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Expanding Horizons

Settlement Patterns and Outfield Land Use in the Norse North Atlantic

Dawn Elise Mooney, Lísabet Guðmundsdóttir, Barbro Dahl, Howell Roberts and Morten Ramstad (eds.)

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The wood artefacts on the left side are from Borgund, Norway while the artefacts on the right side are from Norse Greenlandic sites.

Contents

List of authors

Irene Baug
Department of Archaeology, History, Cultural Studies and Religion,
University of Bergen (UiB),
P.O. Box 7805,
5020 Bergen, Norway
irene.baug@uib.no

Douglas J. Bolender
Fiske Center for Archaeological Research,
University of Massachusetts Boston,
100 Morrissey Blvd,
Boston, MA 02125, USA
douglas.bolender@umb.edu

Susanne Busengdal
Møre and Romsdal County Council,
Julsundvegen 9,
6412 Molde, Norway
susanne.iren.busengdal@mrfylke.nov

Kathryn A. Catlin
Department of Chemistry and Geosciences,
Jacksonville State University,
Martin Hall, 700 Pelham Road North,
Jacksonville, AL 36265, USA
kcatlin@jsu.edu

Writing of this article was carried out while the author was employed by the Institute at Brown for Environment and Society, Brown University, 85 Waterman St, Providence, RI 02912, USA

Barbro Dahl
Museum of Archaeology,
University of Stavanger (UiS),
4036 Stavanger, Norway
barbro.dahl@uis.no

Solveig Roti Dahl
Rogaland County Council,
Arkitekt Eckhoffsgate 1,
4010 Stavanger, Norway
solveig.roti.dahl@rogfk.no

Kristoffer Dahle
Møre and Romsdal County Council,
Julsundvegen 9,
6412 Molde, Norway
kristoffer.dahle@mrfylke.no

Lísabet Guðmundsdóttir
Department of Archaeology,
University of Iceland,
Sæmundargata 2,
102 Reykjavík, Iceland
lisabetgud@gmail.com

Ramona Harrison
Department of Archaeology, History, Cultural Studies and Religion,
University of Bergen (UiB),
Postboks 7805,
5020 Bergen, Norway
ramona.harrison@uib.no

Kari Loe Hjelle
University Museum of Bergen,
University of Bergen (UiB),
Postboks 7800,
5020 Bergen, Norway
kari.hjelle@uib.no

Dawn Elise Mooney
Museum of Archaeology,
University of Stavanger (UiS),
4036 Stavanger, Norway
dawn.e.mooney@uis.no

Therese Nesset
University Museum of Bergen,
University of Bergen (UiB),
Postboks 7800,
5020 Bergen, Norway
therese.nesset@uib.no

Élie Pinta
Institut d'Art et d'Archéologie,
Université Paris 1 Panthéon-Sorbonne,
3 rue Michelet,
75006 Paris, France
elie.pinta@gmail.com

Lisbeth Prøsch-Danielsen
Museum of Archaeology,
University of Stavanger (UiS),
4036 Stavanger, Norway
lisbeth.prosch-danielsen@uis.no

Morten Ramstad
University Museum of Bergen,
University of Bergen (UiB),
Postboks 7800,
5020 Bergen, Norway
morten.ramstad@uib.no

Jennica Einebrant Svensson
Rogaland County Council,
Arkitekt Eckhoffsgate 1,
4010 Stavanger, Norway
jennica.einebrant.svensson@rogfk.no

Preface

This volume stems from the Expanding Horizons project, which began in 2018. The project was funded by a Workshop Grant from the Joint Committee for Nordic Research Councils in the Humanities and Social Sciences (NOS-HS), held by Orri Vésteinsson, Ramona Harrison, and Christian Koch Madsen. Funding was awarded for two workshops, as well as a subsequent publication of the material presented. Workshop organisation and grant administration were carried out by Morten Ramstad, Lísabet Guðmundsdóttir, Howell Roberts, Barbro Dahl, Birna Lárusdóttir, and Dawn Elise Mooney. The workshops gave researchers and practitioners from across the North Atlantic region an opportunity to forge new connections with each other, not only through academic presentations but also through shared experiences of archaeological sites, standing Medieval structures and their surrounding landscapes.

The first Expanding Horizons meeting took place in Norway, on June 1st–4th 2018. The program began in Bergen with a tour of the city's Medieval sites, led by Prof. Gitte Hansen, before travelling to Mo in Modalen for two days of presentations and discussions. The workshop was attended by 36 participants, 27 of whom gave presentations on topics including archaeological survey in mountain regions, driftwood, seaweed, stone, birds and feathers, and fishing and marine mammals. The two-day seminar was followed by an excursion visiting sites including the stave churches at Borgund, Hopperstad and Kaupanger, the Viking trading sites at Kaupanger and Lærdal, and Norway's oldest secular wooden building, Finnesloftet in Voss, built around AD 1300. In between archaeological sites, the excursion also took in the dramatic fjord landscape of western Norway. Here and in Iceland, both the upstanding structures and their surrounding landscape should be seen as key actors in the development of the settlement and subsistence practices discussed in this volume.

Just under a year later, on April 25th–28th 2019, the Expanding Horizons group met again in Iceland. Forty-one participants gathered in Brjánsstaðir for two more days of talks and discussions. While the first workshop had a main focus on remote wild resources, the second focused on settlement and land-use patterns, agricultural practices, and trade and exchange. Again, the workshop concluded with an excursion to local archaeological sites. Attendees visited the episcopal manor farm and church at Skálholt, the reconstructed Viking Age house at Stöng in Þjórsárdalur, the caves at Ægissíðuhellir, the archaeological site at the manor farm Oddi and the preserved medieval turf-built farm and museum at Keldur. Photographs of the participants of both workshops are presented on the following pages.

Partly due to the ongoing coronavirus pandemic, more time than anticipated has passed between these meetings and the publication of this volume. We thank the authors for their patience, and for their outstanding contributions to the archaeology of western Norway and the Norse North Atlantic diaspora. We are also very grateful to our colleagues who assisted the editors in the peer review of this volume. Lastly, we thank you, the reader, and we hope that you find inspiration in the papers presented here.

Stavanger/Reykjavík/Bergen, Spring 2022

Dawn Elise Mooney, Lísabet Guðmundsdóttir, Barbro Dahl, Howell Roberts and Morten Ramstad

Attendees of the first Expanding Horizons workshop at Mo in Modalen, June 2018.
Back row, left to right: Jennica Einebrant Svensson, Garðar Guðmundsson, Even Bjørdal, Orri Vésteinsson, Morten Ramstad, Jørgen Rosvold, James Barrett, Gísli Pálsson, Michael Nielsen, Christian Koch Madsen, Konrad Smiarowski, Howell Magnus Roberts, Ragnar Orten Lie; Middle row, left to right: Solveig Roti Dahl, Brita Hope, Ragnheiður Gló Gylfadóttir, Kristoffer Dahle, Douglas Bolender, Håkan Petersson; Front row, left to right: Mjöll Snæsdóttir, Birna Lárusdóttir, Lilja Laufey Davíðsdóttir, Irene Baug, Kristin Ilves, Jørn Henriksen, Kathryn Catlin, Lilja Björk Pálsdóttir, Gitte Hansen, Kristborg Þórsdóttir, Élie Pinta, Dawn Elise Mooney, Lísabet Guðmundsdóttir, Sólveig Guðmundsdóttir Beck, Ramona Harrison. *Photo: Kathryn Catlin.*

Attendees of the second Expanding Horizons workshop at Brjánsstaðir, April 2019.
Back row, left to right: Howell Magnus Roberts, Morten Ramstad, Kjetil Loftsgarden, Kristoffer Dahle, Douglas Bolender, Ragnheiður Gló Gylfadóttir, Hildur Gestsdóttir, Michael Nielsen, Orri Vésteinsson, Jennica Einebrant Svensson, Trond Meling, Knut Paasche, Anja Roth Niemi, Knut Andreas Bergsvik, Símun Arge; Middle row, left to right: Guðrún Alda Gísladóttir, Brita Hope, Håkan Petersson, Kathryn Catlin, Even Bjørdal, Ragnheiður Traustadóttir, Élie Pinta, Solveig Roti Dahl, Per Christian Underhaug; Front row, left to right: Kristborg Þórsdóttir, Sólveig Guðmundsdóttir Beck, Guðmundur Ólafsson, Gitte Hansen, Mjöll Snæsdóttir, Lisbeth Prøsch-Danielsen, Kari Loe Hjelle, Irene Baug, Christian Koch Madsen, Ramona Harrison, Barbro Dahl, Dawn Elise Mooney, Thomas Birch, Lísabet Guðmundsdóttir, Jørn Henriksen. *Photo: Lísabet Guðmundsdóttir.*

Dawn Elise Mooney, Lísabet Guðmundsdóttir, Barbro Dahl, Howell Roberts and Morten Ramstad

Expanding Horizons in North Atlantic Archaeology

Introduction

From the 9th century AD onwards, Norse migration resulted in the spread across the North Atlantic of cultural traits originating in Norway. Although these colonies were dispersed over islands scattered across thousands of kilometres of open ocean, they remained politically and culturally interlinked. Moreover, these islands share much with western Norway in terms of climate, landscape and topography, being characterised by heathland and mountain areas, including glaciers and ice caps, bordered by relatively small areas of land suitable for agriculture mainly along the coasts and in sheltered fjords and valleys. These challenging landscapes rewarded resilience and adaptability, as evidenced by complex subsistence strategies including pastoralism, transhumance, hunting and fishing, alongside arable agriculture. However, although the significance of these elements varied both over time and at local and regional scales, this variability itself has so far been little understood.

Although much data addressing such research questions has been, and continues to be, generated through archaeological surveys, development-led excavations, and research projects, this information is often inaccessible: overview publications are lacking, and results are often presented only in unpublished reports. Furthermore, there has been relatively little collaboration between archaeologists in western Norway and the North Atlantic, partly due to separation between research and development-led archaeology, and to differing approaches and methodologies across the region. The Expanding Horizons project aimed to provide a means to address these issues by drawing together junior and senior practitioners in archaeology and related fields, from both within and outside of academia, to present their work.

Two workshops, in Norway in 2018 and in Iceland in 2019, brought together researchers and practitioners from Europe and North America to share their ideas, methods and results, and explore common problems and goals. Importance was also placed on building personal connections through informal discussions and shared experiences of relevant archaeological sites and cultural landscapes. The papers in this volume comprise material presented at the Expanding Horizons workshops, placed in the wider context of Norse settlement and subsistence patterns across the North Atlantic. These workshops and papers were the primary goal of the Expanding Horizons project, but that does not mean that the work is over. There is huge scope for forging further collaborative connections between researchers and practitioners in western Norway and the North Atlantic. Suggestions for how we might achieve this closer

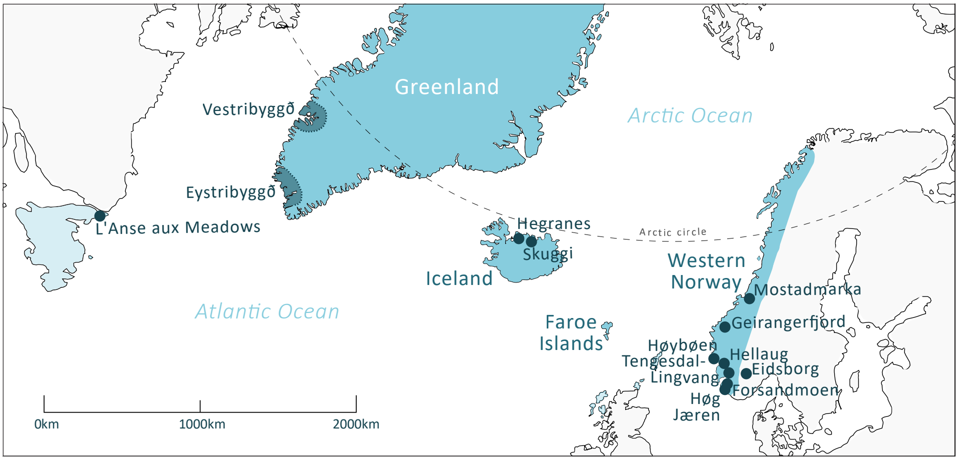

***Figure 1**. Map showing the area defined as the North Atlantic in this volume (mid blue) and other areas potentially included in this definition (light blue), along with some of the key case studies and locations referenced in the following chapters. Map by Dawn Elise Mooney.*

Scandinavia is another geographical unit frequently referenced within the following papers, generally defined as encompassing modern-day Denmark, Norway and Sweden. These countries are politically, socially and geographically intertwined through their shared history, and it is often less convenient to talk about modern geopolitical divisions than it is to reference general regions: southern Scandinavia, western Scandinavia etc. Throughout this volume, these terms will be defined by the authors where necessary.

The geopolitical and linguistic interconnectedness of our region of study has given rise to a shared way of talking about the past, using terms that may be unfamiliar to readers who do not speak a North Germanic language. Chief amongst these is *landnám*. This term, from the Old Norse meaning "land-take", is most often used to describe the Norse colonisation of the North Atlantic islands, particularly Iceland, during the Viking Age. In Scandinavian archaeology, the concept has also been applied to the settlement of new (unoccupied) land throughout prehistory, characterised by both the establishment of settlements and the beginning of agricultural activity. When discussing North Atlantic settlement patterns, authors in this volume define and use *landnám* in their own ways within this framework, as outlined in their papers.

Outfield and remote resources

The complex subsistence strategies that drove settlement across the 'marginal' (for agro-pastoralism) environments of western Norway and the North Atlantic hinge upon the exploitation of so-called 'remote resources' (Keller and Perdikaris 2016). These are defined by their remoteness as experienced from the infield of a typical Norse North Atlantic farm, although in the papers presented below we will see that 'remoteness' is perhaps in the eye of the beholder. To acknowledge this, papers within this volume also use the term 'outfield resources', as distinct from the arable fields and hay meadows of the infield (Øye 2005). These resources, be they marine or terrestrial, animal, vegetable or mineral, are necessary for survival or of high value, or both, and thus draw humans to the peripheral hinterlands of their region. In some cases, their exploitation necessitates only short visits and ephemeral camps, while others engender the establishment of seasonal or even permanent settlements. Many of the papers in this volume address the links between settlement patterns and remote resource exploitation.

Marine resources are perhaps the best studied of the remote resources exploited in the Norse North Atlantic. Such resources include fish, marine mammals, and driftwood. Norwegian and Icelandic fisheries were of great importance to these two countries during the early second millennium AD, although little fishing seems to have been conducted in Norse Greenland (Smiarowski *et al.* 2017). Initially, fishing was a significant element in the subsistence economy of coastal and inland communities in Norway and Iceland (Gísladóttir *et al.* 2012, Guðmundsdóttir 2021, Guðmundsdóttir and Ramstad 2022), and the exploitation of the sea as a part of the outfield was vital to many households. Out of such strategies grew commercial enterprises providing northern European markets with dried fish, beginning around AD 1100 in Norway and AD 1200 in Iceland, which resulted in the establishment of large seasonal fishing stations (Amundsen *et al.* 2005, Tulinius 2005, Edvardsson 2005, 2010, Keller 2010).

The exploitation of marine mammals is much less clearly visible in the archaeological record, yet has been cited as a key driver of the Norse colonisation of Greenland (Frei *et al.* 2015). While walrus ivory was valued as a luxury commodity, seals and whales were vital at a subsistence level. Isotopic analysis of skeletons from Greenland indicates that the diets of some of the late Norse occupants consisted of up to 80% marine foods, likely mostly seal (Arneborg *et al.* 1999). Whales were also highly valued: although there is little evidence for whale hunting in the North Atlantic, beached and drifted whales were vital for both food and the provision of whale bone for the production of a wide variety of objects (Szabo 2008, van der Hourk 2020).

Coastal regions were also a source of gathered resources. Chief among these was driftwood, which was vital as a construction material and fuel source in tree-poor areas in northern Norway, Iceland and Greenland (Alm 2019, Mooney *et al.*, this volume). Seaweed also appears to have been widely used throughout Scandinavia, Iceland and Greenland in the past. This versatile resource has many potential uses in agriculture, craft and food preparation, although its exploitation remains little researched (Mooney 2018). Clear archaeological evidence from Greenland indicates the use of seaweed ash, "black salt", as a flavouring or preservative (Buckland *et al.* 1998). It can also be assumed that shellfish were gathered from the intertidal zone: while shellfish exploitation has been little studied in the Norse North Atlantic, there is unequivocal evidence of limpet harvesting from the Viking Age Faroe Islands (McGovern *et al.* 2004). Shellfish were also extensively collected in Medieval northern Scotland (Noble *et al.* 2018) and Orkney (Milner *et al.* 2007), although it remains unclear whether they were consumed by humans or used as bait.

Norse settlements across the North Atlantic were concentrated around prime agricultural lands. While these sites were often coastal, they did not necessarily permit immediate access to marine resources. The logistics and infrastructure surrounding the exploitation of these resources was therefore complex, involving long journeys, specialised transport and equipment, and often seasonal occupation in 'marginal' regions. Madsen (2019) has conceptualised such sites as 'marine shielings', inviting comparison with inland seasonal sites connected to transhumance.

The agricultural exploitation of the terrestrial outfield played a key role in subsistence across the study area (Stene and Wangen 2016), most clearly evident through shieling sites. Shielings in upland areas allowed farmers to utilise grazing areas in the outfield, especially for dairy production, during the summer months. Evidence from Pálstóftir in Iceland suggests that small-scale craft and hunting activities may also have been integral to the function of shielings (Lucas 2008). Many shielings have at one point in their history been used as permanent settlements, and their study can therefore elucidate not only agricultural practice but also patterns of social and/or environmental change. Two papers in this volume explore shieling use in western Norway (Dahle and Busengdal, Prøsch-Danielsen).

While shielings may have been a base for hunting of wildfowl and small game, the hunting of larger animals required specialist infrastructure. The mountain areas of western Norway are dotted with thousands of devices for hunting reindeer (Bang-Andersen 2004, 2015, Bergstøl 2015, Indrelid 2015), and data from woodlands show a similar pattern related to the large-scale hunting of elk, fur-bearing animals, and birds (Post-Melbye and Bergstøl 2020). The Norse also hunted caribou in Greenland, but remains comparable to those found in Norway have not yet been identified. In Iceland, terrestrial hunting was limited to birds such as falcons (for live export), ptarmigan, and waterfowl, but much remains unexplored regarding practice and economic significance. Other terrestrial outfield resources such as bird eggs, eiderdown, stone and iron ore would also have been collected through short expeditions. In sparsely-wooded Iceland and Greenland, the collection of firewood and the production of charcoal often necessitated such journeys as well. Outfield goods and commodities were traded locally: as is demonstrated below (Nesset and Hjelle, this volume), farms or settlements in areas 'marginal' for agropastoralism often became specialised in the exploitation of local outfield resources.

The vital importance of outfield resources to Norse North Atlantic societies is also clearly visible in historical sources from across the region. The Medieval Norse law codes, such as *Gulatingsloven* and *Grágás*, set out in clear detail the legal basis for the use and ownership of a variety of remote resources, and the punishments for their misuse. The importance of such resources can also be seen in the Icelandic sagas, where they are often a source of conflict. Key examples of this include in *Grettis saga*, where a beached whale carcass becomes the scene of a bloody battle (ÍF VII Chapter 12), and *Eyrbyggja sag*a, in which a dispute over the ownership of the woodland at Krákunes descends into a lengthy feud (ÍF IV Chapter 31 onwards). Scholars have explored the legislation of remote resource use as it relates to woodlands (Mooney 2013), driftwood (Mooney 2013, Alm 2019), drift whales (van der Hourk 2020), eiderdown (Doughty 1979), fishing (Perdikaris and McGovern 2009, Dufeu 2018), grazing lands (Austrheim *et al.* 2008), and hunting (Oehrl 2013). Remote resources continued to be important in early modern Iceland, as demonstrated by the complex networks of ownership rights listed in the 18th century land register *Jarðabók Árna Magnússonar og Páls Vídalíns* (Pálsson 2018).

Trade, exchange and settlement patterns

The exploitation of dispersed remote resources has implications for trade and exchange, routes of movement through the landscape, and settlement patterns. Intensification of marine, outfield, and mountain hunting, as well as fishing, in the Viking and Medieval Periods should be viewed in the light of the development of new networks of exchange reaching far beyond the regional level. What was once consumed and used locally could now be turned into valuables and commodities such as walrus ivory, antler, skins and hides, and eiderdown, which were traded internationally. Such exchanges would have occurred at formalised seasonal trading places (e.g., Skre 2007, Harrison *et al.* 2008, Loftsgarden *et al.* 2016, Traustadóttir 2018) but also informally at gatherings such as politico-judicial assemblies (e.g., Loftsgarden *et al.* 2016, Semple *et al.* 2020), and in the home. Some of the exchange networks are long distance: Norwegian whetstones are found in Iceland and Denmark (Hansen 2011, Baug *et al.* 2019, 2020), Icelandic sulphur reaches the Baltic (Mehler 2015), and Greenlandic ivory is found across Europe (Roesdahl 1995, Frei *et al.* 2015, Barrett *et al.* 2020). Others are more local, allowing marine resources to reach inland valleys (Amundsen 2005, McGovern *et al.* 2006), and upland resources such as antler reach lowland communities (Rosvold *et al.* 2019).

Both the acquisition and exchange of these resources lead to the development and reinforcement of routes and tracks linking sites and settlements together. Such features are difficult to examine archaeologically due to their continued use over long periods of time, but place-name evidence along with the presence of sites along the routes can help us to explore these pathways. Surveys covering large areas from the fjords to the mountains offer new insights into a variety of sites interlinked by terrestrial travel routes (Svensson and Dahl, this volume). Furthermore, in this volume Barbro Dahl argues that the site of Forsandmoen in southwest Norway owes its long occupation history and large size to the control of routes between the mountains and the fjords. While sites like Forsand were situated to capitalise on the movement of goods between lowland and upland areas, the exploitation of outfield resources influenced settlement patterns in a variety of ways. The papers presented in this volume explore this theme through specific examples from western Norway, Iceland and Greenland.

Overview of the articles

The articles presented here address a range of topics relating to the themes explored above, and have all grown out of presentations given at the Expanding Horizons workshops. We begin in western Norway, where Kristoffer Dahle and Susanne Busengdal (Chapter 2) utilise multiple lines of evidence and an interdisciplinary approach to re-examine the origins, development and structuration of the cultural landscape in the marginal areas of Geiranger Fjord. Documentary sources are contrasted with archaeological evidence from both rescue work and targeted research, and placed alongside various theoretical frameworks to produce a more complex and nuanced model of settlement patterns. The paper examines geographical and social factors and their interaction, and develops a new model of longer-term changes in structure.

Kathryn Catlin and Douglas Bolender (Chapter 3) also explore land use and settlement on a regional scale, this time in Iceland. They move away from the traditional narrative of the Icelandic *landnám*, with its focus on the large farms of prominent settlers, in their presentation of excavation and survey results from the Skagafjörður region of northern Iceland. Here numerous small, continuously-occupied dwellings located within what is usually considered as the 'outfield' have been found. These sites date from the earliest settlement and appear to be neither seasonal camps nor standalone farms, but rather part of a network of farm and non-farm dwellings. They appear to have facilitated the exploitation of diverse outfield resources whilst also reinforcing land claims over large areas. It is unclear to what extent this pattern can be applied to the rest of Iceland or the North Atlantic in general, but it provides a new lens through which to explore outfield exploitation and occupation.

The farm of Skuggi, as presented by Ramona Harrison and Howell Roberts in Chapter 4, was occupied for a longer period than the Skagafjörður dwellings presented by Catlin and Bolender, and represents a different style for the organisation of outfield production. The farm's location on a north-facing slope is not ideal for hay production, and it is significant that it seems to have its inception during a period of climatic stability favourable for the use of upland pastures. The zooarchaeological record indicates that, despite its 'marginal' location, Skuggi was well integrated into a complex system of trade and exchange, both in the Eyjafjörður region and further afield via the trading post at Gásir. Climatic deterioration in the 12th century is contemporaneous with destabilisation of the slopes on which Skuggi is located, as evidenced by buried landslide deposits. These events lead up to the abandonment of the farm, after which it is likely that its pastures became part of one of the larger local farms, or the landholdings of the monastery at Möðruvellir.

Norwegian farm sites also demonstrate that outfield resources could be just as important for the success of a settlement as agricultural activities. Barbro Dahl (Chapter 5) discusses the example of Forsandmoen in southwest Norway, which is the largest known prehistoric settlement in the country. The location of Forsandmoen provided easy access to mountain outfield resources, such as pelts and iron. The site acted as an intermediary by controlling the routes from the mountains to the fjord, and took an active part in the exchange of goods. Furthermore, Dahl points out how archaeological methods can shape our knowledge of the past. Methodological changes are demonstrated in the stripping of topsoil in cultivated fields, introduced in Norway by the Forsandmoen project. While surveys and excavations of cultivated fields have revealed sites that radically change our interpretation of past settlement, the potential for the use of mechanical excavators is still largely unexplored in areas currently used as pasture.

The mountain outfield resource areas around Forsand, like the entire region of Ryfylke, have been subject to a limited number of archaeological excavations. Few research excavations take place in Norway, and therefore the archaeological record is greatly biased towards finds from pre-development excavations in lowland areas. Jennica Einebrant Svensson and Solveig Roti Dahl (Chapter 6) argue for the need to combine data from surveys and excavations in their presentation of three cases from Ryfylke. By overlooking the data from surveys, we risk losing crucial knowledge of prehistory, in remote areas in particular, but also undercut the understanding of entire prehistoric and early historic societies. The examples have been chosen to highlight the potential for new insights into Iron Age land use practices from five years of surveys in different areas in the same region. At the same time, the cases represent different levels of previous knowledge, allowing the authors to explore how the survey results can interact with previous research.

The outfields of western Norway are further examined by Therese Nesset and Kari Loe Hjelle (Chapter 7) in their comparison of archaeological and botanical evidence from two abandoned Medieval farms at Høybøen and Hellaug. The characterisation of such farms as 'marginal' is closely tied to the perception of arable agriculture as the main focus of farming activity. However, while these farms were likely subordinate to larger landowners, they were an essential part of a farming system in which the exploitation of outfield resources was critical. While pastoral agriculture was the focus of both farms, the exploitation of other remote resources is seen in the presence of charcoal pits and bloomery slag at Hellaug, and fishing equipment and fishbone at the coastal Høybøen. At both farms, we see an adaptation of traditional farming practices in order to best take advantage of local 'remote' resources. Despite their 'marginal' locations, both farms were in fact an integral part of the Medieval agrarian society.

Another key element in the agricultural systems of the Norse North Atlantic was shielings. These 'summer farms' played an essential role in maximising the exploitation of pastures in the outfield in Norway, Iceland and Greenland. Lisbeth Prøsch-Danielsen (Chapter 8) presents two cases from different shieling zones in the southernmost group of shielings in Norway. Land use practices are discussed in an interdisciplinary, long-term perspective. On the coastal heathland plateau, the use of shielings was implemented during the transition between the Pre-Roman Iron Age and the Roman Iron Age, while the shielings located in the steep inner fjord area were established in the Migration Period. In both shieling zones, haymaking was the driving force for shieling use, and the stacking of hay can be traced back to the Viking Age/ Early Medieval Period.

As has already been touched upon, grassland was not the only outfield resource that was of value. Wood was one of the most important raw materials in past societies, and no less so in the wood-poor North Atlantic islands. Wood was used for a variety of purposes like house construction, boat building, fuel, and for various tools and utensils. Taking this at a starting point, Dawn Elise Mooney, Élie Pinta and Lísabet Guðmundsdóttir (Chapter 9) explore how the Norse settlers in the North Atlantic adapted their wood exploitation strategies to the available wood resources. Based on an up-to-date synthesis of available data, they demonstrate that the investigation of native woodland and driftwood gives insight not only into environmental conditions, but also into materiality and cultural identity. Importantly, it is also stressed that the study of the Norse North Atlantic has a clear relevance for the larger research community working with the Viking Age and Early Medieval Period.

Stone is another key outfield resource, especially where specific types of stone are required for specialised purposes. Irene Baug (Chapter 10) uses whetstone quarry sites to explore outfield resources from a socio-political and economic viewpoint. Her case study's quarries are located in present day Mostadmarka and Eidsborg in Norway. Production of whetstones began here in the 8th century AD, and can be examined in connection with intensified exploitation of outfield resources from the early Viking Age onwards. The whetstones from these sites had a wide distribution network, and were an important factor for the Viking Age economy as well as being integrated into social and cultural systems.

When read in conjunction with one another, these studies demonstrate how settlement patterns, land use, and ways of moving through and interacting with the landscape in the past were deeply influenced by the exploitation of outfield resources. We hope that this volume will lead researchers and practitioners to consider the potential importance of the outfield in all parts of the archaeological process across the North Atlantic.

Future directions

This volume, combined with the wide range of papers presented at the Expanding Horizons workshops, demonstrates the existence of a vibrant and dynamic research community around remote resource use in the North Atlantic. There is also great enthusiasm for collaboration amongst researchers in the region, although this is not always straightforward. The complexity of Norse North Atlantic settlement patterns, land use and resource exploitation requires archaeologists to be adaptable in the methods we employ to identify, excavate and analyse sites, which are often also threatened by the impacts of human activity such as rising temperatures, coastal erosion, and the impact of renewable energy projects on upland areas.

Despite these common challenges, co-operation between archaeologists working in these regions has at times been limited, especially in terms of the sharing of methods. Practitioners working in western Norway are more likely to draw on excavation and recording methods employed elsewhere in Scandinavia, while many archaeologists working in Iceland and Greenland are influenced more strongly by approaches developed in Britain and North America. These regional alignments also influence research results: the differing methods and practice of survey, fieldwork and post-excavation analysis lead to the creation of datasets which can be challenging to compare directly.

The Expanding Horizons workshops took steps towards addressing this by providing a forum in which archaeologists and related specialists working in cultural heritage in western Norway, Iceland and Greenland can compare and discuss the methods we use and the challenges we face in identifying, recording and interpreting archaeological sites. By discussing how archaeological prospection, excavation and analysis are conducted in different regions and at different kinds of sites, we aim to improve methods and practice in all areas of the archaeological process. A future aim is to expand this understanding of different working practices through increased mobility - both internationally and locally, and ideally for both researchers and practitioners. In Norway, for example, this would benefit practitioners working in one specific subfield (e.g., in the University Museums, which are responsible for development-led excavations of prehistoric sites) who may miss out on experience in others (e.g., survey and registration, conducted by regional authorities, or development-led excavations of medieval towns, conducted by the Norwegian Institute for Cultural Heritage Research [NIKU]).

While there has been some progress in this sphere as a result of Expanding Horizons, such as the involvement of Icelandic researchers in the Borgund Kaupang project (Hansen 2020), much has been delayed by recent circumstances. Unfortunately, the coronavirus pandemic (ongoing at the time of writing) has limited the extent to which it is possible to travel and mix with other groups, and this has hindered potential developments in researcher/practitioner mobility. Nonetheless, the groundwork has been laid for future collaborations of this sort, when circumstances permit. All researchers and practitioners who attended the workshops are now much better acquainted with each other's interests and skills, and have a personal connection which can be vital in the inception of collaborative projects.

We must now maintain this momentum in order to address new challenges. The sites addressed in this volume often lie in 'marginal' regions. We can see from the history of their occupation and use that they have in the past been taken into use and abandoned in connection with environmental changes. These 'marginal' outfield areas are by nature less stable than sheltered, fertile agricultural land, and they are therefore at more immediate risk from the effects of the climate crisis. Fishing stations, marine shielings, and other sites related to the exploitation of marine resources lie in exposed coastal areas vulnerable to erosion with worsening winter storms (Pálsdóttir 2014, Harmsen *et al.* 2018, Hollesen *et al.* 2018, Zoëga 2021). Higher demand for renewable energy leads to the establishment of new wind farms and hydroelectric dams, impacting traces of hunting and related infrastructure, and other archaeological remains in upland areas (Friðriksson 2001, Indrelid 2009, Riksantikvaren 2019, Skogstrand 2020). In these same upland areas, and across the Arctic in general, the melting of snow patches, glaciers and permafrost threatens the survival of organic remains (Callanan 2016, Harmsen *et al.* 2018, Pilø *et al.* 2020).

It has been argued (e.g., McGovern 2018) that these 'burning libraries' behove archaeologists to excavate vanishing sites as quickly and as thoroughly as possible, in order to both preserve such remains and archive them for future study. This in itself will require huge increases in funding for archaeology and storage facilities for archaeological material at universities and museums - against a backdrop of general decline in both these resources. Furthermore, while relatively stable materials such as bone require limited intervention in terms of conservation, much more intensive treatment is needed for fragile organic artefacts (e.g., leather, wood, textiles, basketry etc.) - those that are most immediately at risk from changing environmental conditions (Mooney and Martín-Seijo 2021). Responding to these challenges will require a concerted effort from the archaeological community as a whole, both to raise awareness of these issues and to argue for the necessary increases in funding and resources (McGovern 2018). While we do not have the answers here, collaborative projects such as the Expanding Horizons workshops are vital for facilitating the exchange of ideas and fostering new connections, both of which allow us to use our shared knowledge and experience to work together towards solutions.

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Kristoffer Dahle and Susanne Busengdal

Living on the edge: patterns of agrarian settlement and land-use in the fjord landscape of Inner Sunnmøre

In 2005 the Geiranger fjord entered the UNESCO World Heritage List, as a central part of the Western Norwegian Fjord landscape. It represents a marginal agrarian landscape, with small iconic farms situated on ledges and steep mountainsides along the fjord, and a contrast both to central agricultural areas along the coast and the hunting grounds further inland. Yet, our knowledge on the origin and development of these small agrarian settlements is still quite limited, as modern development-led archaeology has not yet encroached into these sparsely populated areas. In 2018 Møre & Romsdal County Council initiated a project to enhance our knowledge on the settlement and land-use in this area, based on archaeological investigations of lynchets and field tillage at the fjord farms. These investigations are viewed in relation to more central farm settlements, on the basis of written sources, grave finds and development-led excavations and surveys, as well as to the numerous traces of hunting and trapping in the mountains beyond. This project has shed new light, not only on the emergence of the marginal farms themselves, but also on long-term relations between centre and periphery, agriculture and hunting, across this liminal landscape.

Introduction

In 2005 the Geiranger Fjord was inscribed on the UNESCO World Heritage list, representing the Western Norwegian fjord landscape. This entire landscape comprises not only a natural attraction, with dramatic mountains and iconic waterfalls, but also some of the most marginal agrarian landscapes in Western Norway with its small, deserted fjord farms high up on the steep cliffs. Situated between the more central agricultural areas along the coast and prehistoric hunting grounds in the mountains further inland, this also represents a liminal landscape.

In 2018 Møre & Romsdal County Council launched a small-scale research project in order to enhance our knowledge of these marginal farms. The aim of the *Geiranger Fjord Farm Project* was to study the origin of the fjord farms and their agrarian development through time.

In this article we will discuss the results from this project across a wider landscape, including more central areas, on the basis of written sources, grave material and recent results from development-led archaeology. Our study area comprises the municipalities of Fjord and Stranda in Møre & Romsdal, equivalent to the 17th century administrative area of *Dale skipreide* (Eng. Hundred). By examining how this agrarian landscape was organised and structurated by various practices and conjunctures in time and space, we aim at obtaining a better understanding of the relations between central and peripheral zones and the changes in agrarian settlement and land-use in a long-term perspective. We will further discuss the remains of alpine hunting and trapping, and whether these activities formed an integrated part of the same social landscape.

Terra incognita?

Earlier studies have referred to the inner-fjord settlements as being of a later date, compared to coastal areas, due both to the marginality of the agrarian landscape and to the lack of early prehistoric grave finds (e.g. Solberg 1976, Øye 1994). According to the topographical descriptions by the clergyman Hans Strøm at the end of the 18th century, Sunnmøre was one of the poorest farming districts along the western coast. Fiscal records from the 17th and 18th century imply that the scale of cereal production was much lower in the *Dale skipreide* than in other areas in Sunnmøre (Øye 1994, p. 136). Bergljot Solberg (1984, pp. 92-94) has correlated these poor conditions for cereal production in relation to the lack of graves in the inner parts of Sunnmøre. She argues there was an expansion from the Migration period onwards, as more central areas along the coast had become overpopulated.

In Norway, most archaeology is development-led. Hence, most excavations in the county of Møre & Romsdal have been conducted along the coast and in the vicinity of the three major cities (Figure 1). Only a few archaeological excavations have been undertaken in the study area, and these are concentrated near the more urban parts (Johannesen 1996, Ramstad 1998, Diinhoff 1999, Underhaug and Linge 2016, Hillesland and Diinhoff 2020).

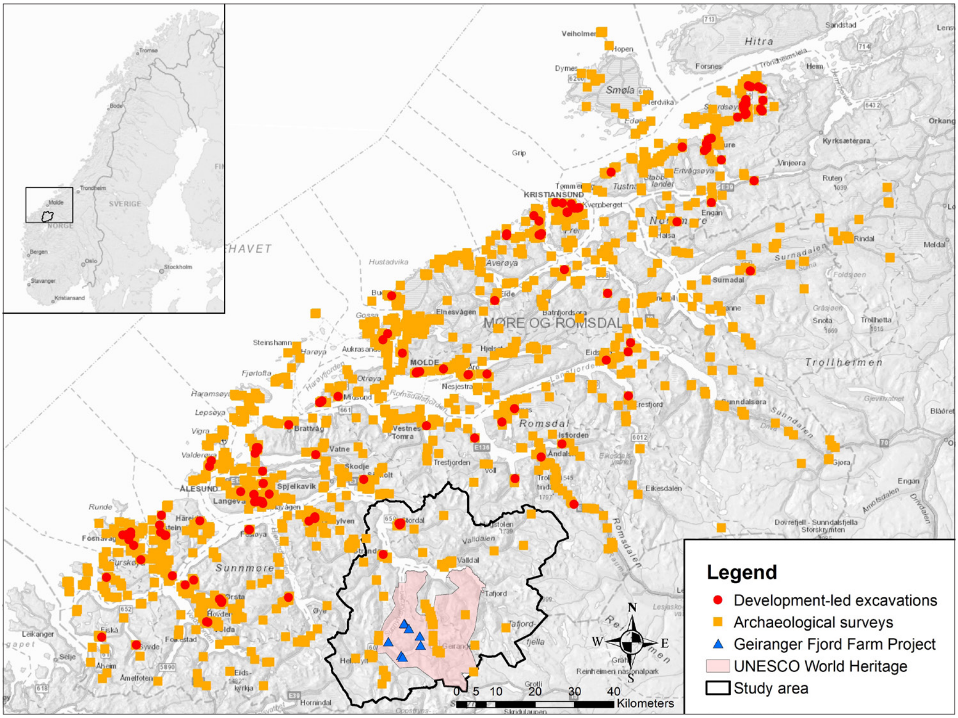

Figure 1. Surveys and excavations across the region, including the Geiranger Fjord Farm Project.

In recent years, there has also been an increasing interest in alpine hunting and trapping, with a particular focus on perennial snow patches (Dahle 2015, Ramstad 2015, Sanden 2016). Our knowledge of agrarian settlement and land-use patterns between the main agricultural centres and the mountains, however, is limited. Yet, due to recent archaeological surveys and small-scale investigations conducted by county archaeologists, a broader part of the landscape has been examined.

Structuration of the landscape and concepts of concentricity, cores and peripheries

Throughout the 20th century, the discussion of the origin of historical farms has been subject to much debate within Norwegian archaeology (cf. Øye 2011). The term "farm" has been criticized by several scholars as problematic and biased (e.g. Holm 1998, Pilø 2005) and the question of origins could therefore depend on how the term is defined (cf. Pedersen 1999). In our definition, we will put emphasis on sedentism, agriculture and husbandry, as well as a more or less fixed territorial landscape (cf. Zehetner 2007, pp. 20-22).

Studying long-term patterns of settlement and landscape requires a theoretical framework for understanding time, space, stability and change. According to the work of the French Annales scholar Fernand Braudel (1980), time was divided into three levels of structural duration: *Longue durée, conjunctures* and événements. Braudel's long term structures - including agrarian structures - could be both mental and environmental, and could often be imperceptibly determining the course of actions on, and by, humans.

Phenomenologists like Richard Bradley (1984) and Christopher Tilley (1994) have regarded landscapes as social constructs, being both the medium for and outcome of social practice. Tim Ingold's perspective on 'dwelling' also put emphasis on landscape in the sense of the world as it is known for those who dwell therein (Ingold 2000). However, these studies have been criticised for being too focused on human-landscape relations, neglecting the social relations *between* humans in the landscape.

Per Cornell and Fredrik Fahlander (2002) have proposed a micro-archaeological approach, focusing on how social practice is structured in relation to the landscape. Rather than cultures and ethnic groups, they discuss past social entities as *social formations*, being the virtual effects of *structurating practices* (actions and chains of action) and *structurating positivities* (material and immaterial principles permeating social practice). The latter lies close to the concept of *longue durée,* but with a higher potential for social dynamics. Classic examples are gender and labour relations.

We would argue that the concentric perception of the historical landscape both mentally and environmentally represents such a *structurating positivity.* The peasants experienced their surrounding micro-landscape from where they dwelled (Dahle 2009, Øye 2011). In studies of wider social landscapes, terms such as core, semi-periphery and periphery have been employed. The notion of the 'marginal' and 'peripheral' landscapes have been criticized as being the view of modern, urban academic society (Holm, Stene and Svensson 2009). We would still argue that the concentric perspective - at various levels - was shared by the agrarian society or social formation inhabiting this past landscape, through the materiality of the landscape and the structurating practices of everyday life.

On a macro level, the inner fjord districts of Sunnmøre must be seen as peripheral in contrast to the core areas along the coast (Solberg 1976, Ringstad 1986), yet the outer parts of the study area may be defined as a semi-periphery in a regional context (Figure 2). In this article, however, we will also emphasize the variation within each of these zones. The study area consists of a very varied landscape, comprising both wide, fertile river valleys as well as the marginal farms mentioned above. These natural conditions - including geology, sunlight and climate - all represent structurating positivities that contribute to the social structuration of landscape. Through events and conjunctures, human actions and structurating practices - such as the clearing of land, the gradual construction of field terraces and erection of monuments - these structures can be maintained and changed (cf. Zehetner 2007).

In the following, the terms *core, semi-periphery* and *periphery* will be used at the local level, adjusted to topography, whereas the periphery and semi-periphery at the regional level will be referred to as *inner* and *outer* areas respectively.

The Geiranger Fjord Farm Project and the agro-archaeological methodology

The Geiranger Fjord Farm Project was launched by Møre & Romsdal County Council in 2018, with financial support from The Norwegian Directorate for Cultural Heritage (*Riksantikvaren*) through World Heritage funding. The aim of this project was to determine the origin and the development of the most peripheral agrarian settlements in the inner fjord areas, uncovering changes in agrarian strategies and the relation between the agro-pastoral landscape and the hunting and trapping activities in the mountains (Dahle and Nytun 2020).

***Figure 2**. Blomberg, one of the marginal fjord farms examined during the Geiranger Fjord Farm Project (Photo by Arve Nytun, Møre & Romsdal County).*

The investigation area comprised some of the most marginal farms surrounding the Geiranger and Sunnylven fjords, limited to the UNESCO World Heritage Landscape in the inner part of the study area (Figure 2). By focusing on a representative selection of farms in terms of size, geography and altitude, the fieldwork was based on mapping the fields through maps, LiDAR scans and visual surveys. Landscape terraces and lynchets were located and examined as an indicator of farm settlement. Due to the steep topography, it is very likely that the locations of both the farmsteads and the fields have been very stable through time. Samples for both radiocarbon dating and palaeo-botanics were taken from every cultivation layer. Due to the dry soil conditions, the pollen material was unfortunately sparse, but still gave some indications on variations in land-use through time (Dahle and Nytun 2020).

Patterns of settlement and land-use can be obscured by prioritising the lowest cultivation layers. This would give us data on the initial use, but not necessarily the establishment of farm settlements, as more fixed entities, nor on their further development. There are also challenges in dating cultivation layers in terms of post-depositional processes (e.g. Iversen 2008, pp. 114-116). Most sections were rather evident and adequately sampled. Still, it is important to note that cultivation layers do not reflect historical actions or événements, but rather *conjunctures* and structurating practices.

Historical settlements and landscapes as the outcome of prehistoric social practice

Rather than simply projecting settlement and landscape patterns onto the past, the early historical landscape is regarded as the *outcome* of former social practice. Prehistoric actions and activities, as revealed by archaeological remains, will thus be seen in relation to their historical landscape zones.

In order to define historical cores and peripheries in the study area, however, we need certain criteria. In addition to topographical criteria, the rate of agrarian utilisation and the present-day perception of the various landscape zones, early written sources work as a guideline. We have thus defined three criteria for historical centrality.

Administrative and socio-political centrality

In order to locate historical administrative and socio-political centres, our main sources are the early church and chapel sites (Figure 3). According to *Trondhjems Reformats 1589*, there were churches in Stordal, Stranda (Sløgstad), Norddal (Dale) and Sunnylven (Korsbrekke). In addition, there were smaller chapels in Valldal (Døving) and Geiranger (Hamre 1983). The 1432 Aslak Bolts's cadastre (AB, pp. 132-134) recorded six parishes; Stordal, Sylte, Stranda, Sløgstad, Sunnylven and Norddal, yet the latter (AB 130) has been questioned. Thus, two historical church or chapel sites are known in both Stranda (Sløgstad and Opsvik) and Valldal (Sylte and Døving), whereas the sites in Norddal and Geiranger appear to have been established rather late.

Valldal is also duly mentioned in the saga of St. Olav, as the King fled through the valley in 1028. This saga mentions the names of some farms and shielings, as well as the local chieftain, Bruse, at the farm Muri by the fjord. According to the saga Olav also raised a cross at the neighbouring farm Sylte. Snorri also mentioned a shieling at Grønningane, in the upper part of valley, implying that the mountain farm by the same name must have been settled later (Hkr 2, pp. 71-73).

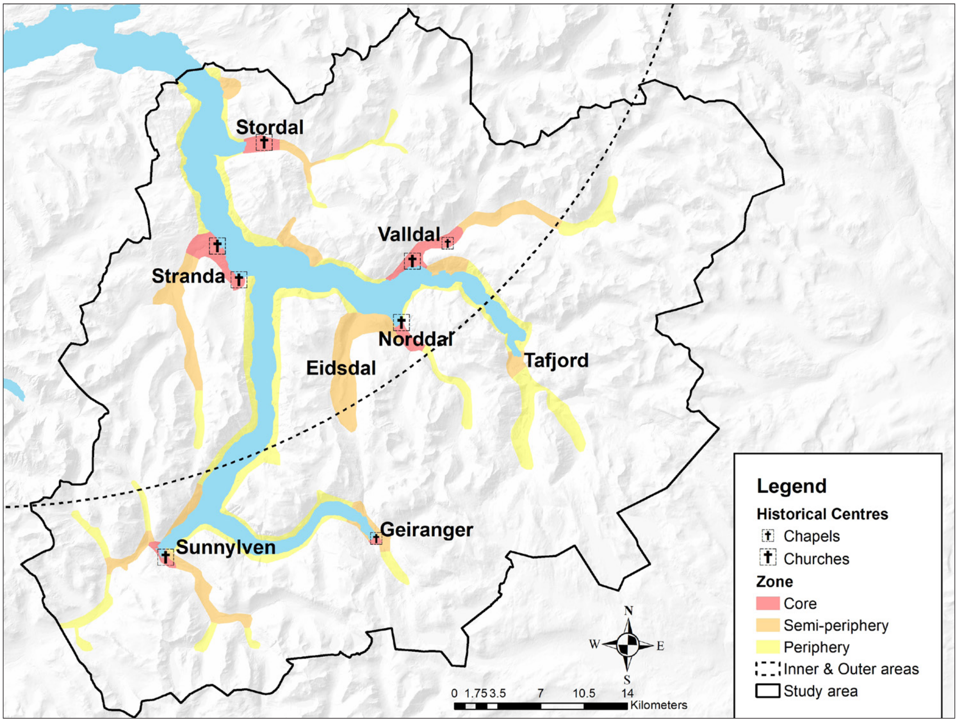

***Figure 3**. Churches and concentric zones within the study area.*

Several men and place names are also mentioned in the *Sunnmørsættleggen* (AM 22b), a transcript from the 17th century documenting lineages back to the ancestors buried in the pagan burial mounds (AD 1000-1300). Some of the place names are hard to interpret, but the transcript indicates where important persons and lineages may have been seated (Øvrelid 1994). These seem to support the historical cores indicated by churches and chapels.

Demographic and economic centrality

In studying historical demography and economic variation, our main criteria are the land rent and number of farms and holdings according to the 17th century fiscal cadastres (cf. Imsen and Fladby 1975). Both in terms of land rent and number of tenant farmers, the 1650 cadastre strengthens what we have defined as administrative core areas as demographic and economic centres within the study area. However, we can clearly see the differences between inner and outer parts. The semi-periphery in outer parts, such as the Stranda and Eidsdal valleys, are just as productive as what we have defined as cores in the bottom of the fjords. We can also observe a relatively high land rent at some of the farms in the Sunnylven valley, situated along a river plain. The most peripheral fjord and mountain farms, however, such as the ones along the Geiranger fjord, are considerably smaller -both in terms of land rent and the extent of farm division (Figures 4 and 5).

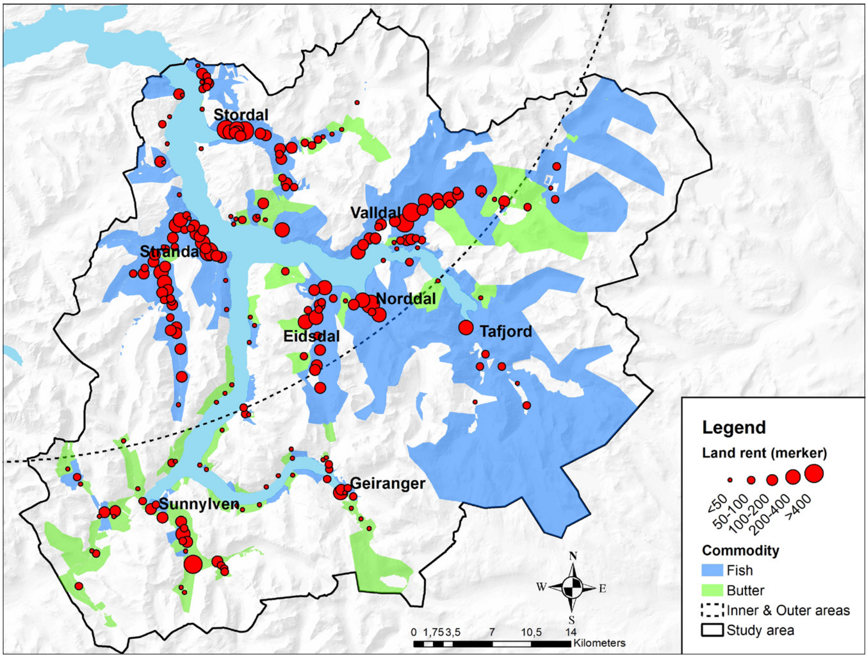

Figure 4*. Land rent and commodities in 1650.*

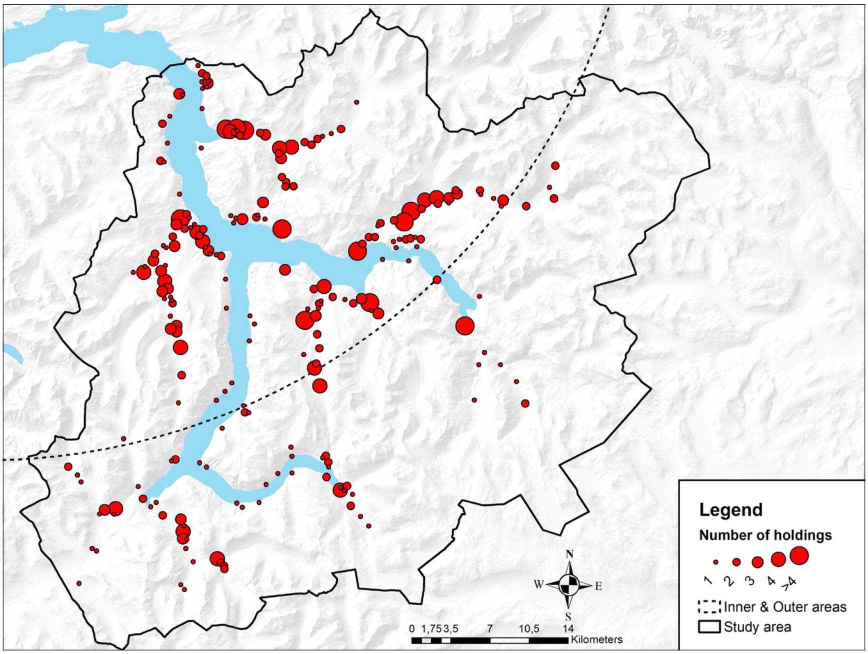

Figure 5*. Number of holdings in 1650.*

Territorial and juridical centrality

The fjord landscape of Inner Sunnmøre has traditionally been referred to as an egalitarian landscape, with a high extent of freeholders compared to the rest of the region (Døssland 1990, p. 143). However, by looking at Medieval sources, such as the aforementioned *Sunnmørsætleggen* (AM 22b), we may get a glimpse of a more aristocratic landscape. In addition to pointing out central farms or manors, this transcript also refers to what farms the landlords possessed. Hence, it offers an empirical basis for the existence of local estates in a High Medieval context.

Research has proved the existence of manors and estates as early as in the Viking Age, originating through local settlement development (Skre 1998, Iversen 2008). Based on retrospective use of later written sources, such as cadastres and fiscal sources, Frode Iversen (2008, pp. 60-62) has argued it could be possible to reconstruct the extent of estates surrounding royal and aristocratic manors. His formal criterion was the existence of an area of at least three neighbouring farms fully owned by one institution, mainly the crown or central ecclesiastical institutions. At the same time, however, it is important to view such patterns in a local and regional context, and in relation to archaeological sources.

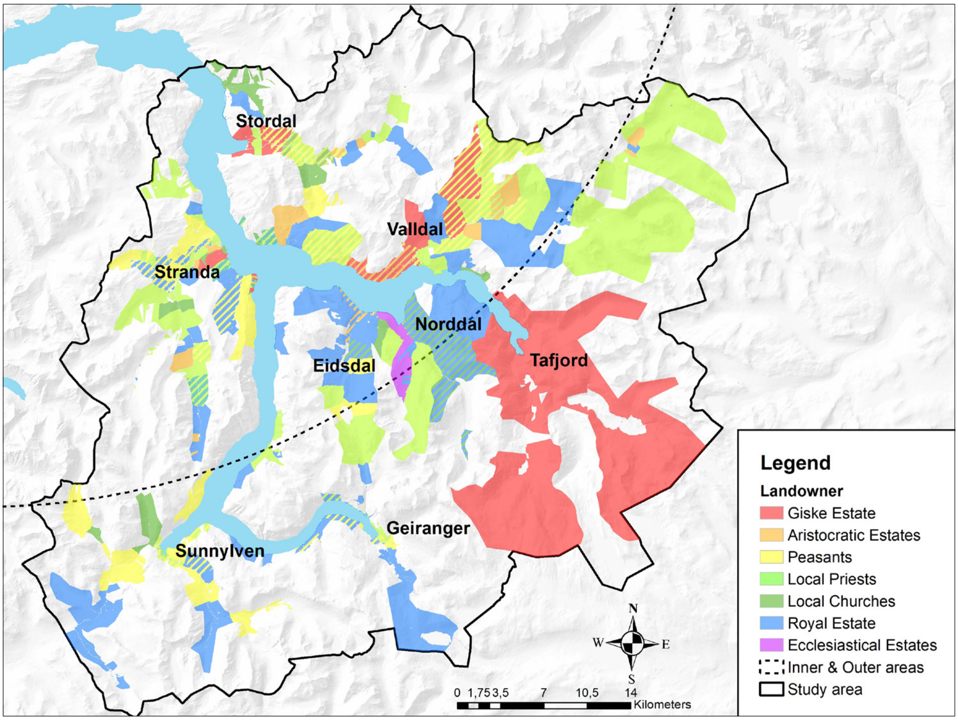

Figure 6. *Landowners and number of holdings in 1650. The property map is based on sheets, made by Tor Myklebust, junctioned by current boundaries.*

If we are looking at who owned the land in various parts of the study area in 1650, we can see that a number of farms in the outer core areas, like Stordal, Stranda and Valldal, were owned by the Giske estate (Figure 6). In Stranda we also find the farm name *Giskehaug*. This vast estate originated from one of the most powerful dynasties in northwestern Norway, perhaps as early as the Viking Age (Sandberg 1986, p. 9). None of the core areas fulfil the criterion proposed by Iversen, as most of the core farms were divided between two or more landowners. However, the Giske estate went through great structural changes in the 16th and 17th century (Sandberg 1986, Fauske 2004), substantiating the former existence of local estate cores in Valldal and Stordal. In Norddal and Eidsdal, on the other hand, most of the land was owned by the crown or central ecclesiastical institutions, implying a somewhat different prehistory.

In the semi-periphery less land was owned by the same magnates. The same goes for the inner cores. According to a diploma, Giske owned land in Geiranger in the 14th century (DN XV 1), but otherwise most land in 1650 was owned by the local churches, priests and farmers. The most peripheral farms on the other hand were mainly owned by the Crown Estate - possibly reflecting the general royal right to common land as declared by Medieval law. Yet, there is an exception in the inner mountain valleys. The Tafjord mountain farms all belonged to the Giske estate, whereas the farms in the upper part of Valldal were owned by a local clergyman at Sylte *in persona* (Imsen and Fladby 1976). Farms in both areas paid their taxes in fish, typical for the Giske estate (Sandberg 1986, pp. 11-12), perhaps indicating that the latter was sold or donated by the same landlord. This could reflect former aristocratic rights or interests in both mountain areas.

Our conclusion based on written sources is that there were significant differences between the zones, in terms of farm size, land rent and property relations, which supports the perspective of a concentric landscape where social status - both locally and regionally - radiated from centre to periphery. Still, there are some internal variations that cannot be explained by this mental and environmental landscape, and must instead be seen as historically constituted and structurated by social practice.

Long-term patterns of agrarian settlement and land-use in the inner fjord landscape of Sunnmøre

In the following analysis, we will try to discern social and economic patterns in this landscape within a long-term perspective. By studying physical remains - as revealed by grave finds and more recent archaeological excavations and surveys - in relation to the historical landscape zones as analytical categories, significant spatial variation and temporal changes may be derived.

The grave material - revisited

Traditionally, grave material has played a major role in settlement studies alongside farm names and studies of farm boundaries (e.g. Solberg 1976, Johannessen and Ringstad 2011). In this chapter we will take a closer look at the grave material in the study area, how different types of grave monuments are represented in the various zones, and to what periods these graves are dated.

In order to complete the list, information is gathered from both the Norwegian Cultural Heritage database (Askeladden), the museum collections (Unimus), and other mentions in local written sources (e.g. Fett 1950-1951). As some of the monuments may have been clearance cairns or natural mounds, only definitely secure or highly probable graves are included.

Most of the graves are cairn types, but there are also mounds and graves without any obvious marking. In his study of the large burial mounds in Western Norway, Bjørn Ringstad (1986) did not recognize any major aristocratic centres in our study area, but some of the burial mounds were defined as large (>20 m dia.). We can also find a number of standing stones. Dating the various graves is difficult. Few are excavated, and we have not established a local typology yet. In general, however, we may assume that most of the grave monuments are from the period AD 300-950 (Johannessen and Ringstad 2011, p. 34).

Based on artefacts found in the graves, the Viking Age seems to dominate the material. Yet, it is important to acknowledge that the grave goods dating from the Early Iron Age, are generally scarce and hence less visible in the archaeological record. If we take a look at the spatial distribution of datable graves, the main tendency is that the graves from the Roman Iron Age are concentrated near the cores, mainly in outer areas, gradually spreading across the semi-periphery from the Migration period until the Viking Age. In the peripheral zone, there are just a few graves, all located in outer areas and none located on the marginal farms belonging to the Crown Estate. This could reflect a gradual settling of the landscape, from centre to periphery at various levels - from the Early Iron Age onwards - whereas the most marginal farms represent the last step up the ladder sometime during the Middle Ages.

***Table 1**. The number of graves across the study area, divided in the various zones (number of graves dated to the early/late Iron Age in parentheses).*

	Outer areas	Inner areas
Core	106 (6/74)	27 (4/14)
Semi-periphery	23 (0/18	23 (1/10)
Periphery	3 (0/3)	0 (0/0)

Whereas the existence of graves and grave monuments strongly suggests some kind of nearby settlement, the absence of graves could also be a question of representativeness and dominion rather than absence of settlement. Intensive cultivation and a higher extent of development in core areas may have contributed to the deletion of graves (Iversen 2008, pp. 76-89). Further, being limited to only a fraction of the free population, slaves and tenants on the estate lands surrounding the manor may not have had the rights to establish grave monuments.

Based on his studies in Romerike, in the central part of eastern Norway, Dagfinn Skre (1998) has emphasized the role of slaves and aristocratic dominion in the Early Iron Age settlement expansion. Initially, new farms could have been occupied by slaves or the semi-free descendants of slaves, with legal ties to their landlord. The concentration of Roman Iron Age graves to core areas could thus be due to its aristocratic dominion over adjacent territories. Accordingly, rather than gradual settlement expansion, the increase of graves in the Viking Age could represent changing social realities in the semi-peripheries, where slaves were replaced by free tenants.

Through the lack of grave monuments on farms surrounding aristocratic centres of western Norway, preferably coherent with areas later fully owned by one institution, Iversen (2008) has substantiated the existence and extent of prehistoric estates, mainly in core areas and close to the aristocratic manor. In our study area, such a pattern cannot be discerned. Rather, the graves seem to be widespread across the fertile river valleys (Johannessen and Ringstad 2011, pp. 34-36). Yet, the spatial distribution of graves seems to follow the gradient from centre to periphery, emphasising stability in the wider social landscape (Table 1).

It is also possible to discern some variation in mortuary practices. Wealthy graves, containing gold and silver and other precious metals, are mainly found in outer areas (Figure 7). This also goes for hoards and other non-ferrous metal finds in other contexts. In inner areas, precious metals are only found in the Sunnylven valley. Nor are there any finds in Norddal. Wealthier graves are found in the neighbouring Eidsdal valley. In accordance with what we concluded from written sources, this core could have been established late - perhaps as an administrative centre. Dale skipreide - the *hundred* constituting the study area - is named by one of its central farms. It is also worth noting, that the only known stirrups in the study area were found in graves at Relling (Fett 1950-1951), the other central farm in Norddal and the only farm in 1650 owned by central ecclesiastical institutions. Stirrups have been seen as a symbol of riders, feudality, and royal administrative and military centres during early state formation (Braathen 1989).

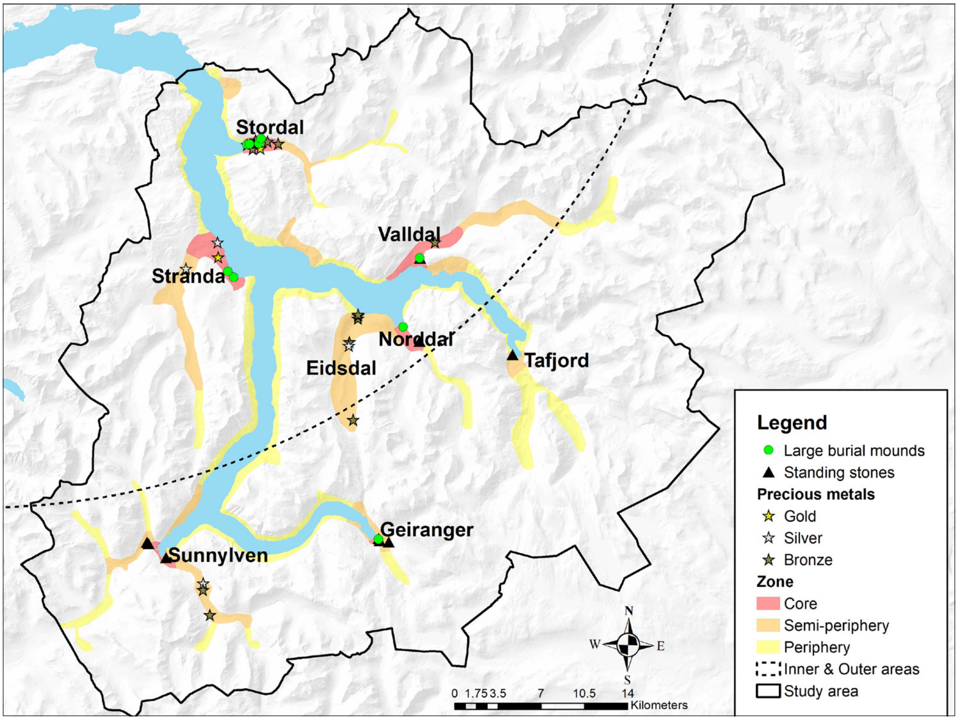

***Figure 7**. Wealthy and monumental graves in the study area.*

The large burial mounds are concentrated in the cores, yet mainly in outer areas and particularly in Stordal. Standing stones on the other hand are mainly found in inner areas. Without excavations, monuments like these are difficult to date. The remains of *Monshaugen* at Hove in Stordal were excavated by Eva Nissen Meyer in 1935, revealing a cremated Viking Age boat grave (Fett 1950). In general, the great boom in the erection of large burial mounds came in the late Roman Iron Age and Migration Period, but with a second boom in the early

Viking Age (Ringstad 1986, 2004). Standing stones also tend to date to the Migration Period or the late Viking Age (Knutzen 2007).

Rather than mere symbols of power, however, both large grave mounds and standing stones should be regarded as *ambitions* of power - reflecting possible watersheds in time and strategic actions in order to restructure the landscape and establish and empower new cores. For further interpretations, however, we need more direct data on prehistoric settlement and land-use.

New perspectives from archaeological excavations and surveys

As mentioned above, few archaeological excavations have been conducted in the study area, and these have concentrated on the cores in outer areas (Johannesen 1996, Ramstad 1998, Underhaug and Linge 2017, Hillesland and Diinhoff 2020). In Stordal, a three-aisled longhouse from the Early Bronze Age was recovered at Melsetbøen (Diinhoff 1999). The overall pattern from these investigations is a more or less continuous settlement from the great *landnám* in the Late Neolithic-Early Bronze Age transition onwards, but structural changes in terms of land-use occur during the late Roman Iron Age (Underhaug & Linge 2017, Hillesland & Diinhoff 2020). Johannessen and Ringstad (2011) have suggested a change from the mobile use of the core territories to more strictly regulated land management. These changes occur at about the same time as the changing grave customs mentioned above and the appearance of large cooking pit sites like the one recently uncovered in Valldal (Busengdal 2020), all of which could imply societal changes, social stratification and restructuration of the core areas.

In addition to these rescue excavations, a great number of hunting and trapping sites have been surveyed in the alpine zone, in collaboration with local volunteers. An impediment to fully understanding the mechanisms and the social and economic relations between the cores in outer areas and the hunting sites in the alpine zone of inner areas, has been the lack of relevant data from the liminal border zone. During the last decade, however, a number of surveys have been undertaken in relation to smaller development projects in the cores and semi-peripheries of both inner and outer areas. In addition, the Geiranger Fjord Farm Project and other small-scale investigations have yielded new data on the most peripheral farms. The material is still scarce and our conclusions could possibly be altered by new investigations. Yet, we believe these investigations jointly provide new and representative data that can shed new light on patterns of settlement and land-use throughout the study area.

The earliest traces of agrarian settlement in the region are dated to the Late Neolithic, with some early pioneers even in inner areas. In the course of the Bronze Age, farm settlements appear to be established in outer core areas (Ramstad 1998, Diinhoff 1999, Underhaug and Linge 2016). By the Bronze Age-Early Iron age transition, the settlements expanded. From surveys in central parts of Geiranger, farm settlement in inner core areas is substantiated by lynchets and rather massive layers of cultivation (Busengdal 2019). Parallel to the intensification in these inner core areas, we also see an expansion in terms of an extensive agrarian land-use, reaching a climax in the early Pre-Roman Iron Age, covering all zones. This expansion was even visible at one of the shieling sites in Oaldsbygda (Dahle and Nytun 2020). These remains simply consist of thin lenses of charcoal or charcoal rich soil, and pollen analyses mainly indicate some kind of clearing for pastures. There is no evidence for cultivation and no obvious indication that these extensive clearings represent farms, as defined above, with continuous use and settlement, until historical times.

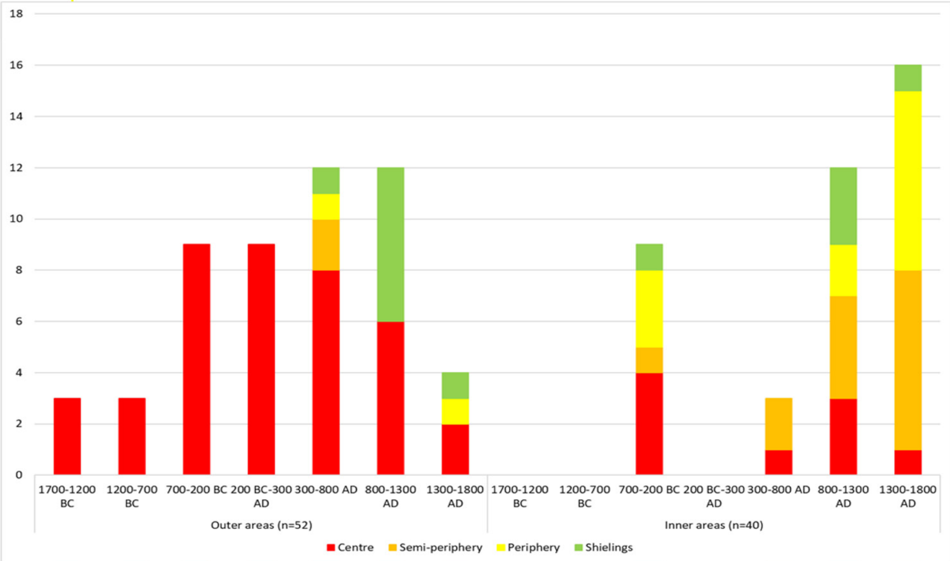

***Figure 8**. 14C-datings from surveys in agrarian contexts in the study area. The number of datings from the periphery in outer areas is still low, whereas the diagram from inner areas is more representative. The low number of late dating results from the core areas could both be due to poorer preservation and the priority of bottom samples.*

From about 200 BC, there seems to be a contraction in the settlement pattern, predating the structural changes in core areas (Figure 8). In contrast to the extensive land-use in the previous period, settlement in the middle of the Early Iron Age once again seems to be confined to outer core areas. This could be due to a limited number of ^{14}C-samples, but the break is also indicated by hiatuses in documented sections, as in Geiranger (Busengdal 2019). New settlement in this core area seems to have started by the end of the Early Iron Age (Svendsen 2013).

There may be a similar pattern at Korsbrekke in Sunnylven, the other interior core area. Here, we have only documented extensive clearings from the Pre-Roman Iron Age. As our investigations here were development-led, we find it likely that farm settlements and more intensively cultivated fields existed at central locations outside our planning area. We can, however, notice the same gap in the section between the initial and later clearings (Busengdal 2018).

In semi-peripheral areas, there are similar traces of clearings from the Bronze Age-Pre Roman Iron Age (Narmo 1994, Sanden 2014), but still no direct traces of farm settlement. As with the inner core areas, a new expansion seems to have started by the end of the Early Iron Age. In outer areas, such as the Stranda and Eidsdal valleys, the archaeological remains could now suggest farm settlements (Narmo 1994, Mokkelbost 2010). In inner areas on the other hand, the activities in the semi-periphery still have an extensive character (Dahle 2018, 2020) and farm settlement is not substantiated before the Late iron Age and Early Middle Ages (Busengdal 2018, Dahle 2021, Smørholm 2021). Hence, there is still no evidence of settlement prior to the Iron Age graves, which would suggest aristocratic dominion and the use of slave labour.

As expected, the Geiranger Fjord Farm Project showed rather late settlement at the most peripheral of the farms, but by the end of the Middle Ages most of the historical farms were settled, combining cereal production and animal husbandry.

The contraction prior to the Roman Iron Age clearly demonstrates the non-linear development in prehistoric settlement and land-use, and could also have laid the foundation for the societal changes in the end of the period. In the following expansion, however, the patterns indicated by agro-archaeological investigations are quite similar to the patterns shown by the grave material. New cores were established in inner areas - possibly manifested by standing stones and monumental graves - and from the Migration Period until the High Middle Ages the settlement expanded, culminating in the peripheral fjord and mountain farm settlements in Late- and Post Medieval Period. Hence, we have not been able to discern any great impact of the 6th and 14th century crises on the land-use. The structural changes may already have taken place and the focus on animal husbandry could rather have been enhanced by these climatic and demographical changes (Øye 1994, p. 136).

We can also see an increased use of shielings in the outfields. This was probably part of the same agro-pastoral strategy, but could have been further driven by the growing demand for wool and milk products as a regional economic *conjuncture* in the late Viking Age or Early Middle Ages. From the earliest site, Klovset, in the vicinity of Valldal, dated to the Merovingian Period (Dahle 2016a), we can see a general expansion of shielings across the study area in the 10th and 11th century (e.g. Dahle 2016b, 2019, 2020), and continued use all the way up to the 19th century (Figure 8).

Hunting and herding - changing practices in a border zone landscape

The last topic to discuss is how the changes in settlement and land-use relate to alpine hunting and trapping - as indicated by the numerous sites in the alpine zone and further inland. As hunting and herding could have been conflicting activities, we have to take closer look at these changing practices and how they have contributed in structurating the landscape.

Looking at the spatial distribution of the alpine sites, there is a belt of so-called hunting blinds in the north-western part of the study area - following the border between the inner and outer area (Figure 9). Further inland the sites are dominated by hunting pits. This spatial pattern could be due to varying topography and hunting strategies, but it could also reflect chronological patterns (Dahle 2015, Sanden 2016). Once again, Sunnylven differs from other interior areas. Whereas the agrarian landscape may have been prosperous, there are just a few traces of hunting and trapping.

One of the main challenges when dealing with alpine sites is the lack of datable material. Through the last decade, however, a number of arrows, scaring sticks and other related artefacts have been uncovered by melting snow patches in the vicinity of these trapping sites. Some of the sites go all the way back to the Mesolithic-Neolithic transition, showing continuous use until it intensifies in the Roman Iron Age-Migration period (Dahle 2015). Hunting continues in the Late Iron Age, but it seems to decrease and contract to eastern areas (cf. Hofset 1980), and it diminishes in the Middle Ages.

The material is still sparse, varied and possibly obscured by climatological variation. Based on the existing material, however, this *conjuncture* seems to predate the general agro-pastoral expansion in inner areas. Hence, there is no apparent chronological and functional relation between the marginal and peripheral settlements and the alpine hunting sites. Rather, the hunting and trapping sites seem to fill the gap between the two agro-pastoral expansions mentioned above.

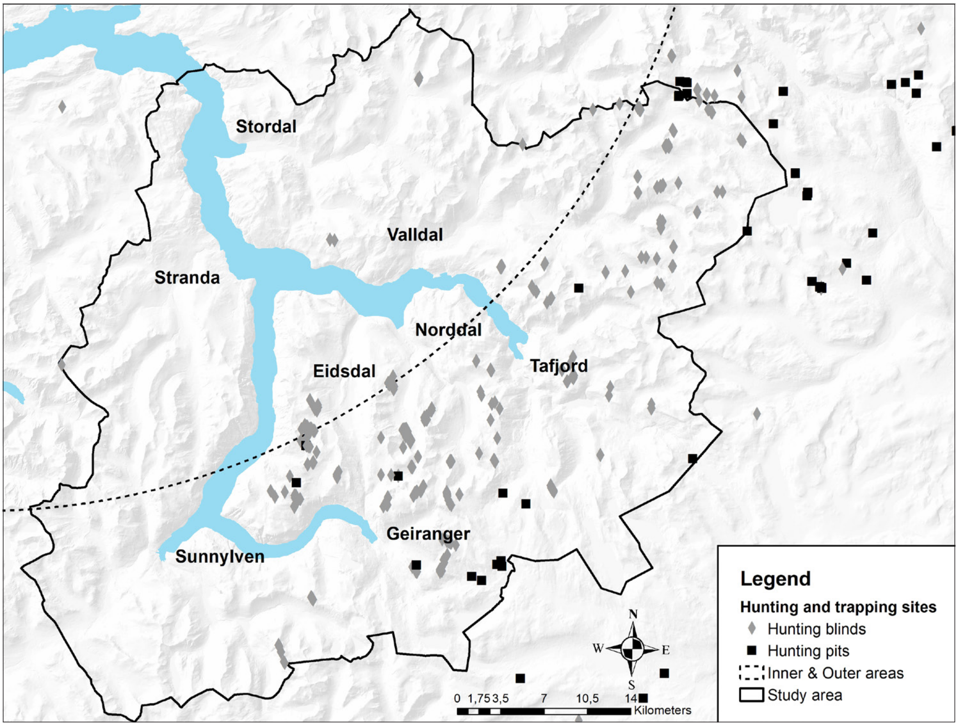

***Figure 9**. Hunting and trapping sites in the study area (Askeladden 27.05.2020).*

The main questions remain: Who were these hunters, where did they live, and what was their relation to the agrarian settlement? Were they Norse pioneers or specialists, exploiting an uninhabited landscape? Or could they also represent other social formations, such as the Saami people, with other perceptions of the landscape? Investigations further inland have documented Saami presence in Southern Norway at the time (Bergstøl and Reitan 2008; Gjerde 2009), and there is also a valley called *Finndalen* - possibly denoting a Saami valley - further east and on the other side of Reinheimen mountains.

We may have found some traces of these hunters in a rock shelter by the county border with a great view over the migration routes and hunting pits below (Dahle 2016c). The rock shelter was dated to the Viking Age-Middle Ages transition, yet we are lacking markers to determine the identity of the hunters. The same goes for the artefacts uncovered by the melting ice. However, the missing relation to nearby agrarian settlements weakens the idea of hunting as part of a combined subsistence strategy in these peripheral landscapes. The apparent continuity from pre-agricultural Stone Age contexts rather indicate some kind of cultural dualism.

Without concluding on their ethnic or cultural identity, it is possible to view the increased activity from the Roman Iron Age onwards in relation to the contraction and societal changes in the core areas - possibly resulting in social stratification and a more aristocratic society being able to exploit the alpine resources through specialist hunters and trappers. Following the agro-pastoral expansion in the Late Iron Age and Middle Ages, however, hunting gradually lost its role. As mentioned above, these could have been conflicting activities, and the hunters could gradually have been suppressed to hunting areas further east (cf. Hofset 1980).

Further assessments can be made against the background of property relations, as we have shown above. Throughout the region, the Giske estate covered strategic and important areas. In our study area this included parts of the outer core areas, but also some of the most peripheral farms in the Tafjord mountains. They also possessed similar mountain farms at Lesja (Kjelland 1987, p. 34) and Skjåk (Hosar 1994, p. 260) on the other side of the Reinheimen mountains. Without further investigations we don't know the origins of these mountain farms, but our hypothesis is that territorial rights in these alpine mountain valleys were based on aristocratic control and exploitation of hunting and trapping, prior to farm settlement.

A socially structurated landscape - living on the edge

In this article we have examined patterns of settlement and land-use in inner Sunnmøre - one of the most marginal agrarian landscapes in the region. We argue that the landscape was concentrically organised and perceived, forming a *longue durée*. By dividing the historical landscape into zones, from centre to periphery, we have a flexible and analytical framework for studying prehistoric activity in various landscape contexts, including variation in time and space, and how these structurating practises and their physical remains have contributed to the long-term social structuration of landscape.

From the initial colonization in the Late Neolithic/Early Bronze Age we can see a great spread in terms of land clearance by the Bronze Age-Iron Age transition. Extensive land-use seems to have covered all landscape zones, even in inner areas. In the middle of the Early Iron Age, however, there is a great contraction in land-use, with no traces of settlement outside the cores in outer areas. This coincides with structural changes within these cores, in terms of more intensive land-use as well as social stratification, as documented by monumental graves and archaeological excavations.

From the Late Roman Iron Age/Migration period onwards we can see a new spread, possibly as a result of intensive exploitation of the cores. Large burial mounds and standing stones in inner areas could thus be seen as the empowerment of new cores. Through the Late Iron Age and Middle Ages we can see an agro-pastoral expansion from core to periphery, culminating in the settlement of the marginal fjord farms. Still, we have not documented farm settlement in any of these areas prior to the erection of grave monuments, which would indicate aristocratic dominion and initial occupation by slaves or semi-free settlers. The natural conditions in a marginal landscape like inner Sunnmøre may have provided limited possibilities of maintaining strong control over agrarian production outside the cores, hence promoting other social relations between centre and periphery.

The late settlement of the peripheral fjord and mountain farms implies that they had no apparent chronological and functional relation to the intensive hunting and trapping in the mountains above and further inland. Rather than being part of the same diverse subsistence economy, these strategies represent various *conjunctures* and *social practices.* The incipient intensification in the alpine zone in the Roman Iron Age coincides with the contraction in the agrarian settlement and land-use, reaching a peak in the Migration period. Following the agro-pastoral expansion in the Late Iron Age and Middle Ages, however, the hunting and trapping activities seem to contract to inner areas and diminish.

Two explanations have been suggested; the hunting and trapping could have been conducted by other *social formations*, such as the Saami people, filling the gap and not necessarily being structurated by the same social landscape. The other perspective is that a more intensive and organised exploitation of the alpine zone may have been conditioned by the restructuration and social stratification in core areas. These perspectives need not be mutually exclusive.

In order to shed new light on these - still hypothetical - processes, we still need more dates from both agro-pastoral and alpine contexts. It would also be possible to look at the same spatial and chronological patterns in a wider geographical context, but it is important to include an understanding of the local landscapes - and its structurating practices and positivities - in the social structuration of space.

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Kathryn A. Catlin and Douglas J. Bolender

Beyond the farmstead: the role of dispersed dwellings in the settlement of Iceland

Norse farms of the Viking Age were organised in diverse ways, and adaptable to the variety of geographic, social, and ecological circumstances throughout Scandinavia and the Norse diaspora. Scandinavian farms show a range of dispersed infrastructure, including outfields, shielings, and specialised sites. Early settlers in Iceland also exploited the hinterland; however, settlement archaeology in Iceland has focused primarily on farmhouses, and few targeted investigations have taken place beyond the farmstead. Recent archaeological work has revealed numerous small, continuously occupied dwellings beyond core farmstead areas. These sites were part of the earliest settlement and included a wide range of productive activity but do not appear to be specialised, seasonal camps or standalone farms. These sites do not fit into existing categories of habitation, seasonality, or land use derived from analogies to later history. The settlement of Iceland was therefore characterised by different patterns of land use and farm organisation than later periods, including a distributed network of farm and non-farm dwellings. These sites appear to have played a transient but critical role in the settlement process.

Introduction

The Settlement of Iceland (c. AD 870-930) has traditionally been conceptualised as a stream of elite Norse chieftains and farmers along with their households, arriving in Iceland to claim large, discrete territories throughout the productive lowlands and inland valleys. This settlement organisation is described in historical and literary accounts, and archaeological research has supported the general outlines of this process. The initial settlement landscape of dispersed farms had remarkable continuity, and most modern Icelandic farmhouses are only metres from buried ruins of their thousand-year-old counterparts. Considerable archaeological research has understandably focused on Settlement-period longhouses, with over 30 having been fully or partially excavated.

However, a recent archaeological survey from the Hegranes region in North Iceland has demonstrated that small, non-farm dwelling sites were also an important dimension of the settlement landscape. These dispersed sites seem to have gone out of use by the early 11th century and have no clear ethnohistoric or archaeological analogue. The unexpectedly early date, small size, short time span, and diverse activities of these sites demonstrate that the settlement process was more diverse than literary sources and previous archaeological research have indicated. The new site-type opens an opportunity to look beyond the immediate households of original land claimants to illuminate radically different and historically unacknowledged settlers and settlement processes.

We contextualise this early Icelandic settlement pattern with studies of medieval agricultural hinterlands in Scandinavia, where many of the settlers originated. The Scandinavian cases demonstrate that intensive exploitation of land beyond the farmstead was vital to Norse economic practice and provide context for the critical role that people living and working outside centralised farms played in the settlement of Iceland.

Historical and Archaeological Perspectives on the Settlement of Iceland

Historical accounts of the settlement of Iceland describe migration, land claiming, and farm establishment from c. AD 870 until 930, when the landscape was 'fully settled' and new immigration largely ceased (Grønlie 2006). It is generally understood that the first settlers imported ecological practices from their homelands, organised around dispersed farming households. Each farm had an infield for growing arable crops or hay to support livestock, with more distant cleared land used for pasture and other resources. These practices were then slowly modified to better suit the Icelandic environment (McGovern *et al.* 2007).

Landnámabók (*Book of Settlements*), with its origins in the 12th century, describes approximately 400 original land claims (Pálsson and Edwards 1972, Friðriksson and Vésteinsson 2003). These land claims were huge in comparison to later farm properties, often encompassing the lands of 20-30 later farms and covering essentially all the productive land in Iceland. Settlement parties often included individuals beyond the land claimant's immediate household. These large expedition parties often split into multiple households as important members went on to establish their own properties. Many of the Icelandic sagas trace regional family histories from settlement to the 11th century (Clunies Ross 2010, p. 90). The sagas depict a complex settlement landscape with many more farms than are recorded in *Landnámabók*, spanning a range of household statuses from chieftains to farms that belonged to formerly enslaved individuals.

The Icelandic farm has traditionally been positioned as the main settlement type and the farming household (farmer, immediate family, and dependent labourers) as the primary unit of production, consumption, and social and biological reproduction prior to the 20th century (Gunnlaugsson 1988, Miller 1990). Historical and literary sources rarely mention dwellings that were not farms, though there are occasional references to cottages, shielings, or shelters for outlaws in the sagas. *Egils saga Skallagrímssonar* notably describes the establishment of some non-farm dwellings during the late 9th century. When Skallagrím settles in Borgarfjörður, he gives land to members of his crew and his sons and establishes several farms for himself, each specialised to exploit a specific ecological niche. Most of these holdings are described as farms (*bú*) but two are instead described simply as places where Skallagrím set a man to live on the land (*bjó*). These places are associated with the exploitation of wild resources, and in one case the man apparently lives alone as a place-name element implies a solitary dwelling (*einbúa-*) (Halldórsson *et al.* 1998, pp. 402-403).

Since the 19th century, archaeological research has focused on the settlement landscape, driven in part by an enduring interest in the historicity of the sagas (Friðriksson 1994, Friðriksson and Vésteinsson 2003). Archaeological work has assumed that the primary unit of settlement was the single-household farm, and focus has usually been on longhouses and buildings that comprise the core farmstead area. Recent work has moved beyond literary-based accounts to produce new insights on rapidity of settlement, such as processes of initial land claims, land division, and new farm establishment (Steinberg *et al.* 2016); inland frontiers of settlement (Sveinbjarnardóttir 1992, Vésteinsson *et al.* 2014); and ecological impacts of human colonisation (McGovern *et al.* 2007). This work has demonstrated that settlement processes varied considerably in different regions, although the farm and its associated household continue to be the primary units of analysis.

Icelandic farms consisted of a 'farmstead' - the core concentration of farmhouse, barns, and homefield - as well as extensive pastures and outfield areas. Outfields have received some archaeological attention, including special activity areas such as shielings (Sveinbjarnardóttir 1991) and iron production sites (Smith 2005), wall and boundary networks (Einarsson *et al.* 2002), and the management of rangelands (Thomson and Simpson 2007). The few small, distant sites that have been systematically investigated were seasonally occupied shielings and activity areas rather than year-round dwellings, and generally date to the mid-10th century or later (Lucas 2008, Kupiec and Milek 2014).

More recently, work in several regions has demonstrated that small dwellings outside of traditional farmstead boundaries were a significant part of the settlement landscape (Vésteinsson *et al.* 2010, Vésteinsson and McGovern 2012, Catlin 2019, 2021). These sites share some but not all attributes of farmsteads, with some similarity to the descriptions of single-person dwellings in *Egils saga*. This discovery adds a new dimension to our understanding of settlement processes, providing the opportunity to look beyond the immediate households of the first settlers. However, because the dwellings share few characteristics with known archaeological site types, literary sources, or the historical record of the 13th century and later, it has been difficult to situate them within the social and ecological landscape of settlement.

We define 'dwelling sites' as distinct from 'activity areas.' Dwellings have evidence for full-time occupation rather than seasonal, as well as a range of productive activities, including those required for subsistence (hunting, fishing, livestock, agriculture, and on-site food preparation), and may include craft activities such as textile or metal production. Dwellings with generational continuity (such as farmsteads) will also show evidence of household reproduction, such as childrearing (Callow 2007) and care for the elderly (Sigurðsson 2008). During the Viking Age, pagan and early Christian cemeteries associated with individual farm properties also suggest multigenerational household continuity (Friðriksson 2004, Zoëga 2015). In this conception, dwellings include farmsteads as well as the small early non-farm dwelling sites that are the focus of this paper. 'Activity areas' are associated with specialised practices and were sometimes inhabited by part of the household temporarily or seasonally, although their middens may contain evidence of varied practices. These include shielings, fishing stations, and processing sites for iron or charcoal.

We argue here that the new-to-us Icelandic small dwelling sites are best understood via a comparative perspective on settlement organisation and outfield use across medieval Scandinavia and the Norse diaspora. Norse settlement patterns and economic practices had considerable diversity prior to the 7th through 11th centuries, during which time livestock herding and transhumance began to increase in prominence over other economic activities (Øye 2004, Pettersson 2005, Øye 2011, Svensson 2015). Earlier settlement patterns included diverse ecological practices that were adaptable to many different social and ecological contexts, with significant and varied exploitation of hinterlands and outfields. Therefore, if Icelandic settlers began with an existing Norse model of economic and agricultural practice, such a model was almost certainly more diverse than the relatively simple, historically documented landscape of dispersed, centralised farmsteads.

New Evidence for Early Non-Farm Dwellings

Between 2015-2018, the authors and other researchers from the University of Massachusetts Boston and the Skagafjörður Heritage Museum performed an archaeological settlement survey of medieval dwelling sites in the region of Hegranes in Skagafjörður, North Iceland (Figure 1). Hegranes is an eroded rocky headland between the mouths of the Héraðsvötn river. Dwelling sites are mostly located just above wetland areas or in spatially distinct pockets of deeper soil.

The Skagafjörður Church and Settlement Survey (SCASS) and its predecessor, the Skagafjörður Archaeological Settlement Survey (SASS, 2001-2014), aimed to determine the size and earliest settlement date of farmsteads in Hegranes and the neighbouring Langholt region. New farms were created into the 11th century, as initial land claims were first divided among subsequent generations, then subdivided into smaller holdings presumably occupied by dependent farming households (Bolender 2015). This settlement landscape was highly stable: between the 9th and 20th centuries, few farmsteads were abandoned for long periods, and none moved farther than a few hundred metres from its initial location (Bolender *et al.* 2011). Farmstead establishment dates significantly correlate with size and historically documented production values: sites established earlier are both larger (by the 12th century) and more productive (in the 18th and 19th centuries) (Steinberg *et al.* 2016).

The *Fornbýli* Landscape and Archaeological Survey on Hegranes (FLASH), Catlin's doctoral project, investigated the environmental and settlement history of eighteen sites at peripheries of farm properties, of which thirteen may be classified as dwelling sites (Catlin 2016, 2019, 2021). Most sites in the FLASH survey were described by Hjalti Pálsson (2010) in his *Byggðasaga Skagafjarðar* as *fornbýli* (ancient farms: sites of probable medieval settlement) or *rústir* (ruins: likely without medieval settlement). The sites are several hundred metres or more away from the nearest known farmstead, and most have visible surface ruins of livestock buildings and enclosure walls from the 12th through 19th centuries, long after dwelling at the sites came to an end. To date, excavations at these dwelling sites have focused on middens.

Eleven of the small dwelling sites have domestic midden dating to the late 9th or early 10th centuries (Figure 2, Table 1) (two other surveyed sites, Hendilkot and Ríp 2, were established later and are better categorised as small farmsteads or cottages). Coring survey at some of the sites suggested that Settlement-period turf ruins may be present beneath the ruins of more recent outbuildings. These early sites were settled at the same time or slightly before neighbouring farmsteads. Radiocarbon dating from one site (Kotið) indicates activity prior to cal. AD 884, placing it among the earliest sites identified in Skagafjörður (Damiata 2019). Most of the dates are from Hordeum seeds; however, the earliest dates are from charred Empetrum nigrum and Ericaceae seeds recovered from the interface of cultural and prehistoric sterile layers. The later dates for Hordeum may indicate that arable cultivation was not part of the earliest activities at small dwellings.

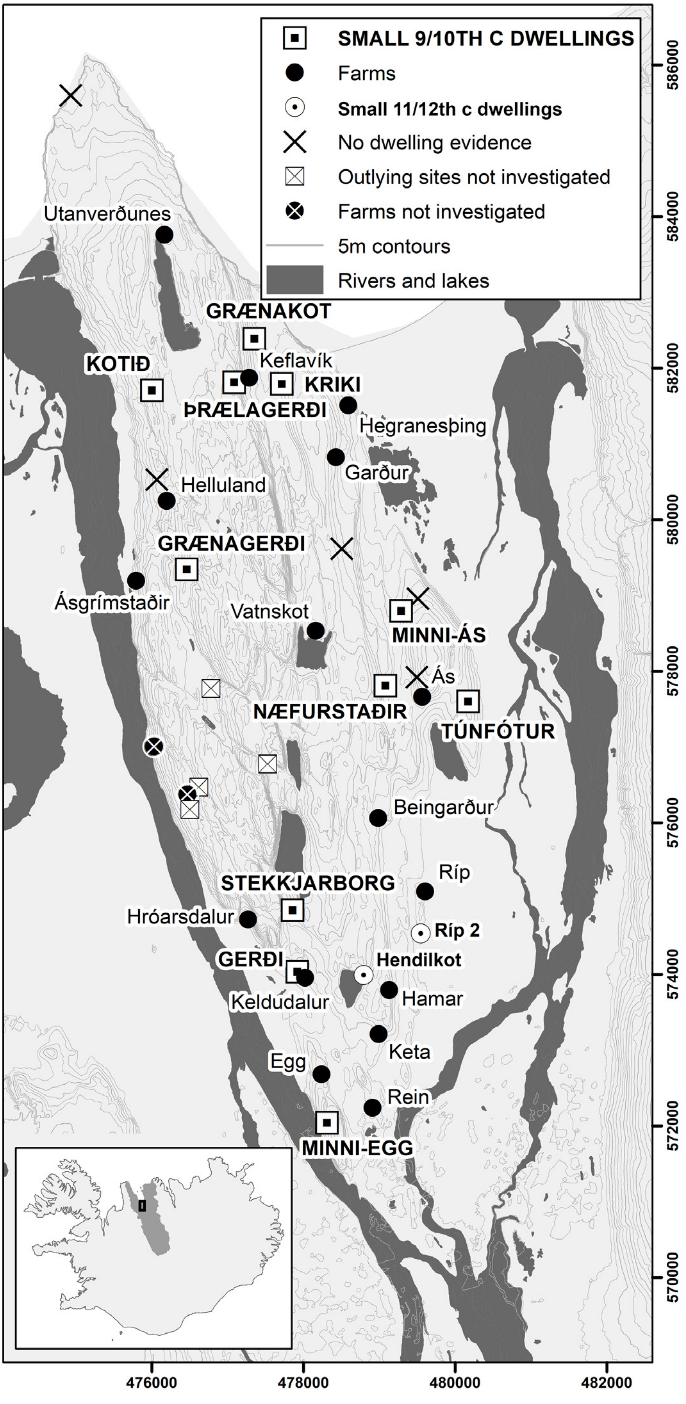

Figure 1. *Map of the Hegranes survey area. Easting and northing (metres) are shown in the ISN93 coordinate system on the bottom and right edges of the figure respectively.*

All the dates are consistent with establishment during the Settlement period. End dates are less clear, but it is likely that most sites had either lost habitation entirely or were undergoing a transition to a second phase by the late 10th century or earlier. The four sites with a second dwelling phase nonetheless came to an end by the early 12th century. These small, early dwellings therefore do not fit the observed settlement sequence for farms in Skagafjörður, in which the oldest farmsteads are also the largest, nor do they exhibit the strong continuity and stability that categorised most farmsteads over the following millennium. In fact, they seem to have been abandoned before the smallest farmsteads were established in Langholt and Hegranes.

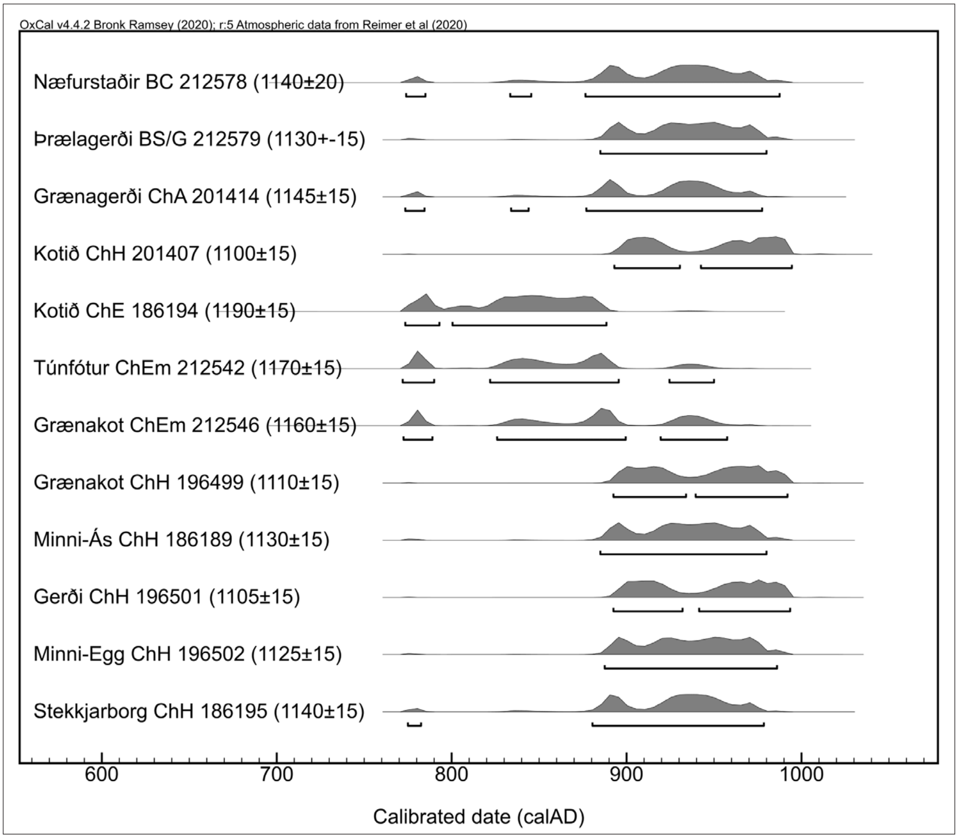

***Figure 2**. Radiocarbon from the earliest contexts of small dwelling sites on Hegranes (Damiata 2019). No dateable specimens were retrieved from Kriki. Radiocarbon source: BC - cow bone, BS/G - sheep/goat bone, ChA - charred cf Avena (likely oat), ChE - charred Ericaceae (heather), ChEm - charred Empetrum (European blueberry), ChH - charred Hordeum (barley); 95.4% probability range is shown. Sample numbers are UCI AMS# and years BP are provided in parentheses.*

Site Name	Phases	Site Area (m^2)	Midden Matrix	% Wild Faunal NISP	Notable Macrobotanicals
Gerði	1	45	Peat Ash	-	17 Hordeum
Grænagerði	2	420†	Charcoal	82% (Ph1) 79% (Ph2)	34 cf. Avena* 28 Hordeum*
Grænakot	2	135†	Peat Ash	-	6 Hordeum**
Kotið	1	316†	Charcoal	83%	1 Hordeum
Kriki	1	25†	Charcoal	-	-
Minni-Ás	1‡	439†	Both‡	-	3 Hordeum
Minni-Egg	1	29	Charcoal	-	1 Hordeum
Næfurstaðir	2	1575†	Charcoal (Ph1) Peat Ash (Ph2)	93% (Ph1) 83% (Ph2)	-
Stekkjarborg	1	634	Charcoal	-	4 Hordeum
Túnfótur	2	163†	Charcoal (Ph1) Peat Ash (Ph2)	-	-
Þrælagerði	1	535†	Charcoal	93%	-

***Table 1**. Data from coring survey and midden excavations at small dwelling sites on Hegranes. Notes: NISP: Number of Identified Specimens. cf. Avena: likely oat. Hordeum: barley. Ph1/Ph2: Phase 1/Phase 2. †: Likely area prior to late-10th century tephra. All others, area is pre-H1104. ‡: Coring at Minni-Ás revealed two midden areas, one primarily charcoal and the other primarily peat ash, but existing data does not permit us to place them in a relative chronology. *: All but one seed of each type at Grænagerði was retrieved from Phase 2 contexts (11th-century). **: All seeds at Grænakot were retrieved from Phase 1 contexts (likely 9/10th century). (Catlin 2019, 2021, Cesario 2021, Ritchey 2019)*

Small dwelling sites range in size from 30 to 1600 m^2 of turf and midden (all but one of them are under 650 m^2), generally smaller than the Viking Age component of sites historically identified as farms in the Langholt and Hegranes surveys (which ranged from 600 m^2 to more than 15,000 m^2) (Steinberg *et al.* 2016). The sites appear to have been occupied year-round: middens were not laminated to suggest seasonal deposition. Dwellings show a range of production and consumption activities (Catlin 2019, 2021). Middens at many of the sites were primarily composed of charcoal, indicating a preference for wood over peat as fuel. While all faunal assemblages included a farm-like signature of domestic mammals (all ages and cuts of cattle and caprine), they also included a higher-than-expected proportion of wild foods, mostly marine birds and fish (>70% of NISP) (Cesario 2021). Fish exhibit a producer signature (more head than body bones), indicating that people at the sites were involved in preparation of dried fish to be sent elsewhere for consumption. Seven sites had charred barley in their macrobotanical assemblages (Ritchey 2019), and artifacts included two carved bone pins. One site has evidence for iron production (Zeitlin 2020).

Interpreting Small Icelandic Dwellings

The evidence for year-round occupation and diverse economic activities indicates that the dwelling sites were not simply outbuildings or specialised activity areas. They also differ substantially from excavated farmsteads. Some farmstead establishment models suggest the first buildings at a new farm may have been pit houses, occupied during construction of the main longhouse (Milek 2012). If such a site were abandoned before the longhouse was complete, perhaps upon discovering the available land was insufficient for farm production, archaeological remains would include a small midden. However, this scenario does not match what appears to be long-term midden accumulation, on the scale of years to decades. We must therefore look beyond existing site typologies to make sense of these sites.

One way to clarify the role of small dwellings is to consider them in terms of their reproductive, as opposed to productive, capacity. Historical sources indicate that the capacity to support a farming household was intrinsic to the notion of a farm. While the sites have evidence of farm-like production, their small size and the apparent absence of typical domestic farm buildings, such as longhouses, and associated outbuildings suggests a limited capacity for household reproduction. Household reproduction implies multiple generations dwelling together and often goes along with long-term habitation at a site (see also Netting *et al.* 1984, Øye 2003).

The later historical rural landscape of Iceland included some small dwelling places for people whose social status and reproductive capacity did not fit into the narrow notion of the farming household or the farm as a legal unit. These included small dwellings on farm properties and contract labourers whose production was only partially tied to the household in which they were resident. These labourers were highly mobile, often moving from place to place, such that their lifetime economic production and reproduction transcended any single farm and was not encompassed by a single, enduring dwelling place (Bolender and Johnson 2018). However, the dwelling itself would continue contributing to the reproduction of its associated farm, as specific residents departed and new ones arrived. This is distinct from the apparent closure of habitation at early small dwellings: no one arrived to take the place of the final occupants. Thus, historically known small sites do not provide a good analogy for the small dwellings of the Viking Age.

Empirically, the small dwelling sites did not reproduce themselves in the long run: depopulation appears to have occurred after no more than a few decades of habitation, perhaps one or two generations of inhabitants. Many of the sites may have ultimately supported the reproduction of some other, larger economic unit, such as a more traditional farming household. The sites may therefore have lost viability when economic or social pressures, such as a growing emphasis on farming over communal exploitation of wild resources, brought these cooperative arrangements to an end.

Small dwelling sites also likely contributed to land clearance and the domestication of Iceland's pre-settlement landscape (Catlin 2019). Hegranes rapidly declined in woodland cover during the hundred years after settlement (Hallsdóttir 1996), and the prevalence of charcoal in middens at small dwelling sites demonstrates a ready source of wood for fuel. Most dwelling sites are on slopes between wetlands below, and now-eroded bedrock above (Figure 3). Distributed dwellings may therefore have facilitated the dispersal and supervision of livestock in wet pastures, while residents cleared land to create more extensive, drier pastures. Open land may have been an important criterion for settlement location, especially at wetland boundaries (Vésteinsson 1998, Øye 2011), and areas of grassland away from the farmstead may thus have been critical while homefield areas were being first established. A need for such places would come to a natural end when extensive pasture land had been created on Hegranes.

Figure 3*. Photos of small dwelling sites and their landscapes. Lines denote visible walls and features that date to the 12th century and later. A: Minni-Egg, drone photo, facing west; star denotes location of Viking Age midden. B: Þrælagerði, facing south; wetlands to the west (not visible) include evidence of peat cutting.*

Due to some combination of environmental, economic, and social pressures, all the small dwelling sites of Hegranes were depopulated by the early 12th century. Whatever ongoing contributions the sites may have made to regional production, they no longer included human habitation. Rather, their economic function was reduced to providing outfields and short-term livestock housing for nearby farmsteads. Other productive activities appear to have moved from the small dwellings to farmsteads or seasonal activity sites.

Assessing the Prevalence of Small Icelandic Dwellings

Small early dwelling sites have also been observed elsewhere in Skagafjörður, though no follow up work has yet been conducted. SASS identified two areas of isolated midden well away from main farmsteads during systematic reconnaissance coring in Langholt, dating to before AD 1104. However, as the survey did not specifically target small sites, others easily could have been missed due to the widely-spaced reconnaissance coring grids (between 25m-100m intervals in outfields) (Steinberg *et al.* 2016). Surveying in back valleys by Byggðasafn Skagfirðinga suggests that small, early non-farm dwellings are likely present in other regions of Skagafjörður (Zoëga *et al.* 2017).

Limited survey and excavation at numerous small sites in Mývatnssveit revealed similar traits to the Hegranes dwellings. Many of the sites pre-date the 940 tephra, were permanently inhabited, and hosted a variety of activities comparable to farms. These have been interpreted variously as early attempts at farming, or as 'outstations' - permanently inhabited sites that facilitated access to resources or asserted ownership over land on behalf of a parent farm, perhaps as an effective way to control land before hayfields were established (Vésteinsson 2010, Vésteinsson *et al.* 2011). In other parts of Iceland, limited survey suggests similar diversity in early land use (Lárusdóttir 2006, Júlíusson 2016).

Based on the limited scope of current work, it is difficult to assess the prevalence of non-farm dwelling sites during Iceland's settlement, or their comparability across different regions. The establishment of small, dispersed dwellings may have varied as a response to local social or geographic conditions. It is also possible that small dwellings are common but difficult to locate. In Hegranes, the sites had visible, named ruins due to their reuse over many centuries, albeit under a different production regime. Small middens were difficult to detect even at sites where their presence was suspected, often requiring 10 m coring grids and a little luck (Catlin 2019). In regions with direct access to extensive or highland pastures, small early dwellings may not have been repurposed, and thus might lack surface signs or placenames. Likewise, field flattening, cryoturbation, or sediment deposition may obscure or bury ruins. Identifying sites without surface features would be prohibitively time consuming. We would like to see more investigation away from farmsteads, but suggest that the search for small, early dwellings should concentrate on places with visible outfield infrastructure, especially where historians and surveyors have speculated about prior settlement, while acknowledging that placenames may be modern and have little bearing on Settlement period activity.

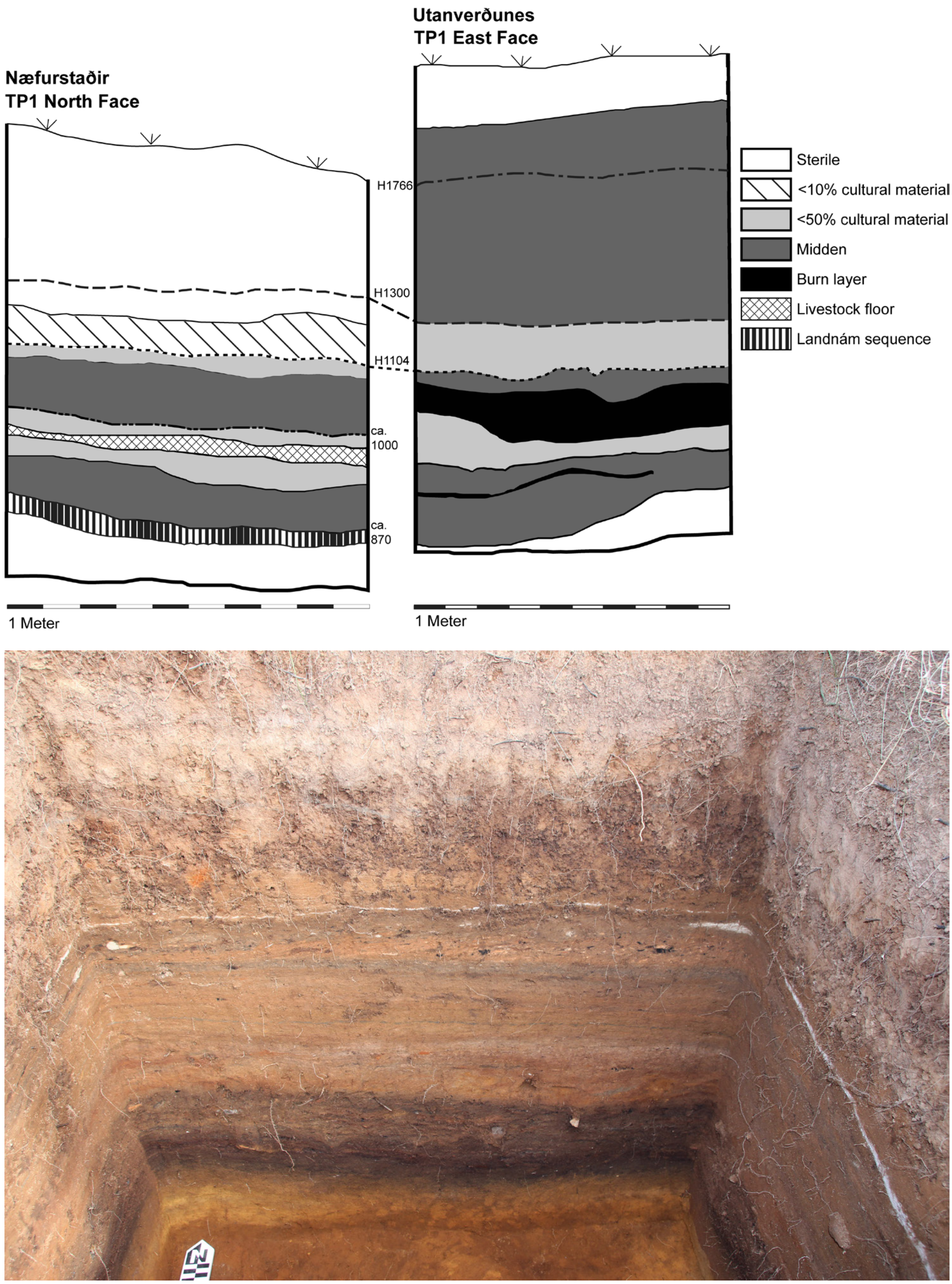

Figure 4*. A: Simplified profile drawings from excavation units at Næfurstaðir and Utanverðunes. B: Photo of Næfurstaðir TP1 North Face.*

Figure 4*. C: Photo of Utanverðunes TP1 East Face.*

Furthermore, some early dwelling sites may have transitioned to farmsteads, with their own defined farm properties and households. If these transitions were successful over the long term, evidence for early non-farm dwellings would be obscured beneath later farmstead deposits. Several sites in Hegranes have depositional sequences that suggest a transition from non-farm dwelling to farmstead. At Næfurstaðir, one of the dwellings on the contemporary property of the farm Ás, there is a break in human occupation during much of the 10th century, after which the site was re-settled on a slightly larger scale with midden deposition more like farmsteads, before being permanently abandoned by the early 12th century (Figure 4). This second dwelling phase appears to represent a short-lived, unsuccessful attempt at full-scale farming. Furthermore, at some farmstead sites, early midden deposits were identified that fit the character of the small dwellings. At Utanverðunes, the earliest midden layers have a high concentration of wild bird bones, similar to some small dwelling sites (Cesario 2021). This is followed by evidence for extensive burning across the site before the sequence transitions to more typical farmstead deposition. This is not dissimilar to other excavated farm sites that showed evidence of activity prior to farmstead establishment (Smith 2005, Vésteinsson 2010).

Viking Age Outfield Use in Scandinavia and the North Atlantic

As in Iceland, archaeology of the Viking Age in Norway and Sweden has traditionally focused either on farmsteads or on broad ecological studies of landscape change, while the relationship between farms and outfields has been largely based on ethnohistoric analogies. Recent work has demonstrated the importance of studying farmsteads together with outfield resources and infrastructures, to fully understand the context of the farm and its role in social and economic development (Holm 2002, Øye 2003, 2005, 2011, Svensson 2015). There appear to have been site types and landscape practices throughout the medieval Norse world with no clear ethnohistorical analogy, including sites that have been interpreted as shielings but appear to have been occupied year-round.

Norse landscape practices depended upon diverse and flexible outland strategies that could be adapted to unfamiliar environments. These strategies required different sets of knowledge and expertise, including game hunting; fishing; iron, charcoal, and tar production; gathering plant resources; clearing wooded land for use as pasture or outfields; dairying and tending livestock; and gathering winter fodder. The specific implementation of these landscape practices depended on local ecology and topography, availability of resources, and the social and economic context of the farm (Eriksson-Trenter 1998, Øye 1999, Holm 2002, Øye 2003, 2004, 2009). Settlement organisation and outfield use varied substantially both within and between regions, including the balance between hunting, arable agriculture, and extensive grazing in the farm's productive strategy. In some places, agriculture appears to have been supplemental to outfield resources, especially in regions where little land was available for cultivation. Norse economic practice has therefore been described as an 'innovation package' (Costello and Svensson 2018, p. 10), from which elements could be lifted and applied to changing social and environmental conditions. This flexible, adaptable agricultural framework was important to the successful establishment of Norse colonies across the North Atlantic (Øye 2005).

The Faroe Islands and Greenland have evidence for small, diverse outfield sites during their settlement, ranging from barely-occupied shielings to something less than a traditional farm. For example, the artifact assemblage from Argisbrekka, a shieling in the Faroes, is similar to that at traditional farms (Arge 2014). At the other end of the range, Madsen (2019) has recently drawn on an adaptive model of outfield use to explore 'marine shielings' in Greenland - stations that facilitated hunting, fishing, and travel, often without evidence of sustained seasonal or permanent occupation. Within this diversity, many small settlement sites appear to have exploited environmental niches characterised by semi-open wetlands and mixed heath (Borthwick 2006, Ledger *et al.* 2013). Likewise, small sites were often abandoned within a couple of centuries, and thus appear to have played a transitional role between the initial settlement and historically documented landscape management practices (Mahler 1998).

Thus, from the beginning of North Atlantic colonisation, outfield exploitation was a necessary part of the settlement process. A new Norse settlement of the late 9th century would likely incorporate diverse types of land use, with regional variation in length and seasonality of occupation, type of activities performed, and spatiotemporal relationship to farmsteads. Greater flexibility might be expected in early Iceland than in Scandinavia, since creative innovations to existing strategies could be freely applied on the frontier, in a landscape without millennia of embedded economic practices. The early small dwellings in Iceland may thus represent an innovative transformation of the Norse economic system to the conditions of the Icelandic landscape. We therefore look to Scandinavia not for specific comparative examples, but to emphasise the broad range of possible landscape practices.

Norse Shieling Diversity

Shielings may present the closest available analogue for small non-farm dwellings. Shielings have been instrumental to agricultural production across much of Europe since the Neolithic, including Scandinavia and the Norse diaspora, though their specific form and cultural context has varied considerably across time and space (Sveinbjarnardóttir 1991, Øye 2005, Svensson 2015, Costello and Svensson 2018). Traditional Norse shielings facilitated seasonal dairy production and livestock transhumance during summer months, permitting grazing far from arable fields in advance of the harvest. Shielings can resemble farms in the number and basic form of their buildings, and often transitioned between permanent and seasonal habitation throughout their histories. Therefore, it can be difficult to distinguish between farms and shielings archaeologically, though detailed analysis of excavated floors or artefact assemblages can sometimes differentiate between seasonal and year-round occupation (Lucas 2008, Kupiec *et al.* 2016).

Across the Norse diaspora, archaeological shielings have usually been identified based on comparison to ethnohistoric landscape practices up to the 19th century. Although historically known shielings could be flexible in use and function, comparisons between shielings of the 19th century and the Viking Age have been critiqued on the basis that specialised seasonal sites do not adequately capture the diversity of activities performed at older sites (Øye 2004, Pettersson 2005, Øye 2005, 2009, Kupiec and Milek 2014, Svensson 2015). There is mounting evidence that Scandinavian shielings during the Iron Age supported a diverse array of productive activities and were likely used for longer periods throughout the year, rather than only for dairying and pasture in summer. The relationship between shielings and farms also varied widely, and the extent to which outfield activities were managed by farms or directly at shielings is unclear. In some places, sites interpreted as shielings appear to pre-date the establishment of a nearby farm, while elsewhere shielings seem to have begun as dependent sub-holdings of older farms (Skyllberg 1998, Øye 2003).

The transition to a more seasonal and specialised Norse shieling appears to have been underway during the 8th and 9th centuries. This period corresponds to a demographic increase in Scandinavia, accompanied by more land clearance, farm subdivisions, and settlement reorganisation, including the creation of new farms in former outfields and increased emphasis on transhumance (Øye 2004, Pettersson 2005, Øye 2011). The settlement of Iceland occurred in the context of these profound transformations of the Scandinavian landscape. It is therefore likely that early Icelandic outfield use had more in common with late Iron Age Norse practice than with ethnohistoric shielings from anywhere in Scandinavia or the North Atlantic. Although it has been assumed that summer farms were transplanted to Iceland by the earliest settlers, archaeological evidence is limited for shielings prior to the mid-10th century (Sveinbjarnardóttir 1991, Vésteinsson and McGovern 2012, Kupiec and Milek 2014). Ninth and early 10th century Icelandic outfield dwellings may have facilitated a broad spectrum of diverse activities, similar to Pálstóftir, a late 10th century shieling that had evidence of hunting, metalworking, and possibly religious practice (Lucas 2008). Shielings and small sites at the boundaries of farm properties might also have served to reinforce claims over large areas (Lucas 2008, Vésteinsson 2010, Vésteinsson *et al.* 2011).

Svensson (2015) has suggested that shielings, as an inclusive and broad category, should be understood as an adaptive process rather than a static typology and as a flexible method for strategic problem-solving to meet diverse and changing needs for activities beyond agricultural infields. This expansive shieling concept, an innovative and flexible outfield infrastructure, becomes a useful lens through which to examine parts of the built landscape that are not adequately explained through other means. It is possible that small dwelling sites like those on Hegranes may have been similar to Iron Age shielings, adapted to the needs of the immediate context of settlement. These needs included many of the same purposes that were later served by seasonal sites as well as by farms, but were performed in the context of permanent habitation separate from a traditional farmstead.

The Settlement Farmstead as an Incomplete Landscape

The variety and adaptability of the Norse agricultural package to diverse contexts throughout the Norse diaspora suggests that we may consider early Icelandic landscape practices as a particular adaptation of farming to the specific context of settlement. However, as a concept, the Norse farm is as ambiguous as the shieling, shifting in underexamined ways that may bear little resemblance to the way medieval Norse understood their landscape. Differing assumptions of the meaning of 'farm' have led to confusion when comparing research between different academic disciplines or regions of Scandinavia (Øye 2011). In Norway, the word had little specific meaning and substantial regional variation, and could refer to essentially any type or size of agrarian settlement (Øye 1999, 2004, 2005). This might include multiple households sharing one or more dwellings and infields, along with the broader landscape and resource base that contributed to subsistence.

Historical and archaeological research in Iceland has traditionally understood the farm as a social and ecological unit that extended well beyond the buildings and fields of the core farmstead. Historical and archaeological sources suggest farm properties were highly stable. Texts describing the earliest settlement patterns, such as Landnámabók, make it clear that farms or land claims comprised a tessellated mosaic encompassing practically all productive land. At the same time, multiple people could share rights to resources outside of individual farm properties, and land use extended into communal areas to cover the whole island. While land claims were bounded territories owned by individuals, there is no evidence that they had equivalent legal or practical status to that of later farm properties. In most cases, the recorded land claims are far larger than medieval farm properties, including those associated with named Settlement farms (Friðriksson and Vésteinsson 2003). The rapid division of primary claims into secondary and tertiary properties indicates that claims were more easily dissolved and subdivided than later farm properties, and much of this land would presumably have been undeveloped and underutilised during the first years of settlement (Bolender 2015).

Most archaeology in Iceland has concentrated on farmsteads - especially longhouses - or indirect evidence of extensive land use (e.g., Streeter and Dugmore 2014). The result of this farmstead-centric approach has been an incomplete understanding of the settlement landscape, and the farm as an expansive and bounded property has been largely taken for granted in Icelandic archaeological research. Archaeologists have usually understood any permanent dwelling site as a farm, which has contributed to our difficulty in interpreting small early dwelling sites, as they challenge our notions of what it means to be a farm (Catlin 2019). The existence of small dwellings illustrates our incomplete understanding and provides a mechanism to engage archaeology beyond the farmstead, by illuminating boundary practices, settlement organisation, and resource exploitation patterns of the earliest settlers.

Conclusion

Assessing both conservatism and innovation in the Icelandic settlement requires a deep understanding of Norse homeland and diasporic settlement patterns, including the range and variation of outfield land use. It is clear that the Norse dwelling sites of the Viking Age were diverse, part of a distributed network of land use that was highly adaptable to changing ecological and social conditions. We join a growing body of scholars who have called for more interregional and comparative study to clarify the settlement diversity of the Norse diaspora, including the changing roles of outfields and shielings, the conceptual and methodological implications of the 'farm,' and the processes that accompany colonisation (Øye 1999, Holm 2002, Øye 2005, 2011, Kupiec *et al.* 2016,).

There is a clear need for more attention to the role of small early dwellings in the settlement of Iceland. This will require broadening the conceptual approach beyond farmsteads to include the complete landscape. Small early dwelling sites appear to represent a form of landscape organisation and productive activity that corresponds neither to later ethnohistorically documented practices nor to the traditional model of the Settlement farm. These small dwellings seem to have served a purpose in the process of settling the new landscape. The social and ecological practices that they facilitated appear to have changed during the late 10^{th} and 11^{th} centuries, as the process of new farm establishment ended (see Steinberg *et al.* 2016), and much of the lowlands had been converted from woodlands to pasture (Simpson *et al.* 2003). The end of habitation at small dwellings may also have enabled farm production to the extent that resources in the broader landscape, such as outfield hay and grazing, became more accessible (Catlin and Bolender 2018).

A more complete understanding of outfield practices, small and marginal dwellings, and diverse settlement patterns has the potential to illuminate processes of social complexity throughout the Norse world (Øye 2003, 2009, Costello and Svensson 2018). The opportunity to look beyond the immediate households of the original land claimants allows us to more clearly distinguish the lives of landowners from other members of the household. Studying the closure of non-farm dwellings and the transition from diverse to specialised outfield use also sheds light on long-term human ecodynamics in Iceland, as the long settlement process gave way to the historically familiar landscape.

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Ramona Harrison and Howell M. Roberts

Skuggi landnám farm and site economy in transition: an assessment of the Structure A and household midden remains from the Viking Age to the Medieval period

This paper provides an initial overview and assessment of the Skuggi Settlement Era farm in Hörgárdalur, Eyjafjörður. Excavations on the marginal site in 2008-09 resulted in organic and inorganic remains collected from a domestic midden infilling a turf and stone building, Structure A, which was fully excavated in 2013-14. Located on land owned by the Staðartunga farm, the site was discovered on a seemingly marginal, north-facing slope. The midden and structural remains inform us about changing farming and thus economic strategies from the Viking period and Middle Ages. Buried contemporary landslides indicate destabilized slope conditions, potentially coinciding with human settlement on this steep mountain slope. Skuggi can be viewed as one small, and early, part of a larger socio-economic network within and beyond Eyjafjörður, based on exchange in luxury goods for export, but also bulk goods such as dried fish, and, in this case, a shift from subsistence agro-pastoralism toward increased sheep wool production. Along with local and overseas politics and religious institutions exerting power on such small-scale farming operations, the changing environment may have also played a role. Research at Skuggi forms a part of the Eyjafjörður Ecodynamics Project (EE) which was developed from the Gásir Hinterlands Project (GHP).

Introduction

This paper provides an initial synthesis of excavation data from the Viking Age farm site of Skuggi in Hörgárdalur, Eyjafjörður. It aims to create a general site narrative through a multi-stranded, proxy data-based view into the past at this Settlement Era site. The dataset consists of both previously published zooarchaeological data from the 2008/2009 investigations (Harrison 2010b, 2014, Smiarowski *et al.* 2017) and new results from the 2013/2014 midden and structural excavations (Harrison and Roberts 2014). The results of the latter investigation allow the authors to present the site chronology in five activity phases, starting in the late 9th century and ending in the early 13th century.

- The paper first presents the research background, then discusses the site chronology and the Structure A remains. It then briefly presents general overviews of results from the artefact, geochemical, and archaeobotanical analysis. The buried landslides from Trench

3 are presented, followed by an overview of the overall finds from the zooarchaeological analysis. The latter forms the greater part of the Skuggi farm site story. A discussion addresses the main questions:

- Can we define changes in site activity and farming economy over time?
- Do the archaeological remains at Skuggi show evidence of environmental impacts that might affect the use and longevity of the site?

Background

Skuggi is located about 200 m southwest of the abandoned farm of Oddstaðir (Harrison 2014), and a little more than 20 km southwest of the Medieval trade site of Gásir which is located on the estuary of the Hörgá, a river which runs through Hörgárdalur (see Figure 1). Skuggi is situated about midway uphill on a north facing slope, below steep rocky outcrops and south of the Hörgá. Positioned on a little plateau at an elevation of about 160-170 m above sea level, Skuggi may be considered a semi-upland site. The Skuggi midden deposits have been radiocarbon dated to between cal. AD 970-1208 (Figure 4); tephrochronology further aids in dating the remains. All midden deposits are sealed by the H1300 tephra (from the volcano Hekla), and most of them also by H1104. A well preserved turf and stone structure under the midden contains tephra layers deposited during the Settlement Era volcanic activity (Landnám Tephra Layer, LTL), now dated to AD 877 ± 1 (Schmid *et al.* 2016).

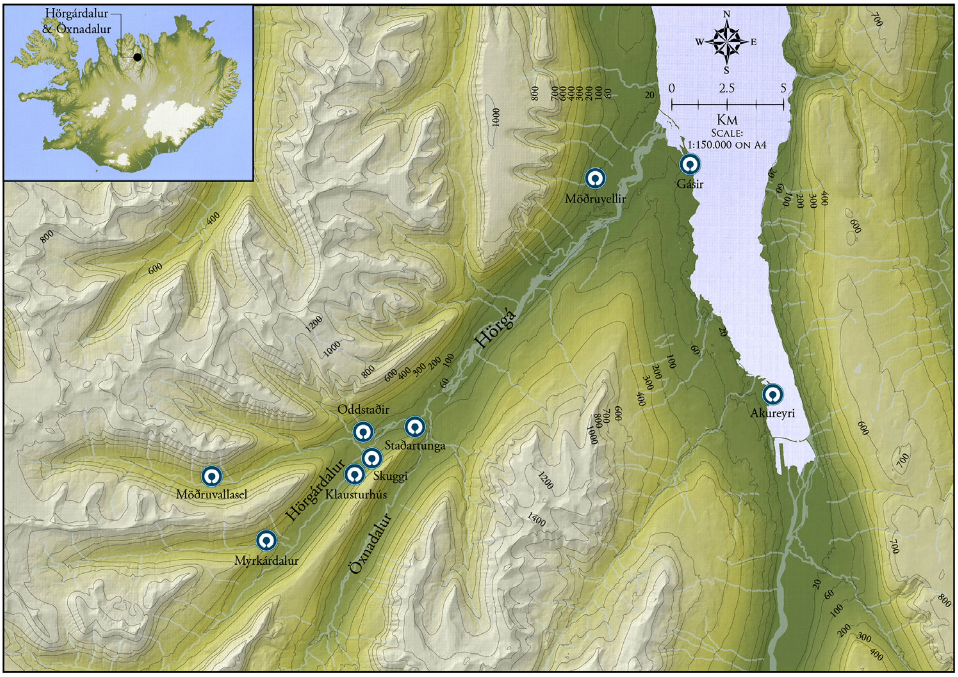


Figure 1. Map of Hörgárdalur, indicating the sites mentioned, as well as others investigated as part of GHP and EE research (Map: Gisli Pálsson, 2013).

Archaeological investigations at this seemingly marginal site originated as part of a study of the larger socio-economic context of the 12-14th century AD trading site of Gásir (e.g. Harrison *et al.* 2008, Roberts 2009, Vésteinsson 2011). Although the Skuggi remains predate those from Gásir, they can be directly compared to archaeological remains from the early occupation periods at neighboring Oddstaðir. Its ruins are located on relatively flat, south facing pastureland at c. 150-160 m above sea level, and it was one of Skuggi's northern neighbors from across the Hörgá (Harrison 2013). The Oddstaðir midden produced stratified deposits that indicate a continuous site occupation from the late 9th /early 10th century to the early 15th century. The animal bone data suggests that Oddstaðir could have started out as an independent farm and thus may have enjoyed a higher social status than Skuggi (Harrison 2014).

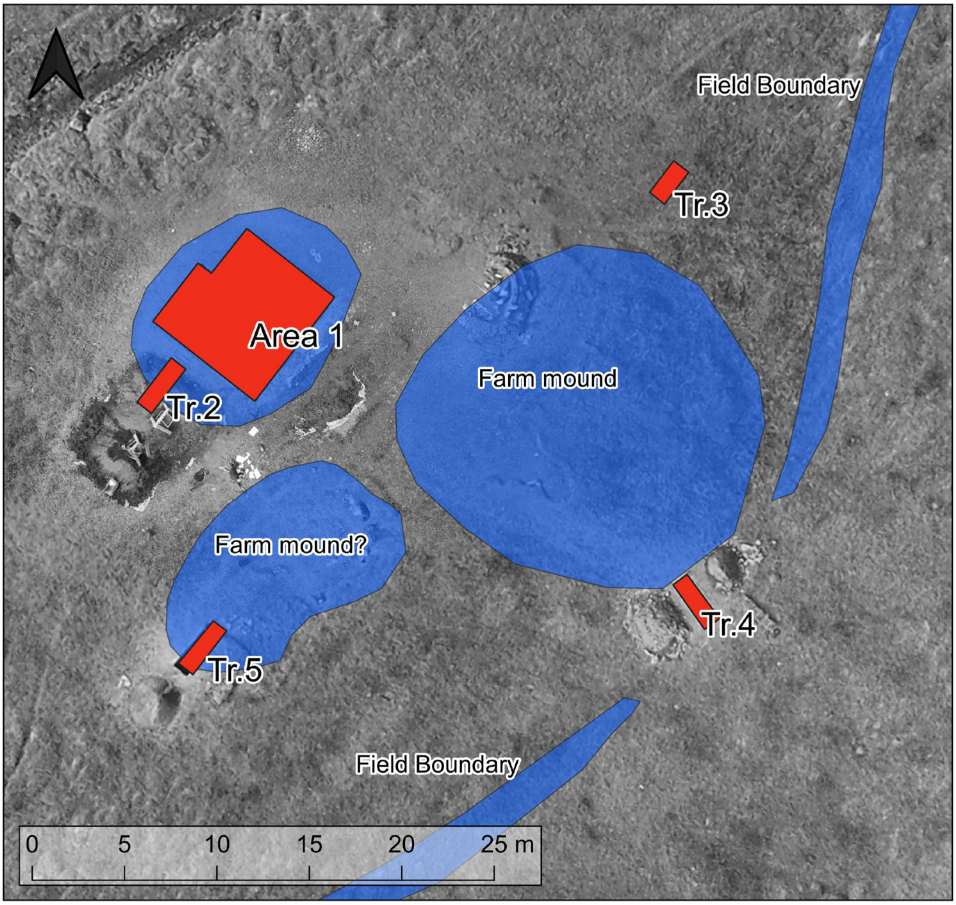


***Figure 2**. Overview of Skuggi Site elements and excavated areas.*

Skuggi may have originally been constructed as a small subsidiary farm and was later incorporated into the larger landholdings of the Staðartunga farm. Staðartunga, at one point a church farm, eventually came under ownership of the Möðruvellir church estate in the mid-15th century (Hreiðarsdóttir and Pétursdóttir 2008, p. 230). Möðruvellir, located close to the Hörgá delta, developed from a church farm during the 11th century to a parish church in about AD 1150. This large ecclesiastical estate became a House of Canons in 1296 and was under the continuous control of the northern bishopric at Hólar from about the first half of the 13th century onwards (Vésteinsson 2001). Its 13th-20th century archaeofauna postdates the Skuggi archaeological remains (Harrison 2011), with few written records about the Möðruvellir economy available prior to the 15th century (Júlíusson 1996).

Site Chronology

As indicated in Figure 2, Structure A forms only a small part of a much more extensive farm site. The remains/features visible on the surface suggest a farm mound, or mound and outlying buildings, measuring at least 40 m in diameter. This is consistent with other structures on site remaining in use whilst Structure A becomes infilled with domestic waste. The visible remains of the farm mound are further associated with field boundary walls currently visible for a length of approximately 70 m, located upslope of the farm mound. A fan-shaped geological feature renders the extent of the farm boundaries somewhat obscured.

***Figure 3**. Outline of Skuggi, Structure A.*

During the initial excavation project, faunal remains, artefacts, and palaeoecological samples from the well-stratified Skuggi midden were retrieved and analyzed to discuss farming activity and site economy in the 11th-12th centuries (Harrison 2010a, 2010b, 2013). In 2013 and 2014, fieldwork focused on excavating a structure containing the midden materials, and this revealed the remains of a semi-sunken turf and stone outbuilding dating to circa AD 900.

***Table 1**. Time periods mentioned in the paper.*

Phase	Period	Description
I	Late 9th-Mid 10th century AD	Primary structure
II	Mid 10th-Early 11th century AD	Changes to structure/function + midden
III	Early-Mid 11th century AD	Earlier use as midden, last function of structure
IV	Mid 11th-Mid 12th century AD	Later midden, change in animal taxa profile
V	Mid-Later 12th century AD	Pre-site abandonment to site abandonment

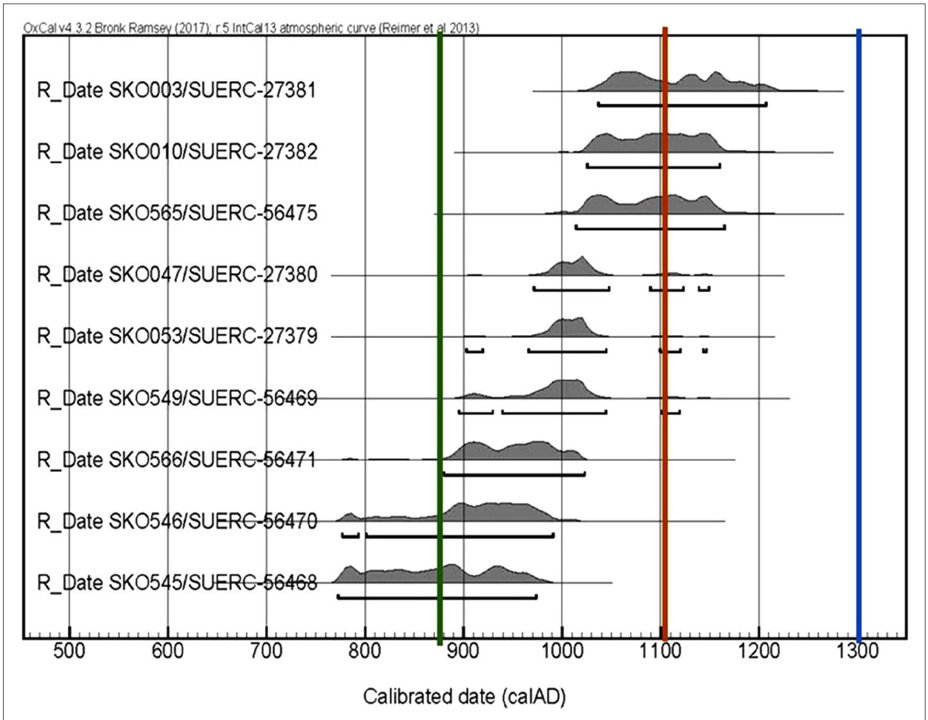


***Figure 4**. Skuggi calibrated (2 σ) Radiocarbon Dates displayed on multi-plot graph (OxCal program v4.3.2; Bronk Ramsey (2017), Reimer et al. 2013). The coloured lines indicate tephra horizons - green = Veiðivötn 877± 1, red = Hekla 1104, and blue = Hekla 1300.*

The Skuggi midden and structural remains required careful stratigraphic excavation, with as much focus on single-context excavation as possible to investigate the human and environmental activities involved in site formation processes (detailed excavation and sampling information is available in Harrison 2010a, Harrison and Roberts 2013). The authors located several *in situ* tephra layers as well buried rockslides, possibly connected to human impacts on the steep Staðartunguháls slopes where Skuggi is located (Harrison 2013). Tephrochronology samples were gathered and analyzed by Richard Streeter, University of St. Andrews, with the results demonstrated in the Trench 3 stratigraphy in Figure 7 (see also Streeter and Dugmore 2013).

Based on site stratigraphy, radiocarbon dates from terrestrial mammal bones, tephrochronology, and artefact typology, the authors discerned five activity phases which are presented and described in Table 1.

Phase I activity begins early on during the settlement of Iceland, the *landnám*, in the late 9th century AD. The excavated Phase I structural remains comprise a small, semi-sunken turf and stone house, aligned southwest to northeast (Structure A). The (upslope) south-eastern wall is cut into the natural ground surface, while the (downslope) north-western wall survives to a height of circa 55 cm. Structure A measures 4.9 x 2.7 m internally, and the walls are between 0.85-1.05 m in width. It is broadly rectangular in form, and its south-western gable was at some point used to form part of another building (Structure B), which is yet to be excavated.

The semi-sunken Structure A (Figure 3) has narrow entrances at the southwestern and northwestern corners. Its interior is equipped with a stone-built oven in the south-eastern corner and its thin, laminated floor layers allowed for extensive sampling for geochemical and archaeobotanical studies (Kremkova 2015, Mooney 2020). Excavation of the floor layers also revealed numerous very small stake-holes, typically 1-3 cm in diameter. The area where these stake-holes truncated the floor layer (context 721) was kept clean of other debris and could have been used for wool processing (Kremkova 2015, p. 58).

***Figure 5**. Picture of context 721 floor layer and stake-holes; southern extent slightly truncated to allow micromorphology sample removal; picture facing north.*

Phase II midden remains revealed a large amount of faunal material including extensive numbers of sheep and goat skulls. Structure A itself undergoes an architectural modification at this point, with the northwestern entrance being blocked (Figure 6, below). The main function of Structure A during this phase is unclear.

By Phase III, during the early-mid 11th century, the primary purpose of Structure A had ended, and from that point on it seems to have been used as a site-wide household refuse, or midden, area. The midden material is substantial and especially rich in animal bone remains and provides evidence for barley and other macrobotanical remains, and a moderate artefact assemblage, briefly discussed further below (see also Harrison 2010a, 2010b).

Figure 6. *Picture from 2013 season, prior to final excavation of Structure A, with Structure B just emerging in western part. Area A was extended in 2014 to explore the edge of this structure (see Figure 3). Lighter coloured turf layer connecting Structures A and B, thus blocking northwestern entrance to Structure A during Phase II; picture facing north.*

Phases IV and V indicate continued use as a household refuse area, with the midden restricted in area and volume during the final phase, which is suggestive of significantly reduced activity prior to the 13th century site abandonment.

The buried landslides

In addition to the excavation of Structure A, the 2013 and 2014 project involved a series of test trenches to investigate structural remains observed on the surface. Trench 2 (Tr. 2) that proved inconclusive, while Trenches 3 and 4 were more productive. Trench 3 (Tr. 3) was dug in 2013 to investigate the area around Structure A (originally Trench 1). The trench was placed at the northeastern limit of the primary farm mound to the southeast of Area 1 (Figure 2). Tr. 3 measured 1 x 3 m and revealed evidence of two landslides (contexts 587 and 585) sealed by tephra deposits (Figure 7). The younger landslide deposit was composed of rubble and gravel (context 585) and occurred between eruptions of the volcano Hekla in AD 1104 and AD 1300 (contexts 586 and 583, respectively). The older landslide (context 587) consisted of much larger boulders and occurred shortly before the H1104 tephra layer. A midden deposit (588) was found beneath the landslide sequence (Harrison and Roberts

2014). One more recent tephra layer (581) was detected in Tr. 3 and was found to be most likely from 1477 according to R. Streeter (personal communication, 2013). Other than the midden deposits underneath the earlier landslide (587), none of the later deposits contained inclusions indicative of anthropogenic activity.

Trenches 4 (Tr. 4) and 5 (Tr. 5) (Figure 2) also revealed sequences of buried landslide deposits that seem to have covered structural remains. The remains of these trenches still need further interpretation, and it is currently not possible to determine that the landslides discovered there were part of the same landslide events as those observed in Tr. 3.

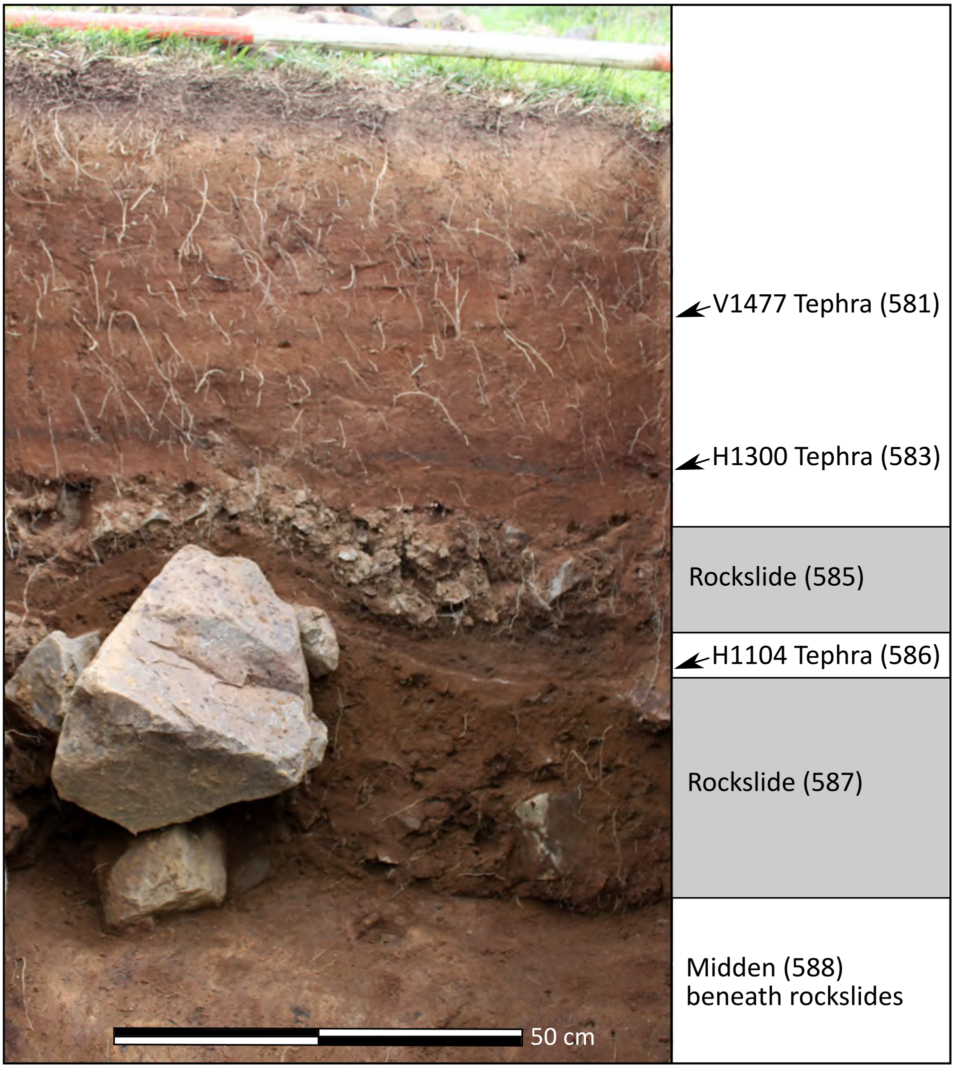


Figure 7. Skuggi, Trench 3. Sequence of landslides and dated tephra layers on top of midden deposit. Tephra layers marked by Harrison for clarity: white = H1104, blue = H1300, grey = most likely AD 1477 eruption (Streeter, personal communication 2014).

Household and Midden Remains

The Skuggi artefacts

Excavations between 2008 and 2014 produced a total of circa 360 artefacts, including a broad range of generally well-preserved objects that cover most material classes. The great majority of the artefactual assemblage was recovered from the post occupational midden infill, and thus generally represents the broader activity taking place at the site, rather than the function of Structure A *per se*. The finds were widely distributed amongst many separate deposits, throughout the depositional sequence. The Skuggi finds await further interpretation, with the 2008 and 2009 artefact results reported previously (Harrison 2010a).

The finds categories with the most objects are iron (96) and stone (162), with copper alloy, glass and worked bone artefacts present in smaller numbers. Finds of particular note include the folding arms of a bronze balance scale from context 546, Phase II (F13-353 - discarded in an external midden dump; see Figure 8), 14 beads (11 of glass, 2 of amber and 1 of stone), 10 gaming pieces (5 of worked fish bone, 5 of sandstone), fragments of 4 bone combs, 1 fragment of stone crucible, 4 bone pins, 1 complete spindle whorl of steatite, 13 whetstones (or fragments), and 20 stone strike-a-lights (15 of jasper). The finds category is completed by a small amount of industrial residue/hearth waste/slag (1.6 kg).

Figure 8. *Skuggi find 13-353, context 546, Phase II. Two arms of a copper alloy folding scale. (Photo: Hólmfríður Sveinsdóttir/FSÍ).*

A small number of the artefacts may be directly associated with the floors and internal occupational features of Structure A. These include 6 of the 14 beads (4 of glass and the 2 of amber), along with a worked stone gaming piece, the steatite spindle whorl, and a small whetstone - pierced for suspension. As such, this small assemblage suggests that textile associated crafts may have been among the potential activities carried out in Structure A (see also results from environmental samples analysis below).

The geoarchaeological samples and analysis to date

During the 2014 excavation the five distinct occupation layers (contexts 710, 718, 721, 725, 726) in Structure A were sampled for flotation/wet sieving and chemical analysis on a 0.5 m grid. Julia Kremkova, under the direction of Karen Milek (University of Durham), analysed the samples as part of her unpublished Master's thesis (Kremkova 2015). Samples for micromorphology analysis were also taken in the field, but still await analysis.

Kremkova's results based on micro-residue analysis, pH and electrical conductivity (EC), magnetic susceptibility, and loss on ignition (LOI) analysis showed that areas with lower pH levels presented higher concentration of burned bones. The LOI values indicated that floor layers seem to have been kept dry and clean by ashes from the corner oven. From the micro-residue analysis, Kremkova found that slag remains were only present from contexts 726 and 725, the earliest occupation layers encountered in Structure A. Charred seeds were recovered from context 710, the latest phase of the floor layer sequence which was well-protected from turf collapse layers of the ceiling. Kremkova further detected burned bone and unburned wood fragments at varying frequencies in each occupational layer (2015, p. 55-56). The charred seeds from context 710 were sub-sampled and analysed by Dawn Elise Mooney, University of Stavanger. The results from her unpublished report will be briefly discussed below (Mooney 2020).

Based on the single spindle whorl retrieved from the site (Find 542 from context 675) and the potential presence of staffs connected to spinning (as indicated by the small holes in floor layer 721), Kremkova (2015) concludes that the semi-sunken structure could at least at one point have been a place for wool processing and textile production. However, she does not claim to demonstrate that this was Structure A's main purpose, but rather refers to other Viking Age sunken featured buildings (pit-houses) where there was stronger evidence for such activity, based on artefact and geochemical analysis (e.g. Milek 2012). Neither the artefact assemblage, nor the structural components themselves are conclusive enough to claim a single-purpose use of this structure. During her analysis of the Skuggi occupation layers, Kremkova (2015, p. 65) detected small beads and the presence of minute remains of slag, possibly indicative of iron-working activities. The geochemical analysis concluded that peat and wood ash was distributed across the house floor, likely to keep it dry and smooth, and to cover odours (cf. Milek 2012).

The archaeobotanical samples and analysis to date

The materials from soil bulk samples collected from the 2008/09 seasons were sorted after initial flotation and the archaeobotanical remains were communicated by Mike Church, University of Durham (personal communication, 2013). So far, 7 samples from the 2009 excavation season have been analysed, with the results as yet unpublished. The samples contained fragments of birch (*Betula sp.*) and willow (*Salix sp.*) charcoal, charred seeds of wild species, and four charred grains of hulled barley (*Hordeum vulgare*) from sample 20 (context 022). This context belongs to Phase III and can be dated to the early-mid 11th century.

It is not clear whether the barley grains recovered from Skuggi were indigenous or imported. It is possible the cereals were locally grown more frequently and were potentially less of an elite-site arable undertaking than previously assumed (Catlin 2019). A thorough study of Settlement Era midden remains from marginal sites from the Hegranes area in neighbouring Skagafjörður demonstrated that nearly every soil sample taken contained barley seeds, presumably locally/regionally grown (Catlin 2019, p. 40). Macrobotanical collections from various regions in Iceland that date from the late 9th and early 10th centuries demonstrate fairly common cereal consumption. Cereal production on the other hand, was not easily done in sub-arctic Iceland, declined by the 12th century, and disappeared around AD 1500 (Trigg *et al.* 2009, Catlin and Bolender 2018, p. 123).

In addition to the archaeobotanical analysis of the above-mentioned midden samples, an initial analysis was conducted of sub-sampled remains of charred seeds recovered in 2014 as part of the geochemical sampling of the Structure A floor layers. These charred seeds were identified by Dawn Elise Mooney, who identified the presence of seeds of at least four different sedges (*Carex sp.*), along with bulbils of alpine bistort (*Bistorta vivipara*) and one buttercup (*Ranunculus sp.*) seed (Mooney 2020, p. 1). These plant remains were also identified from the midden samples. The identified plant remains are common in Icelandic hay meadows or damp grassland. Mooney suggests that the fact that the seeds were found in an occupational deposit (context 710) rather than a primary burning context, may represent secondary deposition of burnt material, probably in the form of ash spread on the floors for moisture and odour control. This seconds Kremkova's (2015) interpretation of the geochemical results. Mooney (2020, p. 2) suggests further that the sedge seeds may reflect the use of these plants in bedding or flooring, with the charring either due to waste burning, or accidental burning.

Zooarchaeological materials and methods

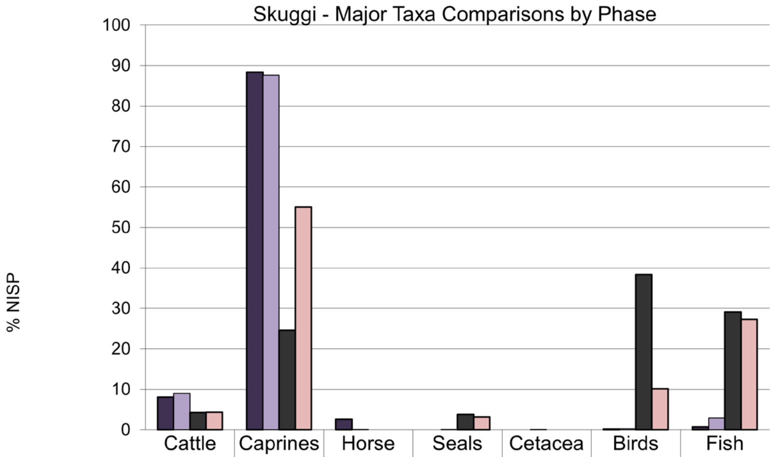
All the Skuggi midden materials were dry-sieved through 4 mm mesh size and where applicable materials were targeted for bulk sampling for post-excavation analysis (see section on archaeobotanical samples), in accordance with North Atlantic Biocultural Organisation (NABO) recommendations. Faunal analysis followed practices and standards developed at the Northern Science and Education Center (NORSEC), located at CUNY, New York. Recording and data curation followed the NABONE protocols (NABONE 2009). Following widespread North Atlantic tradition, bone fragment quantification utilizes the Number of Identified Specimens (NISP) method (Grayson 1984). Mammal identifications follow Hillson (1992), fish identifications follow Canon (1987), bird identifications follow Cohen and Serjeantson (1996) and Serjeantson (2009), and sheep/goat distinctions follow Boessneck (1969), Mainland and Halstead (2005), and Zeder and Pilaar (2010).

General patterning of the archaeofauna

Weighing a total of 100 kg, the retrieved Skuggi animal bone collection is substantial, and the ongoing analysis has to date resulted in a Number of Identified Specimens (NISP) of 3 622 and a Total Fragment Count (TNF) of 11 629 (see Harrison 2010b for an extensive discussion of the 2008-2009 archaeofauna). The animal bone collection from the 2013-2014 excavation seasons resulted in an increased data set from the basal midden layers that helped improve the site's chronological resolution and resulted in a much more clearly defined Phase III period (early to mid-11th century). Therefore, intra-site comparison of midden materials from four different activity periods (Phases II-V) is possible. Comparing faunal data from these four activity periods allows for a better insight into the farming strategy on the site and indicates how the focus on certain animal taxa and species as well as the nature of site activity might have changed over time. A discussion of those results will follow a general overview of the Skuggi archaeofauna.

The Overall Major Animal Taxa

Midden deposits from phases II, III, IV and V contained animal remains that were deposited in the same area once structure A was no longer used for its original purposes. Instead, this ruin seems to have been used as a receptacle for several centuries of household refuse deposits which, upon stratigraphic excavation, revealed well-preserved faunal remains.

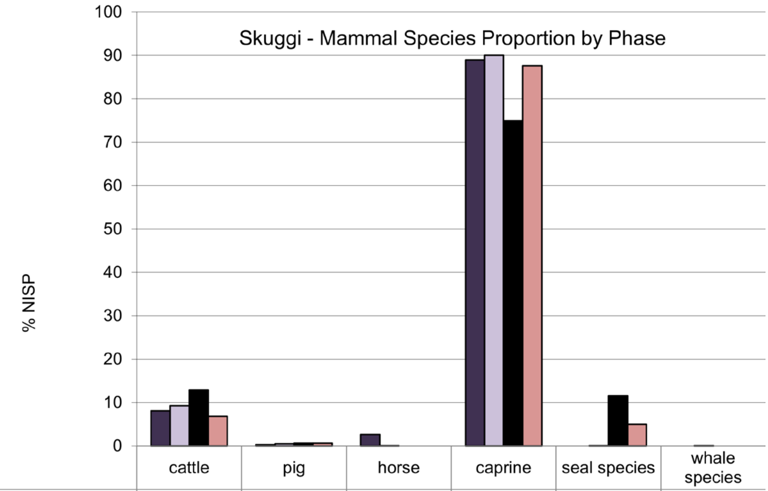


	Cattle	Caprines	Horse	Seals	Cetacea	Birds	Fish
Phase II: Mid10th-Early11th c; NISP=1155	8,09	88,35	2,61	0,00	0,00	0,17	0,78
Phase III: Early11th-Mid11th c; NISP=1233	8,99	87,63	0,08	0,08	0,08	0,25	2,89
Phase IV: Mid11th-Mid12th c; NISP=1004	4,21	24,57	0,00	3,81	0,00	38,31	29,09
Phase V: Mid12th-Late12th c; NISP=257	4,30	55,08	0,00	3,13	0,00	10,16	27,34

Figure 9*. Skuggi major taxa comparisons (NISP %). Phase II-V intra site comparisons.*

Figure 9 presents Skuggi Major Taxa NISP comparisons by phase. Caprines (sheep/goats) clearly dominate the phase II and III fauna, with a strong shift to a more varied overall taxa profile in phases IV and V (although Phase V has a low count of identifiable elements). NISP numbers of phases II through IV are large enough to discuss the herd strategy management as well as the clear change in animal taxa distribution after the mid-11th century; that is, from phase III to IV. There is a very clear shift from predominantly domesticate mammals to a more broad-spectrum resource management at Skuggi. This signature is not uncommon in other Icelandic farm midden excavations (e.g. McGovern *et al.* 2007, Smiarowski *et al.* 2017).

The bird category shows a marked increase in Phase IV, and so does the presence of marine fish which ends up comprising nearly 30 % of the major taxa proportion in Phase IV and Phase V, a pattern which has been observed elsewhere in contemporary Icelandic farming contexts (McGovern *et al.* 2007, Harrison 2010a, Smiarowski *et al.* 2017). The presence of raven (*Corvus corax*) in Phase IV and V contexts are of particular interest as these birds are not regularly found in Icelandic midden deposits (for more detailed reporting on the Skuggi animal bone remains, see Harrison 2010b and 2013).



	cattle	pig	horse	caprine	seal species	whale species
Phase II, M10th - E11th c; NISP=1155	8,14	0,26	2,63	88,97	0,00	0,00
Phase III, Early11th - Mid11th c; NISP=1233	9,23	0,51	0,08	90,01	0,08	0,08
Phase IV, Mid11th - Early12th c; NISP=1004	12,84	0,61	0,00	74,92	11,62	0,00
Phase V, Mid 12th -Late12thc; NISP=257	6,83	0,62	0,00	87,58	4,97	0,00

***Figure 10**. Skuggi domesticate species distribution, Phase II-V intra site comparisons.*

The Skuggi Mammals

Figure 10 displays the domestic and wild mammal species proportion divided into phases. Except for a very small fraction of seal and whale (0.8 % each), the earlier two phases, dated to the late Viking Age and the transition to the Middle Ages, display a mammal assemblage where domestic mammals, and especially caprines (sheep and goats) and cattle, dominate. In phase II, the total caprine category comprises 89 %, the cattle category 8 %, and the horse category close to 3 %. The proportions in phase III are nearly the same for the caprines and cattle categories. Horse, pig, seal, and whale elements are present in this period, but at below 1 % of the total mammal assemblage. The Medieval period assemblages in phases IV and V display a continuation in an overall caprine bone predominance at 75 and 88 %, respectively. The phase IV and V cattle percentages are markedly different from each other, with a respective decline from 13 % to 7 %. The pig proportion at 0.6 % remains stable, but the phase IV seal proportion of 12 % declines to 5 % in phase V. There are no horse or whale remains analyzed in these two phases.

Major domesticates ratios

Caprines clearly dominate the Skuggi domesticate fauna. The goat vs sheep ratios in table 2 indicate that goats were present in all periods except phase V. In phases II through IV, there were about three sheep per every goat present.

Table 2*. Sheep versus goat ratios by phase.*

Phase	Goat : Sheep ratio	Cattle : Caprine ratio
II	1 : 2.48	1 : 10.92
III	1 : 3.40	1 : 9.75
IV	1 : 2.67	1 : 5.83
V	N/A	1 : 12.82

Table 2 also displays how the phase II, III, and V cattle to caprine bone ratios range from about 10 to 13 caprines per one cattle bone, while the phase IV cattle caprine ratio shows six caprines per one cattle bone.

As mentioned above, the cattle to caprine ratios are relatively consistent for Phases II and III, but phase IV has a low cattle to caprine ratio in comparison. The total NISP count of the animal bones collected from the phase V deposits was low, and therefore the ratio for that period might be somewhat skewed in favor of the cattle remains.

Brief Faunal Data Discussion

Early on, the small amount of marine fish bone attests to the site's inland location, although it rises in the medieval deposits, and together with the seal elements indicates an outside supply with marine species. Similar to the Sveigakot and Hrísheimar archaeofauna from Mývatnssveit, there seems to be a clear indication of provisioning of even smaller inland farms with marine fish and sea mammals (McGovern *et al.* 2007, Smiarowski *et al.* 2017). There were no dog elements in the archaeofauna, but gnawing marks left on many faunal elements are associated with presence of the species. One long bone element shows potential rodent gnawing, but no physical remains of rodents have been found.

The Skuggi farm depended on mostly sheep/goats during the Later Viking Age and the transitional phase III, dated to the early to mid-11th century, with a shift from predominantly domesticate utilization to a broader animal resource strategy during the early Medieval deposits in Phase IV. Besides the usual domesticates, the site occupants now increased their reliance on birds, fish, and marine mammals. Changes in the site taxa profile can be observed in Phase IV and are detectable for most of the animal categories presented here. This change in the animal bone data in the mid-11th to early 12th century could represent a re-organisation of the site provisioning strategy, or even the site's economic organisation itself.

Discussion

As indicated by the title, this paper is meant to be an assessment of the combined analysis of Structure A and the household midden remains excavated at Skuggi. Whereas much more extensive discussions of the 2008-2009 midden remains have been provided elsewhere (Harrison 2010b, 2010c, 2013, McGovern *et al.* 2014, Smiarowski *et al.* 2017), the results from the 2013-2014 excavation project have yielded archaeological and environmental evidence that allow for a more refined site activity chronology, which especially applies to Phases I-III. It has also provided an insight into the landscape and environmental story at Skuggi, particularly based on the landslides, but also the archaeobotanical evidence.

Based on its structural features, the nature of the artefact assemblage, and the results of geochemical analysis, it seems Structure A could have been used for different purposes, among them textile working, smithing, and possibly personal hygiene if it was also used as a bathing hut and/or sauna. Continuing archaeobotanical and micromorphological analysis is expected to add to our understanding of Structure A's purpose, and perhaps the site's use over time. More detailed archaeofaunal analysis from the 2013-2014 seasons is currently underway and will add to our understanding of local and regional faunal resource utilization practices and, together with a detailed analysis of the artefact assemblage, can potentially provide us with indicators for status, as well as craft and exchange activity. To date, we have learned enough about the archaeology of Skuggi to address the questions we stated above.

Can we define changes in site activity and farming economy over time?

The archaeological investigations indicate establishment around AD 900. The marginal location of a seemingly full-fledged farm operation, of which the excavated Structure A was a part, contributes to the idea of an early, extensive, and rapid settlement process as seems to have happened elsewhere in Iceland (Vésteinsson & McGovern 2012, Steinberg *et al.* 2016, Catlin 2019). Though not indicative of site status, the artefact material suggests a diverse range of actions took place on site which were of a domestic and personal nature on the one hand, but also clearly connected to craft working and possibly trade-related activities. The latter can be inferred from the find of the remains of the copper-alloy folding scales as seen in Figure 8. This is also suggested by the overall change in Structure A's function and the animal bone patterns that suggest a different occupation activity in the later phases, with a more and more scaled down activity at the site itself. Upon abandonment, it could be feasible that the Skuggi pasturages were incorporated into the larger Staðartunga or Möðruvellir landholdings to increase the number of sheep for an increased regional wool production focus.

With Phase I as the Structure A building and occupation phase, changes between Phase II and Phase III that suggest a change in building, and potentially farm activity are observed from the structural remains. These are the blocking off of the Structure A northwestern entrance, and the change in purpose from household to household midden site. The mid-10th to early 11th century midden contents from Phase II have yielded faunal remains suggestive of a significant number of the sheep and goat herds slaughtered within a fairly short period of time, which could be connected with this change in purpose in Phase III.

One reason for this change in Structure A's utilization is that the site was expanded, potentially because a larger group of people lived there by some point in Phase II. It has been suggested elsewhere that sunken-featured buildings were often the earliest structures on Icelandic farm sites, for example at Sveigakot and Hofstaðir in Mývatnssveit (Lucas 2009). A larger household might have made the upkeep of the relatively small structure with room for only a few at one time inefficient, and might have required focus on larger structures to carry out the activities previously associated with Structure A. Even though the buried landslides were not obviously from this period and can likely be more directly associated with Phase IV and V site activities, it is possible that earlier landslides could have forced a farm reorganization. Another reason could be that the site itself underwent reorganization due to a changed political/economic situation, with more significant changes observed in Phases IV and V.

The archaeofaunal record suggests that Skuggi started out as a farming operation focused almost entirely on domesticates. This strategy was changed in Phase IV, indicated by a higher reliance on wild resources. The mentioned change in site economy together with the domesticate ratios suggests that Skuggi may have started out as a dependent farm or sub-farm specializing in sheep/goat herding. The change in use of Structure A, the enormous midden deposits accumulated, and the archaeofaunal profile drastically changing in Phase IV could be interpreted as a larger household in need of wild species to supplement its own supply of domesticates. A second explanation accounting for the increase in marine species could be a stronger connection to the larger region and profiting from an exchange network; i.e., supplying meat, dairy, or wool in exchange for fish and seal and potentially other goods moved from the coast or other farms to this inland site. The Skuggi marine fish collection includes Atlantic cod and (especially) haddock, but also a mix of other cod-family species and halibut (Harrison 2010b). This broad species diversity is similar to Viking Age and early medieval patterns in Mývatnssveit and fits the current model for an Icelandic Viking Age/early medieval artisanal fishery profile. It does not reflect the strong focus on cod seen in the late medieval and early modern export-oriented archaeofauna (Smiarowski *et al.* 2017).

Thus, driven by as yet unknown factors, the site function during phases III-V in the 11th and 12th centuries AD is either changed and/or farming activity reduced. This could have been in the form of either multi- to single-site consolidation or a single animal species site focus, likely toward a certain sheep/goat product (e.g., Harrison 2013). As mentioned earlier, the church farm at Möðruvellir became a parish church in the mid-12th century, which could have resulted in an economic reorganization of the pasturages and contributing farms as part of its landholdings. It does not necessarily mean that this new, powerful landholder was Möðruvellir, but the site is one reasonable contestant.

Do the archaeological remains at Skuggi show evidence of environmental impacts that might affect the use and longevity of the site?

As discussed in detail elsewhere (Harrison 2013), available climate data for Eyjafjörður suggest that the transition from a relatively stable Viking Age and early Medieval pattern, which was favourable to home field pasture productivity and use of upland pasturages, was followed by a cold and variable climate pattern in the 13th century, with a period of marked cooling in temperatures and increase in weather instability in the 14th century. However, based on multi-proxy climate data reconstructions, a significant period of cooling temperatures has been identified for the period between AD 1118 and AD 1127 (Ingram 2012, see also Harrison 2013, p.127). Climate seems to be a major driver of Hörgárdalur landscape instability, but deforestation of the landscape immediately after Settlement may have also contributed to an increased instability of the steep valley slopes (Streeter and Dugmore 2009, p. 16). Landslides seem to have occurred during times of high precipitation fluctuations, especially when coupled with temperature fluctuations around freezing point (A. Dugmore, personal communication, October 2012). Besides being possible factors triggering the landslides, the precipitation fluctuations themselves could have also affected the local farming strategy and might be among the reasons behind the changed Skuggi livestock proportions observed in the later phases.

Structure A, established in Phase I and still used as outbuilding in Phase II, gives us an idea of the beginning of the initial Skuggi settlement. Many more structures, most prominently the primary farm mound, remain unexcavated, and our picture of the whole site is thus incomplete. What can be garnered from the excavated areas, however, is that Skuggi site abandonment seems to coincide with a severely destabilized mountain slope environment in the 12th century, as demonstrated by the buried landslides in Tr. 3 (Figure 6), and possibly Tr. 4 and Tr. 5 (Figure 2). The datable series of landslides from Tr. 3, with the more recent of the two occurring between eruptions of the volcano Hekla in AD 1104 and AD 1300, and the older one shortly before the H1104 tephra layer was deposited, give insight into the change of the Skuggi landscape during that time. Though not yet dated, the uncovered Tr. 4 and Tr. 5 landslides can potentially add to our understanding of how extensive these landslides might have been.

Continued instability moving and depositing large stones and sediment on the mountain slopes where Skuggi lies may be linked with the abandonment of the site, either because it destroyed large parts of the grazing land, or because it damaged living quarters, or even potentially killed livestock and humans. It could have further coincided with factors such as downsized livestock numbers due to unfavourable climate and environmental conditions, or due to a changed regional livestock focus. These hypotheses need to be tested more thoroughly through further analysis, but they provide a scenario of what might have happened at this site that caused changes in farming strategy in the 11th century and abandonment in the 12th century.

Conclusion

At Skuggi, the excavation of the upstanding structures has provided us with a broader idea of very early site activity and the settlement and landscape changes in the late Viking Age/early Medieval periods. These may be associated with changes in the regional economy and the foci of local versus international exchange.

Rather than relying on merely the midden remains as proxies for site, and perhaps even valley-wide, economic strategy, the Skuggi project allows us to investigate the Structure A activities and explore reasons behind site re-organization and abandonment. It also increases our understanding of a change in the Skuggi livestock management strategy during the 11th and 12th centuries AD. For this paper, the focus was placed predominantly on the Skuggi excavations, to allow for a site-scale analysis, and to provide a solid assessment of the results from the two different excavations there.

In comparison with the data sets produced from the Oddstaðir midden excavations and when placed into an even larger context provided by the long-term focus on Eyjafjörður archaeology by the authors and their colleagues, it becomes clear that there was, in fact, an observable shift in the socio-economic organization of the valley system (Harrison 2013). The Skuggi archaeological and environmental record is thus valuable to our understanding of the early Hörgárdalur settlement dynamics, as well as providing an early part of the story of Viking Age to Medieval socio-economic transitions in Eyjafjörður.

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Barbro Dahl

Settlement, resources and routes in Iron Age Forsand

Forsandmoen is a prehistoric settlement site continuously in use from the Early Bronze Age to the Late Iron Age. This paper uses the large settlement as a case study to explore the duality of the agrarian and the outfield resources as two entangled aspects of the Iron Age society. The outfield resources offer a reminder of the need for expanding perspectives, in the same manner as routes and exchange direct our attention towards regional and inter-regional contexts. The abandonment of the large settlement at Forsandmoen in the Late Iron Age is the central research question. This paper argues that Forsand played a role as an intermediary between the outer coast of Rogaland and the mountain areas of South-Norway. It is suggested that the lines of communication broke down or were reorganised in a way that made an intermediary excess in the eighth century. At the other end of the routes from Forsand, finds in Setesdal are concentrated in the areas were these routes come down from the mountains. Grave finds start to appear in Setesdal at the same time as the abandonment of all known settlement sites in Forsand. It is proposed that the divergent, but coinciding regional patterns can be related. The divergent patterns are seen as a strong argument against an intensified exploitation of resources governed by leaders seated along the coast.

Introduction

With 275 buildings covering the time span from 1500 BC to AD 700, Forsandmoen is the largest prehistoric settlement site in Norway. The location, providing easy access to mountain resources at the mouth of intersecting fjords, enabled a role as an intermediary in the communication lines between the coast and the mountain areas of South-Norway. In this paper, I wish to explore the possible reasons for its abandonment at the brink of the Viking Period, at a time when we should expect increased exchange.

This paper aims to expand our perspectives in five different ways. The first challenge concerns the separation of the outfield and the agrarian perspectives into two parcelled areas of research. Due to its character and size, Forsandmoen has been compared to the villages in Denmark and South-Sweden and interpreted in an agrarian context. However, most of Norway can be characterized as outfield, and the use of outfield resources was an integrated part of farming (Martens 1992, Kallhovd and Larsen 2006, Mjærum and Larsen 2014, Loftsgarden 2017, Stene and Wangen 2017). The farms are not limited to farming, and the settlement depends upon all the resources available for exploitation (Martens 1992, Stene and Wangen 2017). This approach should not be restricted to studies of the diverse use of large outfield areas in the Viking Period and Middle Ages, but brought into all settlement studies.

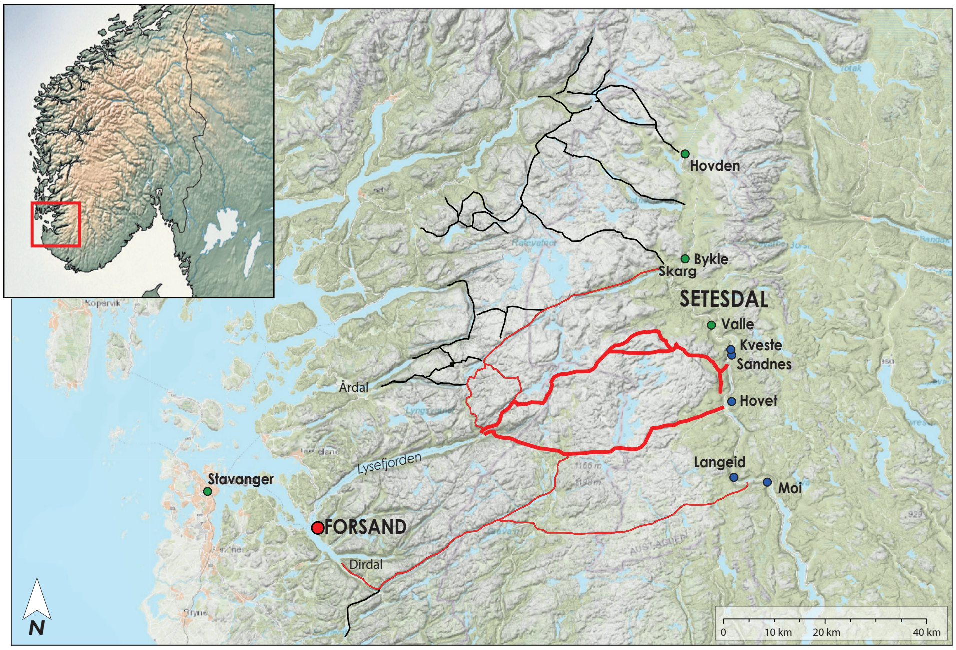

Figure 1. Map showing sites and places mentioned in the text. Old routes are marked by lines. The thick red line is the Hide Road. Lines in red could have been controlled from Forsand. Ill: Theo Gil Bell/Barbro Dahl, AM, UiS.

Including the outfield in the sphere of the farm can represent an alternative path beyond the dichotomies agrarian-outfield and centre/core-periphery. A second aim of this paper is to challenge the organisation of sites into systems of centres and margins. Applying Forsandmoen as a case study in order to explore the outfield could easily fall into the biased perception that comes from taking the farm and the agricultural economy as a granted point of departure in explaining the use of the outfield resources, its organisation and contexts (see Holm *et al.* 2009, Stene and Wangen 2017). The dense settlements along the south-western coast are not interpreted as centres that had managed to take control over a vast but homogenous inland. As I will show, communication with the inland area could play a central role in the understanding of large settlements where the mountain routes meet the fjords.

Routes and resources underline the need to apply an inter-regional delimitation, which is the third aim of this paper. Resource exploitation must be viewed in connection with both local settlements and larger societal contexts (Stene and Wangen 2017, p. 160-161). Forsandmoen, and other known sites in Forsand municipality, represent the local context. The perspective will be expanded into a regional context that includes other settlements at the end of the fjords, and into an inter-regional context with Sirdal and Setesdal at the other end of the mountain trails. A fourth aim is to combine different categories of archaeological sources, from both excavations and surveys, in several counties and museum districts. The wide range of sources touches upon the fifth aim of applying a wide chronological frame by investigating both the Early and the Late Iron Age. The attempt to combine a wide range of sources within a larger geographical and chronological perspective may provide new insights into differences and resemblances, as well as long-term transformations and rapid changes. At the same time as the long-term perspective holds a strong position in archaeology, a sensitivity towards deviating developments and disruptions can offer alternatives to a grand narrative of linear and steady growth culminating in the Viking Period. *Skinnvegen*, the old route between Forsand and Setesdal (Figure 1), will be used as a material link between two areas that seem to go through contradictory developments during the Iron Age. The eighth century stands out as the age of both large and interregional transformations. The coincidence in time can suggest related developments that need to be addressed using an inter-regional perspective.

Field methods and challenges

The wide perspective attempted here is challenged by the way the scope of pre-development surveys and excavations influences new knowledge. Areas surrounding the larger cities at the outer coast have a much higher development pressure, and have been surveyed more intensively. Moreover, most of the surveys and excavations in Rogaland are conducted on farmed land. Important exceptions are surveys due to the establishment of new power lines and reservoirs in the mountains (see Svensson and Dahl, this volume). East of Rogaland, mountain areas have been the subjects of surveys by the counties of Vest-Agder and Aust-Agder, and excavations by the University of Oslo. The development of tourism has uncovered large iron production sites in the low alpine area of Bykle, in the north of Setesdal (Kallhovd and Larsen 2006, Johansson 2012, Russ 2012, Kile-Vesik 2014, Mjærum and Larsen 2014), whereas excavations along the main road through Setesdal have revealed new settlements and graves on low sandy terraces along the river Otra (Reitan 2009, 2011, Loftsgarden and Wenn 2012, Reitan 2014, Wenn *et al.* 2015, Glørstad and Wenn 2017, Wenn and Arnarsson 2019). Bearing in mind the enormous and heterogenous areas, the number of surveys and excavations in the centre of South-Norway is low, with a deficiency of recent syntheses (see Stene and Wangen 2017).

Early Iron Age	Pre-Roman Iron Age (PRIA) Early Roman Iron Age (ERIA) Late Roman Iron Age (LRIA) Migration Period (MP)	500 BC-1 1-150 150-400 400-550
Late Iron Age	Merovingian Period (MEP) Viking Period (VP)	550-ca.800 ca. 800-1050

Table 1. *Iron Age periods and abbreviations mentioned in the text.*

Research history of Forsandmoen

The research project at Forsandmoen started in 1980. The investigation led to the discovery of a large site which has come to play a unique role in the study of settlement development in Norway (Myhre 2002, p. 78, 132). The project was the first large-scale investigation of a settlement beneath cultivated fields in Norway (Løken *et al.* 1996, Løken 1997, Dahl 2009). Through the adaptation and development of new survey and excavation methods, 275 houses were documented and partly to completely excavated (Figure 2). The three-aisled buildings cover the entire time span from 1500 BC to AD 700. In addition, two excavations in 2007 and 2017 investigated the southern part of the settlement site (Dahl 2008, 2009, 2019, 2021) (Figure 3 and 4). During the Late Roman Iron Age (AD 150-400) and Migration Period (AD 400-550) the settlement reached a maximum of 20 farms organised in east-west oriented rows. Each farm consisted of a main building, which housed people and animals, as well as a secondary longhouse defined as a workshop. In the Merovingian Period (AD 550-c. 800), the settlement shrank down to two small settlement areas that were abandoned around AD 700.

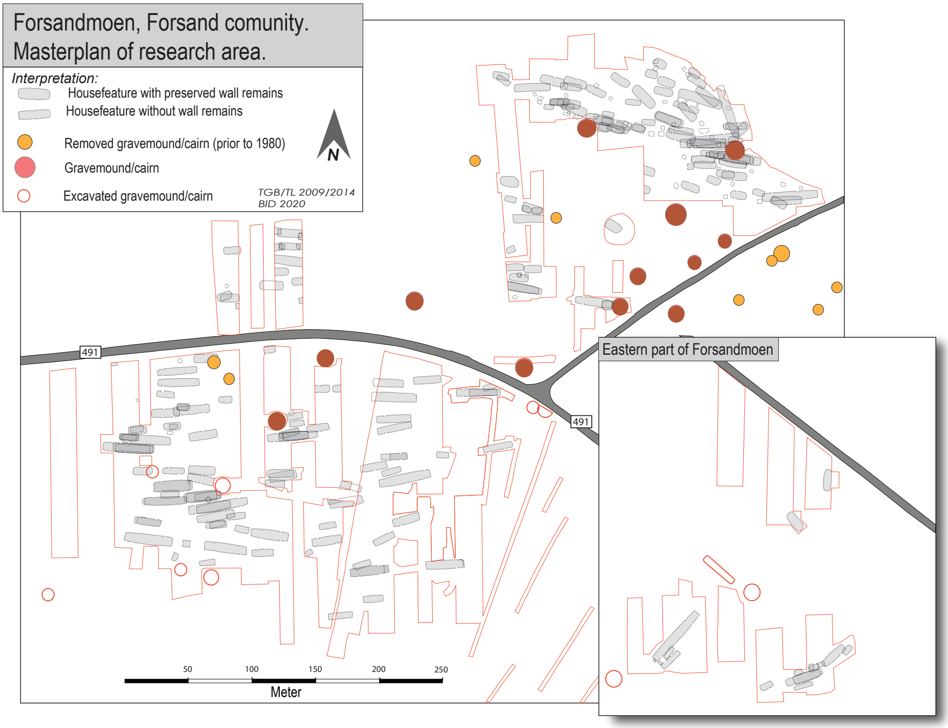

Figure 2. *Overview of the settlement area at Forsandmoen. Ill: Theo Gil Bell/Barbro Dahl, AM, UiS.*

Figure 3. *Overview of the settlement area at Forsandmoen during the excavation in 2007. Photo: Barbro Dahl, AM, UiS.*

Figure 4*. Overview of the settlement area at Forsandmoen at the beginning of the excavation in 2017. Mound 1 in the southwestern part of the settlement has been uncovered. Photo: Theo Gil Bell, AM, UiS.*

A prominent question regarding Forsandmoen has been the possible reasons for the abandonment of such a massive and long-lasting settlement. The end of the settlement has been seen as a process similar to the abandonment of numerous farms in South-West-Norway in the transition between the Early and Late Iron Age (Løken 1988, 2001, Myhre 2002, Dahl 2009, 2016b). New radiocarbon dates confirm that Forsandmoen was still in use in the Merovingian Period, although as a much smaller settlement than in the Migration Period (Dahl 2019). Instead of merely interpreting the abandonment as part of a general shift in the settlement pattern of the region, which seemed to have occurred before the final termination of Forsandmoen, we can try to expand the perspective by exploring the regional and interregional context of Forsand.

The abandonment of Forsandmoen could be closely linked to the location of the settlement. The key to understanding the massive settlement might not be its location at a large moraine terrace suitable for farming alone. Rather, it is crucial to examine the access to mountain resources and the possibility to play the role as an intermediary in the communication lines between the outer coast and large mountain areas. Lysefjorden in Forsand, as well as Frafjord a bit further south, represent accesses to large mountain areas with connections by mountain trails to Sirdal and Setesdal (Figure 1).

Local context

Forsandneset is a headland by the intersection of Høgsfjorden, Lysefjorden and Frafjord, 1.4 km west of Forsandmoen (Figure 5 and 6). Extensive settlement traces have been detected in all surveyed areas at Forsandneset (Hemdorff 1991, Gjerpe 1998, Syvertsen 2003, Viste 2010, Frækhaug 2015, Dahl and Mooney 2020). Diagnostic ceramics and the few current radiocarbon dates indicate a widespread settlement in the Late Roman Iron Age/Migration Period (Figure 5). Excavations have resulted in a far more differentiated image of the settlement with overlapping longhouses from the end of the Late Neolithic to the Merovingian Period. While the youngest buildings found by the church are from the LRIA (Dahl and Mooney 2020) and the MP (Hemdorff 1991), the houses excavated in Bergevik show continuity from the Early Iron Age to the Late Iron Age (Dahl *et al.* 2017). Two buildings are dated to the Merovingian Period, but there are no houses from the Viking Period at the site overlooking the transection of the fjords. Further, a comparison between the two buildings from the Merovingian Period and the 67-meter-long house from the Late Roman Iron Age indicate that the settlement at Bergevik also contracted at the transition between the Early and the Late Iron Age (Figure 7).

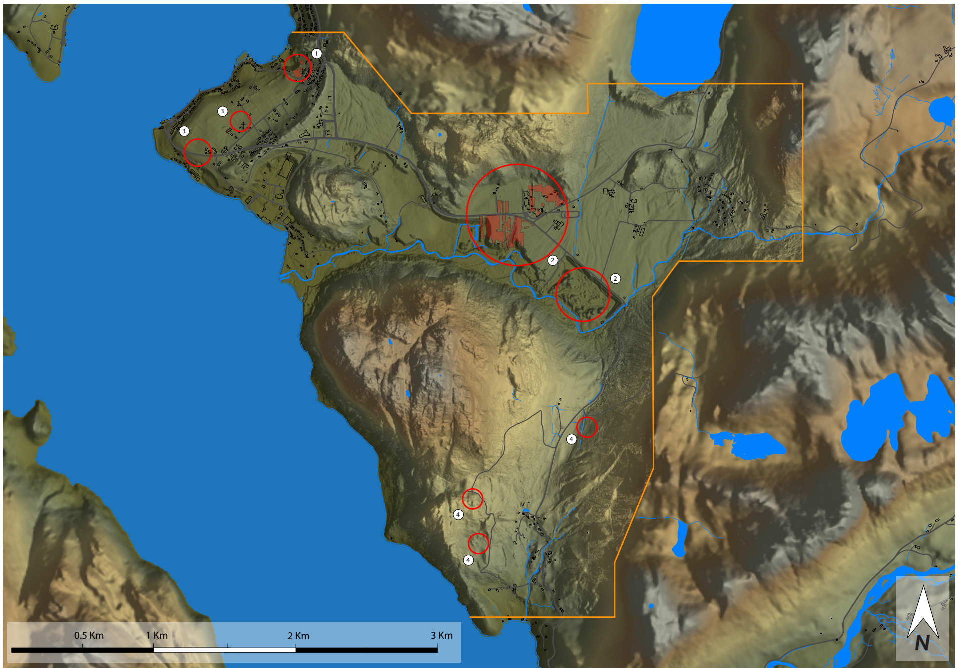

***Figure 5**. Overview of Forsandmoen and Forsandneset. 1. The settlement area at Bergevik. 2. The settlement area at Forsandmoen. 3. Other known settlement areas at Forsandneset. 4. Preserved farm complexes in grazing areas. Ill: Theo Gil Bell, AM, UiS.*

Figure 6. *The location of the site Bergevik on a terrace at Forsandneset (to the right). Lysefjorden in front. Photo: Jon R. Husvegg, AM, UiS.*

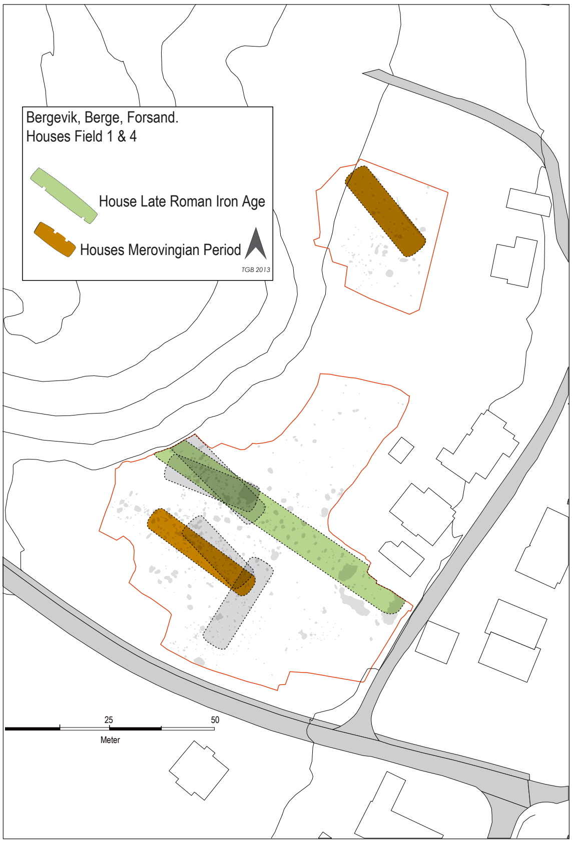

Figure 7. *Selected houses at Bergevik. House 1 from the Late Roman Iron Age, House 2 and 9 from the Merovingian Period. Ill: Theo Gil Bell, AM, UiS.*

***Figure 8**. The settlement area by the church. The entrance of Lysefjorden in the background with the settlement site at Bergvik in the area under development to the right. Photo: Theo Gil Bell, AM, UiS.*

Preserved farm complexes further east show that these more regular settlements coexisted alongside the densely settled areas at Forsandmoen and Forsandneset in the Late Roman Iron Age and Migration Period (Figure 5). A sample from the central fireplace in the almost 50-meter-long house in Heia, the farm complex closest to Forsandmoen, has been radiocarbon dated to the Migration Period (Løken 2006, p. 318), and three samples from a longhouse in the farm complex in Oaland have been dated to the Migration Period (Bjørdal 2019). The local society in Forsand must have gone through large transformations from AD 200 to 700, from an extensive and dense settlement in the Late Roman Iron Age/Migration Period, through a considerable contraction at the transition to the Merovingian Period, to what appears to be an abandonment during the Merovingian Period. The settlement development may indicate that the area of Forsand lost its position as a link between the outer coast and the mountain areas at the threshold of the Viking Period, precisely at a time with an expected increase in the exchange.

Transitions

The case of Forsand represents a reminder against a linear approach where the entire Iron Age is viewed as a steady and gradual growth culminating in a peak in the Viking Period. There is reason to believe that the upheavals in Europe towards the end of the Early Iron Age created a break in the lines of exchange for the outer coast of Rogaland, interpreted as the primary access point to North Sea trade and further redistribution along the Norwegian coast (Slomann 1956, Magnus and Myhre 1976, Farbregd 1980). Bjørn Myhre has later moderated his interpretation of a general decline at the beginning of the Merovingian Period (Myhre

2002, 2003), and the transition between the Early and the Late Iron Age has lately been the object of much attention and many interesting debates (Gjerpe 2014, Gundersen 2019). Myhre pointed out that archaeological excavations on the outermost coast and in highland districts show that fishing, summer dairying and other forms of resource utilisation increased rather than declined in the seventh century (Myhre 2003, p. 85).

The apparently opposing intensification in the use of the outfield and decline in settlement at Forsand strongly indicate large regional differences. While long-lasting settlement sites were abandoned in Forsand municipality in the Merovingian Period, the regional settlement patterns indicate a transverse movement of many buildings at the same time (Dahl 2016b). The local and regional transformations must have had an impact on the organisation of inter-regional exchange with communities in the mountainous areas in South-Norway. The increased resource exploitation in mountainous areas might be related to the transformations in settlement at the other end of the mountain trails, as a common or divergent relocation of interest, resources or routes.

Routes and resources

Skinnvegen (The Hide Road) is the name of the mountain trail from Lysebotn, at the end of Lysefjorden, to Setesdal (Figure 1). The route is considered to go far back in time, but the name derives from the transport of leather and hides from Setesdal to Stavanger in the Middle Ages. Setesdal was part of West-Norway and paid taxes to the bishop in Stavanger (Rolfsen 1977, Mikkelsen 1980, Larsen 1981, Tjeltveit 1999). In addition to leather and hides, Setesdal paid their taxes in cattle, butter and cheese, while grain, salt, herring, clothes, horses and other merchandises were transported from Stavanger to the inland areas.

Iron was most probably also transported down from Setesdal (Løken 1982, p. 103, Mjærum and Larsen 2014, p. 109, Loftsgarden 2017, p. 125). Kjetil Loftsgarden points out the distinction between the many known iron production sites in the east of Norway, and the almost absence of such sites in the west; an exchange between the different regions would have required stable economic, social and political networks between the coast and the inland of South-Norway (Loftsgarden 2017, p. 14). Large-scale iron production sites from the Viking Period and Middle Ages have been discovered in Hovden in Bykle, but excavations in 2011 and 2012 dated some of the iron production back to the Roman Iron Age (Johansson 2012, Kile-Vesik 2014, Mjærum and Larsen 2014). However, the general picture shows iron production along the coast, in the valleys, forest and lower heaths of Agder in the Early Iron Age, where the known sites from this early phase provided a surplus production (Kallhovd and Larsen 2006, Mjærum and Larsen 2014). At this point we have to take into consideration that the iron production sites from the Early Iron Age can be underreported compared to the iron production sites from the end of the Late Iron Age and Middle Ages, which were large charcoal pits visible on the surface. Among the many surveyed iron production sites and finds of iron slag in Sirdal, a few, if not all of them, are assumed to be from the Early Iron Age (Stylegar 1999, Larsen 2009). Despite heavy development of tourism in the upper part of Sirdal, this valley has not been the object of excavations and new discoveries in the same manner as Hovden in the upper part of Setesdal. Regarding Sirdal, the discovery of the southernmost pitfall trap in the world at Degjevatnet (Bang-Andersen 2004, 2015) is an important reminder of the wide range of traces from resource exploitation we can come across on surveys in this low alpine area.

Regional context

Several of the routes could have been controlled by Forsand (Figure 1). Where the routes from the mountains meet the fjords, we find large concentrations of archaeological features, not only in Forsand, but also in Dirdal and Årdal in Hjelmeland. Most of the known sites in Dirdal appear to be from the Late Roman Iron Age and Migration Period. Hence, the dense settlement of Dirdal point towards the same peak as Forsand, and the two areas should be considered as interrelated in the last part of the Early Iron Age as they were in historical times when Dirdal was part of Forsand municipality. Forsand is situated at the entrance of the fjord leading into Dirdal, providing the opportunity to control the seaway. At the same time, we have to bear in mind that sites concentrated at the end of the fjords indicating a peak in the settlement in the LRIA/MP is a common pattern in the southwest. The location of the large concentrations of settlement traces indicate that the mountain resources and exchange were of great importance already in the LRIA and MP.

Located at the intersection of the fjords or at the place of transhipment from boats to mountain trails, the large settlements could facilitate and supervise the transport of commodities. With a settlement of 20 simultaneous farm units, it is reasonable to assume that the population of Forsandmoen took active part in the exchange. Trond Løken has suggested that a surplus of food production in Forsandmoen could have been exchanged for seal skins in Lysefjorden and reindeer skins in Lysebotn (Løken 1992). If we consider the barns in all the longhouses in Forsandmoen, the number of cattle must have been substantial. While cowhides and skins might have been exchanged with Europe, the remaining question is what kind of items Forsand could exchange with Sirdal and Setesdal, particularly to be able to get hold of iron in return. A product we can safely assume a demand for in the inland is salt. A larger number of people could indicate different forms of labour-intensive work, for instance taking care of the transport of commodities, by horses and boats, as well as participating in seasonal work adapted to the use of outfield resources such as hunting, trapping, fishing, harvesting and possibly iron production.

Inter-regional context

At the other end of the routes from Forsand, finds in Setesdal appear to be concentrated in the areas were these routes come down from the mountains (Figure 1). In contrast to Forsand and Dirdal, Setesdal has remarkable finds from the Viking Period. When house remains and two mounds were excavated at Skarg in Bykle in the 1970's, they represented the first finds from the Early Iron Age in Bykle municipality (Rolfsen 1977). In Valle municipality there are also few finds from the Early Iron Age, and no finds from graves are known until rich grave finds start to appear from the eighth century (Larsen 1981). The rich graves in Valle emerge at the same time as the abandonment of Forsandmoen. Five graves with scales and eleven coins from four different contexts have been interpreted as indicators of a trading place in Valle (Larsen 1981). Five of the 18 graves recently discovered at Langeid contained coins, weights, hacksilver and a set of scales (Loftsgarden and Wenn 2012, Wenn *et al.* 2015, Wenn 2016, Glørstad and Wenn 2017). The clear evidence of trade-related activities points towards a transhipment port at Langeid in the Viking Period (Glørstad and Wenn 2017). Both Langeid and Valle are situated at the ends of different routes within *Skinnvegen* (Holen 1968) (Figure 1). Whereas the trade-related finds from Langeid stem from one grave field, the rich grave finds from Valle come from 23 different farms; however, only five of the graves contained scales and coins (Larsen 1981, Glørstad and Wenn 2017).

At the same time as the grave finds from Setesdal appear to be concentrated within a short time span, it is important to point out the source critical challenges of interpreting an area solely on the known grave finds (Dahl 2022). While one challenge is related to the divergent ways of interpreting presence or absence of rich graves (Lillehammer 1996, Myhre 2001, 2003, Williams 2006, Löwenborg 2012, Dahl 2016a, 2016b), Kathrine Stene and Vivian Wangen point out how the scarceness of grave finds from the Early Iron Age was interpreted as a clear sign of sparse settlement and a late *landnám* in the valleys in East-Norway (Stene and Wangen 2017). While the term *landnám*, literally meaning taking land (Store Norske Leksikon), is often associated with the Norse settlement of Iceland in the Viking Period, the inner *landnám* refers to new and denser settlement in Norway during the Iron Age. Recent excavations and pollen samples indicate farming throughout the Early Iron Age with an intensification around AD 200, in line with the coastal areas of Rogaland (Myhre 2002, Dahl 2016b). An increased exploitation and a multifaceted utilisation with extraction of iron, hunting and trapping, quarrying of stone, and the use of summer pasture and shielings, took place in the mountainous areas in southern Norway from the beginning of the Iron Age (Myhre 2002). The intensification of livestock grazing is most prominent in West-Norway (Stene 2015, p. 198). Pollen samples from Forsandmoen indicate a change towards less farming and heavier grazing in the Late Roman Iron Age and the Migration Period (Prøsch-Danielsen and Simonsen 1988).

Surveys and excavations along the main road through Setesdal (RV-9) offer new insights into settlements from the Late Bronze Age into the Middle Ages. While the earliest traces of settlement at Moi and Kveste have been dated to the Late Bronze Age (Reitan 2009, 2011, 2014, Wenn and Arnarsson 2019), the earliest use of a grave mound at Sandnes is represented by a cremation burial from the Late Bronze Age (Wenn and Arnarsson 2019). At Langeid, farming has been dated back to the Pre-Roman Iron Age. The level of activity increased in the Roman Iron Age, represented by cooking pits, traces of iron processing and farming (Wenn 2016). At Moi, parts of a 49.5 m long and 9-9.5 m broad house from the Late Roman Iron Age was discovered (Reitan 2009, 2011, 2014). The width of the house is remarkable and could be compared to the contemporaneous House II in Forsandmoen interpreted as a hall (Løken 2001, 2006, Dahl 2022). As in Langeid, pits for iron processing were dated to the Late Roman Iron Age, but at Moi the pits could be related to the contemporaneous large building (Reitan 2011). Apart from the large House II at Moi, the most frequent discovery along the RV-9 were houses from the Viking Period. Six houses from the Viking Period were discovered at Sandnes, while two or possibly three buildings from the period AD 900-1200 were found at Moi. In an overall perspective, the recently excavated settlement sites point towards the same peak in the Viking Period as indicated by the known grave finds from Valle. If we compare with the more recent development in Rogaland, where an increasing number of buildings from the Late Iron Age have been discovered (Bjørdal 2016), future excavations in Setesdal may detect both a growing number of houses from the Late Iron Age and long-term settlements from the Bronze and Iron Ages.

Recent surveys and excavations illustrate the great potential for new insights into settlement, farming and graves in Setesdal, in the same way as in other valleys in East-Norway (Stene and Wangen 2017). The most extraordinary discovery has been the grave field at Langeid. Two Viking Period graves found outside a mound at Hovet in Valle municipality in 2007 (Kjos 2015) bear resemblance to the graves at Langeid, as well as representing a general Viking

Period trend of burying the dead deep in the subsoil (Dahl 2016b). The graves were not discovered until the mechanical uncovering of the subsoil. Langeid, Hovet and Forsandmoen emphasise the challenge of interpreting areas solely based on visible features and known finds. At the same time, we have become more aware of this challenge because of the rapidly growing amount of material, due to recent developments and methodologies. If we manage to use the pre-development surveys and excavations as generators of archaeological research, the continual access to new, not only cumulatively more, material should ensure for archaeology the advantageous position of generating rapidly altering images of the past.

Conclusions and future attentions

We need to address how shifting methods and interpretations produce altered images of the past. The necessity of ongoing discussions of the way methodology shapes our knowledge of the past becomes even more intrusive in attempts to apply a broad, interregional perspective. Methodological changes may include the top soil stripping of cultivated fields, introduced in Norway by the Forsandmoen project. While surveys and excavations of cultivated fields have revealed sites that radically change our interpretation of past settlement, the use of mechanical excavators still has a largely unexplored potential in areas currently used as pasture. Surveys in pasture areas cannot be limited to evidence visible on the surface, lest we end up with two different sets of knowledge, where the modern use of the survey area defines the methodology and thus the archaeological record (Dahl 2020).

Up until the introduction of surveys and excavations of cultivated fields in Norway, the presence and development of the Iron Age settlement was inferred from known grave finds and preserved graves visible in the landscape (Dahl 2022). At Forsandmoen, the number of grave finds and their narrow chronology do not correspond well with a 2200-year-long and massive settlement. The discrepancy between the known grave finds and the large settlement illustrates a major challenge regarding representativeness and source criticism in the interpretation of settlement development. This discrepancy can also illustrate how divergent ways of interpreting the grave material produces conflicting images of different periods. All the known burials in Forsandmoen are from the Late Roman Iron Age/Migration Period. The construction of the burial monuments can be interpreted as indicating a time of growth and prosperity, or a need to argue and convince when power is disputed (Löwenborg 2012).

If we bring such an approach to the interpretation of the known grave finds from Setesdal, the society started investing in richly furnished graves from the eighth century. The pattern in the grave finds cannot be used to infer sparse settlement in earlier periods, as demonstrated by the material from Forsandmoen, but it may indicate larger transformations and possible disputes starting to appear at the same time as the abandonment of all the known settlement at Forsand. While they invested in constructing grave monuments in Forsandmoen solely in the Late Roman Iron Age/Migration Period, the richly furnished graves in Setesdal can indicate disputes and displays of power in the Viking Period. At the same time the character of the grave finds in Setesdal shows attention directed towards trade-related activities, interpreted as indicating trade places in Valle and Langeid. Valle and Langeid are located at the other end of *Skinnvegen*, and the route becomes a material link between two areas that seem to go through contradictory developments. The eighth century stands out as the age of large and interregional transformations, a time that happens to coincide with the introduction of a new type of furnace for iron production, although we do not have knowledge of many production sites from that period (Rundberget 2015). The coinciding, but diagonally different images can be taken as an argument for related developments in the two regions. Further, the divergent patterns are seen as an argument against an intensified exploitation of resources governed by leaders seated along the coast. A sensitivity towards possibly fast changes and divergent local variations, linked in larger interregional contexts, might represent a fruitful path to avoid a linear and heavily generalised story of larger areas through longer periods.

Balancing fast changes and longer processes is challenging. We can imagine how material culture gained more attention during larger and more sudden transformations in society. In archaeology it might be easier to identify times of larger disputes and tipping points, like the lavish period at the end of the Early Iron Age in Rogaland. Pollen analyses can play a key role in directing attention towards both abrupt changes and longer time spans. Like the pollen analyses that changed the impression of the Iron Age farming in the valleys of East-Norway (Stene and Wangen 2017), the pollen samples from Forsandmoen show a change from less farming to more pasture already in the Roman Iron Age and Migration Period (Prøsch-Danielsen and Simonsen 1988). At the same time, many farm complexes were established in South-West-Norway in areas first and foremost favourable for grazing. Hence, both the unusually large settlement and the more frequent farm complexes indicate a strong orientation towards pastoralism. This trend coincides with the increased exploitation of the mountainous areas in southern Norway already from the beginning of the Iron Age (Myhre 2002), where the intensification of livestock grazing is most prominent in West-Norway (Stene 2015). Whereas some areas show an increased and diverse resource utilisation in the seventh century (Myhre 2003, p. 85), the settlement structure in Rogaland went through massive transformations. The material from larger regions imply that the beginning of the Late Iron Age represents a tipping point in a long-term transformation towards an increased emphasis on pastoralism.

An increased emphasis on pastoralism, both as an ongoing long-term trend in western Norway from the start of the Iron Age and as different steps of intensification through the Iron Age, has been suggested as a possible reason for the transverse movement of many buildings in the beginning of the Late Iron Age in South-West-Norway (Dahl 2016b). Such a development cannot explain the abandonment of an area characterised by its easy access to pastures. And while many of the other sites in Rogaland are being reused in the Viking Period both as dwellings and burial fields, the large settlement of Forsand went out of use. The reasons for the changes appear to be more compound (see Dahl 2009, 2016b). In the case of Forsandmoen it is tempting to suggest that the lines of communication broke down or were reorganised in such a manner that created an intermediary excess. In such a scenario the large settlement of Forsand would have lost the foundations of power and the necessary access to resources and exchange. At the same time, grave finds start to appear at the other end of *Skinnvegen*, indicating a movement of power disputes from the mouth of the fjords to the inner valley. While the inter-regional scarceness of finds in the later part of the Merovingian Period point towards a breakdown in the communication lines established in the LRIA, the local display of trade-related objects in graves indicates the presence of trade places in the later part of the Viking Period in Langeid and Valle. In the Middle Ages, *Skinnvegen* is the route for transport of cattle, butter and cheese from Setesdal to Stavanger, while grain, salt, herring, clothes and horses were transported the opposite direction.

We can expect different choices regarding strategies and developments in different regions. At this point it seems like the wide range of resource exploitation documented in the vast and heterogenous mountain areas of South-Norway might have been a successful strategy, in contrast to the impression we get from the decline and abandonment of the long-term settlement sites in Forsand. We need to ask whether the apparent lack of varied recourse utilisation is a result of bad strategic choices in the past or in the present. In South-West-Norway we have had a tendency to focus on the earliest farming in most pre-development projects. To gain more insights into the possible multifaceted resource utilisation in the Late Iron Age, as well as the entire Iron Age, we have to keep in mind that the Norwegian farms were not limited to farming.

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Jennica Svensson and Solveig Roti Dahl

Recent archaeological surveys in Ryfylke, with examples from Sandsa, Grasdalen and Forsandmoen

In 2015, Rogaland County Council began the most extensive archaeological surveys in the mountain areas of Ryfylke since the development of hydropower came to a halt in the 1980s. This article aims to demonstrate how such pre-development surveys can bring new knowledge to landscape use and exploitation of remote resources. It argues that by overlooking data produced by pre-development surveys, we will lose important knowledge of archaeology and prehistoric societies, particularly in remote areas. This topic is discussed and illustrated by examples from three areas that were included in the recent Ryfylke powerline surveys: Sandsa, Grasdalen and Forsandmoen.

Introduction

Over a period of five years, from 2015 to 2020, Rogaland County Council conducted archaeological surveys related to powerline upgrades in the mountains of Ryfylke. These surveys are the most comprehensive archaeological investigations done in the region in more than thirty years. In Norway, most pre-development surveys are carried out by the County Councils, and most of the results never enter the realm of research. However, in contrast to previous surveys and research, the recent surveys have identified a variety of sites dating mainly to the Iron Age and Medieval Period. While previous excavations have largely focused on sites related to Stone Age hunting grounds, it is studies of vegetation history that have provided the most information concerning landscape use during the Iron Age and Medieval Period. With this in mind, the aim of this article is to demonstrate how pre-development surveys can bring new knowledge and understanding to landscape use and the exploitation of remote resources during the Iron Age and Medieval Period. In addition, we hope to shed some light on the methods and practicalities of surveying, and how these affect the collected materials capacity to answer certain questions. With the ambition to take the reader along for part of the surveying process, we have chosen a local approach when presenting the results and examples.

The three areas selected as examples are Sandsa, Grasdalen and Forsandmoen (Figure 1). The surveys cover a total of approximately 223 km of powerline pathway, as well as construction sites and roads for access. In total, 124 cultural heritage sites have been surveyed in relation to these projects, of which 42 sites were previously unknown (Dahl 2015, 2016, Svensson 2018, 2020). The sites vary in size from a single cooking pit, to sites with several hundred features. The three example areas were chosen mainly based on the new results from the survey, which included several sites dated to the Iron Age and Medieval Period. However, they also represent areas with different levels of previous knowledge, which will allow us to examine how the survey results interact with previous research in a given area. Last but certainly not least, all three happen to be resource areas that relate to large and well-known Iron Age settlement areas in the lowland of Ryfylke. When resource areas or remote resources are discussed in this article, these terms generally refer to the diverse use of natural resources outside the core settlement. A resource area thus includes everything outside the main farm and infield, which is also defined as Zone 2-4 in Øye's model of extensive farming (Øye 2012, p. 52).

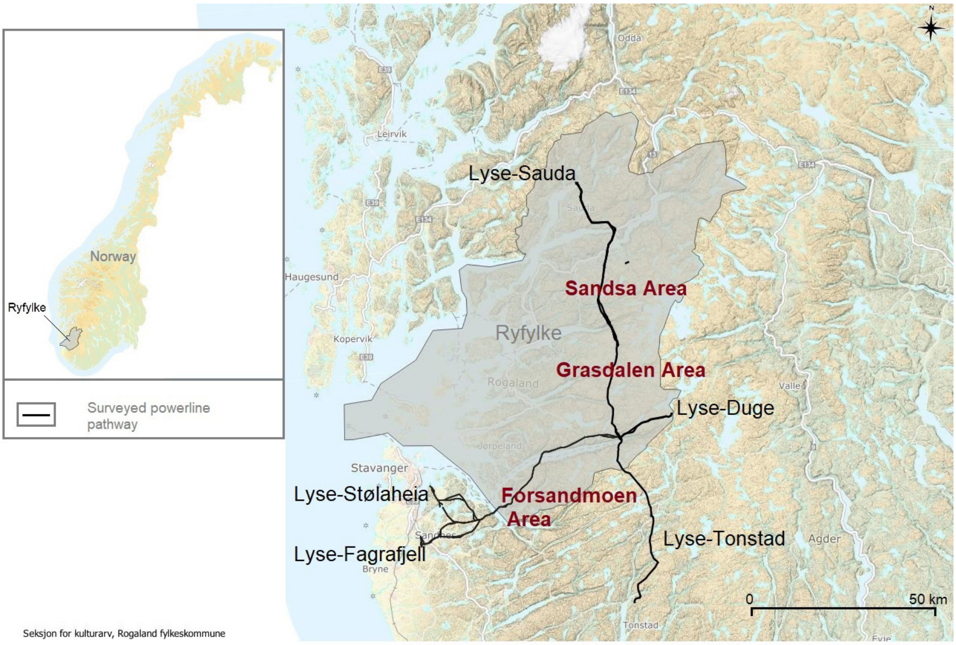

***Figure 1**. Overview of Ryfylke powerline surveys 2015-2020, including the example areas of Sandsa, Grasdalen and Forsandmoen.*

Archaeological surveys carried out by the County Councils in Norway generate a significant number of cultural heritage sites from all time periods and varying greatly in size. Taken together, these sites add up to a substantial body of potential research material that, with a few exceptions, has been left unexploited. Over the five years that the Ryfylke powerline surveys were carried out, a total of approximately 500 previously unknown heritage localities were registered in Rogaland County alone.

It is difficult for contractors to preserve and avoid conflict with protected heritage sites in more densely populated areas. This requires a dispensation from the protection given by Norwegian law, *The Cultural Heritage Act*. If dispensation is given, it is normally granted on the condition that the site is excavated. The excavations that follow are conducted by a research institution such as the regional museums or the Norwegian institute for Cultural Heritage Research (NIKU). As a result, the data from certain development-led projects can ease their way into the consciousness of research environments.

However, in less densely populated areas, such as Ryfylke, there is less development pressure and more room to make alterations in the projects and avoid conflict with cultural heritage sites. As a result, the surveys done in remote locations are more likely to be the only archaeological investigation carried out in that particular area. Out of the 124 sites registered during the recent powerline surveys, only four sites have been excavated as a consequence of the planned development. Based on this, we argue that by overlooking data produced by pre-development surveys, we not only stand to lose important knowledge of archaeology in remote areas in particular, but also undercut the comprehension of entire prehistoric and historic societies.

Previous research

Archaeological investigations in the mountain areas of Ryfylke got a virtual jump-start with the hydropower development in the 1960s. This construction led to archaeological excavations of several Stone Age sites at Storhiller and Nilsebu, along with the Iron Age shieling sites at Lyngsvatnet. Prior to this, archeological investigations in the district of Ryfylke, and Rogaland in general, mainly concentrated on lowland and coastal sites.

New reservoirs for hydropower production also triggered the comprehensive interdisciplinary research project Ulla-Førre. The fieldwork was carried out in the period 1972-1979 (Vinsrygg 1974a, Bang-Andersen 1975). 246 sites were registered during the surveys, of which ten per cent were further investigated through archaeological excavations (Lillehammer 2016, p. 122). Although a variety of sites were surveyed, the sites chosen for more comprehensive study were with few exceptions related to Stone Age hunting grounds. One of the exceptions is the Iron Age site excavated at Stråpa-Sandsa, which will be discussed in more detail below.

The projects in Kvanndalen and Tengesdal-Lingvang in 1983-1984 were also a result of hydropower development (Prøsch-Danielsen 1990, p. 21-70). These interdisciplinary research projects greatly contributed to new knowledge of grazing in heath and upland areas in the northern part of Ryfylke. In 1986, the Museum of Archaeology in Stavanger also led a collaborative project in Sauda with the ambition to study the use of resources around Sauda in a long-term perspective (Prøsch-Danielsen 1990, p. 9-20). The vegetation history in Kvanndalen indicates that it had been a marginal area in an agricultural context, taken into use relatively late in the Neolithic Period. The Tengesdal-Lingvang and Sauda projects overlap with the northernmost part of the recent Ryfylke powerline surveys. In these areas, the palynology displays an increase in grazing indicators in the Late Neolithic, and a visible increase from the Late Bronze Age to the Early Iron Age. As a general pattern, traces of increased grazing indicators were also found throughout the Viking Age and Medieval Period. There is, however, no evidence that indicates a change in grazing intensity as a consequence of the Black Death pandemic in the 14th century, nor in the 19th century when shieling activity is historically known to have increased (Prøsch-Danielsen 1990). The Tengesdal-Lingvang area is also one of the cases included in Lisbeth Prøsch-Danielsen's analysis of shieling practices in this volume. Since the completion of research in the mid-1980s, there have not been any research projects focusing on Iron Age landscape use in the mountain areas of Rogaland (Lillehammer 2016, p. 168-171).

Nevertheless, research has been done in relevant locations that can offer important insights on the recent surveys, such as Bang-Andersen (1983, 2015) and Løken (1982), who investigated hunting and trapping in Setesdal-Vesthei as a resource for the lowland farms. The old travel routes, shieling routes and shelters are important for identifying nodes in the landscape and for understanding movement in Ryfylke. These elements have to a great extent been mapped and described by Holen (1968), Hageland (1998), Tjeltveit (1999) and Herstad *et al.* (2011). Finally, the massive iron production in Setesdal, Bykle and Hovden, also described by Løken (1982, 1991) and Loftsgarden (2017), represents another essential backdrop in the understanding of Iron Age activity in the mountains of southern Norway and Ryfylke. A general observation concerning previous research in this area is that while reports from early surveys and excavations describe various sites dating to all time periods, scientific publications mainly address the Mesolithic and the archaeobotanical material. Reflections concerning shieling sites are more commonly found in popular articles and local publications, such as *Stavanger turistforenings årbok* and *Frá haug ok heiðni*. This is also reflected in the bibliography of this article.

For the purpose of this publication, the collected data has been approached from a local perspective that also reflects how the landscape was examined during the pre-development surveys. In future research, however, it would be enlightening to see the survey results in a wider context. Despite an increasing interest in the subject of outfield archaeology and landscape use, both in other parts of Norway and in the North Atlantic region, the archaeology of shieling sites and the Iron Age use of heaths and uplands are still rather unexplored in Rogaland. The general image of Iron Age landscape use in these areas is predominantly based on studies of vegetation history Thus, the registered sites from the Ryfylke powerline surveys would benefit greatly from comparative perspectives provided by research projects such as Vestlandsgården, the outfield research network and DYLAN, along with the development-led research of Gråfjellprosjektet, to mention but a few projects that have explored the archaeology of remote resources (Øye 2002, Stene *et al.* 2005, Stene 2014, Austrheim *et al.* 2015, Indrelid *et al.* 2015). There have also been fruitful discussions on the theoretical aspects of outfield archaeology regarding how the landscape is perceived and referred to. Holm *et al.* (2009) provides a critical approach to the concepts of periphery and marginality, and explores the inherit liminal qualities of the landscape in a way that could be relevant for the surveyed areas. Last but not least, a number of relatively small projects, related to MA and Ph.D. theses, have made a notable contribution to the subject of outfield archaeology and resource use, particularly in western Norway (Øye 2012, p. 50-51).

Premises and Methods

As with most surveys carried out by the County Councils, the intention of the Ryfylke powerline surveys has been to identify conflict between the plans for development and protected cultural heritage sites. The construction of powerlines rarely leads to major excavations, as the plans can, in most cases, be adapted to avoid a direct conflict with cultural heritage sites. Hence, the trenches that are dug are relatively small and the number of samples analyzed from each site is often limited. One additional factor is that the developer cannot be expected to cover the costs of excessive work or expenses. However, the decision of how comprehensively each site should be examined is mainly balanced between getting enough data to determine the status of protection, and how much, potentially unnecessary, disturbance a site should be exposed to. The examination of sites where a direct conflict can be avoided is normally kept to a minimum, while sites where conflict cannot be avoided are more thoroughly examined, in order to provide enough information for the regional museum to estimate the research potential and costs for a full excavation. This approach leads to a discrepancy in the data that is collected.

Standard methods for archaeological fieldwork and documentation were used during the survey. In short, test pits and small trenches were dug to retrieve information about natural stratigraphy and cultural remains, and to collect samples for carbon dating. The methods applied were adapted to different terrain and to the assessed potential of each area. The selection of sites and examined areas was based on studies of historical data, aerial photographs, previous research, place names and visual analysis of the locations. For more details on the priorities made, see Dahl (2016), Frækhaug (2016) and Svensson (2018, 2020).

In terms of method, it should also be mentioned that, due to logistics for most remote locations, archaeologists are only granted one opportunity to survey a given site. In this project, we were able to revisit some of the areas over a period of several years, partly because new alternatives were added to the project. However, the survey of each stretch of pathway was also planned to overlap, and to be accessed from two directions. To visit the same area repeatedly over a relatively long period of time, in different weather conditions and seasons, has proved very useful for the understanding of the landscape, and the resources available within the area. Not only do the surroundings change somewhat from one visit to the next, but an archaeologist will bring new knowledge and different perspectives to the site each time. It may lead to the discovery of a few more features, but most importantly it leads to a better understanding of how the features relate to each other and to the surrounding landscape.

The examples of Sandsa, Grasdalen and Forsandmoen

The Bronze- and Iron Age settlement area at Forsandmoen has been an object of research for several decades (Løken 2020), while the Sandsa area was the object of smaller archaeological excavations and interdisciplinary studies during the Ulla-Førre project in the 1970s (Vinsrygg 1974a, Bang-Andersen *et al*. 1975). Grasdalen, on the other hand, is an area that had only been partially surveyed prior to the surveys in 2016. This provides an opportunity to observe how survey data can be applied to and interact with different levels of previous knowledge. The vegetation zones and types of remains that are recorded in each of the three areas also vary. In that respect, the examples were chosen because they are different from each other, but also because they share some significant common ground. Forsandmoen, or in this case the surrounding heath and uplands to Forsandmoen, along with Grasdalen and Sandsa, are all historically known resource areas for large Iron Age settlement areas, namely Forsandmoen, Årdal and Suldalsosen. A common denominator between these settlement areas is that they are located along or at the end of main mountain travel routes between Ryfylke and Setesdal east of the mountains, and Haukeli and Hardangervidda further north.

Forsandmoen is the largest prehistoric settlement in Norway. If one were to look for other possible examples in Rogaland, Årdal and Suldalsosen would be good candidates to begin investigations with. Årdal and Forsandmoen are both coastal sites, while Suldalsosen is located 17 km upstream from the river estuary in Sand. The landscapes are characterized by wide plains of flat moraine riverbanks, surrounded by steep mountains. At Årdal, the river plains stretch from the great grave fields at Rivedal and Valheim, past Vadla, Lund and Kyrkhus, to the estuary between the large grave mounds at the farms Mæle and Svadberg. Finds indicate an increase in settlement activity in Årdal from AD 300 onwards, and several high status finds from the Late Iron Age have also been identified (Espedal 1976, Lillehammer 1976). Suldalsosen is equally rich in Iron Age heritage sites. Many of the grave mounds were destroyed and flattened by farming in the 19th and 20th centuries; nevertheless, based on historical records and preserved remains, it has been estimated that there were originally approximately 250 grave mounds and no fewer than 25 Iron Age farms in the valley, with an expansion phase in the Roman Iron Age and the Late Iron Age (Lillehammer 1986).

Sandsa - background

The area around Sandsa, including the three shieling sites Haugastøl, Tjøstheim-Sandsa and Åmotsdalane, was surveyed during the Lyse-Sauda project in 2016 (Figure 2).

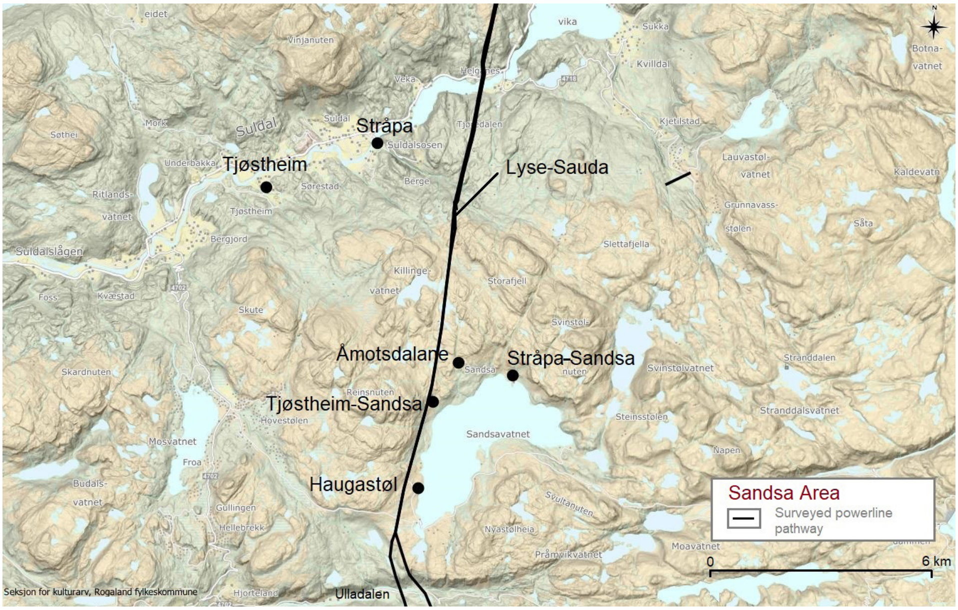

***Figure 2**. Overview of the Sandsa area and surveyed sites.*

The shieling Tjøstheim-Sandsa was first recorded during the Ulla-Førre project, and the nearby sites at Stråpa-Sandsa, Lund and Haugastøl were also excavated as a part of this project (Vinsrygg 1974a, Bang-Andersen *et al*. 1975). The excavations at Lund uncovered three small ruins located on the south side of the lake, on the side opposite Stråpa-Sandsa. The site was very poor in finds and inconclusive in terms of dating results. One of the features, Tuft III, was interpreted as a small boat house (Bang-Andersen *et al.* 1975, p. 125-139).

Two km east of Tjøstheim-Sandsa we find the shieling Stråpa-Sandsa, with remains of settlement from the Iron Age and early Medieval Period. Stråpa-Sandsa and the surrounding area were surveyed in 1973 and partly excavated in 1974 (Vinsrygg 1974a, Bang-Andersen 1983). The excavated site revealed features within and around the historic shieling. Based on the plan drawings, the excavated area can be interpreted as a small building or part of a building, with four hearths concentrated at the northeastern end. Among the finds are 35 possible loom weights, some of them produced from local slate at the site. These could indicate textile production, but can also be interpreted as net sinkers related to fishing. Other finds from the site include an unfinished bead of crystal quartz, two spindle wheels, a knife, an arrowhead and a fire starter made of iron. A rather large amount of slag from iron production was found spread all over the site. Diagnostic finds indicate that Stråpa-Sandsa was in use from around AD 750 and into the early Medieval Period, but there might have been earlier and later phases of usage. According to Vinsrygg (1974a), it is difficult to determine whether the dwelling was used seasonally or year-round. However, the material is considered to be more comprehensive than is normally found at seasonal locations, which could indicate that the settlement at Stråpa-Sandsa had been permanent already in the late Iron Age. The excavation did not produce any material to indicate animal husbandry or traditional shieling activity. The palynology research on material from the bog at Stråpa-Sandsa shows that birch had been cleared repeatedly over a long time-span. The area may have been cleared for grazing, but birch would have been a useful resource for iron production as well. There are also indications of at least one attempt to grow barley, though it was probably not very successful (Selsing 1978, p. 125). Traces of barley production have also been found at the shieling Hovestølen, 580 m above sea level, 5 km west of Sandsa (Lillehammer 1971).

Recent surveys

Tjøstheim-Sandsa is located at 715 m above sea level, and about 300 m northwest of the lake Sandsavatnet. The shieling at Tjøstheim-Sandsa has four standing buildings and nine ruins. Two previously unknown ruins were discovered in 2016, and the shieling infield was sampled for ^{14}C analysis. The samples were recovered from a small trench in the shieling infield. The earliest layer indicates a clearance phase dated to the Roman Iron Age, cal. AD 337-419. The early date corresponds well with the vegetation history of the area, and with research from other areas in Western Norway that have provided evidence for an increase in the exploitation of outfield resources during this period (Prøsch-Danielsen 1990, Øye 2012, Lillehammer 2016, p. 170).

The surveys in 2016 also led to the discovery of a shieling in Åmotsdalane. This shieling is located at 802 m above sea level, 1.2 km northeast of Tjøstheim-Sandsa and 1.5 km north of the Iron Age site at Stråpa-Sandsa. No shieling was previously recorded in this area. The two ruins were interpreted as the remains of a shieling with a small dwelling and byre. Floor layers from the dwelling and byre were dated to cal. AD 1271-1306 and cal. AD 1246-1290. A stone fence with enclosures and haystack features was also recorded next to the dwelling. At Haugastøl, ruins next to the standing building had been recorded during the Ulla-Førre project in the 1970s. In 2016, one of the ruins was examined and samples were taken from a floor layer, which could be dated to the late Medieval Period, cal. AD 1455-1525.

***Table 1**. Dated samples for the case study of Sandsa. OxCal v4.2.4 Bronk Ramsey (2013); r:5 IntCal 13.*

Sample no.	Name	ID Askeladden	Type	Periode	±2σ
ETH-71731	Tjøstheim-Sandsa	142809	Burn-layer	Roman Iron Age	337-419 AD
ETH-73289	Åmotsdalane 1	223513-1	Floorlayer	Medieval	1271-1306 AD
ETH-73290	Åmotsdalane 1	223513-2	Floorlayer	Medieval	1246-1290 AD
ETH-73288	Haugastøl	142866	Floor layer	Late Medieval	1455-1525 AD

Interpreting the Sandsa area

The Sandsa area has eastbound routes towards Setesdal, but would likely not have been situated along the main artery of movement, which is assumed to be along Suldalsvatnet and Kvanndalen. ^{14}C results from the recent surveys of Tjøstheim-Sandsa, Åmotsdalane and Haugastøl indicate that there was human activity on the shieling sites around Sandsa in the Roman Iron Age, as well as in the early and late Medieval Period. The previous results from excavations at Stråpa-Sandsa also indicated activity in the late Iron Age and early Medieval Period. The location that stands out as the most favorable in the area is Stråpa-Sandsa, and this impression is further strengthened by the fact that it was a permanent settlement during the 17th century (Vinsrygg 1974a). In a pioneer phase, it must be considered very likely that Stråpa-Sandsa was taken into use at the same time as Tjøstheim-Sandsa, if not earlier.

***Figure 3**. View of the shieling Tjøstheim-Sandsa and the lake Sandsavatnet. Photo: Solveig Roti Dahl.*

Historically, the farms in Ulladalen, 2.5 km south of Sandsa, had their shielings on the southern side of the lake, while the farms Tjøstheim and Stråpa in Suldalsosen, 7.5 km to the north, had access to the shielings on the northern side (Figure 3). Iron Age graves are known in both valleys, and the valleys were likely occupied in the Roman Iron Age, and quite possibly earlier. Both Tjøstheim and Stråpa have grave fields from the Iron Age, and there is also a hillfort at Tjøstheim, both of which demonstrate the farms' strategic location. Surveys in 2005 uncovered several cooking pits dated to the Bronze Age and Iron Age located between the largest concentration of grave mounds and the hillfort at Tjøstheim (Viste 2005). The placename Stråpa likely describes how Suldalsvatnet narrows into the small passage where river Suldalslågen begins. The name is assumed to be an ancient word for estuary (Bakka 1978, p. 148).

Several slate weights, of the same type and material as those found during the excavation at Stråpa-Sandsa, are still kept at the farm Stråpa (Vinsrygg 1974b, p. 207). Other archaeological finds from the main farms Stråpa and Tjøstheim indicate settlement in the Iron Age. The importance of shieling rights, as documented in the earliest laws from the 10th century (Robbestad 1937, p. 103-105), makes it plausible that these relationships extend back into the Medieval Period, and may even go back to the Iron Age. Åmotsdalane, on the other hand, does not have a placename or features commonly associated with a late historical shieling. Thus, it is possible that this shieling was related to a permanent settlement at Stråpa-Sandsa during the early Medieval Period.

Grasdalen - background

The valley of Grasdalen is situated at 600-800 m above sea level in Hjelmeland municipality, and stretches 4.5 kilometers from the lake Gamlestølsvatnet in the north, down to the lake Futevatnet in the south (Figure 4). Grasdalen is characterized by rich grass plains along the river, while the sloping sides of the valley are dominated by thin vegetation and scattered with large boulders. The surveys in Grasdalen in 2016 included the site at Gamlestølen, Grasdalen 1 and 2, and the area east of Futevatnet.

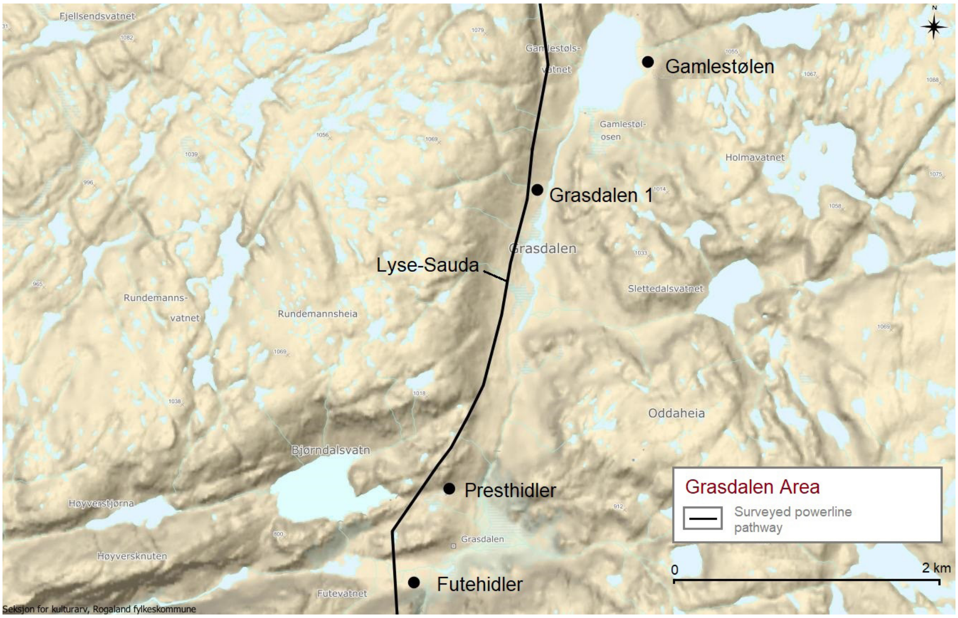

***Figure 4**. Overview of the Grasdalen area and surveyed sites.*

Grasdalen was partly surveyed in connection with the early hydropower development in the 1960s and 1970s. The sites at Gamlestølen and Futevatnet were previously registered as historical shielings as a part of the status report when the landscape conservation area was established in Setesdal Vesthei, Ryfylkeheiane and Setesdal Austhei (Herstad *et al.* 2011). The material registered in this report consists of 536 sites in Rogaland, and, so far, resources to verify the age or accurate location of these sites have not been available.

Previous surveys in Grasdalen have registered one Stone Age site, three shieling sites and three shepherd's shelters that were assumed to date to the 18th and 19th centuries AD. The shieling Gamlestølen was a functioning shieling until the 1840s, and was later used as a shepherd's shelter (Hageland 1998). The term 'shepherd's shelter' is in this case a translation of the Norwegian term *driftelege*, which points to the relatively modern use of rock shelters and old shielings as part of the commercial herding of livestock in the uplands. This was an activity that peaked during the 18th and 19th centuries, and many of the sites have been recorded and mapped by Torfinn Hageland (1998). Recent investigations of these shelters have revealed that many of them were in use long before the commercial livestock trade began.

In historical times, the farm Svadberg in Årdal owned the rights to the shieling Futeheller in Grasdalen. Court documents reveal a complex situation regarding the property rights and use of Grasdalen (Høyfjellskommisjonens kjennelser 1931, p. 80-85). Written sources show that people from the islands of Ryfylke sent their livestock to the uplands for grazing already in the Medieval Period (Reinton 1955, p. 133-135). Grasdalen was utilized for livestock grazing by farmers from the islands Sjernarøyene in Ryfylke from the middle of the 18th century, at the same time as the farm Svadberg had shieling privileges in the area (Eikeland 1966). Grasdalen also has a history of being utilized as common land (Hageland 1998).

Recent surveys

The shieling Gamlestølen is located northeast of Gamlestølsvatnet at 818 m above sea level. A relatively well-preserved ruin, interpreted as the main building during the latest phase of use, is surrounded by seven older overgrown ruins. Some features are so diffuse that it is difficult to tell whether they are ruins or clearance cairns without further investigation. In the rocky hillside north of the shieling, four storage features under big boulders were identified, and above the shieling there is a rock shelter in the side of the mountain. The shelter overlooks the shieling infield, and a hearth in this shelter was dated to the 16th century, cal. AD 1515-1597. Unfortunately, no samples from the shieling infield could be dated.

The site Grasdalen 1 is situated about a kilometer south of Gamlestølen, at 811 m above sea level. It is a shieling built on a hilltop surrounded by small rivers and stone fences (Figure 5). The area stretches from the mountainside down towards the river, where there is a flat grass plain used as the infield. A haystack site was also recorded on the other side of the river, across from the shieling, which indicates that hay was stored here until winter to be brought down to the main farm. During the recent survey in Grasdalen, the previously unknown remains of one house ruin and two clearance cairns were found. Furthermore, three ruins and a circular stone enclosure were mapped. These features were previously mentioned in connection with the surveys for the hydropower development of Årdalsvassdraget in the 1960s, as well as by Hageland (1998). A floor layer in the ruins was sampled in 2016 and could be dated to the High Medieval Period, cal. AD 1282-1316. A clearance cairn next to the ruins was constructed on top a layer dated to cal. AD 1170-1263.

The shelter and shieling site Presthidler is located further south in Grasdalen. ^{14}C-results from the shepherd's shelter show that it was in use during the 19th century AD. This indicates that both the shepherd's shelter and the shieling were in use at the same time.

Figure 5. *Ruin at Grasdalen 1. Photo: Solveig Roti Dahl.*

Finally, Futehidler, in the southernmost end of Grasdalen, is situated by Futevatnet at 611 m above sea level. The shieling itself consists of several stone-built walls next to big boulders. Futehidler was a known shieling in 1648, and belonged to the farm Svadberg. Like Gamlestølen, it was in use as a shieling until the 1840s, when it became a shepherd's shelter (Hageland 1998). During the recent surveys, several contexts at Futehidler were dated. A floor layer from a ruin at Futehidlerstølen was dated to the Early Modern Period, cal. AD 1541-1635. A cultural deposit from the enclosure was dated to the Medieval Period, cal. AD 1277-1315, while the layer in the main structure, Futehidler, was dated to the 19th century. However, a waste flint flake and a flint fire striker were also discovered inside Futehidler, which may indicate prehistoric use.

Table 2. *Dated samples for the area Grasdalen. OxCal v4.2.4 Bronk Ramsey (2013); r:5 IntCal 13.*

Sample no.	Name	ID Askeladden	Type	Periode	±2σ
ETH-71735	Gamlestølen	221513-9	Shelter	Medieval/Early Modern	1515-1597 AD
ETH-71737	Grasdalen1	221511-4	Floor layer	Medieval	1282-1316 AD
ETH-71738	Grasdalen1	221511-7	Activity layer	Medieval	1170-1263 AD
ETH-71743	Futehidler	142709-1	Floor layer	Early Modern	1541-1635 AD
ETH-71742	Futehidler	142709-1	Cultural deposit	Medieval	1277-1315 AD

Interpreting the Grasdalen area

Several old travel routes converge in Grasdalen. The mountain trails from Bykle in Setesdal are channeled into two main arteries that descend to the fjords in Årdal and Førre. The valley of Grasdalen runs north to south and becomes a hub for the alternative routes between east and west. There are also trails leading from Grasdalen, past the Iron Age farms at Trodla-Tysdal or Viglesdalen, to Årdal, located by the sea (Tjeltveit 1999).

The farm Svadberg is situated by Årdalsfjorden, and, similar to Tjøstheim and Stråpa in the Sandsa area, is a farm with several grave mounds and cultural heritage sites from the Iron Age. It is assumed that the waterways have played an important role in communication networks, and that the use of outfield resources is related to the prosperous Iron Age farms (Løken 1982, Mikkelsen 1989, p. 15). The strategic location by the fjord is likely one of the reasons for Svadberg's and Årdal's prosperity, as it becomes an important node and destination for the terrestrial travel routes between Årdal and Bykle in Setesdal. Svadberg had shieling privileges at Futehidlerstølen in Grasdalen from 1648 onwards (Hageland 1998). Because of the strong traditions and laws regarding shielings, outfield resources and trading routes displayed in *Gulatingslova* (Robbestad 1937, p 103-105, 108), we assume that shieling rights, and hence the farm's relation to resource areas, did not drastically change from the Middle Ages to the 16th century. When it comes to the Iron Age in Grasdalen, however, there are no conclusive finds dating to that period.

Figure 6. *Futehidler. Photo: Solveig Roti Dahl.*

The most likely explanation for not detecting Iron Age remains in Grasdalen might be a combination of the fact that the Medieval Period was a period with high activity in Grasdalen, and the fact that we have not found Iron Age deposits in our relatively small trenches. It is a matter of forced inconsistency in our sampling strategy. In rock shelters and within ruins, there is a higher probability of encountering mixed and redeposited cultural layers that date to later periods of use. In comparison, the stratigraphy in shieling infields is easier to control. However, the traces of human activity are very sparse at many of the remote mountain sites: there may not be an infield, and the only traces of activity are then concentrated inside the shelter or ruin itself. This is also the case with shielings located in stone screes, or in areas with very thin vegetation and natural deposits. In locations like Futehidler and Prestehidler in Grasdalen, it is known that shepherd's shelters of the 19th often had an earlier use, as the first buildings at the shielings (Figure 6). This also applies to shepherd's shelters in nearby areas like Stakken in Lyseheiane (Hageland 1998). Although the ^{14}C-analysis only indicates use in modern times at Presthidler, the possibility that these natural shelters were used in prehistoric times must still be considered very likely. The shelters used as main buildings in early shielings in Western Norway were often simple structures (Reinton 1961, p.10), similar to the shepherd's shelters in Grasdalen. Investigations of similar features in the Breheimen project also indicate use in prehistoric times (Randers 1986, p. 11). Carbon dating results from several known shepherd's shelters in Ryfylke also indicate use of similar features in the Iron Age and Medieval Period (Dahl 2017). The possibility of identifying the earliest use of these shelters archaeologically depends on the level of preservation and the scale of the excavation.

Forsandmoen - background

The area around Lysefjorden, including part of Forsandmoen, was surveyed in relation to the Lyse-Fagrafjell and Lyse-Stølaheia projects in the seasons 2015 to 2020 (Figure 7).

In contrast to the previous examples from Grasdalen and Sandsa, Forsandmoen has been subject to extensive interdisciplinary research for several decades. The large excavations at Forsandmoen took place in the 1980s and 1990s (Løken 2020). Since then, the site has been revisited as part of several pre-development excavations (Dahl 2008, 2009, 2019, Dahl *et al*. 2021). The excavations at Forsandmoen have uncovered the remains of more than 270 buildings from the early Bronze Age (1500 BC) to the Merovingian Period (AD 700). The Roman Iron Age and Migration Period represent the peak of the settlement, before it was abandoned around AD 700 (Løken 2020).

Numerous houses contemporary with the large settlement at Forsandmoen have been excavated at several sites at Forsandneset, 2 km northwest of Forsandmoen (Løken *et al.* 1996, Dahl *et al.* 2017, Dahl and Mooney 2020). During the excavations at Forsandmoen, a farm complex at Heia that lies a kilometer southeast of Forsandmoen, was the object of a minor investigation in 1988. A small trench was dug through the longhouse, and the earliest phase of the central hearth was sampled. This sample was dated to the transition between the Migration Period and the Early Merovingian Period (Løken 2003, Appendix 11). There is only one site in the surrounding area that dates to the Viking Age. At Rettedal, 1.5 km east of the large settlement at Forsandmoen, a Viking Age grave mound was excavated by Lars Tjøtta in 1908 (Petersen 1944).

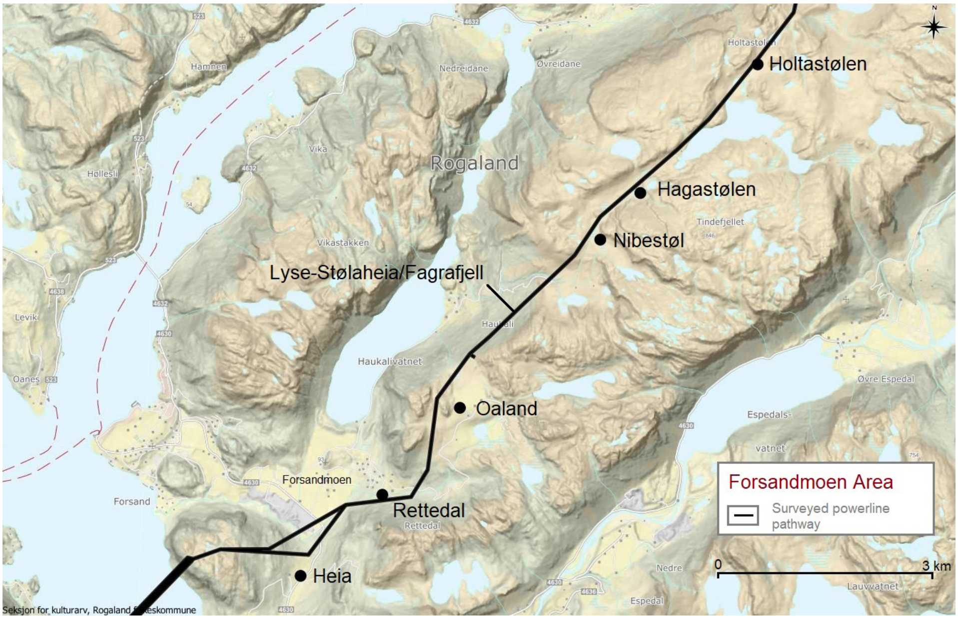

Figure 7*. Overview of the Forsandmoen area and surveyed sites.*

The excavations at Forsandmoen are known for exploring new methods in Norwegian archaeology by using machine-assisted topsoil stripping at a large scale, but the interdisciplinary approach applied to the site was also new. Most relevant to the use of outfield resources are the prehistoric cattle trails identified through systematic phosphate sampling of the settlement area. The results revealed several trails with increased levels of phosphate, which could be traced within a few hundred meters of the core settlement (Prøsch-Danielsen 2005). However, as we move into the landscape beyond the settlement at Forsandmoen, the resource areas have not been archaeologically explored previously.

Recent surveys

Three shielings north of Forsandmoen were surveyed. Nibestøl is located about 5 km north of Forsandmoen at 595 m above sea level, and consists of four small rooms on the northwestern side of a big boulder (Figure 8). A sample from the hearth in the largest room was dated to the 13th century, cal. AD 1246-1288. Hagastølen is situated a kilometer northeast of Nibestøl, at 625 m above sea level, and has two visible occupational phases. The older phase is quite similar, and likely contemporary, with Nibestøl. Due to contamination by microscopic roots, the charcoal samples could not be dated.

The shieling Husmannsstølane is located 2.5 km further northeast at 720 m above sea level. The old name of the shieling is Holtastølen, which relates to the farm Holte. Based on linguistic analysis, local historians consider the origins of the farm to go back to the era of Norse language, approximately 700-1350 AD (Engen 1981, p. 829). The shieling is still used for grazing and hunting, and has been in frequent use by several farms since the 18th century, hence the later name Husmannsstølane. The samples sent for ^{14}C analysis were inconclusive and could not confirm early activity at Holtastølen. In collaboration with the Museum of Archaeology, UiS, core samples from three bogs close to Hagastølen and Holtastølen were collected during the surveys. The carbon dating of the cores revealed that the earliest phase of the bog at Hagastølen dates to the Mesolithic, cal. 7589-7447 BC, while the earliest bog formation at Holtastølen began 3000 years later (Eilertsen *et al.* 2017, e-mail correspondence 26 Jan and 9 Nov 2020).

Figure 8. *Nibestøl. Drawing, and sitting inside the ruin, H. Eltoft. Photo: Jennica Svensson.*

Table 3. *Dated samples for the case study of Forsandmoen. Calibration method for ETH samples: OxCal v4.2.4 Bronk Ramsey (2013); r:5. IntCal13. Calibration method for Beta samples: BetaCal3.21: Data set INTCAL13. Calibration method for UBA samples: CALIB REV7.0.0, Data set: intcal13.14c*

Sample no.	Name	ID Askeladden	Type	Periode	±2σ
ETH-73896	Heia	14483	Burn-clearance	Neolithic	2137-2008 BC
ETH-96660	Heia	222896	Burn-clearance	Bronze Age	747-686 BC
ETH-102327	Rettedal	248269	Activity/Clearance	Pre Roman Iron Age	357-119 BC
ETH-102328	Rettedal	248269	Activity/Clearance	Pre roman Iron Age	358-168 BC
ETH-96659	Heia	222896	Activity/Clearance	Roman Iron Age	425-550 AD
Beta-548611	Oaland	229588	Longhouse	Migration Period	420-565 AD
Beta-548612	Oaland	229588	Longhouse	Roman Iron Age/ Migration period	382-538 AD
Beta-548613	Oaland	229588	Longhouse	Migration Period	420-565 AD
ETH-66719	Nibestøl	215790	Shieling	Medieval	1246-1288 AD
UBA-33501	Holtastølen	142062	Peat bog core samples	Mesolithic	4745- 4551 BC
UBA-33502	Hagastølen	215791	Peat bog core samples	Mesolithic	7589- 7447 BC

A new site was discovered at Oaland, located between the shielings and Forsandmoen. The farm complex consists of two visible longhouse ruins, stone fences and at least one large cairn in the adjacent forest. Since one of the longhouses had been damaged by tractor trails, the Museum of Archaeology, UiS, conducted a small rescue excavation in 2017 to assess the damages and secure the context. The remains turned out to be relatively well preserved under a layer of disturbed soil and turf. Samples from floor layers within the longhouse were dated to the late Roman Iron Age and the Migration Period, cal. AD 382-538 and 420-565 (Bjørdal 2017, Appendix 1).

When the entire area of Heia was surveyed in 2016, the number of localities increased from four to five, all localities increased in size and the number of visible features increased to a total of 283. Remains of buildings were found in three different locations, possibly representing three different farm units, and grave cairns as well as several hundred clearance cairns are scattered over the heath. During the surveys, two cairns at the northwesternmost end of Heia were deturfed and partially excavated to determine the earliest phase of activity (the cairns are located 450 m south of the settlement at Forsandmoen). A layer under cairn R56, interpreted as the earliest phase of clearance, was sampled. This sample was dated to the late Neolithic, cal. 2137-2008 BC. Under cairn R95, in the locality Brodane, the earliest phase of clearance was dated to the late Bronze Age, cal. 747-686 BC; however, the cairn was constructed on top of a layer dated to the Roman Iron Age, cal. AD 425-550.

Additionally, a small pasture at Rettedal, 0.8 km east of the settlement area at Forsandmoen, was surveyed in 2019. The five cairns recorded at Rettedal were interpreted as clearance cairns. The earliest clearance phase was dated to the Pre-Roman Iron Age, cal. 357-119 BC. A layer that had formed next to the cairn was dated to the same period, cal. 358-168 BC.

Interpreting the Forsandmoen area

One could argue that it is unfortunate that a modern powerline dictates the areas for survey and, hence, the collected data. However, in this terrain even powerline pathways must, to some extent, follow the same principles as the Iron Age traveler. The old travel routes are often the most cost-efficient way to move crew and equipment, and that applies to modern contractors as well. Through our surveys we were able to follow some of these old travel routes parallel to the Lysefjord, as well as the routes to Årdal and Suldal. The route Skinnveien, which runs from Lyse to Setesdal, was also surveyed during the Lyse-Duge project (Dahl 2015b).

The Bronze Age and Iron Age settlement at Forsandmoen was strategically located where Lysefjorden meets Høgsfjorden, and the closest access to the fjord for travel and transport was the estuary of Forsandåna, 1.5 km west of the settlement. However, in relation to our surveys, it was considered a key element that Forsandmoen is located where the old terrestrial travel routes descend from the mountains. Lysefjorden would have been the main artery for transport in the region; however, the weather and waters could be unpredictable, as could the people in control of boats and landings. The maritime route would likely depend on facilities controlled by farms at Lysebotn and along Lysefjorden. Agreements had to be made and paid for. The mountain trails, on the other hand, most likely offered a more independent way of traveling.

Trond Løken (1991) has previously explored the possibility of Forsandmoen being a central hub in a redistributive system between territorial chieftains in Jæren and Setesdal. He suggested that one of the resources Forsand and Ryfylke could offer, in comparison to Jæren, were the vast woodlands that provided fuel to process large quantities of iron from Setesdal into tools. The intention would have been to redistribute iron items to Jæren. At the opposite end, Jæren would have produced a surplus of grain, for export in return (Løken 1991, p. 219). Several buildings interpreted as workshops were identified within the village settlement in the Late Roman Iron Age and Migration Period, and many hearths in these buildings demonstrate traces of metalworking in the form of slag (Løken 1991, p. 215). He later describes these buildings as 'type 10' houses, multifunctional workshops with a narrow and elongated shape (Løken 2020, p. 185-191). Contrary to other types of houses in the settlement area, type 10 houses all have finds that indicate various metalworking activities and two of the buildings contained remains of smithies (Løken 2020, p. 190-191). It is however uncertain if these facilities could have been operating at such a scale that Forsandmoen could function as a center for redistribution of iron. Nevertheless, it appears likely that the organized trade and exchange between chieftains, particularly of heavy goods like iron, would have made use of the waterways whenever possible. It is, however, still reasonable to assume that other travelers and less organized trade, in addition to the transportation of other commodities in the organized exchange, would have utilized the mountain routes along Lysefjorden. In addition to the strategic location by Lysefjorden and Høgsfjorden, which provides access to Jæren and the inner parts of Ryfylke, Forsandmoen has direct access to the mountain routes that would have strengthened the settlement's position as a node in a redistributive network even further.

Figure 9*. View towards Forsandmoen from cairn R56 at Heia. Photo: Jennica Svensson.*

Both valleys north of Forsandmoen would likely have been used to reach the mountain routes towards Setesdal. The western valley leads to the farms Haukali, Holte and Eide, which are all likely to have had prehistoric settlement (Engen 1981). For part of this route, over Haukalivatnet, the preferred mode of transportation would have been by boat. The alternative was to make one's way along the steep and unstable slopes surrounding the lake. Thus, it appears likely that the eastern route over Rettedal and Oaland would have been a safer option for most parts of the year.

During the Migration Period, the village settlement at Forsandmoen reached its maximum, with 20 contemporary farm units. The Migration Period farm discovered during the recent surveys at Oaland is located where the mountain trails descend to Forsandmoen. Within the village settlement, evidence of social stratification has been identified and a communal management of shared resources between the farm units has been suggested (Løken 1991, Dahl 2009, Løken 2020). This level of organization raises questions regarding the relationship between the village settlement and the mountain farm at Oaland, and whether it was based on cooperation or dependency.

The same question applies to the neighboring settlement at Heia, where the travel route over to Rossavik and Espedalen went across this wide pass. The cairns examined during the surveys in 2016 are located 200 m and 400 m across the valley from the longhouse that is dated to the transition between the Migration Period and the Merovingian Period (Løken 2003). The earliest phase of clearance, sealed under cairn R56, was dated to the late Neolithic, and predates the establishment of the settlement at Forsandmoen (Figure 9).

Grave cairn R95 was constructed on top of a layer dated to the Roman Iron Age. The north-facing location makes it likely that this was a cleared outfield at the time when the cairn was built. In comparison, the earliest clearance phase at Rettedal, 800 m east of Forsandmoen, was dated to the Pre-Roman Iron Age. The cairn at Rettedal was constructed in the same process as the initial clearing of the area. This small pasture appears to have gone out of use again rather soon, or at least seems to have been used in a less intensive way. In the Pre-Roman and early Roman Iron Age, from 500 BC to AD 200, the settlement at Forsandmoen consisted of seven to ten contemporary farm units (Løken *et al.* 1996, Løken 2020). This means that two rather poorly situated north-facing slopes at Heia and Rettedal were both taken into use, and had gone out of use again, before the village settlement had fully developed to its maximum.

Reflections on results, interpretations and methods

The survey results for the examples of Sandsa, Grasdalen and Forsandmoen have all contributed new data to their respective areas. The question that lingers is to what degree and certainty this new data actually translates into new knowledge in the interpretation of an area.

New radiocarbon dates from the Sandsa area revealed that the first clearing phase in the infield of Tjøstheim-Sandsa took place in the Roman Iron Age, cal. AD 337-419. Apart from a small number of Stone Age artefacts, this is the earliest known attempt to exploit resources in the Sandsa area. This result provides new knowledge that corresponds well with previous studies of the vegetation history of other sites in the northern part of Ryfylke (Prøsch-Danielsen 1990, Lillehammer 2016, p. 170). The result is also consistent with research in other areas of Western Norway that have shown an increase in the exploitation of outfield resources during this period (Øye 2012).

In the case of Tjøstheim-Sandsa, the stratigraphic relationships of the infield are rather straightforward. The uncertainty regarding this site concerns the interpretation of the clearance layer itself and whether it is a remnant of human clearing activity or the result of a natural event, such as a forest fire. The interpretation depends on the previous experience of the surveying archaeologist, and the visual and tactile observations that are done. The level of detail and certainty in the interpretation could be improved by a dedicated strategy of sampling for further scientific analysis such as entomology, palynology and micromorphological analysis. This type of sampling has so far not been common practice in the surveys that have been carried out. One reason is that the current level of accuracy is frequently perceived as relatively adequate for its purpose, which makes it difficult to justify the additional cost of analyzing such samples. Another reason is the logistics of working in remote locations with long distances to cover, lots of equipment to carry and several sites to sample on the way. The number and size of samples are normally kept to a minimum.

Previous knowledge of permanent settlement at Stråpa-Sandsa in the 17th century has most likely influenced the interpretation of the recent surveys of the Sandsa area. There is no definitive evidence of permanent settlement in the archaeological record from the excavation in 1974 (Vinsrygg 1974a). Such evidence can generally be very difficult to identify at shieling sites, particularly in small-scale interventions. The historical and archaeological records for the site describe several phases of occupation, where some of the phases may have been of a permanent nature, and others may have been seasonal. The alteration between permanent and seasonal use of shielings and mountain farms is not unique to Stråpa-Sandsa. The same dynamics are well known in other sites and is also described at Birkelandsstølen, to mention one example (Petersen 1936, p. 71-72).

The site Haugastøl, also located in the Sandsa area, has been radiocarbon dated to the late Medieval Period, cal. AD 1455-1525. This implies that the resources at Sandsa were of such high quality that they were preferred to many of the lowland farms left deserted during the Black Death. It is also interesting to note that the resources in Grasdalen were already in use by the early 16th century AD, before the general expansion in the use of shielings in the 18th century AD, and, similar to Sandsa, before many of the deserted lowland farms were taken into use. Although none of the surveyed sites, so far, indicate activity during the plague in the 14th century, it should be taken into consideration that previous research in the north of Ryfylke (Prøsch-Danielsen 1990) showed no apparent decrease in grazing markers in upland areas related to the Black Death pandemic.

Regarding the relations between the shielings at Sandsa and the contemporary Iron Age settlement in the lowlands at Tjøstheim and Stråpa, it is often difficult to know how far one should stretch the interpretations of the Iron Age based on historical records. There is no evidence of an Iron Age connection between the lowland farms and the shielings in our survey data, but there is potentially a direct link through the material from the excavations of Stråpa-Sandsa in 1974, where slate net sinkers kept at the farm Stråpa are identical to the ones found in the Viking Period context (Vinsrygg 1974b). It is perhaps not important to decide whether it was the Iron Age settlements in Ulladalen or Suldalsosen that first exploited the resources around Sandsa; regardless, the exploitation of resources in the Roman Iron Age at Tjøstheim-Sandsa underlines the importance of the remote resources as a prerequisite for the development of contemporary lowland settlements. So far, the use of shieling sites at Sandsa corresponds with the expansion periods in the lowlands in the Roman Iron Age, Viking Period, early Medieval Period and the period after the Black Death.

Prior to the surveys in 2016, the archaeological knowledge of Grasdalen was very sparse. This means that all results from the surveys provide new knowledge, and yet, when it comes to the interpretation of these finds, it is difficult to know how representative they are. The data from the surveys, combined with previous knowledge from written sources, indicate extensive use of the mountain areas in Grasdalen in the early and High Medieval Period, as well as in the 16th century. So far, the radiocarbon dates from the sampled contexts in Grasdalen do not show any activity during the Iron Age, and hence no relation to the Iron Age farm at Svadberg. A few flint artefacts from Futehidler are the only indications of prehistoric activity in Grasdalen. The finds are however not diagnostic to a certain period. This raises questions concerning the Iron Age use of Grasdalen. Was there any Iron Age activity in Grasdalen, and if so, why have we not found preserved remains of it?

The most important resource in Grasdalen is, as its name implies, grass. Hence, it has been suggested that the growth in activity in Grasdalen may be related to an increased interest in sheep husbandry in the Medieval Period. This intense period of use would likely have disturbed any possible Iron Age deposits. The commercial herders in the 18th and 19th centuries are also known to have preferred to reuse the oldest features within the shielings (Hageland 1998). As previously mentioned, when excavating and sampling in small trenches, rock shelters or shieling ruins, it is difficult to fully grasp the phases and contexts of the site as a whole. In locations like this, there is a higher probability of encountering mixed deposits and cultural layers that date to later periods of use. The level of disturbance requires more specific examination and sampling strategies in order to pinpoint preserved prehistoric deposits in such contexts. The stratigraphy in shieling infields is easier to control, but there may not be an infield at many of the remote mountain sites, and in such cases the only traces of human activity are concentrated inside the visible ruins. Depending on the local conditions it can be difficult and sometimes impossible to maintain an infield sampling strategy.

Forsandmoen is an area that differs from the other two in many aspects. Although the resource areas around Forsandmoen have not previously been examined archaeologically, the lowland settlement has been an object of thorough and systematic research. The surveyed areas are located in the vicinity of the settlement and were known and used by the Bronze Age and Iron Age population. This means that there are excellent preconditions for understanding the wider archaeological context, including both the infield and remote areas, and for considering the representativity of the data. The recent surveys provide new insights into activities in the Forsand area which predate the known Bronze Age and Iron Age settlement on the plain. Clearing activity appears to have taken place in the late Neolithic at Heia, only a few hundred meters south of the Forsandmoen plain. In the adjacent field, also at Heia, the stratigraphy reveals a clearance phase in the late Bronze Age, contemporary with the settlement on the plain. A third clearance phase has been dated to the Roman Iron Age, followed by the construction of grave cairns in the same field, which overlook the village settlement on the plain. An additional outfield was cleared at Rettedal, a few hundred meters east of the settlement area, in the Pre-Roman Iron Age (Figure 10). It appears to have been a short period of usage. This reveals that a rather poor north-facing slope was taken into use, and probably went out of use again, in the same period that the Forsandmoen settlement was reorganised (Løken 2020), and long before the village settlement was fully developed.

While the largest farm complex at Heia was contemporary with the last stages of the Iron Age village (Løken 2003), the dating of the mountain farm Oaland was contemporary with the village settlement at its peak in the Migration Period. The recent radiocarbon dates from Oaland (Bjørdal 2017) provide an interesting line of thought concerning social organization and the control of remote resources along the mountain travel routes to Forsandmoen during the Migration Period.

***Figure 10**. View towards Forsandmoen from clearance cairn at Rettedal. Photo: Jennica Svensson.*

The solid previous knowledge of Forsandmoen provides excellent preconditions for comparison, but it might also influence the critical approach to the survey data. In this context, there may be a tendency to discuss results rather than method. For instance, the interpretation of layers, also discussed in relation to the clearance activity at Tjøstheim-Sandsa, should be equally valid in more densely populated agricultural areas, such as Forsandmoen. However, based on personal experience, there may be a tendency to be less critical concerning whether a layer or a feature is the result of human activity if the observation is done in an area with several known localities in the lowland, in contrast to the heath and mountain areas.

Finally, it should be mentioned that in all three areas discussed in this article, historical shieling sites are easily traced through local placenames. It is important to keep in mind that the archaeology of historical shieling sites does not necessarily translate to prehistoric shieling activity. However, research shows that historical shieling sites can be an indicator of locations for the diverse utilization of resources, and that the use of these sites often goes far back into prehistory (Øye 2012, p. 58-59, Austrheim 2015, p.162). Within the Forsand area, the shieling site Nibestøl was carbon dated to the 13th century during the surveys, while the results from Hagastølen and Holtastølen came back inconclusive. However, further analysis of the bog core samples, collected during the surveys in 2016, could provide new and important insight to the vegetation history and remote resources around Forsandmoen, before, during and after the presence of the Iron Age village there.

Conclusions

Although the survey material is somewhat fragmented, it provides hitherto unknown information about the timeframe of and type of resources utilized in the areas of Sandsa, Grasdalen and Forsandmoen. It should be emphasized that the survey data is more compound and comprehensive than radiocarbon dates, as the survey itself depends on thorough studies beforehand to understand the cultural landscape and its natural preconditions and history.

The results from recent surveys in the Sandsa area to a large extent confirm earlier archaeobotanical research (Prøsch-Danielsen 1990). The survey data indicate an increase in the use of outfield resources in the Roman Iron Age and during the Late Iron Age and Early Medieval Period. The shieling Haugastøl in the Sandsa area was in use in the 15th and 16th centuries, similar to Futehidler and Gamlestølen in Grasdalen (Dahl 2016). This indicates that the quality of the remote resources in these areas was preferred to that of lowland farms, which had been deserted since the Black Death in the 14th century. In the area of Grasdalen, the survey results indicate an extensive use of resources in the Medieval Period, which can also be confirmed by the written sources. The results from the area around Forsandmoen provide new information on Neolithic clearing activity in the upland of Heia, a few hundred meters south of the large settlement site, which is earlier than any settlement identified on the plain. In the same area, survey results have also revealed clearing activity contemporary to the settlement in the Late Bronze Age and Roman Iron Age, before grave cairns were built in the same field overlooking Forsandmoen. The survey also discovered a relatively brief phase of clearing at Rettedal in the Pre-Roman Iron Age. The largest farm complex at Heia is dated to the Late Migration Period (Løken 2003, Appendix 11), and the mountain farm at Oaland was dated to the transition between the Roman Iron Age and Migration Period (Svensson 2015, Bjørdal 2017, Appendix 1, Svensson 2018). Both Iron Age farms provide an intriguing perspective on relationships with the village settlement on the plain, as well as discussions of social organization and control of remote resources along the terrestrial travel routes to Forsandmoen.

Regardless of the quantity and quality of previous research, the survey results in these three examples have all demonstrated their potential for producing new knowledge, and have pointed towards further research potential. However, the discussion of interpretation and method shows that there are certain aspects of survey data that demand extra care when data sets are interpreted and used in comparative studies. As mentioned previously, the purpose of archaeological survey can vary between sites, and hence the comprehensiveness of the investigation of each locality varies. This means that the number of finds, the type of data, and the interpretation of the sites can be affected. Improved sampling strategies can undoubtedly enhance the accuracy and detail of the survey results, and thus the certainty of the interpretation. As an example, shieling infields have been suggested as a preferred source of information for the long-term use of sites, in contrast to visible features such as ruins and rock shelters. A dedicated sampling strategy that allows us to explore the material through archaeobotanical, entomological, palynological and micromorphological analysis would certainly benefit the research potential of the survey data and increase the accuracy of interpretation. However, the variation in local conditions, particularly with regard to disturbance by later cultural activity and naturally exposed sites, makes it difficult to maintain any sampling strategy consistently.

Archaeological survey data do not automatically add to the understanding of the surrounding area, as the data are not collected for that purpose. The results from surveys are not designed to answer a specific research question, but that does not mean that they cannot do so, provided the question is well formulated.

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Therese Nesset and Kari Loe Hjelle

Settlement and subsistence strategies in western Norway: examples from two deserted medieval farms

Two deserted medieval farms are investigated: the coastal Høybøen farm, located on an island on the western coast of Norway, and the inland Hellaug farm located in an upland but low-lying mountain valley. Both farms were settled during the Viking Age and abandoned during the Late Middle Ages. Abandoned Medieval farms have traditionally been perceived as less well-off than central contemporary farms. They have often been characterized as marginal, especially with regard to agrarian conditions. However, little is known about their subsistence strategies and whether they were sustainably farmed for several hundred years before they were abandoned. This paper discusses social aspects of farm establishment, the settlement basis, and land-use practices at the Høybøen and Hellaug farms by using archaeological and botanical sources. Both farms were settled during a time when the areas became more intensively used by neighboring farms. The farms were likely subordinated to a main farm and the people working the newly established farms were tenants. The subsistence strategies were based on the infield-outfield system, but the economic basis of both farms mainly came from outland resources where available pastures were especially important. The combined source material shows that the farms participated in different cultural and economic networks.

Introduction

During the Viking Age and early Middle Ages (for dates, see Table 1) the character of Norse rural settlement developed and expanded both domestically and abroad. In addition to the *landnám* to the west, it was a period with different types of farm formation, organization, and reorganization of resource areas, farms, and estates in Norway (Øye 2009a). Often, new farms were cleared in land that was available, but less suitable, for agrarian purposes. During the late Middle Ages, many farms became abandoned (Sandnes and Salvesen 1978, Lunden 2004) and some were never settled again. Deserted medieval farms located on the periphery of the more established rural community have been characterized as dispersed single farm units with poor conditions for sustainable land use (Zehetner 2007, Øye 2009a). During the 20th century such areas also lost their economic and social importance with the introduction of modern and industrialized agriculture. This has enhanced the modern perception of outland areas (the term outfield is also used - Norwegian *utmark*) as marginal and peripheral, potentially biasing research into earlier rural settlements, as has been highlighted by different studies (e.g. Kaland 1979, Svensson 2007, 2015). Further, it has been pointed out that the general idea of isolated settlements in the north is problematic, and often serves as an obstacle to understanding local and regional variations in settlement patterns (see Vésteinsson 2006).

Archaeological research on deserted Medieval farms has stressed the importance of considering the settlement conditions and the cultural and socioeconomic context they were part of (e.g. Martens 1988, Svensson 2007, Stene and Wangen 2017). For instance, many Medieval farms in upland and forested areas of Scandinavia had an economy connected to surplus production of resources such as hunting and iron production. These activities had high economic importance, decisive for the farms' abilities to take part in cultural and social trends (Martens 1988, 1998, Svensson 2007, Stene and Wangen 2017). However, hunting and iron production were not activities resulting in the mass production of highly demanded goods in the western part of Norway. Little is known about the basis for life at the peripheral and relatively short-lived farms in this region. The natural topographical conditions here are different from the inland and eastern part of Norway, probably resulting in a different settlement basis and social conditions during the Viking Age and Early Middle Ages.

***Table 1**. Time periods mentioned in the paper.*

Period	Abbreviation	Year AD
Late Iron Age:	LIA	570-1030
Merovingian Period	MP	570-800
Viking Age	VA	800-1030
Middle Ages:	MA	1030-1537
Early Middle Ages	EMA	1030-1150
High Middle Ages	HMA	1150-1350
Late Middle Age	LMA	1350-1537

Here, we present two deserted Medieval farms from western Norway, and the social and economic aspects of their settlement and subsistence strategies are discussed from a long-term perspective. The farms were settled during the late Iron Age and abandoned during the late Middle Ages. The site of the Høybøen farm is located by the outer coast while the Hellaug farm is in a small mountain valley. After abandonment, the sites have been used as outland areas by nearby farms for grazing and haymaking. Because of this, archaeological and botanical remains from the two farms have been well preserved compared to farms that have been in use until present. The Høybøen and Hellaug farms therefore represent highly important sites to investigate settlement basis and farming practices in two different geographical settings.

The primary sources in this paper are archaeological and botanical data from the Høybøen and Hellaug sites, from contexts dated to the beginning of the late Iron Age until the late Middle Ages. In addition, archaeological data in - and from - the farms' surrounding outland areas are studied and compared to earlier palynological studies. The following research questions are addressed:

- What kind of resource exploitation and land-use practices can be recognized before the establishment of the Medieval farms?
- What was the social and cultural position of the Høybøen and Hellaug farms?
- What were the farming strategies and how were they related to natural resources?

The sites

The sites represent different geographical and topographical settings with different climate and vegetation, and therefore have strongly different potential for agrarian output. This is essential when considering both land-use practices from a long-term perspective and subsistence strategies at the Medieval farms.

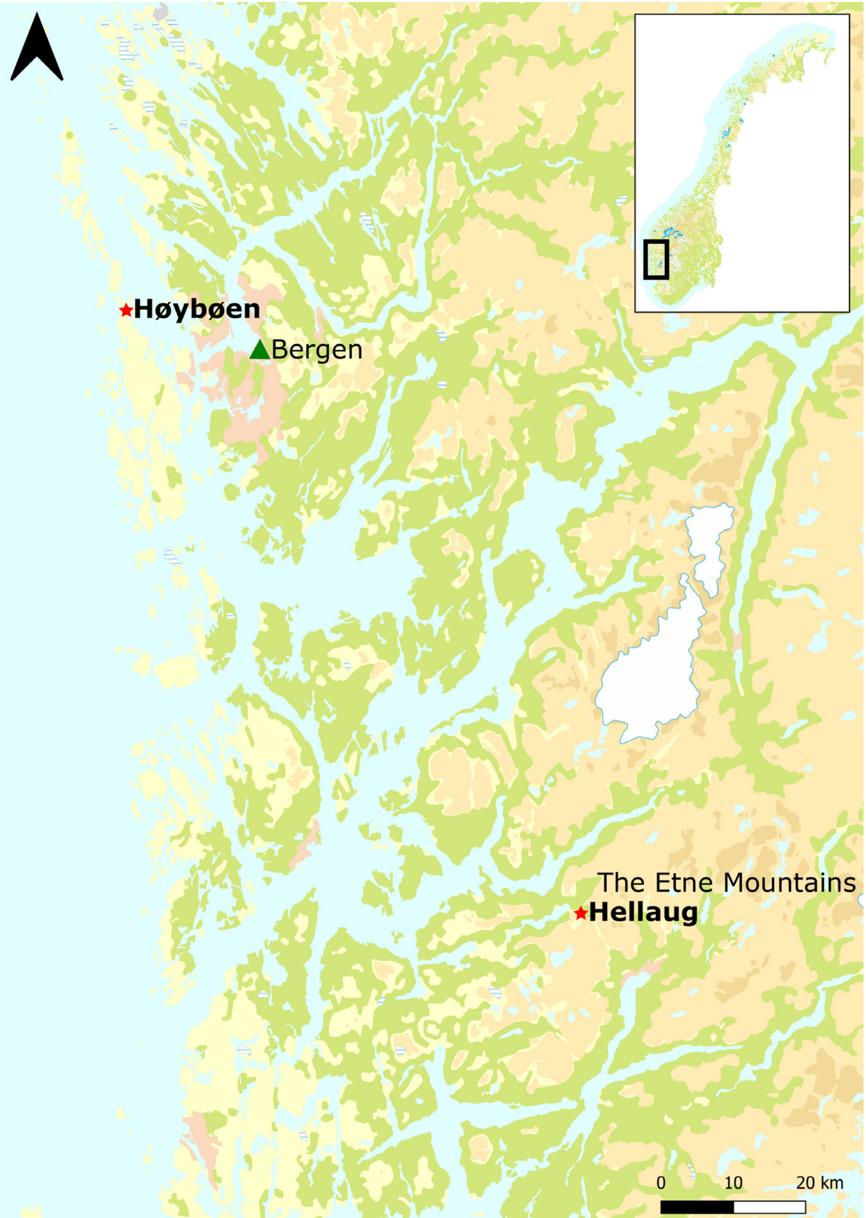

Figure 1*. The location of Høybøen and Hellaug in Western Norway.*

Høybøen

Høybøen is located by the outer coast on the Vindenes Peninsula. The Medieval farm was connected to the sailing route to Bergen (Figure 1), Norway's largest city and trade port in the Middle Ages. The landscape at Høybøen is characterized by bedrock, heathlands, scattered forested areas, and mires. The climate is oceanic with strong winds, cool summers, and mild winters. The mild climate makes it possible for year-round grazing for suitable breeds of sheep and cattle because of the winter-green *Calluna vulgaris* (heather).

Figure 2*. The ruins from the coastal Medieval Høybøen farm lie close to a small bay that connected the farm to the sea. Photo: Therese Nesset.*

Høybøen (Figure 2) is today part of the outland area of the farm Vindenes. The infield area consists of two terraces of south-facing slopes with old, cultivated fields. The resource area outside of the infields stretches north from a small mountain between Høybøen and Vindenes and includes the northern part of the peninsula (Randers 1981a). The distance between Vindenes and Høybøen is c. 2.3 km.

Hellaug

Hellaug (Figure 3) is located in a small low-lying mountain valley (275 m above sea level) in the Etne mountains, in the southernmost part of Vestland County, 90 km from Høybøen. Here, the landscape is typical of the inner fjords, with warmer summers and cooler winters than at Høybøen. The climatic conditions at Hellaug are almost the same as at lower elevations but with longer and colder winters. Today, the vegetation at Hellaug and the nearby areas consists of partly open grasslands and mixed forests. The surrounding mountain areas have been used for grazing and summer farming until the present.

***Figure 3**. The open area by the lake is the Medieval infield area of Hellaug. Photo: Therese Nesset.*

In recent times, Hellaug has been a shieling site and is part of the Vinja farm's outland area. The remains of the medieval farmyard and infield at Hellaug are located on a west-facing, partly rolling slope towards the lake. The distance between Vinja and Hellaug is c. 2.6 km. The outland resource area of the medieval Hellaug farm is considered to have been the mountain areas east of Hellaug connected to the watercourse Hellaugvassdraget which contains lake Hellaug.

Materials and methods

Excavations and sampling

The primary archaeological and botanical source material from Høybøen and the surrounding areas stems from archaeological excavations on the Vindenes Peninsula during 1977 and 1978 (Berge 1978a, 1978b, Ågotnes 1978, Randers 1981a, 1981b). Figure 4 is based on the results of the excavation (Randers 1981a), and shows the visible structures and trenches where samples were taken for pollen analysis and radiocarbon dating. The two main buildings and a boat house were excavated, and the infield area was investigated by surveys, documentation of visible structures, and digging of trenches in old fields. Also, three grave mounds from an Early Iron Age farm at Høybøen, abandoned c. AD 400, were excavated. The buildings were excavated using mechanical layers and levelling of artefact contexts (Randers 1981a). Sediment and peat cores were taken from lake Herøyvatn and a bog west of Herøyvatn (Figure 4) for palynological studies (Berge 1978a, 1978b, Mehl *et al.* 2015).

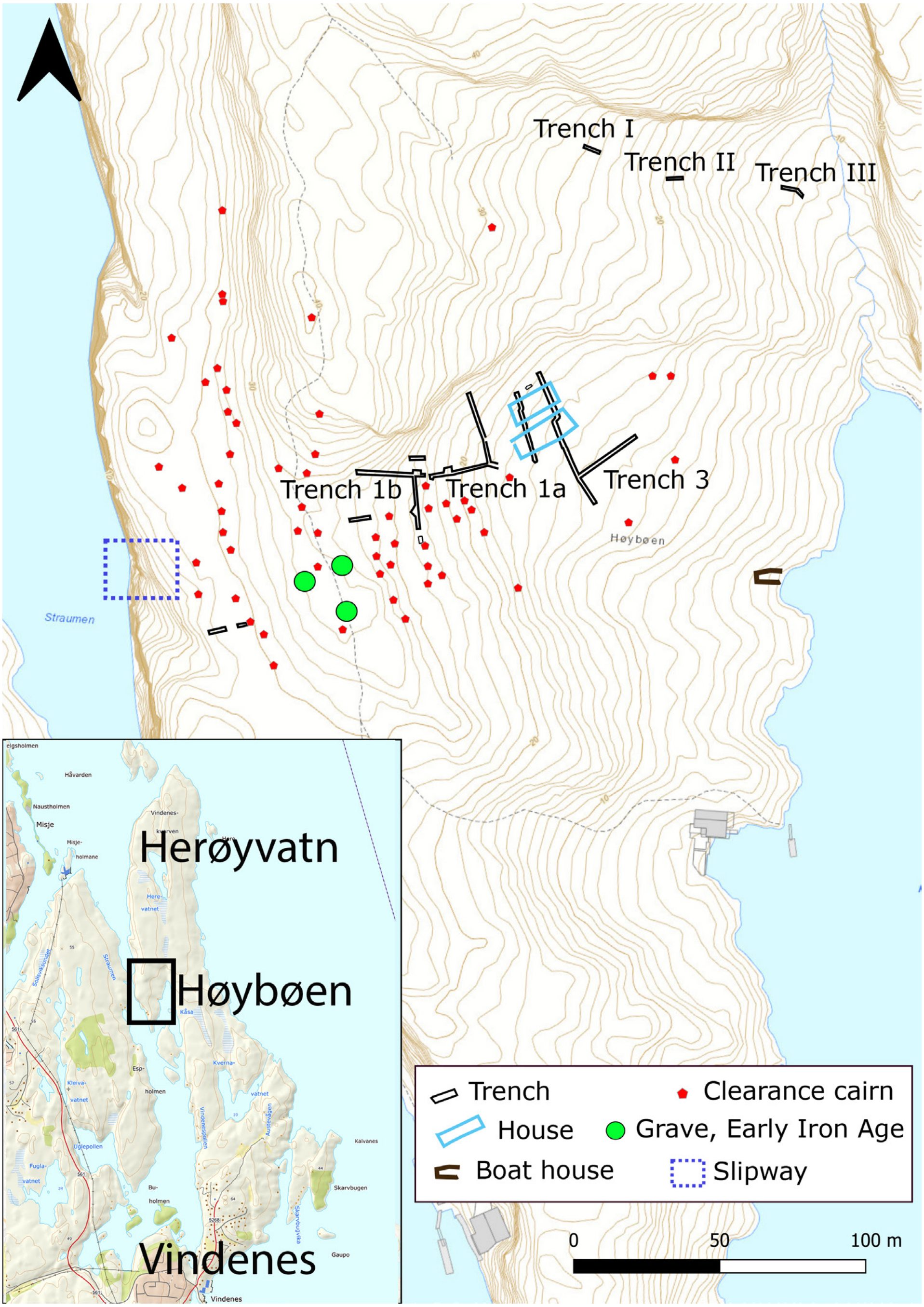

Figure 4. *The infield of Høybøen with visible structures and trenches where pollen samples were taken, including a map of the outfield area with sites mentioned in the paper.*

The primary source material from Hellaug and the surrounding areas stems from several investigations. One of the two house-remains (house 1, Figure 5) at the medieval farmyard was excavated as early as in 1929 and 1932 (Lindøe 1932), using mechanical layers in a grid system of 1 x 1 m. In 2012 field structures surrounding the farmyard at Hellaug were documented (Nesset 2013). Figure 5 is based on an archaeological investigation in 2012 and shows the visible structures as well as trenches where samples were taken from soil profiles for pollen analysis and radiocarbon dating. Together, the farmyard and infield consist of two buildings, two cattle lanes, several clearance cairns, and a stone fence surrounding the infield. Trenches and test-excavations were dug in the infield to document cultivation layers.

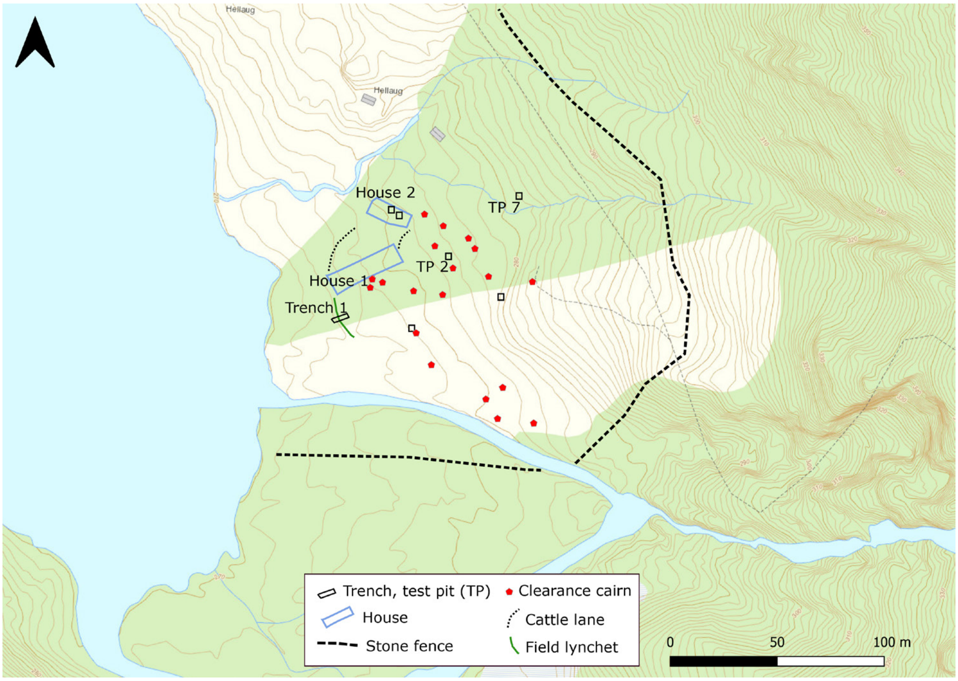

Figure 5*. The infield of Hellaug with documented cultural heritage monuments, visible structures, and trenches from which pollen samples were taken.*

In the 1980s, archaeological surveys and palynological investigations were conducted in the mountain area surrounding Hellaug, including areas connected to Hellaugvassdraget (Martinussen and Myhre 1985, Kvamme 1985, 1988). As part of a PhD-project, cultural heritage monuments connected to Hellaugvassdraget were re-documented, mapped, and several rock shelters, stone fences, charcoal pits, a reindeer pit, and hunting posts (Figure 6) were examined with archaeological test-excavations (Nesset 2015).

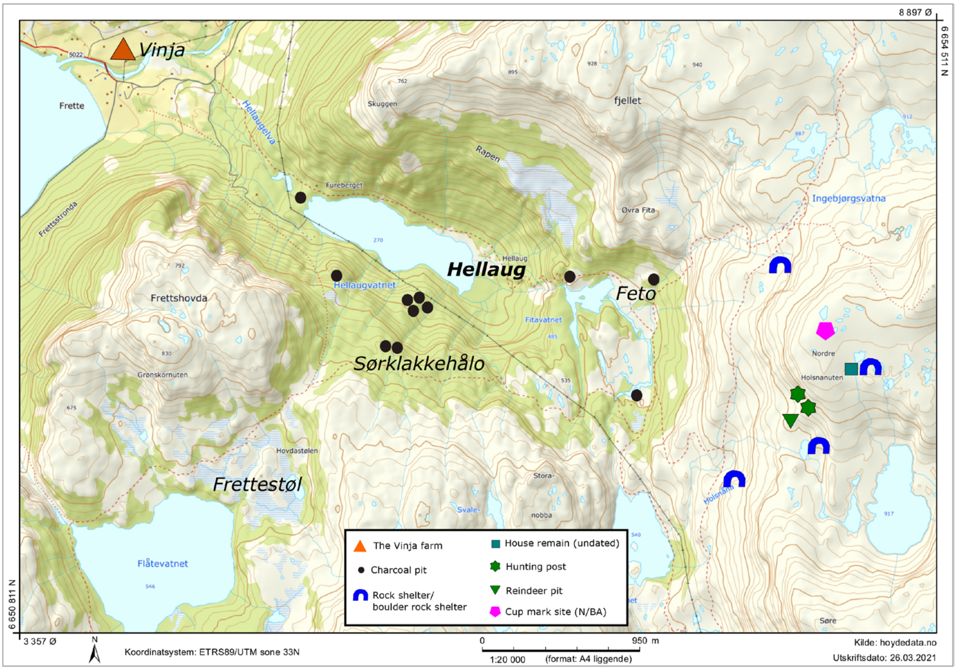

***Figure 6**. The sites and cultural heritage monuments in Hellaugvassdraget mentioned in the paper.*

Archaeology

Here, the criterion for permanent settlement at the farms is the presence of physical structures of graves or buildings from the first settlement phase in the farmyard, and/or thicker cultivation layers indicating intensified farming and evidence of a complex farming system (crop cultivation, grazing, haymaking) in the pollen diagrams.

Because of the different methods applied at the two sites, it has been important to re-document and re-analyze the archaeological material to make the sites comparable. The structural remains have been identified and mapped and show the farms' physical organization, which in turn indicates farming strategies. All ^{14}C dates presented in the paper have been re-calibrated using OxCal v4.3.2 software (Bronk Ramsey 2017), and are presented in table 1 for Høybøen and table 2 for Hellaug.

Artefacts have been studied using the same typological references. Basic identification of object type, the raw material, and, when possible, the objects' provenance have been studied to consider the farms' social and cultural positions. Here, all finds from the farmhouses, farmyards, and infield areas broadly dated to when the medieval farms were settled have been included. The identified objects are presented in table 4 for Høybøen and table 5 for Hellaug. The function of the objects has been interpreted based on methods applied on artefact assemblages from urban Norwegian contexts (Nordeide 1989, Ulriksen 1996, Hansen 2005) but modified to better suit rural contexts.

Pollen analysis

At Hellaug, pollen samples from one soil profile (Figure 7) have been analysed. In the laboratory, 1 cm^3 samples were taken from the original samples and processed following the methods described in Fægri *et al.* (1989) with KOH, acetolysis, and HF treatment. Fuchsin was added and the samples mounted in glycerol. Analysis was done using a Zeiss Imager. M2 microscope with phase contrast and 63x magnification. Identification is based on keys in Fægri *et al.* (1989) and Beug (2004), as well as the modern reference collection at the University of Bergen. The nomenclature follows Lid and Lid (2005), and identification of non-pollen palynomorphs (NPPs) follows van Geel *et al.* (2003). The results are shown as percentages of the sum of total terrestrial pollen. Percentages of spores, NPPs, and charcoal are calculated based on the pollen sum + the sum of the microfossil group in question.

Pollen data from Høybøen were extracted from the investigation carried out by Jan Berge in 1977 and 1978 (data in the palaeobotanical collections, University Museum, University of Bergen, Berge 1978a, 1978b). For comparison, open-land taxa in samples from layers dated to the Middle Ages in the infield of Hellaug and Høybøen are shown. The pollen taxa are grouped into pastures and meadows, cultivated fields, heathlands, other open-land taxa, and unidentified.

Results

Structural remains

The ^{14}C dates (Table 2) aligned to the late Iron Age/early Middle Ages are from physical structures that represent an older settlement phase at Høybøen, providing a *terminus ante quem* for the establishment of the farm (Randers 1981a).

At Hellaug, there is no archaeological evidence from the farmyard older than the High Middle Ages: the ^{14}C date from the bottom floor layer in house 2 (Table 3). The earliest traces of agrarian activity in the infield are clearance layers (layers 4 and 6; Figure 7) ^{14}C-dated to the Merovingian Period/Viking Age. A thicker cultivated soil layer in the trench (layer 2; Figure 7) dated to the Viking Age/early Middle Ages indicates intensively worked fields. This suggests a permanent farming settlement at the site.

Table 2*. Radicarbondates from Høybøen and Herøyvatn, including context interpretation. Dating is carried out by NTNU Trondheim, Norway and Beta Analytic Inc., USA.*

Lab. No.	Context	Material dated	Conventional Radicarbon Age	Calibrated date, 2 sigma (95,4 %)	Period	Context interpretation
Høybøen (farmyard, infield):						
T-3263	House 2b, layer 4	Charcoal	1070 ± 70	773-1156 calAD	MP, VP, EMA	Charcoal layer, possible part of burnt-down wall (Randers 1981a)
T-3262	House 2a, layer 5	Charcoal	1070 ± 60	774-1151 calAD	MP, VP, EMA	Charcoal layer under southern wall (Randers 1981a)
T-3683	Between room 2a and 2b, house 2, layer 3	Peat	1050 ± 70	775-1161 calAD	MP, VP, EMA	Phase of abandonment with re-forestation (Berge 1978)

T-2762	Trench 6, 'upper charcoal layer'	Charcoal	1000 ± 70	893-1211 calAD	VP, EMA, HMA	Field. Clearance layer (Randers 1981a; Berge 1978)
T-3264	House 2b, corner fireplace	Charcoal	880 ± 60	1037-1263 calAD	EMA, HMA	Charcoal found in fireplace (burnt firewood) (Randers 1981a)
T-3063	House 1c, under floor pavement	Charcoal	810 ± 70	1041-1299 calAD	EMA, HMA	Possible fill (waste) under floor pavement (Randers 1981a)
T-3061	Boat house, layer 4	Bark/ Birch bark (Betula)	770 ± 60	1054-1388 calAD	EMA, HMA	Floor layer (Randers 1981a)
T-3684 B	Storåkeren, Trench III, lower part of layer 1b	Peat	610 ± 80	1270-1442 calAD	HMA, LMA	Layer from abandonment. Re-growth and water logging (Berge 1978)
T-3682 B	Trench 3, lower part of layer 2	Peat	600 ± 60	1285-1425 calAD	HMA, LMA	Layer from abandonment. Re-growth and water logging (Berge 1978)
Herøyvatn (close outland):						
Beta-346689	Core sample, from lake, 642-643 cm depth	Plant remains	1410 ± 30	597-664 calAD	MP	(Mehl et al. 2015)

Table 3. *Radicarbondates from Hellaug, Sørklakkehålo, Feto and Frettestøl, including context interpretation. Dating is carried out by Beta Analytic Inc., USA and NTNU Trondheim, Norway.*

Lab. No	Context	Material dated	Conventional Radicarbon Age	Calibrated date, 2 sigma (95,4 %)	Period	Context interpretation
Hellaug (farmyard, infield):						
Beta-332448	Trench 1, layer 4	Charcoal (Betula)	1220 ± 30	687-888 calAD	MP, VA	Field lynchet. Clearance layer (Nesset 2013)
Beta-332447	Trench 1, layer 6	Charcoal (Betula)	1200 ± 30	706-945 calAD	MP, VA	Field lynchet. Clearance layer (Nesset 2013)
Beta-332446	Trench 1, layer 3	Charcoal (Betula)	1190 ± 30	709-952 calAD	MP, VA	Field lynchet. Cultivation layer, grazing (Nesset 2013)
Beta-331297	TP 7, layer 2	Charcoal (Betula)	1180 ± 30	771-973 calAD	MP, VA	Field/meadow. Cultivation layer (Nesset 2013)
Beta-332443	TP 2, layer 4 (bottom)	Charcoal (Betula)	1140 ± 30	774-992 calAD	MP, VA	Field. Cultivation layer (Nesset 2013)
Beta-331298	TP 7, layer 3	Charcoal (Betula)	1110 ± 30	882-1015 calAD	VA	Field/meadow. Cultivation layer (Nesset 2013)

Beta-332445	Trench 1, layer 2 (bottom)	Charcoal (Betula)	1040 ± 30	896-1114 calAD	VA, EMA	Field lynchet. Cultivation layer, crop cultivation (Nesset 2013)
Beta-331294	TP 2, layer 3	Charcoal (Betula)	970 ± 30	1022-1159 calAD	EMA	Field. Cultivation layer (Nesset 2013)
Beta-331293	TP 2, layer 2	Charcoal (Betula)	810 ± 30	1178-1276 calAD	HMA	Field. Cultivation layer (Nesset 2013)
Beta-331296	House 2, layer 3	Charcoal (Betula)	730 ± 30	1229-1378 calAD	HMA, LMA	Floor layer, farmhouse (Nesset 2013)
Beta-332444	Trench 1, layer 2 (top)	Charcoal (Betula)	680 ± 30	1276-1390 calAD	HMA, LMA	Field lynchet. Cultivation layer, crop cultivation (Nesset 2013)
Beta-331295	House 2, layer 2	Charcoal (Betula)	480 ± 30	1407-1456 calAD	LMA	Floor layer, farmhouse (Nesset 2013)
Sørklakkehålo (close outland):						
Beta-401655	S5, TP3, layer 4	Charcoal (Betula)	970 ± 30 BP	1022-1159 calAD	EMA	Charcoal pit. Charcoal layer (Nesset 2015)
Beta-401656	S2, TP 2, layer 2	Charcoal (Betula)	900 ± 30 BP	1042-1219 calAD	EMA, HMA	Charcoal pit. Charcoal layer (Nesset 2015)
Feto (shieling site):						
Beta-401652	S10, TP 5, layer 2	Charcoal (Betula)	1000 ± 30 BP	992-1154 calAD	VA, EMA	Charcoal pit. Charcoal layer (Nesset 2015)
Beta-401651	S8, TP 4, layer 5	Charcoal (Betula)	880 ± 30 BP	1045-1228 calAD	EMA, HMA	Charcoal pit. Charcoal layer (Nesset 2015)
Frettestøl (shieling site):						
T-5560	Core sample from bog, layer 2	Peat	930 ± 80	989-1269 calAD	VA, EMA, HMA	Introduction of intensive shieling activities (Kvamme 1985, 1988)

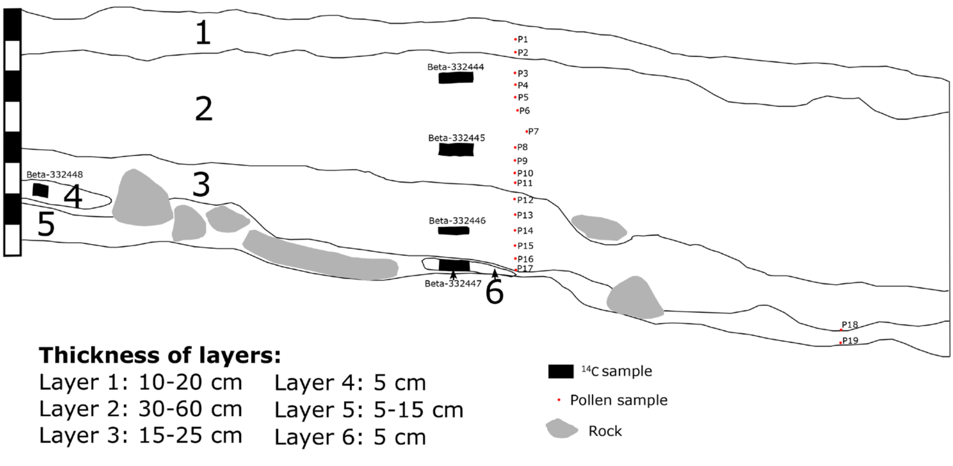

***Figure 7**. Profile from a field lynchet (trench 1, Figure 5) showing the thickness of agricultural layers and position of the radiocarbon-dated samples and pollen samples.*

The structural remains documented and mapped in Figures 4 and 5 at Høybøen and Hellaug represent the last settlement phases at the sites. Based on pottery dated typologically and on ^{14}C dates, the *terminus post quem* of abandonment at Høybøen is c. AD 1350-1400 (Randers 1981a). The *terminus post quem* of abandonment at Hellaug is c. 1450, based on the ^{14}C date of the top floor layer in house 2. The estimated size of the area of cultivated fields at Høybøen at this time was between 3 and 7 decares with at least 3 decares intensively farmed (Randers 1981a). At Hellaug, the total area of intensively cultivated fields has been estimated to be at least 2.5 decares, based on documentation of cultural layers in the infield (Nesset 2013) and the distribution of clearance cairns.

Figure 6 shows the distribution of documented cultural heritage monuments in the outland area of the Hellaug farm. In the close outland south of lake Hellaug and at the shieling site Feto, several charcoal pits have been dated to the Early and High Middle Ages (Table 3). The physical connection and chronological similarity between these sites and Hellaug suggest that the activity was connected to the farm.

Further east at higher elevations there are rock shelters with traces of human activity from prehistoric and early historic times (Nesset 2015). A cup-mark site also shows that these mountain areas were in use in prehistory. As seen in Figure 6 the rock shelters and cup-mark site are located close to pastures on mountain plateaus in addition to hunting posts and a reindeer pit.

Artefact assemblage

Tables 4 and 5 show the results of the analysis of the artefacts from the farms. The interpreted objects are listed in the table according to their function. The find frequency differs between the farms: Høybøen has a higher number of total finds, but the objects from both farms represent a range of consumables for different tasks of everyday life in Medieval rural households in western Norway. In addition, several fishing tools were found at Høybøen.

Table 4. *Artifact assemblage from Høybøen.*

Artifact assemblage from the Høybøen farm (from house 1, 2 and stray finds from farmyard)	
Tools: agriculture and domestic animals	3 scythes (iron), 3 nails from horseshoes (iron)
Tools: fishing	9 fishhooks (iron), 1 trident (iron) 15 line sinkers (soapstone), 7 net sinkers (soapstone), 1 anchor stone for net (soapstone)
Tools: crafting	3 knives (iron), 3 scissors (iron), 5 pumice stones, 1 rotating whetstone (red sandstone), 39 hones (most light grey schist, dark fine-grained schist, and some of sandstone), 25 spindle whorls (most soapstone, lead), 68 loom weights (soapstone)
Waste: crafting	Ca. 10 kg. soapstone waste and blanks, ca. 8 kg. of iron slag
Food preparation, storing and serving	59 soapstone vessels and 2 iron handles from soapstone vessels, 36 cooking pots (pottery), 30 tableware (pottery), 20 kg of bakestone fragments (most schist, some soapstone), 1 quernstone (schist), 273 pieces of flint
Personal equipment	2 combs (antler, bronze), 1 belt-buckle (bronze), 2 lead weights, 2 small salve pots (pottery)
Micellaneous: various equipment, part of buildings, moveables	3 lamps (soapstone), 2 locks (iron), 3 keys (iron), 1 handle (iron), 6 fittings (iron), 3 fittings (bronze), 1 chain (iron), 1 hinge (iron), 5 plugs (wood), ca. 170 pieces of rivets and nails (iron), 20 unidentified fragments (iron)

***Table 5**. Artifact assemblage from Hellaug.*

Artifact assemblage from the Hellaug farm (from house 1, stray finds from farmyard)	
Tools: agriculture and domestic animals	1 scythe (iron), 1 horseshoe (iron)
Tools: crafting	11 hones (light grey schist), 1 spindle whorl (soapstone), 5 loom weights (soapstone)
Waste: crafting	Ca. 100 g. of iron slag, ca. 20 g. bloomery slag
Food preparation, storing and serving	5 soapstone vessels, 3 kg of bakestone fragments (schist), 1 quernstone (schist), 13 pieces of flint
Personal equipment	1 amulet with runes (lead)
Micellaneous: various equipment, part of buildings, moveables	Rivets and nails (iron), 1 ring (iron), 1 fitting (iron)

Pollen data

The pollen diagram from the infield at Hellaug reflects the field lynchet and the different agricultural layers exposed in Trench 1 (Figures 5 and 7). All samples are characterized by high values of open-land taxa (Figure 8). The diagram is divided into four local pollen zones.

Pollen zone 1 (layer 6 and the lower part of layer 3; Merovingian Period/Viking Age) has the highest percentages of tree pollen in the diagram (12-18% of the pollen sum), dominated by *Alnus* (alder). Poaceae (grasses, up to 60%), *Rumex acetosa* (sorrel), *Ranunculus acris* (buttercup), and *Silene dioica* (red campion) have high values, and *Plantago lanceolata* (ribwort plantain) is continuously present, reflecting an open herb-rich and grass-dominated vegetation at the site. Polypodiaceae (fern spores) and charcoal have high values. This shows presence of people and grazing in the area, but also the existence of fern dominated vegetation without trampling from grazing animals.

Pollen zone 2 (upper part of layer 3; Merovingian Period/Viking Age) still has relatively high values of *Alnus*, Poaceae contributes around 60%, and the same herbs are present as in zone 1. This indicates the continuous dominance of grass-dominated vegetation, while the presence of *Salix* (willow), Cyperaceae (sedges), and *Filipendula* (meadowsweet) may indicate humid conditions in the vicinity. Some arable weeds, such as *Spergula arvensis* (corn spurrey) and *Persicaria maculosa* (lady's thumb) are sporadically present and may indicate that cereal cultivation also took place in the area. Both fern spores and charcoal values are high.

Pollen zone 3 (layer 2; late Viking Age/early Middle Ages) is characterized by less than 10% tree pollen, a decrease in fern spores, and high values of grassland taxa. Also, cereals (*Hordeum* (barley)) and arable weeds such as *Galeopsis* (hemp-nettle) and *Spergula arvensis* obtain high values. Cereal cultivation most probably took place locally. The presence of coprophilous fungal spores with high values of *Sordaria* HdV55 and sporadic occurrences of *Podospora* HdV368 (van Geel *et al*. 2003), indicates grazing or manuring of the fields. A high diversity of grassland species, including *Achillea*-type (yarrows), *Campanula* (harebell), *Trifolium pratense* (red clover), and *Plantago lanceolata*, indicates mowing in addition to grazing (cf. Hjelle 1999). The field was probably surrounded by hay meadows or an oscillation between cultivation and hay production took place, in which the area could have been grazed seasonally.

Pollen zone 4 (layer 1; recent time) has high values of grasses and meadow species, whereas cereals and arable weeds are nearly absent. The zone reflects grazing at Hellaug after abandonment of the farm.

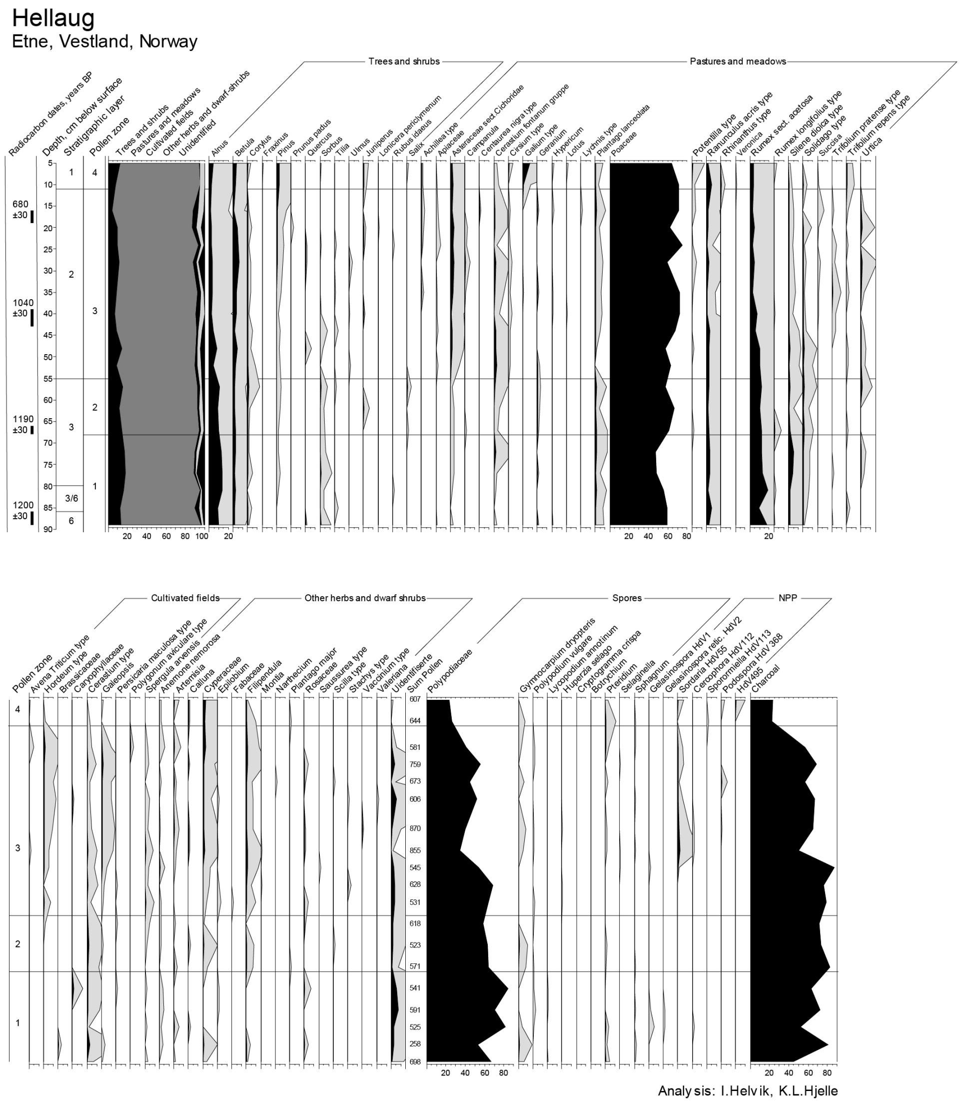

Figure 8*. Pollen diagram from Hellaug. Black curves show percentages, grey curves percentages x 10.*

Pollen samples representing agricultural layers from medieval times from Hellaug and Høybøen are compared in Figure 9. The open landscape and importance of cereal cultivation are reflected at both sites, and both areas are dominated by grassland species, indicating that part of the infield area was used for hay production. Grazing was important and at Høybøen both grass-dominated summer pastures and heathlands for winter grazing were probably found in the vicinity of the farm. In addition to *Calluna vulgaris* (heather) and other dwarf-shrubs, Cyperaceae (sedges) is included in the group heathlands, reflecting bog communities in the heathlands. At Hellaug beyond the infield area, grass-dominated pastures made up the outlands.

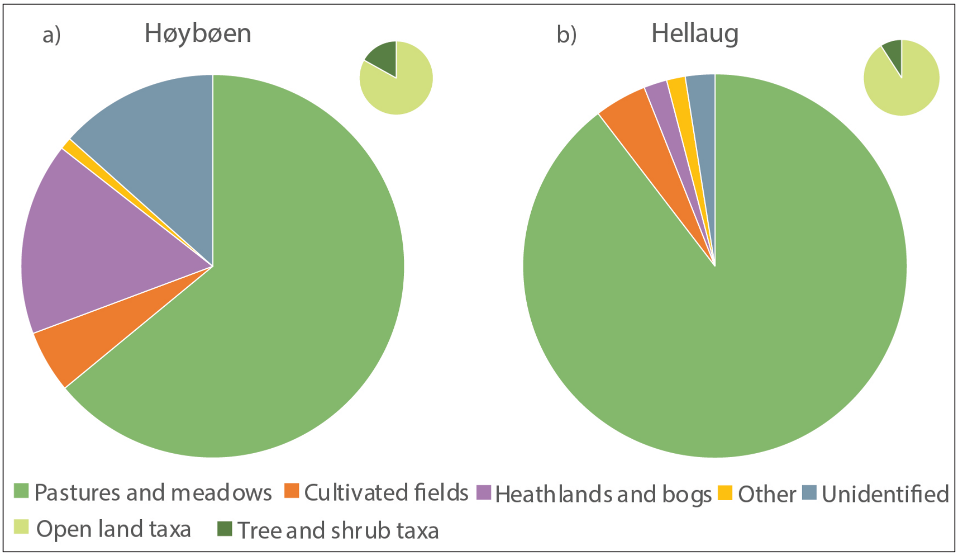

Figure 9*. Pollen samples representing agricultural layers from the period of farm settlement in the Early Middle Ages at Hellaug and Høybøen.*

Discussion

Social aspects of farm establishment

Prior to the Late Iron Age, human activity in the surrounding areas of Høybøen and Hellaug was mainly based on use of the natural resources available in the respective areas: hunting and fishing, which gradually became supplemented with extensive grazing, first along the coast and later in the mountain areas (Berge 1978a, 1978b, Randers 1981a, Ågotnes 1981, Kvamme 1985, Martinussen and Myhre 1985, Mehl *et al.* 2015, Nesset 2015). Apart from a period during the Early Iron Age when there was permanent agrarian settlement at Høybøen (Randers 1981a), the human settlement in both areas was seasonal.

There is no archaeological nor botanical evidence of permanent settlement at Høybøen or Hellaug from the earliest part of the Late Iron Age. The botanical sources reflect, however, a development in the agrarian economy, where nearby farms probably started to use the outlying areas of their local territory more intensively. This suggests an increased agrarian economic importance of the areas and thus an increased presence of both humans and grazing animals, reflecting a general trend in the agrarian development at the time. In this period, the farming economy, focusing on animal husbandry, was intensified in most areas of western Norway, thus changing the economic - and consequently the social - importance of outland areas (Kvamme 1988, Bjørgo *et al.* 1992, Overland and Hjelle 2009, Hjelle *et al.* 2012, 2018, Hope 2015).

The farms seem to have been permanently settled after a period of intensification of grazing activities in the areas from the Merovingian Period at the latest. Similar tendencies have also been observed in pollen diagrams from several sites in southern Sweden, where farms were settled during the late Iron Age after an initial period of increased seasonal land use (Lagerås

2007). The increased human activity prior to permanent settlement at both Høybøen and Hellaug clearly indicates a continuation of use, probably connected to an increased economic importance in this period. Who, then, would settle here?

Individual colonists were rewarded with tax relief and partial ownership of, and reduced farm rent from, farms cleared in the commons (Norwegian *allmenninger*) (Øye 2009b). According to the early provincial medieval law for western Norway, *Gulatingslova*, when a farm was cleared within this area, what is considered the core area of the newly established farm was legally the king's farm (G 145 in Robberstad 1981), and thus the colonists were the king's tenants. This would also lead to the loss of usage rights for the people that had used these areas prior to the permanent settlements, resulting in a great economic disadvantage for them.

However, *Gulatingslova* (G 86 in Robberstad 1981) and the National Code, *Landslova* of 1274 (L 61 in Taranger 1970), also state that an area considered to be the commons could legally be part of a farm's resource area if they had a right to its use: if the land had been used by a farm for a given period (the *Gulatingslova* states more than 20 winters and *Landslova* states more than 60 winters), the area would become the property of the user. For instance, an area used for shieling, or plots used for grazing or hay-making (Norwegian *markateig* or *teig*) could be claimed as legally part of a farm. This could mean that farms established in such areas were considered the property of the main farm that had the rights to use. Based on the pollen data and ^{14}C dates from the infield at Hellaug, and the lake Herøyvatn close to Høybøen (Mehl *et al*. 2015), it is likely that the two areas had been used for seasonal agrarian activities, and at the coast also whole-year grazing, for more than 60 years prior to the establishment of the farms.

The property rights of the Høybøen and Hellaug farms are thus important to consider, especially in relation to the marked grave mounds. Several studies in Scandinavia have shown a clear relationship between visible grave mounds from the Viking Age and property rights (Zachrisson 1994, Skre 1998, Iversen 1999, 2008, Ødegaard 2007). There are no known or visible grave mounds from the Viking Age at Høybøen or Hellaug, thus indicating the lack of property rights (see also Zehetner 2007). In the cases of Høybøen and Hellaug, they could have been subordinated to the nearby farms that had increasingly used the areas prior to the permanent settlement.

In Greenland, several subsidiary farms have been documented at varying distances from the main farm, itself often a large farm or a manor (Madsen 2014). At each of these farms there was only one associated shieling, which suggests a setup with a large farmstead or manor, a subsidiary farmstead, and a shieling that together constitute one farm unit (Madsen 2014). Hellaug at least shared the shieling site at Feto and the outland areas further east with Vinja. A shared use of the Vindenes peninsula could also be the case for Høybøen and Vindenes, although the use of outland at the coastal farms was quite different from Hellaug (see below). Also, the relatively long distance from the main farms suggests that Høybøen and Hellaug were not typical holdings. Although there is nothing to imply that Vindenes or Vinja were above-average sized farms in their local community, it is possible that Høybøen and Hellaug represent subsidiary farms, perhaps initially settled by tenants (see Øye 2009b) connected to the main farms. Were these farms independent economic sub-units, or were they specialized but less self-sufficient sub-units; what was the basis for life at these farms?

The infields' cultural importance

The establishment of the farms led to extensive clearing on both sites, as seen in the large number of clearance cairns in the infield areas of both farms. The results from the pollen analysis from Hellaug indicate that both cereal cultivation (barley) and hay production took place in the infield. The physical structure of the infield and the pollen diagram thus suggest that the infield consisted of small plots of fields surrounded by large open areas of meadows, and pastures at some distance from the infield. At Høybøen the physical organization of the infield suggests a similar layout of the infield, with the fields demarcated by terrain and clearance cairns.

It is generally assumed that clearance cairns reflect the presence of cultivated fields, but it may also be that some of the cairns at Hellaug reflect clearance for hay production (cf. Overland and Hjelle 2013). Also, at Høybøen, high percentages of grassland taxa are recorded, indicating that part of the infield could have been used for hay production although the need for winter fodder probably was less in the coastal heathland region than in the mountain valleys. Regardless, scythes and hones were found at both farms, and are important tools for gathering hay and heather.

Although the fields used for crop cultivation at both farms were small, large amounts of energy must have been put into clearing and working the fields, thus indicating their importance. The quern stones and bakestones found at both farms further suggest that cereal was part of the daily diet. Soapstone vessels are also associated with production of porridge (Baug 2015). Bakestones were mainly used for baking bread (Tengesdal 2010), and their presence shows that this was a common daily practice in Medieval households. The North Atlantic islands of Iceland, Shetland, and the Faroes are the only areas where bakestones have been found in large quantities outside Norway (Baug 2015). The bakestones represent the cultural importance of a specific food tradition - a way of baking bread - across the North Atlantic.

If an adult person doing physical work needs c. 3000 calories per day, and one gets c. 3550 calories from 1 kg of barley (see Kaland 1987 for similar calculations) then, based on estimates of output from the fields at Høybøen (Randers 1981a), the farm was not self-sufficient with grain for daily consumption for a household during a year. At Hellaug, the fields were smaller than at Høybøen, suggesting a similar situation. Farms such as Høybøen and Hellaug may, then, have been partly dependent on obtaining grain from outside (see also Kaland 1979). The presence of the arable weed *Centaurea cyanus* (cornflower) at Høybøen (Berge 1978b), is also an indicator that grain was obtained from Bergen. *Centaurea cyanus* is commonly found in medieval layers in the town, in contrast to its absence in the countryside, and is therefore an indicator of foreign trade and cereal import when found in Bergen (Hjelle 1986, 2007). Its presence close to a house at Høybøen probably reflects pollen dispersal through human activity. However, based on the work effort put into the fields, domestic production of grain must have been important. This indicates that grain cultivation was an expression of social and cultural identity (see Svensson 2007), and was rooted in the infield-outfield system (e.g. Øye 2004, Arge 2005, Øye 2009a, Kaland 2014, Prøsch-Danielsen *et al.* 2020).

The outfields (*utmark*) as settlement basis

The material culture from the farms, the compressed farmyards with multi-functional houses (see Randers 1981a, Nesset 2013), and the physical organization of the infields show similarities in farming strategies and living conditions at Høybøen and Hellaug. The results also show the importance of outland resources with, however, significant differences in the natural conditions. How did this affect the adaptation to the infield-outfield system?

The changes in the pollen diagrams from Frettestøl broadly dated to the late Viking Age-High Middle Ages are interpreted as indicators that humans and animals stayed in the mountain area for longer periods, thus suggest that a shieling system similar to that of the Early Modern period was established in the area (Kvamme 1985). The development at Frettestøl corresponds with the time when Hellaug was permanently settled. The increased human activity during the transition between the late Iron Age and early Middle Ages is also documented by archaeological and botanical sources from other sites in the Etne mountains (Kvamme 1985, Martinussen and Myhre 1985). The permanent settlement at Hellaug, located at a higher elevation and at some distance from the main farm, corresponds with the increased agrarian importance of the mountain area the farm was a part of. The find of a piece of bloomery slag at Hellaug, as well as the charcoal pits, indicate possible small-scale iron production in addition to hunting activities in the mountain area. However, the scale indicates that these activities were aimed at household consumption. The settlement basis at Hellaug seems to have been related mainly to agriculture, with a focus on pastoralism: an agrarian economy based on vertical transhumance and shieling. This system is characterized by the annual movement of livestock and parts of the household to higher elevations during the summer months (Solheim 1952, Reinton 1955). The natural topographical conditions east of Hellaug with the mountain terraces at different elevations and the location of the Medieval farm facilitated this farming system.

From the pollen diagrams from Herøyvatn and the bog west of Herøyvatn, north of Høybøen, it appears that heather dominated the landscape far back into prehistoric times, but with a marked expansion in the early Iron Age, continuing into the late Iron Age and Middle Ages (Berge 1978b, Mehl *et al.* 2015, Hjelle *et al.* 2018). The intensification of grazing and heathland expansion around Høybøen fits into the general development along the western Norwegian coast (Kaland 1986, Prøsch-Danielsen and Simonsen 2000, Hjelle et al. 2010, 2018). The land use at Høybøen accordingly corresponded with the local and regional development on the outer coast during this period.

In the houses at the coastal Høybøen farm, there were several different tools for fishing: a net, a line for fishing at different depths, trolling, and a trident for fishing in shallow waters. A few analysed fishbones of cod, haddock, and common ling from Høybøen (cf. Hufthammer in Randers 1981b) indicate seasonal winter fishing. Historically, farmers along the coast of western Norway and northwards are characterized as fisher-farmers (e.g. Nielssen 2014): the traditional economic organization of the coastal community was a combination of agriculture with some cereal cultivation but with a focus on pastoralism and seasonal fishing. The traditional fisher-farmer economy is associated with an extroverted economy, where fishing was largely aimed at sales and exports from the 11^{th} century onward (Nedkvitne 1988, Nielssen 2014). Stockfish could be imported via long-distance trade, but fresh fish had to be obtained locally. Thus, the demand for fresh fish stimulated local fisheries, especially around Bergen (Myking 1986). The contact between Høybøen and Bergen can be seen in the material culture at Høybøen, especially the noticeably high prevalence of imported pottery. In the Middle Ages, there was no domestic production of pottery in Norway, thus the commodity clearly indicates trading activities. The provenance of the pottery found at Høybøen is mostly from the eastern part of England, in addition to wares from Germany, Belgium, and southern Scandinavia (Randers 1981a). Although imported pottery is one of the most frequent artefact types found in excavations in the medieval town of Bergen (Demuth 2015), little imported pottery has been found outside the larger medieval towns' immediate surroundings (Demuth 2019). Therefore, the pottery found at Høybøen suggests trade between the Høybøen farm and Bergen. The complete source material from Høybøen thus implies that the fisher-farmer economy was established at Høybøen in the High Middle Ages. This economy was based on the infield-outfield system where the outland resources - including seasonal fishing - made it possible for surplus production.

Concluding remarks

The establishment of the Høybøen and Hellaug farms happened during a time when different types of outland areas became increasingly important to the farming economy in western Norway. The palynological data show an increase in pastoral activities at both sites before the farms were permanently settled. The increased pressure on the outlands during the late Iron Age and early Middle Ages could have been a driving factor to establish farms by tenants in these areas to secure property rights of important resources. This could be the initial settlement basis of the farms. The study further shows how farms in two different types of landscapes adapted the traditional infield-outfield system to their local resource basis, as well as taking part in the development of the local farming economy: the fisher-farmer economy and the establishment of a more organized shieling system with a focus on vertical transhumance. It is likely that the Høybøen and Hellaug areas were not perceived as marginal or peripheral in this period, but an integral part of the agrarian society. Although they were subordinated farms, they were also independent household units, taking part in cultural trends connected to household consumption and land-use practices.

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Lisbeth Prøsch-Danielsen

Haymaking as the driving force for shieling use from the Viking Age/early Medieval Period: a comparative study of two outfield areas in southwestern Norway

This paper focuses on the southernmost group of shielings in Norway where haymaking was the driving force for the shieling practice. Two shieling zones in the county of Rogaland that differ in respect to relief and proximity to their 'home' farms are compared: one from the inner fjord, subalpine birch zone and one from the outer coastal heathland plateau. Land-use practice is discussed using archaeological, ethnological and historical data supplemented by pollen analysis. The activities in these two shieling zones vary over time, as did the way in which they stored hay. On the coastal plateau the use of shielings has been practiced since the Pre-Roman Iron Age/Roman Iron Age transition, while in the inner fjord area it is recorded from the Migration Period. The use of shielings for haymaking can be traced back to the Viking Age/Early Medieval Period in both areas; however, the Post-Medieval Period seems to be the major period for the stacking of hay. On the coastal heathland plateau, hay was stored using single poles and four-post buildings, while single poles and enclosures were used in the fjord district. Mowing was practiced in both areas up to AD 1950.

Introduction and background

In recent decades, efforts have been made to illustrate the exploitation of outfield resources and in particular those areas associated with shieling zones and mountain pastures in western Norway (e.g., Magnus 1986, Kvamme 1988, Randers and Kvamme 1992, Bjørgo *et al.* 1992, Prescott 1995, Moe 1996, Potthoff 2005, Lillehammer 2007, Hjelle *et al.* 2015, Hope 2016).

The term shieling (støl in western Norway) refers to a property in the outfields used annually for the permanent farm's livestock and for hay harvesting. The shieling includes buildings and the adjoining outfields (Potthoff 2005, p. 8). The shieling's curtilage (stølsbø) refers to the area between the buildings strongly influenced by the livestock, whether it is fenced in or not.

A prerequisite for the use of shielings is a settled 'home' farm nearby. Shielings served three main functions: to provide summer pastures for the livestock, as a site for processing milk products and to serve as a base for collecting additional winter fodder (Reinton 1955, Daugstad and Schippers 2016). Grazing in the infield is thus avoided in the summer season, as this area is reserved for winter fodder production and for cultivation. The Norwegian shielings were divided into three groups: full, dairy and haymaking shielings, based on Reinton (1955, pp. 3, 12-13).

One of the aims for the interdisciplinary Expanding Horizon workshops was to shed light on the exploitation of outfield resources and the use of shielings as part of the farm's economic system from the Viking Age/Early Medieval Period across the North Atlantic region. Since Iceland and later on Greenland were settled largely from Norway, it seems reasonable to assume that they all shared cultural traits such as land organization and subsistence strategy (Albrethsen and Keller 1986, Sveinbjarnardóttir 1991, Øye 2005, Sveinbjarnardóttir *et al.* 2008, Ledger *et al.* 2013).

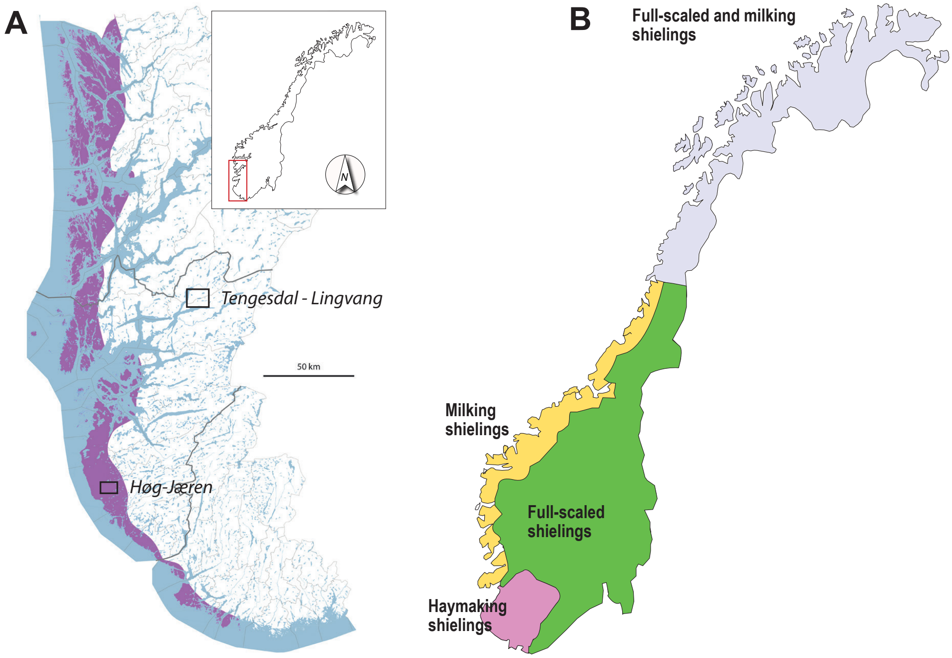

Figure 1*. a). Map showing the location of the two studied shieling zones in southwestern Norway; the Høg-Jæren Plateau within the coastal heathland (shaded in pink) and the Tengesdal-Lingvang watercourse in the subalpine forest in the inner fjord district; b). The distribution of shieling practices in Norway according to Reinton (1955).*

The main topic of this paper is to compare two shieling landscapes in Rogaland, southwestern Norway, namely the Tengesdal-Lingvang watercourse (T-L W) and the Høg-Jæren Plateau (H-J P) (Figure 1), where haymaking was the driving force for the use and crucial for the maintenance of the shielings. Milking of the livestock was also practiced in both areas, but dairy products were usually processed at the 'home' farm. Additionally, the archaeological and historical remains and differences in stacking traditions (the way hay is cut, dried and stored) will be discussed. The second goal is to provide a chronology for the stacking tradition in Rogaland, and, finally, to see if shieling practices with regard to haymaking have parallels in Iceland and Greenland by using relevant literature.

The use of shielings reached its peak in Norway in the period AD 1600-1850 (Grude 1891). After AD 1890, shielings went out of use in the coastal areas of Rogaland, while in the fjord area of Ryfylke ten shielings continued in use. In the T-L W, the last shieling was abandoned in AD 1947. After the Second World War, haymaking in outfields also decreased dramatically, and in AD 1959 none were reported anywhere in Norway (Statistisk Sentralbyrå 1961). Farmers had begun cultivating pastures close to the 'home' farm and storing grass in silos; since c. 1980 they have stored hay in large round bales.

The use of shielings and the regulation of outfield resources and the storage of winter fodder, including the use of haystacks, was first mentioned in the Gulating Law from c. AD 1050-1260. This law was replaced by Magnus Lagabøte's Law from AD 1274, which illustrates how permanently settled farm(s) and the adjacent shieling(s) were interlinked and exploited as commons between farmers from one bygd (Berge 2019). The Law of Tenancy (Larson 1935, pp. 89-107) dictated that, *"If men have a dispute over a shieling pasture or a lot in the forest, let him have it who has been in possession of it with a right unquestioned and unimpaired for twenty winters or more than twenty, if the facts are known to witnesses"* (paragraph 85). So, *"the boundary markers of the shieling pasture shall be where they were of old. Let no one move them from their places unless it is done so that no one suffers damage thereby"*. Rights were similar in the mountain pasture: *"No one is there allowed to send cattle (and other ruminants) home (to the owner) with a warning, for there horn shall meet horn, and hoof (shall meet) hoof"* (paragraph 84). This saved the costs related to fencing in the outfields. The dates for joint movement of cattle between the farms in the lowlands and the shielings was set, "*If men lived near together on the same farm, they shall drive (their cattle) out of the farm pasture when two months of the summer (c. 14 June) are spent"*. One is not allowed to leave the upper pasture before the end of the fifth summer month (14 August).

Hjálmróður, a pole where a haystack could be raised, is also mentioned in the Gulating Law: *"It is not allowed to dig up the stack support after the moving day; he may cut them off above the ground and take them away; but if he (the tenants) digs them up, he shall pay the fine for trespass to the owner of the land"* (paragraph 75). It says that both hay- and cereal stacks could be owned by a single farmer or shared between several farms. In the Gulating Law it is confessed that the pole belonged to the farmer(s) that had the legal rights to scythe and thus harvest in the outfields.

The fact that the Gulating Law is cited as a model for the Icelandic law code at the establishment of the Icelandic commonwealth in the year AD 930 (Robberstad and Lien 1981), is of interest for the Expanding Horizons project.

The studied areas

Tengesdal-Lingvang watercourse (T-L W)

The investigation of the T-L W took place in the period 1982-84 (Høgestøl 1984, Høgestøl and Prøsch-Danielsen 1986, Prøsch-Danielsen 1990), and covered an area of c. 70 km^2. Three farms and their shielings from this area will be addressed: Tengesdal, Selland and Lingvang (Figure 2).

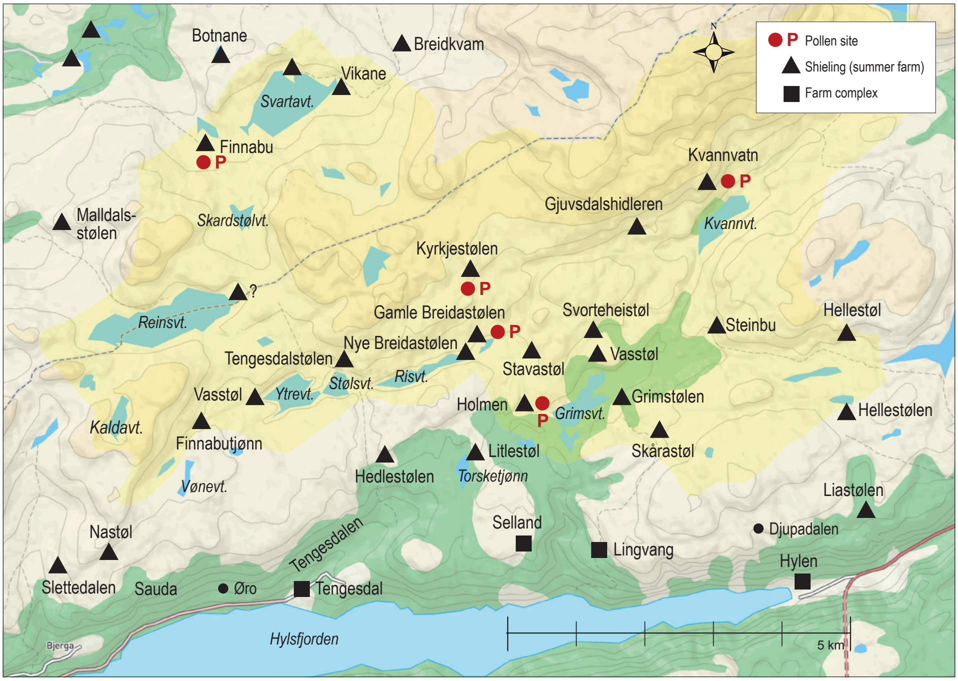

Figure 2. Map showing the studied farms, shielings, and the location of pollen sampling sites in the Tengesdal – Lingvang watercourse (shaded in yellow).

The T-L W is situated in the steep, inner fjord district of Rogaland, with mountains ranging up to 1540 m. The mountainous terrain widens out to a more undulating landscape at an altitude of c. 500-750 m. The area lies within the marked oceanic zone O2, with altitudinal zonation, and with high annual precipitation (Moen 1999, p. 126).

The farms are situated within mixed forests, while most of the shielings are situated in the subalpine birch forest or just above the forest limit ranging from 530-690 m asl (Selsing *et al.* 1991, p. 223). The shieling zone covers small patches of grass- and fertile moorland suitable for livestock grazing (cattle, goat and sheep) and haymaking (see also Pedersen 1982).

Høg-Jæren Plateau (H-J P)

This project started in 2000 and focused on the interior of the southern coastal heath section (Prøsch-Danielsen and Simonsen 2000, Prøsch-Danielsen and Fyllingsnes 2013, Prøsch-Danielsen *et al.* 2018, Prøsch-Danielsen *et al.* 2020). The study is limited to the present-day farm Aniksdal (80 m asl), stretching 7 km upwards to 360 m asl and covering c. 31 km^2

(Figure 3). The farm is divided into three parts: Foren (an infield area with crop fields and hay-meadows), Bumarka (fertilized infield used for grazing) and Engjane (non-fertilized outfield used for grazing and haymaking). The shielings were situated in Engjane outfield, at a modest altitude stretching from 180-250 m asl.

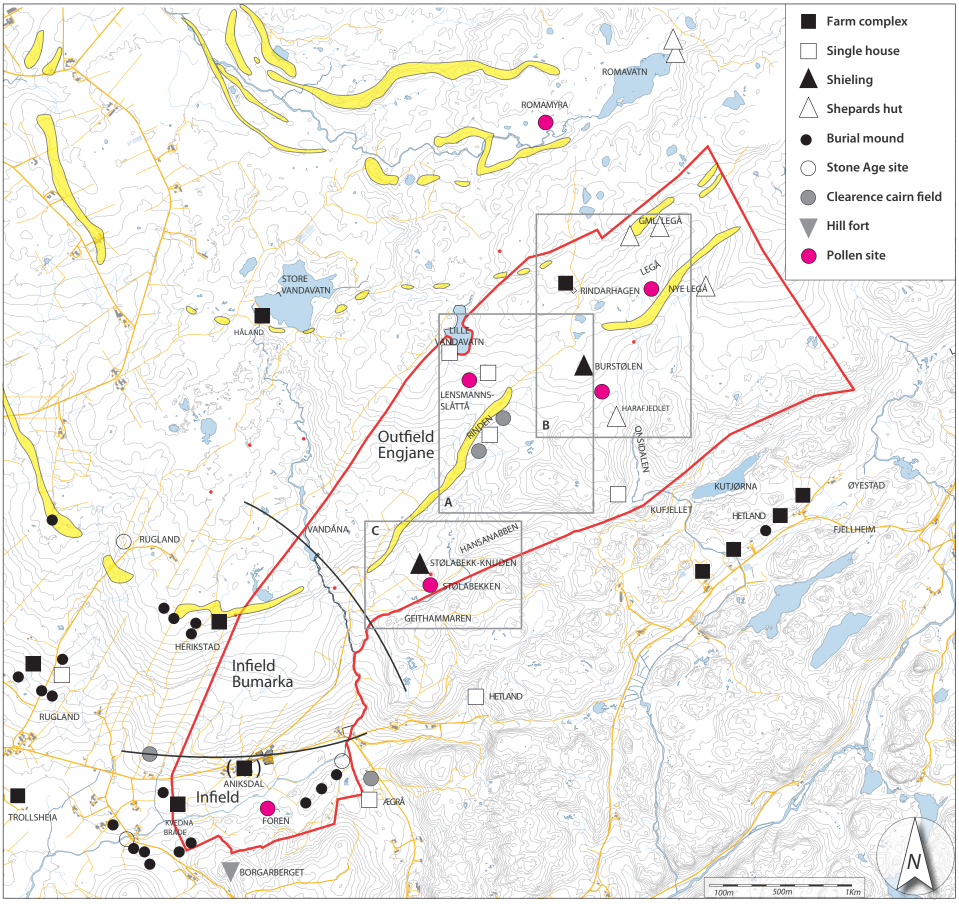

Figure 3*. Map showing the borders of the farm Aniksdal with outfields at the Høg-Jæren Plateau. Shielings, cultural remains, and pollen sampling sites are marked. Yellow lines mark marginal moraines. Boxes A-C correspond to Fig. 9 (after Prøsch-Danielsen et al. 2020).*

The basement is divided into two parts: bedrock is exposed to the east while Quaternary deposits dominate in west. Rinden, a marginal moraine, forms a natural corridor between the farm and the shielings. The area lies within the highly oceanic section O3, humid sub-section O3h, with high annual precipitation (Moen 1999, pp. 126, 131).

The plant cover is heath- and grassland, with mires and bogs. The area is treeless although human impact has decreased since the Second World War. The pressure on the vegetation continues due to grazing by young cattle and sheep.

Methods and material - a landscape historical approach

Two different approaches and data sets are combined to make a diachronic study of the use of these two shieling zones. The first approach uses the archaeological and ethnological data sets found by field surveys (Table 1), small test trenches, radiocarbon dates (Table 2a), interviews and databases (askeladden.ra.no and www.unimus.no).

***Table 1**. Four farms with their shielings within the Tengesdal-Lingvang watercourse and at the Høg-Jæren Plateau. All structures inside and outside the curtilage are described (information from Hoel and Jacobsen 1983, Jacobsen and Hoel 1984, Høgestøl 1984).*

Home farm and shieling m asl	Structures at the curtilage	Structures outside the curtilage
TENGESDAL Suldal 0-200		
Litlestølen 530	Ruin (1) with cowshed, clearance cairns, single pole haystack base (1)	Raised barns (3) with inscriptions AD 1935-50, haystack enclosure 5 x 3 m to the N, haystack enclosures (3) east of Torsketjønn
Hedlestølen 625	Ruins (4), two with planks recorded. One of them registered as a barn	Barns (2) partly destroyed, west of Tengesdalselva: one built in AD 1923, one with initials from 1883, 1891 and from 1930-40. To the east, near Risvasshøgda, one barn probably built on the remains of an older shieling. Several haystack enclosures nearby, one of them 3 x 5 m
Vasstøl 700	Ruins (2), one probably a barn or a cowshed. Fence or enclosure for haystack, single haystack pole base	Pathway to Tengesdalstølen. Fence in southwest part of the lake Ytrevatnet
Tengesdalsstølen 700-715	Existing buildings (4), ruins (4) one probably a living quarter, one used for making cheese, one for pigs. Fence separating the curtilage into two parts; one for livestock grazing, the other for haymaking. Cowshed below one of the buildings. One building raised in AD 1928. In the 1930s, used for goats (300-400). Then up to up to AD 1947 used for cows in addition to haymaking	Haystack enclosures (2) (one 4 x 3.5 m), single haystack pole base 1.5 x 1.5 m, situated at "Legdå", all north of the curtilage. South of Tengesdalstølen; a large flagstone over a brook on the pathway to Stølsvatnet; haystack enclosures (2), one measuring 5.5 x 4.5 m, single stack pole bases (2) at "Geitasteinen", one rock shelter for storing poles. North side of Risvatn; pathway, barn, haystack enclosures (3) 5 x 3.6 m, 5 x 5 m, a fence preventing the cows to go to fare from the curtilage. Stone fence northeast of Torsketjønn

Home farm and shieling m asl	Structures at the curtilage	Structures outside the curtilage
Finnabutjønn 775 (holding Øro)	Ruins (4) probably a living quarter, a barn, cowshed and shed for calves or pigs, several clearance cairns	Fences (2) between Finnabutjønn and Vønevatnet. West of Finnabutjønn, grassland and boggy area
SELLAND Suldal 300 (abandoned AD 1888)	Abandoned AD 1888	After AD 1900, the outfields used for sheep (owned by a company). Hay meadows mown by the farmers at Tengesdal and Lingvang from AD 1888 until AD 1950
Holmen 620	Ruins (3), one with cowshed beneath (4.4 x 3 m), one with a younger single haystack pole base inside, animal pen, deep pools (2), a curtilage that is closed by two fences	East of the curtilage: enclosures for haystacks (4), one measuring 4 m in diam. with a single haystack pole base inside, two of them (5 m in diam, and one 6 x 3 m) with birch trees inside, one single haystack pole base. North of the curtilage: 2 enclosures for haystacks (both 4 m in diam.), one with a single haystack pole base. West of the curtilage: single haystack pole bases (5), one mown mire measure 40 x 50 m
Vasstøl 590	Ruins (4), one used as a shed for pigs?, one served as a cowshed or barn, enclosures for haystacks (4), with an in-fenced (50 m)	Enclosures for haystacks (several), of which one is highly visible 5 x 3 m to the east. Several mires used for haymaking
Nye Breidastølen 695	Existing building, built app. AD 1900	Enclosures for haystacks (2)
Gamle Breidastølen 710-745	Ruins (4), separated in two and two, one used for pigs?, another used for making cheese	A nutrient rich curtilage vegetation (zone with phyllite) used for both livestock grazing and haymaking. Enclosures for haystacks (3), one larger 5 X 5, one with fences nearby. Oval enclosure for haystacks 9 x 8.2 m between Svartenut and Risvatn
Gjuvsdalshidleren 705	Ruins (2) measuring 6.5 x 3 m and 4.3 x 4.2 m, enclosures for haystacks (2), one up to 4 m in diam, single pole haystack base	All haystacks in Gjuvsdalen might be in use for Gjuvsdalshidleren as well. Grassland for livestock grazing and haymaking
Svorteheistøl 710	Ruins (7), two with cowsheds, one for pigs, one barn. Single pole haystack bases (4). The curtilage covers 30 x 75 m	North of the curtilage enclosures for haystacks (2), the largest measuring 4 x 5 m. Large areas with grassland and mires
Stavastølen 740	Ruin, rock shelter used for storing, enclosure for haystacks (6 m in diam.)	Enclosures for haystacks (3) between Risvatn and Holmane. Two measuring 3 x 7. 5 m. Rich grassland, above the birch forest
Kyrkjestølen 860	Ruin 7 x 6 m, animal pen 15 m in diam.	Enclosures for haystacks (3). All app. 5 m in diam., single pole haystack base. An area probably used for single pole haystacks is fenced in. All situated east of Kyrkjestølen in Gjuvsdalen. Scanty vegetation, marginal
Fence separating the farm Selland and Lingvang		

Home farm and shieling m asl	Structures at the curtilage	Structures outside the curtilage
LINGVANG **Suldal** **300** (abandoned AD 1950s)		
Grimstølen 590-610	Existing buildings (3) (5.5 x 3.1 m and 3.5 x 3.4 m) one with a cowshed beneath, one for pigs, one used for making cheese, enclosures for haystacks (2) measuring 11 x 7.3 and 3.2 m in diam., both with bases for poles, one deep pool, clearance cairns	Existing building (used for hunting deer) and ruin, both southwest of Grimstølen. Between Fisketjørn and Grimstølen several fences and enclosures for haystacks are registered. Between Grimstølen and Skåråstølen, an enclosure for haystacks (9 m in diam.), a 50 m long fence crossing the valley and a 25 m long fence probably used to guide the livestock. In the valley system from Grimstøl to Hellestøl and the lake Krokvatnet, fences crossing the valley and several enclosures for haystacks. Grassland and mires, small brooks nearby. Regrowth of birch and shrubs. North part of Grimsvatn, enclosure for haystack, a meadow for haymaking and a fence
Steinbu 680	Existing building raised in 1945, ruins (2) made of stones, one with a cowshed underneath, one probably a barn, enclosures for haystacks (2) measuring 15 x 20 m and 10 x 5 m. The largest one has three intact single haystacks poles inside. The curtilage measure 40 x 40 m and is fenced in north.	Southwest: enclosures for haystacks (3), largest 3 m in diam., three separate fences of which one in a mown meadow. One of the fences is made up of birch wood like a rustic fence of diagonal design (*skigard*) that seems rather modern. Grassland south of Vardanuten. Large areas with mires/meadows southwestern of Steinbu used as hay meadows
Skårastøl 690	Ruins (3), two probably used for calves or pigs. Enclosures for haystacks (2) measuring 4 and 5 m in diam, the curtilage in closed by fences in north and east.	Fence between Skårastøl and the farm Lingvang and one southeast of the shieling. Enclosures for haystacks (2) below Vardfjell, one with to single haystack pole bases (720 m asl)

Home farm and shieling m asl	Structures at the curtilage	Structures outside the curtilage
ANIKSDAL **Hå** 65-80		
Stølabekk-knuden 180	Ruins (4-5), three measuring 3.5 x 4 m, probably three living quarters and one or two probable houses for storing the milkmaid's equipment. Probably not used as living quarters. Animal pen (1). Curtilage covers the hilltop. Distance to permanent farm 2 km	Pathway from the permanent farm passing the hilltop Gjeithammaren (Goat Mountain), enclosures for haystacks (2) measuring 6.5 x 7 m and 10 m in diam. Ruin (animal pen or barn) to the north in the outfield, separated to the shieling by flagstones over the brook, Stølabekken. Known fields for haymaking close by.
Rinden, shieling and shieling zone 200-230	Ruin with two rooms, measuring 5-7 x 19 m, probably serving as storage in multiple periods. The oldest room might be a living quarter.	Along the marginal moraine, animal pens (4), several clearance cairns, one dated to AD 18-214, a group of haystack foundations with four-posts and one enclosure for haystack with a four-post building inside. Partly cleared for grazing, partly for haymaking. To the north is a large gently sloped fen used for haymaking and peat cutting
Burstølen 250	One ruin probably used for storing food or hay. Not used as a living quarter. A small fence stretches 5 m from the ruin to the south. The fence might have served as a shed for the livestock. No curtilage visible.	A valley system, Onsidalen, with nutrient rich grassland, stretches southward to the mountain Kufjedlet (Cow Mountain). Northeast are large areas with mires used for haymaking. Several (20) haystack foundations with four-posts are registered close to Burstølen and downslopes to Stølabekk-knuden in the Engjane outfield. Four shepherds' huts are registered in the upper Aniksdal valley system; all probably from Post-Medieval Period

The second approach uses pollen analysis to reveal human impact and shaping of the landscape over time. Samples were collected from peat bogs close to shielings by using a peat corer or PVC-tube. Samples for microfossil studies and microscopic charcoal particles (10-200 μm) have been prepared and analyzed using standard methods (Fægri and Iversen 1989). It is possible to distinguish between pollen assemblages from mown meadows and grazed sites, but in western Norway the assemblages may vary along a gradient from coast to inland (Hjelle 1999). Both practices favour light demanding species like *Plantago lanceolata*, *Rumex acetosa*-type, *Ranunculus acris*-type and Asteraceae sect. Cichorioideae (Hjelle *et al.* 2018, Prøsch-Danielsen *et al.* 2018). In our studied areas the different sites have been put to multiple alternating uses: 2-3 years cycles of haymaking followed by use as pasturage. Here, therefore, the criteria for pastures and mown meadows were increased values of Poaceae, Cyperaceae, and an increase in pollen from taxa associated with grassland and meadow plants. In the fjord area, *Gentiana purpurea* is a signature for scything (Høeg 1976, p.32), while in the coastal heathland the parallel species is *Gentiana pneumonanthe* (Steinnes 2011). Coprophilous fungal spores, such as Sordariaceae-type, Sporomiella-type and Podospora-type (van Geel *et al.* 2003) have been counted from the cores at the H-J P and recently at one locality (Holmane) in T-L W. The pollen diagrams were plotted using the TILIA computer program (v. 2.0) and CONISS was used to assist in creating the LPAZ (Local Pollen Assemblage Zone) (Grimm 1987, 1992).

***Table 2a**. Radiocarbon dates obtained from structures in the Tengesdal-Lingvang watercourse and at the Høg-Jæren Plateau in Rogaland.*

Lab. ID.	Locality	M asl	Context	Dated material	Conv. radiocarbon age (BP)	BC/AD (2 sigma)	Sampling year
	Tengesdal-Lingvang Watercourse						
T-7649	Kyrkjestølen, shieling	860	Charcoal layer in ruin	Charcoal, unspec.	500 ±90	AD 1291-1632	1983
T-7648	Holmen, shieling	620	Lowermost charcoal layer in ruin	Charcoal, unspec.	190 ±70	AD 1524-1631	1983
	Høg-Jæren Plateau						
B-293859	Aniksdal, farm	80	Field, agricultural phase	Hordeum vulgare var vulgare	1770 ±30	AD 223-375	1973/74
T-1765	Kvednabråde	80	Charcoal layer from a farm complex	Charcoal, unspec.	2150 ±80	389 BC-AD 8	1973/74
T-1766	Kvednabråde	80	Charcoal from a posthole in a farm complex	Charcoal, unspec.	2190 ±90	406 BC-AD 9	1973/74
TUa-7663	Stølabekk-knuden, shieling	180	Charcoal layer, building 2, latest use	Charcoal, Betula	225 ±30	AD 1636-1925	2008
TUa-7656	Rinden, clearings cairn	198	Layer 3, infill min. age of clearings cairn	Charcoal, Betula	1910 ±35	AD 26-219 A	2008
TUa-7657	Rinden, clearings cairn	198	Layer 5, just below clearings cairn, max. age	Charcoal, deciduous trees	2860 ±35	1187-919 BC	2008
TUa-7660	Burstølen, shieling	252	Fire place, latest use	Charcoal, unspec.	780 ±35	AD 1212-1285	2008
TRa-425	Rindarhagen, enclosure	257	Just below enclosure, max. age	Charred seeds	645 ±25	AD 1284-1395	2009
TRa-428	Rindarhagen, enclosure	257	Just below enclosure, max. age	Peat	920 ±25	AD 1036-1205	2009

Lab. ID.	Locality	M asl	Context	Dated material	Conv. radiocarbon age (BP)	BC/AD (2 sigma)	Sampling year
TUa-7659	Nye Legå, shepherd's hut	265	Fire place, latest use	Charcoal fragments, Ericaceae	70 ±30	AD 1692-1919	2008
TUa-7658	Gamle Legå, shepherd's hut	280	Fire place, latest use	Charcoal fragments, Ericaceae	160 ±35	AD 1662-1904	2008

Table 2b*. Radiocarbon dates from pollen cores close to shielings in the Tengesdal-Lingvang watercourse and at the Høg-Jæren Plateau in Rogaland. The dated material is peat.*

Lab. ID.	Locality	Locality	Depth below surface	Conv. radiocarbon age (BP)	BC/AD (2 sigma)	Dated event	Sampling year
	Tengesdal-Lingvang W.						
T-5732	Breidastølen	Breidastølen	17.5-20 cm	1200 ±70	AD 675-986	Start shieling phase, grazing and mowing	1983
T-5734	Breidastølen	Breidastølen	35-37.5 cm	2540 ±80	812-416 BC	Forest clearance, antropogenic indicators	1983
T-5735	Breidastølen	Breidastølen	52.5-55 cm	3600 ±70	2189-1751 BC	Regrowth	1983
T-5731	Breidastølen	Breidastølen	95-97 cm	4750 ±80	3651-3365 BC	Sporadic grazing	1983
T-5733	Breidastølen	Breidastølen	122-123 cm	5890 ±90	4992-4543 BC	Alnus-Betula forest	1983
T-6293	Holmane	Holmane	39.5-40.5 cm	730 ±70	AD 1174-1397	Shieling phase, mowing and grazing	1984
B-577899	Holmane	Holmane	56.5-57.5 cm	1490 ±30	AD 545-642	Start shieling phase, grazing	1984
T-6292	Holmane	Holmane	94.5-95.5 cm	2630 ±80	986-522 BC	Start human impact, grazing	1984
	Høg-Jæren Plateau						
B-363991	Foren	Foren	47.5-48.5 cm	3050 ±30	1405-1223 BC	Home farm settled	2008
B-315530	Legå	Legå	26-27 cm	250 ±30	AD 1522-1940	Grassland, mowing cont.	2011
B-315531	Legå	Legå	53-54 cm	1100 ±30	AD 887-1017	Grassland and mown meadows, shieling	2011
B-381524	Legå	Legå	67.5-68.5 cm	2160 ±30	356-57 BC	Grassland and mown meadows	2011
B-315532	Legå	Legå	124-125 cm	3080 ±30	1421-1263 BC	Drop in AP. Grassland, regularly burnt	2011
B-381525	Legå	Legå	199.5-200.5 cm	4300 ±30	3011-2881 BC	Shrub and field layer with herbs	2011

All radiocarbon dates have been calibrated using the IntCal13 calibration curve in OxCal (v. 4.3) (Reimer *et al.* 2013, Bronk Ramsey 2015), and reported as radiocarbon dates BP and/or as calibrated years BC/AD at 2σ (Table 2a and 2b).

Results

Tengesdal-Lingvang watercourse (T-L W)

Archaeological and ethnological data set

Altogether, twenty-three registered shielings were shared between eight farms (Figures 2 and 4). Sixteen of these belong to three farms, Tengesdal (5), Selland (8) and Lingvang (3) (Table 1).

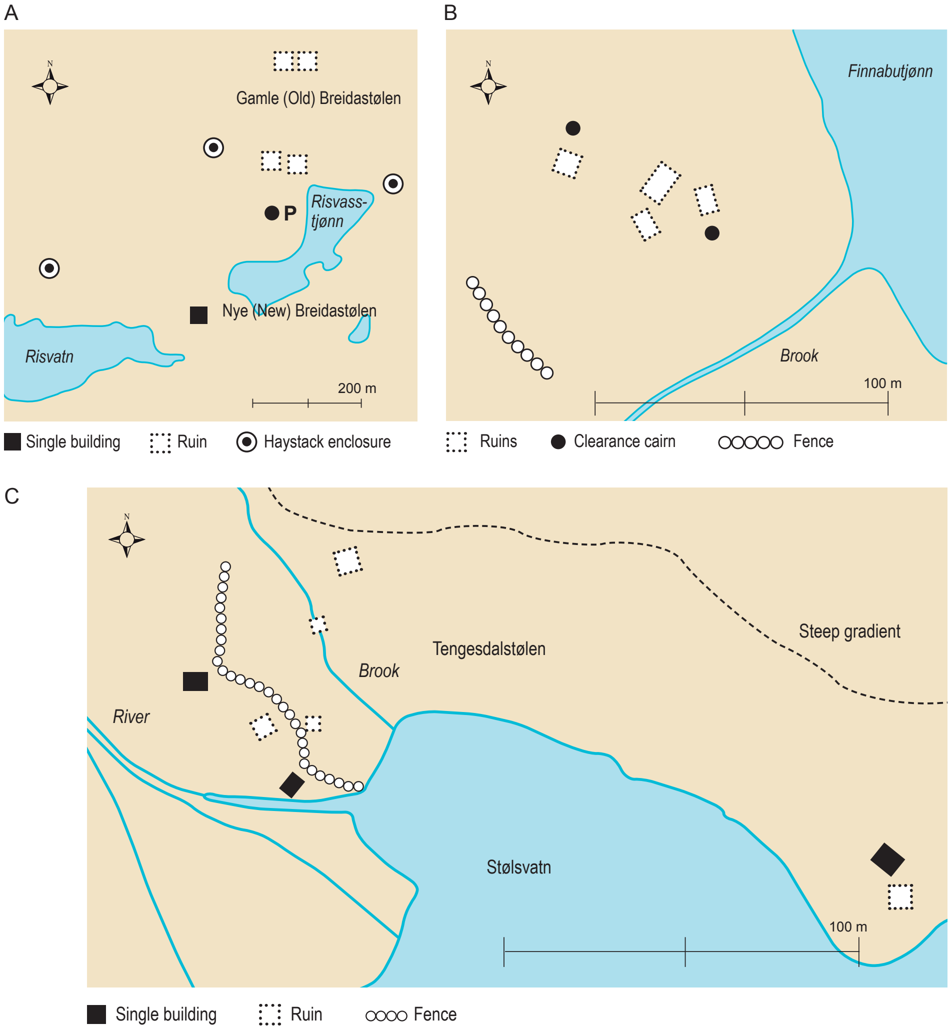

Figure 4. *Close up of some shielings and the distribution of cultural remains in the Tengesdal-Lingvang watercourse; a). Nye Breidastølen and Gamle Breidastølen (from Prøsch-Danielsen 1990); b). Finnabutjønn (original drawing, Anne Ragnhild Hoel 1984); c). Tengesdalstølen (original drawing, Anne Ragnhild Hoel 1984).*

The Tengesdal farm is actually a collection of several farm holdings. It held a central position, close to the fjord. Shielings were in use until AD 1947, while mowing in the outfields were performed until AD 1950.

The farms Selland and Lingvang were situated on terraces along the steep fjord side and are now abandoned. At Lingvang, shielings were in use until AD 1939.

At Tengesdal and Lingvang, there was a shift from cattle to goat husbandry in the 1920-1930s (Jacobsen and Hoel 1984). Up to 400 goats were kept at Tengesdal at one time. Between AD 1940 and 1947, the farmers at Tengesdal returned to cattle husbandry.

The oldest farms facing Saudafjorden were settled in the Late Bronze Age/ Pre-Roman Iron Age, while those facing Hylsfjorden were settled in the Viking Age/Medieval Period (Høgestøl and Prøsch-Danielsen 1986). Stray finds, a whetstone and some ceramics, found close to Holmane (Selland) date to the Viking Age/Medieval Period, and the lowermost charcoal layer in one of the ruins is dated to 190 ±70 BP (90 % in the range AD 1630-modern day). At Kyrkjestølen (Selland) one charcoal layer is dated to 500 ±90 BP (AD 1287-1632). These charcoal layers may represent one of several periods when these shielings were in use. Many of the shielings have two sets of buildings (e.g., Gamle and Nye Breidastølen, Tengesdalsstølen). Four shielings still have one or several buildings intact, now used for recreation. The main period for the shielings and the cultural monuments left as ruins in the landscape is the 1800s-early 1900s (Jacobsen and Hoel 1984).

Each farm's shieling zone was framed by natural watercourses and lakes and were separated by boundary markers in the terrain such as fences or cairns. There are also several fences separating the shielings within individual farm units. In most cases, fences are found close to hay meadows with haystacks, their main function being to prevent livestock from gaining access to the winter fodder. Otherwise, fences helped the dairymaids to keep the cattle close to the shielings (e.g., Tengesdalsstølen). There is close correlation between shielings and patches of grass and meadows used for pastures and haymaking.

The mown meadows or mires are rather small in T-L W, some cover only 40 x 50 m, and the curtilage varies between 40 x 40 m to 30 x 70 m. Groups of clearance cairns are recorded at several of the curtilages.

The shielings consist of one or several buildings with dwelling houses for peoples that stayed there throughout the season. Many of these buildings have a cowshed in the basement, which was also used for sheep and goats; otherwise, the animals (including calves and pigs) were kept in separate buildings. The cattle were sometimes kept in animal pens close by during the night (e.g., Holmane, Kyrkjestølen). There were separate buildings for storing dairy products and for cheese-making. Deep pools for cooling the milk are also recorded at some of the shielings. This demonstrates that dairy products were being processed at the shielings. Although often associated with goat breeding, these structures are also seen at Gamle Breidastølen, a farm that was abandoned in AD 1888, prior to the main period of goat husbandry in the Ryfylke area. This suggests that both cattle and goats were being milked.

Hay storage

Haystack enclosures (stakktufter) and single-pole haystack bases are recorded both inside and outside the curtilage (Jacobsen and Hoel 1984, Table 1). Both types are primarily built of stone. Altogether, 80 enclosures have been recorded in the T-L W, sometimes using natural blocks as one sidewall (Figures 5 and 6). The enclosures vary in size from approximately 4 m in diameter to 15 x 20 m (Steinbu). The largest ones could accommodate up to four single-pole haystacks.

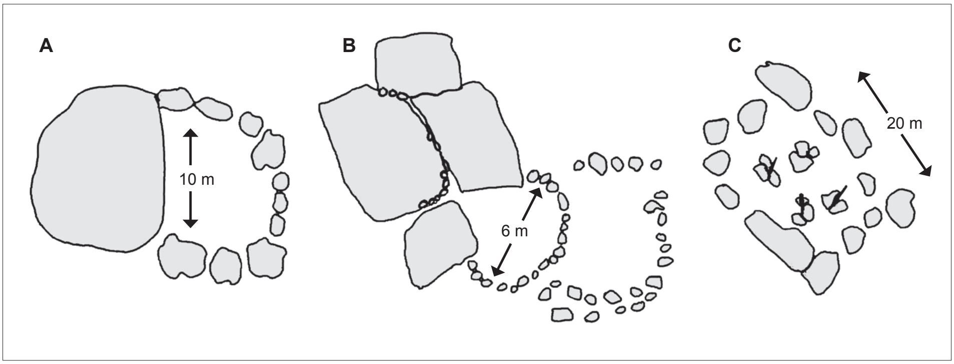

***Figure 5**. Haystack enclosures (stakktufter) vary in shape and size within Tengesdal-Lingvang; a). Haystack enclosure from Steinbu, Lingvang (original drawing, Åse Jacobsen 1984); b). A double haystack enclosure from Stavastøl, Selland (original drawing, Anne Ragnhild Hoel 1984); c). Haystack enclosure (stakktuft) with four single-stack poles (stakk) from Steinbu, Lingvang (original drawing, Åse Jacobsen 1984).*

***Figure 6**. Haystack enclosures (stakktufter) in Tengesdal. Photo: Per Kristian Austbø.*

***Figure 6**. Haystack enclosures (stakktufter) in Tengesdal. Photo: Per Kristian Austbø.*

Some poles used in single-pole haystacks are still intact, but generally only the stone base is visible today. The stone base can measure up to 1.5 x 1.5 meter. Some of the rock shelters have served as storage for poles.

Raised barns (7 in all) for storing hay outside the curtilage are only recorded in the lower valley system close to the Tengesdal river, and they all seem to have been built from AD 1880 onwards. They were probably in use until mowing ceased around AD 1950.

Pollen data set

Two pollen diagrams are presented from the Holmane and Breidastølen shielings. Both belong to Selland farm (Figures 7 and 8).

At Holmane, the following pre-shieling phases indicate human impact in the area:

- LPAZ H2: AP (arboreal pollen) is c. 50 % throughout this zone. The lower boundary is dated to 2630 ±80 BP (BC 860-790). Anthropogenic influence is recorded by continuous pollen curves for *Plantago lanceolata*, *Rumex acetosa*-type, *Urtica*-type, and a slight increase in microscopic charcoal. Coprophilous fungi spores from *Sporomiella* starts at the zone border.

Shieling phases:

- LPAZ H3: From 1490 ±30 BP (AD 436-644) (the Migration Period), there is a slight decrease in AP followed by a rise in microscopic charcoal dust. There is also a rise in *Plantago lanceolata* and the appearance of *Podospora* and species in the genus Sordariaceae appear, indicating animal dung and thus grazing activity in the area. Grazing is further indicated by a rise in pollen types indicative of that process, such as Poaceae, Cyperaceae, *Rumex acetosa*-type, *Ranunculus acris*-type, *Urtica*-type, *Geranium*-type and *Geum*-type and a peak in light-favouring *Potentilla* species, mostly *P. erecta*.

- LPAZ H4a: The lower boundary is dated to 730 ±70 BP (AD 1161-1399) (Early Medieval Period). All grassland indicators recorded in LPAZ H3 are present. *Ranunculus acris* and Asteraceae sect. Cichorioideae increase and may represent the start of mowing. A single grain of *Hordeum* pollen is also recorded. Simultaneously there is a peak in the coprophilous fungi *Sporomiella*.
- LPAZ H4b: The lower part of the zone border is estimated to c. AD 1600 (Post-Medieval Period) and the upper part to c. AD 1800. There is a drop in AP followed by an increase in microscopic charcoal dust, indicating forest clearance. Simultaneously there is an increase in species associated with mown meadows and grassland like *Plantago lanceolata*, *Rumex acetosa*-type, *Ranunculus acris*-type, Asteraceae sect. Cichorioideae and A. sect. Asteroideae. The indicator species for mown meadows in southwestern Norway, *Gentiana pneumonanthe*-type (here probably *G. purpurea*) is also recorded.
- LPAZ H4c: There is a decrease in pollen types indicative of grazing and mowing, while there is a peak in *Sphagnum* spores and spores from coprophilous fungi, Sordariaceae and *Sporomiella*.

At Breidastølen, the following pre-shieling phases indicate human impact in the area:

- LPAZ B3 + B4: Sporadic use of the area for grazing (*Plantago lanceolata*) is recorded from 4750±80 BP (3662-3364 BC), the Early Neolithic (EN). The site was forested by *Alnus* and *Betula* with peaks in pollen from species usually found in subalpine birch forests, such as *Potentilla* type, *Trientalis* and *Melampyrum*. Increase in AP (LPAZ B4) is recorded between 3600 ±70 BP (BC 2060-1900) and 2540 ±80 BP (BC 810-550).
- LPAZ B5: From c. 500 BC, AP decreases from 50 % to 30 %, indicating forest clearance. There is a rise in anthropogenic indicators seen by continuous curves for *Plantago lanceolata* and *Artemisia* and a rise in microscopic charcoal.

Shieling phases:

- LPAZ B6a: At the transition between the Merovingian Period and the Viking Age, pollen from grazing indicators such as Poaceae, *Plantago lanceolata*, *Artemisia*, *Chenopodiaceae* and *Rumex acetosa*-type as well as pollen from meadow plants like Asteraceae sect. Asteroideae, *Geum*-type, *Thalictrum* and *Ranunculus acris*-type increase together with a rise in the curve for microscopic charcoal. A single grain of *Avena* pollen is recorded at Breidastølen 1200 ±70 BP (AD 675-975).
- LPAZ B6b: Pollen from taxa associated with mowing is recorded; like Asteraceae sect. Cichorioidea and *Gentiana pneumonanthe*-type.

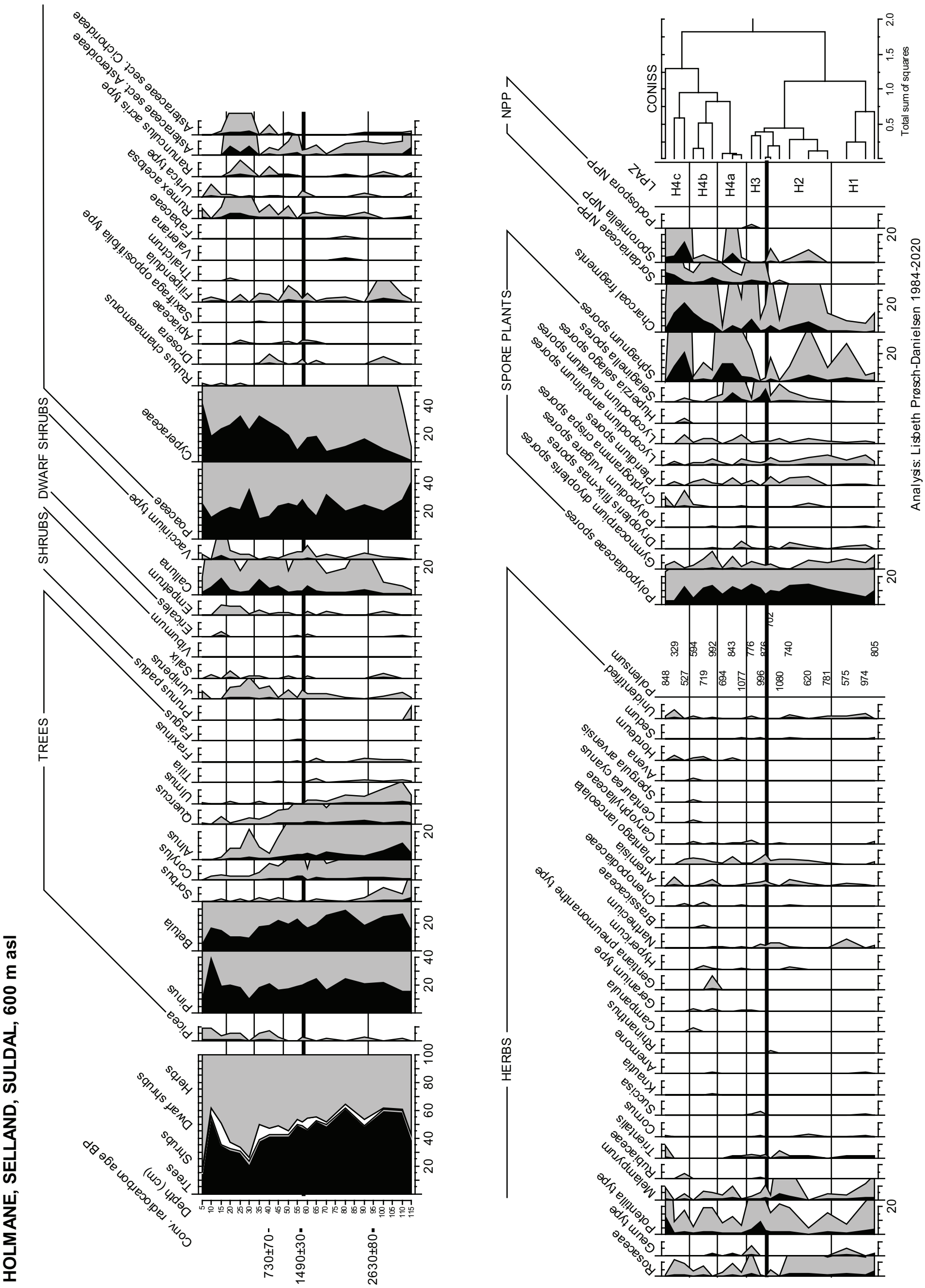

Figure 7. Pollen diagram from Holmane, Selland.

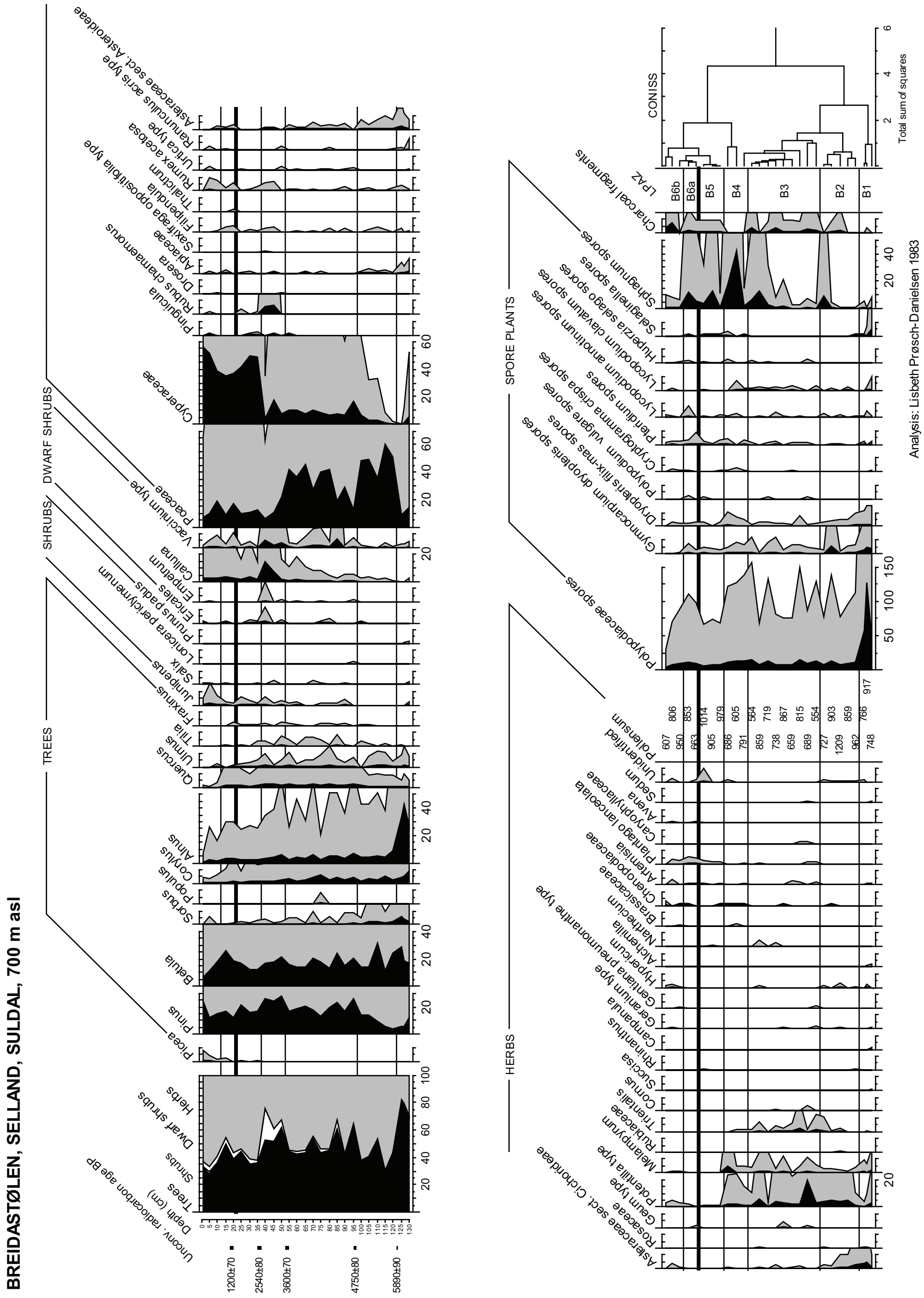

Figure 8. *Pollen diagram from Breidastølen, Selland.*

Høg-Jæren Plateau (H-J P)

Archaeological and ethnological data set

Ruins of three separate shielings are recorded in the Aniksdal valley system (Figures 3 and 9, Table 1), although these have not been used within living memory.

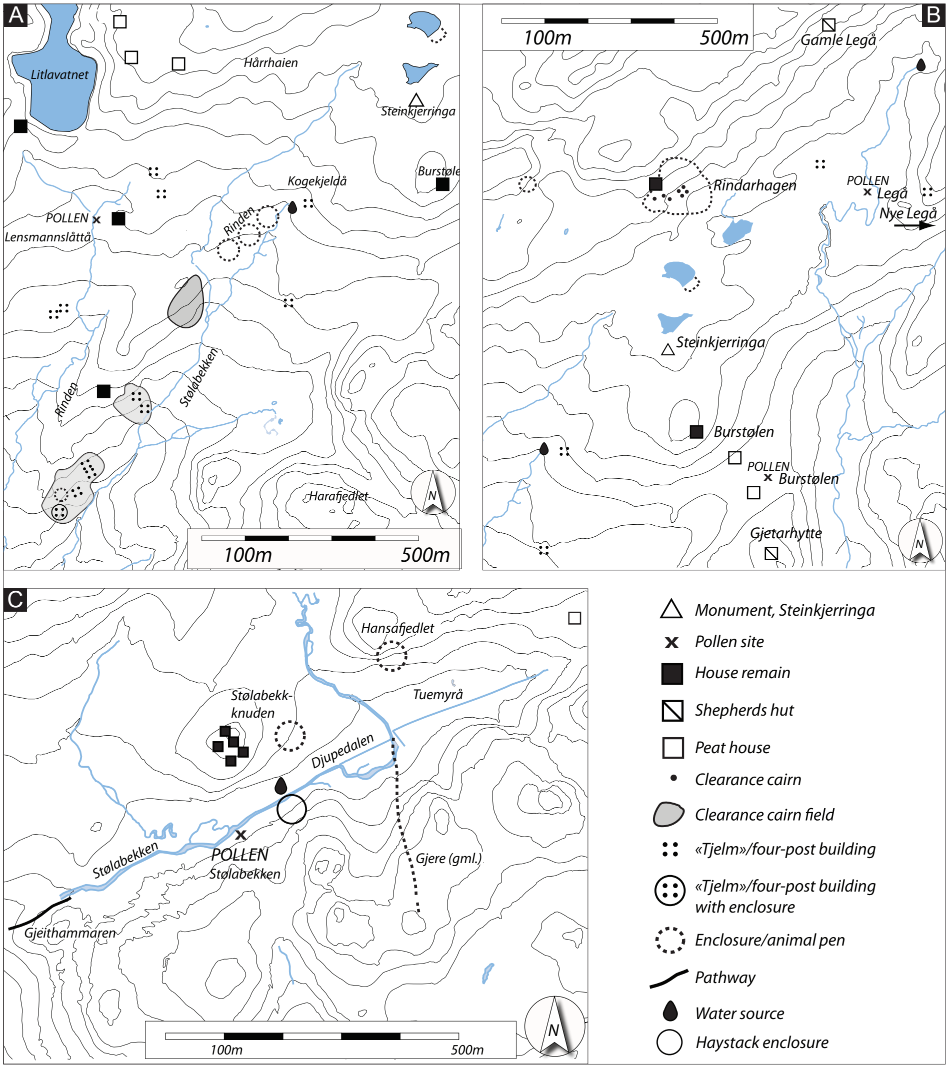

Figure 9. *Close up of the separate shielings and shieling zones and the distribution of cultural remains at the Høg-Jæren Plateau; a). The shieling zone at Rinden; b). The farm complex Rindarhagen and the intertwined shieling Burstølen; c). The shieling at Stølabekk-knuden (from Prøsch-Danielsen et al. 2020).*

The farm Aniksdal included several farm holdings. Today, sheep graze in the outfields, cattle in the infields and young cattle in both. One holding keeps up to 300 pigs. Shepherds (children) were used until AD 1910, a practice that is visible in today's landscape as a series of small rock shelters and shepherds' huts situated in the upper valley system, 3-5 km from the 'home' farm. Two of these have been dated to 160 ±35 BP (AD 1664-1912) and 70 ±30 BP (AD 1691-1924, 70 % within AD 1810-1919) (Prøsch-Danielsen *et al.* 2020).

Aniksdal's advantage, compared to other farms in low-lying Jæren, is its large outfield areas. Historical evidence from AD 1667 documents that farmers from coastal farms rented strips of fields in the Engjane outfields (Næss 1986). In AD 1723, the farm's livestock comprised 8 horses, 34 cattle and 32 sheep. Many horses were needed for transport of resources from the outfields: hay for fodder, as well as peat and twigs of heather for fuel. Outfields were common land and joint resources prior to the AD 1860-1890s. In AD 1912, the Engjane outfield areas with hayfields and peat rights were regulated (Prøsch-Danielsen and Fyllingsnes 2013). The heath vegetation has been regularly burnt, and grassland mowed up to AD 1950 in a rotation system. Only one of the local farmers can recall hay being stacked, in AD 1935. After AD 1950, hay was dried on the ground and later brought back home using horses and wagons. Today the Engjane area is used partly for grass cultivation, and since 1980 hay has been stored in round bales. The modern infields at Foren and Bumarka have been fenced in since the 1850s.

Most of the prehistoric farms and cultural monuments in the lower part of the Aniksdal valley and in the valley system southeast of the H-J P, can be traced to the Iron Age (askeladden.ra.no). The oldest farm complex at Aniksdal, Kvednabrådet, is dated to 2190 ±90 BP (406 BC-AD 8) and 2150 ±80 BP (389 BC-AD 9), which indicates a date within the Pre-Roman Iron Age. However, plough marks have been found underlying the Iron Age occupation surface, indicating that the site was settled prior to this (A. Lillehammer and Andreasen 1974). This is also suggested by pollen analysis from the infields (Prøsch-Danielsen *et al.* 2020). A relief brooch and a cruciform brooch date a group of burial mounds in the infield to the Migration Period (c. AD 400-550) (Kristoffersen 2000) and indicate that the farm was in use throughout the Iron Age. Only one find, a single-edged sword, is dated to the Viking Age, c. AD 800-900 (Petersen 1919). No finds or cultural remains from the Medieval Period have been identified in the infield, and it is likely that these underlie the modern farm buildings. However, there are many medieval finds in the Engjane outfields.

Some of the house ruins in the outfields may have had different functions at different times, as shielings, cowsheds, or barns. The three shielings of Rinden, Burstølen and Stølabekk-knuden represent different periods, and only the youngest one comprises several buildings (Table 1, Figure 9c). None of the shielings or their curtilage is fenced in.

The oldest ruin, at Rinden (Figure 9a), is separated into two rooms that probably represent multiple periods. Test trenches did not uncover any artefacts or charcoal layers. Three larger stones inside the upper room indicate that this could not have functioned as living quarters. The building probably served as storage for fodder or it may simply have functioned as a shed for the livestock (Wankel 2010). A nearby group of clearance cairns has been dated to the Roman Iron Age (see Table 2a). Four animal pens and a haystack enclosure are also recorded. The undated animal pens are either earthworks or stone-built, all with an opening downslope. There is also a group of four-post buildings (tjelm, see definition below) along Rinden, one situated within a haystack enclosure.

The Rindarhagen farm complex is situated in the upper Aniksdal valley. The remains (two houses) were destroyed in AD 1960 (Figure 9b). Clearance cairns, a row of stones at the edge of a field and the farm's stock passage and enclosure still exist. The infield area covered 10,700 m^2. Outside the farm's enclosure there is a 420 m^2 animal pen with usage dated to the Viking Age/Medieval Period, 920 ±25 BP (AD 1030-1167) and 645 ±25 BP (AD 1283-1394). The tax lists show that Rindarhagen was abandoned before AD 1520 (Fyllingsnes 2013, p. 116). The Burstølen shieling, 600 m south of Rindarhagen, is dated to 780 ±35 BP (AD 1190-1283) and comprised a small fence attached to a single house. From here, there is access to fertile meadows towards the Onsidalen valley and to a larger mire complex known as Legå. Several ruins of four-post buildings (tjelm) are found close to Burstølen.

The shieling at Stølabekk-knuden comprised a group of five buildings and two animal pens (Figure 9c). The sizes of the ruins (3 in all) suggest they served as living quarters. Two buildings were smaller and could have been used for storage. One of the houses is dated to 225 ±30 BP (AD 1640-1931), but the period of use must have been prior to the late 19th century, as there is no living memory of its use. One larger and one smaller enclosure (earthworks) for keeping haystacks are recorded close by.

Hay storage

At H-J P, three categories of haystacks are recorded (Prøsch-Danielsen and Fyllingsnes 2013). The simplest ones are single-pole haystack bases found in the Engjane outfield. The largest group (20 in all) is the four-post buildings called *tjelm* (Lillehammer 2004, pp. 135-137). Four piles were raised in a square 2.7-2.8 m apart, each pile with a base of stones. The hay was stacked on a pole in the middle and then the *tjelm* was sealed by a roof made of rye or sedges to protect the haystack from rainfall (Figure 10). All examples are recorded in the Engjane outfield. In Aniksdal only the four stony bases are recorded.

Figure 10*. Four-post building (tjelm) from Råneheia in Hå, 1926. Photo: Ingjald Mehus, copyright Dalane folkemuseum.*

Haystacks with an outer enclosure are called *stakktuft*. The enclosures might be built of stones, as earthworks or a combination of both. Five are found in Bumarka or the lower part of the Engjane outfield.

Only one ruin of a barn for storing hay is recorded in the Engjane outfield. It measures 6 x 6 m and is of a western Norwegian type that can be dated to the late 19th or early 20th century. Just outside the entrance, several single-pole haystacks bases have been observed.

Pollen data set

One pollen diagram from Legå, approximately 500 m from the shieling at Burstølen, will be presented (Figures 9b and 11). Five other pollen diagrams from the 'home' farm and the outfield are described in Prøsch-Danielsen *et al.* (2020).

Pre-shieling phase at Legå indicating human impact in the area:

- LPAZ L3: The lower boundary is dated to 3080 ±30 BP (1418-1208 BC). AP drops from 70 % to 40 %; this is especially visible in the curve for *Alnus*. Grassland taxa like *Rumex acetosa*-type, *Ranunculus acris*-type, *Valeriana*, *Circium* and other species included in the genus Asteraceae, Rubiaceae, *Lychnis*-type and Cyperaceae increase. A few pollen grains of *Plantago lanceolata* and *Succisa* were also identified. At the transition between the subzones LPAZ 3A and 3B, estimated to c. 500 BC, the number of herb taxa decreases. Grasses and the content of microscopic charcoal increase.

Shieling phases:

- LPAZ L4a: The lower boundary is dated to 1100 ±30 (AD 889-1013). AP is below 20 %. There is a sudden increase in microscopic charcoal reaching a peak at 80 %. The LPAZ is characterized by grassland and meadow taxa such as Poaceae, Cyperaceae, *Ranunculus acris*-type and *Potentilla* type and coprophilous fungal spores of Sordariaceae are present from the onset. The number of herb pollen increases and comprises taxa such as species in the genus Asteraceae, *Achillea*, *Pedicularis*, *Vicia cracca*, *Succisa*, *Plantago lanceolata* and Brassicaceae. A single grain of *Hordeum* pollen is also recorded.
- LPAZ L4b: The content of microscopic charcoal drops from 80 % to 35 %. This event is dated to 250 ±30 BP (AD 1521-1800). There is a peak in Poaceae, *Rumex acetosa*, *Plantago lanceolata*, *Urtica*-type and in the coprophilous fungi spores of Sordariaceae.

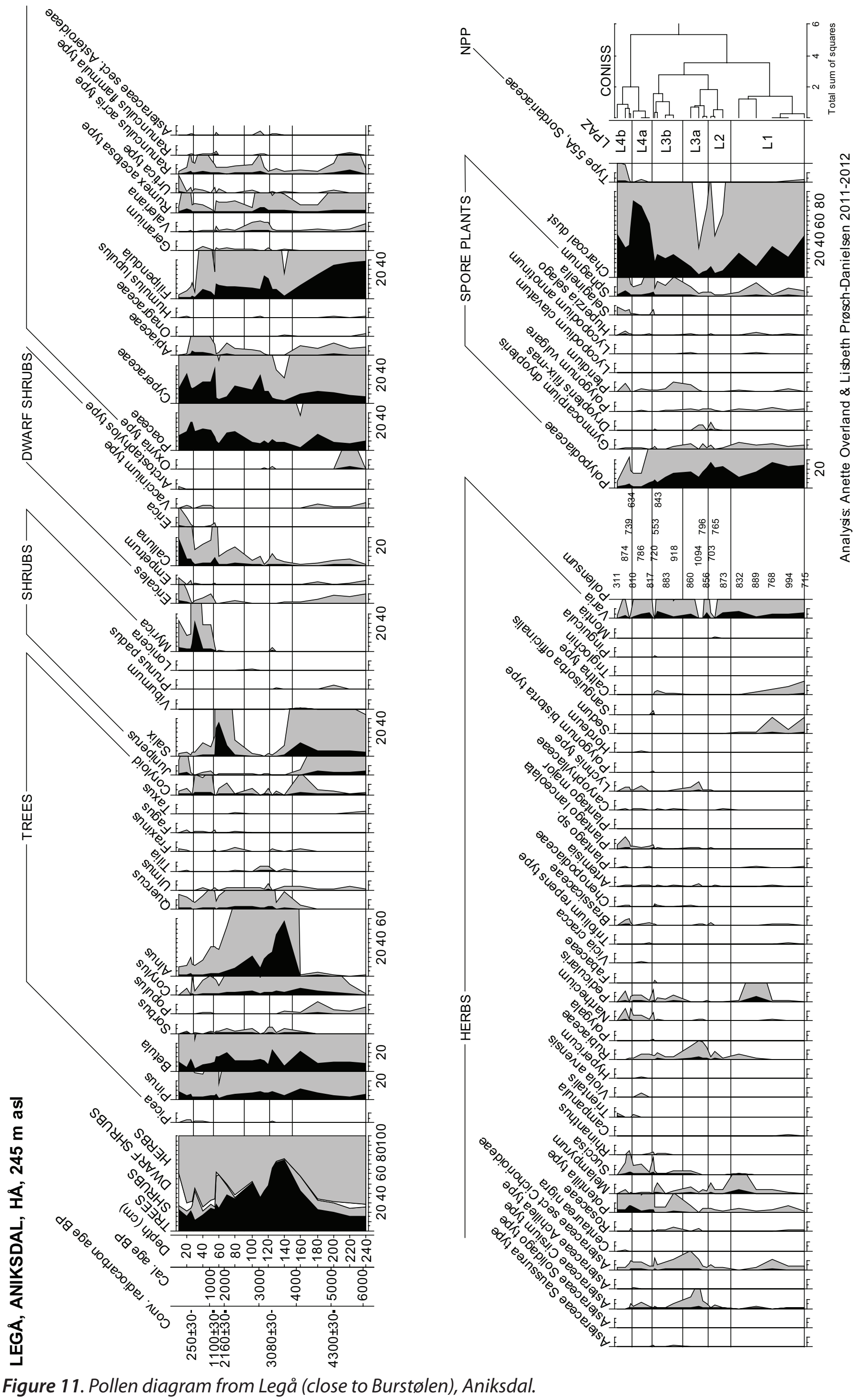

Figure 11*. Pollen diagram from Legå (close to Burstølen), Aniksdal.*

Discussion and conclusion

In the following, the shieling management strategy will be discussed from the two separate areas in Rogaland and then compared with the shieling practice in Iceland and Greenland.

Tengesdal-Lingvang watercourse (T-L W)

The earliest farms on the west side of the mountainous massif were settled at the transition between the Late Bronze Age and the Pre-Roman Iron Age, c. 500 BC. This early influence is recorded in all pollen diagrams in the T-L W shieling zone (Breidastølen, Holmane, Kyrkjestølen, Kvannvatn, Finnabu) c. 500 BC, by continuous curves for *Plantago lanceolata* and a rise in microscopic charcoal (Prøsch-Danielsen 1990). This corresponds fairly well with other western Norwegian outfield studies (Kvamme *et al.* 1992, Moe 1996, Stene 2015). It coincides with the development of the rigid infield-outfield agrarian system, with an increased need to obtain manure for the permanent fields and enough fodder to overwinter livestock. To solve these problems, outfields were used for summer pastures.

Initial expansions in western Norwegian shieling zones are often followed by new expansions in the first century AD (Magnus 1986, Kvamme 1988, Moe 1996, Skrede 2005, Hope 2016). This is only recorded in our study area in the pollen diagram from the Holmane shieling by records of pollen taxa associated with grassland followed by an increase in microscopic charcoal and coprophilous fungi spores and is dated to 1490 ±30 BP (AD 436-644), the Migration Period. It is suggested that Holmane had served as a summer farm from this time.

The main expansion seems to occur in the Viking Age/Early Medieval Period and is called the 'Indre Landnåm'/ '*Inner Colonization*' (Pedersen 1982, Høgestøl and Prøsch-Danielsen 1986, Loftsgarden 2017). The farms in our study facing Hylsfjorden were settled in this period.

The '*Inner Colonization*' is expressed in the T-L W shieling zone as diagnostic stray finds of a whetstone and ceramics, and by an increase in pastoral pollen indicators, grass (Poaceae) and pollen taxa indicative of meadows, like *Plantago lanceolata*, *Rumex acetosa*-type, *Ranunculus acris*-type and Asteraceae sect. Cichorioidea (Hjelle 1999). This rise, recorded in the pollen diagrams from Holmane and Breidastølen, may represent the start of mowing at the shielings. The finds of clearance cairns at several of the shielings in the T-L W also imply that the curtilage was cleared of stones to allow grazing and hay production. Of interest here is the fact that, in Icelandic, the noun *breiða* may be related either to something that is distributed widely, or to fertile meadows that were ideal for mowing sedge or hay, and that the farm Breiðabólstaðr was the first farm settled in the Reykholt valley due to its attractive fertile plains (Þorláksson 2011, pp. 213-214).

This period was, climatically, the most favourable epoch of the Middle Ages in the fjord district, and was followed by a period of climatic decline (Selsing *et al.* 1991). Single pollen grains of cereals are recorded in the pollen diagrams from the studied shielings. In the shieling zone at Hamrabø, further east, there are also finds of clearance cairns and cereal pollen combined with a high content of microscopic charcoal, but these have been interpreted as a permanent settlement within the time period AD 980-1050 (Selsing *et al.* 1991). Nevertheless, the presence of cereal pollen in the T-L W indicates a close contact between the lowland farms and the uplands, and probably represent the earliest use of shielings in a more permanent multi-altitude system.

The Black Death (starting AD 1350) caused a population decline in the inner part of Ryfylke that took about 200 years to recover from, and farms and shielings were abandoned (Pedersen 1982). This hiatus is not immediately obvious in the pollen diagrams, but level 35 cm (LPAZ H4a) at Holmane might point in that direction. This could probably have been clarified by counting several spectra around this level.

A new expansion occurs in the Post-Medieval Period when the population growth increases to the same level as before the Black Death. In the pollen diagrams this period is recorded in LPAZ H4b from Holmane (estimated from AD 1600 to AD 1850) and in LPAZ B6b from Breidastølen. In both pollen diagrams there are pronounced records of pollen taxa representing both grazed areas and meadow plants associated with haymaking.

The greatest population growth occurred during the first half of the 19th century, which peaked and then began decreasing just before AD 1900 (Pedersen 1982, p. 19). According to written sources, the changes in population are mirrored in the exploitation of outfield resources, and the re-use of shielings arrived relatively late in Ryfylke, from c. AD 1760s (Pedersen 1982, p. 72). The most intensive period of use is in the time interval between AD 1800 and AD 1850. After AD 1850, all farms had access to one or several summer farms (Pedersen 1982, p. 34).

The distance from the 'home' farm to the shieling(s) was not great, but the steep fjord landscape (up to 650 m in height) made it impossible to transport the milk home every day, so dairy products were processed at the shieling and brought home later. This is particularly clear in the goat breeding period from AD 1920-30, where several of the shielings had separate houses for milk processing and storage, as well as pools for cooling. These shielings are all situated in subalpine birch forest with access to fuel. In the late 19th century, farmers focused on meat production to minimize the need for milking, as the inner part of Ryfylke was far from the market for dairy products (Pedersen 1982, p. 78). This reorganization of work may be recorded in LPAZ H4c from Holmane, which shows a peak in coprophilous fungi spores in the upper part of the pollen diagram and a drop in pollen taxa associated with meadow plants and haymaking.

Winter fodder was necessary for breeding livestock, and farmers steadily expanded upwards to meet this need. Nearly every small patch of mire, grassland or meadow was mown. Some of the shielings that are situated in the lower subalpine birch forest may have been used in springtime for haymaking as a supplement to the main shieling, e.g., Litlestølen and Hedlestølen for Tengesdalsstølen (Jacobsen and Hoel 1984). The capacity of the infields at the permanent farm was limited, and the farmers compensated by utilizing the most remote areas in the valley system throughout the summer season in a rotation system, e.g., at Selland, which had as many as eight summer shielings. Hayfields were mown each second or third year. A corresponding rotation system with multiple shielings has also been recorded in the Hamrabø shieling zone further to the east (Hoel and Jacobsen 1983).

In the Viking/Medieval Period the shieling zone was owned jointly, as described in the Gulating Law (c. AD 1100) and Magnus Lagabøte's Law (AD 1274). Ownership of the shielings was gained through continuous occupation over a certain period and was geographically framed by the natural watercouses, rivers, lakes, and mountains. It is unknown when private ownership became a reality in the T-L W, but ownership of shielings is reported from other western

Norwegian upland sites from the mid-19th century (Potthoff 2005, p. 81). The fencing-in of separate 'properties' seems to be a relatively new phenomenon. However, curtilages and hay meadows were sectioned off with fences to prevent the livestock from gaining access to the winter fodder, and most haystacks were fenced in. The stacked and dried hay was brought home during winter on sledges.

In the T-L W, the shielings were primarily used for haymaking, with dairying as a secondary practice. The use of shielings for haymaking has roots in the transition between the Viking Age and the Early Medieval Period. Haystack enclosures and single haystack poles primarily coincide with the curtilages and fenced-in areas. This leads us to believe that stacking is a relatively new phenomenon in the T-L W, probably postdating AD 1600-1760.

Høg-Jæren Plateau (H-J P)

Høg-Jæren held a central position for coastal people who utilized resources seasonally beginning in the Mesolithic (Bang-Andersen 1979). Transhumance is seen already by 2500 BC, with increases in activity at c. 1300 BC and c. 200 BC. This is c. 1000 years earlier than is recorded at the T-L W. The landscape was steadily transformed to a heath- and grassland by intentional fire management, where tree and shrub cover was reduced to 20 % around the turn of the first millennium, and 10 % by the transition between the Viking Age and Early Medieval Period (Prøsch-Danielsen *et al.* 2020).

A pollen diagram from the infield area Foren in Aniksdal shows that the 'home' farm in the valley floor was established in the Early Bronze Age, 3050 ±30 BP (1401-1226 BC) (Prøsch-Danielsen *et al.* 2020). This corresponds with the earliest records of pollen taxa associated with grassland and with an increase in microscopic charcoal at the Legå site in Aniksdal. This confirms that the first farmers in Aniksdal also used the outfields in Engjane for grassland (Prøsch-Danielsen *et al.* 2020).

The use of shielings can be dated to c. AD 1, with subsequent use at the transition between the Viking Age and Early Medieval period, and in the period AD 1600-1700. At the H-J P, the three shielings do not overlap in time and thus do not occur in a multiple-altitude system as in the T-L W.

The oldest shieling at Rinden is complex, with several structures probably used over several periods, with a clearance cairn dated to c. AD 100 as the starting point (Table 2b). This coincides with the farm complex Kvednabråde further down the valley system and with the development of the rigid infield-outfield system mentioned earlier. The groups of clearance cairns at Rinden show that the marginal moraine was cleared of stones to improve grassland/meadows and to increase outfield pastures. Rinden may, therefore, represent the earliest shieling zone used by the farmers in the Aniksdal valley in the yearly transhumance cycle. The building at Rinden may have served as a milking shed, hay storage or as a shed for the livestock, with a base at the 'home' farm 3-4 km downslope. This may also be the case for the building's youngest phase, which had an additional room upslope (Prøsch-Danielsen *et al.* 2020).

The three earthwork animal pens at Rinden belong to a period with extensive use of shepherds, probably younger than Roman Iron Age. Similar earthworks or sheepfolds are encountered in Iceland (Bruun 1928), in the Faroe Islands (Arge 2005, p. 70) as well as in Eastern Greenland.

However, in Greenland, the Norse ruins are interpreted as sheep and/or goat pens that served to round up free-roaming animals (Madsen 2019, pp. 136-137). At the H-J P these animal pens have also been used for shearing wool, a tradition that was maintained up to the Second World War at Ualand, the farm next to Aniksdal (Agnes Ualand, pers. comm.). The four-post buildings (*tjelm*) at Rinden most likely post-dates the Pre-Roman Iron Age.

The Burstølen shieling is dated to the Viking Age/Early Medieval Period and may be considered as a home-shieling closely intertwined with the farm complex at Rindarhagen (250 m asl) and with the animal pen in-between. Milk could be processed at the farm, using peat for fuel in this heath- and grassland area. At Rindarhagen, all criteria for a year-round occupation are present (Myhre 1978, p. 258): arable land, livestock and probable hunting/fishing near Storamos. So, Rindarhagen represents an independent production unit on the margins of a larger agrarian system (see discussion in Lillehammer 2007, p. 167, model 3), dated to the Medieval Period. Several smaller buildings close to known pathways suggest increased activity in the Medieval Period (Prøsch-Danielsen and Fyllingsnes 2013).

The building at Burstølen has probably been used as storage, either for food or for hay. The utilization of meadows for haymaking in the outfield is documented continuously in the pollen diagram from Legå in LPAZ L4a, covering the time period between 1100 ±30 (AD 889-1013) and 250 ±30 BP (AD 1521-1800), even after the nearby Rindarhagen farm was abandoned (before AD 1520). At this stage, the grassland was included in the common land again.

The youngest shieling at Stølabekk-knuden is a home-shieling, closely intertwined with the farm holdings at Aniksdal just two km distant. It is dated to the Post-Medieval Period but was probably only in use in the Early Modern Period (1600s or 1700s), as its use is out of living memory. Milk could be brought back home every day for further processing. The fact that Stølabekk-knuden is situated close to the favourable grass and meadows Gimrahodl, Finnarvodl, Sædhodl and Teigdugane, illustrates that there was a focus on haymaking in the daily work at the shieling. This is also verified by finds of enclosed haystacks nearby. As opposed to the T-L W, the studied curtilages, grassland and hay meadows were not fenced in. This implies that outfields were common land and is an argument for occupation of the shieling at Stølabekk-knuden prior to AD 1860-1890, when the outfield areas were regulated.

Access to winter fodder was never a concern. Aniksdal had several advantages: a gentle gradient from the lowlands to the upper plateau, trackways on natural features that facilitated transport by horse (documented from AD 1723), and a varied and patchy vegetation with grasses and meadows, mires and heathland covering c. 80-90 % of the valley floor. When burnt, heathland could be grazed throughout the year in this snow poor part of the country. These advantages created a surplus. The farmers at the coast were welcomed to rent hay meadows and strips for peat-cutting in the Engjane outfields at least from AD 1667.

Stacking of hay by using single-pole haystacks or four-post building (tjelm) was practiced up to 1970 in the uplands east of the H-J P (Figure 10, Øyri 2000, p. 33). One interviewer remembered a haystack set up in AD 1935. The fact that the haystacks are constructed without a protective enclosure most likely indicates that these forms of hay storage are from a period of renewed transhumance and controlled herding, also seen in a series of shepherd huts in the upper part of the Engjane outfields. Charcoal layers from firepits in the ruined huts date this herding to the Post-Medieval Period (AD 1660-1920), a period of population recovery after the Black Death, when the use of outfield resources once again became essential for the farmers' survival. It seems that stacking using single-pole haystacks and four-post buildings (*tjelm*) is a post-Medieval phenomenon. On the other hand, five examples of enclosed haystacks are situated within the infield area, close to an old fence system at the border between Bumarka and Engjane. This fence system might have roots in the Iron Age/Medieval Period, separating the farmland within the fence (*innan garðs*) from the outfields (*utan garðs*) (Øye 2005, pp. 10-11). These haystacks could represent a period without herding going back to the Viking Age/Early Medieval Period.

These types of haystacks must not be mixed up with the earthen enclosures called *alvedanser* recorded at the low-lying parts of Jæren (Lillehammer and Prøsch-Danielsen 2001, Prøsch-Danielsen 2001, Lillehammer 2004). *Alvedanser* comprise an enclosure and a ditch and served as bases for haystacks, dating at the earliest to AD 410-450 and AD 670-900 (Lillehammer 2007, p. 168). These two traditions meet at the Høg-Jæren escarpment, though with a time lag of c. 600-700 years.

The two shieling zones investigated here differ in many ways: altitude, access from the 'home' farm, human impact and forest clearance, and the utilization of grass pastures and hay meadow resources in the outfield over time. One common characteristic is that the 'home' farms had low infield capacity, but large outfield resources. In addition, fodder and the use of shielings were key elements of the farmers' survival strategy at least from the Viking Age/Early Medieval Period, and perhaps already from the Pre-Roman Iron Age/Roman Iron Age transition at the H-J P, as seen by clearing of the Rinden shieling zone. The use of haystacks is mainly a post-Medieval phenomenon in both areas, but probably with roots in the Viking Age and Early Medieval Period in the Aniksdal valley. At Jæren, stacking of hay is built on years of traditions in the use of *alvedanser*.

Does a practice of haymaking shielings have parallels in Iceland and Greenland?

The Norwegian three-partition shieling model by Reinton (1955) has been included in studies from Iceland and Eastern Greenland (Albrethsen and Keller 1986, Sveinbjarnardóttir 1991, p. 91, Ledger *et al.* 2013), but Sveinbjarnardóttir pointed out that this rigid model did not fit into the Icelandic system. The Norwegian model made in the 1950s is probably based on shieling practices in the post-Medieval Period from AD 1600-1850. According to Sandnes (1991, pp. 219-220), 'this is also the period when 'Real', or ethnographical shielings, in the historical known sense, are established'.

The use of shielings was practiced from the onset of the Landnám period, AD 872, in Iceland. This is documented in many studies (e.g. Sveinbjarnardóttir 1991, Lucas 2008, Brown *et al.* 2012). According to Thompson and Simpson (2007, p. 152), 'the Icelandic agricultural system of sedentary pastoralism remained virtually unchanged through much of the Icelandic history'. In the 19th century the shieling system was slowly dying out (Vésteinsson pers. comm.).

The Norse met a new set of challenges related to their subarctic location, with a harsh climate and sparse or no tree cover. They occupied the valley floor grassland in the coastal areas, which provided rich pastures in springtime and sufficient fodder to overwinter the stalled animals later in the season. In addition, the farmers had ready access to marine resources (Byock *et al.* 2005, p. 204). The resources in the infield were relieved by using the shieling zone or the common highland (*afréttur*) for livestock grazing in the summer season.

The use of shielings as part of a decentralized farming economy is also confirmed in the Icelandic sagas, the Grágás lawbook (AD 930-1262/4) and in the Icelandic Jónsbók lawbook of AD 1281, where the word *sel* (Icelandic for shieling) is mentioned as a grazing field. Also, the periodic use of the shielings is highly regulated (Jónsbók, 172), as well as the use of *engi* (meadows) (Hastrup 1989). However, stacking is not mentioned. *Heimavvinnu* (housework) and *heyvinnu* (hay-work) are first mentioned as part of the maid's daily work in the household law of the 17th century (Hastrup 1989). Folds or animal pens are found at several of the Viking Age to Medieval Period shielings studied, but no haystack bases or haystack enclosures are reported. In only one shieling study, from Pálstóftir (starting point, AD 950 ±2) in Eastern Iceland, has decomposed hay/grass been identified in a small storage cell tied to the living quarter (Lucas 2008). Together with the find of an animal pen, this illustrates traditional shieling practices.

According to Orri Vésteinsson (pers. comm., Dec. 2020),

> *Haymaking was not an integral part of the shieling system as we know it from ethnographic accounts. The pastures around the shielings were so heavily grazed that there would not be much grass left to be mown. A large number of haystacks, especially in northern Iceland, are found in the outfield close to where the hay was mowed for easier transport during the winter. Hence, the location of the haystacks is dictated by the logistics of transport from meadow to farm and any connection to shielings would be incidental. Even if haymaking was a part of the shieling function, the haystacks providing evidence for this practice would unlikely be found on the shieling site itself.*

In Greenland the Norse settlement is dated to c. AD 985 and a practice with shieling activity is recorded shortly after at AD 1050-1150 in the southern part (Ledger *et al.* 2013). In the first phases at the 'Mountain Farm' Vatnahverfi, the plant communities seem to have been burnt to create grassland and good pastures. The palynological signature with high values of Poaceae, a rise in microscopic charcoal and coprophilous fungal spores is used as evidences for a full shieling. In the time interval between AD 1225-1325 the management was intensified to create hayfields (Ledger *et al.* 2013, pp. 815-816). Here Ledger *et al.* (2013, p. 819) use the presence of high values of Poaceae and *Ranunculus acris*-type pollen as the palynological signatures for haymaking. The authors, however, do not go to the step of calling this a haymaking shieling. Their assumption is that hay production reflects the spread of settlement from the lowland valley into the mountain, or reflects a full farm when population pressure increased (Ledger *et al.* 2013, pp. 819-820). Albrethsen and Keller (1986, pp. 96-101), on the other hand, classify several ruins belonging to the 'Eastern settlement' in Greenland as haymaking shielings. Their criterion is that the ruin group should consist of one or more barns placed on terrain where access is difficult and/or in places with good but limited grass areas. However, the archival material in this study is unclear. Currently, there is no archaeological evidence for hay stacking in Greenland.

The study from south and southwestern Greenland by Madsen (2019) distinguishes between two types of shielings: the marine shielings with a non-farming functionality focusing on marine resources, and the terrestrial shielings associated with agropastoral transhumance. Here the definition used for shieling is a seasonal, task-specific production or logistic site.

As seen from this study, there are local adaptations in shieling practices and in spatial organization within the Norwegian shielings and in the shielings across the North Atlantic region. Several models have been demonstrated, encompassing local environmental conditions, from lowland to highland transhumance in Norway to a more horizontal transhumance along fjord coasts in Greenland. There is no doubt that haymaking was practiced in the shieling zones throughout the North Atlantic region, as hay (winter fodder) was essential for the survival of the livestock, but of course there seems to be a delay westward in the North Atlantic due to the arrival of the Norse settlers first in the Viking Age/Medieval Period. Currently, the storing of hay in the shieling zone is only recorded from Norway and Iceland.

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Dawn Elise Mooney, Élie Pinta and Lísabet Guðmundsdóttir

Wood resource exploitation in the Norse North Atlantic: a review of recent research and future directions

The North Atlantic islands have always been relatively wood-poor. Nonetheless, from the Viking Age they were home to Norse settlers who in their homelands relied significantly on wood resources for the production of a huge variety of objects from cooking utensils to ships. The story of how these settlers adapted their craft processes and exploitation strategies to the limited wood resources available on these islands has only in the last decade begun to be explored in detail through the examination of archaeological remains. Assemblages of wooden artefacts, woodworking debris, charcoal and mineralised wood have been examined from across the region, with a view to understanding patterns of both wood exploitation and woodland management. In the absence of significant forest areas with large trees suitable for construction and boatbuilding, driftwood became an extremely important source of timber. However, several of the wood species which arrive as driftwood also could have been imported to the islands, and as yet there is no reliable method for conclusively identifying archaeological wood remains as driftwood. This paper presents a review of recent research in wood resource exploitation in Iceland and Greenland, along with possibilities and potential pitfalls in future research.

Introduction

Wood was by far the most common craft and construction material in the Norse world: that is, late Iron Age and early Medieval Scandinavia. However, the North Atlantic islands (Iceland, Greenland and the Faroe Islands), which were colonised by the Norse in the 9th and 10th centuries AD, have always had a limited tree flora. In the course of these colonisation events, known as *landnám* after the Old Norse for 'land-take', the Norse settlers adapted their craft processes and exploitation strategies to these limited wood resources. During the last decade in particular, archaeologists have begun to explore these adaptations in detail, analysing uncharred, charred, and mineralised remains of wooden artefacts, timbers, fuel, and boat elements. This paper synthesises published and unpublished results from these investigations to explore the 'state of the art' of wood exploitation studies in the Norse North Atlantic (from the colonisation of Iceland to the abandonment of the Norse colonies in Greenland, c. AD 870-1500). The paper concludes by presenting current challenges and potential future directions in this field.

Historical background

During this period there was significant social and political change in Scandinavia and the North Atlantic region, which influenced trade and availability of imported goods, including timber. The 9th-10th centuries AD saw the Viking colonisation of the Faroe Islands (where there had been earlier settlements [Church *et al.* 2013]), Iceland (Schmid *et al.* 2018, Vésteinsson 2000a), and Greenland (ÍF IV 1985, Arneborg 2004, 2008). All were independent states, but came under the rule of the Norwegian crown by the mid-13th century AD (Arneborg 2008, Roesdahl 1987). In Iceland, these changing political allegiances had economic impacts: union with Norway opened greater possibilities for trade, especially of stockfish and woollen cloth, which were traded with English and Hanseatic merchants in the later Medieval period (Barrett 2016, Vésteinsson 2016, Perdikaris and McGovern 2009, Hayeur Smith 2018). Another key influence was religious change: Iceland officially converted to Christianity in AD 1000 (Vésteinsson 2000b). The import of wood from Norway specifically for church construction appears as a recurring motif in the Icelandic sagas, although is this not necessarily supported by the archaeological material (Mooney 2013, Guðmundsdóttir 2013a).

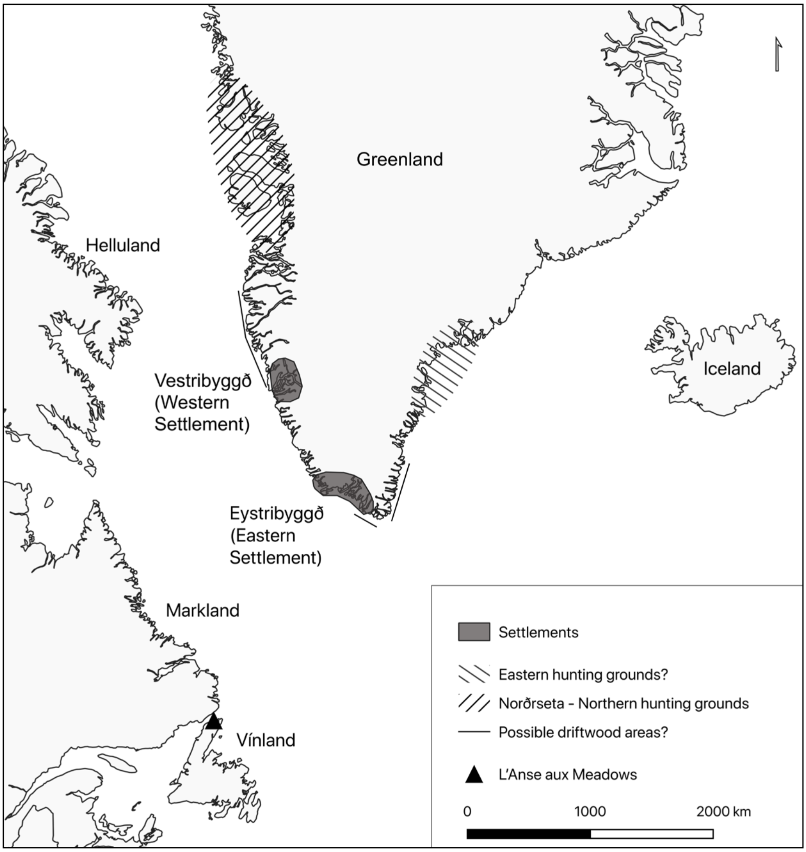

Figure 1. Map showing the locations of Norse settlements and resource regions in Greenland and North America. By Lísabet Guðmundsdóttir.

Norse settlements in Greenland were concentrated in two areas, the *Eystribyggð* and the *Vestribyggð* (Figure 1), with a maximum combined population of 2-3000 (Lynnerup 1998, Arneborg 2004, Madsen 2014). The settlements were likely motivated by the potential for economic exploitation of animals including walrus, polar bear and seal, especially in the óbyggðir, wilderness areas including Disko Bay and the southeastern coast (Seaver 1996, Arneborg 2004, Perdikaris and McGovern 2008, Keller 2010, Frei *et al*. 2015, Star *et al*. 2018, Madsen 2019). The trade of these resources with Europe was vital to the Norse Greenlandic economy (Arneborg 2008). The settlements declined and were ultimately abandoned – the Vestribyggð during the 14th century, and the Eystribyggð by AD 1450 (Arneborg *et al*. 2012).

Around AD 1000, the Greenland Norse voyaged along the North American coast, naming the regions they encountered *Helluland*, *Markland* and *Vínland* (Figure 1). A settlement was established at L'Anse aux Meadows (LAM) in Newfoundland (Ingstad 1977, Wallace 2005, 2009). These expeditions aimed to identify new resource regions, including sources of timber, and both sagas and contemporary medieval sources reference the transport of timber between Markland/Vínland and Greenland (ÍF IV 1985, Storm 1888). It has been argued that LAM was a short-lived, seasonal outpost for resource acquisition (Ljungqvist 2005, Wallace 2005). However, recent research indicates the site may have been used for significantly longer (Ledger *et al*. 2019).

Environmental background

The flora of these islands is limited by their northerly latitude and harsh climate (Olson *et al*. 2001). This is evident in the native woody taxa, many of which are low-growing shrubs rather than trees suitable for construction (Figure 2). One of the drivers of research into wood utilisation in these areas has been the contrast between the limited availability of wood, and the critical role played by wood in material culture in the rest of the Norse world (Ljungkvist 2008, p. 188). The Norse reliance on wood makes their successful colonisation of these windswept islands all the more intriguing.

This is of course not to say that there was no scarcity of wood in the Norse homelands. Although large parts of Norway remain thickly forested in modern times, large swathes of the country's outer coast were deforested during the late Neolithic and early Bronze Age (Hjelle *et al.* 2018). In southwestern Norway adaptations to wood scarcity mostly consisted of developing procurement strategies focusing on inland areas less amenable to agriculture, where forest cover persisted. However, on the coasts and islands of northern and arctic Norway there was a considerable amount of driftwood which has a long history of human exploitation (Alm 2019). The Norse settlers would have brought their experience from these environments, as well as from settlements on the tree-poor Western and Northern Isles of Scotland, to the islands of the North Atlantic.

The Norse *landnám* had an enormous impact on native woodlands across the North Atlantic. Low temperatures and short growing seasons mean that woodlands are slow to recover, and Iceland in particular is often given as an example of human impact on a 'pristine' environment (e.g. Smith 1995, Buckland *et al.* 1991). Unlike Greenland and the Faroes, Iceland had never had a significant human population before *landnám*, and also had no native grazing animals. Woodland cover in Iceland has declined from 25-40% before *landnám* to around 1% in the present day (Jónsson 2005, Dugmore *et al.* 2014, Eysteinsson 2017, Erlendsson and

Edwards 2010). The original extent of woodland in Greenland and the Faroes is less well understood, and more research is needed to understand the environmental impacts of the Norse settlements.

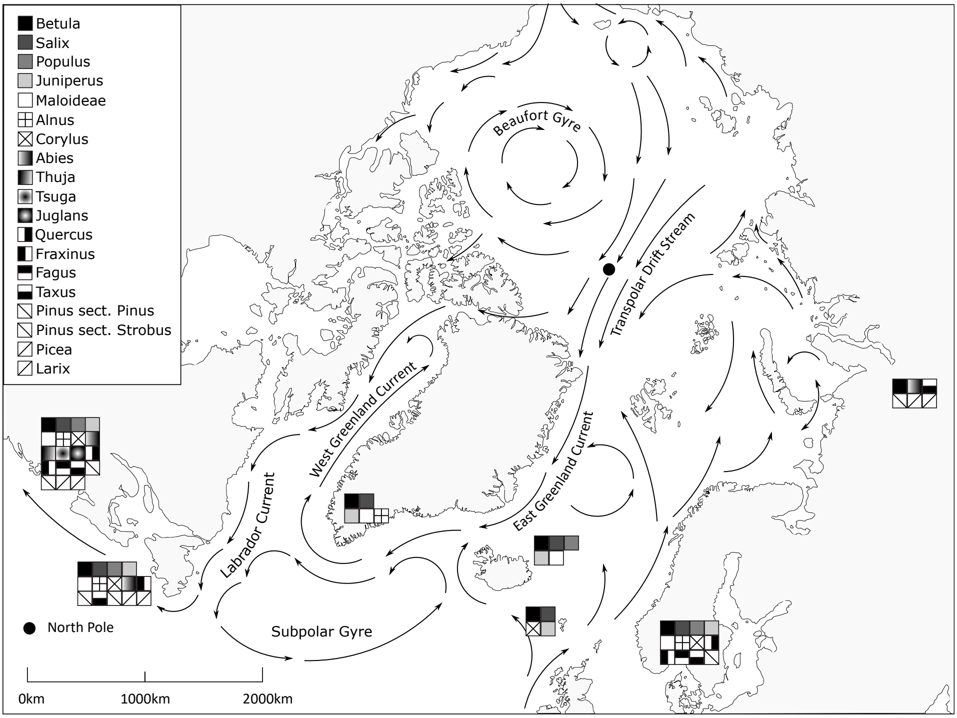

***Figure 2**. Map showing ocean currents affecting the circulation of driftwood in the Arctic and North Atlantic, and the regions in which wood taxa mentioned in the text are native. The taxa listed do not represent a comprehensive list of the tree flora of all regions, nor do they necessarily indicate the presence of any one taxon at the precise location indicated. By Dawn Elise Mooney.*

Woodland decline is generally attributed to the activities of the settlers. They burnt wood as fuel, cleared areas for hayfields, grazed livestock in the woodlands, and collected birch twigs for winter fodder. Deforestation led to widespread soil erosion in Iceland (Dugmore *et al.* 2009, 2014) and Greenland (Massa *et al.* 2012, Schofield *et al.* 2008, 2010, Edwards *et al.* 2008, Ledger *et al.* 2017, Gauthier *et al.* 2010, Bichet *et al.* 2014). Palynological research from southwest Iceland (Hallsdóttir 1987, Hallsdóttir and Caseldine 2005), suggests that most deforestation occurred within 100-150 years (Hallsdóttir 1996). However, later investigations indicate that the speed of woodland decline varied significantly across Iceland, and that areas of woodland survived into the 18th century (Lawson *et al.* 2007, Erlendsson and Edwards 2010). Studies from Greenland are even more divided about the environmental impacts of *landnám*. Most studies from the Eystribyggð suggest woodland clearance occurred very rapidly (Fredskild 1988, Edwards *et al.* 2011, Ledger *et al.* 2014), but some show the opposite trend (Schofield and Edwards 2011, Bichet *et al.* 2014). In the Vestribyggð, the Norse footprint is barely visible beyond the farmstead and its homefield (Schofield *et al.* 2019). At LAM, paleoenvironmental analyses indicate no significant vegetation change following the arrival of the Norse (Henningsmoen 1977, Davis *et al.* 1988).

The native woodlands were not the only source of wood available – ocean currents transport large quantities of driftwood to certain North Atlantic beaches (Figure 2). This wood originates in Siberia and North America, where trees growing on river banks are washed out by erosion and carried out to sea (Eggertsson 1993, Alix 2005, Hellmann *et al*. 2013). Logging now contributes significantly to this system (Hellmann *et al.* 2016), but even at the time of *landnám* a considerable amount of driftwood was reaching Iceland (Kristjánsson 1980). The wood is mostly of conifer taxa, especially pine (*Pinus* sp.), larch (*Larix* sp.) and spruce (*Picea* sp.). This partly reflects the forest composition of source areas (Eggertsson 1993, Hellmann *et al.* 2013, 2017), but also that conifer wood is more buoyant than wood of broadleaf trees (Häggblom 1982) and can float long enough to be incorporated into the sea ice. In contrast to the native trees of the islands, driftwood logs are often long and straight, and were of key importance in construction.

Methods of wood analysis

Given these multiple potential sources of timber, determining the origin of wood remains is essential in understanding wood exploitation in the North Atlantic. The primary method employed is *taxonomic provenancing*. This method uses wood anatomical analysis to identify the taxon to which archaeological wood remains belong (Figure 3), and compares the results with palaeoenvironmental data to determine the potential provenance of the wood. This method is well-suited to environments with limited native taxa, and has been used in the Canadian Arctic (Laeyendecker 1993a, 1993b, Alix 2009a, 2009b, Steelandt *et al.* 2016), Alaska (Lepofsky *et al.* 2003, Alix 2012, Shaw 2012), and Patagonia (Caruso Fermé *et al.* 2015) as well as the North Atlantic. Here the method was pioneered by Claus Malmros (1990, 1994, Andersen and Malmros 1993) and has since been developed by various scholars (e.g. Grønnow 1996, Bishop *et al.* 2013, Christensen 2013, Mooney 2016b, Pinta 2018).

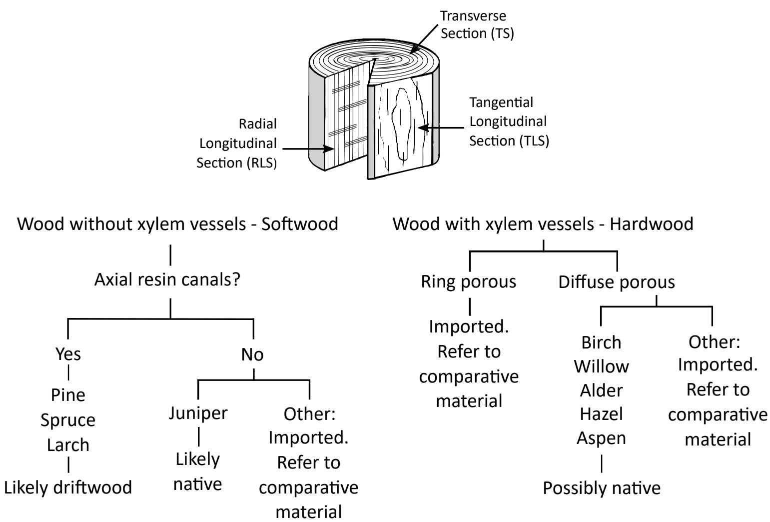

***Figure 3**. Diagram showing simplified process of taxonomic identification and preliminary provenancing in the North Atlantic. Taxonomic identifications should always be conducted through comparison with modern and/or published reference material. By Lísabet Guðmundsdóttir, after Mooney 2016a.*

Wood anatomical analysis is carried out by examining wood remains in three planes (Figure 3) at magnifications of up to 400x (Hather 2000). Taxonomic identifications are assigned by comparing suites of anatomical characteristics visible with published (e.g. Schweingruber 1990, Schoch *et al.* 2004, Hather 2000) and modern reference material.

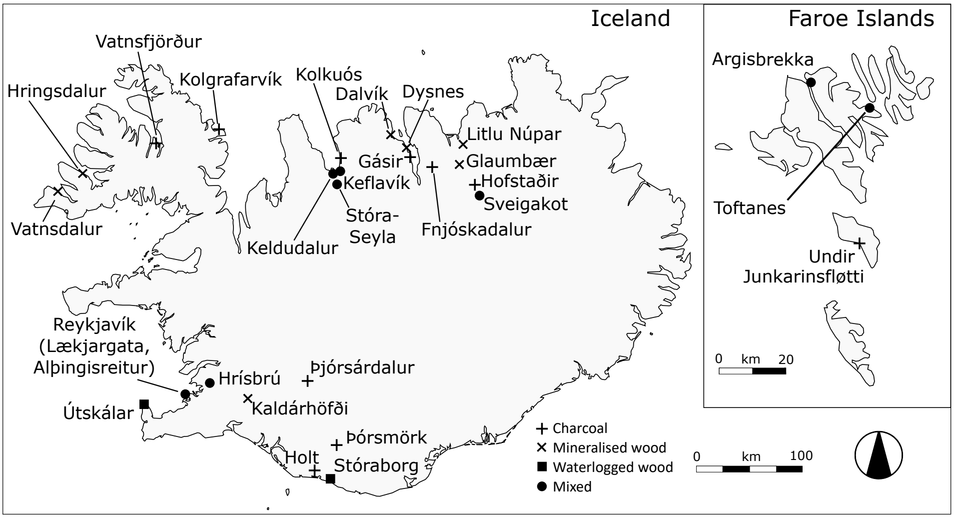

Figure 4. *Location of sites in Iceland and the Faroe Islands where analysis of archaeological wood remains has been conducted. Not all sites are mentioned in the text. By Dawn Elise Mooney.*

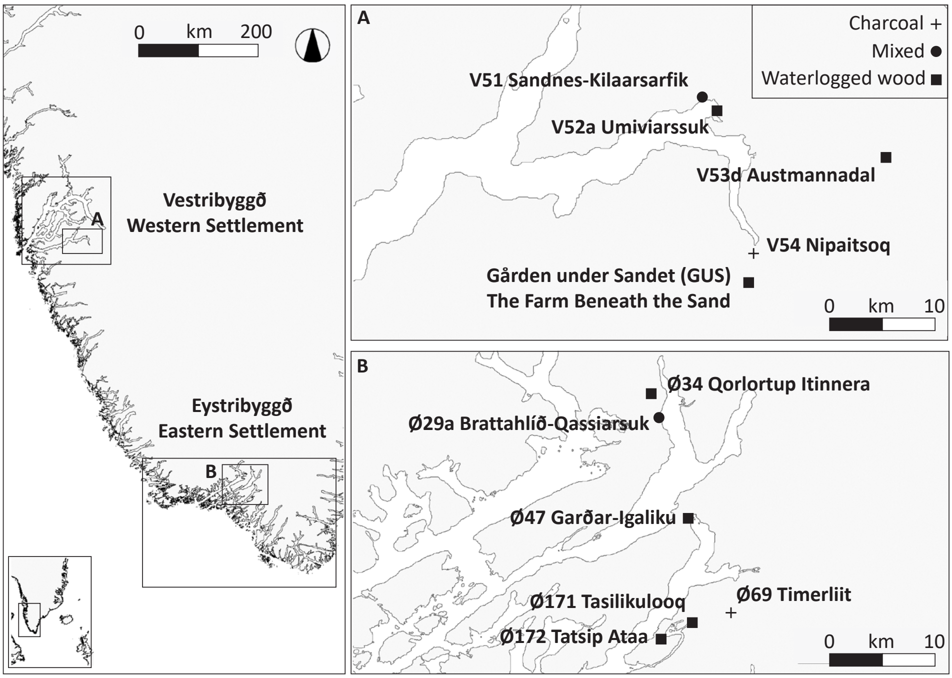

Figure 5. *Location of sites in Greenland mentioned in the text. By Élie Pinta.*

Not all wood species can be distinguished from one another on the basis of their microscopic anatomy – Iceland's nine native trees correspond to just four 'anatomical' groups. Spruce and larch cannot be identified beyond genus level, and can only be conclusively differentiated by the observation of pit borders in the ray tracheids (Bartholin 1979, Anagnost *et al.* 1994, Talon 1997). Such details are often hard to observe in archaeological material. Despite these limitations, taxonomic provenancing has illuminated patterns of wood use in the North Atlantic (e.g. Malmros 1994, Mooney 2016b, Pinta 2018) through the study of charred, uncharred, and mineralised wood. In order to achieve the most direct comparisons between sites and regions, studies of wood exploitation presented and discussed below are grouped by the preservation conditions of the remains analysed. The origins of the assemblages presented here are shown in Figures 4 and 5.

Charred wood remains

Wood charcoal is near ubiquitous on archaeological sites, due to its chemically inert nature, and provides information about local environment and choice of fuel. Assemblages can be easily compared across different environments and time periods. Charcoal studies in the North Atlantic can generally be divided into those which investigate wood fuel remains, and investigations into charcoal production, although the taxonomic identification of individual fragments for radiocarbon dating is also common.

Charcoal was of key importance in the North Atlantic. Charcoal burns at a high temperature and is used in metalworking, and was therefore essential in the maintenance of metal tools. The value of woodlands which could support charcoal production can be seen in their strategic acquisition by wealthy farms (Pálsson 2018). This may have been a key factor in the abandonment of lower-status farms in Iceland (Dugmore *et al.* 2007). Charcoal in Iceland was generally produced from birch (*Betula* sp.), the main component of the native forests. This can be seen in analyses from Þórsmörk and Þjórsárdalur in the south (Church *et al.* 2007, Dugmore *et al.* 2006, 2007) and Reykjavík and Hrísbrú in the southwest (Guðmundsdóttir 2010, 2012). In Fnjóskadalur, one of the oldest surviving forest areas in Iceland, studies have shown that birch alone was used to produce the vast amounts of charcoal required for large-scale iron production (Guðmundsdóttir 2014, 2016). It is often assumed that only birch was used for charcoal-making in Iceland (e.g. Bishop *et al*. 2018), as driftwood was more valuable for construction. However, charcoal pits are found adjacent to driftwood beaches in northwest Iceland (Lárusdóttir *et al.* 2003), and excavations at Kolgrafarvík have confirmed that driftwood was used in such pits (Mooney 2016d).

Of the trees native to Iceland, birch is by far the best fuel wood (Taylor 1981). At Vatnsfjörður, once one of the wealthiest farms in Iceland, almost all the charcoal from domestic and industrial contexts dated from the 9th-17th centuries AD is of birch (Mooney 2013). The same is true of the farm of Hofstaðir, where birch maintained a dominant presence in the local landscape (Lawson *et al.* 2007, 2009). Despite this, at nearby Sveigakot a decline in availability of birch wood precedes the abandonment of the site in the 13th century AD (Vésteinsson and McGovern 2012, Mooney 2013). Less efficient fuel woods like willow (*Salix* sp.) become more common, along with conifer taxa which may reflect the burning of artefacts or timbers. Birch dominates the assemblages from Keldudalur, Hrísbrú and Reykjavík (Guðmundsdóttir 2010, 2011, 2012), while elsewhere firewood varies between sites and over time. Birch is the main fuel at the trading site of Kolkuós until AD 1104, after which conifer taxa are more common. At another trading place at Gásir, a mix of native wood, imported wood and driftwood was used (Bishop 2016).

Relatively few charcoal studies have been conducted elsewhere in the North Atlantic. In Greenland, charcoal fragments deriving from domestic fuel at V51 and V54 in the Vestribyggð were primarily identified as willow, with occasional finds of conifers and oak (*Quercus* sp.) (McGovern *et al.* 1983, Fredskild and Humle 1991, Buckland *et al.* 1994). At Ø69 in the Eystribyggð, the charcoal assemblage was dominated by local taxa such as birch, alder (*Alnus* sp.) and willow. A few fragments of non-native conifer are interpreted as driftwood, imported wood or wood felled in North America (Bishop *et al*. 2013). Similar trends have been noted at Ø29a (Edvardsson *et al*. 2007). Preliminary studies at Ø47, Ø171 and Ø172 suggest that birch was preferred, supplemented by local willow and juniper (*Juniperus communis* L.).

Native taxa such as birch, juniper and heather (*Calluna* sp.) also dominate the few existing charcoal studies from the Faroes. Larch, spruce and pine in these studies are treated as driftwood, while oak is interpreted as imported (Church *et al.* 2005, Lawson *et al.* 2005, Vickers *et al.* 2005). It is thought that wood was used as domestic fuel and in ironworking (Malmros 1994), probably in combination with turf and peat. Juniper was also used in smoking meat and fish (Hansen 2013). At LAM, a study by Paulssen (1977) indicates a preference for native conifers such as larch, spruce and fir (*Abies* sp.), although birch, alder and heather were also noted.

Uncharred wood remains

Unlike charcoal, uncharred wood requires specific preservation conditions. In the North Atlantic, uncharred wood is only preserved in either waterlogged or highly compacted, anaerobic contexts, or in permafrost. Despite this, numerous studies have been conducted on uncharred wood from the North Atlantic islands. Some of these focus on a single class of artefact (e.g. Mehler and Eggertsson 2006, Pinta 2018), while others are more holistic. These show clear trends which contrast sharply with contemporary assemblages from Europe and southern Scandinavia (Figure 6). Studies of Icelandic artefacts have demonstrated a "North Atlantic island signature" (Mooney 2016b, 287), where conifer wood, most likely driftwood, is dominant. In Iceland and the Faroes conifer wood mostly seems to replace the broad category of 'other taxa', while oak remains a significant component of many assemblages (Figure 6), mostly due to the presence of imported stave-built vessels (Mooney 2016a, 2016b, Mehler & Eggertsson 2006). Some oak may also represent the reuse of boat elements (Mooney 2016b).

Remains of Viking Age structures in Iceland have shown that longhouses were constructed from both native birch and driftwood. For example, timbers from Sveigakot were identified as birch, while both birch and conifers (likely driftwood) were identified among structural timbers from Lækjargata and Hrísbrú. Analysis of timbers from Keldudalur suggests that both the byre and longhouse were constructed of birch (Guðmundsdóttir 2011). Birch seems to be common in construction until the 12th century AD, when it gives way to driftwood. Churches from the 11th-12th centuries AD were mainly constructed from conifer taxa while remains from internal components, such as panelling, were of birch (Guðmundsdóttir 2013a, 2014b).

The Faroes follow a similar trend: driftwood taxa dominate, supplemented by native wood and occasional imported taxa (Malmros 1990, 1994) – although there is some debate about the categorisation of taxa (Christensen 2013). Native juniper was used for the production of ropes and bindings for stave-built vessels (Larsen 1991, Hansen 2013).

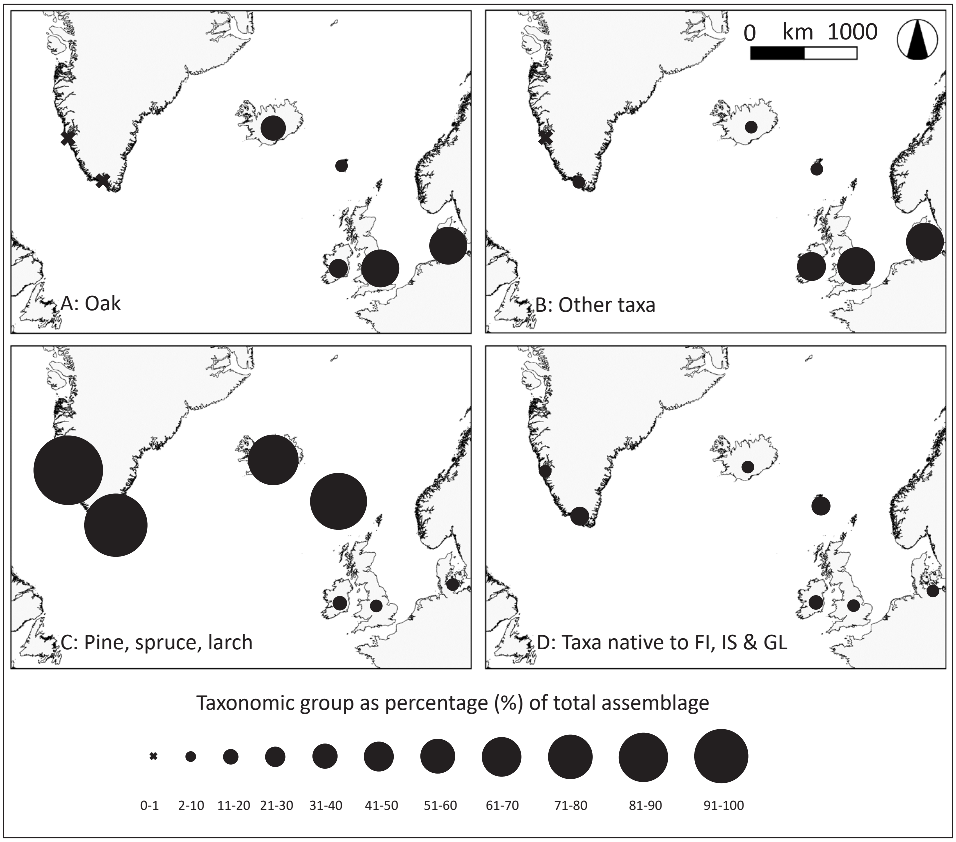

***Figure 6**. Proportions of different taxonomic groupings in medieval wooden artefact assemblages (total n=10413) from Iceland (n=829 [Mehler and Eggertsson 2006; Mooney 2013, 2016a]), Greenland Eystribyggð (n=1818 [Andersen and Malmros 1993, Pinta 2018, Guðmundsdóttir 2021]), Greenland Vestribyggð (n=628 [Andersen and Malmros 1993, Pinta 2018, Laeyendecker 1985]), the Faroe Islands (n=763 [Malmros 1994, pers. comm., Christensen 2013), the British Isles (n=1983 [Morris 2000, Comey 2010, Scannel 1988]) and southern Scandinavia (n=4408 [Sørensen et al. 2001, Christensen 1990, Westphal 2006, Bartholin 1978]). By Élie Pinta, after Mooney 2016a.*

Selected wooden remains from individual Norse Greenlandic sites have been described with precise measurements and illustrations (e.g. Roussell 1941, Arneborg 1998), sometimes as part of a broader analysis (Imer 2017), but never in a holistic way (although one such study is underway at the time of writing [Guðmundsdóttir 2021]). Only one published study focuses exclusively on wooden artefacts (Andersen and Malmros 1993), while an unpublished report from V51 examines a few miscellaneous remains (Laeyendecker 1985). Recently there has been renewed interest in the wooden material culture of the Greenland Norse. Pinta (2018) analysed containers ranging from drinking bowls to buckets and vats used in domestic and agropastoral activities from sites across the Eystribyggð (Ø34, Ø171, Ø172) and Vestribyggð (V51, V52a, V53d, GUS). This study describes a trend towards driftwood exploitation, as seen elsewhere (Malmros 1994, Mooney 2016a), but also fewer imported materials, especially oak (Figure 6).

***Figure 7**. Examples of wooden artefacts from Norse Greenlandic sites. A: Part of stave-built vessel base, spruce/larch, V52; B: Part of decorated object, spruce, Ø47; C: Broken carved horse figurine, larch, Ø47; D: Spindle, Scots pine, Ø47; E: Toggle, juniper, Ø47; F: Turned vessel, spruce/larch, V51; G: Part of stave-built vessel lid, Scots pine, Ø171; H: Part of handle stave with runic carving or owners mark, larch, Ø47; I: An unidentified object, larch, Ø47. Photographs by Élie Pinta and Lísabet Guðmundsdóttir, illustration by Dawn Elise Mooney.*

Studies from both the Eystribyggð and Vestribyggð also show a higher incidence of driftwood in artefact assemblages and woodworking debris. Greater taxonomic variation at Ø47 may indicate more frequent use of imported wood, possibly linked to its high socioeconomic status as the episcopal see. These recent studies from Greenland highlight differences between sites and between classes of artefacts, related to variations in wood availability as well as socioeconomic status and site type. Such variations emphasise the importance of combining provenience analysis with a technological approach (Pinta 2018, cf. Morris 2000, Comey 2010). This approach facilitates the exploration of craft techniques and the choices of the craftsperson in order to better understand the full extent of the *chaîne opératoire*, from the acquisition of the raw material to the finished object, its discard and its reuse (Roux 2019).

Although wood remains from LAM have been analysed, and the presence of butternut (*Juglans cinerea* L.) at the site is given as evidence for Norse voyages south (Wallace 2009), the reports are unpublished and difficult to access. A summary (Wallace 2005, p. 18) indicates that most of the woodworking debris is of local taxa, while a few artefacts of Scots pine must have been imported. Perem (1974) identifies local/drifted taxa such as spruce and fir (*Abies* sp.) along with potentially imported cedar (*Thuja* sp.) and hemlock (*Tsuga* sp.), but neither the artefact types nor their contexts are given in either source. The potential of wood technology in distinguishing indigenous and Norse artefacts at LAM has also been explored (Gleeson 1979).

Mineralised wood remains

The final category of wood remains commonly studied in the North Atlantic is mineralised wood. Mineralisation occurs when minerals in solution in the soil precipitate onto parts of wooden objects (Keepax 1975, Haneca *et al.* 2012). Although the visibility of diagnostic features in mineralised wood is variable, these remains can still be useful in exploring wood use in poor preservation conditions. This method has often been used in studies of boat construction (e.g. Crumlin-Pedersen 1997, Owen and Dalland 1999, Konsa *et al*. 2009, Schanche 1991). The only comprehensive studies of mineralised wood in the North Atlantic are on Icelandic material.

A study of mineralised wood from boat burials in Iceland (Mooney 2016c) showed significant variation. Some produced only oak remains, some only conifer wood. Others contained a mix of these two categories, while birch was also identified at one site. These findings compare well to Scandinavian clinker-built boats built mainly of oak and/or conifer wood but opportunistically repaired with other materials. A higher incidence of conifer wood in the Icelandic examples suggests the use of driftwood (Mooney 2016c). This is backed up by boat graves at Dysnes, where one boat was built entirely of larch (almost certainly driftwood) while the other was built from pine but repaired with larch (Gestsdóttir *et al*. 2017).

Mineralised remains of other artefacts at Dysnes included a wooden chest of birch, knife handles of birch and oak, and a shield constructed from several wood taxa including Scots pine (*Pinus sylvestris* L.) and wood of the apple (Maloideae) group (Gestsdóttir *et al.* 2017). Mineralised wood remains from 11th century church sites suggest that while coffins were mostly of driftwood, oak and birch were also present (Guðmundsdóttir 2013a). Research on coffin remains has also revealed the reuse of boat timber, mostly oak and Scots pine (Guðmundsdóttir 2013b, 2019).

Problems and future directions

While the studies discussed above have identified clear trends in wood exploitation, due to the wide distribution of many taxa and difficulties in their identification there is an overlap in the North Atlantic between drifted and imported taxa (Mooney 2017). For example, Scots pine

(*Pinus sylvestris* L.) could arrive in the Norse North Atlantic settlements as driftwood, or as an import from Europe. It is furthermore indistinguishable from species within the botanical group *Pinus* sect. *Pinus* native to North America and Europe. Taxa within *Pinus* sect. *Strobus*, found in both Siberia and North America, are also identical in terms of microscopic anatomy. Lastly, even when spruce and larch can be distinguished from one another in archaeological material (e.g. Malmros 1990, 1994, Pinta 2018, Mooney 2016b), several species of both genera are present across all potential timber source areas (Figure 2).

For these reasons, along with the fact that human influence on wood availability cannot be disregarded, we advise researchers to be wary when discussing wood provenancing based solely on taxonomic identification. We also recommend greater transparency when disseminating the results of taxonomic identifications, to limit over-interpretation. Where identifications have been made of genera or species which can be challenging to distinguish from one another, ideally the reasoning for making these identifications should also be reported. Furthermore, Christensen (2013) has advised caution in comparing assemblages comprising different artefact classes, noting that the contribution of native and imported wood in the Faroes may have been underestimated due to the nature of the studied corpus. We reiterate here that this concern should be considered across the North Atlantic.

Researchers have attempted to identify archaeological wood remains as driftwood using chemical analysis. However, results indicate that the soluble compounds which give driftwood its ‘marine’ chemical signature are leached after deposition, and the ‘bulk’ chemical signature of archaeological wood is more closely related to the depositional environment (Caruso Fermé *et al.* 2015, Steelandt *et al.* 2016, Mooney 2017). These studies recommend other directions in provenancing driftwood, especially isotope analysis.

Although analyses of hydrogen (δ^2H), oxygen ($\delta^{18}O$), and strontium ($^{87}Sr/^{86}Sr$) isotopes have been used to map the past movement of people and animals (Price *et al.* 2012 and references therein), few such studies have examined archaeological wood. $^{87}Sr/^{86}Sr$ has been used to provenance construction timbers (English *et al.* 2001, Reynolds *et al.* 2005) and shipwrecks (Rich *et al.* 2016, Hajj *et al.* 2017). These studies highlight several issues, particularly the modification of the chemical signature of timbers in marine environments (Rich *et al.* 2012, Hajj *et al.* 2017). Hajj *et al.* (2017) demonstrate that mass-dependent fractionation of Sr isotopes ($\delta^{88/86}Sr$) can distinguish between marine Sr vs. Sr from carbonate rocks. They suggest targeting lignin molecules, and developing procedures for removing diagenetic Sr. Overlapping biogeochemical profiles between regions may also limit the identification of source areas (Drake *et al.* 2014).

A recent study in this field addresses the role of remote resource regions in the procurement of timber for the Norse Greenlandic settlements (Pinta *et al.* 2021). This work uses biogeochemical analysis of stable hydrogen (δ^2H), stable oxygen ($\delta^{18}O$), and radiogenic strontium ($^{87}Sr/^{86}Sr$) isotopes in soil, water, and modern plant samples from south Greenland and northeastern Canada to characterize expected local isotopic baselines. Similar $^{87}Sr/^{86}Sr$ values shared by sites in Greenland and Newfoundland are probably in part due to sea spray in coastal zones as well as rainfall derived from seawater (cf. Veizer 1989, Evans *et al.* 2010, Alonzi *et al.* 2020). A pilot study of archaeological wood samples obtained at Ø171, Greenland was conducted to test the effectiveness of the $^{87}Sr/^{86}Sr$ biogeochemical baseline. Results demonstrate that at least in some cases, diagenetic processes were not sufficient to mask a non-local $^{87}Sr/^{86}Sr$

signature. Additionally, δ^2H and $\delta^{18}O$ values demonstrate a clearer distinction between regions (especially between Greenland and the northeastern coast of Canada), and even between specific sites. Using a multi-isotopic approach to distinguish wood sources in Norse Greenland seems promising.

Furthermore, an ongoing study combining dendrochronology, isotope analyses and aDNA to explore the origin of timber in northern Europe during the Medieval period (Daly 2017, Van Ham-Meert and Fernández 2020) is also likely to generate improved provenancing methods. Increased use of dendrochronology in the North Atlantic (where artefact size and preservation permits) may be facilitated by the growing availability of tree-ring chronologies from Siberia (cf. Siborova *et al*. 2017 and references therein). Other future directions may lie in the study of cpDNA (genetic material from the chloroplasts of plant cells) from uncharred archaeological wood (cf. Spiers *et al*. 2009) or in the application of isotope analysis to charred remains. The latter is unproven in archaeological wood charcoal but has shown to be somewhat successful in analysis of Sr isotopes from charred cereal grain (Styring *et al*. 2019, Larsson *et al.* 2020).

Conclusions

Over the past 30 years, there have been significant developments in our understanding of wood resource exploitation in the North Atlantic, driven by increased interdisciplinarity in archaeological research. The Norse sites on these islands display unique and precisely-adapted patterns of wood use which reflect both their cultural identity and environmental conditions. Despite regional and local variations, the islands are characterised by their reliance on driftwood timber: for the Norse in the North Atlantic, wood was a dynamic, unpredictable marine resource.

However, just as we are beginning to understand these patterns, anthropogenic climate change has begun to seriously threaten the preservation of organic material (Harmsen *et al.* 2018, Hollesen *et al*. 2019). Anecdotal evidence from Iceland and Greenland suggests that there has been a considerable decline in the preservation of such remains on archaeological sites in the last 5 years alone. We must therefore do all we can to ensure that this vanishing information is made available to future researchers. One way forward may be to improve the monitoring of known sites (cf. Hollesen *et al*. 2019), but we must also ensure that excavated material is treated in a way that facilitates thorough analysis. So far, the discard of non-diagnostic artefacts has led to a shortage of material available for destructive analysis, however this practice is beginning to change in Iceland and Greenland. Archaeologists working on such sites should discuss the treatment of non-diagnostic wood remains during excavation. We also recommend that uncharred wood remains are analysed before they undergo conservation (which often obscures diagnostic anatomical features), and we encourage policymakers and funding bodies to ensure that adequate funds are allocated to post-excavation analysis of these irreplaceable archives of past human-environment interactions.

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Irene Baug

Outland exploitation and long-distance trade AD 700–1200 – seen in the light of whetstone production and distribution

An aim of this paper is to explore exploitation of outlying resources within a socio-political and economic context, where whetstone quarries form the basis for the discussion. Geological analyses of whetstones in Ribe in Denmark demonstrate that most of the finds were quarried within present-day Norway, in Eidsborg in Telemark and Mostadmarka in Trøndelag. Production in Mostadmarka started in the early 8th century, and in Eidsborg approx. a century later. Both sites should be seen in connection with an intensified exploitation of woodlands and mountainous areas that took place in the Scandinavian Peninsula from the early Viking Age onwards. The paper discusses how important products from the outlands were for the Viking-age economy and urban sites, and demonstrates that outlying areas were integrated parts of wider economic, social, and cultural systems.

Introduction

During the Viking Age until the late Middle Ages, an intensified exploitation in woodlands and alpine regions took place, and the Scandinavian Peninsula was a source for hides, furs, walrus ivory and iron - along with different types of stone products. These were desirable commodities on the European continent as well as in the British Isles. Whetstones represent essential equipment for maintaining sharp-edged iron tools, such as weapons, knives, needles, scissors, axes, hoes, ards and other farming implements, and were used daily in both household activities and farming, as well as in professional craft. Geological analyses of whetstones in Ribe in Denmark demonstrate that most of the finds were quarried within the territory of present-day Norway, in Eidsborg in Telemark and Mostadmarka in Trøndelag (Baug *et al.* 2019, Baug *et al.* 2020). These types of whetstones have also been uncovered in other Viking Age and medieval towns and trading places by the coasts of Northern Europe, which suggests that they were widely distributed and available.

Issues to be addressed are what triggered large-scale exploitation of outlying resources, and how important such products were for the Viking-age economy and urban sites. I also discuss how the production and trade of whetstones were organised, and to what extent people in these rural areas of Scandinavia were involved in long-distance trade. Because of the wide dating frames of whetstones and their use, I also consider and discuss the issue of change and stability in production and trade from the early 700s to approx. 1500s.

Outlying resources

Norway is largely shaped by the mountain ridge that runs from the far north towards the south, and where arable land is most limited. Settlement is largely sea-bound, but also extending up into valleys with cultivable moraines (Skre 2018, pp. 782-783); ultimately, less than three per cent of the total land mass is cultivable (Øye 2005, p. 11). Hence, much of the activity took place in outlying areas, in forests and mountainous areas that offered resources that were vital not only within local rural households, but also within the urban economy as traded commodities. Evidence of this trade is the distribution of products from present-day Norway over large parts of Northern Europe, such as reindeer antler combs, quernstones of mica schist, schist whetstones, soapstone vessels and furs (e.g. Resi 1990, Ashby *et al*. 2015, Baug 2015, 2017, Hansen 2017, Baug *et al.* 2019, Rosvold *et al*. 2019).

Special mineral outcrops offered opportunities of creating surpluses and were exploited on a nearly industrial scale from the Viking Age onwards. Quarries and stone products, such as soapstone vessels, quernstones and whetstones, represent non-perishable objects where it is possible to study both production and distribution. Provenance studies show that such items were widely distributed, and quarrying was aimed at larger markets. Extraction of whetstones started in the early 8th century, as seen below, with soapstone vessels a century later, whereas large-scale production and distribution of quernstones date to the latter half of the 10th century (e.g. Resi 2008, Baug 2011, Resi 2011, Baug 2015, Hansen *et al.* 2017, Baug *et al*. 2019). Large-scale production of whetstones and other stone products co-occur within a larger pattern of outfield exploitation aimed at long-distance trade.

During his visit to King Alfred's court c. AD 890, Ohthere from Hålogaland listed a variety of commodities achieved through hunting and regarded as prestigious items, such as whale bone, feathers, hides and furs from marten, bear, otter, reindeer, and seal (Bately 2007, p. 46). Such products were in high demand among the elites in Northern Europe. Exploitation of wild reindeer also provided other products, such as antler important for pre-modern craft and industry in urban sites, specifically for producing items such as combs and gaming pieces (e.g. Ashby *et al*. 2015, Rosvold *et al*. 2019). Hunting of reindeer was carried out in mountainous areas in several places in present-day Norway. Dating of reindeer traps is rather difficult, as preservation is generally poor and organic material from their construction is rarely left in the pitfalls (Bergstøl 2015, p. 53). The finds do, however, indicate that the reindeer population was heavily harvested. Many people must have been involved in hunting and trapping, since the sites required well-organised construction, maintenance and operation (Jordhøy and Hole 2015, p. 13).

Woodland was exploited for a variety of resources - timber, firewood, wood for charcoal production and tar (Øye 2002, pp. 362-364). Tar can be extracted from most types of wood, and is used for many purposes, such as leatherworking, as protection from corrosion and as sealant for wood constructions. From the 8th century, a shift from small-scale to large-scale tar production is documented in the present-day geographical area of Sweden. Tar became an in-demand commodity, and is found in Viking-age towns such as Ribe and Hedeby (Hennius 2018).

Iron was another valuable raw material in great demand. Within the territory of present-day Sweden, iron production may have started as early as the later part of the Bronze Age (Hjärthner-Holdar 1993, p. 38), whereas extraction of iron in present-day Norway dates to the Pre-Roman Iron Age, where in several places it exceeded the local need (Myhre 2002, pp. 154-157). An increase in iron production is clear from the 10th century onwards (e.g. Stenvik 1997, Tveiten 2012, Rundberget 2013, 2015). The production took place across large parts of the forested areas and upper valleys of present-day southern Norway, and characteristic for most of the iron-producing sites is their location in marginally arable areas. It is therefore suggested that people involved in iron production depended on a supply of cereals from the more central agricultural districts (Tveiten 2013, p. 213). The number, size and complexity of the iron production indicate that many actors of varied competency were involved, and that the activity may have been organised by specialists (Tveiten and Loftsgarden 2017).

Whetstones were thus only one of several commodities transported along the west coast of Norway. Most of the objects and raw materials exploited in the outlying areas were meant for the general populace, not only for the elite, and thus were produced in large quantities. These were things that most people could afford and use in their everyday lives, such as household utensils. Many of the commodities, however, have not survived in the archaeological record, and are also difficult to provenance; we have earlier argued that whetstones may, in contrast, be used as a proxy for the trade with Arctic commodities (Baug *et al.* 2019, p. 66). They constitute an important source material for studying interactions and networks between outlying areas and urban sites in Northern Europe.

In search of the quarries

Raw materials suitable for whetstones were rock types containing many small, hard mineral grains that could act as abrasives during whetting (Resi 2008, p. 21). Different types of stones can be used, but some distinguish themselves as superior to others in their honing properties.

Earlier studies have indicated that material for whetstones during this period frequently came from the territory of present-day Norway, with two types of schist predominating. One is *light-grey, fine-grained muscovite-quartz schist*, here referred to as *light-grey schist,* the other is *dark grey or purple very fine-grained muscovite quartz schist,* here referred to as *very fine-grained schist* (Ellis 1969, Mitchell *et al.* 1984, Crosby and Mitchell 1987, Askvik 1990, Resi 1990, Hald 1991, Myrvoll 1991, Baug *et al.* 2019).

Light-grey schist has since the 1970s been considered to stem from the quarries in Eidsborg. The provenance was based on macroscopic identification and microscopic studies of thin sections on whetstones of *light-greys schist* from Kaupang, Hedeby, Wolin, Aggersborg, Ribe, and various sites on the British Isles (Moore 1978, Mitchell *et al.* 1984, Crosby and Mitchell 1987, Askvik 1990, Hald 1991, Askvik 2008, Resi 2011, Askvik 2014). Eidsborg schist belongs lithostratigraphically to the Eidsborg Formation, the uppermost formation in the Bandak Group of the Proterozoic Telemark Supergroup (Oftedahl 1980). The proposed Eidsborg provenance of whetstones of *light-grey schist* was based on radiometric dating (K-Ar) of mica, displaying a cooling age between 900 and 950 million years, typical of the Precambrian rocks in this region (Mitchell *et al.* 1984).

Radiometric dating (K-Ar) of whetstones of *very fine-grained schist* dates this rock type to between 403 ± 10 and 446 ± 7 million years (cooling age for mica), coinciding with the late phase of the Caledonian Orogeny (Mitchell *et al.* 1984). The Caledonides in Europe occur in a belt crossing Scandinavia, England, Scotland, and Ireland, as well as in a zone in central Europe. Within this area, Norway has been considered as the most likely place of origin due to both geological and cultural reasons (for further explanation see Mitchell *et al*. 1984, Crosby and Mitchell 1987, Askvik *et al*. 2008). In Norway, the Caledonian rock units cover approx. 1,700 km from Rogaland to the North Cape (Mitchell *et al*. 1984, Askvik 2008, pp. 8, Figure 2), giving quite a large area of opportunity for whetstone quarries (Figure 1).

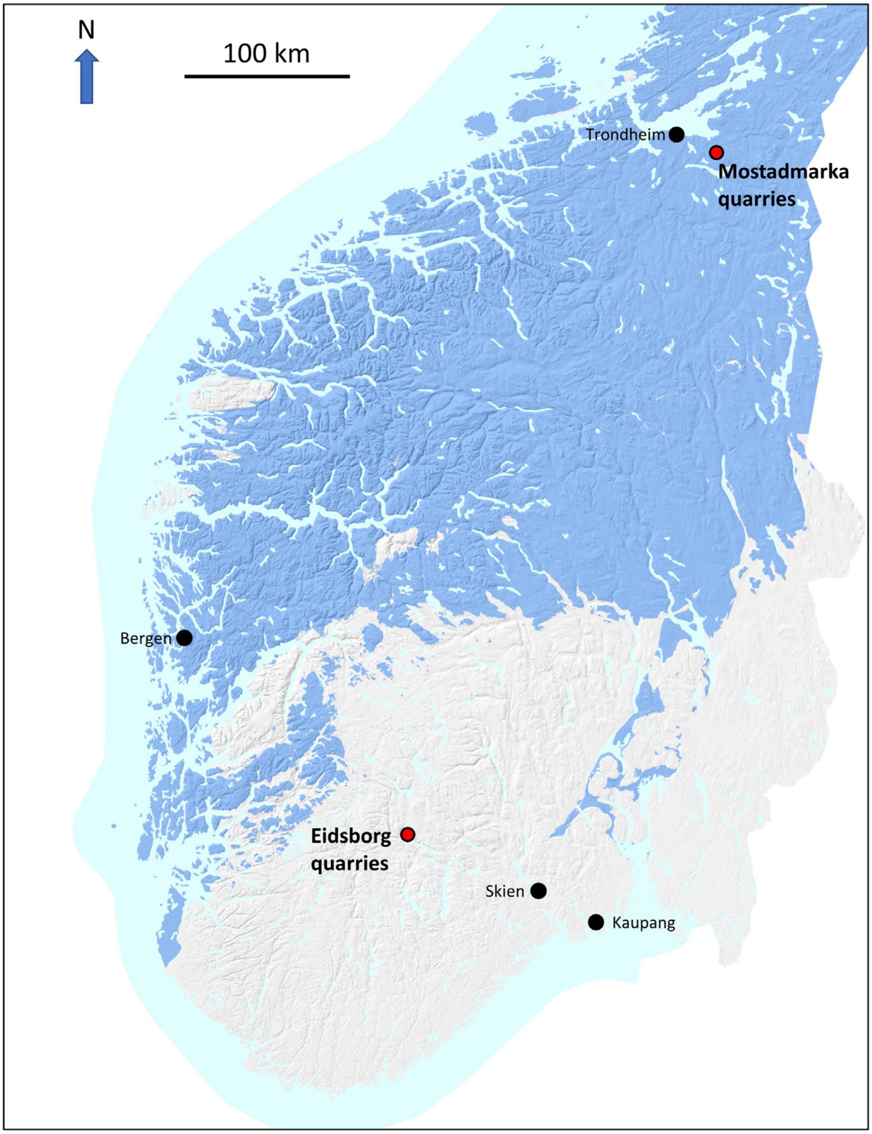

Figure 1*. Caledonide rock units, marked in blue. Important sites referred to in the text are indicated (Map: Map data from the Geological Survey of Norway and Kartverket).*

Recent geological analyses of whetstones in Ribe carried out in 2019, both petrographic analyses of thin sections and geochemical whole-rock analyses (major element analyses by XRF), gave new opportunities for provenancing whetstones. Samples from eleven quarries within four different sites in present-day Norway have been studied: two quarries in Mostadmarka and two quarries in Soknedal in the Trøndelag region (Figure 2), six quarries in Eidsborg in the Telemark region and one quarry in Hardanger in the Hordaland region were compared with samples from 14 whetstones from Ribe (See Baug *et al.* 2019, pp. 52-57, for further explanations of the geological analyses).

The analyses confirmed Eidsborg as the origin of whetstones of *light-grey schist*. The provenance of the *very fine-grained schist* was also established: this type, in both purple and grey colours, originates in Mostadmarka in Trøndelag, where two different quarry sites have been identified: Heingruva and Rollset (Baug *et al.* 2019, pp. 56-57). So far, only whetstones from Ribe have been analysed; however, mineralogical descriptions of whetstones in other Viking-age towns, such as Kaupang and Hedeby, indicate that both types of schist, *light-grey schist* from Eidsborg and *very fine-grained schist* from Mostadmarka, are present there too (See for instance Ellis 1969, Mitchell *et al.* 1984, Crosby and Mitchell 1987, Resi 1990, Askvik *et al.* 2008, Resi 2011).

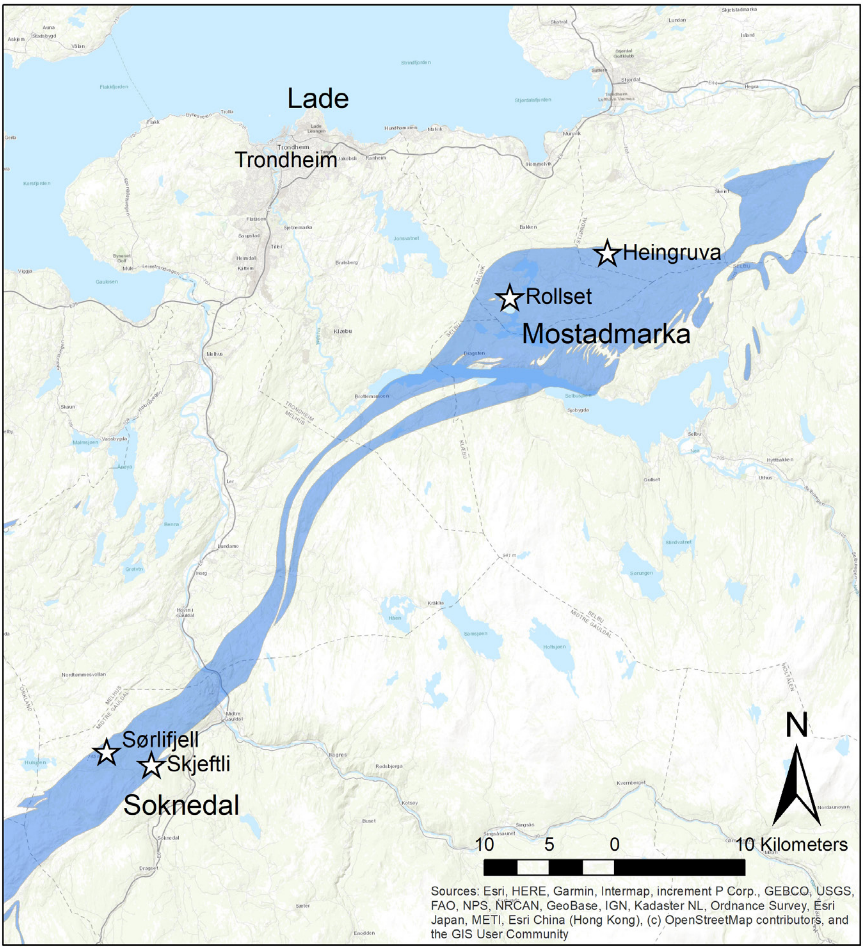

Figure 2. *Location of the quarries in Mostadmarka and Soknedal. Both quarry areas are situated in the Støren Nappe (marked in blue), within the Caledonian rock units (Map: Map data from the Geological Survey of Norway and Kartverket).*

The quarries in Mostadmarka and Eidsborg

The largest quarry site in Mostadmarka is Heingruva (Figure 3). Today, the quarry appears as a hole of 15x30 m filled with water. The bedrock appears as a semi-circle around the waterhole, entering the spoil-heap to the west. Traces from quarrying - both quarried rock as well as spoil - are visible in an area of approx. 200 m west of the water. East of the waterhole, another smaller quarry is identified. Quarrying is known to have taken place in the 1600s, and allegedly also in the 19th and 20th centuries (Bakmark and Rø 2014, pp. 53-55). Additionally, two small quarries are identified in Rolset (of which one has been examined geologically), approx. 30 km south-east of Heingruva. The quarries are in rather overgrown areas, and extraction traces and spoil heaps are difficult to identify (Figure 4).

***Figure 3**. The quarry Heingruva in Mostadmarka (Photo: Irene Baug).*

Different colour nuances in the rock and on the stones in the spoil-heaps are identified, varying from grey to purple. Whetstones of dark grey and purple *very fine-grained schist* found in Viking-Age sites have earlier been considered to stem from different quarries, due to differences in the colour nuances (Myrvoll 1991, p. 121, Resi 2008, p. 25). However, as is evident from Heingruva, different colour nuances may appear within one quarry site, indicating that colours are not sufficient to discriminate between these whetstones.

Production in Mostadmarka was carried out in open-cast quarries, but difficult to identify due to dense vegetation and the small size of some of the quarries. It is likely that several more quarries lie undetected in this area, which is also indicated by place names and Lidar-data, but so far, no thorough registration has been carried out.

Figure 4*. Geologist Øystein J. Jansen at a small whetstone quarry in Rollset (Photo: Irene Baug).*

The largest and best-known production site for whetstones in Norway is located in Eidsborg. Quarries are identified over a wide area, mainly located on the mountain ridge between the parishes of Lårdal and Eidsborg; however, no complete registration of the quarries has so far been published. As late as in the 19th century, the production sites belonged to more than 20 farms, but prior to that the quarry area was commons or common land, exploited by local people in the community (Helland 1900, pp. 592-593). Production carried out in these open-cast quarries has strongly altered the natural landscape. In the largest quarries, enormous spoil heaps are located in front of the bedrocks where extraction took place. At some sites, spoil heaps are now covered with vegetation, but at others the spoil appears as enormous heaps of stone completely without vegetation (Figure 5).

***Figure 5**. Whetstone quarry in Eidsborg (Photo: Irene Baug).*

In Eidsborg, large-scale extraction of whetstones continued until the early 20th century (Falck-Muus 1920, pp. 51-2, Livland 1992). Gunpowder was used in the quarries from the 18th century, and was a common technique from the 1830s. From that period and onwards, one worker could extract approx. 400-1000 whetstone blanks a day, even up to 2000 stones daily if the rock was of good quality (Falck-Muus 1920, pp. 54, 60). This later production most likely removed remains from the Viking-age and medieval quarrying in Eidsborg. Whetstone blanks are sticks of stones in various sizes. They were often c. 3-5 cm thick and between 15 and 30 cm in length (Livland 1992, pp. 20-23). However, whetstone blanks found in an undated cargo just outside Turøy in Western Norway are between 60 and 70 cm in length. The stones are presumably from Eidsborg, but scientific provenance studies have not been conducted.

Dating of whetstone production

There have not been any archaeological excavations in the whetstone quarries. Dating of production is therefore based on whetstone finds from datable contexts, such as Ribe, Kaupang and the medieval towns of Oslo and Bergen.

Quarrying in Mostadmarka started already in the early 8th century, as is documented through whetstone studies in the Viking-age town of Ribe in Jutland in present-day Denmark, where whetstones from Mostadmarka have been dated to AD 705-725. They were only few in number at this stage. In the following phase, AD 725-760, Mostadmarka-stones constitute 33 percent of the total number of whetstones in the town, and post AD 760, more than half of the whetstones in Ribe come from Mostadmarka. From c. AD 800 they start to decline in number (Baug *et al*. 2019, pp. 58-62). This tendency continues after the turn of the millennium, and only a few items are found in Ribe from the 11th to 13th centuries. Mostadmarka-stones are at this point completely outnumbered by whetstones from Eidsborg (Baug *et al*. 2020).

Production in Eidsborg dates to the first half of the 9th century and seems to have started around a century after extraction in Mostadmarka began. The earliest Eidsborg stones in Ribe occur AD 725-760; however, only a few specimens have been found, and the dating is problematic. It is not until AD 820-850 that securely dated whetstones from Eidsborg are present. In this phase, stones from Eidsborg and Mostadmarka are nearly equally numerous (Baug *et al*. 2019, pp. 58-63). Finds from the 11th century onwards in Ribe, however, clearly differ in petrographic types compared to the previous period, as a vast majority of 60 percent are from Eidsborg, whereas only sixteen fragments (c. 16 percent) relate to Mostadmarka (Baug *et al*. 2020, p. 51). Eidsborg-type stones thus seem to increase in prevalence with time.

The same tendency is seen in the Viking-age town of Kaupang (c. AD 800-960/80). Of the total whetstone material from the excavations in 2000-2002, whetstones of Mostadmarka-type constitute c. 60 percent. In the earliest phase (c. AD 800-805/10), eight Mostadmarka-type whetstones were retrieved, but none from Eidsborg. In the following phase (c. AD 805/10-840/50), Mostadmarka-type (N=81) outnumber those of the Eidsborg-type (N=12). From the last phase, c. AD 830-980, 928 of the Mostadmarka-type and 245 of the Eidsborg-type are identified (Resi 2011, Figures 14.2, 14,6, 14,15). The same tendency is observed in other medieval towns, such as Trondheim, Bergen and Oslo, where Eidsborg-type whetstones are far more common than the *very fine-grained schist*. In 11th to 14th century Oslo, the ratio is 12:1, and in 12th century Bergen 3:1 (Christophersen and Nordeide 1994, p. 255, Lønaas 2001, pp. 15-16, Hansen 2017, pp. 74-76). From the 11th century onwards, Eidsborg-outnumbered Mostadmarka-type stones and started to dominate the market, a situation that lasted for centuries. Whether this is caused by better organisation of production and export in Eidsborg, or a general decline of production in Mostadmarka from the 11th century onwards is not known.

From outlying areas to urban sites

During the Viking Age, present-day Norway was a rural society, with scattered settlement mostly organised in farms and farmsteads, but also central farms belonging to elites in a hierarchically organised society. People living in the rural communities provided themselves with food and non-food commodities. However, farming was probably not particularly profitable, as only a few large stretches of cultivated land exist, and mountainous and forested areas are far more wide-ranging and dominant than arable land (Skre 2018, p. 783). Thus, it was not necessarily farming and cultivating that created surpluses and wealth, but rather exploitation of outlying areas. As stated above, the general development evident from the early 8th century onwards is that exploitation of natural resources in the outfield was significantly greater than local need, and this most likely represented an important income for people, and a possibility to create surplus.

Both production areas, Mostadmarka and Eidsborg, are located in marginal areas with regard to cultivation, settlement patterns and marketplaces, and they were both intensively exploited. The substantial proportion of Mostadmarka whetstones in Ribe since AD 705-725 demonstrates that long-distance trade between outlying areas in present-day Norway and the southern North Sea zone took place this early. Whetstones were not the only commodity in this trade, not even the dominant one. The quarries were part of a general development from the 8th century with more specialised handicrafts and a more intensified exploitation of the outfield than before. Provenancing of reindeer antler indicates that trade from present-day Norway and Sweden to the southern North Sea zone occurred in the AD 780s-90s (Ashby *et al*. 2015); however, Ashby and his co-authors found indications of even earlier contact with two finished reindeer-antler combs dated to AD 705-725, and thus the same period as the earliest Mostadmarka whetstones (Baug *et al*. 2019, p. 47). Large-scale exploitation of tar is also documented in the 8th century, with distribution to, for instance, Ribe (Hennius 2018).

Production and trade could have been organised in many ways and in a multitude of combinations. Most of the iron production sites are found in areas where local farmers seem to have had property rights, suggesting that it was undertaken by farmers - probably specialised farmers - in the area (Tveiten and Loftsgarden 2017, pp. 119-120). In Østerdalen in present-day eastern Norway, iron production c. AD 950-1300 was the farmers' primary work for parts of the season, whereas in other parts they worked on the farms (Rundberget 2015, pp. 276-277). I have suggested a similar situation for quernstone production in Hyllestad and bakestone production in Ølve and Hatlestrand in Western Norway, where quarries belonged to the farms at which they were located. Owners of farms and quarries seem, however, to have belonged to the societal elite, in the form of local magnates, during the Viking Age, and ecclesiastical institutions during the Middle Ages. Subordinates, tenants, or others who ran the farm most likely carried out quarrying as part-time or seasonal production. Quernstones and bakestones may possibly have been produced as tribute for landowners and formed part of the land rent that the tenants or other subordinate farmers had to provide to landowners (Baug 2015, pp. 120-146). Ohthere described a similar situation, where he got most of his wealth from tribute from the *Finnas* (Sámi) (Bately 2007, p. 46). Stonecutters may have sold whetstones to middlemen or foreign traders, but perhaps it is more likely that the products were collected as tribute. Landowners most likely exerted influence upon the whetstone quarrying, and agents involved in the extraction may have been obliged to produce whetstones for the landowners. Large-scale production and the wide-ranging distribution and trade witnessed in the archaeological record would have been easier for elites than for lower classes.

The intensified exploitation of outlying areas from the 8th century onwards points to a society where some agents were dependent on networks and economic interaction with the outside world. For instance, it is suggested that the large-scale tar production from the 8th century onwards resulted from the increasing demand for tar driven by an evolving maritime expansion and more far-reaching expeditions. Tar was an important element in shipbuilding, for protecting wood, as well as impregnating and sealing sails (Hennius 2018, pp. 1356-1358). Consequently, it also became an in-demand commodity. In the same way, an extensive need for iron in Scandinavia and beyond led to a massive rise in iron production from the 10th century onwards. The need and desire for these resources made outlying areas integrated parts of wider economic, social, and cultural systems (Tveiten 2013, Baug 2015, p. 113, Tveiten and Loftsgarden 2017, Loftsgarden 2018, Baug *et al.* 2019, Rosvold *et al.* 2019).

Outfield products were traded as both raw material and in some cases as finished products. Whereas soapstone vessels and quernstones were more or less finished at the quarry sites before exporting them, some raw materials, such as iron, may have been subject to a chain of operations from extraction to finished products. Extraction took place in the outfield, but manufacturing of iron objects was to a certain degree carried out in the towns (Andersson 2015), or at central farms. Eidsborg whetstones seem to have been exported as blanks. This is indicated by sunken cargos with whetstone blanks along the Norwegian coast and along the water-based route from the quarry area to the coast (Nymoen 2008, 2011a, 2011b). A few raw blocks from medieval Bergen have also been identified. Blanks and whetstones without traces of use from Viking-age towns such as Kaupang, Hedeby and Ribe, are, however, few in number (Resi 1979, pp. 40-44, 2008, p. 49). In Ribe, four whetstone blanks were found on the southern shores of the river Ribe Å. The stones are presumed to stem from Eidsborg, but scientific provenance studies have not been conducted. The blanks may come from cargo that was lost on its way up the river towards the town (Jensen 1986-1987).

The markets for these commodities were diverse, ranging from local to international consumers. The occurrence of outfield products, such as antler, combs and various stone products in urban settings and marketplaces from the early Viking Age and into the Middle Ages indicates an organized and commercially-based trade, and regular long-distance sailing. In western Scandinavia, the scattered settlement districts from the Viking Age and the Middle Ages are mainly found along the coast and fjords, and travelling and transport was mostly done by sea. The 8th century is a pre-urban phase in Scandinavia, and within this period ships may have sailed more or less directly from shipping sites near the whetstone quarries to the markets in Northern Europe.

Little is known about people involved in producing and trading objects during this period, and they are difficult to identify in the material objects. We have suggested that whetstones from Mostadmarka may have been distributed via Lade (Old Norse *Hlaðir*, 'storing place' or 'loading place') near the mouth of the Trondheim Fjord, and 20-25 km north-west of Mostadmarka. Lade was the residence of the Lade Earls, high-level political agents in Scandinavia from the late 9th to the 11th centuries (Baug *et al.* 2019, p. 64). This suggests a highly organised production and distribution of whetstones from the Mostadmarka quarries, a situation that needs to be understood in relation to the socio-political development beginning from the 7th century along the coast of present-day Norway, which involved a larger political integration of substantial regions. It was also an economic integration of areas with diverse resources (Baug *et al*. 2019). Regional, high-status agents may in this way have been intermediaries and connected peripheral parts of the Scandinavian outfield to interregional trading networks.

In the 8th and 9th centuries, towns were created by kings and petty kings (Skre 2009, pp. 87-88), who then managed to both increase and control trade. Development of the towns was caused by increasing trade within Scandinavia, but it was also a result of a demand for Scandinavian products elsewhere in Europe (Sawyer and Sawyer 1993, p. 151). The need for a stable and reliable supply of commodities in towns and marketplaces may have led to a good organisation of trade. People transported goods from their home areas to towns and marketplaces, but travel and trade was slow and dangerous. Both merchants and merchandise needed to be protected. Long-distance trade was a growing activity from the early 8th century onwards, and a socio-political organisation that could provide a necessary minimum of security and predictability was needed. During the 8th and 9th centuries, high-level political agents able to secure the coastal sailing route - the *Norðvegr* (the Northern way) - established themselves along the coast and were important for making long-distance trade possible (Skre 2018). This polity was strong enough to guarantee safe sailing for those who submitted to it. By establishing alliances with the sea-kings along the sailing route, arctic traders made transport of commodities along the coast viable (Baug *et al.* 2019, pp. 68-70), and this socio-economic development rendered a steady supply possible. In the towns, kings provided the security the merchants and craftsmen needed.

The increase of Eidsborg stones in Ribe in the first half of the 9th century suggests a change in the preferences of whetstones within trading networks to the north, and it corresponds closely with the establishment of the town Kaupang c. AD 800, located only about 130 km from Eidsborg as the crow flies. Kaupang belonged to southern Scandinavia politically, and was under royal authority of the Danish kingdom, and Ribe appears to have been one of Kaupang's most important connections to the southern North Sea zone (Skre 2011). It is likely that the kings of the Danes got access to important northern resources - also from outlying areas - through Kaupang. This slowly led to the change in whetstone types in Ribe from the first half of the 9th century - when a new production site and new suppliers started to gain importance.

Kaupang came to an end around AD 950, but the demand for whetstones from Eidsborg continued, which may have contributed to the establishment of the town of Skien in the southern part of Telemark. Archaeological investigations in Skien have revealed large amounts of whetstones - mostly blanks - and the town is interpreted as a transit harbour dating from the 10th century (Myrvoll 1984, 1986, pp. 165-166). The quarries in Eidsborg are in the inland, with a rather large distance to the nearest harbour and marketplace. The area consists of many valleys separated by high mountains, and where a network of rivers and lakes connect the different valleys, running from the mountain districts to the coast. This water-based route, consisting of 120 km of lakes, rivers, and portages, has been the main communication line, using boats in the summer or sleds on frozen rivers in wintertime (Myrvoll 1984, p. 50). The route involved several transhipments down the waterway to Skien by the coast from where they were exported (Myrvoll 1986, pp. 175-176, Nymoen 2011a).

An important place for transhipment was the farm Kviteseid, where travellers needed to cross over land to continue on their voyage to the coast. The suffix *eid* in Kviteseid comes from the Norse word *eið* and refers to a narrow strip of land surrounded by water, and a place where one had to travel by land instead of water (Norsk Stadnamnleksikon). This is one of the richest areas regarding burial finds from the Viking Age in eastern parts of present-day Norway, whereas there are hardly any finds from the Early Iron Age. Thus, Kviteseid seems to have grown rather quickly as a socio-political centre around AD 800, and the rich burials indicate an economic surplus. This development may connect to the whetstone trade. It is suggested that travellers had to pay duties to people at Kviteseid in order to pass across the strip of land and continue along the water route. Thus, the owners of Kviteseid would earn an income from the export of whetstones and other outfield commodities that needed to be transported this way (Liland 1992, p. 13, Braathen 2006). Another possibility is that people living at Kviteseid were the ones who controlled both production and distribution of whetstones. Interestingly, there are no burial finds from the Viking Age in Eidsborg, which suggests that people in Eidsborg where not the ones who controlled and profited by the production of whetstones. It is suggested that the suffix *borg* in Eidsborg comes from the Old Norse word *bjòrg,* meaning rock. The original meaning of the place name Eidsborg may thus have been "The rock belonging to the farm Eid", which may refer to the farm Kviteseid (Liland 1992, p. 13, Braathen 2006, p. 304). However, in the tax register of 1647, the farm Kviteseid is not very rich, and it is suggested that at an earlier stage it may have belonged to another, wealthier farm, Fjågesund (Liland 1992, p. 13). Nevertheless, local or regional high-status agents may in this way, directly or indirectly, have controlled the intraregional distribution of whetstones to the nearest town or marketplace, which in this case may have been the town of Kaupang and later Skien.

A few Medieval written sources relate to the whetstone production in Eidsborg. In AD 1395, the farmer *Grjotgard Nikolassön* owed tax to the Church and Crown and was therefore sentenced to pay a fine of four *læstir* whetstones from Eidsborg (Norse: *fiorar læstir hardstæin*), equal to nearly 1.3 tons, as well as part of a farm, to Bishop Øystein in Oslo. In the Middle Ages, one *lest* is considered to have equalled two pounds, which is c. 160 kg (Falck-Muus 1920, p. 74). The stones should be transported to the town of Skien (DN IV, no. 651), most likely for further export. The document thus indicates that farmers were involved in whetstone production in Eidsborg, and this particular person may have owned quarries, due to the large number of whetstones he was forced to pay with. The Old Norse term *grjót* means stone, thus the farmer's name also connects him to the whetstones.

Whetstone trade from Eidsborg not only survived into the second wave of urbanisation in Scandinavia that began in the mid-tenth century, it even increased during this period, comprising alone more than 60 per cent of the total amount of whetstones in Ribe in the 11th to the 13th centuries (Baug *et al.* 2020). The whetstone trade was likely important for the Danes, and high-level political agents were most likely interested in maintaining the supply of these commodities. It is suggested that the Danish kings Harald Bluetooth and his son Sweyn Forkbeard may have had connections to Skien at the end of the 10th century - perhaps through a local magnate - because of a demand in Denmark for whetstones and other commodities from the north (Bandelien 2018).

A document from AD 1358 states that people in Skien had the right to trade whetstones 'as in old custom' (DN XV, no. 20 1358). Most likely, they bought whetstones from the producers with the intention of selling them and thus may have acted as middlemen in the whetstone trade. Whetstones, most likely from Eidsborg, were also exported from Bergen during the Middle Ages, on board both Norwegian and Hanseatic ships (Nedkvitne 2014, pp. 81, 84, 596-599). In AD 1305-1306, whetstones were recorded as ballast on ships sailing to Kingston upon Hull and Ravensworth (DN XIX, no. 447 1305-1306), and in AD 1401, an English ship loaded with hides, wool, butter, timber, and whetstones was plundered by the Hanseatic in Langesund along the inner sailing route, not far from Skien (DN XIX, no. 666 1405). In the late 16th century, the priest and writer Peder Clausson Friis described the distribution of whetstones. According to Friis, whetstones were transported from the quarries to Skien in wintertime - on the ice along the rivers and fresh waters that had their outlet in Skien. Upon reaching the town, whetstones were sold as ballast and loaded on large ships together with timber, and transported to Spain (Friis 1632, p. 46).

Distribution of outlying resources could be organised independent of towns; however, there is no doubt that the towns provided access to larger markets. Exploitation of natural resources had a pseudo-industrial character that demanded wider organisation, networks, and markets, where the latter were more easily gained in towns. In Northern Europe, new urban centres were established from the 8th century onwards, which from the very first decades became important arenas and markets for the various products and raw materials from the outlying areas (Ashby *et al*. 2015, Baug *et al*. 2019). Long-distance trade of resources must thus have been encouraged by some form of profit, making the many days of sailing economically viable. The outlying areas provided the towns with valuable and essential goods and raw materials that were geographically restricted and exploited only in certain regions. Thus, long-range networks and access to a variety of non-local products became a vital concern for the towns, and non-agrarian products from the outfield may have been important for the development of regional and interregional trade, and a driving force in the economy. From the early 8th century, the towns were willing to invest energy and resources in communicating with peripheral societies, and a certain reliance on non-local products within towns and marketplaces developed. This suggests stable maritime networks in Northern Europe, where distant outlying areas also played a part.

The agents involved in trade of the various resources changed through the centuries, and so did the nodes and central places along the trading routes. After the establishment of towns in the 11th and 12th centuries in present-day Norway, export was largely channelled through these, which led to changes in redistribution centres compared to the preceding period. Whetstones in Ribe show, however, that networks and contact zones established in the early 8th century persisted throughout the Middle Ages. This is also indicated in the distribution of soapstone vessels and quernstones from quarries in present-day Norway to southern Scandinavia (Baug 2017). Outlying areas were linked to markets in the southern North Sea zone for centuries, and established traditions and contact zones were most likely important for distribution and trade. Despite changes in actors and towns, trading networks seem to have been stable and predictable over centuries.

Conclusions

From the 8th century onwards, an intensified exploitation in woodlands and mountainous areas took place in the Scandinavian Peninsula, and outlying areas became a source for a variety of products regarded as desirable commodities in the southern North Sea zone. Provenancing of whetstones demonstrates that extraction started in the early 8th century in Mostadmarka in Trøndelag, and a century later in Eidsborg in Telemark, and the stones may be used as a proxy for the trade with commodities from distant outfields. They bear witness to an intensified large-scale exploitation that lasted for centuries.

Whetstones from Mostadmarka are among the earliest evidence of long-distance trade in this period. They were obviously desirable commodities in the 8th century, but were nevertheless completely outnumbered by Eidsborg from the 11th century onwards. A new production site and new suppliers started to gain importance - at the expense of Mostadmarka stones.

Evidence points to a highly organised production and distribution of whetstones from both Mostadmarka and Eidsborg, but agents involved in production and trade of whetstones and other products from outlying areas are difficult to identify in the sources. Exploitation of outfield resources represented an important income for people, and a possibility to create surplus and wealth for those in control of the resources. There is no doubt that large-scale production and wide-ranging distribution and trade, which also involved provision of sufficient manpower and ships, would have been easier for elites than for lower classes. A socio-political organisation that could provide a necessary minimum of security and predictability for traders and their commodities was also needed, and long-distance trade should most likely be seen in relation to the development of high-level political agents along the coasts, who were able to secure the coastal sailing route.

Products from outlying areas uncovered in Viking-age and Medieval towns and trading places along the coasts of Northern Europe suggests they were widely distributed, and that their availability was of vital importance to the towns throughout the centuries. This led to an economic and political integration of outlying areas with diverse resources - the outfield became an integrated part of wider economic, social, and cultural systems.

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Full list of participants at the workshops
(alphabetical by first name)

Anja Roth Niemi *The Arctic University Museum of Norway*
Barbro Dahl *Museum of Archaeology, University of Stavanger*
Birna Lárusdóttir *Institute of Archaeology, Iceland*
Brita Hope *Department of Cultural History, University Museum of Bergen*
Christian Koch Madsen *Greenland National Museum and Archives*
Dawn Elise Mooney *Museum of Archaeology, University of Stavanger*
Élie Pinta *University of Paris 1 Panthéon-Sorbonne / UMR 8096*
Even Bjørdal *Museum of Archaeology, University of Stavanger*
Douglas Bolender *Fiske Center for Archaeological Research, University of Massachusetts Boston*
Garðar Guðmundsson *Institute of Archaeology, Iceland*
Gísli Pálsson *Department of Archaeology, History, Cultural Studies and Religion, University of Bergen*
Gitte Hansen *Department of Cultural History, University Museum of Bergen*
Guðmundur Ólafsson *National Museum of Iceland*
Guðrún Alda Gísladóttir *Institute of Archaeology, Iceland*
Hildur Gestsdóttir *Institute of Archaeology, Iceland*
Howell Roberts *Institute of Archaeology, Iceland*
Håkan Petersson *Museum of Archaeology, University of Stavanger*
Irene Baug *Department of Archaeology, History, Cultural Studies and Religion, University of Bergen*
James Barrett *McDonald Institute for Archaeological Research, University of Cambridge*
Jennica Einebrant Svensson *Section for Cultural Heritage, Rogaland Fylkeskommune*
Jørgen Rosvold *Norwegian Institute for Nature Research*
Jørn Erik Henriksen *The Arctic University Museum of Norway*
Kari Loe Hjelle *Department of Natural History, University Museum of Bergen*
Kathryn Catlin *Department of Chemistry and Geosciences, Jacksonville State University*
Kathrine Stene *Department of Archaeology, Museum of Cultural History, Oslo*
Kjetil Loftsgarden *Department of Archaeology, Museum of Cultural History, Oslo*
Knut Andreas Bergsvik *Department of Cultural History, University Museum of Bergen*
Knut Paasche *Norwegian Institute for Cultural Heritage Research (NIKU)*
Konrad Smiarowski *Department of Archaeology, History, Cultural Studies and Religion, University of Bergen*
Kristborg Þórsdóttir *Institute of Archaeology, Iceland*
Kristin Ilves *Department of Cultures, University of Helsinki*
Kristoffer Dahle *Section for Cultural Heritage, Møre og Romsdal Fylkeskommune*
Lilja Björk Pálsdóttir *Institute of Archaeology, Iceland*
Lilja Laufey Davíðsdóttir *Institute of Archaeology, Iceland*
Lísabet Guðmundsdóttir *Department of Archaeology, University of Iceland*
Lisbeth Prøsch-Danielsen *Museum of Archaeology, University of Stavanger*
Michael Nielsen *Greenland National Museum and Archives*
Mjöll Snæsdóttir *Institute of Archaeology, Iceland*
Morten Ramstad *Department of Cultural History, University Museum of Bergen*
Orri Vésteinsson *Department of Archaeology, University of Iceland*
Per Christian Underhaug *Norwegian Institute for Cultural Heritage Research (NIKU)*

Ragnar Orten Lie *Section for Cultural Heritage, Vestfold og Telemark Fylkeskommune*
Ragnheiður Gló Gylfadóttir *Institute of Archaeology, Iceland*
Ragnheiður Traustadóttir *Antikva ehf., Iceland*
Ramona Harrison *Department of Archaeology, History, Cultural Studies and Religion, University of Bergen*
Símun V. Arge *Department of Archaeology, Faroe Islands National Museum*
Sólveig Guðmundsdóttir Beck *Department of Archaeology, University of Iceland*
Solveig Roti Dahl *Section for Cultural Heritage, Rogaland Fylkeskommune*
Susanne Iren Busengdal *Section for Cultural Heritage, Møre og Romsdal Fylkeskommune*
Therese Nesset *University Museum of Bergen*
Thomas Birch *Department of Conservation and Natural Science, Moesgaard Museum*
Trond Meling *Museum of Archaeology, University of Stavanger*

From the 9th century AD onwards, Norse migration resulted in the spread across the North Atlantic of cultural traits originating in Norway. The challenging landscapes of this region rewarded resilience and adaptability, evidenced by complex subsistence strategies incorporating the exploitation of a variety of outfield resources. However, differing methodologies and approaches across the region have limited the extent to which the connections between western Norway and the North Atlantic have been explored in archaeological research. The Expanding Horizons project brought together junior and senior practitioners in archaeology and related fields, from both within and outside of academia, to address this. The papers in this volume present case studies of outfield resource use and its impact on settlement patterns, placed in the wider context of Norse settlement and subsistence across the North Atlantic.

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