The Agrarian Life of the North 2000 BC–AD 1000

Studies in Rural Settlement and Farming in Norway

Frode Iversen & Håkan Petersson Eds.

CAPPELEN DAMM AKADEMISK

THE AGRARIAN LIFE OF THE NORTH 2000 BC–AD 1000

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PORTAL

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Reconstructed Bronze-Age farm at Landa, Forsand, Rogaland. Front-page: Profile of a reconstructed roof at Landa. Photo: Åge Pedseren. Backside: Cultivation experiments at Landa. Spelt (*Triticum spelta*), or dinkel wheat, was an important staple in Scandinavia from the Bronze Age to the Medieval Period. It has stiffer straw than oats, and is not ruined by bad weather. Photo: Sverre Bakkevig. Both photos: Museum of Archaeology, University of Stavanger. CC BY-NC-ND 3.0

Black and white photo page 8: The excavation at Moer, Ås, 1997. Moer is one of the most thoroughly investigated Early Iron Age settlements in south-eastern Norway. Photo: Knut Erik Fønstelien. Museum of Cultural History, University of Oslo. CC BY-SA 4.0

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PREFACE

In 2012, The Research Council of Norway (NFR) began funding a large-scale research project at the five archaeological University Museums in Norway, with the aim of increasing collaboration amongst these institutions. The project, *Forskning i Felleskap* (Joint Research Programme), covered three different themes, selected by the participants based on their own archaeological research interests. One of these themes was agrarian societies, and this book is a result of the Agrarian network and four years' worth of meetings and discussions and work. In this, we present current research from the members of the network as well as results from recent excavations concerning settlement, climate and landscape studies of prehistoric and, in some cases, early medieval rural societies in Norway. Our research scope is national, but rather than an overall picture, this collection presents insights into very specific aspects of rural societies stretching from the Late Neolithic to the Early Medieval Period in various parts of Norway. Our presentation of botanical data from Western Norway, while regional in focus, is an exception in that it provides a comprehensive review of all archaeo-botanical analyses conducted over the years in this area, as well as their research potential. This summary is unique in the corpus of Scandinavian archaeo-botanical literature.

We, the editors, would like to thank all those who have participated in this research network over the years, The Research Council of Norway for its financial support and, of course, the authors who have contributed to this volume. We would like to thank the university museums and, in particular, Professor Håkon Glørstad, the project leader and initiator of this venture, without whom it would not have been possible. One of the stipulations of the original application to the research council obliges the museums involved to maintain the established networks beyond the funding period. So, to borrow a famous phrase, this is not the end. It is hopefully not even the beginning of the end. But it is, perhaps, the end of the beginning. Dear readers, we hope you will enjoy this volume, and look forward to the future research in this area.

Christmas 2016 Stavanger/Oslo
The editors

KNOWLEDGE THROUGH ARCHAEOLOGICAL RESCUE INVESTIGATION

Hundreds of fieldworkers take part in the 100–150 archaeological excavations carried out annually in Norway. Without the efforts of the entire archaeological community, the research presented in this book would not have been possible. The words of Director Håkon Glørstad and Vice-director Karl Kallhovd, speak for us all: "Rescue archaeology and research are commonly considered two separate worlds (...) we have made large excavations the engines of research development."

LONG TIME – LONG HOUSE

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ABSTRACT

This article deals with the *longue durée* of the longhouse in terms of agrarian commitments, households and ontology from the prehistory of Rogaland. The three-aisled longhouse is one of the most long-lived forms of dwelling-place known from prehistory, spanning from the Early Bronze Age (1500 BP) through the end of the Viking period (c. AD 1050). During some 2500 years, the architectural outline and form remained surprisingly similar. The three-aisled longhouse is, in terms of human culture, a longue *durée institution*, a materialisation of a particular lived space. The aim of this article is twofold: First, I explore the tenets of this lived space, and its implications in terms of social practice with a particular regard to the life-space shared by humans and animals inside the longhouse. Further, I examine the dynamics between patterns of change in prehistoric societies and the longhouse that endures as a basic building block for the farming household. I use the ontological turn as a framework for thinking through both of these topics. I mainly focus on the archaeological record from the Early Bronze Age until the Viking period in Rogaland, SW Norway.

THE FARMING PRACTICE AND ONTOLOGY

Being a farmer is sometimes a tough deal, it entails the loss of freedom to the agrarian commitment: to toil and sweat in the fields, making space, food, fertile soil for plants and animals, hoping that they will return your efforts manifold. This entails place-making, as in carving out a physical space where plants could grow, animals could live, reproduce and graze, etc. Such a way of life entails what I term the *agrarian commitment*, namely a pledge to a way of life in which farming is the dominant mode of existence, regarding economic strategies, social practice and cosmology, all aspects of a fundamental understanding of the world – an *ontology*. In this article I try to tease out the ontology of the agrarian commitment as a way of life and as manifested materially in the three-aisled longhouses.

Ontology is the study of, and inquiry into, that which is understood as given. By this I mean that it grapples with the very foundational building blocks of the world – and moreover, how these building blocks are perceived by different cultures. Ontology is, then, not by its own nature fixed and stable, but it appears so by the way it is situated in time-space, within its own historical-cultural context.

Recently, there has been a return to inquiry into ontology in anthropology, and to a minor degree in archaeology - frequently referred to as the ontological turn (most notably, Viveiros de Castro 1998; Kohn 2013; Latour 2013). For example, Kohn (2013) explores ontology as an interconnected web of emergent meanings. It is the web of meanings that give ontological status to beings. This is often termed *relational ontology*, meaning that ontological status springs from the sum of threads in the web - what Ingold (2011) refers to as meshwork. A bounce on the web travels along the threads and affects various entities.

Thus, a core idea situated in the midst of the ontological turn is that the nature of the world (ontology), is constructed just as much as knowledge (epistemology) is constructed. In a discussion article on the ontological turn, Fowles (in Alberti, Fowles et al. 2011: 898) argues that ontology springs from an understanding of origins and that ontology is anchored in narrative; "The world is as it has come to be." My main argument follows Alberti (2011: 900), "I conceive of ontological inquiry as a means to insert a difference (...) in the present and in our accounts of pasts."

Returning to farming practice, a fundamental aspect to the life-world of the agrarian commitment can be found in a cyclical understanding of time, and the turnings of the world at large. The life of a farmer is bound to the cycle of the year. The old Norwegian calendar *primstav*, a wooden stick with symbols carved into it, denotes special and auspicious stages of the farming year. The same *primstav* was used for every year and is a materialised witness to the cyclical nature of farming. Every year, lambs are born in the spring, the harvesting is done in late summer, and mid-winter is the time to sit still, eat sparingly and wait for the earth to come alive again. And so the seasons change, perceptibly, but maybe year to year less so.

The archaeological evidence of past agrarian commitments tells us something of the cyclical nature of the farming year, but maybe even more so of the unchangeable nature of that which lies underneath. There are several strands of evidence that suggest that underlying the farming year was a belief in permanence, one cycle carried into another, seamlessly. One non-material strand is the dedication to the agrarian commitment as a steadfast way of life, unbroken for millennia. A material strand is the commitment to the three-aisled longhouse for a long stretch of time, in Norway as well as in other parts of Scandinavia, from the Bronze Age period I-II (c. 1700 BP) through the end of the Viking period (c. AD 1000). This way of building became an anchor for farm-life in all of northern Europe for centuries. In this article I will focus on farming in Norway, and especially in Rogaland and the west country, and how the agrarian commitment carved out a particular way of living that became a structure of long-lived duration. I acknowledge, though, that processes in Rogaland are a part of larger processes also found further afield in Southern Scandinavia and Northern Europe. Then I will examine one of the principles underlying this *longue durée*, namely the *duty of care* that is a fundamental premise for the agrarian commitment.

THE THREE-AISLED LONGHOUSE – THE *LONGUE DURÉE*

In the Early Bronze Age, a monumental change in the planning and building of houses happened. This change is subtle and would not be very apparent from the outside, but inside it created a different vista and new possibilities: The transition from two-aisled to three-aisled longhouses. Such houses are found from the Bronze Age onwards in Southern Scandinavia and Northern Europe, the low countries and at Alpine lake sites (Harding 2000: 38)

The two-aisled longhouse is constructed with three rows of posts, the central of these is a line of evenly spaced, roof-bearing posts, an architectonic structure that creates two loosely separated large length-wise rooms. By adding another, parallel row of roof-bearing posts, the construction changed, it became stronger and more stable, and the interior space became increasingly divided, into three lengthwise rooms, or aisles. The two rows of posts made for a greater number of posts inside the house, and it would be easier to, for example, separate off distinct spaces by using the posts to fasten walls, fences, screens, etc. Thus, the three-aisled house made for a more flexible use of the interior space.

This architectural change is believed to be associated with a change in how animals were kept; they were moved into the three-aisled house and lived with humans (Tesch 1992: 290; Rasmussen and Adamsen 1993b: 138; Lagerås and Regnell 1999; Rasmussen 1999: 281; Årlin 1999). The transition is normally dated to Bronze Age period II (1800–1500 BP) although there are regional variations within Scandinavia. By the late Bronze Age, indoor stalling of animals seems to have been the norm in most of Scandinavia (see for example Tesch 1992, 1993; Rasmussen 1999; Zimmermann 1999; Årlin 1999; Streiffert 2001; Grön 2004). It is beyond the scope of this article to examine the empirical evidence from different parts of Northern Europe, Southern Scandinavia or even Norway in depth. Therefore, I will mainly draw on case studies from Rogaland, which is a region in Norway where house remains from the Early Bronze Age until the end of the Viking period are well-documented. I will also make use of sites from other places in Southern Scandinavia, when appropriate. However, the data from Rogaland is broadly speaking representative for processes that happen at a much larger scale, including most of Southern Scandinavia in the Bronze Age and Iron Age.

The factors that caused the architectural change are not properly accounted for in the archaeological discourse. A common assumption is that a result of the architectural change was indoor stalling of domestic animals in one part of the house. In Early Bronze Age Jutland, a number of houses have well-documented byres with individual stalls (see e.g. Rasmussen 1999). Houses with byres are not found at this early date in Norway. However, I have suggested that in the case of Rogaland, underlying the architectural change was a drive to make space for sheep to facilitate lambing and early socialisation of individual sheep (Armstrong Oma in press). Individual stalls are thus not necessarily a critical feature for stalling animals indoors. That indoor stalling of animals was a reality is demonstrated by the remains of a house that burnt some centuries later at Nørre Tranders, in Jutland (Nielsen 2002), where the bones of animals were unearthed in the byre of a longhouse. No traces of individual stalls were found in this house.

It is commonly assumed that two-aisled longhouses were for human habitation only (e.g. Ethelberg et al 2000). Some archaeologists (Tesch 1992: 290; Rasmussen and Adamsen 1993a; Rasmussen 1999: 281; Lagerås and Regnell 1999; Årlin 1999; Armstrong Oma 2007; 2010; 2013a; 2013b) have previously suggested that the change to three-aisled longhouses happened due to a change in the perception of domestic animals, leading to them becoming household members and embedded in the life-space of humans. Thus, a more intimate human-animal relationship developed. On the basis of this, I suggest that in many houses, the household consisted of human and animal household members (see also Rasmussen 1999; Årlin 1999; Armstrong Oma 2007; 2010; 2013a; 2013b).

Figure 1 shows an overview of houses and house types from the Late Neolithic until the Viking period in Rogaland, but is also valid for the general development of houses in both Norway and Southern Scandinavia throughout these periods. The prehistory of settlements in Rogaland has been

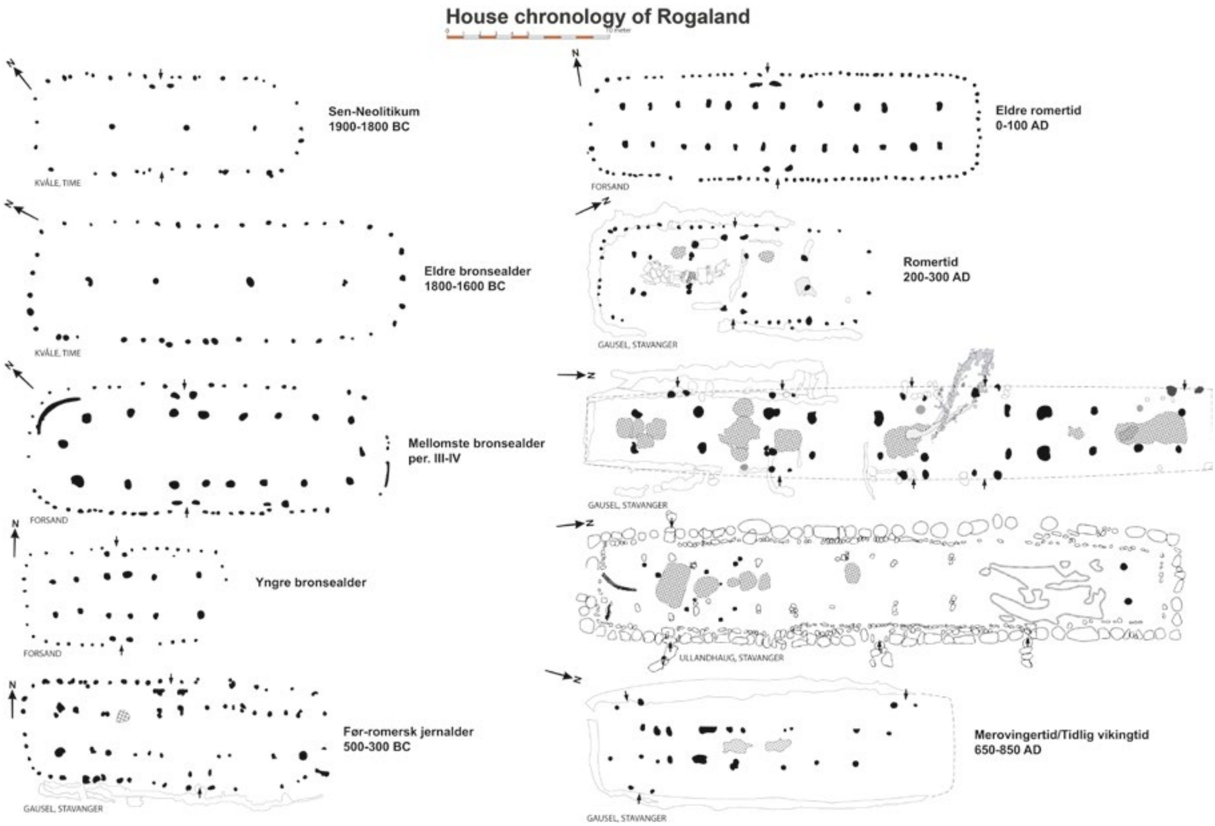

Figure 1. The development of longhouses in Rogaland from the late Neolithic until the Viking period, a span of 3000 years. Note the transition from two-aisled to three-aisled that happened early, at the 1800-1600 / 1600-1400 transition. Figure by Ragnar Børsheim.

explored extensively over the last 30 years, and well documented. The figure shows that although there are changes through the eras, the architectonic features that define the ground plan of the houses remain remarkably consistent.

The French historian Fernand Braudel developed a model to describe the temporality of changes, both at a geological scale and at a biological scale – *durées* and *evenements*. The durées can be likened to geological eras, and are durable structures that underlie society (Braudel 2002, see also Bintliff 1991). It is tempting to think of the three-aisled longhouse in terms of a *longue durée*, as something that remained a stable, unchanging and enduring feature over a very long time. This describes the phenomena but does not account for the underlying cause. Therefore, such an observation begs the question, why? What are the reasons behind, first – this choice of building and living, and, second – why it endured for such a long time?

Below, I investigate these questions with regard to the kinds of social relationships that the longhouse facilitated, particularly concerning the shared life-space between humans and animals. The tenets for the discussion are briefly set out here, prior to a discussion of the houses themselves, followed by an outline of changes in other parts of society. Then, these questions will be re-examined in light of the evidence presented.

The Bronze Age longhouses from Southern Scandinavia could be termed post-domestication household arenas. These houses provided for animals that were fully domesticated and came from a long line of domestic animals, stretching back thousands of years in time. The post-domestication household arena thus signifies the physical environment where people and animals lived. The built environment provided preconceived choices determining how relationships could be performed within the household arena. Those choices were probably made with particular reference to human-animal relationships. Following the presentation of the case studies, I outline an argument to propose that by investigating the spatial organisation of the material remains of the household it is possible to extrapolate the physical meeting points between humans and domestic animals.

LONGHOUSES – LONG TIME: EARLY BRONZE AGE TO MIGRATION PERIOD

In the following, I present some well-published case studies, mainly from Rogaland, that represent settlements throughout these periods to look at how longhouses develop through prehistory – what remains and what changes. This article is not an analysis of one case study, but rather attempts to build a synthesis based on an overview of case studies.

One of the earliest examples of a three-aisled longhouse is from Kvåle on Jæren (Soltvedt, Løken et al. 2007). Here, a three-aisled longhouse had been built on top of the remains of two two-aisled longhouses, with the transition dated to 1780 BP. The placement of the houses on top of each other suggests knowledge of the proper place for building houses, indicating continuity from one mode of building to the other.

There is one site that in particular lends itself neatly to this study due to its great time depth and consistency, namely Forsandmoen, a prehistoric village occupied over a long period of time, from c. 1500 BP to c. AD 600. A multitude of house remains spanning two millennia have been excavated (for example Løken 1997; 1998; Dahl 2009).

The settlement was seemingly established around 1500 BP in the Early Bronze Age period II, and all houses are three-aisled. Altogether 254 house remains from this period demonstrate continuous settlement from c. 1500 BP to AD 600 (Løken 1997; 1998; Dahl 2009). All of the longhouses retain the same basic features - the rectangular shape and the three-aisled construction. Throughout the period, however, some variations occur, mainly in shape. There are also differences regarding preservation, the Iron Age houses are better preserved and easier to understand in terms of the inner use of space. Early Bronze Age houses were large, up to 23 m long and 8 m wide. At the transition to the Late Bronze Age the houses became smaller, and a marked division between areas for humans and areas for animals is seen. In the Pre-Roman Iron Age, the houses were about the size of the Late Bronze Age houses. Generally, 3–7 farms existed simultaneously throughout these periods.

With the onset of the Roman period, there is a drastic change in the settlement, the houses grow considerably larger, with a typical length of 30 m, although one 50 m long example was identified. Similarly, a 50 m long house from this period was excavated at Hundvåg (see Tsigaridas 1997; Meling this volume). Several large early Roman period longhouses have been found in other parts of Norway, famously the two Missingen houses in Østfold county, 61 and 50 m long (Bårdseth 2007), as well as others from Western Norway (see Diinhoff 2010). These brief examples demonstrate that this development was not limited to Forsandmoen. More information about the household and its strategies can be gleaned from this period. For example, the human life-space and the animal life-space each have their own entrance, and there is a space for storage. The large houses have a large, open room in the middle, interpreted as a hall used for the lord to entertain his retainers, for feasting and suchlike.

During the Roman and Migration periods the organisation of houses in relation to each other change and they are placed in rows, forming a village-like structure. Each farm unit consists of two houses. As many as 19–20 farms are found simultaneously (Dahl 2009: 103), indicating that the population had grown significantly since the Bronze Age. On the basis of differentiated size, three social strata have been suggested, a high-status farm with a hall structure, used for feasting; a middle sized farm and a smaller sized farm (Løken 1997; 1998). A similar pattern is seen in the Roman period houses from the Gausel settlement (Børsheim 2001).

The settlement is abandoned for unknown reasons around AD 600-650 This is a pattern that is seen throughout Rogaland – all of the Migration Period farms are abandoned in this period (e.g. Løken 1997; 1998; Solberg 2003). Suggested reasons for this range from the Justinian Plague to climate change due to an environmental disaster to changes in social structure in which old settlements were abandoned and new were formed (see Iversen; Rødsrud; Stamnes, this volume).

LATE IRON AGE HOUSES

Until fairly recently, little was known about settlements from the Merovingian and Viking periods (Myhre 2000; Sørheim 2009), and the Viking Period house excavated in the 1930s on Oma in Time was for many years hailed as the most important Viking Period longhouse (Petersen 1933). However, recent excavations have somewhat rectified this and several Merovingian and Viking Period houses have now been unearthed (see catalogue in Hem Eriksen 2015 and also references in Bjørdal; Meling, both this volume). But for the most part, the recently excavated houses are not complete and do not render as rich an archaeological record as the earlier periods. Meling (this volume, references and table) describes the situation at Hundvåg, where altogether 7 three-aisled longhouses have been dated to the Merovingian and Viking periods. Most of these are only partly preserved but seem to have been c. 15–20 m long and 4–7 m wide. At Nedre Tasta, houses from the Viking Period were also excavated (Armstrong and Kjeldsen 2008).

In general, it appears, as Bjørdal points out in this volume, that there is a great variety in house types, ranging from longhouses that are very similar to the Early Iron Age houses, to smaller pit-houses, houses of "Trelleborg"-type (although these are also rectangular longhouses), to longhouses with concave walls that appear to be boat-shaped (see also Løken 1997; 1998). Nonetheless, while houses might be smaller and more variable, the basic form remains in most cases – that of three-aisled longhouse.

Meling holds that the Hundvåg houses commonly have separate rooms for animals and humans. Similar to Trond Løken (1998) and Lise Nordenborg Myhre (2004: 46–47), Meling suggests that each of these houses represent "a family based unit" who had ownership of the livestock. He further suggests that smaller buildings were homes to families without rights to keep animals (see also Løken 1998: 119). The buildings could, then, represent social stratification, as seen in other parts of society (see discussion of graves below).

LONGHOUSES – SOCIAL UNITS AND BASIC BUILDING BLOCKS FOR SOCIETY

This short presentation demonstrates that although the basic architectonic premises of the three-aisled house remains over some 2500 years, the houses themselves do not remain unchanged throughout the periods. There are changes in size (both length and width), placement of entrances and some internal features, use of the rooms and arrangement of houses in relation to each other (space does not permit a full discussion of these differences here). Although not examined in depth in this article there are also regional variations within Norway and Southern Scandinavia. Presumably, this diversity represents changes in social structure, such as the social stratification of society, population growth, definition of membership in individual households – the size of the household group, and space required to facilitate economic farming strategies, such as haymaking and storage.

Some of the changes are thought to reflect changes in social structure. For example, variations in size are often supposed to be related to an altered understanding of household membersship regarding how big the "in"-group is. A large house can accommodate a larger number of people and animals. It can also account for differences in economic strategies, such as a husbandry-based way of living, or subsistence strategies based on cereal cultivation. Or, a large central space, such as seen in the Roman period houses from Forsandmoen, could accommodate special events such as feasting and other gatherings of community members.

What is not changed throughout the prehistoric periods is the longhouse itself. The basic layout, the rectangular (sometimes with slightly concave walls) shape of the longhouse, the placement of the trestles – as pairs, and a tendency for a partition into two sections, roughly evenly sized, stay unchanged. The longhouse remains an institution, a fixed way of building, which speaks volumes considering the embedded *habitus* of living.

Before I explore the implications of this, I wish to briefly investigate other aspects of society, and look at how the material record shows changing versus durable practices, and how these can be understood as illuminating larger changes in society.

LONG TIME, GREAT CHANGES – MORTUARY PRACTICES

Even though the longhouse persists for a long time, other aspects of society are not static and unchanging. Burial customs, material culture and cultural exchange are but some of the changes in the archaeological record that fluctuate. Let me illustrate this using the changes in burial customs: A number of factors regarding burials change throughout this long time period, both regarding the manner of rituals, the way that graves are constructed, the treatment of the dead and the inclusion of grave goods. In the following, I use examples from Rogaland, but the examples are reflections of larger-scale processes and serve well to exemplify these (see for example Harding 2000; Kristiansen & Larsson 2005 for broad descriptions of mortuary practices in the Scandinavian Bronze Age, and Solberg 2003; Hedeager 2011 for broad descriptions of Iron Age mortuary practices in Scandinavia).

One factor that distinguishes the Bronze Age from the Neolithic is the construction of large grave mounds built for individuals, as opposed to the Neolithic megaliths known from other areas of in Europe that functioned as mass graves (e.g. Scarre 2007). In Rogaland, the mounds appear in Bronze Age period I-II, at roughly the same time as the three-aisled longhouses start appearing (e.g. Nordenborg Myhre 2004; Syvertsen 2005; Austvoll 2014). The early mounds are massive monuments, their size often accentuated by their strategic placement in the local topography, on natural hilltops. They are also often placed with regard for visibility, not only from the surrounding areas on land but also from the sea (Nordenborg Myhre 2004; Syvertsen

2005). The mounds that have been excavated show the graves of individuals, both women and men, placed on their backs with status objects made from bronze. Women were buried with richly ornate jewellery such as belt plates, tutuli, bracelets and neck collars, and often a dagger (Myhre 1979; Syvertsen 2005). Men were buried with weapons, swords and daggers. Some of the graves hold chambers with slabs bearing rock carvings (Syvertsen 2005).

At the transition to the Late Bronze Age, there is a marked change both in the treatment of the dead and in the manner of burial. The dead are cremated, and the burnt bones placed in urns, with small and simple jewellery, weapons or objects interpreted as implements for self-care, such as razors, pincers and ear scoops (Treherne 1995). These latter objects led Paul Treherne (1995) to suggest that they express particular ideals of beauty. The urns with burnt bones were often placed as secondary burials in the large mounds from the Early Bronze Age.

With the onset of the Pre-Roman Iron Age, the custom of cremating the dead and placing them in urns remains, but the urns are now placed directly in the ground, sometimes the grave is marked by a low mound but often there is no marker that is visible today. Grave goods become scarce, towards the end of the period simple pins and fibulas are sometimes found. Status markers, such as ostentatious grave goods and massive monuments, are absent (e.g Solberg 2003). Could this denote a society in crisis – or, an egalitarian society, in which status markers were obsolete?

In the Roman Iron Age, burial customs retain features from the Pre-Roman Iron Age as well as branching out in new directions, and are more than anything noted for their great diversity. The dead are often cremated together with animals, and both human and animal bones are placed together in urns (Mansrud 2004a; 2004b). The urns are no longer only simple pots but can be large bronze cauldrons imported from the Roman Empire (Hauken 2014). The urns are placed in a range of monuments and in different landscapes. For example, large cemeteries are found along the stony beaches of Jæren, where graves are marked by stone settings constructed in a range of shapes, from star-shaped and rectangular to oval and circular (Lillehammer 1996[1985]; Bukkemoen 2007). In these cemeteries, graves are found from the very beginning of the Roman Period until the Merovingian Period. Even though the majority of graves from the Roman Period are cremations, inhumations become common at the end of the period.

In the Migration Period, inhumations are common and the dead are sometimes placed in chamber graves covered by mounds. The dead in these graves are frequently richly adorned with fine textiles and ornate jewellery, often decorated with Sahlins style I (Kristoffersen 1995), an animal based decorative style.

The opulently rich graves from the Migration Period come to a halt in the Merovingian Period, in which both the grave marker and the grave goods become low-key and inconspicuous. There is a marked decrease in the number of graves, as well as a change in grave goods, to a simpler set-up with simple tools and simple ornaments (Solberg 2003). However, some graves remain that are more elaborate in their visual communication, such as the male graves with horse equipment (Meling 2000; 2014).

The pendulum swings again with the onset of the Viking Period, and a large variety of graves are seen, ranging from the lavish, such as the presumed grave of Harold Fairhair at Avaldsnes (Grønhaug, see Opedal 1998), and the grave of the so-called Gausel Queen, with the spectacular horse bridle (Bakka 1993; Meling 2014), to more modest graves. A common feature in the Viking Period are boat graves, and although the west country lacks the magnificent ship burials found in Vestfold, several boat graves have been excavated during the past few decades, such as at Gausel (Børsheim 2001). These graves attest to a maritime orientation. Overall, the mortuary practices in the Viking Period suggests both physical as well as social mobility, and social stratification.

Even though the treatment of the dead, the construction of the burial and the grave goods change throughout the Bronze- and Iron Age, this short review of the basic patterns demonstrates that there is at the same time some continuity, but also significant changes.

From one period to another, the changes build incrementally on previous practices and retain features from earlier times, so there is no distinctive break from one period to another. For example, the urns with burnt bones from the Late Bronze Age are placed in the large mounds from the Early Bronze Age. And the urns with cremated remains continue through the Pre-Roman Iron Age, although they are moved away from the mounds and the grave goods change. Barbro Dahl demonstrates this in her study of a grave mound at Håland in Time, which was in use over a period of 2000 years (Dahl in press)

This short presentation of mortuary practices throughout the period demonstrates that there are significant changes in for example the material expression of social hierarchies, in the beliefs expressed in the treatment of the dead, and also the manner and location of final resting place. These are not trifling matters, based on fashion and likely to change, but rather deep-seated beliefs rooted in religion and philosophy. Thus, we can surmise that many aspects of society changed rather drastically throughout these periods. For example, Anders Kaliff (1998) has suggested that the change from inhumation burials in the Early Bronze Age to cremations in the Late Bronze Age is related to a shift in the perception of the soul: the cremation pyre was meant to free the soul so that it could rise upwards.

Yet, these changing beliefs do not express themselves in architectural choices. The changes in mortuary practices cannot be separated from wider European historical processes, encompassing both changes in environment, adaptive changes to agricultural strategies, decimations of populations by starvation, plagues and diseases as well as political changes and power shifts, such as the rise and fall of the Roman Empire. Remarkably, the farm as longhouse remains throughout all of these upheavals. Confronted with the changes in the mortuary record, it seems that the three-aisled house is, indeed, a kind of *longue durée*. In the following sections, I explore possible reasons underlying the longevity of the longhouse.

LONGHOUSE AS *HABITUS*

One way of understanding the permanence of the longhouse is to think of it along the lines of *habitus*. This concept was introduced by Pierre Bourdieu and has become a widespread model for understanding societies in the archaeological discourse, to the extent that it barely requires introduction. Very briefly, it can be explained as follows: *Habitus* is "systems of durable, transposable *dispositions*", and "the mode of generation of practices" (Bourdieu 1977: 72, original emphasis) within any society. The *habitus* is the everyday actions that we perform, the choices we make without reflecting on them, and the way that our past actions are carried into the future. Bourdieu stressed the importance of practice, which constitutes how life is lived, according to structuring principles that together form the *habitus* of society. He described *habitus* as being in its own nature an assemblage of dormant dispositions; it is constituted to, and oriented towards, practice, structured within structuring dispositions; it is orchestrated, but without a conductor (Bourdieu [1980]1990: 52–53). It follows that those that are within a *habitus* organise their life according to their embodied dispositions, which are simultaneously experienced history inscribed within their bodies, and also the templates that structure the way future practices are generated. But *habitus* cannot be grasped, it is not by itself anything that is material. Still, the durable dispositions are carried out in a material world, and so the structuring principles can imprint themselves upon that world. I suggest that the three-aisled longhouse became such an imprint. As such, it could become a very stable part of society, that provided and facilitated a durable disposition.

Further, I suggest that the imprinted *habitus* that the longhouse was, provided a base – a spatial setting – for the household practice, and one aspect of this was the byre, the animal section of the house. Although not all longhouses had a byre, they all had the potential for it and were constructed in such a way that facilitated this spatial segregation. This is where the human-animal relationship was situated – *habitus* in this case formed in the day-to-day interaction between all participants. Within this setting, practice was anchored by structuring principles, such as architectural layout, activities, material culture and agents. Structuring principles are a way of organising one's actions and dealings with the world within a framework (Barrett 2000). Rather than a passive form of structuralism, it is a system of active categories that forms a drive in which agents can operate within their own *life-space* and with the world at large (Giddens 1984). Life-space here denotes the choice of living arrangements and the structuring of these, such as whether to live with animals or live apart from them – here termed shared or non-shared life-space. Opting to live with animals has a profound impact on the lives of humans, as animals, through their demands of being tended and taken care of, create specific patterns of living in the human society. As such, humans and animals become naturalised parts of each others' experience of life. This implies that not only do humans domesticate animals but humans themselves are to a certain degree domesticated *by* animals.

DUTY OF CARE AS A STRUCTURING PRINCIPLE

In the following, I attribute weight to the partition of the house into byre and human life-space. I argue that such a set-up was a response to a specific ethics of care in which humans responded to the needs of animals and instead of only using animals and their materiality by killing them, there was a sense of, and possibly a need to, care for the animals by giving back. Giving back could manifest in practices such as building shelters, aiding during giving birth, providing food by collecting grass, leaves, bark, and ultimately more complex strategies that involved storage, such as haymaking. From the animals' perspective, what better servants could they have than these humans who clear and guard pastures, build shelters, bring water and food, and so on.

I understand such practices under the umbrella-term *ethics of care*. This term is associated with *duty of care* and is normally used in social sciences and particularly in medicine and nursing to denote the duty and practices of protecting, nurturing and caring for those that are weak, sick, injured or disabled. But it is also a much wider term, and in UK legislation, duty of care is implemented in the Animal Welfare Act[1]. In a broader sense, it denotes the duty of behaving in such a way to others as to not do them harm, but to protect them – and it is in this sense that I extend this notion to animals in the past.

Introducing an ethics of care into the domestication discourse discloses an attitude in which the relationship between humans and domestic animals is seen as asymmetrical. However, this does not necessarily imply that animals are mindless creatures, Cartesian automata, or slaves devoid of agency that

1 https: //www.gov.uk/government/publications/animal-welfare-act-2006-it-s-your-duty-to-care

were completely dominated by humans. I acknowledge that animals have the capacity for agency, in line with the growing interdisciplinary recognition that many animals possess characteristics such as intelligence, emotion and awareness that vary from humans by degree rather than kind (see for example Shapiro and DeMello 2010;DeMello 2012).

As in the humanities at large, human agency has been granted supremacy in archaeology. Ontologically, the nature of being is the nature of human being; the nature of action is of human action (Johannsen 2012: 305). But animals are more than cultural abstractions: what is lacking is considerations of the animals *as themselves*. Animals are alive, active participants in their worlds, and the spaces where those worlds intersect and enmesh with humans are often messy and difficult to divide into clean compartments. In addition to how humans "use" them, animals often take part in subjectified relationships with humans that impact both species at various levels of scale (e.g. Birke, Bryld and Lykke 2004: 172–173).

Recognising animals as active co-creators of the world (Haraway 2003; 2008) has a particular relevance for farming societies. By way of their sentience, animals possess agency by their ability to purposefully act upon the world, unless severely physically restrained. On the farm, space is created, shared and mutually constituted by humans and domestic animals. Meanings arise and practices are constituted as joint actions unfold; whilst herding, milking, plucking wool, walking together, resting together, and creating spaces, thresholds (Armstrong Oma 2007). The consideration and care in which individuals are allowed to carve out their personal place is created everywhere on the farm.

RELATIONSHIPS EMBEDDED IN THE CONSTRUCTION OF SPACE

To study human-animal relationships it is imperative to start with the actual, physical encounters. Within the framework of archaeology, this means beginning with an understanding of the spaces where the relationship was expressed. Humans and animals carried out their lives together in and around buildings and in pens and fields in the landscape. Space is constructed according to preconceived choices, made before the building process proper commences. Preconceived choices give rise to particular life-spaces that are shared by its members – that could include both humans and animals. Life-spaces go beyond Ingold's (2000) concept of dwelling (a term he in later years has abandoned, see Ingold 2011: 12). Life-spaces are, simply, spaces where life is made to happen. Rather than dwelling, life-spaces embody Ingold's new brain-child meshwork – the web of life, entangled, enmeshed and interwoven lines, where primacy is given to the lines in-between the nodes in the network rather than the nodes themselves (Ingold 2011: 63). Life is lived along lines rather than in points, constantly unfolding, ever surpassing itself. There is no beginning nor end, only a middle. And this middle is "an endless path, along which wayfarers travel" (Ingold 2011: 12–14). I see the meshwork as the threads of relationships, that allows a focus upon the act of relating, a shift away from perceiving agents as freestanding monolithic nodes. Life-space is a ploy to study relationships, and relationships happen in a meshwork – here, there and everywhere; both in-between and across the walls, fences, pens that humans build to create the framework for their lives. For example, when life-space is shared by humans and animals together, their actions become intermingled and flow through space and time together (Armstrong Oma 2007: 161–163). Life-space is thus both an analytical tool and a physical phenomenon.

Life-space can be studied archaeologically by considering architectural choices embedded in excavated remains of houses and their layouts. House plans can reveal structuring principles, and since these act as anchors for practices, they are fundamental to the construction of space and reveal choices made prior to construction.

Friction arises when the preconceived space is put into use and becomes a place of experience. Out of this tension grows relationships, sometimes in novel and unforeseen ways. Building upon this, I argue that one way of studying human-animal relationships in the past is to look at spatial constructs that accommodate both human and animal agents. Investigating kinds of spatial designs allows for a consideration of the preconceived notions – dispositions – that underlie social choices. Effectively, spatial constructions would restrict or allow access for human and animal agents, thus regulating the degree of proximity between them, and ultimately create the framework for how their relationships would develop through the process of living – or not – together.

Returning to the main questions in this article: How is the longhouse a part of the *longue durée*? – in this context begs the question: Is living with plants and animals a part of the *longue durée*? How are these other beings so deeply embedded in the farmscape and lifespace that they are fundamental to being? Partly, the answer surely lies in their immutability, the cyclical nature of farming life, in which life is centred around animals and plants, individuals die, but the life force of the flock, the plants and the family remains.

The farmhouse as an anchoring point brings all of these farming practices together. The farmhouse can thus be seen as an ontology unto itself, the basic framework upon which every aspect of life depended. The framework of the longhouse appears to have been a physical, spatial as well as embodied, structuring principle upon which social relationships were given meaning and were played out. In this article I have focused particularly upon relationships between humans and animals and how the longhouse became a physical embodiment of their relationship. However, inter-relational aspects to society such as gender, age and ethnic identities can also be explored from the longhouse as a structuring frame for practice.

The longhouse was – for 2,500 years – the world as it had come to be.

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EFFECT OF TEMPERATURE CHANGE ON IRON AGE CEREAL PRODUCTION AND SETTLEMENT PATTERNS IN MID-NORWAY

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ABSTRACT

This paper will investigate the relationship between land available for cultivation and settlement patterns, and the potential effect temperature changes had on settlement patterns in the Iron Age of central Norway. Temperature, more specifically the accumulated temperature sum (*døgngrader* in Norwegian, abbreviated as "ACT"), is an important indicator of the potential for producing ripe crops. By calculating the ACT values at different locations, it is possible to geostatistically model and create maps showing how varying temperature conditions affect arable areas. The results of this can be drawn into a discussion concerning the effect of changing climate conditions on settlement patterns. What is the liminal zone for crop production at a specific time? In which regions would a given temperature change have the greatest effect? Would temperature change have any effect on subsistence strategies? This paper will demonstrate how GIS-systems are a powerful tool for analysing and modelling past climatic conditions, and may possibly reveal important information not previously accessible.

INTRODUCTION

The Migration Period (AD 400-560/570) in Norway is generally considered a period of settlement expansion and increased wealth. The erection of large burial mounds with rich grave finds indicates that power was centralized, probably in relatively unstable, petty kingdoms or territories with shifting alliances and struggles for power. The society at that time is thought to have been socially stratified, based on alliances arranged through marriages, the exchange of gifts, barter and war. Large boat houses, hillforts and weapons from graves and sacrificial offerings tells us a story of a competitive society where a surplus of resources and raw materials such as iron, hides, craft products and agricultural products could be transformed into power and were necessary to feed workers, craft specialists and warriors. Towards the 6th century AD, human activity expanded into outlying areas that had few traces of activity in earlier periods. This included fishing along the coasts, iron production, systematic hunting of elk and reindeer, animal husbandry and summer dairying. In some instances, areas were cleared that have never been used for agricultural purposes again. This situation seems to be similar over most parts of Scandinavia (Pedersen and Widgren 1998: 267; Prestvold 1999; Solberg 2000; Myhre 2002: 59-160; Stenvik 2005).

There are a series of changes in the archaeological evidence in the middle of the 6th century. Rich graves disappear, deposition of hoards and sacrificial offerings is discontinued, and a large number of farms seem to have been abandoned (Solberg 2000; Löwenborg 2012). In Trøndelag, the extensive iron production seen in the previous centuries disappears completely, and the same technology is never to be seen again (Stenvik 1994; Stenvik 2005; Prestvold 1999). Boat houses also disappear from the archaeological record. Such boat houses are assumed to be indicators of trade or military activities, and connected to the social and political organisation of the area. If they disappear, then there is reason to believe that the organisation behind them also disappeared (Myhre 1987; Johansen 2007; Grønnesby and Ellingsen 2012: 137). While all these aspects might point towards a crisis, some scholars have indicated that this transition might not have been as dramatic in Trøndelag as in other regions of Norway (Myhre 2002: 173).

Several suggestions have been put forward to explain these events, and these can generally be organised as either internal or external explanations. Internal explanations are, for instance, that due to an increased population, technological changes and wider contact networks in the 6th century (Myhre 2002: 159-170), society reached the limit of land available for settlement and exploitation. Another internal explanation is that an increased consolidation of power could allow wealthy chieftains and their families to restructure the settlements in the landscape (Prestvold 1999: 99 and Myhre 2002: 159-170 and 198).

This is a notion that contrasts with observations made by Grønnesby and Ellingsen (2012: 137) concerning the disappearance of the boat houses in the archaeological record. This could be explained as a downfall in trade with the Roman Empire (Solberg 2000: 210), or other external factors such as the Justinian Plague. A plague could have altered the power balance in the societies, but could also have led to technological innovation to counter the fall in labour or inspired a change of focus from cereals to animal husbandry (Solberg 2000: 176-182; Myhre 2002: 172-173; for a more general discussion on the effect of disasters, see Löwenborg 2012 and Iversen; Rødsrud, both this volume).

Another suggested external explanation is the effect of climatic changes on population size, settlement size and the way societal organisation. Issues related to the "AD 536 event", a proposed drastic climatic shift c. AD 536-37, have been particularly heavily debated. This event is described as a drastic climatic catastrophe, which has been observed through low growth in tree rings and layers of sulphate in glacial ice sheets. Such an event is well documented, and is assumed to be caused by one or several large volcanic eruptions. The effect of this catastrophe would have been lower summer temperatures, with a temperature fall of up to 3-4 degrees Celsius (Gräslund 2007; Gräslund and Price 2012, both with references to Briffa et al. 1990, Scuderi 1990 and Grudd *et al* 2002). Classical written sources from Europe, the Middle-East and China also mentions years of cold summers, and this dramatic fall of temperatures is by Gräslund connected to the Nordic tradition of the "Fimbulvinter" (Gräslund 2007; Gräslund and Price 2012; Löwenborg 2012).

The regional effect of such a dramatic fall in temperature can be modelled through the notion of growing degree days (abbreviated to "GDD", or *døgngrader* in Norwegian), which will indicate whether or not it is possible to cultivate cereals that reach maturity. The GDD can be calculated for every meteorological measurement station, and effects of climatic variation on available land can be visualised through a geostatistical analysis and visualisation. These maps will tell us the effect of such temperature variation on the amount of available land for cultivation of grain. The aim of this paper is to model the effect of climate variations, and use the results of such models in a discussion of the potential effect this might have on settlement patterns, agricultural practices and social structures in an Iron Age society in the region of Trøndelag, Norway. Various available archaeological sources, as well as natural-historical and archaeobotanical evidence will also be investigated.

CLIMATE, CEREALS AND SETTLEMENT STRUCTURES

Climate changes can have detrimental effects on growing conditions for cereals. Different cereal-species have varying requirements for soil conditions, pH and growing degree days (GDD). A nutritional soil is dependent on the local geology. Various minerals such as silicate, aluminium, iron and magnesium in combination with nutrients such as oxygen, hydrogen and carbon, are components that contribute to the health of plants and agricultural cereals (Strahler and Strahler 2005: 610-611, 641). Soils of a higher pH will also be more fertile than acidic soils, as long as the pH is not too high. Chalk-rich soils can also be beneficial. Modern barley requires a pH of at least 5.8 on sandy and silty soils. However, a moist climate with increased rainfall will wash nutrients and alkaline ions out of the reach of plants, potentially creating a non-ideal situation for further cultivation (Welinder 1998: 42; Frøseth 2004: 175). In the early stages of the cultivation season, it is important that nitrogen is available for the plants, which happens in "warm" soils, typically when exposed to sun or on more stony, moraine soil types. At the same time, a low temperature early in the season will make the plants grow slowly and give them time to develop properly (Stamnes 2008: 38 with personal reference to Randi Berland Frøseth).

As mentioned earlier, different types of cereals have different temperature requirements during the growing season, typically referred to as "Growing Degree Days" (GDD). For the cultivation of grain, this is the accumulated temperature from the day the average temperature goes above 6˚ C in spring until it falls below 10 ˚C in the autumn. 10 ˚C is necessary for the grains to reach maturity. The GDD increases by 20 points per latitude degree above approximately 60˚, due to longer and sunnier days during the summer season at higher latitudes. At the same time, a rainfall above 250mm during the growing season will decrease the GDD by 60-80 for barley and 100-110 for wheats (Frøseth 2004: Stamnes 2008: 36-41).

Table one presents the GDDs required for various modern cereal types. These numbers are based on modern cereal types.

The numbers presented in table 1 are based on modern cereal types, and will vary with the amount

Cereal type	Growing Degree Days	Average Corrected GDDs for cereals in Nord-Trøndelag
Early Barley	1250	1200
Late Barley	1330	1280
Early Oats	1300	1258
Late Oats	1380	1338
Spring Wheat	1460	1423

Table 1: GDD requirements for the various modern cereal types (source Frøseth 2004– corrections calculated depending on average latitude and rainfall in Nord-Trøndelag by the author)

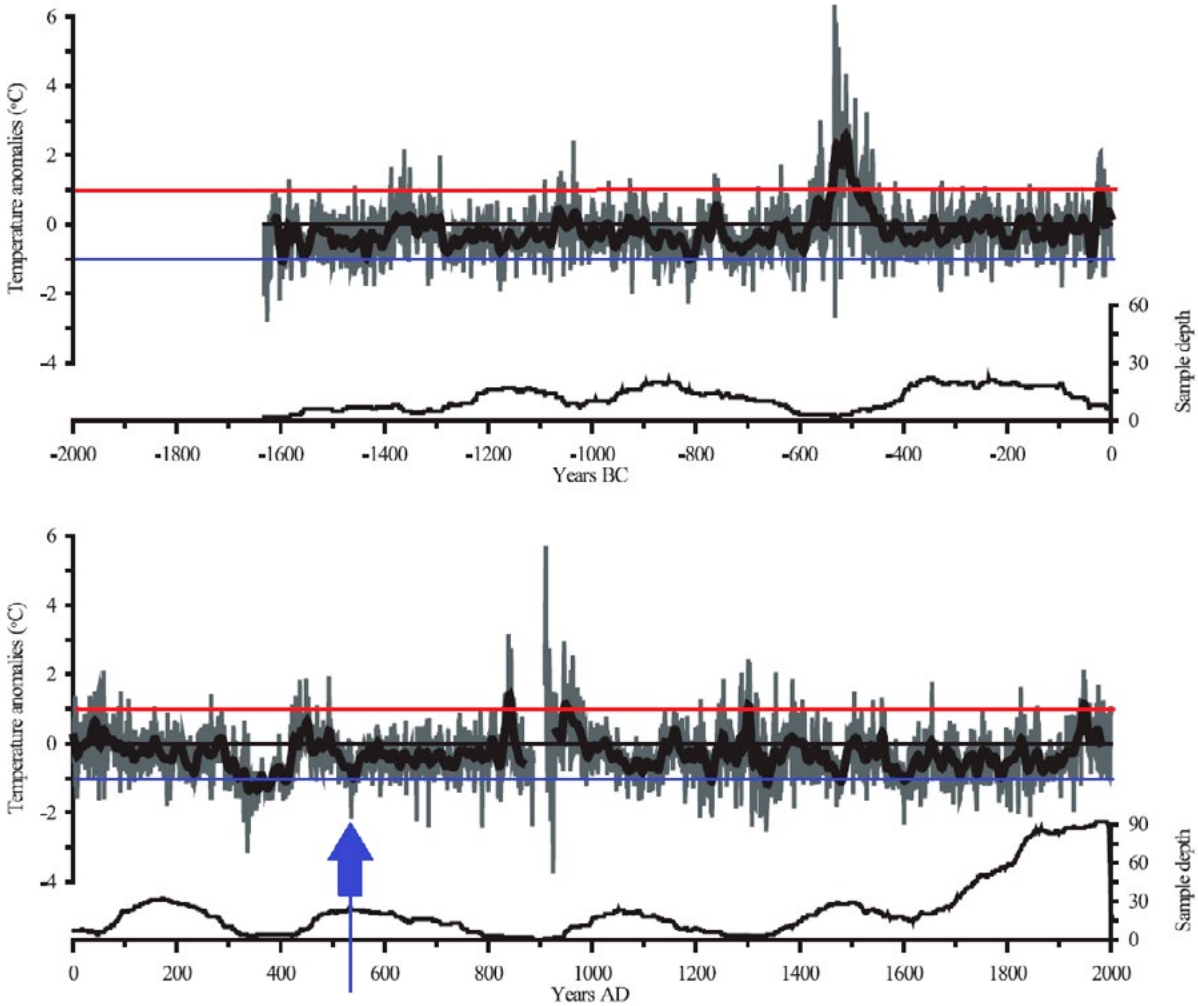

Figure 1. The reconstructed summer temperatures (June to August) from Jämtland as presented by Linderholm and Gunnarson 2005: 237. The upper part of the figure is for the years BC, and the bottom part is for the years AD. The lines and arrow have been inserted by the author, and indicate + 1 degree C in red and -1 degree C in blue. The blue arrow indicate the time of the potential *fimbulvinter*-event. Used with permission.

Period	Effect	Approximate temperature change compared to the 1961–1990 mean
450-550 BC	Warm	+ 1-2,4 degrees
AD 300-400	Cold	1 degree
AD 900-1000	Warm	+ 0,5-1 degrees
AD 1550-1900	Cold	0,5 degree

Table 2: Climatic periods highlighted by Liderholm and Gunnarson (2005).

of rainfall. It is possible that locally adapted species, developed through careful selection of the best seeds from each cereal, could have had a lower GDD than the current available cereal types. Of cereal types found in archaeological contexts in North-Trøndelag up to 2006, barley was found at 11 out of 15 sites where cereals were discovered; 10 of these finds are covered barley. Barley is known to have been cultivated from the Early Bronze Age and throughout through the Iron Age. The other cereal types found are wheat (2), oats (1) and rye (1) (Stamnes 2008: 42). Pollen analysis conducted in mid- and northern Norway also show that farming activities expanded in the Late Roman Iron Age (especially in the period AD 200-375), and that the cultivation of barley increased in particular (Vorren *et al.* 1990).

When it comes to temperature variations during the Scandinavian Iron Age, Berglund (2003) compiled and compared several sources looking at solar variability, ice rafted debris, lake levels, lake catchment erosion, peat growth, tree-ring records, glacier advances, sea-level changes and paleosols correlated with dry periods. He emphasises a rapid cooling period based on tree ring data, sea surface temperatures and rising lake levels in the period AD 480-540. This probably led to a wet climate. He also suggests a shift during the Viking Period which led to a warm and dry climate, with high tree lines, glacier retreat and reduced lake catchment erosion. This lasted until around AD 1200, when a gradual change to a more cool and moist climate occurred (Berglund 2003: 9-10). Linderholm and Gunnarson (2005) also emphasise a series of climatic variations based on tree ring samples taken from bogs and lakes in the Jämtland area, which is more inland but geographically close to Trøndelag (Table 2).

The Linderholm and Gunnarson (2005) sequence does not seem to indicate a dramatic temperature decline around AD 500-550, but a small low peak deviating from the 30 year moving average at around AD 530-540 might be exactly the *fimbulvinter*- event at AD 536-37 suggested by Gräslund (2007) (indicated by the blue arrow in figure 1) and Gräslund and Price (2012). There are other outlying events during this time period, but the sequence and the article by Linderholm and Gunnarson (2005) focus on general trends rather than dramatic events.

METHOD

The Norwegian Meteorological Institute has a database of historical climate data called "eKlima"[1] which contains historical data of rainfall and temperatures recorded by their meteorological measurement stations all over Norway. Exported data from this database has been used in this investigation. Points with recorded coordinates and data properties can be used to generate maps, models and visualisations of the inherent properties at these locations. The geographical location of each meteorological measurement station, as well as the recorded rainfall and temperatures at these locations have been used as data. By using an interpolation technique called cokriging, coverage maps of the GDD can be generated in the software ArcMap10.1 with the Geostatistical Analyst-extension. Kriging is considered an exact interpolation method, and is based on spatially modelling variables under the assumption that natural occurring properties will be more similar the closer they are to each other. The statistical relationship between spatial distance and the correlation between measurements can be statistically modelled through what is called a variogram, which describes the spatial variability of a variable in terms of its magnitude, scale form and contribution of random noise. The variation of the measurements or parameters, as well as the distance between measurement points, are used to perform the most ideal interpolation – increasing the accuracy of the models. Cokriging is a variant

1 www.eklima.no

of kriging used to model a property in instances where few measurements of the primary variable exist, and measurement of a secondary variable are more abundant. The correlation between the property one wishes to model and a secondary property can be utilized to model the primary variable based on the secondary one. In essence, this means that we can use the abundant information of height above sea level as a secondary variable to model the GDD over a chosen area, as long as there is a strong statistical relationship between GDD calculations at the known sample points and the height above sea level. The mathematics behind these methods is quite advanced and thoroughly explained in, for instance, Isaaks and Srivastava (1989).

The use of geostatistical modelling to model past climatic conditions has not previously been undertaken for this part of Norway. While a map of the GDD of Sweden have been presented in Welinder (1998: 252), it is unclear how the map was produced as there are no references related to it in the publication. This project will also be considered as a test of the applicability of this methodology for this type of modelling. Some notes on the methodological drawbacks and advantages will therefore be discussed later.

To investigate the potential effect of climate change on settlement patterns, agricultural practises and social structures in Iron Age mid-Norway, it is possible to use publicly available climatic data. A database of such data was compiled, and temperature variations for the various meteorological measurement stations within the geographical area of interest were calculated. Information on the average temperatures from all meteorological stations that had recorded data from the climatic standard period between AD 1961-1990 in the county of Nord-Trøndelag were exported. Based on the geographical location and mean average height above sea level for each station, this information was entered and processed in a Geographical Information System using geostatistical programme extensions (ArcMap 10.1 with the Geostatistical Analyst plugin). There are 49 stations spread out over the county, and additional measurements were exported from neighbouring municipalities in the counties of Nordland and Sør-Trøndelag, making it a database of 64 stations in total, with 365 measurements for every year. For each station the average temperature for each daily measurement was increased by 1 °C, 0.5 °C, as well as reduced by 0.5 °C, -1 °C and -3.5 °C, creating a sequence of temperature calculations for each meteorological station. The GDD was then recalculated for each average temperature at each station, making it a total of 384 calculations. The height above sea level is available for each station. The Pearson correlation coefficient (*r*) between the GDD and the recorded height is -0.93, showing a close relation between the decrease of temperature with an increased height above mean sea level. In essence, this means that using mean height above sea level as a secondary variable is highly applicable in a cokriging procedure as described above, and increases the confidence in the final results of the model. 13604 height measurement points, including those at the meteorological stations, have been used as a secondary variable. These height measurements were also compared with the calculated GDDs for each station, to identify approximately the highest station with a GDD equal to the average for early barley in the region, and for the purpose of comparison with to the geostatistical models.

RESULTS

The result of these cokriging operations is a series of raster datasets. Below are visualisations of the results for the GDD of the average period 1961-1990 (Fig. 2), the effect of a temperature rise of 1 °C (Fig. 3), a temperature decline of 1 °C (Fig. 4) and a temperature decline of 3.5 °C (Fig. 5).

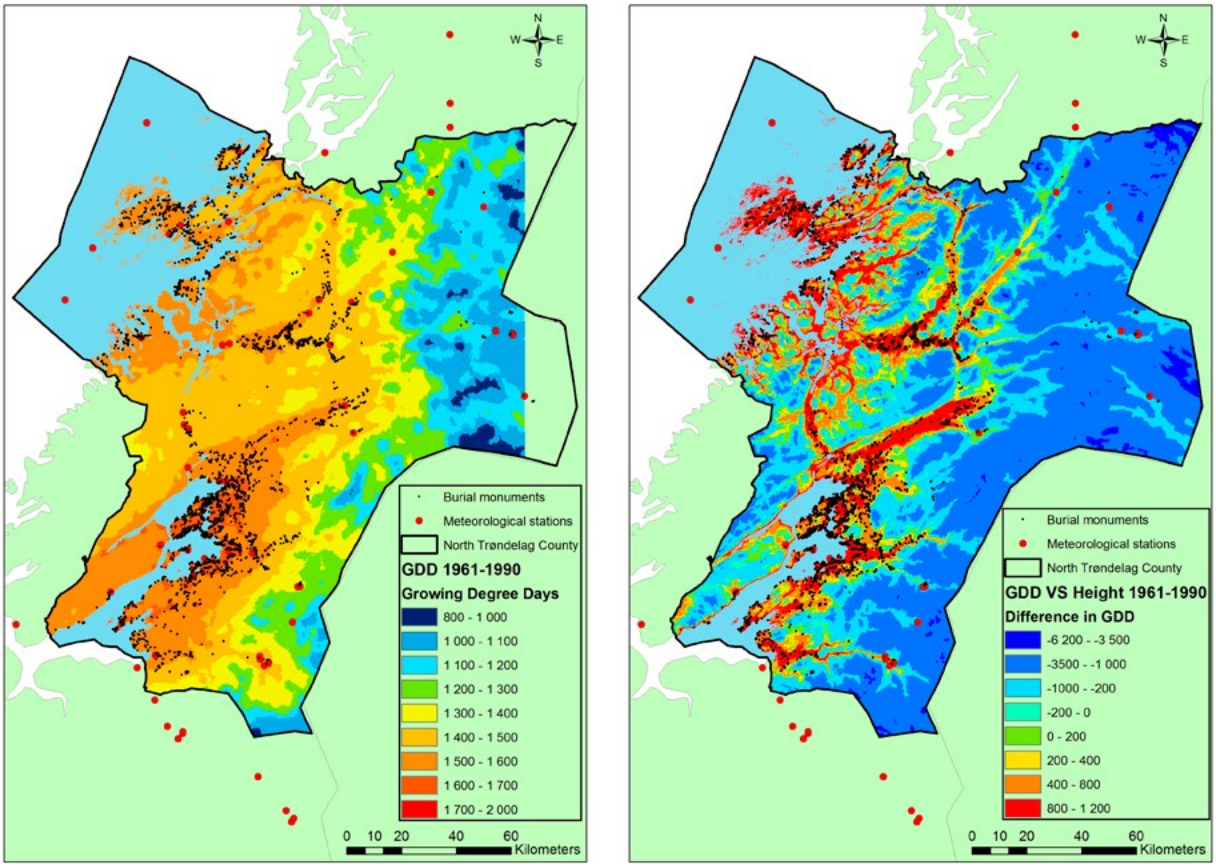

Figure 2. Left: The cokriged model for GDD based on the average temperature between 1961-1991. Right: The calculated maximum height above sea level based on the calculated GDD.

All these maps (Figs. 2-5) shows how temperature variation affects GDD. It is important to be aware of the fact that an increasingly wet climate might increase or decrease the GDDs, and potential changes in rainfall have not been taken into account in this modeling. As mentioned earlier, a rainfall above 250 mm during the growing season decreases the GDD by 60-80 for barley and 100-110 for wheats. Still, it can be demonstrated how a small change in temperature might have a large effect on the potential for a ripe cereal harvest, and how the potential cultivatable areas are highly affected by these changes. A lowering of the average temperature from the 1961-1990 period by 1 °C moved the maximum extent for agriculture on average 15-32 kilometers closer to the sea or fjord. Still, the number of possible settlement sites within the affected areas can be roughly estimated using the distribution of known monuments. These calculations are presented in table 3.

This table does not take into account chronological differences in the construction of the monuments, but it is believed that the sheer number of mapped monuments, 7996 – 4348 with their diameter recorded, still

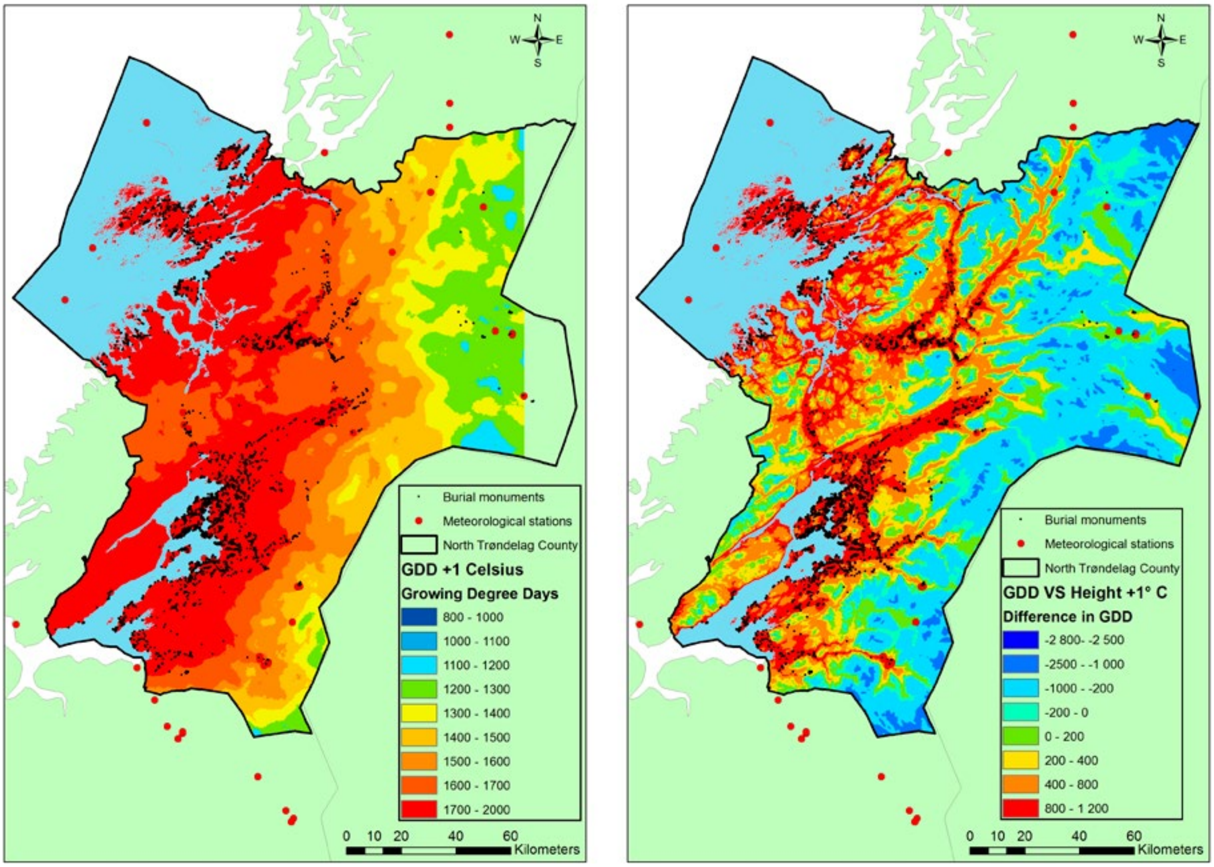

Figure 3. Left: The cokriged model for GDD based on an increased average temperature by 1 ˚ C compared with the standard period between 1961-1990. Right: The calculated maximum height above sea level based on the calculated GDD.

Temperature	Percentage of burial monuments within 1200/1400 GDD	Average GDD for burial monuments with measured dm.[2]	Average GDD for burial monuments above 15m in dm. (highest quartile)	Average GDD for burial monuments above 20m in dm. (highest 7th quantile)
Average 1961-1991	99,59/99,25 %	1555,7 (1562,5)	1565,3	1573,5
+ 1 ˚ C	99,99/99,91 %	1787,7 (1798,1)	1798,3	1807,6
- 1 ˚ C	98,5/14,22 %	1325,8 (1337,7)	1338,3	1345,6
- 3,5 ˚ C	0/0 %	794,1 (796,7)	809,1	816,7

Table 3: GDD calculations for burial monuments of various sizes at different average temperatures. The GDD values indicate whether or not the burial mounds are situated in an area of ideal climatic conditions for the cultivation of crops. An increased GDD for burial monuments of higher diameter, i.e. more monumental and potential indications of farms and families of increased power and wealth (c.f. Myhre 1987, Presvold 1999, Solberg 2000 and Stenvik 2005) can indicate a relation between farming conditions and increased power/wealth. This could be related to other factors such as strategic locations in the lower regions above sea level – i.e. closer to the fjord.

2 Data in brackets are for all monuments including those without diameter information

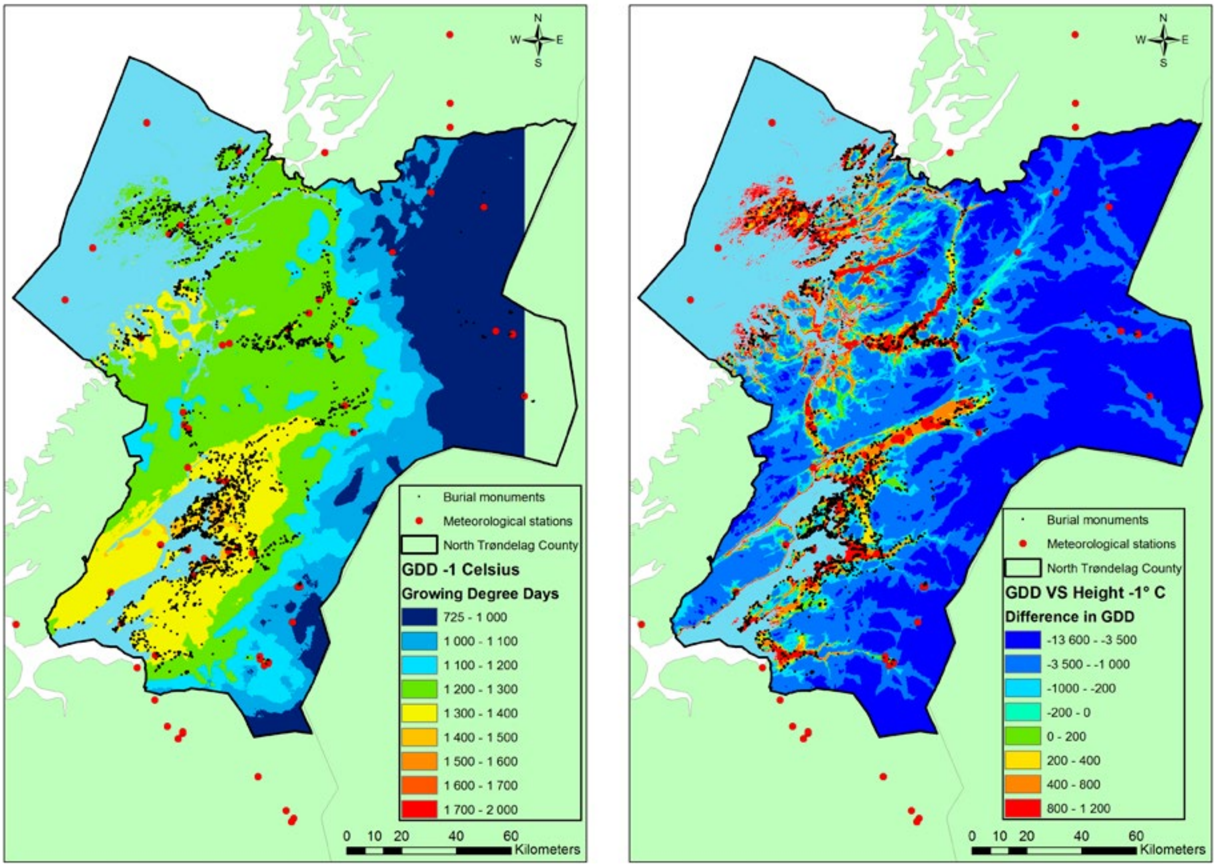

Figure 4. Left: The cokriged model for GDD for a decreased average temperature by 1 ° C compared with the standard period between 1961-1990. Right: The calculated maximum height above sea level based on the calculated GDD.

have some cultural historical analytical significance when analysed in this manner. It is also believed that this way of using these results could help identify monuments that might belong to a certain period of time or areas that are anomalous for some reason.

There are some differences in the two model types presented, which shows that while the cokriging creates a good general idea of the GDD values and to some extent uses the height values purposefully, it still lacks some detail that the maximum height above sea level might contain. The latter on the other hand does not take into account potential regional variance. Due to the apparent lack of resolution in the GDD calculation, it is therefore important that the accuracy of this model can be investigated further. The principles of cokriging make it possible to model the spatial accuracy of such a model. This is called a prediction standard error, and shows the predicted accuracy of the interpolated values.

A visual inspection of this map (Fig. 6) tells us that most of the known burial monuments are within an area of higher accuracy. This means that the analysis

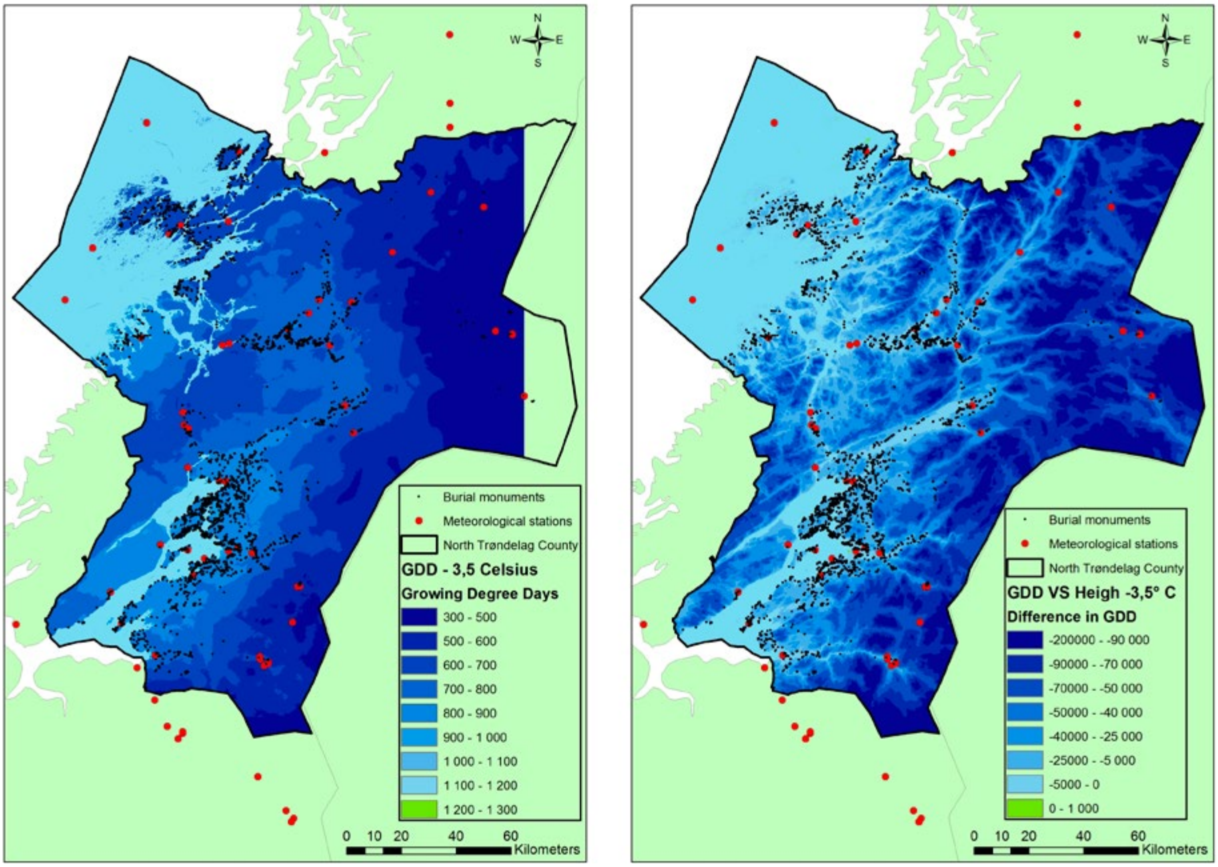

Figure 5. Left: The cokriged model for GDD based on a decreased average temperature by 3,5 ° C compared with the standard period between 1961-1990. Right: The calculated maximum height above sealevel based on the calculated GDD.

in table 3 is more likely to present adequately correct information. The Prediction Standard Error also tells us that the interpolated values are less accurate in areas far between each meteorological measurement point, especially in the mountainous areas to the east.

DISCUSSION

These geostatistical and GIS models show the effect of climatic change on the potential for growing cereals in varying temperature conditions. Their results are quite convincing in demonstrating that even small changes in the average temperature in the past might have a large effect on agriculture in liminal areas. While the maximum limit, i.e. the potential area to cultivate, increase and decrease with as much as 15-32 kilometres with a change of ±1 °C, the GDD numbers for each digitally mapped burial monument in the area also tells us a story.

In table 3 it is demonstrated how the average GDD for the location of each burial monument can be extracted from the models. As the burial monuments are assumed to be associated with

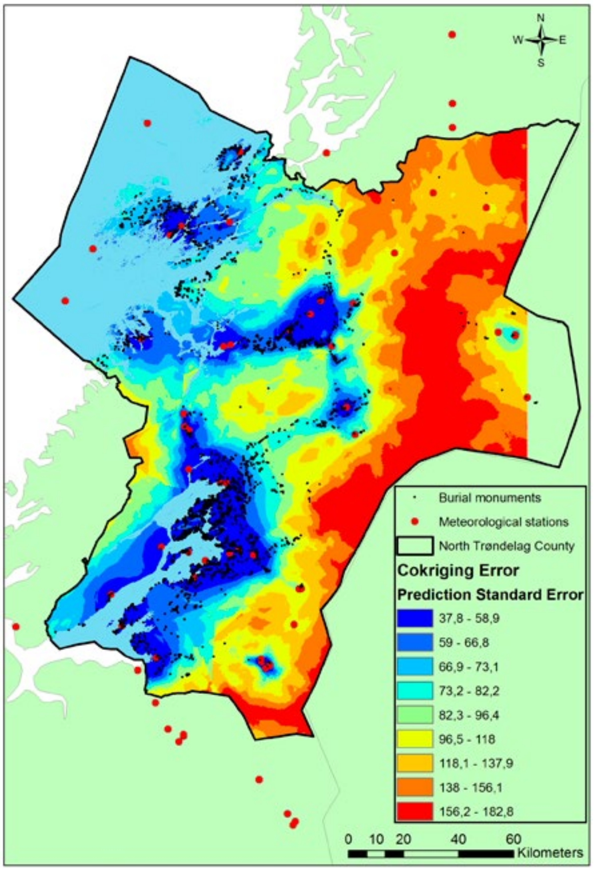

Figure 6. The Prediction Standard Error for the cokriging model. This figure shows an estimation of the quality of the interpolations that are included in the models.

prehistoric settlements in one way or another, the distribution of the surviving monuments can give a rough indication of past land use. It is interesting to note how the burial monuments larger than 15-20 meters in diameter are situated within areas with a higher GDD. Additional investigations are needed to assess if this could be related to agricultural surplus, or might be connected to other factors such as strategic locations in the lower regions above sea level. Still, this could be an indication that the farms assumed to be wealthier were more beneficially situated for increased agricultural yields. For a more general overview, 99.25 % of the burial monuments are within a GDD of 1400 calculated for the present day temperatures. This means that almost every location is within a larger margin of barley cultivation today. If the temperature dropped by 1 ˚C, this changes to only 14.22 %. 98.5 % will still be somewhere between 1200-1400 GDD, but there is reason to assume that this is relatively marginal. The yields would be lower, and the general possibilities for a production surplus and access to cereals as food would be lower. The same accounts for the possibilities for brewing beer or providing feasts, which is generally assumed to be an important part of social networking and the demonstration of wealth and power. We also know from medieval sources that about 60 % of the diet can be assumed to be from cereals (Øye 2002: 323-25). Figure 5 and table 3 also demonstrates a complete collapse of cereal production in the event of a temperature fall of 3.5˚C, as suggested by Gräslund (2007) and Gräslund and Price (2012). The models therefore yield additional support for the theory of an agricultural collapse in case of such an event. The question is then what the consequences would be for agriculture and subsistence.

It is not unlikely that this could result in a shift towards outfield hunting and gathering, and the potential increase in animal husbandry. In Jämtland a series of C14 dated hunting pits shows a steady increase in the amount of pits from approximately AD 400 to AD 800 (Bengtsson 1997: 23). It is rather hard to say if this is directly related, but at least it shows that the potential of getting access to elk- or reindeer meat should have increased in the centuries after the AD 536-37 event.

In the pollen diagrams of the seven farms investigated by Vorren *et al.* (1990), two were probably not settled in this period, three farms had a decrease in the levels of particulate carbonate (or charcoal dust) around AD 530-60, one farm might have had a small hiatus around AD 580, and the Strugstad farm had a small increase in the charcoal levels. The latter is generally not considered one of the major farms in the area. A pollen diagram from the higher altitude farm of Neset in Lierne, about 400 masl, also shows a fall in charcoal dust around this time. The cultivation of cereals does not appear in the diagram before around AD 750-1150, while charcoal dust observed in the pollen diagram indicates an increased activity in the Roman Iron Age before disappearing around AD 200 (Selvik and Stenvik 1983). This farm can generally be considered to be liminal for agriculture. One of the meteorological stations happens to be only five kilometres away on the shores of the same lake- Laksjøen. This station has a GDD value of 1002 for the 1961-1990 period, a GDD of 1202 with an increase of 1 °C, 1102 GDD with the increase of 0.5 °C, 908 with the decrease of 0.5 °C and 807 with the decrease of 1 °C. The appearance of cereal production in this landscape should in theory either be short-lived in better years, but might also indicate that the prehistoric cereals cultivated might have a lower GDD requirement than modern ecological types.

A more thorough study of natural historical and palaeobotanical sources is necessary to understand changes in agricultural practices from cereals to pastoralism. The effect this had on architectural practices and settlement structure could also be investigated further. Settlements sites from the Late Iron Age, and especially the Merovingian period, are absent in the material (Solberg 2000; Myhre 2002; Stamnes 2008).

CONCLUSION

The transition between the Early and the first part of Late Iron Age in Scandinavia is a much discussed period, with huge changes in the material culture and types of archaeological features present. Many explanations for this change have been suggested, including the Justinian plague, restructuring of the landscape and consolidation of the power, as well as climatic changes. The purpose of this paper has been to model the potential effect of climatic changes through geostatistical modelling of temperature conditions. The results showed how a change in mean temperature throughout the year might push the limits for cultivating cereals, in this instance barley, by as much as 15-32 kilometres with just an average change of ±1 °C. The results also showed that the distribution of settlement sites in the period in general, with burial monuments as a proxy for settlements, are generally found within the limits for the cultivation of barley. These locations become more liminal without much margin for getting ripe crops in colder years. A change of -3.5 °C in average temperature would have been detrimental to cereal production in Nord-Trøndelag. The models presented demonstrate how climatic change can have a large effect on agricultural potential. It is not unlikely that climatic change, paired with already changing currents in the power structure and fixation of power towards controlling larger areas and more people, created a situation where the leading families and dynasties could benefit by controlling and reorganizing the settlement structure to suit their needs as suggested, by Myhre (2002: 159-170). The fact that the larger burial mounds are placed in areas with a higher GDD, even though the increase is not enormous, might be an indication of a situation where richer farms are placed in areas that are more suited for larger agricultural production.

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ESTATE DIVISION: SOCIAL COHESION IN THE AFTERMATH OF AD 536–7

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ABSTRACT

In Scandinavia, large scale abandonment of farms and farmlands is recorded in the 6th century. Most scholars today argue that this was linked to contemporary plague epidemics and climate change. The different social strategies for adapting to this crisis are, however, poorly understood. This paper investigates some of the largest, excavated, elite settlements in eastern Norway, and how these developed throughout this period. One strategy to counteract the crisis seems to have been to divide old estates into smaller production units. The lack of labourers may have led to problems maintaining production levels on the estates. The fact that more than 70% of the larger settlements abandoned during the Migration Period are located on the boundaries of later historic farms, supports this theory. This is further strengthened by an in-depth analysis of five larger settlements in eastern Norway, which were abandoned or reorganised in the mid-6th century.

INTRODUCTION

In recent research, climate and cultural change have been linked. In the words of the climatologist Christian Pfister (2010): 'Whether and to what extent climatic factors mattered for social vulnerability needs to be determined through empirical analyses.' In recent years, archaeologists have shown a strong interest in the dramatic event of AD 536–7, 'The Dust Veil' (Tvauri 2014), while climatologists claim to have identified a longer cold period, from AD 536–660, termed 'The Late Antique Little Ice Age' (LALIA) (McCormick et al. 2012; Büntgen et al. 2016). Ulf Büntgen et al. (2016) emphasise the need for new case studies and warn against using climate models that are too simplistic and reductionist for explaining cultural change. At the same time, new aDNA research shows that pandemic plague spread north of the Alps in the 540s (Harbeck et al. 2013), and probably recurred until around AD 750, just as the plague in southern Europe (Little 2007).

This is also my starting point. In this study, a structuralist approach has been adopted. I do not perceive cultural evolution as determined by climate and crisis, but instead as important factors for societal developments, which create possibilities and new frameworks for different social groups.

This article will explore how Scandinavian elites dealt with what appears to have been a double-edged

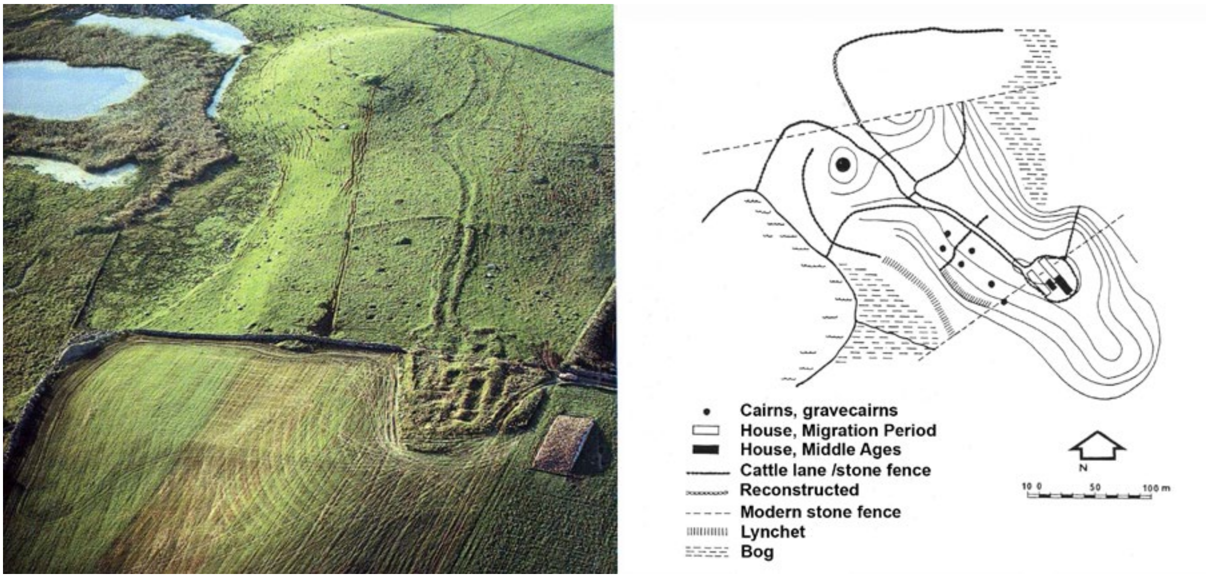

Figure 1. Bo Gräslund has intepreted the many abandoned farms in Scandinavia in the context of a major climate crisis after a volcanic eruption of AD 536. The farm Hanaland in Time, Jæren, was abandoned in the Migration Period and resettled in the late 10th century. It was finally deserted in the Late Middle Ages. Photograph from Myhre 2002, AM, UiS, Ragne Johnsrud, illustration from Myhre 1972, with additions by the author.

crisis, with plague and a colder climate over a prolonged period. The starting point will be taken in settlement evidence from south-eastern Norway, followed by an in-depth analysis of five larger settlements that were abandoned or reorganised at the end of the Migration Period (Fig. 5, Table 1).

Earlier studies of settlements in Scandinavia from the period AD 500–750 have focussed on small abandoned farmsteads near the outer edges of larger settlement areas (Rønneseth 1966; Myhre 1972; Widgren 1983; Fallgren 2006). These farms are preserved and visible 1,400–1,500 years after their abandonment, and consist of house foundations, cattle tracks, fences, clearance cairns, fields and graves (Fig. 1). These settlements were presumably linked to the lower social strata, and seemingly not attractive enough to be resettled, as they have been used for grazing until modern times.

A lot of Scandinavian settlement evidence has become available since c. 1990. Several hundred settlements and several thousand buildings have been identified through machine-based de-turfing (mechanical top-soil stripping) (Edblom 2004; Streiffert 2005; Söderberg 2005; Göthberg 2007; Iversen 2013). Many of these had more central locations than the classic abandoned farms. Examples include Veien in Ringerike, and Missingen in Østfold (Fig. 2). Here longhouses with integrated halls belonging to the higher echelons of society have been excavated (Bårdseth 2009; Gustafson 2016).

Somewhat simplified, it could be said that while early investigations focussed on small marginal farmsteads, later research also dealt with larger, central, estates. Both types of farm were abandoned in the Migration Period. The question is why, and the degree to which settlements were re-organised during this

Figure 2. Photograph taken in 2003 during reconstruction of the large hall at Veien, Ringerike, Buskerud. Photo T. Bjørnstad, CC-BY-SA.

turbulent era. This article will investigate whether these factors triggered the partition of larger estates.

In Norwegian settlement history, it has long been argued that the farms of the Middle Ages were the result of divisions of large Bronze Age farms, *urgårder*. This term is problematic, since it suggests a static origin for the rural settlement patterns (Pilø 2005; Gjerpe 2014). The so-called 'geometrical method' was introduced by the historian Håkon Hovstad in 1980. The geometrical shapes and sizes of the farms were seen as evidence '… of boundaries and spheres of interest for the original settlements …' (Hovstad 1980: 10). Prehistoric burial monuments, toponymical evidence (farm names) and the size and location of farms provided vague chronological indicators for the partition processes. At the time when this method was developed, little was archaeologically known about settlements and their chronology. Since then, however, the empirical situation has changed, as far more settlements now are known. Unlike Hovstad and other agrarian historians, I will use new archaeological settlement material, and to a higher degree analyse this in the context of the plague outbreaks and climatic crisis of the 6th century. The attempt to explain societal change based on climate history and plague is not new, rather the opposite. Research has, however, progressed considerably since the 'geometrical method' was introduced in 1980 and the first comprehensive studies of abandoned farms presented in the 1960s and 70s.

My hypothesis is that the social structure of Scandinavian society was radically changed between AD 500 and 750. Population levels were reduced by plague and agriculture had to be adapted to a colder climate. The farming 'middle class' grew in relative terms, with recruitment both from upper and lower tiers of society. Parts of the elite were unable to sustain their estates and lost social status, while others abandoned marginal farms in favour of better land available elsewhere, and thus gained status. Production of grain was reduced and extensive animal husbandry grew. One central outcome of this investigation is that the large areas of abandoned estates seem to have been divided into smaller units in the 6th century. We also need to consider whether the members of the elite who managed to sustain their large estates became more powerful. If so, did a new 'super' elite arise in the Merovingian period, and was this a prerequisite for the emergence of the Scandinavian kingdoms?

PLAGUE AND CLIMATE CHANGE IN THE 6TH CENTURY

Several archaeological studies of the last 15 years have focussed on 'The Dust Veil', of AD 536; when a gigantic volcanic eruption created a global climate crisis, which led to the desertion of farms (Axboe 2001a; Gräslund 2007; Gräslund and Price 2012; Löwenborg 2012; Iversen 2013; Amundsen and Fredriksen 2014; Tvauri 2014). Ash and aerosols reached the stratosphere, shaded the sun and led to several years of crop failure (Oppenheimer 2011). This had serious effects for the northern, climate senistive, farming of Scandinavia and the Baltic area.

Frands Herschend (2009: 403), Lotte Hedeager (1992; 2011) and others have argued that also the preceding Migration Period was turbulent. The societies of northern Europe stagnated after the collapse of the Western Roman Empire as markets and elites' connections changed. The deteriorating climate and the events of AD 536 amplified these developments in the north. Unoccupied land, without obvious owners, opened new opportunities for estate acquisition and created the opportunties for the large land owners of the Viking Age (Gräslund and Price 2012: 434, 440; Herschend 2009: 404; Löwenborg 2012: 19-25). A similar development has been described also for Norwegian lands (Myhre 2002:202-203; Iversen 2013; Amundsen and Fredriksen 2014).

The Estonian archaeologist Andres Tvauri (2014), who recently reviewed this type of research, has found clear evidence of a crisis in Scandinavia and around the Baltic Sea. Pollen diagrams from Lake Hino in south-eastern Estonia show less human impact on the landscape between the 7th and the 10th centuries (Tvauri 2014: 35). Pollen analyses from Lithuania indicate an overall cooling of the climate after the Roman Climate Optimum. Pollen diagrams from Stążki, on the Baltic coast of northern Poland, show a cessation of human activity in the mid-6th century, after 3,000 years of previous occupation (Tvauri 2014: 36). Similar finds of recession have been made in Sweden, e.g. in Lake Mälaren (Sporrong 1971: 197), in Östergötland (Widgren 1983), Hälsingland, the rest of Norrland (Engelmark and Wallin 1985), Öland (Herschend 1988: 54), and also in Denmark (Hamerow 2002: 109-111). The question is whether this type of evidence can be connected to the archaeological settlement evidence. In my opinion, the answer is probably yes.

In Scandinavia, the archaeological evidence has many traits suggesting a large crisis. Research shows that the number of farms in Uppland (Sweden) was reduced by 75% during the 6th century (Göthberg 2007: 440). Another indication is that the number of Merovingian-Period graves found in Norway, equals only 5–10% of the total number of graves from the Migration Period (Solberg 2000: 180-182, 197-198). This may, of course, be a result of changing burial practices, but it seems clear that many Early Iron Age burial sites were abandoned at the beginning of the Merovingian Period. This is seen, for example in Västmanland, Sweden (Löwenborg 2010; 2012: 12-13). In Denmark, the number of hoards increased in the 6th century (Axboe 2001a; 2001b; 2004; Hamerow 2002: 109-111), which

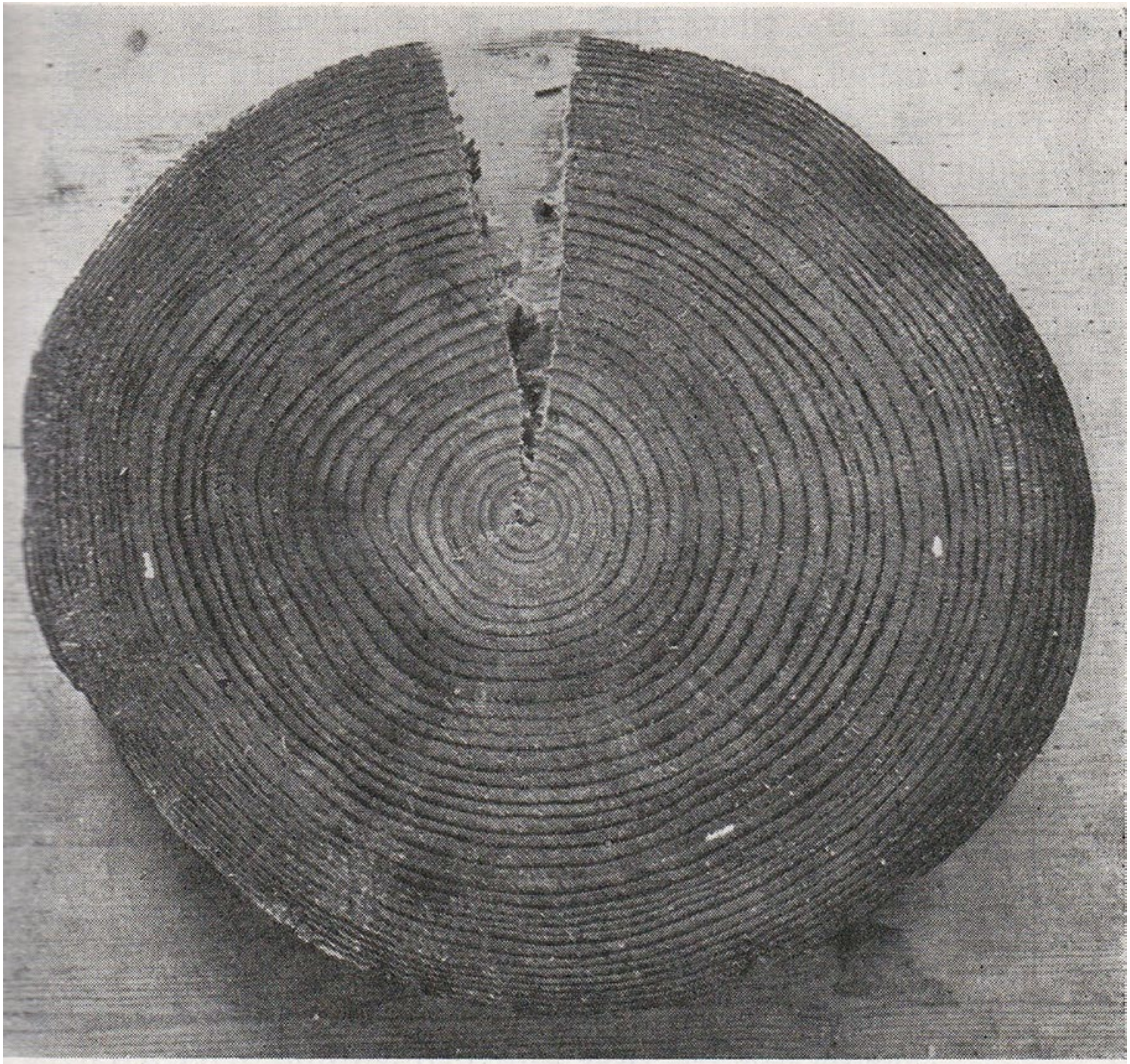

Fig. 9. Stammeskive fra tømmerlag I i Raknehaugen.
«Årring nr. 15» er merket med tre hvite flekker.
Tree section from timber layer I in Raknehaugen.
»Annual ring No. 15» is marked with three white dots. (Fot. H. Roll-Hansen.)

Figure 3. Tree section from Raknehaugen ('the Rakne mound') built in AD 552. The timbers used as building material were felled in 551. The abnormal tree-ring (no. 15) represents AD 536 is marked in white. Photo H. Roll-Hansen, after Ording 1941.

either suggests that the owners died (Tvauri 2014), or that offerings to the gods became more common in times of crises (Axboe 2004). It has also been shown that contacts between Scandinavia and the outside world ceased, or were significantly reduced, and not re-established until the 8th century (Høilund-Nielsen 2006: 48; Arrhenihus 2013). All this may be interpreted as indications of a crisis. The question is of what type, and how it affected settlements and population development.

The theory of 'The Dust Veil' has, in the Scandinavian context, been most systematically described and analysed by Bo Gräslund (2007), and further developed by Gräslund and Neil Price (2012). Gräslund emphasised mythological stories about the Fimbulwinter and Ragnarok in *Gylfaginning* and *Kalevala*. By using Late Antiquity and Chinese sources, he argued that the start of this crisis stretching over several years was AD 536. This was further supported by material produced by natural scientists. Two summers failed to appear between March 536 and September 537 (Gräslund 2007: 104, 105). This is corroborated by unusually high frequencies of sulphates in the ice of eastern Antarctica (540 ± 17 years) and Greenland (534 ± 2 years), interpreted as traces of a volcanic eruption. Later ice-cores studies have also indicated that there were several eruptions at this time (Sigl et al. 2015).

At the beginning of the 20th century, Scandinavian botanists, e.g. Johan Rutger Serander and Rolf Nordhagen (1933), showed great interest in pre-historic climate. A. W Brøgger (1933, 28) brought these ideas into archaeological research as seen in his work 'Sigd, Ljå og snidill' (Sickle, Scythe and Pruning Knife). Brøgger argued that the poor climate was attributed far too much importance and was not convinced of the existence of a Fimbulwinter. More recently it has been shown that the crisis is observable in the dendrochronology of timber found in the largest burial mound of northern Europe, the *Raknehaugen* in Romerike (Norway) (Fig. 3) (Skre 1997; 2016).

A new large meta-study shows that a cold period between AD 536 and 660 is mentioned in and corroborated by all climate studies in the Northern Hemisphere, covering the last 2,000 years (Büntgen et al. 2016). It has been named the 'The Late Antique Little Ice Age (LALIA)', and has been considered as an additional environmental driver of crop failure, plague and famine, as well as a possible trigger for political, societal and economic turmoil. The changing climate is seen to have impacted on the transformation of the East Roman empire, the collapse of the Sasanian Empire, migrations of the Asian steppe and on the Arabian Peninsula, as well as political turbulence in China (Büntgen et al. 2016). The direct links between climate and cultural change have, however, been rarely studied.

Somewhat simplified, recent research suggests three main phases of climate change in Scandinavia in the last 2,000 years: 1) a warm period during The Early and Late Roman Iron Age, 2) a colder period from AD 500 to 1100, and 3) another warm period during the High to Late Middle Ages, which was followed by the so-called 'Little Ice Age' (c. 1550–1850). The annual mean temperature varied c. 1.5° C from AD 1 to 1000. The Roman Iron Age (AD 1–400) was a relatively stable warm period. Temperatures dropped markedly in the 6th century, but recovered around AD 600. In the 8th and 9th centuries it grew colder again, but from the 10th century to the High Middle Ages temperatures again raised to Late Roman Iron Age levels (Lauritzen and Lundberg 1999) (Fig. 4). These results are confirmed by other studies based on dendrochronology and summer temperatures (Esper et al. 2012), as well as studies of glacier dynamics (Svendsen & Mangerud 1997; Nesje 2009).

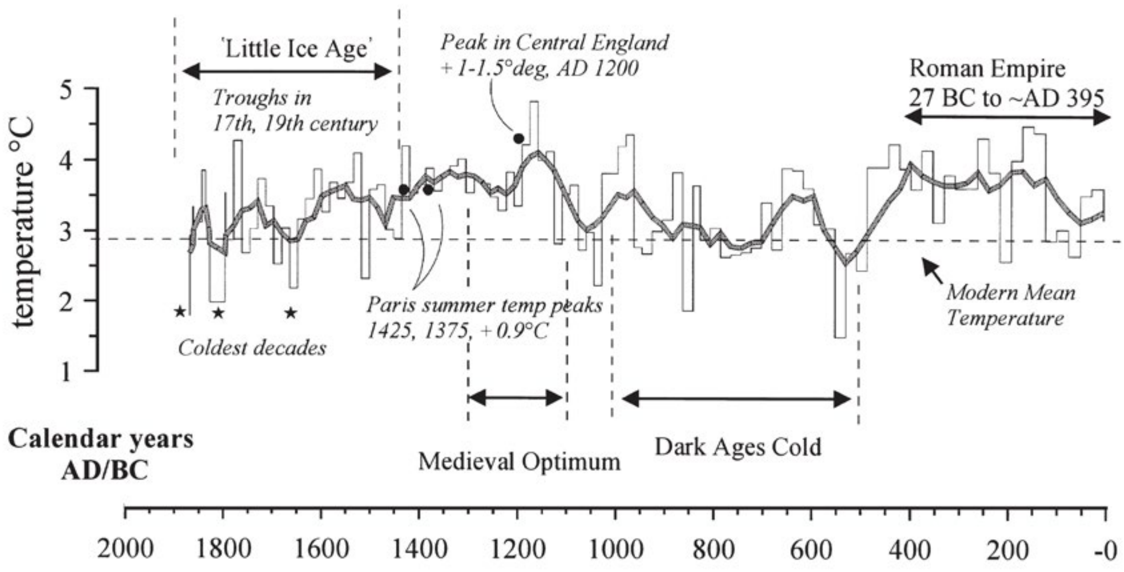

Figure 4. Changes in temperature in Scandinavia over the last 2,000 years. Based on speleothem-data from Søylegrotta ('the Søyle cave') in Nordland. After Lauritzen and Lundberg 1999: 668.

These climate changes may suggest that the Scandinavian conditions for farming deteriorated from the Early to the Late Iron Age. (See climate and vegetation zones in Norway in Hjelle, Prøsch-Danielsen and Soltvedt: Figs. 1-3, this volume) The warm climate of the Roman Iron Age contributed to good growth conditions for cereal and other cultivated plants, while the colder climate of the Late Iron Age led to shorter growing season and poorer crops, thus favouring animal husbandry. This may have changed the balance between cereal and cultivated plants on the one side, and animal husbandry on the other.

Plague outbreaks have often been seen to explain the abandoned farms in Scandinavia, although mostly as a theoretical possibility, rather than reality. A pandemic outbreak of plague is documented in southern Europe in AD 541/2, which flared up on several occasions until c. AD 750 (Little 2007). It has not been clear whether this plague spread to northern Europe and Scandinavia, but in 2013 the discovery of aDNA from the bacteria *Yersinia pestis*, was secured from three individuals in a burial ground in Aschheim, near Munich in Germany (Harbeck et al. 2013). This confirms that the plague spread north of the Alps, perhaps through the Brenner Pass (Little 2007: 20), and most likely also affected Scandinavia.

It is estimated that between 1/3 and 2/3 of the Norwegian population died in the plague outbreaks of the Late Middle Ages (Benedictow 1992: 73). It is well-known that owners of large estates were unable to run them, their income dwindled and labour costs rose. The elite in England tried to keep wages and prices down through the introduction of 'The Ordinance of Labores' in 1349 (Cartwright

1991). In AD 544, similar measures were used, when Emperor Justinian I (AD 527–65) declared that the plague was over and that prices and wages were to return to previous levels (Little 2007: 22). Recurring epidemics kept the population down and mostly affected younger people, who were not immune to the plague. The Greek poet Agathias Scholasticus of Myrina (c. 536–82/94), the main source of information for Emperor Justinian I, tells us about a plague outbreak in AD 558 that affected the young above all. Another epidemic, in Basra in AD 707, was named 'the plague of the maidens' by contemporaries (Little 2007: 18). The plague of the Late Middle Ages shows possible similarities to those of 542–767, since it also affected and killed many young people (Benedictow 1992: 20).

The 6th-century crisis, however, had a different social and economic context than the late medieval crisis. Before the 13th century, around 20% of the Scandinavian population were slaves (Myrdal 2011: 293-295). By the 14th century slavery had been abolished. For maybe as much as 60–80% of Norway's farm land, a tenant system was in place, governed by supply and demand of land. In 1661, only 19% of the land in Norway was farmed by landowners themselves (Bjørkvik and Holmsen 1978: 100). The land tenure system, which was governed by contracts and lacked social obligations, was based solely on economic relations between landowner and tenant, previously discussed by Tore Iversen (1995; 1996; 1997).

Lester K. Little (2007: 23) has argued that the lack of labour in the 6th century may also have affected the running of large estates. Possible evidence is found in the laws of the early Germanic kingdoms, which contain regulations regarding runaway slaves. Similar regulations are found in the much later Scandinavian provincial laws. The Law of the Gulathing (c. AD 1150) promises a retriever's reward for the return of a slave in chains (i.e. returned against her/his will) (G 68). Naturally, Scandinavian medieval law cannot be attributed to circumstances of the 6th century. Control over humans must have been important for owners of large estate in the 6th century as well.

MATERIAL AND METHOD

I have chosen the southern and eastern parts of Norway (Sørlandet and Østlandet, respectively) as the basis for my analysis. Changes in these areas can perhaps reflect developments important for central Scandinavia as a whole. This study comprises 10 out of Norway's 19 counties.

In my earlier research I have shown that farm abandonment within this study area was more extensive during the Migration Period than in any other pre-historic period (Iversen 2013). In this area by 2010, 139 settlements with a total of 450 buildings had been investigated (Fig. 6). A third of the settlements were abandoned in the Migration Period (38 out of 139) (Fig. 5). Larger settlements with long continuity will be investigated. This study has been limited to settlements with five or more buildings. A total of 17 such sites with the last occupation phase in the Migration Period have been identified (Table 1).

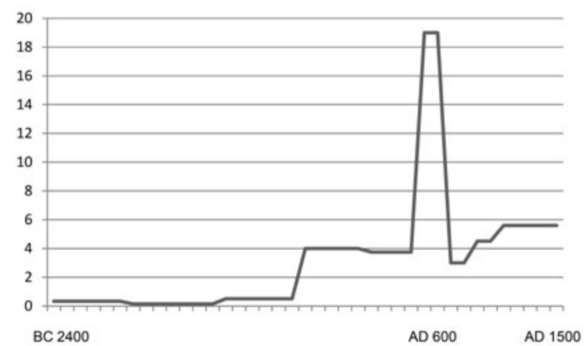

Figure 5. Abandoned sites in south-eastern Norway, between 2400 BC and AD 1500, displayed by century. N = 139. After Iversen 2013.

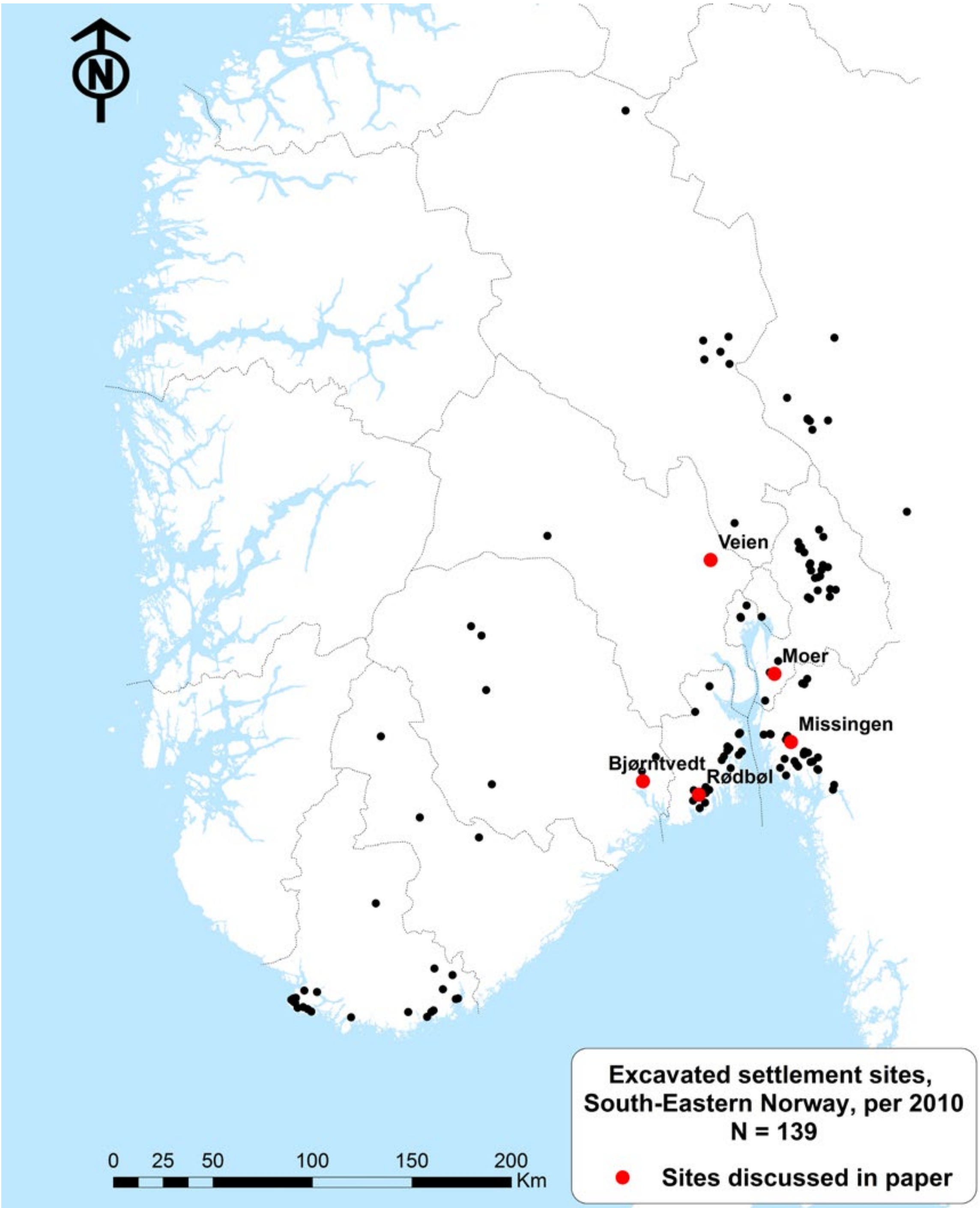

Figure 6. Settlements in south-eastern Norway excavated before 2010. The five case-studies are marked with red dots. Map Frode Iversen.

Case study area	Name	Farm no.	Council	County	Year investigated	No. of houses	ID no. Askeladden / Other
1	Bjørntvedt (Kongerød)	221	Skien	Telemark	2008	6	92057
2	Rødbøl	2040	Larvik	Vestfold	2005	8	112764
3	Bråten (Veien)	48	Ringerike	Buskerud	2000	6	71137
4	Moer	54	Ås	Akershus	1997	12	76045
5	Missingen	84	Råde	Østfold	2003	6	100016
	Prestegården	38	Kristiansand	Vest-Agder	1971	25	23285
	Augland	20	Kristiansand	Vest-Agder	1974	9	62150
	Lunde	71	Søgne	Vest-Agder	2001	6	134423
	Ringdal	2041	Larvik	Vestfold	2005	21	112762
	Korsegården	27	Ås	Akershus	1989	9	Excavation report
	Åmål	148	Nannestad	Akershus	1995	8	Excavation report
	Nannestad	26	Nannestad	Akershus	2004	6	54786
	Børgen	30	Sørum	Akershus	2003	5	Excavation report
	Habberstad	114	Ullensaker	Akershus	1993	5	Skre (1998: 140, 141)
	Rør	3	Rygge	Østfold	1996	5	103656
	Busgård	1003	Sarpsborg	Østfold	2005	5	100239/ 100240 /100243
	Skøyen	5	Spydeberg	Østfold	2006	5	97632 (Loc. 3)

Table 1. *Large settlements in south-eastern Norway abandoned in the Migration Period, excavated before 2010. 17 settlements with five or more buildings have been identified, of which five sites are investigated in detail in this paper.*

At these settlements, buildings from the pre-Roman Iron Age (BC 500–1), Roman Iron Age (1–400 AD), and Migration Period have been identified, but not from the Merovingian Period or later. It is unusual with more than two or three simultaneous households at these settlements. What caused the abandonment of these seemingly viable, well-established settlements in the Migration Period?

The representability and reliability of the material must be taken into account. The study area encompasses 30,880 of 55,688 land-registered farms, i.e. 55% according to the register entitled *Norske Gaardesnavne* ('Norwegian Farm names'). Less than 0.5% (135) of the registered farms in the study area have been investigated archaeologically. Lowland and coastal areas are overrepresented. Nearly half of the settlements are situated in three counties: Østfold, Vestfold and Akershus, where a lot of building activity has taken place in the last two decades. The valleys, forests and mountains of Agder and eastern Norway are therefore underrepresented in this material.

Five farms have been selected for in-depth analysis in order to understand the processes leading to abandonment: Bjørntvedt (Telemark), Rødbøl (Vestfold), Veien (Buskerud), Moer (Akershus) and Missingen (Østfold) (Fig. 6; Table 1). With the exception of Moer, these were all large estates in the Middle Ages and later (so-called *fullgårder*, i.e. paying full tax). These examples may shed light on how the elite dealt with the challenges of the 6^{th}-century.

For each of the farms to be studied in detail, a 'cultural geographical' context has been devised (Figs. 7, 10, 12, 15 and 17). This includes farm boundaries, historical farmsteads (*tun*) and older roads, documented on historic maps from the 18th and 19th centuries. Information regarding farm sizes is available from 16th and 17th-century sources, together with more scattered information from the 13th and 14th centuries onwards. The land rent for these farms came to c. 1/5–1/6 of their production capacity, as will be shown below. There is very little archaeological evidence showing when the historic farms were first established which limits this investigation.

I have carried out a thorough review of finds and ancient monuments in the study areas in the data base of artefacts of the Norwegian Museum of Cultural History and the cultural-heritage data base *Askeladden*. Whether fire cracked stones and traces of cooking and brewing are present near the farmsteads has not been surveyed in this study (see Grønnesby, this volume). In a few cases, pre-historic graves are present near the historic settlements which can provide possible, although unreliable, data regarding the settlement chronology. I have also investigated farm names suggesting partitions of the farming settlements. This will be explained in more detail below.

RESULTS

This study shows that 12 of the 17 settlements with five or more buildings are situated between later farm areas, which indicate that partitions have taken place. These are: Åmål, Rødbøl, Nannestad, Bråten (Veien), Bjørntvedt, Missingen, Børgen, Rør, Busgård, Ringdal and possibly Skøyen. Bjørntvedt, Rødbøl, Veien and Missingen will be examined in greater detail (case studies 1, 2, 3 and 5).

Four of the 17 larger abandoned settlements are situated by historically known farmsteads centrally placed within a farm territory: Prestegården, Moer, Haberstad, and possibly Lunde, which suggests continuity of use. Moer illustrates this well (case study 4). The settlements from the Early Iron Age seem to have been bigger than those of historic times, which may suggest partial abandonment, i.e. that some farm units were deserted while others continued in use (see Bjørdal, this volume).

Specialised settlements have only been established at one of the 17 identified sites. This was Augland in Vest-Agder, which specialised in pottery production (Rolfsen 1980). I have not examined this site further.

THE FIVE CASE STUDIES

This section contains a short presentation of five farms in different counties in order to provide a clearer picture of the nature of farm abandonment.

Case study 1. Bjørntvedt, Skien and Porsgrunn (previously Solum and Eidanger), Telemark

This settlement is situated on the boundary between the large farms of Bjørntvedt (221) and Klyve (223) (Fig. 7). The site was investigated in 2008 when 8,800 sq. m was deturfed (Skogsfjord and Glørstad 2010) (Fig. 8). In Area A, six houses were found, in Area B one house with two phases, and in Area C there was one house (Fig. 9). The houses had atypical shapes with curved gables and non-roof supporting posts. The excavators suggested this was a less substantial house than a longhouse, perhaps with a hip roof. The latest C14-date, derived from house 1, was AD 545–600. Houses 2 and 4 were from the Late Bronze Age, house 5 from the pre-Roman Iron Age, and house 6 from the Bronze Age/pre-Roman Iron Age. In Area B houses from Roman Iron Age/Migration period were found, and in Area C, there were houses from the transition between the Bronze and Iron Ages. No indications of activity in the Late Iron Age and Early Middle Ages were found.

Four farms may have formed part of a large estate. These are Bjørntvedt and Klyve, and also

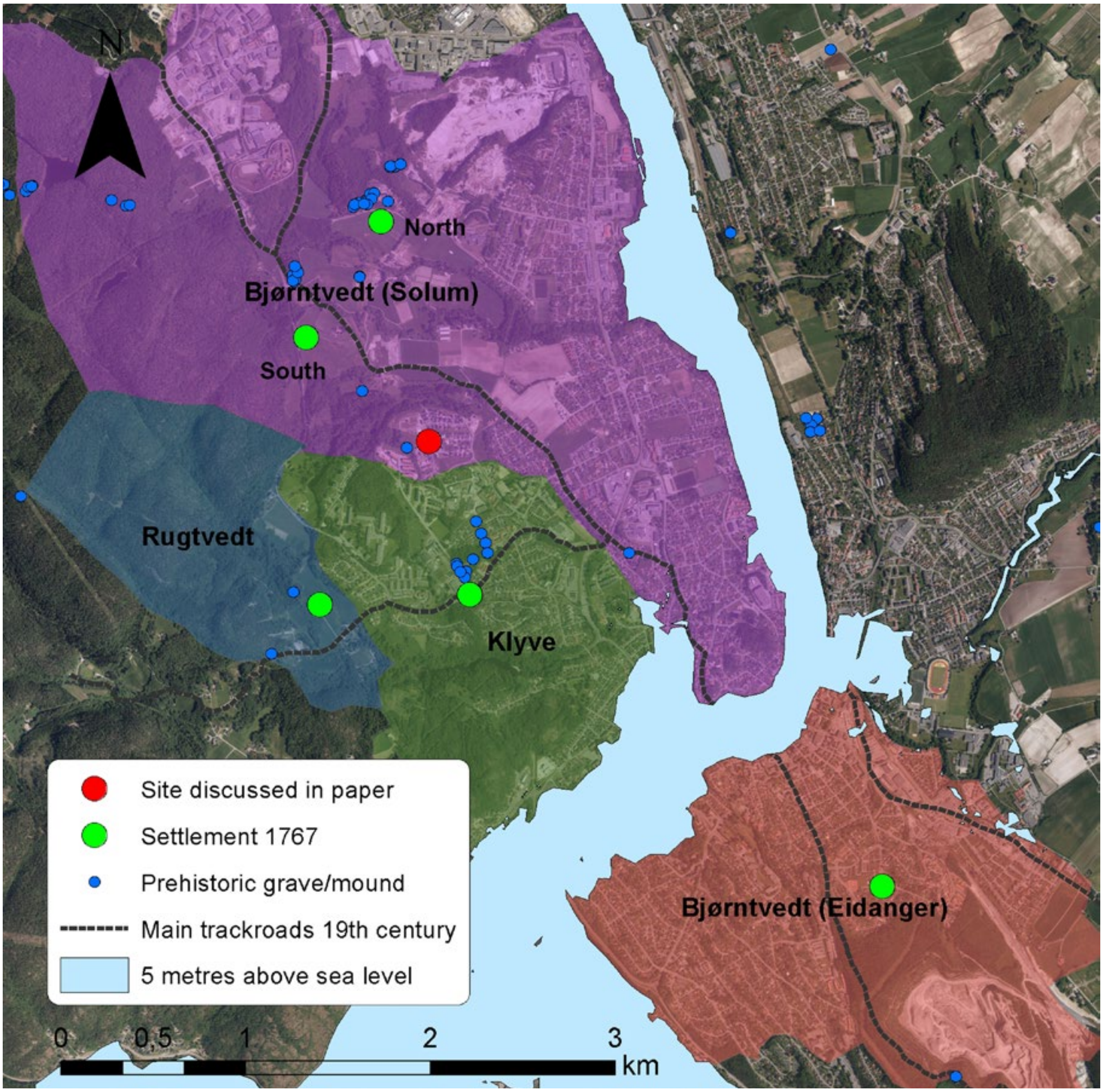

Figure 7. Bjørntvedt. The large estate of Bjørntvedt in the County of Telemark is situated at the end of the Frier fjord and the estuary of the River Far. Since the water levels of the 6th century were five metres higher than today the river was navigable far inland, and there were natural landing sites on both sides of the estuary. This river later formed the boundary between the two herred ('hundred') of Eidanger and Solum. When Porsgrunn emerged in the 17th and 18th centuries, the urban settlements on both sides of the river were integrated into Eidanger. The old estate included land holdings on both sides of the river, and the investigated site is situated on the boundary of a supposed primary division. Later three farms were known in this area: Bjørntvedt, Klyve og Rugtvedt (when the two Bjørntvedt farms on either side of the river were counted as one farm). The historic farmsteads were initially documented in the 14th century, as well as on maps from 1767 and the 19th century. There are also burials close to the historic farmsteads indicating that the division into smaller farms was made during the Iron Age. These burials have not yet been dated. Map Frode Iversen.

the small farm of Rugtvedt (225) which may have been parcelled off from Klyve. On the eastern side of the river, in Porsgrunn Municipality (previously Eidanger), there was another farm named Bjørntvedt (47). An older Bjørntvedt farm must originally have held land on both sides of the river.

Together, these four farms form a natural delimited farming area with a total of five farm yards, shown on a map from 1767 (Moseng 2006: 128). Bjørntvedt, in Solum, was always divided in a southern part (containing two units) and a northern, one-unit, part, known from c. 1390 (RB 18, 19, 38). This farm thus had two farmsteads. The two households of Bjørntvedt in Eidanger, however, shared one farmstead. At Klyve there was one unit in 1602, and two, sharing a farmstead, in 1647. Rugtvedt had one settlement, noted in 1767 and earlier.

Pre-historic burials are found near some of the farm yards. At both Klyve and Bjørntved (Solum) there are large mounds, with a diameter of more than 30 metres (Rolfsen and Larsen 2005). The engineer J. Christie, of the Museum of Skien, excavated/robbed Bjørntvedt in Solum, in the early 20th century. He found several Early Iron Age burials, but did not record their location (Gjone 1965: 37). Both burial mounds located closest to our excavated site have looting pits, perhaps remnants of Christie's excavations. In 1880 another burial from the Early Iron Age was found at Bjørntvedt in Solum (C 10095, C 10096 and C 10101). No location was recorded.

By the northern farmstead of Bjørntvedt in Solum, burials – including a cemetery with eight burial mounds – indicate that also they were in place in the Iron Age. At Bjørntvedt in Eidanger, a burial by a track way on the southern boundary of the farm functions as a territorial marker. Several Late Iron Age burials have been found in the area of the suggested estate. A bowl-shaped bronze buckle was found in a burial mound at Bjørntvedt in Solum (C 20305), and in a demolished mound in 'Bjørndalen' there was a male burial (C 23083), which contained e.g. a sword and an axe. Bjørndalen is situated between Klyve and Bjørntvedt in Solum, next to an old trackway. At Rugtvedt, finds from the Viking Age have also been made, a head from a throwing spear (C 28796) and an iron spearhead (C 37162). It is not clear whether these came from a grave. It is possible that the two cemeteries along the road to Klyve indicate that this farm was parcelled off in the Iron Age.

How did the partition process of large estates develop? Klyve and Bjørntvedt were both large farms in their own right. In 1647, the two farmers at Klyve paid a total of 16 hides in land rent, while the three farmers at Bjørntvedt in Solum paid as much as 24 hides. Rugtvedt was considered a fully taxable farm and paid 4 hides, while Bjørntvedt in Eidanger paid a total of 12. These were very large farms, illustrated by the fact that northern Bjørntvedt in Solum, with its 24-hide land rent, was the largest farm in the parish and one of the largest in Telemark's shire in 1647. An initial division may have been parcelled off from southern Bjørntvedt/ Rugtvedt, which also included Klyve and eastern Bjørntvedt. The northern farms paid a 28-hide land rent in 1647, and eastern Bjørntvedt / Klyve 28 hides. If this was the case, Klyve and Rugtvedt must have been parcelled off later. The total area is 1,878 hectares and my suggestion for a primary division results in a relationship of 1,103 to 775 hectares for each part (Table 2).

To conclude, this site is located on the boundary between Bjørntvedt in Solum (221) and Klyve (223). Together with Rugtvedt (225) and Bjørntved in Eidanger (47), these farms may have been part of a large estate in, and before, the Migration Period. The settlement was abandoned in the latter half of the 6th century, and by historic times, the old estate had been divided into four productive farms paying full tax. These farms were among the largest in the area in the Middle Ages (c. AD 1000–1500).

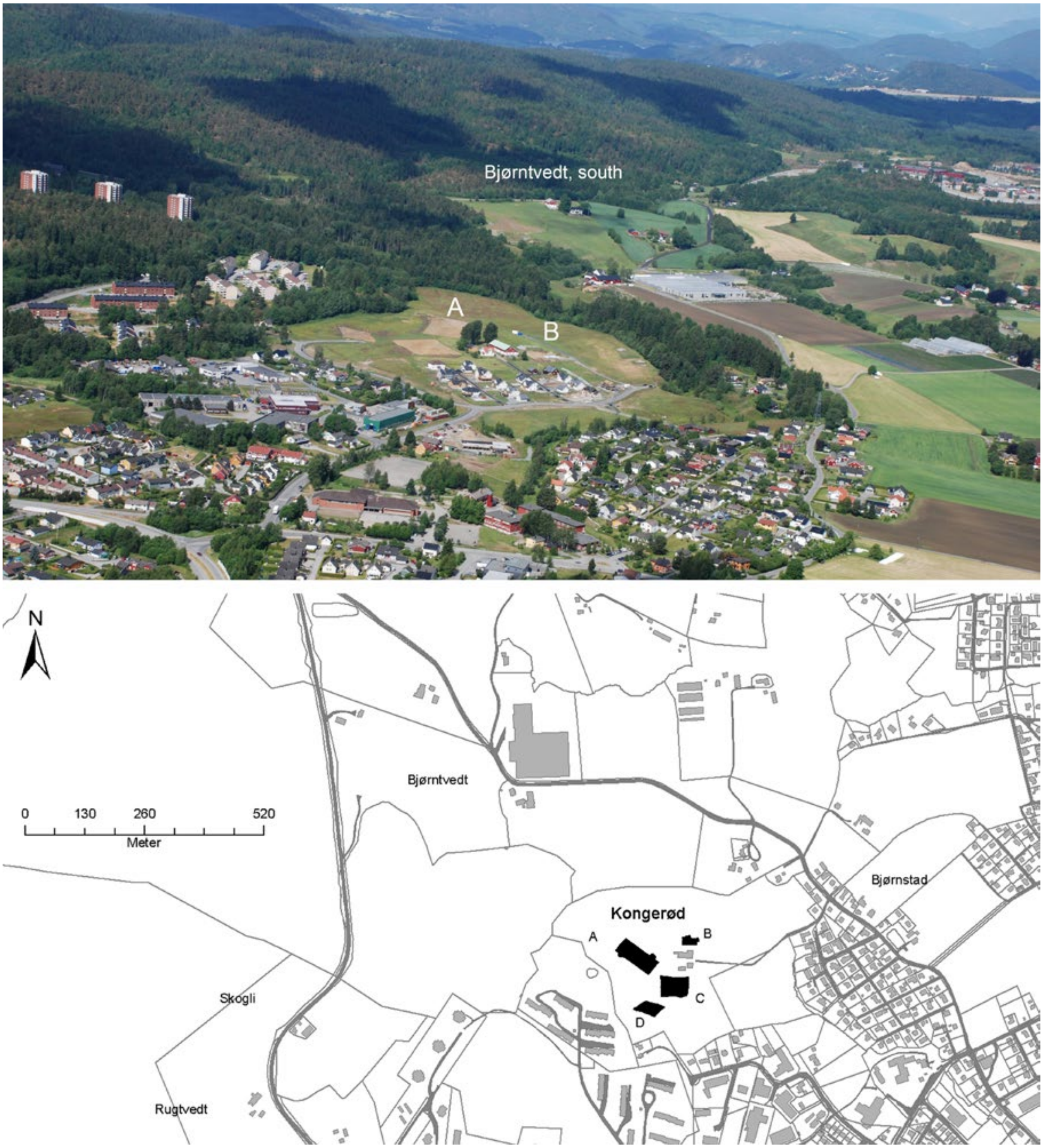

Figure 8. Overview Bjørntvedt. Aerial photo and map of the Bjørntvedt excavation area. Skogsfjord and Glørstad (2010) / Tom Heibreen, Museum of Cultural History.

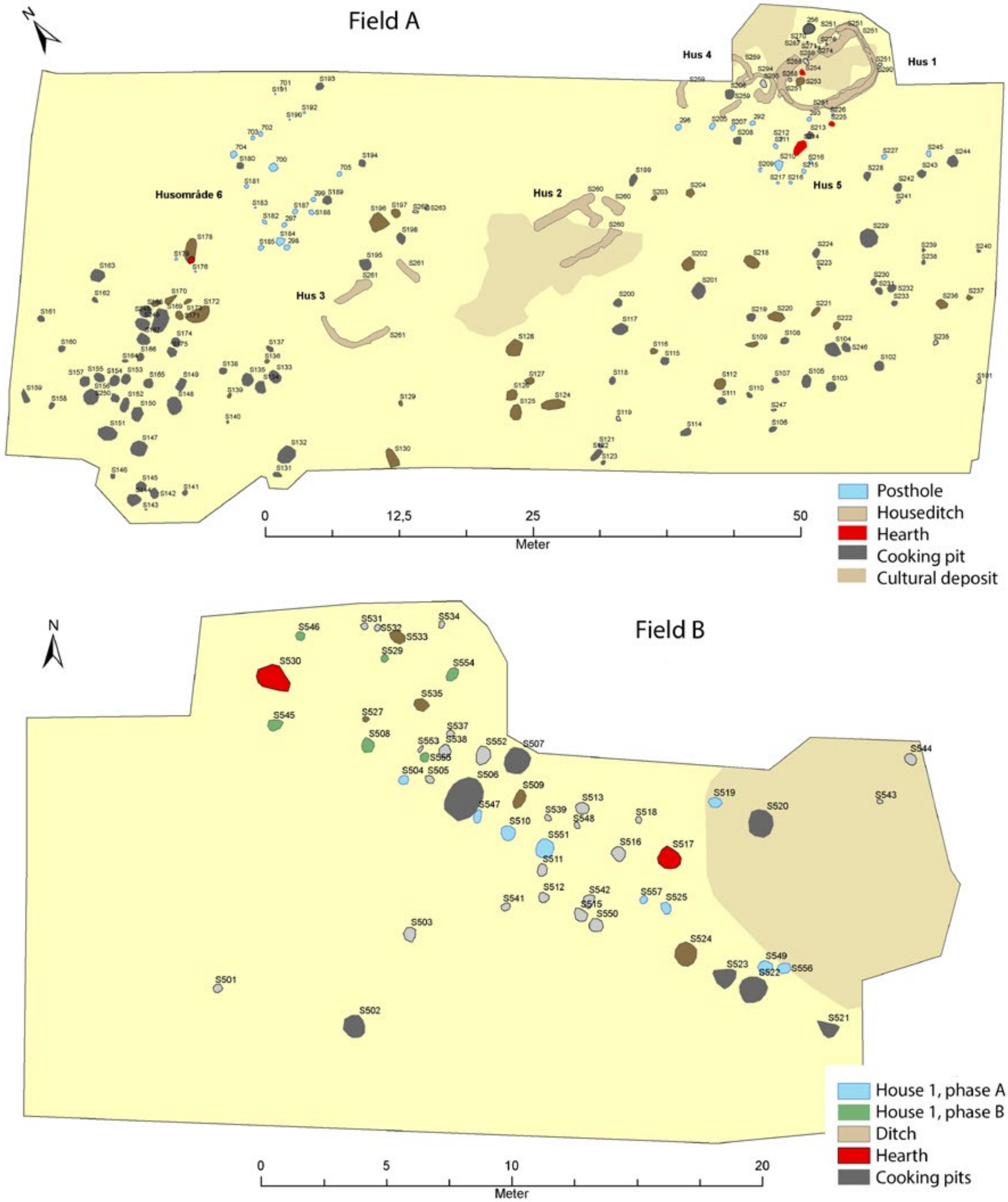

Figure 9. The Bjørntvedt excavation area. Skogsfjord and Glørstad (2010) / Magne Samdal, Museum of Cultural History, additions by author.

Case study 2. Rødbøl, Hedrum, Vestfold

At Rødbøl in Vestfold, an Early Iron Age settlement was excavated when the new E18 Motorway was constructed (Gjerpe and Rødsrud 2008: 143-193) (Fig. 10). The excavation covered c. 4.200 sq. m. Houses 2, 3, 5 and 6 were all dated to the Roman Iron Age and the Migration Period (Fig. 11). Three burials from the Roman Iron Age and one Viking-Age burial were also investigated. The large number of post holes indicates that further houses may have existed. All houses had the same orientation. Christian Rødsrud argued that there were two or three contemporary houses in the farm yard, and that the largest longhouse measured 45x7.5 metres. This suggests a relatively large farm with one or two simultaneous units.

This site (marked red on Fig. 10) is situated on the boundary between eastern Seierstad (2037) and Rødbøl (2040) farms. In 1604, Seierstad consisted of three farms paying full tax: southern Seierstad (2035), northern Seierstad (2036) and eastern Seierstad with its sub-unit Grevet (mentioned in the 1390s). Lorens Berg argued that the three part division is '… probably very old' (Berg 1913: 241), although there is no clear evidence. These three Seierstad farms each paid a four-hide land rent in 1647. Rødbøl, however, only had one unit in 1604 and paid a five-hide land rent in 1647. The total size of Seierstad was c. 386 hectares and Rødbøl covered c. 213 hectares, and there was a relatively large difference in land rent and production capacity (Table 2).

The county map ('grevskapskartet') shows that in c. 1820 the farmsteads were clustered in an area where the boundaries of the three Seierstad farms joined. Rødbøl had, at this time, one large farmstead and a smaller one in the south, which was probably a result of a division in c. 1655 (Berg 1913: 254). Our site was situated c. 700 metres from both the main Rødbøl farmstead and the three at Seierstad. It is therefore located on the border between the two later farms. The question is whether it represents an older settlement for an area, which included the two later farms.

If placed in a settlement-burial context, the one or several farmsteads at Seierstad seem to be of Iron Age origin. There are two undated burial mounds on the ridge (Hesteløkka), immediately north of the Seierstad farmsteads. Farm-name chronology is an unreliable method, but the *stad* element of farm names is traditionally interpreted as being of Late Iron Age origin, which corresponds to the Seierstad division.

200 metres southwest of our site there was a pre-Roman Iron Age settlement (Rønne 2008: 301-316). Viking Age burials have been found on top of both house plots, which are situated on either side of the later farm boundary. Additionally, in the area in-between the plots, a late Viking Age Urnes brooch was found, which possibly derives from a burial (Rødsrud 2005).

To sum up: our settlement must be interpreted as an older one, shared by the later farms of Seierstad and Rødbøl. This potential old estate may have been split up at the end of the Migration Period, when the settlement was abandoned. The settlement area, on either side of the new farm boundary, was used for burial. The two farm territories were more equal in size (1:1.8), than in terms production capacity (1:2.4). If an equal division was initially made, activties such as the clearing of land at Seierstad during the Viking Age and Middle Ages, may have increased the yield beyond the possibilties of Rødbøl. It must, however, be taken into account that future finds of other settlements on these farms may lead to new interpretations.

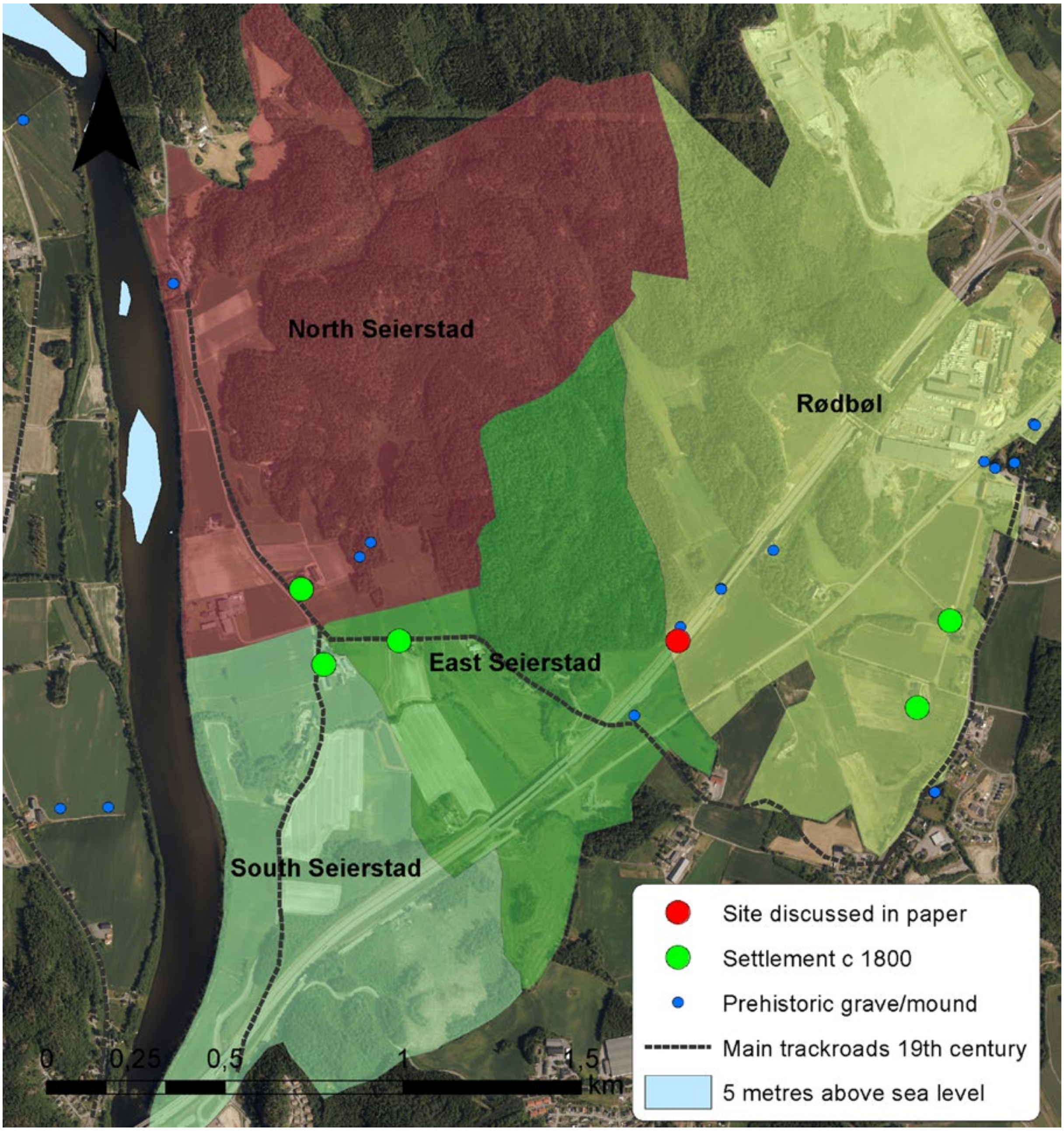

Figure 10. Rødbøl. Around AD 500, Rødbøl and Seierstad in the County of Vestfold may have been part of a larger estate situated by the estuary of Lågen (water levels were then five metres higher than today). The later Seierstad farm was divided into three units, each the size of Rødbøl. The historic farmsteads in the area are mentioned in written sources from the Late Middle Ages onwards, and also shown on the county map (N grevskapskartet) from the beginning of the 19th century. Undated burial mounds are found close by the old farm yards, and it is possible that a division into smaller farms took place in the Iron Age. Map Frode Iversen.

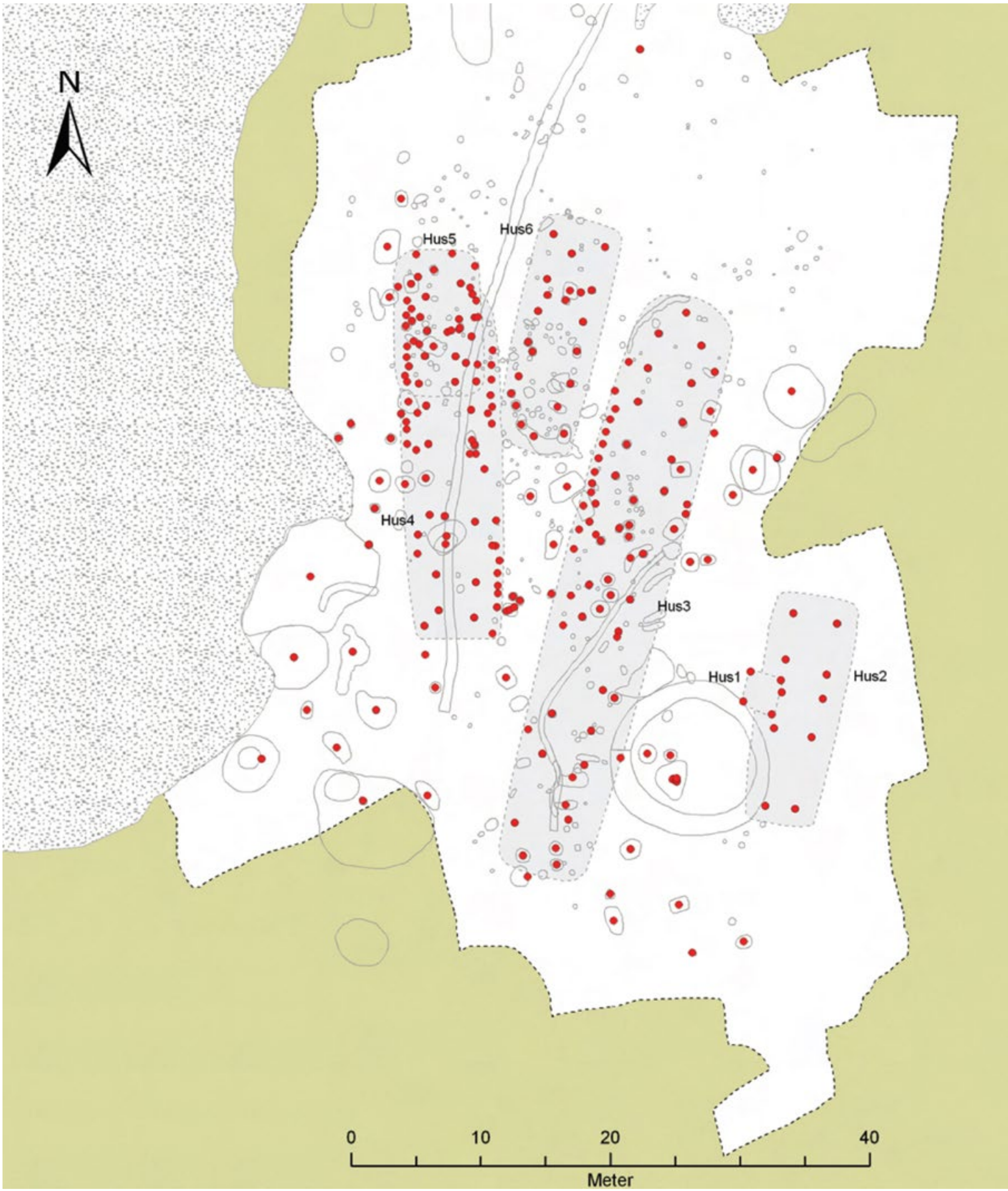

Figure 11. Excavated houses and structures at Rødbøl. The site was abandoned 6th century. After Gjerpe and Rødsrud 2008.

Case study 3. Bråten (Veien), Norderhov, Ringerike, Buskerud

This site is located on the small farm Bråten (48) between the larger farms, Sørum (47) and Veien (49) in Norderhov (Fig. 12). Five houses, from the pre-Roman Iron Age to the Roman Iron Age/ Migration Period have been excavated (Fig. 13). House V, from the Roman Iron Age, measured 47x8 metres and had 17 pairs of roof-supporting posts (Gustafson 2016). The last phase of settlement (house IV) is stratigraphically dated to the Migration Period (Gustafson 2016: 113). Next to the settlement, there is a large contemporary burial ground with 200 burials, dated to AD c. 1–500 (Gustafson 2016: 131), and single finds of earlier and later dates (Skre 1998: 246) (Fig. 14). It has been argued that Bråten, mentioned in 1723, was separated from Veien, but since Bråten has land holdings inside the area of Sørum it is more likely that it was separated from Sørum (Fig. 12). The settlement therefore seems to be situated just 100 metres from the boundary between Sørum and Veien.

In 1647, both farms were fully taxed; Veien paid 1.5 *skippund* of flour, and Sørum 2 (corresponding to 270 and 320 kg). The biggest farms in the area was Tandberg (5 *skippund*) and Sætrang (8 *skippund*).

Dagfinn Skre (1998: 246) and Lil Gustafson (2016: 131) have both suggested that other farms nearby may have been separated from Veien. Gustafson argues that the Early Iron Age settlement spanned the area of the four historic farms, Ve (54), Vessal (55), Sørum (47) and Veien (49). Skre points to the fact that the name Sørum is derived from *sørlige heim* ('southern home'), and that the farm lies south of Veien. He also suggests that Oppen (52) and Opsal (56), on the ridge above Veien, may have been part of an older estate. It also seems plausible that Sørum was, as suggested, separated from Veien. Such a scenario is less likely for the other farms. There are several medieval farms between Veien and Oppen/ Opsal: Hallum (53), the aforementioned Ve (54) and Vessal (55), which all appear in late medieval sources (NG V, 33). It is more unlikely that these were products of a division. Ve paid as much tax as Veien (1.5 *skippund* flour), while Vessal paid less (2 pounds of malt).

In 1647, there was one farmer and one farm yard at both Sørum and Veien, while in 1854 there were two farmsteads at Sørum ('northern' and 'southern') and one at Veien with two households ('upper' and 'lower') (Gustafson 2011: 20) (Fig. 14).

Our site (marked red on Fig. 12) is found 400 metres from the farm yard at Veien in the north, and 720 metres southwest from the nearest farmstead at Sørum. The site is also c. 700 metres from the historic farmstead at Ve. To conclude: Veien and Sørum may have been one estate, which was split in two, where Bråten was later separated from Sørum. If Ve, Vessal and Veien formed one farm, a two-part division into equal-size units may have taken place. The total area is 717 hectares and my suggestion for a primary division gives a relationship of 385 to 332 hectares for the respective parts (Table 2).

Figure 11b. Solidus of gold portraying the roman emperor Flavius Valerius Constantinus (AD 306-337), minted in Nicodemia prior to AD 330 (in modern Turkey). It is worn and used as jewelry, indicated by the secondary loop. Found at the gravefield at Veien 1893 (Fig. 14). Only six such finds are known in Scandinavia. Photo: Museum of Cultural History.

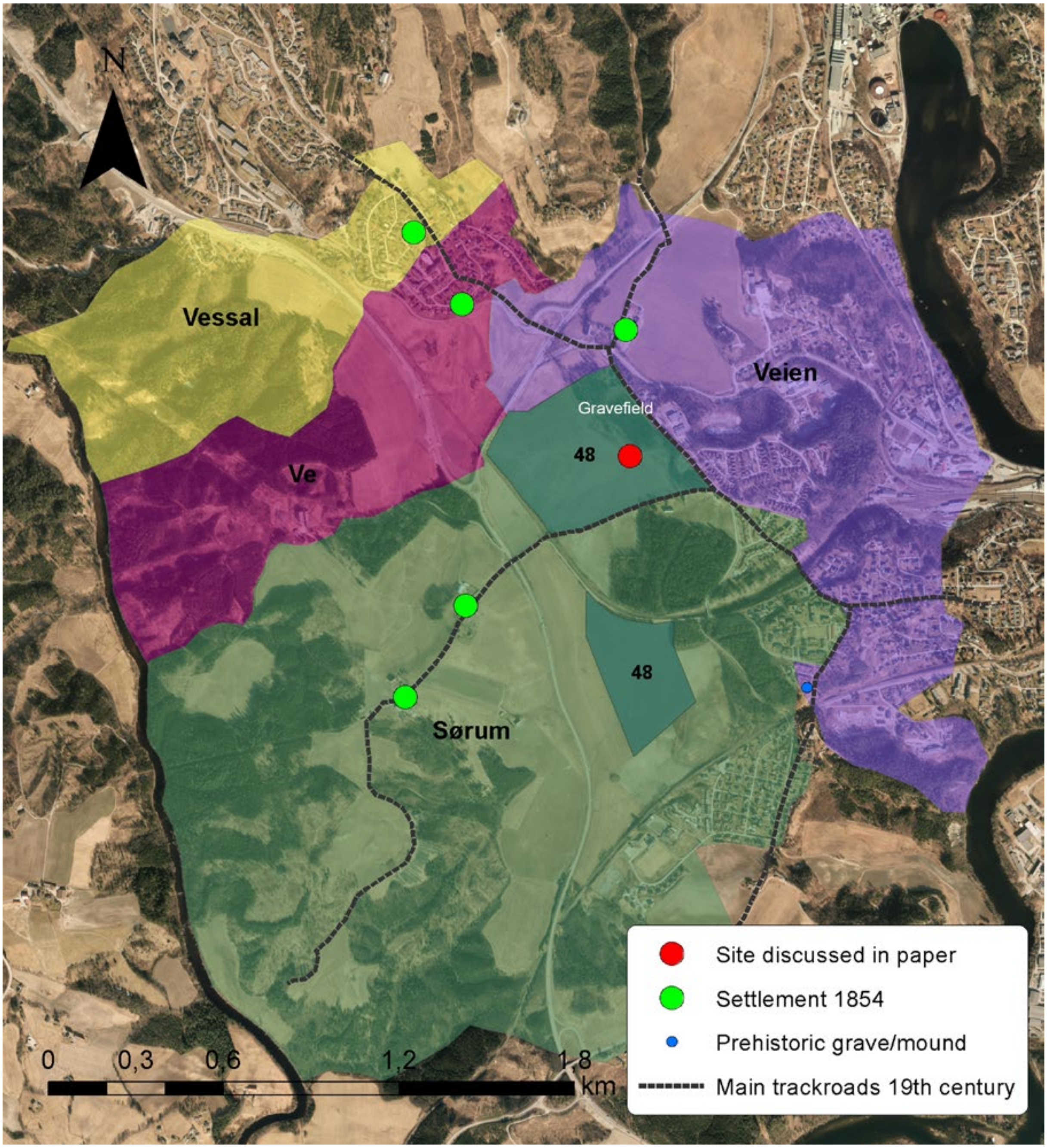

Figure 12. Veien. In the 1990s, five houses from the Roman Iron Age to the Migration Period, of which one was a longhouse with a hall from the Late Roman Iron Age, were investigated. A large contemporary burial ground, with 200 burials, was situated next to this site (Fig. 14). The abandoned settlement is located close to the boundary of the later farms of Sørum and Veien, possibly also Ve/Vessal. This has been interpreted as a large estate, which was divided into two or three equal parts during the 6th-century crisis. Map Frode Iversen.

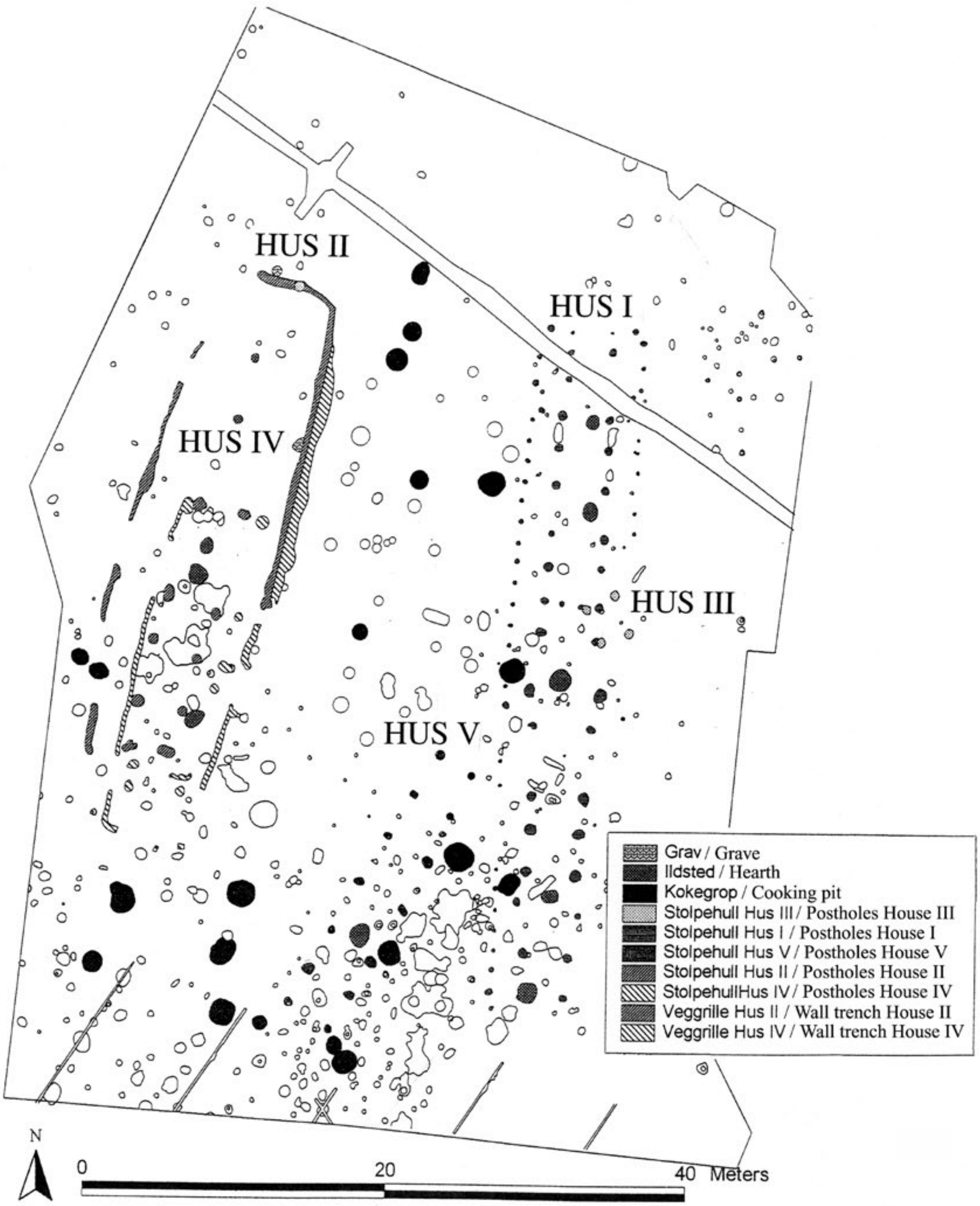

Figure 13. The excavated houses at Veien. After Gustafson 2016.

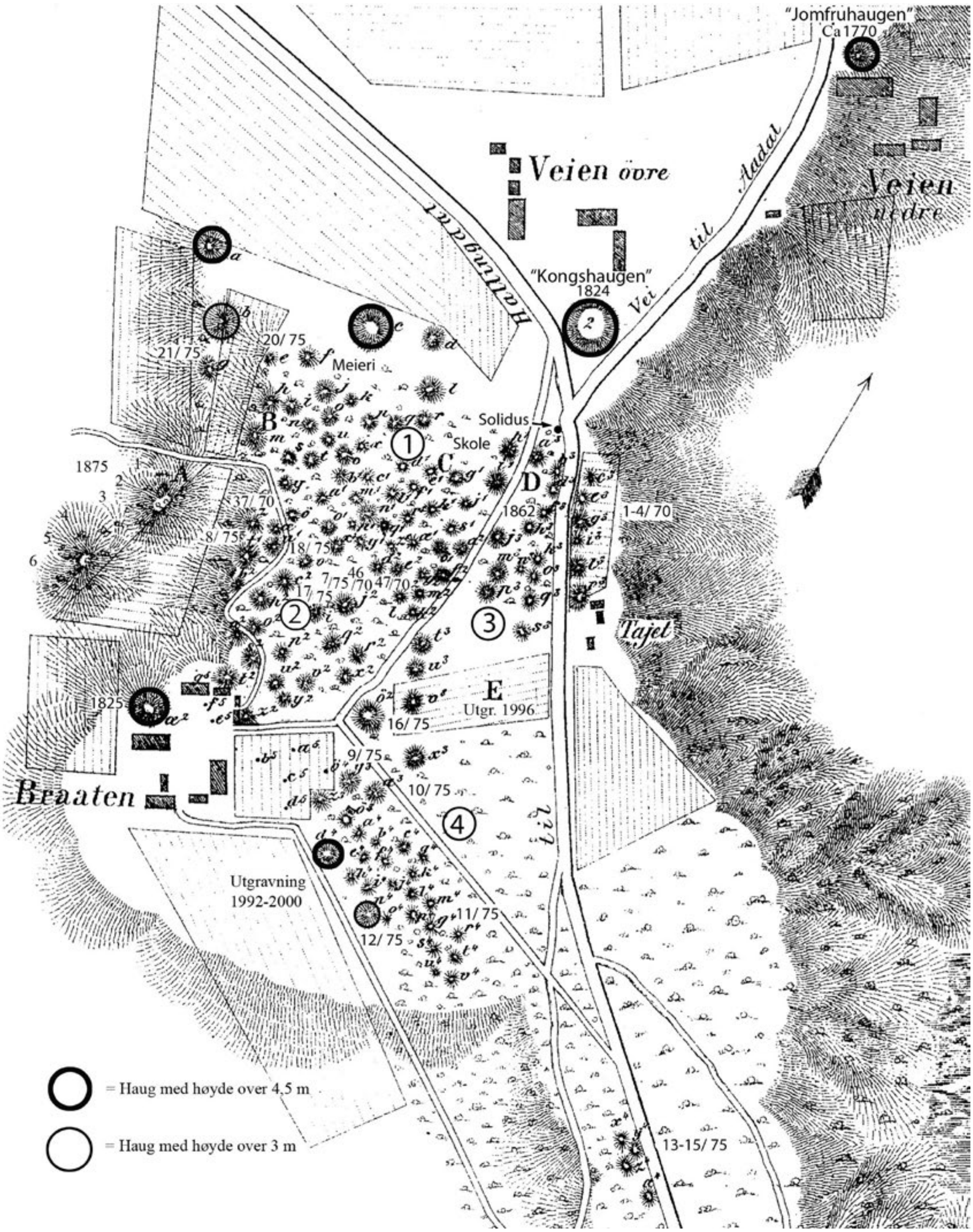

Figure 14. The large burial ground at Veien dated to AD 1–500. The remarkably large mounds, excavation areas and various find spots are marked on this map from 1847. After Gustafson 2016.

Figure 15. Moer in Ås, a middle-sized farm in historic times. From the Roman Iron Age until the 6th century there were three contemporary farmsteads here, while in the Late Middle Ages there were two units, and in the 17th century, there was only one. Moer is one of the most thoroughly investigated farms of south-eastern Norway and the crisis of the 6th century seems to have resulted in a reduced number of units or complete abandonment. The settled area was much bigger in the Early Iron Age than in historic times.

Case study 4. Moer, Ås, Akershus

Altogether, c. 47,000 sq. m. were excavated at Moer, Akershus, in 1997, 1998, 2000, 2004 and 2005 (Guttormsen 2003; Derrick 2005; Martens et al. 2010) (Figs. 15 and 16). Six longhouses, in addition to other possible houses and buildings, e.g. four-post

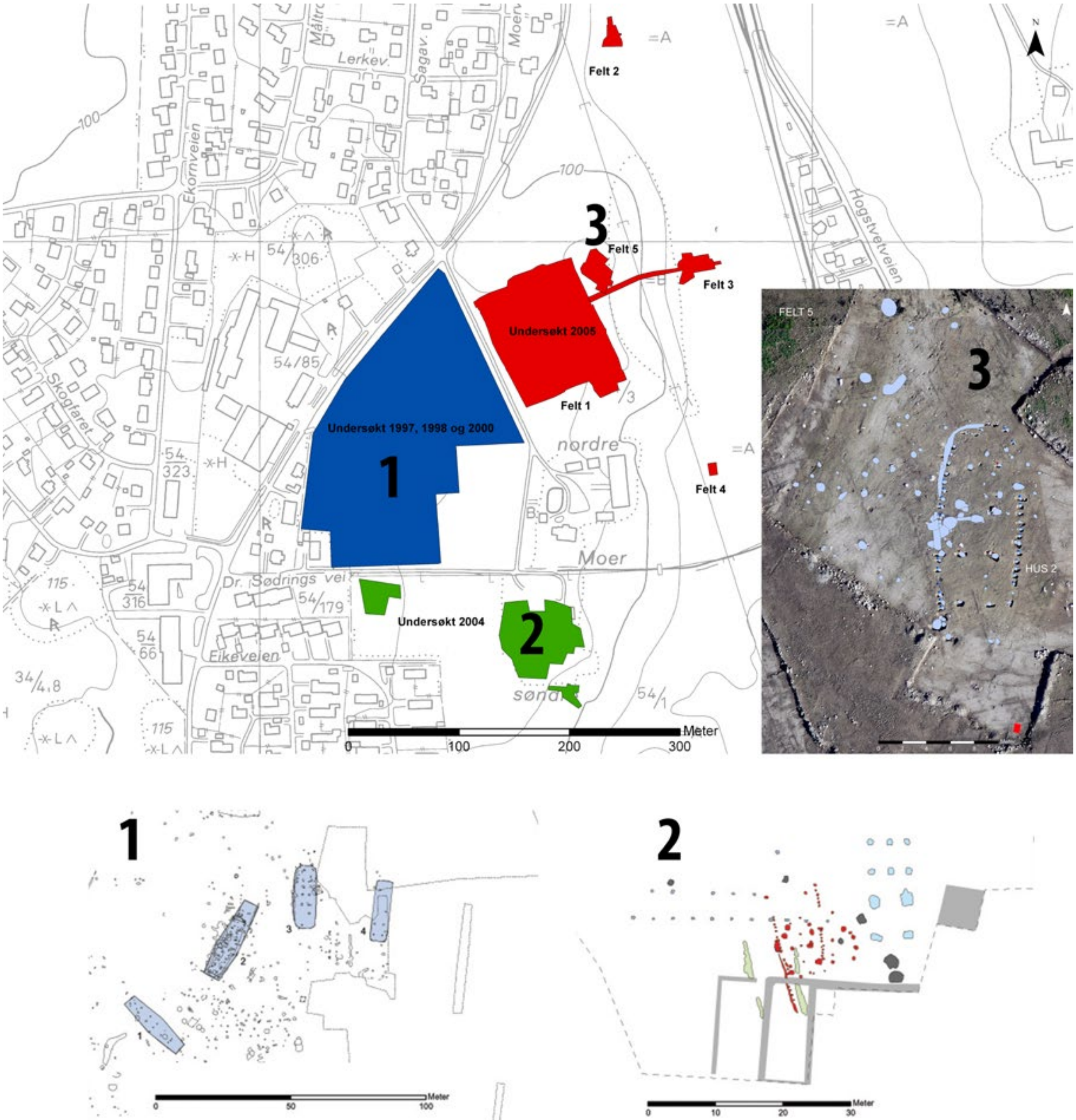

Figure 16. The houses at the farm Moer in the Roman Iron Age and Migration Period. These were excavated during the three archaeological campaigns of 1997–2000, 2004 and 2005. The investigated areas are marked in blue, green and red. The houses show that there were three contemporary settlements during the Roman Iron Age and Migration Period. The modern farmstead at Moer is located in the middle of the archaeological sites, and may also be situated on top of the Viking Age and medieval settlements (after Guttormsen 2003; Derrick 2005; Martens et al. 2010).

houses and pit-houses, were excavated. Altogether, this is one of the most thoroughly investigated farming areas in south-eastern Norway where the evolution of the settlement is well known. Vibeke Vandreup Martens et al. (2010: 49) concluded that this was not '… a farm which moves around over a large area over time – but probably three contemporary farms of roughly equal size'.

Chronologically, the buildings span the pre-Roman Iron Age, Roman Iron Age, and the Migration Period. There were 1–2 longhouses in each unit during the Roman Iron Age and Migration Period. A comparably large amount of high quality pottery was found at each of the three units. Three Bronze Age dates suggest that there may also have been an older house at site 2 (Fig. 16).

According to the The Cadastre of Bishop Eystein (c. 1390), Moer was divided into a southern and northern unit in c. 1390. From 1600 to 1741, there was, however, only one unit on the farm (Vik 1971, 299). Later the two-part structure is resumed, and historic maps from c. 1800 show the closely spaced farmsteads of southern and northern Moer, on either side of a road which ran through the estate (Derrick 2005: 9). A farm, to the south, abandoned in the Late Middle Ages (northern Brekke), was used by the southern Moer for some time (Vik 1971: 299-300; Derrick 2005: 6). Moer paid full tax in 1647, and a land rent of 9 pounds of flour, and was therefore a medium sized farm for this area. The farm covered c. 72 hectares (Table 2).

To summarise: Early Iron Age settlements are known to the north, west and south of the historic settlements at Moer, which have been interpreted as three separate and contemporary units. The settlement area was bigger in the Early Iron Age than later. The settlements seem to have been centralised to a smaller area, which may indicate partial abandonment and contraction. In the Late Middle Ages there were two units and in the 17th century one. What we see here is a variation from one to three units, where the settlement was the largest before the crisis at the end of the Migration Period.

Case study 5. Missingen, Råde, Østfold

The site is located on the boundary between Åkeberg (82/83) and Missingen (84), which were both large and productive farms (Fig. 17). The settlement at Missingen has six houses dating from the Early Roman Age to the Migration Period (Fig. 18). During the excavations of 2003 and 2004 an area of c. 1,500 sq. m. was uncovered. House 5, which was roughly dated to the Early Iron Age, was situated 100 metres south of the other buildings and was possibly a separate unit. Longhouses 1-3 follow each other chronologically. House 1, from the Early Roman Iron Age, was 61 metres long with a central hall (Bårdseth & Sandvik 2007; Bårdseth 2009). Traces of fields and ard marks were found to the west of the settlement.

It is unclear when this site was abandoned. 30 cooking pits have been found, of which two were dated. A cooking pit at the farm yard to west of the houses was dated to AD 545-660 (1. sigma) (Bårdseth and Sandvik 2007: 170). None of the buildings could be dated with certainty to the Migration Period, although this cooking pit also indicates activity in this period.

Gro Anita Bårdseth (2009) links this settlement to a Roman Iron Age warrior aristocracy, but not to the top elite. Although the soil layers on top of the settlement were examined with metal detectors, no prestigious artefacts were found. Metal detection at four nearby sites in 2014 revealed many high status finds. Birgit Maixner (2015) argues that Missingen/Åkeberg was a central site both in the Early and Late Iron Age and emphasises the continuity between these periods. Evidence of specialised high-skilled metal craftsmanship and precious metal finds, forms the basis of this interpretation (Maixner 2015). Area

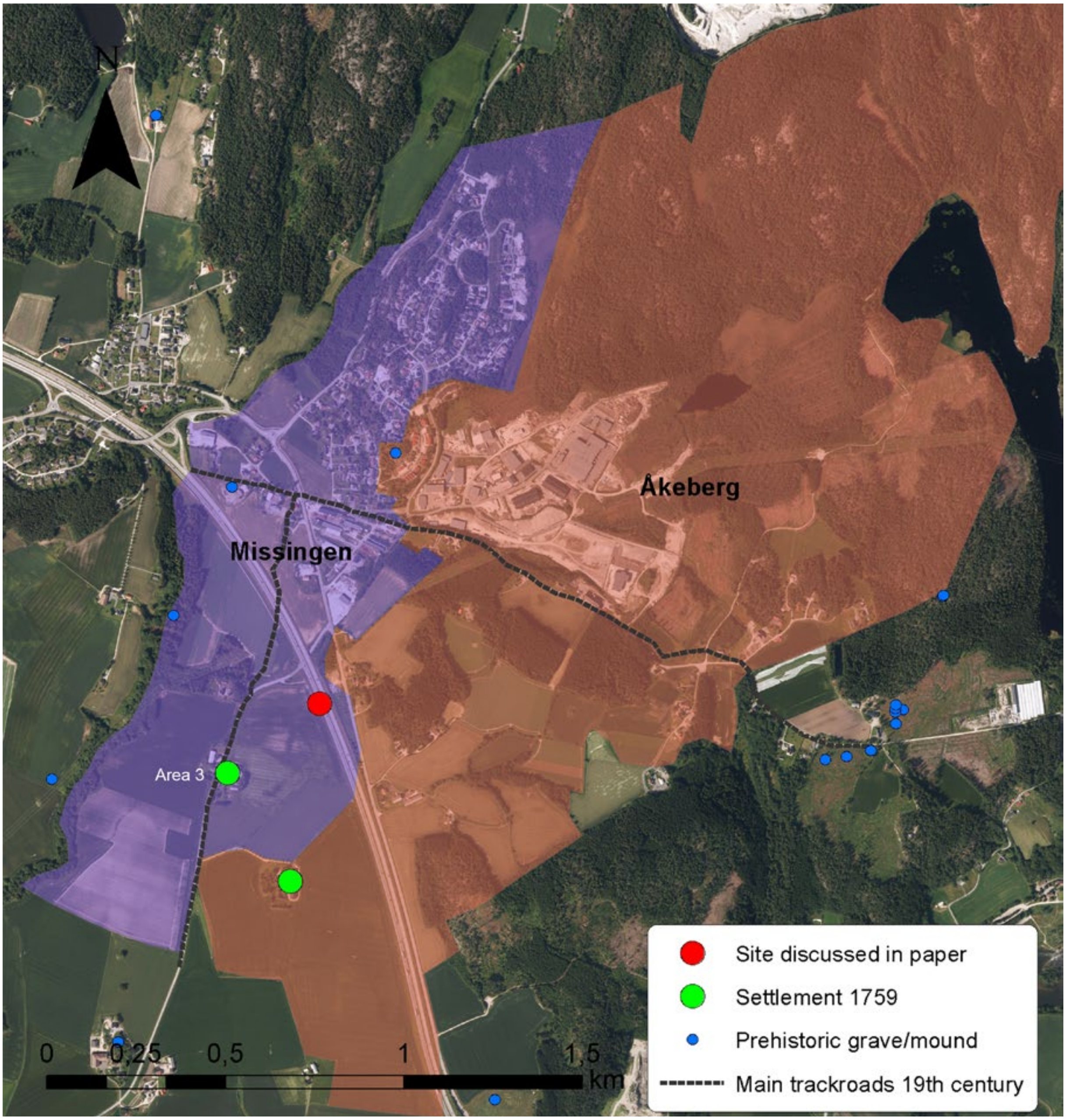

Figure 17. Missingen. In 2003 and 2004, six houses from the Roman Iron Age were excavated at Missingen. The largest was 61 metres long and had a central hall. The abandoned settlement is situated on the boundary between Missingen and Åkeberg, both large and productive farms in the 17th century. It has therefore been suggested that during the 6th-century crisis, one large estate was divided into two equally sized units. In area 3, typical settlement finds from the Late Iron Age and the medieval period, as well as traces of textile production of at least Viking-Age date, have been uncovered. The evidence suggests continued use of the area from the Early to the Late Iron Age, although the settlements were probably moved, and the estate divided. Map Frode Iversen.

Figure 18. Site plan and building traces at Missingen. After Bårdseth & Sandvik 2007 and Bårdseth 2009. Graphics: Per Erik Gjesvold, Museum of Cultural History. Photo: Museum of Cultural History. Collage by author.

Figure 19. Map 1759. The known historical settlements at Missingen and Åkeberg. Statens kartverk, historiske kart: Amt2 Smaalenenes Amt 56 vest 1759.

3, to the west of the historic farmstead at Missingen (Fig. 17), is the most thoroughly investigated. The presence of a workshop for precious metals is indicated by fragments of gold and silver of suitable size for crucibles. The oldest trace of metal work at the site is a Merovingian-Period matrix used to produce gold foil for cloisonné work. The lead moulds are presumably from the Viking Age. A lot of metal from the Early Iron Age was also found at the site, although it is unclear whether this was used in contemporary production or for reuse in the workshop, although Maixner suggests the latter. At this site, typical settlement finds from the Late Iron Age and the medieval period, as well as traces of textile production of at least Viking-Age date, have been uncovered. It is possible that the function of the site changed over time (Maixner 2015: 33-34).

In 1593 Åkeberg consisted of two units ('east' and 'west'), while Missingen was a single unit. In 1759, these two historic farms had a farmstead each (Fig. 19). Judging by the amount of land rent paid in 1664, Missingen and Åkeberg were not of the exact same size (Engebretsen and Roer 1968), as Åkeberg paid a total of four *skippund* (640 kg) grain, and Missingen the equivalent of c. 2.7 *skippund* (c. 430 kg). Eastern Åkeberg, paid half the land rent of Åkeberg, and was itself a fully taxed farm in 1647.

To sum up: the excavated site is located on the boundary between Åkeberg and Missingen. A division from a larger initial estate seems plausible. New farmsteads were established on the two historic farms. Missingen had a workshop for precious metal, where the first dateable evidence is from the Merovingian Period, although the workshop itself could be older.

Case study no.	Name	Farm no.	Interpreta-tion	Farms produced through partition	Land rent 1647	Hectare	Primary division
1	Bjørntvedt	221	Division	Bjørntvedt (S) Rugtvedt Klyve Bjørntvedt (E)	24 hides 4 hides 16 hides 12 hides	926 177 287 488	Equal division between Bjørntvedt (S) / Rugtvedt and and Bjørntvedt (E) / Klyve?
2	Rødbøl	2040	Division	Rødbøl South Seierstad East Seierstad North Seierstad	5 hides 4 hides 4 hides 4 hides	213 84 89 165	Equal division between Rødbøl and Seierstad?
3	Bråten (Veien)	48	Division	Sørum Veien Ve Vessal	2 skippund 1,5 skippund 1.5 skippund 2 pounds of malt	385 162 89 81	Equal division between Veien / Ve / Vessal and Sørum?
4	Moer	54	Contraction	None	9 pounds of flour	72	
5	Missingen	84	Division	Åkeberg ('east' and 'west') Missingen	4 skippund 2,7 skippund	341 126	Equal division between Åkeberg and Missingen?

Table 2. Five large Migration-Period farms in south-eastern Norway have been investigated. These sites are either located on or close to later property boundaries or, in one case, near a historic farmstead. This table shows which farms may have been part of the original estate, as well as the sizes of the later units.

FINAL RESULTS

12 of the 17 settlements with five or more buildings show signs of estate division: Åmål, Rødbøl, Nannestad, Bråten (Veien), Bjørntvedt, Missingen, Børgen, Rør, Busgård, Ringdal, Korsegården and, with less certainty. Skøyen. In four cases, settlement contraction is evidenced, where the historic settlement is smaller than the settled area in the Migration Period, as seen at Moer (case study 4). This presumably applies to Prestegården, Moer, Haberstad and possibly Lund.

This means that 70% of the abandoned settlements are located on the boundaries of later farms. Table 2 lists the case-study farms that may have been created from older, divided estates. The sizes of land rent in later sources, and size of farm land (hectares) have been used in order to assess whether the divisions were equal or asymmetrical, as this may have been relevant for inheritance. A lot of land may have been cleared in the Late Iron and Middle Ages, which means that caution must be exercised in terms of what conclusions can be drawn from later tax registers and their potential to reflect productivity of the Early Iron Age. Bjørntvedt, Veien and Missingen may be examples of equal divisions, although this is far from certain.

DISCUSSION AND CONCLUSION

It was not until 1983 when Richard Stothers and Michael Rampino published an overview of known volcanic eruptions before AD 630 that scholars became aware of 'The Dust Veil' of AD 536–7 (Stothers and Rampino 1983; Stothers 1984; Tvauri 2014: 30). Before the 21st century, neither Brøgger nor Scandinavian archaeologists in general took this into consideration. Since Morten Axboes short article from 2001, however, the crisis has received a lot of attention and has been used to explain almost all changes between the Early and Late Iron Ages. Very few researchers examined in detail the cultural implications of the crisis, or the strategies used to tackle it. Cultural changes were thus seen as passive reflections of this crisis.

Researchers in the first decade of the 21st century were concerned with whether such an event really took place. Later researchers have acknowledged the crisis, but point to a longer cold period lasting until AD 660. Recent aDNA studies have indicated that recurring plague epidemics took place until c. AD 750, influenced settlement development. It is therefore clear that there were more factors at play, not only 'The Dust Veil', which only lasted a short term. How did the elites deal with these?

The results are relatively unambiguous: more than 70% of the larger settlements (12 of 17) abandoned during the Migration Period are located on the boundaries of later historic farms. One strategy to counteract the crisis seems to have been to divide old estates into smaller production units. The lack of labourers seems to have led to problems maintaining production on the estates, just as during the late medieval crisis when family farms came back into existence.

A warmer climate and better growing conditions may have contributed to more grain production in the Roman Iron Age. The elite networks brought them luxury goods and a good supply of labourers, some of whom may have been slaves.

The historian Johan Schreiner (1948) argued that the late medieval plague epidemics brought a new economy with more animal husbandry and less grain production (Benedictow 1992: 41). Similar developments may have taken place during the 6th-century crisis. The historian Michael M. Postan (1950: 342-343) argued that around 1350 the 'rural proletariat' in England was reduced twice over; initially by death, and then by an increase in social mobility. The farmers of the English lowlands had to give up the advantages of economic specialisation and goods exchange, and were forced to adapt to a family based self-sufficient farming. Similar ideas have been proposed for Norway in the Late Middle Ages (Holmsen 1977; Sandnes 1977; Benedictow 1992: 187).

Bjørn Myhre (2002) argued that the agricultural landscape was reorganised in the 6th century. He stated that the crisis theory was part of historiography, and pointed to continuities of settlement and farming from the 6th century to the Viking Age (Myhre 2002: 179-180). He opposed an earlier simplified crisis theory which linked the lack of burial mounds with a lack of settlement. I would like to combine these different perspectives. Society may have responded to the plague and the cold by changing its production methods and reorganising its settlements. At the same time there may have been a population decline. One does not exclude the other.

Society may to a larger degree have based its economy on animal husbandry. Availability of large amounts of manure may have reduced the need for crop rotation and periodic fallowing. The amount of arable land may have been reduced, but was fertilised to a higher degree. This opened up earlier grain producing fields for pasture and hay production. The colder climate shortened the grazing season and the length of time needed for winter feeds increased. The lack of labourers stimulated a development towards family run units and fewer unfree labourers. It seems likely that some large estates survived the crisis. Bjørn Myhre suggested that there was an increase in land and estate acquisition during these centuries. He pointed to Borre in Vestfold, and the area around the Raknehaug in Romerike, as examples of emerging power centres in the Merovingian Period.

There are many indications of power concentration in the Merovingian Period. Rich burial finds from the 'Åker complex' have been dated to the 7th century. Terje Gansum (1995) has investigated the large mounds of Vestfold. There are fewer mounds, but the ones known are wealthier and bigger, and are placed in dominating positions in the landscape (Gansum 1995). This suggests that a smaller elite attained more control. A similar scenario has been suggested for Sweden (Bratt 2010). Research has shown that the settlements around the power centre of Old Uppsala changed a lot around AD 600 (Göthberg 2007: 442). This has also been observed by Linköping in Östergötland and further south in Sweden (Petersson 2011: 251; Ericsson 2001). Settlements were relocated, while the land was still in use (Petersen 2006: 32). This may suggest reallocations and changes in land use (Zachrisson 2011: 144).

A recent study by Ingunn Røstad has shown an emerging uniformity in the aesthetics of clothes and jewellery in the 7th to 8th centuries, within a large geographical area (Røstad 2016). The quality of the workmanship was reduced and mass-produced jewellery took over. This can lend support to theories about a new social 'middle class', seemingly more uniform. At the same time, parts of the elite may have become even more powerful. Purchase and sale of land and property may have been crucial to this development.

There is little doubt that there was a climate crisis around AD 536–7, which initiated a colder period. At the same time Scandinavian societies were hit by the plague. This article suggests that many large estates were split into smaller units as a cultural response to the crisis, while smaller farms were abandoned. This had a great impact on the social structure of Scandinavia, as both the higher and lower strata in society were reduced in number. As a result of the division of the land, a more equal society emerged.

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WHY DID POTTERY PRODUCTION CEASE IN NORWAY DURING THE TRANSITION TO THE LATE IRON AGE?

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ABSTRACT

This article discusses why pottery production in Norway ceases at the transition to the Late Iron Age in Norway. The use of pottery undergoes a range of changes throughout the Iron Age, from simple storage vessels, via various forms of decorated tableware which are a part of a sophisticated table service placed in graves, to simpler forms of storage vessels with stamped decoration, before disappearing altogether. The decline of pottery production coincides with a number of larger societal changes, involving the abandonment of farms, a change in inheritance regulations, and trade contacts with Europe. There is a decrease in the number of grave finds at the same time as there are changes in clothing styles and weapons use. In addition, the use of hillforts intensifies, as does the hoarding of precious metals, and these changes together provide the basis for the theories of societal restructuring due to crisis and rivalry. Hypotheses about the decline in pottery production are discussed in the context of Ian Hodder's theories about the process of change. I discuss whether the changes have socio-cultural reasons and/or can be explained as the outcome of crises such as climate deterioration, failing crops/loss of resource base, disease or war. Another factor is whether the changes can be associated with political instability and, as a final point whether the break in continuity occurs quickly or comes as the result of long-term processes. Overall, it appears that several factors are involved, but that the basis for the large consumption of ceramics falls apart when the old warrior aristocracy is no longer able to maintain their own power base.

INTRODUCTION

Over the course of the Iron Age, pottery production gained momentum in Norway, developing from relatively simple shapes without decoration in the period 500 BC–AD 200[1], to more complex vessels with rich ornamentation during the 3rd and 4th centuries. The craft reached its greatest technical and aesthetic levels towards the end of the Migration Period in the early 6th century (Fredriksen, Kristoffersen & Zimmermann 2014), after which it disappears rather abruptly. In this article, I will focus on this break in continuity and attempt to outline various explanations for what may have caused this and how it may shed light on other processes taking place during the transition to Merovingian Period. First, a brief description of pottery use throughout

1 Kjelmøy pottery is not considered in this article.

the Early Iron Age will be presented, after which previous interpretations of the break in pottery production will be discussed, followed by a description of several other social changes taking place at that same time. In conclusion, I will attempt to compile the various explanations and discuss different suggested interpretations against the background of the theories presented.

The subject of the article will revolve around the craft's cessation and research questions that rely partly on older theories but also on Ian Hodder's (2012) more recent thoughts on the process of change. It will be discussed whether the changes have a socio-cultural basis and/or they can be explained as the outcome of periods of stress such as climate deterioration, loss of resource base, disease or war. Another factor is whether the changes can be associated with economic reorganization, political instability or something similar. As a final point, it will be discussed whether the discontinuity occurred quickly or was the result of long term processes.

POTTERY IN IRON AGE GRAVES

Burial deposits currently provide the best basis for studying the development of pottery use in the Iron Age. The use of vessels as burial urns, or crushed as a part of the burial rite characterizes the Pre-Roman Iron Age and Early Roman Period (Fig. 1). A new feature appears in single graves from the Early Roman Period. Assemblages of both ceramic vessels and imported items replace the use of single vessels. This is particularly evident initially in rich inhumation burials with Roman imports (glass, scoops, strainers, bronze cauldrons) in Eastern Norway, but transfers rapidly into individual graves with combinations of ceramic vessels and imported items in Vestfold. Eventually the inclusion of these sets of tableware extends to various forms of cremation burials. The sets initially consist of import goods (often in pairs), or of imported objects combined with ceramic vessels. In the Late Roman Period (particularly from the 4th century AD) changes continue and with greater impact. By this stage a set of ceramic vessels had become common in the graves, usually two or three, but up to six have been found in the same grave. Import objects never appear uniquely, but in combination with ceramic vessels in a type of hybridization process. The tradition of burial urns did not die out completely, even if the symbolic meaning of the vessels was altered through inclusion in sets. Urns continued to be used in parallel with other pottery/tableware, but to a much lesser extent. The placement of ceramic vessels in burials became gradually less frequent over the course of the Migration Period (already by AD 400 in Østfold), before dying almost completely in the Merovingian Period, when only a few of the graves[2] are equipped with pottery (Rødsrud 2012).

The transition from individual urns to sets of burial equipment may be associated with two types of vessels: cookware/storage vessels and tableware/drinking cups. As the sets are becoming more common, changes in pottery techniques are also occurring. These changes involve finer tempering and further development of shape (a greater range of vessel types) and surface (polishing), but it is the ornamentation which stands out. During the last half of the 3rd century, pottery production develops towards being an industry, with the period AD 300-500 being somewhat of a Golden Age of pottery production. Results of trace element analyses on 13 vessels from burial contexts in the Oslofjord area (Isaksson 2008) supports the functional subcategories mentioned above (Rødsrud 2010; 2012: 84-90). Both vessel categories are found throughout the Early

2 20 graves according to Gudesen 1980: 69-70, see also Rødsrud 2012, attached database.

Figure 1. A typical collection of Early Iron Age pottery from Rogaland. S1423, S1478, S327, S1850, S2008, S3741 a, S2697 a, S5852. Photo: Terje Tveit. Arkeologisk museum, University of Stavanger.

Iron Age, but it is the finely polished tableware that dominates the Late Roman/Migration Period. In the 6th century, the production of the finer vessels slowly declines, and these disappear completely from the material culture by the Migration/Merovingian Period transition (Rødsrud 2012). Despite the disappearance of tableware, some examples of coarser, stamp decorated pottery are known from very early Merovingian Period graves (Gudesen 1980: 69-70; Rødsrud 2012: 194) (Fig. 2). A decline is also seen in Denmark and Sweden, but here it is largely an issue of the reorganization of production, where the polished, sand-tempered tableware is replaced by simpler, granite-tempered storage vessels (Brøndsted 1960: 290; Brorsson 2002: 113).

Figure 2. Stamp decorated vessel from the Merovingian Period. C9013 from Nalum, Brunlanes, Vestfold. Photo: Christian L. Rødsrud.

EARLIER INTERPRETATIONS

With the transition to the Late Iron Age, we are facing a clear break in pottery production. Only 19 graves with pottery are known from Eastern Norway, including two with possible "burial sets", dating to the Migration/Merovingian Period transition or Merovingian Period (Rødsrud 2012). The following summarizes earlier attempts at explaining this change:

1. Bøe (1931: 234-237) calls this the end of the pottery craft, and argues that there is no satisfactory explanation for the degeneration and disappearance of pottery. Is it possible that there was a change in the symbolism associated with burial? One interpretation, mentioned briefly by several authors (Bøe 1931; Solberg 2000; Nordby 2012), is that vessels made of soapstone and organic materials take over.

2. A general approach to the interpretation would involve comparing the disappearance of pottery with the main social trends in Scandinavia. There is a pattern to ritual investments throughout the Iron Age. The creation of new elites in the Roman Period and Migration Period was manifested most notably through large burial mounds or high status burial items (especially of foreign origin) as a demonstration of power (Myhre 1987; Kristoffersen 2000). In her study of the consolidation phases within the Iron Age in southern Scandinavia, Lotte Hedeager (1992: 207) finds that after many years in the burial arena, ritual symbolism seems to be transferred to other theaters such as public, ceremonial places. The changing of ritual arenas may have been intended to emphasize the divine nature of elite families and their function as a link between humans and gods. With the change of arenas, pottery production may have become too excessive and in turn unnecessary to maintain. From this it can be deduced that the social structures associated with elite hospitality, which are established and renegotiated throughout the Roman/Migration Period, are no longer an arena of social rivalry towards the end of the Migration period. Once these social structures were consolidated and became an integrated part of society, it was not necessary to use metaphors for elite hospitality in burials (Rødsrud 2012: 187-191).

3. Terje Østigård (2007) has treated this theme indirectly through his work on the "Transformer" in the Iron Age. His starting point is that the blacksmith, as a "master of fire", had a primary role in cremation burial rituals, in addition to metal production. He argues that the smith was a "jack of all trades" and not least a liminal character with both creative and destructive powers and a leading social position. This coincides with the role of cremator, responsible for the realm of death and the transformation to a new life (Østigård 2007: 40-44). Such a role may explain the uniformity in graves from 500 BC–AD 100 where cremations are standard, and the use of urns dominates. Over the course of the Iron Age, the responsibilities of the Transformer slowly narrow before seemingly disappearing completely in the Late Iron Age. Both in cremation patches and in graves, the bones are buried on the site of the cremation and this may indicate that family members take responsibility for parts of the cremation ritual, perhaps under the guidance of the Transformer. As one nears AD 500, these burial forms intensified while the role of the Transformer became more marginalized. By the transition to the Late Iron Age, this process of change appears to be complete (Østigård 2007: 44-46, 81-83, 109, 169). Østigård (2007:115-116, 135) suggests that the meeting of the earlier pagan, animistic religion

and Christianity is at the heart of this change. The use of vessels in burials may therefore have become taboo to the point that they were no longer used in that context.

4. Another factor which may explain the transition is the "popularisation" of vessels (the "turnstile effect" in Appadurai 1986: 56). If ceramic pottery is kitsch, it loses its value, and alternatives will be sought (such as vessels of iron, soapstone and organic materials), or perhaps given an entirely new material expression. Pierre Bourdieu's (2002 [1979]) research into distinctions provides the basis for an indirect explanation. The burial vessels have become representations of an idealized death, which reflects the lifestyle pursued (Rødsrud 2012). When the custom dies out towards the end of the Migration Period, this can be interpreted as a result of the elite seeking new ways of distinguishing themselves in death, a response to a wider range of people (although not slaves or laborers) using elite symbolism (Dietler 2001: 86).

CONTEMPORARY SOCIAL CHANGES AT THE TRANSITION TO THE MEROVINGIAN PERIOD

The history of research on the Merovingian Period has provided plenty of fodder for theories of change based on crises, restructuring or strife/conflict. The transition between the Early and Late Iron Ages marks not only a rift in Scandinavia but across most of the European continent (Randsborg 1991). Whether due to internal dynamics or external influences, there are many aspects of change. Several factors may have affected pottery production, while at the same time the decline in pottery production can provide insight into other, contemporary changes.

It is not just the use of pottery that changes in burial rituals. In general, the number of grave goods decreases, and a simplification of burial equipment can be seen during the transition to the Merovingian Period (Shetelig 1925; Stenberger 1933; Gudesen 1980; Solberg 2000:186-197). There is also a clear change in the use of personal items of adornment, as clasp brooches, relief brooches and cruciform brooches (Solberg 2000: 192-195; Rostad 2015: 99-170, 348-349) disappear from the graves. Yet it must be stressed that, unlike pottery, female decorative items do no completely disappear from the record, with new types of jewelry, and likely a new dress style, appearing. The ornamentation on burial items also changes from the Scandinavian Style I to the more continental and insular inspired Style II (Solberg 2000: 192-195). The combinations of weapons burials also change, the axe becoming a permanent feature in the grave material. The change in weapons coincides with the fall in the use of hillforts and this has been associated with the rise of guerrilla warfare and the development of new fighting techniques (Ystgaard 2014).

It is not only the burial inventory which gives voice to troubled times. A significant upsurge in the deposition of gold hoards coincides with the changes in the burial deposits (Bøe 1923; Stenberger 1979: 493 Axboe 1999) and a number of farms and fields of arable land are abandoned (Welinder 1975; Rønneseth 1981; Pedersen 1999: 50; Widgren 2012). This abandonment can be seen in connection with the restructuring of agriculture and changes in property rights in which land was gradually united into larger estates (Skre 1998; Iversen 1999; Myhre 2002: 191; Ljungkvist 2006; but see also Hamerow 2002 for European examples). It appears that smaller farms were abandoned and large estates established by an elite on the best available ground in the vicinity of power centres, characterized by, among other things, monumental burial mounds (Myhre 1987; 2002). The transition in building techniques from supporting posts dug into the underground to cross-timbered structures may also explain the decreasing number of settlement traces in the Late Iron Age, contra the Early (Weber 2003).

Changes in inheritance laws/rights are much discussed in connection with the restructuring. Based on the Odal rights in medieval legislation, it is likely that property rights can be inherited (Zachrisson 1994; 2011; Iversen 2013), but in Nørre Snede, Jutland there is evidence which suggests that land rights are controlled by a central authority (Holst 2010). Perhaps the transition to primogeniture (only the eldest heir receives the inheritance) and subsequently split inheritance (property is divided amongst several heirs) does not begin prior to the amalgamation of smaller farms into larger estates in the Late Iron Age. As a complement to the changes in social organization, a modification in the runic alphabet (syncope) at the transition to the Merovingian Period should also be noted (Voyles 1992; Nielsen 2009). One final process of change stands out as a positive development. Iron production finds a new technological form and organization in the 7th century, when several new sites are put to use (Larsen 2009: 70-97).

Although changes can be followed at the local level, there is reason to believe that external factors have influenced the developments. The collapse of both the Roman Empire, on the continent, and the Sasanian Empire, in the Middle East, would have consequences for trade relations and networks previously maintained through imperial control over vast lands (Ystgaard 2014; Buntgen et al. 2016) and, in addition, the migrations which admittedly started even earlier. Large population movements are described in a number of written sources and many of them deal with groups of people moving into and out of Scandinavia, but ethnic groups also moved from the Arabian Peninsula and the Asian steppes into Europe (Hedeager & Tvarnø 2001: 138-191, 267-281; McCormick et al. 2012). Developments on the continent, as well as the rise of Christianity must likewise have caused great social turmoil, failing/irregular trade networks and breaks in alliances and/or federations, especially after the fall of the Roman Empire (Hedeager & Tvarnø 2001: 192-231; Wiker 2004; Ruhmann & Brieske 2015).

In earlier literature, the Merovingian Period is described as a period of decline that is readily explainable by population decrease due to pestilence, crisis, crop failure and/or a restructuring of trade routes from the continent (Shetelig 1925; Gjessing 1934; Gräslund 1973). In such interpretations, myths surrounding *Fimbulwinter* and *Ragnarök* were associated with real events and collective memory related to hunger and collapse. In recent years, these have become theories involving the impact of natural disasters, and several authors have suggested that a known climatic crisis, the AD 536 dust veil event, could have given rise to changes of greater magnitude (Axboe 1999; Gräslund 2007; Lowenborg 2010; Gräslund & Price 2012; Arrhenius 2013; Tvauri 2014; Sigl et al. 2015; Büntgen et al. 2016). Later data from volcanic eruptions in other parts of the world in AD 540 and AD 547 have reinforced the situation on a global level (Buntgen et al. 2016). The Justinian Plague, in combination with excessive land use (Welinder 1975), may have compounded the situation (Gräslund 1973; Iversen 2013).

WHAT CAUSES CHANGE WHEN SOCIAL BONDS ARE STRONG?

From scarce occurrences in the early Pre-Roman Iron Age, pottery production becomes increasingly intertwined in society and this creates a dependent relationship (Hodder 2012). A sophisticated symbolic language gradually developed as the potters widened their selection of shape, style and decoration. When the craft is at its most developed in Norway, the dependent relationships were many and ceramics played an important role in domestic production, in food processing, as tableware in drinking rituals and not least in death and burial rites. Pottery use ceases rather abruptly after this.

Changes in the use of ceramics also seems to coincide with changes in farm structure, as discussed above, and part of the explanation is likely to be found in a new, or altered, social structure. A key to understanding this most probably lies hidden in the social interplay within the walls of longhouses in the 5th century, although no one has been able to fully explain it. Obviously, it appears that demand for pottery changes in the 6th century, and disappears completely during the early Merovingian Period. Some of the finest examples of the craft belong to the late Migration Period, and have clear parallels to the fine metal working associated with Style I (Fredriksen et al. 2014), but the craft then disappears/degenerates at the same time as the structure and layout of farms seems to be changing.

The change, as mentioned above, is obvious when it comes to burial contexts, but also seems to apply to settlement contexts. In a new study of houses from the Late Iron Age, it is seen that only 6 of 65 possible dwellings contained pottery (Eriksen 2015 catalog). Three of these six contexts have datings stretching back to the Migration Period (Aure IV, Gausel 8F and Rossaland E). In the last three, the find contexts of the pottery are not secure, and it cannot be stated with certainty that the fragments do not belong to an older phase (Garder I, Gausel 11 and Evje). In Sweden and Denmark, pottery production continues in this period, but in the form of simpler storage vessels with a different quality and shape than previously. The transition in these areas thus also represents a break, even though pottery production continues (Brorsson 2002).

This leads to a broader question: What is the catalyst that makes it possible to dissolve societal structures? Ian Hodder (2012: 159-165), in his book *Entangled*, attempted to outline the types of events that can alter the course of a society, despite its strong bonds:

- Climate catastrophes
- Collapse of resource base
- Disease
- War
- Ideological, social or political instability
- Slow, long term changes that erupt during periods of instability

The AD 536 climate disaster and the subsequent collapse of the resource base can of course have triggered change. If grazing resources and agricultural yields were stressed to begin with (Welinder 1975; Herschend 2009), such a crisis would have worsened the situation to the point where the weakest and most vulnerable in society fell below the subsistence level (Buntgen et al. 2016). However, that can hardly be a satisfactory explanation for the complete loss of all potters and knowledge of pottery production. Such a disaster may have helped to change the supply and demand over time, if it led to poor harvests and demographic crisis (population decline) as Bo Gräslund and Neil Price (Gräslund & Price 2012) have claimed. This could have ripped the bottom out of the market, but does not answer why the craft disappeared so abruptly in Norway, while continuing in another form in Sweden and Denmark. It is difficult, therefore, to see a climate disaster as the single causal factor. Both crops and livestock populations can, of course, have been affected, but research on adaptation to disaster (resilience) shows that the vulnerability of a society tends to be scattered on several fronts. While some areas are left with social disaster, abandonment and degraded resource bases, other areas/regions may gain momentum and are characterized by development and adaptation (Widgren 2012: 129, 131-133).

The question of disease as a causal factor should be considered in the same way as the climate catastrophe theory. The Justinian Plague (*Yersinia pestis*) that ravaged Europe in the 540s and after (Gräslund 1973; Solberg 2000: 201-202; Wagner et al. 2014) may have contributed, but hardly caused the cessation of pottery production by itself. The plague bacillus has been identified via DNA analyses performed on skeletal material as far north as Bavaria, Germany and Vienne, France and outbreaks are documented in historical sources from Marseilles, France (Drancourt et al. 2007; Little 2007; Rosen 2007; Wagner et al. 2014). The mortality rate in Northern Europe is unknown and there is so far no historical or archeological evidence that the plague reached Norway or Scandinavia, but mass mortality in southern Europe could have caused a break in trade and communication routes with the continent which in turn would have led to a shortage of resources and thus instability for the craftsmen. This probably would have affected the petty kingdoms and merchants of Scandinavia.

The next candidates are war and instability. Ingrid Ystgaard (2003; 2014) has convincingly explained how the upswing in the use of hillforts and a change in the weapon burial set, with axes coming to be included, coincides with the breaking of lines of communication with the Roman Empire in the 500's, and the introduction of guerrilla warfare. The weapons and equipment used until the 6th century were a Germanic adaptation of Roman legionary equipment, and were used for large-scale warfare against external enemies. Ystgaard believes that the axes, which begin to appear in the weapons sets after AD 500, are a Germanic addition, and mark the transition from large battles against external enemies, to small-scale warfare.

The appearance of axes and the use of hillforts are linked, as warfare begins to be focused on internal/local competition for resources. By the time conditions stabilized, around AD 600, many of the smaller chieftains had succumbed, with only a few remaining. This led to a new concentration of power, which may have formed the basis for a reorganization of land and perhaps a completely different need for pottery. Frands Herschend's (2009) interpretations of the restructuring of settlement on Öland, and my earlier description of the use of burial pottery in eastern Norway, together form an important base for interpreting the phenomenon (Rødsrud 2012).

Herschend (2009: 287-298) argues that a population surplus at Öland[3] towards the end of the Early Iron Age occurs as the result of the Roman Period practice of raising sons to be warriors. In a situation where the profits of war decrease or disappear, and larger armies can no longer be maintained, a strain on the available resources arises, and this can provoke a crisis. It is in such a situation that a small elite appears able to collect power and property in fewer hands. If this is combined with Per Ditlef Fredriksen's (2006: 133-135) view that vessels in graves should be seen as representations of the individual's life experience and an interpretation of the vessels as representations of feasting/gatherings in halls, and thus the ability to maintain military forces (Rødsrud 2012), the fall in pottery production appears somewhat more understandable.

If a large part of the basis for ceramics production is to be found in the aristocracy and their need for ritual symbols, the importance of metaphors for the hall and feasting in burials (Rødsrud 2012: 187-191) decreases as the elite class is reduced in size and turn their focus to new symbols. This would then contribute to a decrease in the demand for pottery. In general, it seems that pottery has an important domestic function in the first part of the Early Iron Age, while towards the end of the period of production it appears as if bucket-shaped vessels in

3 Similar circumstances can also be seen during the reign of Charles XII of Sweden.

particular were manufactured for the express purpose of inclusion in burials (Fredriksen & Kristoffersen 2014). The demise of pottery production in Norway corresponds to a change in Sweden and Denmark, where the fine tableware disappears, but simpler storage vessels continue to be produced. The similarity is that the fine tableware, which in a burial context can be associated with prestige items such as glass, ladles/sieves and bronze cauldrons, disappears with the old elite (Rødsrud 2012), while simpler, functional pottery continues in some areas, and is probably replaced by vessels made of organic materials and soapstone in others.

In my opinion, there is also a change in which drinking vessels cease to be used in burial contexts, but are rather given a public ritual significance, as votive deposits and in religious ceremonies. Even though pottery production ceases, there are high status finds, for example imported glass from building contexts dating to the second half of the Migration Period in Uppåkra, Scania, in Sweden (Larsson & Lenntorp 2004), in Lille Børke, Ringsaker, Hedmark (Lislerud & Stene 2007), on Helgö in Sweden (Arrhenius 2013) and apparently also in the form of sherds in the as yet unpublished building from early Merovingian Period at Hov, Lillehammer (Resi 2008). Sherds of claw beakers (*snabelbeger)* found at Borre in Vestfold have a somewhat more obscure context (Myhre 2015: 45-57). The cups can be interpreted as ritual objects belonging in a sacred building or part of a hoard deposited in a settlement context. The find from Lille Børke was recovered from a settlement context and is currently interpreted as a hoard, but it cannot be excluded that it also belonged to a cult house or similar.

Hodder's final explanation is long term changes that erupt suddenly during periods of instability. This point is important because there seems to be many parallel events or processes that reach a *crescendo* at the end of the Migration Period. Although many researchers have focused on crisis as an explanation, Ulf Näsman (1988; 2012) takes a different approach when he suggests that the material changes may be caused by issues of representativeness and believes that an upheaval of social and political structures lays behind it all. Herschend (2009: 288-289) also maintains that the changes must be understood in a long-term perspective, where a complex regional pattern underlies the triggering of an imbalance in the system. The idea is therefore that changes can be traced to social rivalry such as was known in the Roman Period, but that it takes many years before this causes permanent changes, perhaps triggered by crises or crop failure, eventually leading to a loss of ceramics as one of several outcomes. This is also a chain of events paralleled in adaptations to disasters seen in modern-day cultural geographical/anthropological studies (Widgren 2012).

WHAT HAPPENED TO THE CRAFTSMEN?

When demand ceases, it is natural to consider the causes as well as the long term effects on the craftsmen. What was the source of inspiration for the changes in technique and style over time, and why could production not continue?

Fine-tempered, polished pottery was introduced to Norway in the Early Roman Period. In earlier research, this pottery was referred to as "foreign decorated ware" or Jutish ware, but was actually produced locally and only inspired by the craftsmanship of areas in Northern Denmark (Bøe 1931: 24-41; Resi 1986: 51-55; Rødsrud 2012: 48, 208-211). The Black Polished Ware common in the Late Roman/Migration Period (Stout & Hurst 1985; Stout 1986) were in turn inspired from these early forms of tableware, and it was perhaps the specialized potter rather than the pots that were imported.

A further question that arises is how the craftsmen were organized. Was it purely domestic production or was it organized at a higher level? Most studies

Enestående i Norden:

Industrisamfunn fra Jesu tid er blitt avdekket i Torridal

-4. JUL. 1975

— Det samlede resultat av de arkeologiske utgravinger i Torridal er, som vi tidligere har skrevet, helt enestående i Norden — man kan for første gang påvise et helt landsby-samfunn som har ernært seg ved kommersiell keramikk-fremstilling. Vi har hittil funnet nærmere 50.000 keramikk-skår, og vi har gravd ut flere hustufter som man må helt ned til Nord-Tyskland for å finne maken til i større mengder. De finnes sporadisk i Sør-Sverige og Danmark. «Industrisamfunnet» i Torridal skriver seg fra Romertiden — funnene er datert til tiden fra Kr. fødsel til år 400 e. Kr., sier konservator Perry Rolvsen fra Universitetets Oldsakssamling til Fædrelandsvennen.

— Østlandet og Sørlandet øst for Lista er et fattig område når det gjelder tydelige spor fra folkelivet på denne tid. Det har vært noen gravfunn og fornminnefunn — men utgravingene i Torridal viser en landsby som gir et godt bilde av hverdagslivet den gang. Folket bodde i rektangulære hus — vi har funnet fire tufter etter slike — det største på 20 X 5 m. Videre har vi funnet et grophus på 11 X 8 m og et rund-hus som er 4 m i diameter. Vi vet ikke hva de to siste hustypene ble brukt til — det er mulig det har vært verksteder eller smier. Mellom hustuftene har vi funnet graver, avfallsgroper og ildsteder. Landsbyboerne har livnært seg av bygg fra en åker i nærheten, men de har også spist mye kjøtt — det viser benrester etter gris, sau, ku og smågnagere, sier konservator Rolvsen.

— Vi har også funnet rester etter en 4.000 år gammel boplass like i nærheten — her lå bl.a. en pent forarbeidet spydspiss av flint. En praktnål av forgylt bronse som i virkeligheten er en bit av et bokbeslag av anglo-saksisk opprinnelse, har forvirret oss en smule. Bokbeslaget skriver seg fra år 800 — altså den tidligste vikingetid — og den kan ikke ha noe med de øvrige funn å gjøre. Vi har siktet et matjord-lag på 1,2 m. tykkelse, det går på transportbånd opp i en siktemaskin, og vi vet ikke hvor dypt i matjordlaget dette funnet lå. Det er mulig praktnålen er kommet fra Kristiansand eller et annet sted på kysten, og at den har havnet i jorden sammen med gjødselet. Andre funn tyder på at de har fulgt gjødselkjerren — bl.a. en mynt fra 1668 (ca. 38 år etter Kristiansands grunnlegging) og

like utenfor husene — i graver som ligger like ved avfallsgropene. Vi har funnet mennesketenner som viser dette, sier konservator Rolvsen.

— Svære klatter med råleire — over en meter i diameter — er blitt lagret i området. Vi har sendt prøver av leiren til keramikere i Oslo som har laget de nydeligste krukker av den. Keramikerne slår fast at leiren må være bearbeidet — den er nesten helt ren. Det finnes fortsatt mye fin råleire i grunnen i Torridal sier konservator Rolvsen.

Utgravingene i Torridal ble påbegynt i fjor i forbindelse med omleggingen av riksvei 12. Det ble allerede etter fjorårets undersøkelser i selve veitraseen klart at man stod overfor funn som var enestående i Norden. Og de seneste gravinger har så absolutt bestyrket dette.

Utgravingene i Torridal av-

under konservator Perry Rolvsens ledelse, vil nå reise hjem etter å ha gjort en fin jobb.

Og etter noen spredte etterundersøkelser som skal være avsluttet før fellesferien er over — kan så Vest-Agder vegvesen fortsette sine arbeider på riksvei 12. Arkeologene har gravd ut og finsiktet til sammen 3 mål jord i løpet av de to siste somrene.

Det kan fastslås at «industrisamfunnet» fra Keiser Augustus' tid dekker et større område enn 3 mål. Man vet at landsbyen fortsetter på begge sider av veien mot nord, men hvem skal finansiere eventuelle utgravinger her ?

Dette er nemlig alle norske arkeologers hodepine — de får ikke penger til utgravinger dersom ikke det moderne menneskes inngripen i naturen gjør at

Perry Rolvsen: 50.000 keramikkskår i hustufter fra Romertiden.

ved veibygging, kraftutbyg-

bekoste arkeologiske undersø-

Figure 3. Newspaper article reporting the excavations at Augland, Kristiansand, Vest-Agder. Fædrelandsvennen, July 4, 1975.

of craft environments are based on material from the Late Iron Age/Medieval Period, but in general the discussion focusses on the scale of production (Christophersen 1980; Hagen 1994; Strand 2011):

- Domestic production – for personal use, requiring only general knowledge of production processes
- Domestic industry – sale of all items that exceed the needs of the household
- Professional craft production – production is source of livelihood, production of surplus, specialist knowledge required

The scale of pottery production may have varied, but it has its origin in the household. In the Pre-Roman Iron Age the style is uniform and unsophisticated (Rødsrud 2012: 47-48, 65-68), which may indicate a simpler technical level. During the Roman Period, however, production escalates, and the production site at Augland, Kristiansand bears witness to large-scale production/manufacturing (Fig. 3). At Augland, c. 55000 fragments (137 kg) from an estimated 7-8000 vessels, four clay beds, six longhouses, one pit-house, an underground (dug down) house, at least 14 pits which may be remnants of furnaces and 141 pits (graves, fireplaces, cooking pits, charcoal pits, slag pits, waste pits and postholes) that can be linked to pottery production were identified (Rolfsen 1980). Evidence for pottery production was found together with iron objects, copper alloy and beads, all of which suggests that several craftsmen were gathered in one place and working on a large scale. It is, however, not possible to state whether or not they lived there year-round. In Sogn, craft traditions are discussed on the basis of manufacturing techniques of bucket-shaped pottery, and it has been concluded that there must have been a center for production of high quality crafts, even though no specific site is known and the size of the production unclear (Kristoffersen & Magnus 2015). Considering the distribution of high quality pieces amongst larger estates which may have been linked in alliance systems, there is reason to believe that specialist production goes beyond the needs of the individual household.

It has been previously noted that in Western Norway the production of handled vessels ends by about AD 500 (Stout 1986: table on page 51), while in Eastern Norway the timing of this is less certain. The black polished vessels, except shoulder-bossed pots (*bulevaser)*, generally seem to disappear from graves about the same time as cruciform brooches (Kristoffersen 2000; Kristoffersen & Magnus 2010: 62-64 and figs. 16-19), further linking potters and metalworkers at this time. Similar decorative elements and styles have also been shown on both pottery fragments and fine metalwork, indicating a close relationship between potters and metalworkers. In addition, traces of gold have been found in bucket-shaped pottery, which may suggest that production took place in the same workshop (Fredriksen et al. 2014). The same authors also propose a possible explanation for ceramics production collapse in the link between metalwork and pottery making, although space does not allow for an in-depth discussion of this. The large number of objects decorated in the Style I found together with pottery stands in stark contrast to the objects in Style II which are alone in this respect. There seems to be a lacuna in the material between Style I and the introduction of Style II (Fredriksen et al. 2014: 16). Pottery in the Merovingian Period can primarily be related to Eastern Norway, and specifically the first part of the period (Gudesen 1980: 69-70). The form gets more rustic, using coarser temper and thicker walls than previously and is ornamented with stamped decoration (Bøe 1931). Stamped decoration is known from bucket-shaped vessels, but otherwise there is little evidence of continuity. It seems rather that one is back at a simpler household level production.

With this as an overall basis, I conclude that it is the specialized craftsmen rather than the production itself that disappear, since pottery is still found in Eastern Norway in the Merovingian Period (Gudesen 1980: 69-70; Rødsrud 2012: 194) and on a larger scale in Sweden and Denmark (Brøndsted 1960: 290; Brorsson 2002: 113). The abrupt fall in the production of tableware must be viewed in the light of lack of demand, which in turn must be seen in conjunction with the many social changes and reorganization that occur at the transition between Early and Late Iron Age. Perhaps there was no longer a market for tableware; mostly because there was no longer any need for ritual symbolism in the graves of the fragmented warrior aristocracy. A demographic crisis in connection with an epidemic or the proverbial dust cloud could have worsened the situation, but the die had already been cast in the 4th and 5th centuries. At Augland, where a group of artisans were practising several handicrafts in a delimited area, pottery production ceases completely, and the lack of locally produced pottery is not supplemented by imported ware. This stands in contrast to comparable South Scandinavian central sites, such as Gudme/Lundeborg (Grimm & Pesch 2011) and Uppåkra (Hårdh 2002), where both the production and importation of pottery increases after a period of decline. The reason for Augland's decline as production site needs to be investigated through multiple data sets, but it appears that potters were central to the site's existence.

CONCLUSION

I believe that the sum of the social changes described above forms the basis for explaining the decline of pottery production. It seems that several factors were working together and that the outcome varied locally (Widgren 2012), but climate disasters and plague epidemics may still have been precipitating causes. The seed of this lies far back in time, but seems to be connected to the warrior aristocracy no longer being able to maintain its power base in many areas. This in turn caused a change in ritual investments and further a rapid fall in pottery production as the basis for the large consumption of pottery associated with ceremonial use in tombs amongst the elite lapses. Although the vessels were originally items of everyday life, this role seems to disappear in the late Migration Period, when they come to be linked to a greater degree to ceremonial use in burials (Rødsrud 2012; Fredriksen & Kristoffersen 2014). The need for clay vessels seem to end when production ceases in Norway and changes in Sweden and Denmark occur at the end of 6th century.

That the cult moves in and uses vessels of other materials is only one explanation of the whole complex of changes described, and it is clear that society is affected long before pottery production stops. It seems that the potters became redundant as a result of the reorganization of society that takes place in the 6th century. If one imagines the craft as a limited "tacit" knowledge that was passed on from generation to generation (Arnold 1988; Gosselain 2011), it may make sense that the craft ceases abruptly and degenerates when the craftsmen move or are forced to take up other livelihoods. It has been previously argued that the fine-polished vessels common in the Roman Period have their origins in Jutland. Perhaps highly specialized potters from Jutland were taken to larger estates (e.g. Augland) and produced pottery there. With the fall in demand for pottery, in a time when the old warrior aristocracy was crumbling, it may be that craftsmen became unemployed and were forced to leave once the aristocracy could no longer maintain the old social structure.

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RELATIONS BETWEEN BURIALS AND BUILDINGS IN THE IRON AGE OF SOUTHWEST NORWAY

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ABSTRACT

Recent archaeological excavations in Rogaland have revealed several cases of Late Iron Age (LIA) burials overlying Early Iron Age (EIA) buildings. In spite of a growing interest in the transition between the EIA and the LIA, there has been a tendency to treat burials and buildings separately, limiting discussions of the relationship between the two. The superimposition of burials over older buildings, understood as references to the past, can be seen as a characteristic pattern in the Scandinavian Viking Period. Presenting new sites, alongside a few well-known older excavations, and discussing common traits amongst them, I hope to develop new insights into Iron Age society. The most frequent burial-building combination is Viking burials associated with buildings from the Late Roman Iron Age/Migration Period. This may indicate that expansion in the period AD 150–550 played a special role in the Viking Period, and that the placing of Viking burials on Late Roman/Migration Period houses reflects disputes over land rights, more precisely the ownership of the farmyards from the Early Iron Age.

BUILDINGS AND BURIALS

This chapter deals with the past in the past. In the same way as today's archaeologists work on the past in our present (Shanks 2007: 591; Olsen 2010: 126), it is safe to presume that prehistoric people interacted with the past in their present. The important role material culture plays in enabling, remembering and upholding the past has, until recently, been underrated (Williams 2006: 3; Olsen 2010: 110). Asking how subsequent societies dealt with the relics of previous times, informed by their collective understanding of the past (Connerton 1989), leads us to the topic of social memory and how it supplies the members of a society with an identity and a historical consciousness (Holtorf 1998: 24). Social memory is considered to refer to the selective preservation, construction, and obliteration of ideas about the way things were in the past, in service of some interest in the present. Social memory is often used to legitimate power by creating an idealized, naturalized, seamless connection with the past. Another ideological use of memory involves the creation

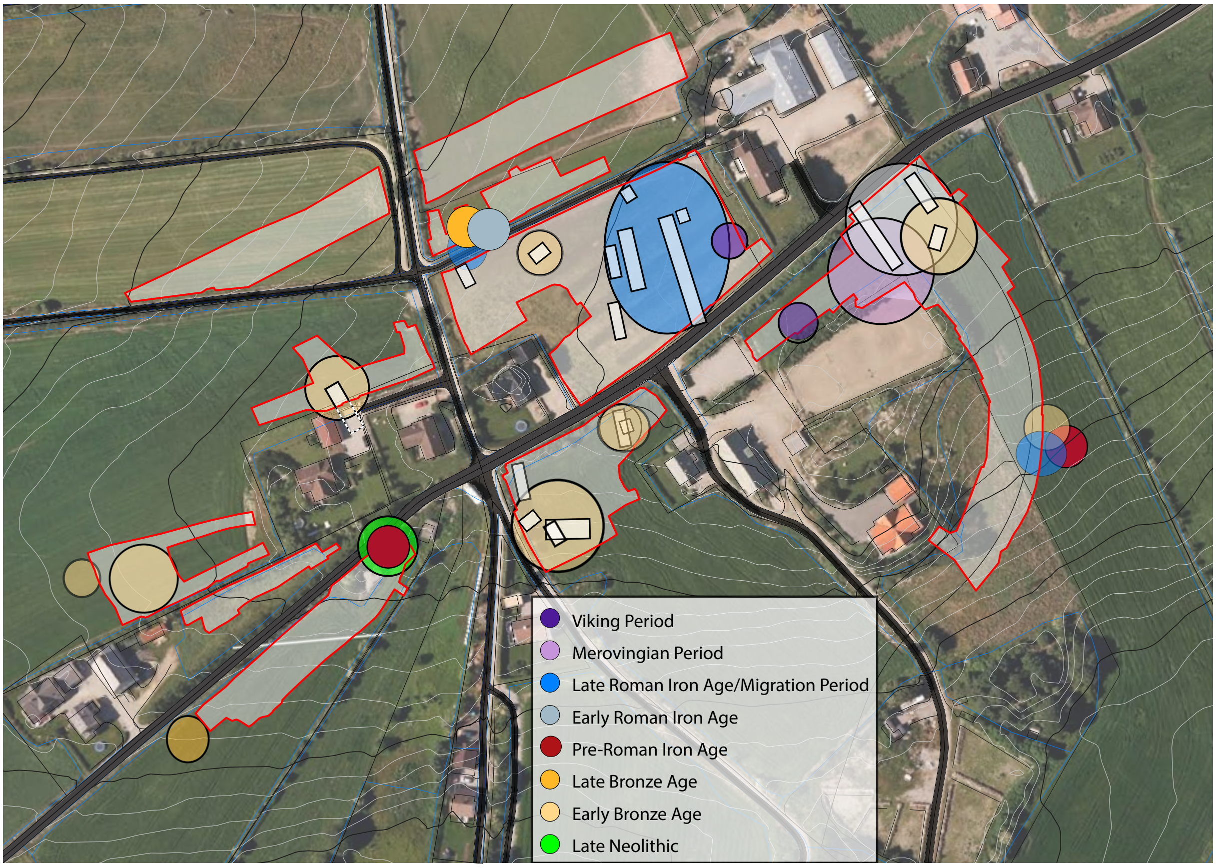

Figure 1. The different phases at Myklebust.

of social identities, drawing together groups of people with real or imagined common pasts (Van Dyke 2011: 237). Sometimes these relationships are grounded in genealogies or histories and, as argued in this paper, reuse is interpreted as reflecting an awareness of the past and a strategy for constructing memory in the Viking Period. The material culture surrounding people in the Iron Age was actively used to establish relationships with the past as an expression of continuity in times of massive social transformations.

The point of departure for this examination of the relationships between burials and buildings is a series of observations made while excavating a settlement site at Myklebust in Sola municipality (Dahl 2014). Change and continuity during the transition from the EIA to the LIA thus became a central theme in the post-excavation analysis. While several larger buildings dominating the landscape represent the EIA, the LIA is only represented by burials (see fig. 1). The locations of these burials, over and around buildings from the EIA, represent a fascinating pattern in themselves. The superimposed burials stand out as intentional references to the past, and this particular way of reuse can be seen as a characteristic pattern in the Scandinavian Viking Period (Stenholm 2012: 10,

Figure 2. Map showing the sites used as examples in the paper: 1. Myklebust 2. Nedre Øksnavad 3. Gausel 4. Ullandhaug 5. Storrsheia 6. Rossaland 7. Espeland 8. Skadberg 9. Søra Bråde 10. Frøyland. Ill. Theo Gil Bell/ Barbro Dahl.

226). Exploring the coincidence of older buildings and younger burials may provide new insights into the transition between the two periods.

When reporting the results of large excavation projects, it is quite common to discuss settlement remains and burials separately. In this paper, I will integrate the two in order to consider the relationships between them and raise questions regarding the possible motives behind the superimposition of LIA burials over EIA buildings. The traditional separation of settlement and burial evidence may be connected to the latter being viewed as an expression of ritual and religious dimensions, as opposed to the everyday life made material in the buildings (see Stenholm 2012: 103). If one defines settlement solely through the presence of building traces, the lack of LIA buildings at Myklebust may be interpreted as a sign of a break in a seemingly continuous settlement from 1800 BC to AD 550. While the relationship between the burials and the buildings is an issue which springs quickly to mind, it does so primarily in the context of attempting to locate the missing LIA buildings. Late Iron Age burials are often found close to modern farmyards that have not been subject to investigation (Børsheim and Soltvedt 2002; Dahl 2014). Assessments of possible prehistoric settlement outside of excavation areas will remain hypothetical as long as we continue the practice of only investigating the farmed fields surrounding today's settlements (see Grønnesby in this publication). Analyzing the relationships between buildings and burials may offer a constructive alternative to speculation on the possible locations of missing LIA buildings. This type of study can also be regarded as an alternative to macro studies based on visibility, estimated age and associations with historical terms such as "farm" and "boundary".

Excavation reports generated over the past two decades at the Museum of Archaeology, UiS, allow for the discussion of these relationships in a regional perspective. The examples used in this study are burials associated with settlement evidence uncovered using the mechanical top-soil stripping method. Seen in a national and international perspective, Rogaland has an exceptionally rich archaeological record, represented by numerous preserved farm complexes under modern grazing areas. The excavations of a number of such farm complexes, undertaken during the first half of the 20th century, can offer important insights into the relationships between buildings and burials and function as a broader context for the more fragmented sites found in farmed land (see Fig. 2).

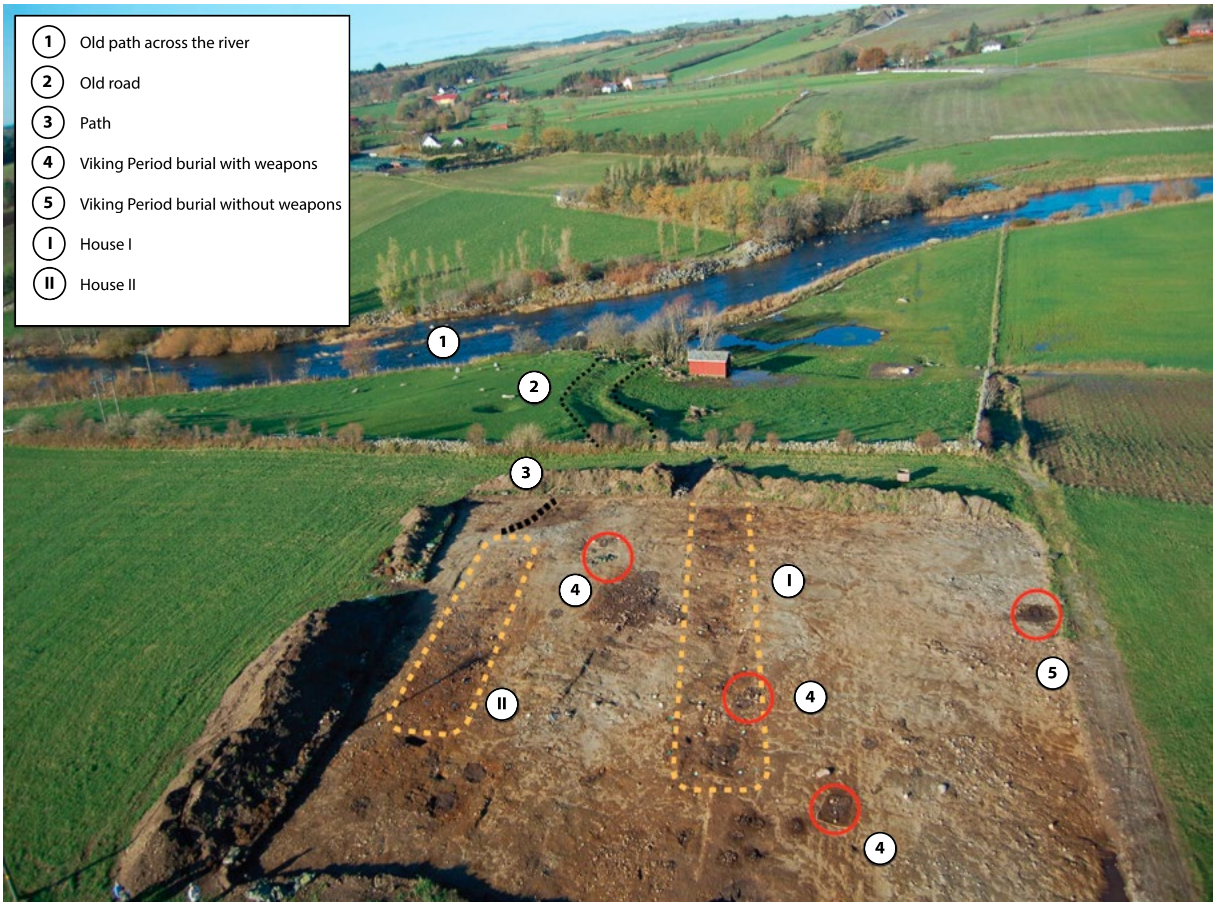

Figure 3. The excavation site at Nedre Øksnevad seen from the air (Theo Gil Bell).

SITES WITH BURIALS SUPERIMPOSED ON BUILDINGS

A review of burials related to older buildings, in this context, shows that the burials are from AD 550–1050 while the buildings can be dated all the way back to c. 2000 BC (see table 1 and 2). However, burials from AD 550–1050 appear most frequently in combination with buildings from AD 200–550.

A single Viking burial was found outside a cattle lane leading out of a 42 meter long building dating to AD150–550 at Myklebust, Sola municipality. 50 meters to the east, a Merovingian Period burial field was constructed over and around two buildings from AD 1–150 and one building from the Early Bronze Age (EBA) (see fig. 1 and table 1). Several burials were superimposed over the the longer of the two AD 1–150 buildings., across the central aisle, along the aisle and by the wall. Burnt bones from the cremation burials have given dates in the 7th and the first half of the 8th centuries AD. The single inhumation burial, with a deep rectangular chamber, can be typologically dated to the 10th century (Dahl 2014).

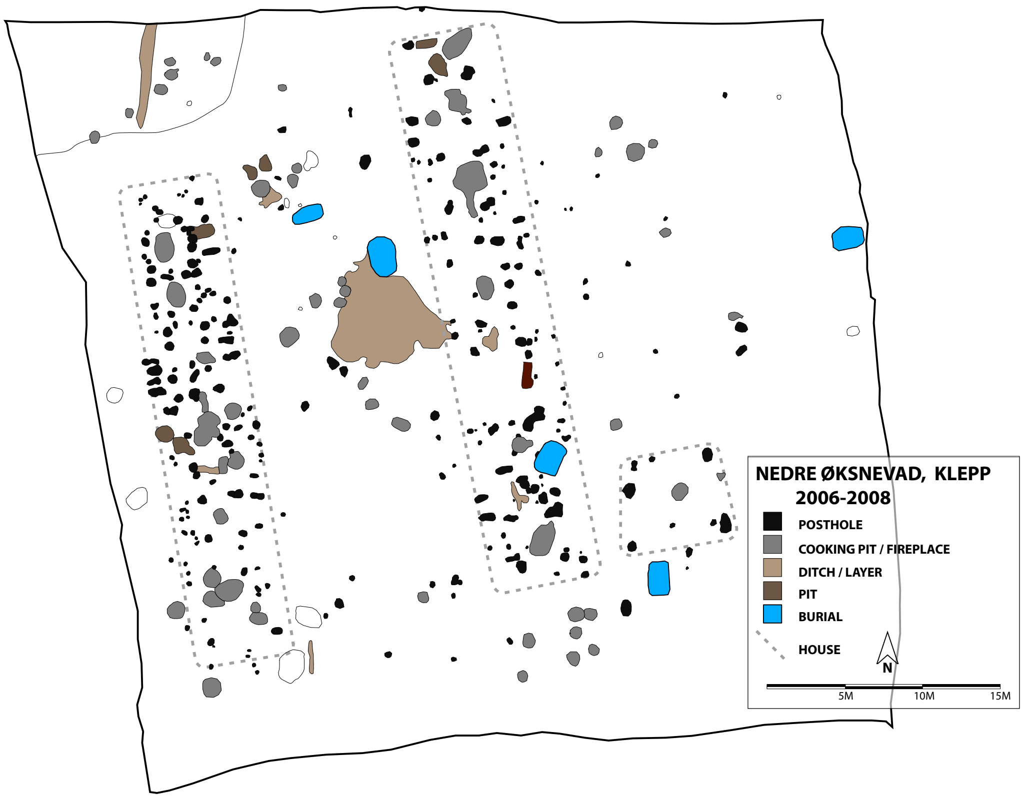

Figure 4. Buildings and burials at Nedre Øksnevad marked in blue.

A farm complex and five burials from Nedre Øksnevad in Klepp municipality represent a close parallel to Myklebust. An inhumation burial dating to AD 800–900 was located between the entrances of two earlier (AD 150–550), parallel long houses (Bjørdal 2006, appendix 11). A Viking burial was found in the central living area of the longest house, with two additional Viking burials located outside the building. In the yard between the two long houses, in an area paved with horizontal slabs, a feature interpreted as a possible Viking burial was found (Figs. 3 and 4). Both the feature and its location have a close parallel in a shallow waste pit covered by irregularly placed slabs in Myklebust (Dahl 2014). The feature also bears a strong resemblance with the two wells at Ullandhaug, Stavanger municipality (Myhre 1980a). The possible superimposition of a burial over an earlier waste pit or a well is interesting, but beyond the scope of this paper.

Two LIA burials were associated with walls of older buildings in Gausel, Stavanger municipality (Børsheim and Soltvedt 2002). Burial 1006 was incorporated into the stone wall of House 7, which dated to AD 150–550. The burial was located near

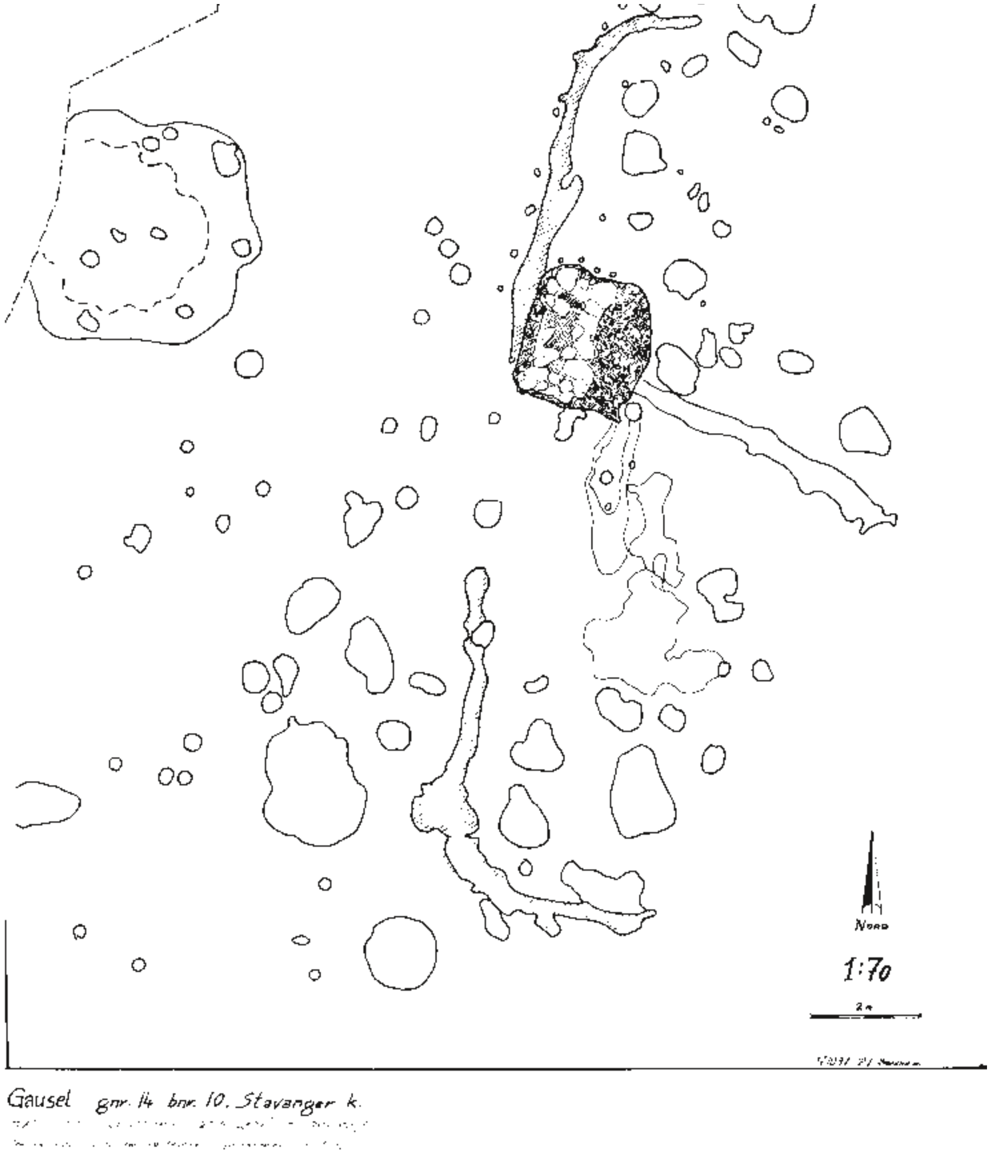

Figure 5. The burial of the Gausel queen, placed between the wall and the line of the roof bearing posts. Ragnar Børsheim, topographic archive of AM, UiS.

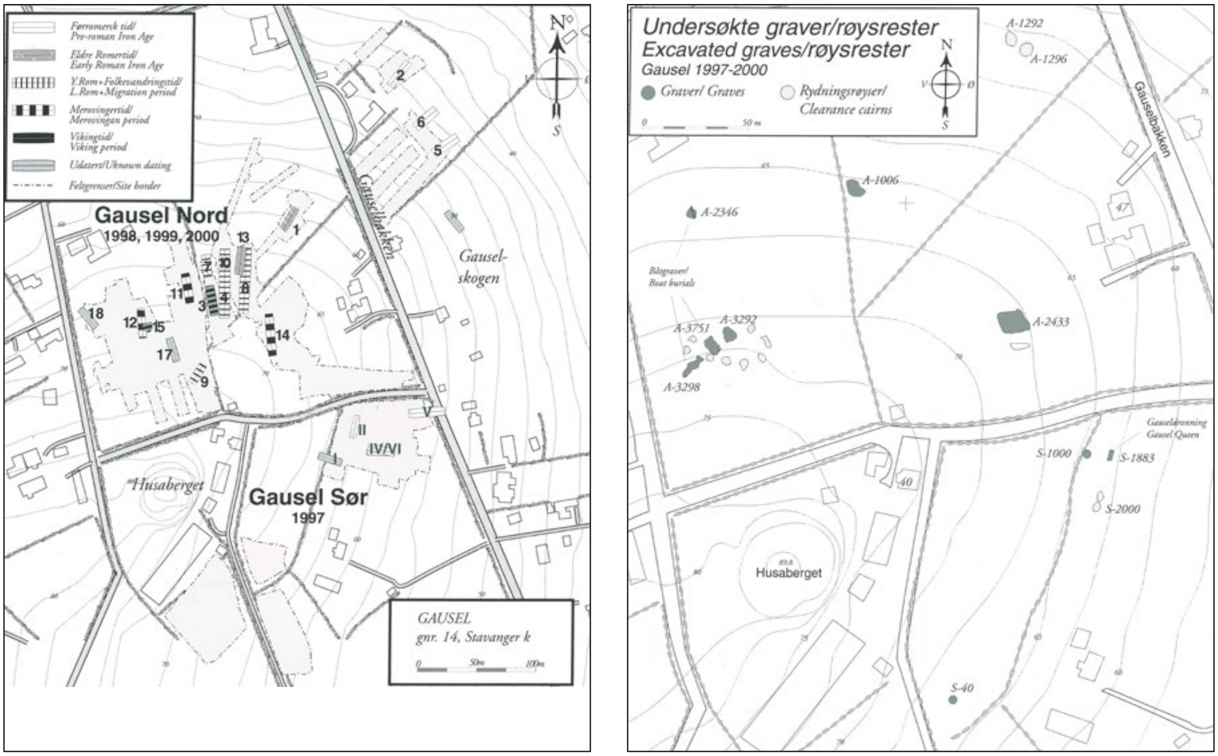

Figure 6. Buildings found at Gausel to the left and burials to the right. Børsheim and Soltvedt 2002.

the corner of the central domestic area of a main building. Burial 1883, known as the Gausel Queen (see table 1), was discovered in a building interpreted as a Pre-Roman Iron Age smithy. It was found in a rectangular pit which had been placed exactly between the building's outer wall and a line of roof bearing posts, on the northern side of the entrance (Fig. 5).

Ragnar Børsheim compares the burials overlying the walls of older buildings in Gausel with the superimposed burials found on the AD 150–550 farm complex at Ullandhaug (Børsheim and Soltvedt 2002: 228). After the collapse of the walls of house 1 at Ullandhaug, two long barrows were constructed, neatly adjusted to the shape of the building (Myhre 1967; 1980a; 1992, see Figs. 7 and 8). Three Viking burials were found in house 3. The building's central domestic area, characterized by a large number of fireplaces, also contained one cremation burial and one inhumation burial. While the cremation burial, which dates to the LIA, was built into what was left of the building`s stonewall, a coffin had been placed directly on the floor layer and covered by a mound in the period AD 800–900 (Myhre 1992: 58). Outside the eastern wall, a layer of pebbles covered an early Viking inhumation burial. This burial had the same position and orientation relative to the house as the late Viking burial at Myklebust.

One or two cremation burials dating to AD 800–900 were found in a Migration Period house (house 1) on the large farm complex at Storrsheia, Bjerkreim municipality (Petersen 1933: 38–54, see Fig. 9). The burial, oriented in the same direction

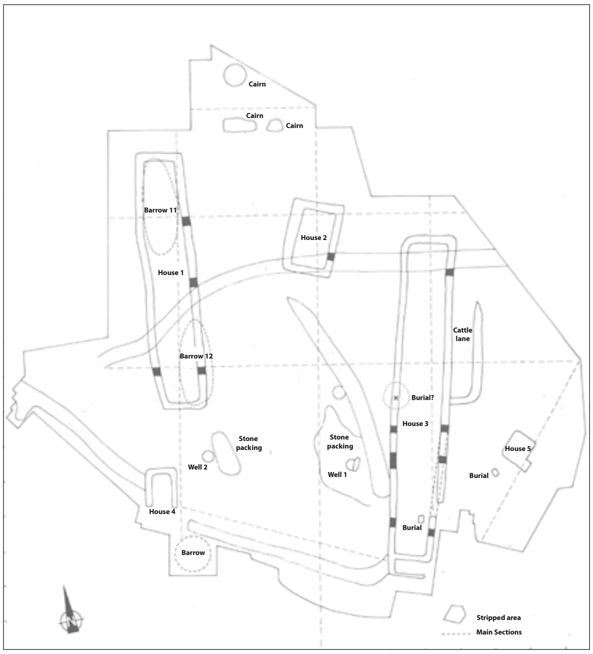

Figure 7. The burials related to house 1 and 3 at Ullandhaug. Myhre 1980a.

Figure 8. Long barrow 12 over the wall of house 1. After Myhre 1980a.

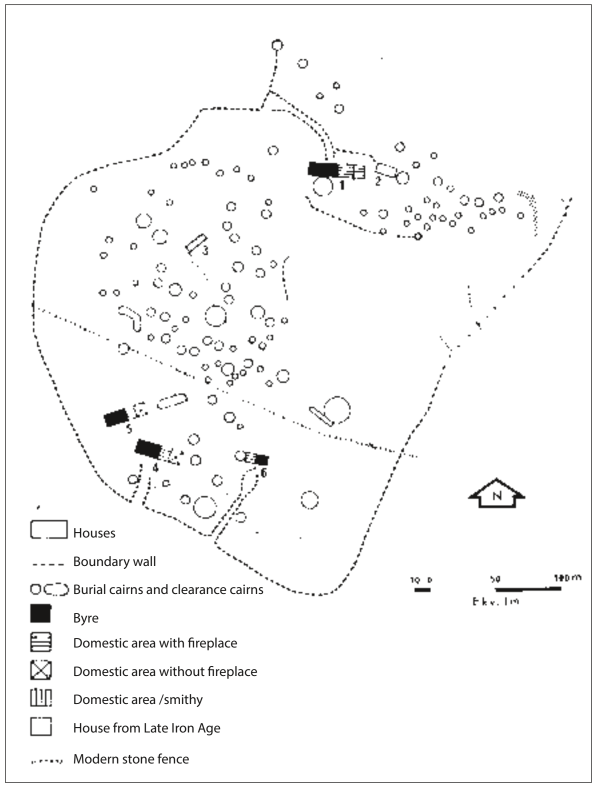

Figure 9. The buildings at Storrsheia. After Myhre 1980a: 282.

as the axis of the house, was built into the remains of the wall of what had been a central living area dominated by several fireplaces. While house 1 is the longest building in the complex, the smaller house 2 had a long, stone built entrance where a cremation burial from AD 800–1050 was incorporated into the wall. House 2 is thought to be from the LIA, although EIA pottery sherds recovered from the structure may indicate older phases. Outside the wall of house 2 lay a long barrow with the same orientation as the building. The barrow contained no preserved traces of burials. A circular mound covered one end of house 6, which dates to AD 200–400. In the same way as at Ullandhaug, the mound must have been constructed after the collapse of the stone walls. Parts of a soapstone vessel indicate that the mound was built in the LIA.

Two LIA burials were found in the corners of a building dating to AD 400–550 at Rossaland, Sandnes municipality (Myhre 1966). One of the

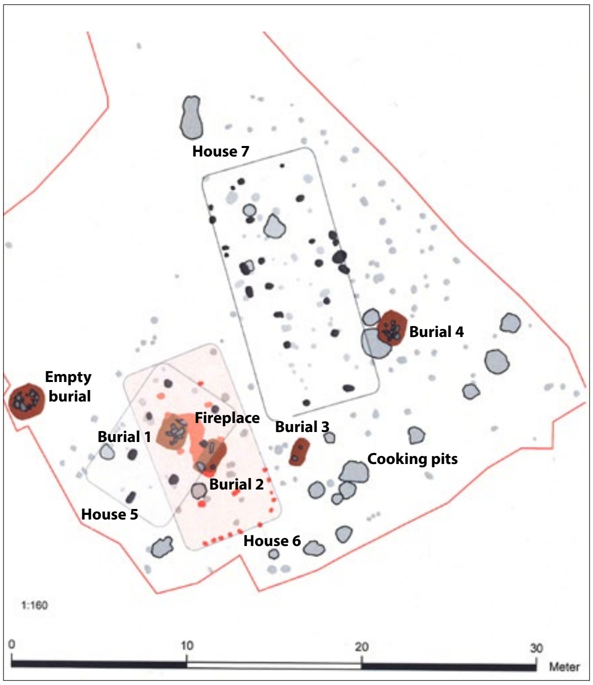

Figure 10. Buildings and burials at Skadberg. Ater Bjørlo 2011.

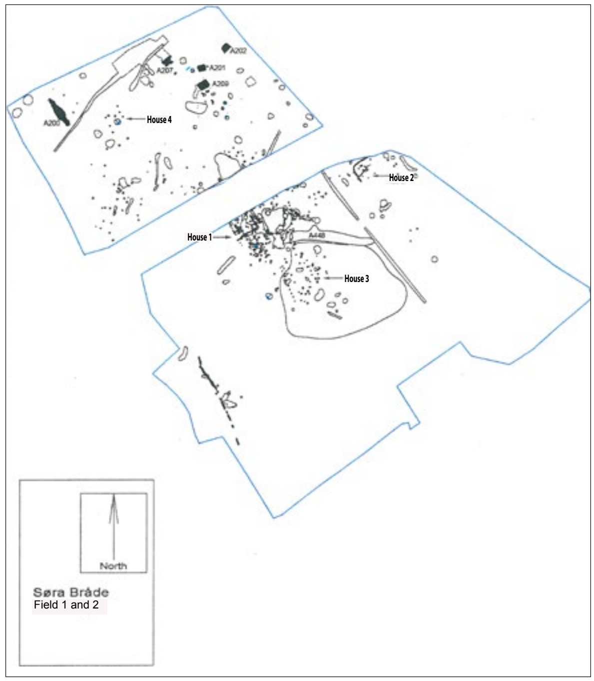

Figure 11. Buildings and burials at Søra Bråde. After Bertheussen 2008.

burials bears a great resemblance to the coffin burial in Ullandhaug, placed on top of the floor before the collapse of the stonewalls. The time gap between the abandonment of the building and the burial must have been short. Outside the building, a Viking Period boat burial had the same orientation as the building and the other burials.

An 8th century burial was found outside the largest building in the farm complex at Espeland, Sandnes municipality (Espedal 1966). The 42 meter long building from the Migration Period (MiP) had some sort of annex along the wall. The wall of the annex served as one of the sides in the rectangular inhumation burial (Thäte 2007: 103). While the excavator interpreted the many finds in the floor layer as an indication of the whole building being used as living area, Bjørn Myhre interprets this part of the building with the annex as the byre (Myhre 1980a: 310).

Five Viking burials were found in and around three smaller buildings at Skadberg, Sola municipality (Bjørlo 2011a). Two of the overlapping buildings had burials placed on top of the central aisle, a situation similar to that in house XIII from Myklebust. Burial 2099 (burial 1 in fig. 10), in house 6, was placed exactly where one would expect to find the building's central fireplace. Postholes in the corners of the deep, rectangular pit indicates some sort of wooden superstructure. Both burial 2099 and the adjacent burial 2144 (burial 2 in Fig. 10) cut through an older fireplace belonging to house 5, which dates to 500–1 BC. This burial had visible traces of a coffin. A third burial was parallel to the other two, all with the same orientation as house 6 (Fig. 10). Most of the datings from this building fall within the period 500–1 BC, however, features dating to AD 400–550 were also present. The fourth burial

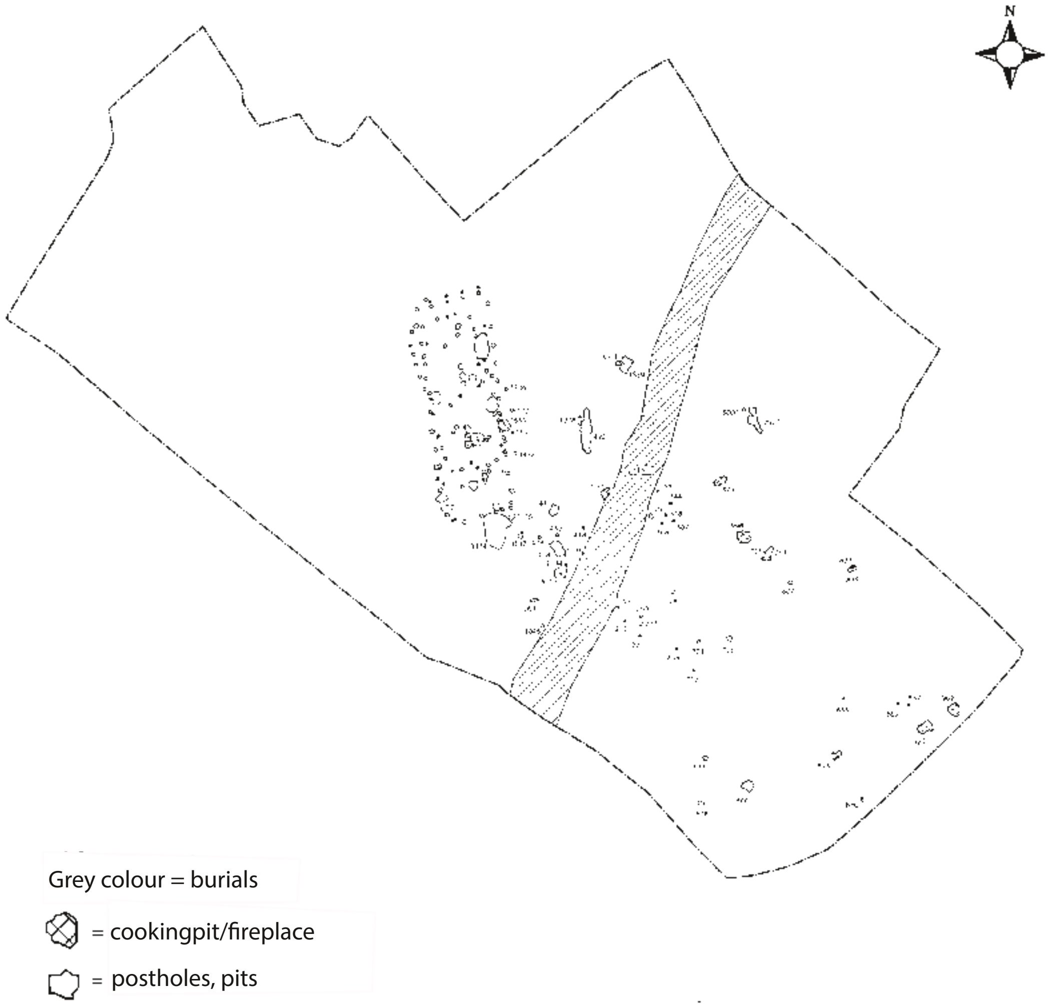

Figure 12. The site at Frøyland. Bjørdal 2009.

was located outside the wall of the Late Bronze Age (LBA) house 7, while a possible burial west of the buildings stands out with a circular shape and no finds (Bjørlo 2011a: 18–19).

As a parallel to Skadberg, Viking burials were also found next to Pre-Roman Iron Age buildings at Søra Bråde, Stavanger municipality (Fig. 11). The five burials are most likely all 9th century (Bertheussen 2008). An inhumation burial in a boat, with the same orientation as house 4, was located to the western part of the site. House 4 has not been dated, but it resembles the smaller, 500–1 BC buildings at Skadberg. Two buildings further south are dated to the transition between the LBA and PRIA. The rest of the burials were gathered on the eastern side of house 4, north of the buildings dated broadly to 1100–1 BC. Three burials are interpreted as inhumations in coffins, while one inhumation burial had a stone built chamber. One of the burials had postholes in every corner, similar to burial 2099 at Skadberg.

Four burials from the LIA were found next to two overlapping buildings from the Late Neolithic/Early Bronze Age at Frøyland, Time municipality (Bjørdal 2009). Two Viking Period boat burials have the same orientation as the two-aisled houses found at the site (fig. 12). One of the boat inhumation burials is particularly rich, interpreted as a female burial and dating to AD 800–900 (see table 1). Two of the burials from LIA have been interpreted as children`s burials. The two smaller burials might have been located within a three-aisled house cut by a broad, modern ditch. Unfortunately, the excavation at Frøyland was carried out in the middle of the winter, and due to the harsh weather conditions and lack of time the four burials and the two-aisled buildings were the only features that could be excavated. The long distance between the small, circular roof bearing postholes can imply a Bronze Age dating. However, since the postholes are neither excavated nor dated, we can only pinpoint a relation between burials from LIA and buildings from Late Neolithic/Early Bronze Age at Frøyland.

PATTERNS IN THE RELATIONSHIP BETWEEN BURIALS AND BUILDINGS

An overview of the relationships between burials and buildings is presented in the table below. The Merovingian Period grave field in Myklebust contains the only burials dated to the start of the LIA (Fig. 13). Among the burials with more precise datings within the Viking Period, twelve are dated to AD 900 and just three to AD 900–1050. Cremation burials also stand out as less common than inhumation graves. The radiometrically dated cremation burials dating to AD 550–800 give the impression of a short span of time between the burials. Similarly, the furnished inhumation burials at Søra Bråde, typologically dated to the 800s, seem to have been produced over a short time.

The single Viking burial from Myklebust, typologically dated to the AD 900–1050 represents an anomaly in an otherwise consistent body of material, characterized by small concentrations of 4 to 5 burials each. However, the grave at Myklebust was located on the edge of the survey area and it cannot be ruled out that it was part of a burial field stretching towards the east and the Merovingian Period burials. In spite of these differences, the Late Viking Period grave goods from Myklebust have a parallel in the similarly dated burial at Espeland. Another parallel is this burial`s location, right outside a 42 meter long main building from AD 150–550.

Regarding construction, one of the burials at Søra Bråde closely resembles the Viking grave in Myklebust. Both consisted of large and deep pits that must have rapidly filled up with soil and stones as soon as their wooden coffins or chambers decayed and collapsed. The large, round stones mixed in with the fill indicate that the grave would have had an outer covering of mixed stones and soil, probably in the form of a mound, later removed by agricultural activities.

In some instances, the recovery of nails from a grave gives a clear indication that a coffin was used. In cases with good preservation conditions, it has been observed that burials in coffins were placed on top of the floor of an abandoned building. In other circumstances, dark organic layers documented in the bottom of pits reveal the presence of the decayed coffin. Occasionally, postholes situated in the corners of a grave, interpreted as the remains of a wooden superstructure, remind us that a variety of wooden containers may have been in use. Some wooden structures may have been temporary, being used for a funeral ritual and removed prior to the closing of the burial.

Highly fragmented rivets and nails, considered as possibly belonging to a boat were found in the Viking burials at Myklebust and Søra Bråde. It is possible that boats, or at least parts of a boat, were used to cover these burials. Boat burials are common in burials related to older buildings. Rivets and nails have been found in most of the burials (see table 1). The shallow dug features would have only provided support for the keel of a boat, a reminder that we are generally only left with the remains and traces of the graves. Since most of the recently discovered burials are found in farmed fields, any mound or cairn covering the burials could easily have been removed during farming activities. Hence, one must be careful against automatically categorizing burials found under such circumstances as flat graves. In a more simplistic sense, the boat can be regarded as a wooden coffin, a very frequent feature in the material. In all of the examples where the outlines of a boat are clearly visible, their orientations are the same as those of nearby buildings. Even more common than wooden coffins are inhumation burials in rectangular pits, lying on the same orientation as the buildings they are related to.

The grave goods from burials related to older houses, particularly the elaborate jewellery, suggest a high frequency of female burials, with female burials being more than twice as common as male burials. We do, however, need to exercise caution here and acknowledge the problems related to identifying the sex of an individual based solely on grave goods. The burial record is, however, strongly dominated by inhumations, and as it is extremely rare to find unburned bones preserved in the acidic soil of Rogaland, osteological determination of sex is usually not an option. Grave goods are therefore still being grouped into typically female or typically male with some difficult objects in between. In this context, it is important to note that three quarters of all known LIA burials are assumed to be male burials. This makes the high frequency of female burials related to older buildings even more significant. In Vindafjord, in northern Rogaland, 90% of the burials have been interpreted as male (Høigård Hofseth 1988: 7), while at Klepp, in mid-Rogaland, a more even representation of the sexes is seen. This suggests a large regional variation.

One burial strongly stands out in this material. The burial of the so-called "Gausel Queen" is one of the richest burials in Norway (Børsheim and Soltvedt 2002). The fact that this burial was found along the aisle of an older building suggests that the individuals being buried in association with older buildings may have had a high status in LIA society. This can also be seen in the highly furnished female burials at Søra Bråde and Frøyland, and is mirrored in superimposed burials from Mälardalen in Sweden (Renck 2008, Stenholm 2012). In these cases both the burials and the buildings can usually be ascribed to the high ranking members of society. As in Rogaland, the most common pattern at Mälardalen is LIA burials found on top of buildings dated to AD 150–550 (Stenholm 2012: 197). This form of reuse can be understood as a material expression of connection to, and continuity with, ancestry and the past, as a reference to the past and a way of constructing memory. The reuse of places is such a striking pattern that it can be seen as a deliberate strategy in the LIA (Stenholm 2012: 10). In the same way, the quality and the quantity of the evidence for monument reuse as burial sites in Early-Saxon England, between the 5th and early 8th centuries AD, suggests that this reuse was not fortuitous, accidental or practical, but the deliberate appropriation of ancient structures within the ritual context of mortuary practices (Williams 1998: 1).

Burying the dead in or over the remains of 400-year-old buildings implies that these are considered to be significant ruins (see Herschend 2009). This idea may be particularly fruitful when considering farm complexes from AD 150–550, where the outer stonewalls are still visible in modern grazing fields. Indeed a clear pattern is for the burials to

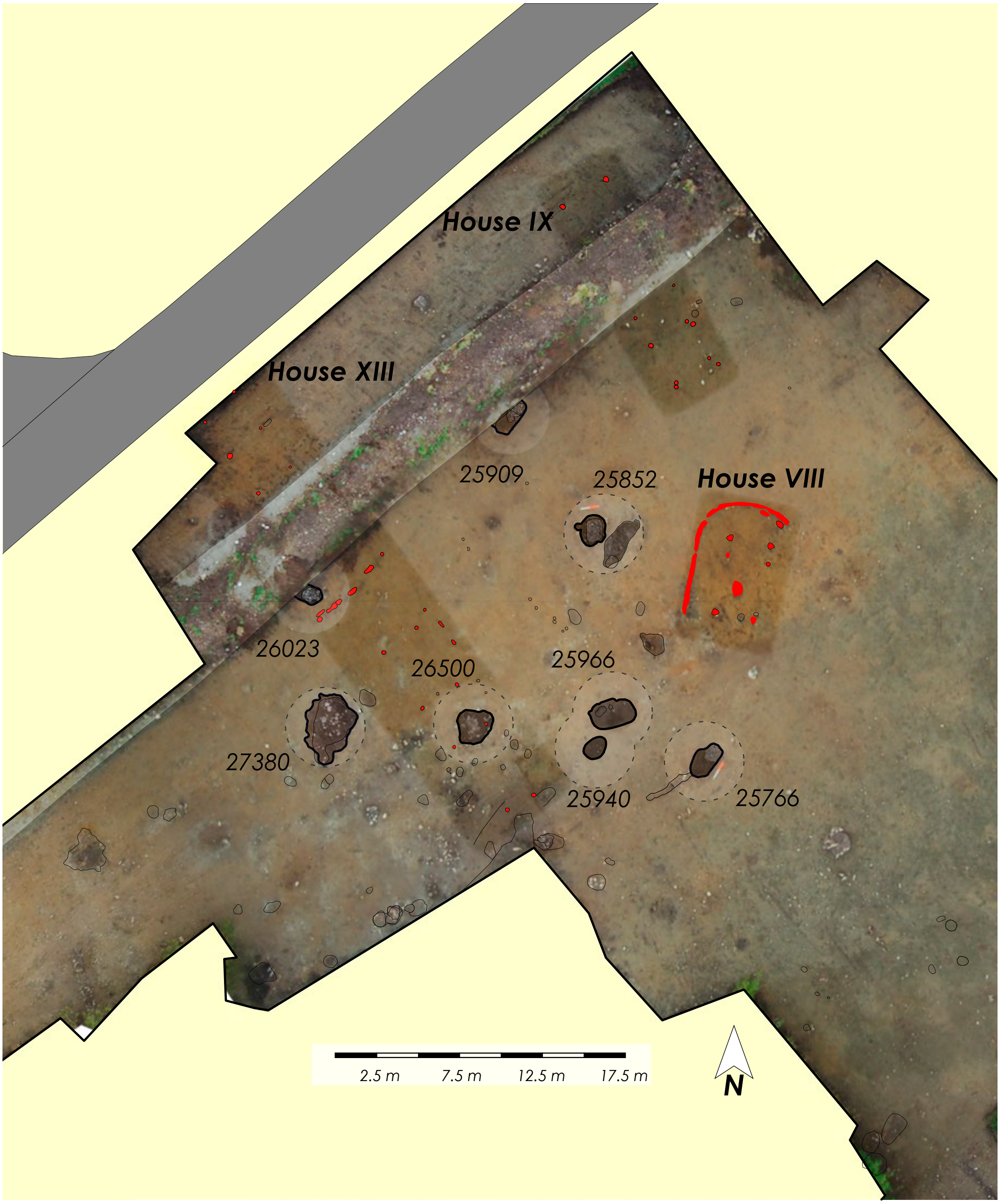

Figure 13. The Merovingian Period burial field at Myklebust.

be found in the stone walls of the older buildings. In some of the examples, the burials are placed over collapsed walls covering the floor. In these instances, buildings must have been abandoned for a considerable period of time prior to reuse for burial purposes. In other instances, when the burials are found directly on top of the floor, prior to wall collapse, the excavators have suggested that the interval between the abandonment of the building and the burial may have been short.

Burials are frequently found in association with the central aisle of buildings. They can be situated parallel to the building's main axis (like a fireplace), at right angles to it, or offset obliquely (see table 1 and 2). Several burials are placed along the building, between the wall and the row of roof bearing posts. Superimposed burials also seem to occur frequently at the corners of buildings. Several of the burials are also related to entrances (see Hem-Eriksen 2015). The material from Rogaland shows that some locations within the building are preferred over others, such as the central aisle and the fireplace, walls and entrances. This suggests that these areas played a special role in the LIA mind-set.

The significance of certain areas of the building can be seen in historical sources. When buying land in the Early Medieval Period, Gulating law requires the gathering of soil from certain locations on the farm in order for the farm to be "rightfully taken" (Robberstad 1969: 262, *Gulatingslovens Odelsløysing* chapter 28). First, soil needs to be taken from the four corners of the fireplace. Soil is then gathered from the middle of the long wall of the hall, where the seat of the leader had been located. It is also important to take soil from two boundary areas outside the buildings, where the grazing field and the farmed field meet and where the garden and the forest meet.

If we take a closer look at the buildings reused as burial places in the LIA, the majority of these stand out as large constructions. Where several buildings are clustered together, it is the largest building that is chosen for reuse. This is especially the case for farm complexes from AD 150–550, both those preserved and visible in modern grazing fields and those found by topsoil stripping of farmed fields. The burials tend to be placed over or next to the main building of the farm, specifically the central domestic area of the main building or, in cases where the entire building appears to have been used as domestic area, over the entire building. Burials associated with areas of buildings interpreted as byres, as at Ullandhaug, are less frequent. Some of the buildings with overlying burials show multiple phases and use over an extended period of time, as at Myklebust, Ullandhaug and Storrsheia. The Pre-Roman Iron Age smithy underlying the Gausel Queen burial itself seems to have been built over an earlier Bronze Age building. At Frøyland, there is evidence of a three-aisled building in the same area as a multi-phase two-aisled building. The burials at Skadberg were found associated with two overlapping, and thus non-contemporaneous, buildings themselves located near an earlier, Late Bronze Age building.

In the cases where we have detailed knowledge of the buildings later reused for burials, it is highly interesting that many of the burials are placed in or near rooms with a great number of fireplaces. While the fireplaces may indicate a long period of use and a broad range of activities, a central aisle packed with fireplaces can also indicate rooms used for gatherings of larger groups of people. Thus the LIA burials frequently appear in and around buildings and rooms that may have had a central role as focal points in the past. This pattern is in line with the material from Mälardalen, Sweden, where rich Viking burials are associated with large buildings in use over a long period and with many fireplaces. According to Stenholm, both the buildings and the burials could have played central roles in their societies (Stenholm 2012). Having considered possible patterns in the relationships between buildings and burials, the significance of, or motivation behind this phenomenon should be discussed.

AN ODAL FARMER DWELLING IN THE MOUND?

Burials placed on top of older houses can be interpreted as demonstrations of connections to earlier inhabitants and as a legitimization of affiliation. The house combines domestic and sacral elements in the sense that the affiliation can be perceived as both explicit and juridical, as ownership of land, and as a more symbolic connection to ancestors. This leads to the question: who would have had a strong need for such legitimization of ownership? Burials are not seen as directly mirroring the society, more as material arguments. The dead can be portrayed as something other than they were in life (Lillehammer 1996; Williams 2006: 5). This is not only the case when it comes to grave goods, but also in regards to the choice of burial location. It may be that burials placed on top of older houses reflect disputes concerning land rights during the LIA, specifically the ownership of old farmyards dating back to the EIA?

When discussing the connection to ancestors, we often emphasize genealogy. At the same time, it should be considered that new settlers in an area could have experienced a stronger need for legitimization of membership in the society and affiliation to the locale. Anna Maria Renck argues that superimposed burials in eastern Mälardalen were a means creating ancestry that legitimized claims over land owned by others (Renck 2008: 104; Löwenborg 2012: 19). The superimposed Merovingian Period burials at Mälardalen are different from the rest of the contemporary burials and are interpreted as indications of new people in the area. The opposite can be seen in Rogaland where inhumations in deep, rectangular pits rich in jewellery, tools and weapons are common patterns in the local Viking burial customs (Dahl forthcoming).

It can be argued that AD 150–550 is a period of massive expansion which left heavy material traces in the landscape (Myhre 1980b). In Rogaland, the archaeological record of the period gives an impression of densely spaced settlements in good agricultural areas. At the same time, new farms are established in higher, more marginal areas. This indicates an inner wave of settlement, an inner *landnam*. The Viking Period, on the other hand, had an outer wave of settlement. This outer *landnam* also involved huge transformations, both for the ones left behind and the ones who returned.

Did the expansive period AD 150–550 play a special role in the Viking Period? In a time of intense social transformation, were the dead purposely placed in association with the houses and graves of the EIA settlers? Stenholm argues for a common interest in the past in Scandinavia and Western Europe during the period AD 800–1050. Massive transformations in the settlement structure throughout Scandinavia led to an interest in the past directed towards houses and burials. The transformations culminate, in AD 800–1050, in an agenda of creating a genealogy, an origin and memory anchored in the period AD 150–550 (Stenholm 2012: 226). The older farmsteads, as visible expressions of historical depth, can have played an increasingly important role in the LIA mind-set as the society underwent huge transformations. The burials can be seen as a strategy to demonstrate rights – to property, to earlier inhabitants at the same place, and to older monuments (Zachrisson 1994; Holtorf 1998; Renck 2008; Löwenborg 2012; Stenholm 2012). Indeed, the buildings from AD 150–550 stand out as monumental when it comes to size and seeming permanence. The buildings could have been conceived of as monuments of an outstanding past, revitalized by being incorporated into burial customs during the LIA.

While both the buildings and the graves preserved in modern grazing fields can be considered as monuments, it is problematic to focus on the visible memory in the same way when it comes to the graves found in farmed fields. Since it is normally only the burial we find preserved in these fields, it might be more fruitful to use the burial itself as the starting point. Burial customs in the VP were heavily focused on the afterlife and, in particular, the journey to the realm of the dead (see Dommasnes 2001: 36–38, 131). Hence, grave goods are primarily considered as valuable tools for the journey to the other side. The placement of elaborately furnished chambers next to older buildings may also be a burial custom that intentionally hearkens back in time. The chambers stand out as well-equipped rooms for the dead (Birkeli 1943: 114), in this case as dwellings built in connection to older houses. Instead of focusing on the burials as well-equipped journeys away from the realm of the living, placement and burial customs might just as well represent a furnished dwelling closely related to the ruins of lived lives. In other words, the burials take on a growing resemblance to the house remains (see Herschend 2009), and dead buildings are transformed into monuments. Through the burial, a permanent room is created, a place in a previous social order from the EIA that had its centre precisely within the farmyard.

An inner wave of settlement in the period AD 150–400 implies that many of the farms must have been recently settled. The graves placed around the recently settled farmyards may have played an important role regarding the *odal*, and this materialization of *odal* rights may have continued into the LIA (Zachrisson 1994). In the EIA, it seems to be the first one who died in the newly settled farm that was buried close by the building. In the phase of establishment, or re-establishment, there might have been special needs to stress the close relationship between the inhabitants and the land. Burying a family member brings together and seals the relationship between the land and the family (Kristoffersen in Bakka et al 1993: 201). As described in Gulating law, mentioned above, several locations on the farm had a legal role as representatives of the farm, and some of these are repeatedly used for burials.

While the term “deserted farms” has been used to describe the preserved farmsteads in grazing fields, the burials placed over the abandoned buildings actually suggests that that the farms were still in use (see Gerritsen 2003: 95). The Merovingian Period grave field at Myklebust was located in the upper part of a ploughed field in use between the settlement in AD 1–250 and the establishment of the graves c. 600 AD (Dahl 2014). The botanical analysis from Søra Bråde shows that the grave field dating to AD 800–900 was established in a grazing field (Bertheussen 2008). It is also reasonable to assume that many of the abandoned houses from the period AD 150–550 were in use as grazing fields when the LIA burials were built. It is worth considering whether or not burials placed on top of older buildings in grazing fields were intended to highlight not only the previous settlers, but also the importance of grazing fields in the LIA. If this is the case, we can imagine an increasing emphasis on pastoralism, as a form of specialized adaptation to the local environment within a European trading network, a change in economy that could help explaining the transverse movement of the buildings in LIA (see Dahl 2014). In contrast to the Gamla Uppsala area in the period after AD 550–800 where the dominance of pastoralism has been established (Löwenborg 2012: 17), more focus needs to be directed towards sampling and analyses of the latest prehistoric agricultural traces in future rescue excavations in Rogaland to provide a better understanding of LIA agricultural practices. A plague (Löwenborg 2012) or several volcanic eruptions at the end of the

Migration Period (Büntgen et al 2016) could have created an abundance of land together with a shortage of labour that might have stimulated extensive farming such as animal husbandry. Such a crisis may have been a catalyst for social stratification where the superimposed graves are an expression of renewed or changed property rights (Löwenborg 2012: 19).

The material in this paper gives an impression of wealthy women as owners of the farmsteads established in the previous periods. Here the archaeological material seems to contradict the written medieval sources. The Law of Magnus Lagabøte from 1274 states that daughters should inherit goods and property not included in the *odal* rights, while the Gulating Law states that women under certain circumstances could inherit *odal* land (Zachrisson 1994: 220). It is possible that it was felt necessary to strengthen these exceptions to rights of inheritance through material expressions (i.e. graves). However, the female burials in these contexts are not the exception in the archaeological record, they are the rule. If we choose to consider these burials as marking the *odal* right, the archaeological material draws a completely different picture of women's rights of inheritance in Viking Rogaland than the one provided by written medieval sources. The awareness of the past in the Viking Period as described by Stenholm in the case of Mälardalen, stands out as a strategic use and entanglement of old and new monuments.

	GRAVES	HOUSES
Myklebust	**Inhumation burial VP (1), cremation burials MeP (8)**	**Farm complex LRIA/MiP and ERA**
	1. Inhumation burial (LVP):	Outside 42 meter long house from LRIA/MiP with many fireplaces
	Rectangular, deep pit with slabs along the edges and inner wooden construction	Outside the cattle-lane from the house
	Ring-headed pin, axe, sickle, knifes, button, bone comb, nails, cup mark stone, unburned bones	Obliquely oriented compared to the building
	2. Cremation burial (MeP) (8):	House from ERIA
	Cairn 26500 (MeP)	Central aisle in ERIA house
	Burned bones, whetstone, black-burnished sherds	Across central aisle in the house
	Cairn 27380 (prob MeP)	Outside wall of ERIA house
	Black-burnished sherds	Obliquely oriented compared to the building
	Rectangular pit with stone packing in one end 26023 (prob MeP)	In the aisle of ERIA house
	Burned bones	Same orientation as the building
	Rectangular pit with stone packing in one end 25909 (prob MeP)	In between two houses from ERIA and house from EBA
	Flintflakes	Opposite orientation compared to the ERIA houses
	Rectangular pit with stone packing in one end 25766 (MeP)	Outside houses from ERIA and EBA
	Burned bones	Opposite orientation compared to the ERIA houses
	Cremation burial 25966 (MeP)	Outside, towards SE-corner of house from ERIA
	Burned bones, sherds	Obliquely oriented compared to the houses

	Cremation burial 25940 (MeP)	Outside, towards SE-corner of house from ERIA
	Bead, burned bones, sherds	Opposite orientation compared to the long houses
	Stone packing with surrounding charcoal layer 25852 (prob MeP)	Between two houses from ERIA and a house from EBA
	Fragments of iron, flintflakes, quartz	Same orientation as the EBA house, obliquely compared to the ERIA houses
Øksnavad	**Inhumation burials VP (4-5)**	**Farm complex LRIA/MiP**
	Inhumation burial (EVP) (2006)	In the farm yard
	Rectangular pit. Inner wooden construction within cist	Between two entrances in the two long houses
	Sword, ring-headed pin, belt buckle, knife, nails, human teeth	Opposite orientation compared to the long houses
	Inhumation burial (VP) (2009)	In living room with several fire places, south in the long house
	Rectangular pit. Weapons (sword). Not cataloged yet.	Obliquely oriented compared to the long house
	Inhumation burial (VP) (2009)	Outside living room in the long house, by SE-corner
	Rectangular pit. Weapons (sword). Not cataloged yet.	Same orientation as the long houses
	Inhumation burial (VP) (2009)	Outside eastern wall of long house
	Rectangular pit. Finds, but no sword. Not cataloged yet.	Opposite orientation compared to the long houses
	Possible inhumation burial (VP) (2009)	In the farm yard between the long houses. Garbage pit with slabs or well
	Rectangular pit. No finds.	Same orientation as the long houses
Gausel	**Inhumation burials VP/LIA (2)**	**House LRIA/MiP and PRIA**
	Grave 1006 (LIA)	House 7 from LRIA/MiP
	Placed in the older stone wall. A cairn covered the burial	In outer stone wall, close to corner
	9 glass beads, arrowhead, spindle whorl, sickle, heckles, knifes, belt-hook, ring of iron, nails,	Main building, only partially preserved
	pottery sherds, slag, horse teeth, burned bones, oval stone	SE-corner of living room with fireplaces. Several building phases.
	Grave 1883 (EVP)	House II from PRIA
	Cist post excavated in 1997. Originally covered by a mound	In the aisle, between wall and fireplace and forge
	Gilded mounts, mounts for reliquary casket, bridle, strap buckle, oval brooches, equal-armed	On the northern side of an entrance
	brooch, bronze pin, silver armlets, jet ring, glass beads, bronzemounts for drinking horn, rivets	Smithy. Possible older building under the smithy
	spit, pan, bronze vessel, knifes, shield boss, scissors, weaving sword, horse teeth and cranium	Same orientation as the building
Ullandhaug	**Long barrows LIA (2), inhumation burials EVP (2), cremation burial LIA (1)**	**Farm complex LRIA/MiP**
	Long barrow 11 (LIA)	House 1 (LRIA/MiP)
	Inner, boat shaped stone setting. Rectangular chamber. No finds	The shape of the barrow fits the walls of the house in the northern room (barn)
	Long barrow 12 (LIA)	House 1 (LRIA/MiP)
	Boat shaped. No finds. Charcoal layer in the bottom (Helliesen 1900)	On top of SE-entrance to the main living room (part of two opposite entrances)

	Inhumation burial I (EVP)	House 3 (LRIA/MiP)
	Coffin placed on top of the charcoal layer in the burned down house. Covered by a mound	In collapsed wall, inside two opposite entrances in living room
	Axe and 42 nails	In living room with many fireplaces
	Cremation burial II (LIA)	House 3 (LRIA/MiP)
	Covered by a small, round cairn	In western wall, in the middle of the house. Living room
	Burned bones	In living room with many fireplaces
	Inhumation burial III (EVP)	House 3 (LRIA/MiP)
	A layer of pebbles covered a wooden coffin	Outside wall, outside living room with the two other graves
	Oval brooch, bronze armlet, belt-hook, round stone, nails, iron fragments	
Storrsheia	**Cremation burials VP (2-3), mounds (2)**	**Farm complex LRIA/MiP and VP**
	Cremation burial (EVP) (1-2)	House 1 (MiP)
	On top of a big stone in the wall: Weaving sword, oval brooch, spindle whorl	Cut down in the outer wall. Same orientation as the building
	Behind a big stone in the wall, 24 cm deeper: Knife, parts of heckle, burned bones	In living room with many fireplaces. Longest house in the complex
	Cremation burial (VP)	House 2 (LIA)
	In the wall, cut down to the same level as the natural subsoil	Into wall in long, stone built entrance. House with one room, several phases
	Two whetstones of slate, burned bones	Obliquely oriented compared to the houses
	Long barrow (LRIA?)	House 2 (LIA)
	Two fireplaces under the barrow can be interpreted as traces of cremations	Outside the wall of the house. House with one room, several phases
	Spread in the barrow: 586 pottery sherds, burned bones, charcoal and slag	Same orientation as the building
	Mound (LIA)	House 6 (LRIA)
	Spread in the mound: 12 pottery sherds, part of a cooking pot of soapstone, nails, slag, barch	On top of collapsed wall to the living room. Many, big fireplaces
Rossaland	**Inhumation burials VP (2)/LIA (1)**	**House MiP**
	Inhumation burial (EVP)	On top of house from MiP
	Rectangular chamber with slabs along the edges, on top of big stone in the floor	In the corner of the house
	Oval brooch, bronze pin, spindle whorl	
	Inhumation burial in coffin (LIA)	On top of house from MiP
	Coffin placed on top of the floor in the house	In the corner of the house
	Sword, sickle, file, nails	Same orientation as rectangular chamber, house and boat burial
	Inhumation burial in boat (VP)	Outside house from MiP
	Glass bead, hammer, whetstones, flint, flywheel, strap buckle, arrowhead of iron	Same orientation as house and graves within the house
Espeland	**Inhumation burials VP (1), MiP (1)**	**House LRIA/MiP**

	Inhumation burial (LVP)	Outside wall in house from MiP
	Stone built, rectangular chamber covered by stones from the walls of the house	
	Ring-headed pin, axe, knife	Same orientation as the house
	Mound (MiP)	Outside house from MiP, in the wall of smaller house older than MiP
Skadberg	**Inhumation burials VP (5)**	**Houses LBA, PRIA/MiP**
	Inhumation burial 2099 (EVP)	House 6 (PRIA/MiP)
	Rectangular pit. Postholes in the corners	Along the central aisle of the house. Same location and orientation as a fireplace
	Oval brooches, spindle whorl, knife, handles and hooks, mounts, nails, iron rod, round stone,	Same orientation as the house and burial 2144 close by
	burned bones	Cuts a fireplace from PRIA belonging to house 5
	Inhumation burial 2144 (EVP/LVP)	House 5 (PRIA)
	Rectangular pit. Visible traces of a wooden coffin	Across the central aisle in house 5. Same orientation as house 6 and the burials
	4 glass beads, soapstone bead, spindle whorl, mounts, nails, small iron rod	Cuts a fireplace from PRIA belonging to house 5. In living room in house 5
	Inhumation burial 1889 (VP)	Outside of house 5 (PRIA)
	Rectangular pit	Outside the wall, towards the SE-corner.
	Knife, round stone, nails, iron fragments and wire	Obliquely oriented compared to house 5, but same as house 6 and the graves
	Inhumation burial 6182 (LVP)	House 7 (LBA)
	Rectangular to oval, deep pit. The finds were under a stone packing	By the wall. Outside room without fireplace
	2 glass beads, amber bead, bronze pin, head of a weaving sword, sickle, knife, key, nails,	Obliquely oriented compared to house 7 , but same as house 6 and the graves
	mounts, round stone, traces of textiles and wood, human teeth	
	Possible inhumation burial 11670	Outside house 6 (PRIA/MiP)
	Sircular, three layers of stones. No finds	In line with three rectangular burials
Søra Bråde	**Inhumation burials EVP (5-6)**	**Houses PRIA**
	Inhumation burial in boat A200 (EVP)	Outside house 4 (undated)
	Boatshaped. Originally covered by a mound plowed away	Same orientation as house 4 and house 1
	Amber beads, mounts, arrowheads, knife, fragmented shield bosses, iron fragments, slag	
	Inhumation burial in coffin A201 (EVP)	Outside house 4 and house 1 (PRIA)
	Rectangular, inner wooden construction or coffin	Opposite orientation compared to the houses
	Oval brooches, plate fibula of silver, amber bead, weaving sword, spindle whorl, nails, burned	
	bones, fur, iron-, textile- and woodfragments	
	Inhumation burial A202 (VP)	Outside house 4 and house 1 (PRIA)
	Rectangular. Postholes in the corners. Disturbed.	Opposite orientation compared to the houses

	Carnelian bead, amber bead, iron mounts, nails, traces of textiles	
	Possible inhumation burial A207	Outside house 4 and house 1 (PRIA)
	Almost rectangular. Modern fill. No finds	Opposite orientation compared to the houses
	Possible inhumation burial in coffin A208 (LIA)	Outside house 4 and house 1 (PRIA)
	Very disturbed and uneven	Between the other burials
	Iron fragments, nails, fur/hair	
	Inhumation burial in cist A209 (LIA)	Outside house 4 and house 1 (PRIA)
	Rectangular. Stone walls. Disturbed	Opposite orientation compared to the houses
	Gilded bronzebutton, amber bead, silver-, bronze- and ironfragments, iron ring, nails, burned	
	bones	
Frøyland	**Inhumation burials LIA (4)**	**Houses LN**
	Inhumation burial in boat (VP)	Outside houses from LN
	Boatshaped pit	Same orientation as houses and the other boat burial
	Spearhead, knife, whetstone, rivets, nails, iron fragments	
	Inhumation burial in boat (EVP)	Outside houses from LN
	Oblong	Same orientation as houses and the other boat burial
	Equal-armed brooch, oval brooches, 18 glass beads, amber bead, strap buckle,spindle whorls,	
	sickle, scissors, knife, whetstone, key, button, pottery sherds, nails, iron fragments, slag,	
	burned bones, human tooth	
	Inhumation burial (LIA)	Outside houses from LN
	Rectangular stone packing. Interpreted as child burial	Outside SE-corner of LN house
	Arrowhead, sickle, knife, nails, iron fragments	On top of a three-aisled building?
	Inhumation burial (LIA)	Outside houses from LN
	Small. Interpreted as child burial	Outside SE-corner of LN house
	Small sickle, nails, iron rods	On top of a three-aisled building?

Abbreviations:

EBA Early Bronze Age
EIA Early Iron Age
ERIA Early Roman Iron Age
EVP Early Viking Period
IA Iron Age
LBA Late Bronze Age
LIA Late Iron Age
LN Late Neolithic
LRIA Late Roman Iron Age
LVP Late Viking Period
MeP Merovingian Period
MiP Migration Period
RIA Roman Iron Age
PRIA Pre-Roman Iron Age
VP Viking Period

Table 1. Relations between burials and buildings.

	Burials	Houses	Relation
Myklebust	MeP (8)	ERIA	Central aisle, aisle, by the wall, outside
	VP (1)	LRIA/MiP	Outside
Nedre Øksnavad	VP (4-5)	LRIA/MiP	In living room, outside entrances, outside
Gausel	LIA [1]	LRIA/MiP[1]	In the wall
	VP[1]	PRIA[1]	Along the aisle
Ullandhaug	LIA (3)/VP (2)[2]	LRIA/MiP	In the wall, by entrance, outside
Rossaland	VP (2)/LIA (1)	LRIA/MiP	Over house, outside
Espeland	VP (1)[2]	LRIA/MiP	By the wall, by the annex
Storrsheia	VP (2)[2]	LRIA/MiP, LIA	In the wall
Skadberg	VP (5)	PRIA/MiP	Central aisle, by the wall, outside
Søra Bråde	VP (5)	PRIA	Outside
Frøyland	VP/LIA (4)	LN/EBA	Outside

1 More burials and houses from the period PRIA-MeP were found, but the mentioned burials are the ones that were placed directly on top of identified houses.
2 The burials mentioned in numbers are the ones found on top of and beside houses.

Table 2. A summary of the relationships between burials and buildings.

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COOKING AND FEASTING: CHANGES IN FOOD PRACTICE IN THE IRON AGE

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ABSTRACT

This article seeks to explore to what extent food practices were altered with the establishment of a new social structure in Late Iron Age, specifically in relation to an assumed abandonment of open air-cooking pit sites and changes in kitchen utensils in the late 6th century AD. In the Late Iron Age, new types of kitchen utensils, such as roasting spits, frying pans and various types of vessels appear in the grave material. New ways of handling waste may also be visible from the Viking Age onwards. These changes are discussed with reference to theories of commensality and feasting, and with regards to a newly excavated site at Guåker in Stange, Hedmark.

INTRODUCTION

Food and food preparation are important aspects of society because they encompass fundamental practices that structure everyday life as well as social and ritual settings. The 6th and 7th - centuries AD witnessed profound changes in many ways, both cosmological and institutional (Herschend 2009; Hedeager 2011; Ystgaard 2014). Change is manifested through architecture, in the numerous abandoned settlements, in the grave goods and overall burial customs, in the production of pottery and in the political landscape. Suggested explanations include social change, war, plague, climatic changes, changes in the hereditary rights, or different combinations of these (Gräslund 2007; Gräslund and Price 2012; Löwenborg 2012; Iversen 2013).

As this transitional period is often analyzed in a macro-perspective, through elite manifestations like large burial mounds and hall-buildings, I wish to highlight the processes of change through an alternative perspective. This article seeks to explore to what extent food practices were altered with the establishment of a new social structure in Late Iron Age by discussing an assumed abandonment of open air-cooking pit sites and changes in kitchens utensils in the late 6th century. Through the years numerous cooking pits have been excavated in Norway. Their use and function have been thoroughly discussed (e.g. Gustafson et. al. 2005), but as will be argued, their primary function, at least in the setting of large sites of cooking pits, seems to have been as ovens for dry-cooking. The dating of cooking pits indicates that they are predominantly used in the Early Iron Age, c. 500 BC–AD 600, with a peak in the period c. AD 200–500 (Narmo 1996; Gjerpe 2001; 2008; Diinhof 2005; Gustafson et. al. 2005; Kjos 2007; Samdal og Bukkemoen 2008; Bukkemoen og Simonsen 2009; Baar-Dahl 2012; Derrick 2012; Iversen 2013). Although cooking pits are still in use in the Late Iron Age, the numbers are low compared to earlier periods. During the 6th century, a previously rich and vibrant pottery production ends (Rødsrud 2012; Fredriksen et. al. 2014) and new culinary objects like roasting-spits, frying-pans and soapstone-vessels are introduced in the grave goods. These might represent a break with the earlier practices of cooking. The possibility of new manners of waste handling are discussed in relation to layers of fire cracked stones and kitchen refuse in the vicinity of historical farms (e.g. Pilø 2004; Grønnesby and Heen-Pettersen 2015). The important role of drinking in Iron Age society is emphasized by many (Enright 1996; Gjerpe 2001; Rødsrud 2012). However, the use and preparation of food in communal settings is rarely focused upon. By using different archaeological data I wish to broaden the perspectives on social practice in this period.

COMMENSALITY, FEASTING, AND FOOD PRACTICE

Commensality is a fundamental aspect of all meals, both spectacular feasts and meals shared by family members as part of the daily routine (Pollock 2011: 9). At its simplest, commensality is about eating and drinking together, but it is far more than just a physical act. It also comprises the myriad of social and political elements entailed in those occasions (Pollock 2011: 9). Food practice and commensality also comprises sensual aspects, the material world eliciting emotional responses in human beings (Harris and Sørensen 2010; Hamilakis 2013). The practice of eating is therefore a complex business.

It has been proposed that feasts are commensal events that disrupt normal temporality and produce time as a distinctive moment (Hamilakis 2008). This disruption can be materialized through eating in an unusual locus, sharing a meal with people outside the normal social unit, by consuming unusual food, often but not always in excessive quantities, or following distinctive rituals, such as animal sacrifice (Hamilakis 2008). Yet there is fair reason to believe that feasts have been intimately involved in the processes of social change (Dietler and Hayden 2001: 16) and that food can function as a political tool (Dietler 1996). Food and feasting has for some time been recognized as having a prominent role in the emergence of social hierarchies and in the negotiation of power and identity (Bray 2003: 1). Likewise, class, gender, and ethnicity are deeply implicated in distinctive sensorial regimes (Hamilakis 2013: 3). As "embodied material culture", food has an unusually close relationship to the person and to both the inculcation and the symbolization of concepts of identity (Dietler 2010).

The archaeological material from houses and graves as well as the written sources make it evident that feasting was ideologically and symbolically important in the Iron Age (Herschend 1997; Lönneroth 1997; Eriksen 2010; Rødsrud 2012; Likewise, hall-buildings, and thereby feasting, are believed to display strategies and negotiations of power and status (Herschend 1997; Eriksen 2010). Food preference and the way a meal is prepared and consumed is a socially constructed and dynamic concept (Bourdieu 1995). However, most people within a limited geographical region ate more or less the same thing. The crucial point is to examine the products, preparations and consumption that have been used to distinguish between cultural groups, genders or social ranks (Montanari 1994:7; Bourdieu 1995; Isaksson 2000:9; Eriksen 2015:73). As will be discussed later on, a meal serves two diametrically opposed semiotic functions; it can serve to indicate and construct social relations characterized by equality, intimacy, or solidarity; or, it can serve to sustain relations characterized by rank, distance, or segmentations (Appadurai 1991: 496).

COOKING AND FEASTING IN EARLY IRON AGE – WHAT HAPPENED TO THE COOKING PITS?

There are several categories of Early Iron Age material associated with food preparation, meals and feasting. The Iron Age longhouse, as a basic social institution (Herschend 2009; Eriksen 2015), represents a key space for (everyday) commensal activities, and all activities inside the house seem to be structured to a great extent by the placement of the hearths (Webley 2008; Bukkemoen 2015; Eriksen 2015). Nevertheless, an analysis of changing interior, e.g. the morphology and placement of hearths exceeds the limits of this article but has a potential in future research.

One of the most common structures unearthed on archaeological excavations are cooking pits, and sites with large numbers of cooking pits, the so called specialized sites, will be the central category of discussion. A cooking pit contains a layer of fire cracked stones at the bottom, most often with a layer of charcoal underneath. The stones' primary aim is to store heat; as the pit is sealed by a layer of turf the heat will create an excellent oven for cooking of meat or fish. Cooking pits are most commonly found on Iron Age settlement sites but do also appear in grave fields, outlying fields, and in isolated large clusters. The dating of cooking pits show that they are predominantly used in the Early Iron Age, c. 500 BC– AD 600, with a peak in the period c. AD 200–500 (Gustafson 2005: 105). There seems to be a consensus that their main purpose is food preparation (Gustafson et. al. 2005), although there exist examples of alternative uses. Some pits might have been used in craft production, e.g. production of cod liver or blubber oil (Isaksson 1996; Solberg 2014), but interpretations as e.g. sauna or pits for human sacrifice have also been promoted (Gustafson 1993; Oestigaard 2000). Numerous ethnographic examples underline the use of earth ovens or cooking pits for preparation of large quantities of food, and are still commonly found in the Pacific region (Lerche 1970; Heibreen 2005; Perminow 2005). Material remains from cooking pits are most often from the layer of back fil on top of the pits. Thus the material might mirror secondary use of the area and not the actual function of the pits (Langsted 2005). Analysis of animal lipids from cooking pits has not yielded convincing results but does not exclude the use of pits for food preparation (Langsted 2005).

During the last 20 years, numerous open-air cooking pit sites have been unearthed. Sites generally vary from about 20 pits to more than 500 (e.g. Narmo 1996; Gjerpe 2001; 2008; Kjos 2007; Samdal and Bukkemoen 2008; Bukkemoen and Simonsen 2009; Baar-Dahl 2012; Derrick 2012; Iversen 2013). None of the sites are excavated in their entirety and the total number of pits is quite likely considerably higher. Such sites are well known in Northern Europe, primarily Denmark, Sweden and northern Germany as well as Norway up to Trøndelag. In South Scandinavia and Germany the fields seem to date back to the Bronze Age and Pre Roman Iron Age (Heidelk-Schacht 1989: 225; Thörn 1993; Henriksen 1999; 2005) while the sites in Northern Scandinavia are normally later (Martens 2005). An overview of cooking pits from Vestfold show that specialized sites are most intensely used in the Roman period, AD 200–400 (Gjerpe 2008; Baar-Dahl 2012). This trend is supported by the results from Foss nordre in Sørum, Akershus, although

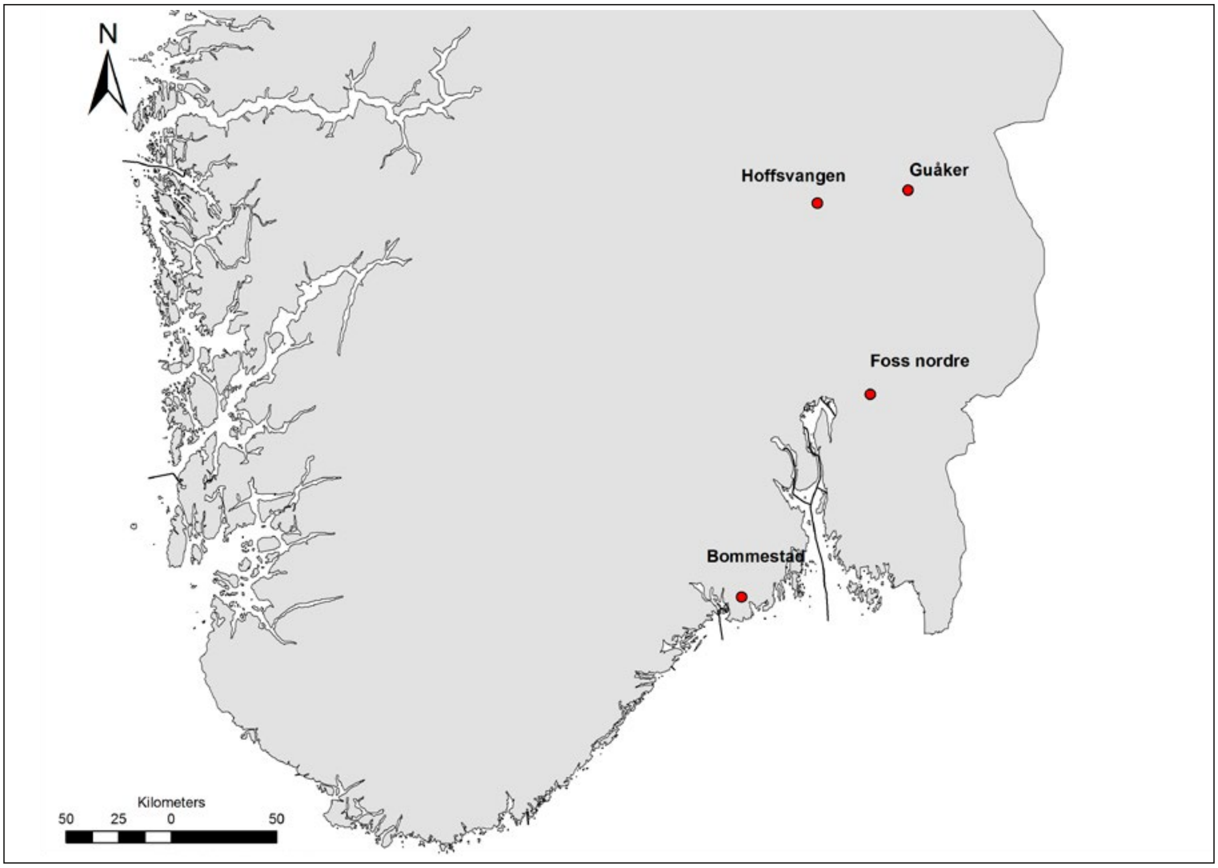

Figure 1. The southern part of Norway with the sites mentioned in the article. Illustration by Grethe Bukkemoen, Museum of Cultural History.

sporadic use in the Late Iron Age is also documented (Bukkemoen and Simonsen 2009).

The preservation conditions for bones are poor in most parts of Eastern Norway, nevertheless some burned and unburned bones and teeth are occasionally found in the pits. Remnants of animal heads, generally horse, are frequently found in the top layer of cooking pits, and might represent cultic aspects connected to the head (Oma 2005). At Bommestad, in Vestfold, a site with more than 500 pits, a total of c. 300 g of Roman Period pottery was found in addition to burned bones of beaver, cattle and unspecified mammal (Gjerpe 2008; Samdal and Bukkemoen 2008). At Foss nordre, in Sørum, Akershus, a well preserved site with c. 200 cooking pits surrounded by grave mounds, 14 % of the pits contained finds, mainly of burned animal bones or unburned teeth of cattle, but also shards of pottery, an iron knife, a whetstone, an iron needle and a horse bridle (Bukkemoen and Simonsen 2009). At Hoffsvangen, Østre Toten, Oppland, a total of c. 500 cooking pits was unearthed. The site was established in the early 2nd –century AD and had its height in the 4th to 5th –centuries AD through

Figure 2. Foss nordre in Sørum, Akershus; an open air cooking pit site surrounded by gravemounds that are now damaged by ploughing. Photo: Tom Heibreen, Museum of Cultural History

to the mid-5th -century AD. Sporadic use is documented in the Merovingian and early Viking Age. More than 50 % of the pits contained cattle teeth, unburned animal bones or a combination of these finds (Derrick 2012). Supported by the finds from Guåker, Stange, Hedmark (Bukkemoen 2010) presented below, it seems rather likely that at least for the large sites the cooking pits' main purpose is food preparation and consumption.

Considering the time aspect, preparing a meal using cooking pits was not an everyday activity. This assumption is supported by the ratio of pits relative to their time depth, both on cooking pit sites and in settlement contexts (Gustafson et.al. 2005). Preparing meat might also be associated with special occasions. A Swedish study based on analysis of lipid-extraction from pottery found in settlement-contexts and graves indicates that meat is not so prominent in everyday-cooking but has had an exceptional cultural and mythological position (Isaksson 2000; 2003). Furthermore, recent studies suggest that members of the same household could consume different types of food, based on age and/or social status (Naumann et. al 2014).

Large clusters of pits may represent communal sites for gathering with a pronounced culinary aspect. The cultic or ritual aspect inherent in these communal meals and their preparation is stressed by several archaeologists (e.g. Bergstøl 2005; Diinhof 2005), most clearly by Lars Erik Narmo (1996) in his interpretation of the cooking pit site at Leikvin in Sunnmøre. Various researchers highlight the resemblance between cooking pits and the *seydir* mentioned in early Scandinavian written sources. The *seydir* is most likely a cooking pit where a meal is prepared as part of the pagan tradition of sacrifice, *blót* (Narmo 1996; Diinhof 2005; Steinsland 2005:276). The meal is then considered a sacrifice to the gods. The egalitarian structure that these feasts and sites reflect is stressed by Lars Erik Gjerpe (2001), who emphasizes the political and social function of the meals, probably arranged by men of more or less equal status and rank. Gjerpe suggests that all participants contributed meat and beer to the feast, and he puts great emphasis on intoxication as an important part of the feast. The administrative dimensions of these sites are also central in novel works on the subject (Ødegaard 2015).

Feasts are ritualized social events in which food and drink constitute the medium of expression (Dietler 1996: 89). In this respect, food can likewise be crucial in the production of collective remembrance (Hamilakis 2013: 84). Cooking pit sites appear strongly regulated and arranged, placed in areas without traces of settlement. As such, they can, in Hamilakis' (2013: 87) terms, materialize the disruption of normal temporality by eating in an unusual locus. The meal, as in preparation, eating and drinking, is obviously the center of attention, and the duration gives an opportunity for social interaction. A ritual meal differs from an ordinary meal in, amongst others things, the way the meal is prepared and consumed (Hamilakis 2013: 87), and in the *blót* the meat and its treatment are essential elements. Crucial in this respect is the evocative power of sensuous memory generated through eating, connecting people to places (Hamilakis 2013: 85). In a sacrificial meal both man and gods were brought together creating a state of *friðr* (peace), a harmony between man and the gods (Steinsland 2005: 276). Participating in the ritual meals was considered crucial for the social status in the Iron Age and being shut out meant that you were *fredløs*, an outlaw (Steinsland 2005: 279). As with Gjerpe, Steinsland (2005) emphasizes the *blót* as a shared meal where food and drink were provided by all participants thus creating an ideal environment for discussion and interaction as important parts of commensal acts (see also Pollock 2011).

CHANGES IN POTTERY PRODUCTION IN THE MIGRATION PERIOD

The use of cooking pits fades during the transition to the Late Iron Age. Likewise pottery production disappears totally in the Merovingian period. The production of pottery is vital in the Early Iron Age and different types of vessels, both finely decorated table ware and common utility vessels are frequently found in contemporary graves. A study of pottery and vessels from eastern Norway show that early in the period the vessels are used as cremation urns, but from the beginning of the Roman Period (AD 1) complete sets of vessels for food and drink were also placed in the graves alongside the deceased. The scene is reminiscent of a table setting associated with ritualized feasting (Rødsrud 2012; 2016; this volume). In the later part of the Migration Period (c. AD 550), there is a marked decrease in the practice of placing clay vessels in burials, and in the Merovingian Period this practice became obsolete and ceased altogether (Rødsrud 2012; 2016; Fredriksen et. al. 2014). A novel article on bucket-shaped pots suggests that at the peak of their development the pots were made in intimate connection with high-quality metal objects, perhaps even made in goldsmithing workshops by smiths themselves (Fredriksen et. al. 2014). The production of pottery had become increasingly excluded from the everyday material repertoire of the household, perhaps related to societal changes and changes to burial symbolism culminating in ceramic containers no longer being members of the material world (Fredriksen 2006). Bucket-shaped pottery thus became tied to the ideology of commensality and elite production of high-quality metal objects (Fredriksen et. al. 2014: 14).

THE INTRODUCTION OF NEW FOOD PRACTICES IN THE MEROVINGIAN PERIOD

Although the use of cooking pits does not cease completely by the end of the Early Iron Age, the frequency changed dramatically, as illustrated by the abovementioned sites. The use of pottery on the other hand, seemed to end more suddenly. Does this indicate spatial and technological changes related to food practice in the 5th and 6th centuries? It is suggested that a consequence of the development of a more hierarchic society in Late Iron Age was that the communal meals were, to a larger degree, moved indoors (Herschend 1992; Gjerpe 2001; Ystgaard 2014; Eriksen 2015). Furthermore, new elements in the grave goods in the periods to come might indicate not only the use of new cooking techniques but also the use of food in political contexts and as a means to signal group identity.

Different types of vessels made of iron or soapstone represent the most noticeable changes in cooking utensils as they seem to replace pottery as the main utensils for every day cooking (Petersen 1951; Skjølsvold 1961; Rabben 2002; Baug 2015). However, different types of frying equipment also turn up in graves in this period, although in relatively small numbers. From both literary and archaeological

Figure 3. Iron roasting spit from Liltvedt in Hurum, Buskerud (C409). Photo: Ellen C. Holte, Museum of Cultural History. Iron frying pan from Aakeren in Tokke, Telemark (C1757). Photo: Eirik Irgens Johnsen and Ove Holst. Museum of Cultural History.

sources we learn that roasting spits of metal were a well-known object in ancient Greece and date back to 700 BC (Bøgh-Andersen 1999). The use of roasting-spits spread from Greece via Italy and northwards and was adopted early by the Celts. During the Merovingian period the first roasting spits of metal occur in the Nordic area, with a clear connection to warrior graves (Rabben 2002). Susanne Bøgh-Andersen (1999: 69) has convincingly shown that roasting-spits most likely are associated with the aristocracy, as the spits from Sweden in the Merovingian period are known exclusively from the rich male boat graves in Vendel and Valsgärde in Uppland. A total of 72 spits are documented (Bøgh-Andersen 1999), and as many as 50 are found in Norwegian graves. The material is clustered in two main areas; Western Norway and the Oslofjord-area. There seems to be a connection between high-status graves, especially warrior graves, and kitchen utensils in this period. Along with the spits the roasting grates and the frying pans underline a seemingly new focus on different cooking techniques as roasting and frying, at least for the upper strata of society. The oldest examples of fry-pans go back to the 7th century, but the majority of pans are dated to the period AD 850–1000 (Petersen 1951; Rabben 2002: 43–44).

COOKING AND EATING AT GUÅKER IN STANGE, HEDMARK

To investigate the tendencies proposed thus far in this article, I will use newly excavated material from Guåker in Stange, Hedmark. The site at Guåker was excavated by the Museum of Cultural History in 2009 (Bukkemoen 2010).

A total of 93 cooking pits were unearthed along with an area used for waste management. The area of excavation was limited by the requirements of the project and the number of cooking pits is supposedly much higher. The activities at Guåker display an evident horizontal stratigraphy as they appear grouped according to date. Furthermore, the activities seem to reflect aspects related to food practice in the transition between Early and Late Iron Age. A main area of cooking-pits in the north dating from the Roman and Migration periods was dominated by seemingly standardized large pits, round or oval in form. One small pit, east of the main clustering, is dated to the early Roman Period, and represents the earliest activities at the site. Some of these pits contained small amounts of unburned teeth from cattle (Hufthammer 2010). None of the pits in the main clustering showed any signs of being reused, although some physical overlap did occur, but there is clearly an internal differentiation as the pits seem to be grouped more or less according to date (Bukkemoen 2010). Like other larger cooking pit

Figure 4. The site at Guåker in Stange, Hedmark. Illustration by Grethe Bukkemoen, Museum of Cultural History. Kartverket, license-number: NE12000-150408SA.

sites in Norway, the site at Guåker has well-defined outer borders, while more or less internal disarray, in contrast to the regular rows documented in Swedish and Danish examples (e.g. Henriksen 2005; Samdal and Bukkemoen 2008; Bukkemoen and Simonsen 2009).

In the southern part of the site the pits gave a more heterogenic impression and were not dispersed in clusters. The pits are dated from the Roman Iron Age to the Viking Age, c. AD 200–900. One of the pits contained a large amount of unburned bones from sheep/goat, cattle (calf), swine and horse. Cattle-bones and charcoal from birch were dated to the transition between the Migration and the Merovingian periods, AD 535–600 (1530±40 BP, TRa-3252) and AD 535–595 (1530±30 BP, TRa-581). Comparative material on this topic is scarce, but the amount of unburned bones might indicate alterations in bone treatment following a (ritual) meal compared to the small amounts normally left in the Early Iron Age cooking pits, as mentioned. The various species represented in this pit most likely denote remnants that are left from one occasion.

A culture layer, 10–40 cm thick, interpreted as waste-deposit, covered large parts of this southern area. The layer consisted of fire-cracked stones, burnt and unburned bones and charcoal. I believe the layer has originally been cairns or heaps that were spread by the plough later on (cf. Grønnesby and Pettersen 2015). Still visible remnants of cairns were observed and investigated during the excavation. The bones from the layer and cairns are identified as mostly mammal: cattle, sheep/goat, swine and horse, but bones of crow and kestrel were also identified (Hufthammer 2010).

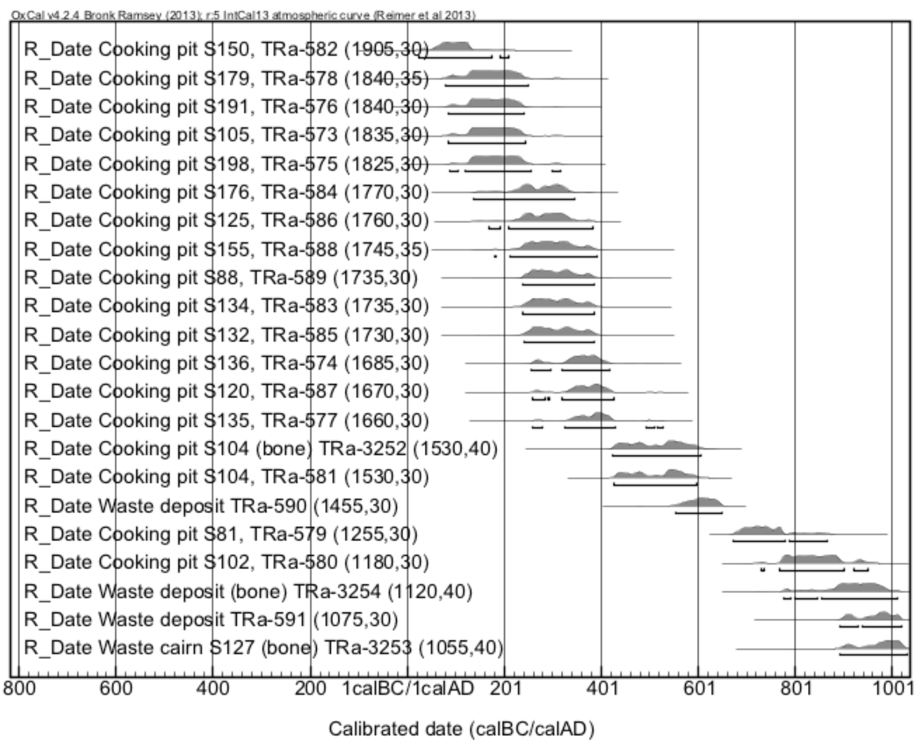

Table 1. An overview of C14-datings from Guåker (cf. Bronk Ramsey 2013; Reimers mf. 2013). OxCal 4.2.4: Bronk Ramsey 2013; Reimer et al 2013.

There exists several C14-datings from the layer. One sample of pine is dated to the Merovingian period, AD 600–650 (1455±30 BP, TRa-590). The pine could be of old age, and this may interfere with the dating result. Another sample, of birch, is dated to the Viking Age, AD 970–1010 (1075±30 BP, TRa-591). Two bone samples are also C14-dated. An unburned bone of horse from one of the still visible cairns was dated to the Viking Age, AD 975–1020 (1055±40 BP, TRa-3253) and a burned mammal bone from the cultural layer was also dated to the Viking Age AD 890–980 (1120±40 BP, TRa-3254). The C14-datings thus indicate that the waste and the cairns where deposited primarily during the Viking Age. At Guåker, there were also found a few cooking-pits dated to AD 700–800, but cooking in pits seems much more sporadic in this period.

Generally, open-air cooking pit sites seem to lose their relevance as meeting places and for communal meals by the end of the 6th century AD (Eriksson 1998; Ødegaard 2015). We still find cooking pits in settlement contexts in the Viking Age, e.g. at Totenvika and nearby Åker (Pilø 2004; Loktu and Hovd 2014) and single datings from the Viking Age do appear at cooking pit sites, but the tradition of communal meals prepared and consumed at these large sites seems to have decreased. It is uncertain whether a single cooking pit with a large amount of unburned bone at Guåker is evidence of these changes as early as AD 600. This is in contrast to the previous periods where only small amounts of burned bones and unburned teeth are left in the pits (Gustafsson 2005; Oma 2005). A similar context was documented at a cooking pit site at Ringvold in Ringerike, Buskerud, where unburned remnants of a horse dated to AD 430–650 (Ua-53453) was found in a cooking pit along with bones from cattle and swine (Wenn and Bukkemoen, forthcoming). The most evident change at Guåker is the waste-deposit documented south of the cooking pits. The same pattern is documented at nearby Åker where the cooking activities are replaced by areas for waste disposal during the Viking Age (Pilø 2004).

FOOD PROCESSING TECHNIQUES - COOKED AND ROASTED MEAT

As mentioned, objects for roasting and frying as well as vessels for cooking turn up in the grave material in the Late Iron Age. At Guåker, the use of cooking pits diminishes and the area was used for waste management in the Viking Age. The large amounts of fire-cracked stones indicate cooking and boiling, rather than roasting. Such layers of stones seem to accumulate at historical farmsteads with roots in the Late Iron Age, and are often interpreted as stones used for brewing (Pilø 2004; Grønnesby and Heen-Pettersen 2015). The bone material at Guåker, both burned and unburned bones has not been analyzed to identify whether the bones have been boiled, butchered and /or roasted. In my view they are clear signals of waste handling, possibly from food processing. Nearby grave finds give a clear impression that the new kitchen utensils were known in the district from the Merovingian Period onwards.

At Arstad in Ottestad, Stange, two roasting-spits of type II were documented in a double grave that dates to AD 700 (Gudesen 1980; Bøgh-Andersen 1999: 46; C20314). The Arstad grave also contained, among other things, an iron kettle and a frying-pan as well as warrior- and horse equipment (Gudesen 1980). At Berg in Løten one type III spit is found in a male grave from AD 900–950 (C3859) (Bøgh-Andersen 1999: 48), also along with warrior equipment. These two graves, and especially the Arstad-grave, have strong affiliations with the warrior aristocracy and the feasting-rituals of the Late Iron Age. At Flagstad in Hamar another two roasting-spits of type II were found in a woman's grave dated to the Viking Age, about AD 900 (C 21671) along with a frying pan, a bronze bowl, a bronze ladle, jewelry and a horse (Petersen 1951; Bøgh-Andersen 1999:46).

One of the most obvious aspects concerning cooked vs. roasted food processing techniques is the visibility. While the cooked meat is prepared in a cooking pit or a cauldron, often accompanied by vegetables, roasting implies visibility and emphasizes both the meat in question and the utensil. Likewise the use of frying-pan involves bringing the food up from the ground or fire and preparing it using a specially designed utensil. As mentioned in *Rigstula* the earl's bread was made of wheat and baked on frying pans of iron with shafts, in contrast to the thrall and farmer's flat-bread which was baked in the ashes or on a baking stone (Baug 2015: 39). Likewise there are indications that bread was used and baked on special ritual occasions (Bergström 2007; Zachrisson 2014 and ref.). Furthermore, the description in *Rigstula* of the diet in different strata of society makes it evident that it is the qualitative differences that are important. The thrall, the farmer and the chieftain all serve meat and bread. The thrall served meat in a soup, the farmer served cooked meat and the chieftain served cooked swine and roasted birds (Isaksson 2003). As mentioned, lipid-analysis of pottery from settlement contexts and graves in Sweden show that meat was more often represented in pottery from graves, indicating that meat had a certain cultural and mythological role. While the everyday cooking seemed to be characterized by porridge, stews of vegetables and meat were made in cauldrons (Isaksson 2003: 275; Baug 2015).

Spit-roasting must have been used by those who could afford consuming fresh meat, like steaks, joints and birds and seem to be used at feasts and special occasions (Bøgh-Andersen 1999: 104). On the Bayeux-tapestry from c. AD 1000 there is an image of roasting spits in a royal context (Isaksson 2003). In the daily life, it seems that fresh meat was rarely eaten and spit-roasting must be considered a waste both when it comes to fresh meat and fuel (Grøn 1927; Bøgh-Andersen 1999: 108). According to Claude Lévi-Strauss (1979) spit-roasting and open fire are closer to the the wild and the untamed nature than boiling in a pot. Despite this there is a close connection between the elite in Late Iron Age Scandinavia and the *Wild* or *Beast of prey*, first and foremost through the Odin cult and the close relation between roasting spits and warrior graves (Montanari 1994; Isaksson 2000). Odins warriors were called *ulfheðnar* (in wolf garments) and *berserk* (in bear garments) and Odins companions are two wolves and two ravens (Isaksson 2000: 23). Sven Isaksson argues that the roasting spit provides a symbol of the spear; further, Odin is called the God of spears, which ultimately connects the two.

Deduced from this, preparing food by using roasting-spits and other roasting or frying equipment would bring new sensual aspects to the commensal act (Hamilakis 2013). The meat would be more visible, the sound and smell of the prepared meat more tangible. Following from this, the new utensils and the whole sensorial regime can be interpreted as a diacritical symbolic device to naturalize and reify concepts of ranked differences in social status (Dietler 1996: 98) and mark group identity especially relevant in this period. The use of differentiated cuisine and styles of consumption are distinguishing elements of feasts of this kind (Dietler 1996: 98). If the communal meals earlier performed on cooking pit sites were moved indoors in the Late Iron Age and developed a greater exclusivity, new techniques of food processing may have developed as well. It thus seems that utensils for food preparation are increasingly used in specific contexts and underline the importance of food as a marker of change in social settings. Not only does food highlight social identity, but the preparation itself, in the way food is handled, seems to provide the occasion with a special dimension (cf. Hamilakis 2013: 89).

FINAL REMARKS

The aim of this article has been to discuss to what extent food practices were altered with the establishment of what seems to be a new social structure in the Late Iron Age. I've chosen to focus on cooking pit sites and to some degree kitchen utensils as the two categories appear to be changing during the relevant time span. The open air cooking pit sites are taken to represent places set aside for repetitive ritual meals with a more or less egalitarian structure, creating an environment suitable for social interaction and generating synchronicity, promoting group identity (cf. Hamilakis 2013: 87). Lack of settlement evidence in the vicinity of these sites, implies that these gatherings were held outside the immediate farmsteads (e.g. Martens 2005; Samdal and Bukkemoen 2008; Bukkemoen and Simonsen 2009; Ødegaard 2015) As such, they represent a different context than a feast in the hall of a lord or chieftain (Enright 1996). The layout, and the large dimensions of the pits, along with the obviously regulated food preparation speak in favor of regular activities that are distinguishing qualities of ritual meals (Hamilakis 2013: 87; 2008). The use of cooking pit sites has its peak in the Roman and, to a lesser degree, Migration periods. The production of pottery came to an end in the 6th – century. At least for the bucket shaped pots, the production of pottery and the production of high quality metal work seem to have gone hand in hand during this final period.

I introduced a case study from the cooking pit site at Guåker where activities are documented both in the Early and the Late Iron Age. After intense use during the Roman period, the use of cooking pits faded, albeit with sporadic use in the Viking Age. However, in the Merovingian period we witness a change at Guåker. Large amounts of unburned bones turn up in one of the cooking pits as a contrast to the earlier more or less empty pits. Later on, accumulations of fire cracked stones and animal bones, both burned and unburned, indicate a break with the earlier practice in this area. Looking at the Late Iron Age grave material we see the introduction of new types of kitchen utensils, such as vessels of iron and soapstone and utensils for roasting and frying, often alongside warrior equipment. It seems rather clear that food, and especially the way food is prepared, was increasingly used as a political tool and as a means to distinguish between social groups and hierarchies in the Late Iron Age.

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HOT ROCKS! BEER BREWING ON VIKING AND MEDIEVAL AGE FARMS IN TRØNDELAG

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ABSTRACT

Cultural layers associated with farmsteads in Norway have received relatively little attention from archaeologists. This article describes test excavations at two sites in Trøndelag, Sparbu and Hitra. The aim of these surveys was to determine how common such layers are and to which period they date. The cultural layers were dominated by fire-cracked stones, so-called "brewing stones". Furthermore, the article discusses whether these stones are actually related to brewing of beer and whether or not the brewing of beer was tied to larger social institutions.

"Seductive... as warming as a log fire, as inviting as a cozy hearth; the perfect bedtime beer"—Michael Jacksons description of German "steinbier" in the television-series "Beer Hunter".

INTRODUCTION

Norwegian settlement archaeology has traditionally been concerned with settlement from the Bronze- and Early Iron Age. One of the reasons for this is the relatively sparse settlement evidence from the Late Iron Age and Medieval Period. It has been suggested that the reasons for the lack of finds is a change in building techniques or that the remnants of these settlements are actually beneath modern farmsteads (Martens 2009). The change from houses built with posts dug into the subsoil to cross-timbered houses appears to have occurred gradually from the beginning of the 10th century (Sørheim 2003; Weber 2003) and thus does not explain the relative lack of settlements from the middle of the 6th century. It seems more reasonable that Late Iron Age and Medieval settlements have the same location as, the modern farm.

The modern farm has traditionally been the subject for historians, and what we do know comes from historical sources. The farm between c. AD 600 to 1850 will, in this article, be labelled "historical farm". Most historical farms have a history which goes back at least to medieval times and from evidence in the sagas, written down in the 12th–13th century, we can be fairly certain that many of these farms have a history stretching back into the Viking Age. What is more uncertain is how old the historical farm is. A key to understanding the history of the historical farm is archaeological research on cultural layers from the farmstead. Many of the farms in Trøndelag have cultural deposits from the farmstead with huge amounts of fire-cracked stones. These stone are called "bryggestein" (literally "brewing stones") and are usually dated to between AD 600 and AD 1600. These deposits have, to a small degree, been the subject of research, but we know fairly little about them. It is these cultural deposits which are the main focus of this article. How common are they and can they be found on every farm with a history back to the Medieval Period? To answer this, several small test pits have been excavated at various farms in two areas of Trøndelag. The second objective of this article is to discuss the use of this large volume of fire cracked stones. What were they used for and why the so many?

"BREWING STONES"

Burnt or fire-cracked stones are common finds in archaeological contexts the world over. In Scandinavia they are primarily associated with cooking pits, which generally date to the Bronze Age or Early Iron Age (1500 BC–AD 550) (Gustafson 2005; Narmo 1996). "Brewing stone layers", in this context, are defined as cultural layers on the modern farms, or on the site of farms which preceded the historical farm, in which fire-cracked stones are found in a high frequency.

The little we know about "brewing stones" comes from a description by the pioneering Norwegian sociologist Eilert Sundt, and was recorded during his trip to Hedmark in 1861. He noted that mounds of fire-cracked stones could be found on each farmstead. Upon asking about these, he was told that they were "brewing stones", stones used for cooking in the old days, before iron pots became more readily available. It was further explained to him that many farmers levelled the mounds, or spread the stones out on the ground, and at many farms the layers were so compact with stones that they could be used as foundations for new buildings (Sundt 1865).

Even though the relevance of these layers were understood by Sundt already in the 1860s, they have received little attention from modern archaeologists. Oddmunn Farbregd (1985) conducted test trenching at the Egge farmstead in Steinkjer and found a cultural layer over a meter thick with a large amount of fire-cracked stones. A radiocarbon date from the bottom of the layer returned a result of AD 403–715 (uncal. 1460 ±90, T-06348). Dagfinn Skre was the first to use layers with brewing stones to identify farmsteads associated with church grounds (Skre 1988: 16f). In the same article, he addressed the presence of layers with large numbers of brewing stones found in medieval urban contexts. Birgitta Berglund investigated historical farms with large amounts of fire-cracked stones at Viklem, Ørlandet and Viggja, Skaun (Berglund 1997; 2003). Lars Pilø recorded fire-cracked stones in ploughed fields while field walking (Pilø 2005: 181). All layers dated by Pilø fell in the range 600 AD – 16th century (Pilø 2005: 138). Kathrine Stene carried out research on the yard at Fusk farm, Askim, where large numbers of fire-cracked stones were recovered (Stene 2009). At Torgårdsletta, outside Trondheim, a series of excavations were undertaken in fields surrounding the modern day farms. Post-holes and cooking pits were found over a wide area. The dating of these settlement sites range from the mid-Bronze Age to the end of the Early Iron Age. One gets the impression that settlement ended after the 6th century. Smaller test excavations on the existing historical farms showed cultural layers with large amounts of fire-cracked stones on the farmsteads and that these layers started accumulating during the 600s (Grønnesby 2013; 2015). In 2013, a farmstead at Ranheim, outside Trondheim, was excavated. The farm once belonged to the abandoned Vik estate. Cultural layers that included large amounts of fire-cracked stones were

Figure 1. Mounds of fire cracked stones, or "brewing stones", on Ranheim, Trondheim (Photo: Geir Grønnesby, NTNU University Museum).

identified here (Fig. 1). The farm settlement began in the 7th century and the accumulation of fire-cracked stones appears to have started somewhat later (Grønnesby and Heen-Pettersen 2015).

All of these studies have provided datings in the range AD 600–1600. Even though there are cooking pits from the Late Iron Age, the vast majority date to before AD 600 (Narmo 1996; Gustafson 2005). The close connection between large amounts of fire-cracked stone and the historical farms suggests that the transition to the use of stones to heat liquid in the cooking process should be seen as an expression of a change in settlement structure (Grønnesby and Heen-Pettersen 2015).

Although cultural layers with fire-cracked stones seem to be commonly associated with historical farms, there is little systematic data concerning them. With the exception of Pilø's (2005) work in Hedmark, and the smaller studies at Torgårdsletta (Grønnesby 2013; 2015), there has been no systematic recording of cultural layers on farmsteads. If it turns out that these layers are common on farms with a known history back to medieval times, it may confirm that major changes in population structure occurred during the transition to the Late Iron Age. They would then also be a very important source of knowledge about society in the Late Iron Age and Medieval Period.

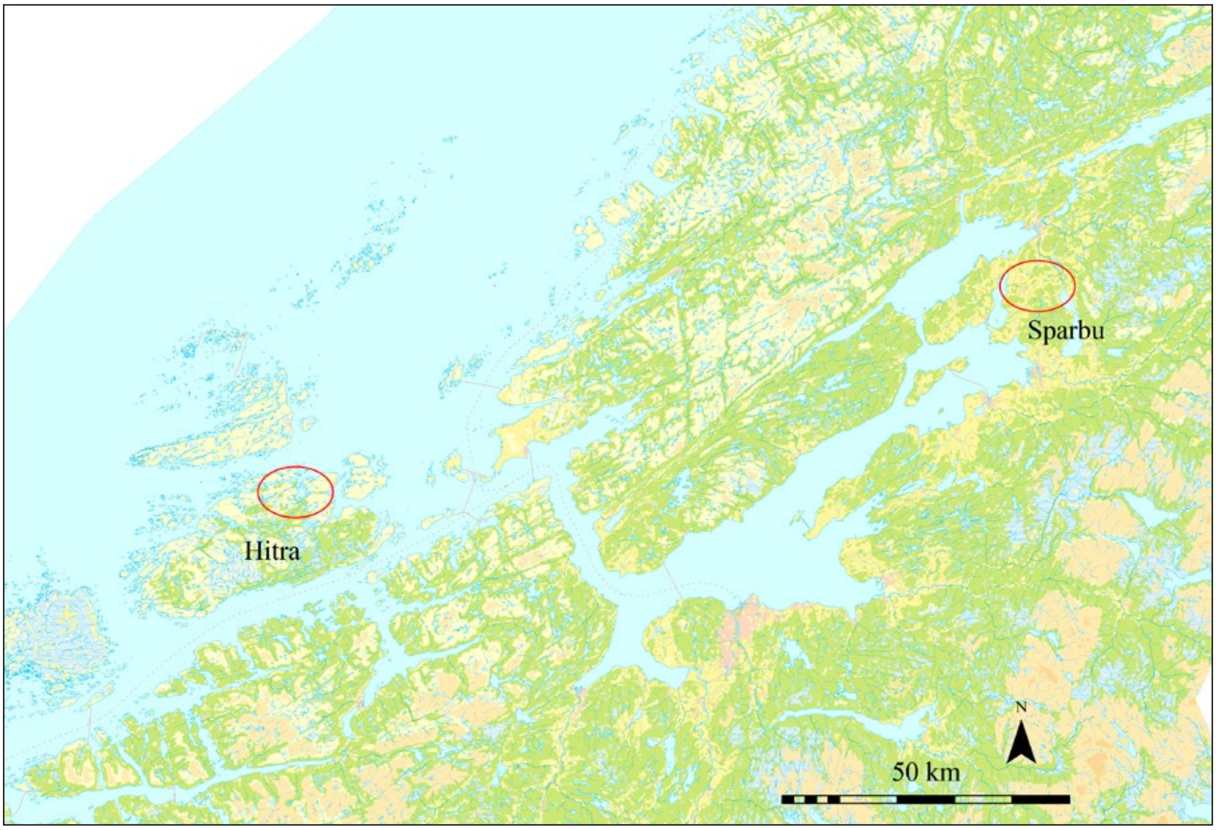

Figure 2. Map showing the two survey areas.

THE SURVEY

Two locations in Trøndelag were chosen to investigate whether these layers actually are a common feature of historical farms. Sparbu, Steinkjer, Nord-Trøndelag is taken to be an example of a typical agricultural area, and one rich in Iron Age grave finds. The second location, the northern section of Hitra, South Trøndelag, has been chosen as an example of a coastal environment where the exploitation of marine resources took precedence over arable farming (Fig. 2).

Test trenches measuring c. 50 × 50 cm were dug by hand at various farmsteads in both of these areas; their locations on each farm were selected based on visual analysis of the topography and in consultation with the land owner and other locals. The main purpose was to identify the presence or absence of these layers rather than to define their extent, as well as to recover material for radiocarbon dating.

To the extent that it was possible, the trenches were dug down to the sterile underground. Investigations at each farm area ceased as soon as the layers were identified. It may be, therefore, that the nature of the layer on a given farm, in terms of its extent and thickness, differs somewhat from the impression given by the test trenching. If there was no prior information about the moving of the farmstead, the excavations were undertaken on the existing farm, around the houses and preferably on the lawn. In situations where no finds were made on existing farmsteads, other locations in the immediate area with strong potential for positive results were investigated. It is not uncommon that earlier farmsteads are today ploughed fields, making it difficult to identify substantial remains of cultural layers.

The results are divided into four categories:

1. *Positive:* clearly identifiable cultural layer in which brewing stones are a primary component. This includes positive results on existing farmsteads, former farmsteads and sites traditionally believed to have been farmsteads at one time. This category further includes positive results from older farmsteads with no oral tradition recording their existence and where there are no cultural layers associated with the modern farmstead. Examples where there is only weak evidence of a cultural layer, but where the land owner has information about finds or the clearance of large amounts of black soil and fire-cracked stones, are also registered as positive.

2. *Probable:* presence of a disturbed cultural layer with some fire-cracked stones. This may be, for example, presence on a site of a previous farmstead, but where the soil has been afterwards ploughed. The basis for classification in this category can also be an oral tradition of an earlier farmstead combined with the land owner's personal observation of cultural layers and stones. Many of these may be seen as positive, but the evidence is slightly weaker than those results in the Positive-group.

3. *Negative, but where there has been insufficient research*, that is, that more comprehensive investigation might identify evidence of an earlier farmstead. Sites where an oral tradition suggests the presence of an earlier farmstead, but where test trenches provide weak evidence of its location, are assigned to this group. In one case, oral tradition relates the location of an earlier farmstead in an area now destroyed due to gravel extraction, making it impossible to verify the presence of an earlier farmstead.

4. N*egative:* no evidence of a cultural layer with brewing stones within the assumed limits of the earlier farmstead.

SPARBU AND HITRA

A total of 16 farms were investigated at Sparbu (Fig. 3). One of these is a smaller excavation conducted by the NTNU University Museum (Dalem). Of these 16, 9 were registered as positive (56,25%), 2 as probable (12,5%), 4 as negative but with insufficient research (25%) and 1 negative (6,25%). At Hitra 8 farms were investigated. Five were classified as positive (62,5%), 1 probable (12,5%), 2 negative but with insufficient research (25%) and none negative (Fig. 4).

On certain farms, preserved cultural layers were found below the modern day farmstead (Sparbu: Gilberg, Mære, Jørem, Oppem. Hitra: Hofstad, Akset). These cultural layers vary in thickness from 30cm to 1m (many test trenches were not excavated all the way through the cultural layer: in these situations the actual thickness of the layer is greater than reported) and are comprised of large amounts of somewhat compact fire-cracked stones. The upper layers produced animal bone, pottery fragments, glass and roof tile. The layers are stratified, with varying amounts of stone in each layer.

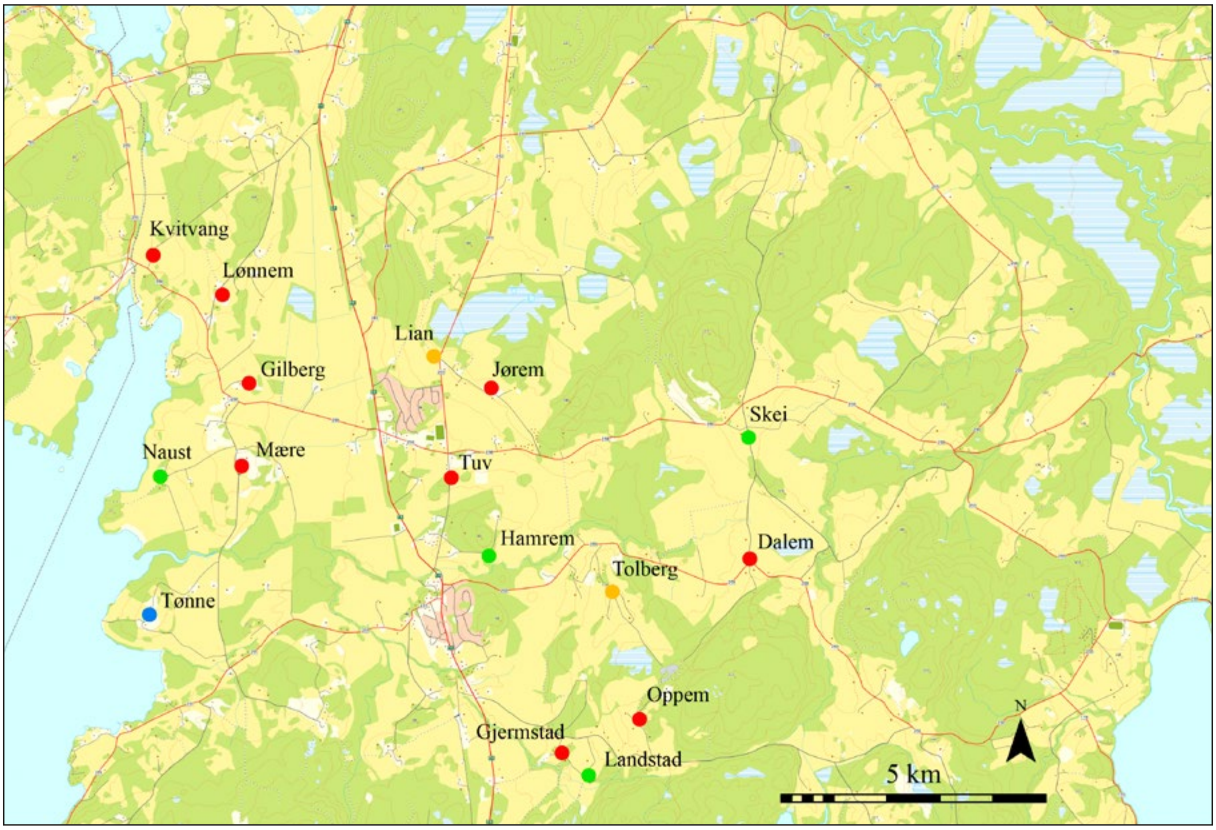

Figure 3. Farms surveyed in Sparbu, Steinkjer. Red dots = positive, orange dots = likely positive, green dots = not fully examined, blue dots = negative.

In some examples, cultural layers were not identified under the modern day farm, but in the immediate vicinity. Some of these secondary locations were traditionally associated with earlier farmsteads (Sparbu: Lønnem øvre. Hitra: Glørstad, Eid), while others lacked the oral tradition but provided clear enough surface evidence (Sparbu: Gjermstad, Tuv. Hitra: Undås, Glørstad). The layers were destroyed at Glørstad, but information from the previous land owner who cleared and ploughed the area was deemed reliable.

In other situations, where no traces were found on the modern farmstead and there exists no tradition of an earlier farm on the site, topography, remains of disturbed cultural layers and information from the land owner confirm that the location of an earlier farmstead had been identified (Sparbu: Lian, Tollberg (Nordgården). Hitra: Småge).

A number of farms produced no finds (Sparbu: Landstad, Hamrem. Hitra: Dolm, Mastad), but time restrictions limited the extent to which each farm could be investigated, and it may be that further test trenching in these areas will return positive results. The Naust farm, at Sparbu, where there is a tradition of an earlier farm having been located on the site but evidence of possible cultural layers

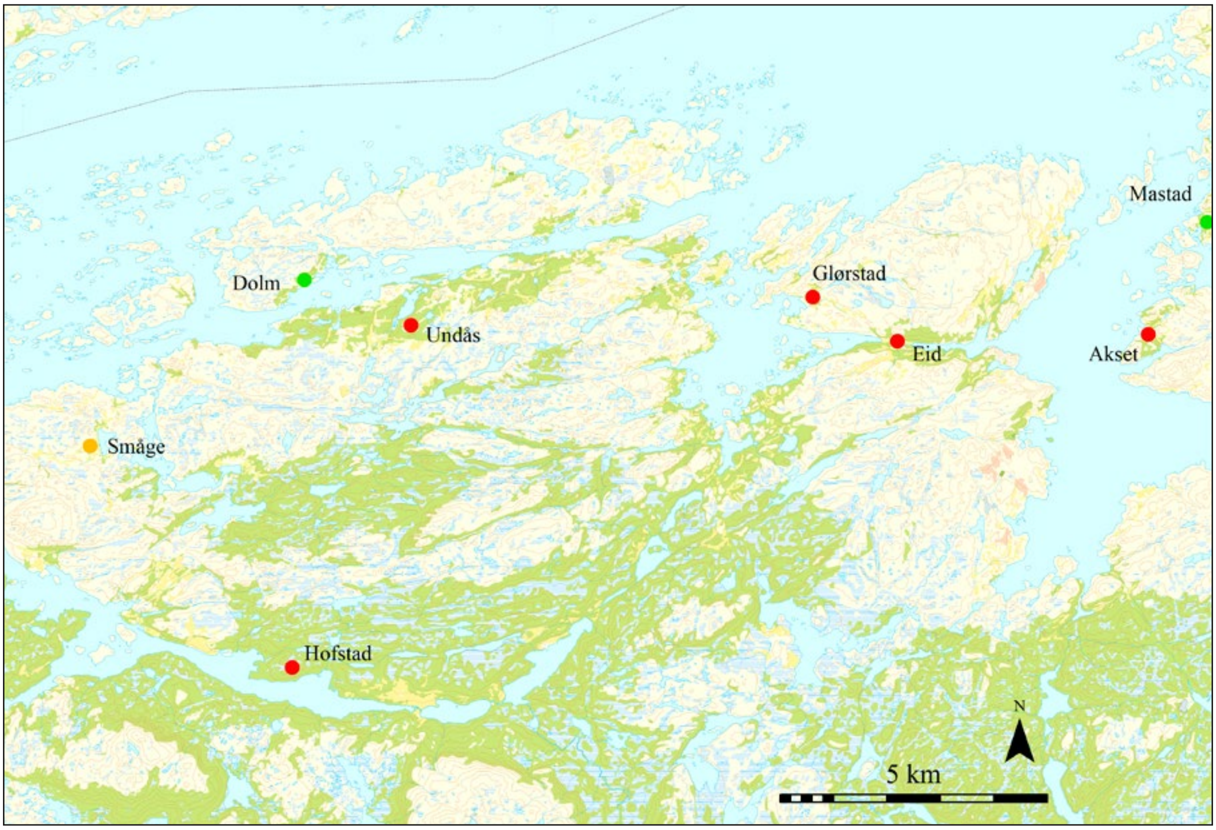

Figure 4. Farms surveyed in Hitra. Red dots = positive, orange dots = likely positive, green dots = not fully examined, blue dots = negative.

is very weak, is also assigned to this group as there are areas of good potential at various locations on the farm which have yet to be investigated.

Tønne, at Sparbu, is the only farm which has been categorized as negative. There is a tradition of an earlier farm having been located on the site, and disturbed cultural layers were noted. The layers, however, contained very little fire-cracked stone.

All of the original farmsteads in Sparbu were placed on higher ground with good visibility and one, or several, large burial mounds below them. Many farmsteads were moved to lower ground over the course of the 19th century. It is unclear why this was done, but it may be associated with the large scale restructuring of agriculture at that time. Moving the farm to lower ground did make transport to and from the farm less onerous. It may be that the original location of the farmsteads, on higher ground, was for security purposes, that it was necessary to have a clear view of the surrounding landscape. There also may have been a symbolic value in such locations that waned over the 19th century. Changes in the structure of land and property ownership at this time may have had an effect on the location of farmsteads. A study of both the archaeological and historical records would be required to adequately address this topic. In any case, the moving of these farmsteads makes the connection between the farmsteads and the large burial mounds less obvious. Today many of these mounds lay isolated in the landscape. The relationship between farmstead and burial mound/grave field was at one time much clearer than the modern landscape suggests. The farm at Lian is a good example. Modern gravel extraction has possibly removed much of the evidence of the earlier farmstead, but if it was indeed located in this area, it would have been flanked by large burial mounds. Today, with the modern farm located far down the hillside, the close relationship between farmstead and burial mound is lost. The large mounds stand alone on the higher ground. At Oppem and Lønnem, both of which probably lie on the site of earlier farmsteads, two and one large burial mounds, respectively, lie just below the farms. Large burial mounds are also known from the Early Iron Age, but this does not necessarily mean that the relationship between burial mound and farmstead was as close as in the Later Iron Age.

It seems that in the northern section of Hitra the oldest farmsteads were well protected from the wind and the weather. They did, however, have access to the sea. The farm at Småge is an example of this. Today the farm lies inland, but a few meter increase in sea level would have provided it with direct access to the sea. This same applies to the vicarage at Undås which was possibly moved to Dolm due to isostatic uplift. A marked difference between Sparbu and Hitra is the absence of large burial mounds in the vicinity of the farmsteads at Hitra.

SURVEY RESULTS

Between Sparbu and Hitra, 58.33% of the farms returned positive results, 12.5% probable, 25% negative but with insufficient research, and 4.17% negative.

There are a number of possible explanations for the lack of preserved cultural layers with fire-cracked stones on seven of the farmsteads in the study. It may be that these farms were established at the 16th century. It may be that the test trenches were simply put in the wrong place. The cultural layers may have been destroyed, or maybe they were never there to begin with. If this last is the case, then the basic assertion of this article, that all farms with a history dating back to the Viking/Medieval Period engaged in an activity which produced cultural layers with fire-cracked stones, is incorrect. It may be that the test trenches at Landstad and Mastad were simply placed in the wrong location. The topography at both sites suggests that they would be ideal locations for earlier farms. The vicarage and church at Dolm may have been established at its present location in the 15th or 16th centuries (Brendalsmo 2006: 411f). This may have been a result of isostatic uplift, which made it impossible to travel to the church at Undås by boat. So it may be, as Brendalsmo suggests, that Norddolm is the actual location of the earlier farm at Dolm. From a topographic perspective, the location of this farm shows similarities with those of other older farms in the northern section of Hitra. The farm at Norddolm, however, was not investigated in this project. The only farmstead with a negative result which is difficult to explain is Tønne at Sparbu. Today there are two farms on a marked elevation. Test trenches were taken along the entire elevated area. Tradition indicates that the original farmstead was located on the area where the border between the modern day farms lies. Black soil with some fire-cracked stones was found in this area, but very little. It is likely that the fill of the cultural layer was removed at some stage.

If the farms which have not provided clear results, situations where there is reason to believe further work would return a positive result, are not considered, the number of results classified as positive and probable rises to over 90% of the total. This high percentage of positive/probable results, and the low percentage of negative results, suggests that cultural layers with fire-cracked stones are present, or have been present, on all farmsteads with a history dating back to the Viking/Medieval Period. Preservation conditions are, however, very different. It appears that there are more well preserved cultural layers at Hitra than at Sparbu, where many farms have been more systematically levelled, or worked, and the material from the cultural layers thus removed. Another factor is the complex history individual named farms can sometimes have. Farms get divided up. Sometimes they are reunited. Fields and boundaries change. Both Tuv and Dolm are examples of farms with complex histories. That there is little evidence of these layers on some farms can be put down to these factors. Kvitvang and Glørstad are examples of farms where we know there have been thick cultural layers with fire-cracked stones, but where the layers have been decimated by levelling, cultivation and ploughing.

The most important difference amongst farmsteads is, therefore, not whether or not there are cultural layers with brewing stones present, but the preservation conditions. This is a cultural heritage category which is, or has been, common, but one which is threatened. At farms such as Kvitvang, in Sparbu, and Glørstad, in Hitra, there is very little evidence of these layers left. Fortunately, due to information from local farmers with firsthand knowledge of these layers, we do know that they were once present. This may also be the case at, for example, Naust and Tønne, where there is also little evidence of these layers and where the modern land owners have no knowledge of them. The need for level farmsteads has increased due to the requirements of modern farming equipment. There is thus reason to fear that many more examples of this type of cultural layer will disappear in the coming years.

It is puzzling that we know so little about cultural layers from farmsteads, particularly given the important role both the Viking and Medieval periods have played in the development of the Norwegian national identity (Holm 1999; Gjerpe 2014; Grønnesby and Heen-Petersen 2015). The vast majority of the population in the Late Iron Age and Medieval Period lived on farms. Many Norwegian farmsteads are likely sitting upon a rich assemblage of cultural historical material from the Late Iron Age/Medieval Period. Excavations at Ranheim are an example of the great potential lying in cultural layers on farmsteads (Grønnesby and Heen-Pettersen 2015).

This type of cultural layer can be found at various locations in Trøndelag. A preliminary, and unsystematic list assembled by the author shows over 100 farmsteads in Trøndelag where their presence has been either registered or indicated by secondary evidence. Datings are available from 47 of these sites (Fig. 5). Apart from one Pre-Roman Iron Age date (Undås, Hitra), and one 19th century date from Hamrem, at Sparbu, they all fall in the range 600 AD-17th century. While the dated material from Undås was recovered from a secure brewing stone context, the Hamrem date comes from an insecure context. Most of the samples taking during the registration project returned dates post-1000 AD. The lack of dates from the period 600-1000 AD suggests that the samples were rarely taken at the bottom of the layer.

Layers with so-called brewing stones are not limited to farmsteads. The phenomenon can also be found in medieval urban contexts (Skre 1988). At Torgårdsletta, beneath the farm at Torgård West, a smaller brewing stone layer was identified near a well. Evidence of a smaller brewing stone layer in the vicinity of where there historically had been a well at Ystgården, in Sparbu, may reflect the same process. In addition to these, a mound of brewing stones is known from Melandsjø, at Hitra (Grønnesby 2013: 86). The farms at Hitra had access to the sea, and

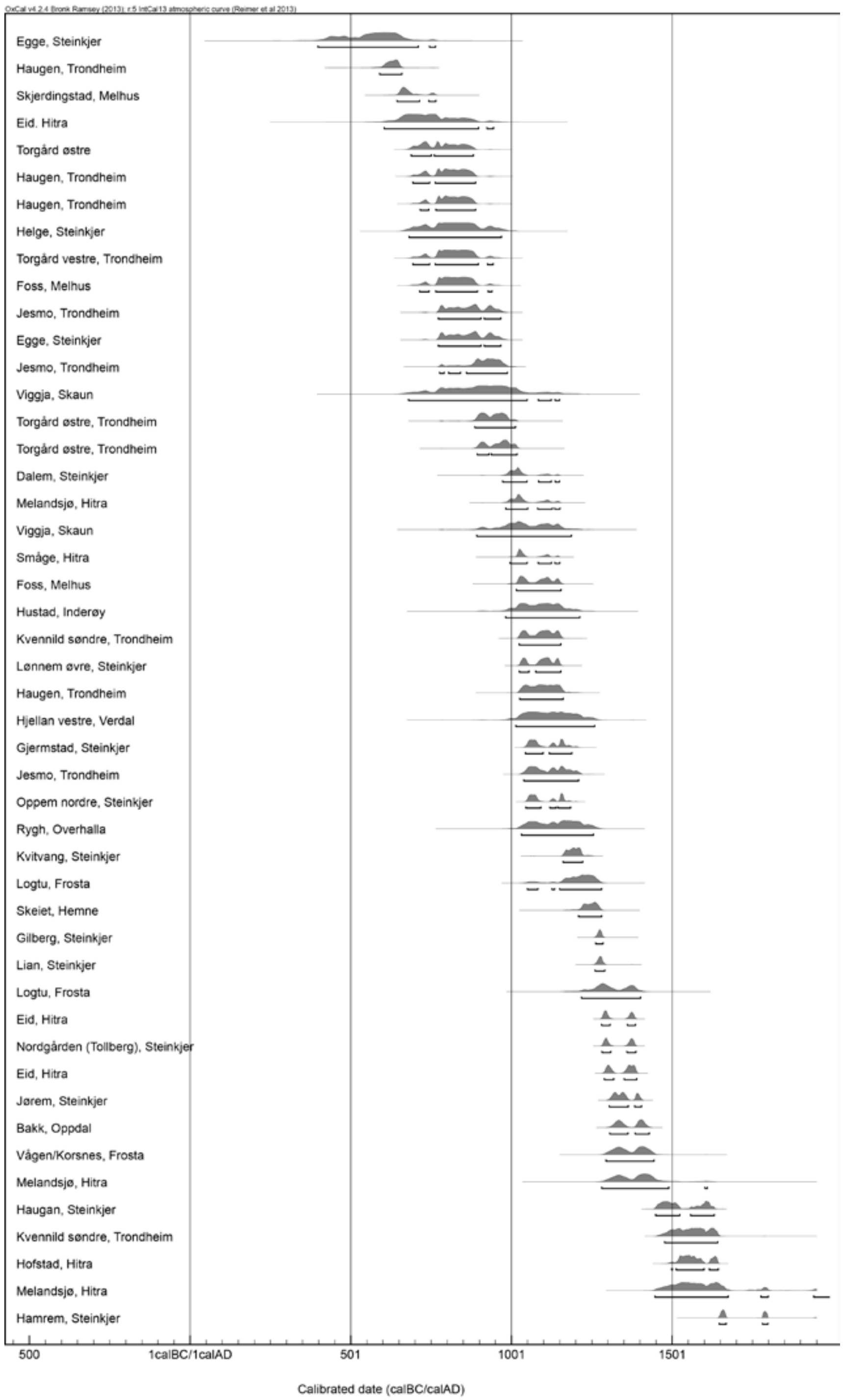

Figure 5. Calibrated 14C-dates from cultural deposits on farm yards. The C14-date from Undås, Hitra is omitted of practical reasons.

many of these coastal points have been named after the adjacent farms, for example Meland – Melandsjø and Hopen – Hopsjøen. This mound of brewing stones must therefore be seen in connection with activities undertaken near the beach.

FIRE-CRACKED STONES AND SOCIETAL STRUCTURES

A number of mounds of brewing stones were identified during the excavation of sections of a Late Iron Age farmstead at Ranheim, outside Trondheim (Grønnesby and Heen-Petersen 2015). The mounds, however, were not purely made up of stones, but had a stratigraphy which included cultural layers without any stones. Within the mounds, all of which date to the Merovingian/Viking Period, large amounts of tooth enamel of animals was found. Test trenching at Sparebu and Hitra produced animal remains, pottery fragments and tiles, primarily in the upper layers. This suggests that the mounds are not merely piles of brewing stones, but waste heaps where brewing stones, food waste, hearth waste, butchery waste and general rubbish was deposited. At Ranheim, it appears that the mounds lay at the edge of the farm. Even though the mounds must be understood as waste heaps, the amount of stone is so overwhelming that Sundt (1865) seems to have interpreted them as piles of fire-cracked stones. Sundt further reported that farmers levelled these mounds, or spread the stones on the ground.

There are, therefore, few mounds of brewing stones to be found today. One exists at Melansjø, Hitra (Grønnesby 2013; 2015), providing a reason to believe, as the example from Hofstad illustrates, that some mounds registered as burial mounds may actually be mounds of brewing stones. The test trenching and excavations at Ranheim have demonstrated that the cultural layers on farmsteads can be complex. One of the reasons for this is the practice of levelling the mounds. A review of the NTNU University Museum's collections highlights that when farmers deliver in artefacts such as loom weights, fragments of soapstone vessels, spindle whorls, etc., they are often recovered from the farmstead or from where "the old farm" had once stood. Both at Glørstad and Akset, the land owners had in their possession various finds from cultural layers with brewing stones. These can be things which were thrown on the waste heap, but may also be from house remains in the cultural layers.

The registrations at Sparbu and Hitra have demonstrated that all, or at least most, of the farms with a history dating back to the Medieval Period have cultural layers with large amounts of fire-cracked stones.

Hitra and Sparbu are different in terms of both climate and topography. The farms at Hitra are not as well suited to cultivation as at Sparbu, and it is the exploitation of marine resources as well as pastoralism which provided the inhabitants with a means of living. Fishing in particular has provided resources and wealth beyond mere subsistence. And yet the phenomenon of cultural layers with large amounts of brewing stones occurs at both locations in significant levels. The reason for the large amounts of fire-cracked stones must therefore be found in some overarching structure not directly related to subsistence.

BREWING BEER WITH HOT STONES

In general, one can say that brewing stones have been cracked due to heat exposure. It further appears that these are cracked to a greater extent than stones typically found in cooking pits as they tend to be smaller. It is also rare that one finds such stones with well-preserved original surfaces (see also Pilø 2005: 136). There is little historical literature on boiling liquid with heated stones. The single example is an Icelandic saga, *Ljósvetninga saga*, which tells of milk warmed by stones (Skre 1988). The advantage of this cooking technique is that one can boil larger amounts of liquid in a wooden vessel than is possible in a soapstone vessel. Even though larger soapstone vessels are known, most are relatively small, with a diameter of 20–30 cm (Skjølsvold 1961: 20). So there is reason to believe that the stones were used to boil large quantities of liquid. They may have been used in association, for example, with butchery (e.g. scalding of pigskin) or cheese production.

The following discussion, however, will focus on beer brewing as a significant cultural activity. Sundt reports talking to an "elderly" crofter who explained that the stones in these mounds were "brewing stones", used to boil liquid in "the old days before they got iron pots". The labelling of these layers as "brewing stone layers", and the stones themselves "brewing stones", rests on this crofter's statement. However, there is reason to believe that the term "brewing stone" was current in the latter half of the 19th century because it referred to a living tradition. There is, therefore, a distinct possibility that they are primarily associated with beer brewing. We know that Germanic peoples on the continent consumed beer and other alcoholic beverages, mead, among others, already in the Roman and Migration periods (Nelson 2005: 78ff), and that this was a part of social and religious life linked with various institutions. We have little evidence of the consumption of beer in Early Iron Age Norway, but traces of organic materials on pottery fragments suggest that this did occur (Rødsrud 2012: 84ff). The same seems to have been the case in the Viking Period, although with a greater emphasis on beer than other alcoholic beverages (e.g. mead). In *The Saga of Harald Fairhair*, the bard Torbjørn Hovklove says "Fain outside would he drink ale at Yule-tide, the fray-loving folk-warder, and Frey's game play there" (Sturluson 1999: 72). *The Saga of Håkon the Good* describes how all participants should consume beer during sacrifices. It further relates that "The sacrificial beaker was to be borne around the fire, and he who made the feast and was chieftain, was to bless the beaker as well as all the sacrificial meat. Óthin's toast was to be drunk first – that was for victory and power to the king – then Njorth's and Frey's, for good harvests and for peace…Men also drank toasts also in memory of departed kinsfolk – that was called *minni* [memorial toast]" (Sturluson 1999: 107).

The social and ritual significance of beer, as with many other aspects of pagan society, was adopted by Christianity. Håkon the Good decreed that Yule should be celebrated at the same time as the Christians and the beer should be brewed for the festivities. The institutional significance of beer drinking can be seen in old law tracts. The Gulating Law, for instance, grants equal validity to decisions or agreements made in the "beer house" to those taken at church assemblies or on a "fully-manned ship" (Hauge 1996: 13). This was true for many types of decisions including for agreements on the transfer of land and giving away of children as debt bondage. The consumption of beer was also an important aspect of feasting associated with gatherings such as marriages, funerals and the like. In addition, there were various seasonal celebrations, such as Christmas, Easter, Midsummer and Michaelmas in the autumn (Robberstad 1981: 322).

Beer drinking was thus an integral part of the society's social and religious institutions and was, to a certain extent, subject to social control (Nordland 1969: 283ff). The oldest laws regulating beer production on farms must be seen against the background of the institutional significance of beer production. The Gulating Law required that three farmers work together when brewing. Each farmer would brew a one *mæle*, a traditional unit of volume, for himself and one for his wife. The beer should blessed and dedicated to Christ and the Holy Mary. Only those who had fewer than six cows or less than six *såldså* of arable land were exempt (Robberstad 1981: 19). Whoever failed to brew beer had to pay three marks to the bishop. An individual who failed to brew beer for three consecutive years was required to cede half of his farm to the bishop, the other half to the king and leave the country.

There is some evidence that the institutional significance of beer lessened over the course of the Medieval Period. This can be seen in the late 13th century law-code of Magnus Lagabøte, where feasts were of less importance and the first regulations limiting the consumption of beer appeared (Hauge 1996: 14). The law-code included, amongst other things, a prohibition against bringing beer to the Thing. The final rupture between beer and social institutions seems to have come with the Reformation. The former social control inherent in the relationship between social institutions and beer disappeared and over the course over the 16th century and drunkenness became a major problem, as attested by the number of alcohol related killings. Provisions were also established prohibiting the sale or serving of beer during church services. In 1607, the sale of beer at church rectories was banned (Hauge 1996: 15-16).

Production of beer on farms, however, continued to the 1800s. Interestingly, beer production was still strongly linked to superstition. Production was surrounded by numerous rules to ensure that the brewer had the help of supernatural forces and there are accounts of purification rituals associated with production. Beer was placed under the house as a sacrifice to *tøltebonden* (the first to have cultivated the land on the farm) as well as to various supernatural beings, *gardvorden* (or *tunvorden*), *haugatussen* and *nisser*. Beer was sacrificed to the grain fields, to *tuntreet* and to *haugabonden* (in the burial mound associated with the farm). Some places were sacrificed to *kråkjerringene*, or *årevetten*, (a supernatural being associated with the hearth). There were also rules dictating who was allowed to taste the beer and in what order. Still, the consumption and serving of beer remained tied to special events like Christmas, marriages and funerals. The quality of the beer one produced was a matter of honor, and was measured in how intoxicated people became. It is said that hosts would become upset if their guests were not drunk, and some guests would therefore pretend to be more intoxicated than they actually were so as not to offend their host (Nordland 1969: 263ff).

Norwegian society went through major changes over the course of the 19th century, one consequence of which was the disappearance of local beer production. The traditional values and practices of the farming community disappeared, the cash economy became dominant, the first brewery was built and temperance became a strong social force (Nordland 1969: 13 and 286ff). Although the final rupture between social institutions and beer consumption occurred during the Reformation, it was not until the 1800s that the break between the consumption of beer and rural social norms occurred. With this, the connection to older pagan practices disappeared as well. Only in some rural areas, such Stjørdal, in Nord-Trøndelag, is brewing still a living tradition. In recent decades, brewing has regained popularity and many of the old techniques are again put to use.

The use of stones to boil liquid appears to have ceased in the 16th -17th centuries, and is thus coincident with the Reformation. The change is also, however, coincident with the development of the Norwegian mining industry, and it may be that this drove a transition towards boiling in metal vessels rather than wooden tubs with stones (Skre 1988: 16). However, one can imagine that the new metal vessels were expensive to purchase, while a wooden vessel was something most people could produce. For the time being, this issue must remain open, but it seems to be the case that the end of the use of brewing stones for heating liquid coincides with the break between beer consumption and social institutions.

If it is true that the presence of cultural layers with brewing stones, at places as diverse as Sparbu and Hitra, can be attributed to overarching structures in the form of institutional frameworks surrounding the production and consumption of beer, then such layers should also be found elsewhere in Norway. After Trøndelag, Eastern Norway is the area of the of the country where these are best known (Skre 1988; Østmo 1991; Pilø 2005). While finds of brewing stones in farm mounds in northern Norway are rare, there are some examples, such as Kulstad, Vefsn (Wik 1988) and Vik, Saltdalen (Oppvang and Kjellman 2015).

Two or three such examples are known from Rogaland (pers. comm. Trond Meling, University of Stavanger) and three from the west coast (pers. comm. Soren Diinhoff, University of Bergen)

The practice of cooking with heated stones must have been in use in Iceland since the technique is recorded in *Ljósvetninga saga* (Skre 1988). The lack of brewing stones in both Iceland and northern Norway can be explained by the unfavorable conditions for grain cultivation in those areas.

The use of heated stones in beer brewing is also known from Germany, where the tradition of "stone beer" continued up to 1917 (Simonsson 1956: 241). The practice was revived in recent times and "stone beer" is produced today in Germany. The types of stones used, however, tolerate heat without fracturing, and would therefore not be as obvious in the archaeological record as Norwegian brewing stones (Nordland 1969: 124; Oliver 2011: 764–765). Layers with fire-cracked stones are also known from the Viking settlements on the Orkney Islands and Shetland. These have been interpreted as saunas, but it has also been suggested that they may be associated with brewing (Dineley and Dineley 2008).

Boiling liquid with heated stones in connection with brewing is also known from England, Finland and the Baltics (Simonsson 1956: 244). The presence of cultural layers of fire-cracked stones are also known from several Late Iron Age/Medieval sites in Denmark and Sweden (Christensen 1991 (Lejre); Nielsen and Fiedel 2001; Nielsen and Love Luck 2011 (Stavnsager); Jørgensen 1998; Söderberg 2002 (Järrestad)). These are defined as central or significant places and the layers are interpreted as an expression of cult and/or handcraft activity. If one uses the slightly imprecise descriptions of the sizes of these layers, they vary between 150 and 1200 m^3. In comparison, 700 m^3 of fire-cracked stones were removed from Ranheim (Grønnesby and Heen-Petersen 2015), an amount which represents only part of the farmstead. At Egge, in Steinkjer (Farbregd 1985), the volume of the layer is estimated to be approximately 1,080 m^3, and at Vik, Flatanger (Farbregd 1979) this number is 1471 m^3.

While these numbers must be read with some caution, they do illustrate that the size of the cultural layers and the volume of fire-cracked stones associated with them are not necessarily less in Mid-Norwegian farms than they are on southern Scandinavian central sites. At both Egge in Steinkjer, and Vik, in Flatanger, the cultural layers seem to be quite extensive. They are, however, generally found on a far smaller scale. In 2014, shovel tests were taken at the Valderåsen farm in Melhus. Here, cultural layers with fire-cracked stones were identified on a site which tradition suggested was the site of an earlier farmstead. The amount of stone, however, appears to be far less than at Egge and Vik. This may reflect the size of the farm. If the amount of fire-cracked stone reflects the amount of beer that was produced, and the amount of beer produced reflects the size of the farm, then the lower amount of stone at the Valderåsen farm is only logical and natural. This could mean that these layers are far more common than previously thought, not only in Norway, but in Sweden and Denmark, and are not necessarily associated with a function as a central place.

CONCLUSION

This investigation has demonstrated that cultural layers are very common on farmsteads in Trøndelag and may be a feature on all farms with a history dating back to medieval times. In some cases, the farmsteads were moved to a more convenient location, particularly in the 1800s. In cases where tradition describes the previous location of the farm, that location is often referred to as "the old farm", "toft" or something similar. There is great variation in the preservation of the layers, however, generally due to leveling, removal and ploughing.

The fact that this phenomenon can be found in areas as topographically and climatically distinct as Sparbu and Hitra, suggests that the cause must exist in some overarching structure and not in local conditions. The close relationship between production/consumption of beer and social institutions may be just such an overarching structure. The most obvious effect of this was the legal regulation of beer production. If this is correct, there should be similar evidence in other parts of the country. The long tradition of "stone beer" in Germany, and extensive cultural layers of fire-cracked stones in Denmark and Sweden, indicate that the phenomenon is much wider ranging than merely Mid-Norway, or Norway in general.

It has been previously noted that the relatively little attention given to cultural layers on farmsteads is a question of recognition (Grønnesby and Heen-Pettersen 2015). Investigations on farms at Sparbu and Hitra have shown that there is great archaeological potential on the yards of historic farms. Here can be found cultural layers, artefacts and building remains which represent an important resource, not merely for the history of the farm or even general settlement history, but for the economic, social and political history of the Viking and Medieval periods. A majority of the population lived on farms, and farmsteads still contain traces of those individuals. Late Iron Age settlement has received increased attention in recent years (e.g. Iversen 2013 Eriksen 2015), partially as a result of a focus on the 536 AD "dust veil" (Nielsen 2005; Axboe 2007; Gräslund 2007, Gräslund & Price 2012; Löwenborg 2012; Iversen 2013). Future research on Late Iron Age and Medieval settlement should be based in the yards of historic farms. The investigations at Sparbu and Hitra have shown that there is great variation in the preservation levels of these cultural layers. One important question which must be addressed, therefore, is what are the preservation conditions in other parts of the country? The answer to this may dictate the urgency of archaeological research on historic farmsteads.

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FARM – MANOR – ESTATE: AGRICULTURAL LANDSCAPE AND SETTLEMENT AT HUNDVÅG, SOUTHWEST NORWAY

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ABSTRACT

This article discusses the results of a comprehensive assembly and analysis of agricultural settlement evidence which has been excavated on the island of Hundvåg in Rogaland, SW Norway. The settlement sites date from the Late Neolithic Period to the Viking Age, and the main objective of this review is to examine their organization throughout this long period. This study reveals that activity on Hundvåg bears many similarities to the general patterns of subsistence-settlement along the coast of western Norway during the period and was not significantly influenced by the natural limitations of the island. The oldest traces of agriculture on Hundvåg date from the beginning of the Late Neolithic, and the whole island seems to have been exploited for agricultural purposes shortly thereafter. In the latter part of the Late Neolithic, and throughout the Bronze Age and Early Iron Age, there is evidence of relatively dense and stable settlement on Hundvåg. The most distinct change in how settlements were organized took place around the birth of Christ. At this time, the farms became concentrated on areas of high ground in the central part of the island, and the first manor houses were established. Settlements continued to be situated in similar locations throughout the Late Iron Age and Viking Age, and both archaeological evidence and historical sources suggest that Hundvåg became part of an estate during this period.

INTRODUCTION

The island of Hundvåg, in Stavanger municipality, is one of several areas in Rogaland where numerous archaeological excavations have been carried out since the late 1980s using the mechanical topsoil stripping method (Fig. 1). The results of some excavations, where material dating to the Late Neolithic and onwards was discovered, have been published in short articles over the years (i.e. Tsigaridas 1997; 2000b, Meling 2001a; 2001b). However, most of the data is only accessible in excavation reports stored in the topographic archive at the Museum of Archaeology, University of Stavanger and has not been previously consolidated for analysis.

The main goal of this article is to examine the structure of settlement on Hundvåg from the Late Neolithic to the end of the Viking Age. Since Hundvåg is an island, it provides an ideal opportunity to study agricultural settlement from a long-term perspective in an area with clear physical boundaries. After reviewing the archaeological evidence, I will examine the character and organization of settlement over time and attempt to determine if this was influenced by the island's natural constraints. The focus will be on the excavated settlement areas, but stray finds, rock carving sites and graves will also be considered. Various historic sources will be central to the interpretation of the Late Iron Age/ Viking Age settlement on the island.

HUNDVÅG

Hundvåg covers an area of 4.7 km^2, and is the main island in an archipelago of several small islands and islets situated just northeast of the town centre of Stavanger (Fig. 1, Fig. 2). Most of the small islands have very poor soil, and in historic times were utilized as grazing areas for the farms on Hundvåg (Lindanger 2003). There are numerous inlets and sheltered bays along the coastline of Hundvåg which offer naturally protected harbours and the narrow straits on the east and south of the island are rich in fish and other marine resources. The name Hundvåg may in fact reflect the importance of the sea to the island's earlier inhabitants, the first part of the name, *Hund*, probably derives from a word for 'catch' (as in fish catch), while *våg* is most likely related to the Norwegian word *vake*, which translates as 'feed near the surface' (Særheim 2007: 110). Hundvåg's geographical position in the southern part of the Boknafjord area is also likely to have been considered an advantage in the past. From the island, there is a broad view overlooking several fjords stretching inland towards the north and east, and in the west, there is only a short distance to the open sea (Fig. 1).

The undulating landscape of Hundvåg resembles the Jæren-coastline of southern Rogaland. The highest points on the island are only around 30 m a.s.l. In the south, there is a rather steep slope towards the sea, while the rest of the island possesses a relatively smooth and gentle coastline. The island's fertile Quaternary deposits, particularly prominent in the central areas, present favourable conditions for cultivation (Bergstrøm *et al* 2010). Four historic farms are located on Hundvåg: Husabø in the west, Austbø in the southeast and Skeie and Lunde in the north (Fig. 2).

ARCHAEOLOGICAL EXCAVATIONS ON HUNDVÅG

Traces of settlement dating from the Late Neolithic Period to the Late Viking Age have been identified at nine excavated areas on Hundvåg (Fig. 2). Archaeological surveys have revealed an additional four areas with settlement remains from the same period. Surveys have been carried out at all the historic farms on Hundvåg, but the majority of the excavations have taken place at Austbø. Altogether, archaeological investigations have covered nearly one-quarter of the island.

The first excavation project to employ the mechanical topsoil stripping method on Hundvåg took place in the southeast part of Austbø between 1987 and 1990 (Gjerland 1989a; 1989b; Juhl 2001). An area of 450 acres was examined prior to the development and 27 sites were revealed (Fig. 2, No. 1). Though the identification of agricultural settlement was not a priority (Juhl 2001: 89), traces of settlement-related activity from the Late Neolithic to the Viking Age were documented at ten localities. Most of these sites were clustered in the southern part of the examined area.

Numerous development instigated archaeological excavations were carried out on Hundvåg between 1997 and 2002 (Tsigaridas 1997; 1998; 2000a; 2000b;

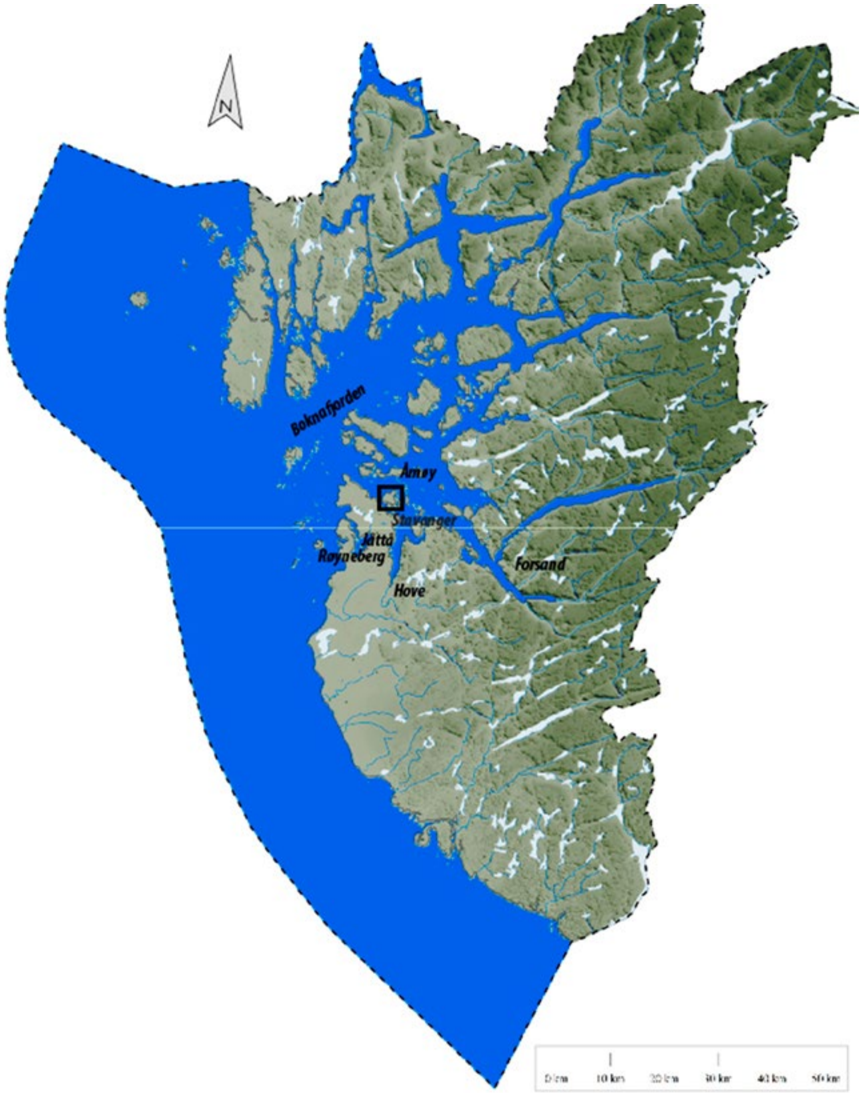

Figure 1. Rogaland County with place names mentioned in the article. Hundvåg is marked with a black square.

Skare 1998a; 1998b; Aakvik 2000; 2001; Meling 2001a; 2001b; 2006; Hemdorff 2006). The basis of this work was an extensive survey, completed in 1994, which examined 750 acres of land in the central part of the island (Juhl and Hemdorff 1994; Hemdorff 1994; 2003). The investigations identified many previously unknown sites in the northern part of Austbø, as well as settlement localities at Skeie and Husabø. The remains of multi-period settlements were comprehensively excavated at Austbø and Skeie, while most of the settlement evidence at Husabø was not subjected to further investigation. However, even with only the survey material as a reference, long-term settlement in the central part of Husabø

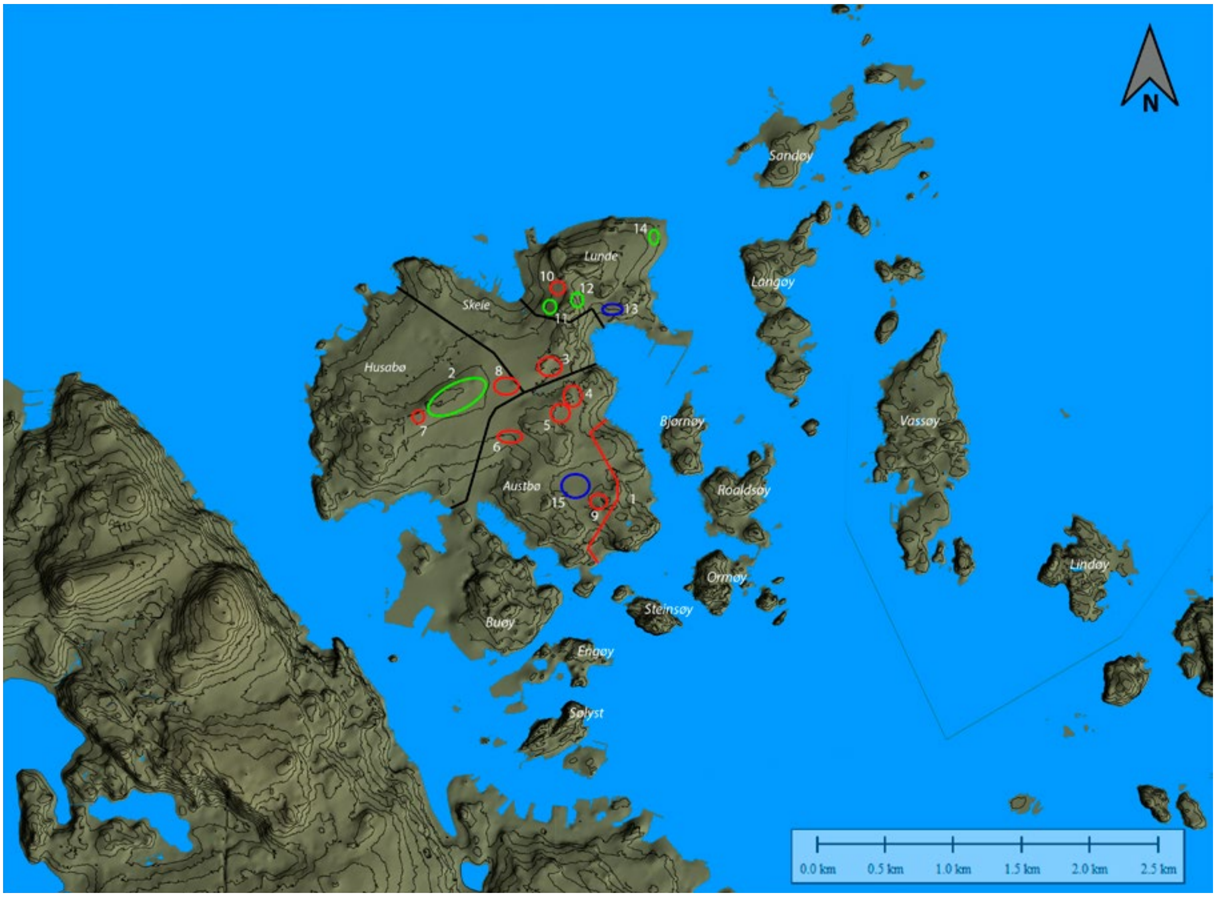

Figure 2. Hundvåg with historic farm names and farm borders. The red circles and lines marks excavated areas, the green circles marks surveyed areas where traces of settlement have been found, and the blue circles marks surveyed areas where no traces of settlement have been found. The numbers refers to the different excavation and survey projects. The same numbers are also used in Table 1 and Table 2.

(Fig. 2, No. 2) is apparent from the large number and great variety of structures observed, as well as the presence of thick cultural layers (Hemdorff 1994; 2003).

Since 2009 minor excavations at Husabø (Fyllingen 2009) and Lunde (Fyllingen 2011; Pedersen 2013) have revealed traces of settlement from the Early Bronze Age to the Migration Period.

Comprehensive macrofossil sampling programs have been undertaken at a number of sites and allowed for paleobotanical analysis of house structures, cultural layers and other settlement related features (Griffin and Sandvik 2000; Juhl 2001; Sandvik 2002; 2003; Soltvedt 2013). Unfortunately, efforts to collect pollen samples from Hundvåg have been unsuccessful due to the absence of suitable sampling locations (Prøsch-Danielsen and Simonsen 2000: 40; Juhl 2001: 20).

THE SETTLEMENT ON HUNDVÅG FROM THE LATE NEOLITHIC TO THE MEDIEVAL PERIOD

The main goal of the archaeological excavations on Hundvåg has been to investigate houses and other forms of settlement evidence from the prehistoric period. In total, 62 structures interpreted as houses have been documented; just over two-thirds of these are dated (Tabell 1). Dating has typically been achieved through radiocarbon analysis; when this was not possible, typological features of the houses and associated artefacts were used to estimate age. All ^{14}C-datings are presented below with 1σ calibrations.

2300-1100 BC: THE LATE NEOLITHIC AND EARLY BRONZE AGE

One of the oldest ^{14}C-dated cereals in Norway, a carbonized naked barley grain (*Hordeum vulgar var. nudum*), was sampled from the eastern part of Austbø (Fig. 3, No. 1, Table 2, No. 1 Loc. 20). This was found in a fireplace, and has been dated to the Late Neolithic (LN), 2390-2060 BC (Sandvik 2003). There was no contemporary building on the site, but several cooking pits and a cultural layer from the same period were recorded nearby (Table 2, No. 1 Loc. 4, 21, and 22). This combination of features suggests that the fireplace was part of a Late Neolithic (LN) dwelling site. Further north at Austbø, several carbonized cereals of LN/EBA (Early Bronze Age) date (Table 2, No. 5 and 9) have been found (Fig. 3, No. 5, 9), mainly naked barley and wheat (*Triticum*). Most of the cereal remains originate from cultural layers rather than buildings. However, a possible wall ditch ^{14}C-dated to the LN, along with several post holes, was recorded close to one of the cultural layers (Fig. 3, No. 9, Table 2, No. 9 Loc. 2). The features probably represent the remains of one, or possibly several, building(s) contemporary with the layers (Meling 2001b). LN/EBA ^{14}C-dates have also been obtained from Early Mesolithic sites in the area (Table 2, No. 9 Loc. 4, 7 and 5). These are associated with layers containing Early Mesolithic stone artefacts (as opposed to structures) and most likely reflect a resumption of activity during later prehistoric periods.

Table 1.

No.	Farm	House no.	House type	Length	Width	Dating method	Dating	Literature
1	Austbø (Loc. 20)	No. I	Three-aisled	23m	7,5m	Typological/ ^{14}C-dating	EBA (BA II)	Juhl 2001
1	Austbø (Loc. 20)	No. II	Three-aisled	23m	7,5m	Typological/ ^{14}C-dating	EBA (BA II)	Juhl 2001
1	Austbø (Loc. 20)	No. III	Square building	3,3m	3,3m	^{14}C-dating	VA	Juhl 2001
1	Austbø (Loc. 21)	No. IV	Three-aisled	12m	4-5m	Typological/ ^{14}C-dating	LBA/ PRIA	Juhl 2001
1	Austbø (Loc. 21)	No. VI	U-shape	3,5m	4,5m	Typological	LBA/ PRIA	Juhl 2001
3	Skeie	No. I	Three-aisled	> 16m	-	^{14}C-dating	VA	Tsigaridas 1997
3	Skeie	No. II	Three-aisled	17,5m	4m	^{14}C-dating	VA	Tsigaridas 1997
3	Skeie	No. III	Three-aisled	> 10m	-	^{14}C-dating	LIA	Tsigaridas 1997
3	Skeie	No. IV	Three-aisled	> 17m	4,5m	Artefacts/ ^{14}C-dating	VA	Tsigaridas 1997
3	Skeie	No. V	Three-aisled	> 14m	-	-	-	Tsigaridas 1997

No.	Farm	House no.	House type	Length	Width	Dating method	Dating	Literature
3	Skeie	No. VI	Two-aisled	17m	7m	Typological	LN/EBA	Tsigaridas 1997
3	Skeie	No. VII	Three-aisled	> 12m	-	^{14}C-dating	VA	Tsigaridas 1997
3	Skeie	No. VIII	Three-aisled	> 13m	5-6m	-	-	Tsigaridas 1997
3	Skeie	No. IX	Three-aisled	> 17m	5-6,5m	Stratigraphically	LIA	Tsigaridas 1997
3	Skeie	No. X	Three-aisled	17m	6,5-7m	^{14}C-dating	LIA	Skare 1998
3	Skeie	No. XI	Three-aisled	35m	5,5m	Typological/ ^{14}C-dating	PRIA/ ERA	Skare 1998
3	Skeie	No. XVI	Three-aisled	>12m	5m	Typological/ ^{14}C-dating	PRIA	Skare 1998
3	Skeie	No. XVII	Three-aisled	> 11m	-	-	-	Skare 1998
3	Skeie	No. XVIII	Three-aisled	> 10m	-	^{14}C-dating	LBA/ PRIA	Skare 1998
3	Skeie	No. XIX	Circular	5,7m	-	^{14}C-dating	LIA	Skare 1998
3	Skeie	No. XX	Three-aisled	> 17m	-	^{14}C-dating	LBA	Skare 1998
3	Skeie	No. XXI	Two-aisled	15m	6m	Typological	LN/EBA	Skare 1998
3	Skeie	No. XXII	Three-aisled	28m	-	-	-	Skare 1998
3	Skeie	No. XXIII	Three-aisled	20m	5,5m	-	-	Skare 1998
3	Skeie	No. XXIV	Two-aisled	13m	5m	Typological/ ^{14}C-dating	LN II-BA II	Skare 1998
3	Skeie	No. XXV	Three-aisled	16m	6,5m	^{14}C-dating	LIA	Skare 1998
3	Skeie	No. XXVI	Three-aisled	15-18m	5-7,5m	-	-	Skare 1998
4	Austbø	No. I	Three-aisled	25m	-	Typological/ ^{14}C-dating	PRIA/ ERIA	Tsigaridas 2000
4	Austbø	No. II	Three-aisled	12-31m	4-5m	^{14}C-dating	PRIA/ ERIA	Tsigaridas 2000
4	Austbø	No. III, phase A	Three-aisled	18-19m	5,5m	^{14}C-daing	LRIA/ MiP	Tsigaridas 2000
4	Austbø	No. III, phase B	Three-aisled	-	-	-	-	Tsigaridas 2000
4	Austbø	No. IV	Three-aisled	25-26m	6m	Artefacts	LRIA/ MiP	Tsigaridas 2000
4	Austbø	No. V	Two-aisled	10-19m	7m	-	-	Tsigaridas 2000
4	Austbø	No. VI	Three-aisled	-	-	^{14}C-dating	LBA/ PRIA	Tsigaridas 2000
4	Austbø	No. VIII, phase A	-	-	-	-	-	Tsigaridas 2000
4	Austbø	No. VIII, phase B	Two-aisled	-	-	^{14}C-dating	EBA (BA I-II)	Tsigaridas 2000
4	Austbø	No. VIII, phase C	Three-aisled	> 17m	6,5m	Artefacts/ ^{14}C-dating	LRIA/ MiP	Tsigaridas 2000
5	Austbø	No. I	Square building	2m	1,9m	-	-	Meling 2006
5	Austbø	No. II	Three-aisled	50m	7-7,5m	Typological/ Artefacts/ ^{14}C-dating	RIA	Meling 2006
5	Austbø	No. III	Three-aisled	25m	7-7,5m	Typological	RIA	Meling 2006
5	Austbø	No. IV	Three-aisled	25-30m	7,7,5	Typological	RIA	Meling 2006
5	Austbø	No. VI	Three-aisled	15-20m	6m	Artefacts/ ^{14}C-dating	RIA	Meling 2006
5	Austbø	No. VII	-	15m	5,5-6m	-	-	Meling 2006
6	Austbø	No. I	Three-aisled	23-30m	5,5m	Typological/ ^{14}C-dating	LRIA	Hemdorff 2006
6	Austbø	No. II	Three-aisled	18m	5,5m	Typological	RIA	Hemdorff 2006
6	Austbø	No. III	Three-aisled	-	5m	-	-	Hemdorff 2006
6	Austbø	No. IV	Three-aisled	41m	7,5m	Typological/ ^{14}C-dating	ERIA	Hemdorff 2006

No.	Farm	House no.	House type	Length	Width	Dating method	Dating	Literature
6	Austbø	No. V	Three-aisled	25m	6m	Typological/ ^{14}C-dating	LRIA	Hemdorff 2006
6	Austbø	No. VI	Three-aisled	20m	6,5m	Typological/ ^{14}C-dating	ERIA	Hemdorff 2006
6	Austbø	No. VII	Square building	3m	3m	-	-	Hemdorff 2006
7	Husabø		Three-aisled	-	-	Artefacts	RIA/MiP	Fyllingen 2009
7	Husabø		Three-aisled	-	-	Artefacts	RIA/MiP	Fyllingen 2009
8	Husabø	No. I	U-shape	2,8m	3,1m	Typological	LBA/ PRIA	Aakvik 2001
8	Husabø	No. II	Square building	2,8m	2,8m	-	-	Aakvik 2001
8	Husabø	No. III	Circular	5,5m	-	Typological	LIA	Aakvik 2001
9	Austbø	No. I	Three-aisled	> 15m	5-6m	-	-	Meling 2001
9	Austbø	No. II	Three-aisled	> 20m	5-6m	-	-	Meling 2001
10	Lunde	No. I	Three-aisled	> 12m	7m	^{14}C-dating	EBA	Pedersen 2013
10	Lunde	No. II	Three-aisled	> 19m	6,5m	^{14}C-dating	PRIA	Pedersen 2013
10	Lunde	No. III	Three-aisled	> 11m	-	^{14}C-dating	EBA	Pedersen 2013
12	Lunde		Three-aisled	-	-	^{14}C-dating	RIA	Fyllingen 2011

Table 1. House structures from Hundvåg. The numbers in the left column refers to the excavation/survey projects. The same numbers are used in the maps.

Table 2.

No.	Farm	Locality	Structure/layer	Dating method	Dating	Literature
1	Austbø	Loc. 16		Artefacts	LN/EBA	Juhl 2001
1	Austbø	Loc. 20	Fireplace	^{14}C-dating	LN I	Juhl 2001
1	Austbø	Loc. 20	Cooking pit	^{14}C-dating	LN II-BA II	Juhl 2001
1	Austbø	Loc. 20	Cooking pit	^{14}C-dating	LBA (BA IV-VI)	Juhl 2001
1	Austbø	Loc. 20	Cooking pit	^{14}C-dating	VA	Juhl 2001
1	Austbø	Loc. 4	Cultural layer/Cooking pits	^{14}C-dating	LN I-BA II	Juhl 2001
1	Austbø	Loc. 4	Cooking pits/Fireplace	^{14}C-dating	LBA/PRIA	Juhl 2001
1	Austbø	Loc. 4	Fireplaces	^{14}C-dating	RIA	Juhl 2001
1	Austbø	Loc. 21	Fireplace	^{14}C-dating	LN II-BA II	Juhl 2001
1	Austbø	Loc. 22	Fireplaces	^{14}C-dating	LN II-BA III	Juhl 2001
1	Austbø	Loc. 22	Fireplaces/Wall ditch?	^{14}C-dating	LBA	Juhl 2001
1	Austbø	Loc. 22	Fireplace	^{14}C-dating	RIA	Juhl 2001
1	Austbø	Loc. 2	Cooking pit	^{14}C-dating	LBA	Juhl 2001
1	Austbø	Loc. 23	Fireplace	^{14}C-dating	PRIA	Juhl 2001
1	Austbø	Loc. 3	Cooking pit	^{14}C-dating	PRIA	Juhl 2001
1	Austbø	Loc. 27	Fireplaces	^{14}C-dating	PRIA/ERIA	Juhl 2001
1	Austbø	Loc. 15	Fireplaces/Cooking pits	^{14}C-dating	RIA	Juhl 2001
4	Austbø	Loc. 1	From unspecified layer	^{14}C-dating	LN I-II	Tsigaridas 2000
4	Austbø	Loc. 3	Fireplace?	^{14}C-dating	LN I-BA I	Tsigaridas 2000
5	Austbø	Loc. 1	Cultural layer	^{14}C-dating/ Artefacts	LN I-BA I	Meling 2006
9	Austbø	Loc. 1	Cultural layer	^{14}C-dating/ Artefacts	LN II	Meling 2001
9	Austbø	Loc. 2	Wall ditch	^{14}C-dating	LN II	Unpublished
9	Austbø	Loc. 2	Post hole	^{14}C-dating	LBA/PRIA	Unpublished
9	Austbø	Loc. 4	From unspecified layer	^{14}C-dating	LN II-BA I	Unpublished

No.	Farm	Locality	Structure/layer	Dating method	Dating	Literature
9	Austbø	Loc. 7	From unspecified layer	^{14}C-dating	LN I	Unpublished
9	Austbø	Loc. 5	From unspecified layer	^{14}C-dating	LN I	Unpublished
9	Austbø	Loc. 5	From unspecified layer	^{14}C-dating	BA IV	Unpublished
14	Lunde		Fireplace	^{14}C-dating	LRIA	Rønne 2001

Table 2. ^{14}C-dated structures and layers from different sites at Hundvåg. The numbers in the left column refers to the excavation/survey projects. The same numbers are used in the maps.

The oldest known buildings on Hundvåg are three two-aisled houses found at Skeie (Fig. 3, No. 3). The structures are 13-17 m in length and 5-7 m in width (Table 1). One of the buildings (House XXIV) has been ^{14}C-dated to 1780-1625 BC (Skare 1998); age determinations for the other buildings (Houses VI and XXI) were inferred through typological comparison of structural elements (Børsheim 2005: 113). Traces of two similar buildings (Table 1, No. 4 Houses V and VIII) were documented in the northern part of Austbø (Fig. 3, No. 4), one of which has been ^{14}C-dated to around 1500 BC (Tsigaridas 2000a; 2000b). Both buildings were, unfortunately, only partly preserved, and as such their former sizes and shapes are uncertain (Tsigaridas 2000a).

The first three-aisled houses appear on Hundvåg in the EBA, between 1500 BC and 1400 BC. A total of four houses from this period are recorded on the island (Gjerland 1989b; Juhl 2001: 45; Pedersen 2013), two in the eastern part of Austbø (Fig. 3, No. 1, Table 1, No. 1 Houses I and II), and two at Lunde (Fig. 3, No. 10, Table 1, No. 10 Houses I and III). The two houses at Austbø display remarkable similarities. In addition to their near contemporaneous ^{14}C-dates, both were 23 m long by 7 m wide and had several post holes replaced during their life span (Juhl 2001: 48). It was not possible to record the full extent of the two houses at Lunde, but they are both estimated to have been over 12 m long, and one of them 7 m wide. The ^{14}C-dates obtained from the structures indicate that they were probably not contemporary, although the time gap between them would have been short (Pedersen 2013).

1100–0 BC: THE LATE BRONZE AGE AND PRE-ROMAN IRON AGE

There are few traces of settlement from the period between 1400 BC and 700 BC on Hundvåg. In the eastern part of Austbø (Fig. 4, No. 1, Table 2, No. 1 Loc. 22), a ditch that might belong to a building has been ^{14}C-dated to 900-815 BC. Elsewhere in the area, there are only a few cooking pits and some fireplaces which can be related to this period (Juhl 2001). However, this lack of settlement evidence changes towards the end of the Late Bronze Age (LBA), when numerous houses start appearing at all the historic farms at Hundvåg.

From Skeie (Fig. 4, No. 3) there are three houses (Table 1, No. 3 Houses XVI, XVIII and XX) which have been ^{14}C-dated to the LBA or Pre-Roman Iron Age (PRIA) (Skare 1998a; 1998b). Two of the structures returned very similar dates, but since they overlapped horizontally they cannot have been contemporary. The precise dimensions of the three houses were not established, but one example was estimated to have been over 17 m long. At Lunde, a house measuring 19 m long by 6.5 m wide, was excavated in 2013 (Fig. 4, No. 10, Table 1, No. 10 House II) and has been ^{14}C-dated to 510-400 BC (Pedersen 2013).

In the northern part of Austbø (Fig. 4, No. 4, Table 1, No. 4 House VI), the remains of a three-aisled

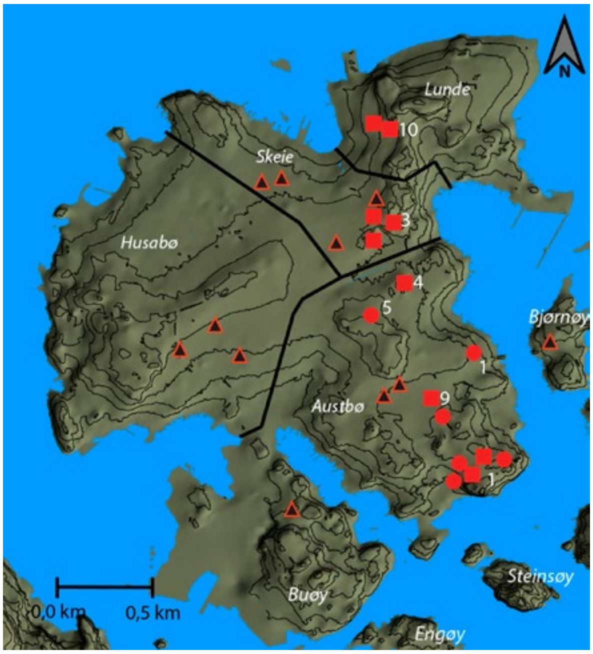

Figure 3. Areas on Hundvåg with traces of settlement from LN and EBA. The red squares mark house structures and possible house structures, the red dots mark cultural layers and structures, and the triangles mark stray finds. The numbers refer to the different excavation projects.

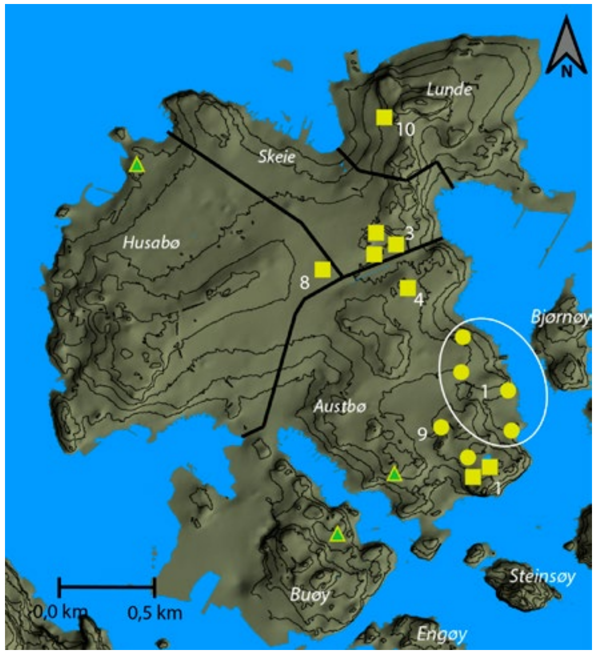

Figure 4. Areas on Hundvåg with traces of settlement from the LBA and PRIA. The yellow squares mark houses, the yellow dots mark structures and the triangles mark rock carvings. The numbers refer to the different excavation projects and the circle marks an area at Austbø where only cooking pits and fireplaces have been found.

house have been ^{14}C-dated to the transition between the LBA and the PRIA (Tsigaridas 2000a). From the eastern part of Austbø (Fig. 4, No. 1, Table 1, No. 1 Houses IV and VI), there are records of two buildings from the same period (Gjerland 1989b; Juhl 2001: 51). House IV was a three-aisled structure, approximately 12 m long by 4-5 m wide in use between 790-400 BC. The other building in this part of Austbø has not been dated directly, but its shape indicates that it belongs to the LBA or early PRIA (Juhl 2001: 51). The remains of the building covered an area of approximately 20m^2, and consisted of a U-shaped wall trench which opened towards the south. In the centre of the structure was a red-coloured patch, probably the remains of a fireplace. A building of similar size and construction was excavated at Husabø in 2000 (Fig. 4, No. 8, Table 1, No. 8 House I). Unfortunately, there are no ^{14}C-dates available, but both the size and shape of the building indicate that it was contemporary with the U-shape building at Austbø (Aakvik 2000; 2001).

Cooking pits and fireplaces are documented at several sites in the eastern part of Austbø (Fig. 4, No. 1, Fig. 5, No. 1). These features usually occur in isolation or as small clusters of 2-4 pits and most have been ^{14}C-dated to the PRIA and the Roman Iron Age (RIA) (Juhl 2001).

AD 0-550: THE ROMAN IRON AGE AND THE MIGRATION PERIOD

A total of 15 three-aisled houses with dates from the RIA and the Migration Period (MiP) are

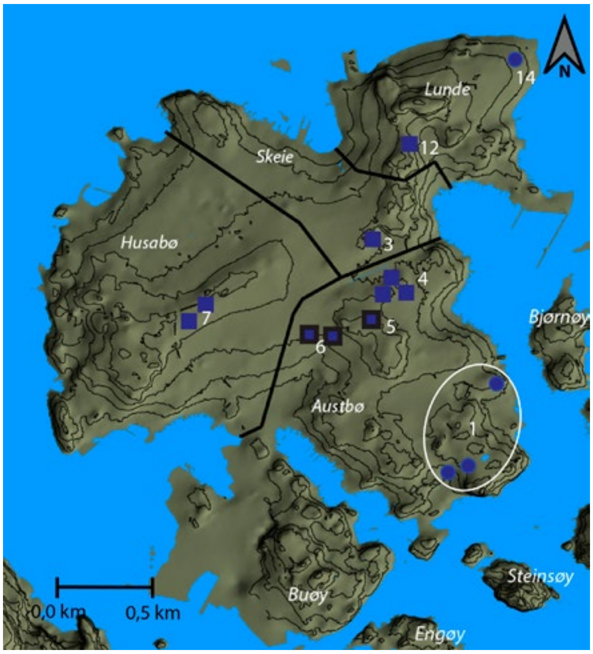

Figure 5. Areas on Hundvåg with traces of settlement from the Roman Iron Age and Migration Period. The blue squares mark houses, the blue squares with a black border mark farm complexes with several houses and phases, and the blue dots mark structures. The numbers refers to the different excavation and survey projects, and the circle marks an area at Austbø where only cooking pits and fireplaces have been found.

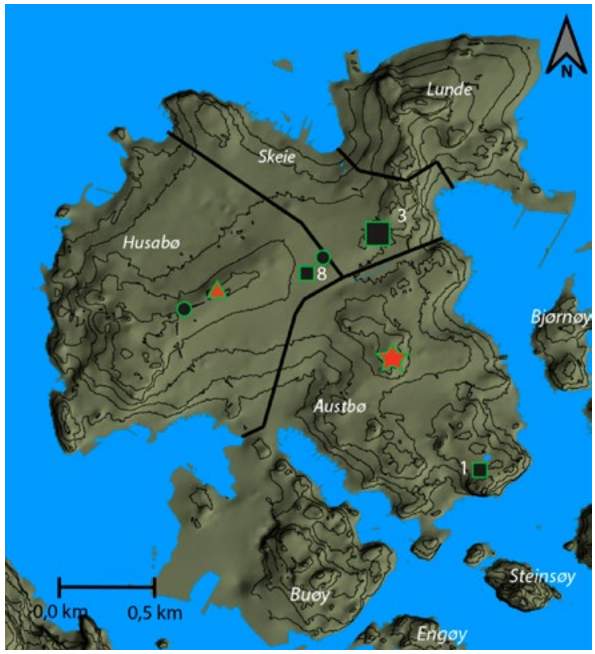

Figure 6. Areas on Hundvåg with traces of settlement and other structures from the LIA/VA and the Medieval Period. The black squares are buildings, the black dots are grave mounds dated to the LIA/VA and the triangle is a stone cross from the late VA. The red star marks the position of a stone church from the Medieval Period. The numbers refer to the different excavation projects.

documented on Hundvåg (Fig. 5, Table 1). A single example comes from Skeie (Fig. 5, No. 3), while the rest were situated in the northern part of Austbø (Fig. 5, No. 4-6).

The house at Skeie (Table 1, No. 3 House XI), and two of the houses from Austbø (Table 1, No. 4 Houses I and II) date to the transition between the PRIA and the RIA. The house at Skeie measured nearly 35 m long by 5.5 m wide (Skare 1998a). One of the houses at Austbø was found in a fragmented state, and its dimensions were estimated as 20 m long by 5 m wide. The second house was approximately 25 m long (Tsigaridas 2000a; 2000b).

Eleven of the houses from the RIA at Austbø constitute three farm complexes, with each complex containing two parallel long houses and a farmyard between them. Two of these farms, located in the northwest part of Austbø (Fig. 5, No. 6), approximately 30 m from each other, were found to have at least two phases (Hemdorff 2006). The best-preserved farm complex consists of a 41 m long by 7.5 m wide main building, and a 20 m long by 6.5 m wide secondary building (Table 1, No. 6 Houses IV and VI). Both structures were ^{14}C-dated to the early Roman Iron Age. Several fireplaces and cooking pits were recorded in the farmyard between the two houses, and in the western part of the yard, there was a small square building (Table 1, No. 6 House VII). In the late RIA, the main building was replaced by a 25 m long by 6 m wide long house (Table 1, No. 6 House V).

The second farm complex in this area consisted of a nearly 30 m long by 5.6 m wide main building, and an 18 m long, 5.5 m wide secondary building (Table 1 No. 6 Houses I and II). The main building was ^{14}C-dated to the late RIA. A few meters to the northeast of the main building, the remains of a third building were uncovered (Table 1, No. 6 House III). It was not possible to establish the structure's age or size, but most probably, it represents an older phase of the farm (Hemdorff 2006: 8).

The third farm complex at Austbø was located c. 350 m east of the two complexes mentioned above (Fig. 5, No. 5). It consisted of a main building, rebuilt at least two times on the same spot (Table 1, No. 5 Houses II, III and IV), and a secondary building (Table 1, No. 5 House VI) with two overlapping phases (Meling 2001a; 2006). At one point, the main building may have been nearly 50 m long by around 7 m wide. It was not possible to establish the full length of the two other phases of the building, but it does not seem to have exceeded 25-30 m. The secondary building, situated 7 m west of the main building, was approximately 15-20 m long by 6 m wide in both phases. There is one ^{14}C-dating from the main building, and two from the secondary building. All are Roman Iron Age, and correspond well with some of the ceramics found in the main building (Meling 2001a: 26).

In the northern part of Austbø (Fig. 5, No. 4, Table 1, No. 4 Houses III, IV and VIII) there are two, possibly three, buildings dated to the transition between the late RIA and the MiP (Tsigaridas 2000a; 2000b). One of the houses is estimated to have been around 25 m long by 6 m wide, while the other was over 17 m long by 6.5 m wide. The two structures overlap horizontally and thus cannot have been contemporary.

In addition, partial remains of houses from this period have been investigated at Lunde (Fig. 5, No. 12) and Husabø (Fig. 5, No. 7). At Lunde, a large fireplace was ^{14}C-dated to AD 80-130. The presence of several post holes on either side of the fireplace led the excavator to interpret this assemblage of features as part of a three-aisled building from the early RIA (Fyllingen 2011). A small excavation carried out at Husabø in 2009, revealed several post holes, fireplaces and cultural layers. It was possible to distinguish the remains of at least two buildings amongst these features, and ceramics of RIA and MiP type found in the various features, indicates that most of the settlement activity at the site can be attributed to this period (Fyllingen 2009).

AD 550-1050: THE LATE IRON AGE AND VIKING AGE

A total of nine houses with dates corresponding to the Late Iron Age (LIA) and the Viking Age (VA) are known from Skeie (Fig. 6, No. 3). Five of the buildings are of late seventh- to eighth- century date (Table 1, No. 3 Houses III, IX, X, XIX and XXV) while the remainder were in use during the late ninth- to the tenth- century (Table 1, No. 3 Houses I, II, IV and VII). All but one were three-aisled. Most of the buildings were only partly preserved, but it seems that the majority had a length of around 15-20 m and a width between 4 m and 7 m. The best-preserved house (Table 1, No. 3 House X) was 17 m long by around 7 m wide (Skare 1998). Artefacts typical of the LIA and VA, (i.e. a fire steel, a loom weight, and a number of slate hones) were recovered from some of the buildings.

One of the buildings at Skeie was circular in shape with a diameter of approximately 6 m (Table 1, No. 3 House XIX). This was situated c. 50 m to the southwest of the other buildings from LIA/VA and consisted of a wall trench outlining the plan of the building, two post holes in each corner and a large stone in the middle. The number and position of the post holes indicates that the building had two phases, both of which have been ^{14}C-dated to the Late Iron Age (Skare 1998a; 1998b). Pieces of slag retrieved from the fill of one of the post holes indicate that the building probably functioned as a smithy during at least in one of its phases (Skare 1998b: 19).

A similar circular building was excavated at Husabø in 2000 (Fig. 6, No. 8, Table 1, No. 8 House III). This structure was not ^{14}C-dated, and there were no finds from any of the associated features to inform interpretation of its function (Aakvik 2000; 2001). Both its form and size, however, suggest that it is of the same age as the circular building from Skeie. In the eastern part of Austbø (Fig. 6, No. 1, Table 1, No. 1 House III), a small 10m^2 rectangular building, probably related to outfield exploitation, has been ^{14}C-dated to the VA (Juhl 2001: 99).

DISCUSSION

The first agricultural settlement

Although there are no pollen diagrams from Hundvåg, the general vegetation history shows that this part of Rogaland was gradually deforested throughout the Neolithic and Bronze Age leading to the eventual formation of heathland (Prøsch-Danielsen and Simonsen 2000: 40). One of the most pronounced clearance phases took place during the transition between the LN and EBA (1900-1400 BC). This corresponds with the dates for two-aisled houses in Rogaland and an increase in the number of carbonised cereals related to houses and other settlement structures (Soltvedt 2000; Høgestøl and Prøsch-Danielsen 2006: 27). A similar pattern is also seen along the coast further north, and both the botanical data and the archaeological evidence suggests that the deforestation phase corresponds with the establishment of an agrarian economy throughout most of western Norway (Bakka and Kaland 1971; Prescott 1996; Soltvedt 2000; Hjelle *et al.* 2006; Høgestøl and Prøsch-Danielsen 2006). The LN and EBA settlement on Hundvåg is part of this picture, and the dates of cereals from Austbø implies that the shift towards a new economy on the island took place in the first half of the Late Neolithic. The locations of the sites suggests the same. The oldest dated cereal from Hundvåg comes from a site in the eastern part of Austbø (Fig. 3, No. 1). This site is located on a ridge with good conditions for cultivation, but also close to the sea, an area where human activity had been focused during the Early and Middle Neolithic (Juhl 2001: 39-43). This suggests that although farming had become part of the economy, fishing and hunting requirements were still important influences on settlement patterns. In the middle of the LN, around 2000 BC, however, we see a shift in the location of settlements, as new dwelling sites begin to be established in the central part of the island (Fig. 3, No. 5, 9). These were situated at a greater distance from the sea and at places with no Early or Middle Neolithic settlement. Sites from this period are typically located in areas with good drainage and fertile soils, and it is obvious that the agricultural potential of the land was the main factor governing the choice of location. The changing settlement patterns are even more apparent in the record from the Early Bronze Age (1800-1400 BC), a period when the number of dwelling sites situated in these types of locations increases (Fig. 3, No. 3, 4, 10).

The distribution of stray-finds (i.e. flint daggers, shaft-hole axes and flint sickles) paints a similar picture of life during the LN and EBA. Such finds are often interpreted as indicators of an agricultural economy, and assumed to be representative of the size and location of settlements (Bakka and Kaland

1971; Solberg 1993; Hjelle *et al.* 2006). On Hundvåg the majority of the stray-finds are from the inner part of the island (Fig. 3). A number occur close to known LN/EBA dwelling sites, confirming that their distribution approximately reflects the location of contemporary settlements and fields. It is also worth noting that all of the typologically classified flint daggers from Hundvåg are of the types IV, V and VI (Zinsli 2007) dating to the end of the LN and EBA (Vankilde 1996).

It has been suggested that early agricultural practice in parts of Scandinavia was based on a rotating system in which both cultivation patterns and the choice of settlement location, were structured around movement within the borders of defined territories (Björhem 2003; Björhem and Staaf 2006; Olsen 2013). In spite of its emphasis on mobility, this lifeway is viewed as inherently sedentary since the same settlement sites were inhabited on multiple occasions and at regular intervals. This theory is primarily based on the observation that several LN/EBA settlement sites have two or more overlapping house structures. Often, there is also a minor time gap between the houses, indicating that it took some time before a new house was built at the same place (Olsen 2013: 143-144). On Hundvåg, evidence of settlement continuity during the LN and EBA is seen at several sites. This is most apparent in the eastern part of Austbø, where a number of structures, as well as cultural layers, date to this period. Several ^{14}C-dates from cultural layers in the north of Austbø add additional weight to this interpretation (Table 2). However, since there are no known houses from the LN and the earliest part of the EBA at any of these sites, it is difficult to determine whether this material reflects continuous settlement at the same place, or is the product of a rotating settlement system based on repeated visits to the same locales. It has not been possible to establish an internal chronology for the two-aisled houses from Skeie (Fig. 3, No.3) and Austbø (Fig. 3, No. 4) but their relative abundance and the frequently encountered evidence of rebuilding/replacement indicates that there was a more permanent settlement structure on the island at this time, where the houses have been replaced on a regular basis. The two early three-aisled houses from the eastern part of Austbø (Fig. 3, No. 1) demonstrate that this was in place during the later portion of EBA period II (1500-1400 BC). These houses have identical ^{14}C-datings and overlap horizontally. Evidence of post hole replacement was observed in both structures, indicating that each had a long life span. One house most likely succeeded the other since there is nothing suggesting that the site was abandoned for a period. Similar continuity of settlement is also probable at Lunde (Fig. 3, No. 10) where two Early Bronze Age houses were found to be of a very similar age.

In general, there seems to have been rather stable, agriculturally based settlement on Hundvåg from at least the latter part of the Late Neolithic onwards. This pattern can also be seen in other parts of western Norway (Diinhoff 2005a). Within Rogaland, well established and enduring settlements have been found at Kvåle in Time, and Jåttå and Røyneberg in Stavanger (Børsheim 2005). At these places, overlapping house structures from the LN and EBA suggest that the same spots were occupied continuously for hundreds of years.

Short-lived houses and permanent ritual places

At several places in southern Norway, especially along the western coast, there is evidence of a distinct expansion of settlement towards the end of the LBA and into the early PRIA (i.e. Løken *et al* 1996; Løken 1998; Diinhoff 2005b; Myhre 2004). As established habitation zones widened, land was cleared to facilitate farming and the construction of settlements. Such an expansion is not evident on Hundvåg, but there is a concentration of both buildings and structures ^{14}C-dated to BC 700-400 (Table 1 and 2), indicating that the settlement went through a similar development and was structured in the same way as in the rest of southern Norway.

The majority of the three-aisled houses from this period on Hundvåg were discovered in a fragmented state, but based on their length (Table 1) they seem to have been of the common type with separate rooms for animals and people. A family based unit who had ownership of the livestock probably occupied such houses (Løken 1998; Myhre 2004: 46-47). Along with the signs of settlement expansion, the houses are seen by some as a reflection of a more egalitarian society, in which colonizing and investment in new land became easier (Skoglund 1999; Myhre 2004; Feldt 2005; Björhem and Staaf 2006; Herschend 2009). Another explanation for the large number of farms and houses from this period is that houses usually lasted for just one generation. The settling of new land was probably not related to family or inheritance, but strictly regulated and organized by the community (Herschend 2009: 170), and in such a society, it is possible that not everyone had the right to build a house or establish a farm. It is also reason to believe that this stratification, where certain families/groups had limited rights and a poorer social position, was expressed through the size and shape of house construction (Herschend 2006: 169). For instance, the two U-shaped buildings from Austbø and Husabø differ from the uniform three-aisled longhouses of the time. Similar small buildings are also found elsewhere in Rogaland (Løken 1997; 1998), and it has been suggested that they express this kind of diversity in society and were homes for families with no rights to keep animals (Løken 1998: 119).

Three rock carving sites have been recorded on Hundvåg, one at Husabø and two at Austbø (Fig. 4). The carving at Husabø is a ship figure and one of the carvings at Austbø consists of a single panel with two ships (Myhre N. 2004: 142). The second carving at Austbø is a composition of assorted lines framing what appear to be upturned ships (Myhre, N. 2004: 119). It is difficult to date the carvings more precisely than to the Bronze Age. The sites on Hundvåg are located in a rock art rich area of Rogaland (Myhre, N. 2004); one of the most extensive concentrations of such material is situated on the island of Åmøy, 3.5 km north of Hundvåg (Fig. 1). The highly variable iconography on display at Åmøy is the cumulative result of activity throughout the Bronze Age. The density and variety of rock art found here, along with its strategic location in the southern part of the Boknafjord basin, suggests that the island served as a ritual sanctuary for a large social catchment. In contrast, smaller and less prominently positioned sites, such as those on Hundvåg, most probably served as local ritual places. Their location close to the seashore and inter-visibility with other similar sites, however, linked them to the wider rock art landscape (Myhre, N. 2004: 142).

Myhre (2004: 59) emphasizes that the most common motif in Rogaland, the ship, and the close relation between the rock art sites and the sea, signal mobility and communication. Although Myhre`s theory is a criticism of the traditional association between rock art, settlement and centre-periphery models, her theory is, in my opinion, consistent with the general settlement pattern in the Bronze Age. In a society characterized by extensive clearance of new land, farms scattered around the landscape and the need to "re-establish" the farm every new generation, rock-carving sites and their motifs may have symbolised the importance of mobility and communication while at the same time serving as permanent and stable places in the landscape.

From farm to manor

Around the birth of Christ, there is a distinct change in the organization of settlement on Hundvåg.

Several places, which had been occupied since the Late Neolithic, seem to be more or less abandoned, at least as habitation areas, and settlement becomes concentrated in the central part of the island (Fig. 5). The first farm complexes with two parallel buildings are also established at this time, and by the late Roman Iron Age, three contemporary farms existed in the northern part of Austbø. At least two of these were in use throughout the whole Roman Iron Age, and at one point the main buildings were 40-50 m in length. These large buildings resemble, in both size and construction, several large manor houses found elsewhere in western Norway (Diinhoff 2011). One example is a 50 m longhouse from the early Roman Iron Age which was discovered at Forsandmoen in Forsand municipality (Løken 1997: 176; 2001: 59). This is likely to have been a multifunctional building on a chieftain's farm, and a large room in the central part of the house is interpreted as a hall for feasts and ceremonies (Løken 2001: 66). It was not possible to define a hall in the two large houses from Austbø, but their substantial size suggests that they were manor houses and as such served as the residences of leading families with political and economic power. It is unlikely that the two farm complexes at Austbø were contemporary, presumably they represent different phases of the same farm.

In the late Roman Iron Age, around AD 200, there is a restructuring of the settlement at Forsandmoen, and a dense village like settlement with a main farm in the centre surrounded by smaller farms was established (Løken *et al*. 1996). So far, there are no direct parallels for this on Hundvåg, however, the amount and density of farms at Austbø suggests that organized and planned settlements existed in the area at this time. These were probably founded and controlled by a leading family. Most likely, the farms were organized as a multi-yard farm, where the different farm complexes had a common infield. A fence probably enclosed the infield, similar to those seen at several well-preserved farm complexes on Jæren from the RIA and the MiP (Myhre 2004: 51). This kind of organization must have led to rather stable fields, and the clear division of the infield and the outfield illustrates the economic importance of cattle at the time (Myhre 2004: 56-57). Due to the limited space available on the island, cattle, or more precisely the need for grazing and hay fields, was most likely a significant influence on the restructuring of settlement beginning in the latter part of the Pre-Roman Iron Age. Unfortunately, it has not been possible to detect any fields or fences on Hundvåg. However, individual and small assemblages of fireplaces and cooking pits not directly related to any contemporary settlements have been found at several sites in the southern part of Austbø and at Lunde (Figs. 4 and 5). Most of these date from the latter part of the or the RIA (Table 2), and could represent traces of activity or small camps in outfield areas related to cattle herding and grazing (Tesch 1993: 137).

During the Migration Period, changes in settlement on Hundvåg seem to have taken place. At Austbø, at least two overlapping houses are ^{14}C-dated to the transition between the RIA and the MiP (Fig. 5, No. 4), but otherwise there is little settlement evidence from the period in this area. However, it is not likely that the settlement was restructured, and no houses from the Migration Period have been found at sites closer to the coast. One possibility is that the settlement became concentrated in the central part of Husabø, where comprehensive traces of settlement have been found. Unfortunately, these traces are not dated, so only future excavations will be able to address this.

There are no rich grave finds of RIA or MiP date on Hundvåg. The only object that can be related to the high status milieu of the time is a gold finger ring from the Migration Period which was found in an anonymous ravine around 1850 (Bøe 1922:

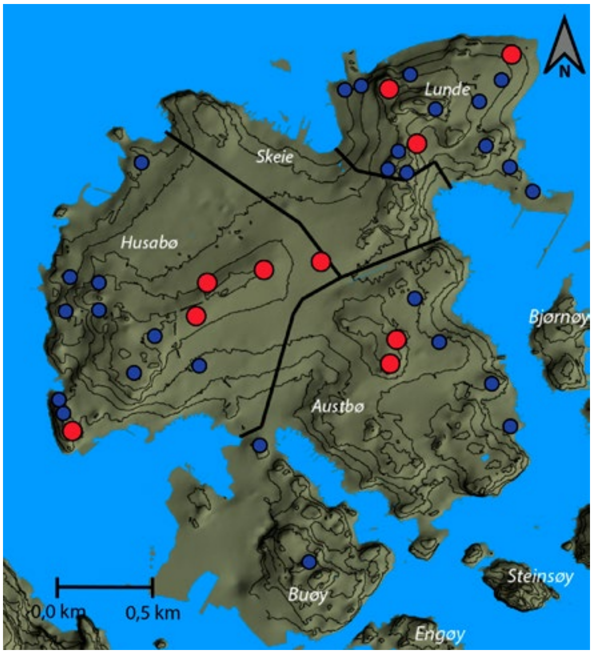

Figure 7. Gravemounds on Hundvåg. The blue dots mark mounds with a diameter of less than 15 m, while the red dots mark mounds with a diameter of 15 m or more (after Helliesen 1901).

37). A number of gravemounds have been recorded on the island (Helliesen 1901), but most have been destroyed over the years as a result of farming activity and construction projects. Just two mounds have been professionally excavated. With the exception of Skeie, grave mounds could once be found at all the historic farms on Hundvåg (Fig. 7). Smaller mounds (10-13m diameter) were generally located close to the coastline (Helliesen 1901). The largest mounds (>15 m diameter), however, were situated in the central part of the island (Fig. 7), in close proximity to the settlements from the Roman Iron Age and onwards. A large mound at Husabø, excavated in 2000, has been dated to the LIA (Aakvik 2000; 2001), and it has been suggested that a second mound at the farm, the largest on the island, dates from the Bronze Age (Hemdorff 2003). This date, however, is based solely on the mound's exceptional size (c. 30 m in diameter and 6 m high). Helliesen reports that farmers found pottery, burnt bones and several grave chambers when they removed the two big mounds at Austbø (Helliesen 1901: 38). We cannot assign an accurate date based solely on this information, but the presence of pottery indicates that the mounds are older than the LIA/VA. Additionally, the occurrence of several grave chambers in each mound suggests that these monuments were used over a period of time.

Several places, there is a clear association between RIA/MiP farm complexes and large grave mounds with rich burials. At Forsandmoen, for instance, three of the biggest grave mounds in the area were located close to a chieftain`s farm from the early Roman Iron Age (Løken 2001: 68-69). At Hove in Sandnes (Fig. 1), several rich Roman Iron Age burials were situated adjacent to a large farm complex from the same period (Myhre 1997; Bjørdal 2014). On Hundvåg, the biggest grave mounds were separated from Roman Iron Age farm complexes by a distance of 200-500 m. There is no direct evidence that any of these mounds are from the Roman Iron Age. As noted above, excavation work has in fact revealed that at least one example is Late Iron Age in date. However, based on their close spatial association with settlements from the Roman Iron Age and onwards, I would argue that the larger grave mounds on Hundvåg are related to the restructuring of the settlement on the island in the latter part of the Pre-Roman Iron Age. By placing the mounds in the centre of the island, adjacent to settlements, the ruling families substantiated their territorial rights and the ancestral bonds to their predecessors (Bukkemoen 2014). A similar association between graves and the farm structure is also evident in the Late Iron Age on Hundvåg.

Estate and administrative functions

Although the Late Iron Age/Viking Age houses from Skeie were discovered in a fragmented state, both their size and associated artifact assemblages, suggest that they represent different phases of a farm. The circular smithy, placed in a distance from rest of the buildings, indicates the same. The location of the house structures demonstrates that settlement in the LIA/VA, as in the previous period, was concentrated in the central part of the island. There is also some evidence that the boundaries of Hundvåg's historic farms were, at least in part, established at this time. There are no grave finds from Skeie, but one of the large grave mounds at Husabø was located on the farm's border with Skeie, and close to the convergence of three historic farm (Skeie, Husabø and Austbø) boundary points (Fig. 7). During the excavation in 2000, the remains of a boat grave dated to the Late Iron Age were uncovered in this mound. There were no older burials, so the mound must have been erected in the LIA. Its construction and location could therefore be associated with the demarcation of the historic farm units, and be seen as an assertion of territorial rights and landownership (Skre 1998: 204-220; Ødegaard 2010).

The reason for such a division could have been hereditary rights (Zachrisson 1994), but the division could also have been the consequence of a reorganization of settlement on Hundvåg, in which the farmland was divided under the auspices of a central landowner. Such a development took place in southeastern Norway during the latter part of the Migration Period and into the first decades of the LIA (Iversen 2013). The lack of house structures from the late Migration Period and onwards at Austbø, and the establishment of a farm at Skeie in the LIA, suggest that some sort of reorganization of the settlement took place on Hundvåg during this time. The name Austbø also points us in the same direction. Austbø is a divided farm name, meaning 'the eastern part of Bø'. Originally, Austbø must have been part of a farm named Bø, and on Hundvåg this could only be Husabø (Helle 1975: 73). The medieval property structure on Hundvåg also indicates that the farms were part of a large unit in the Viking Age, perhaps an estate. During the Medieval Period, Husabø and Austbø were among the biggest farms in Rogaland, and the Apostle Church in Bergen owned both. The Apostle Church was the most prominent of the royal chapels in Norway, and most likely, it received Husabø and Austbø as a gift from the king (Helle 1975: 59). The king on the other hand probably acquired the farms through confiscations during the unification process at end of the ninth century, or through one of the many conflicts that characterize the political situation in Norway until the first part of the thirteenth century (Helle 1975: 56; Bjørkvik 1995: 73).

During the Medieval Period, many farms in this part of Rogaland were in royal or ecclesiastical possession and this suggests that a series of confiscations took place in the area from the late ninth century onwards (Bjørkvik 1995). Although we have no direct knowledge of the property structure in the Viking Age, prior to the confiscations, it is likely that many of these farms belonged to one or several large estates (Bjørkvik 1995: 74-75). It has been suggested that farms named Husabø/Huseby had a prominent position in such estates (Westerdahl and Stylegard 2004: 125), and there is a general assumption that the Husabø/Huseby farms went on to become royal administrative centres in the late Viking Age and early Medieval Period (e.g. Helle 1975; Westerdahl and Stylegard 2004; Iversen 2011). One important function was probably related to the taxation and storage of goods, and there is a concurrence between the distribution of Huseby farms and the late medieval taxation regions in Norway (Iversen 2011: 239).

We cannot determine with certainty when the historic farms were established on Hundvåg, or when and how the farms became royal and ecclesiastical property. Parts of the archaeological material and several historical sources suggest however, that some of these changes may have taken place during the LIA and VA. The historic sources also suggest that Hundvåg had a significant political and administrative position in the region, especially in the latter part of the period. A stone cross from the late Viking Age at Husabø and a private stone church from the Medieval Period at Austbø (Fig. 6) reinforce this impression; wealthy and important persons probably initiated the erection of both.

CONCLUDING REMARKS

On Hundvåg it has been possible to follow the patterns of agriculturally based settlement from the Late Neolithic to the end of the Viking Age. From around 2000 BC onwards, most of the island seem to have been exploited for agricultural purposes, and both ^{14}C-datings and the number of house structures suggest that the settlement has been rather stable, at least since the end of the Late Neolithic. Up to the birth of Christ, the landscape on Hundvåg most probably was a mosaic of farms, fields and grazing areas, and the most pronounced change in the organization of the settlement took place in the early Roman Iron Age. At this time, the settlement became concentrated around the height in the central part of the island, and it seems to have been restricted to this area throughout the Late Iron Age and Viking Age.

Changes in the settlement organization over time are readily visible at Hundvåg, and the main reason for this is the extensive archaeological surveying of the area. Because the island presents limited space for settlement and cultivation, it has also made it easier to detect changes in the use of the landscape. From a long-term perspective, however, the settlement structure on Hundvåg bears many similarities with the general subsistence-settlement along the west coast of Norway. The size of the island has not compromised the general trends according the size of the farms, how the farms have been organized, or how the settlement was situated in the landscape throughout this long time span.

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A LATE BRONZE AGE SHEEP FARM NORTH OF THE ARCTIC CIRCLE?

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ABSTRACT

In this article, we present a discussion of Late Bronze Age farming close to the northern cereal limit in Norway based on archaeological and palaeobotanical evidence from Sandvika, Tromsø municipality, Troms County. Here, a three-aisled longhouse was constructed on a meadow close to the marine shoreline between 1000 and 800 BC. We propose that the site represents a short-term settlement with Nordic Bronze Age characteristics and, based on the presence of bone fragments found in association with a fireplace, an economy relying on both animal husbandry and fishing/hunting. No clear evidence of cereal cultivation was found at the site, although the climate at this time would have been suitable and indications of cereal growth are seen in the palaeobotanical records of other sites in the vicinity. However, there is evidence that the site was exposed for several hundreds of years after its abandonment, and the absence of proper indicative plant macrofossils might also be explained by taphonomic loss.

INTRODUCTION

The discovery of a three-aisled longhouse in context with other archaeological features and artifacts typically associated with Nordic Bronze Age settlement as far north as 69°36' N (Arntzen 2015a) adds a new dimension to the debate on farming as part of a sustainable economy and a possible prerequisite for permanent settlement in this region. However, with the exception of burnt bone fragments identified as sheep or goat, possibly predating the house remains by c. 200 years, there is no unequivocal evidence of farming from the house site. The lack of cereal grains in the botanical subfossil records and absence of other features directly related to agriculture (e.g. traces of primitive ploughing or well-developed field layers), does not strengthen a hypothesis of intra-site cultivation. In this publication, we will discuss the empirical data from the site with a particular emphasis on examining the plausibility of farming, and will, in this respect, relate our results to other comparable investigations in the region.

The main focus will be on the archaeological and botanical finds.

Previous research involving perspectives on Bronze and Early Iron Age agriculture in northern Norway was limited by the type and quality of evidence available. Archaeologists have discussed the small amount of bronzes, rock carvings, cairns, and asbestos ceramics within the region as a possible link to southern farming communities, although in the main they have been understood as evidence of only a slight cultural influence amongst otherwise hunter-fisher-gatherer settlements (Munch 1966; Bakka 1976; Johansen 1982; Jørgensen 1986; Olsen 1988; Andreassen 2002). The older evidence in most cases consists of finds lacking a reliable context, therefore the Sandvika site, along with other new evidence (cf. Arntzen 2013a), nuances and expands the basis for interpretation in studies of Bronze Age farming.

The most reliable botanical evidence of cereal growth is ^{14}C-dated cereal grains retrieved from field layers or other archaeological features, preferably in a context with other objective proof of cultivation to correct for import. Very few investigations meeting these criteria have been carried out in northern Norway. The empirical foundation for research on early agriculture in the north is dominated by indirect proofs, such as stray finds of cereals in a context dated by archaeological typology or charcoal, or from pollen analyses performed on mire or lake sediments with varying stratigraphical and chronological control. The general pattern regarding the development of the cultural landscape is nevertheless strikingly comparable with results from coastal areas further south in Norway, particularly from the Late Bronze Age and Pre-Roman Iron Age onwards when the impact from grazing and subsequent mowing is an essential driving force. The most controversial issues of the debate concentrate on the interpretation of early observations of cereals and cereal pollen types among other anthropogenic indicators from contexts dated to the Neolithic and Bronze Age (Vorren 1986, 2005; Vorren et al. 1990; Sjögren and Arntzen 2012; Jensen 2012; Lahtinen and Rowley-Convy 2013). These overlap in time with the introduction and consolidation of agriculture in both southern (e.g. Høgestøl and Prøsch-Danielsen 2006; Prøsch-Danielsen and Soltvedt 2011; Hjelle et al. 2012) and central Norway (Solem 2002), and may be seen as evidence of attempts to introduce a new economy.

An archaeological survey project at Sandvika in 1994 (Helberg 1994), resulted in the surprising finds of asbestos tempered ceramics, part of a bronze casting mould, a piece of a thin-walled soapstone vessel, and palynological indications of farming impact on a nearby mire (Tveraabak and Alm 1997). A single ^{14}C-date of charcoal, now known to derive from the "collapse context" of a house, indicated activity in the Late Bronze Age/Pre-Roman Iron Age. Detailed information about the subsequent archaeological research excavation in 2013 is given in Arntzen (2015a).

STUDY AREA AND SITE DESCRIPTION

Sandvika (18°5'30"E, 69°36'40"N) is a north facing shallow bay situated on the southwestern coast of a large island, Kvaløya, west of the town Tromsø in northern Norway (Figs. 1, 2). The landscape is coastal alpine where the tallest mountain on this part of Kvaløya is 566 m a. s. l. and an outer archipelago somewhat shields against the open ocean. The present settlement in this area is located on the strandflat, scattered or in small fishing villages, typical of the traditionally dominant economy of fishery in combination with small-scale farming. There is no permanent settlement in Sandvika today. The climate is markedly oceanic and the site lies within the vegetation ecological region classified as northern boreal, or the northern conifer-birch zone (Moen 1999). The mean annual temperature during the last

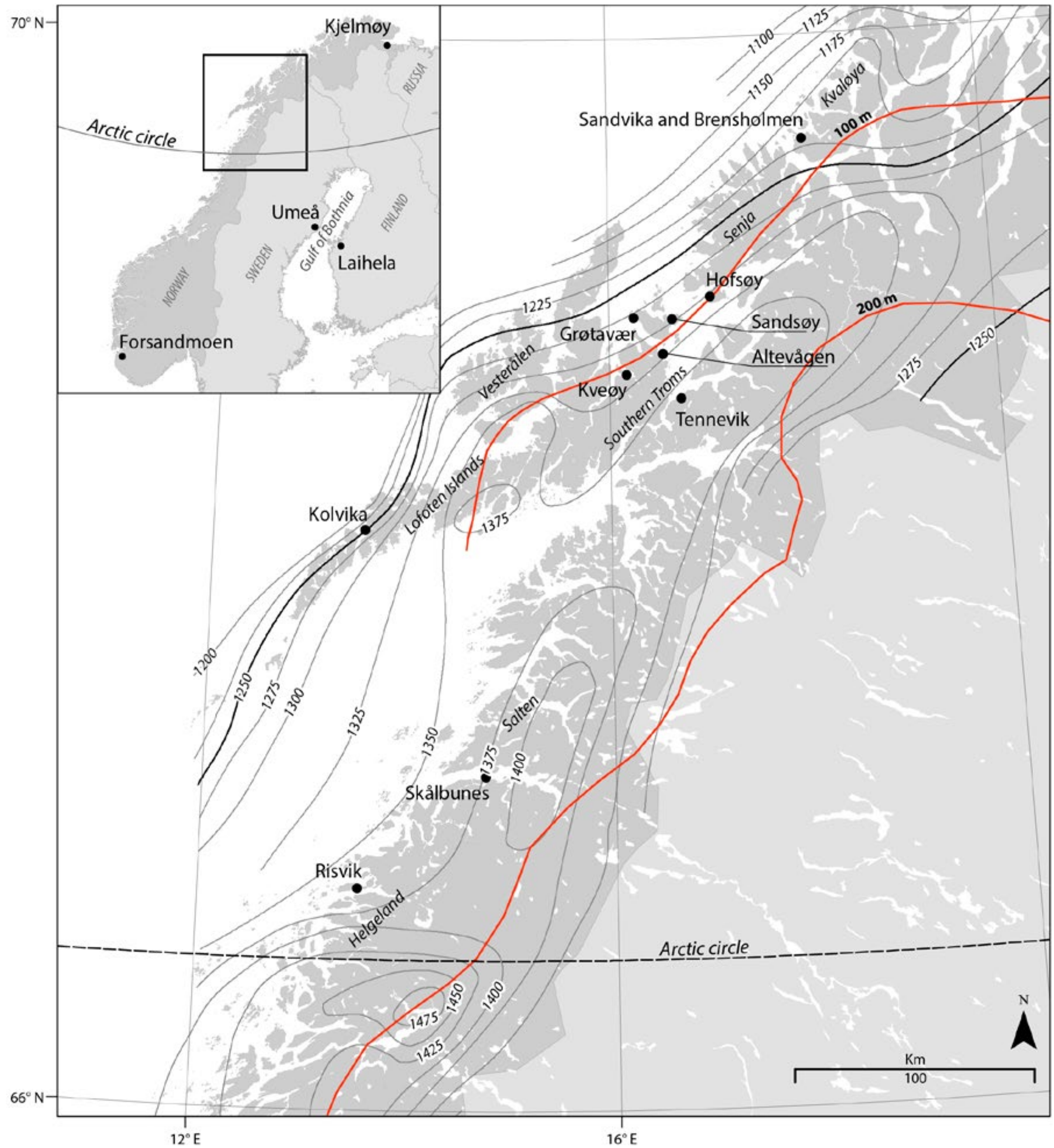

Figure 1. Map of the geographical region comprising the northern limit of cereal growth in Norway with Sandvika and other sites mentioned in the text included. The midboreal altitudinal limit is shown with red countours (Moen 1999), while day degree isotherms are marked with grey contours (Fjærvoll 1961). The 1250-isotherm is highlighted in black.

Figure 2. The Sandvika excavation site, Tromsø. Photo towards north 17.3.2013.

normal period (1961-1990) at Sommarøy, c. 3 km NW of Sandvika, is 3,9 °C, July and January mean temperatures are 11.9°C and -1.9°C respectively (Aune 1993), while the mean annual precipitation is 940 mm (Førland 1993).

The excavation site is located 360 m south of the present marine shoreline, at 10 m a. s. l., which is close to the local maximum sea level of the Tapes transgression. The marine limit is 40 m a.s.l. (Vorren et al. 2013). A tentative sea level curve for the Sandvika area, calculated with software developed by Møller and Holmeslet (2002, see also Møller 1989), renders a sea level of c. 5 m a. s. l. around 3000 years ago (Vorren et al 2013). The present vegetation consists of herb-rich tidal meadow behind the sandy beach, while dwarf shrub heathland, birch woodland and extensive mires with two main brooks dominate the area between the tidal meadow and the excavation site.

MATERIAL AND METHODS

Based on the hypothesis that the find types present in Sandvika could indicate agrarian settlement, a research-initiated excavation was conducted in 2013 (Arntzen 2015a). Experience gained from previous excavations in the region, particularly the Kveøya investigations (Arntzen and Sommerseth 2010; Sjögren and Arntzen 2012; Arntzen 2013b), favoured an interdisciplinary approach including botanical, phytolithic and entomological analyses.

Due to an unexpectedly high water table, two large drainage ditches had to be excavated around the site before the excavation could commence. Two drier areas with positive finds of settlement remains

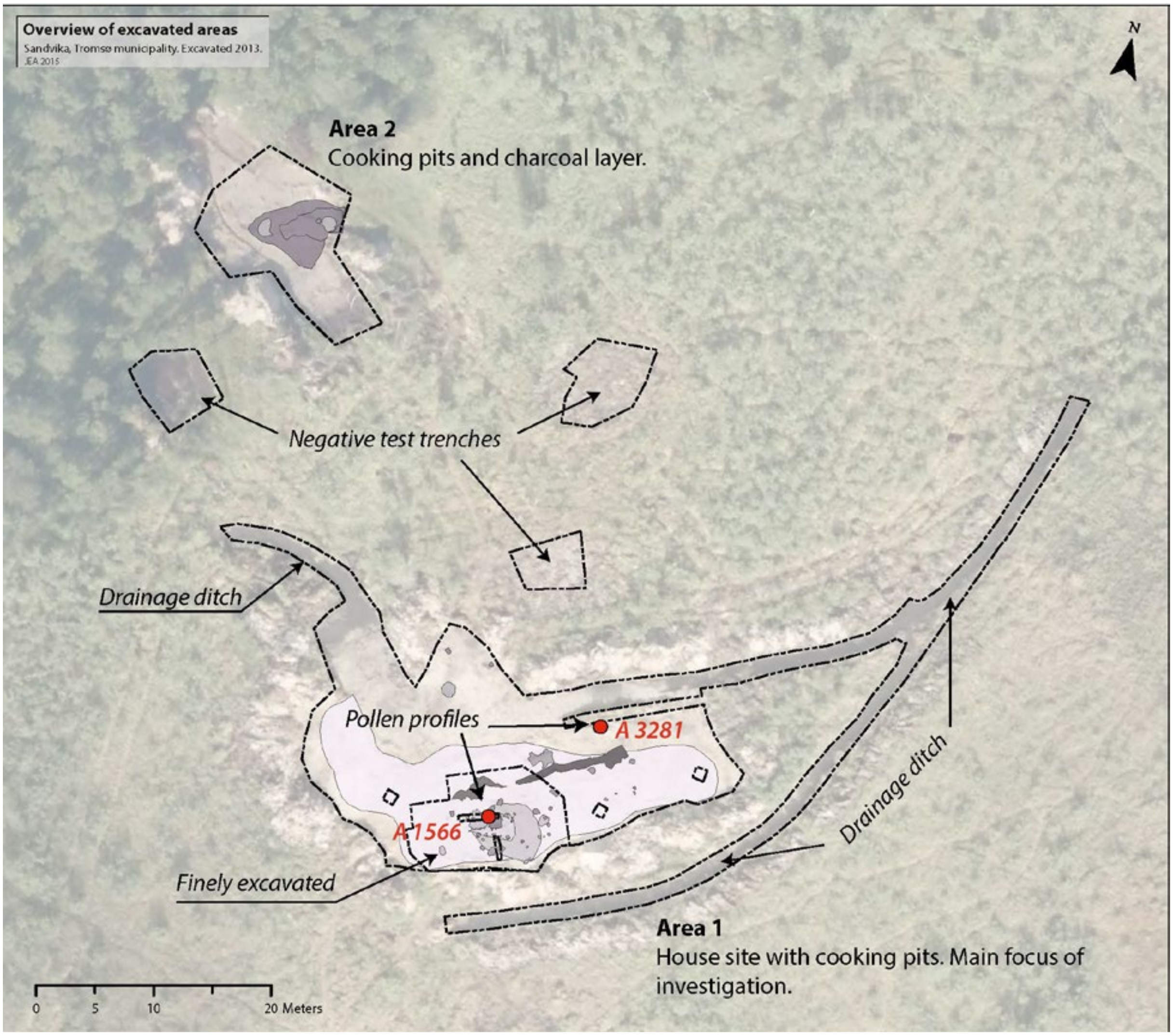

Figure 3. Overview of the excavated areas in Sandvika. Ortophoto © Geovekst.

were thereafter stripped of topsoil by a mechanical excavator. Area 1 had a total extent of 688 m^2, and resulted in the location of a longhouse, two cooking pits, as well as the large majority of the artifacts recovered. Area 2, which was situated 30 meters north of Area 1, covered 140 m^2 and resulted in the identification of charcoal mixed deposits as well as two cooking pits (Figs. 3, 4). The main effort during the fieldwork was focused on Area 1. Here a 100 m^2 grid was laid out enabling detailed excavation (Arntzen 2015a).

Plant macrofossil samples were gathered from all features and the floor layer of the longhouse. Vertical soil profiles through the central part of the collapsed house as well as from the outskirts of the activity area were subsampled in the field, primarily for microfossil

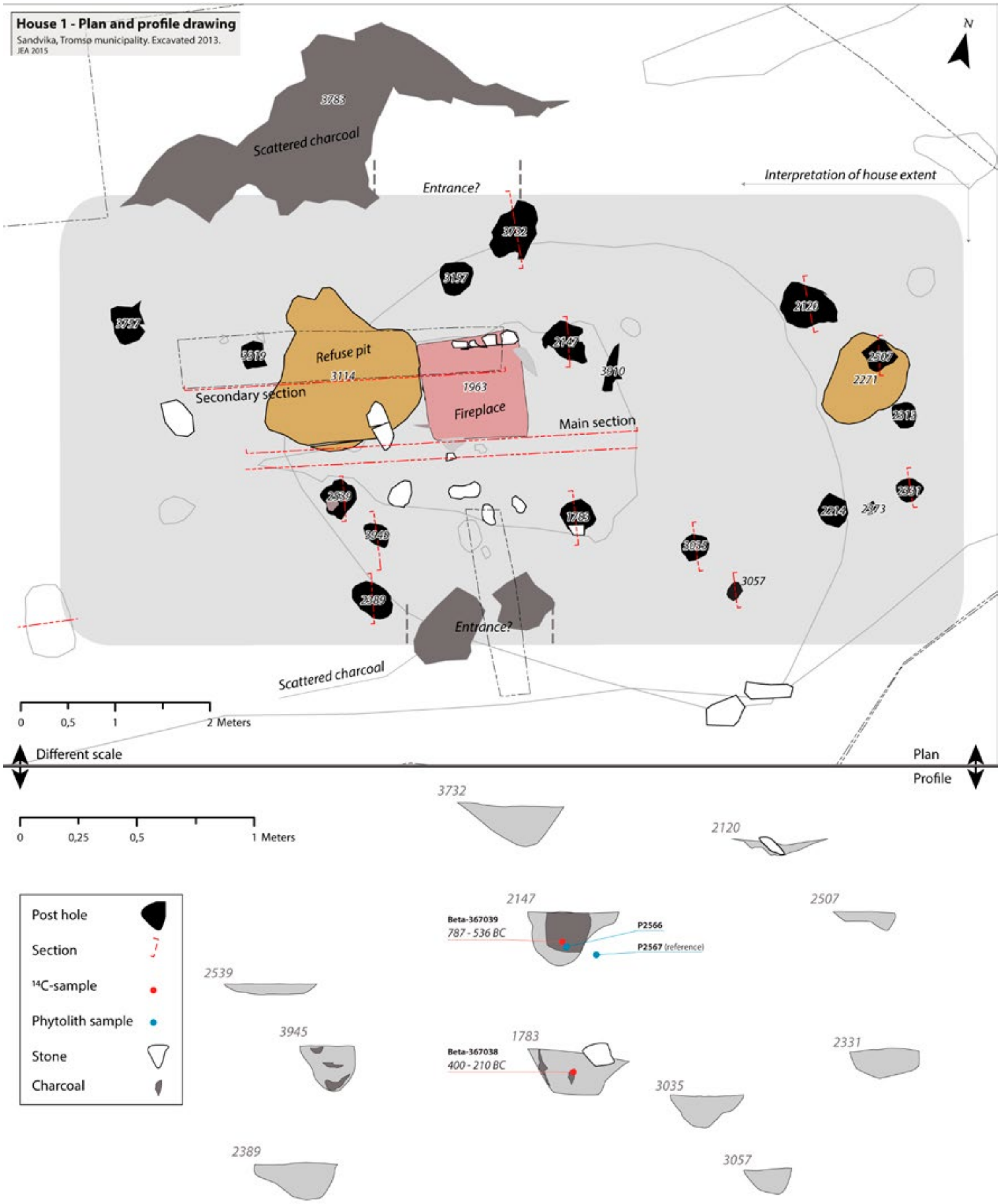

Figure 4. Plan- and profile drawing of House 1 in Sandvika.

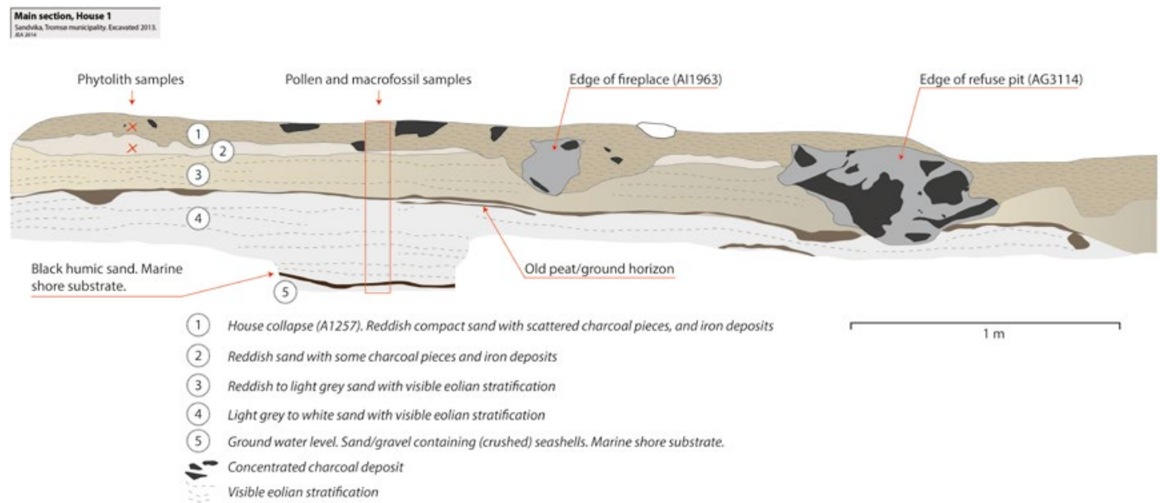

Figure 5. The main section of the excavated house in Sandvika, marking the place of botanical sampling.

(pollen) analysis, but also for macrofossil analysis (Figs. 4, 5). Laboratory preparation of pollen samples involved treatment with hydrofluoric acid (HF) and potassium hydroxide (KOH) in addition to standard acetolysis according to Fægri and Iversen (1989). For the calculation of pollen concentration, 2 tablets of *Lycopodium clavatum* spores were added prior to the acetolysis. The pollen content was too low to justify the calculation of percentages, and results are thus presented as concentration, i.e. numbers per unit of volume. The pollen identification follows Fægri and Iversen (1989), Moore et al. (1991) and Beug (2004), while plant macrofossils were identified with the help of Cappers et al. (2006), the reference collection at the University of Stavanger and personal communications. Calibrated radiocarbon ages are given as calendar year ranges at a 2σ level and all calibrations have been performed by the authors using Calib 7 (Stuiver and Reimer 1993) and the INTCAL13 dataset (Reimer et al. 2013). Deviations from these reporting and calibration standards will be noted in the text as necessary.

RESULTS AND INTERPRETATION

The house

Perhaps the most important find from the Sandvika excavation was the remains of a longhouse. The evidence took the form of 18 features interpreted as postholes as well as a fireplace, a refuse pit, and an artifact-bearing layer interpreted as the collapse context or floor of the building. The archaeological remains were covered by a topsoil layer consisting of up to 15 cm of white sand below 15-40 cm of turf. The sand layer may be contemporary with a white sand layer recorded in the mire nearby, whose deposition has been radiocarbon dated to between c. 600 and AD 700 (Tveraabak and Alm 1997). If so,

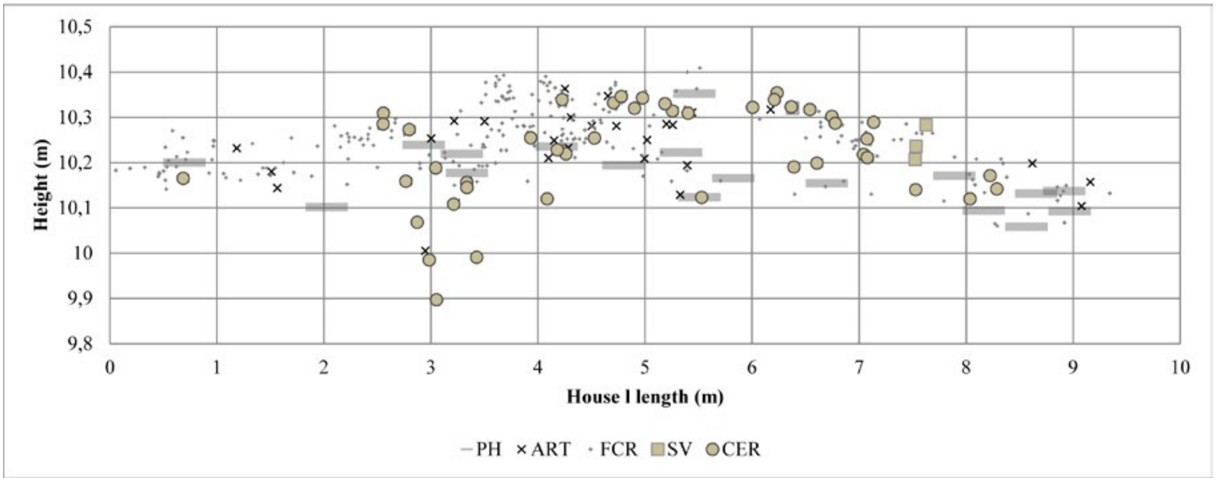

Figure 6. Plot showing the height-levels at which postholes (PH), artifacts (ART), fire-cracked rocks (FCR), soapstone vessel sherds (SV) and ceramics (CER) were documented. The diagram includes features and artifacts found within the delimitation of the house floor (interpretation), as shown in Fig. 5. The lowest outliers are artifacts found within the refuse pit.

this would leave us with a time gap of 1500-1600 years where the archaeological site may have been exposed to sand drift and erosion.

Many of the postholes were poorly preserved, and affected by sand drift activity. The best preserved examples are three features interpreted as remains of roof bearing posts and located in the centre of the house. Two of these form an opposing pair at right angles to the long axis of the house, with a distance of 1.82 meters (measured from the centre). One of these postholes was lined with stone and contained two pieces of asbestos ceramics, two pieces of quartzite debris, and a piece of burnt animal bone. The third feature lies 2 meters to the west of the pair, along the long axis of the building.

A rectangular fireplace was documented slightly off centre, towards the north and west of the floor area. The feature measured 1 x 1 meter, had parts of a stone lining preserved, and was filled with a fine ash deposit from which 150 grams of burnt animal bones were recovered. Adjacent to the fireplace, a pit of 1.6 x 1.7 meters in size was documented, stratigraphically contemporaneous with the fireplace. The pit, which was up to 40 cm deep, contained a dark, sticky, charcoal-mixed fill different from that of the fireplace. In addition to 14 liters of fire-cracked rocks, the feature contained 44% of the ceramics uncovered during the excavation (64 g) as well as 38 grams of burnt animal bone and two pieces of retouched chert debris. Although the pit contained fire-cracked rocks, it cannot be reliably interpreted as a cooking pit. Its position right next to the fireplace indicates a joint function, probably as a refuse pit or some form of storage.

In order to reliably delimit the house area, all pieces of fire-cracked rock above 5 cm in diameter found outside of individual features were recorded. The total comprises c. 70 liters and 277 find spots all clearly concentrated within the house floor. The interpretation of the house is also strengthened by the distribution of the ceramics and the soapstone artifacts, all of which were recovered within the expected delimitation of the house.

When the vertical distribution of postholes, fire-cracked rocks, thin-walled soapstone vessels and ceramics are plotted against the house's length, a rounded ridge is formed (Fig. 6). This plot further illustrates how sand drift has particularly affected features towards the edges of the house ground. The range of the level at which postholes were documented was 29 cm, a clear explanation for the variation in depth when sectioned. The vertical distribution also shows that all of the above mentioned categories are evenly distributed, supporting the idea that the totality of the evidence likely belongs to a single settlement phase.

Although there is considerable uncertainty when assessing the impact of post depositional processes, it is likely that the construction at Sandvika was a three-aisled building. Several of the features have probably been erased by sand drift, while others are markedly obscured, making any detailed architectural interpretation impossible. However, there is sufficient evidence to suggest that the building was c. 10 x 4 meters in size and that it had roughly centred entrances situated along its long walls. This form of construction resembles the late Bronze Age house from Kveøy, which was three-aisled, somewhat more than 12 meters in length, and c. 5–7 meters in width (Arntzen 2013b). The size and placement of entrances also roughly resembles Late Bronze Age constructions from Forsandmoen in Rogaland, where this particular type is interpreted to be a combined dwelling and barn (Løken 1998).

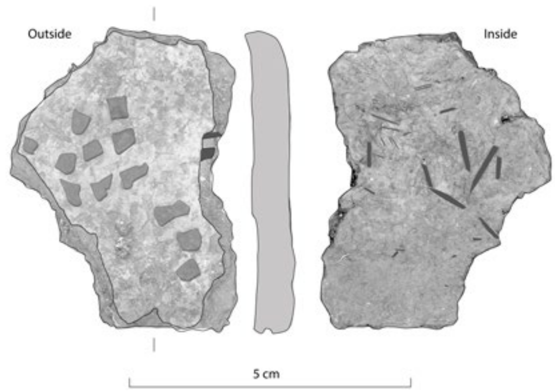

Figure 7. Pin-stamp-decorated asbestos tempered ceramics from House 1.

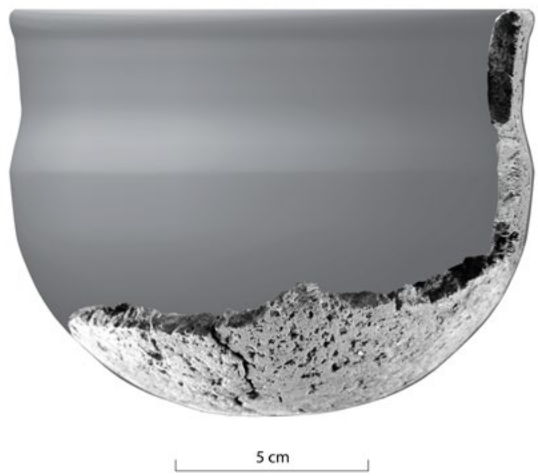

Figure 8. Reconstruction of the thin-walled soapstone vessel found within the floor area of House 1. The sherds used in the reconstruction are included in the illustration.

Artifacts

The most numerous artifact category associated with the Sandvika house comprised 90 sherds of asbestos ceramics, weighing 144 grams, with a high degree of fragmentation and in a generally poor state. Their thickness averages only 4.4 mm and ranges between 1.7 and 7.5 mm. Only a single rim sherd is present which, although small, could indicate a vessel of c. 17 cm in diameter. The tempering is varied, with both long, thin and short, thick fibers present. Three sherds have irregularly placed pin stamp decorations and the aforementioned rim sherd has small dot decorations (Fig. 7). The assemblage is varied to such a degree that at least two to three different types must have been in use, neither of which fit plainly within any of the six known "groups" of asbestos ceramics in use in northern Norway during the Late Bronze Age and Early Iron Age (Jørgensen and Olsen 1988). The question of how the Sandvika find relates to the ceramic typology will be further dealt with below.

A find that did fit clearly into an established typology related to the south was a large part of a thin-walled soapstone vessel uncovered within the floor area of the house (Fig. 8). In addition to a large portion of the base, four conjoinable sherds were discovered, making the reconstruction of a complete vessel possible. Based on the reconstruction, the vessel was bowl-shaped, c. 10.5 cm in height and 13.5 cm in width with a 2.5 cm wide band below the rim and no decoration. The thickness varied between 1.5 cm at the bottom to only 0.9 cm at the thinnest parts of the walls. The bowl-shaped form as well as the band beneath the rim corresponds with Pilø's (1989) type I, dated to the Late Bronze Age. A charred film or food crust on the inside of the vessel has been dated to 896–802 BC (Beta-389928, 2680±30 BP), affirming the typological date.

The corner of one of the valves for a soapstone bi-valve mould, measuring only 2 x 5 cm, also found within the house floor, is of great importance when discussing a connection to the Nordic Bronze Age. Although a small find, the so-called core-prints, used to lock the clay core into place when casting hollow objects, gives a hint as to what has been cast. These are located above the internal casting cavities in the preserved part of the mould, and have a stepped design element only paralleled in a Nordic soapstone mould for casting a socketed axe, found in Grøtavær in Southern Troms (Munch 1966; Engedal 2010). It is therefore likely that the Sandvika mould was also designed to cast a socketed axe or a similarly sized hollow object of Nordic Bronze Age type. Although not analyzed in detail, a magnetic piece of slag found within the house floor could indicate that bronze casting took place in Sandvika.

Other finds from the excavation include 18 pieces of lithic debris, several pieces of pumice with grinding marks, a fishing sinker, a hard hammerstone as well as a single edged slate knife stemming from a context dated to the Neolithic.

Burnt animal bone and plant remains

With only a handful of find spots for bone material connected to early agriculture in the region, the discovery of 188 grams of burnt animal bone within the fireplace and a refuse pit belonging to the house was of great importance. Although butchery practice, burning and post depositional destruction makes the assemblage very fragmented, osteological analysis successfully identified sheep/goat, fish, bird and seal (Denham 2014). The sheep/goat bones, which were the most numerous of the few identifiable fragments, are considered typical butchery waste fragments. The small and fragmented data set does not allow for any quantitative assessment, but there are some qualities worth mentioning. The degree of burning is rather low, something that could indicate that the bones were not deliberately used as fuel, but discarded. With the possible exception of a single fragment, evidence for larger fauna is lacking. If interpreted as general food waste this implies that the people in Sandvika were neither hunting nor keeping larger animals. It must however be taken into account that meat bearing elements could have been deposited elsewhere and that preservation conditions, perhaps related to the degree of burning, might be a factor.

A macrofossil sample recovered beneath the largest piece of the soapstone vessel contained one burnt seed of chickweed (*Stellaria media*). This is a common weed that may have been part of a local food resource. Burnt seeds from crowberries (*Empetrum nigrum*) and saltbush (*Atriplex* sp.) were found in the hearth and postholes. Crowberry is edible, and is a common species of the local heath and mire vegetation, while saltbush is a common species on the sea shore. Phytoliths from grasses were present in samples taken within the habitation area; this could imply that grass was used as animal fodder (Zurro 2014).

Dating

Since no reliable types were found, the ceramics from Sandvika provide a wide chronological timeframe of c. 2100 BC–AD 1. The Risvik type, with which the Sandvika assemblage has its closest parallel, is (based on directly dated food crusts) placed at c. 1100–270 BC (Jørgensen and Olsen 1988; Andreassen 2002). The bowl-shaped, thin-walled soapstone vessel is typologically dated to the Late Bronze Age (1100–500 BC, see Pilø 1989) and the mould fragment most likely belongs to period V-VI (950–500 BC, see discussion with references in Arntzen 2015a) of the Bronze Age.

A total of 9 ^{14}C-dates from the site give an age range of 1400 BC–AD 200 (Table 1). While two dates from the building's postholes produced results stretching into the Pre-Roman Iron Age, this is most likely a reflection of later use and contamination related to colluvial activity. The dates stem from charcoal particles retrieved from the fill of the postholes.

A probability summation of all the dates (excluding the Neolithic result connected to the slate knife) indicate the main period of settlement to be 1120–799 BC within 2σ and 1054–804 BC within 1σ (Fig. 9). The determination from the food crust on the

Lab nr.	Context	Material	^{14}C-age BP	1 σ	2 σ
Beta-367037	Cooking pit (AK1138). Area 1	Charcoal (*Betula*)	1900±30	AD 71 - 129	AD 29 - 213
Beta-367038	Posthole (AS1783). House 1, area 1	Charcoal (*Betula*)	2270±30	395 - 237 BC	300 - 210 BC
Beta-367039	Posthole (AS2147). House 1, area 1	Charcoal (*Betula*)	2500±30	767 - 550 BC	787 - 536 BC
Beta-367040	Refuse pit (AG3114). House 1, area 1	Charcoal (*Betula*)	2780±30	991 - 895 BC	1003 - 844 BC
Beta-367041	Cooking pit (AK3668). Area 2	Charcoal (*Betula*)	2750±30	916 - 843 BC	975 - 823 BC
Beta-389928	Soap stone vessel. House 1, area 1	Food crust	2680±30	889 - 804 BC	896 - 802 BC
Beta-389929	Pit with slate knife (A3091)	Charcoal (*Betula*)	3860±30	2454 - 2236 BC	2461 - 2209 BC
Beta-389930	Ceramics. House 1, area 1	Soot layer/food crust	2870±30	1109 - 1003 BC	1187 - 930 BC
T-11620	Collapse/floor layer, House 1, area 1	Charcoal (*Betula*)	2415±90	748 - 400 BC	794 - 362 BC
Beta-399126	Burnt sheep/goat bone from fireplace (AI1963). House 1, area 1	Burnt animal bone	3030±30	1374 - 1226 BC	1395 - 1135 BC

Table 1. Radiocarbon datings from Sandvika. With the exception of T-11620, all are AMS-determinations.

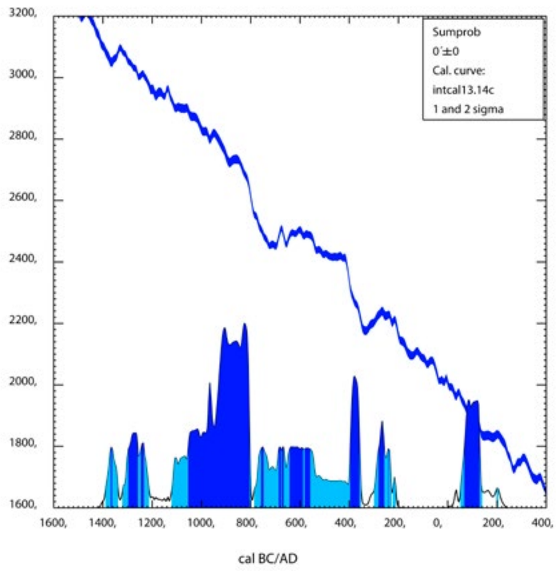

Figure 9. Probability summation based on nine ^{14}C-dates from the excavation (Table 1).

thin-walled soapstone vessel yielded of 896–802 BC. This determination is regarded as one of two dates from the excavation where the contextual control is good and the potential sources of error low. The other one, a charcoal determination (single piece of *Betula*) from the bottom deposits of the refuse pit, yielded a result of 1003–844 BC (Beta-367040). Considering these two dates in connection with the probability summation, it seems safe to place the main period of settlement between c. 1000–800 BC. A cooking pit in the western portion of Area 1, which was dated to the years around BC/AD, shows that the site has been in use during later times and could explain some of the contamination from more recent charcoal. When taking into account the features interpreted as belonging to House 1 as well as the artifact types and their amount, it is probable that the house represents a single settlement phase and that the later activity had its main settlement areas elsewhere.

Bone fragments found in the fireplace of the house (Figs. 4, 15) were identified as parts of the lower leg of sheep/goat (Denham 2014) and radiocarbon-dated to 1390–1335 BC within 2σ (Beta-399126, table 1). This deviating result will be further discussed below.

The litho- and biostratigraphy of the site

The lithology and pollen- and macrofossil content of the two sediment profiles sampled within the central part of House 1 (Figs. 3, 10) and at the border of Area 1 (Figs. 3, 11), show several similar features. Both profiles extend down to a marine shore substrate consisting of coarse coral sand and gravel, probably covering bedrock or moraine. The basal peat overlaying marine sediments in the nearby mire (Fig. 12, mire lok 2) is radiocarbon-dated to 4095±115 BP, which is in accordance with the proposed local sea level curve showing a regression from 9 m a.s.l. during the last c. 4500 years (Vorren et al. 2013).

In the A 1566 profile beneath House 1, the upper part of the stratified sand layer (Fig. 10, Layer 4) appeared less marine and is probably an aeolian deposit. A distinct thin organic layer (subsoil), covered by light grey drift sand, is interpreted as a former terrestrial ground surface based on its strongly humic character and the content of charcoal and pollen (Fig. 10, Layer 3). No macrofossils were identifiable to species level, but a *Hordeum*-type pollen was found in addition to pollen from mustards (Brassicaceae) and meadowrue (*Thalictrum*). It fulfills the identification criteria regarding size and morphology of *Hordeum* –type according to Fægri and Iversen (1989) and Beug (2004), but the thickness and foveolation of the cell wall does not satisfy the criteria of the cereal *Hordeum* (barley). The close vicinity to the marine shore makes the large native grass *Leymus* (former *Elymus*) *arenarius* (blue grass) a plausible alternative on a sandy seashore.

In our tentative interpretation of the soil stratigraphy, the corresponding level of the A 3281 soil

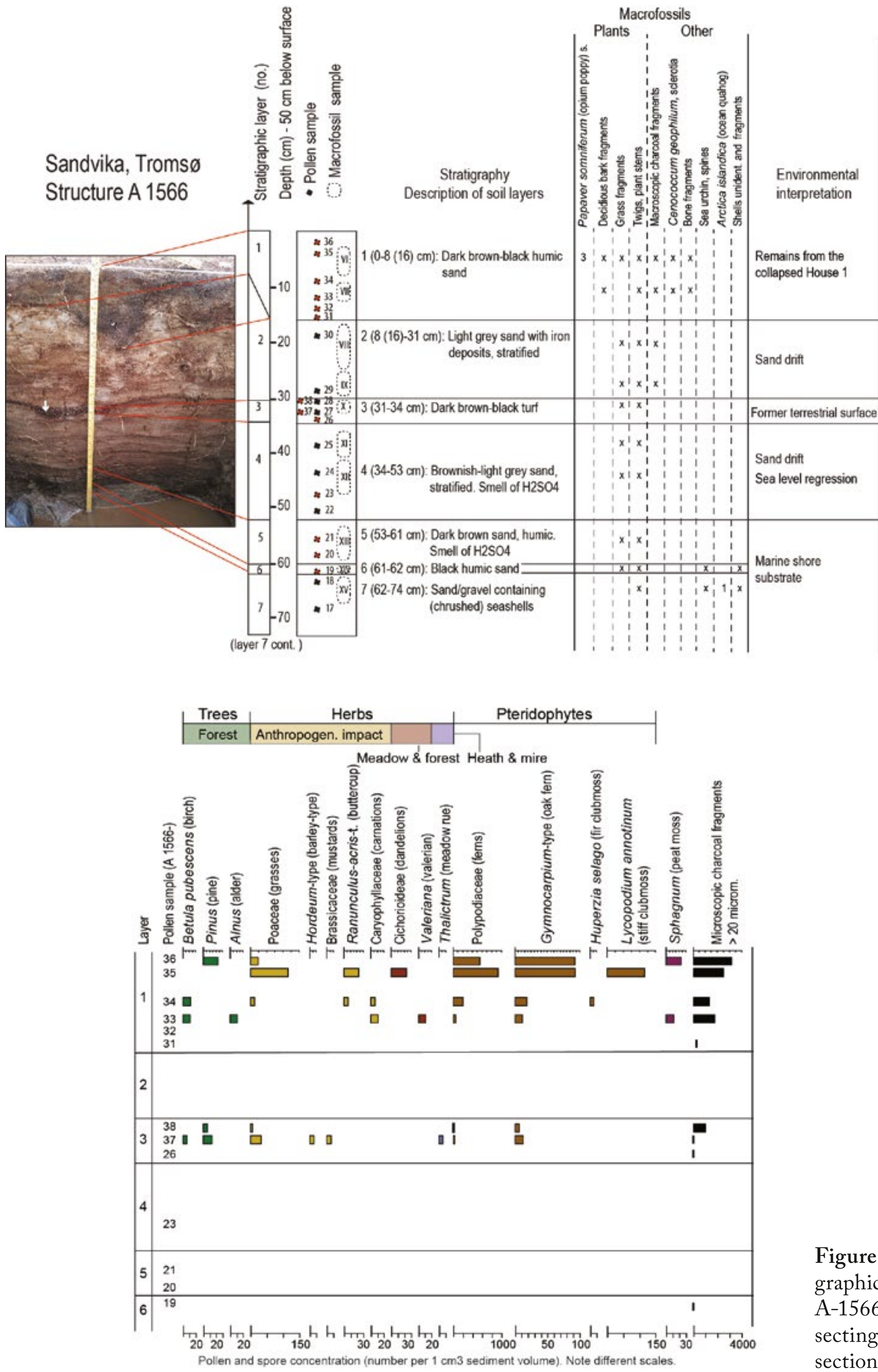

Figure 10. Litho- and biostratigraphical description of the A-1566 sediment profile intersecting the central axis (main section) of House 1, Sandvika.

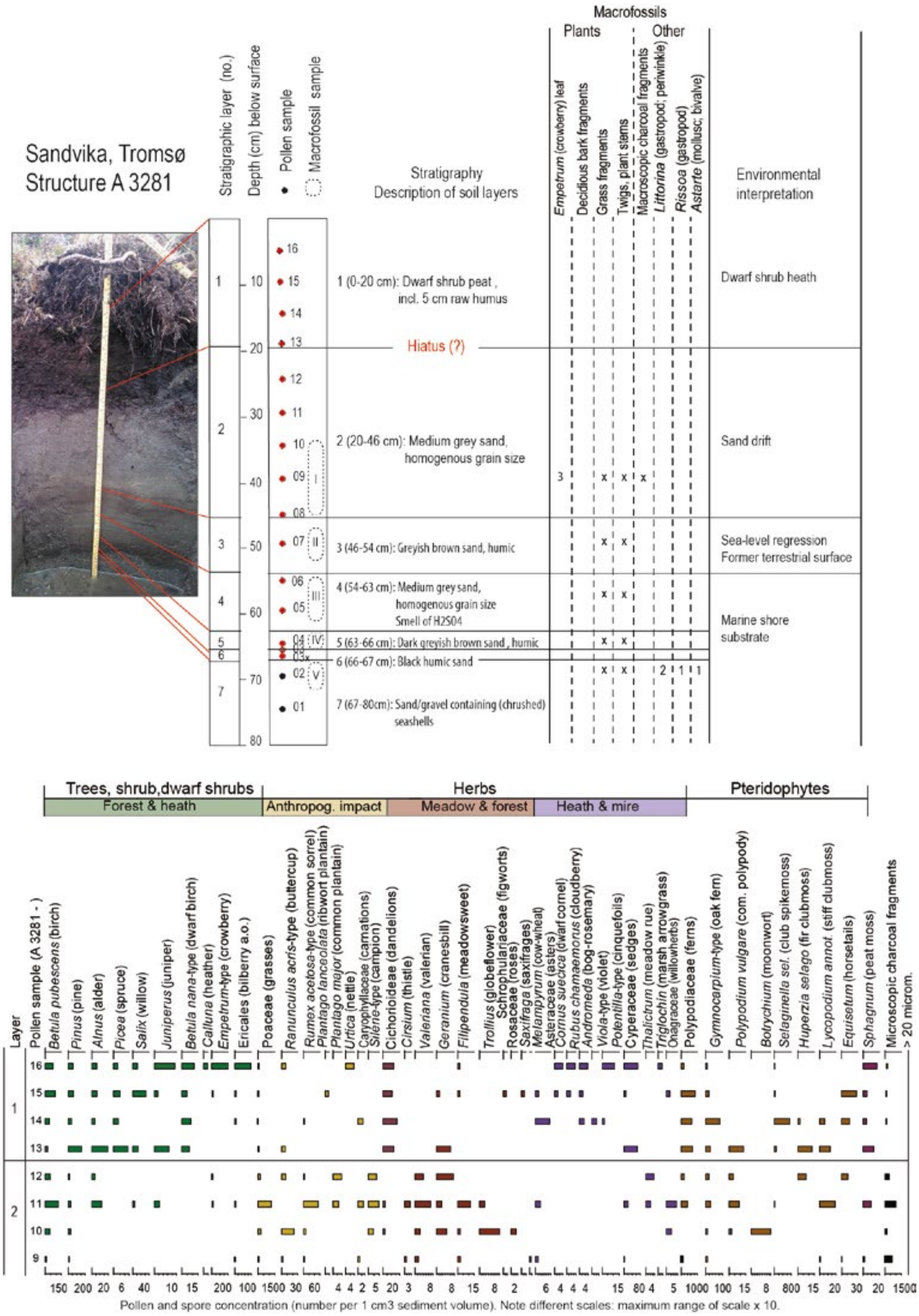

Figure 11. Litho- and biostratigraphical description of the A 3281 sediment profile at the western border of the excavation area with House 1, Sandvika.

profile has a much less distinct organic layer (Fig. 11, Layer 3), and is believed to represent a former seashore rather than an anthropogenic environment. The homogenous greyish sand "package" overlaying the organic layer in this profile may be contemporary with the drift sand below House 1 (Fig. 10, Layer 2). The pollen content of A 3281 displays a flora indicating the possibility of anthropogenic plant communities nearby. A pollen assemblage consisting of a combination of buttercups (*Ranunculus acris*-type), sorrel (*Rumex acetosa*-type), ribwort plantain (*Plantago lanceolata*) and grasses (Poaceae) connects with northern grazed meadows (e.g. Vorren 1986). Species belonging to the carnation family (Caryophyllaceae, *Silene*-type) are also a characteristic feature of such meadows. Tall herbs like meadowsweet (*Filipendula ulmaria*), thistles (*Cirsium*), valerian (*Valeriana*), cranesbill (*Geranium*) and dandelions (Cichorioideae) are native to mesic forest or woodland, but could also characterize the medium successional stages of fallow grazed land. Common plantain (*Plantago major/media*) is characteristic of ruderal anthropogenic habitats, like paths and trampled areas. The finds of spores from the pteridophytes moonwort (*Botrychium*) and northern spikemoss (*Selaginella selaginoides*) add to the picture of an anthropogenic impact on the flora, as these species are particularly responsive to the environment created by grazing.

The distinction to the upper heathland turf in A 3281 is marked, and there may be a hiatus due to erosion, perhaps related to the settlement activity at House 1 and erosion processes following its abandonment. The pollen assemblage of the upper part of A 3281 Layer 2 is comparable with the pollen content of A 1566 Layer 1 (the collapsed House 1), and may represent the same phase of activity. Although care should be taken in interpreting the indicative value of the pollen types present, as they may also be part of non-anthropogenic plant communities, the overall image of the palynological assemblages points to an environment influenced by humans and animals. This is supported by the compliance with pollen assemblage zone SA 2-3 in the pollen diagram from the nearby mire (Fig. 13).

The presence of three partly carbonized seeds of opium poppy (*Papaver somniferum*) is a peculiarity of the upper part of the collapsed house remains (Figs. 10, 16). This species has not been a part of the northern field flora, and to find such seeds in a Bronze Age context is surprising. No other early finds are known from Norway, but there are reports of Pre-Roman opium poppy seeds from Jutland in Denmark (Radoslaw Grabovski pers. comm. 07.11. 2014, Jensen 1985) and southern Sweden (Artelius 1989; Viklund 1989; Lindahl-Jensen et al. 1995). Late Neolithic and Pre-Roman finds are recorded in the Dutch archaeobotanical database, but none from a Bronze Age context (Otto Brinkkemper, pers. comm. 07.11.2014). Additionally, considering the generally low content of macro- and microfossils in the Sandvika material, it is not likely that the poppy seeds are in original situ, and are most probably a result of a more recent intrusion.

As documented by the archaeological features and the sediment stratigraphy, House 1 is probably the remains of one single phase of settlement between c. 1000 and 800 BC. The early date associated with the sheep/goat bones found within the fireplace, reaching as far back as 1395–1135 BC, could be marred by contamination. The dated portion of the bones, which is the carbonate fraction, provides for uncertainties as to the origin of the carbon. Since the result conforms poorly to all other observations, it could be explained as an effect of migrating carbon from an older fuel source, possibly driftwood (Hüls et al. 2010; Van Strydonck et al. 2010; Olsen et al. 2013). The sheep/goat bone is hence considered as derived from the settlement of House 1.

		Plant macrofossils, burned				Plant macrofossils, not burned								Other macrofossils				
Sample	Feature	Volume	*Empetrum* (crowberry) fruit	*Stellaria media* (chickweed) seed	*Atriplex* cf. *littoralis* (saltbush) seed	*Empetrum* (crowberry) leaf	Poaceae (gras) seed	Poaceae (gras) flower (fl) + spikelet (sp)	*Taraxacum officinale* (dandelion) seed	Seed unidentified	Cyperaceae (sedge) fruit	*Equisetum* (horsetail) sporangium	*Equisetum* (horsetail) stalks	Charcoal	*Cenococcum geophilum* (fungus) sclerotia	Burned bone	*Mytilus edulis* (blue mussel) shell < 1mm	Gastropod shell
1617	Posthole	1,5 l/10 ml			1			1 fl, 1 sp			1							1
1892	Soapstone filling	1 110 ml		1		1	1			1							1	
2087	Hearth, bulk sample	10 l/100 ml	1		0,5	1						1		I	I			
2116	Hearth, bulk sample	10 l/200 ml										1	I	I	II			
2194	Cooking pit	1,5 l/10 ml												II		I		
2212	Posthole	11,5 l/80 ml							2				I					
2464	Posthole	1,5 l/50 ml												I	I			
2524	Posthole	2,5 l/200 ml					1					1	I	I	III			
2859	Hearth	1,5 l/10 ml													I			I
2925	Hearth	1,5 l/50 ml												I	I	I		
2945	Hearth	2 l/50 ml												I	II			
2957	Hearth	2 l/30 ml												I	I			
2963	Posthole	1,6 l/30 ml												I				
2968	Hearth	1,8 l/40 ml												I	I			
2988	Hearth	2,5 l/60 ml													I	I		
2999	Hearth	2,5 l/60 ml												I	I			
3074	Posthole	3 l/110 ml												I	I			
3370	Pit	6 l/50 ml												III	III	I		
3782	Posthole	2,5 l/10 ml											I	I	II			
1574 A		?/10 ml												I				
1939	Hearth	?							1					I	II	I		

Table 2. Macrofossils from soil samples within House 1, Sandvika, presented as numbers or abundance according to this scale: I=present, II=common, III=abundant**, IV=dominant. Sample volume before/after flotation (0,5 mm).

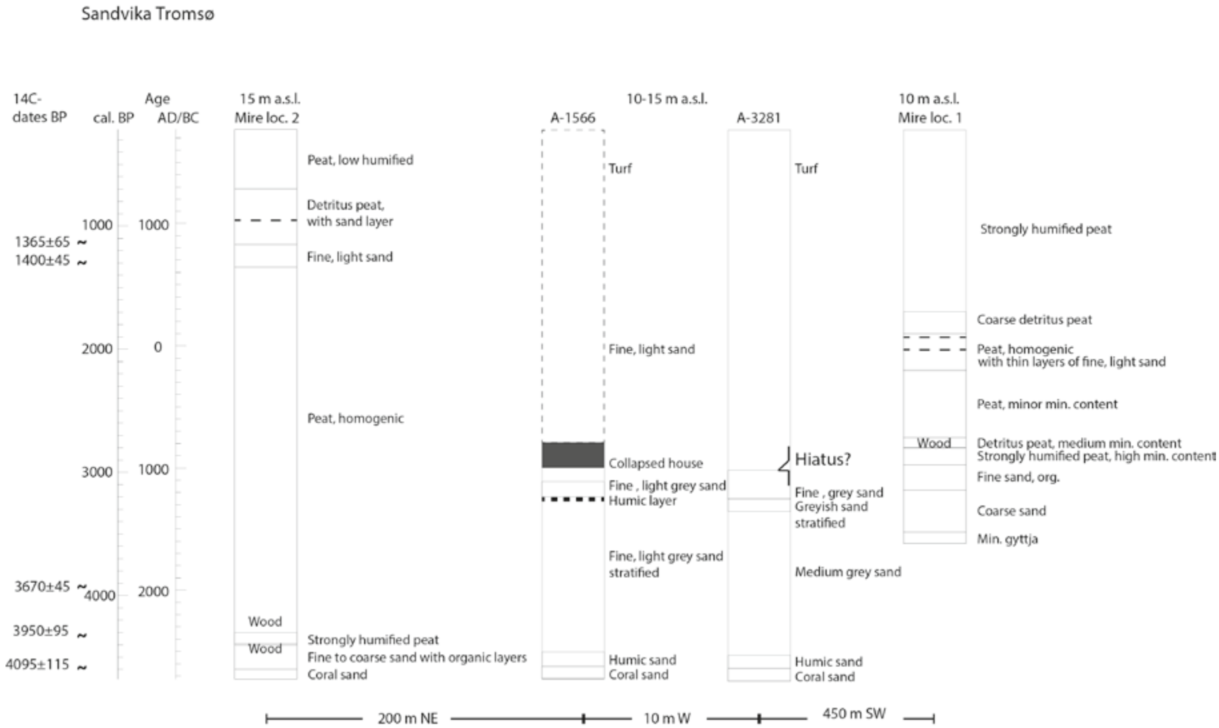

Figure 12. Correlation of sediment profiles from Sandvika. The main chronology is based on Bayesian radiocarbon calibration (Buck et al. 1999) and a linear age-depth model (Bennett 2005). The chronological placement of the stratigraphic layers of A-1566 (except Collapsed house) and A-3281 is tentative.

The pollen diagram from the nearby mire (Fig. 13) reveals a peak in relative charcoal dust that may be associated with the House 1 settlement. According to the chronologies depicted in the pollen diagram (Fig. 13) and by Bayesian calibration (Fig. 12), the charcoal peak falls within a period of time that overlaps with the probable use of the House 1 settlement. The date of this event in the pollen diagram is achieved by linear interpolation between the two ^{14}C-dates 3670±45 BP and 1400±45 BP over a peat sequence of 28 cm. Tveraabak and Alm (1997) describe the peat stratigraphy of this sequence as homogenous, which in this case may render an adequate chronology by linear interpolation. The deviation in age may therefore not be large. The resulting sedimentation rate of 105 years per depth cm is, however, high for peat, even if the degree of humification is itself moderately high. Although not observed in the stratigraphical records, we may consider the possibility of a hiatus, caused by natural or anthropogenic erosion, within the dated peat sequence. The pollen assemblage correlated with the charcoal peak shows no indication of agriculture or husbandry (grazing). The vegetation signal is more of a low-herb, birch woodland. Might the charcoal peak represent an initial burning of woodland, and the subsequent, somewhat lower charcoal curve be the actual reflection of the settlement? Immediately following the charcoal peak there is a marked change in the observed pollen flora with a strong indication

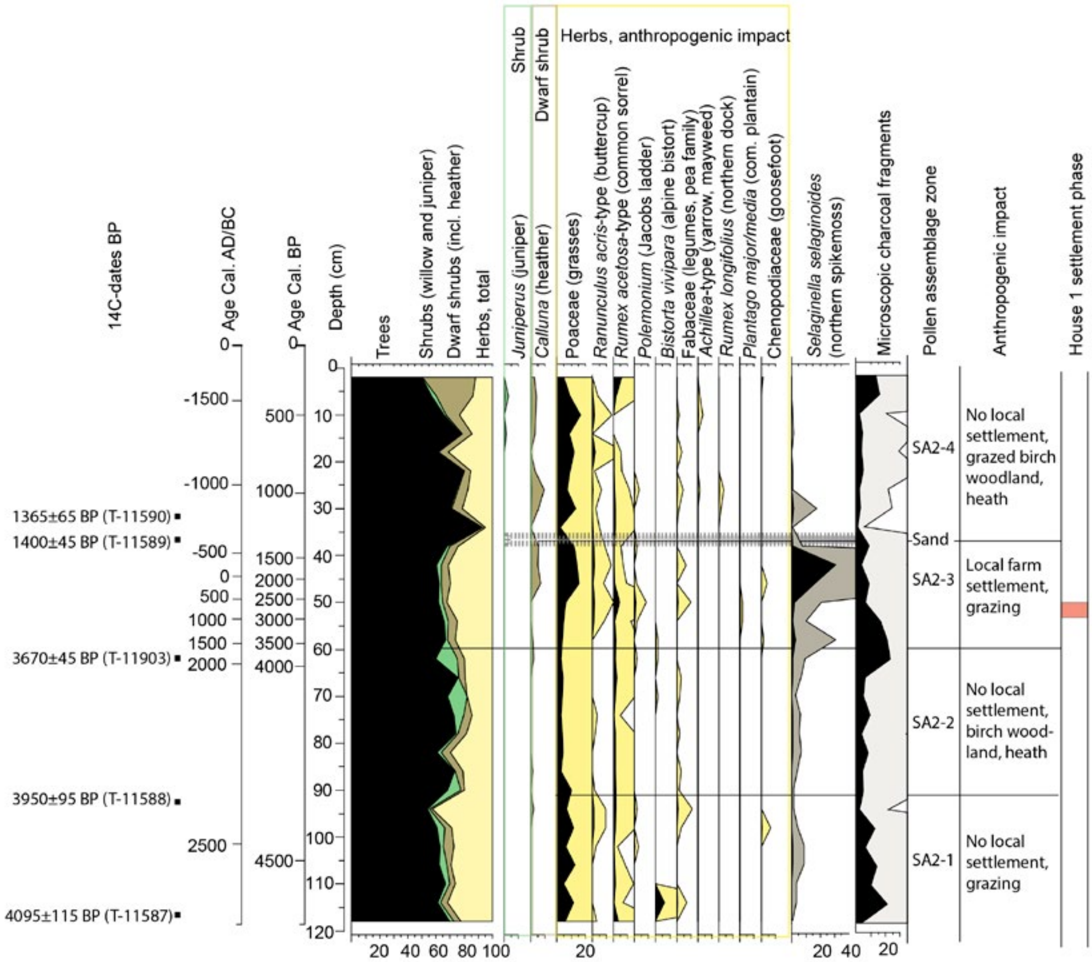

Figure 13. Percentage pollen diagram from Sandvika, mire locality 1. Modified after Tveraabak (1997), presenting taxa indicating anthropogenic impact (farming). Pollen assemblage zones and interpretation of anthropogenic impact is according to Tveraabak and Alm (1997). The estimated period of House 1 (present investigation) is marked.

of human impact, presumably the effects of grazing, as seen by the increase in grass (Poaceae) and the diversity of herbs connected with pasture. A peak in *Selaginella selaginoides* spores leads to the conclusion that the mire has been grazed, not only the surrounding upland. This tiny pteridophyte benefits from fertilization by animal dung and is a characteristic species on grazed minerotrophic mires. The upper limit of this grazing event is set by the sand layer that represents an episode of sand drift between c. 560–687 AD and 544–851 AD. The grazing impact is lower after the event of sand

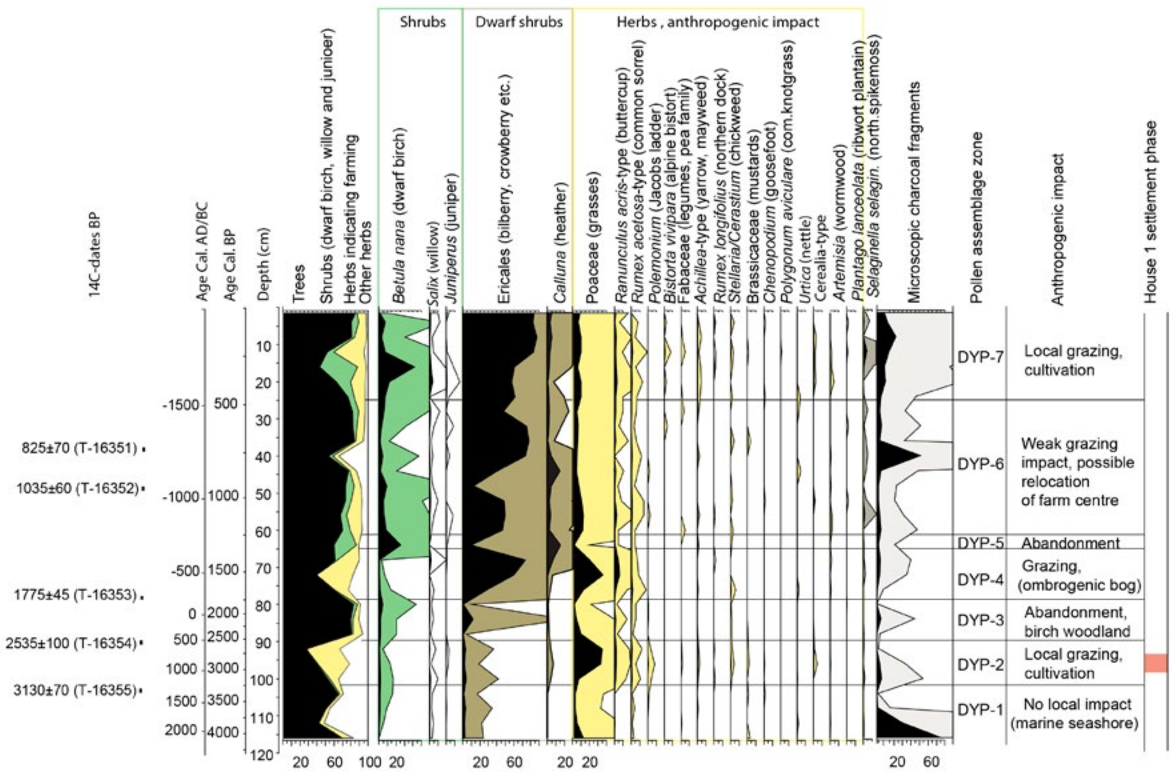

Figure 14. Percentage pollen diagram from Dypingen, Brensholmen. Modified after Vorren (2005), presenting taxa indicating anthropogenic impact (farming). Pollen assemblage zones and interpretation of anthropogenic impact is according to Vorren (2005). The estimated period of House 1 (present investigation) is marked.

drift and the character of the mire changes towards a regime dominated by sedges and grasses. In view of the observed increase in birch pollen and fern spores, the mire and near surroundings seems to be subject to abandonment and regrowth.

The Dypingen site at Brensholmen, only 3-4 km south of Sandvika, shows a comparable anthropogenic impact on vegetation during the Late Bronze Age and subsequent periods (Vorren 2005). The pollen diagram (Fig. 14) contains assemblages indicating grazing impact and possible cereal growth during the period 1150–550 BC, overlapping with the House 1 settlement phase in Sandvika, and followed by a period of abandonment until c. AD 200. The abundance of grass pollen and start of a more or less continuous presence of taxa like buttercups (*Ranunculus acris*-type) and common sorrels (*Rumex acetosa*-type) are typical features of meadow pastures. The presence of Jacobs ladder (*Polemonium*) is another attribute connected with northern coastal meadows subjected to long term grazing or mowing. *Polemonium caeruleum* occurs

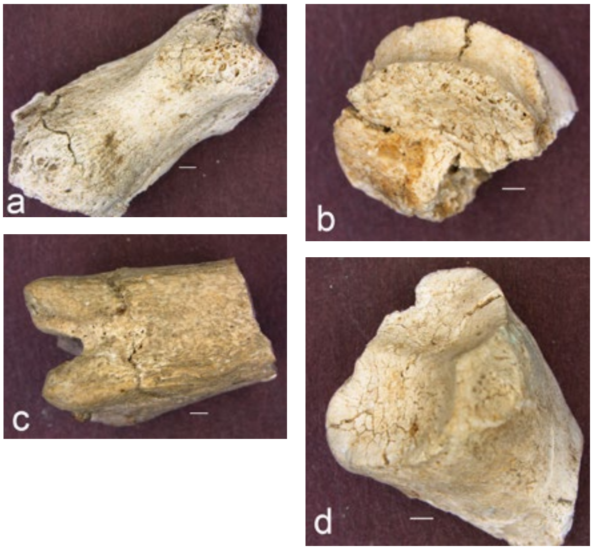

Figure 15 a-d. ^{14}C-dated bone fragments (phalanges, metapodials) from sheep or goat. The scalebar is 1 mm.

in association with tall grasses like downy oat-grass (*Avenula pubescens*), false oat-grass (*Arrhenatherum elatius*) and tall herbs within mesic meadows as well as dry meadows on calcareous/alkaline ground (Fremstad 1997, Vorren 1986). Such meadows may develop as an intermediate stage between natural and anthropogenic plant communities. *Polemonium* pollen occurs at Sandvika as well, and this type of grassland seems to have been a general aspect of the Bronze Age landscape. Cerealia-type pollen recorded at Dypingen from this period is interpreted as possibly *Hordeum*- and *Triticum*-type. The sandy well-drained river terraces may have been well suited for cereal growth. The Bronze Age anthropogenic impact at Dypingen decreases around 550 BC, and is interpreted as abandonment followed by regrowth of birch woodland. Note that the peat profiles of the Sandvika and Dypingen mires are not contiguously analysed, containing stratigraphical gaps, and this event may be contemporary with the abandonment of House 1 in Sandvika.

DISCUSSION

Taphonomy

A striking feature of the empirical data from the natural scientific analyses is the very low amount - and for some samples even lack of - explanatory finds. One reason may be that the sampling procedure was not sufficiently extensive, i.e. the number and volume of samples taken for macrofossil analysis were too low. However, when comparing with investigations of three-aisled house foundations from southern Scandinavia, the abundance of botanical macrofossils retrieved from even a small number of soil samples is generally sufficient to establish whether or not agriculture was part of the economy. Uncharred organic remains are best preserved in anaerobic environments. A prerequisite for the recovery of plant macrofossils in a terrestrial minerogenic soil type like that at Sandvika is that they are charred, and have thus undergone a mineralization process making them resistant to biological decay. The house in Sandvika was probably abandoned without being burned, which may have reduced the possibilities of preservation. Pollen, however, is more resistant to biological and aerobic decay due to the content of sporopollenin in the cell wall. Although pollen production is low at the coast and this far north (Jensen et al. 2007), a higher concentration of pollen was expected. Given the indications of long-term exposure of the house ground after abandonment, biological and chemical decay in addition to washout of material during rainfall may be a likely explanation. The ground water table is high in the area at present, but appears to have been lower at the time of the House 1 settlement, although local mires existed in the vicinity.

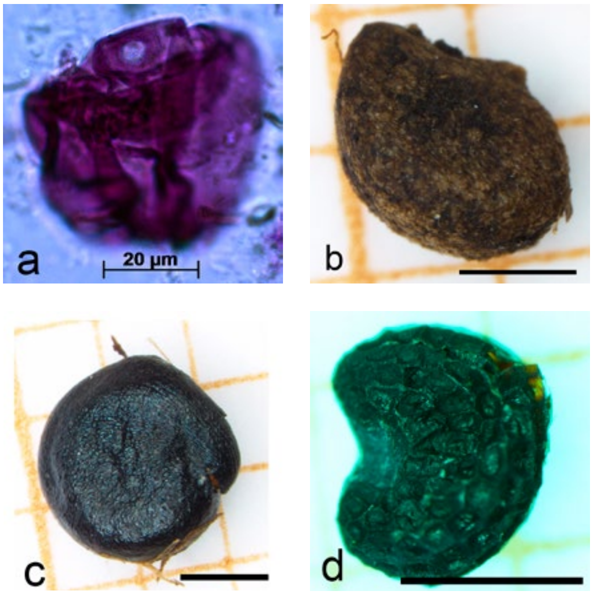

Figure 16 a-d: Selected identified pollen and seeds. Scale bars of pollen and seed photos are 0, 010 m and 1 mm, respectively. **a:** *Hordeum*-type pollen from sample A 1566-37. The measurable diameter of the grain is 49 µm. The diameter of the pore annulus is 12 µm, while the width of the annulus is 3,7 µm. **b:** *Empetrum nigrum* (crowberry) from sample PJ 2087-A1566 (fireplace), **c:** *Atriplex* cf. *littoralis* (saltbush) from sample PJ 1617.1574-1475 (posthole) and **d:** *Papaver somniferum* (opium poppy) from sample A 1566-VI.

Climatic conditions for agriculture

In general for Norway, the mid-boreal bioclimatic zone (Moen 1999) defines the geographical distribution of profitable cereal growth, i.e. where it is possible to achieve a more or less stable harvest of ripened cereals. It is associated with a climate favorable for mature conifer forest and temperate deciduous tree species. For Troms County, which is north of the Holocene natural distribution area of spruce, the relevant indicator species are pine (*Pinus sylvestris)* and grey alder (*Alnus incana)*.

At present, we find that for northern Norway the mid-boreal zone has a fragmented areal distribution in the coastal lowlands, and for Troms and Finnmark it is mainly found in the sheltered fjord districts. As for the southern part of Kvaløya, we find ourselves in a transitional area between the northern boreal and mid-boreal bioclimate. Pine is extinct in this area today, probably due to exploitation by man. Elverland and Vorren (2009) found palaeobotanical evidence of local pine forest at Lillevardhaugvatnet, 112 m a.s.l. 10 km SE of Sandvika, between c. 3600 BC and c. AD 600, with a climate related decrease from c. 350 to 0 BC. They suggest a mean July temperature of at least 12.6 °C (0.6°C above modern temperature) during the period of local pine growth. Their findings are supported by a dendrochronological study of a maritime pine enclave 20 km to the east (Kirchhefer 2001).

A mid-boreal climate regime is thus likely to have extended further north during the period of longhouse settlement in Sandvika. This means that another common presupposition of stable cereal growth – the 1250 day degree isotherm as a mean temperature requirement for the relevant types of cereals - was met as well. This is calculated by summing up individual mean diurnal temperatures during the main growing season; June 1st –September 30th (Fjærvoll 1961). This isotherm (Fig. 1), correlates well with modern and historical knowledge about agriculture in the region. It is possible to get ripe cereals north of this limit where the local climate is good, such as in the fjord districts, but not every year. Historical records show that cereal cultivation has been a part of the economy in northern Norway, even in periods when the climate was less favourable. The vulnerability of this farming practice is however, unquestionable. The keeping of animals, particularly the small cattle species like sheep and goat, combined with exploitation of marine resources, provides a more stable economy.

Several pollen analytical investigations from coastal area of northern Norway show indications of temporary farming practice including possible cereal growth during the Bronze Age. The discontinuity in botanical agricultural indices during the last millennium BC, may be linked to the regional climatic deterioration observed by several independent climate proxies as a change to a cooler and more humid climate (Vorren et al. 2007). Based on palaeobotanical reconstructions of Holocene July mean temperature from lake sediments in the interior of Troms and northern Finland, Jensen and Vorren (2008); Bjune et al. (2004) and Seppä et al. (2001), postulate a summer temperature 1-1.5 °C higher than today during the period covering the Late Neolithic and the Bronze Age. The start of a successive temperature decline is, however, observed from the Late Bronze Age until the Pre-Roman Iron Age. Several wet shifts (transition from high to low peat humification) possibly related to a regional climate shift are seen in the Sellevoll bog at Andøya during the Late Bronze Age (Vorren et al. 2007).

Bronze Age settlement sites near the northern cereal limit

The Bronze Age is usually referred to as the Early Metal Age (1800 BC–AD 1) within northern Fennoscandia, although metal itself only is represented by very few finds (cf. Jørgensen 1986). Compared to the south, the differences are striking in terms of house types, material culture, settlement organization and the availability of resources. Asbestos ceramics do however form the basis for most discussions surrounding the period. While asbestos tempered ceramics occur in the form of Comb Ceramics in the Neolithic of eastern Finland, their chronological lower limit in northern Norway is drawn at c. 2100 BC (Jørgensen og Olsen 1988; Carpelan 1979). For Finnmark, Olsen (1994) has used the transition between the earliest Textile ceramics and the later Kjelmøy ceramics to suggest a Textile ceramic phase (1800–900 BC) and a Kjelmøy ceramic phase (900 BC–AD 1). Jørgensen and Olsen (1988) have so far provided the broadest review of asbestos ceramics in the region, dividing the material into six distinct groups.

For the present study the two latest types are most relevant, namely the aforementioned Kjelmøy type and the Risvik variety. Several scholars (e.g. Hansen and Olsen 2014) see the differences in find contexts and geographic distribution as markers of different ethnic groups. The Risvik type is defined by a smoothed band beneath the rim and an otherwise crude outer surface with short, thick asbestos fibers. The vessels are generally thought to have been bowl-shaped, rather small (an average diameter of c. 20 cm) and with little or no decoration (Andreassen 2002). The Kjelmøy type on the other hand, is tempered with finely crushed asbestos, is thinner and has marked geometric decorations. When it comes to these types, it must be emphasized that the variation within categories is vast, and being far beyond of the scope of the present article, the typology cannot be explored to any length. The differences between wall thickness, tempering, color of the ware and especially the decorations do, however, make the division between the Kjelmøy variety and the coarser asbestos ceramics found further south (including the so-called Risvik type) sound.

That the two broad ceramic categories represent different processes is especially clear when studying their geographic distribution. The Kjelmøy type is mainly found within coastal and interior Finnmark, as well as in northern Sweden and Finland (here called Säraisniemi 2 ceramics), while the Risvik type is found in the coastal areas further south without any clear parallel in the neighboring countries. Links between the latter type and the Nordic Bronze Age have, traditionally, been established based on material from five graves situated between Stad in Sogn og Fjordane county and Skjeggesnes in the Helgeland area (Bakka 1976). At Skjeggesnes, the northernmost professionally excavated barrow with Nordic bronzes (Lund 1963), a bronze razor was found together with a pin and large parts of an asbestos ceramic vessel in a double grave dated to period V.

In recent years, there have been several new discoveries that confirm the relationship between Risvik type ceramics and agricultural settlements. (Arntzen 2013a). One such find comes from the previously mentioned Kveøy excavations, where ceramics were recovered from the postholes of a Pre-Roman longhouse. Further south, in the Salten region at Skålbunes, several additional sherds were found in the wall ditch of a longhouse of similar date (Arntzen 2012). There are several find spots for ceramics south of northern Norway, of so-called Northwest-Norwegian asbestos ceramics, where the type has appeared in connection with ard marks, field layers, palynological indications of cereals as well as other artifacts pointing towards agriculture (Ågotnes 1986). This type is similar to what is found in northern Norway, and could in all likelihood represent the same phenomenon. A somewhat older category of asbestos ceramics, bucket-shaped and with thinner walls than the later types, is also known from some settlement, grave and rock shelter contexts in Southwestern and Western Norway, even as far south as the Agder area (Hop 2011).

Thin-walled soapstone vessels are chronologically isolated from later Iron Age types, and are mainly linked to the Late Bronze Age and to the Pre-Roman Iron Age. Their distribution is restricted to the coast and mainly concentrated in Rogaland and Hordaland counties in Southwest Norway. Here, a large number of the vessels are associated with burials, while further north many of the finds come from settlement contexts and several occur together with asbestos ceramics. While the first typological treatment involving this artifact type puts them within a chronological timeframe from the Pre-Roman Iron Age up to and including the Migration period, more recent studies assign the artifacts to the former period (Møllerup 1960; Schetelig 1912). Pilø (1989), who in a reassessment of dated contexts also finds evidence for a Late Bronze Age type, has done the latest treatment. While the Pre-Roman type is spherical in shape, the earlier varieties are bowl-shaped. This corresponds to the find from Sandvika, which is the most complete and largest find north of the Helgeland region.

Until the late 2000s, ceramics and soapstone vessels from along the northern Norwegian coastline were the most important body of evidence related to Bronze Age settlement in the region. As this material in many cases originated from sand dunes where stray finds had been uncovered by amateurs, it has been impossible to reliably interpret any details of the settlements themselves.

One example is the Kolvika site in Vestvågøy, a locality topographically similar to Sandvika, where small-scale archaeological investigations were carried out in 1969 and 1978 (Jørgensen 1989). Ceramics, slate implements and two halves of bi-valve soapstone moulds had previously been collected from the site by amateurs and the excavations documented the presence of charcoal-mixed layers as well as two rectangular stone lined fireplaces similar to the one found within the house in Sandvika. Important to note about Kolvika is that the ceramics and slate implements were located on two separate terraces, with the slate portion of the assemblage spread over the highest lying areas. ^{14}C-dates from the locality span between c. 2000 BC–AD 400, while much of the artifact material clearly points to the Bronze Age. Unlike Sandvika, this site had not been covered up and protected by wetland, but stood open to massive erosion and sand drift throughout the years. Today it stands out as a crater in the landscape with little archaeological potential left.

A site with a considerable research potential, and with great similarities to Sandvika, is the Hofsøy locality on the southern tip of Senja. The site is located next to the seashore, in a sandy area partly covered by wetland. Although excavations here in the late 1970s and early 1980s were focused on the remains of a 40 meter long house from the Roman Iron Age, both Bronze Age and Neolithic finds were recovered. A refuse pit, not unlike the one from Sandvika, containing five cattle teeth as well as a tooth from sheep or goat, was uncovered beneath the wall of the house construction (Johansen 1976; Lahtiperä 1980). In addition to the animal remains, both asbestos tempered ceramics and a slate knife appeared in the feature, which was dated to 1498–1059 BC (T-3028, 3060±80 BP) (Johansen 1982).

Unfortunately the excavations at Hofsøy were limited to two one meter wide trenches laid out at right angles to the long axis of the house ground, and it is therefore not possible to evaluate whether or not the refuse pit belonged to a Bronze Age house construction.

Deggemyra, a mire located next to the site, was subject to one of the first palynological investigations that indicated Late Bronze Age/Pre Roman Iron Age agriculture in northern Norway (Vorren 1986). The impact of Iron Age farming is clearly visible in the pollen stratigraphy by a marked temporary increase in grasses, barley *Hordeum*-type and apophytic taxa during the Roman period and into the Viking Age, but an early stratum with a find of *Hordeum*-type pollen associated with the introduction of apophytic taxa is dated at c. 480–50 BC (T-2863, 2240±80 BP). Interestingly, a comparable pollen assemblage zone, with *Hordeum*-type, grasses and apophytic meadow plants, was observed in another pollen profile closer to the border of the bog and rendered an even earlier age, i.e. ca. 1520–850 BC (GX-3822, 2995 +/-140 BP) thus suggesting the presence of a Late Bronze Age farming culture.

The empirical basis for research has greatly improved since the introduction of mechanical topsoil stripping to north Norwegian archaeology in the early 2000s. The investigation at Kveøy in Southern Troms in 2008-2009, which still stands as the largest excavation of this type in the region, provided important evidence of Bronze Age agricultural settlement in the region (Arntzen and Sommerseth 2010; Sjögren 2010; Sjögren and Arntzen 2012; Arntzen 2013b). A c. 12 meter long three-aisled longhouse, field layers, the possible remains of cremation graves and several cooking pits were found. The site also provided evidence for a full-scale farm structure in the Pre-Roman Iron Age, including a 23 m long longhouse (with asbestos ceramics), a utility building, a clay built oven, several cooking pits and cremation graves.

A single carbonized grain of barley (*Hordeum)* was directly ^{14}C-dated to the late Neolithic (3936±30 BP, Wk-26504). The find context, an oblong pit with charcoal rich sandy fill, superimposed by massive Pre-Roman field layers, is regarded as uncertain by the authors (Arntzen 2013b) due to the lack of corresponding dates from any other area of the excavation. A new ^{14}C-dating, performed by Beta-Analytic on another grain identified as barley (*Hordeum)*, was performed as part of our present investigation. The find context was a posthole belonging to House 1 at Kveøya, interpreted as a Late Bronze Age house. The ^{14}C-date of the barley grain, however, rendered a much younger age: 1550±30 BP (Beta-399667), calibrated at AD 420–575. This cereal grain, dated to the Migration period, raises questions about contextual control on the site and consequently, the assumption of cereal cultivation during the Late Bronze age. Yet the large number of features dated to this period from the excavations at Kveøya, including cooking pits, possible flat graves, field layers, and postholes, do indicate the presence of a settlement similar to what is found in Nordic Bronze Age contexts further south.

At Nordsand on the Sandsøy Island, 30 km northeast of Kveøy, an excavation in 2013 resulted in the discovery of a three-aisled longhouse tentatively dated as Pre-Roman, or possibly as far back as the end of the Late Bronze Age. The majority of the Sandsøy material, however, belongs to the later stages of the Iron Age. Farm houses were constructed during the Roman Iron Age and probably remained in use until the Merovingian Period (Cerbing 2016). Evidence of cereal growth and animal husbandry (impact from grazing and fertilization) during the period from the Late Roman Iron Age to the Migration/Merovingian period has been documented by the botanical analyses (Jensen and Ahlquist 2015). A toe bone from sheep or goat was dated to the Merovingian Period, and was found in the same context as a grain of awned barley (*Hordeum vulgare* ssp. *vulgare)* dated to the Migration Period. Hence, there is no direct evidence of farming associated with the Pre-Roman (or earlier) structures in the botanical or osteological material from Sandsøy.

The southern Troms region, where these sites are situated, is also home to two find spots for Nordic bronzes and, additionally, the previously mentioned mould from Grøtavær. The bronzes include one crescent-shaped neck collar found beneath a rock outcrop near a field at Altevågen in Trondenes and two very similar collars, found in a joint in an outcrop at Tennevik in Skånland only 20 km from the former find spot (Munch 1966; Bergum 2007, Arntzen 2015b). Such finds are very rare in a Nordic Bronze Age context, only paralleled by two collars from Skåne in Sweden and a fragmented soapstone mould from Vilsted on Jylland in northern Denmark (Engedal 2010: 56). Based on the Swedish and Danish material, the collars should be dated to period V.

South of the southern Troms, Lofoten and Vesterålen districts in northern Norway, evidence of Bronze Age settlement is even scarcer due to a lower frequency of archaeological investigations. South of Kveøy we find the next longhouse reliably dated to the period as far south as the Trondheim area (Grønnesby 2005; Rønne 2012). Graves with dateable bronzes, rock carvings and other features do, however, clearly indicate that both North-Trøndelag and southern Nordland had been integrated into the Nordic Bronze Age (Bakka 1976; Sognnes 1989; Grønnesby 1998; Fyllingen 2003; Rønne 2012).

In spite of recent excavations, the overall picture of the Bronze Age in northern Norway remains dominated by stray finds of ceramics, thin-walled soapstone vessels and a few bronzes. Based on Arntzen's (2013a) recent review of prehistoric settlement sites related to agriculture in northern Norway it is clear that dates from the Pre-Roman Iron Age are much more common when excavating or surveying within the northern Norwegian agricultural landscape. The low number of documented Bronze Age sites does, however, still correlate well with the lack of archaeological investigations within the region. The Sandvika site strengthens the impression that stray finds of ceramics and thin-walled soapstone vessels may reflect settlements with links to the Nordic Bronze Age or the Pre-Roman Iron Age, and that these links can include both architectural commonalities and similar communal or ritual frameworks (e.g. the use of cooking pits).

Looking eastward, recent investigations at the mouth of the Umeå River in Västerbotten, northern Sweden, recovered the hitherto oldest and northernmost evidence of cereal cultivation in Sweden (Heinerud and Larsson 2013; Lindquist and Granholm 2016). From the site Klabbölevägen (63°49'N 20°7'E), seven samples of barley, found in postholes, cooking pit and fireplace were ^{14}C-dated and returned corresponding ages in the range of 1400-1120 BC (Östman 2014 a; Ellinor Johansson pers. comm. 12.01.2016). A bone fragment from sheep/goat rendered a date overlapping with the cereals, c. 1400–1130 BC. This site is situated on the southern bank of the river, which would have been a strait in the Bronze Age.

Two settlements were excavated on the northern river bank. The larger of these, Sockenvägen, produced traces of several longhouses and large amounts of cereal grains (mostly barley). The oldest ^{14}C-dates from the site span the period 840–560 BC (Persson 2014; Östman 2014 b). The other site, Klockarbäcken, contained a probable single-aisled building and is associated with finds of barley in postholes and pits (Lindquist and Granholm 2016; Östman 2014 c). The ^{14}C-dates of these cereal grains fall in the range 1260–810 BC (Johansson pers.comm. 12.1.2016), the same time frame as the Sandvika site.

These settlements are detectable in the paleorecords from the adjacent mire Prästsjömyren (Engelmark 1976; Wallin 2011). Wallin (2011) identified two periods of Bronze Age barley cultivation from pollen- and charcoal analysis. The older period is set to 1400–1000 BC, and the younger one to 1300–800 BC, both are in good accord with the dates of cereal grains from the nearby settlements. The microfossil assemblages of both periods indicate burning close to the mire, especially during the later period, and the presence of weeds confirms cultivation.

On the Finnish side of the Gulf of Bothnia, at the site Jätinhaudanmaa in Laihia, small-scale excavations and soil sampling in relation to Bronze Age burial cairns have yielded indications of an agrarian economy (Holmblad 2010). Seeds of hulled barley (*Hordeum vulgare* var. *vulgare*) from a hearth and a cultural layer at this site have been ^{14}C-dated to the Late Bronze Age; 1000–830 and 840–540 BC, respectively. These dates correspond well with the age of a cultivation phase detected in a nearby mire, which is estimated to take place c. 1000–400 BC. The level where a *Hordeum*-type pollen emerges in connection with a rise in sedges and charcoal, produced a ^{14}C-date of 1040–840 BC (Wallin 2009; Holmblad 2010).

But, as in northern Norway, the number of large scale archaeological excavations in northern Sweden and Finland are few. The empirical indices of early agriculture are botanical, mainly from pollen analyses, and frequently documented as a combination of animal husbandry and cereal growth. A review covering northern Fennoscandia is given in Josefsson et al. (2014). The results of our investigation adds to the general picture that animal husbandry was established as part of a sustainable economy during the Bronze Age at the high northern latitudes, possibly prior to cereal cultivation and as the dominant farming activity.

CONCLUSIONS

The Sandvika settlement was inhabited during the last period of the Nordic Bronze Age and shows similarities with southern Scandinavian agrarian settlements from this period. Animal husbandry is documented by the finds of bones from sheep or goat, and signs of grazing impact on the local vegetation. Clear evidence of cereal growth is lacking, but this may be due to taphonomic loss during a long period of exposure after the settlement was abandoned.

This investigation raises the possibility that early coastal-bound permanent settlements were sustained by a farming economy based on animal husbandry (primarily sheep and/or goat) in addition to the exploitation of marine resources. Unstable climatic conditions during the Late Bronze Age may partly explain the fragmentary evidence of farming activity in the region. Erosion and sand drift caused by increased storm activity, and possibly exacerbated by the impact of grazing, may have led to periods of abandonment.

Both large scale rescue-excavations as well as strategic, interdisciplinary research projects are needed to further illuminate the agrarian Bronze Age settlements of the region.

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IRON AGE BUILDING TRADITIONS IN EASTERN NORWAY: REGIONS AND LANDSCAPES

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ABSTRACT
Iron Age building traditions in Eastern Norway show clear regional and local characteristics, to the extent that it is difficult to talk about a unified Eastern Norwegian building tradition. At the same time, these building traditions also share clear similarities with contemporary, general Scandinavian building trends. The most common building type was the three-aisled building with internal support posts dug into the ground, but there were also four-post structures as well as two-aisled buildings. There are clear differences between building traditions in the southern and northern areas of Eastern Norway. In northern Eastern Norway, all identified/registered building entrances belong to Herschend's central Scandinavian type, and 80% of the three-aisled buildings are oriented east-west. In southern Eastern Norway, building entrances of both central and southern Scandinavian type appear, and 80% of the buildings are oriented approximately north-south. This distinction is evident throughout the Iron Age. In both regions, buildings whose orientations differ from the predominant orientation seen in their respective regions are on average shorter than those with the predominant orientation. Two-aisled and four-post buildings are absent from northern Eastern Norway, highlighting the existence of regional differences. There are also some indications of local buildings traditions. These, however, are difficult to clearly define as relatively few buildings from each area and each period have been found

INTRODUCTION
This article presents an overview of local and regional building traditions from Eastern Norway in the Iron Age (500 BC–AD 1030) Three-aisled houses with internal, roof support posts dug into the subsoil were the most common house type throughout the entirety of the Early Iron Age and into the Late Iron Age both in Eastern Norway and Scandinavia in general; these seem to have been gradually replaced by other building types in the Viking Age or Early Medieval Period (Pedersen and Widgren 1999; Myhre 2002; Øye 2002; Jensen 2004; 2006; 2009; Martens 2009; Eriksen 2015). A general analysis of building traditions would therefore suggest that Eastern Norway was an integrated part of the larger Scandinavian world. There is significant geographic variation in

building styles within Eastern Norway, such that a unified Eastern Norwegian building style, distinct from more general Norwegian or Scandinavian trends, cannot be demonstrated. Instead, I will show that building traditions in Eastern Norway can be divided into two regions, which can, in turn, be divided into various landscapes each with local building traditions.

The data set is limited to buildings associated with agriculture, and is initially comprised of c. 300 examples from an area bordered by Sweden to the south and east, Skiensfjord to the west, and the northern border of Oppland (Table 1, Fig. 1)[1]. The modern county borders are used to define individual analytical geographic units for practical purposes only. It is not intended to imply that these borders are in any way reflective of Iron Age political divisions. The variables used to identify different building traditions are the placement of the entrance, the orientation of the building and the architectonic design of the gable, as indicated by any offset gable-posts. Although the purpose of this article is, first and foremost, to describe geographic variation in building traditions, it must be emphasized that the house was not merely a building, but a central social institution, at the same time both mirroring and shaping society (Hastrup 1990; Carsten og Hugh-Jones 1995; Norr 1996; Gerritsen 2003: 31 Webley 2008; Herschend 2009; Eriksen 2015; Gjerpe in prep.;).

Recently, Marianne Hem Eriksen (2015) published an overview of Late Iron Age buildings in Norway. There is, however, no typology or general overview of Iron Age building types from Eastern Norway (Martens 2007; Gjerpe 2016). Furthermore, very few diagnostic artefacts from secure contexts within houses have been found. The dating of houses thus relies, to a great extent, on radiocarbon dating and the chronological resolution is necessarily rough. Radiocarbon dates from c. 2450 BP always calibrate to the period 800–400 BC (Becker 1993; van der Plicht 2005). In other words, datings from this period are not precise, and I have chosen to assign all houses with datings within the period 800–1 BC to the Pre-Roman Iron Age. The radiocarbon calibration curve is also flat at the transition between the Roman Period and the Migration Period, as well as for the periods AD 700–930 and AD 1050–1200 The relatively narrow plateau at the Roman-Migration Period transition leads to an artificial decrease in the number of Roman Period datings and a corresponding artificial increase in those from the Migration Period. I have therefore chosen to treat the transition between the Roman and Migration periods as its own period. The following divisions will be used in this study: Pre-Roman Iron Age (PRIA, c. 500–1 BC) Roman Period (RP, c. AD 1–400), Roman-Migration Period transition (RP–MiP, c. AD 350–450), Migration Period (MiP, c. AD 400–550), Merovingian Period (MeP, AD 550–800) and Viking Period (VP, AD 800–1030). I have attempted to identify the construction phase of the buildings rather than their occupation phases, and the datings of individual houses according to my overall judgment of radiocarbon dating results, artefact finds and stratigraphic relationships.

SOURCE CRITICISM: BIASES IN THE ARCHAEOLOGICAL RECORD

The buildings are divided into four groups according to what I have termed the "Diagnostic degree". The diagnostic degree is an overall assessment a structure's ability to provide information about building traditions, based on documented remains of roof support structures, walls, hearths, entrances as well as datings (Gjerpe 2008). The assessment is based on the plan drawings. Ideally, the preservation level should be estimated on the basis of each building's original

1 This material will be presented more thoroughly in my doctoral thesis, currently in progress.

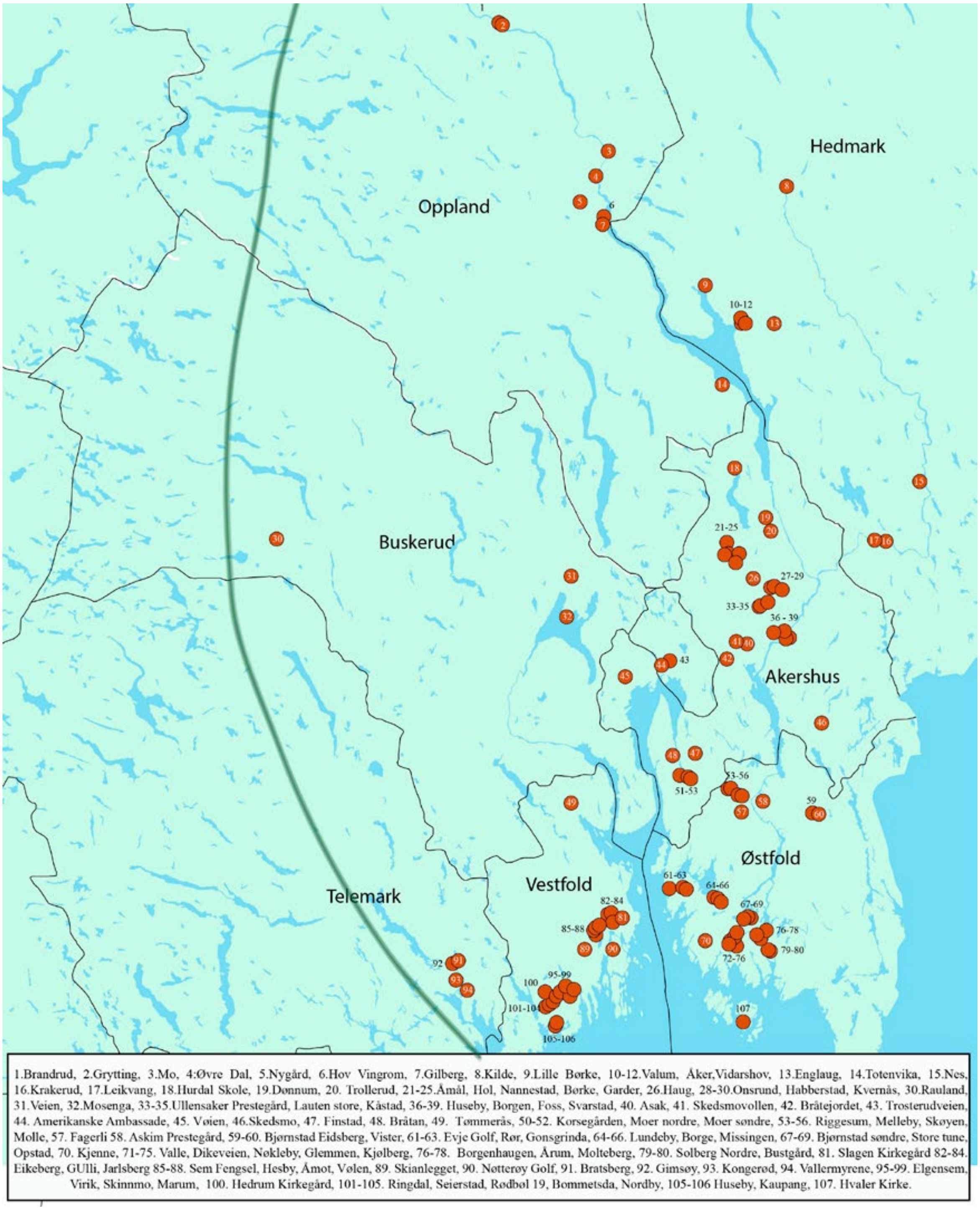


Figure 1. Map of the study area with sites of house finds labelled.

construction, but this is not possible, for obvious reasons. The diagnostic degree is rated on a scale from 1 to 4. 1 indicates that only parts or fragments of the house has been identified or that the dating is unsecure. These houses can only be used to a limited extent as evidence of building techniques, but can be useful for more precisely defining the settlement's geographical extent and period of occupation. They are not included in the statistical analyses presented in this article. Houses assigned to Group 2 are those where the basic features of the roof support structure have been identified, for example whether the building is a two- or three aisled construction; other characteristics, such as length or width, are occasionally identified. The dates for these houses are generally relatively secure, although not to the degree of Group 3 houses. In Group 3, the length, width and roof support structure have been identified, and the dates are relatively secure. The final group, 4, indicates that the length, width, entrance, fireplace and roof support structure have been defined, and the building well dated. These assessments can easily be criticized for being subjective, but they do provide a means of differentiating between buildings that can further our understanding of building techniques/traditions, and those which merely help us to define the extent of a settlement. Furthermore, a number of buildings cannot be assigned to a specific period and must be generally dated to the Iron Age, or Early Iron Age. These only appear in the analysis to a limited extent.

The archaeological evidence is, with few exceptions, found by machine topsoil stripping performed after 1990. Espen Uleberg (1990a; 1990b) was the first archaeologist in Eastern Norway to identify an Iron Age house using this method (Østmo 1991; Martens 2007; Gjerpe 2016). The houses are generally from rescue/development-initiated excavations. The geographical distribution therefore does not necessarily reflect the reality of Iron Age settlement. Rather, it reflects the current trends in infrastructure development. It appears that transport development has been a major factor in the identification of houses (Berg 1997; Helliksen 1997; Bårdseth 2008; Gjerpe

Period	Total	Akershus	Buskerud	Hedmark	Oppland	Oslo	Østfold	Telemark	Vestfold
PRIA	77	12	1	2	1	2	46	3	10
RP	63	22	3	6	8		16	1	7
RP-MiP	41	14	1		2		7	3	14
MiP	36	12		6	2		7		9
MeP	18	5		4	2		3		4
VP	6	2			1		1		2
VP-MP	5	1	1	1	2				
IA	64	28	1	4	1		13	5	12
IA?	1							1	
Total	**311**	**96**	**7**	**23**	**19**	**2**	**93**	**13**	**58**

Table 1. Total numbers of buildings from Eastern Norway, irrespective of construction type, divided by county and date. PRIA=Pre-Roman Iron Age, RP=Roman Period, MiP=Migration Period, MeP=Merovingian Period, VP=Viking Period, MP=Medieval Period, IA=Iron Age, ?=Unsecure dating.

2008; 2013; Simonsen and Martens 2008). This is obviously due not only to the fact that much of this development focuses on large areas of farmland, but also that the development is relatively inflexible. Motorways will not be diverted for the sake of preserving a prehistoric settlement site. At the same time, such development has great economic consequences, and thus developers accept the cost of excavation. The overall lack of Iron Age buildings from Telemark, Oppland and Buskerud can be most readily explained by the lack of modern development on farmland in these areas after 1990, not their lack of Iron Age settlement. This point is highlighted by the fact the first traces of three-aisled buildings in Oppland, an area rich in other types of Iron Age evidence, were only recently identified during work on the E6 road project (Gundersen 2016).

The sheer number of grave monuments from the Late Iron Age and Viking Period suggests that most of Eastern Norway was inhabited (Løken 1974; Gudesen 1980; Forseth 1993; 2003; Stylegar 2004). And yet, relatively few Late Iron Age buildings have been found (Table 1, Eriksen 2015). This may reflect a combination of current development conditions and the actual Iron Age settlement pattern. Houses without support posts dug into the subsoil will not be identified by machine topsoil stripping, and it may be that this is the case for a large portion of the houses in the Viking Age. If the Viking farmsteads are located under the modern farmsteads they will similarly not be found, as these areas are rarely excavated and prolonged activity on these sites will make it difficult to identify whatever traces do remain.

A SHORT INTRODUCTION TO THE BUILDINGS

The building evidence is spread unevenly across time and space (Table 1). As mentioned, this may be attributed, to a great extent to the nature of the source material, but may also reflect conditions in pre-history. The greatest number of buildings are found, by far, in Akershus (96) Østfold (93) and Vestfold (58), with only 64 total in Hedmark, Oppland, Buskerud and the southeastern part of Telemark. The material is, as previously described, largely collected through development-initiated excavations since 1990, and particularly after 2000. The buildings are therefore mainly found in areas with high development activity, particularly in connection with major infrastructure developments in Østfold, Vestfold and Akershus.

The criteria for arable land was different in the Iron Age than today, yet I believe the relationship between the number of houses and the current farmed area strongly supports the suggestion that the buildings from Vestfold, Akershus and Østfold are best represented, in addition to being the most frequent (Table 2). It is, perhaps, wrong to oversell the buildings in Vestfold as well represented, with only one building examined for every seven square kilometers of farmland. Nevertheless, the situation is better than for the other counties. Buildings in Buskerud, where only one building is excavated for every 74 square kilometers of farmland, are particularly poorly represented (Table 2).

Since most buildings are found through machine topsoil stripping of arable land, only features extending or buried beneath the plow-depth are recovered. Any buildings without such elements are therefore not represented. Buildings can generally be divided into three groups based on the structure. The 225 three-aisled houses, characterized by the fact that the roof is supported by two rows of posts dug into the subsoil, are found in all periods and all areas, and were, as mentioned, the dominant house type. It is primarily this building type which is used to illustrate regional variations in construction practices. Eleven two-aisled buildings, characterized by a single row of internal roof support posts, have been found in Østfold and Akershus and are, with one exception, all from the EIA. It is uncertain whether this building type functioned as a dwelling. Twenty-nine four-post structures, probably used for storage, have also been investigated. Only 15 of these are dated to the period in question all of which, apart from one MeP construction, are from the EIA. Most of these are found in Akershus, Vestfold and Østfold, while one is found in Oslo and one in Telemark. A group of 46 buildings do not fit into any of these categories, either because they are constructed in other ways, or because the method of construction cannot be adequately determined. These buildings will be used infrequently in the analyses of building techniques presented here. Pit-houses are excluded from the study.

As mentioned, the buildings are not distributed evenly across periods or counties (Table 1). It is worth noting that as many as 46 of the 77 PRIA buildings are from Østfold. Otherwise, Akershus distinguishes itself with 98 of the 311 surveyed buildings. Approximately one-third of the dated houses in Oppland are from the LIA, a high percentage, and roughly ten percent of the total number of LIA buildings in the study area. Nearly 90 percent of the buildings from Eastern Norway are thus from Pre-Roman Iron Age, Roman Period and Migration Period. Granted, the EIA (500 BC–AD 550) is more than twice as long as the LIA (AD 550–1030), but there are far more buildings per century in the EIA (around 20 per century) than in the LIA (roughly 5 per century).

SOUTHERN OR MID-SCANDINAVIAN BUILDING TRADITIONS IN EASTERN NORWAY

Frands Herschend (2009: Fig. 1a-c) identifies two different building traditions in Roman and Migration Period Denmark, parts of southern Sweden and southern Norway. The most striking difference between the two building types is the location of the entrances. In the southern Scandinavian house, the entrance room is located between the byre and the living space, with entrances on both long sides. The entrance room is approximately centrally place in the house, depending on the relative size of byre and living quarters. Viewed from one end to the other, the rooms are ordered living space-entrance room-byre. The mid-Scandinavian house, however, has two entrance rooms, one in the byre and one in the living space. These entrance rooms are located at opposite ends of the house, in some cases with a small room or storage between the entrance room and the short end of the house. The byre and living space are adjacent to each other, with no entrance room in between. Herschend (2009: 13-15, Fig. 11a-c, note 11) assumes that the outer Oslofjord area, Østfold and Vestfold built in the southern Scandinavian tradition, while Hedmark and Buskerud followed the mid-Scandinavian tradition. He stressed, however, that there is little material and the data set under constant development.

In the material from Eastern Norway, byres and living spaces are rarely identified, so my division between southern and mid-Scandinavian building techniques takes the placement of the entrance as a starting point. Unlike Herschend, I am looking at buildings from the entire Iron Age, not merely from the Roman or Migration periods. Entrances that can be characterized as southern or mid-Scandinavian were identified in 77 buildings (Table 3, Fig. 2). They have roughly the same chronological and geographic distribution as the identified and dated three-aisled houses, with the exception of the eight Merovingian and Viking Period houses from Akershus, none of which have identified entrances. Therefore, there is reason to believe that the houses with identified entrances provide a fairly representative picture. Altogether I find 31 of Herschend's southern Scandinavian house types with common entrance rooms for humans and animals, and 46 of the mid-Scandinavian house types with separate

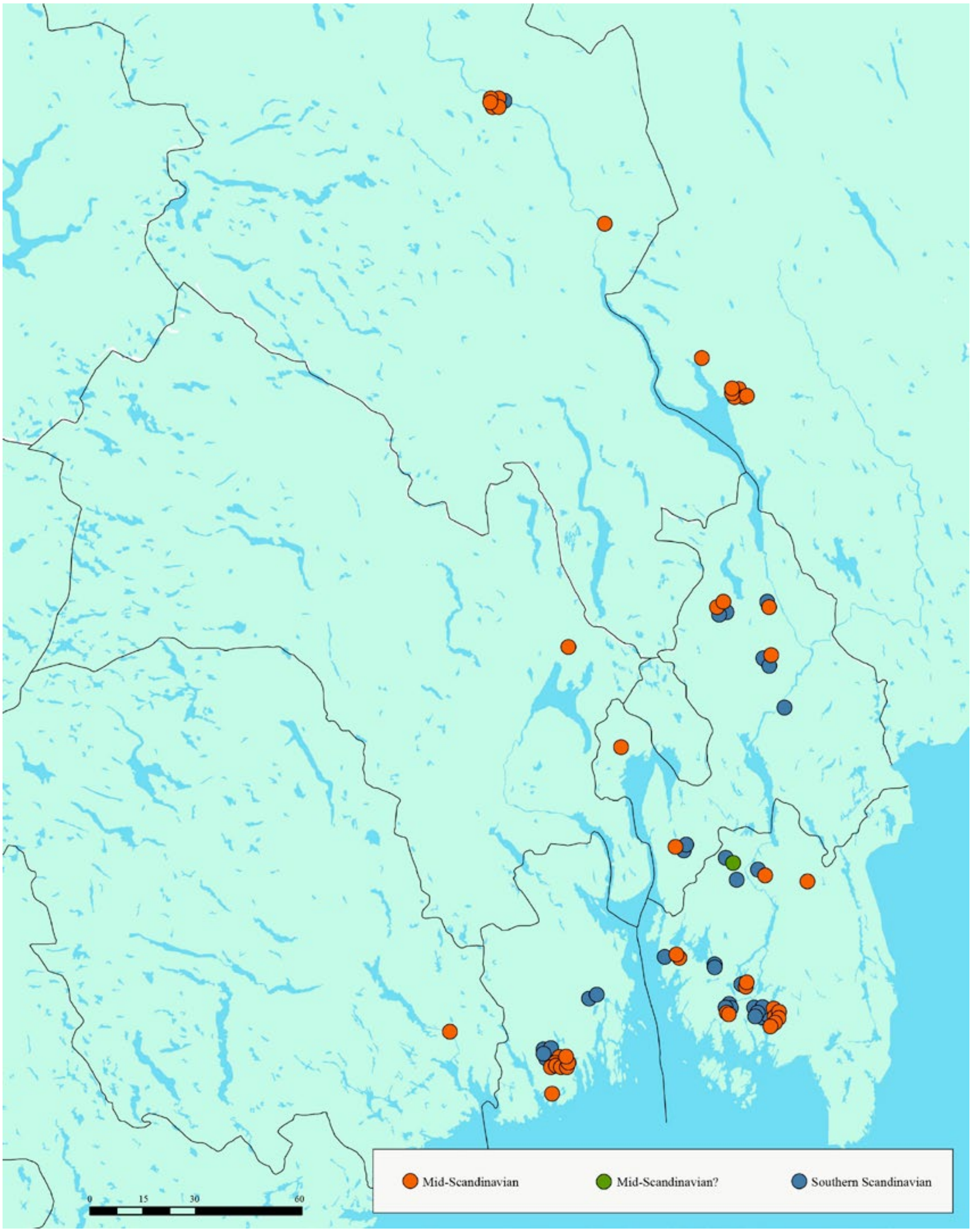


Figure 2. Distribution of houses with southern and mid-Scandinavian entrances.

County	Mid-Scandinavian	Southern Scandinavian
Hedmark	7	
Oppland	6	1
Akershus	6	8
Østfold	15	16
Vestfold	10	6
Telemark	1	
Buskerud	1	
Oslo		
Total	**46**	**31**

Table 3. Number of southern and mid-Scandinavian buildings divided by county.

4 a)

Period	Total	Akershus	Østfold	Vestfold	Buskerud	Hedmark	Oppland	Telemark
PRIA	14	1	12	1				
RP-MiP	4	1	1	1			1	
RP	5	4	1					
MiP	4	2		2				
MeP	2		1	1				
VP	1			1				
IA	1		1					
Total	**31**	**8**	**16**	**6**			**1**	

4 b)

Period	Total	Akershus	Østfold	Vestfold	Buskerud	Hedmark	Oppland	Telemark
PRIA	8	1	7					
RP	13	2	4	1	1	2	3	
RP-MiP	6	1	1	3			1	
MiP	12	2	2	4		2	2	
MeP	4			1		3		
VP	1		1					
IA	2			1				1
Total	**46**	**6**	**15**	**10**	**1**	**7**	**6**	**1**

Table 4. Number of houses with southern Scandinavian (a) and mid-Scandinavian (b) entrance types divided by county and period.

County	Mid-Scandinavian	Southern Scandinavian
Hedmark	27	-
Oppland	24	14
Akershus	28	15
Østfold	21	17
Vestfold	24	28
Telemark	-	-
Buskerud	45	-
Oslo	-	-

Table 5. Average length of houses with southern and mid-Scandinavian entrances dated to the Iron Age and assigned to diagnostic degree 2 or higher, divided by county.

entrance rooms for humans and animals (for an overview of entrances in LIA buildings in Norway, see Eriksen 2015). There appears to be a pattern in the spatial distribution of the entrance types. The southern Scandinavian type occurs in all periods, but only in Østfold, Vestfold and Akershus, with one possible exception (Table 4a), a building with a weakly identified entrance in Oppland. It is thus possible that the boundary between mid- and southern Scandinavian house types, such as Herschend defines them, runs between Hedmark, Oppland and Buskerud on the one side, and Vestfold, Østfold and Akershus on the other. The absence of southern Scandinavian entrances in Buskerud, however, will not be accorded too much weight, since there is only one house with an identified entrance in this area. The distribution of houses with southern Scandinavian entrances coincides with that of four-post structures, supporting the idea that there is a distinction between the two building traditions. Two-aisled buildings exist in some sections of the southern Scandinavian distribution area, but not in the mid-Scandinavian area. The mid-Scandinavian type occurs in all periods and throughout the study area (Table 4b), but is limited to Østfold during the Pre-Roman Iron Age (with the possible exception of a poorly identified houses that can be from Pre-Roman Iron Age in Akershus). Thus, there does not seem to be any pattern in the spatial distribution of the mid-Scandinavian houses. Accordingly, it is the absence of southern Scandinavian entrances more than the presence of the mid-Scandinavian type that defines the mid-Scandinavian area. The houses with mid-Scandinavian entrances are generally longer than those with southern Scandinavian entrances (Table 5, note that only well-identified and dated buildings are included, 69 of the 77 buildings with southern or mid-Scandinavian entrances). However, two southern Scandinavian houses each over 40 meters long suggest that house length and entrances are not completely correlated. Entrance types can therefore indicate that there are two regional building traditions in Eastern Norway, where the mid-Scandinavian type predominates in the north Eastern Norway, while the mid- and southern Scandinavian types are used interchangeably in the south. It is also interesting that while Herschend originally identified this distinction in the Roman and Migration periods, in Eastern Norway it can also be seen in the Late Iron Age and probably in the Pre-Roman Iron Age.

BUILDING ORIENTATION

To investigate further whether the distinction between the two regions can be substantiated, I

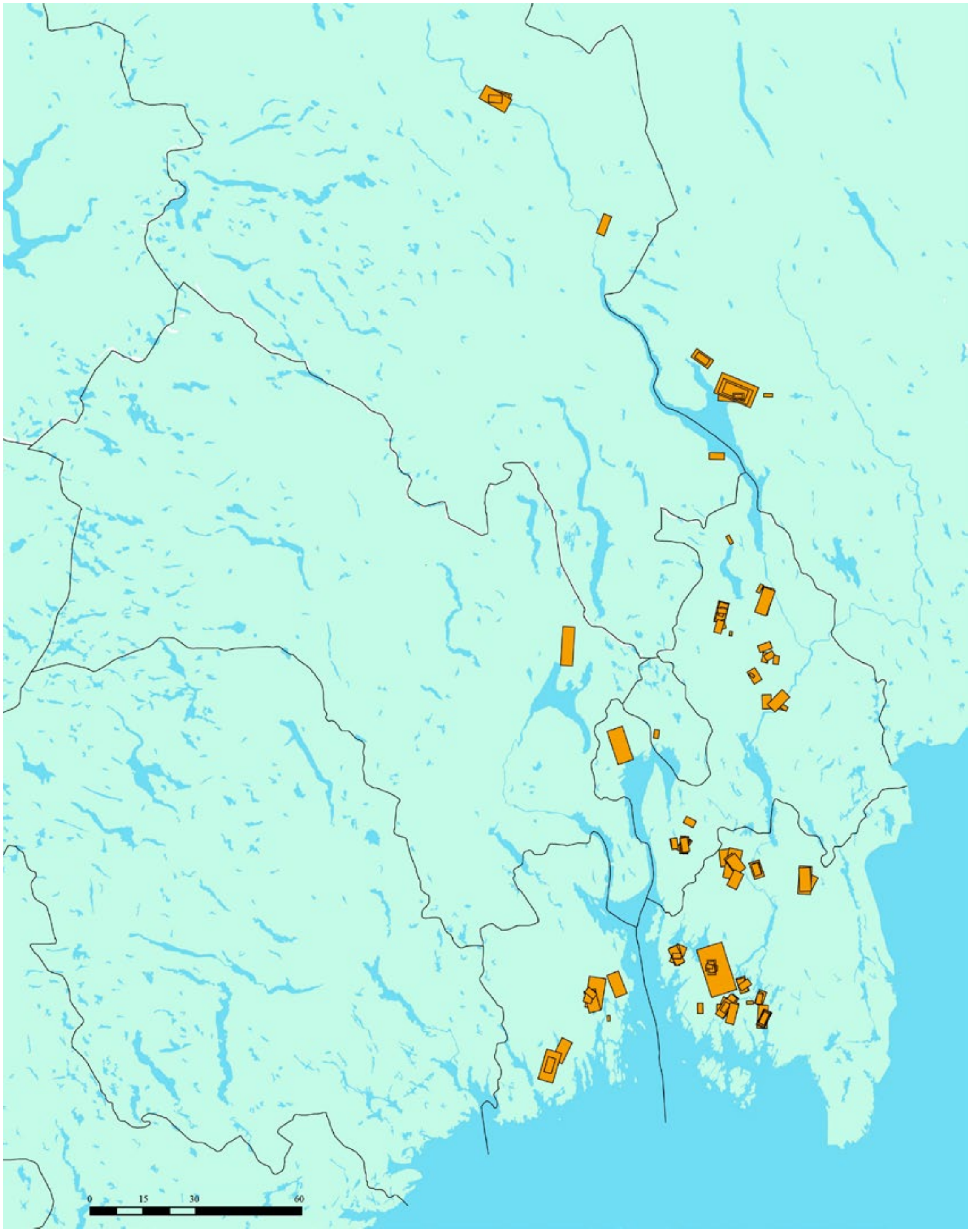


Figure 3. Map displaying the length and orientation of the houses.

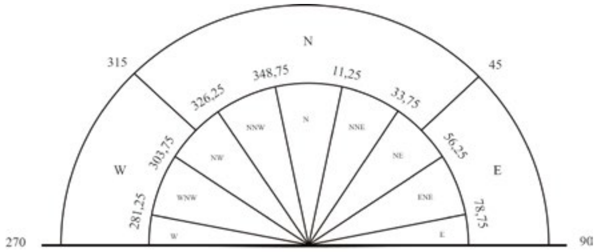


Figure 4. Basis for identifying the houses' general (gray) or more precise (black) orientation. Numbers presented are degrees.

will consider both the orientation and the length of the houses (Fig. 3). Three different ways to define a building's orientation are used in this work, each of varying precision and all based on the building's northernmost end (Fig. 4). In absolute degrees (0-360), the orientations in the data set vary from 270 to 90 degrees. No attempt has been made to identify living spaces or byres. There are three main groups of house orientations, either North (315-45 degrees), East (45-90 degrees) and West (270-315 degrees). These are further divided into eight different orientations (Fig. 4). Providing the orientations at varying levels of precision allows the data to be comparable with other sites, often with less precise measurements, while still maintaining the appropriate level of precision (Lindström 1997: 112).

Securely dated, well-defined three-aisle buildings are aligned on different orientations (Table 6, Figs. 5 and 6). In Oppland and Hedmark, E-W is the dominant orientation, while in Østfold, Vestfold, Akershus and Buskerud N-S dominates. We thus have two areas each with a different dominant orientation, each of which corresponds well, although not perfectly, to the two regions where mid-Scandinavian entrances and a mixture of mid- and southern Scandinavian entrances dominate. The houses in Buskerud stand out in that N-S is the dominant orientation, while the only house with identified entrances in this area is of the mid- Scandinavian type. If, in future surveys, a building with southern Scandinavian entrances is found, something I believe may happen, Buskerud will be assigned to the southern region, where both southern and mid-Scandinavian entrances are used.

In both regions, there are exceptions to the dominant orientations. In Østfold, Vestfold, Akershus and Buskerud this includes 26 of 125 houses. All of these, apart from 4 examples, are between 7 and 18 meters long, and are on average shorter than the other houses (Figs. 7 and 8). The longest houses with divergent orientation differ slightly from the other E-W houses. The longest house, Borgen 1 (27.5 m) is aligned at 47°, only two degrees away the limit of the N-S group. Two other houses, Dikeveien 2 and Glemmen 2, both date to the Bronze Age-Pre-Roman Iron Age transition, and may be from the Bronze Age. If so, it makes it even clearer that houses with an E-W orientation in the area of a dominant N-S orientation are shorter than those with the N-S orientation. Furthermore, two houses in Akershus with divergent orientation and length of 18 meters can distort the picture somewhat, but these buildings are not securely identified and are possibly composed of several buildings. In other words, it is primarily, perhaps entirely, short houses that have a divergent orientation in southern Eastern Norway.

In Oppland and Hedmark a majority of the buildings are oriented E-W, but 5 of the 26 houses are oriented N-S. The data set is small, but in the periods where both orientations are present the N-S oriented houses are the shortest. The average length of E-W oriented houses is 23 meters and the N-S oriented houses 13 meters (Fig. 5). Four of the N-S oriented houses are between 5 and 18 m long, with one longer, 23.5 m example. The relationship between length and orientation can thus help to strengthen the assertion that there are two regional building traditions in Eastern Norway, with a clear distinction between the northern and the

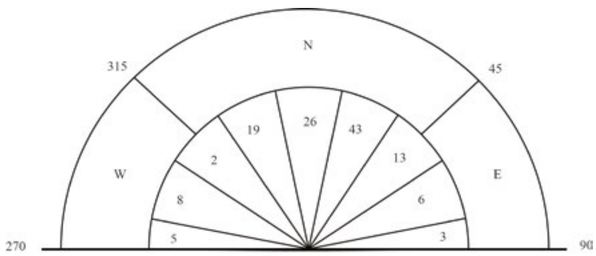


Figure 5. Securely dated three-aisled buildings from Vestfold, Akershus, Østfold, Buskerud and Telemark with a diagnostic degree of 2 or higher, divided by precise orientation.

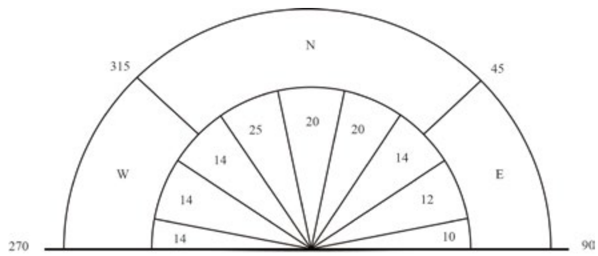


Figure 7. Average length of three-aisled buildings from Østfold, Vestfold, Akershus, Buskerud and Telemark with diagnostic degree of 2 or higher, divided by precise orientation.

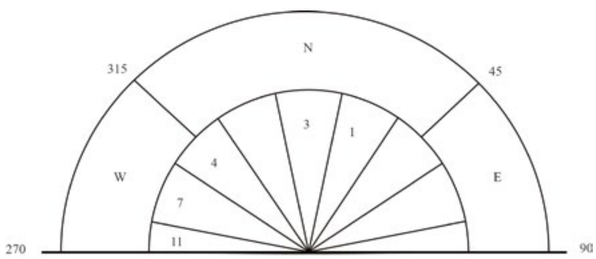


Figure 6. Securely dated three-aisled buildings from Oppland and Hedmark with diagnostic degree of 2 or higher, divided by precise orientation.

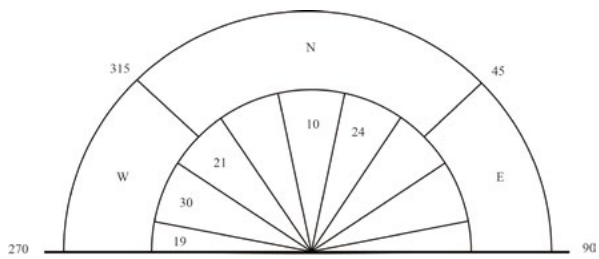


Figure 8. Average length of three-aisled buildings from Oppland and Hedmark with diagnostic degree of 2 or higher, divided by precise orientation.

	Hedmark and Oppland	Østfold, Vestfold and Akershus
	Nr.	**Nr.**
E-W	21	26
N-S	5	99

Table 6. Securely dated three-aisled buildings with a diagnostic degree 2 or higher, divided by general orientation.

southern areas of this region. The houses in Oppland and Hedmark are mainly oriented E-W and have exclusively mid-Scandinavian entrances. Houses in Oslo, Akershus and Østfold are mainly oriented N-S and have both southern and mid-Scandinavian entrances. The few houses from Buskerud share a N-S orientation those in the southern Scandinavian area, however the only house with clearly identified entrances belongs to the mid-Scandinavian group.

OFFSET GABLE-POSTS AND OTHER LOCAL VARIANTS

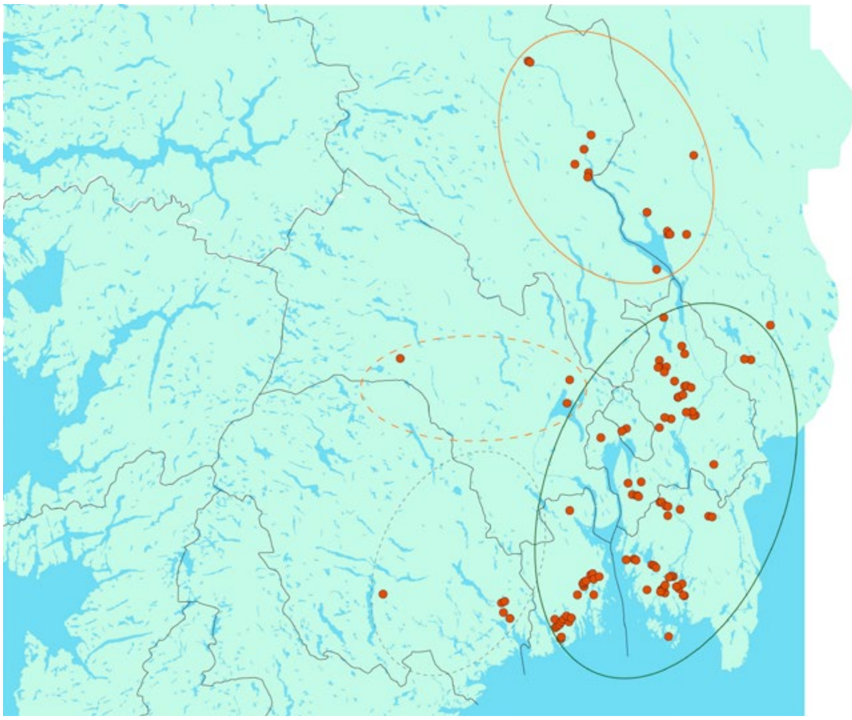
The orientations and entrances of three-aisled houses demonstrate that Eastern Norway has had two overarching and differing regional building traditions. I will now consider whether these two regions each consisted of minor landscapes with local variations in building traditions. The use of offset gable-posts is one example of local variations in building techniques. A small percentage of the houses in Østfold show offset gable-posts, and the feature does not occur later than the Roman-Migration Period transition. In Oppland and Hedmark, there is a large percentage of houses with offset gable-posts from Roman Period to the Viking Period. There are no clearly identified houses older than the Roman Period in these counties, and thus the absence of this feature during these earlier periods cannot be given much weight. However, that offset gable-posts do not appear later than the Roman-Migration Period transition in Østfold may be significant.

In Akershus and Vestfold, offset gable-posts also appear in the LIA, in spite of the few houses from the period. Two-aisled buildings from the Iron Age are only found in Østfold and Akershus. As mentioned earlier, there is great variation in the number of houses identified, the counties they have been identified in, and the periods to which they date. For instance, Pre-Roman Iron Age Østfold stands out as having a high number of houses. A total of 46 buildings date to this period, while only 16 date to the Roman period. In the other counties, there are either more buildings from the Roman Period than from the Pre-Roman Iron Age, or the differences are small. It is difficult to imagine that modern development or archaeological research in Østfold has somehow preferentially affected areas of Pre-Roman Iron Age settlement in comparison to areas of Roman Period settlement. Therefore, this unequal distribution reflects settlement patterns in prehistory. The numerous Pre-Roman Iron Age houses as well as the use of offset gable-posts in the Pre-Roman Iron Age and Roman Period distinguishes Østfold from the other counties. Furthermore, it is only in Østfold and Akershus that two-aisled buildings are known. It can thus be inferred that Østfold, and perhaps Akershus as well, had its/their own unique building tradition, at least in the Early Iron Age.

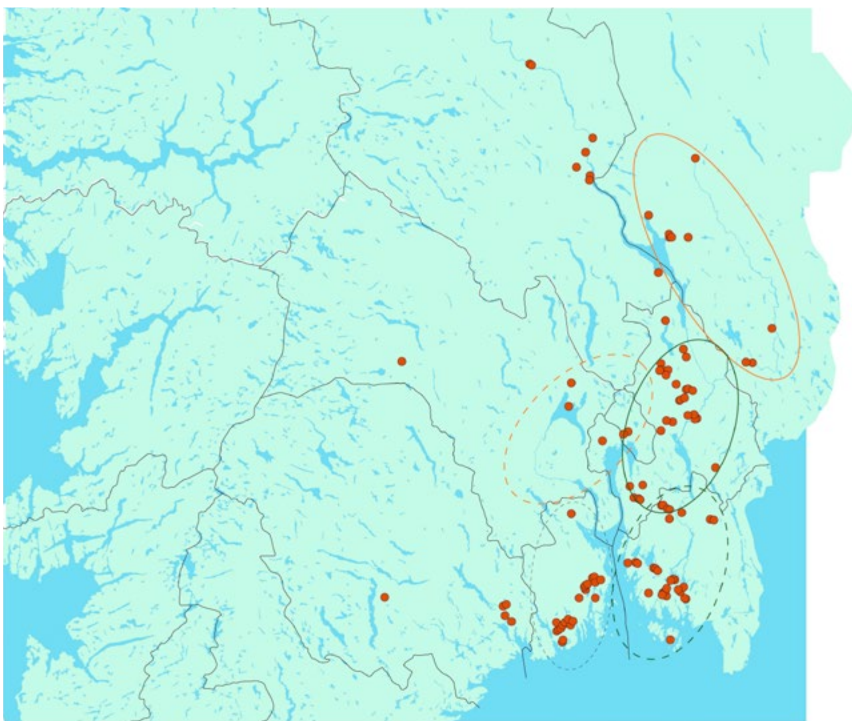
REGIONS AND LANDSCAPES

Eastern Norway can thus be divided into northern and southern regions, of which the latter can be divided into several landscape (Fig. 9). There appears to be a marked distinction between the northern region, consisting of Oppland and Hedmark, and the southern region, consisting of Østfold, Akershus and Vestfold, while the data set from Buskerud and Telemark is currently too small to determine to which group they belong. The houses in Oppland and Hedmark are primarily oriented E-W with mid-Scandinavian entrances. In Østfold, Akershus and Vestfold they are primarily oriented N-S and show both southern and mid-Scandinavian entrances. There are also many four-post structures from this southern region. In line with Herschend's (2009) assertion of a separation between southern and mid-Scandinavia, I have demonstrated that the northern limit of the southern Scandinavian building techniques runs roughly between Akershus in the south, and Oppland and Hedmark in the north. As mentioned above, the house was the central social institution in the Iron Age, and in line with Herschend (2009), I suggest that different building traditions reflect different cultural conditions. Although all the houses in this analysis belong to the rural/agricultural environment, there is a significant difference between the two regions.

Outland activities such as iron extraction and hunting must have played a significantly larger economic and cultural role in the northern region of Eastern Norway than in the southern. This may have influenced cultural contacts or preferences with respect to both house orientation and building style in general. The border between northern and



A)



B)

Figure 9. Eastern Norway with the two regions and two to four landscapes drawn in.

southern Eastern Norway, at least as defined by the building tradition, goes far back in time, and it is therefore tempting to see whether it can be detected in written sources from the Medieval Period. In future work, I will examine the boundary between the political or cultural territories of Viken and the Uplands, and between the areas under the jurisdiction of the Eidsivating law and the Borgarting law. The Uplands and the Eidsivating law cover large parts of northern Eastern Norway, as well as Romerike in Akershus (Holmsen 1979; Halvorsen 1987: 37). The houses in Romerike are oriented N-S and use both southern and mid-Scandinavian entrances, thus belonging to the southern region of building traditions. Viken and the Borgarting law covers nearly the entires southern region of Eastern Norway. This is a complex topic, which will be treated much more thoroughly, in future work (Gjerpe in prep).

The southern region of Eastern Norway also contains smaller landscapes with local building traditions. In all likelihood, there are local traditions in the northern region as well, but currently there is not enough material to address this question adequately. In Østfold, a large percentage of the houses date to the Pre-Roman Iron Age, and offset gable-posts disappear earlier than in the rest of the region. At the same time, two-aisled buildings are only found in Østfold and Akershus. I would therefore suggest that Østfold and perhaps the southern part of Akershus is one landscape. Furthermore, I would suggest that Vestfold and perhaps the northern part of Akershus stand out as a different landscape. The houses in this landscape may appear to be less homogeneous, but are distinct from those in the northern region, while offset gable-posts were in use much longer than in Østfold. There are no two-aisled buildings known from Vestfold, something which argues against Vestfold and Akershus being seen as a single landscape. Previous studies of burial customs also supports that there are differences between the different landscapes in the southern Scandinavia region (Hougen 1924; Løken 1974; Forseth 1993; 2003; Stylegar 2004; Wangen 2009; Rødsrud 2012; Skogstrand 2014). The topographic and climatic conditions in Østfold and Vestfold are so similar that the differences in building traditions cannot be explained through an eco-functionalist approach. Thus, there is no unified eastern Norwegian architectural style, but regional and local building traditions, all of which were well integrated into the general Scandinavian trend of three-aisled buildings with posts dug into the subsoil.

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GEOMETRIC OBSERVATIONS REGARDING EARLY IRON AGE LONGHOUSES IN SOUTHWEST NORWAY

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ABSTRACT
This paper presents a geometric model for the analysis of prehistoric longhouse ground plans. It is divided into three parts, starting with a description of the methodology. This will be followed by a presentation of the geometric model using several examples which date to the Early Iron Age. A brief discussion at the end of the article is meant to be read in concert with the first part of the article. The material for the case studies comes from excavations in Rogaland, Norway: Forsandmoen in 1991 and 2007, Myklebust in 2010, Høgevollen in 1991 and Ullandhaug in 1968-69. The author has taken part in the excavation of all buildings apart from Ullandhaug house 1, Høgevollen house II and Forsandmoen house 150.

INTRODUCTION
This article deals with the overall distribution of posts in prehistoric buildings with internal roof support; more specifically in those with structural arrangements composed by two parallel rows of internal posts. These constructions, commonly referred in archaeological literature as three-aisled longhouses, are common in much of the area defined as temperate Continental Europe during the Early Iron Age (EIA). Most of these houses share a common construction feature, a linear succession of transversal post frames called trestles constitute the principal element of the structure.

Some of the aspects of the geometric observations presented here originate from the necessity for a solid and scientifically valid method of identification of posthole patterns in field archaeology. To illustrate these observations, a handful of building remains are to be considered. These examples incorporate different types of constructions dating back to the Early Iron Age in Rogaland, (SW Norway), with special focus on some buildings excavated at Forsandmoen, (Forsand County). By examining the distribution of these specific structural remains, I hope to open new insights regarding the construction techniques that define the main form of these buildings.

Although there is a certain component of architectural understanding and reverse engineering involved in the process, the principle is very simple. Nevertheless, I strongly believe it has further implications regarding the understanding of sub scientific mathematics by EIA house builders. In addition, I believe there is a strong possibility in a future automatization of the process, in order to replicate the results in buildings with the same characteristics, using feature based pattern recognition algorithms through Geographic information system (GIS) software.

POSTHOLE RECOGNITION IN FIELD ARCHAEOLOGY

The identification and discussion of different types of building remains constitutes the starting point in a great deal of studies regarding settlement archaeology. Most of these discussions originate already during the process of excavation. In a mechanical topsoil excavation, large areas are stripped down to the natural subsoil. Within these areas, prehistoric building foundations in the form of posthole arrangements become easily identifiable in contrast to the mineralogical background. In Rogaland, the methods tested within this type of excavation have been implemented over time with the use of new recording techniques, but remain essentially the same as presented in Løken et al. 1996.

Although a posthole is relatively easy to identify in a stripped surface, relating it to other features may be difficult in some instances. These features, often truncated by later farming activity, are often not stratigraphically related to each other (Fig. 1).

We tend to rely on spatial observations such as shape, the identification of consistent pair arrangements or clear alignments in order to build up valid interpretations. This process is often based on a mixture of personal experience, *ad hoc* interpretations and a general familiarity as to what to look for. In other words, we often revert to the application of previous knowledge in order to validate and understand our own field observations. A pattern or posthole arrangement previously recorded in a similar site is most likely to be accepted as true, in some occasions without a full understanding of their structural function.

Figure 1. Partial overview of the dwelling quarters of a AD 200–575 longhouse, house 1 in Myklebust, Sola municipality. Some of the identified structural features have been marked with blue plates, forming two parallel lines and disposed in consistent pairs. Part of this identification process was done during the first stages of excavation. The house interpretation, based on the initial hypothesis, was later validated by excavation results. Foto AM-UiS 2010.

One of the tasks, both during excavation and in post-excavation analysis, is the identification of these buildings and the understanding of their different phases. As archaeologists, we are aware that differences, as well as similarities between different features are crucial in order to establish relationships and, eventually, puzzle-together the history of a building. Documentation of field observations, such as photography, drawings or digital measurements, help us in this task.

Time and financial limitations within rescue archaeology make it necessary to prioritize certain features over others. In some instances, the overwhelming number of features often results in the excavation of a mere fraction of what has been documented on the surface. This will influence the standards to which the excavation is conducted.

In cases where prioritization is necessary, we tend to excavate features that can be phased, that is; features that we understand and that can be related to each other. By proceeding in this manner, it becomes clear that knowledge of similar sites is a great advantage.

Depending on the site, the frequency and the state of preservation of the features defining a building, the assessment process can become rather complicated and difficult to verify. Posthole arrangements related to house foundations can appear in different states of preservation depending on how disturbed the site may be. Often only the deeper foundations survive. This has obvious implications for the legibility and understanding of the building remains (Trebsche 2009: 507).

Earlier attempts of computerized analysis applied to posthole assemblages can be defined as template based pattern recognition. As such, the identification of valid correlations is in relation to previously assumed templates such as straight angles, alignments and circular arrangements. (Litton and Restorick 1983; Fletcher and Lock 1984). Some of these pattern recognition algorithms can be implemented within modern archaeological GIS applications, but their utility is still in need of assessment. In fact, although the use of modern GIS methods of field recording has sped up the documentation process, spatial analysis is often allocated to the post excavation phase. As a result, the advantages of this type of analysis are not part of the onsite decision-making process, resulting in a potential information loss.

Ultimately, an adequate assessment of what is relevant to investigate is regarded as one of the most important stages in field archaeology. This aspect also affects the documentation of the site, often characterized by standard cross sections that offer little contextual information. Some authors have argued for an improvement of excavation techniques, from the common "objective" approach towards a more "interrogative" type of excavation (Millet 2008: 13; Trebsche 2009: 516). Leo Webley, in an extensive study of Iron Age houses in western Denmark, has noticed a decrease in detailed contextual evidence from rescue driven excavations (Webley 2008: 18). Parallels to this situation can be observed in Rogaland, as in many other areas of Norway.

GENERAL TRENDS REGARDING IA BUILDINGS IN ROGALAND, AN ARCHAEOLOGICAL PERSPECTIVE

In Rogaland, the research excavation program at Forsandmoen (1980-1990) resulted in the gradual adaptation of mechanical topsoil stripping as a systematic excavation method for farmed surfaces. This project represented a milestone for the professionalization of this method in Norway (Martens 2010: 243). It also enhanced our understanding of over 2000 years of building construction in Rogaland, through the end of Migration Period (AD 400–550) (Løken 1999b). Although several Late Roman Iron Age (AD 200–400) and Migration period houses had been excavated before Forsandmoen, few settlement remains dating back to Pre-Roman Iron Age (500–1 BC) and Bronze Age (BA) had been found.

The posthole arrangements representing the remains of three-aisled Iron Age longhouses are often the reflection of a very consistent architectural form, which originates in BA and disappears during the medieval period (Løken 1998: 169; Grindkåsa 2007: 15). In addition to the structural foundations, other evidence such as entrances or fireplaces contribute to our understanding of the function of different areas within the building. These remains are further illuminated by the recovery of quantifiable data such as ecofacts, artefacts or as the result of systematic botanic sampling. The analysis and comparison of these datasets often results in valid archaeological interpretations.

Generally speaking, these houses have an elongated, rectangular structure, which often combined a dwelling area and a stall area under the same roof (Webley 2008: 48). Although the main construction technique remains the same for the entire period, the size, function and longevity of these structures changes over time. This chronological development involves a progressive change in building materials, posthole foundation techniques, and use of internal space, resulting in identifiable and comparable remains between different sites. In archaeological literature, we find a wide variety of studies dealing with the identification of these general traits, later summarized in specific building types for a given period. In addition, the evolution in form, size and function of these constructions over time has been widely discussed in many investigations, dominated by a context of social paradigm explanations (Løken 1998: 169; Webley 2008: 68; Herschend 2009).

Towards the end of 500–1 BC, we witness newer types of building sharing the same construction principle. The houses show a consistent length over time, as well as a longer use span. This evolution culminates towards the end of EIA with longstanding, multi-functional buildings, frequently inhabited over several generations. In Rogaland, the remains of these later constructions are characterized by complex archaeological sequences that are difficult to analyze in detail (Myhre 1980; Løken 1992).

BEYOND THE FOUNDATIONS: HOUSE RECONSTRUCTION AND THE ARCHITECTONIC APPROACH

Some early architectonic reconstructions such as the one at Ullandhaug in the early 1970s have been defined by some as too primitive (Fig. 2a). These reconstructions showed the necessity of further archaeological investigation of prehistoric buildings with internal roof support. In spite of a large number of buildings having been excavated before Ullandhaug and the uniqueness of placing the reconstructions directly over the sites of the recently excavated houses, later research showed the limitations of the structural knowledge regarding these houses at the time the reconstructions took place (Fig. 2b) (Myhre 1992: 26; Møllerop 1992: 19; Løken 1992).

Modern reconstructions of archaeologically inspired wooden buildings, initiated in the 1980s, provided a different perspective from which to view the archaeological data (Komber 1987; Näsman 1987). The approach required a compromise between a framework dictated by the archaeological and the architectonic data, and the physical limitations of the material. This interchange of ideas had a positive effect on archaeological theory, as it necessarily involved an interpretative approach (Herschend 1987; Schelderup 2008: 43).

Much of the architectonic focus has used, as its primary data, ground plans from excavated buildings. Statistical analysis of large datasets (Herschend 1980; Hvass 1985; Løken 1994) helped to identify general characteristics that would constitute the groundwork towards more accurate reconstructions.

The work of J. Komber provides an insight into the advantages of multi-disciplinary studies, resulting in a variety of well-grounded conclusions, and subsequent new knowledge production. Komber, and later other authors such as Carter, are aware of the importance of the position of the roof bearing

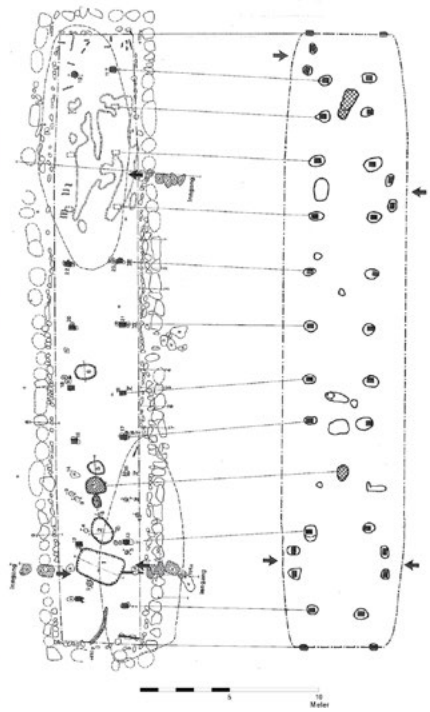

Figure 2a. Left: Ullandhaug reconstruction in Stavanger. Foto AM **Figure 2b. Right:** Comparison between House 1 in Ullandhaug and House169 at Forsandmoen (after Løken 1992).

posts in the building's ground plan and the trestle as a cohesive unit (Komber 1989; Carter 2008). These authors also pay attention to the different imposed loads and the requirement of a coherent structure in order to obtain the necessary stability. Komber`s valuable work regarding the structural performance of a trestle frame inferred from archaeological material has been very useful for modern day reconstructions of prehistoric buildings in Scandinavia.

His calculations regarding the implications of the trestle quotient, roofing materials and the foundation problems within prehistoric building technology have been utilized in a variety of posterior reconstructions and analysis (Schjelderup 2008). However, their use has been limited in archaeological field literature, partly because it does not have much effect on the process of excavation and many of his conclusions concentrate on the three-dimensional nature of archaeological reconstructions.

In general terms, EIA buildings are characterized by the use of an internal roof support construction technique based on post frames resulting in three-aisled constructions. It is generally accepted, through analogy with modern post frame constructions and experimental reconstruction work, what the structural elements of these houses would have looked like. In these constructions, roof bearing posts are placed in two clearly defined rows of paired foundation holes along the longitudinal axis of the house. Since the foundations are often shallow, the posts were stabilized by different means, both within the foundation and above the ground. Above the ground, each pair of posts was usually connected by a transversal tie beam, forming a trestle. Although the trestle constitutes the primary cohesive unit for the majority of these buildings, there are a few examples on which a purlin may have constituted the primary connection between the roof bearing posts. This type of roof must have been a gable roof with two equal sides. An internal framework formed by a cohesive construction of different wood elements supported the roof. Adjacent trestles were connected by two inner purlins running above the roof bearing posts, forming primary modules. The successive combination of these modules resulted in a continuous rectangular platform above the central aisle. Over this platform, the primary roof structure would rest. On some occasions, a ridge beam, supported by kingposts, would have run above the center of each trestle. This ridge represents the highest point of the roof and constitutes a straight line through the main longitudinal axis of the house. On either side of the ridge, a series of rafters would have connected the highest point of the roof with the walls, resting over the inner purlins connecting the trestles. On top of these rafters, battens covered by straw or turf would have comprised the roof.

The structural principle that defines this construction creates an internal roof support system which functions satisfactorily. The vertical loads are successfully transferred from the point where they arise to the underground beneath the roof bearing posts, resulting in stable constructions capable of bearing their own weight and any loads imposed on them (Rosberg 2013: 5). The design of a structure capable of fulfilling this function is essential in architecture. It is the result of an understanding of the loading problems faced by a building of these characteristics (Macdonald 1994: 9).

This architectural design creates a continuous free space, divided in three aisles, with a modular character for the areas between the trestles. Following its linear principle, the space is dynamic, allowing re-arrangements and future extensions in length if necessary. These modifications can be conducted without major changes in the building, predominantly because of the modularity of the trestle frames. In addition, the areas between the trestles can be shortened or enlarged depending of the need, creating or dividing the inner rooms between the trestles and allowing the multi-functional use of the space within these buildings (Webley 2008: 48-70; Herschend 2009: 236).

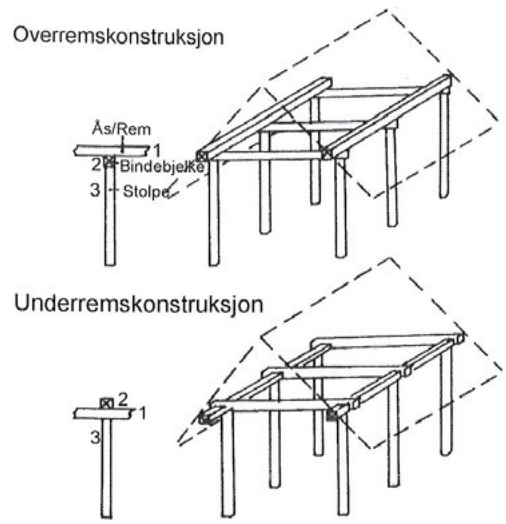

Figure 3. Two examples of three-aisled roof bearing systems, the trestle frame system (above) and inner purlins (below). This latter system does not necessarily need a pair correlation of the roof bearing posts in the plan and it is not further treated in this article. (after Näsman 1983, please notice that the original illustration has been clipped)

Although the previously mentioned elements help to explain the vertical and static load transmission, there are certain difficulties explaining the horizontal, dynamic load resistance of the building through the archaeological material. In Komber`s work, the overall horizontal distribution of the trestles and the subsequent need of equilibrium within a structural system have not received the same degree of attention. This is partially because, structurally speaking, there is a greater amount of strain in the postholes along the transverse axis of the house (Komber 1987: 56). In addition, few complete house plans with structural arrangements of posts had been published in Norway at the time his study took place (1989).

In the case of substantially long buildings, we must take into consideration a significant economic and social investment. During its construction, and even at a previous stage, a large amount of construction materials had to be gathered, transported and transformed, and the necessary manpower coordinated. The material inferred from different archaeological datasets shows some regional patterns (Løken 1999b; Herschend 2009). In addition, the consistent occurrence of different building types in different periods and regions show that there is a common idea of what these constructions should look like. This ideal layout may be encouraged by the fact that house building is a social activity with many actors involved. Webley has recently highlighted the implications of collective work affecting house type standardization (Webley 2008: 68). As many authors who deal with the tangible materiality inferred from the archaeological observations, I am interested in an ideal model, based on the same original material from a structural perspective.

THE GEOMETRIC MODEL

I believe that it was at the beginning of the construction process when a preliminary layout of the how and where of the building took place. During this process, a form of mathematical knowledge must have been used.

The regularity in the ground plans inferred from the archaeological remains gives reason to assume that a certain form of geometry must have been applied. Geometry, as a technique of spatial organization, enables the necessary calculations for planning, coordination and material transformation involved in the construction process. This process is still visible, to a certain extent, in the ground plan and by analyzing the location of the visible elements.

Earlier studies have considered the placement of these and other elements within a house plan as a way of obtaining information regarding the use of specific measurement units (Herschend 1987; 1991; Løken 1999a) and indirectly linking the construction techniques of the analyzed material with the classic Mediterranean world. Along the same lines, authors such as Meyer-Christian have recently shown clear indications related to the use of Pythagorean mathematics within the layout planning of the EIA longhouses in Federsen Wierde, northern Germany. The results of his analysis show proportional distances within the placement of the structural elements, as well as the use of Pythagorean triangles to obtain straight angles. His work is a good demonstration of the existence of a previous set of calculations for determining the best possible placement for each posthole (Meyer-Christian 2008).

Similar, symmetric arrangements are common in many longhouse plans. Regardless of the width of the trestles, the main axial line runs along the center of the main aisle and coincides with the peak of the roof. On either side of this line, both the roof bearing postholes and, in certain occasions, some of the wall postholes are placed in pairs, apparently mirroring each other. The length of this line is what we normally regard as the house length.

The axial line within this type of constructions deserves detailed attention. It has often been regarded as a way to determine the relative location of the fireplaces and other structures such as the roof bearing posts. However, this line may perhaps be more important than we have previously thought. In the following examples, I will try to demonstrate that those who built these houses were very preoccupied

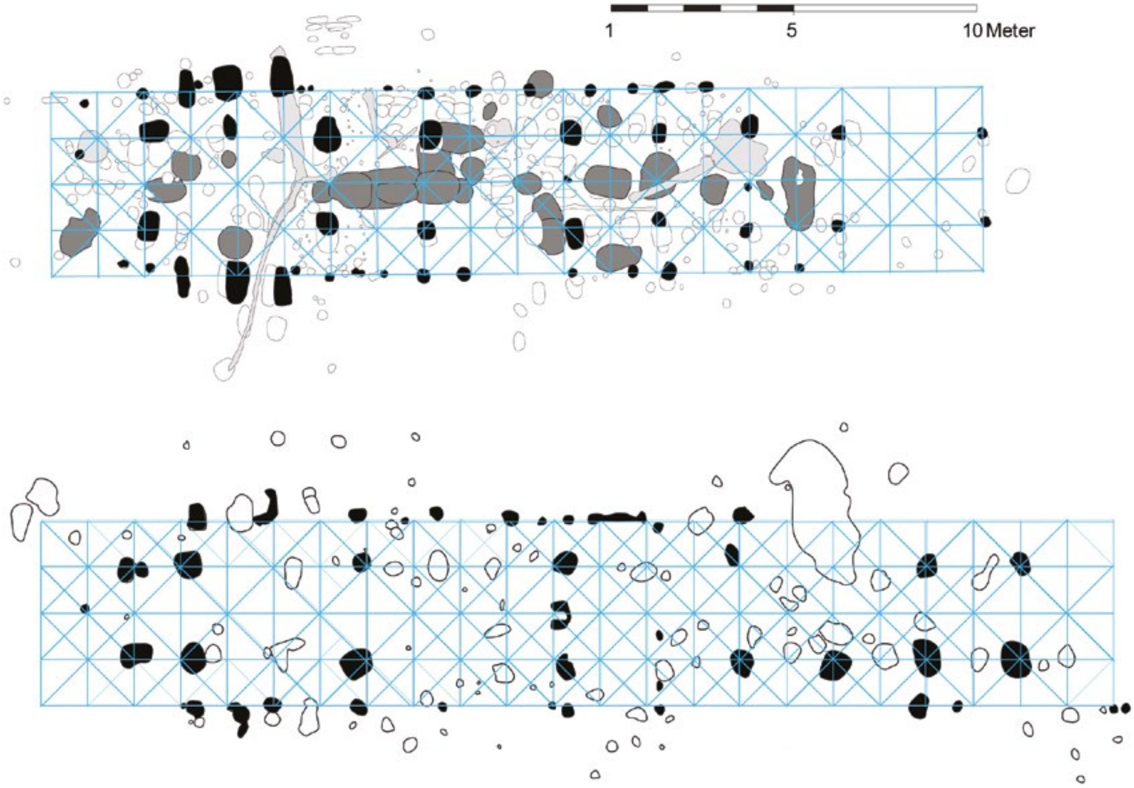

Figure 4. Two buildings from MP in Rogaland. House 1 from Myklebust in Sola County (above) and *Høgevollen in Egersund* (below). Notice the regular pattern of posts highlighted by an overlaid grid (blue).

with arranging the structural elements of the house in relation to this line.

An important aspect of geometry in architecture is symmetry. A construction that allows a division in two equal parts is defined in structural design as bilaterally symmetric, and represents one of the most common ground plan forms in architecture (Williams 1999). In a bilateral symmetrical arrangement, the relation between a structural element and its counterpart must be the same in relation to the main axial line.

Since the foundations are not deep enough to take lateral thrusts, the stability of the building is dependent on other factors. A systematic placement of the posts would have resulted in a much more stable structure, with a subsequent arrangement of the different components in a very regular manner. In other words, the posts would have been arranged in a perfect square. This method would have resulted on ground plans such as the ones in Federsen Wierde, that can be analyzed by overlaying a grid and establishing secure relations between the foundations (Fig. 4). In fact, there is a general tendency towards regularity in most ground plans, especially in AD 200–550 buildings. However, it is common to notice a few postholes that appear slightly misplaced.

In a building where a considerable number of posthole foundations need to be dug, turning an

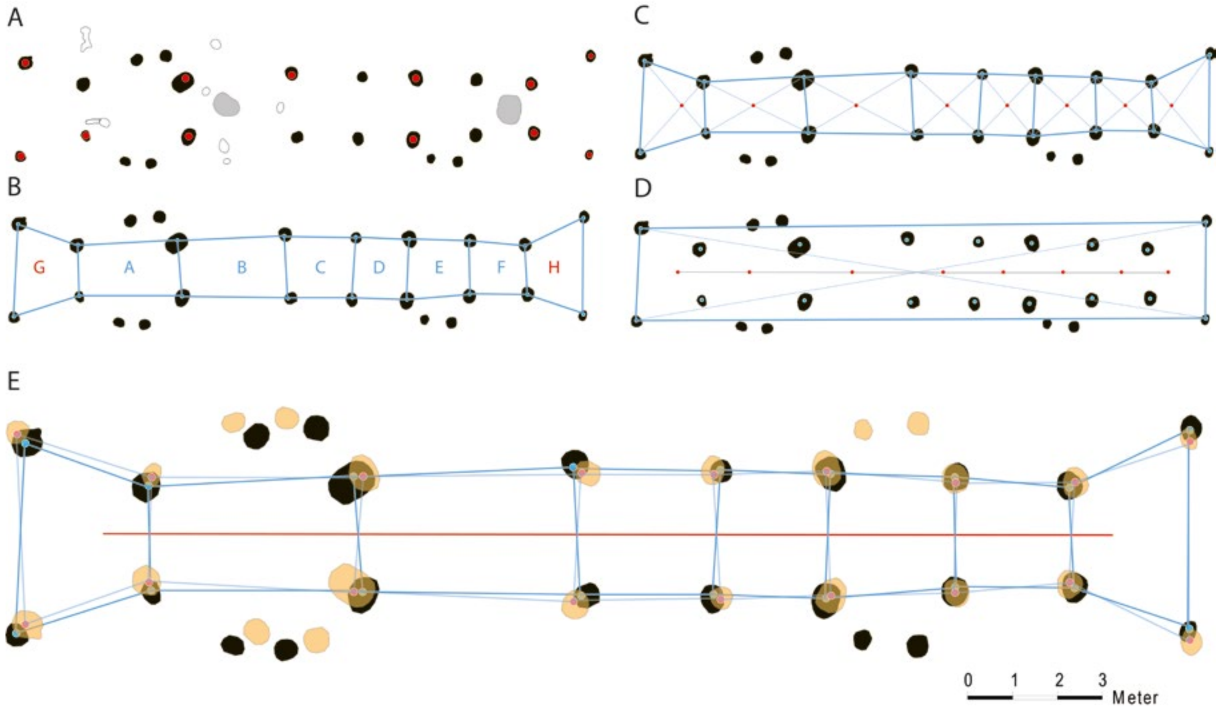

Figure 5. Geometric principle exemplified in house 248 from Forsandmoen. See text for a detailed explanation.

idealized post layout into reality is difficult. The main problem resides in the nature of a posthole itself. In Rogaland, it is common to come across a glacier moraine sub-soil layer, characterized in many occasions by the presence of large boulders. This may, for example, prevent a more regular posthole distribution. Thus, we do not expect these posthole arrangements to be perfectly symmetric, that is, bilaterally symmetric.

Some authors, when working with wooden constructions, have considered these misalignments to be within an acceptable tolerance level (Jensenius 2010: 158). On other occasions, some of the stability problems caused by irregular or shallow foundations could have been corrected by the use of reinforcements above the ground (Komber 1987: 56). These assumptions are difficult to prove through the archaeological data.

But the arrangement is, in fact, much more precise than we think, a point I will illustrate using a series of buildings from different periods at Forsandmoen. The building numbers presented here coincide with those given to the houses during the excavation.

House 248 from Forsandmoen (Fig. 5) was excavated in 2007 and represents a typical example of a main longhouse from AD 200–550 (Dahl 2009). The house consists of seven pairs of roof bearing posts and three entrances. The ground plan shows no indication of the walls, which is typical for buildings within truncated sequences. On the other hand, two pairs of corner posts on both ends of the building provide clear indications of its dimensions.

Many of the foundations bear traces of the original post location, marked as a red circle (Fig. 5a). Taking into consideration the original placement of the posts when possible, adjacent posts are connected by lines (blue) creating eight polygons (A-H). These polygons represent eight linear modules along the longitudinal axis of the house forming the basic roof bearing structure (A-H, Fig. 5b). Notice that these modules are apparently not completely regular.

By tracing diagonal lines between the opposite corners of these polygons, we will obtain a point representing its center. (red dots, Fig. 5c). These points are perfectly arranged in a line. In addition, the point formed by the diagonals between opposite corner posts also falls on this line. (Fig. 5d). In a bilateral symmetric arrangement, paired elements should be equidistant from the mid-axis. This fact can be seen exemplified by reflecting the ground plan around the symmetric axis we have established. Figure 5e illustrates this by overlaying both plans, the original (black) and its reflection (transparent yellow). The impression of bilateral symmetry is manifest.

This simple visual analysis shows that the placement of the posts, although not regular, fulfill the requirements of structural equilibrium exemplified by bilateral symmetry. I believe that this was the solution of the Iron Age house builders for accommodating the structural layout required by such a building regardless the position of the postholes (Fig. 6).

In order to illustrate these results in a more general perspective, I will apply this principle to other buildings from the same site. The following example (Fig. 7) encompasses nine construction sequences from the same period as house 248, excavated in 2007. The results must be considered in the light of

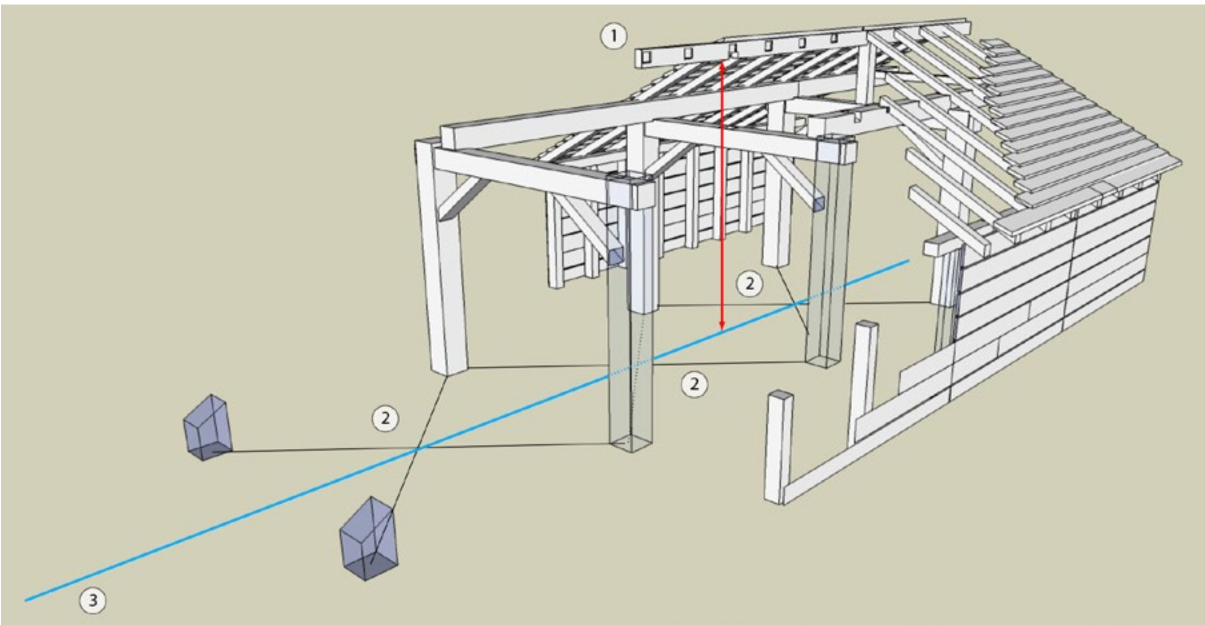

Figure 6. Three dimensional representation of the geometric principle. The main axis line (3) coincides with the uppermost part of the roof (1). The roof supporting pairs are located in diagonal relation to this line (2).

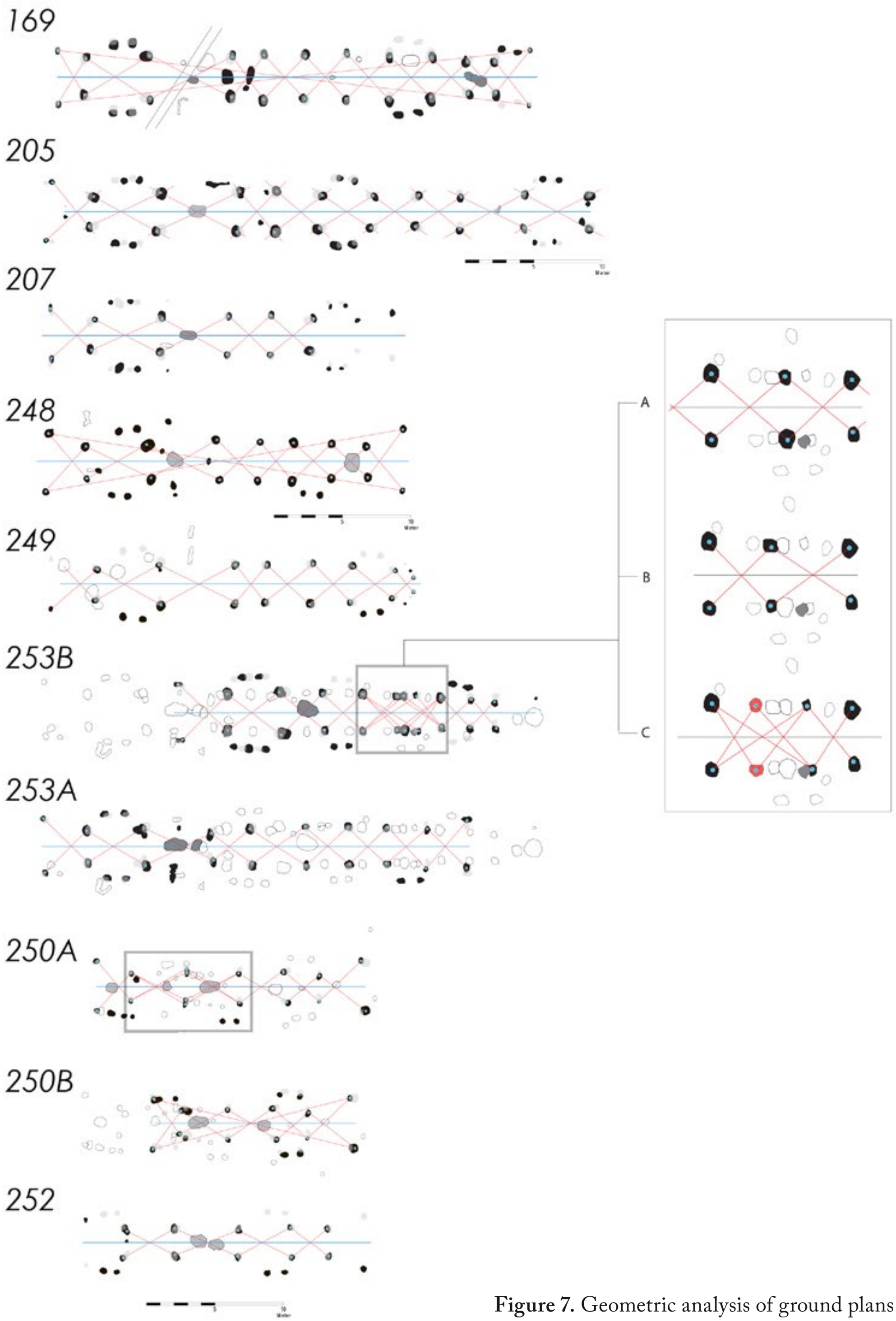

Figure 7. Geometric analysis of ground plans from RA-MP buildings dug in 2007 at Forsandmoen discussed in the text.

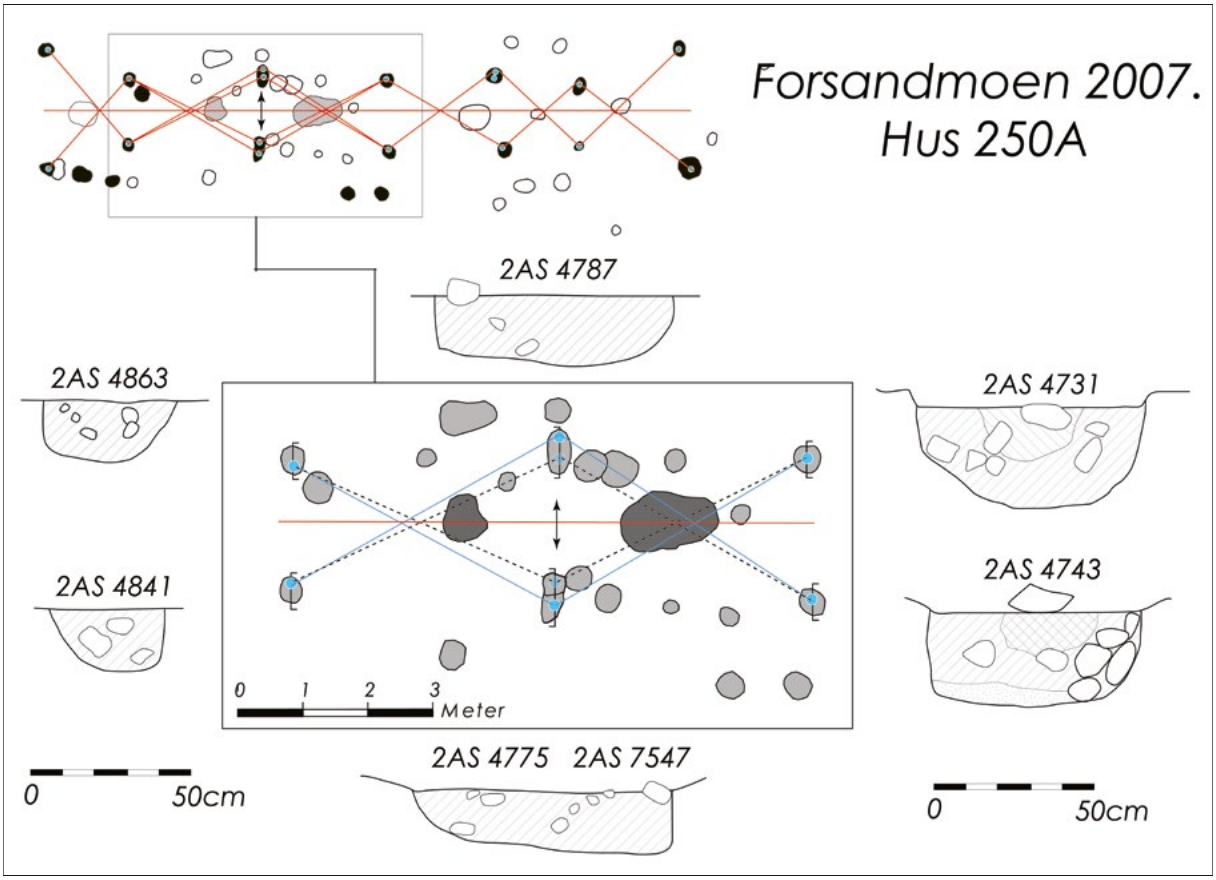

Figure 8. Analysis of house 250A at Forsandmoen discussed in the text.

the limited size of the dataset and the fact that all the buildings are from the same site. Most of the houses represent one phase with the exception of 253 and 250, which consist of two sequences each in addition to several structural adjustments. The analysis has special relevance for these multi-phased buildings since it offers a visual understanding of the phase divisions which is both logical and easily defendable. The phasing of the repair sequences in buildings 250A and 253B may also be described through this visual principle.

The analysis shows that an axis of symmetry is present in all of the buildings. This result is especially interesting in sequences with a large number of roof bearing posts, and thus a large number of diagonal crossings and longer axis lines, such as houses 169, 205 and 253A. The adherence to a longer axis of symmetry should have been more difficult in such buildings since it involves a large number of perfectly aligned points. This indicate that those results consistent with the model are not accidental.

In the case of house 249, the diagonal combination between three known posts helps to pinpoint the location of a missing corner post (on the far left end of the house in Fig. 7). In this case, there is a possibility that the missing post had been destroyed by a later cooking pit structure. This example shows how such visual analysis could help in the location of missing or otherwise unrecorded structures.

The ground plan of three of the analyzed houses show corner pairs in both ends, (houses 250A-B and 253A). Only in one of these (250B) can we produce the same results as in house 248. In the other two, the point at which the diagonals between the end pairs cross falls off of the inferred axis of symmetry (not illustrated). This preliminary result may indicate that the placement of the corner post pairs in these houses is not dependent on bilateral symmetry. A symmetry analysis of multi-phased buildings can help in defining of which postholes paired with each other (Fig. 8). In addition, it could assist in the subdivision of the structural adjustment sequence. House 250A-B constitutes an example of a repair that has maintained the same symmetric axis, probably as the result of a structural rearrangement of a still standing building with a complete roof structure. The resulting ground plan (250A) is the consequence of an extension of an original building (250B) involving the shifting of a roof bearing pair.

The ground plan for houses 253A-B (Fig. 7, Fig. 9a-c) shows a complete reconstruction process that has retained the same symmetric axis. Over a first, considerably shorter building, a second, larger structure was raised. The ground plan shows that the original house was probably dismantled during the construction of the second building and that, most likely, the structural elements from the first phase were utilized for the second.

In addition, the first building, 253B shows a repair sequence prior to the second phase. A closer look comparing the posthole cross sections shows further details within this sequence. Figure 9a shows the original placement of the trestle foundations, regularly placed at equal distances. Due to a first modification, the central pair has been shifted, as

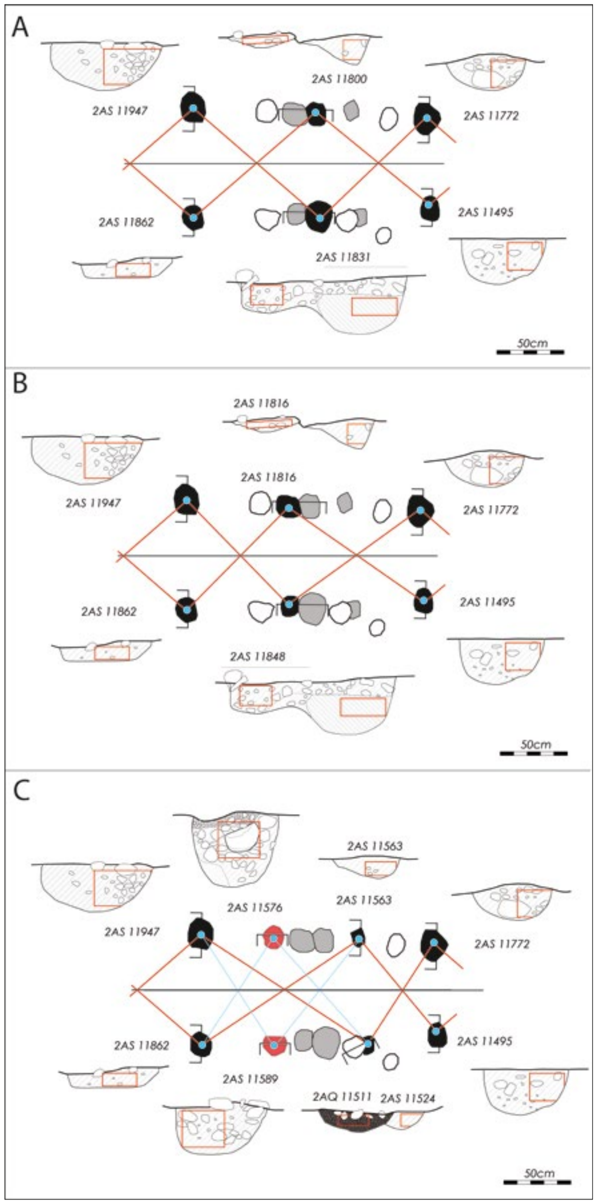

Figure 9. Analysis of house 253 from Forsandmoen, discussed in the text. See also figure 7 for a complete overview of the overlapping building plans.

the cross section of postholes 11848/11831 clearly illustrates (Fig. 9b). Notice that the placement of the new pair is still consequent with the axis line.

At a later stage, the same area has undergone a new repair in which possibly two extra pairs have been included (Fig. 9c). In the last repair sequence, the geometric analysis provides two possible structural combinations, both arrangements could have functioned satisfactorily. In addition, there is reason to believe that the two new trestles could have remained when the new house (253A) phase was constructed. Although the later sequence offers multiple interpretations, the overall repair sequence appears clear and maintains a certain structural logic. This example shows how this visual analysis can provide useful information when attempting to clarify the construction sequences in buildings with multiple phases and repairs. In the case of building 253A-B there is a strong indication that the later phase (253A) constitutes an enlargement of the building.

The potential of this type of geometric analysis as an aid for defining the different construction sequences is exemplified in the dwelling area of house I from Myklebust, Sola (Fig. 10). This building, excavated in 2010, also dates from AD 200–550 and is comprised of two main phases with several structural adjustments each (Dahl 2014). The type of complex archaeological sequence represented by this building is quite common for many large farm buildings from this period in Rogaland, where the central building has been standing in the same place for over 250 years, in some examples even longer. In addition, it was considered a possibility that this house may have been surrounded by an outer, protective stone wall. This structure would have been removed later as a result of modern farming, without leaving any traces.

The number of possible combinations for house I at Myklebust would have been difficult to analyze in detail without digital visualization tools. Usually, these buildings are regarded as multi-phased, and a detailed analysis of their elements and phases is often not completed under the limitations of present day rescue archaeology.

In this case, the different diagonal combinations clarify both which posts are more likely to form a pair and which pairs could have belonged together, defining two main construction phases and a large number of repairs. Both construction phases share the same axis line, which indicates that they are likely not the result of a complete dismantlement of the house structure, although this coincidence could be a result of the limitations set by the previously mentioned outer stonewall.

The scope of this article does not allow for a detailed discussion of the different phases and structural adjustments of the house. This case is merely intended to illustrate possibilities when dealing with complex sequences.

We have seen many examples related to later periods within EIA. The buildings within this period are characterized as more regular than the buildings from earlier periods. On the other hand, the placement of wall posts is not regular and in many instances they are not present at all. This has been considered a general characteristic these buildings and has been seen as an indication of the introduction of wall paneling (Løken 1998). In 500 BC–AD 200 the buildings are characterized by a regular amount of wallposts, providing a series of examples suitable for a further analysis, such as house 150 from Forsandmoen (Fig. 11 a-c).

House 150 from Forsandmoen, excavated in 1991, constitutes the main building of an opulent farm from AD 1–200 (Løken 1994: 337-341). A closer look to the ground plan indicates that this building is closely related to what has been later defined as the Central Scandinavian house type (Herschend 2009: 14). In addition, the wide trestle in the middle room and other characteristics within the building have been seen as evidence of a hall room within the building, enhancing the prominent nature of

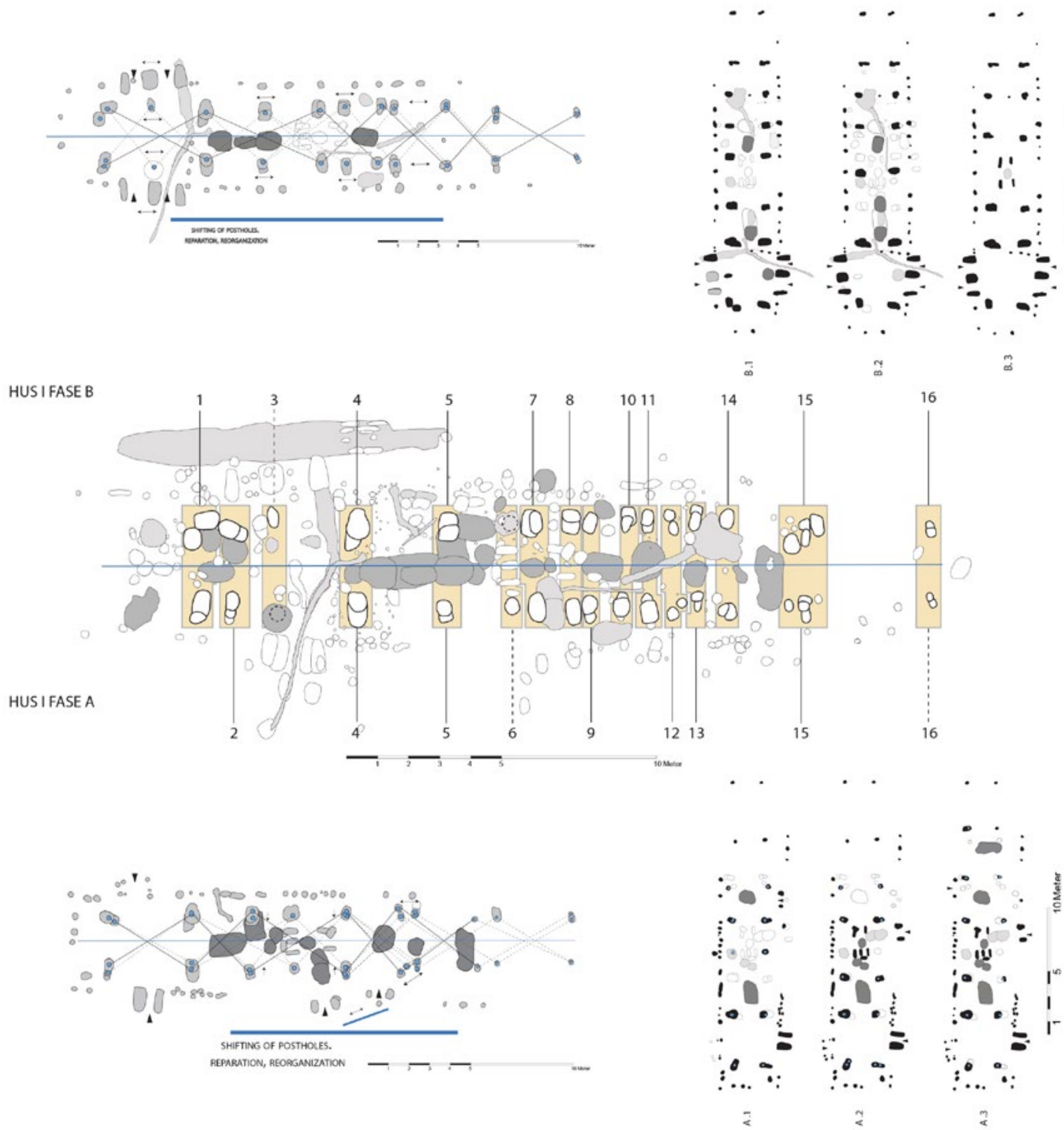

Figure 10. Different phases and options within each phase for house 1 at Myklebust.

the structure (Løken 2001: 68). The building plan does not show clear indications of several phases, possibly indicating that this building has not had the long lifespan that characterizes house I from Myklebust. In fact there are some slight indications that the building may have burned down (Løken 1994: 339). House 150 may constitute a building occupied by the upper spheres of Forsandmoen`s society sometime around the first century AD.

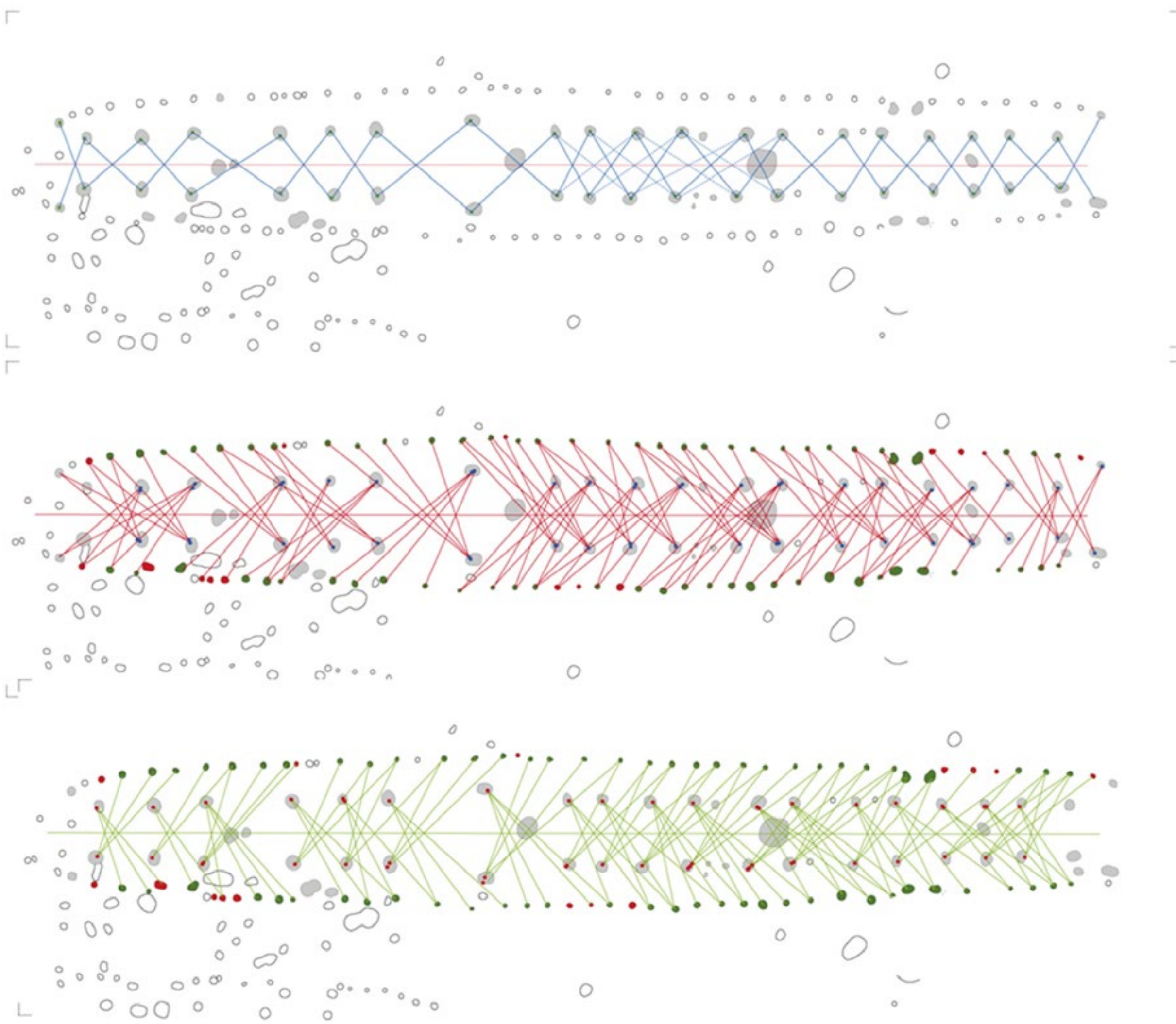

Figure 11. House 150, Forsandmoen. Fig 11a (above) the geometric principle applied to the roof bearing elements and the walls Fig b-c (middle and below).

A closer look at the placement of the roof bearing posts (Fig 11b-c) shows that these are consistent with the previously described geometric principles. The closely placed trestles in the middle section of the building, interpreted as part of a stall and a storage room could be the result of a repair. When it comes to the wall postholes in relation to the main axis, we can deduce that most of these were carefully placed in relation to this line. The result of the analysis shows that most of the wall posts, as well as the roof bearing posts, have a distinct placement that creates a clearly equilibrated and structurally robust construction. This pattern is not the result of pure chance, but a rare example of early architectural planning where a very distinct and complex form of geometry has been applied. The implications of these types of results are that use of geometric principles precede AD 200–550houses and are possibly a common characteristic of three-aisled longhouse architecture. Examples of this type should help us understand the complex planning processes involved in the construction of these houses.

CONCLUSION

The different examples presented in this paper point towards the existence of a clearly defined pattern in the distribution of the roof bearing postholes in Iron Age houses. I believe this organization is related to the necessity of an equilibrated distribution of the structural elements as a prerequisite for a successful construction. A geometric analysis of the archaeological remains presented here illustrates a carefully worked-out strategy for achieving this, repeating over several centuries and in different types of buildings. The approach presented here could be defined as a type of reverse engineering (RE), resulting in a new understanding of these constructions. The purpose of this exercise has been to examine the "repetitivity" of collective action and the degree of regularity of the material consequences of such activities (Barcelo 2009: 179). In this context RE is understood as the process of discovering the technological principles of a building through the analysis of its structure (Nazidizaji et al. 2013: 515).

Some of these ideas have a clear and specific application within field archaeology while others may have a more general value. The primary goal was to contribute to the process of posthole pattern recognition by establishing a feature based systematic approach, using architectural necessity rather than the previous templates. The examples here presented deal with this aspect and a replication of this model may contribute to a better praxis, especially when combined with more deductive ways of excavation (Trebsche 2009). The geometric configurations here presented, as graphic representations of a reproducible mathematical pattern, could be automated within a GIS program. Other authors, within the fields of both architecture (Nazidizaji et al. 2013: 514) and archaeology (Barcelo et al. 2011: 53), have highlighted the advantages of different forms of the computational study of geometry. Field interpretations and decision making within large sites would benefit by applications grounded in these observations.

Although not within the scope of this article, there are other implications of a more general significance regarding Iron Age architecture. The inference of geometric patterns within the analyzed buildings constitutes an example of the practical application of sub-scientific mathematics in their construction (Høyrup, 1989: 66). This type of knowledge, understood as acquired and transmitted in view of its applicability, is witness of a specialized type of work with distinct ways of proceeding. A type work from which, until now, we grasp only a little more than its large scale; houses had been planned and constructed.

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LATE IRON AGE SETTLEMENT EVIDENCE FROM ROGALAND

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ABSTRACT

Amongst Norway's 19 counties, Rogaland has one of the highest frequencies of Late Iron Age building remains. Previous research on house evidence from this period has, to a great extent, relied on data from 20th century excavations of visible house remains. This article is intended to provide an overview and discussion of Late Iron Age building evidence which has come to light over the last 35 years as a result of the introduction of machine-assisted topsoil stripping. This new material supports older hypotheses of the longhouse as a multifunctional construction and this role continuing from the later stages of the Early Iron Age into the Late Iron Age. Another clear trend is that Viking Period farmsteads are rarely placed on the same site as later Early Iron Age settlements. Machine-assisted topsoil stripping has revealed very few traces of buildings younger than the mid-11th century. This suggests that major changes occurred at the onset of the Early Medieval Period, amongst other things the relocation of central farmsteads and the use of alternative building techniques.

Abbrevations used in this article.

EIA	Early Iron Age	BC 500–AD 550	VP	Viking Period	AD 800–1050
RIA	Roman Iron Age	AD 1–400	EVP	Early Viking Period	AD 800–900
ERIA	Early Roman Iron Age	AD 1–150	LVP	Late Viking Period	AD 900–1050
LRIA	Late Roman Iron Age	AD 150–400	MP	Medieval Period	AD 1050–1537
MiP	Migration Period	AD 400–550	EMP	Early Medieval Period	AD 1050–1200
LIA	Late Iron Age	AD 550–1050	HMP	High Medieval Period	AD 1200–1350
MeP	Merovingian Period	AD 550–800	LMP	Late Medieval Period	AD 1350–1537

INTRODUCTION

This article focuses on Late Iron Age (AD 550 AD–1050) sites uncovered in Rogaland, Norway over the past 35 years through the use of machine-assisted topsoil stripping (see Figs. 1 and 6). The primary goal is to present building evidence identified during these excavations. In addition, aspects of this material related to changes and continuity in development and placement of settlement sites within the two periods which constitute the LIA, the Merovingian

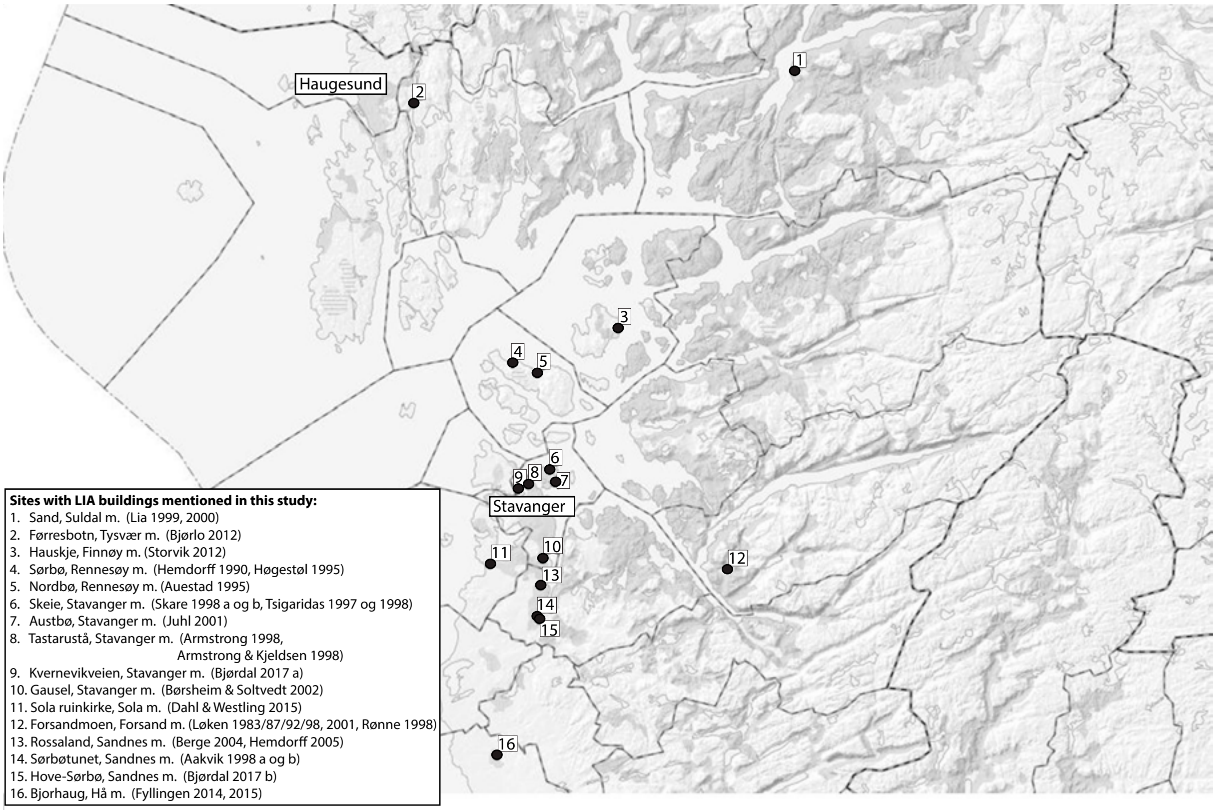


Figure 1. Sites from Rogaland mentioned in this study, listed in geographic order from north to south. Map numbering follows Appendix and Fig. 6.

Period (AD 550–800) and the Viking Period (AD 800–1050), are discussed. Three specific issues will be focused on: 1) What was/were the date(s) of the settlement activity at the various sites?, 2) Is there evidence of clear changes in building techniques between the EIA and the LIA or within the LIA itself? 3) What does this material indicate in relation to the widespread hypothesis of an increased division of functions or new trends in the organisation and layout of settlements in the Late Iron Age?

This text is the first step towards a much more comprehensive treatment of the topic (Bjørdal in prep). While, as mentioned, this article focuses on house remains identified over the past few decades through machine-assisted topsoil stripping, the larger, planned work will include data from older excavations undertaken prior to the adoption of this method. Relevant Norwegian and Scandinavian research on building traditions and societal development in the EIA and LIA will be included in the discussion of the situation in Rogaland, placing it in a wider, national and international context and thus providing a greater understanding of the information value of what is, at first glance, dispersed, local settlement.

In order to place this article in a proper research context, an overview of some central themes in Norwegian settlement archaeology will be presented (e.g. Skre 1996).

SETTLEMENT ARCHAEOLOGY IN PRACTICE AND THEORY: FROM VISIBLE HOUSE REMAINS TO DATA COLLECTED FROM MACHINE-ASSISTED TOP-SOIL STRIPPING

Archaeological investigation of structures associated with Iron Age settlement in Norway began in earnest in the 1930s (e.g. Petersen 1933; 1936). Throughout much of the 20th century, these excavations tended to focus on small areas and features/structures visible in the landscape, such as *hustufter* (visible house remains). Such *hustufter* often date to the latter part of the EIA (c. AD 200–550), although some were in use during the LIA and Medieval Period (MP). The situation was such that as late as the 1980s there were disproportionately few traces of LIA buildings in comparison to known housing remains from earlier periods.

In the early 1980s, Bjørn Myhre wrote about Iron Age and Medieval Period dwellings from southwest Norway, their function and layout (e.g. Myhre 1982a and b). To highlight trends in, and similarities between the EIA and LIA, Myhre presented 43 Late Roman AD 150–400) and Migration Period AD 400–550) houses from 19 farms spread across Rogaland and Vest-Agder. Securely identified longhouses from the LIA and MP share so many features in common with EIA houses that a continuity of organisational principles and norms is clear.

Buildings dating to the MP are more varied in shape and size than those of the LIA, and over the course of the period roof-bearing posts and centrally placed hearths are replaced with solid wall constructions and off-center fireplaces. But the multi-roomed longhouse did survive into the Medieval Period as did tradition of living space and byre being integrated into one building. Myhre predicted that future excavations would demonstrate examples of LIA/MP longhouses with combined living space and byre from sites in Rogaland as well. Furthermore, he highlighted that the source material was relatively small and skewed both geographically and socially, in particular he was missing a fuller understanding of houses and built environments from prosperous farms in central settlements.

In the mid-1990s, Dagfinn Skre published an article discussing the development of the main house/dwelling on Norwegian farms throughout the Iron Age and into the Medieval Period. (Skre 1996). Using various sites from across the country, including those uncovered using machine-assisted topsoil stripping, Skre demonstrated that the data shows aspects of both change and continuity (1996: 63-69). The continuity, according to Skre, is represented by the survival of the longhouse as a building type, at some sites into the Medieval Period (see Myhre 1982 a and b). There was, however, a gradual shift, particularly noticeable in Eastern Norway, away from large, multifunctional longhouses in the period AD 400–550 towards shorter, single- or limited function houses in the High Medieval Period (AD 1200–1350), when the two-room *stova* house became the most common. Skre places significance on the fact that this development occurred to a large degree without relying on the import of new building techniques, such as the cross-timbering technique (1996: 64-66).

A similar development from longhouse to LIA/MP *salshus* occurred in Denmark. The *salshus*, unlike the longhouse, was primarily a dwelling and thus lacked a byre. The Trelleborg style house (**p. 252**) was a type of *salshus* from the Viking Period (Schmidt 1994: 78-88; Bender Jørgensen & Eriksen 1995: 17-26; Ethelberg 2003: 361-364). In these houses, most of the roof load is carried by the walls, rather than interior, roof-bearing posts, an important indicator that the traditional, three-aisled longhouse was going out of use during the transition to the Medieval Period. True Trelleborg style houses had one large, open central room, often with a central hearth, two smaller, unheated rooms at either end, and external support posts. This provided little or no room for livestock, and indicates that the desire for an increased physical division between human dwelling and animal stalling spaces had developed across society. This situation should not be overgeneralised, however, and there are Trelleborg-like buildings which did, in fact, house both humans and animals (e.g. Schmidt 1994: 88; Ethelberg 2003: 364).

Settlement archaeology in Norway has changed greatly since the 1980s, primarily due to the wealth of building evidence uncovered during machine-assisted top-soil stripping of farmed land. The situation is not what is once was (e.g. Myhre 2000: 36-37; Sørheim 2009: 54-55), when only a few houses and farmsteads from AD 550–1050 were known from southern Norway. The number of building remains and other constructions from AD 550–1050 and 1050–1200 in Rogaland has steadily increased over the past few decades (e.g. Hemdorff 1990 og 2005; Hemdorff & Høgestøl 1995; Løken et al. 1996; Tsigaridas 1997 and 1998; Aakvik 1998a and b; Skare 1998a and b; Lia 1999 and 2000; Juhl 2001; Børsheim & Soltvedt 2002; Berge 2004; Armstrong 2008; Armstrong & Kjeldsen 2008; Bjørlo 2012; Storvik 2012; Bjørdal 2014; 2017a and b; Fyllingen 2014 and 2015; Meling 2014; Dahl 2015; Dahl & Westling 2015).

Søren Diinhoff and Helge Sørheim have highlighted a range of factors which may explain the relative lack of LIA and MP settlement evidence in comparison to earlier periods (Diinhoff 2009a; Sørheim 2009), but there are probably several aspects of archaeological fieldwork which need to be improved. *"A starting point is a review of the current state of knowledge and what experience we have identifying structures."* (Diinhoff 2009a: 162). A 2014 conference in Oslo, *Scandinavia: One, Three or Many* at the University of Oslo, with its presentations and subsequent discussions on buildings, settlement units, centrality and society, demonstrated that there is a clear trend towards viewing Norwegian LIA/MP sites in a larger Scandinavian and northern European context.

In her 2015 doctoral thesis, Marianne Hem Eriksen compiled LIA building evidence from all of Norway (Eriksen 2015, Vol. I and II). The data set includes the remains of 166 dwellings from 65 different sites and is the most comprehensive work on Norwegian, LIA settlement evidence yet undertaken. There are so many similarities between the Norwegian material and that from the rest of Scandinavia as to the classification of longhouse types, settlement organization/placement in the landscape and hall buildings, that the LIA built environment in Norway should perhaps be understood as the material expression of a common Scandinavian identity (Eriksen 2015, vol. I; e.g. Artursson 2005).

Eriksen (2015, Vol. I: 61-64; also, e.g. Bender Jørgensen & Eriksen 1995; Skre 1996) has identified eight different categories of LIA house: 1) The narrow, three-aisled longhouse, 2) The convex longhouse, 3) The rectangular longhouse, 4) Rectangular, stonewalled houses, 5) The three-aisled longhouses, fragmented, 6) One-aisled longhouses, 7) Two-aisled longhouses, and 8) N/A. Settlement contexts were divided into three main categories: the solitary longhouse, the lined/parallel settlement and the angled settlement (Eriksen 2015, Vol. I: 180-185; also, e.g. Hvass 1988; Løken 1992; Bender Jørgensen & Eriksen 1995; Carlie 1999; Myhre 2002; Carlie & Artursson 2005). These subdivisions are used in the following article, although the author has chosen to add a final category, "the dispersed/scattered settlement". This new category includes longhouses lying at some distance from each other, but which in all likelihood functioned together.

SOURCES, SOURCE CRITICISM AND CONCEPTS

This article focuses on traces of 71 dated buildings from 16 different sites (see Fig. 1, Appendix).

Generally speaking, one should be cautious not to draw too many conclusions from such a small data set, but over 70 buildings associated with over 100 Late Iron Age C^{14}-dates is at the very least a good starting point for further analyses. Any patterns that appear must be interpreted as possible trends and interesting aspects to pursue in future excavations or research. Archaeological excavations conducted by Bergen Museum between 1980 and 2010 have demonstrated at least as extensive numbers of buildings from the Late Iron Age further north in Western Norway (Diinhoff 2013: 58).

Data for the sites dealt with in this paper has been taken from published and unpublished work related to various excavation projects (see Fig. 1), and the author has, as far as possible, not allowed his own interpretations to affect the individual site descriptions (Appendix). In situations where the relevant C^{14}-dating results or plan drawings have not been presented in reports or articles, original material stored in the archives of the Museum of Archaeology, University of Stavanger, has been used. Further, syntheses of Late Iron Age settlement archaeology research have been consulted, preferably dealing specifically with Rogaland, but otherwise Norway in general (e.g. Myhre 1980; 1982a and b; Løken 1992; 1997; 1998b; Skre 1996 and Eriksen 2015).

A more extensive discussion of the Rogaland material in relation to research results from the rest of Scandinavia lies beyond the scope of this article. No attempt has been made to divide the Late Iron Age buildings into specific typological categories such as those mentioned earlier for Norwegian, Danish or Swedish sites (e.g. Skov 1994; Bender Jørgensen & Eriksen 1995; Artursson 2005; Eriksen 2015). Such work would require much broader research, evaluating a range of aspects of social development in Rogaland (e.g. economic development, social stratification, political changes).

The buildings used in this work (see Appendix) have been selected because they are each associated with at least one LIA C^{14}-date (except Gausel 15 and Rossaland A, which have been dated typologically and by context). The author has not performed his own assessment of the validity/security of each individual C^{14}-date, and has chosen to accept the interpretations of the authors of the excavation reports or articles. The buildings included in this review are taken to be academically credible with respect to the expected correlation between C^{14}-dates, typological features and contextual information. Some buildings from Rogaland, with significant variation in the C^{14} results and an extremely poor preservation level, cannot be securely date to the LIA, and have therefore been excluded. The work has focused on dates which point to a period of occupation completely within the LIA (Fig. 6). Dating results which indicate use in the preceding or succeeding periods, as well as the LIA, are discussed generally in the text and in more detail in the Appendix.

9 of the 16 sites are located in a relatively small geographic area, Stavanger, Sola and Sandnes municipalities. This has as much to do with the high number of archaeological excavations over the recent decades in these areas as it does with their agricultural potential or relevance in prehistory. Therefore this overview of Late Iron Age sites is not representative of the overall settlement structure at that time (see Myhre 1982a: 206).

A variety of factors, such as available resources (both financial and time), total uncovered surface area, disturbance and destruction of prehistoric remains and contexts, and weather, combine to create huge variation in the amount and quality of data produced by each of these excavations. One challenge in the interpretation/identification of prehistoric buildings is variation in preservation levels. This affects the level of precision with which one can identify what was occurring on a site and where. Sites uncovered using machine-assisted top-soil stripping generally produce few artefact finds, fewer than 20th century excavations of individual *hustufter*. This makes localizing activities to specific areas and, further, interpreting these as rooms in buildings even more demanding.

Traditionally, it has been the presence of a hearth, as a source of light and heat and a means of food preparation, which has been the key factor in defining a building as a dwelling, and this is generally adhered to in the present article.

There is some legitimate criticism of this approach, however. One may encounter a situation where the hearth has not been preserved, for example. Alternatively, a hearth may be preserved in a building which served a non-domestic function, such as a scullery, a craft production site, or a byre. It is likely that at several sites archaeologists have not managed to completely understand the function of structures with traces of an intentional use of fire / heat, and which of these structures were active contemporaneously, something that will lead to an imprecise picture of the functional division of the buildings. Diinhoff (2009b: 68) uses the general category "fire-producing structure" for structures that have been used for various activities involving fire. In connection with this arises the question of how large such a dwelling would be and whether it comprised one or several rooms (e.g. Myhre 1982a: 195; Eriksen 2015, Vol. I: 69-81).

The author of the current article has chosen to be conservative in his interpretation of what may be deemed to be a dwelling, that is to say, only zones/rooms with clear hearths/fire-producing structures have been identified as dwellings. The members of the household probably had several zones/rooms which they considered living quarters, often adjacent to the room with the central hearth. However, this is difficult to interpret from a source material that includes few definite examples of interior partitions, such as dividing walls, interior doors and the like. In general, the interior divisions which have been identified can be divided into three categories: 1) room with a clearly demonstrated hearth/fire-producing structure, 2) entry room and 3) parts of the house without a clearly demonstrated hearth/fire-producing structure. The areas assigned to the third category vary in terms of size, shape and placement.

The evidence suggests that these areas had various, unique functions within the settlement unit, and this includes elements from both Eriksen's (2015, vol. I) more specific categories, and Myhre's (1982a) identification of byres, storerooms and living spaces without hearths. Spaces which were not primarily used for living quarters on the farm are, in this article, defined as areas of the settlement associated with farming or production. This encompasses food and craft production, livestock husbandry and storage. It can be particularly difficult to interpret the use of rooms/zones which do not have clear indications of intentional use of fire/heat, such as byres, stables, barns and storage rooms (e.g. Schmidt 1994: 87-88). It may be common in archaeological research to interpret byres/stables as being placed next to the living quarters in an IA longhouse, but in reality, there are few such houses which actually have clearly demonstrated remains of animal stalls (Carlie 1999: 102-110).

A farm may have had several settlement units and yards connected to it (Myhre 2002: 121-126). It can be difficult, however, when faced with fragmented archaeological material to identify which such units functioned together. This is made all the more challenging by the variation over time of what is meant by the terms "farm" and "settlement unit". The social and socio-economic preconditions changed in AD 550–1050 in comparison to the period 500 BC–AD 550. The restructuring of agriculture and an increased emphasis on crafts production for local and regional trade allowed for a reorganisation of what activities were undertaken within the settlement,

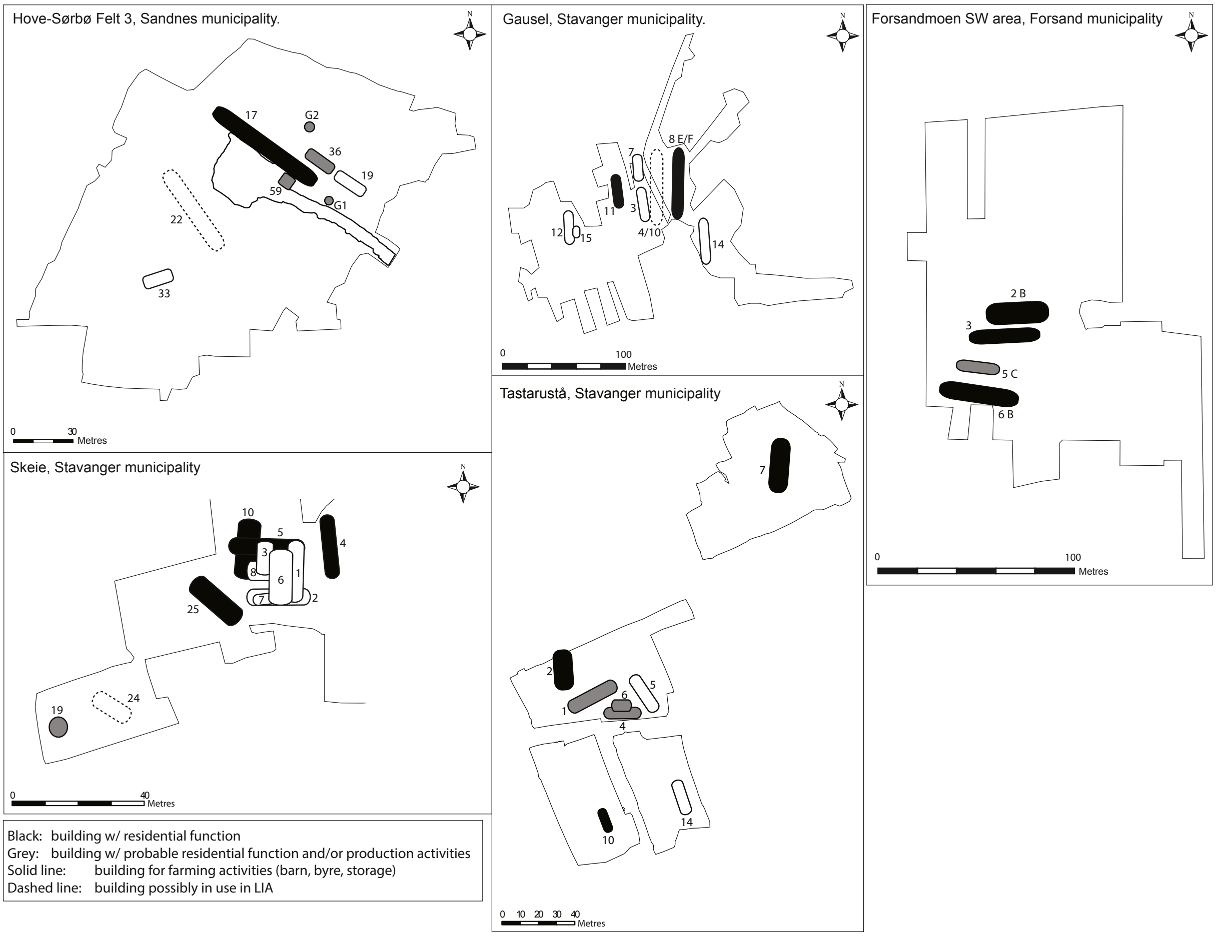


Figure 2. Examples of typical LIA farms from Rogaland.

in different parts of the landscape and levels of the social hierarchy (e.g. Skre 1998; 2001; 2011; Myhre 2002; Artursson 2005; Iversen 2008).

WHEN WERE THE SETTLEMENTS AT THE DIFFERENT SITES OCCUPIED?

The sites included in this study all have traces of buildings with one or more Late Iron Age C^{14}-datings. But 500 years is a long time, and it is therefore desirable to obtain a more precise understanding of settlement development. For the individual dating results at both 1σ- and 2σ- standard deviations (68.2% and 95.4% certainty, respectively), see the table in the attached appendix.

There are sites with continuous settlement between the periods AD 400-550 and AD 550-800. The clearest examples of this are the sites at Forsandmoen, Gausel, Hove-Sørbø (Field 3) and Sørbøtunet. There is no doubt that people continuously occupied these sites, either on the exact same spots as the earlier Migration Period houses or in newly raised buildings adjacent to these (see appendix for information on houses with activity phases dating to the EIA). Even though the location was the same, the organisation of the built area changed in the decades around 600 AD. This is particularly noticeable at Gausel and Hove-Sørbø (Field 3) (Figs. 2 and 3).

The AD 150–400 and AD 400–550 settlements at these sites were dominated by large main houses placed parallel to each other, separated by farmyards; however, over the course of the 6th century this pattern disappeared. Activity areas were scaled down to such an extent that by the transition most likely only one of the main houses was in use. At Forsandmoen, the settlement shrunk from 16 farms in the period c. AD 300–500 to around 3 farms in the period c. AD 500–700 (Fig. 2). Over the course of the 7th century, the last remaining farms disappeared (Løken *et al.* 1996: 72-78).

It is striking that sites with continuous settlement between the periods AD 400-550 and AD 550-800 usually do not have clear VP occupation phases. There is no evidence of built areas or farming activity dating to either the Early Viking Period (AD 800–900) or the Late Viking Period (AD 900–1050) at Forsandmoen, Hove-Sørbø (Field 3) or Sørbøtunet. The evidence indicates that settlement activities at these sites shifted away from traditional locations, with roots in the EIA, to new sites over the course of the 7th and 8th centuries. The situation may be the same at Gausel, but the C^{14}-dates suggest that here the shift probably occurred somewhat later, in the 9th century. It should be noted that Gausel 3 stands out in this respect, with C^{14}-dates from AD 550–800 through the Medieval Period (see below). This house did not have a preserved fire-producing structure, and was interpreted as a building associated with farming or craft production rather than a dwelling. It has not been determined whether Gausel 3 was part of an unexcavated farmyard in the area, or whether it should be seen as an outbuilding on the periphery of a farm that had moved higher up in the terrain (Appendix, Børsheim & Soltvedt 2002: 256).

There is *one category of houses with occupation phases dating to both the Merovingian Period and the Early Viking Period*. These are seen at Bjorhaug, Hauskje, Sand and Sørbø, on Rennesøy. The building remains at Hauskje are too fragmentary to be of much use. The site at Sand, on the other hand, is a well-documented example of a settlement unit with neither earlier nor later Iron Age activity.

The largest group of sites were in use throughout the entire Late Iron Age. This includes Førresbotn, Hove-Sørbø (Field 4, Field 5), Sola Ruinkirke, Skeie and Tastarustå. At these sites, occupation clearly continued well into the 10th/11th centuries. It must be noted, however, that at Førresbotn and Hove-Sørbø (Field 4) occupation probably does not stretch far back into the period AD 550–800 thus these are primarily Viking Period sites.

Several sites have C^{14}-dates which suggest use in AD 1050–1200 including Gausel, Hove Sørbø (Field 4), Rossaland, Sola Ruinkirke and Skeie. Of these, only Hove Sørbø 21 is a clear dwelling. Other buildings at these sites are a pit house (Sola Ruinkirke), two-aisled constructions (Skeie VI, and possibly XXIV) and post-built, three-aisled houses without fireplaces, most likely farm buildings (Gausel 3 and Rossaland D). The change from dwellings to outbuildings in AD 800–1200 at these sites is something Gausel and Rossaland have in common, and this suggests a moving of the farmstead and a reorganisation of landscape use.

Some sites do not fit in with the more general pattern presented above. The small, four-post outbuilding at Austbø produced an 10th century AD date, and has thus no clear connection to Early Viking Period. This stands at odds with the other Viking Period sites presented here, but it is an individual outbuilding, used for a short period of time, placed apart from any central built area. Rossaland D, dating to the periods AD 900–1050 and AD 1050–1200 should also probably be seen as a building on the periphery of settlement.

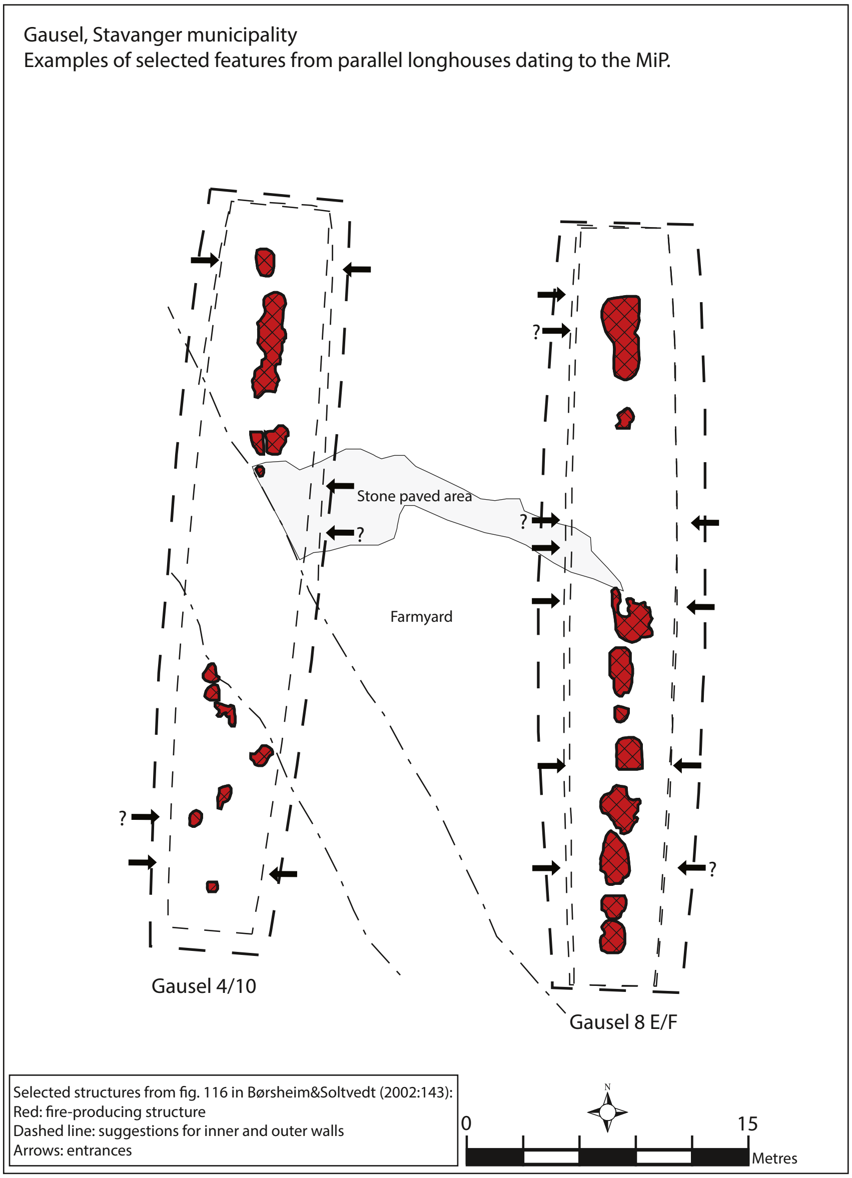


Figure 3. Examples of selected features from parallel longhouses dating to the MiP at Gausel.

At Kvernevikveien, there is no clear continuity from the AD 400–550 farmstead with parallel longhouses to the 7th–10th century AD Kvernevikveien 4 building. This building was probably built amongst the remains of long abandoned houses (Fig. 4). The building has features in common with the so-called "Trelleborg style house" (e.g. Skov 1994; Bender Jørgensen & Eriksen 1995; Wranning 1999; Ethelberg 2003; Artursson 2005), with curved, roof-bearing walls, only two pairs of internal roof-bearing supports and

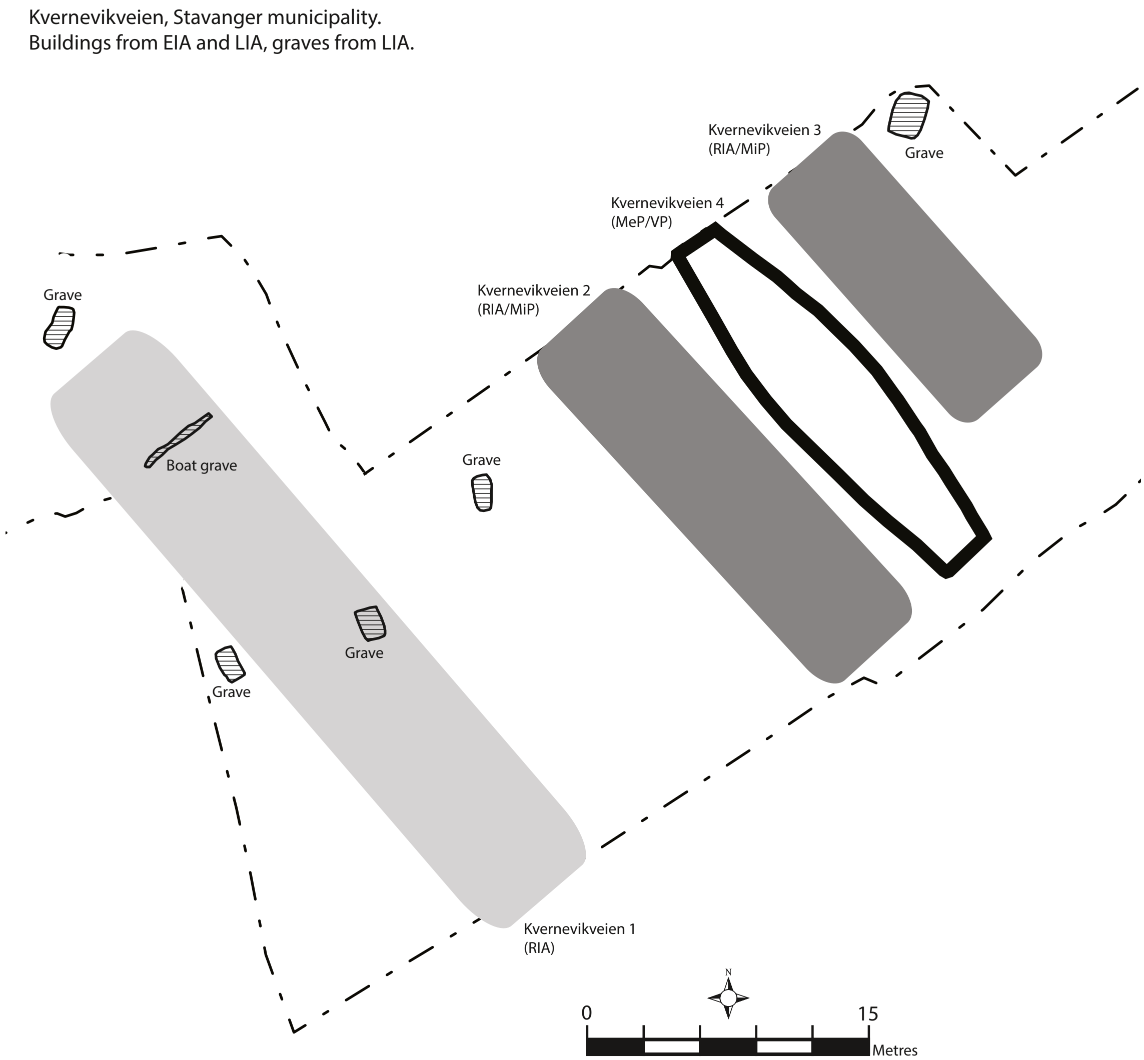


Figure 4. Settlement evidence at Kvernevikveien, with the MeP/VP house set amongst EIA building remains.

a large, open central room, but lacks, on the other hand, traces of external, angled support posts. There are several examples of such "false" Trelleborg style houses from other Scandinavian sites (e.g. Ethelberg 2003: 361-362), and they can be understood as the adaptation of an ideal form to local traditions, expertise and requirements (Wranning 1999: 48; Artursson 2005: 140,147)

The data reveals a complex picture, with aspects of both continuity and change in settlement development in Late Iron Age Rogaland. The early MeP emerges as a transition period, in which some sites show a marked continuity from the MiP, while other locations developed new settlement units. The dating results indicate that the rest of the MeP was a dynamic period for some sites, with buildings either being built or torn down during the 7th-8th centuries. It follows from this that the built areas generally did not occupy the same sites in AD 800–1050 as in AD 400–550. This distinguishes itself from that which some other archaeological excavations in Norway have shown, for example Borg in Lofoten. (Munch et al. 2003). There is very little settlement evidence in the material younger than the mid-11th century.

The reason behind this is unclear. It may be that settlements were simply relocated to other sites, such as the historical farms (i.e. settlement units known from the Medieval Period and onwards). Alternatively, the new building traditions and housing types which appear (e.g. an increased use of sill stones or the cross-timbering technique) may have left weaker and/or unrecognizable physical traces.

An interesting contrast is the boat-house remains with traces of roof-bearing posts identified at Nordbø (Fig. 1 and Appendix, Auestad 1995). This is dated to AD 1000's–1300's, and shows that in such specialised buildings, features of earlier building traditions survived. It is important to emphasize that many factors were involved in the version of Late Iron Age settlement presented here, many of which are, unfortunately, beyond the scope of this article. This includes, among other things, changes connected to property rights and/or power, changes of focus on various resources (e.g. grain cultivation, animal husbandry, uncultivated/outfield (utmark)resources, and craft production), purely geographical/terrain-related limitations and opportunities for continuity or relocation of settlement units, and thus varying norms of conservatism and innovation, respectively.

ARE THERE CLEAR EXAMPLES OF CHANGES IN BUILDING TRADITIONS BETWEEN THE LATER EIA AND THE LIA, OR WITHIN THE LIA ITSELF?

How do AD 550–800 sites with clear settlement continuity from the EIA distinguish themselves from AD 550–800 sites which do not show such continuity? The current study suggests that there are no trends in the data which would support such a distinction.

The sites at Gausel and Hove-Sørbø (Field 3), for example, do not appear in AD 550–800 particularly "old-fashioned", even though both have direct links to extensive EIA farmyards. The AD 400–550 connection appears to be limited to a final period of use of sections of older dwellings (Figs. 2 and 3, and Appendix). Remains of new buildings, built in AD 550–800 show as much difference in house types and built areas from central AD 400–550 farmsteads as from AD 550–800 buildings on sites without any evidence of settlement continuity.

The situation at Sørbøtunet is rather more difficult to interpret (see page 259). The site, in the 7th century AD, should perhaps be seen as a final phase of use of a longhouse with no hearth, together with a smaller storage building.

Settlement during the period AD 500–700, at Forsandmoen, appears in many ways to be a continuation of certain EIA building traditions and organisation. In spite of the heavy decline in the number of buildings and farmsteads compared to the period AD 400–550, it seems that several of these buildings (House II, III, V and the western end of VI) represent the final phase of use of an older built environment.

Neither Gausel, nor Hove-Sørbø Field 3, nor Sørbøtunet have clear remains of larger longhouses similar to the Viking Period main houses seen at Hove-Sørbø (20, 21 and 51), Skeie (IV) and Tastarustå (2 and 7) (Fig. 5). But this must be understood in the context of the preservation and recovery conditions affecting each of these sites individually. At Gausel there are several areas near the identified Merovingian Period buildings which have not been excavated, and these can, in theory, be hiding houses of this type. At Hove-Sørbø (Field 3), it is unclear if and how Hove-Sørbø 19 and 36 functioned as a single unit. If these two longhouses were used simultaneously, it is possible that Hove-Sørbø 19 functioned as a farm building placed adjacent to a dwelling (Hove-Sørbø 36). This would then be a 7th century example of a building context/settlement tradition reminiscent of the characteristic Viking Period longhouse type, previously mentioned.

Regarding changes in building techniques within the Iron Age, there is, for example, a tendency for the *clearest* entrance features to be associated with building remains dated to the early phase of the Late Iron Age, particularly the 7th and 8th centuries. These entrances are somewhat offset from the outer wall of the house, while in later houses the entrances are more integrated into the outer wall and thus more difficult to detect.

Examples from Forsandmoen, as well as Gausel 8 E/F, Hove-Sørbø 17 and Sørbøtunet 2, have AD 550–800 activity phases in buildings first raised in the EIA, which retain their original Late Roman Iron Age/Migration Period entrance type. Bjorhaug 4, C^{14}-dated to the early 7th century, have solid, opposing entrances of a type traditionally associated with the period AD 150–550. Clear entrances have also been shown at Sand A, Skeie III and X, and Hove-Sørbø 36, all of which date to AD 550–800. Furthermore, a similar entrance was identified in the multi-phase house Hove-Sørbø 51, although it is unclear whether or not it was in use in the house's Merovingian or Viking Period occupation phase.

The longest buildings (≥ 18 meters) without a clear residential function, are all C^{14}-dated (1σ-standard deviation) to AD 550–900. If one ignores Førresbotn 1 (from the 9th century), the impression that such buildings (Gausel 14, Hove-Sørbø 55, Tastarustå 5 og 14) are primarily a 7th and 8th century phenomenon becomes even stronger. It is natural to interpret this house type as buildings associated with farming activities, one likely function being animal stabling. At each of these sites, buildings with clear residential functions (Gausel 11, Hove-Sørbø 51, Tastarustå 2) were identified in the same areas as, and contemporary with the farm buildings mentioned above.

The buildings at Gausel disappear from the material at the onset of the Viking Period. Hove-Sørbø 51 and Tastarustå 2 were multi-phased longhouses in use until the Late Viking Period while the two associated farm buildings Hove-Sørbø 55 and Tastarustå 5, according to the datings, were put out of use towards the end of the Merovingian Period. Regarding Hove-Sørbø Field 5, House 55 goes out of use at the same time that the main dwelling, House 51, enters a new phase of use. House 51 was probably extended, and the living space moved towards the northern end. It is plausible that at this time an addition was built in the northern gable end. All of this *may* indicate that the activities associated with House 55 were relocated to House 51, and distinguishes the 8th century as a clear period of change at this site.

The buildings with the clearest examples of additions/annexes, Hove-Sørbø 20, 21 and 51, and Tastarustå 2 and 7, all date to the VP (Figs. 2 and 5). This *may* suggest that the use of these annexes was more widespread in this period than in the MeP, but this is too small of a data set to say anything definitive. Icelandic house remains from the VP/Viking/Early Medieval Period (e.g. Lucas 2009) show that such additions to the typical "longhouse form" were relatively common, and Myhre (1982a: 205) mentions variations of this in both EIA and LIA house remains.

Two-aisled buildings in the data set are C^{14}-dated to AD 900–1200. This house type is therefore not seen in AD 550–800 contexts, but as this comprises so few buildings (Skeie VI and possibly XXIV), it is unclear how representative this is.

When it comes to pit-houses the situation is complex. Small, circular (or sub-circular) pit-houses have been securely identified at Hove-Sørbø Field 3 and C^{14}-dated to AD 550–800. They are primarily in use during the 7th century. Sørbøtunet may have had similar pit-houses. The relevant structure is itself undated, but was found in context with building remains C^{14}-dated to AD 550–800 as with the pit-house at Hove-Sørbø. This type of pit-house is not known from the Viking Period but a much larger, sub-rectangular example dating to AD 900–1200 was found by Sola Ruinkirke. This site should be understood as a site used for a specialised activity associated to a power center, and the large pit-house reflects this. Pit-houses do not appear to have been a common building type in the LIA, and it is possible that the smaller pit-houses were associated with specific traditions/functions during the MeP.

INCREASED DIVISION OF FUNCTIONS OR NEW TRENDS IN THE ORGANISATION AND LAYOUT OF SETTLEMENTS IN THE LIA?

It has been argued, within Scandinavian settlement archaeology, that one of the most important development trends of the built environment on farms is the shift from the large, multifunctional longhouses which characterize the periods AD 150–400 and AD 400–550 to multiple, smaller and, to a large degree, single-function buildings (e.g. shed, smokehouse, barn, stable, storage, workshop) in the Late Iron Age and Early Medieval Period (see Hoffmann 1944; Bender Jørgensen & Eriksen 1995; Skre 1996). Bjørn Myhre (1982a) was one researcher who took a somewhat different view on this point.

The material presented in this article demonstrates that aspects of the built environment *were* organised differently in the LIA than at the end of the EIA, but that large, complex longhouses with room for several different functions were in use into the 12th century. At the same time, it is important to be aware that in AD 150–550 there also existed relatively small, specialised buildings for production and agricultural activities, probably of similar type to those Myhre (1982a: 200) mentions in connection with his review of house remains (*hustufter*). The following will focus on multifunctional longhouses of a somewhat new type in the LIA, and on diversification of function, that various activities were given their own, dedicated buildings.

The basic concept from the later EIA, of the multifunctional longhouse as main dwelling (Fig. 3), can be found at several LIA sites, but some elements of the layout have changed. Regarding main dwellings from the EIA, it is important to distinguish between Myhre's small-to-medium sized, tripartite houses, and the larger, more complex buildings such as the longhouses at Ullandhaug and Lyngaland (Myhre 1982a: 195-199). Since the introduction of machine-assisted topsoil stripping in recent decades, several buildings of this larger type have been identified (see Børsheim & Soltvedt 2002; Dahl 2014; Bjørdal 2017b). If one compares these sizable, multi-room buildings with the type of main houses dated to LIA, such as Gausel 11, Hove-Sørbø 20, 21 and 51, Sand A, Skeie IV and Tastarustå 2 and 7, there appears to have been some changes, that a somewhat different form of main house came into use in the LIA (Fig. 5).

This new form primarily involves a reduction in the number and location of hearths and other fire-producing structures in the main house. In the LIA material, such houses have, first and foremost, fewer traces of light and heat sources than in the older, large main houses known from, for example, Gausel (Fig. 3). Secondly, in the LIA such features (fire-producing structures) were often placed together, in a part of the building or a room interpreted as a dwelling, while in the large main houses from AD 150–550 these were often spread over several rooms along the axis of the building.

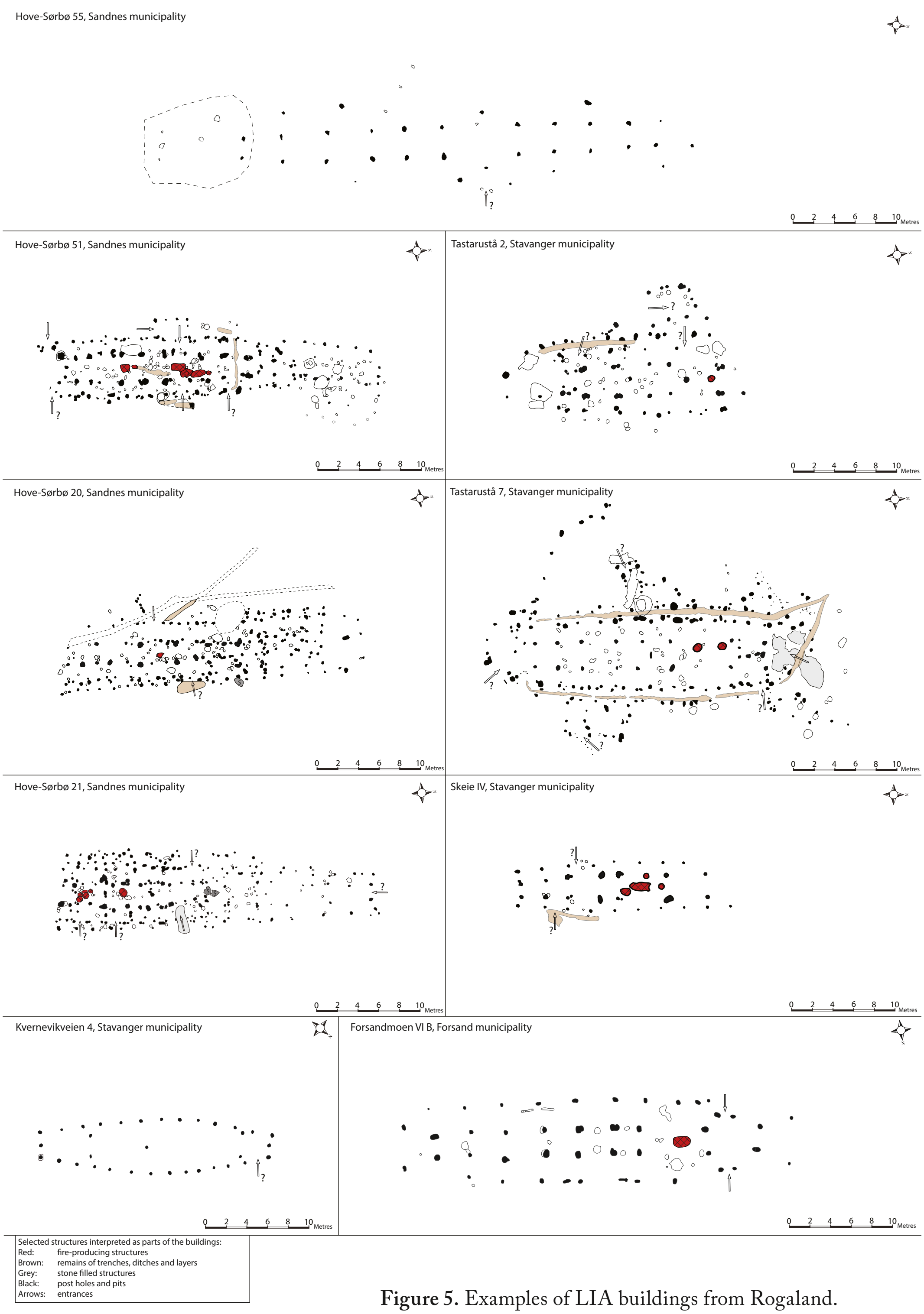
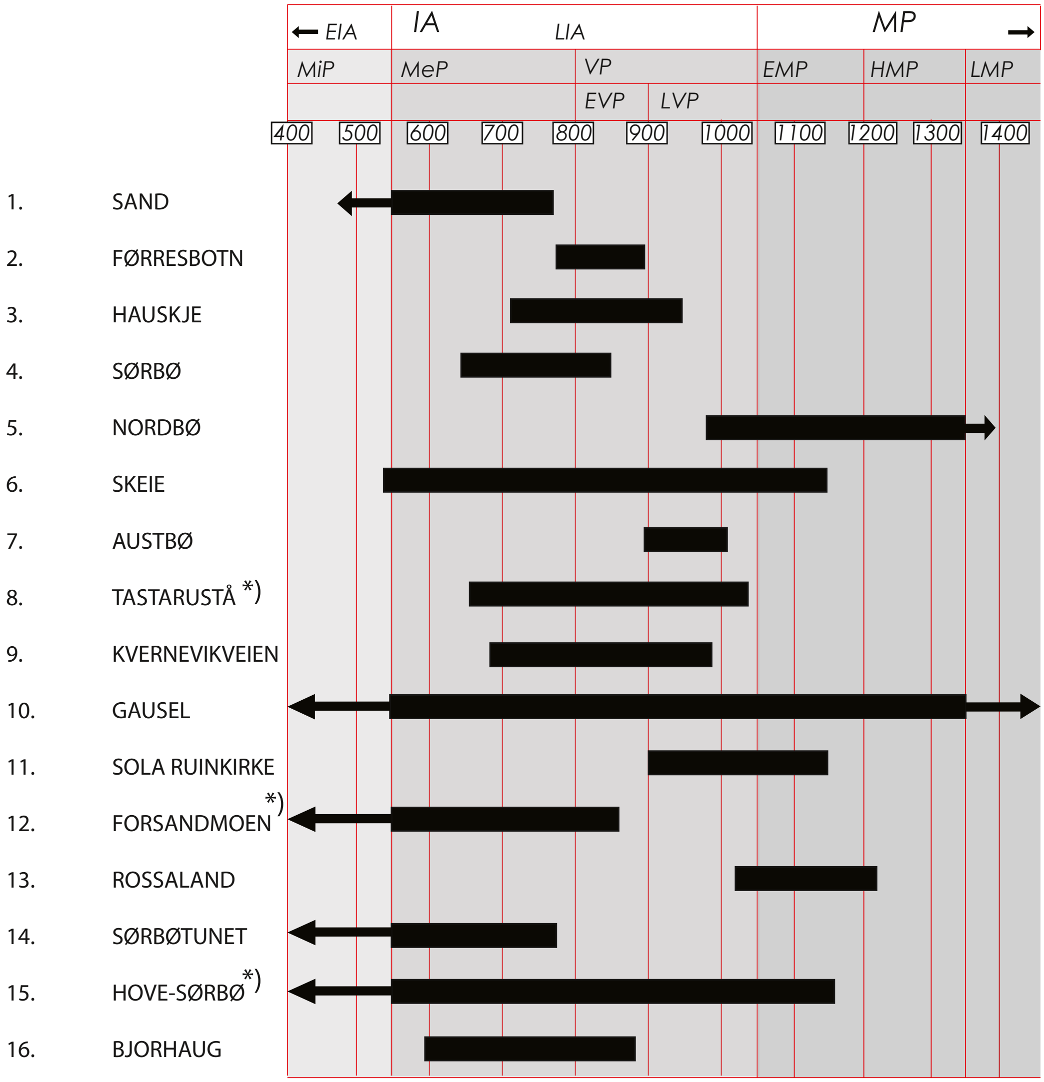


Figure 5. Examples of LIA buildings from Rogaland.



Overview of date ranges for LIA, EMP and HMP activity on sites mentioned in the text.

Each site is represented by a time span based upon the oldest and youngest C^{14}-dates (1σ) from the LIA buildings. This gives a relatively imprecise overview, and this figure should only be utilized together with the information provided in the appendix.

The arrows indicate LIA/EMP/HMP buildings with activity phases C14-dated to the preceding or succeeding periods.

*) Site encompasses several excavation areas, and the rather significant distance between some of the buildings indicates the existence of several individual farmsteads.

Figure 6. Overview of C^{14} dates from LIA and early MP sites.

In LIA main houses, the room with the central hearth often lay in, or slightly off, the center of the longhouse. On both sides of this living space were found areas without hearths, and these should probably be interpreted as rooms for entrances, storage or craft production or other farmstead functions. The size and layout of several of the rooms may indicate that these were byres or stables. Thus, LIA main houses generally appear to be bi- or tripartite, with a centrally placed room, at the buildings widest point, with a hearth for heat and food preparation, flanked by one or two areas for other functions and/or unheated living spaces. This trend can be seen from the early Merovingian Period e.g. Gausel 11 and Sand A.

The LIA main house is different from several known large, complex main houses from AD 150–550 sites in central Rogaland, but does have clear similarities with the layouts that Myhre presents for main houses from more remote areas in this period. Does this mean that the large main houses from AD 150–550 (Fig. 3) represent scaled up longhouses (in terms of size and function) during a period of growth and progress, whereas in the LIA this is scaled back down to a layout similar to the smaller, simpler, tripartite main houses known from peripheral settlements?

There are some factors which must be considered in conjunction with this explanation. The first is source critical in nature, and involves problems associated with the interpretation and dating of the previously mentioned remains of light and heat sources. The emphasis on the point that there have been different *types* of such fire-producing structures in EIA longhouses (Diinhoff 2009b: 68) is relevant to similar, contemporary buildings in Rogaland. This suggests that there were fewer hearths and more structures associated with manufacturing in these longhouses than one might otherwise imagine, and may indicate that many activities associated with this type of production in some of the large AD 150–550 main houses were moved to other buildings in the LIA. It may be, therefore, that such LIA buildings, to a greater and more general degree than earlier, had distinct functions (Skre 1996: 64), such as scullery, smithy and craft production.

The second factor is associated with the results of earlier research on building traditions in AD 150–550 Rogaland, particularly by Trond Løken (Løken 1983; 1987; 1992; 1997). He has shown that there are many commonalities, primarily between the house remains from the relevant periods demonstrated at Forsandmoen and earlier excavations of stone-walled houses; it is here that, amongst other things, main houses have one or more hearths (fire-producing structures) in a large room in the central area of the building. These traits also apply to Forsandmoen II B and VI B, which, due to their MeP activity phases, are included in this article's data set (see Appendix). Forsandmoen VI B is, thus, an example of a building first built in the later EIA and then occupied until the 7th century, that appears more like some LIA main houses (Fig. 5) than contemporary Migration Period main houses (e.g. Hove-Sørbø 17, Gausel 4/10 and 8E/F).

The functional similarity between the longhouse without byre/barn section (divided in two, with one large living space and one smaller room towards one of the gable ends) known from the Viking Period and the two-room *stova* buildings from the 12th century, has been previously noted. Furthermore, it has been speculated that there was a gradual development from the one to the other (Skre 1996: 67-68).

The remains of several relatively small LIA buildings with one or more hearths/fire-producing structures have been found, none of which stand out as a clear main house with a residential function such as one finds in the large AD 150–550 longhouses. For many of these, the fire-producing structure was probably associated with craft production or for food preparation or meat curing, but the possibility that at least some of these were smaller main or secondary houses cannot be excluded (see Løken's [1997: 177] description of similar AD 150–550 buildings and Myhre's [1982a: 200-203] bipartite, AD 550–1050 houses). Examples of such houses are Hove-Sørbø 36, Sand F, Skeie VI, Sørbøtunet 3, and Tastarustå 1/4/10.

The material includes a number of buildings used for either one, or a limited range of functions, with no clear fire-producing structures. Selected examples of this are Gausel 14, Hove-Sørbø 19/33/52, Sand B, Skeie I/II/III/VII/VIII and Tastarustå 5/14. These were most likely barns, stables or storehouses. This indicates that activities related to the function of the farm could be found either integrated into the large main houses or in separate buildings. One interesting point is that most of the largest and possibly free-standing farm buildings in the material, have activity phases in the 7th and 8th centuries. There are few examples from AD 800–1050 of such separate farm structures. There may be a connection here with additions to main houses in the Viking Period (see Hove-Sørbø 20/21/51), in that during the later part of the LIA, on some farms it was more common to add the barn to the main house in the form of an annex, but this is not clear. Many of the main houses, such as Hove-Sørbø 20/21/51 and Tastarustå 7, have evidence of annexes placed against the building, often outside one of the shorter walls. This agrees with similar constructions described by Myhre (1982a: 205). These building additions are a feature which distinguishes LIA main houses from older main houses such as Forsandmoen VI B.

Several longhouses in the data set have previously been presented as examples of *buildings with a hall (hospitality) function.* This includes Forsandmoen II B (Løken 2001), Gausel 8 E/F, Kvernevikveien 4, Skeie IV and Tastarustå 7 (Eriksen 2015: vol. I: 80-81, vol. II). A discussion of the Pre-Christian *hall* is beyond the scope of this article, it will be enough to highlight here certain features suggesting that Kvernevikveien 4 stands out from the other mentioned buildings. The context in which the building was found included at least six Late Iron Age graves, including one boat grave, intentionally placed in and among older building remains (Fig. 4). This, together with the shape and placement of the building itself, indicates that Kvernevikveien 4 had a specialised function, most likely associated with Pre-Christian rituals.

The following section will look at how individual houses, each with their specific function(s), operated collectively. One way to categorise such contexts is as either solitary longhouse, lined/parallel settlement, angled settlement or the dispersed/scattered settlement (Eriksen 2015 vol. I: 180-185, as presented above).

The solitary, multifunctional longhouse is the most widespread house type one sees in the LIA Norwegian material as a whole (Eriksen 2015, vol. I: 180). It is not unexpected, therefore, that one also finds them in Rogaland, for example Sørbø 1 from Rennesøy municipality and Førresbotn 1 from Tysvær municipality. However, this category is not the most frequent in Rogaland when it comes to results of machine-assisted topsoil stripping over the past few decades. It is more common to find sites with multiple buildings located together. There are some challenges which should be discussed in connection with the the solitary longhouse. The first is the question of whether these longhouses actually did function in isolation, with no associated buildings in the vicinity. Many factors, such as the limits of the excavation area and varying preservation levels, can give a distorted image of the original LIA situation. For the second problem, imagine a large longhouse which gives the impression of having been a multifunctional main house with integrated living quarters, but which is missing a clear room with a hearth. Førresbotn 1 is a good example of this. It is equally accurate to interpret such buildings without rooms for hearths as large farm buildings/outbuildings, something which makes them less certain indicators of settlement units/farmsteads.

There are a few sites in the data set which have been excavated so thoroughly that they allow for a detailed interpretation of how the built environment on LIA farms was organised. Forsandmoen, Gausel, Hove-Sørbø Field 3, Sand, Skeie, Sørbøtunet and Tastarustå are examples of relatively well preserved farmsteads (Fig. 2). On both Gausel and Hove-Sørbø Field 3, the MeP houses were rather spread out. The AD 150–550 concept of parallel longhouses separated by clear farmyards (Gausel 4/10 and 8 and Hove-Sørbø 9, 17 and 22; see EIA-datings listed in the appendix) was abandoned and replaced with a more open and loose organisation. With the exception of the farm building Hove-Sørbø 33, building orientations were consistent between the periods AD 400–550 and AD 550–800. It is probable that the placement of older main houses from AD 150–550 had an influence on the placement of the AD 550–800 main houses; due both to overlapping periods of use for the old and new main houses and to the possibility that the remains of main houses from the EIA were still visible as ruins in the landscape.

Hove-Sørbø 36, at Hove-Sørbø Field 3, may originally have been built as a secondary building to the traditional main house Hove-Sørbø 17 during the last occupation phase of this main house, before the built environment changed again with the building of Hove-Sørbø 19 and the pit-house, and the abandonment of House 17. Hove-Sørbø 19 and Hove-Sørbø 36 may have been in use at the same time, either as separate buildings arranged in a line, or with Hove-Sørbø 36 as a relatively small main house and Hove-Sørbø 19 as an annex associated with farming activities. Hove-Sørbø 33 clearly stands out as a building set apart from the core of the settlement, the layout and placement suggesting a focus more on livestock and the surrounding fields than on activities associated with the farmstead.

It appears that in the latter half of the 7th century at Gausel, the multifunctional building Gausel 11 assumed the role of main house with residential function from Gausel 8 E/F, a building with roots in the MiP. Gausel 11 probably had a byre integrated into the longhouse, a feature not clearly demonstrated in Gausel 8 E/F. The other LIA buildings at Gausel, 3, 12, 14 and 15, lay scattered in the vicinity of Gausel 11 and were clearly separate buildings for farming and manufacturing activities. None of these could have been annexes to Gausel 11.

The site at Sand gives the impression of a different organisation. Here a more dynamic development of the built environment on the farmstead area occurred over the course of AD 550–800. Sand F, a building probably associated with some sort of production, is described as stratigraphically younger than the farm building Sand B/D, and possibly also the main house Sand A, with living quarters and byre. This is not consistent with the C^{14}-dates, where Sand B/D is clearly *younger* than Sand F. It is clear from the stratigraphy that Sand F was not contemporaneous with either Sand A or Sand B/D.

There are several possible explanations for this. It may be that when Sand A went out of use, the built area was reorganised along a more N-S orientation, with Sand C as main house - and heir to the abandoned Sand A - and Sand F. Another possibility is that over the course of the 7th century the clear continuity in site use and settlement clusters ceased, and the focus moved to Sand C, which is the youngest securely dated building on the site. The placement of Sand C and F in a line is similar to the organisation of Hove-Sørbø 19 and 36. It is also possible that conditions should be understood as an example of an L-shaped or angled settlement, with Sand C and F oriented N-S and the rest E-W (Eriksen 2015, vol. I:182). In any case, it is clear that the built environment here was at no time organised with two parallel longhouses separated by a farmyard.

The development of the built area at Skeie from AD 550–800 to AD 1050–1200 was a complex process which has proved difficult to place in a comprehensive overview. The particularly dense arrangement of building evidence, where buildings have been raised, torn down, and raised again within a limited area, have made it difficult to propose a detailed interpretation and chronology for either individual buildings or the overall context they represent. Eriksen (2015, vol. I: 182-184) has suggested an interpretation for the Skeie settlement which mostly agrees with this author's opinion. The following attempt at an overview is based on C^{14}-dates, stratigraphic relationships, building function and consideration of which buildings were contemporaneous (Fig. 2).

The discussion will begin with a short description of main houses and more secondary buildings. Skeie IV, X and XXV stand out as the best candidates for main house with residential function. They are placed such that they can have been occupied at the same time, and if so, this would have occurred in the earliest of the site, the Merovingian and the Early Viking Period. Of these three, it is only Skeie IV which was in use until the AD 900 This house has been interpreted as a possible hall building (Eriksen 2015: vol. I: 184, vol. II), and it may therefore be that it should not be considered as part of the normal pattern of main house and secondary buildings. Skeie V, the remains of which are somewhat vague, may also have been a dwelling in the VP, where it lay partially over the older Skeie X. The other Late Iron Age buildings on the site have probably served various functions associated with production and agriculture.

The first LIA phase at Skeie may have included the buildings Skeie I (which was C^{14}-dated to *both* AD 550–800 and AD 900–1200), III, IV, XIX and XXV. These all had the same general orientation. That would lead to a farmstead with two sizable longhouses (IV and XXV) placed nearly parallel to each other, with farm buildings (I and III) in between. Eriksen (2015: vol. I: 182-184) has chosen to include Skeie II/VII here instead of Skeie I, leading to a somewhat different layout. The distinctive, round feature, Skeie XIX, interpreted as a possible smithy, lay a bit apart from the farmstead. Later in the phase a new building was raised, whilst the smithy fell out of use. Skeie X was built partly over the abandoned Skeie III, and probably stood together with Skeie XXV until they both went out of use over the course of the 9th century.

In the 9th and 10th centuries, the orientation of the buildings at the heart of the farmstead changed, with buildings lying on an E-W axis and in possibly three parallel rows (Skeie II/VII, V and VIII). The multi-phase Skeie IV was still in use on the outskirts of the settlement cluster. By the end of the 11th century, most of the buildings were abandoned and the settlement moved; Skeie VI, a characteristic, two-aisled farm building, possibly stood on the site at this stage. Just as at Sand, buildings were reoriented on new axes in the Viking Period although probably somewhat later. There are a number of various layouts possible for the built area at Skeie, but buildings arranged in a line (e.g. Hove-Sørbø Field 3 and possibly Sand) is not one of them.

At Sørbøtunet one finds a layout which at first appears to have clear links to the preceding period in the EIA. The built area in the early Merovingian Period may have included the longhouses Sørbøtunet 2 and 3, lying parallel to each other and separated by a farmyard. But it is unclear how reliable the identification of Sørbøtunet 3 as a Merovingian Period building is; the youngest C^{14}-date (1σ) suggests that it was in use until the late 6th century. It is probable that during the 7th century, activity at the site was limited to a final phase at Sørbøtunet 2 and the use of the small storage building Sørbøtunet 4, representing a break with the spatial organisation and distribution of functions which characterised the site in AD 400–550. It is unclear whether Sørbøtunet 2 had the hearth necessary for a dwelling, and the possible absence of a heat source may indicate that the entire settlement unit had moved by this stage and that the building served some other purpose.

Tastarustå may have traces of several, adjacent dwellings from both the Merovingian and Viking Period (Fig. 2). Tastarustå 4, 5 and 10 all date to the period c. AD 660–780, whereas Tastarustå 14 was in use from c. AD 660 to AD 860 (1σ standard deviation).

The Merovingian Period buildings were placed both in the terrain and in relation to each other such that it is plausible to suggest that they represent two separate, contemporary settlement units/farmsteads: Tastarustå 4 (dwelling) and Tastarustå 5 (probable farm building) in a type of L-shaped or angled farmstead, and Tastarustå 10 (dwelling) and Tastarustå 14 (probable farm building, multi-phased) laying parallel to each other, the two farmsteads being separated by over 30 meters. Tastarustå 5 and 14 were so similar that the balance of evidence suggests that they served the same functions, including byres. These buildings have, in other respects, many similarities with Forsandmoen VI B, but lack the clear central hearth that this older house has (Fig. 5). At the onset of the Viking Period, new buildings were raised on the site: Tastarustå 1, 2 and 7. These were located higher up the slope, and can be seen as two separate settlements. Tastarustå 1 and 2 lay together in an L-shaped, angled configuration. This suggests a continuity in the organisational pattern from the MeP. Both longhouses had hearths, but the solid and well-preserved Tastarustå 2 was probably the more important building.

About 150 meters away lay Tastarustå 7. This was a large, characteristic main house with possible hall functions (Eriksen 2015, Vol. II), and with no clear evidence of associated farm buildings. The design of this house has certain commonalities with the hall Forsandmoen II (Løken 2001), but appears to have had several annexes (Fig. 5). Similarities between Tastarustå 2 and 7, make it likely that these were main houses with residential functions on two adjacent settlement units in the Viking Period

The final phase at Forsandmoen, towards the end of the EIA and the onset of the LIA, was a time characterised by the disappearance of the village settlement (Løken *et al*. 1996: 78). There was some continuity on a few of the earlier farmsteads, in particular an important unit which included the hall building Forsandmoen II, as well as the neighboring farmstead with Forsandmoen VI B as main house (Fig. 2). There is also evidence of activity associated with the longhouse Forsandmoen CIX (109) to the east, and possibly also in the area of the longhouse Forsandmoen CXXXIV A (134 A) to the north. A thorough and detailed analysis of the extensive material from the EIA/LIA transition at Forsandmoen (cfr. Løken *et al*. 1996, Løken 1997, Rønne 1998) is beyond the scope of this article, but it appears likely that the two best preserved farm units in the western end of the site retained the traditional organisation layout with parallel main and secondary buildings.

CONCLUSIONS

The 71 buildings with Late Iron Age activity phases presented above, all uncovered in Rogaland over the past 35 years through the use of machine-assisted topsoil stripping, attest to the existence of a large and constantly expanding data set of buildings and building contexts from this period.

This article has focussed on three questions: 1) What are the dates of the settlement activities at the different sites?, 2) Are there examples of clear changes in building traditions between the later phases of the Early Iron Age and the Late Iron Age, or within the Late Iron Age itself?, and 3) What does this material indicate in relation to the widespread hypothesis of an increased division of functions or new trends in the organisation and layout of settlements in the Late Iron Age? The following summarises some of the most important results.

The various sites went out of use at different stages in the Late Iron Age or early in the Medieval Period (Fig.6). Some show a clear continuity between the periods AD 400–550 and AD 550–800 while others were only occupied during the MeP and EVP. The largest group had occupation phases in the MeP, and in both early and late Viking Period On many sites, settlement can be followed all the way into the Early Medieval Period. There are no clear examples in the data set of a Viking Period settlement occupying the same site as a Migration Period farmstead.

There is no one, definitive pattern for the layout and organisation of the various LIA sites (Fig. 2). Whilst on the larger settlement units, in the later phases of the EIA, an easily recognisable layout of parallel longhouses separated by a farmyard was common (Fig. 3), in the LIA such an organisation was not particularly widespread.

The Late Iron Age longhouse appears to have existed in both single-/limited function and multi-functional variants. It is sometimes unclear whether a farmstead has had a number of such buildings in use at the same time, possibly for several households, or if these buildings have succeeded each other in the role of main house for those controlling the settlement unit. The LIA longhouse interpreted as the main house on the farmstead, often had a centrally placed room with a hearth. On either side of this obvious living space were areas with no fire-producing structures. What these two areas were actually used for is unknown. They may have been rooms for various domestic activities (e.g. residence, craftwork), for storage or for stalling of animals.

The Late Iron Age material from Rogaland includes several examples of longhouses with possible byres, both as additions and integrated into the longhouse itself. Traces of the internal structural details of the houses are often poorly preserved in buildings uncovered via machine-assisted topsoil stripping, and this can make it difficult to understand what functions different areas of the building were dedicated to. The data set includes several variants of the small building: small structures such as four-post buildings and "sheds", buildings approaching longhouse size, various additions/annexes to longhouses and pit-houses. These have, for the most part, probably been dedicated to agricultural or manufacturing activities (storage, craft production, barns). Overall, these are probably the types of buildings that Myhre was missing from the LIA *hustuft* material (1982a: 205). But smaller buildings are also known from the EIA (Myhre 1982a: 200; Dahl 2014; Bjørdal 2017b), the situation should therefore not be interpreted as clear evidence that the multifunctional longhouse was split up into smaller, single-/limited function buildings over the course of the LIA.

The data recovered from machine-assisted topsoil stripping in Rogaland since the 1980s does not prove conclusively that the longhouse tradition continued from the Late Iron Age into the Medieval Period (Myhre 1982a: 200). There are very few longhouses, and post-built structures in general, which can be dated to the late 11th century or younger (see Appendix). Have archaeologists been looking for this missing material in the wrong place, or using the wrong methods? Or perhaps the two-room *stova* (see Skre 1996) also became popular in Rogaland, as in Eastern Norway? Since archaeological excavations have been and will, in all likelihood, continue to be development-initiated projects, it is perhaps more useful to reflect on fieldwork methods (see discussion in Diinhoff 2009a and Sørheim 2009).

Many of the characteristic features of Medieval Period buildings (see Myhre 1982; Skre 1996), such as hearths, stone paved floor surfaces, dry-stone walling, sill stones, and slab lined entrance floors should be identifiable using well-planned and carefully executed machine-assisted topsoil stripping of ploughed fields. The balance of evidence gives some suggestions to the way forward for developing a better understanding of rural settlements from the Late Iron Age and the Early Medieval Period. In addition to an increased focus on longhouses, this to a large degree requires a raised awareness of the small and the diffuse: that is, free-standing small buildings and annexes/additions of longhouses, and cultural layers and structures that appear vague and difficult to define for archaeologists used to distinct and clear features associated with post-built structures from older periods.

APPENDIX

Appendix: Table with overview of the basic data from individual LIA and early MP buildings associated with the sites mentioned in this article.

Site	Building name, House type, Function	Orientation	Remains of outer wall (Yes/No)	Number of plausible entrances	Length (m)	Width total/ Width partially preserved (distance betw. paired roof bearing posts) (m)	Estimated floor surface area (m^2)	Number of fire-producing structures	Number of pairs of roof bearing posts / Number of rooms	Type of C14-dated structure (FPS: fire-producing structure, incl. hearth; PH=post hole)	C14-result(s) (BP) from LIA/MP	Cal. 2σ (AD), OxCal 4.2.4, INTCAL13	Cal. 1σ (AD), OxCal 4.2.4, INTCAL13	Comment
1 Sand, Suldal m.	House A, 3-aisled longhouse, Dwelling, Byre.	E-W	Yes; traces of wall PHs.	2; E and W on S long wall	21	6,5 / 1,80-3,15	137	1	9 / 3?	FPS	1495 (+/-55)	428-648	474-639	
1 Sand, Suldal m.	House B, 3-aisled longhouse, Farm building.	NW-SE	Yes; traces of wall PHs.	0	11	5 / 1,5-1,7	55	0	6 / 1?	PH	1315 (+/-60)	618-871	655-768	Building contains 4 parallel rows of posts.
1 Sand, Suldal m.	House C, 3-aisled longhouse, Dwelling? Craft production? Farm building?	NNW-SSE	No	0	17	> 3 / 2,5	> 51	1	5(+3?)/2-3?	FPS	1380 (+/-80)	433-865	578-764	
1 Sand, Suldal m.	House F, 3-aisled longhouse, Craft production? Dwelling?	N-S	Yes; traces of wall PHs and wall trench	1; N on W long wall	17	4,5 / 1,1-1,2	77	3	5 / 2-3?	FPS	1440 (+/-80)	422-764	539-667	Selected finds: slag from smithy, sherds from soapstone vessel.
2 Førresbotn, Tysvær m.	House 1, 3-aisled longhouse, Farm building?	NW-SE	Yes; traces of wall PHs.	2; one entrance in each long wall	> 25	5,5 / 2-2,5	138	0	> 9 / 4-5?	PH, PH	1200 (+/- 30), 1170 (+/- 30)	715-940, 771-965	775-873, 777-893	
2 Førresbotn, Tysvær m.	House 2, 3-aisled building?, poorly preserved.	NW-SE	No	0	?	? / 2,5	?	0	1 / ?	PH	1090 (+/- 30)	892-1014	899-990	2 PHs, probably paired (roof bearing?).
3 Hauskje, Finnøy m.	House 1, 3-aisled longhouse, Undefined function.	SE-NW	No	0	7	? / 2	?	0	3 / ?	PH, PH, PH	1225 (+/-20), 1220 (+/-20), 1160 (+/-20)	695-882, 728-865, 775-961	722-865, 713-885, 778-944	
4 Sørbø, Rennesøy m.	House 1, 3-aisled longhouse, Dwelling? Craft production? Farm building?	SW-NE	Yes; traces of wall trench	0	25	5 / 1,75-2,1	125	2	8 / 3?	FPS	1310 (+/-80)	583-937	642-853	One FPS at each end of building. Selected finds: whet stones, loom weights.

Site	Building name, House type, Function	Orien-tation	Remains of outer wall (Yes/No)	Number of plausible entrances	Length (m)	Width total/ Width partially preserved (dis-tance betw. paired roof bearing posts) (m)	Estimat-ed floor surface area (m²)	Num-ber of fire-pro-ducing struc-tures	Number of pairs of roof bearing posts / Number of rooms	Type of C14-dat-ed struc-ture (FPS: fire-pro-ducing structure, incl. hearth; PH=post hole)	C14-result(s) (BP) from LIA/MP	Cal. 2σ (AD), Ox-Cal 4.2.4, INT-CAL13	Cal. 1σ (AD), OxCal 4.2.4, INTCAL13	Comment
5 Nordbø, Rennesøy m.	Boathouse, 1-aisled building, possibly part of the leidang naval defense system.	SW-NE	Yes; PHs in 1-aisled building	1* (a gate for the ship in the N gable)	29,5	max 6,8 m/ floor surface area (12 incl. outer wall)	Not estimated	0	1?	PH, PH	*990 (+/-80), *640 (+/-65)	886-1221, 1266-1418	986-1155, 1285-1394	29 roof bearing PHs in E and 26 in W. *Single C14-date, 1030-1220 AD, also associated with this building.
6 Skeie, Stavanger m.	House I, 3-aisled building, Farm building?	N-S	No	0	> 16	> 2,5 / 1,85-2,0	> 40	0	7 / 1?	PH, PH	1345 (+/-80), 1020 (+/-55)	556-881, 895-1155	615-769, 908-1147	
6 Skeie, Stavanger m.	House II, 3-aisled longhouse, Farm building?	ESE-WNW	Yes; traces of wall PHs	0	17,5	4,8 / 2,00-2,07	84	0	6 / 2-3	PH, PH, PH	1255 (+/-55), 1145 (+/-55), 1085 (+/-55)	661-888, 726-1013, 777-1030	674-860, 778-972, 895-1015	Internal doors in separation walls.
6 Skeie, Stavanger m.	House III, 3-aisled longhouse, Farm building?	N-S	No	2; opposing entrances in long walls at S end	9,5	>2,3 / 2,05-2,30	> 22	0	5 / 2	PH	1290 (+/-75)	610-940	653-855	
6 Skeie, Stavanger m.	House IV, 3-aisled longhouse, Multifunctional, incl. Dwelling, Hall? Farm building?	NNW-SSE	Yes; traces of wall PHs	2?; Some indications of opposing entrances in long walls, but not clear	> 17	4,5 / 1,4-2,4	> 77	1, (+ 2 "cooking pits")	6 (7) / 3?	PH, PH, FPS	1280 (+/-45), 1155 (+/-50), 1140 (+/-55)	657-868, 723-991, 769-1015	673-769, 777-963, 778-977	Possible depot next to FPS.
6 Skeie, Stavanger m.	House V, 3-aisled longhouse, Dwelling? Craft production? Farm building?	E-W	No	1	14	2,7 / 2,0-2,5	> 38	2?	6 / 3?		*			* Stratigraphically dated to c. 850-1000 AD
6 Skeie, Stavanger m.	House VI, 2-aisled longhouse, Craft production? Farm building?	N-S	Yes	0	22	7 / -	154	2?	?	PH, PH	1010 (+/-55), 990 (+/-50)	896-1160, 904-1165	980-1147, 992-1150	Traces of wall PHs.
6 Skeie, Stavanger m.	House VII, 3-aisled longhouse, Farm building?	ESE-WNW	No	0	> 12	> 1,8 / 1,4-1,8	> 22	0	6 / 2?	PH, PH	1240 (+/-60), 1165 (+/- 55)	660-944, 696-990	688-865, 775-946	Traces of door in internal separation wall
6 Skeie, Stavanger m.	House VIII, 3-aisled longhouse, Farm building?	E-W	Yes; traces of wall PHs	2; one entrance in each long wall	> 13	6 / 2,6-3,2	> 78	0	6 / 2-3?	PH	1105 (+/-55)	777-1021	885-1011	
6 Skeie, Stavanger m.	House X, 3-aisled longhouse, Dwelling.	N-S	Yes; traces of wall PHs and a wall ditch	1; placed centrally in W long wall	17,5	6,75 / 2,0-2,4	118	1	6 / 3	PH, PH	1250 (+/-55), 1235 (+/-85)	661-891, 655-972	679-862, 688-878	Selected finds: whet stone, loom weights.

Site	Building name, House type, Function	Orien-tation	Remains of outer wall (Yes/No)	Number of plausible entrances	Length (m)	Width total/ Width partially preserved (distance betw. paired roof bearing posts) (m)	Estimated floor surface area (m²)	Number of fire-producing structures	Number of pairs of roof bearing posts / Number of rooms	Type of C14-dated structure (FPS: fire-producing structure, incl. hearth; PH=post hole)	C14-result(s) (BP) from LIA/MP	Cal. 2σ (AD), OxCal 4.2.4, INTCAL13	Cal. 1σ (AD), OxCal 4.2.4, INTCAL13	Comment
6 Skeie, Stavanger m.	House XIX, Small, circular 4-post building, Smithy? Storehouse?		Yes; wall trench	0	5,7	5,7 / 2,7 (between corner posts)	32	0	2 / 1	Wall trench, PH, PH	1405 (+/-100), 1315 (+/-80), 1305 (+/-65)	417-865, 578-892, 625-883	540-765, 638-800, 656-770	Selected finds: slag from smithy, significant amount of charred cereals in PH.
6 Skeie, Stavanger m.	House XXIV, 2-aisled longhouse, undefined function.	NW-SE	Yes; traces of wall PHs	1?; poss. in N long wall	12,5	5,5	69	1?	?	PH, PH	*1020 (+/-30), *1010 (+/-30)	909-1147, 973-1150,	991-1026, 991-1033	*3 EIA C14-dates also associated with this building.
6 Skeie, Stavanger m.	House XXV, 3-aisled longhouse, Dwelling? Craft production?	NW-SE	Yes; traces of wall PHs	0	16	6,5 / 3,4	104	1, (+1 "cooking pit")	5 / 2	PH, PH	1285 (+/-75), 1240 (+/-55)	618-941, 663-938	655-860, 688-864	Traces of door in internal separation wall.
7 Austbø, Stavanger m.	House III, Small, 4-post building, Storehouse.		No	0	3,3	3,3	11	0	2 / 1	PH	1085 (+/-60)	773-1036	894-1016	Selected finds: significant amount of charred cereals in PH.
8 Tastarustå, Stavanger m.	House 1, 3-aisled longhouse, Dwelling, Craft production? Farm building?	WSW-ENE	No	1?; possible entrance in S long wall	> 24	5,5 / 3,4-4,1	> 132	1	7? / 2?	FPS, PH	1130 (+/-60) , 1090 (+/-40)	732-1019, 780-1024	778-987, 895-994	Traces of door in internal separation wall.
8 Tastarustå, Stavanger m.	House 2, 3-aisled longhouse, Dwelling, Farm building?	N-S	Yes; traces of wall PHs and wall trench	2?; possible entrances, one in each long wall	> 20	7,3 / 2,14-3,0	146	1	7 / 3-4?	PH, FPS, PH	1200 (+/-40) , 1140 (+/-40) , 1020 (+/-40)	689-950, 775-985, 900-1152	773-881, 779-975, 975-1040	
8 Tastarustå, Stavanger m.	House 4, 3-aisled longhouse, Dwelling, Craft production? Farm building?	E-W	No	0	> 18	> 3 / 2,12 - 2,80 (+1,4 at W gable end)	> 54	1	9 / 2?	FPS	1260 (+/-40)	666-875	678-774	
8 Tastarustå, Stavanger m.	House 5, 3-aisled longhouse, Farm building: poss. byre.	NW-SE	Yes; traces of wall PHs.	1?; possible entrance in N long wall	> 26	5,6 / 1,77-1,89	146	0	8 / 2?	PH, PH	1310 (+/-40), 1290 (+/-40)	651-772, 652-861	662-765, 671-767	
8 Tastarustå, Stavanger m.	House 7, 3-aisled longhouse: Trelleborg-like, Dwelling, Hall? Farm building?	N-S	Yes; traces of wall PHs	0	24,5	9,5 / 2,2-2,6	233	2 secure (+2 poss.)	7 / 3-4?	PH, FPS, PH	1250 (+/-40), 1160 (+/-40), 1080 (+/-40)	672-879, 770-980, 885-1024	681-855, 777-946, 900-1012	Probably had several annexes.

Site	Building name, House type, Function	Orien-tation	Remains of outer wall (Yes/No)	Number of plausible entrances	Length (m)	Width total/ Width partially preserved (dis-tance betw. paired roof bearing posts) (m)	Estimat-ed floor surface area (m²)	Num-ber of fire-pro-ducing struc-tures	Number of pairs of roof bearing posts / Number of rooms	Type of C14-dat-ed struc-ture (FPS: fire-pro-ducing structure, incl. hearth; PH=post hole)	C14-result(s) (BP) from LIA/MP	Cal. 2σ (AD), Ox-Cal 4.2.4, INT-CAL13	Cal. 1σ (AD), OxCal 4.2.4, INTCAL13	Comment
8 Tastarustå, Stavanger m.	House 10, 3-aisled longhouse, Dwellling, Craft production? Farm building?	NNW-SSE	No	0	13,6	> 2,5 / 1,6-1,9	> 34	2	5 / 2-3?	FPS elongated, FPS circular	1280 (+/-40), 1270 (+/-40)	657-864, 662-868	677-768, 682-770	The two FPS might form a "set" and thus indicate a single occupation phase.
8 Tastarustå, Stavanger m.	House 14, 3-aisled longhouse, Farm building poss. byre, Craft production?	NNW-SSE	Yes; traces of wall PHs	1?; possible entrance NW in W long wall, leading to room w/ FPS	18,2	6 / 1,9-2,1	109	1	7 / 2-3?	FPS lower phase, FPS upper phase, PH	1320 (+/-40), 1250 (+/-40), 1240 (+/-40)	648-770, 672-879, 680-881	657-764, 681-855, 689-862	
9 Kvernevik-veien, Stavanger m.	House 4, 3-aisled longhouse: Trelleborg-like, Cultic building? Hall?	NW-SE	Yes; traces of wall PHs and wood from posts	0	21,5	5 / 1,9-2,2	108	0	2 / 1?	PH, PH	*1270 (+/-40), *1100 (+/-40)	662-868, 778-1022	682-770, 895-987	Unusual, very convex shape to building. Traces of solid wall PHs, while internal roof bearing PHs were shallower. *Quoted C14-dates based on uncharred wood from partially preserved wall posts. 2 additional C14-dates, based on charcoal, give RIA dates; this is intrepreted as contamination of older, RIA/MiP material in younger structures.
10 Gausel, Stavanger m.	House 3, 3-aisled longhouse, Farm building poss. byre.	NNW-SSE	No	0	c. 16 (Phase A)	6 / 1,9-3,9	96	0	9 / 1	PH, PH, PH, PH	1195 (+/-65), 960 (+/-55), 700 (+/-50), 450 (+/-65)	682-974, 988-1206, 1223-1394, 1321-1635	721-941, 1021-1154, 1263-1385, 1408-1616	Undefined period of use.
10 Gausel, Stavanger m.	House 4/10, 3-aisled longhouse, Dwelling, Craft production.	N-S	Yes; wall trenches and poss. an outer stone built support wall	8?; along both long walls	39	7 / 2,0-3,0	273	11	min. 10? / Undefined	FPS, PH, PH, PH	*1595 (+/-75), *1570 (+-/70), *1550 (+/-55), *1540 (+/- 55)	258-616, 343-630, 397-616, 405-622	390-550, 415-559, 428-558, 429-572	*7 RIA & MiP C14-dates also associated with this building
10 Gausel, Stavanger m.	House 7, 3-aisled longhouse, Farm building?	NNW-SSE	Yes; wall trenches and an outer stone built support wall	0	> 12,5	> 7 / ?	?	1?	?	PH, Wall trench, PH, PH	*1610 (+/-60), *1565 (+/-60), *1550 (+/-60), *1420 (+/-60)	261-587, 358-621, 394-630, 433-764	395-536, 422-550, 428-560, 580-661	*1 LRIA/MiP C14-date also associated with this building.
10 Gausel, Stavanger m.	House 8 E/F, 3-aisled longhouse, Dwelling, Craft production, Hall?	N-S	Yes; wall trenches and an outer stone built support wall	10 (E), 7 (F)	40	7 / 2,2-3,0	280	12 (E), 9 (F)	11 (E), >12 (F) / Undefined	FPS, FPS, Wall trench	*1580 (+/-105), *1425 (+/-65), *1400 (+/-70)	245-651, 430-764, 435-770	384-596, 570-661, 570-680	*9 RIA and MiP C14-dates also associated with this building.

Site	Building name, House type, Function	Orientation	Remains of outer wall (Yes/No)	Number of plausible entrances	Length (m)	Width total/ Width partially preserved (distance betw. paired roof bearing posts) (m)	Estimated floor surface area (m²)	Number of fire-producing structures	Number of pairs of roof bearing posts / Number of rooms	Type of C14-dated structure (FPS: fire-producing structure, incl. hearth; PH=post hole)	C14-result(s) (BP) from LIA/MP	Cal. 2σ (AD), OxCal 4.2.4, INTCAL13	Cal. 1σ (AD), OxCal 4.2.4, INTCAL13	Comment
10 Gausel, Stavanger m.	House 11, 3-aisled longhouse, Dwelling, Byre	NNW-SSE	Yes; remains of wall trench	3	> 21	8 / 1,8-2,2	168	2	12 / 3-4?	FPS, Wall trench	1330 (+/-70), 1290 (+/-70)	590-880, 622-892	643-769, 654-800	Probably first built w/ 6-8 pairs of roof bearing posts.
10 Gausel, Stavanger m.	House 12, 3-aisled longhouse, Farm building?	NNW-SSE	No	0	> 17	? / 2,0-2,3	?	0	5 / 1	PH	1370 (+/-65)	542-776	601-763	
10 Gausel, Stavanger m.	House 14, 3-aisled longhouse, Undefined function.	NW-SE	No	2	22,5	6 / 2,0-2,4	135	0	8 / 2-3	PH, PH	1345 (+/-50), 1290 (+/-70)	607-771, 622-892	643-764, 654-800	
10 Gausel, Stavanger m.	House 15, Small. circular 4-post building, Storehouse?	NW-SE	No	1?	4,2	4,2 / 2,4 (betw. the 4 posts)	17-18	0	1		*			*Dated to LIA, based on typological traits and context.
11 Sola Ruinkirke, Sola m.	Pit-house, Large and sub-rectangular sunken construction, Undefined function.	N-S	No	0	4,5 (top) / 3,5 (bottom)	2,7 (top) / 1,7 (bottom)	12 (top)	0	1	Bottom layer, Bottom layer, PH	1080 (+/-30), 1020 (+/-30), 980 (+/-30)	894-1018, 909-1147, 993-1155	901-996, 991-1026, 1018-1147	Structure was backfilled w/ fire-cracked stones. Around 1,3 m deep.
11 Sola Ruinkirke, Sola m.	House I, Undefined structure: several rows of posts, Undefined function.	NW-SE	No	0	c. 8	c. 4	32	0	?		*			*Based on typological traits, given an estimated VP date.
11 Sola Ruinkirke, Sola m.	House II, 3-aisled longhouse?, Undefined structure and function.	NW-SE	No	0	> 5	c. 6	> 30	0	?	PH	930 (+/-30)	1025-1165	1041-1154	
12 Forsandmoen, Forsand m.	House II phase B, 3-aisled longhouse, Hall, Main Residence	E-W	Yes; traces of wall PHs and unusual wall trenches for sill beams	2, in opposing long walls	31	9.1 / 2,8	c. 270	2	7 / 1-2?	FPS	*1440 (+/-50)	438-672	581-650	*3 RIA and MiP C14-dates also associated with this building.
12 Forsandmoen, Forsand m.	House III, 3-aisled longhouse, Dwelling, incl. byre?	E-W	Yes; traces of wall PHs and wall trenches	4; 2 and 2 in opposing long walls	35	7 / 2,8	c. 225	3	9 / 4-5	FPS	*1470 (+/-80)	406-680	437-654	*7 RIA and MiP C14-dates also associated with this building.

Site	Building name, House type, Function	Orien-tation	Remains of outer wall (Yes/No)	Number of plausible entrances	Length (m)	Width total/ Width partially preserved (distance betw. paired roof bearing posts) (m)	Estimated floor surface area (m^2)	Number of fire-producing structures	Number of pairs of roof bearing posts / Number of rooms	Type of C14-dated structure (FPS: fire-producing structure, incl. hearth; PH=post hole)	C14-result(s) (BP) from LIA/MP	Cal. 2σ (AD), OxCal 4.2.4, INTCAL13	Cal. 1σ (AD), OxCal 4.2.4, INTCAL13	Comment
12 Forsand-moen, Forsand m.	House V phase C, 3-aisled longhouse, Craft production, Dwelling?	E-W	Yes; traces of wall PHs and wall trenches	2; in same long wall	21	c. 5,5 / 2,4	c. 115	1	5 / 2-3	FPS	*1420 (+/-90)	421-772	478-759	*2 LRIA and MiP C14-dates also associated with this building.
12 Forsand-moen, Forsand m.	House VI phase B, 3-aisled longhouse, Dwelling, incl. Byre?	E-W	Yes; traces of wall PHs	2; in opposing long walls	38,5	8 / 2,8	c. 300	1	9 / 3?	FPS	*1390 (+/-70)	435-774	575-687	*2 LRIA and MiP C14-dates also associated with this building.
12 Forsand-moen, Forsand m.	House LXIII (63), 4-post building, Storehouse.	NNE-SSW	No	0	2,6	1,2	c. 3	0	2 / 1	PH	1440 (+/-100)	387-775	434-674	
12 Forsand-moen, Forsand m.	House CIX (109), 3-aisled longhouse, Craft production, Dwelling?	E-W	No	1	12	> 4,5 / 2,4	> 55	1	4 / 2	FPS	1370 (+/-70)	539-862	601-764	Situated in an area that had a distinct LRIA/ MiP farmstead.
12 Forsand-moen, Forsand m.	House CXXXIV phase A (134 A), 3-aisled longhouse, Dwelling, incl. byre?	E-W	No	2; in same long wall	> 25,7	> 5 / 2,6	> 130	1	7 / 3-4	FPS	1290 (+/-75)	610-940	653-855	Due to lack of symmetry, may also be interpreted as two, smaller buildings next to each other.
12 Forsand-moen, Forsand m.	House CCXLIII (243), Small, 6-post building probably, Farm building, Storehouse.	NW-SE	No	0	> 4	? / 1,8	> 7	0	3 / 1	PH	1255 (+/-80)	646-968	673-865	
12 Forsand-moen, Forsand m.	House CCXLV (245), Small building, Farm building, Storehouse.	E-W	No	1	> 7,4	> 4,8 / 2,3-2,7	> 36	0	4 / 1-2	PH	1470 (+/-65)	428-661	539-650	
13 Rossaland, Sandnes m.	House A, 3-aisled longhouse, Farm building.	N-S	Yes; traces of wall PHs	0	11	5,5 / 2	61	0	5 / 2?		*			*Based on typological traits, given an estimated MeP date. Sherds from bucket shaped pot indicates LRIA/ MiP/early MeP date.
13 Rossaland, Sandnes m.	House D, 3-aisled longhouse, Farm building	NNE-SSW	Yes; traces of PHs	0	14-16	5,5 / ?	c. 85	0	? / ?	PH, PH	955 (+/-50), 875 (+/-35)	992-1189, 1041-1246	1024-1153, 1054-1217	Multiphased building, no detailed interpretation.

Site	Building name, House type, Function	Orien-tation	Remains of outer wall (Yes/No)	Number of plausible entrances	Length (m)	Width total/ Width partially preserved (dis-tance betw. paired roof bearing posts) (m)	Estimat-ed floor surface area (m^2)	Num-ber of fire-pro-ducing struc-tures	Number of pairs of roof bearing posts / Number of rooms	Type of C14-dat-ed struc-ture (FPS: fire-pro-ducing structure, incl. hearth; PH=post hole)	C14-result(s) (BP) from LIA/MP	Cal. 2σ (AD), Ox-Cal 4.2.4, INT-CAL13	Cal. 1σ (AD), OxCal 4.2.4, INTCAL13	Comment
14 Sørbøtunet, Sandnes m.	House 2, 3-aisled longhouse, Dwelling? Craft production? Farm building?	N-S	No	4; 2 opposing entrances in each long wall	21	5,5 / 2,0-2,3	116	0 (1 poss. Fire pit)	8 / 5?	PH, PH	1495 (+/-95), 1435 (+/-95)	343-687, 408-770	431-645, 435-678	Pot sherds, typologically dated to 4th century AD, indicate older activity here.
14 Sørbøtunet, Sandnes m.	House 3, 3-aisled longhouse, Dwelling? Craft production?	N-S	Yes; traces of wall PHs.	1?; one possible entrance N on W long wall	13,75	5? / 1,8-2,85	69	1?	7? / 2?	PH, FPS, PH	1585 (+/-115), 3955 (+/-65), 1925 (+/-95)	181-663	351-597	FPS dated to the Late Neolithic Period: unclear if this actually is that old a strucure or if this is the "old wood effect".
14 Sørbøtunet, Sandnes m.	House 4, small, 4-post building, Storehouse.	NE-SW	No	0	3	3	9	0	1	PH, PH	1355 (+/-65), 1325 (+/-65)	555-860, 602-875	620-765, 649-768	Stratigraphically younger than House 3.
15 Hove-Sørbø, Sandnes m.	House 17, 3-aisled longhouse, Multifunctional: Dwelling, Craft production (incl. metal working), Hall?	NW-SE	Yes; traces of PHs, and wall trench at SE gable end	14?; along both long walls	c. 60	max 6,5 m (internal measurement) / 2,3-3,4	c. 400	> 25	22 / 6-7?	PH, FPS, FPS	*1511 (+/-27), *1503 (+/-26), *1426 (+/- 32)	430-618, 433-630, 572-660	539-598, 545-595, 606-650	Multiphased and in use together w/ the adjacent House 59. Related to a partially dug down/ sunken farmyard which went out of use during the 6th century AD. *9 RIA and MiP C14-dates also associated with this building.
15 Hove-Sørbø, Sandnes m.	House 19, 3-aisled longhouse, Craft production? Farm building?	NW-SE	No	0	> 14	> 2,3 / 1,8-2,3	> 32	0	6 / 2?	PH	1283 (+/-21)	670-770	684-765	A centrally placed pit w/ a quern stone fragment may indicate function.
15 Hove-Sørbø, Sandnes m.	House 20, 3-aisled longhouse, Dwelling, Farm building incl. byre	N-S	Yes; traces of wall PHs	2?; several possible entrances along long walls	> 29,5	5,6-6,2 / 1,4-2,0	> 169	1	12? / 5?	FPS	1172 (+/-28)	771-961	777-892	Has additions at the N end, these are counted w/ the rooms.
15 Hove-Sørbø, Sandnes m.	House 21, 3-aisled longhouse, Dwelling, Farm building incl. byre	N-S	Yes; traces of wall PHs	5?; several possible entrances along long walls, also one at the N gable.	> 29,9	4-5,8 / 1,8-2,6	> 148	5	14-15? / 5-7?	PH, PH, FPS	1202 (+/-28), 1128 (+/-33), 928 (+/-26)	716-937, 777-990, 1031-1162	774-870, 889-970, 1043-1153	Has additions at the N end, these are counted w/ the rooms. Poss. example of entrance through gable end.
15 Hove-Sørbø, Sandnes m.	House 22, 3-aisled longhouse, Dwelling, Craft production? Byre?	NW-SE	Yes; traces of wall PHs	14?; several possible entrances along long walls	46? (36?)	6 / 2,6-3,5	270? (220?)	4	22? / 7?	PH (S end of building), Cooking pit (may post-date the building), PH (N part of building)	*1572 (+/-25), *1506 (+/-32), *1475 (+/-26)	420-545, 430-636, 547-641	429-536, 537-607, 564-615	Unclear if the northernmost 10 metres of House 22 (poss. byre) actually belonged to a separate building. *6 RIA and MiP C14-dates also associated with this building.

Site	Building name, House type, Function	Orien-tation	Remains of outer wall (Yes/No)	Number of plausible entrances	Length (m)	Width total/ Width partially preserved (dis-tance betw. paired roof bearing posts) (m)	Estimat-ed floor surface area (m^2)	Num-ber of fire-pro-ducing struc-tures	Number of pairs of roof bearing posts / Number of rooms	Type of C14-dat-ed struc-ture (FPS: fire-pro-ducing structure, incl. hearth; PH=post hole)	C14-result(s) (BP) from LIA/MP	Cal. 2σ (AD), Ox-Cal 4.2.4, INT-CAL13	Cal. 1σ (AD), OxCal 4.2.4, INTCAL13	Comment
15 Hove-Sørbø, Sandnes m.	House 33, 3-aisled longhouse, Farm building: Byre? Barn? Sheep shed?	ENE-WSW	No	2?; possible entrances, one in each long wall	> 13,3	> 2,7 / 1,5-2,7	> 36	0	5 / 2?	PH, PH	1445 (+/-23), 1275 (+/-26)	572-650, 671-772	602-641, 686-767	Possible fences leading to both long walls of the building.
15 Hove-Sørbø, Sandnes m.	House 36, 3-aisled longhouse, Dwelling? Craft production?	NW-SE	Yes; traces of wall PHs	2?	> 13	max c. 4,5 / 1,5-2,6	59	1	6 / 3?	PH	1376 (+/-30)	608-683	640-670	Quite unusually, charred rye cereals have been found in structures assocaited with this building.
15 Hove-Sørbø, Sandnes m.	House 51, 3-aisled longhouse, Dwelling, Farm building, incl. byre?	N-S	Yes: traces of wall PHs	5?; several possible entrances along long walls, one has a special entrance room as an annex to the building.	> 34	5,8 / 1,9-2,8	> 165	6	11-12?/5-6?	FPS, FPS, FPS	1252 (+/-38), 1228 (+/-25), 1099 (+/-26)	672-876, 691-882, 889-995	680-800, 718-866, 899-984	The building has some additions/annexes added to it at the N end, these have been included w/ the rooms.
15 Hove-Sørbø, Sandnes m.	House 52, Small 2-aisled or multipost building, Farm building.	E-W	Yes; remains of poss. wall trenches	0	8,1	4,7 / no post pairs	37	0	0 / 1?	PH, PH	1171 (+/-26), 1130 (+/-32)	771-952, 777-989	777-892, 888-970	Might have some additional, external PH connected to it, in that case they are support posts outside the wall trenches / drainage ditches.
15 Hove-Sørbø, Sandnes m.	House 55, 3-aisled longhouse, Dwelling? Farm building?	NW-SE	Yes? (weak, poss. PH remains)	1?; placed centrally on E long wall	> 44	9? / 2,3-2,9	> 300?	0	> 12 / > 3	PH, PH, PH	*1325 (+/-25), *1281 (+/-26), *1259 (+/-24)	652-766, 670-770, 670-860	657-760, 682-766, 691-770	Possibly more than 60 m long and 9 m wide, but the preservation was rather poor. Convex shape. *2 LBA and PRIA C14-dates also associated with building, these are interpreted as contamination from older material.
15 Hove-Sørbø, Sandnes m.	House 59, Small building w/ wall ditches and several posts, Craft production (metal working), Storehouse?	NW-SE	Yes	2-3; 2 secure (opposing) and poss. 1 more	4,5	4,5 / no post pairs	c. 20	4	No post pairs / 1	FPS	*1411 (+/- 27)	596-664	617-654	*3 LRIA and MiP C14-dates also associated with this building.
15 Hove-Sørbø, Sandnes m.	Pit-house 1, Sub-rectangular dug down construction, Craft production? Storehouse?	NW-SE	No	0	3,1	2,6 / 2,9	6,9	0	1 / 1	Layer of fill	1361 (+/-35)	610-764	642-681	C14-date on burnt animal bone from fill; may represent somewhat later activity?

Site	Building name, House type, Function	Orientation	Remains of outer wall (Yes/No)	Number of plausible entrances	Length (m)	Width total/ Width partially preserved (distance betw. paired roof bearing posts) (m)	Estimated floor surface area (m²)	Number of fire-producing structures	Number of pairs of roof bearing posts / Number of rooms	Type of C14-dated structure (FPS: fire-producing structure, incl. hearth; PH=post hole)	C14-result(s) (BP) from LIA/MP	Cal. 2σ (AD), OxCal 4.2.4, INTCAL13	Cal. 1σ (AD), OxCal 4.2.4, INTCAL13	Comment
15 Hove-Sørbø, Sandnes m.	Pit-house 2, Circular sunken construction, Craft production? Storehouse?		No	0	3,2	3,2 / no post pairs	8,5	0	0 / 1	Layer of fill	1317 (+/-28)	655-768	660-763	
16 Bjorhaug, Hå m.	House 4, 3-aisled longhouse, Craft production?	SE-NW	No	2; opposing entrances, central placed in each long wall	> 10	? / 1,5-2	> 20	3	2? / 2?	FPS	1450 (+/-30)	561-651	592-643	Selected finds: slag from smithy and sherds of RIA/MiP type of pot.
16 Bjorhaug, Hå m.	House 7, 3-aisled longhouse, Dwelling? Craft production? Farm building?	SW-NE	No	0	12,9	? / 3,3	> 43	2?	3 secure / 2?	PH	1240 (+/-30)	684-876	689-860	Poorly preserved building.
16 Bjorhaug, Hå m.	House 8, Multipost construction w/ one open "gable", Craft production? Farm building?	SE-NW	Yes	0	4	3,5	14	0	/ 1	PH	1200 (+/-30)	715-940	775-873	Selected finds: slag from smithy found in pit nearby.

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RURAL BUILDINGS FROM THE VIKING AND EARLY MEDIEVAL PERIOD IN CENTRAL NORWAY

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ABSTRACT

There are 23 rural buildings dating to the Late Iron Age and Early Medieval Period known from Central Norway. This article presents a review of all of these buildings, and the five construction types they represent: three-aisled buildings, single-aisled buildings, pithouses, U-shaped buildings and cross-timbered buildings. An excavation at Viklem will be presented as an example of a farmstead consisting of several buildings of varying type, each with a unique function. This represents the separation of activities previously performed under a single roof. The development is consistent with a general development in farm settlement across Northern Europe. Changes in building techniques throughout the period will be discussed as well. At the outset of the Early Iron Age three-aisled constructions dominate, but around AD 900 single-aisled buildings with new construction principles are introduced. The cross-timber technique appears to be introduced in the 11th century. Functional division of farm buildings seems to coincide with pervasive changes in settlement structure and farm organization between the Early and Late Iron Age, with the gradual introduction of new building traditions which break with earlier patterns.

INTRODUCTION

The development of rural building traditions in the Late Iron Age and Medieval Period of Central Norway has received relatively little attention. Much of what we know about buildings and building traditions has come to us through excavations of Medieval urban contexts. Although some material is known from outside of the towns, it has not been analyzed or presented in a general review. It is also a fact that the various source material has increased considerably in recent years, as a result of development-initiated excavations in the areas surrounding historic farms. This places us in a much better position to investigate buildings on the farms, outside of the medieval towns in this period.

There is a widespread belief amongst researchers that building traditions underwent major changes in the Late Iron Age and Early Medieval Period. The standard narrative has three-aisled, multifunction longhouses with support posts buried into the subsoil being replaced by smaller, single- or limited-function buildings (Skov 1994; Skre 1996;

Myhre 2002; Jensen 2004; Martens 2009; Eriksen 2015; Sørheim 2015). The cross-timber technique was introduced during the Late Iron Age and Early Medieval Period and became, over the course of the period, the main building tradition, particularly in medieval towns (Schia 1979; Schia and Molaug 1990; Christophersen and Nordeide 1994).

This development must have occurred in parallel with substantial changes in the already established building tradition in which the main load bearing structure consisted of posts. This long-lived building tradition changed over the course of the Viking Period throughout Northern Europe. In broad terms, the changes involve the transition from three-aisled stave constructions with posts dug into the subsoil, to single-aisled redeveloped stave structures set on a wooden frame above the ground level (Zimmermann 1998; Jensenius 2010). The result of this development can still be seen today in some of Norway's best known, still-standing medieval buildings, stave churches (Christie 1974).

In this article, we attempt to investigate the general characteristics of the evolution of building styles in the Late Iron Age and Medieval Period, based on material from Trøndelag, Nordmøre og Romsdal - here referred to as Central Norway. Firstly, we want to look at whether the region's material follows the same general lines of development of building traditions described in archaeological research from Southern Norway and Northern Europe, or whether we can see regional characteristics that provide a different picture. We also want to examine specifically the changes in building techniques which can be detected throughout the period and how this appears against the overall picture of development outlined above. For this we will use material from a 2014 excavation on the Viklem church grounds, in Ørland, Sor-Trondelag.

RURAL BUILDINGS DATING TO THE LATE IRON AGE AND MEDIEVAL PERIOD IN CENTRAL NORWAY

Archaeological evidence of settlement and buildings in rural areas dating to this period must be regarded as sparse for most areas of Norway (Berglund 2003; Grind Kaasa 2007; Martens 2009). This stands in contrast to the abundant material from the same period known in medieval towns. The major archaeological surveys in Trondheim center in the 1970s and '80s uncovered a large number of wooden buildings dating from the late 10th century to the mid- 14th century (Christophersen and Nordeide 1994). This imbalance has led to several studies of medieval construction methods in urban contexts (eg. Høgseth 1997 and 2007), while few equivalent analyses of the corresponding rural material have been undertaken. An important contributory factor to this disparity is the lack of archaeological investigation in areas where preserved Late Iron Age and medieval farm settlement might be located, often presumed to be associated with modern farmsteads.

This work assembles available information on buildings from the period AD 600–1100. In total, we have information on about 23 buildings. The material is summarized in Table 1, and presented in more detail in Table 2.

Table 1.

Main shape	Construction	Nº.	Place
Single-aisled	Single-aisled longhouse with roof supported by wall posts in ground	4	Ranheim Structure 10, Ranheim Structure 11, Viklem House I, Viklem House V
Single-aisled	Single-aisled longhouse with roof supported by wall posts in ditch and by angled posts on one side	1	Viklem House III
Single-aisled	Single-aisled longhouse with convex walls and roof supported by wall posts in ditch and by angled posts on one side	1	Viklem House IV
Single-aisled	Single-aisled house with roof supported by wall posts in ground	2	Nedre Humlehaugen House I, Mære
Pit house	Pit house with earthen walls and roof supported by internal posts in ground	1	Viklem
U-shaped	U-shaped wall ditch and roof supported by internal posts in ground	2	Kvenild Søndre House A, Saltnessand House II
Cross-timbered	Cross-timbered house	3	Ommundgarden House K10 and House K20, Mosetet
Three-aisled	Three-aisled house with roof supported by internal posts in ground and angled posts on both sides	1	Ranheim Structure 5
Three-aisled	Three-aisled house with roof supported by internal posts in ground and no visible traces of outer walls	5	Ranheim Structure 1, 2, 3, 4 and 9
Three-aisled	Three-aisled house with roof supported by internal posts in ground and traces of outer walls	2	Vikebukt House III (south), Vikebukt House IV (north)
Three-aisled	Three-aisled house with earthen walls and roof supported by internal posts in ground	1	Skei House 5

Table 1. Main construction and building types

Table 2.

Site	Main type	Construction	Radiocarbon dating	Sources
Nedre Humlehaugen	Single-aisled	Single-aisled house with wall posts in ground	Viking Age. Post no. 100: 1100 ± 30, cal. 895 - 990 AD.	Øyen 2010
Mære ("The Wooden Church")	Single-aisled	Single-aisled house with wall posts in ground	Viking Age-Early Middle Ages (pre. 1150)	Lidén 1969

Site	Main type	Construction	Radiocarbon dating	Sources
Ranheim Structure 10	Single-aisled	Single-aisled longhouse with roof supported by wall posts in ground	Late Iron Age/Viking Age	Grønnesby and Heen Pettersen 2015, Heen Pettersen and Grønnesby in pres.
Ranheim Structure 11	Single-aisled	Single-aisled longhouse with roof supported by wall posts in ground	Late Iron Age/Viking Age	Grønnesby and Heen Pettersen 2015, Heen Pettersen and Grønnesby in pres.
Vikebukt House IV	Three-aisled	Three-aisled house with roof supported by internal posts in ground and traces of outer walls	Merovingian/Viking Age. Post no. 86: 1335 ± 50, cal. 660-760 AD (T-16674). Fireplace 93: 1220 ± 95, cal. 680-960 AD (T-16675).	Haug and Johansen 2003, Johansen 2003
Vikebukt House III	Three-aisled	Three-aisled house with roof supported by internal posts in ground and traces of outer walls	Late Iron Age/Viking Age. Post no. 56: 1595 ± 60, cal. 415-545 AD (T-16190). Post no. 68: 1350 ± 75, cal. 640-770 (T-16191). Post no. 74: 1195 ± 105, cal. 700-980 AD (T-16192).	Haug and Johansen 2003, Johansen 2003
Kvenild Søndre 2005 House A	U-shaped	U-shaped wall ditch and roof supported by internal posts in ground	Viking age	Normann & Ellingsen 2006
Saltnessand House II	U-shaped	U-shaped wall ditch and roof supported by internal posts in ground	Merovingian/Viking Age. Post no. 164: cal. 780-1020 AD (T17891). Post no. 229: cal. 780-1020 AD (T17890). Wall ditch: 1040-1270 AD (T-16962).	Rønne 2009
Mosetet	Cross-timbered	Cross-timbered	Late Viking Age/Early Middle Ages. Charcoal from coal rich layer beneath cultural layer in the house: 1150 ± 80, cal. 760-1020 AD (T-714) Brennmoen II, from house: 910 ± 100, cal. 960-1280 AD (T-967). Brennmoen III, from house: 910 ± 70, cal. 1015-1260 AD (T-968). Norwegian coins from the 11th century.	Berglund 2003, Vestrum 2009
Ommundgarden Tuft K10	Cross-timbered	Cross-timbered	Early Middle Ages. Cultural layer, dated twice: cal. AD1025-1245, AD1030-1220.	Berglund 2003
Ommundgarden tuft K20	Cross-timbered	Cross-timbered	Early Middle Ages – High Middle Ages. Top layer: cal. AD1285-1395.	Berglund 2003
Ranheim Structure 5	Three-aisled	Three-aisled house with roof supported by internal posts in ground and angled posts on both sides	Viking Age/Early Middle Ages. Post no. 159: 1070±30, cal. AD 985-1040, 1110-1115 (BETA-376141). Post no. 631: 1190±30, cal. AD 770-900, 925-945 (BETA-376180). Post no. 630: 1180±30, cal. AD 775-970 (BETA-376181). Post no. 518: 1120±30, cal. AD 780-785, 880-990 (BETA-376182).	Grønnesby and Heen Pettersen 2015, Heen Pettersen and Grønnesby in pres.

Site	Main type	Construction	Radiocarbon dating	Sources
Ranheim Structure 9	Three-aisled	Three-aisled house with roof supported by internal posts in ground and no visible traces of outer walls	Viking Age, mainly 770-995 AD. Post no. 94: 1140±30, cal. AD 775-975 (BETA-376144). Post no. 95: 1200±30, cal. AD 770-900, 925-945 (BETA-376147). Post no. 99: 1280±30, cal. AD 685-885 (BETA-376169). Post no. 101: 1650±30, cal. AD 390-540 (BETA-376158). Post no. 104: 1150±30, cal. AD 780-790, 870-985 (BETA-376160). Post no. 391: 1230±30, cal. AD 725-740, 770-895, 925-940 (BETA-376143). Post no. 393: 1180±30, cal. AD 770-900, 925-945 (BETA-376145). Post no. 400: 1110±30, cal. AD 895-1020 (BETA-376146). Post no. 417: 1140±30, cal. AD 885-995 (BETA-376159). Post no. 745: 1200±30, cal. AD 775-970 (BETA-376170).	Grønnesby and Heen Pettersen 2015, Heen Pettersen and Grønnesby in pres.
Skei Tuft 5	Three-aisled	Three-aisled house with earthen walls and roof supported by internal posts in ground	900-1000 e.Kr. Burnt deposit in top of wall mound: 970 ± 65 BP, cal. 1000-1160 AD (T 8908).	Stenvik 2001
Ranheim Structure 1	Three-aisled	Three-aisled house with roof supported by internal posts in ground and no visible traces of outer walls	Viking Age	Grønnesby and Heen Pettersen 2015, Heen Pettersen and Grønnesby in pres.
Ranheim Structure 4	Three-aisled	Three-aisled house with roof supported by internal posts in ground and no visible traces of outer walls	Viking Age. Post no. 111: 1210±30, cal. AD 775-975 (BETA-374321). Post no. 112: 1150±30, cal. AD 780-785, 880-990 (BETA-374308). Post no. 120: 1130±30, cal. AD 780-790, 870-985 (BETA-374310). Post no. 540: 1190±30, cal. AD 775-970 (BETA-374305). Post no. 550: 1170±30, cal. AD 885-995 (BETA-374323). Post no. 578: 1210±30, cal. AD 775-970 (BETA-374309).	Grønnesby and Heen Pettersen 2015, Heen Pettersen and Grønnesby in pres.
Ranheim Structure 2	Three-aisled	Three-aisled house with roof supported by internal posts in ground and no visible traces of outer walls	Late Iron Age/Viking Age	Grønnesby and Heen Pettersen 2015, Heen Pettersen and Grønnesby in pres.

Site	Main type	Construction	Radiocarbon dating	Sources
Ranheim Structure 3	Three-aisled	Three-aisled house with roof supported by internal posts in ground and no visible traces of outer walls	Late Iron Age/Viking Age	Grønnesby and Heen Pettersen 2015, Heen Pettersen and Grønnesby in pres.
Viklem House I	Single-aisled	Single-aisled longhouse with roof supported by wall posts in ground	975-1030 e.Kr. Post no. 353: 900 +/- 30 BP, cal. AD 1035-1215 (BETA-406522). Post no. 510: 1030 +/- 30 BP, cal. AD 975-1030 (BETA-406525).	Mokkelbost and Sauvage 2014
Viklem House II	Grophus	Pit house with earthen walls and roof supported by internal posts in ground	970-1165 e. Kr. Layer no. 454: 1040 +/-30 BP, cal. AD 970-1025 (BETA-389190). Burnt layer in bottom of stone fireplace, no. 8149: 930 +/-30 BP, cal. AD 1025-1165 (BETA-389189).	Mokkelbost and Sauvage 2014
Viklem House III	Single-aisled	Single-aisled longhouse with roof supported by wall posts in ditch and by angled posts on one side	780-1020 e. Kr. Wall ditch no. 425: 1120 +/-30 BP, cal. AD 780-785, 880-990 (BETA-389188). Internal post 230: 1070 +/- 30 BP, cal. AD 895-925, 940-1020 (BETA-401518). Post no. 372: 1060 +/- 30 BP, cal. AD 900-925, 945-1020 (BETA-401516).	Mokkelbost and Sauvage2014
Viklem House IV	Single-aisled	Single-aisled longhouse with convex walls and roof supported by wall posts in ditch and by angled posts on one side	Early Middle Ages. Wall ditch no. 345: 890 +/-30 BP, cal. AD 1040-1220 (BETA-389187). Post no. 6620: 590 +/- 30 BP, cal. AD 1295-1370, 1380 to 1415 (BETA-406523). Post no. 6609: 570 +/- 30 BP, cal. AD 1305-1365, 1385-1420 (BETA-401517).	Mokkelbost and Sauvage 2014
Viklem House V	Single-aisled	Single-aisled longhouse with roof supported by wall posts in ground	Viking Age-Early Middle Ages	Mokkelbost and Sauvage 2014

Table 2. Known excavated rural buildings from the Viking and Early Medieval Period in Central Norway

THE EXCAVATIONS AT VIKLEM

The grounds of Viklem church are located in Brekstad, Ørland municipality, on a height with good visibilty of the surrounding landscape and coastline. The present church was probably built in the Late Medieval Period and is a whitewashed stone building. It has not been studied in depth and very little is known of its history. Written sources date the church grounds back to the mid-12th century. Viklem was a manor in the Medieval Period and both the farm and the church seem to have been incorporated into the larger church organizational structure by AD 1300 at the latest (Brendalsmo 2006). Close by the church is one of Sør-Trøndelag's largest burial mounds, Viklemshaugen. The mound testifies to the fact that the site was of great importance long before Viklem became a church. A similar relationship between church and pagan burial monument can also be found at Alstadhaug, Skogn, Nord-Trøndelag (Stenvik 2005).

NTNU Museum has previously conducted several archaeological excavations at Viklem. In the area

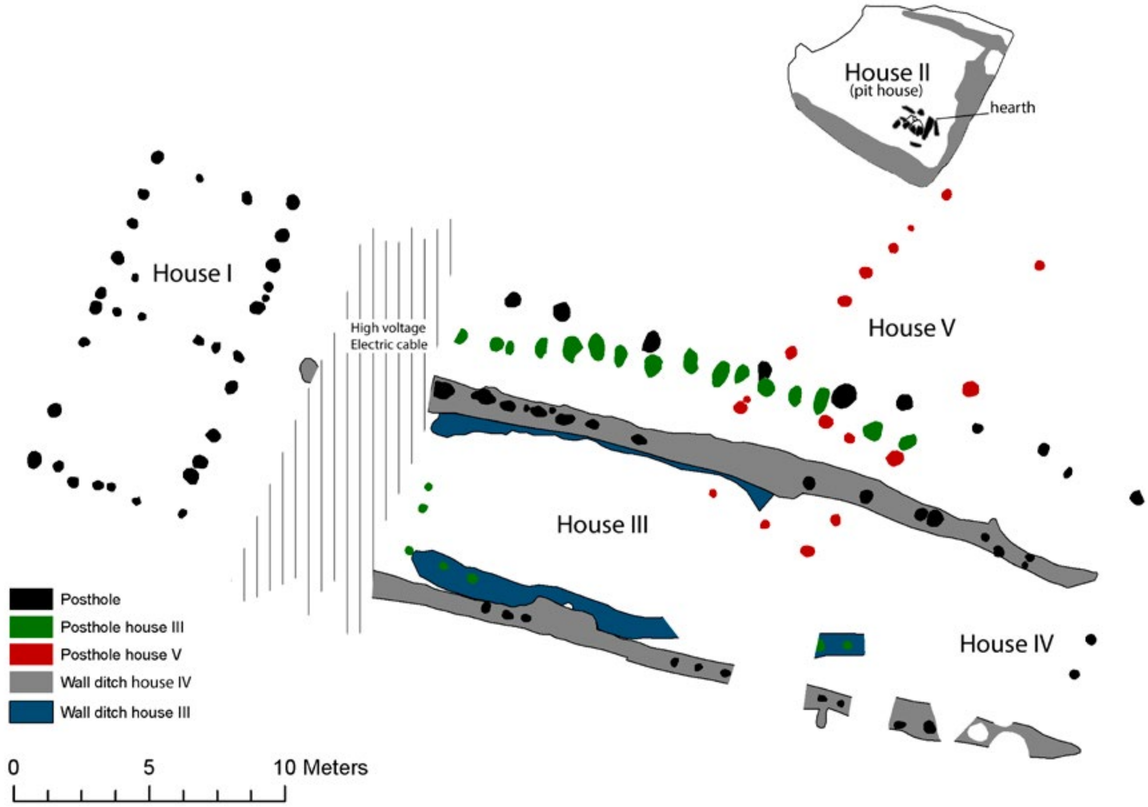

Figure 1. Plan of buildings excavated in 2014. Illustration Raymond Sauvage, NTNU University Museum.

west of the church these were undertaken in 1995, 2000, 2001 and 2007. These investigations resulted in evidence of nine houses, most dating to the Late Iron Age. In 2014, excavations were carried out in connection with a planned expansion of the cemetery (Mokkelbost and Sauvage 2015). This excavation resulted for the first time in unambiguous findings of buildings and settlement evidence which we believe belong to a Late Iron Age and medieval farmyard associated with Viklem farm.

Five buildings were investigated in total, four single-aisled buildings with posts dug into the subsoil and one pit-house (Fig. 1).

The two largest buildings were overlapping, parallel constructions oriented NW. The first house (House III) was 18 meters long and 7 m wide, consisting of two parallel convex wall ditches. These wall ditches were up to 50 cm deep, and contained rows of evenly spaced postholes placed every 80 cm. On the outside of the northern wall lay a slightly curved row of 16 angled postholes which would have provided support for the wall. The documentation suggests that House III had curved long walls. Soil samples from these postholes contained high amounts of charcoal. It is unclear why the house was abandoned, but the high amounts of charcoal may indicate that the house burned down. The radiocarbon dates fall within the period AD 780–990 (Mokkelbost and Sauvage 2015). Since there are no post-Viking Period dates associated with the house, one can imagine that the house burned down at the end of this period.

In the next phase, House III is replaced by a larger building placed on the exact same location and with the same orientation. House IV was single-aisled structure, at least 27 meters long and 8.8 meters wide, comprised of two parallel, straight wall ditches. As with House III, the wall ditches contained rows of postholes; however, these were unevenly spaced and may therefore indicate some changes to the building structure over the course of its life. House IV also had angled support posts along the outside of the northern wall. Three of the four analyzed plant macrofossil samples contained carbonised barley and rye grains. The dates for this building fall largely within the Early Medieval Period and High Middle Ages (Mokkelbost and Sauvage 2015): however, the deviation in the radiocarbon calibration curve for this period gives the dates a relatively broad range, so we cannot exclude a Late Medieval date. We do believe that the large overlap in the Early Medieval and High Middle Age dating results is such that there is reason to believe that the house replaced the older House III relatively quickly. This is also supported by the location and the similarities of construction.

In addition to the two largest houses, two smaller houses were excavated. Houses I and V were both single-aisled longhouses with posts dug into the subsoil. The houses had a rectangular ground plan with straight gable and long walls, measuring approximately 12.5 m x 6 m. There were traces of internal dividing walls which split each of the buildings into two separate compartments. The wall posts had solid foundations dug into the subsoil with large support stones in over half of the postholes (18 of 33). Datings of one of the buildings is based on charcoal and cereal from postholes, and fall within the ranges AD 974–1300 and AD 1035–1215.

In addition to the buildings that were identified from wall ditches and postholes, one pit-house with a preserved cultural layer was excavated. The pit-house was almost square in plan, measuring 6.5 m on a side, and was located some distance away from the other houses. The internal area has been estimated at approximately 20 m^2. The pit-house was dug 50-60 cm into the underground, and the load bearing function was performed by internal posts. The house seems to have originally had a hard-packed earth floor which was covered by cultural deposits and a floor layer deposited over the course of the house's life. The outer walls seem to have been covered by peat, remnants of which were found in the cultural layer. In the southern corner of the pit-house there was a corner fireplace with furnace chamber, the superstructure of which had been built up of blue clay and stones. The fireplace proved to be partially buried in the ground, the chamber itself was buried approximately 50-60 cm below the floor level. The chamber had a flat slab at the bottom, and was built of dry masonry boulders placed in rings on top of each other. The oven had sides which were formed by leaning flat slabs and an opening at floor level. Artefacts recovered from the cultural layer included spindle whorls, a fragment of a loom weight and a sewing needle, all of which testify to textile production during the building's phase of use. A 24-gram copper alloy measuring weight was also found. The dating of the pit-house falls within the period AD 970–1165 (Mokkelbost and Sauvage 2015).

The buildings on Viklem all lay within a limited area and it appears that the settlement organization remained the same over several centuries during the Viking-Medieval Period transition, except the largest house, which was rebuilt after a fire. Overall it is likely that we are looking at a farmstead. The buildings were perpendicular to each other, creating a defined yard with good shelter from the prevailing southwest winds.

All the buildings identified at Viklem had structures that were buried in the ground, either in the form of postholes dug into the subsoil, wall ditches or a pit-house. This common feature made them possible to recognize using machine topsoil stripping. The similarity of building techniques was also great. All of the buildings were single-aisled with load-bearing wall lines.

The pit-house is the building type with the most readily identifiable function. Earlier surveys of pit-houses in Scandinavia have shown that these were a common building on farms in the Late Iron Age (Christensen 1990; Åqvist 1992; Fall Branch 1994). A popular interpretation links this building type to craft production. The find material shows evidence, among other things, of metallurgy and textile production (Fall Branch 1994; Mileks 2012). The pit-house at Viklem produced tools associated with textile production: spindle whorls, loom weights, needles and needle sharpeners. A corner fireplace provides evidence of cooking and baking, as well as heating.

Two single-aisled houses with wall posts dug into the subsoil identified at Viklem, House I and House V, can be interpreted as dwellings. Neither of them had traces of fireplaces, but we assume that these houses may have raised floors, so the fireplaces would not have left visible traces in the subsoil. Both buildings were divided into two rooms, which one may imagine was important for limiting heat loss in a house of this size (75-85 m^2). Such two-room buildings are consistent with the classic image of common residential houses in the Medieval Period, smaller, two-room cross-timber structures (Grindkåsa 2007; Sørhiem 2015). The size and internal division suggests, therefore, that this was a dwelling.

Two other buildings from Viklem appear, in our opinion, to hold a central or elevated status on the farm. These are House III and House IV, which we here have interpreted as substantial buildings with no clear room division. The two overlapping buildings occupy the exact same location and have the exact same orientation. The oldest was built in the Viking Period, while the younger was used well into the High Middle Ages. These houses may have held a special position on the Viklem farm in the Late Iron Age. The height which Viklem occupies is one of only a few such locations in Ørland municipality, and has probably been a site of significance in the terrain since the land rose from the sea in the Bronze Age. That a house the size of House III, nearly 140 m^2, was replaced after being burned down in the Early Medieval Period, attests to its importance. That it was replaced by a house nearly double its size underscores this. The farm's central position and function in connection with the medieval church site can be an important starting point for interpreting the function of these buildings.

THE EVOLUTION OF RURAL BUILDINGS IN CENTRAL NORWAY

There appears to be a consensus amongst researchers that the rural building tradition in Norway underwent a radical change in the Late Iron Age and Early Medieval Period. Longhouses were largely replaced by single-aisled buildings (Skre 1996; Grindkåsa 2007; Eriksen 2015), eventually without support structures dug into the subsoil (Jensenius 2001).

Skov's (1994) overview of the archaeology of buildings from southern Scandinavia can be a good point of departure for comparison with Central Norway. Using 171 localities, Skov compiled a synthesis of developments in building styles. Between AD 600 and about AD 900 three-aisled longhouses and pit-houses dominate. Around the year AD 1000 the three-aisled longhouse becomes less significant,

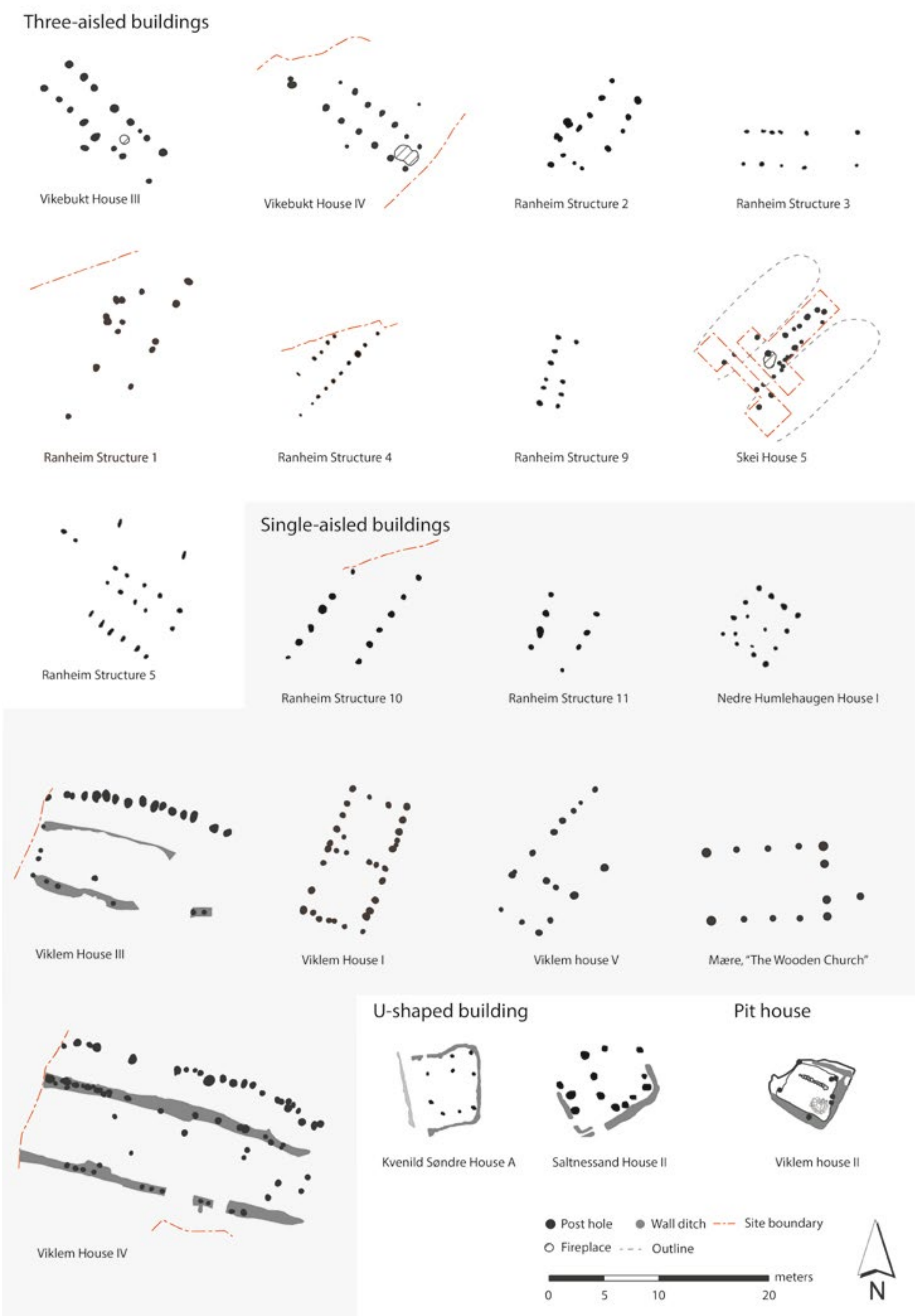

Figure 2. Plans of known excavated buildings from the Viking and Early Medieval Period in Central Norway, excluding cross-timbered buildings. Illustration: Marte Mokkelbost, NTNU University Museum.

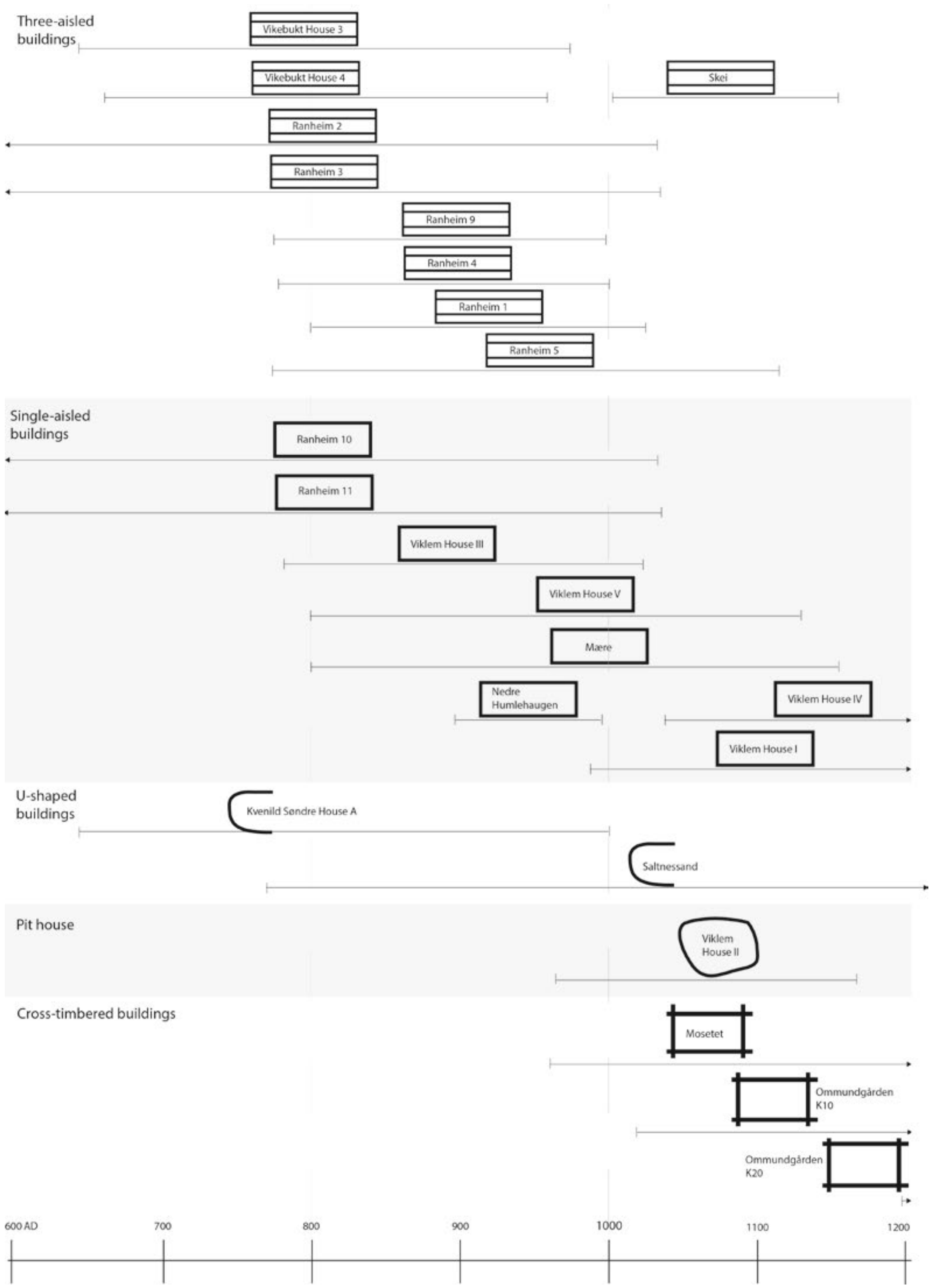

Figure 3. Chronological overview. Illustration Raymond Sauvage and Marte Mokkelbost, NTNU University Museum.

and disappears between roughly AD 1100 and AD 1200. Furthermore, single-aisled buildings with wall posts dug into the subsoil appear at the beginning of the 10th century. The complete overview of known buildings from Central Norway in this period (Tables 1 and 2) shows that we have nine three-aisled buildings, eight single-aisled buildings, three cross-timbered buildings, two U-shaped buildings and one pit-house (Fig. 2). Remains of the cross-timbered structures were, unfortunately, not sufficiently preserved to allow for presentation in plan. The suggested chronological positions of the different buildings are shown in Figure 3.

The analyses in this article are first and foremost based on the buildings that we have been able to identify in the form of postholes. These buildings are the easiest to analyze in terms of architectural style, shape and size. Sufficient remains of the U-shaped houses and cross-timbered buildings were not available to allow for an analysis of construction and building techniques. The three cross-timbered buildings in the data set have been previously treated by Berglund (2003). We know very little about the U-shaped buildings. They consist of U-shaped wall ditches and internal roof bearing posts, which do not appear to be placed in pairs. We do not have immediate parallels to these houses, and it is difficult to understand their physical structure. The nearest archaeological parallels are in Møre og Romsdal and date to the Bronze Age and Pre-Roman Iron Age (eg. Haug 2000).

FROM THREE-AISLED TO SINGLE-AISLED

Stave construction is a general term for several related types of construction common in prehistoric and historic times. The main feature is a load bearing structure consisting of vertical staves and horizontal beams and cross-beams. Stave construction has its origins in the double-aisled buildings of the Neolithic (Olsen 2009). Most of the identified buildings from Central Norway are examples of stave construction. There are two forms which dominate: three-aisled stave constructions with internal support beams dug into the subsoil and single-aisled stave constructions with wall posts dug into the subsoil supporting the roof load. The introduction of single-aisled stave buildings during the Viking Period represents a marked change in the building technology of the period. On the basis of the material used here, it seems that this building method is common in Central Norway from around AD 900. This coincides well with the occurrence of single-aisled buildings with posts dug into the subsoil in the southern Scandinavian material (Skov 1994). The introduction of this building tradition represents something new in the material, a development which we believe happened simultaneously over large parts of Scandinavia.

From a structural standpoint, these buildings differ from three-aisled buildings in that the roof load if borne by the walls rather than internal support posts. We have no preserved building remains in the material and it can be difficult to determine the building principles on the basis of postholes alone. However, we have some comparative material which may contribute to an interpretation. We here suggest that the single-aisled houses we know today from rural Central Norway are an evolved form of stave constructions with corner and mid-wall line staves, as in the medieval stave construction in towns and in the oldest remains of wooden churches. Evolved forms of stave construction are known from archaeological contexts in most parts of northern Europe (Christie 1974; Hauglid 1989; Jensenius 2010). Many of these buildings are distinct from later stave churches in that they consist of staves dug into the ground with recessed, bottom sills between the staves. Traces of this type of building are often found beneath medieval churches, on the occasions where excavations beneath the floors of these churches have taken place (Jensenius 2010). Later stave churches are based on the same principle, but are supported by integrated frameworks consisting of bottom sills and corner poles with no soil dug element (Jensenius 2010). Archaeologically identified stave buildings in Norway generally have staves dug into the subsoil with mid-wall line staves and recessed sills between the staves. One example from Central Norway is a post-built structure from the earliest activity phase on the site of the Folkebibliotek in Trondheim (Christophersen and Noreide 1994).

A stave building at least 6 meters in length was found on the Folkebibliotek site. The surviving parts of the house consisted of a post dug into the soil and two sills with grooves on the side where the wall planks originally stood. Northern Europe also provides examples of lay-buildings erected using this technique, such as a building from the 10th century in Husterknupp, Germany (Hauglid 1989). Here most of the support framework has been preserved, consisting of posts dug into the ground and mid-wall line posts with an interstitial bottom sill. The building is very similar to that found on the site of the Folkebibliotek in Trondheim. It is also interesting to note that the oldest buildings in this technique seem to be about the same age as those in Central Norway. The only soil dug elements of such buildings are holes for the posts. It is quite probable that these types of features will be the only identifiable remnants of such buildings in rural/farmed areas. The layout of the soil dug elements in these buildings, in our view, agree well with the single-aisled buildings presented here.

An obvious example is the building found beneath the church at Mære in Nord-Trondelag, interpreted as a single-aisled church of post-construction (Lidén 1969). We also believe that all preserved single-aisled buildings at Viklem were probably constructed using such a technique. Wall posts are substantial and placed at even interval, in good accordance with the corner and mid-wall line posts of the evolved form of a stave construction. This substantiates our view that most of the single-aisled buildings with wall posts dug into the subsoil from rural contexts in Central Norway represent the evolved form of stave construction.

An interesting feature that we have not previously seen are in two of the buildings from Viklem, where there are clear indications of external, angled support posts. The northern long walls of both houses were fitted with these. Such angled-support posts are well known in connection with stave construction, where they are known are *skårder*, or exterior wall supports. This technique may have been used in exceptional circumstances, e.g. in harsh environments or when houses were built to a considerable height. Both the stave churches at Kvernes, Averøy and at Rødven, Rauma have *skårder* (Christie 1978). They are part of the Møre type of stave church, characterized by long walls with corner posts and mid-wall line posts. It is believed that the Møre type did not have balconies, but from the beginning was supported by *skårder*. The location at Viklem is central and exposed to the elements and this may have been the determining factor. Such external angled support posts are also known from southern Scandinavia, where they are a feature of well-known building types from Trelleborg and Hedeby. These houses, however, are three-aisled constructions (Skov 1994).

THE FUNCTIONS OF STAVE-CONSTRUCTED BUILDNGS

The origin of the stave-construction technique has been widely debated in architectural historical and archaeological research. The three-aisled stave constructions which appear in the material from Central Norway seem to have had various functions. Most three-aisled buildings have been interpreted as associated with peripheral farm activities, perhaps sheds or simple outbuildings. This can be seen at

Ranheim (Grønnesby and Heen-Pettersen 2015) and at Vikebukt, Vestnes (Haug and Johansen 2003), in the form of a smithy and a barn. The only building that stands out is Tuft 5 at Skei, which is part of a circular arrangement of structures dated to the Viking Age (Stenvik 2001). The building's context is not expressly a farm context, but rather a place that is interpreted as a meeting point and focal point for military activities. This building represents an exception. We therefore believe that most three-aisled stave-buildings from Central Norway from the Late Iron Age and Early Medieval Period are associated with various agricultural functions. There is amongst three-aisled buildings, no clear residential function.

Regarding single-aisled stave construction, we see a more complex picture. Berglund (2003) interpreted stave constructed houses as lower status than cross-timbered houses. Stave construction may have been an older building style that came to be used for such lower status houses. This is supported by, among other examples, the material from the site of the Folkebibliotek in Trondheim; stave construction was used in free-standing structures and smaller structures, such as simple house additions and sheds (Christophersen and Nordeide 1994). Such an interpretation may be applied to some of the single-aisled buildings in the data set, such as Ranheim Structure 10 and Structure 11, but we see a more central role for most of these buildings. At Viklem two single-aisled buildings built in the evolved form of stave construction, House I and House V, have been interpreted as dwellings. Rural medieval residences in the form of two-bedroom buildings were not exclusively built using the cross-timbering technique, as they were in the towns, but are represented in the evolved form of stave construction. This indicates that the evolved form of stave construction was commonly used for residential structures.

Two other buildings are also important for highlighting the use of stave construction in houses, House III and House IV at Viklem. These buildings stand out in terms of their central location, substantial construction and impressive size. If the assumption that these buildings served public functions linked to manor farms is correct, it highlights how stave construction was used in high status buildings. That this form of construction was used in lay-buildings associated with public functions on larger farms in the Medieval Period can be seen in the still-standing building known as *Finnesloftet* at the Finne farm, Voss. This building, dating to the late 1200s, is built in the evolved form of stave construction with two cross-timber arches on the lower level and has been interpreted as a hall for feasts/gatherings (Berg 1951). The Viklem farm's central position and status in Ørlandet suggest that it may well have held similar functions, and the two large buildings (House III and House IV) are, in our view, reasonable candidates for this purpose. The evolved form of stave construction permits buildings to be built higher than is possible with three-aisled stave construction (Olsen 2009). Terje Gansum (2008) believes this was the preferred method of construction for hall buildings.

Perhaps the most well-known use of the evolved form stave construction is in church buildings, and a religious function must always be considered when evaluating buildings in this construction style in Central Norway. The origins of the stave church are thought to be found in Pre-Christian, Scandinavian religious architecture (Lidén 1969; Sundqvist 2006; Grindkåsa 2007), an interpretation supported by the placement of several stave churches and stone churches on earlier cult sites. Stave constructions are also generally treated in discussions about church buildings and the development of the early wooden churches (e.g. Christie 1974; Hauglid 1989; Jensenius 2001). One building from the Central Norwegian house material can be said to be relevant to such a discussion, a single-aisled building discovered beneath the church at Mære, Nord-Trondelag. This is interpreted as an early wooden church built in the stave technique with support posts dug into the subsoil (Lidén 1969). Traces of older buildings, interpreted as Norse cult buildings, as well as some 20 gullgubber, among other finds, were also found on this site.

CONCLUSION

The archaeological building material which has been presented in this article seems to largely coincide with the known development of building traditions in northern Europe and southern Norway. At the beginning of the Late Iron Age one primarily finds three-aisled buildings serving either one, or a limited number of function (e.g. barn, smithy, outbuilding). This constitutes a break with the older tradition of multifunctional longhouses. From c. 900 AD, we see the introduction of single-aisled buildings to the material. We cannot see any typical longhouses as they are known in the Early Iron Age. Rather, we see several buildings built in varying styles and it appears relatively clear that each building has had some specific and limited function or functions. Viklem is a good example of how a farm can contain several buildings with unique functions, including the main dwelling, a pit-house with associated functions, and larger buildings possibly serving a feasting/gathering function, or some other key social function.

A general development from multifunctional longhouse to smaller buildings with one or few functions seem to have broad support amongst archaeologists (Åqvist 1992; Skov 1994; Skre 1996; Ramqvist 1998; Myhre 2002; Jensen 2004; Grindkåsa 2007; Martens 2009; Eriksen 2015). It is in our opinion possible to trace an incipient division of building function in Central Norway from about AD 600. This first appears in three-aisled buildings. Interestingly, the onset of this process coincides with the pervasive, larger-scale changes occurring in this phase. It appears that settlement structure changes at several places in Norway, Scandinavia and Northern Europe at the transition between the Early and Late Iron Ages (Göthberg 2000; Hamerow 2002; Myhre 2002; Grønnesby 2013).

This itself coincides with a series of radical changes in the archaeological material at the transition between the Migration and Merovingian Periods. It is in this context that it is suggested that over the course of the Merovingian Period, settlement appears to centralize around areas where modern farmsteads occur (Myhre 2002; Grønnesby 2013; Grønnesby and Heen-Pettersen 2015). Viewed in relation to rural building traditions, we believe that this transition corresponds to how farm buildings are organized and used, and that one has largely moved on from the traditional longhouse. Perhaps the longhouse was considered an older and no longer relevant farm structure?

Within the purely technical aspects of building construction, there are two innovations in the Late Iron Age and the Early Medieval Period. The introduction of single-aisled buildings in the evolved form of stave construction appears to have occurred around AD 900, across Northern Europe generally as well as in Norway (Christie 1974; Haug Lied 1989; Jensenius 2010). An important contribution of this article is that it has been possible to identify buildings in the evolved form of stave construction in rural areas, without preserved building remains. It is probable that most single-aisled buildings identified during standard machine topsoil stripping represent this type of construction. Towards the end of the Viking Period and into the Medieval Period cross-timbered buildings also appear in the material. Space limitations prevent a discussion of this building type in the present article, but it is worth noting that the appearance of this style coincides with the founding of medieval towns, where it was the preferred building tradition.

Carpentry and building construction are crafts that are difficult to verbalize. They exist in the form of practical knowledge expressed, among other experiences, through tools use, actions and gestures (Molander 1996; Molander 2004; Høgseth 2007). This can cause a certain conservativism in craft industries, and thus slower process of change. It is interesting to see that the evolved form of stave construction was introduced simultaneously in Central Norway, Scandinavia and Northern Europe. It is therefore difficult to use a traditional diffusion model for explaining the introduction of the technique. It is possible that it is not a coincidence that such a building traditions were spread in this particular period. The extensive contact over large areas typical of the Viking Period may have led to the rapid transfer of craft knowledge through social and economic interaction.

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POTENTIAL AND RECOMMENDATIONS: AGRARIAN BOTANICAL DATA FROM WESTERN NORWAY

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ABSTRACT

Palaeobotanical sampling in relation to legally required rescue excavations from agrarian contexts, has been carried out for half a century, with increased effort since the introduction of mechanical top-soil stripping from the 1990s. Development instigated excavations have increased our knowledge of the agricultural history of Western Norway, and highlighted the importance of systematic palaeobotanical sampling. Samples with charred seeds and other macroscopic plant remains, as well as in-context pollen samples, are only available through archaeological excavation. These data represent the primary data set for understanding the development of farming, cultivation and land-use practices.

Each site is a step towards greater knowledge of the development of agrarian societies. In this paper we present samples from house remains, cultivated fields and clearance cairns found in the collections of the University Museums of Bergen and Stavanger. The time periods covered are the Late Neolithic/Early Bronze Age (2200–1100 BC), Late Bronze Age (1100–500 BC), Early Iron Age (500 BC–AD 550) and Late Iron Age (AD 550–1030/50). In Rogaland, samples from house structures dominate the record, whereas samples from cultivated fields are more numerous further north. This is discussed in relation to natural resources and collection strategies, and gaps of knowledge related to archaeological periods and geographical distribution are identified. Effort has been made to highlight the potential of botanical sampling.

INTRODUCTION

The *Agrarian Network* is one of three subprojects associated with the *Joint Research* project, conducted by the University Museums of Norway. One of the aims of the *Joint Research* project was the activation of material/data collected during rescue excavations, as suggested by the Ministry of Education and Research (2008). Another aim was to strengthen the collaboration between the University Museums of Norway and emphasize the potential of the existing material. The *Agrarian Network* was designed to focus on the traces found within settlement areas. Specific focus has been placed on house structures, cultivation layers/soil profiles, and clearance cairns. Botanical samples from these contexts contain information on economy, land-use practices and environment of people in the past. The data produced from these samples are presented in publications, reports, or as lists in topographical archives at the respective museums together with lists of unprocessed samples. This paper, as a product of the *Agrarian Network*, will focus on samples collected from different agrarian contexts and their potential for future research by:

- Presenting a compilation of botanical material (both macro- and microfossil remains) sampled and stored from archaeological contexts in western Norway
- Giving a brief review of the differences in botanical sampling strategy and methods between the University Museums in Stavanger and Bergen
- Identifying knowledge gaps in western Norway related to the actual archaeological contexts, either geographically or chronologically
- Presenting the potential of the botanical material and providing some ideas and recommendations for the future

Archaeological data has been protected by law, and stored at the responsible institutions/museums, since the implementation of the Cultural Heritage Act in 1905. Samples for botanical analysis have, on the other hand, not automatically been collected and stored. At the University Museums of Bergen and Stavanger, interdisciplinary collaboration between archaeology and palaeobotany has been distinct and a broad competence within pollen analysis and plant macrofossil analysis in relation to archaeological excavations has developed. This has resulted in a large amount of samples in the storerooms of the respective museums available for further research.

Holmboe's (1927) analysis of plant macrofossil remains recovered during the excavation of the Oseberg ship in Vestfold was the first archaeobotanical investigation in Norway. His work was ahead of its time. In the late 1960s, sampling of charred seeds from the prehistoric farm at Ullandhaug demonstrated the potential of integrating archaeological and botanical data for investigating the agrarian economy (Lundberg 1972; Myhre 1980; Rindal 2011). In contrast to plant macrofossil analysis, pollen analysis became an important method for understanding the development of agriculture already by the 1940s and 50s.

Knut Fægri, one of the pioneers in developing the method, collaborated with archaeologists and contributed to our understanding of human impact on vegetation history, using pollen diagrams from lakes and bogs (Fægri 1940; 1944). The importance of integrated archaeological and palynological studies, although still based on peat and lake sediments, became clear through the work on early farming in Hordaland by Egil Bakka and Peter Emil Kaland (1971). With the excavation of the farm at Lurekalven in the 1970's, the potential of pollen analysis of agrarian contexts was shown (Kaland P.E. 1979; Kaland S. 1979; Kvamme 1982).

From the 1980's, an increased focus has been on the collection of pollen samples from archaeological sites in addition to sampling from bogs or lakes in their vicinity (see Høgestøl 1985; Danielsen et al. 2000; Prøsch-Danielsen 2005; 2011; Kaland 2009, for more detailed history and references therein). With the exception of Ullandhaug and a few others, it was not until the 1980s that archaeobotanical sampling in general, gradually became a regular part of rescue excavations of prehistoric sites in Norway, strongly associated with the adoption of mechanical topsoil stripping. There are, however, considerable differences between the museum districts regarding sampling practices, which is also visible in the following presentation of data from the University Museums of Bergen and Stavanger.

The histories of the two University Museums are quite different. Stavanger Museum was founded in 1877, but it was not until 1909, with the hiring of archaeologist A. Brøgger, that the Department of Archaeology and Cultural History was established. Sampling of botanical material started in 1967. In 1975, Archaeological Museum in Stavanger (AmS) was established as a separate museum which, in 2009, was fused with the University of Stavanger (UiS/AM). Bergens Museum was founded in 1825, with focus on collections both within cultural history and natural history from the very beginning. In 1914, the museum got five professorships, one of these being awarded to archaeologist H. Shetelig, another to botanist Jens Holmboe. With roots in Bergens Museum, the University of Bergen (UiB) was established in 1946, and the museum departments included in the faculties. Bergen Museum (BM) was re-established as a faculty within UiB in 1993, and since 2002, BM has been an independent unit with two scientific departments – Cultural History and Natural History. The name Bergen Museum was changed to University Museum of Bergen (UM) in 2011.

Today, one basic difference exists in the organization of archaeology and botany at the University Museums in Stavanger and Bergen – in Stavanger archaeologists and botanists are organised in common units, whereas these disciplines are organizationally separated in Bergen.

STUDY AREA AND ENVIRONMENT

Our study area covers the counties Rogaland, Hordaland, Sogn og Fjordane and Sunnmøre (southern part of Møre og Romsdal) (Fig. 1). This is the area for which the Museum of Archaeology/UiS and the University Museum of Bergen/UiB have administrative responsibilities. In the following we will use UiS/AM and UiB/UM for these institutions, independent of the institutional name at the time of sampling.

The bedrock is mainly of Precambrian age, both in the southern and northern study areas. Rocks of Caledonian orogeny constitute a broad field from the Boknafjord area to inner Hardanger and from the coast north of the Hardangerfjord to the inner Sognefjord. An area along the northwestern coast contains Devonian sedimentary rocks (Sigmond 1985; Moen 1999:Figs. 13 and 14). In the southern part of western Norway, areas with phyllite, mica schists and limestones contain nutrients valuable for plant growth while in the northern part the basement rocks are comprised of thrusted and folded gneiss and granites with poor nutrient value. However, it is the combination of the bedrock and overlying Quaternary deposits which determine the properties of the actual soil cover, and hence influence plant growth and suitability for agriculture. In our study area, thick Quaternary deposits are found especially in the Jæren region in Rogaland and western parts of Sunnmøre (Fig. 1) (Moen 1999:Fig. 15), areas that were ice-free during the Younger Dryas stage (Olsen et al. 2013:Fig. 22). Large terraces and moraines are also found within the fjord systems.

The data represent four climate sections; O3 (t and h), O2, O1, OC from west to east (Fig. 2) (Moen 1999:Fig. 88), where the inner part of the Sognefjord

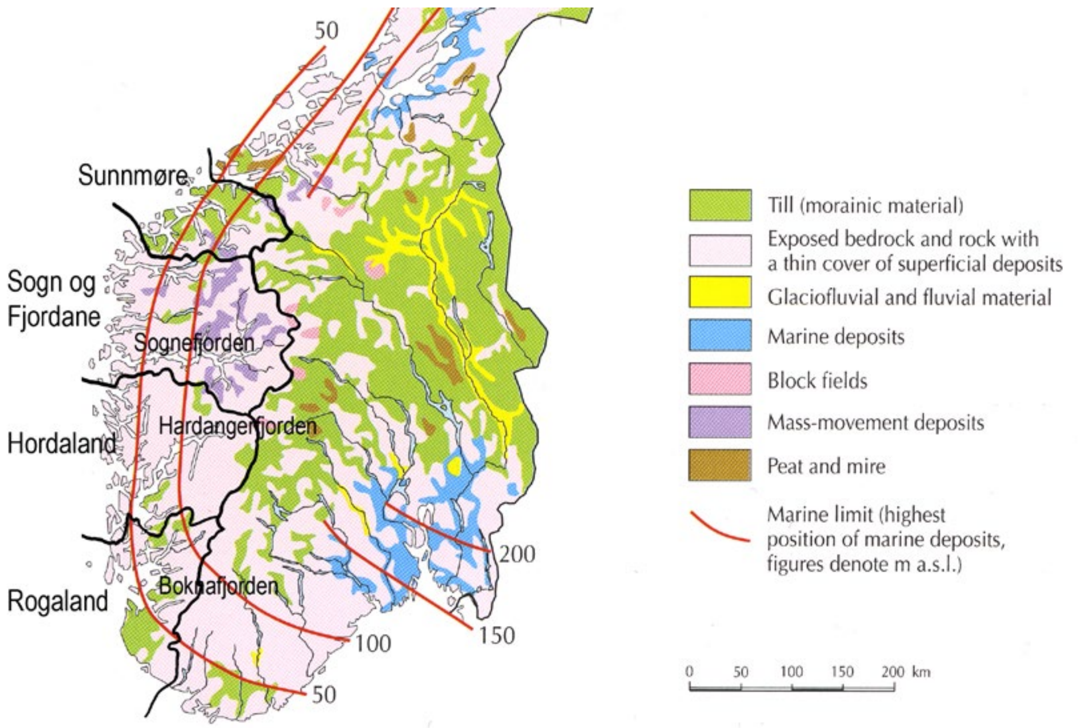


Figure 1. The study area in Norway (Sunnmøre, Sogn og Fjordane, Hordaland and Rogaland) with a coarse scaled map of the distribution of seven categories of superficial Quaternary deposits (from Moen 1999:Fig. 15). Note the areas with huge till moraines (green) along the coast of Jæren and Sunnmøre. The borders of the study area are outlined in bold.

belongs to the OC, indifferent section. These sections are mainly distinguished by differences in oceanity, where precipitation and winter temperature are decisive for the distribution of different plant species and vegetation zones, especially for plant species in the boreonemoral zone that occupy the coastal areas. The study area is further divided into five vegetation zones mainly corresponding to high summer temperatures. They are arranged from west to east and with rising latitudes and altitudes, the boreonemoral zone, southern boreal zone, middle boreal zone, northern boreal zone and the alpine zone (Figs. 3a and 3b) (Moen 1999:Figs. 70 and 71).

In Rogaland, the northern boreal and alpine zones constitute approximately 25 % of the area, rising to around 50 % in the counties further north. The vegetation zones define limits for where one can expect agrarian settlement. The most suitable areas for agriculture are found in Rogaland, where around 50 % of the area lies within the boreonemoral and southern boreal zones.

Our data set is restricted to the permanently settled lowland regions, containing houses, cultivated fields and clearance cairns, thus the summer farm/shieling region in the mountains and localities within the northern boreal (sub-alpine birch forest) and

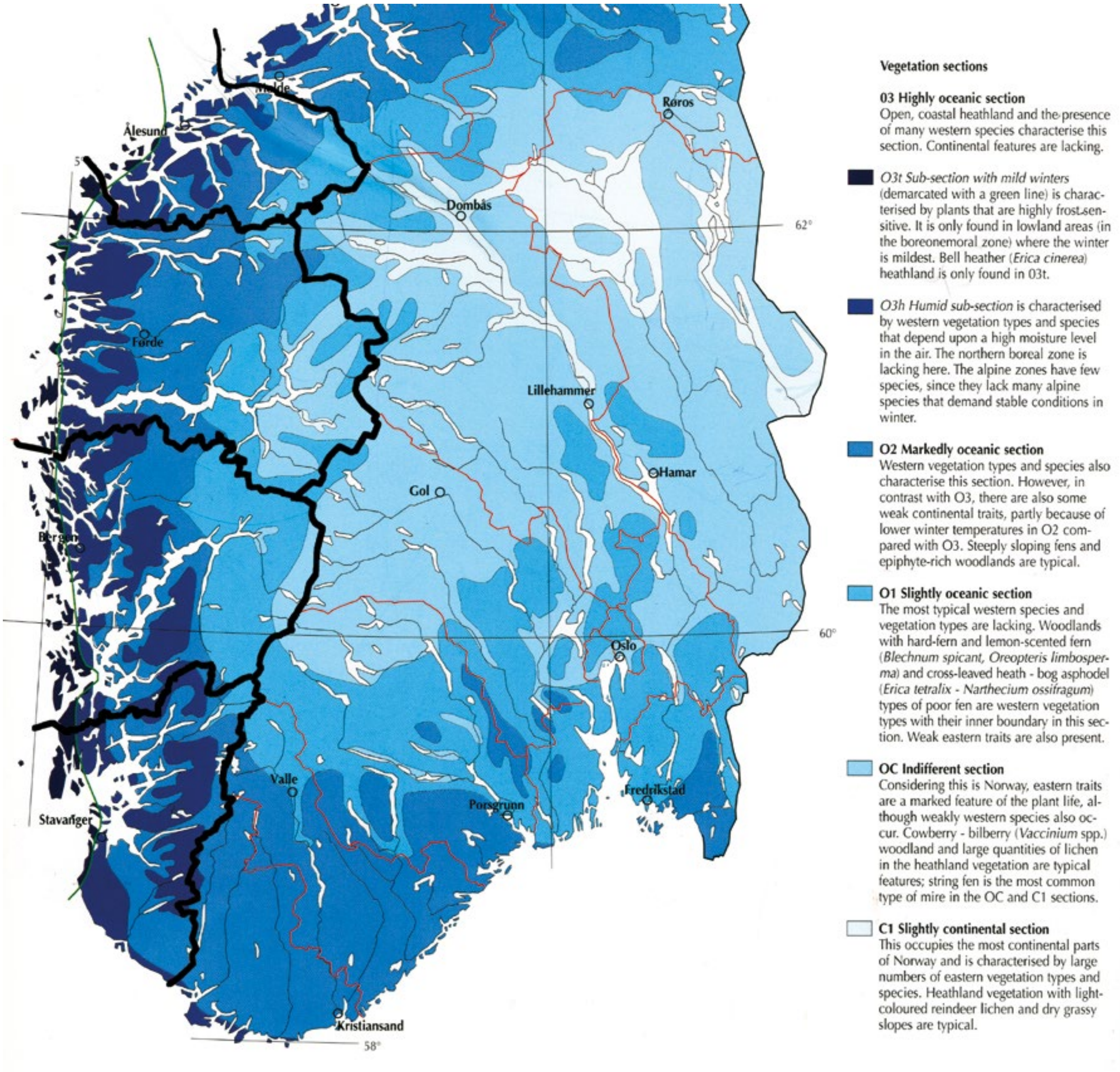
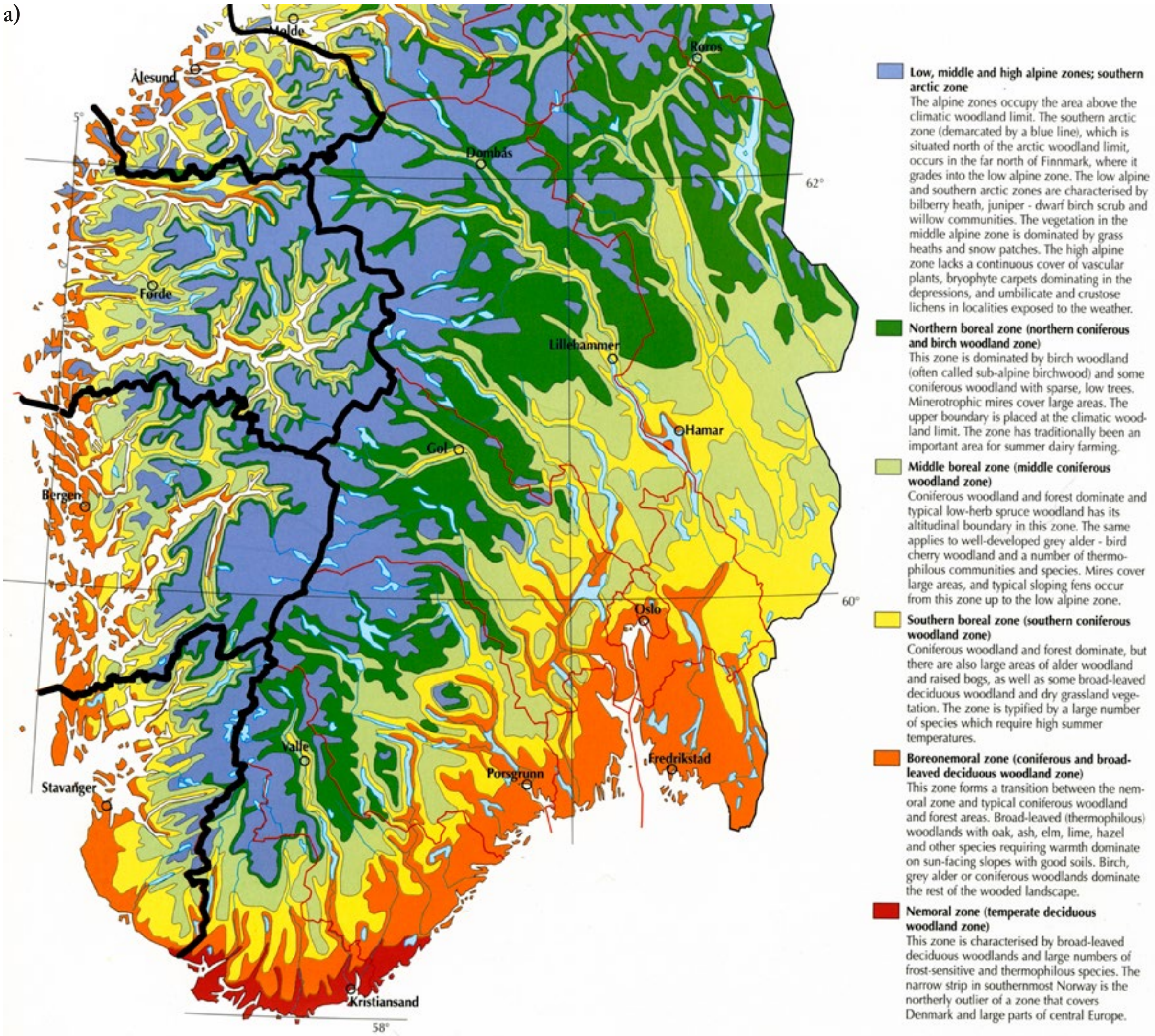


Figure 2. The distribution of the vegetation sections from the coast to inland in western Norway, primarily the result of differences in oceanity along a west-east gradient (from Moen 1999:Fig. 88). The borders of the study area are outlined in bold.

alpine zones are not included in this study. Fields from three localities in Suldal/Rogaland, today lying in summer farm areas, have, however, been included due to the likelihood that they were continuously settled in the Late Iron Age/Medieval Period.

MATERIAL AND METHODS

The data included are samples from agrarian monuments older than AD 1030/50 that are automatically protected by the Cultural Heritage Act (Act No. 50 § 4) (Ministry of Environment 1993), and include a)



b)

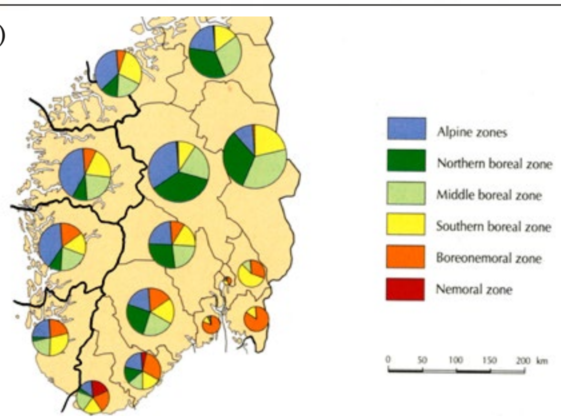


Figure 3. Vegetation zones in western Norway, depending on summer and winter temperature.

a) The distribution of the zones (from Moen 1999:Fig. 70).

b) The coverage of the different vegetation zones (from Moen 1999:Fig. 71). The borders of the study area are outlined in bold.

houses and traces of cultivation such as clearance cairns and fields, as well as lynchets and plough furrows. Fences and enclosures are omitted even though they define the limits between infield and outfield systems (*i.e.* Juhl 2002; Øye et al. 2002; Soltvedt et al. 2007). Pastoralism constituted an important part of agrarian subsistence, but is not included in this study. The topic, thoroughly described and compiled in Prøsch-Danielsen and Simonsen (2000a; 2000b); Hjelle et al. (2006) and in Høgestøl and Prøsch-Danielsen (2006), is one of the topics within the *Outfield Network* of the *Joint Research* project (Hjelle 2015).

The study covers palaeobotanical material, both micro- and macrofossil remains (Table 1, Fig. 4). For the Stavanger region all samples collected since 1968 have been included (see i.e. Bakkevig et al. 2002). With a few exceptions, the samples included from Bergen have all been collected since 1990. This covers the main period for excavations of agrarian contexts in the region (Diinhoff 2012). Samples collected by archaeologists and not included in the palaeobotanical collections may, however, be missing, meaning that the data presented from Bergen reflect a minimum.

The farm is traditionally seen as originating in the Iron Age, but indications of permanent agrarian settlements are found from the Late Neolithic/Early Bronze Age. The time interval studied in this paper is from 2200 BC to AD 1030/50. The data in Table 1 are separated into four periods and given as calibrated BC/AD:

Late Neolithic/Early Bronze Age (2200 – 1100 BC)
Late Bronze Age (1100 – 500 BC)
Early Iron Age (500 BC – AD 550)
Late Iron Age (AD 550 – 1030/1050)

SAMPLING STRATEGIES

Different strategies are used when sampling houses, cultivated fields and clearance cairns and sampling methods are not yet standardized.

Pollen and plant macrofossils supplement each other. Pollen provides information on the vegetation at the site and its surroundings, whereas plant macrofossil remains reflect plant species that have been present at the site. Herbs, cultivated plants and weeds are generally better represented by pollen than by seeds in prehistoric cultivation layers and clearance cairns. On the other hand, seeds can almost always be determined to species level and charred seeds may be the only preserved remains in sandy soils. Thus, using only one of the methods gives limited information – related to either the specific land-use activity on the site (e.g. cultivation, mowing and/or grazing) or the age of the monument/layers. In some cases, micro-morphological sampling has been included (Sageidet 2009; Fredh and Westling 2014), adding further information to the investigated deposit and insight into the activity which has taken place.

Houses

Though some examples have been typologically dated (marked x in Table 1 from Rogaland), the chronology of the houses in our data set is primarily based on radiocarbon dating of charred plant macrofossil remains (mainly cereals), charcoal or sheep/goat faeces from postholes, fireplaces, pits and floor layers (see also Bakkevig et al. 2002). In these features, plant macrofossil remains are often well preserved. At UiS/AM, material from all postholes in a house is generally sampled. This may occasionally be the case at UiB/UM, generally only a few postholes are sampled.

In the present paper, the numbers of samples taken from different features or from different parts of a posthole are not given. The number of samples from one house varies from a few to more than one hundred.

Cultivation layers, lynchets and clearance cairns

From clearance cairns, lynchets and other cultivation layers, sampling for either pollen analysis or a)

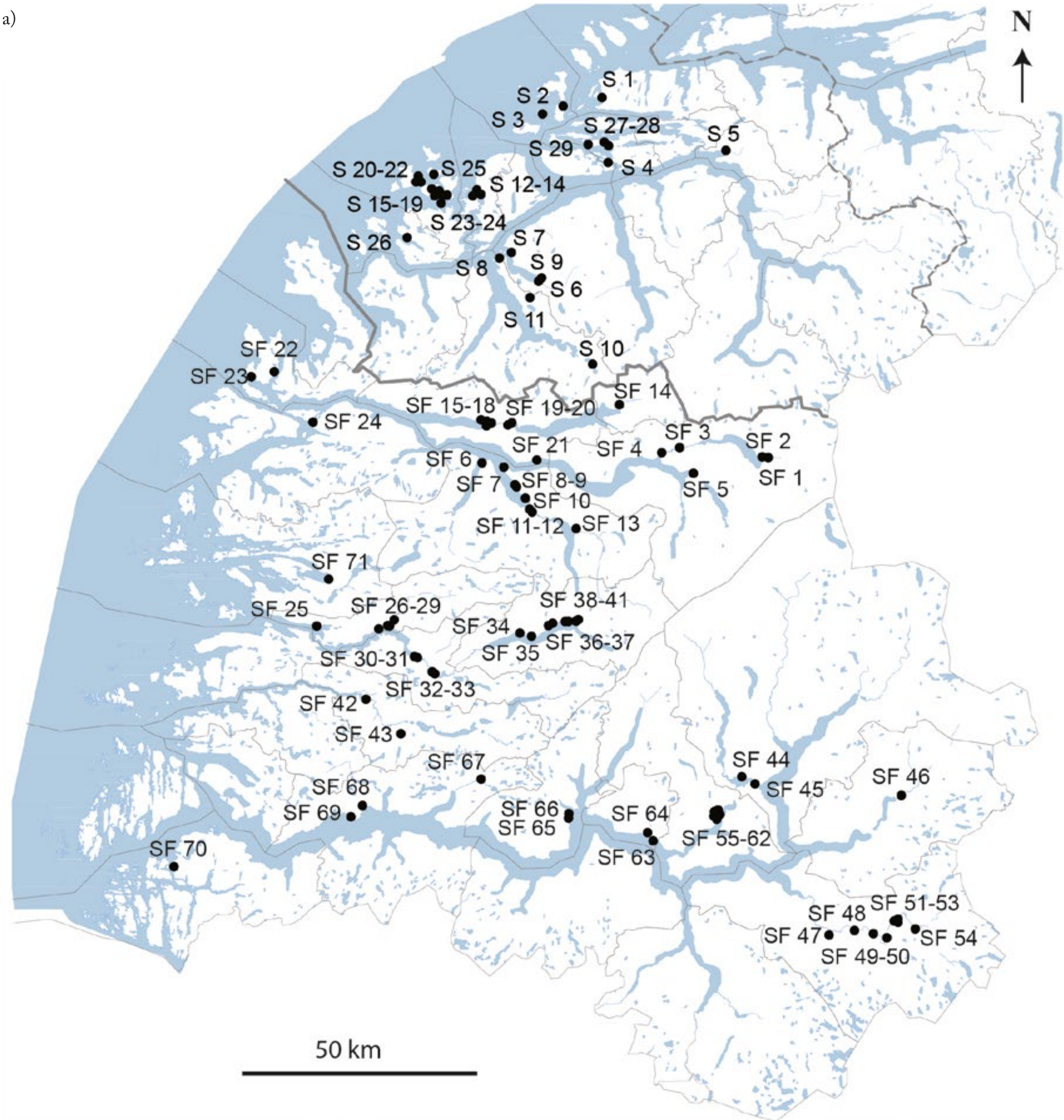
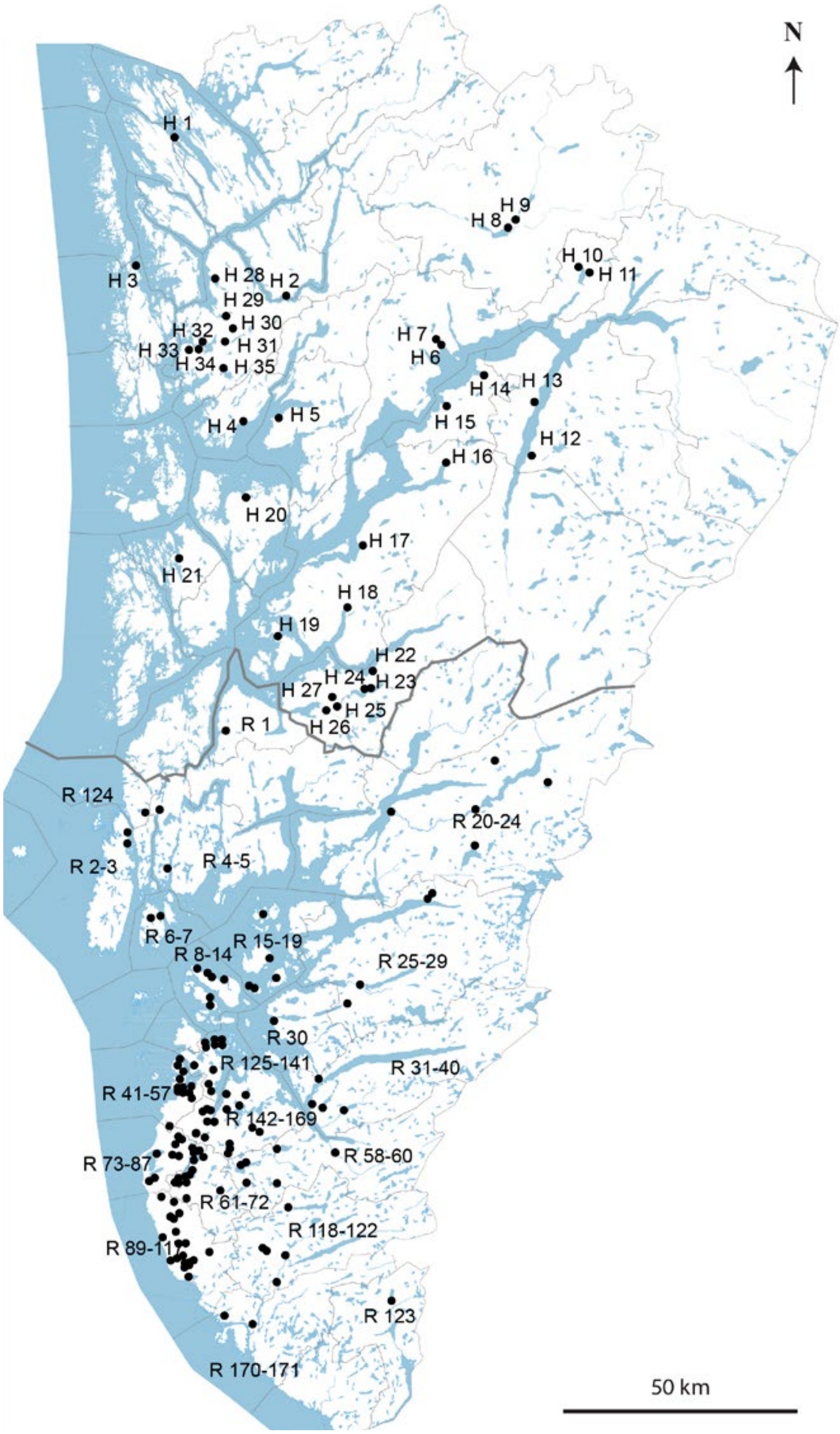


Figure 4. The four municipalities **a)** Møre og Romsdal (Sunnmøre, southern part), Sogn og Fjordane. **b)** Hordaland and Rogaland with all sites included in the investigation. Numbers refer to Table 1. Each site might represent one or several samples, and cover a specific or unknown archaeological period.

b)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R 8-14
R 15-19
R 25-29
R 30
R 125-141
R 31-40
R 41-57
R 142-169
R 73-87
R 58-60
R 61-72
R 118-122
R 89-117
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50 km

radiocarbon dating began prior to the introduction of top-soil stripping. The preferred method today is to combine sampling for pollen and plant macrofossils (charcoal or seeds) (see Table 1). However, it still happens that only series of pollen samples are taken with the addition of a few macro samples for radiocarbon dating, or even that only samples for radiocarbon dates are sampled from a profile of prehistoric cultivation layers.

Samples are most commonly taken from vertical sections through soil profiles representing a sequence of stratigraphical layers and occasionally horizontally from a particular stratigraphical layer after the removal of the overlying soil (Diinhof 2005; Hjelle 2005a; Overland and Hjelle 2007; 2013; Soltvedt et al. 2007; Soltvedt and Jensen 2011). To obtain more statistically robust data, and to identify potential sources of error such as vertical pollen transport, it is preferable to take several samples from each layer. The number of pollen/plant macrofossil samples taken from a profile may vary from less than ten to more than one hundred, and in cases of large fields several vertical series are often taken in order to allow for the investigation of spatial patterning. For clearance cairns, the most commonly used sampling strategy today is to sample material beneath the cairn/bottom layer (representing the period before the cairn was made), the bottom part of the in-fill (the first period of activity), and in some cases through the cairn and above. Pollen and plant macrofossil samples from all these levels provide information on the vegetation and activity before, during and after clearance, bringing in both the local and extra-local land-use perspective. Radiocarbon dates from the same samples may represent the maximum *(terminus post quem)* age, the time of activity and the minimum *(terminus ante quem)* age of the activity.

Chronologies are constructed using either directly dated plant macrofossil remains or charcoal from cultivation layers, or indirectly through stratigraphic relationships. Small plant macrofossil remains have become increasingly important as the AMS-dating method has developed.

RESULTS AND COMMENTS

Late Neolithic/Bronze Age (2200 BC – 1100 BC)

Rogaland

With the exception of Forsandmoen, where a total of 254 houses have been archaeologically excavated, plant macrofossils were sampled from all the investigated LN/EBA two- and three-aisled houses in Rogaland (Table 1, Fig. 5a). At Forsandmoen, only a selection of EBA houses were investigated for plant macrofossil remains (Bakkevig 1998; Prøsch-Danielsen and Soltvedt 2011). The majority of two-aisled houses are dated to the LN and transition to the EBA. Three-aisled houses began to appear in the EBA. Plant macrofossil analyses from some sites are published, but many unanalyzed samples still exist.

The agrarian structures like fields, lynchets and clearance cairns have been documented through plant macrofossils as well as pollen samples (Fig. 5b). In Rogaland, both houses and fields have been found in areas with a continuous cover of Quaternary deposits (Fig. 1). Fields are often identified by traces of plough marks. They vary in thickness and their horizontal limits are not always well defined. The sampled clearance cairns (29 in all) from the LN/EBA show the same distribution pattern as the houses. Fields and clearance cairns are in many cases dated to the LN/EBA transition. Most of the sites are situated within the vegetation sections O3t, O3h and O2 in Rogaland.

Hordaland, Sogn og Fjordane and Sunnmøre

Samples for radiocarbon dating have been collected from excavated two- and three-aisled houses in

Hordaland, Sogn og Fjordane and Sunnmøre (cf. Diinhoff 2012; Olsen 2012); samples for plant macrofossil analysis have been collected from 20 sites (Fig. 5a). In most cases only a selection of postholes has been sampled. In contrast to the relatively low number of sampled houses, prehistoric fields from 59 sites have been sampled for pollen and/or plant macrofossil analysis (Table 1, Fig. 5b). Cultivated fields are found in all climate zones (cf. Fig. 2), mostly on Quaternary deposits and terraces, mainly along the fjords or, especially in Sunnmøre, on islands along the coast. Plough marks may be found, and have been sampled in some cases. At some sites both house remains and cultivation layers were found, whilst in the relatively small excavated areas at other sites only cultivation layers were identified. As in Rogaland, several fields have been dated to the LN/EBA transition.

Late Bronze Age (1100 BC – 500 BC)

Rogaland

All houses from the LBA are three-aisled. Of the c. 26 LBA houses identified at Forsandmoen, only one of these (no. 99) was sampled for plant macrofossils (Bakkevig 1992). At Sørbø-Hove, a total of 90 houses have been investigated and plant macrofossil samples taken from four LBA houses (Bjørdal, Westling and Jensen in prep.). Sampled botanical remains from LBA houses are given in Fig. 6a.

Plant macrofossils and pollen were only sampled from eight sites with cultivation layers dated to the LBA (Fig. 6b). As expected, some of these fields are close to known settlement sites. In the Boknafjord basin, only fields, and not their corresponding houses, have been found. From this period, botanical remains from clearance cairns are sampled from the eastern part of low-lying Jæren, with a concentration in mid-Hå municipality.

Hordaland, Sogn og Fjordane and Sunnmøre

In Sogn og Fjordane, LBA houses from nine sites have been excavated and sampled for plant macrofossils. Only a small number of LBA houses have been sampled from Hordaland and Sunnmøre (Fig. 6a). A large number of cultivated fields (57 sites in total) have been sampled from the region, documenting the agrarian economy in this time period (Fig. 6b). Many sites show continuity from LN/EBA (Table 1). In a few cases pollen samples have been taken without plant macrofossil samples, but samples for radiocarbon dating exist in all cases.

Early Iron Age (500 BC – AD 550)

Rogaland

The investigation of Early Iron Age house complexes has a long tradition in Rogaland (Petersen 1933; 1936; 1951). Prior to 1967, none of the postholes in these houses were investigated for plant macrofossil remains. In 1967–68 the farm complex at Ullandhaug was investigated by Myhre (1973; 1980). Natural scientists became involved in this research excavation and plant macrofossil samples were taken for the first time from a house complex in Rogaland (Lundeberg 1972; Rindal 2011).

Between 1980 and 2009, a total of 243 EIA houses were excavated in Rogaland. Of these, plant macrofossil samples were taken from 92 houses. By 2014, the number of sampled houses had increased to 135 (Table 1, Fig. 7a). With the exception of Ullandhaug and Gausel, macrofossil samples from stonewalled houses are underrepresented. The majority of houses with sampled plant macrofossils are from Forsandmoen and the island Hundvåg. More recently excavated sites with numerous botanical samples include Gausel and Tasta in Stavanger, and Sørbø-Hove in Sandnes. Plant macrofossils are sampled from 20 % of the EIA houses excavated since 1967. Houses are

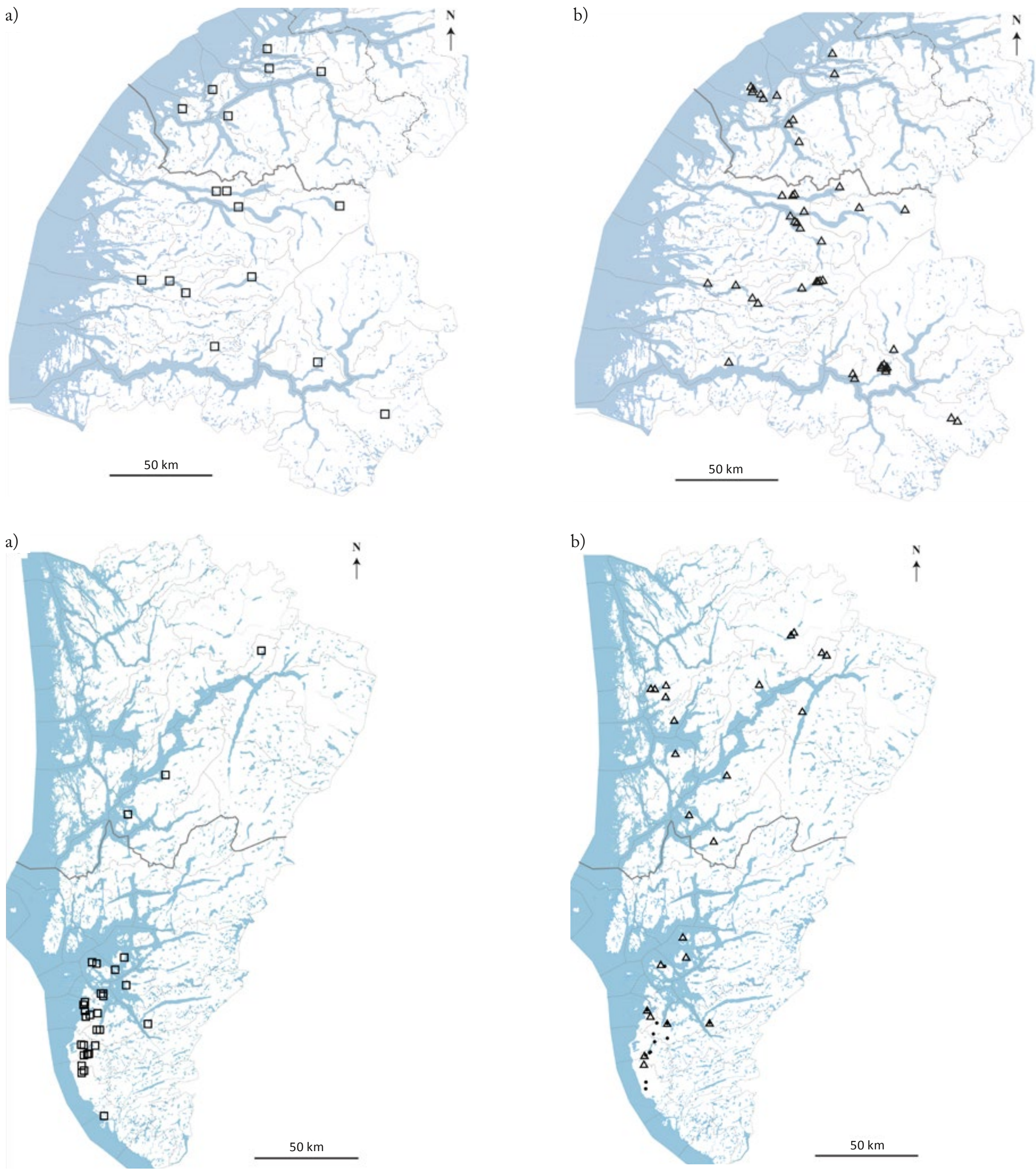

Figure 5. a) Collected botanical samples from house remains dated to Late Neolithic/Early Bronze Age (2200 BC-1100 BC). **b)** Collected botanical samples from fields (cultivation layers, open triangles) and clearance cairns (filled circle) dated to Late Neolithic/Early Bronze Age (2200 BC-1100 BC).

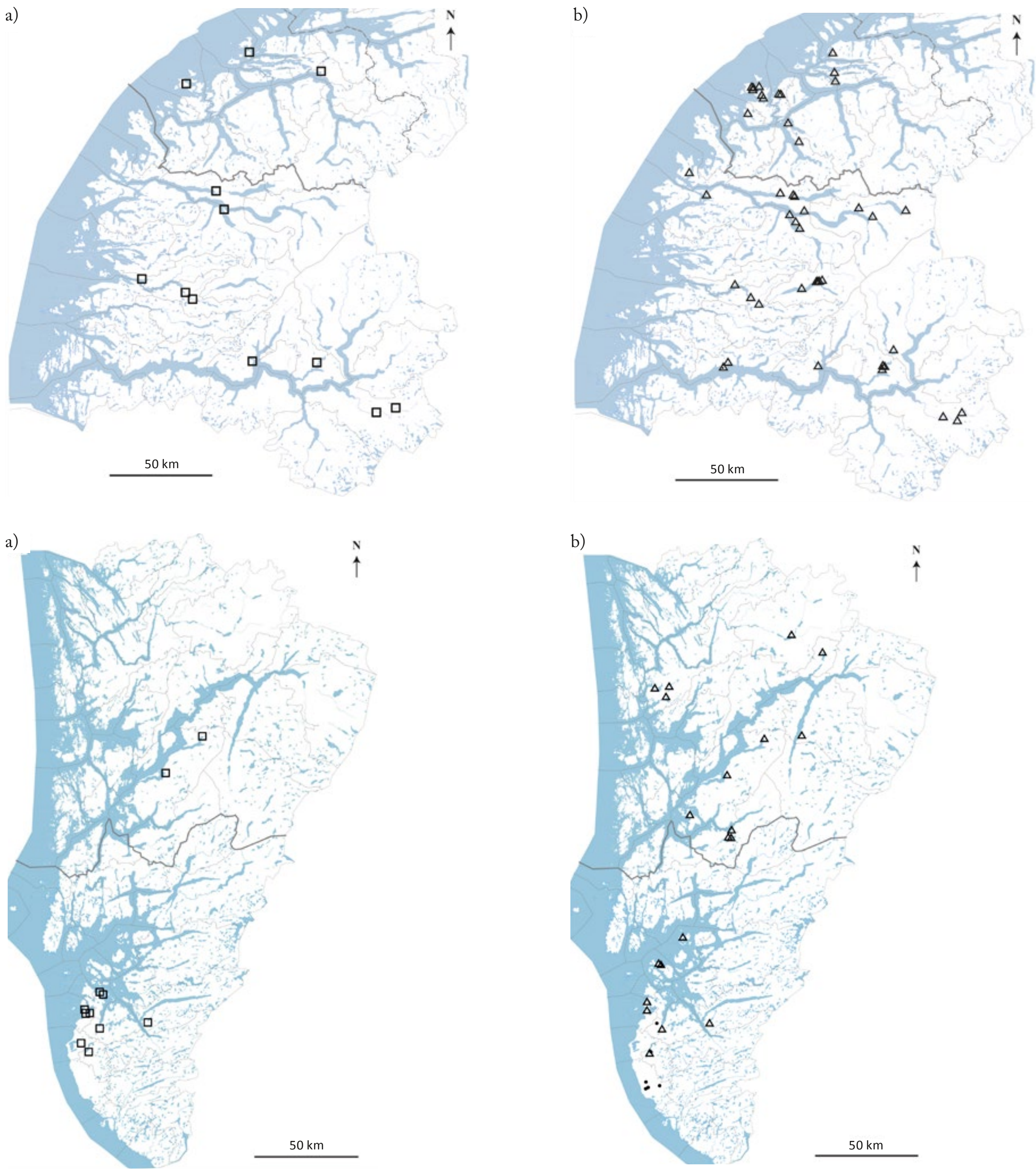

Figure 6. a) Collected botanical samples from house remains dated to Late Bronze Age (1100 BC-500 BC). **b)** Collected botanical samples from fields (cultivation layers, open triangles) and clearance cairns (filled circle) dated to Late Bronze Age (1100 BC-500 BC).

mostly found in the northern part of Jæren, close to urban areas.

Fields are distributed in the same areas as the houses (Fig. 7b), but have been detected at only some of the sites. Generally both pollen and plant macrofossils are sampled from each field. Investigated clearance cairns are concentrated to the southern part of Jæren, in Time and Hå municipality (Fig. 7b).

Hordaland, Sogn og Fjordane and Sunnmøre

In Hordaland, Sogn og Fjordane and Sunnmøre, the majority of palaeobotanical samples collected from house sites (32) belong to the EIA (Fig. 7a). Similarly, the majority of sites with cultivation layers (96) can be attributed to this phase (Fig. 7b). On many of the sites, multiple fields have been sampled, giving a more extensive sampling than the figures would otherwise indicate. In a few cases only pollen samples have been taken, but then supported by samples for radiocarbon dating.

Both houses and cultivation layers are documented by samples from the coast to the fjord region of Sunnmøre, whereas samples from the inland and fjord region dominate in Sogn og Fjordane and Hordaland. As in previous time periods, several samples come from the concentration of excavated sites in Sogndal in Sogn og Fjordane, the Nordfjord area (Eid and Gloppen), and from Herøy on the coast of Sunnmøre (Table 1).

Late Iron Age (AD 550 – AD 1030/50)

Rogaland

In Rogaland, plant macrofossil samples from this period have been taken from 50 houses distributed across 14 separate sites (Fig. 8a). Some of these sites show a continuity from the EIA to the LIA, i.e. at Skeie in Hundvåg, at Forsandmoen, at Gausel and Øvre Tasta in Stavanger and at Sørbø-Hove in Sandnes (Table 1). The number of buildings sampled per site varies. At some sites the number is around 4–6, while at Sørbø-Hove the number was increased to 14 buildings. They are mainly concentrated in the northern part of Jæren. A couple of sites, Marvikstykket in Sand and Førresbotn in Tysvær, are placed along maritime lines of communication north and northeast in the Boknafjord basin. No plant macrofossil samples from stonewalled houses are available for this period.

Botanical material (whether plant macrofossil samples, pollen samples or both) from fields related to the LIA has been sampled at seven sites (Fig. 8b). These sites are found throughout the region. Their find distribution seems to be more random and their distribution shows no trends. In 2001–2002, the Kvåle farm complex was studied in detail in order to reconstruct settlement, agriculture and land-use practises. During this investigation, several fields and lynchets were investigated. In total, seven fields or lynchets belonging to this time interval were recorded at Kvåle.

Hordaland, Sogn og Fjordane and Sunnmøre

The number of LIA sites with houses and cultivation layers sampled for plant macrofossil and/or pollen analysis is low compared to that of the Early Iron Age (Table 1, Figs. 8a and 8b). In Sunnmøre, only five sites with cultivated fields have been sampled, whereas house remains from three sites and cultivated fields from 14 sites have been sampled in Hordaland. In Sogn og Fjordane the data set is larger, and plant macrofossil samples exist from houses at 12 sites. Botanical samples from cultivated fields have been collected at 26 sites. The sites are spread east – west and north – south. Along the Sognefjord, sites are found from Gulen on the western coast to Lærdalen in the eastern fjord district, reflecting all climate regions.

SPATIAL DIFFERENCES IN NATURAL BOUNDARIES

The type of agriculture possible in a given area, as well as the visibility of cultural features in the landscape, are dictated by nature. The topography and climate as well as Quaternary deposits presented different challenges for agriculture within the study area. Climate has changed throughout the Holocene, with fluctuations both in precipitation and temperature, but with generally higher temperatures than today in the time period covered by this study, 2200 cal BC to AD 1030/50 (Nesje et al. 2005). Climate fluctuations influence where different crop species could have been cultivated and consequently where clusters of agrarian settlements are found. Today, the length of the growing season decreases northwards and eastwards (Moen 1999:Fig. 6), a pattern which likely applied in prehistory as well. The soil resources in Rogaland differs from those further north, as exemplified by the higher amount of Quaternary deposits (Fig. 1).

Late Neolithic two-aisled houses, and three-aisled houses of all periods, are connected to good soil/superficial deposits along the coast and on terraces along the fjords (Figs. 5a, 6a, 7a and 8a). In Rogaland, houses are found in regions with the strongest oceanic climate (O3 and O2), whereas further north they may also be found in areas of only slightly oceanic climate (O1, OC).

DIFFERENCES IN COLLECTION STRATEGIES BETWEEN THE TWO UNIVERSITY MUSEUMS

For both University Museums, the increased amount of botanical data from agrarian contexts since the 1990s can primarily be attributed to the introduction of top-soil stripping (Løken et al. 1996; Diinhoff 2012) where archaeological monuments not visible on the surface have been released for development. An additional factor is an increased number of excavations in centrally located areas with access to good topsoil. This is especially observed in expanding regions close to towns, due to house construction, road building and industrial development of areas formerly dedicated to agriculture. The sampling strategy and organization of the University Museums also play a significant role.

At UiS/AM, natural scientists have been members of the Ancient Heritage Committee in Rogaland since 1975, and have played a role in the planning of new development projects. Today natural scientists have an even more central role in the committee and comprise nearly half the staff. This has led to a focus on the sampling of natural scientific material. The situation in Rogaland stands in stark contrast to that which exists at UiB, where only archaeologists are members of the Ancient Heritage Committee and thus natural scientists have no formal input in the start of the planning process of new projects.

An additional factor which may influence collection strategies is distance. In Rogaland most archaeological sites are only a short distance from the museum in Stavanger. This is not the case in northern counties, where it can be both difficult and expensive to carry out one day fieldwork or *ad hoc* trips as one gets further away from the museum in Bergen.

Houses: An obvious difference between the University Museums is the higher number of houses sampled by Stavanger than by Bergen, as well as the higher number of samples from each house (not shown in Table 1). It must be highlighted that the data from Bergen is underrepresented in this paper. Without a specific budget for botany in the projects in question, collected samples have in some cases not been communicated to the botanists, and as a result are not included in the botanical data-bases. This will, however, not change the main pattern given by our study. There has traditionally been a higher focus on plant macrofossils in Stavanger, compared

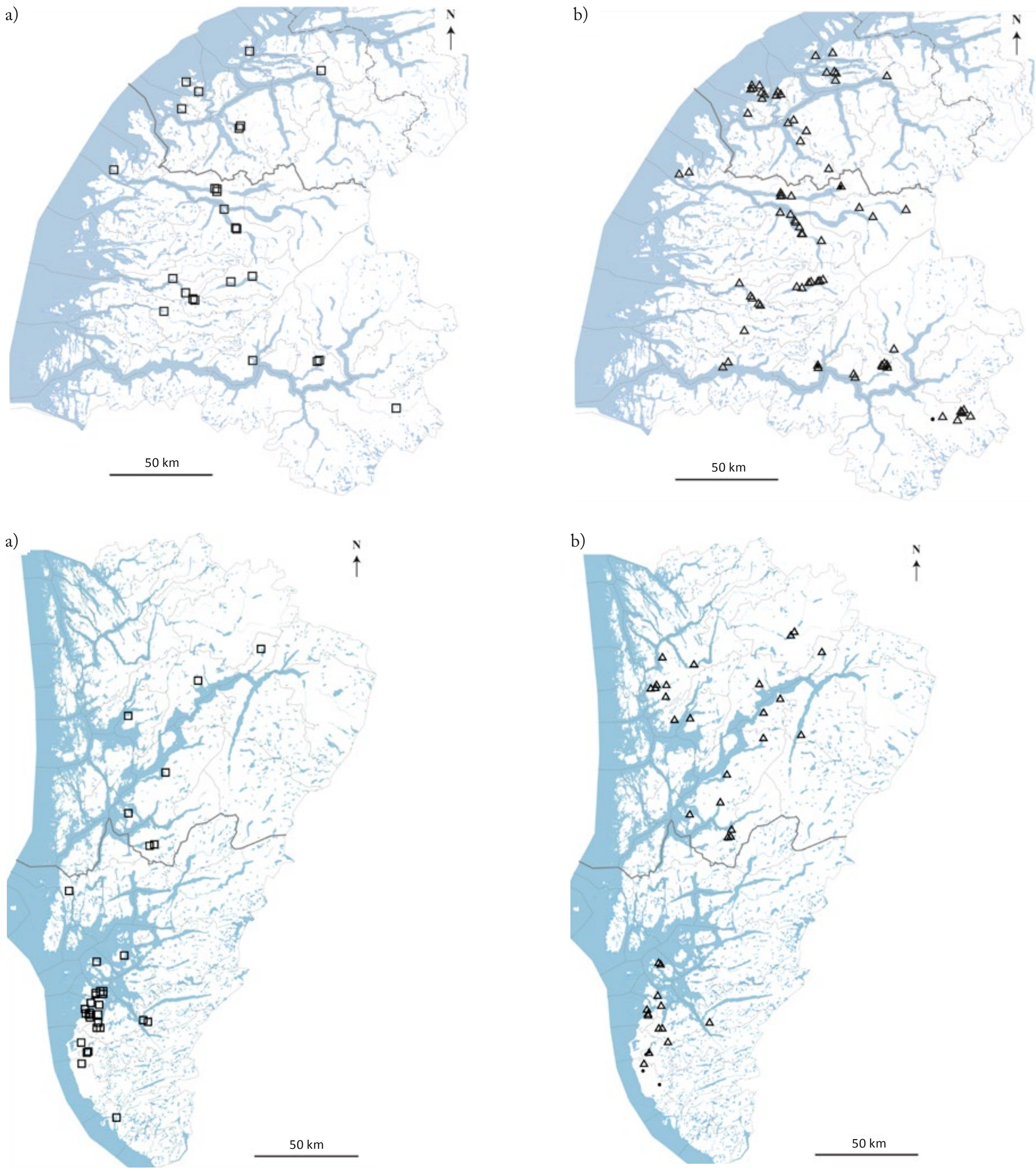

Figure 7. a) Collected botanical samples from house remains dated to Early Iron Age (500 BC – AD 550). **b)** Collected botanical samples from fields (cultivation layers, open triangles) and clearance cairns (filled circles) dated to Early Iron Age (500 BC – AD 550).

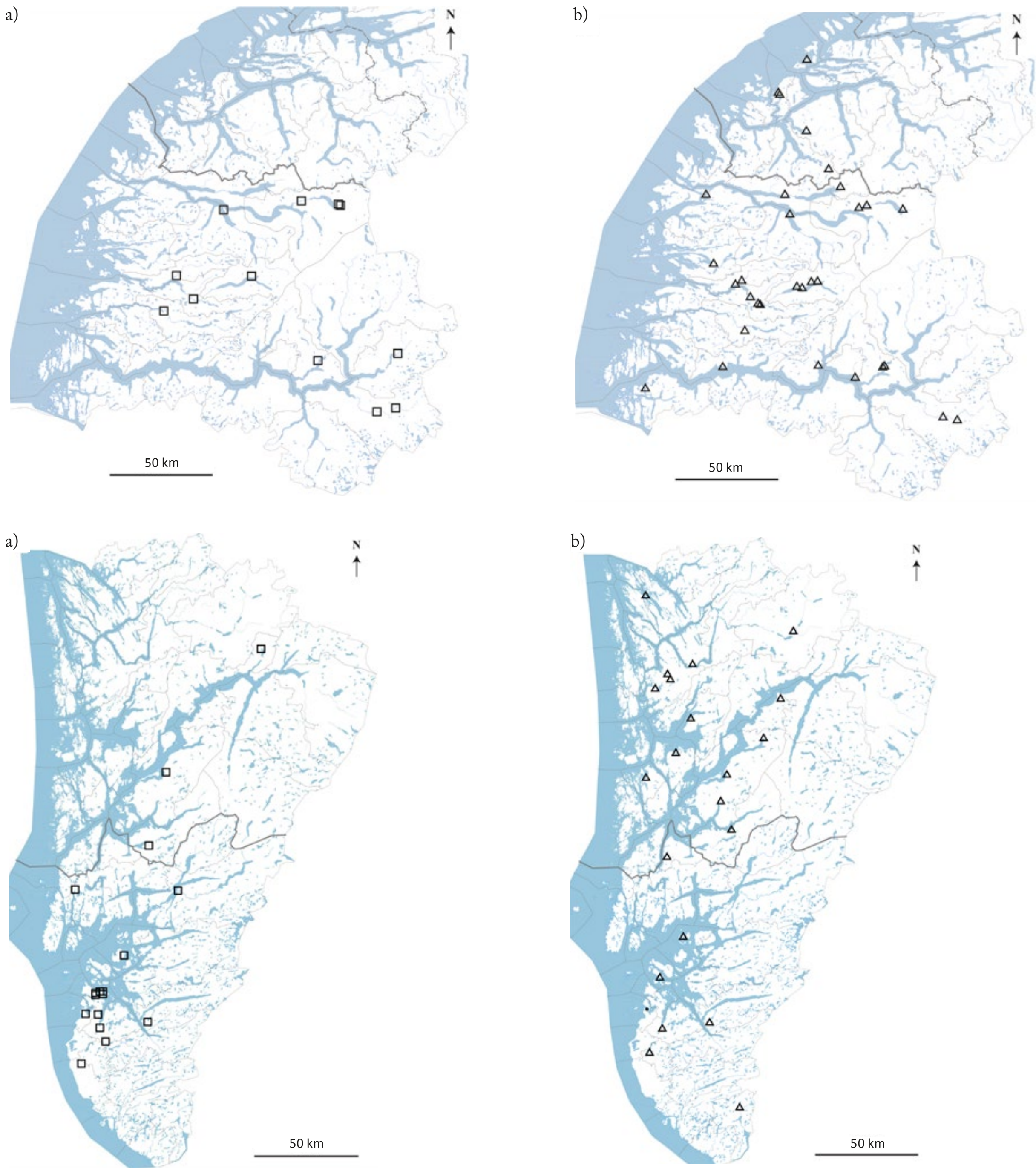

Figure 8. a) Collected botanical samples from house remains dated to Late Iron Age (AD 550 – AD 1030/50), **b)** Collected botanical samples from fields (cultivation layers, open triangles) and clearance cairns (filled circles) dated to Late Iron Age (AD 550 – AD 1030/50).

to the preference for pollen in Bergen. This can again be attributed to the different competences present at the institutions in the early 1990s.

In Bergen, all plant macrofossil remain fractions have been stored, whereas Stavanger stored only the large fraction (> 2 mm) until around 1989. This limits the potential of interpreting and comparing land-use practices, functions of houses etc. on samples sieved before 1990. At both institutions we have been facing a long process of development of sampling strategies and competence within palaeobotanical methodology and there is today no reason not to change towards a common strategy for the institutions.

Fields: There is a marked difference in topography from the flat low-lying Jæren in Rogaland to the spatially more limited areas of flat land and terraces suitable for cultivation along the fjords in Hordaland, Sogn og Fjordane and Sunnmøre. Continuous cultivation has, over time, resulted in the accumulation of ancient field layers. Due to steep terrain and heavy precipitation erosion often occur in the fjord areas of the northernmost counties. At several sites, especially along the Sognefjord, field layers have also been sealed by mass-movement deposits resulting in the isolation of cultivation phases. Thick layers are also found in flat areas by the coast, e.g. at Sunnmøre, reflecting different processes in building up these layers. Sampling from prehistoric cultivation layers have been more frequently carried out in the Bergen region than in Stavanger. However, intentional sampling from field layers has been practiced in Rogaland since 1980s (i.e. Line in Time from 1983), thus it appears that the differences in the number of sampled sites may reflect differential distribution of cultivated fields.

Clearance cairns: Visible fields of clearance cairns/and or cairns are characteristic elements in the landscape of Rogaland. Cairns have therefore been a focus of investigation of past agricultural practices (Prøsch-Danielsen 1999). Early sampling in Rogaland included only pollen samples, with limited possibilities for radiocarbon dating. The value of these samples for further studies is therefore limited. The lack of cairn fields further north is partly due to the limited distribution of unsorted morainic material (Fig. 1). Scattered cairns are found at excavations (Table 1) and clearance cairn fields do exist (Holm 2007; Overland and Hjelle 2007), but the focus on these has naturally been rather limited at the museum in Bergen.

POTENTIAL OF OUR DATA AND RECOMMENDATIONS

The overview shows that there is a large research potential in the palaeobotanical data. Different contexts and proxies (plant macrofossil remains or pollen) may be investigated on different spatial scales from a local site to gradients north-south and east-west along the coast of western Norway (see i.e. Prøsch-Danielsen and Soltvedt 2011; Hjelle et al. 2013). The fact that many plant species have their northern limit in Norway, emphasize the value of this material. The compilation of data from two of the University Museum districts opens the possibility for future comparative studies between larger regions with longer geographic, climatic and topographic gradients.

Archaeological priorities fluctuate. Over the course of the second half of the 20th century and into the new millennium, periods emphasizing the importance of natural sciences (e.g. the 1970s) have alternated with periods focusing on theoretical perspectives. The data show that there is a need for systematic sampling to protect data which will be otherwise lost, irrespective of the theoretical perspective of the time. In archaeology, one continues to excavate so as not to lose data which may provide knowledge of the past. The same must be the case for botanical samples from archaeological contexts.

New methods have developed, such as analysis of phytoliths, isotopes, and ancient DNA, as well as micromorphology and geochemistry, which have the potential to contribute to research questions in the future and some of these can exploit archived botanical data. The availability of samples is therefore important. However, some of these methods are inherently destructive, and the material undergoing analysis will not be available for future research, thus the "old" methods — plant macrofossil and pollen analysis — should remain important parts of palaeobotanical studies. A long history of development (e.g. improved microscopes which increase the taxonomic resolution of pollen and plant macrofossil remains, increased knowledge of non-pollen palynomorphs in pollen samples, taphonomic processes in soil as well as new knowledge on pollen productivity and dispersal characteristics) has led to an increase in the potential of these methods. Developments in quantitative methods have further increased the potential of these proxy data, by enabling the analysis of much larger data sets (e.g. Prøsch-Danielsen and Simonsen 1998; Simonsen and Prøsch-Danielsen 2005; Hjelle et al. 2013), and increasing our understanding of land use practices in the past (e.g. Hjelle 1999a; 2005a).

With improved methods and an increased amount of data, it is inevitable that research questions will continue to evolve, in turn demanding even larger amounts of high quality data. It is thus essential that the botanical data is evaluated in line with archaeological data and that the University Museums take the responsibility to continue sampling – otherwise a priceless source will be lost. Botanical and archaeological data should thus be given the same weight and attention. By having comparable data the projects may be seen as part of larger research programs, instead of individual projects.

In sampling from archaeological contexts, collaboration between archaeologists and palaeobotanists is important. Samples for plant macrofossil analysis may well be sampled by archaeologists, whereas owing to the risk of contamination, pollen samples should be sampled by those trained in palynology.

Plant macrofossil remains such as cereals and seeds of weeds or other herbs have increasingly been used for radiocarbon dating. Seeds and plant remains deposited in archaeological house structures are supposed to reflect the time of occupation (i.e. Engelmark 1985; Viklund 1998; Ranheden 1996; Engelmark et al. 1997; Gustafson 2005; Prøsch-Danielsen and Soltvedt 2011), and the dating of plant macrofossils has even made it possible to detect several activity phases within a house (Table 1). The advantage of these is that they represent one season, narrowing the actual time interval. However, one must keep in mind that available calibration curves are based on decadal data. The potential of contamination (e.g. through bioturbation) must also be considered. Experience from excavations also report that postholes are reused (e.g. Børsheim and Soltvedt 2002; Gjerpe 2008). Independent of dating a house – finds of cereals and weeds can be used to date agricultural activity at the site.

There is little consistency in the number of postholes sampled when excavating house structures. To be able to interpret different functions within a house, a full scale analysis of all postholes is optimal. Alternatively sampling of all postholes along the long axis of a house may be sufficient (Viklund 1998) and is recommended when full scale sampling is not possible.

Plant macrofossil remains and pollen from cereals and weeds can provide information on cultivated species and land-use practices, e.g. cutting straw at the top or the bottom, fertilization of fields, soil quality, cultivation in a rotation system or permanent cultivation. Pollen samples from fields provide information about the vegetation at the site and in the area surrounding the fields and may contribute to identification of, for example, grazed and mowed grasslands (Hjelle 1999a, 2005a).

A combination of botanical sampling, stratigraphic investigation, and identifying the extent of cultivation layers is needed in order to obtain a full understanding of the land-use practices that took place at a site. Through this, botanical data may contribute to archaeological questions such as technological improvements, land-use practices and house function, and may indirectly inform on animal husbandry through the presence of grazed or mowed communities as well as stalling. This represents the primary means for building an understanding of the development of cultivation. The focus of the present paper is samples taken from agrarian contexts within archaeological sites, but pollen analysis of lakes and bogs are also important for understanding these data in the context of the larger landscape. Moreover, compilation of the different data-sets allows for quantitative reconstructions of landscapes on different spatial scales (e.g. Mehl and Hjelle 2016).

Based on our review, we observe significant differences between the geographical areas and time periods represented in available samples. It may be that these are an accurate reflection of prehistoric agricultural practices, but it also indicates that sampling from houses should have high priority in Hordaland, Sogn og Fjordane and Sunnmøre, whereas the Late Bronze Age should have priority in Rogaland compared to other time periods. Both museum districts seem to have had a higher focus on the periods earlier than the Late Iron Age, limiting the potential for new research into the Late Iron Age using the existing data. Plant macrofossil samples have been taken from nearly all two-aisled houses in Rogaland and altogether around 50 houses from the LN/EBA have been sampled. With samples from only three house remains in Hordaland, eleven in Sogn og Fjordane and six from Sunnmøre, comparisons between geographical regions may be difficult. It is therefore important in the future to collect samples from all archaeological house contexts. On the other hand, cultivated fields are intensively sampled in Hordaland, Sogn og Fjordane and Sunnmøre, and less thoroughly sampled in Rogaland. House structures are often not found in the northern counties, probably due to the size of the investigated area. When large areas are excavated, there is a strong relation between fields and houses. With this in mind some of the differences in data from agrarian settlement contexts between the regions decrease.

In line with the development of strategic management plans for different archaeological time periods at the University Museums (incl. Oslo, Trondheim and Tromsø), a plan for botanical sampling should also be developed. We have not included zoological/osteological data in the present overview, but these too need to be included in future management plans. In this, principles for the budgeting and recommendations for standardized sampling strategies should be given, e.g. the size of the samples and sampling within clear, preferably sealed stratigraphical units. This work is in progress both in Bergen and Stavanger. Another important aspect for the future will be to integrate the palaeobotanical databases into MUSIT (the IT-infrastructure of the University Museums), providing a great tool for connecting archaeological and palaeobotanical data.

The University Museums experience an increased interest, both nationally and internationally in objects in their collections for use in research projects. At UiB/UM, the large osteological collections are widely used and in recent times several inquiries have also been received at UiS/AM. There is no reason to believe that the development will be different within botany. Clear policies for destructive analysis on the stored collections are therefore needed. The palaeobotanical data from archaeological contexts are unique data that inform on plants growing in Norway and on the lives of people in the past. They generate potential research projects both within botany and across disciplines, between institutions, between local and international scholars, and by both experienced researchers and university students. Continued sampling is therefore extremely important.

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Table 1. Sites with collected palaeobotanical samples stored in the University Museums at UiB and UiS according to county and municipality. Botanical macrofossil remains are labelled M, while pollen samples are labelled P. Some house structures are dated typologically (marked x in Rogaland) and some are undated. Some houses with different phases might be defined as separate houses at some localities, some as one house with several phases. The number of sampled contexts (houses, fields) is given from UiS/AM, whereas the presence of samples (marked with 'x') is given from UiB/UM. The data are separated into four periods: Late Neolithic/Early Bronze Age (2200 – 1100 BC), Late Bronze Age (1100 – 500 BC), Early Iron Age (500 BC – AD 550), Late Iron Age (AD 550 – 1030/1050). Material given dates covering two time periods are placed in the most probable time period.

Site no	Municipality no	Municipality	Site	Farm no	Excavated year	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LBA	LBA	LBA	LBA	LBA	EIA	EIA	EIA	EIA	EIA	LIA	LIA	LIA	LIA	LIA	UNDAT	UNDAT	UNDAT	UNDAT	UNDAT	References
						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
Sunnmøre																															
S1	1534	Haram	Søvik	175	2009	x		x					x					x										x			Halvorsen 2010b; Åstveit and Zinsli 2011
S2	1532	Giske	Gjøsundneset	7	2006						x					x		x										x			Lotsberg and Halvorsen 2010; Slinning 2008
S3	1532	Giske	Giske	127/2,23	2011																	x	x				x	x			Hatling 2012; Halvorsen and Hjelle 2011
S4	1531	Sula	Solevågseidet	61	1994								x					x													Torske 1995
S5	1523	Ørskog	Lånemarka, Sjøholt	97	2000, 2001	x					x					x		x										x			Hjelle (manus); Johannessen 2002
S6	1520	Ørsta	Mo	18	1999											x															Diinhoff 2002; Hjelle 2002
S7	1520	Ørsta	Håvoll	5/23,2	2004	x	x	x									x	x								x					Berge 2005a; Halvorsen 2005b
S8	1520	Ørsta	Ytre Steinnes	63/1	2007		x	x				x	x				x	x									x	x			Halvorsen 2008b; Olsen 2008
S9	1520	Ørsta	Velle	15/14	2011											x	x	x				x	x								Halvorsen 2012c; Østebø 2012a
S10	1519	Volda	Hjellbakke og Nes	50/1,51/3	2008												x	x				x	x				x	x			Danielsen and Halvorsen 2009
S11	1519	Volda	Aurstad	43/2,44/1	2013		x	x				x	x				x	x													Overland and Halvorsen 2014

Site no	Municipality no	Municipality	Site	Farm no	Excavated year	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LBA	LBA	LBA	LBA	LBA	EIA	EIA	EIA	EIA	EIA	LIA	LIA	LIA	LIA	LIA	UNDAT	UNDAT	UNDAT	UNDAT	UNDAT	References
						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
S12	1516	Ulstein	Krusham-maren	97	2002	x						x	x				x	x								x	x	x			Halvorsen and Hjelle 2004; Johannessen 2004; Hjelle et al. 2010
S13	1516	Ulstein	Saunnes	25/5	2004-2005		x	x				x	x				x	x				x	x								Knutzen and Simpson 2005, 2006; Overland 2014h
S14	1516	Ulstein	Osnessanden	7/775	2006												x	x				x	x								Diinhoff et al. 2014
S15	1515	Herøy	Mjølsteinne-set, Espeset	22/1,24	1992																							x			Kvamme 1994; Narmo 1994
S16	1515	Herøy	Eggesbønes	38	2002								x																		Hjelle and Halvorsen 2014
S17	1515	Herøy	Hjelmeset lok 4	45	2001								x					x													Overland 2014a
S18	1515	Herøy	Nedre Berge	29	2009													x									x	x			Melle and Simpson 2005
S19	1515	Herøy	Mjølstadneset lok 1	175	2001			x					x					x													Overland 2014a
S20	1515	Herøy	Teige I	5/14,16	2009		x	x				x	x				x	x									x	x			Halvorsen 2010e; Zinsli and Olsen 2010
S21	1515	Herøy	Teige II	5/14,16	2012		x	x			x	x	x			x	x	x													Halvorsen 2013c; Aander-aa 2013
S22	1515	Herøy	Kvalsund	4/12; 192	2010			x										x										x			Zinsli and Olsen 2011a
S23	1515	Herøy	Myklebust	37/496	2013		x	x																			x	x			Overland 2014d
S24	1515	Herøy	Hjelmeset	31/189	2014											x										x					Overland 2015 (3)
S25	1515	Herøy	Sævik	11/6	2014							x	x				x	x									x	x			Dahlberg and Linge 2015; Helvik and Overland 2015
S26	1514	Sande	Ytre Hauge	12	2003	x						x	x			x	x	x													Halvorsen 2011b
S27	1501	Ålesund	Åse	50/17,35,85,183	1999			x										x										x			Hjelle 2002b; Diinhoff 2002b
S28	1501	Ålesund	Åse Vest	50/1	2002	x	x					x					x														Halvorsen and Hjelle 2006b; Olsen 2006
S29	1501	Ålesund	Ratvika	23	2002												x	x													Overland 2014f
																			Sogn og Fjordane												
SF1	1448	Stryn	Hjelle	gbnr. 20/2	1994	x	x	x				x					x				x										Gundersen 1995; Soltvedt 1994
SF2	1448	Stryn	Hjelle	gbnr. 20/2	2002																x		x								Hjelle 2005c; Olsen 2005a
SF3	1448	Stryn	Kyrkjeeide	63/10	2005																x	x	x								Hjelle 2006c; Slinning 2006
SF4	1448	Stryn	Ytre Bø	59/1	2013		x	x				x	x				x	x				x	x								Aanderaa 2014a; Overland 2014e
SF5	1448	Stryn	Loen	70	2009							x	x				x	x									x	x			Halvorsen 2010f
SF6	1445	Gloppen	Eikenes	32/18	2000													x													Simpson 2004
SF7	1445	Gloppen	Hjelmeset og Sandane lufthavn	54/3	2007,2008		x	x			x	x	x			x	x	x			x	x	x						x		Halvorsen and Lotsberg 2009; Lotsberg 2009; Olsen 2010
SF8	1445	Gloppen	Vereide	59	1991-1993			x										x										x			Kvamme 1997
SF9	1445	Gloppen	Tystad	64/1	2009			x					x					x													Haugen and Diinhoff 2010b, Halvorsen 2010c
SF10	1445	Gloppen	Austrheim	69/5	2003		x	x				x	x				x	x													Halvorsen and Hjelle 2005; Olsen 2005b

Site no	Municipality no	Municipality	Site	Farm no	Excavated year	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LBA	LBA	LBA	LBA	LBA	EIA	EIA	EIA	EIA	EIA	LIA	LIA	LIA	LIA	LIA	UNDAT	UNDAT	UNDAT	UNDAT	UNDAT	References
						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
SF11	1445	Gloppen	Evebø	77/14,23	2000											x	x														Diinhoff 2006a
SF12	1445	Gloppen	Eide	76,77	2000											x	x	x													Diinhoff 2006b
SF13	1445	Gloppen	Reed	100/3	2014		x	x									x	x													Overland 2016a
SF14	1444	Hornindal	Lødemel	181/4,9	2009		x	x									x	x	x	x		x	x				x	x			Halvorsen 2012a
SF15	1443	Eid	Indre Skårhaug	42/1	2010, 2011		x	x				x	x				x	x													Halvorsen 2011a; Hatling and Olsen 2011
SF16	1443	Eid	Skaffarmarka, Lunden	44/4,330,530	2010											x		x													Zinsli and Diinhoff 2011
SF17	1443	Eid	Myklebust	44/31	1993											x															Olsen 1993; Soltvedt 1993
SF18	1443	Eid	Golvsengene	66	2007	x					x	x	x			x	x	x				x	x			x	x	x			Halvorsen 2009c
SF19	1443	Eid	Hjelle (Klokkar-garden - Hjelle)	52/7,4	2012		x	x				x	x				x	x									x	x			Halvorsen 2013a
SF20	1443	Eid	Hjelle	52/6,8	2004	x		x																							Halvorsen 2005c; Slinning 2005b
SF21	1443	Eid	Indre Henne	147/1	2003	x	x	x				x	x																		Hjelle and Halvorsen 2007; Olsen 2012
SF22	1439	Vågsøy	Amon-damarka	117	2011								x					x										x			Flogenfeldt and Diinhoff 2012; Halvorsen 2012e
SF23	1439	Vågsøy	Våge	136/6	2013											x		x													Diinhoff 2014; Halvorsen 2014
SF24	1438	Bremanger	Kolset	86/1	2009							x	x									x	x				x	x			Halvorsen and Overland 2010
SF25	1433	Naustdal	Engebø	31/1,2,3	1991	x	x	x			x																x	x			Hjelle 1992: Johnson 1992
SF26	1433	Naustdal	Sæla	96/2,4	2007	x		x														x	x				x	x			Halvorsen 2008d; Olsen and Tellefsen 2008
SF27	1433	Naustdal	Mallasvika	96/6	2009							x	x				x	x									x	x			Halvorsen 2010g; Zinsli 2010
SF28	1433	Naustdal	Gardsbøen	99/1	2006											x															Halvorsen 2007c: Johan-nessen 2010
SF29	1433	Naustdal	Løken	99/36	2007																x	x	x								Halvorsen 2008c; Olsen and Tellefsen 2009
SF30	1432	Førde	Hornesvika	gbnr. 20/2	2005												x	x				x	x								Berge 2006a; Hjelle 2006b
SF31	1432	Førde	Hornnes	gbnr. 20/7	1996	x	x	x			x	x	x			x	x	x													Diinhoff 1997; Kaland 1996
SF32	1432	Førde	Vie	43/7,8,18,..	2013		x	x			x	x	x			x	x	x			x	x	x				x	x			Aanderaa 2014c; Overland 2014b
SF33	1432	Førde	Sunde	58/2	2008											x	x	x				x	x				x	x			Halvorsen 2009a; Tellefsen 2009
SF34	1431	Jølster	Hegrenes, Ålhus	73/2	2009											x	x	x				x	x								Haugen and Diinhoff 2010a; Halvorsen 2010d
SF35	1431	Jølster	Bjørset	74/3	2014		x	x				x	x				x	x				x	x				x	x			Overland 2016b
SF36	1431	Jølster	Ytre Årdal	3/2,5	2014												x	x									x	x			Overland 2016b
SF37	1431	Jølster	Indre Årdal	4/1,3,6	2014												x	x				x	x				x	x			Overland 2016b
SF38	1431	Jølster	Helgheim	gbnr. 6/4	2014		x	x				x	x																		Overland 2016b
SF39	1431	Jølster	Hus	7/1,2,3,4	2014	x	x	x				x	x			x	x	x			x	x	x								Overland 2016b

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						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
SF40	1431	Jølster	Fyglastrand	gbnr. 8/1	2014		x	x				x	x				x	x													Overland 2016b
SF41	1431	Jølster	Haugen	9/1,15	2014		x	x				x	x				x	x									x	x			Overland 2016b
SF42	1430	Gaular	Osen gard	94/1	2001,2002											x					x										Diinhoff 2008
SF43	1430	Gaular	Birkeland, Sande	58/1	2012												x	x				x	x								Halvorsen and Overland 2013; Aanderaa and Olsen 2013
SF44	1426	Luster	Beheim	149/1,97	2012		x	x				x	x				x	x									x	x			Overland 2013a
SF45	1426	Luster	Solvorn	172	2009																						x	x			Halvorsen 2010h
SF46	1424	Årdal	Ytre Moa	9	2002																x										Hansen et al. 2003
SF47	1422	Lærdal	Rikheim	8	2002														x												Holm 2007; Overland and Hjelle 2007
SF48	1422	Lærdal	Bjørkum	gbnr. 3/2	2009							x	x				x	x			x	x	x			x	x	x			Halvorsen 2012b
SF49	1422	Lærdal	Fremre Øygarden	49/2	2000	x	x	x			x																x	x			Diinhoff 2007b; Hjelle and Overland 2008
SF50	1422	Lærdal	Kyrkjevoll	56/1	2005		x	x				x	x				x	x				x	x								Berge 2006b; Hjelle 2006a
SF51	1422	Lærdal	Berge	64/1	2005						x					x	x	x								x	x	x			Halvorsen 2007a; Knagenhjelm 2008
SF52	1422	Lærdal	Russland	62/2	2004-2005												x	x									x	x			Halvorsen 2007a; Knagenhjelm 2008
SF53	1422	Lærdal	Nygård	61/3	2005							x	x				x	x			x										Halvorsen 2007a; Knagenhjelm 2008
SF54	1422	Lærdal	Eråker	77/4	2004												x	x									x	x			Halvorsen 2007a; Knagenhjelm 2008
SF55	1420	Sogndal	Gurvin	gbnr. 25/2	2007							x	x				x	x									x	x			Halvorsen 2009b
SF56	1420	Sogndal	Bondevik	23/14	2007	x	x	x																			x	x			Halvorsen 2009b
SF57	1420	Sogndal	Kvålslid	23	1999			x					x					x													Hjelle 1999b; Hjelle 2005a
SF58	1420	Sogndal	Kvålslid Aust	23/4, 5	2004			x																			x	x			Hjelle 2005b; Slinning 2005a
SF59	1420	Sogndal	Kvåle	23	2003		x	x				x	x				x	x				x	x				x	x			Diinhoff 2005; Diinhoff and Hjelle in prep.
SF60	1420	Sogndal	Fosshagen	gbnr. 19/1	2013											x	x	x			x		x								Halvorsen and Overland 2014
SF61	1420	Sogndal	Rutlin	gbnr. 22/4	1997,1998		x	x			x	x	x			x	x	x	x	x							x	x			Diinhoff 2003; Hjelle 2003, 2005a
SF62	1420	Sogndal	Nedrehagen	gbnr. 64/4	2006			x																				x			Halvorsen 2008a; Olsen 2007b
SF63	1419	Leikanger	Njøs	24/20	1999		x	x									x	x				x	x								Hjelle 2001, 2005a; Johannesen 2001
SF64	1419	Leikanger	Henjum	17	2001			x										x								x		x		x	Overland 2016c
SF65	1418	Balestrand	Fjørestad	gbnr. 8/1	2000													x										x			Diinhoff 2001
SF66	1418	Balestrand	Bala	gbnr. 10/36	2010						x	x	x			x	x	x	x	x		x	x								Hjelle 2011; Zinsli and Olsen 2011c
SF67	1416	Høyanger	Ekrene	62/3,4	2011	x																									Bjørkli et al. 2013
SF68	1416	Høyanger	Norevik	gbnr. 26/3	2006		x	x				x	x				x	x													Halvorsen 2006; Tellefsen 2007

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						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
SF69	1416	Høyanger	Torvund	101/1,4	2006							x	x	x	x		x	x				x	x								Halvorsen 2006; Tellefsen 2007
SF70	1411	Gulen	Mjåneset	gbnr. 15/9	2005																		x					x			Hjelle 2007a; Slinning 2007a
SF71	1401	Flora	Eikefjord	55/1,2	1998																		x								Diinhoff 2000; Hjelle 2000
Hordaland																															
H1	1263	Lindås	Lurekalven	57	1975-1979																		x					x			Kvamme 1982
H2	1253	Osterøy	Havrå	68	1991, 1996													x					x					x			Hjelle 1999a; Øye et al. 2002
H3	1246	Fjell	Høybøen	26	1977																							x			Berge et al. 1978; Berge unpubl.
H4	1243	Os	Lurane	63/1	2012		x	x									x	x													Dahl and Ramstad 2013; Halvorsen 2013d
H5	1241	Fusa	Oppsal	34	2003											x	x	x				x	x			x	x	x			Halvorsen and Hjelle 2006a; Kristoffersen 2006
H6	1238	Kvam	Mikkjelsflaten	44/620	2002																						x	x			Overland and Halvorsen 2013
H7	1238	Kvam	Øvre Øystese	44/746	2013		x	x								x	x	x									x	x			Overland 2014c
H8	1235	Voss	Bavallsveien	54/1	2010		x	x				x	x				x	x									x	x			Halvorsen 2010i; Zinsli and Olsen 2011b
H9	1235	Voss	Gjerde	54	2012		x	x									x	x				x	x				x	x			Overland 2013b
H10	1234	Granvin	Seim	94/3, 95/1	2006	x	x	x				x	x			x	x	x			x					x	x	x			Halvorsen 2007b; Olsen 2007a
H11	1234	Granvin	Hollve	96/2	2012		x	x																			x	x			Halvorsen 2013f
H12	1231	Ullensvang	Segelgjerd	85/8	2000								x					x													Hjelle and Overland 2001
H13	1231	Ullensvang	Aga	64/3	2005			x																				x			Berge 2008
H14	1227	Jondal	Samland	5	2008												x	x				x	x				x	x			Mehl and Hjelle 2016
H15	1227	Jondal	Vik	31	2000													x										x			Randers and Hjelle in prep.
H16	1224	Kvinnherad	Flatebø	54/2	2005						x		x					x					x					x			Halvorsen and Hjelle 2007; Slinning 2007b
H17	1224	Kvinnherad	Jensajordet	82/5,183,202	2008	x	x	x			x	x	x			x	x	x			x	x	x				x	x			Halvorsen 2009d, unpubl.
H18	1224	Kvinnherad	Indre Matre	250	2003-2006													x					x					x			Hjelle 2007c; Zehetner 2007
H19	1224	Kvinnherad	Kvitevoll	198/1,2	2004	x	x	x				x	x			x	x	x								x	x	x			Engedal, Handeland, Kristoffersen 2006; Halvorsen 2007d
H20	1223	Tysnes	Nedre Gjerstad	95/57	2007			x															x								Danielsen 2008; Slinning and Simpson 2010
H21	1222	Fitjar	Fitjar innmark	65	1997																	x	x				x	x			Overland 1999; Overland and Hjelle 2009
H22	1211	Etne	Sævareid	117/5	1996								x					x										x			Hjelmtveit 1996; Hoftun 1996
H23	1211	Etne	Håland	52/4,53/4	1996								x					x					x								Hjelmtveit 1996; Hoftun 1996
H24	1211	Etne	Stordalstun-nelen	50/1	2012							x	x				x	x									x	x			Halvorsen and Helvik 2012a; Østebø 2012b
H25	1211	Etne	Etne sentrum	6/3	2013											x															Flognfeldt and Diinhoff 2014; Overland 2014g

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						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
H26	1211	Etne	Etnesjøen	9, 6	2013											x					x										Overland 2014i
H27	1211	Etne	Etne, Sørheims-moen	36/10	2001			x																							Overland and Hjelle 2001
H28	1201	Bergen	Vollane-Hau-gane	211, 216	2013												x	x													Aanderaa 2014b; Overland 2013c
H29	1201	Bergen	Årstadgeilen	163/103	2005																	x	x								Hjelle 2007b
H30	1201	Bergen	Indre Sædalen	7/2	2009																	x					x				Olsen and Olsen 2009
H31	1201	Bergen	Nattland	11/728	2009		x	x				x	x				x	x									x	x			Halvorsen 2010a
H32	1201	Bergen	Straume	21/4	2011-2012												x	x													Halvorsen 2012d; Melvær and Åstveit 2013
H33	1201	Bergen	Dolvik	34/2 mfl.	2004		x	x									x	x									x	x			Berge 2005b; Halvorsen 2005a
H34	1201	Bergen	Søreide	35,36,156,442	2012		x	x				x	x				x	x				x	x								Flognfeldt and Åstveit 2013; Halvorsen 2013b
H35	1201	Bergen	Hatlestad	82/21,225	2011		x	x				x	x				x	x									x	x			Halvorsen and Helvik 2012b
Rogaland																															
R1	1154	Vindafjord	Nedre Vik	331	2010																		1								Meling 2010
R2	1149	Karmøy	Avaldsnes	86	2011																										Not finished yet
R3	1149	Karmøy	Gunnarshaug (Torvastad)	143	2011																						3	3			Westling 2012a, 2012g
R4	1146	Tysvær	Odland	1	1998																						1	1	1	1	Journal nat.science UiS/AM
R5	1146	Tysvær	Førde	79	1978+2011																2									1	Westling 2012c; Bjørlo 2012
R6	1145	Bokn	Gunnarstad (Ulvågshau-gane)	24	1998																								3	3	UiS/AM Top. Arch.
R7	1145	Bokn	Sæbø (Føresvik)	9	2012																						1	1			Rogaland County Council
R8	1142	Rennesøy	Askje (Der Vest)	46	1981																		1							2	Journal nat.science UiS/AM
R9	1142	Rennesøy	Vaula	47	1985																									2	Høgestøl 1995
R10	1142	Rennesøy	Askje (Der Vest)	46	1989																									4	Høgestøl 1995
R11	1142	Rennesøy	Voll	4	1990	1																									Prøsch-Danielsen 1993; Soltvedt 2000
R12	1142	Rennesøy	Ertenstein	13	1990			1					1					1								x					Høgestøl 1995
R13	1142	Rennesøy	Sørbø	12	1990	1						1				2	1													1	Høgestøl 1995
R14	1142	Rennesøy	Austbø	22	1991					1																					Høgestøl 1995
R15	1141	Finnøy	Opsal (Storås-dalen/Fogn)	30	1977																							1			Journal nat.science UiS/AM
R16	1141	Finnøy	Østabø (Talgje)	43	1993	1																									Hemdorff 1993; Soltvedt 2000
R17	1141	Finnøy	Meling (Talgje)	42	1997																						2	2			UiS/AM Top. Arch. (Olsen 1997)

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						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
R18	1141	Finnøy	Hauskje, Haga (Judaberg/ Finnøy)	25,26	2011	1	1	1								1					1						1	1			Westling 2012b; Njøs Storvik 2012
R19	1141	Finnøy	Eik	67	2014		1	1				1	1									1	1								Jensen, Ahlqvist and Fredh 2015
R20	1134	Suldal	Vetrhus (Håvestølen)	57	1971																							1			Simonsen 1971
R21	1134	Suldal	Stråpa (Sandsa I)	31	1972																							1			Journal nat.science UiS/ AM
R22	1134	Suldal	Austarå (Øystøl, Ham-rabø)	52/2	1983																							1			Selsing et al. 1991
R23	1134	Suldal	Sand (Mar-vikstykket)	103	1999																4					2					UiS/AM Top. Arch. (Lia 2000)
R24	1134	Suldal	Kolbeinstveit	36	2002																					x					UiS/AM Top. Arch. (Meling 2002a)
R25	1133	Hjelmeland	Måland	133	1985																									4	Journal nat.science UiS/ AM
R26	1133	Hjelmeland	Nedre Hauga	30	1991																									3	Journal nat.science UiS/ AM
R27	1133	Hjelmeland	Øvre Hauge (Litlamo)	32	1998																								2	2	Journal nat.science UiS/ AM
R28	1133	Hjelmeland	Soppaland	138	2011																						1				Westling 2012d; Gil Bell 2012; Bjørdal 2007
R29	1133	Hjelmeland	Tjentland	137	2011																								1		Westling 2012d; Gil Bell 2012
R30	1130	Strand	Prestegarden (Løbrekk)	31	1986+87	2																					1	1	3	3	Løken 2009
R31	1129	Forsand	Forsand (For-sandmoen)	41	1979																							1			Journal nat.science UiS/ AM
R32	1129	Forsand	Forsand (For-sandmoen)	41	1983																							1			Hjelle 1984
R33	1129	Forsand	Berge (Laudal)	37	1990																					1					Journal nat.science UiS/ AM
R34	1129	Forsand	Berge	37	1994																					1					Journal nat.science UiS/ AM
R35	1129	Forsand	Forsand (For-sandmoen)	41	1995					1																					Prøsch-Danielsen 1996
R36	1129	Forsand	Levik	9	1997																								1	1	Journal nat.science UiS/ AM
R37	1129	Forsand	Løland	47	2007																					6					Gil Bell 2008
R38	1129	Forsand	Berge (Ber-gevik)	37	2013											1										6					Soltvedt in prep.
R39	1129	Forsand	Forsand (For-sandmoen)	41	1980-2007	3					1					32					4		1								Løken 1984, 1992; Løken et al 1996; Dahl 2008, 2009;Prøsch-Danielsen and Soltvedt 2011; Bakkevig 1991, 1992, 1995, 1998
R40	1129	Forsand	Forsand (For-sandmoen)	41	1985+86																							20			Prøsch-Danielsen 1988; Prøsch-Danielsen and Simonsen 1988
R41	1124	Sola	Litle Risa (Snøde)	8	1980																									2	Journal nat.science UiS/ AM
R42	1124	Sola	Byberg (By-bergsletten)	25	1983																									1	Journal nat.science UiS/ AM
R43	1124	Sola	Sømme	15	1985												1	1													Prøsch-Danielsen 1993
R44	1124	Sola	Røyneberg (Kidlings-berget)	35	1997	3					1																				UiS/AM Top. Arch. (IVAR); Hulth 1997a, 1997b

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						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
R45	1124	Sola	Skadberg (east)	32	1998																								2		Journal nat.science UiS/AM
R46	1124	Sola	Utsola	16	2001																					x	x				Journal nat.science UiS/AM; Tansøy 2001
R47	1124	Sola	Utsola	16	2007																					1	1				Rogaland County Council
R48	1124	Sola	Tjora (Bakertomta)	10	2008	9	6	6			1	2	2			2	5	5								3	7	7			Fyllingen and Armstrong 2012a, 2012b; Soltvedt and Jensen 2011
R49	1124	Sola	Røyneberg (Forus)	35	2009											x										4					Berge 2009
R50	1124	Sola	Skadberg (II)	32	2010											7											2	2			Soltvedt 2011; Bjørlo 2011a
R51	1124	Sola	Myklebust	3	2010	6				1	1	2	2			5									1	4					Overland 2012; Sandvik in prep; Dahl 2014
R52	1124	Sola	Skadberg (II)	32	2011																						2	2			Overland and Westling 2012a; Soltvedt 2011
R53	1124	Sola	Sømme (IV)	15	2013	1					2					4					2					3	1	1			Meling and Bel Gill in prep.
R54	1124	Sola	Sømme (I)	15	2013																						2	2			Ahlqvist and Fredh in prep.
R55	1124	Sola	Sømme (II)	15	2014												1	1													Fredh and Westling in prep.
R56	1124	Sola	Sande (Einargården)	33	2014		1	1								1															Ahlqvist and Fredh 2015; Aanderaa 2015
R57	1124	Sola	Jåsund	1	2010-2011	1																				x	1	1			Soltvedt and Jensen 2012; Fyllingen 2012, 2015b.
R58	1122	Gjesdal	Ytre Lima	9	1968																									1	Prøsch-Danielsen 1999
R59	1122	Gjesdal	Dirdal	78	1986																								1	1	UiS/AM Top. Arch.
R60	1122	Gjesdal	Eidland (Langevatn)	2	1996																									3	UiS/AM Top. Arch. (IVAR)
R61	1121	Time	Sæland (Lyngaland)	43	1974																									1	Journal nat. science UiS/AM
R62	1121	Time	Litle Oma	12	1979																							1		3	Journal nat. science UiS/AM
R63	1121	Time	Line	5	1983			1																							Journal nat.science UiS/AM
R64	1121	Time	Tegle	25	1986																									1	Journal nat.science UiS/AM
R65	1121	Time	Søra-Kalberg	29	1996																									2	Journal nat.science UiS/AM
R66	1121	Time	Mauland	63	2001																						1				Journal nat.science UiS/AM
R67	1121	Time	Norheim (Kvåle)	19	2001	4			7	7		1	1			x	1	1	2	2		7	6				15	11	4	4	Soltvedt et al. 2007
R68	1121	Time	Frøyland (Stemmen)	28	2007	2																									Bjørdal 2009
R69	1121	Time	Serikstad	20	2007																								2	2	Berge 2008
R70	1121	Time	Håland (Hålandsmarka)	4	2008				1	1									1	1									4		Dahl in prep.
R71	1121	Time	Håland (Re-Svertingstad)	4	2012	x																									Kvæstad 2012b; Westling 2012h
R72	1121	Time	Norheim	19	1996-1998	x			4	3	x			2	1	x													2	2	Juhl 1999, 2002; Bade 1997
R73	1120	Klepp	Stangaland (Håbakken west)	6	1969																									1	Prøsch-Danielsen 1999

Site no	Municipality no	Municipality	Site	Farm no	Excavated year	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LBA	LBA	LBA	LBA	LBA	EIA	EIA	EIA	EIA	EIA	LIA	LIA	LIA	LIA	LIA	UNDAT	UNDAT	UNDAT	UNDAT	UNDAT	References
						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
R74	1120	Klepp	Erga	30	1970																									1	Journal nat.science UiS/ AM
R75	1120	Klepp	Orstad	9	1978																									3	Journal nat.science UiS/ AM
R76	1120	Klepp	Gruda	3	1978																									3	Journal nat.science UiS/ AM
R77	1120	Klepp	Øvre Åse	36	1979																									1	Journal nat.science UiS/ AM
R78	1120	Klepp	Orstad (Håbakken)	9	1983					1																				2	UiS/AM Top. Arch. (Bysveen 1984)
R79	1120	Klepp	Orstad (Håbakken 13)	9	1986																									1	Journal nat.science UiS/ AM
R80	1120	Klepp	Øvra Øks-nevad	8	1996																								1	1	Journal nat.science UiS/ AM; Fyllingen 2008
R81	1120	Klepp	Orstad	9	1996				3	3																				x	Sageidet 2005a, 2005b, 2009
R82	1120	Klepp	Engelsvoll	10	2002																					x					Journal nat.science UiS/ AM
R83	1120	Klepp	Kleppe (Kleppe-varden)	1,6	2006						2					2												1	1	1	Dahl 2007; Bakkevig 2007a
R84	1120	Klepp	Kleppe (Kleppe-stemmen)	1	2007	2																									Berge 2007; Bakkevig 2008
R85	1120	Klepp	Nedre Øksnavad	7,1	2008																					2					Journal nat.science UiS/ AM
R86	1120	Klepp	Kleppe (kleppevarden west)	1	2013																										Ahlqvist and Fredh in prep
R87	1120	Klepp	Erga	30	2014																						1	1			Ahlqvist and Fredh in prep
R88	1119	Hå	Stavnheim	70	1970																									3	Journal nat.science UiS/ AM
R89	1119	Hå	Torland	24	1970																							1			Journal nat.science UiS/ AM
R90	1119	Hå	Høyland	5	1970																							1			Journal nat.science UiS/ AM
R91	1119	Hå	Vigrestad (Øygard)	77	1972																								1	1	Journal nat.science UiS/ AM
R92	1119	Hå	Nord-Hadland (Ødegård)	80	1972																									2	UiS/AM Top. Arch. (Danielsen 1984)
R93	1119	Hå	Nord-Hadland (Ødegård west)	80	1972																									1	UiS/AM Top. Arch. (Danielsen 1984)
R94	1119	Hå	Stavnheim	70	1970-1978																									6	Journal nat.science UiS/ AM
R95	1119	Hå	Bø	26	1979																									1	Journal nat.science UiS/ AM
R96	1119	Hå	Odland	57	1980																									1	Journal nat.science UiS/ AM
R97	1119	Hå	Voll	76	1981																									1	Journal nat.science UiS/ AM
R98	1119	Hå	Høyland	5	1981																									2	Journal nat.science UiS/ AM
R99	1119	Hå	Stavnheim	70	1981																							1			Journal nat.science UiS/ AM
R100	1119	Hå	Høyland	5	1981-1982																									3	Journal nat.science UiS/ AM

Site no	Municipality no	Municipality	Site	Farm no	Excavated year	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LBA	LBA	LBA	LBA	LBA	EIA	EIA	EIA	EIA	EIA	LIA	LIA	LIA	LIA	LIA	UNDAT	UNDAT	UNDAT	UNDAT	UNDAT	References
						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
R101	1119	Hå	Nord-Hadland/ Rugland (Krånå)	81,82	1983																									4	Journal nat.science UiS/ AM
R102	1119	Hå	Skretting	59	1983																									1	Journal nat.science UiS/ AM
R103	1119	Hå	Bø (Dalabekken9	26	1985																							1			Journal nat.science UiS/ AM
R104	1119	Hå	Bø	26	1995	x																				x	x	x			UiS/AM Top. Arch. (Soltvedt in prep.)
R105	1119	Hå	Auda-Motland	18	1996																							1			UiS/AM Top. Arch. (Lillehammer 1996, 2004)
R106	1119	Hå	Kvia	19	1996														1	1								1			Prøsch-Danielsen 2001
R107	1119	Hå	Ånestad	45	2007																								1		Bjørdal 2006
R108	1119	Hå	Bjorhaug	25	2007																								1	1	Journal nat.science UiS/ AM
R109	1119	Hå	Aniksdal	83	2008									1	1				←1?	←1											Prøsch-Danielsen and Fyllingsnes 2013
R110	1119	Hå	Mæland	68	2010				1	1				1	1																Jensen and Soltvedt 2011; Kjeldsen 2011
R111	1119	Hå	Kvia, Motland	19,2	2011	1																					1	1			Westling and Overland 2012; Bjørlo 2011b
R112	1119	Hå	Sæland	63	2012									1	1→																Overland and Westtling 2012b
R113	1119	Hå	Søyland	3	2012																										Ahlqvist and Fredh 2014; Dahl 2015
R114	1119	Hå	Bjorhaug/ Bøhagen	25, 26	2013	1	1	1								2	1	1			1										Fredh and Westling 2014; Fyllingen 2015a
R115	1119	Hå	Tjemsland Nordre (Tjemslands-marka)	53	2013				2	2				1	1													1			Fredh and Soltvedt 2014; Bortheim and Dahl 2014
R116	1119	Hå	Kverme (om-kjøringsvei Brusand)	108	2013																						1	1			Rogaland County Council
R117	1119	Hå	Hobberstad (Graødaland-Brattland R44)	40	2013																						1	1			Westling and Fredh 2014
R118	1114	Bjerkreim	Lakssvela	61	1978																									3	Journal nat.science UiS/ AM
R119	1114	Bjerkreim	Sagland	3	1983																									6	Journal nat.science UiS/ AM
R120	1114	Bjerkreim	Store Byrkjeland	1	1997																									1	Journal nat.science UiS/ AM
R121	1114	Bjerkreim	Slettabø	60	1996																								4	2	Journal nat.science UiS/ AM
R122	1114	Bjerkreim	Gjedreim	30	1999																									1	Journal nat.science UiS/ AM
R123	1112	Lund	Steinberg	38	1980																		1							1	Journal nat.science UiS/ AM
R124	1106	Haugesund	Fedjedalen	3	2010											1															Bjørdal 2011b; Jensen 2011
R125	1103	Stavanger	Ullandhaug	24	1968											3		1													Simonsen 1968; Lundeberg 1972; Myhre 1980; Rindal 2011
R126	1103	Stavanger	Jåttå	16	1997	1																				1					UiS/AM Top. Arch. (IVAR), Hulth 1997a, 1997b; Soltvedt 2005
R127	1103	Stavanger	Gausel (south)	14	1997											5										2					Børsheim and Soltvedt 2002

Site no	Municipality no	Municipality	Site	Farm no	Excavated year	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LBA	LBA	LBA	LBA	LBA	EIA	EIA	EIA	EIA	EIA	LIA	LIA	LIA	LIA	LIA	UNDAT	UNDAT	UNDAT	UNDAT	UNDAT	References
						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
R128	1103	Stavanger	Gausel (north)	14	1999											8					4					1	3	3	3	3	Børsheim and Soltvedt 2002; Solem 2001
R129	1103	Stavanger	Austbø (Krosshaug-Loen, Hundvåg)	7/26, 1049	1999	2					1→					5										1					Tsigaridas 2000; Tsigaridas and Skjelstad 2001; Sandvik 2001; Griffin 1999
R130	1103	Stavanger	Husabø (Hundvåg)	6/4	2000																					3					Aakvik 2000, 2001
R131	1103	Stavanger	Austbø (Hundvåg)	7/1	2002											2															Hemdorff 2006
R132	1103	Stavanger	Revheim	39	2004											1										x	x				Bakkevig 2007b; Bertheussen 2008
R133	1103	Stavanger	Tasta Nedre	29	2005																						1				Rogaland County Council
R134	1103	Stavanger	Tasta Øvre	28	2006											4	1	1			6					x	1	1			Armstrong and Kjeldsen 2008; Soltvedt and Enevoll 2009
R135	1103	Stavanger	Jåttå	16	2007																								3	3	UiS/AM Top. Arch. (IVAR)
R136	1103	Stavanger	Tasta nedre	29	2010											4					1					5					Sandvik et al 2011, 2012; Bjørdal 2012
R137	1103	Stavanger	Lunde nordre (Austre Åmøy)	2	2010											1										x					Bjørdal 2011a
R138	1103	Stavanger	Lunde (Hundvåg)	4	2013	2										1					1										Pedersen 2013; Soltvedt 2014
R139	1103	Stavanger	Austbø (Hundvåg)	7	1987-1990	2					1										1					1					Gjerland 1989; UiS/AM Top. Arch (Sandvik 1999); Juhl 2001
R140	1103	Stavanger	Skeie (Hundvåg)	5	1997-1998	1					2					4					4										Skare 1998; Tsigaridas 1997a, 1997b,1998; Griffin and Sandvik 2000
R141	1103	Stavanger	Austbø (Hundvåg)	7/ 2	2000-2001											2											1				Meling 2006
R142	1102	Sandnes	Krågedal (Heiavodl)	18	1974																									1	Journal nat.science UiS/AM
R143	1102	Sandnes	Tjessem	27	1976																									2	Journal nat.science UiS/AM
R144	1102	Sandnes	Stokka (Stokkaheia)	67	1978																									1	Journal nat.science UiS/AM
R145	1102	Sandnes	Stokka	67	1978																									5	Journal nat.science UiS/AM
R146	1102	Sandnes	Hove	44	1978																									1	Journal nat.science UiS/AM
R147	1102	Sandnes	Bjelland	103	1980																									3	Journal nat.science UiS/AM
R148	1102	Sandnes	Hogstad	105	1980																									1	Journal nat.science UiS/AM
R149	1102	Sandnes	Lura (Ripsbærstraen)	69	1981																									7	Journal nat.science UiS/AM
R150	1102	Sandnes	Stokka	67	1983																									4	Journal nat.science UiS/AM
R151	1102	Sandnes	Lura (Rossaland)	69	1985																							2		1	Journal nat.science UiS/AM
R152	1102	Sandnes	Lura (Fridtun)	69	1986																								2	2	Journal nat.science UiS/AM
R153	1102	Sandnes	Sporaland	15	1988																									3	Journal nat.science UiS/AM
R154	1102	Sandnes	Soma	65	1996				5	4																					UiS/AM Top. Arch. (IVAR)
R155	1102	Sandnes	Skjæveland	52	1996				2	2				1	1														10	5	Gunnarsdottir 1997; UiS/AM Top. Arch. (IVAR)

Site no	Municipality no	Municipality	Site	Farm no	Excavated year	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LN/EBA	LBA	LBA	LBA	LBA	LBA	EIA	EIA	EIA	EIA	EIA	LIA	LIA	LIA	LIA	LIA	UNDAT	UNDAT	UNDAT	UNDAT	UNDAT	References
						Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	Houses M	Fields M	Fields P	Clea. cairns M	Clear. cairns P	
R156	1102	Sandnes	Årsvoll	64	1996																									3	UiS/AM Top. Arch. (IVAR); Sageidet 1997
R157	1102	Sandnes	Sørbø (Sørbøtunet)	45	1998	1						1	1			3	1?	1?									1	1			Sandvik 1999a
R158	1102	Sandnes	Skeiane (Sandve)	40	1998	1					1					2	1									1					Pilskog 1998a, 1998b; Berntsen and Pilskog 1998; Sandvik 1999b
R159	1102	Sandnes	Figgve Rossåsen)	29	2002												1				x								1	1	Meling 2002b
R160	1102	Sandnes	Figgve	29	2003																						1	1			Meling, Sandvik and Nærøy 2004
R161	1102	Sandnes	Lura	69	2003											2										3	3	3			Berge 2004
R162	1102	Sandnes	Espeland (Vindheia)	26	2004				1	1																			3	3	UiS/AM Top. Arch.
R163	1102	Sandnes	Lunde	47	2004																					4					Hafsaas 2005
R164	1102	Sandnes	Vatne	37	2008		1	1	2	2																					Jensen et al. 2009
R165	1102	Sandnes	Sørbø	45	2009	x										1	1	1								1			1	1	Dugstad 2011; Soltvedt and Jensen 2010
R166	1102	Sandnes	Dale	95	2010																						x				Rogaland County Council
R167	1102	Sandnes	Hove, Sørbø	44/45	2011						4					26					14	1	1			8	1	1			Bjørdal 2014; Bjørdal, Jensen and Westling in prep.
R168	1102	Sandnes	Aase (I and II)	46	2012	x																									Kvæstad 2012a; Westling 2012e, 2012f; Overland and Westling 2012c
R169	1102	Sandnes	Vagle	51	2012																						2	2			Rogaland County Council, Journal nat. Science UiS/AM
R170	1101	Eigersund	Hafsøy (Høgevollen)	46	1995											6															UiS/AM Top. Arch. (Soltvedt)
R171	1101	Eigersund	Hellvik	60	2008	1																									Zinsli 2009; Sandvik and Jensen 2009

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