cremated bones were also found during the excavation, but the exact location of these bones is unknown. However, a possible assumption is that they might originate from the low cairn that covered the grave.

A molar tooth of the man and the petrous bone of a child were radiocarbon dated (paper II) and sampled for stable isotope analyses (Blank 2019; paper V). In addition, one of the cremated human bones was radiocarbon dated to the Late Bronze Age (Blank 2017). This bone is discussed and further analysed in paper VI.

18 Lomborg type I

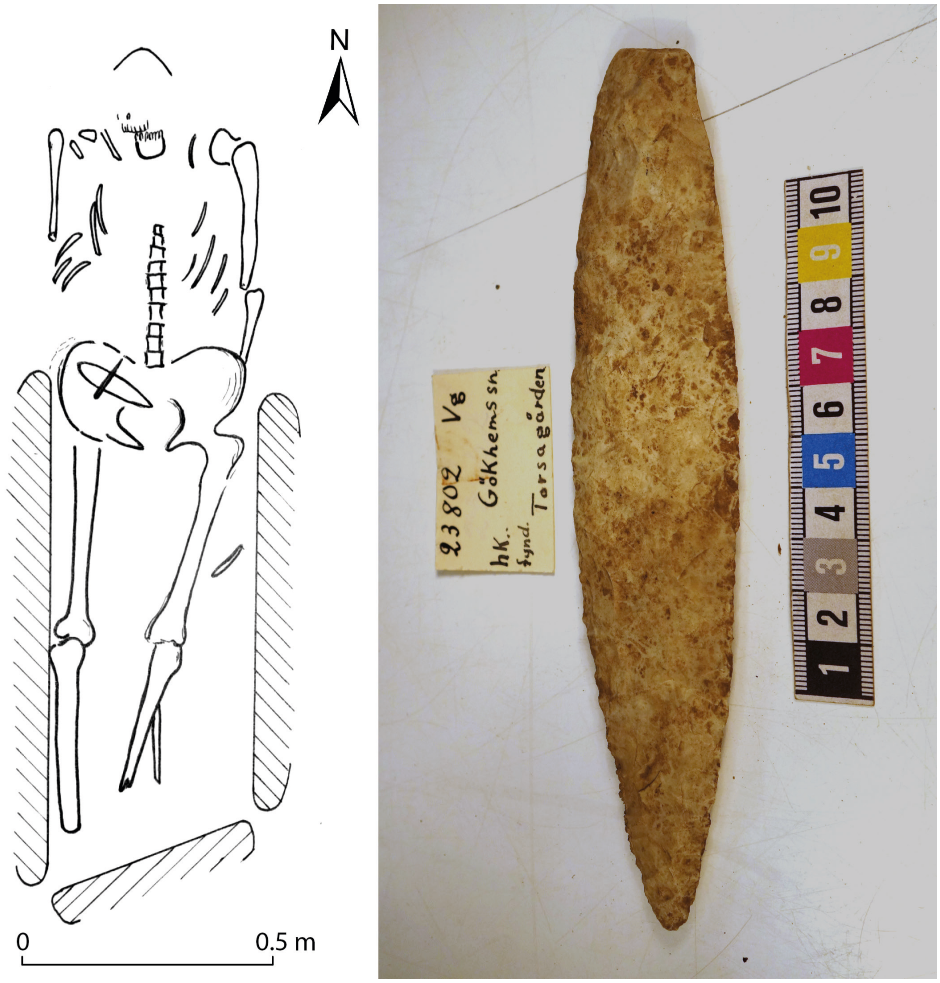


FIGURE A2:11 Left: Drawing of the Torsagården gallery grave based on a field drawing by Sahlström (1947). Right: A flint dagger found at the hip of the buried adult, photo by Malou Blank, CC BY license (SHM).

Gökhem 24:1, Ledsgården passage grave

— WGS84 coordinates: Lat. 58.18635, Long. 13.43273
— Inventory no: SHM 21426

In 1936, Hilding Svensson conducted a series of archaeological investigations and excavations at Ledsgården in Gökhem parish, Falbygden (Svensson 1936). He excavated the remains of a small cairn located at the northern part of the mound of the Ledsgården passage grave. Within the assembly of stones, cremated human bones and pottery sherds were also documented (Svensson 1936). A cremated long bone from this deposition was sampled for radiocarbon dating (Blank 2017; paper VI).

Gökhem 31:1, Nästegården passage grave

— WGS84 coordinates: Lat. 58.18316, Long. 13.42823
— Inventory no: VGM 1M16-104358

Between 1985 and 1987, parts of the entrance area and the mound of this passage grave were excavated. The excavations were led by the University of Gothenburg in collaboration with VGM (Persson and Sjögren 2001; Wattman 1993). The grave is surrounded by a mound and consists of an NNE-SSW oriented chamber. A passage is placed centrally at the eastern chamber wall and ending by façade slabs (Fig. A2:12). The chamber measures approximately 8.0 x 2.5 m in size, and the passage is 6.5 m long. Remains of a possible kerbstone was found. A few roof slabs were still left when the grave was investigated (Persson and Sjögren 2001; Wattman 1993).

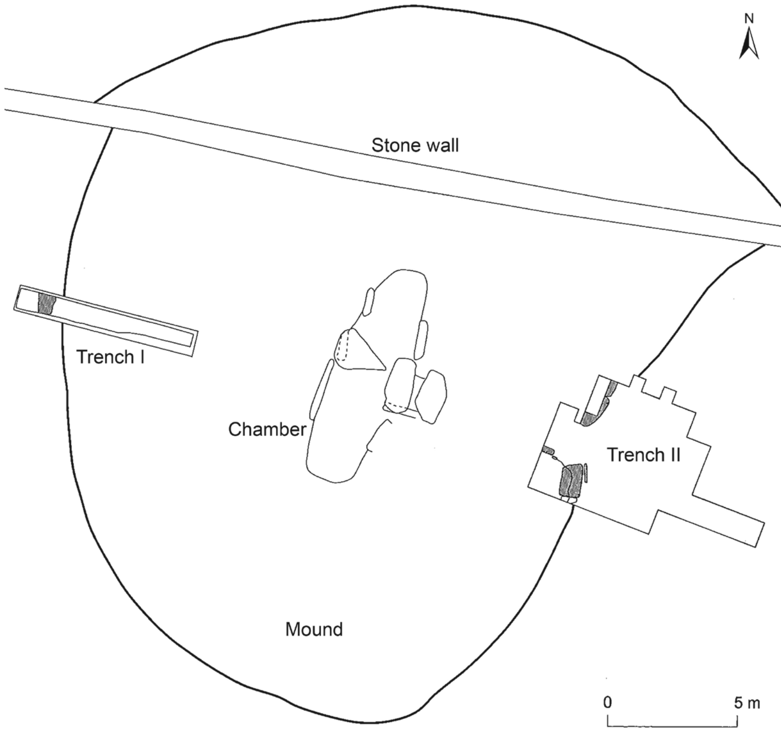


Figure A2:12 Plan of the Nästegården passage grave with excavation trenches from 1985-1987, based on Persson and Sjögren (2001).

A flint flake was found in the mound to the west of the chamber. In front of the entrance, TRB pottery sherds, burnt and unburnt flint, unburnt and burnt bones (human and animal), and a few fragments of burnt bone points were collected. For more details about the excavation, grave construction, and its content, see Persson and Sjögren (2001) and Wattman (1993).

In a previous study (Sjögren 2003: 98), a cremated pig bone that was found in front of the entrance was dated to the latest part of Middle Neolithic A (Sjögren 2003: 98). An unburnt human bone from the same area was radiocarbon dated (Wattman 1993). This date has a large standard deviation and can only be dated to the Neolithic period in general (paper II). In the present study, a human tooth recovered from the entrance area was sampled for radiocarbon dating (paper II) and for stable isotopes (paper V). Furthermore, three cremated human bones also from the entrance area were radiocarbon dated (paper VI).

Gökhem 71:1, Hovmansgården passage grave

— WGS84 coordinates: Lat. 58.15925, Long. 13.45561
— Inventory no: VGM 1M16-107017
The grave is located within a 22 m diameter mound. It consists of a 6.0 x 2.5 m large chamber with a 6 m long passage. Parts of the mound and the entrance area were excavated by members of the University of Gothenburg in collaboration with VGM in 1985-86 (Bågenholm et al. 1993; Fig. A2:13). Underneath the mound a Neolithic settlement layer was documented. This layer contained pottery sherds, flint, and burnt and unburnt bones. A stone-paved floor was found[19] in the entrance area, in front of the façade slabs. An entrance cairn was documented above this floor level. At this location, pottery[20] sherds, flint flakes and blades, and human and animal bones (burnt and unburnt) were recovered. The human bones were concentrated close to the passage and was suggested to derive from burials inside the passage (Bågenholm et al. 1993; Persson and Sjögren 2001).

An unburnt human bone found in the entrance area was radiocarbon dated to the Middle/Late Neolithic with a large standard deviation (Bågenholm et al. 1993).

19 similar to Falköping östra 1

20 TRB

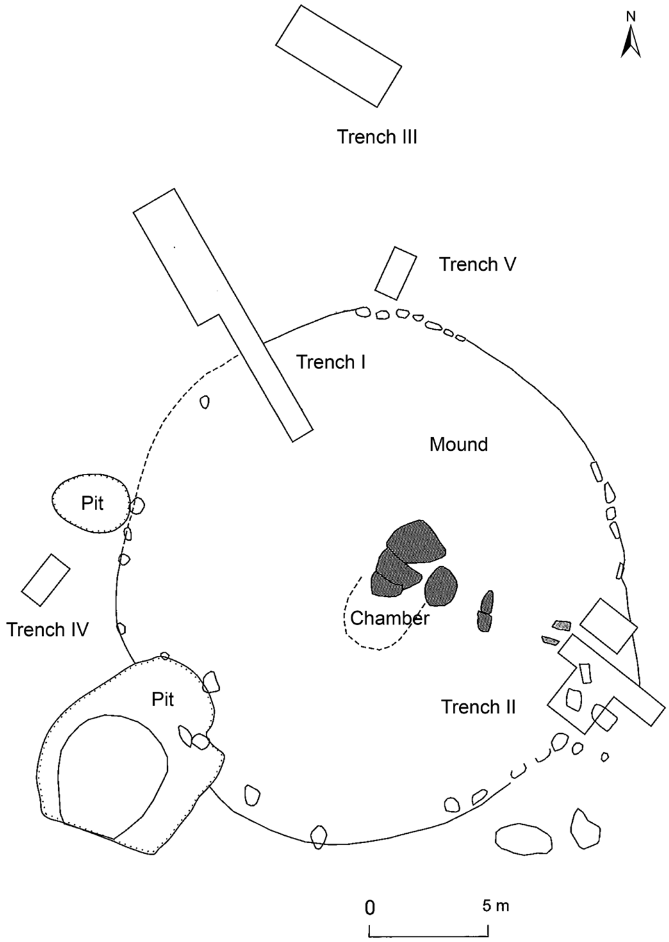


Figure A2:13 Plan of the Hovmansgården passage grave with excavation trenches from 1985-1986, based on Persson and Sjögren (2001).

We sampled two burnt human bones for radiocarbon dating, including a skull fragment recovered from the cultural layer below the mound, behind the grave chamber, and a long bone from the entrance area (paper VI).

Gökhem 78:1, Ormarör passage grave

— WGS84 coordinates: Lat. 58.15232, Long. 13.43411

— Inventory no: VGM 1M16-107139

The Ormarör passage grave is surrounded by a mound and the approximately 5 to 6 m long chamber is oriented S-N. The passage was most probably placed centrally at the eastern chamber wall (Persson and Sjögren 2001: 120). Troili partly excavated the chamber of the passage grave in 1882. In 1985, new excavations were conducted by VGM in collaboration with the University of Gothenburg (Persson and Sjögren 2001; Sjögren 1992). At this time, the mound, including the entrance area, was partly excavated. During these excavations, three trenches were opened to establish the original surface, examine the construction of the mound, and locate and investigate the entrance area (Fig. A2:14).

In trench number I, a sandstone slab with cupmarks was found in the southeastern part of the mound. Furthermore, below a small stone concentration, a layer with cremated bones was found and interpreted as an Iron Age grave (Sjögren 1992: 8; Persson and Sjögren 2001: 121-124). According to the osteological analysis the bones belong to a female estimated to an age between 30 and 50 years (Sjögren 1992: 17; Persson and Sjögren 2001: 124). Below the mound a few pottery sherds, flint and burnt bones were recovered. In trench number III undecorated pottery sherds, possibly dating from the Bronze Age or Iron Age, were found. Furthermore, a bronze buckle and a flint sickle were found in the mound, thus indicating later activities (Persson and Sjögren 2001: 124).

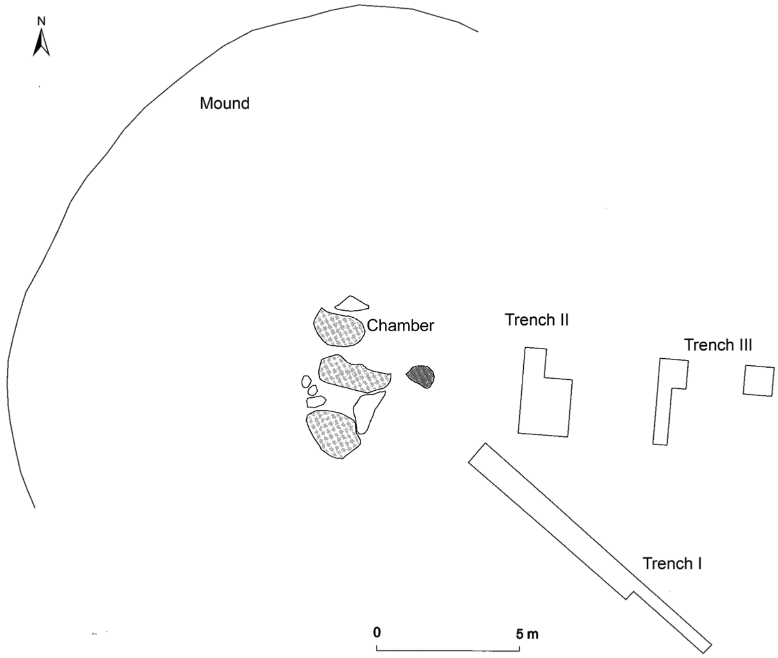


Figure A2:14 Plan of the Ormarör passage grave with excavation trenches from 1985, based on Persson and Sjögren (2001).

We sampled a cremated long bone of the woman buried in the mound for radiocarbon dating (paper VI).

Gökhem 94:1, Frälsegården passage grave

— WGS84 coordinates: Lat. 58.16452, Long. 13.45474
— Inventory no: SHM 18119, VGM 1M16-107047

This severely damaged passage grave was excavated between 1999 and 2001 (Sjögren 2008, 2015). The T-shaped grave consisted of a 9 x 2 m chamber and a 10 m long passage. The chamber was oriented NNE-SSW, and the passage was a centrally placed, perpendicular to the eastern chamber wall. The grave was surrounded by a mound measuring 30 m in diameter. The chamber was divided into several niches by small limestone slabs (Sjögren 2008; Fig. A2:15). Burnt and unburnt flint flakes and pottery sherds were recovered from the entrance area. The chamber and passage contained bones (mainly human), amber beads, flint blades, flint flakes, a flint scraper, a tanged flint blade arrowhead[21], a few pottery sherds[22], bone awls, two small bone cylinders[23] and a small animal tooth-shaped bone pendant[24]. Furthermore, a supposed Iron Age cremation burial was found in the mound (Sjögren 2008). The MNI deposited in the chamber was calculated to 51, while the most likely number of individuals (MLNI) was estimated to 78 (Sjögren 2015).

Molar teeth from eight Middle Neolithic adult individuals found in this grave were previously analysed for Sr isotopes (Sjögren et al. 2009). This data is included in paper IV. Furthermore, four individuals found in this grave have been included in aDNA studies (Skoglund et al. 2012, 2014; Rascovan et al. 2019). The mtDNA haplogroups of these individuals are also discussed in paper IV. Finally, a Middle Neolithic A/B unburnt human thighbone which was previously analysed in a histological study (Hollund et al. 2018) was sampled for stable isotopes (paper V).

21 type A

22 TRB and IA

23 similar to those found in Luttra 16/Knaggården, Karleby 59/Logårds kulle, Torbjörntorp 18/Lilla Balltorp, and Falköping 5/Fredriksberg

24 BAC, see Valtorp 2/Rössberga passage grave and Köpinge 150 flat grave, Scania

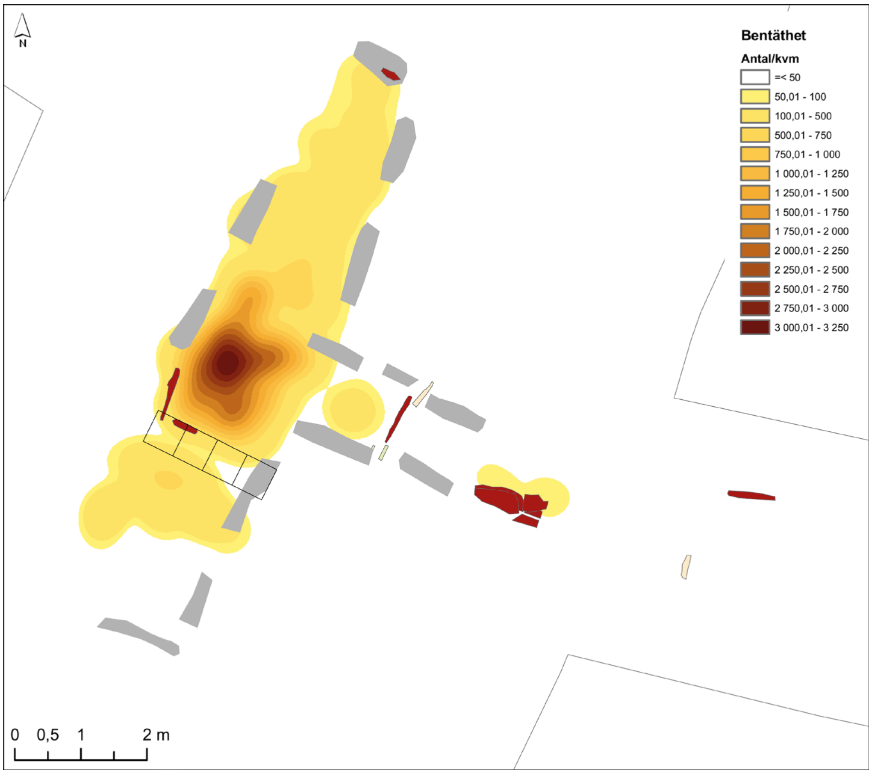


FIGURE A2:15 A kernel density plot calculated from bone midpoints, from Sjögren (2008), under a CC BY license.

Gökhem 94:2, Frälsegården megalithic grave

— WGS84 coordinates: Lat. 58.16393, Long. 13.45283
— Inventory no: VGM 1M16-107047.

Southwest of the passage grave 94:1, another damaged megalithic grave was identified and investigated in 1999. The remains of the megalithic grave had been removed in 1875, and no traces of the construction could be identified (Sjögren 2008). However, recent geomagnetic data suggest that this was, in fact, a dolmen (Sjögren personal communication).

Unburnt human and animal bones, a few cremated bones, an amber bead[25], three flint flakes, a polished flint axe fragment, and five Viking Age glass beads were recovered (Sjögren 2008).

One human tooth recovered during the 1999 excavation was sampled for radiocarbon dating (paper II).

Gökhem 164:1, Frälsegården dolmen

— WGS84 coordinates: Lat. 58.16286, Long. 13.45733
— Inventory no: SHM 20817

In 1934, Svensson excavated a severely damaged grave. According to the documentation (Svensson 1934b), the grave, consisting of a 2 x 1 m large chamber, was placed above ground in a low cairn. The chamber was oriented E-W. It contained a partially articulated skeleton of an adult individual placed in a contracted position, and a flint flake. Furthermore, a few animal bones were recovered outside of the chamber (Svensson 1934b).

A molar from the inhumed skeleton was sampled for radiocarbon dating (paper II) and for stable isotopes (paper V).

Karleby 57:1, Klövatomten passage grave

— WGS84 coordinates: Lat. 58.15286, Long. 13.63776
— Inventory no: SHM 5157

Montelius and Retzius excavated this passage grave in 1872. The grave is surrounded by a mound and consists of a 6.0 x 2.5 m oval chamber and an asymmetrically placed 7 m long passage (Retzius 1899: 69). The cham-

25 Club-shaped

ber was divided into small compartments by stone niches (Montelius 1873; Retzius 1899: 69; Fig. A2:16). The grave was filled with a mix of stones, sand, and soil. At least two bone layers, which were divided by flat stones, were observed. Most of the bones were found inside the chamber. According to Retzius (1899: 69), the dead bodies were placed in sitting positions and some in supine positions. The number of inhumed individuals was estimated to 80 (Retzius 1899: 60). The commingled human bones were accompanied by flint flakes, a Late Neolithic bifacial flint arrowhead[26], a hammer stone/grinding stone, amber beads, animal bones, a bone point, pottery sherds[27] and fragments of an Iron Age comb (the present study; Retzius 1899).

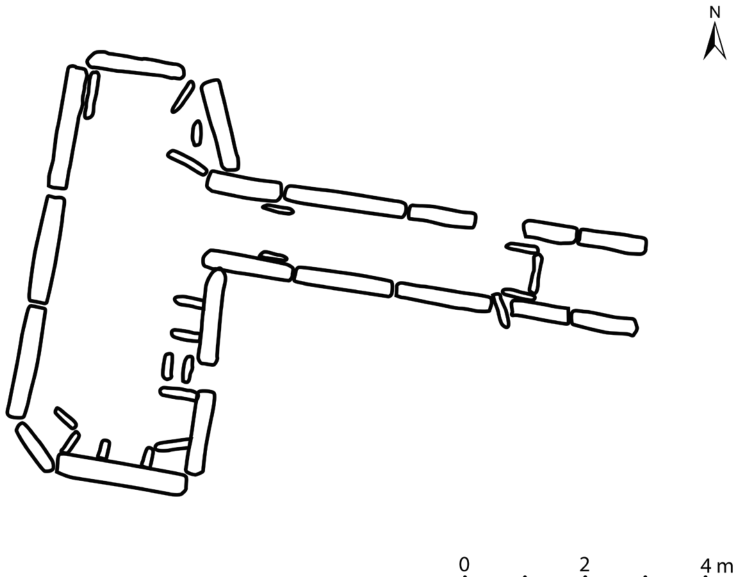


Figure A2:16 Plan of the Klövatomten passage grave redrawn after Retzius and Montelius 1872 (ATA).

Two premolars belonging to different individuals were sampled for radiocarbon dating (paper II), for stable isotopes (Blank 2019; paper V) and for Sr isotopes (Blank and Knipper 2021; paper IV).

Karleby 59:1, Logårds kulle passage grave

— WGS84 coordinates: Lat. 58.15473, Long. 13.63825
— Inventory no: SHM 5386b

Montelius and Retzius excavated the passage and part of the chamber of this grave in 1874. The grave consists of an 11 x 2.5 m chamber that is oriented N-S and an 8 m long passage that was constructed perpendicularly from the eastern wall. A mound surrounds it. Roof slabs, some with cupmarks, cover the grave. The chamber was divided into compartments by niche slabs. Several layers of inhumed human bones were documented in the chamber and in the passage (Retzius 1899: 64; Fig. A2:17). The burials were accompanied by animal bones, tooth pendants, bone awls, small bone cylinders[28], a bone needle, amber beads, two tanged blade flint arrowheads[29], and an adze. Retzius (1899: 64) reported on finding 39 skulls in the chamber and 24 skulls in the passage. In addition, an assembly of burnt human bones, assumed to belong to three individuals (two adults and a child), was recovered at the bottom of the chamber.

One adult and one child from the chamber were dated in Sjögren (2003). The two bone samples were dated to the Middle Neolithic A. Five unburnt skulls that were recovered from the chamber and the passage were sampled for radiocarbon dating and included in the present study (Fibiger et al. 2013; paper II). Three teeth and two bone fragments from these skulls were sampled for stable isotopes (Blank 2019; paper V). Teeth from four of the dated individuals were also sampled for Sr isotopes (Blank and Knipper 2021; paper IV). A healed

26 with a concave base
27 TRB, BAC, LN, and IA
28 see Gökhem 94:1/Frälsegården, Luttra 16/Knaggården, Torbjörntorp 18/Lilla Balltorp, and Falköping 5/Fredriksberg
29 type A

fracture to the mandible and the loss of several teeth before death were identified in one Late Neolithic adult male (Blank and Knipper 2021; Fibiger et al. 2013). Finally, two burnt human bones from this grave were sampled for radiocarbon dating (Paper VI)

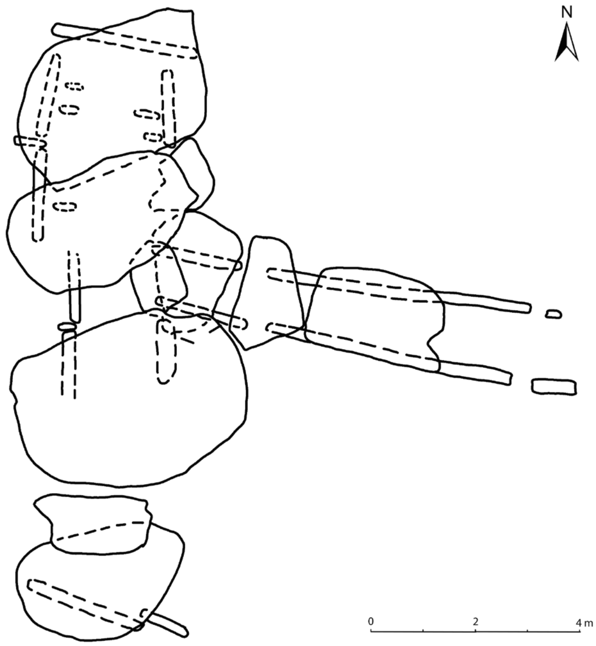


FIGURE A2:17 Plan of the Logårds kulle passage grave redrawn after Blomqvist/Bägerfeldt (1989).

Karleby 71:1, Utbogården gallery grave

— WGS84 coordinates: Lat. 58.16346, Long. 13.64718
— Inventory no: SHM 5386a

Montelius and Retzius excavated this gallery grave in 1874. Later, in 1930, it was restored by Hilding Svensson. The 7 x 2 m large grave consists of two chambers and an ante-chamber. The two chambers and the middle chamber and the ante-chamber are divided by slabs with port-holes (Fig. A2:18; Montelius 1877; Retzius 1899: 68-70). The chamber contained 14 flint daggers[30], three bifacial flint spearheads[31], four bifacial flint arrowheads[32], a few bifacial arrowhead roughouts, flint flakes[33], flint scrapers, a piece of a flint sickle, a flint chisel, four slate pendants, amber beads, two small bronze rings, the tip of a bronze spear[34], four pottery vessels[35], bone awls, bone needles, animal bones, and unburnt human bones (Fig. A2:18; Montelius 1877; the present study). The ante-chamber was found empty, and the smaller chamber contained a few human bones only. According to Retzius (1899: 68-70) and Montelius (1877) the human bones had been moved to make room for new burials, although some skeletons in supine and sitting/contracted positions were still identified. The number of buried individuals was estimated to 60 (Retzius 1899: 68-70). Unfortunately, today, only ten skulls are accounted for, although a more extensive collection of bone material was described at the depository at SHM. At this time, mostly skulls were collected during the excavation, and it seems as if some of these have been lost over the course of time.

One of the skulls, with an ante-mortem[36] fracture, was dated in a previous study (Fibiger et al. 2013). The remaining nine skulls and a cattle bone were radiocarbon dated for the present study (Blank 2017; paper II). A

30 Eight Lomborg type IV, five type V, one type IV/V
31 one with a concave base, one triangular, and one blade shaped
32 with concave bases, triangular
33 some from ground axes
34 BA p. III
35 one covered with comb stamps
36 before death

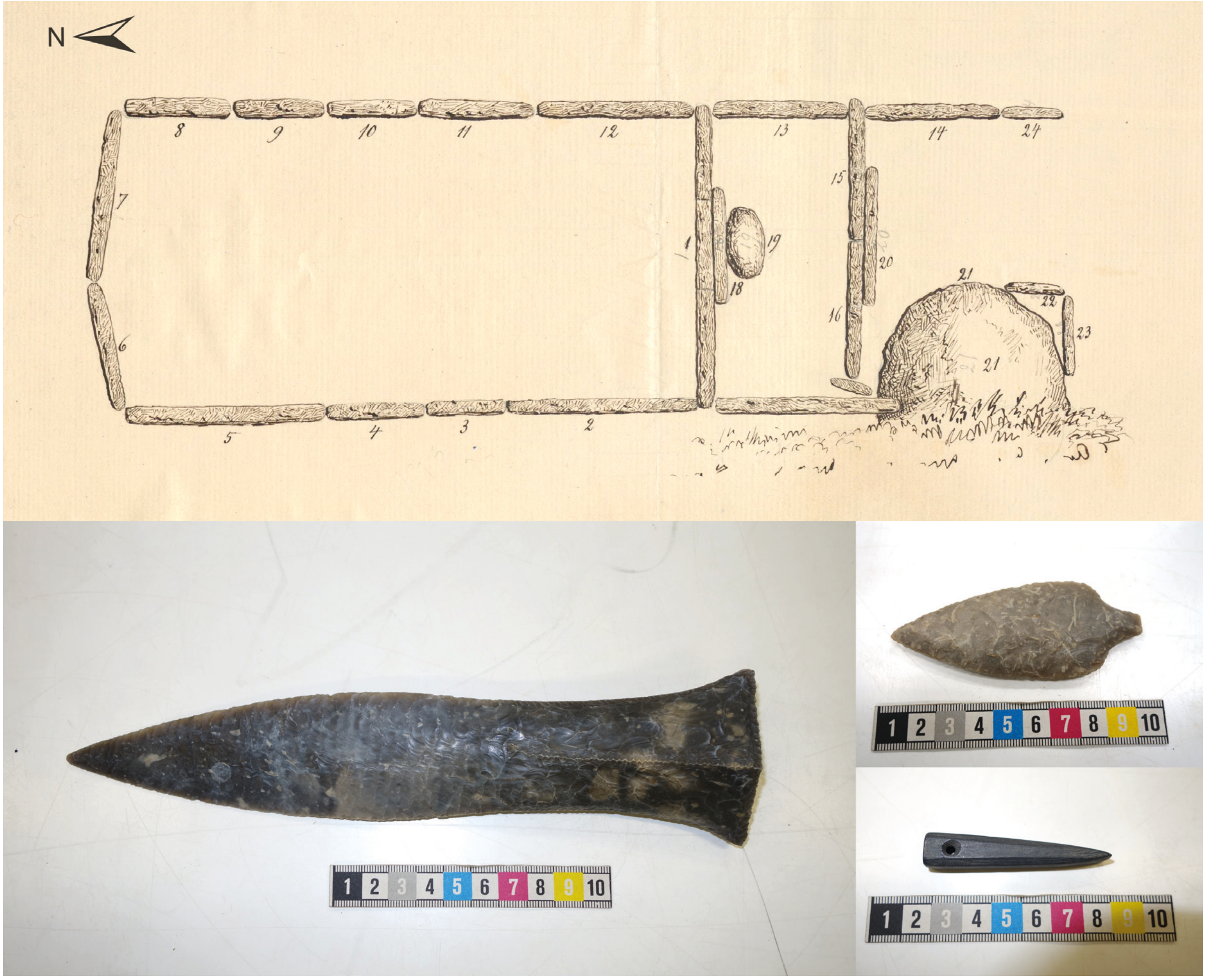


Figure A2:18 Top: Drawing of the Utbogården gallery grave from Montelius (1877, ATA). Bottom: A flint dagger, a flint spearhead and a slate pendant from the Utbogården gallery grave, photos by Malou Blank, CC BY (SHM).

calvaria with a healed trauma (Tornberg personal communication) was included in the set of dated skulls. Nine of the skulls (three teeth and six skull fragments) were sampled for stable isotopes (Blank 2019; paper V). Enamel from the three teeth was also sampled for Sr and ^{18}O isotopes (Blank and Knipper 2021; Blank forthcoming paper; paper IV), and for ^{13}C isotopes (paper V).

Karleby 105:1, Holma passage grave

— WGS84 coordinates: Lat. 58.19006, Long. 13.63280

— Inventory no: VGM 1M16-107140

In 2005, VGM excavated and restored parts of the Holma passage grave. This T-shaped grave, situated in a mound, consists of a 10 x 2 m large chamber with a 5 m long passage (Fig. A2:19). During the excavation, a potential Bronze Age burial (suggested by the presence of a bronze awl along with some cremated bones) was found outside of the chamber. Inside the chamber, amber beads, a pottery sherd, a tanged blade flint arrowhead[37], and human bones were found. A Late Neolithic bifacial flint arrowhead[38] and an Iron Age iron knife were also recovered (Blank 2016, 2017; the present study).

37 type A

38 with a concave base

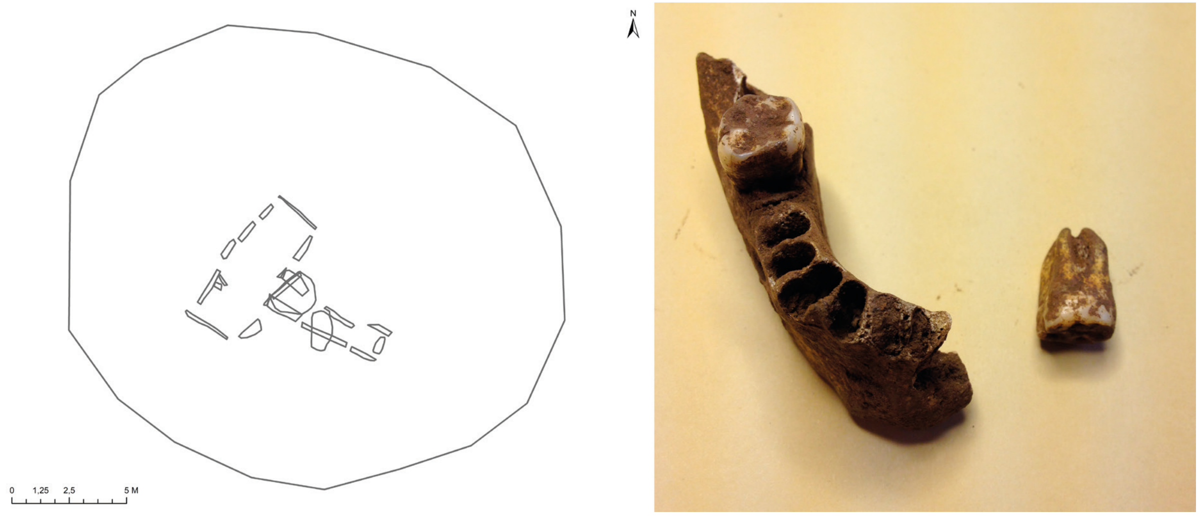


Figure A2:19 Left: Plan of the Holma passage grave, by Malou Blank based on field data from Tony Axelsson. Right: Photo of the mandible of the sampled individual, MK105:1, by Malou Blank.

Teeth from two individuals were radiocarbon dated (paper II). They were also sampled for stable isotopes (Blank 2019; paper V) and for Sr isotopes (Blank and Knipper 2021; paper IV).

Kinneved 21:1, Slutarp dolmen

— WGS84 coordinates: Lat. 58.09010, Long. 13.51231
— Inventory no: SHM 14217
In 1910, Lindqvist excavated and restored the Slutarp grave. It consists of a 2.2 x 1.1 m large chamber, which is oriented ENE-WSW. The chamber is covered by a mound and surrounded by kerbstones (Fig. A2:20). It is constructed by four limestone slabs leaning slightly inwards with a floor composed of two limestone slabs. In

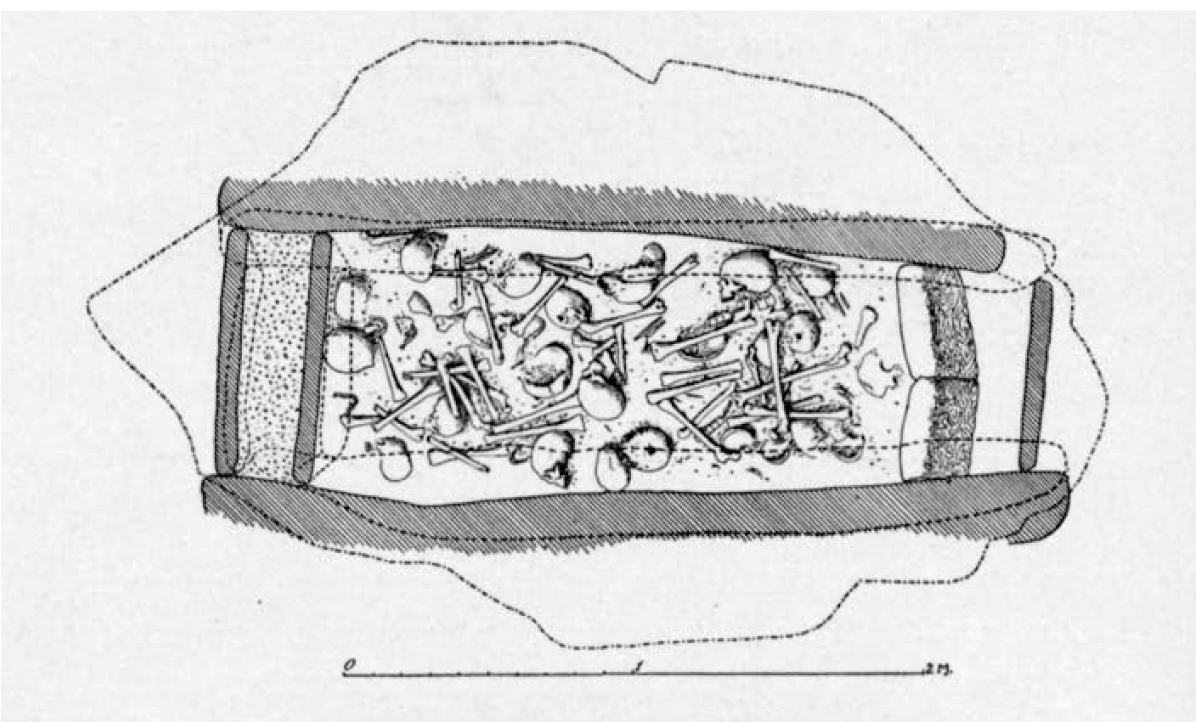


Figure A2:20 Drawing of the Slutarp dolmen, from Lindqvist (1911).

the chamber, roughly 30 cm from and parallel to the western gable, a second slab was documented, standing. The eastern gable was low, like a threshold. Thirty cm west of the eastern gable two slabs, which did not extend in height all the way up to the roof, separated the chamber[39]. A 3.5 x 2.1 m large roof slab with cup-marks and a few foot sole carvings covered the chamber. The chamber contained commingled human bones, amber beads, and flint flakes (Lindqvist 1911). Fürst (1911) estimated the number of buried individuals to 34, consisting of men, women, and children.

In a previous study (Persson and Sjögren 2001), five femora from separate individuals from this grave were dated to the Early/Middle Neolithic A. These dates were included in paper II. A petrous bone of an adult male was sampled for radiocarbon dating (paper II), stable isotopes (paper V) and aDNA (paper IV).

Kinneved 73:1, Fastarp Mossgården gallery grave

— WGS84 coordinates: Lat. 58.08400, Long. 13.53154
— Inventory no: SHM 22987, FM 2028
This grave was located below ground and was partially investigated and restored by Svensson in 1942. A 10 cm thick layer of commingled bones was observed at the bottom of the chamber, which was estimated to include at least three individuals. Furthermore, pottery sherds, a flint scraper, a flint dagger[40], and a slate pendant were recovered (Fig. A2:21; Svensson 1942; the present study).

Figure A2:21 A flint dagger from the Fastarp Mossgården gallery grave, photo by Gunnar Creutz, Falbygdens museum.

In the framework of this thesis, two individuals (an adult and a child) were sampled. The radiocarbon results from the analysis of a metacarpal bone and a deciduous tooth are presented in paper II. The stable isotope data from the same pair of samples are included in paper V. The enamel of the tooth was also analysed for Sr isotopes (paper IV).

Luttra 16:1, Knaggården passage grave

— WGS84 coordinates: Lat. 58.13123, Long. 13.57000
— Inventory no: SHM 3165
Hildebrand excavated the Knaggården passage grave in 1863. The grave is surrounded by a mound and consists of a 4.5 x 2.3 m large rectangular chamber with a 4 m long passage (Fig. A2:22). The chamber is oriented N-S and the passage is centrally placed perpendicular to the eastern chamber wall (Hildebrand 1864; Retzius 1899: 52-55). The chamber and passage contained soil. The lower part of the soil was mixed with commingled unburnt human bones. In parts of the grave, Von Duben observed two to three layers of bone separated by flat limestone slabs (Retzius 1899: 59). Artefacts were recovered at the bottom of the bone layer. They consisted of: three flint daggers[41], the tip of a flint dagger, a bifacial flint spearhead[42], flint scrapers, flint flakes, a piece of a ground flint axe,

39 similar to Tiarp 26/Backgården
40 Lomborg type III
41 Lomborg type I and II
42 with a slightly concave base, similar to Karleby 71/Utbogården

Figure A2:22 Photo of the Knaggården passage grave (Retzius 1899: 53).

Figure A2:23 Amber and tooth pendants from the Knaggården passage grave, photo by Malou Blank, CC BY (SHM).

bifacial flint arrow roughouts, a bifacial flint arrowhead[43], a hammer stone fragment, six oval amber pendants[44], three animal tooth pendants, two small bone cylinders/beads[45] (one decorated), bone points, bone daggers, five bone needles, animal teeth, and an hourglass-shaped bone pendant, and four small bone beads[46] (Fig. A2:23). In addition, two flint daggers[47] were found in the mound outside the northern part of the chamber (Hildebrand 1864; Retzius 1899; the present study).

Of all the inhumed bones recovered at this site, only nine skulls were found at the depository at SHM. The remaining human bones were either not collected or lost. All nine skulls were radiocarbon dated (Blank 2017; Fibiger et al. 2013; paper II), and three of them were dated twice at different laboratories (paper II). Two of the skulls that dated to the Late Neolithic showed peri-mortem[48] fractures (Fibiger et al. 2013). The nine skulls (five skull bones and four teeth) were also sampled for stable isotopes (Blank 2019; paper V). In addition, molar teeth from five of the skulls were sampled for ^{18}O and Sr isotopes, and for aDNA (Blank and Knipper 2021; Blank forthcoming; paper IV).

Medelplana 18:1, Carlsgården gallery grave

— WGS84 coordinates: Lat. 58.57365. Long. 13.36093
— Inventory no: SHM 3482

The Carlsgården gallery grave was excavated and removed in 1865. The grave consisted of a rectangular chamber constructed by four slabs, with a short passage (narrower than the chamber itself) built from two slabs (Fig. A2:24). The grave measured 3.3 x 1.8 m in size and was dug into the ground. It was covered by a mound and surrounded by kerbstones. A half-circular port-hole was documented in the slab dividing the chamber and passage, a half-circular port-hole[49]. A stone slab erected parallel to the long side formed a niche inside the chamber, which was partially covered by a roof slab. The chamber contained a flint dagger[50], a slate pendant, and unburnt human bones (Montelius 1905). Most of the skeletons were reburied in the chamber after the excavation.

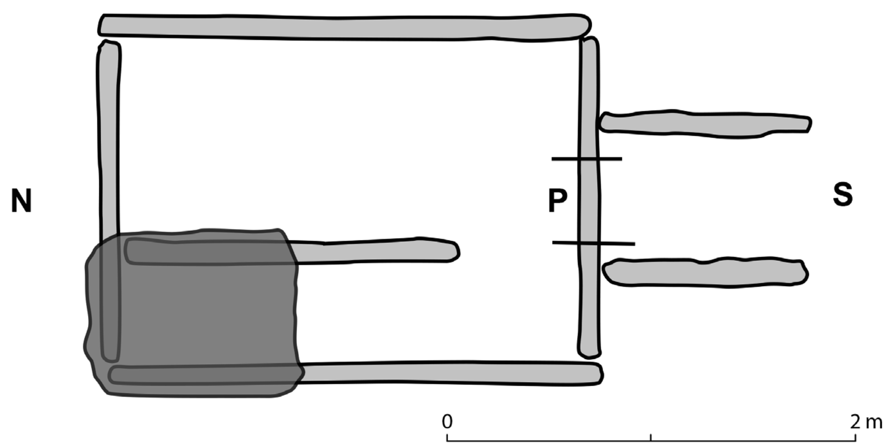


Figure A2:24 Drawing of the Carlsgården gallery grave redrawn after Montelius (1905). N: north, S: south, P: port-hole.

43 with a concave base
44 similar to the ones in Falköping 5/Fredriksberg
45 see Gökhem 94:1/Frälsegården, Karleby 59/Logårds kulle, Torbjörntorp 18/Lilla Balltorp, and Falköping 5/Fredriksberg
46 similar to the one in Falköping 5/Fredriksberg
47 Lomborg type I and II
48 near death
49 These types of port-holes also appear in several gallery graves in Bohuslän and Halland for example in Röd, Lommelanda and Dverred, Lindome, but also in the Utbogården gallery grave, Falbygden.
50 Lomborg type V

An unburnt molar tooth from an adult was sampled for radiocarbon dating (paper II), and stable isotope analysis (Blank et al. in preparation.). Enamel from the same tooth was analysed for Sr isotopes (Blank et al. in preparation).

Medelplana 54:1, Hellekis, Helles gallery grave

— WGS84 coordinates: Lat. 58.61520, Long. 13.39371
— Inventory no: SHM 15660

This 7.3 x 2.5 m large gallery grave was constructed below ground. It was excavated and removed in 1916 by Schnittger (1920). The grave was oriented NW-SE and consisted of a chamber and an ante-chamber (Fig. A2:25). The two limestone slabs separating the chamber and ante-chamber were cut into a vague port-hole. The findings in the grave included a piece of a flint sickle, six flint daggers[51], one tanged blade arrowhead, six bifacial arrowheads[52], flint scrapers, possible arrowhead roughouts, flint pieces, four slate pendants, and pottery sherds from at least three vessels[53] (Schnittger 1920; the present study).

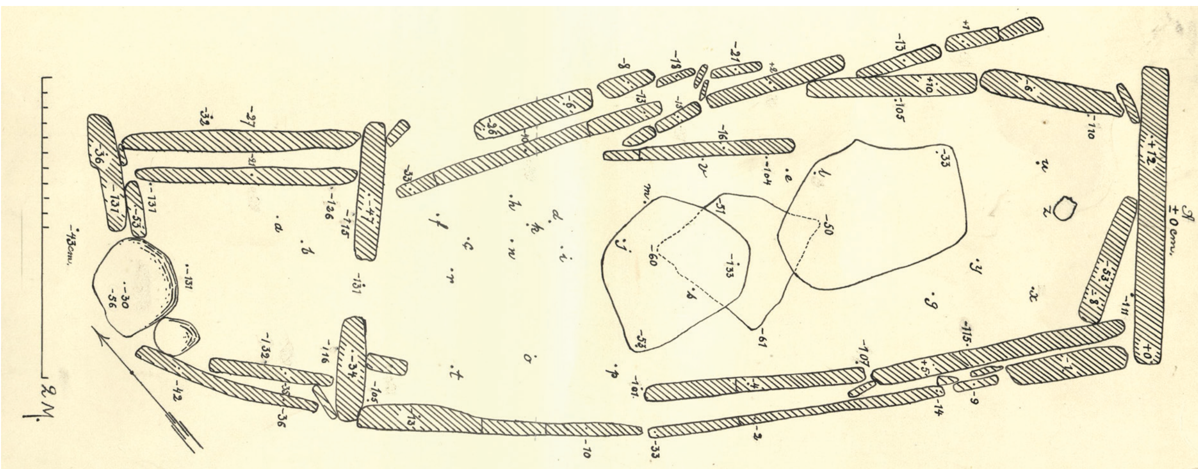


FIGURE A2:25 Drawing of the Hellekis gallery grave from Schnittger (1920).

Schnittger (1920) reported on finding human remains from about 60 individuals. However, a more recent osteological investigation concluded that the MNI of the grave was 20, consisting of 17 adults and three juveniles (Tornberg 2018). Several factors can explain this discrepancy: an osteologist did not make the first estimation, human remains might have been left at the site, and bones could have been lost.

Fourteen individuals from this grave were sampled for radiocarbon dating (paper II) and stable isotopes (Blank et al. in preparation). From 13 of these individuals, 26 teeth were analysed for Sr isotopes. In addition, enamel from 22 of the teeth was sampled for ^{13}C and ^{18}O analyses (Blank et al. forthcoming). These 13 individuals were also sampled for aDNA, the results of which will be presented in a forthcoming study.

Norra Lundby 110:1, Ökull gallery grave

— WGS84 coordinates: Lat. 58.38576, Long. 13.63175
— Inventory no: SHM 6163

The Ökull gallery grave was found below a low cairn in 1878. It was excavated the same year by Torin (1878). This E-W oriented grave measured 7.0 x 1.8 m in size and was constructed of limestone slabs. It was divided into a chamber and a smaller ante-chamber by slabs with a port-hole (Fig. A2:26). At the bottom of the chamber, a layer of commingled inhumed bones from ten to 15 individuals was found (Torin 1878). The skeleton remains were accompanied by a piece of slate, two flint scrapers, two flint daggers[54], and part of a

51 two Lomborg type IV, two type V and two of unknown type

52 with concave bases, some made of local Cambrian flint

53 two undecorated and one covered with stamp decoration

54 Lomborg type IV and VI

flint sickle (Torin 1878; the present study). From the ante-chamber, only two pieces of human femur were recovered (Torin 1878).

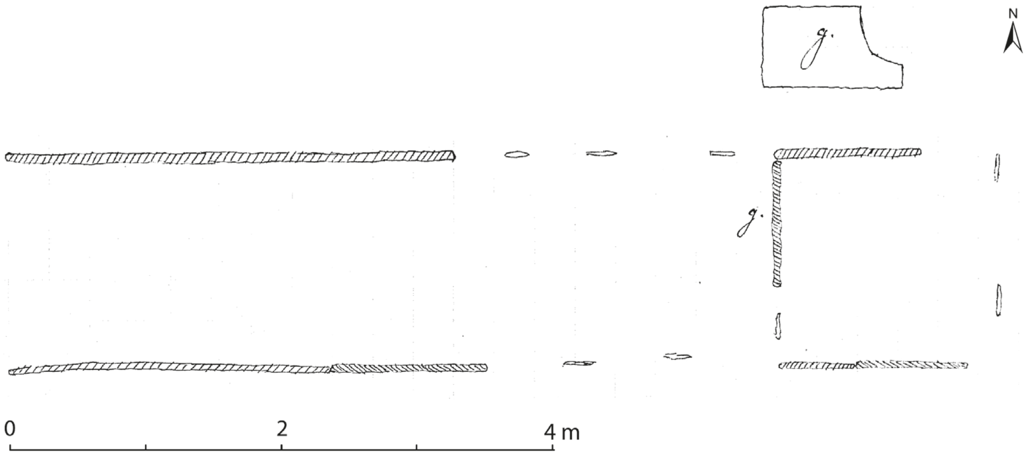


FIGURE A2:26 Plan of the Ökull gallery grave, based on Torin (1878).

One unburnt human skull fragment was sampled for radiocarbon dating and stable isotopes (paper II).

Öglunda 23:1, Måns-Nilsgården gallery grave

— WGS84 coordinates: Lat. 58.43488, Long. 13.69582
— Inventory no: SHM 8058
Montelius excavated this gallery grave in 1866. It consisted of a 4.8 x 2 m large chamber oriented NNE-SSW with a circular port-hole in the southern gable (Montelius 1905: 194). The chamber contained fragments from two bone needles, a fishing hook of bone, fragments from bone awls, two bifacial arrowheads[55], one triangular serrated arrowhead, bifacial arrowhead roughouts, flint scrapers, flint flakes[56], amber beads, fragments of a thin bronze ring, pottery sherds[57], and animal bones (Fig. A2:27; the present study).

FIGURE A2:27 A fishing hook and bone needles recovered from the Måns-Nilsgården gallery grave, photo by Malou Blank, CC BY (SHM).

The number of buried individuals was estimated to about 30 (Montelius 1905). Radiocarbon dating and stable isotope data from an ulna belonging to an adult individual, as well as a tooth from a sheep, is presented in paper II and V.

55 with concave bases
56 some flakes came from a polished ground axe
57 from at least two flat-bottomed Late Neolithic vessels, and two decorated rim sherds

Österplana 27:1, Högebo gallery grave

— WGS84 coordinates: Lat. 58.57947, Long. 13.41484
— Inventory no: SHM 7881, 15944, 16679

In 1885, Nyström (1886) excavated and removed this gallery grave. The grave was constructed of limestone slabs partly below ground. It was 4.0 x 1.4 m in size and oriented ENE-WSW. The grave was divided into a chamber and an ante-chamber by a slab with a circular port-hole. The construction was open in the west-south-west (Nyström 1886; Sahlström 1915a: 81; Fig. A2:28). According to Nyström (1886), the partially articulated skeletons were well-preserved and placed in sitting positions against the chamber's walls. Skeletal remains from about 50 individuals were found in the grave (Nyström 1886). Five bone needles, a thin-bladed polished flint axe, two flint daggers[58], some flint flakes, a bifacial arrowhead roughout, and skulls from seventeen individuals were collected. A now lost shaft-hole axe was also reported (Nyström 1886; the present study).

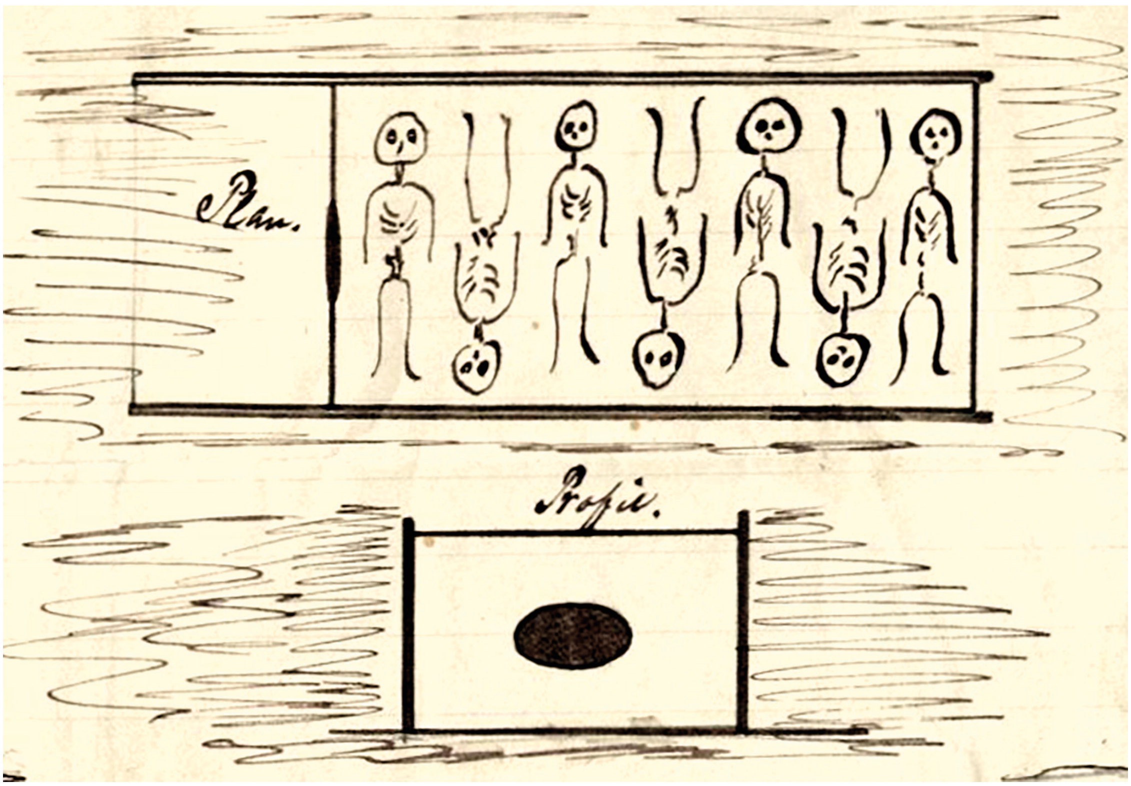


FIGURE A2:28 Drawing of the Högebo gallery grave by Sköldebrand 1885, from Nyström (1886).

In this investigation, three individuals were sampled for radiocarbon dating (paper II) and stable isotope analyses (Blank et al. forthcoming). Enamel from seven teeth from the same individuals was also analysed for Sr, ^{13}C and ^{18}O isotopes (Blank et al. in preparation).

Östra Tunhem 22:1, Mikaelsgården gallery grave

— WGS coordinates: Lat. 58.21731, Long. 13.52143
— Inventory no: SHM 24211

In 1949, Sahlström excavated a disturbed area outside this grave and its entrance area. The grave measured 4.5 x 1.1 m. It was oriented NE-SW and covered by a low cairn (Sahlström 1949; Fig. A2:29). Pottery sherds[59] and inhumed bones from an adult male (estimated) were recovered (Sahlström 1949; the present study).

58 one strike-a-light, one Lomborg type IV

59 Two sherds with comb/barbed wire stamps and one sherd with paired impressions, similar to the Öglunda 23:1 sherd

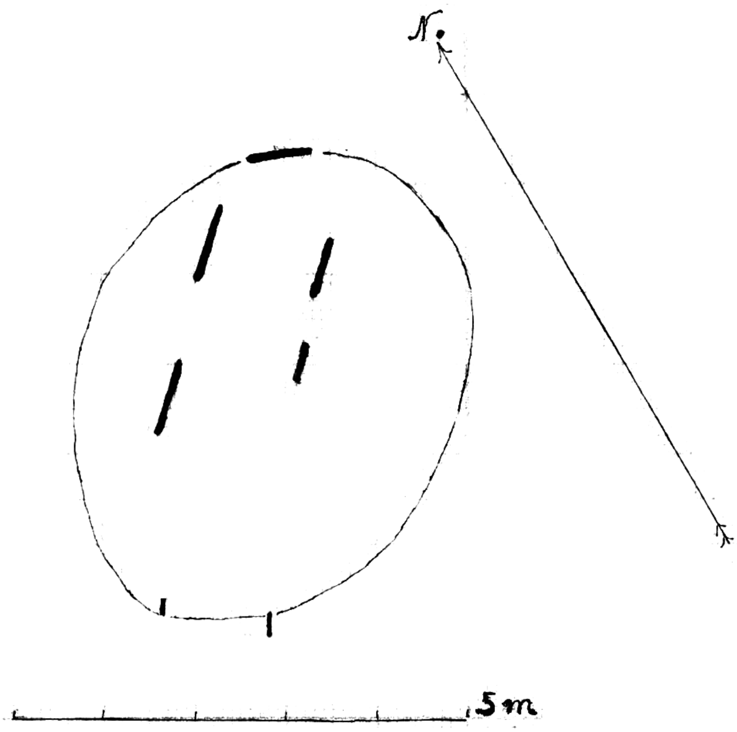


FIGURE A2:29 Plan of the Mikaelsgården gallery grave based on field drawing from Sahlström (1949).

A femur from this individual was sampled and sent for radiocarbon dating (paper II) and stable isotope analysis (paper V).

Segerstad 176:1, Prästbolet gallery grave

— WGS84 coordinates: Lat. 58.23348, Long. 13.65712
— Inventory no: SHM 32672
The grave was found below ground and was constructed of limestone slabs. The length was estimated to be 2 m. It was oriented in a N-S direction. During an inspection by Tengblad, in 1971, some inhumed human bones were recovered (Hjolman 1972).

We dated one ulna belonging to an adult individual (paper II). This bone was also sampled for stable isotopes (paper V).

Skånings-Åsaka 7:1, Munstorp gallery grave

— WGS coordinates: Lat. 58.43576, Long. 13.52546
— Inventory no: VGM 85605
In 1943, Ullenius excavated and removed this gallery grave. The grave was estimated to be 5.0 x 3.5 m in size. Its orientation was NE-SW. The chamber contained at least five flat-bottomed Late Neolithic/Early Bronze Age vessels, some pottery sherds, one bifacial arrowhead[60], four scrapers, two bifacial arrowhead roughouts, flint flakes, six slate pendants, and a flint dagger[61] (Fig. A2:30; the present study; Ullenius 1943). Between eight and ten inhumed individuals was estimated from the bone material (Ullenius 1943).

One molar tooth of an adult and one humerus bone of a juvenile were sampled for radiocarbon dating (paper II) and for stable isotopes (paper V).

60 with a concave base

61 Lomborg type IV

FIGURE A2:30 Photo of artefacts recovered from the Munstorp gallery grave, by Malou Blank.

Skånings-Åsaka 13:1, Övre Sanna gallery grave

WGS84 Coordinates: Lat. 58.43789, Long. 13.48426
Inventory no: VGM 4893
This gallery grave was excavated and removed by Torin in 1878. It measured 7.0 x 2.3 m and was oriented E-W (Fig. A2:31). Originally, it consisted of a chamber and an ante-chamber divided by slabs with a port-hole (Torin 1879). The only finds recovered during Torin's excavation were a few skull fragments.

A skull fragment belonging to an adult individual was radiocarbon dated (paper II) and analysed for stable isotopes (paper V).

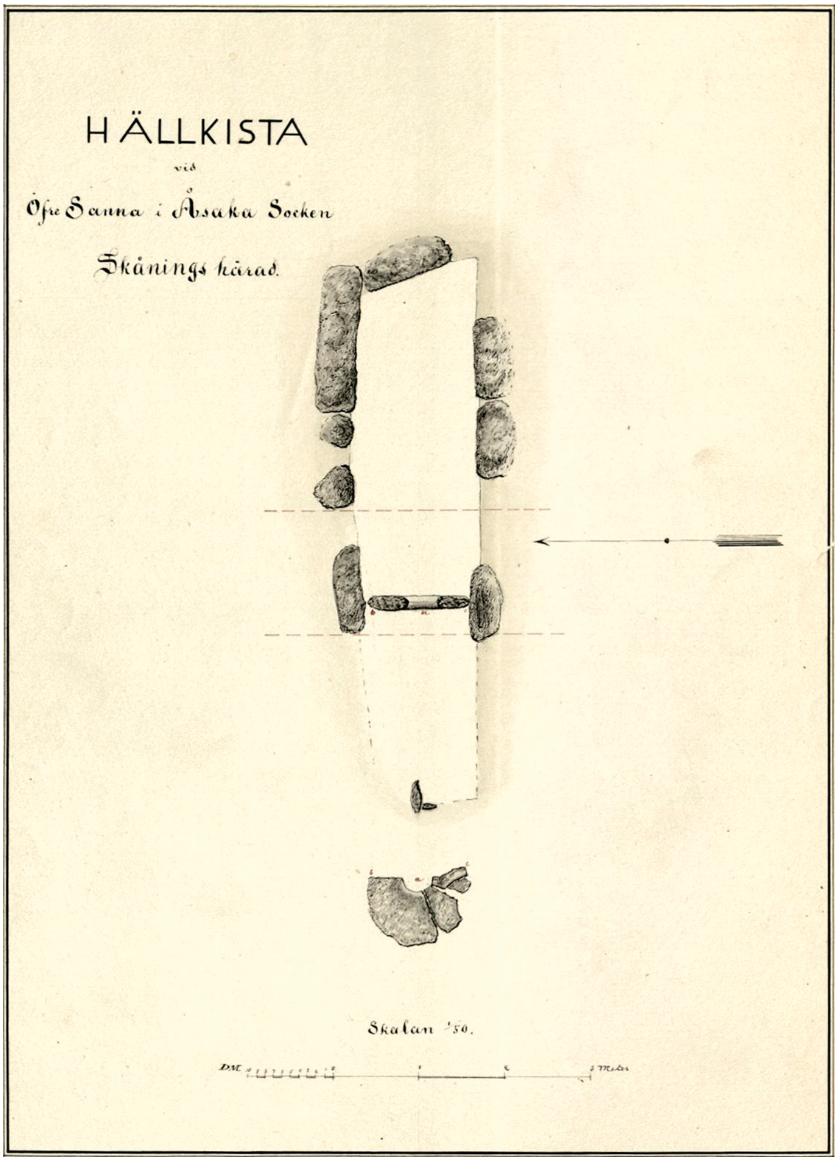


Figure A2:31 Drawing of the Övre Sanna Gallery grave from Torin (1879).

Södra Härene 73:1, Ingmarstorp gallery grave

— WGS84 Coordinates: Lat. 58.09459, Long. 12.83621
— Inventory no: AM 5780-5994

Lundström excavated this gallery grave in 1950 (Oldeberg 1954). The slightly trapezoidal construction was approximately 8 x 2 m large (Fig. A2:32). The western part of the grave had been damaged by modern gravel extraction. In the northern part of the grave an oven from historical times was documented. Roughly 30 l of burnt human and animal bones were found in a pit in the southern part of the chamber (Fig A2:32). The cremated human bones belonged to an estimated number of six individuals (Gejvall 1954). No artefacts and no charcoal were found in this pit.

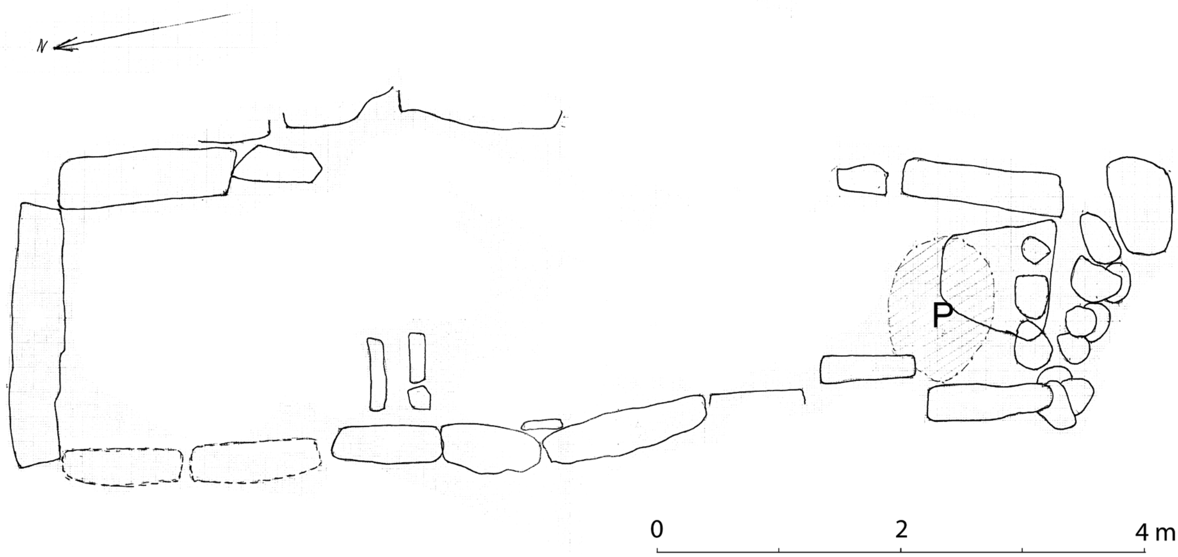


FIGURE A2:32 Plan of the Ingmarstorp gallery grave redrawn after Lundströms field drawing from the excavation in 1950 (ATA). P: pit.

Below the oven, at the bottom of the grave chamber, a layer of gravel and very poorly preserved and heavily fragmented bones along with some artefacts were found. Only a few unburnt human bones could be recovered. This layer was concentrated in the northern part of the grave. The artefacts consisted of nine flint daggers[62], two bifacial spear heads[63], five bifacial flint arrow heads[64], four slate pendants, one amber bead, a few flint scrapers and flakes, and sherds from numerous decorated and undecorated pottery vessels (Oldeberg 1954; the present study). The pottery was typologically dated to the Late Neolithic, Early Bronze Age and Late Bronze Age (Oldeberg 1954). Thus, the grave can be assumed to have been used during these periods. No burnt bones occurred in the bottom layer where the artefacts and unburnt bones were recovered.

To date the cremated bones, a calcined human skull fragment was sampled for radiocarbon analysis (paper VI).

Tiarp 26:1, Backgården dolmen

— WGS84 coordinates: Lat. 58.19329, Long. 13.72468
— Inventory no: VGM 1M16-107065

In 1929, Svensson restored this grave. In 2014, it was partially excavated and restored by VGM (Henriksson 2016). The grave consists of four limestone slabs. It was originally located in a mound, which was reconstructed in 1929 by Svensson (Fig. A2:33). Svensson was informed that a 7 m long row of slabs, a few m from and parallel to one of the long sides of the grave once existed (Svensson 1929). A stone slab that was interpreted as a potential roof slab was documented a few m northwest of the chamber (Svensson 1929). The grave measures 3.1 x 1.0 m and is oriented NE-SW. The grave was divided by a slab, slightly lower than the other slabs, in the southwestern part (Henriksson 2016). The grave resembles the Kinneved 21 dolmen. In the small closed “ante-chamber”, a floor constructed by limestone slabs was found. No finds were observed in this part. However, when the long side slab was removed a few unburnt bones from the bottom layer were recovered before the grave was restored (Henriksson 2016; Fig. A2:33).

62 Lomborg types II to V

63 One in flint and one in slate, both with concave bases

64 with concave bases

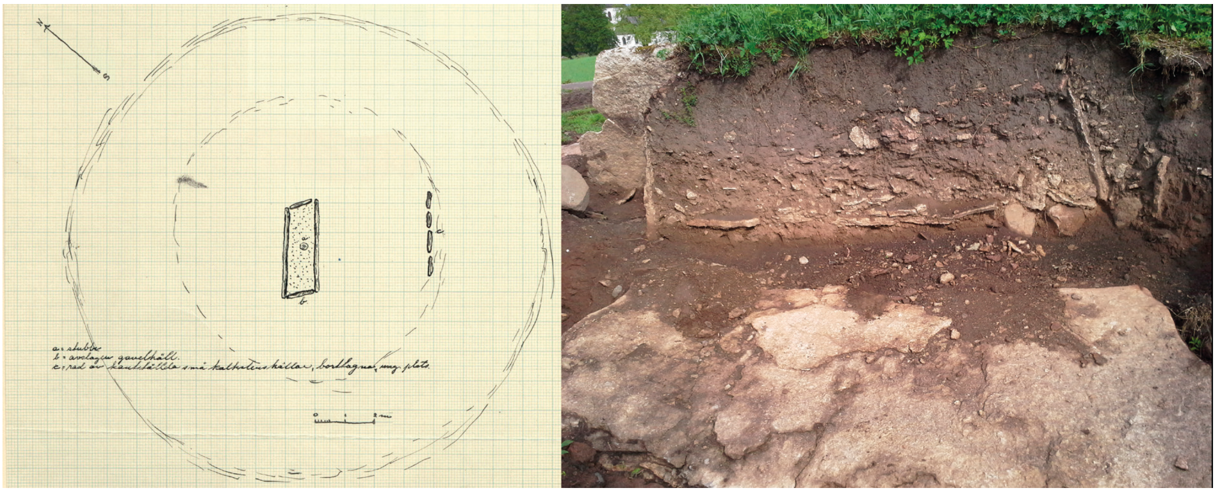


FIGURE A2:33 Left: Drawing of the Backgården dolmen by Svensson (1929). a: tree stump, b: damaged gable slab, c: row of stone slabs, removed, approximate location. Right: Photo of the grave with the long side slab removed during the 2014 excavation, by VGM (Henriksson 2016).

One human toe bone that was recovered from the grave was dated to the Early Neolithic (Henriksson 2016). In addition, we sampled an unburnt human rib bone for radiocarbon dating (paper II) and stable isotopes (paper V).

Timmersdala 5:1, Timmersdala skolhus gallery grave

— WGS84 coordinates: Lat. 58.52372, Long. 13.76709
— Inventory no: SHM 5974

This 6.5 x 1.5 m large gallery grave was oriented NNE-SSW and constructed of limestone slabs. Torin excavated the grave in 1877. The grave was divided into two chambers and an ante-chamber (Fig. A2:34). In the inner and largest room several layers of unburnt human bones were documented. According to Torin (1877), some of the bodies had been placed sitting down, while others were found in supine positions. The bones were accompanied by two flat bottomed pottery vessels[65], some pottery sherds, four flint daggers[66], two pieces of flint daggers, nine bifacial flint arrow heads[67], four bone awls, three bone needles, some animal bones, and a drilled bear tooth. Finally, an undecorated pottery vessel containing a few cremated bones was also recovered from this chamber. Only unburnt human remains were found in the smaller middle chamber, while the ante-chamber was found empty (Torin 1877; the present study).

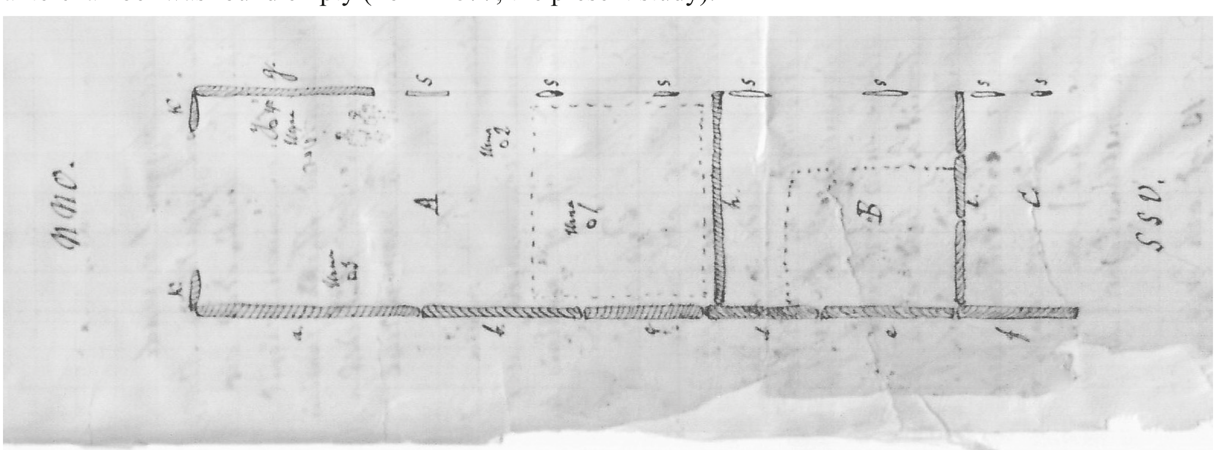


FIGURE A2:34 Drawing of the Timmersdala skolhus gallery grave from Torin (1877).

65 One undecorated and one covered by comb stamps
66 one Lomborg type III, two type V and one type VI
67 with concave bases

A cremated skull fragment most probably belonging to the deposition of the pottery vessel with cremated bones, was sampled for radiocarbon dating (paper VI). A goat bone was also dated and sampled for stable isotopes (paper II, V). Furthermore, of the unburnt human bones recovered in the grave, eight molar teeth from unique individuals and one femur bone were sampled for radiocarbon dating and for stable isotopes. The results of these samplings will be presented in a forthcoming study by Blank and Tornberg.

Torbjörntorp 16:3, Tomtens kalkbrott gallery grave

— WGS84 coordinates: Lat. 58.21883, Long. 13.60757
— Inventory no: SHM 21675

FIGURE A2:35 Photo from the excavation of the gallery grave in 1934, by Falbygdens museum, CC pdm.

FIGURE A2:36 Slate button and flint dagger, photo by Malou Blank, CC BY (SHM).

Svensson excavated the southeastern part of this gallery grave in 1934. It was 4.0 x 1.5 m in size with a port-hole in the entrance gable. The grave was oriented NW–SE and found below ground level (Svensson 1934a). The chamber walls were constructed by limestone slabs and parts of the long sides of the grave comprised of limestone bedrock. Inside the chamber a floor consisting of limestone slabs was documented (Fig. A2:35). During the excavation of the grave, five flint daggers[68], four flint flakes, a couple of bifacial flint arrowhead roughouts, a flint scraper, four bone needles, one hemispherical slate button[69], one bone awl, and human bones of at least 11 inhumed individuals were recovered (Fig. A2:36; Svensson 1934a; the present study).

Six of the buried individuals (one child and five adults) and a pig bone were radiocarbon dated (paper II). The samples were also ana-

68 four Lomborg type III and one type IV

69 v-drilled

lysed for stable isotopes (Blank 2019; paper V), Sr and ^{18}O isotopes, and aDNA (Blank and Knipper 2021; Blank forthcoming; paper IV).

Torbjörntorp 18:1, Lilla Balltorp gallery grave

— WGS84 coordinates: Lat. 58.21796, Long. 13.62104

— Inventory no: VGM 88966

This gallery grave was located below ground level and covered by a low cairn. In 1948, Ullenius excavated and relocated the grave. The 7.5 x 2.2 m large grave consists of a chamber and an ante-chamber that is divided by two slabs with a port-hole (Fig. A2:37). The grave was covered by roof slabs and oriented NNE- SSW. In the middle of the chamber a standing stone slab was placed above the layer containing human remains. The grave filling was a mix of sand, fragmented human bones, and artefacts, approximately 80 cm deep, covered by a 5 cm thick layer of clean sand (Ullenius 1948). The artefacts in the chamber included two small spiral-shaped gold rings, a small bronze ring, a circular slate pendant/belt ring, two hemispherical slate buttons[70], two small bone cylinders[71], three shaft-hole axes, a chisel made from a dagger, 19 flint daggers[72], two amber beads[73], nine slate pendants[74], ten bifacial flint arrowheads[75], bone needles[76], bone awls, at least six Late Neolithic pottery vessels[77], flint flakes, flint scrapers, bifacial arrowhead roughouts, a polished flint axe fragment, and some burnt flint flakes (Fig. A2:38; the present study; Ullenius 1948). In addition, fragmented inhumed human bones, one assembly of burnt human bones and some animal bones were recovered from the chamber (Ullenius 1948). The only finds that were located in the ante-chamber consisted of a small spiral-shaped bronze bead and a flint scraper (Ullenius 1948). There were no signs of burning or of later reuse inside of the grave. However, part of the covering cairn was possibly constructed in the Iron Age, at the same time as the nearby flat cairn (Ullenius 1948).

Lennblad (2015) estimated the number of inhumations to approximately 80 individuals (men, women, and children) and a cremation of one adult individual. A healed fracture on an elbow bone, and a bowlegged femur were observed (Lennblad 2015). The human bones were commingled and fragmentary, most probably due to rearrangement to make place for new burials. However, some skeletons were partially articulated, and both sitting and supine positions have been suggested (Ullenius 1948). In a histological study (Hollund et al 2018), thin sections of human femora demonstrated a variation of bioerosion of the bones.

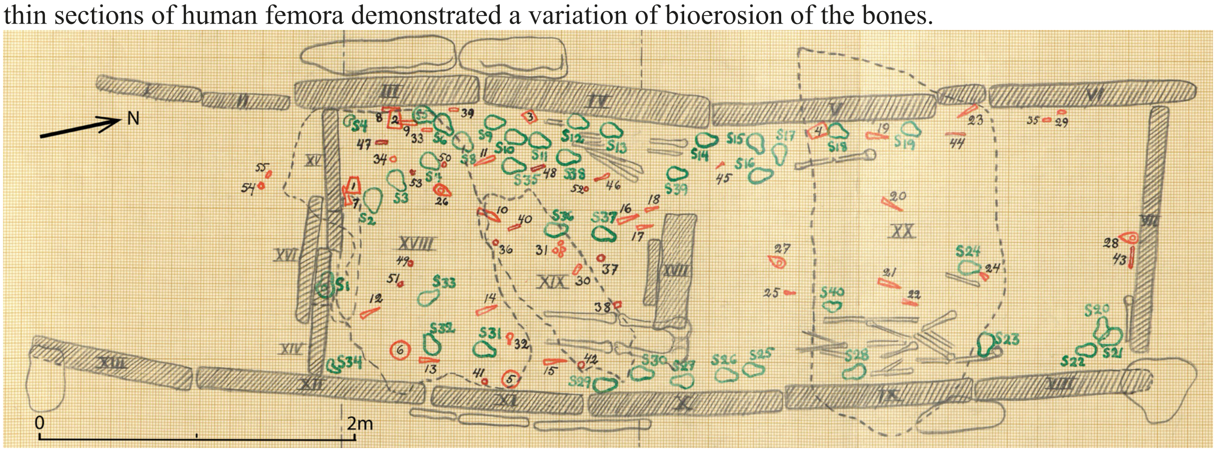


Figure A2:37 Drawing of the Lilla Balltorp gallery grave, by Ullenius (1948). Green: human skull bones, red: artefacts, grey: long bones.

70 v-drilled, similair to the one in Torbjörntorp 16/Tomtens kalkbrott

71 see Gökhem 94:1/Frälsegården, Karleby 59/Logårds kulle, Luttra 16/Knaggården, and Falköping 5/Fredriksberg

72 ten Lomborg type III, five type IV, three type V and one of unknown type

73 axe shaped

74 one spade shaped

75 eight with concave bases

76 some made of antler (Vretemark pers. communication)

77 one with vertical comb stamps, one with barbed wire stamps, and one with two rows of barbed wire beneath the rim and covered by barbed wire stamps

Figure A2:38 Pottery vessel, slate pendant and gold and bronze jewellery recovered from the grave. Photo by Malou Blank.

Unburnt teeth from 23 individuals (paper II; Blank 2017) and ten unburnt femur bones (Hollund et al. 2018) were radiocarbon dated. Collagen samples from the 23 teeth and the ten femora were analysed for stable isotopes (paper V; Blank 2019). Enamel from 22 of the sampled individuals was analysed for ^{18}O, ^{13}C, and Sr isotopes (Blank and Knipper 2021; Blank et al. forthcoming; paper IV, V). Sr isotopes were analysed from multiple teeth (representing different age spans) from nine of the individuals (paper IV). Ancient DNA was sampled from 21 of the teeth (paper IV). Furthermore, a beaver tooth from the chamber was sampled for Sr isotopes (paper III). A long bone from the cremated individual was also dated (paper VI).

Torbjörntorp 31:1, Berga gallery grave

— WGS84 coordinates: Lat. 58.20920, Long. 13.63258
— Inventory no: SHM 18522, 18832

The Berga gallery grave was excavated by Sahlström in 1927. The following year, Svensson (1928) moved the grave to a nearby location. The 2.9 x 1.8 m large grave was found below a low cairn and consisted of a rectangular chamber with a slightly narrower ante-chamber (Fig. A2:39). The grave was oriented NW-SE and the wall slabs were placed in naturally occurring cracks in the limestone bedrock. A single, large limestone slab constituted the floor of the chamber. A smaller niche slab was observed in the north-western part of the chamber. A 30 cm thick stone filling covered a layer of black soil mixed with artefacts and unburnt human bones (Sahlström 1927). The material collected from the grave consists of five flint daggers[78], a strike-a-light, flint scrapers and flint flakes[79], eight bifacial arrowheads[80] (one burnt), the tang of a burnt blade flint arrowhead, a relatively small shaft-hole axe[81], amber beads, a burnt slate pendant, pottery sherds[82], bone awls, a bone chisel, bone needles[83], animal bones, two cremated skull fragments, and inhumed human bones (Sahlström 1927, Svensson 1928; the present study). No traces of fire were documented, in or around the graves (Sahlström 1927; Svensson 1928).

The human bones were fragmented and commingled, thereby suggesting that the buried individuals were moved to make place for new burials. However, two skeletons were described as articulated and placed in a supine position with the head pointing to the north. One of the articulated skeletons (a short woman with a small shaft-hole axe next to the femur) was placed in the entrance with the head and upper body in the an-

78 one Lomborg type II and four type III
79 a few burnt
80 with concave bases
81 in red sandstone
82 some with comb stamps, barbed wire stamps
83 some decorated

Figure A2:39 Top left: Drawing of the Berga gallery grave, by Sahlström 1927, ATA. Top right: The thigh bone of the woman placed in the entrance (TB31:B), photo by Malou Blank. Bottom left: Photo of the reconstruction of the grave, Falbygdens museum, public domain mark (CC pdm). Bottom right: A decorated bone needle found in the grave, photo by Malou Blank, CC BY (SHM).

te-chamber and the rest of the body outside the grave (Fig. A2:39; Sahlström 1927). According to Sahlström (1927) 30 skulls were found in the bottom layer. The MNI was set to 30 individuals (adults and juveniles) in a recent osteological study (Tornberg 2018). Thin sections from the six human femora demonstrated slightly varied bioerosion among the burials (Hollund et al. 2018).

We sampled 22 unburnt human remains, 16 teeth and six femora (Hollund et al. 2018; paper II), a pig bone and a goat bone (paper V), and a cremated skull fragment (paper VI) for radiocarbon dating. These samples belong to at least 16 unique individuals and represent about half of the buried individuals. Collagen from the teeth and the femora was analysed for stable isotopes (paper II, V; Blank 2019). Enamel from the teeth was sampled for ^{18}O, Sr, and ^{13}C analyses (paper IV, V; Blank forthcoming). Several teeth from five of the individuals were sampled for Sr isotopes. Fourteen of the teeth were also sampled for aDNA (paper IV). One of the sampled individuals was a child who dated to the Late Iron Age and was thus not included in the mobility and diet studies.

Valtorp 2:1, Rössberga passage grave

— WGS84 coordinates: Lat. 58.22951, Long. 13.60576
— Inventory no: SHM 27911

Cullberg conducted an excavation and restoration of the Rössberga passage grave in 1962. The grave consists of a 9 x 2m large chamber and an 8 m long passage placed perpendicularly to the eastern chamber wall, continuing in a façade (Fig. A2:40). Roof slabs covered the grave, and the rectangular chamber was oriented NNE-SSW. From the entrance area a large number of fragmented TRB pottery sherds, burnt and unburnt flint flakes, a tanged blade flint arrowhead, several pieces of polished stone and flint axes, a recut Late Neolithic flint dagger[84], a few BAC pottery sherds and cremated bones were recovered (Cullberg 1962, 1963). The chamber was divided into compartments by small niche slabs (Fig. A2:40). It contained unburnt human bones, tooth pendants, a bone needle, amber beads, some flint, and a piece of an ornamented bone ring[85]. According to Cullberg (1963), none of the human bones were articulated. The bones were documented in different units representing the suggested compartments of the chamber. Human bones were also found in the passage along with some flints and amber

FIGURE A2:40 Plan of the Rössberga passage grave chamber, redrawn after field drawings from Cullberg (1963).

84 Lomborg type III

85 BAC and similar to the rings found in the Torsborg gallery grave, Öland and the Köpinge 150 flat grave, Scania

beads (Cullberg 1963). Ahlström (2001, 2009) investigated the bone material belonging to men, women, and children, and set the MNI to 128-131.

In 1992, a series of radiocarbon dates from eight inhumed thighbones was published by Hedges et al. (1992). Another series of fifteen samples were dated at the Uppsala laboratory (Linderholm 2008). Three of these 15 bones were re-dated at the Belfast laboratory (Sjögren 2011). Furthermore, two mandibles from the chamber were dated in an Sr isotope study (Sjögren et al. 2009). The radiocarbon dates from these studies are further discussed in paper II.

In this study, molar teeth and mandible bones from 27 individuals (men, women, and children) were sampled for radiocarbon dating (paper II, V; Malmström et al. 2019) and for stable isotopes (paper V). Twenty-one of these individuals were also sampled for Sr isotopes and 17 for aDNA (Malmström et al. 2019; paper IV). Previously published Sr isotope data (Sjögren et al. 2009) from three of the individuals sampled for other isotopes is also included in paper IV. In addition, stable isotope results from a pig bone found in the grave that date to Middle Neolithic A (Linderholm 2008) are included in paper V.

Valtorp 2:2, Rössberga gallery grave

— WGS84 coordinates: Lat. 58.22954, Long. 13.60625
— Inventory no: SHM 27911

During Cullberg's excavation in 1962, a damaged gallery grave was found 30 m east of the passage grave (Fig. A2:41). The grave, which was originally covered by a cairn, was oriented ENE-WSW. Only three red limestone slabs remained of the chamber walls and the chamber was estimated to at least 3.5 x 1 m in size (Cullberg 1962, 1963). Undecorated pottery sherds, a slate pendant, a piece of a ground stone axe, flint flakes and blades, and cremated and inhumed human remains were recovered from this grave (Cullberg 1963: 119-121).

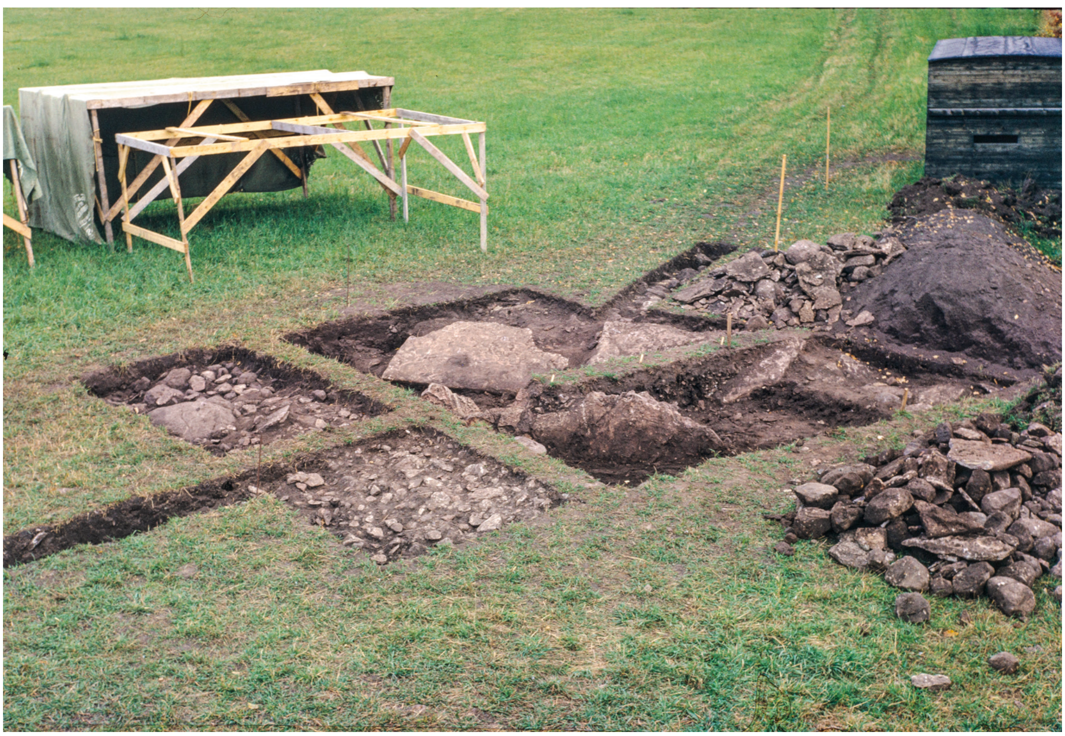
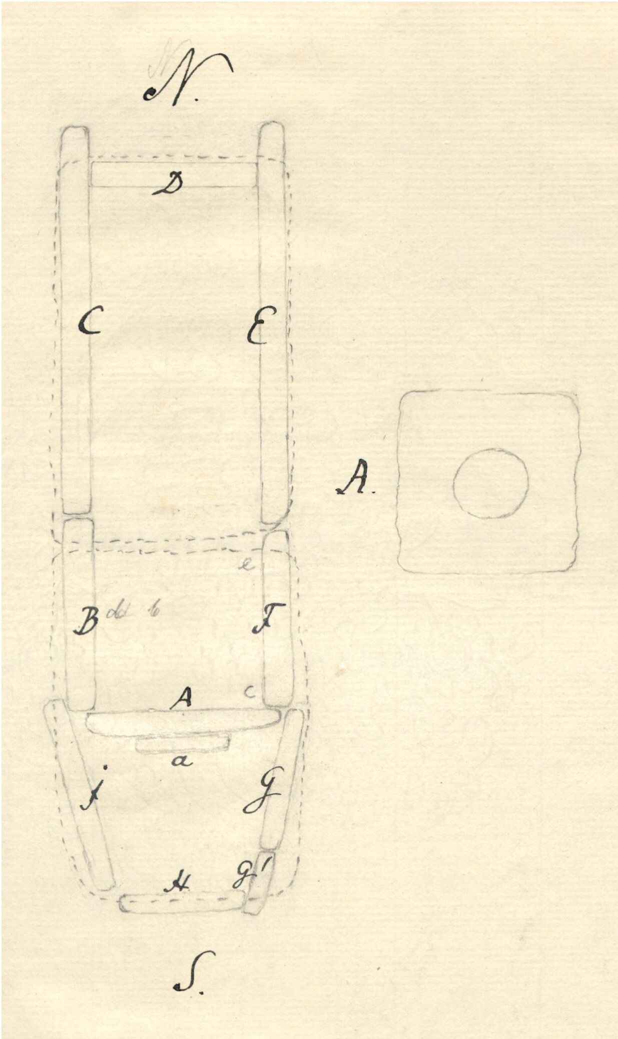


FIGURE A2:41 Photo from the excavation in 1962, ATA, Riksantikvarieämbetet under a Public Domain license.

In this study, one unburnt molar tooth of an adult individual was sampled for radiocarbon dating (paper II) and for stable isotopes (paper V). Furthermore, a cremated skull fragment was radiocarbon dated (paper VI).

Varnhem 116:1, Backa gallery grave

— WGS84 coordinates: Lat. 58.40915, Long. 13.67213
— Inventory no: SHM 5386f, 17709



This gallery grave was excavated and restored by Montelius and Retzius, in 1874. It was constructed below ground level and was covered by roof slabs. It measured 4.0 x 1.5 m and was oriented N-S. The grave consisted of a rectangular chamber and a closed trapezoid ante-chamber in the south. The chamber and ante-chamber was divided by a single slab with a circular port-hole (Fig. A2:42; Montelius 1905, Retzius 1899). The grave contained a bone needle, a flint dagger[86], parts of a flatbottomed vessel[87] and a large assembly of unburnt human skeletons (Retzius 1899: 67). In the southern part of the chamber, nine skulls were observed. According to Retzius (1899: 67), several of the buried individuals appeared to have been placed in a sitting position. Most of the finds and bones were found inside the chamber, while a piece of jaw was the only find in the ante-chamber. According to Fürst (1924), one of the skulls had been trepanned (Fig. 31).

Skulls from one young adult and two adults were radiocarbon dated (paper II). Collagen from these individuals was also sampled for stable isotopes (Blank 2019; paper V). The young adult was dated to the Late Iron Age (paper II) and exhibited $\delta^{13}C$ and $\delta^{15}N$ values that indicated a marine diet during childhood, thus suggesting a coastal origin for this individual.

FIGURE A2:42 Drawing of the Backa gallery grave, by Montelius (1874, ATA).

Vilske-Kleva 26:2, Skattegården gallery grave

— WGS84 coordinates: Lat. 58.19937, Long. 13.43514
— Inventory no: SHM 22681

Svensson excavated and restored the ante-chamber of this grave in 1940. The grave measured 5.7 x 1.6 m and was found below ground beneath a low mound (Fig. A2:43). The ante-chamber contained human bones, a flint flake, a piece of a polished axe, a flint scraper, melted glass, and a bronze tweezer[88] (Svensson 1940). The metal and glass objects indicate a reuse of this part of the grave in the Late Bronze Age and possibly Iron Age. A few bones sticking out of the port-hole that divided the ante-chamber from the chamber were also collected.

Dentine of one tooth that was recovered from the port-hole was sampled for radiocarbon dating (paper II) and for stable isotopes (paper V). The enamel of the same tooth was analysed for Sr isotopes (paper IV).

86 a recut Lomborg type III
87 covered by barbed wire stamps
88 BA p. IV

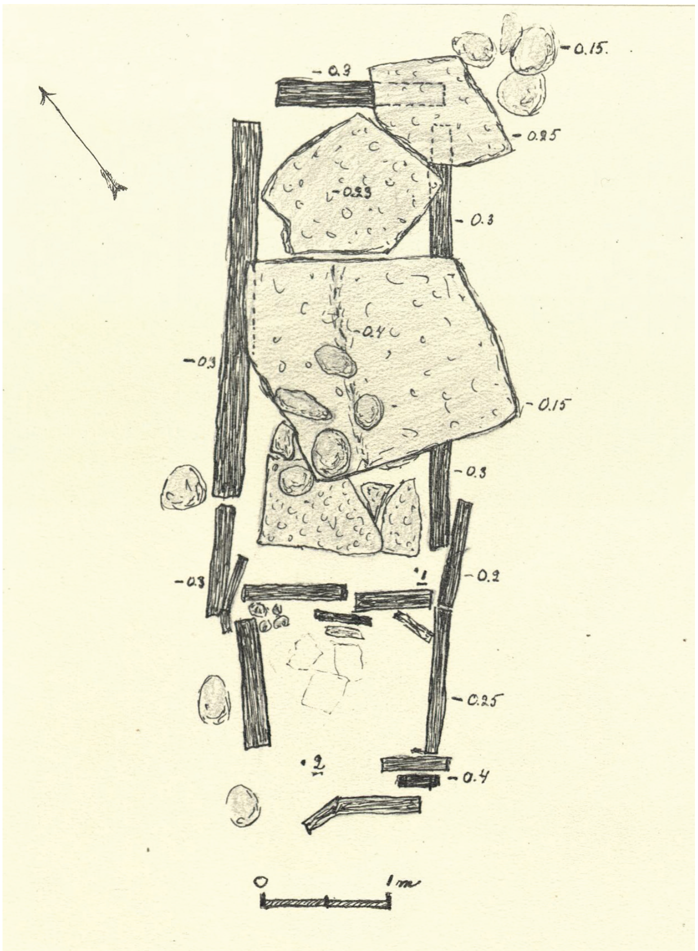


FIGURE A2:43 Drawing of the Skattegården gallery grave from Svensson (1940).

References

Ahlström T (2001) Det döda kollektivet. Bioantropologisk analys av skelettmaterialet från Rössbergagånggriften. In Persson P and Sjögren K-G (eds.) Falbygdens gånggrifter. Undersökningar 1985–1998, Gotarc series C, no. 34. University of Gothenburg, Gothenburg, pp 301–362.

Ahlström T (2009) Underjordiska dödsriken—humanosteologiska studier av neolitiska kollektivgravar. University of Gothenburg, Gothenburg.

Algotsson Å (1996) En mellanneolitisk hällkista? Borttagning av hällkista, fornlämning 26, Falköping stad, Västergötland. SLM rapport 1996:10. Skara museum, Skara.

Anderbjörk JE (1932) Västergötlands megalitgravar. Västergötlands Fornminnesförenings Tidskrift IV(5–6): 5–38.

Axelsson T and Persson P (1995) Rapport. Undersökning av gånggrift. Raä nr 3, Falköpings stad, Västergötland. Gotarc series D. Archaeological reports no. 13 (Raä dnr: 321-4196-2010). University of Gothenburg, Gothenburg.

Axelsson T and Persson P (1999) Rapport. Arkeologisk undersökning 1998. Gånggriften Hjelmars rör, Raä nr 3, Falköping stad, Västergötland. Gotarc Series D. Archaeological reports no. 45. University of Gothenburg, Gothenburg.

Bågenholm G, Persson P, Sjögren K-G (1993) Gökhem 71, Hovmansgården 1:10 Gånggrift och boplatsområde. Rapport från projektet "Gånggrifterna i centrala Västergötland och deras bakgrund". Gotarc series D. Archaeological reports no. 21. University of Gothenburg, Gothenburg.

Blank M (2016) Prehistoric Activities in Megalithic Graves in Falbygden, Sweden. Lund Archaeological Review 21: 49-70.

Blank M (2017) Bronze Age burials in megalithic graves in Falbygden. In Bergenbrant S and Wessman A (eds.) New perspectives on the Bronze Age: Proceedings from the 13th Nordic Bronze Age Symposium, held in Gothenburg 9th June 2015. Archaeopress, Oxford, pp 19–36.

Blank M (2019) Tracing dietary change of the megalithic population in Southwestern Sweden. In Müller J, Hinz M, Wunderlich M (eds.) Megaliths- Societies- Landsacapes. Early monumentality and social differentiations in Northern Europe, Vol. 3. Proceedings of the international the conference "Megaliths, Societies, Landscape, Early Monumentality and Social Differentiation in Neolithic Europe", 16th-20th June 2015 in Kiel. Dr. Rudolf Habelt GmbH, Bonn, pp 691-704.

Blank M and Knipper C (2021) Neolithic mobility in western Sweden: interpretations of strontium isotope ratios of the megalithic population in Falbygden. In Gibson C, Frieman C, Cleary K (eds.) Making Journeys. Archaeologies of Mobility. Oxbow books, Oxford, pp 135-151.

Blomqvist/Bägerfeldt L (1989) Megalitgravarna i Sverige. Typ, tid, rum och social miljö. Dissertation, Department of Archaeology and Classical studies, Stockholm University, Stockholm.

Cullberg C (1962) Rapport över arkeologiska undersökning av gånggriften 2, Rössberga, Valtorp sn, Västergötland. Dnr: 7595/62, ATA, Stockholm. Unpublished excavation report.

Cullberg C (1963) Megalitgraven i Rössberga. Riksantikvarieämbetet, Stockholm.

Fibiger L, Ahlström T, Bennike P, Schulting R (2013) Patterns of Violence-Related Skull Trauma in Neolithic Southern Scandinavia. American Journal of Physical Anthropology 150 (2): 190-202.

Fürst CM (1911) Skelettresterna från en dös vid Slutarp, Kinneveds sn, Frökinds hd, Västergötland. Fornvännen 6: 140-143.

Fürst CM (1924) Tvenne nya fall av trepanation i vårt land, ett från stenåldern och ett från bronsåldern. Fornvännen 19: 81-89.

Gejvall NG (1954) Antropologisk undersökning av benmaterial från ett antal brandgravar. In Oldeberg A Hällkistan i Ingemarstorp. Med benbestämning av N.G. Gejvall. Antikvariskt arkiv 1. KVHAA, Stockholm, pp 58-61.

Henriksson C (2016) Raä 26:1, Tiarp socken, Falköpings kommun. Fördjupat kunskapsunderlag. Arkeologisk rapport 2016:7. Västergötlands Museum, Skara.

Hildebrand BE (1864) Berättelser om antiqvariska undersökningar i Vestergötland år 1863. Antiqvarisk tidskrift för Sverige I: 255-283.

Hjolman B (1972) Segerstad, Prästbolet 1:1, Valtorp 36, Valtorp sn, VG. Skarautgrävningarna, Dnr: 4879/72, ATA, Stockholm. Unpublished report.

Hollund H, Blank M, Sjögren K-G (2018) Dead and buried? Variation in post-mortem histories revealed through histotaphonomic characterisation of human bone from megalithic graves in Sweden. PLoS ONE 13(10): e0204662. https://doi.org/10.1371/journal.pone.0204662

Jankavs P (2014) Vem var Firse? In Alexandersson H, Andreeff A, Bünz A (eds) Med hjärta och hjärna. En vänbok till professor Elisabeth Arwill-Nordbladh. Gotarc series A. Gothenburg Archaeological Studies 5. University of Gothenburg, Gothenburg, pp 185-198.

Lennblad A (2015) Döden i hällkistan. En material och litteraturstudie kring senneolitikums hällkistegravar. Department of historocal studies, University of Gothenburg, Gothenburg. Unpublished master thesis.

Linderholm A (2008) Migration in prehistory: DNA and stable isotope analyses of Swedish skeletal material. Dissertation, Department of Archaeology and Classical studies, Stockholm University, Stockholm.

Lindqvist S (1911) Två västgötska grafbyggnader från stenåldern II. Dös vid Slutarp, Kinneveds sn, Frökinds hd. Fornvännen 6: 130– 140.

Lomborg E (1973) Die Flintdolche Dänemarks. Studien über Chronologie und Kulturbeziehungen des südskandinavischen Spätneolithikums. Nordiske Fortidsminder, Series B, 1. Det Konglige Nordiske Oldskriftselskab, Copenhagen.

Malmström H, Günter T, Svensson EM, Juras A, Fraser M, Munters AR, Prospieszny L, Tõrv M, Lindström J, Götherström A, Storå J (2019) The genomic ancestry of the Scandinavian Battle Axe Culture people and their relation to the broader Corded Ware horizon. Proc. R. Soc. B 286: 20191528. http://dx.doi.org/10.1098/rspb.2019.1528

Montelius O (1873) Undersökning av en gånggrift vid Karleby kyrka i Vestergötland. Kungliga vitterhets- historie och antikvitets akademiens månadsblad januari 1873: 10-13.

Montelius O (1877) Grafundersökningar i Vestergötland 2. Hällkista vid Karleby Utbogården i Vartofta härad. Kungliga Vitterhets Historie *och* Antiqvitets Akademiens Månadsblad 6: *425*–433.

Montelius O (1905) Orienten och Europa. Antiqvarisk Tidskrift för Sverige XIII: 1–252.

Nyström C (1886- June 20th) Berättelse öfer ett graffynd på Kinnekulle, Inventory no. 7881. Högebo, Österplana, VG (Excavation report). ATA, Stockholm. Unpublished report.

Oldeberg A (1954) Hällkistan i Ingemarstorp. Med benbestämning av N.G. Gejvall. Antikvariskt arkiv 1. KVHAA, Stockholm.

Persson P and Sjögren K-G (2001) Falbygdens gånggrifter. Undersökningar 1985–1998. Gotarc series C, no. 34. University of Gothenburg, Gothenburg.

Rascovan N, Sjögren K-G, Kristiansen K, Nielsen R, Willerslev E, et al. (2019) Emergence and Spread of Basal Lineages of Yersinia pestis during the Neolithic Decline. Cell, 176(1): 295-305.

Retzius G (1899) Crania Suecica Antiqua: beskrifning av svenska mennisko-kranier från stenåldern, bronsåldern och järnåldern jämte en blick på forskningen öfver de europeiska folkens ras-karaktärer. Stockholm.

Sahlström KE (1915a) Förteckning över Skaraborgs läns stenåldersgravar. Västergötlands Fornminnesförenings Tidskrift III: 1–92.

Sahlström KE (1927) Undersökning av Berga hällkista, Torbjörntorp sn, VG. Dnr 3678/1927, ATA, Stockholm. Unpublished excavation report.

Sahlström (1929) Hällkista i Edsvära sn, Skånings härad, VG, 21st of June. Dnr 2693/1929, ATA, Stockholm. Unpublished excavation report.

Sahlström KE (1932) Gudhems härads fornminnen. Skövdeortens Hembygds- och Fornminnesförenings skriftserie nr. 3. Skövdeortens Hembygds- och Fornminnesförenings skriftserie 3, Skövde.

Sahlström KE (1947) Torsagården, Gökhem sn, VG. Dnr: 3022/47, ATA, Stockholm. Unpublished excavation report.

Sahlström KE (1949) Mikaelsgården, Östra Tunhem sn, VG. Dnr: 4554/49, ATA, Stockholm. Unpublished excavation report.

Sahlström KE (1951) Hällkista vid Falköpings järnvägsstation, Falköping stad sn, VG. Dnr: 4423/1951, ATA, Stockholm. Unpublished report.

Schnittger B (1920) Hälles och Kisas gravar på Kinnekulle. Västergötlands fornminnesförenings tidskrift IV(1): 26-38.

Sjögren (1992) Rapport, undersökning av gånggrift, Gökhem 78, Västergötland. Gotarc series D. Archaeological reports no. 10. University of Gothenburg, Gothenburg.

Sjögren K-G (2003) "Mångfalldige uhrminnes grafvar…" Megalitgravar och samhälle i Västsverige. Gotarc ser B 27, Coast to Coast books no. 9. Dissertation, Department of Archaeology, University of Gothenburg, Gothenburg.

Sjögren KG (2008) Fragment av ordning. Undersökning av överplöjda megalitgravar vid Frälsegården, Gökhems socken, Västergötland, 1999-2001. Gotarc series D. Archaeological reports no. 62. University of Gothenburg, Gothenburg.

Sjögren K-G (2015) News from Frälsegården. Aspects of Neolithic burial practices. In Brink K, Hydén S, Jennbert K, Larsson L, Olausson D (eds.) Neolithic Diversities Perspectives from a conference in Lund, Sweden. Acta Archaeologica Lundensia, Series in 8o. 65. Lund University, Lund, pp 200–10.

Sjögren KG Price TD, Ahlström T (2009) Megaliths and Mobility in South-western Sweden. Investigating Relations between a Local Society and its Neighbours Using Strontium Isotopes. Journal of Anthropological Archaeology 28: 85–101.

Skoglund P, Malmström H, Omrak A, Raghavan M, Valdiosera C, Gunther T, et al. (2014) Genomic diversity and admixture differs for Stone-Age Scandinavian foragers and farmers. Science, 344(6185): 747–750. https://doi.org/10.1126/science.1253448 PMID: 24762536

Skoglund P, Malmström H, Raghavan M, Storå J, Hall P, Willerslev E, et al. (2012) Origins and Genetic Legacy of Neolithic Farmers and Hunter-Gatherers in Europe. Science, 336(6080): 466–469. https://doi. org/10.1126/science.1216304 PMID: 22539720 17.

Strinnholm A (1996) Falköping stad 3. Arkeologisk undersökning av en gånggrift. Gotarc series D, Archaeological reports no. 40. University of Gothenburg, Gothenburg.

Svensson H (1928) Berättelser förande flyttaning av hällkista samt därvid gjorda iakttagelser, Berga kalkbrott, Torbjörntorp sn, VG. Dnr: 2863/1928, ATA, Stockholm. Unpublished excavation report.

Svensson H (1929-July 3rd) Backagården, Tiarp sn, VG. Dnr: 2715/29, ATA, Stockholm. Unpublished excavation report.

Svensson H (1930) Kapellgatan, västra nolgården, Falköping stad sn, VG. Dnr: 2083/30, 2498/30, ATA, Stockholm. Unpublished excavation report.

Svensson H (1933) Blinningsberg, Falköping stad sn, VG. Dnr: 1019/1933, 918/1933, ATA, Stockholm. Unpublished excavation report.

Svensson H (1934a) Undersökning av Tomtens kalkbrott hällkista, Torbjörntorp sn, VG. Dnr: 4109/1934, ATA, Stockholm. Unpublished excavation report.

Svensson H (1934b) Frälsegården, Gökhem sn, VG. Dnr: 3897/34, ATA, Stockholm. Unpublished excavation report.

Svensson H (1936) Ledsgården, Gökhem sn, VG. Dnr: 1419/36, ATA, Stockholm. Unpublished excavation report.

Svensson H (1940) Skattegården, Vilske-Kleva sn, VG. Dnr: 2616/40, 3271/40, 3409/40, ATA, Stockholm. Unpublished excavation report.

Svensson H (1942) Fastarp Mossgårdens hällkista, Kinneved sn, VG. Dnr: 4049/42, ATA, Stockholm. Unpublished excavation report.

Torin K (1877) Hällkista på Timmersdala Grönegårdens egor i Södra Valles härad. Timmersdala sn, VG, Inv. No. 5974, ATA, Stockholm. Unpublished excavation report.

Torin K (1878) Hällkista i Ökull, Lundby socken och Valles härad. Lundby sn, VG. 23/6 1978, ATA, Stockholm. Unpublished excavation report.

Torin K (1879) Skånings Åsaka, Sanna. Västergötlands Fornminnesförening. Skånings- Åsaka sn, Fornlämningar/ Arkeologi, Hällkista i övre Sanna. Västergötlands Museum archives, Skara. Unpublished excavation report.

Tornberg A (2018) Health, cattle and ploughs: Bioarchaeological consequences of the Secondary Products Revolution in southern Sweden, 2300-1100 BCE. Dissertation, Department of archaeology and ancient history, Lund University, Lund.

Troili GK (1880) Ranten, Falköping stad, VG, June 7th. ATA, Stockholm. Unpublished excavation report.

Troili GK (1881) Brunnsgården, Borgunda, VG, September 1st, Inventory no 6846. ATA, Stockholm. Unpublished excavation report.

Ullenius G (1943) Redogörelse för undersökning den 24/4-27/4 1943 av en skadad hällkista, belägen på Munstorps kronogårds ägor, Skånings- Åsaka sn, VG. Västergötlands Museum archives, Skara. Unpublished excavation report.

Ullenius G (1948) Grävningsberättelser över undersökning av en hällkista samt en kvarstående rest av ett flatröse vid Måns Larsgården, Lilla Balltorp, Torbjörntorp sn, VG, November 27th. Dnr: 5220/ 1948, ATA, Stockholm. Unpublished excavation report.

Wattman L (1993) Rapport. Undersökning av gånggrift Gökhem 31, Västergötland. Gotarc series D. Archaeological reports no. 25. University of Gothenburg, Gothenburg.

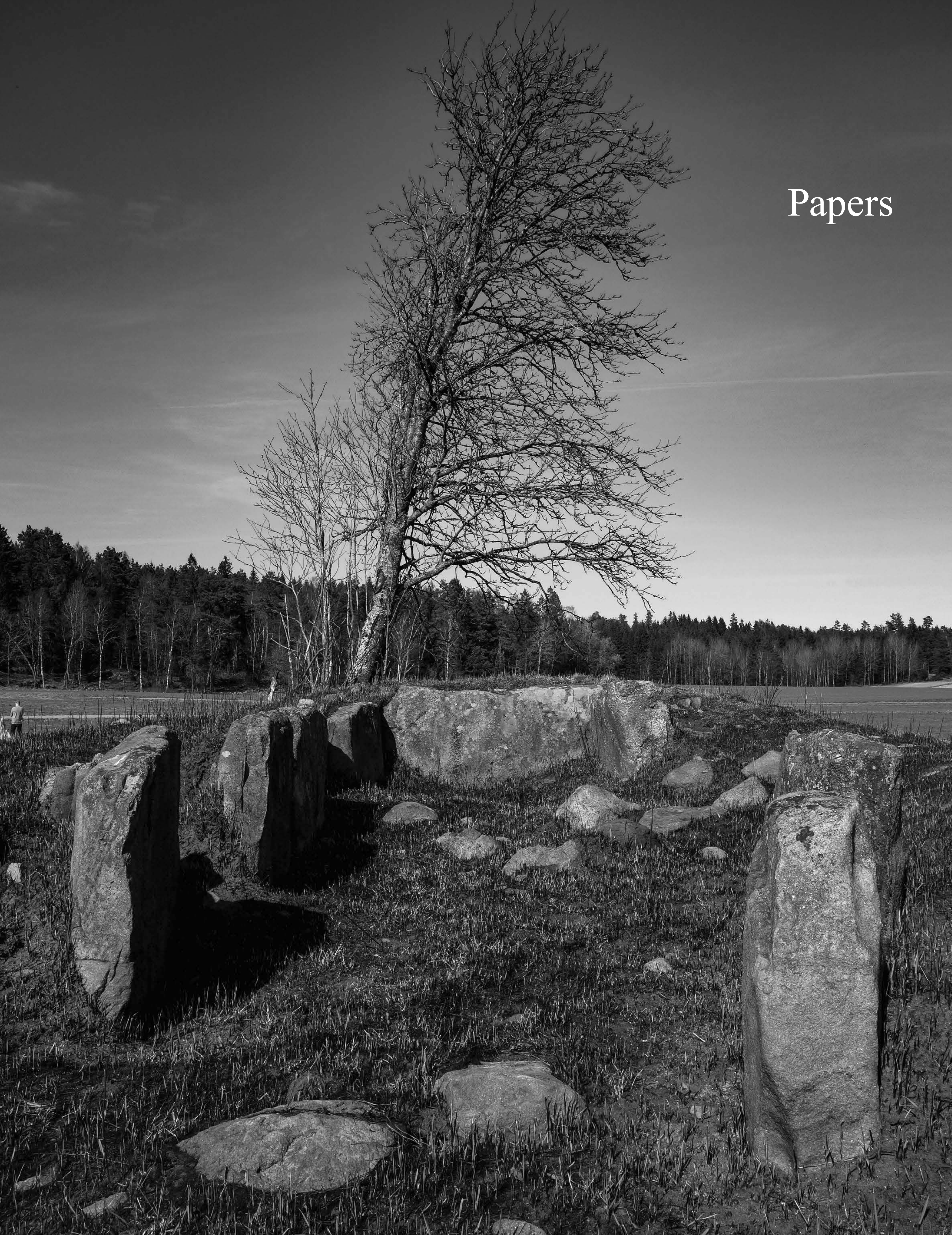
Weiler E (1977) Fornlämning 5, hällkista. Raä och SHM Rapport UV 1977:18. Riksantikvarieämbetet, Stockholm.

Werner H (1870) Antiquariska berättelser afgifna till Westergötlands fornminnesförening. Norrtälje.

Werner H (1873) Antiquariska berättelser afgifna till Westergötlands fornminnesförening II. Stockholm.

Wilhelmson H (2003) Hjelmarsrör, en jämförande studie av ett återuppgrävt gånggriftsmaterial från Falbygden. Department of archaeology and ancient history, Lund University, Lund. Unpublished paper (C-uppsats).

Papers



The Drottning Disas gallery grave.
Photo Malou Blank and graphics by Richard Blank.