

VATNSFJÖRÐUR 2007

FRAMVINDUSKÝRSLUR / INTERIM REPORT



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FORNLEIFARANNSÓKNIR Í VATNSFIRÐI: YFIRLIT 2003-2007

Garðar Guðmundsson (Fornleifastofnun Íslands)

INNGANGUR

Árið 2007 var fimmta ár rannsókna í Vatnsfirði við Ísafjarðardjúp. Þær eru liður í samstarfi nokkurra aðila sem standa að félaginu Vestfirðir á miðöldum. Markmið þessa félags er að stuðla að nýjum rannsóknum á sögu og menningu Vestfjarða á miðöldum og að því standa Hugvísindastofnun HÍ, Fornleifastofnun Íslands, Atvinnuþróunarfélag Vestfirðinga, Byggðasafnið á Ísafirði, Fræðslumiðstöð Vestfjarða, Háskólasetið á Ísafirði og Senter for studier i vikingtid og nordiske middelalder við háskólanum í Osló. Stendur félagið m.a. fyrir ráðstefnuhaldi, útgáfu á fræðiritum og fræðsluefni, og umfangsmiklum fornleifarannsóknum. Í þessu stutta yfirliti er gerð grein fyrir athugunum á fornleifum. Sumarið 2005 barst verkefninu góður liðsauki því Fornleifaskólinn, sem Fornleifastofnun og NABO höfðu starfrækt í Mývatnssveit frá 1997 flutti sig um set 2004, kom sér upp bækistöðvum í Reykjanesi og varð þátttakandi í rannsóknunum við Ísafjarðardjúp. Verkefnið hefur verið styrkt m.a. Alþingi og Fornleifasjóði

YFIRLIT RANNSÓKNA

Fyrsti áfangi fornleifarannsókna fólst í því að taka saman yfirlit yfir fornleifar á Vestfjörðum og stöðu rannsókna í þeim tilgangi að meta hvaða minjaflokka og staði væri heppilegast að hefja rannsóknir á. Hefur samantektin verið birt í Ársriti Sögufélags Ísfirðinga¹, en meðal markverðustu minjastaða er Vatnsfjörður við Ísafjarðardjúp, enda er hann með helstu sögustöðum héraðsins. Var því ákveðið að leggja sérstaka áherslu á athuganir þar. Andrea S. Harðardóttir sagnfræðingur hefur tekið saman sögulegt yfirlit og safnað helstu heimildum um Vatnsfjörð og búsetu þar.² Ragnar Edvardsson fornleifafræðingur gerði sérstaka fornleifaskrá yfir Vatnsfjörð og fann 52 fornleifar á jörðinni. Er nú fengið gott yfirlit yfir þekktar og sýnilegar minjar í Vatnsfirði.³ Ragnar stjórnaði jafnframt forkönnun á bæjarstæði Vatnsfjarðar sumarið 2003. Grafnir voru nokkrir könnunarskurðir, sem m.a. leiddu í ljós að fornleifar í bæjarhól og túni eru vel varðveittar og ákjósanlegt rannsóknarefni. Í túninu fundust leifar skála með langeld í miðju.⁴

Árið 2004 var rannsókn haldið áfram á skálaleifum, en þær eru um 100 m norðan við

¹ Adolf Friðriksson (2003). „Fornleifar á Vestfjörðum.” *Ársrit Sögufélags Ísfirðinga* 43: 43-51.

² Andrea S. Harðardóttir (2003). „Vatnsfjörður við Djúp.“ *Vatnsfjörður við Ísafjarðardjúp. Rannsóknir sumarið 2003*. Adolf Friðriksson and Torfi H. Tulinius. Reykjavík, Fornleifastofnun Íslands. FS213-03092: 10-14.

³ Ragnar Edvardsson (2003). „Fornleifaskráning í Vatnsfirði við Ísafjarðardjúp sumarið 2003.“ *Vatnsfjörður við Ísafjarðardjúp. Rannsóknir sumarið 2003*. ...s. 15-29.

⁴ Ragnar Edvardsson (2003). „Fornleifarannsókn í Vatnsfirði 2003.“ *Vatnsfjörður við Ísafjarðardjúp. Rannsóknir sumarið 2003*. ...s. 30-47.

gamla bæjarhólinn⁵. Uppgrafter svæðið var 70 m² að stærð, en hvergi dýpra en 20 sentimetrar. Minjarnar voru aðeins nokkra sentimetra undir yfirborði. Skálinn er um 16 m langur og 6 m breiður að innanmáli og sneri norður og suður.

Árið 2005 var uppgrafter svæðið því stækkað verulega til austurs, eða um 310 fermetra. Suðaustast á svæðinu fundust leifar lítillar byggingar sem voru rannsakaðar undir stjórn Karenar Milek. Í ljós kom að húsið hefur líklega verið smiðja, en gæti hafa orðið eldi að bráð. Rannsóknir á fornum bæjum á Íslandi hafa takmarkast við húsin sjálf. Hér var ráðist í þá nýjung að grafa fram og rannsaka opin svæði utan húsa. Að þessu sinni var svæðið milli skála og smiðju opnað og til norðurs á mótis við norðurgafli skála. Þar komu fram áberandi, tröðkuð mannvistarlög, svo sem vænta mátti, en athyglisvert var að sjá að þar leyndust einnig soðhola og tvö lítil eldstæði. Líklega hefur eldamennska verið stunduð utandyra og má vera að þessi niðurstaða kalli á frekari athuganir á athöfnum fólks utandyra að fornu en hingað til hefur verið gert. Þetta ár – 2005 – varð verkefnið viðameira. Fornleifaskólinn var fluttur frá Mývatni til Vatnsfjarðar og 11 nemendur víða að úr heiminum stunduðu nám í uppgraftertækni. Þá bættist við nýr rannsóknarþáttur þar sem lögð er áhersla á að kanna staðhætti í því augnmiði að varpa ljósi á uppruna og þróun byggðar í Vatnsfirði. Landsháttarannsóknir eru nýleg en ört vaxandi grein innan fornleifafræði en þar eru minjar og landslag skoðað í nýju ljósi og staðfræðilegu samhengi. Einnig var byrjað á verkefni sem lýtur að því að rannsaka frjósemi jarðvegs og hvernig honum er viðhaldið með áburði. Vonir standa til að með slíkum rannsóknum verði hægt meta grasnytjar og hagvöxt jarðarinnar og hve stóran þátt jarðnytjar túnsins áttu í vexti og framgangi búans.

Árið 2006 var opnað enn stærra svæði við skálann og þrjár nýjar byggingar fundust – allar taldar frá víkingaöld. Þá hófust einnig rannsóknir á bæjarhól Vatnsfjarðar en þangað er talið að bærinn hafi verið fluttur í öndverðu og verið fram á 20. öld. Þar fundust vel varðveittar leifar seinasta torfbæjar Vatnsfjarðar. Auk þess voru grafnir prufuskurðir til að kanna dýpt og umfang bæjarhólsins í því augnmiði að afmarka og staðsetja rannsóknarsvæði framtíðarinnar. Fornleifaskólinn var starfræktur áfram og 17 nemendur og 2 sjálfbóðaliðar frá ýmsum löndum sóttu hann: Noregi, Danmörku, Englandi, Skotlandi, Írlandi, Frakklandi, Bandaríkjunum, Kanada, Ástralíu og Nýja-Sjálandi.

Sumarið 2007 kom enn ein rúst í ljós á víkingaöldarsvæðinu og var hafinn uppgröftur á henni auk þess sem klárað var að grafa fram minjar sem fundust sumarið á undan. Á bæjarhólnum var opnað um rúmlega 400 m² svæði og austari hluti yngsta torfbæjarins í Vatnsfirði afhjúpaður. Sá bær fór í gegnum umtalsverðar breytingar frá því hann var byggður 1884 og þar til hann lauk hlutverki sínu í gerbreyttri mynd á 6. áratug síðustu aldar, þá sem skemma og smiðja. Einnig voru gerðar viðnámsmælingar á hólnum í tilraun til að kanna eðli, þykkt og umfang mannvistarlaganna. Landsháttarannsóknir héldu áfram, gengið var um Vatnfjarðardal og minjar skráðar, en einnig var landslag skoðað af sjó, siglingaleiðir farnar og mið skoðuð. Þá voru aðstæður til þess að gera rannsóknir á sjávarstöðubreytingum kannaðar, einnig tekin sýni úr seti í vötnum til að kanna jarðvegsþykknun, gjóskulög, gróðurfar og loftlagsbreytingar. Fornleifaskólann sóttu 15 nemendur og 4 sjálfbóðaliðar frá mörgum löndum eins og hin fyrri ár.

⁵ Sbr. Ragnar Edvardsson (2004). *Fornleifarannsókn í Vatnsfirði við Ísafjarðardjúpið* 2004. Fornleifastofnun Íslands. Reykjavík.

Afrakstur þessa sumars er til umfjöllunar í þessari skýrslu.

FRAMUNDAN 2008

- Framundan er áframhaldandi uppgröftur á víkingaraldarsvæðinu. Þar mun meginstarfsemi Fornleifaskólans fara fram sem áður.
- Þá verður miðað að því að afhjúpa vestari hluta 19. aldar torfbæjarins á bæjarhólnum í Vatnsfirði og halda áfram rannsóknir á honum.
- Stefnt er að halda áfram landshátta- og samfélagsrannsóknum í Vatnsfirði og nágrenni: Skoða samspil manns og náttúru auk fornleifaskráningar og viðtala við ábúendur og staðkunnuga.

Útgefnar skýrslur og greinar um Vatnsfjörð

Adolf Friðriksson og Torfi H. Tulinius (ritstj.) (2003) *Vatnsfjörður við Ísafjarðardjúp. Rannsóknir sumarið 2003* (FS213-03092). Höfundar efnis: Adolf Friðriksson, Andrea S. Harðardóttir, Ragnar Edvardsson og Torfi H. Tulinius. Fornleifastofnun Íslands, Reykjavík.

Adolf Friðriksson, Torfi H. Tulinius og Garðar Guðmundsson. (ritstj.) (2005) *Vatnsfjörður 2005. Fornleifarannsóknir/Fieldwork at Vatnsfjörður, NW-Iceland* (FS301-03095). Höfundar efnis: Adolf Friðriksson, Oscar Aldred, Colleen Batey, Ramona Harrison, Aaron Kendall, Kate Krivogorskaya, Tom McGovern, Karen Milek, Seth Brewington, Torfi H. Tulinius, Ragnar Edvardsson, Ian Simpson. Fornleifastofnun Íslands, Reykjavík.

Aldred, Oscar (2006) *Landscape research at Vatnsfjörður 2006* (FS343-03096). Fornleifastofnun Íslands, Reykjavík.

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Milek, Karen (ritstj.) (2007) *Vatnsfjörður 2006. Framvinduskýrslur/Interim reports* (FS356-003096).. Höfundar efnis / with contributions by Albína Pálsdóttir, Garðar Guðmundsson, Gavin Lucas, Guðrún Alda Gísladóttir, Karen Milek, Magnús Á. Sigurgeirsson, Oscar Aldred, Thomas McGovern, Uggi Ævarsson, and Véroniques Forbes. Fornleifastofnun Íslands, Reykjavík.

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Ragnar Edvardsson (2004) *Fornleifarannsókn í Vatnsfirði við Ísafjarðardjúp sumarið 2004* (FS249-03093). Fornleifastofnun Íslands, Reykjavík.

Ragnar Edvardsson and Thomas H McGovern (2005) Archaeological Excavations at Vatnsfjörður 2003-04. *Archaeologia Islandica* 4: 16-30.



(1) *Vikingaaldarsvæði. Fjarrest er smiðjan og til hægri við hana lítið hús. Í miðjunni er hús og þá hús með steinlög í gólfi og út úr dyrum. (2) Kennslustund í umhverfisfornleifræði hjá dr. Ian Simpson. (3) Unnið við að mæla og teikna minjar frá vikingaöld. (4) Kennslustund í Fornleifaskólanum. (5) Uppgröfurstur á bæjarhóli Vatnsfjarðar. Núverandi íbúðarhús í bakgrunni. (6) Men úr gulli, upphaflega hluti af írskættaðri nælu, envar klippt niður. Skreytið á gripnum bendir til að hann sé frá tímabilinu 850-950. Nælubrotið fannst árið 2005 á vikingaaldarsvæðinu í Vatnsfirði.*

(1) *The Viking Age part of the site at the end of 2006. In the background is the smithy and a small storage building. In the middle is a small building that had a grinding wheel on the floor. In the foreground is a small building with a paved entrance. (2) Field school students listening to a lecture by Ian Simpson about the homefield soils and the boundary wall around the farm. (3) Students recording deposits in the Viking Age area in 2007. (4) Field school students attending an evening lecture. (5) Excavations on the farm mound at Vatnsfjörður in 2007, with the modern farm house in the background. (6) Gold foil ornament the size of a thumb nail, which was found in the Viking Age part of the site in 2005. It was originally mounted on an Irish kite brooch, and dates to 850-950 AD, but it has been perforated to be worn as a pendant, and may have been lost at Vatnsfjörður significantly later.*

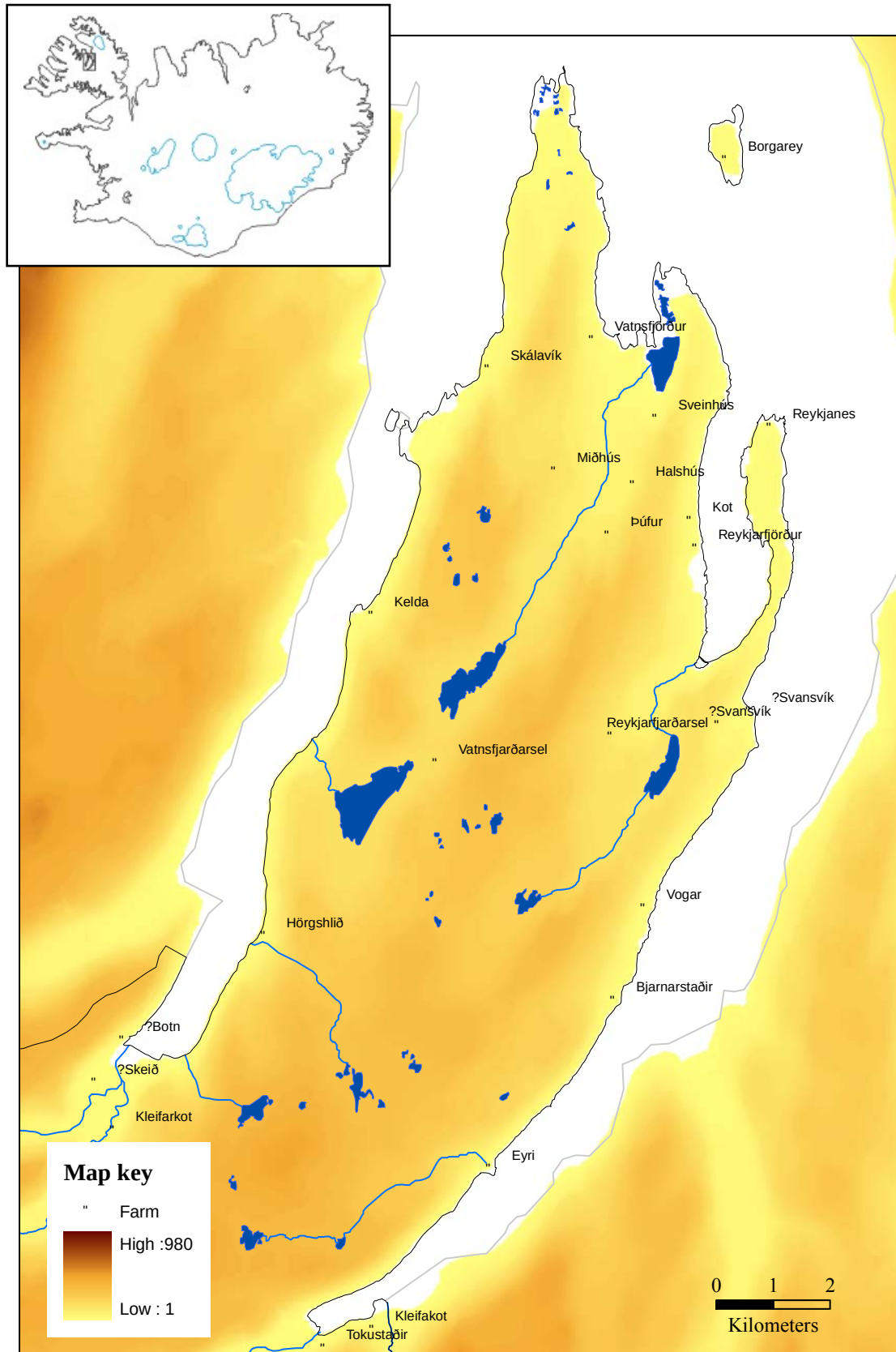


Figure 7. The study area, showing the locations of the main farms and landscape features. (Map by Oscar Aldred).

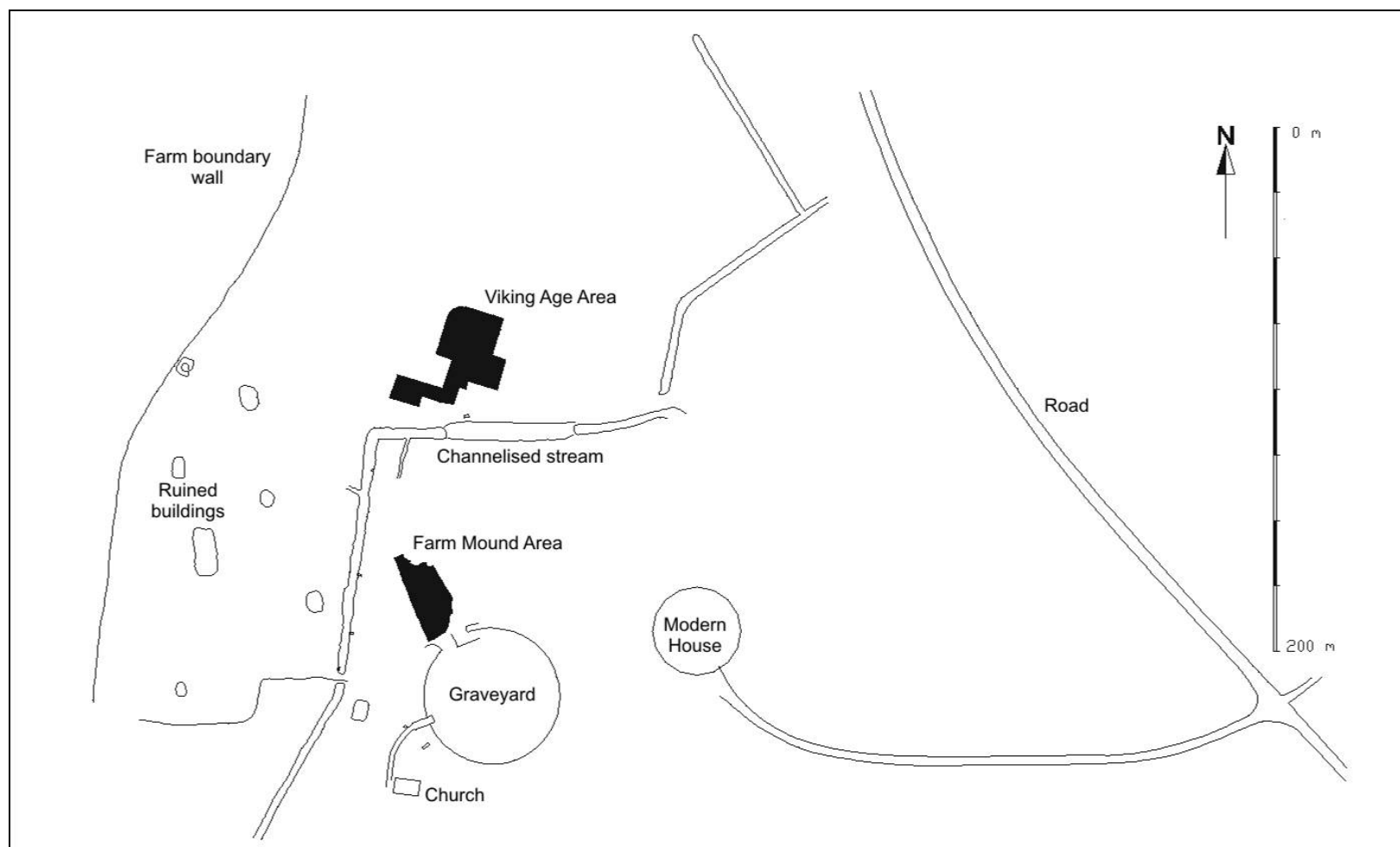


Figure 8. Map of Vatnsfjörður, showing the two excavation areas (the Viking Age Area and the Farm Mound Area) in relation to other visible features (map by Guðrún Alda Gísladóttir).

ARCHAEOLOGICAL INVESTIGATIONS AT VATNSFJÖRÐUR: 2003-2007 OVERVIEW

Karen Milek (Fornleifastofnun Íslands and the University of Aberdeen)

INTRODUCTION AND ACKNOWLEDGEMENTS

July 2007 saw the fifth season of excavation and landscape survey at Vatnsfjörður in Ísafjarðardjúp, in northwest Iceland – the third season in which the team included students from the Field School in North Atlantic Archaeology. Since the first archaeological and historical investigations there in 2003, research at Vatnsfjörður has evolved into a multidisciplinary investigation of the rise and decline of the chieftain's seat at Vatnsfjörður, and the relationship between this farm's evolution and the evolution of its landscape context. The project aims to explain why this apparently infertile farm in the Westfjords was chosen as a seat of power, what factors and social processes enabled it to flourish as a social, economic and cultural powerhouse between the thirteenth and seventeenth centuries, and why the importance of the farm declined after the seventeenth century. The waxing and waning of Vatnsfjörður must in some way mirror the changing fortunes of the Westfjord region, and by gaining a better understanding of the history of Vatnsfjörður, this project aims to shed new light on the social and economic history of the whole of northwest Iceland.

The Vatnsfjörður Project is made possible through the involvement of a large team of professionals, volunteers, and students from Iceland, North America, Europe, and further afield, who contribute enormous amounts of time, expertise and labour to the project. The project also owes its existence to the support of the Icelandic church and to Baldur Vilhelmsson and his entire family, who have kindly permitted us to excavate at Vatnsfjörður, and who have provided us with facilities and assistance in the field. In 2007, the Vatnsfjörður excavation was funded by the Icelandic parliament (Alþingi), the University Centre of the Westfjords (Háskólasetið Vestfjarða), and the Medieval Westfjords Society (Vestfirðir á Miðöldum), and received invaluable support in the form of staff, facilities, equipment, and logistical help from the Institute of Archaeology, Iceland (Fornleifastofnun Íslands), the National Museum of Iceland (Þjóðminjasafn Íslands), the Centre for Research in the Humanities, University of Iceland (Hugvísindastofnun HÍ), the University of Oslo, the University of Stirling, the City University of New York, the North Atlantic Biocultural Organisation (NABO), Hotel Reykjanes (Ferðaþjónustan Reykjanesi), Atvinnuþróunarfélag Vestfirðinga, the Maritime Museum in Ísafjörður (Byggðasafnið á Ísafirði), and the Education Centre of the Westfjords (Fræðslumiðstöð Vestfjarða).

In 2007, Christopher Caseldine, Jeremy Lloyd and Peter Langdon received funding from the Medieval Westfjords Society, and were also supported by their home institutions, the Universities of Exeter, Durham, and Southampton. Brian Damiata and Krissy Larkin were supported by the National Science Foundation, Dawn Elise Mooney was supported by the University of Cambridge, and Véronique Forbes was supported by the Social Science and Humanities Research Council of Canada and the Université Laval. Support for the author's post-excavation work came from the

RESEARCH THEMES OF THE VATNSFJÖRÐUR PROJECT

The archaeological survey, excavation, and palaeoecological work that has been conducted at Vatnsfjörður since 2003 has given rise to the working hypothesis that the waxing and waning of Vatnsfjörður's fortunes are inextricably linked to how the people of Vatnsfjörður and Vatnsfjarðardalur perceived and interacted with a dynamic cultural and physical landscape. In order to explore this hypothesis, five research themes have been developed, each of which integrates the work and ideas of a multidisciplinary team:

1. Evolution of settlement patterns in Vatnsfjarðardalur. Where and when were farms, shielings, and fishing stations established in Vatnsfjarðardalur, why were they located in specific places, and why and when were they abandoned? These research questions are being approached through the integration of archaeological survey and landscape analysis (Oscar Aldred, Poul Baltzer Heide), the archaeological excavation and dating of sites (Garðar Guðmundsson, Guðrún Alda Gísladóttir, Karen Milek, Uggi Ævarsson), and the study of written sources, such as the eighteenth- and nineteenth-century land registers (Már Jónsson). In future, it is hoped that ethnographic information will also be able to add to our understanding of the dates of the abandonment of farms in Vatnsfjarðardalur, and the reasons for their abandonment (Uggi Ævarsson).

2. Knowledge and management of economic resources in Vatnsfjarðardalur, and how this changed over time. What resources were available to the people who settled at Vatnsfjörður and the surrounding valley, what did they use, and how did they manipulate and change them? This research question is being explored through the integration of several data sets: excavation data, especially the animal and fish bones, charred seeds, wood, seaweed, and other organic remains, which provide information about resource acquisition over time (Dawn Elise Mooney, Garðar Guðmundsson, Guðrún Alda Gísladóttir, Karen Milek, Tom McGovern, Uggi Ævarsson); historical data, especially medieval sagas and post-medieval tenancy agreements that describe the locations of resources such as peat and driftwood (Már Jónsson, Torfi Tulinius); ethnographic data on place names and local knowledge about economic resources and soil conditions (Uggi Ævarsson); soil fertility and land management data (Douglas Bolender, Ian Simpson, Karen Milek), and local climate data, which impacts the growing season, hay production, and outfield grazing resources (Peter Langdon, Christopher Caseldine).

3. Evolution of social networks between Vatnsfjörður and other farms. What was the relationship between Vatnsfjörður and the other farms in the valley, and when did Vatnsfjörður develop as a central place in Vatnsfjarðardalur and the northwest of Iceland? This research question requires information about the routes and viewsheds that linked Vatnsfjörður to the other sites in the valley, and the cairns that marked the routes between them (Oscar Aldred, Poul Baltzer Heide), the property and rights owned by Vatnsfjörður, and the social relationships between Vatnsfjörður and its neighbours (Már Jónsson), and how residents of the valley perceived their relationship with Vatnsfjörður in the recent past (Uggi Ævarsson).

4. The evolution of Vatnsfjörður's role in regional trade and exchange networks.

What types of foreign goods were brought into Vatnsfjörður, and was there a local harbour that could have attracted trade and contributed to Vatnsfjörður's rise as a central place? This question is being approached through an analysis of the artefacts recovered from the excavations at Vatnsfjörður in order to determine which ones can be sourced to other parts of Iceland and Europe (Guðrún Alda Gísladóttir), as well as the reconstruction of the coastline and potential harbour places around Vatnsfjörður, especially the timing of sea-level change and its effects on the coastal lake, Sveinhúsavatn (Jeremy Lloyd).

5. The socio-economic rise and fall of Vatnsfjörður. When did Vatnsfjörður begin to develop as a high status site, and when did its influence begin to decline? This research question is being approached through the integration of well-dated archaeological data, including changes in the style and size of the residential buildings, the types of artefacts, and the types of animal and plant food stuffs (Dawn Elise Mooney, Garðar Guðmundsson, Guðrún Alda Gísladóttir, Karen Milek, Tom McGovern, Uggi Ævarsson, Véronique Forbes). This archaeological data is being integrated with written sources on the property and rights owned by Vatnsfjörður and the evolution of its role as a centre of culture and influence (Már Jónsson, Torfi Tulinius).

SUMMARY OF ARCHAEOLOGICAL AND ENVIRONMENTAL RESEARCH AT VATNSFJÖRÐUR AND THE SURROUNDING REGION

Vatnsfjörður 2003-2006

In 2003, several low earthworks that were visible in the homefield at Vatnsfjörður were investigated by Ragnar Edvardsson by means of three evaluation trenches (Ragnar Edvardsson 2003). These revealed walls and preserved floor deposits of two buildings (later called Structures 1 and 3), and encouraged a more intensive, open-area excavation of the larger of the two buildings in 2004 (Area 1) (Ragnar Edvardsson 2004). This turned out to be a Viking Age house (*skáli*), which has been dated to the tenth or early eleventh century on the basis of a radiocarbon essay on a cattle bone from the floor of the building (see Milek 1997). In 2005, when the excavation of the house was completed (Ragnar Edvardsson 2005), this radiocarbon date was further supported by the discovery of a number of tenth-century artefacts in the fill of a pit cut into the east wall of Structure 1, including five glass beads and a gold foil pendant that had originally been mounted on an Irish kite brooch (Figure 6, above) (Milek 2005). The tenth-century house was very similar in size, shape, and internal organization to other contemporary dwellings in Iceland, and included two entrances in the east long wall, a central hearth, a three-aisled structure, and a stone box in the main entrance passageway (Ragnar Edvardsson and McGovern 2005).

In 2005, when the Field School in North Atlantic Archaeology was moved to Vatnsfjörður, the scale of the excavation doubled. In addition to the completion of the Viking Age house in Area 1, a new excavation area (Area 2) was opened up to the east and southeast of the house. In this area, a smithy was found, as well as an outdoor cooking pit, a couple of temporary outdoor hearths, extensive sheet midden deposits,

and a gully on the eastern edge of the dwelling house, which had been filled with domestic rubbish (Milek 2005). There was no stratigraphic connection between the smithy (Structure 3) and the well-dated Viking Age house (Structure 1), and although its proximity to a Viking Age dwelling suggested contemporaneity, the lack of diagnostic artefacts in the smithy meant that it was not possible to be sure about its date.

In 2006 the area around Structure 3 was reopened in order to continue the excavation of the smithy, and a new excavation area was opened up south of the tenth-century house (Area 6), where a new building that had been identified in a test pit in 2005. This brought to light three new outbuildings (see Figure 1, above). One of the long walls of the smithy was abutted by a very small oblong building (Structure 6) that had no diagnostic features or finds in it and was probably used for storage – perhaps the storage of fuel for the smithy. The other fully excavated outbuilding was rectangular, with an entrance in one of its gable walls, a central flat flag stone, and a very thin floor lens containing charcoal, charred seeds, and decomposed plant matter (Structure 5). The only significant find in the building was a small grinding wheel, and this, together with the lack of diagnostic features, the thin floor deposit, and the lack of synanthropic insects in the building, led this building to be interpreted as an unheated workroom and/or a storeroom. Surrounding the Viking Age buildings were widespread sheet middens and trampled deposits, which produced a Borre-style strap end and a multi-coloured Viking Age glass bead (Milek 2007).

In 2007, nine evaluation trenches were also excavated on the farm mound in order to assess its size, the depth of its cultural deposits, and the quality of its preservation. These evaluation trenches revealed that the farm mound is exceptionally large: around 90 m long (north-south) and 60 m wide, with cultural deposits reaching thicknesses of around 1.5 m. The evaluation trench at the top of the farm mound found the last turf dwelling house at Vatnsfjörður (1884-1906), and the trench was extended to reveal very well-preserved wall foundations and a deep cellar infilled with early twentieth-century household rubbish (Guðrún Alda Gísladóttir and Uggi Ævarsson 2007). Three radiocarbon dates from birch charcoal recovered from a section in the farm mound suggested that the occupation of this part of the site began as early as the late ninth or tenth century, and that at least some parts of the farm mound had reached their present height by the thirteenth century.

In addition to the excavations at Vatnsfjörður itself, archaeological surveys in the region around the farm have been ongoing since 2003 (Ragnar Edvardsson 2003; Aldred 2005). In 2006, landscape research by Oscar Aldred and students of the Field school in North Atlantic Archaeology recorded 65 new sites, adding significantly to the 196 sites that had previously been recorded in the area. Most of these new sites were stone cairns, but new peat cuttings, tracks and structures were also recorded (Aldred 2006).

Vatnsfjörður 2007

2007 saw a proliferation of new work on the physical and cultural landscape of Vatnsfjarðardalur, and the relationship of that landscape with the farm of Vatnsfjörður. Three environmental specialists from the United Kingdom joined the

Vatnsfjörður Project team: Pete Langdon (University of Southampton), a specialist in climate reconstruction based on the assemblages of non-biting midges (chironomids) in lake core sequences, Chris Caseldine, a palynologist from the University of Exeter, and Jerry Lloyd (University of Durham), a specialist in sea-level reconstruction using the analysis of foraminifera and diatoms in cores taken from coastal lakes and ponds recently isolated from the sea. The pilot projects conducted by these specialists, which involved taking short cores from a number of lakes in the region around Vatnsfjörður, and preliminary laboratory analyses, are summarised in this report. They demonstrate that there is excellent potential to model sea-level changes and climate changes over the last millennium, environmental factors that would have had a profound impact on the lives of the people in the region, and almost certainly would have influenced the decisions they made about subsistence and land management practices. The analysis of the short lake cores taken in 2007 is ongoing, and a priority for future work is to date the sequences.

The ongoing survey work on the cultural landscape of Vatnsfjarðardalur and the surrounding peninsula by Oscar Aldred and Poul Baltzer Heide identified another 333 new sites in 2007, bringing the total number of cairns, structures, tracks, boat landing places, walls, and bridges in the study area to 599. They also made important progress in the classification of cairn types, a classification system that we hope we will soon be able to compare to the absolute dates of the cairns based on optically stimulated luminescence (OSL) of the rocks and the soils that underlie them (ff. Vafiadou et al. 2007). New sea-based survey work on the coast of Vatnsfjarðarnes, combined with preliminary dating of the farm sites in the study area, has also shed fresh light on the importance of the sea to the settlement history of this landscape. In particular, it is becoming increasingly clear that the earliest farms in this area were established along the northern coastal areas, around Vatnsfjarðardalur (including Vatnsfjörður) and the eastern shore of Ísafjörður, and evidence is finally materialising to support the hypothesis that good boat-landing sites would have been a key factor in the choice of settlement site location.

On the site itself, 2007 was an exciting year. An ambitious programme of large open-area excavation was started at the top of the large farm mound, and the last (nineteenth-century) turf house on the farm was nearly completely exposed (see Figure 5, above). Thousands of artefacts and bones were recovered, which, even at this preliminary stage of analysis, are already giving us a much richer picture of life in the Westfjords in the late nineteenth and early twentieth century. It is also giving us our first basis for comparing how families living on the same farm in different centuries perceived and interacted with their physical-cultural landscape. We can select just a few examples to illustrate this point:

- 1) The commodification, mass importation, and commercialisation of common household items in the early twentieth century by large, centrally organised trading companies was in stark contrast to the more personal networks by which people obtained imported goods in the Viking and Medieval Periods. For example, items such as whetstones, cooking vessels, beads and combs would once have been obtained from itinerant traders and craftspeople who were either met at seasonal markets or who were invited into home. Those who did not have direct contact with such traders or craftspeople would have received these items by means of barter or gift exchange –

possibly through very long networks of personal relationships.

2) The change from open fires to closed stoves, such as the one found on the farm mound in 2007, meant a dramatic change in people's experience of meals, their attitudes towards fuel resources, and their perception of how rubbish such as animal bones should be disposed of. Rather than sitting around an open flame during a meal and tossing bones back onto the fire, as was common practice in the Viking Age, households with closed stoves would have needed to dig special rubbish pits in order to dispose of much greater quantities of bone waste.

3) Relationships with living animals changed dramatically as well. From the nineteenth century bone assemblage, we see evidence that hunting baby seals and very focussed hunting of puffin were common practices, while in the Viking Age bone assemblage, there is not a single neonatal seal, and a very large variety of birds were hunted – a hint, perhaps, of a very different attitude and a more sustainable treatment of wild resources.

As we continue to excavate deeper into the farm mound, and deeper into the past, we will be able to track these cultural and economic changes over time. It will be fascinating to see whether the changes occurred gradually, or whether they occurred suddenly, and what the triggers and mechanisms for these changes were.

In 2007, the excavation on the Viking Age part of the site saw the completion of Structure 3, the smithy, and Structure 4, a small building with a stone pavement on its northeastern half. An interesting discovery was made under the north wall of Structure 4 when it was sectioned in order to remove a thin sheet midden deposit: a piece of a whale bone. Foundation deposits under walls and at the bottom of post holes are not uncommon in Viking Age Iceland, and they must have played a role in a ceremony or ritual associated with the construction of these buildings, but the symbolic meaning of these deposits remains elusive.

A new excavation area was opened up to the west of Structure 4, where an evaluation trench in 2006 had identified the walls of a building (Area 14; see Guðrún Alda Gísladóttir and Uggi Ævarsson 2007; see Figure 3, above). This small rectangular building, which has been named 'Structure 7', contains a stone pavement, as well as a small second entrance on its southern gable end, and is without known parallel in Iceland so far. Although the stratigraphy associated with Structure 7 is not connected with the other buildings in the Viking Age area, the discovery of a Viking Age-Medieval spindle whorl in the turf collapse of this building suggests that it may be roughly contemporary with them. The building had certainly been abandoned long before the H-1693 tephra fell. Structure 7 was fully exposed during the 2007 field season, and its internal deposits will be excavated in 2008.

The interim specialist reports that have been prepared for this volume provide us with some of the greatest surprises of 2007. The tenth-century residents of Vatnsfjörður seemed to cope with nonchalance with what we believe to have been a difficult and stressful environment for farmers, but they were not doing it in the ways we expected. Instead of placing an emphasis on the exploitation of wild species such as fish, sea birds, whales and seals, as we might have expected, wild species make up only a third

of the fauna in the Viking Age bone assemblage. Preliminary analysis of the bones shows that domestic species were paramount: sheep/goat, cattle, pigs, and horses, in descending order of importance (Albína Pálsdóttir et al., this volume). This suite of domestic animals is similar to that on Viking Age farms throughout Iceland, but the nearly equal proportion of caprine and cattle bones is surprising, for such a high proportion of cattle bones is more typical of larger, more productive, and higher-status Icelandic and Norwegian farms. The zooarchaeological data therefore lends further support to the idea that Vatnsfjörður might have been a high status farm since the tenth century AD – a view so far based largely on the find of the gold pendant in 2005. Furthermore, ten percent of the cattle bones are those of young calves, a pattern usually interpreted in this part of the world as reflecting a dairying economy (*ibid.*). Against all odds, then, this northern farm, where soils were thin and seemingly infertile, flourished, and was able to present itself as an equal to the high status farms in much more obviously fertile parts of Iceland.

The secret to how they may have accomplished this probably lies in the earth itself. The geoarchaeologists Ian Simpson and Doug Bolender are investigating how the soils in the homefields at Vatnsfjörður and surrounding farms were managed, and preliminary results are already hinting at a diverse and creative suite of practices, including active homefield soil and wet meadow development (Ian Simpson, pers. comm.; see Doug Bolender, this volume). Understanding how and why Vatnsfjörður became a central place, and what it meant to be a central place in the Westfjords at different times over this last millennia, requires a creative, multi-stranded approach. It is fortunate, therefore, that we have such an interdisciplinary team to work on this problem together. The rise and fall of social and economic power at Vatnsfjörður, and how this is related to its dynamic cultural and physical landscape, will only be understood through the collaborative research of many disciplines.

Future work

The 2008 excavation season will have several key goals:

- In the Viking Age part of the site, the excavation will focus on Structure 7 and a new area will be opened up to the north of this building, where it may be possible to tie its stratigraphy to that of Structure 1.
- On the farm mound, excavations will continue on and to the west of the nineteenth-century turf house, in an effort to expose the entire building at one time, and to excavate the complete building in phase sequence.
- Oscar Aldred and Poul Baltzer Heide will continue to extend their field survey to the more southern reaches of Vatnsfjarðardalur in order to find and map sites in the rest of the study area. They will also extend their sea-survey of the coastline in order to identify fixed features on land that were used for navigation.
- The public archaeology programme will be extended to include a public Open Day, signs at the entrance to the site and on the site itself, and a pamphlet about the site.

CREDITS: STAFF AND STUDENTS OF THE 2007 FIELD SCHOOL IN NORTH ATLANTIC ARCHAEOLOGY

Since it was founded in 1997, the Field School in North Atlantic Archaeology has served as a focal point for interdisciplinary, cooperative teaching and research by archaeologists and natural scientists from Iceland, Europe, and North America. This tradition continued in 2007 at Vatnsfjörður, with archaeologists and palaeoecologists from Canada, the United States, Iceland, the United Kingdom, and Norway contributing to the field school teaching curriculum while carrying out original research at Vatnsfjörður and the surrounding region.

The 2007 field school was directed by the author, with all excavation and survey staff contributed to the teaching and supervision of field work and post-excavation work, including Astrid Daxböck, Christian Keller, Elizabeth Pierce, Garðar Guðmundsson, Guðrún Alda Gísladóttir, Konrad Śmiarowski, Mjöll Snæsdóttir, Oscar Adred, Poul Baltzer Heide, Ramona Harrison, and Uggi Ævarsson. Several graduate student volunteers, who were conducting research projects on material from Vatnsfjörður, also contributed to the teaching, including Albína Pálsdóttir (City University of New York), Dawn Elise Mooney (University of Cambridge), Nicole Taylor (University College London), and Véronique Forbes (Université Laval). Gunnhildur Garðarsdóttir also volunteered on the excavation, and contributed to the smooth running and good moral of the project. Finally, a number of visiting scholars made important contributions to the teaching and research programme, including Adolf Friðriksson, Brian Damiata, Christopher Caseldine, Colleen Batey, Douglas Bolender, Eileen Tisdale, Grant Alston, Graham Langford, Ian Simpson, Jeremy Lloyd, Krissy Larkin, Orri Vésteinsson, Peter Langdon, Torfi Tulinius, and Val Dufeu.

As in previous years, the field school was greatly aided by the involvement of Christian Keller of the University of Oslo, Tom McGovern of the City University of New York, and Orri Vésteinsson of the University of Iceland, who organised the intake of students. Thirteen university students were accepted to the field school in 2007: Bjarney Inga Sigurðardóttir (University of Iceland), Christine Anne Forrestal (University of Glasgow), Claire Cavaleri (University of Oslo), Cláudia Luisa Gouveia Dos Santos (University of Wroclaw), Cory Look (City University of New York), Demelza Kooij (University of Amsterdam), Elisabeth Jeffries (University of Glasgow), Erin Williams (City University of New York), Meghan Markey (University of Maryland), Monika Hronn Ingolfssdóttir (University of Iceland), Patricia Edwards (University of Glasgow), Rebecca Rose Wall (Cornell University), and Todd Kristensen (University of Alberta). A report on the field school from a student's perspective has been written by Todd Kristensen, and is included in this interim report.



Figure 9. Picture taken from the top of Bolafjall, near Bolungarvík, during the July 14 field trip. From left to right: Cory 'Chad' Look, Monika Hronn Ingolfsdóttir, Erin Williams, Elisabeth Jeffries, Albína Pálsdóttir, Meghan Markey, Demelza Kooij, Ramona Harrison, Patricia Edwards, Cláudia Luisa Gouveia Dos Santos, Christine Anne Forrestal. Spying in the background: Konrad Śmiarowski.

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LANDSCAPE RESEARCH IN THE VATNSFJÖRÐUR ENVIRONS

Oscar Aldred (Fornleifastofnun Íslands and University of Iceland)

INTRODUCTION

This chapter presents the result of the landscape research in Vatnsfjörður during 2007. The work focused on the areas that lay between the areas surveyed in 2005 and 2006, although some re-walking took place. Table 1 outlines those areas surveyed in 2007.

Table 1. *Areas surveyed in 2007.*

Date	Area
29/06/2007	Vatnsfjarðarháls
30/06/2007	Vatnsfjarðarsel
03/07/2007	Skalavík & Vatnsfjarðarháls
04/07/2007	Vatnsfjörður to Þufur route
05/07/2007	Vatnsfjarðardalur & Sveinhúsaness
06/07/2007	Vatnsfjörður coast & Sveinhúsaness
09/07/2007	Vatnsfjarðarnes & Eyrarfjall
10/07/2007	Reykjafjarðarháls & Stavatnsháls
11/07/2007	Reykjafjarðarháls
12/07/2007	Vatnsfjarðarnes & Vatnsfjarðarháls
13/07/2007	Reykjafjarðarháls
16/07/2007	Reykjafjarðarháls
17/07/2007	Sea survey
18/07/2007	Reykjanes
19/07/2007	Reykjanes & Skipavík
20/07/2007	Svansvíkurháls & Svansvíkurvatn
23/07/2007	Þufur - Miðhús area

In 2007 333 individual sites were surveyed, excluding the sea survey and the detailed ground survey within the farms of Hálshús and Sveinhús. In total 599 sites were surveyed between 2005 and 2007.

As in previous summaries of survey fieldwork (Aldred 2005; Aldred 2006), this report presents a series of themes. This includes further discussion on cairns and their potential for understanding past landscapes, on the practices of movement which are integral to this understanding, including movement in seascapes, and on the potential of utilizing visibility analysis between farm locations and the surrounding landscape. In addition, a full compendium of the survey data acquired in 2007 is presented.

The survey work was conducted jointly by Oscar Aldred and Poul Baltzer Heide, with Christian Keller, who focused on the farm of Sveinhús. In addition a student landscape project was undertaken by Demelza Kooij and Patricia Edwards at Hálshús, a summary of which is presented here.

METHODS

Landscape as an archaeological study and approaches towards it

The term landscape means different things to different people. This diversity is part of its strength but also its main weakness, as it refers to something we all know and think we understand, yet to each of us it means something different. Defining it more precisely is needed to take it beyond a personal definition – to give it a more grounded and particular meaning. The landscape in this archaeological study is concerned with the human dimension of landscape which is both material (i.e. physically evident as archaeological sites) but also mental (i.e. forms derived from the processes of engagement of the *world* around people). The landscape of Vatnsfjörður, like people, has a distinctive biography which has been inscribed into the land since its earliest use, which constitutes peoples' world view, but which has also been shaped by them. This *dwelling* perspective is centred on the relations between people and the environments in which they live. Each landscape therefore has a different character which is defined not only in terms of its spatial quality (patchworks of vegetation or densities of archaeology) but also in its temporality. Landscape's spatial qualities are exhibited in the distribution of its sites: the cluster or dispersion of sites that defines distinctive regions. These are explored later.

Temporality is central to the understanding of the meanings of the landscape. It is found in the elements of past landscapes that are etched onto or incorporated with other elements with different temporalities. We usually express this effect in several ways: we can think of it as a palimpsest (a manuscript written over a partly erased older manuscript in such a way that the old words can be read beneath the new); or as a patchwork, in which the past and present are weaved together; or as a point of contact where different temporal folds or chiasma meet (a biological term to express the point at which paired chromosomes remain in contact after crossing over during meiosis). These different types of metaphors reflect the idea that landscapes are never static. They are in constant motion and are an on-going process: landscape therefore has time-depth and rather than *being* is in a constant state of *becoming*. Vatnsfjörður's landscape is no exception; its time-depth is concerned primarily with the material inscription of people's activities in the landscape, seen in monuments connected with movement, or domestic and activity spaces. It is also concerned with the immaterial inscriptions which reflect social practices involved in the re-working and re-negotiation of the site, which monuments and landscapes take on at different times.

In order to understand the landscape's temporality a number of approaches have been (and will continue to be) applied during field survey. All of these have at one time or another been applied during the Vatnsfjörður project by specialists involved in the project, including historians, environmental scientists, archaeologists and anthropologists, all of whom emphasise a different kind of human-environment interaction. This can be viewed as a graduation from nature on the one hand to culture on the other, or as a consideration of landscape either as a background or as the material for engagement. First and foremost there have been environment-based approaches that have focused on the evolution of the landscape due to changes in climate and sea-level in the past, as well as human impacts on the environment that have resulted in land degradation as well as its improvement. Another approach that

has been considered is landscape as a system, particularly in terms of site and non-site activities such as intensive and extensive fodder production, which are related to site subsistence and the strategies involved in the maintenance of the status quo. These types of approaches are suitable for understanding the landscape in terms of how people cope with changing environmental conditions, and in understanding the economic and political conditions which contextualise peoples' actions. Thirdly, we can consider landscape in terms of the power embedded in the ideologies contained in the material culture of landscape (for example, farm areas that reflect value and personal status), which are inextricably linked to the patterns of subsistence, economics, and politics mentioned above. In particular, power shapes and constitutes the patterns of resistance and dominance that different sectors of society employ either to control access to resources or to transformation and maintain land status. The fourth and final approach considers landscape as experience – a process whereby understanding people in the past is based on being immersed in the landscapes in which they lived. This is not only a phenomenology of landscape as a study of things as they are perceived by us today, but also an informal re-presentation of the past – a discursive starting-position. The archaeology of landscape in this way is always situated; it is part of a wider archaeological agenda concerned with understanding the distribution of power and the relationship between culture and nature – or rather its synthesis as understood by people in the past.

The study that is presented here is a preliminary attempt to understand the landscape's temporality using the third and fourth approaches outlined above. These are concerned with the ways in which people live and work in the landscape from a *dwelling* perspective, and how humans adapt the landscape and adapt to the landscape in the context of local politics and processes. These types of investigations are concerned with the ways in which people shape the politics of place and the ideologies derived from centres of power in a landscape such as that of Vatnsfjörður. The landscape research agendas are met with here with a two-pronged approach: first, with a consideration of the types of sites and their spatial patterning as derived from the field survey, and second, with a consideration of the social practices that are embodied in the construction, maintenance and abandonment of these sites.

Research themes

Within the general programme of research, the landscape work is concerned with acquiring archaeological data to understand the extent and range of human engagements in the landscape around Vatnsfjörður – monuments and sites that reflect the extent of farming and fishing practices, and communication in small, but nucleated, communities, such as the cluster in Vatnsfjarðardalur. This data is discussed below under Site Themes, with accompanying site distribution maps. Field survey was primarily conducted in the outfield areas, in the land that lay outside the infield areas, where the majority of farm-related activities are usually located. The outfield therefore, presented different types of sites and different types of practices, but the connection with the farm was still quite strong. Several farm infields were also surveyed. In addition to Vatnsfjarðarsel and Reykjafjarðarsel, which were surveyed in 2005 and 2006, Hálshús and Sveinhús were revisited and surveyed using a Differential GPS.

The other research theme concerned a more specific investigation into understanding the complex relationship between people and the environments in which they live. This was specifically orientated in order to understand patterns of maintenance and land-marking, as seen in routes, through wayfinding and navigation practices, as well as material and immaterial boundaries between settlements. Survey from the sea was also conducted in order to gain an alternative perspective on the land(scape), with respect to visibility and sea movement. These are discussed further in the section on Landscape Themes.

RESULTS

The results of the landscape work may be divided between Site Themes and Landscape Themes. The first section describes the types of sites found during survey, their appearance, and distribution. The second section involves a discussion of the interpretative aspects of the landscape work, and also makes use of maps and photographs in an attempt to establish links between the practice of data collection and landscape theory. These are elaborated upon in the Discussion section, below.

Site themes

Cairns



Figure 1. Cairn 289 looking north towards 288 [30_06_07_018].

A total of 244 cairns were surveyed in 2007. This is the most common type of site surveyed during each season. The cairns are therefore important retainers of information about land use practices and the maintenance of the landscapes we are studying. One of the key aspects of using the cairns for understanding the landscape in more meaningful ways is to establish chronology, or at the very least, variations in

their temporal attributes. In several ways it is possible to extract information concerning the *relative* antiquity of these land markings, as well as the duration and use of these sites within different types of *networks* (such as routes, boundaries, burials and so on). Issues that influenced the interpretation of cairns and their function in the landscape included their state of preservation, their construction, and the relationship they had with other sites and their immediate locale. A typology of cairns was developed as a starting point for understanding variations in the design, usage and maintenance of cairn networks, the spatial distributions of types and how they were patterned in the landscape, and their temporal sequence.

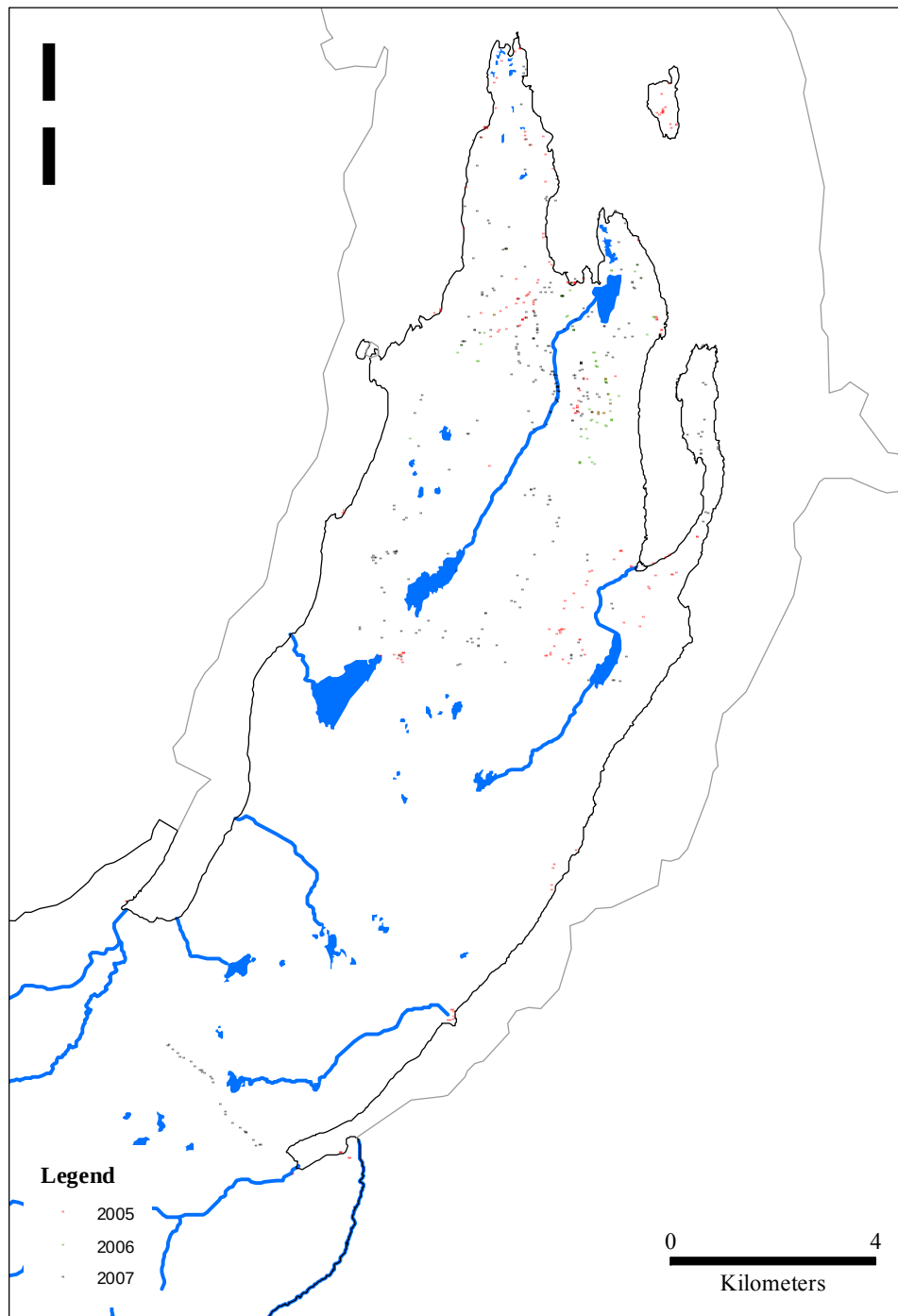


Figure 2. *Survey between 2005 and 2007.*

The interpretative typology, which was developed by Poul Baltzer Heide, is based on the morphology of the cairns. It was recognised that cairns could be classified into beehive, conical, natural, nipple (for want of a better word), single stone and tower shapes. One hundred and thirty-five of the 244 cairns surveyed in 2007 were classified into these types; those not classified were often collapsed, making it impossible to determine the typology of the cairn. Whilst the classification system still needs refinement it nonetheless produced some interesting results. In addition to the 244 cairns and natural stones that were surveyed and classified in 2007, 119 have been classified, which were surveyed in 2005 and 2006.



Figure 3. Cairns 291 in the background and 292 in the foreground [30_06_07_020].

Cairns 291 and 292 were located on the western slopes of Vatnsfjarðarhals and above the farm of Vatnsfjarðarsel. The two cairns were located in close proximity to one another: 291 just east (background in Figure 3) of 292 (foreground and collapsed). 291 was a tower cairn, 2m tall, 0.8m wide on the top and 1.5m on the base. It was located on the edge of a rocky plateau on a small natural mound with good vistas of the land around it. It was also visible from the valley below. It is possible that cairn 292 was deliberately destroyed and replaced by 291. Cairn 292 was 0.8m by 0.8m and only 0.2m tall. The destruction of 292 is suggested by the proximity of 291 to it and the scattering of stones. The change from 292 to 291 may have been related to the fact that 291 was part of a system of time reckoning or marking – something that was not perhaps envisaged when 292 was initially built. It is also possible that the cairns were part of a boundary system and/or were navigation markers, for which greater visibility was needed. The two cairns may therefore represent an element with which we can understand the temporality of the landscape. Firstly, on the one hand, a new construction replaced an earlier one in a change of location for a number of possible

reasons. As the earlier cairn survives in part it may have been kept in its diminutive form because it was part of a farm boundary system – between Kelda and Vatnsfjarðarsel. And secondly, the more prominent location of the new cairn allowed it to be more visible from the valley floor, both to the east and south, therefore connecting rooms of visibility that extended from the valley floor to higher ridge west of it towards Kelda. This increase in its visibility allowed it to be more easily incorporated into a multi-purposeful monument: time marker, boundary point and a waymarker cairn. Furthermore, the place-names suggest that 290 (another cairn) and 291 respectively mark the places called Þrætuflói (anger bay) and Náttmálateigur (nine o'clock spit) seen on a place-name sketch map from the early-20th century.

Structures

Twenty-seven of the sites surveyed in 2007 had structural qualities. This includes sites classified as stone structures, structures, sunken buildings, shelters and boat houses. In total 85 structures have been surveyed since 2005. The variety and distribution of structures surveyed in 2007 can be interpreted in several ways. As expected the majority of the shelters lie between farms and tend to be in areas which are separated from other features, like cairns. For example, the boat house is located next to the sea; though a relatively modern construction, this structure may be on the site of an earlier landing spot or boat house.



Figure 4. *The structure 542 being surveyed [18_07_07_019].*

The area of Reykjanes was of particular interest. On this peninsula four structures were surveyed, including one boat house and one shelter. Structure 542 was located at

the southern end of the Reykjanes peninsula, which is called Seltangi (seal point). This structure was approximately 9m by 10m (Figure 4). There were possibly three rooms: two in the northern part and one in the south. The structure was slightly mounded to a height of 1.5m from the lower ground surface and partially constructed from stone. It faced the sea towards the south and west, and there was potentially a landing spot for boats to the south.

Another area of interest lay between Vatnsfjörður and Sveinhús, on the east side of a stream called Þúfnaá, where there was a cluster of four structures. Structure 346 was a small turf built structure 2m by 3m; 347 was a slightly larger one, 5m by 3m, and faced onto stream; 348 was a larger structure still, comprising three compartments, 12m by 7m in size, turf-built and preserved to a height of 0.4m; 349 was also comprised of three rooms, and was 7m by 5m. Their location close to the stream and close to the boundary between Sveinhús, Hálshús and Vatnsfjörður suggests a squatter settlement or a seasonally-used place. None of this information appears to be mentioned in the place-name surveys for either Sveinhús, Hálshús or Vatnsfjörður.



Figure 5. Structures 346 (right) and 357 (left) in the middle portion of the picture just below the slope; looking south-east [04_07_07_OA_042].

Tracks

Besides the tracks already mentioned that were marked by cairns, of which there were many in this landscape, it was possible to distinguish others which had distinctive marks on the ground surface, indicating walking or riding tracks. They were characterised by a lack of vegetation, usually linear in form, and by erosion of the land surface that was exposed or lying under the vegetation growth, though discernable as a worn walk-ways. When these types of features were observed in

association with cairns it was easier to assign specific, functional interpretations. There were a total of 21 tracks surveyed in 2007, the majority of which correlate precisely with cairns and already inferred route systems. These were well distributed throughout the survey areas.

Of particular interest was the worn track identified in the southern part of the study area across Eyrafjall (Eyri's (low lying ground next to sea) mountain), along Hestaleif (horse route). The steepness of the first part of the track would have made it extremely hazardous for horses even if they were un-mounted during the climb. Therefore it is possible that another alternative route up the slope exists, which was not found in the 2007 season. The track across the heath was marked extensively by cairns, but it was also possible to identify worn and eroded parts; for example at 402, 403, 408, 416 and 421. The route appears to have been well used until relatively recently, indicating the importance of communication across the heath between the two fjörds of Ísafjörður and Mjóifjörður. Furthermore, the cairns along this route were well maintained, with some indications of repair; this is discussed more extensively in the section below.



Figure 6. Track at cairn 411; looking east [09_07_07_PBH_019].

Other types of sites

A variety of different sites were surveyed besides the ones already mentioned. These were found in lesser number. Of particular interest here are fox traps, stone walls (located in the Reykjanes area), bridges and boat landing spots.

Two fox traps were surveyed in 2007. These were sites 476 and 506, both of which

were located on the western slope of Reykjafjarðarháls, above Sveinshús and above the northern end of Sveinshúsavatn respectively. They were square-shaped, with hollow centres; 506 was 2.5m by 1.5m and 0.5m tall.

Six stone-built walls were found on the western coastal edge of Reykjanes, distributed across 0.5 km (530, 531, 533, 535, 537, 538). They were low-lying constructions, often only one course tall, and they may have been subjected to some dismantling and damage. They were located c. 5m from the high-tide mark. Their function is uncertain, though it might be possible that they were connected to enclosing the space between the coast and the wall edge – perhaps for controlling the movement of sheep grazing on seaweed, though the wall was not continuous in length. A cairn (534), a shelter (536) and an unknown feature (532) – a revetment into the coast line – were also found in the same area.

Three bridges were found in 2007, bringing the total number to four. Site 445 was made of turf and stone, whereas both 371 and 578 were made of stone only. The latter two sites crossed the Þúfnaá between Vatnsfjörður and Sveinhús and between Miðhús and Þúfur respectively. Each of the bridges were connected to routes, and therefore these locations marked the crossing points between the main settlements in the survey area.

DGPS survey

Survey continued in 2007 using the Differential GPS (DGPS). Whereas the previous work was focused on Vatnsfjörður it was decided to expand on this and take in parts of Sveinhús and Hálshús. Both farm sites were surveyed by students under supervision, resulting in a detailed and valuable spatial layout of the farm structures and infield areas.

Landscape themes

In this section an interpretative approach is presented. It focuses on the themes connected with regions within the survey areas: farms, seascapes, movement, and visibility. It discusses the major themes that are emerging from the Vatnsfjörður landscape research and that will continue to run through future work.

Regions

Within Vatnsfjörður's landscape several distinct areas or regions can be identified. These regions are defined using a combination of the physical properties of the landscape, such as the water bodies, the hills and the sea, and the density of archaeological sites. The study area is divided by the ridges Vatnsfjarðarháls and Reykjafjarðarháls. The ridges define the valley areas of Vatnsfjarðardalur and Reykjafjarðardalur, in which lie the farms and the main agricultural areas. Besides the east to west division, which is based on the underlying geological structure of the landscape, there is a split between the north and south parts. In Vatnsfjarðardalur much of the southern area has yet to be surveyed, though it is likely that there will be

a fall-off in the number of sites in this area. A similar situation applied to Reykjafjarðardalur and the highland area south of Vatnsfjarðarsel. There are also distinct coastal areas: the peninsular areas such as Sveinshúsanes and Vatnsfjarðarnes as well as a shore-edge on the sides of Mjólfjörður and Ísafjörður.

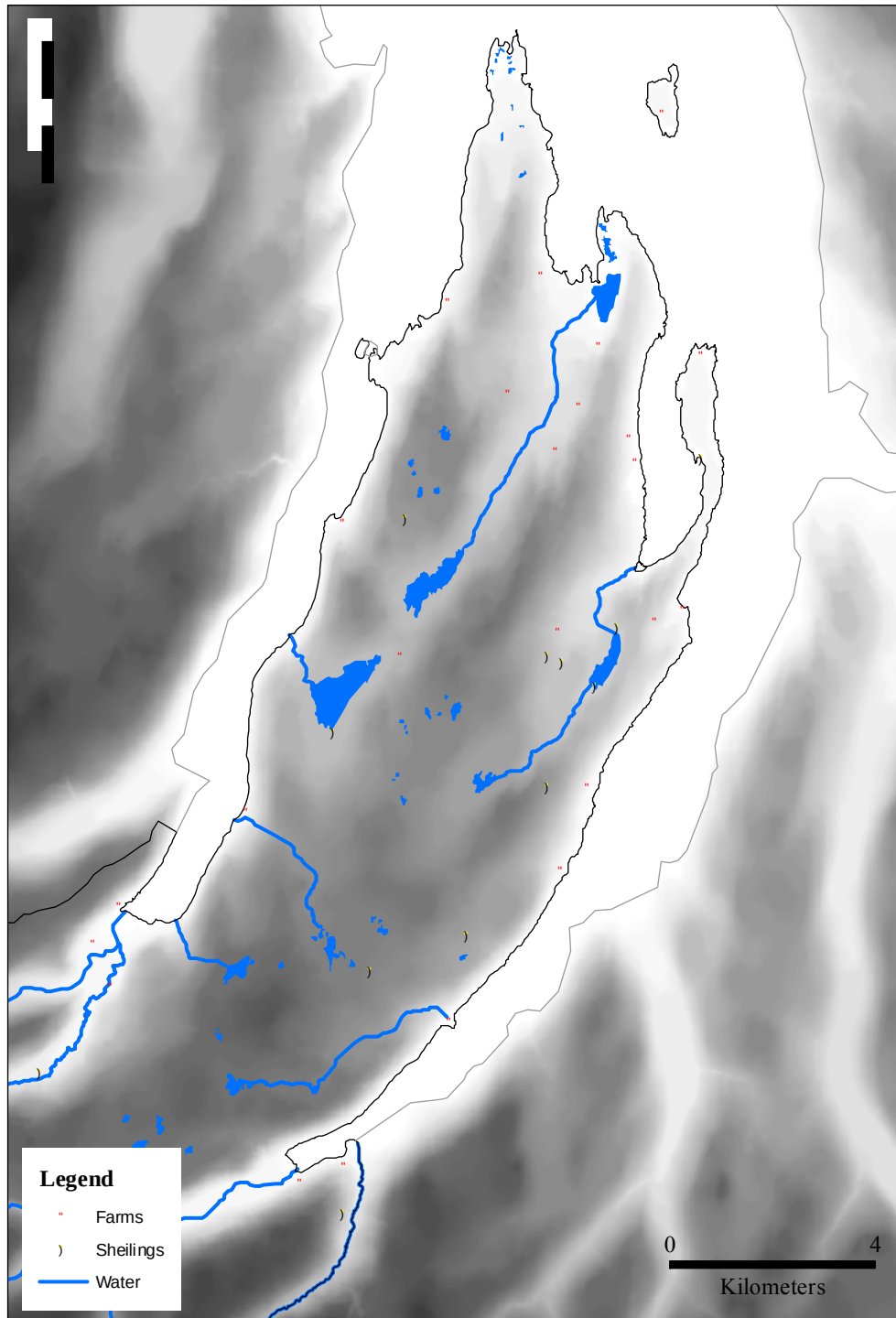


Figure 7. *Terrain model showing farms and sheilings.*

Farms

Table 2. Farms in the study area.

Farm name	Number	Date
Vatnsfjörður	ÍS-205	c. 900
Kelda	ÍS-202	1200
Eyri	ÍS-214	1200
Reykjarfjörður	ÍS-210	1200
Þúfur	ÍS-209	1222
Vogar	ÍS-212	1229
Hálshús	ÍS-208	1327
Borgarey	ÍS-205b	1367
Miðhús	ÍS-207	1382
Svansvík	ÍS-211	1405
Botn	ÍS-199	1458
Hörgshlíð	ÍS-201	1458
Skálavík	ÍS-203	1458
Bjarnastaðir	ÍS-213	1458
Sveinshús	ÍS-206	1495
Seljaland (Sel)	ÍS-204	1700
Kleifarkot	ÍS-200	1710
Reykjafjarðarsel	ÍS-210:024	1870
Kleifakot	ÍS-702:002	1890
Tókustaðir	ÍS-702:003	1949

The distribution of farms reflects an east to west and north to south distribution, in much the same way as the regional patterns described above. These are two distinctive settlement zones: a coastal strip and valley area. We know already that Vatnsfjörður was a Viking settlement and it is likely that there are others. The locations of these other sites can be hypothesised by investigating the landscape history of the region in a more systematic way (a more diachronic assessment of the landscape's settlement development). One approach is to map out the landscape history to develop a chronology of settlement evolution. This should normally be derived from excavations by carrying out test trenches on each farm, focusing on a

several structures to get a chronological cross section through each farm. Although this method is fairly intensive and will take many years to complete. Another method that is less time consuming, and useful for initial assessment studies, is to examine the historical sources in order to identify when a place is first mentioned to establish a possible *terminus post quem*. As a side note, there are obvious problems in this type of approach, but the intention is to help support and give an impression of the evolution and possible understanding of temporal development of settlement in the landscape, onto which test trenches can be placed in farms to tighten the chronology. In any case, understanding settlement chronology, in general, helps to understand the wider impact and daily routines that are negotiated in the landscape.

Looking at the distribution of first document dates in the Table 2 and Figure 8, it is possible to suggest that there appear to be several formative phases in the evolution of settlement patterns in this area. The earliest phase pre-dates the thirteenth century. This phase includes Vatnsfjörður, which is known to date to at least the tenth century based on the artefacts recovered from the excavations there. There is also a later medieval settlement phase, between thirteenth and late fifteenth century, and a post-medieval phase dating from the nineteenth century to the (early) modern period. This model of settlement evolution can be tested and refined with archaeological investigations, and it is hoped that in future years funding will be obtained for this additional excavation work. Nevertheless, even this preliminary, broad-brush approach makes it clear that there was initial settlement of the coastal areas in the northern part of the study area, around Vatnsfjörður and Vatnsfjarðardalur and the eastern shore of Ísafjörður (see Figure 8).

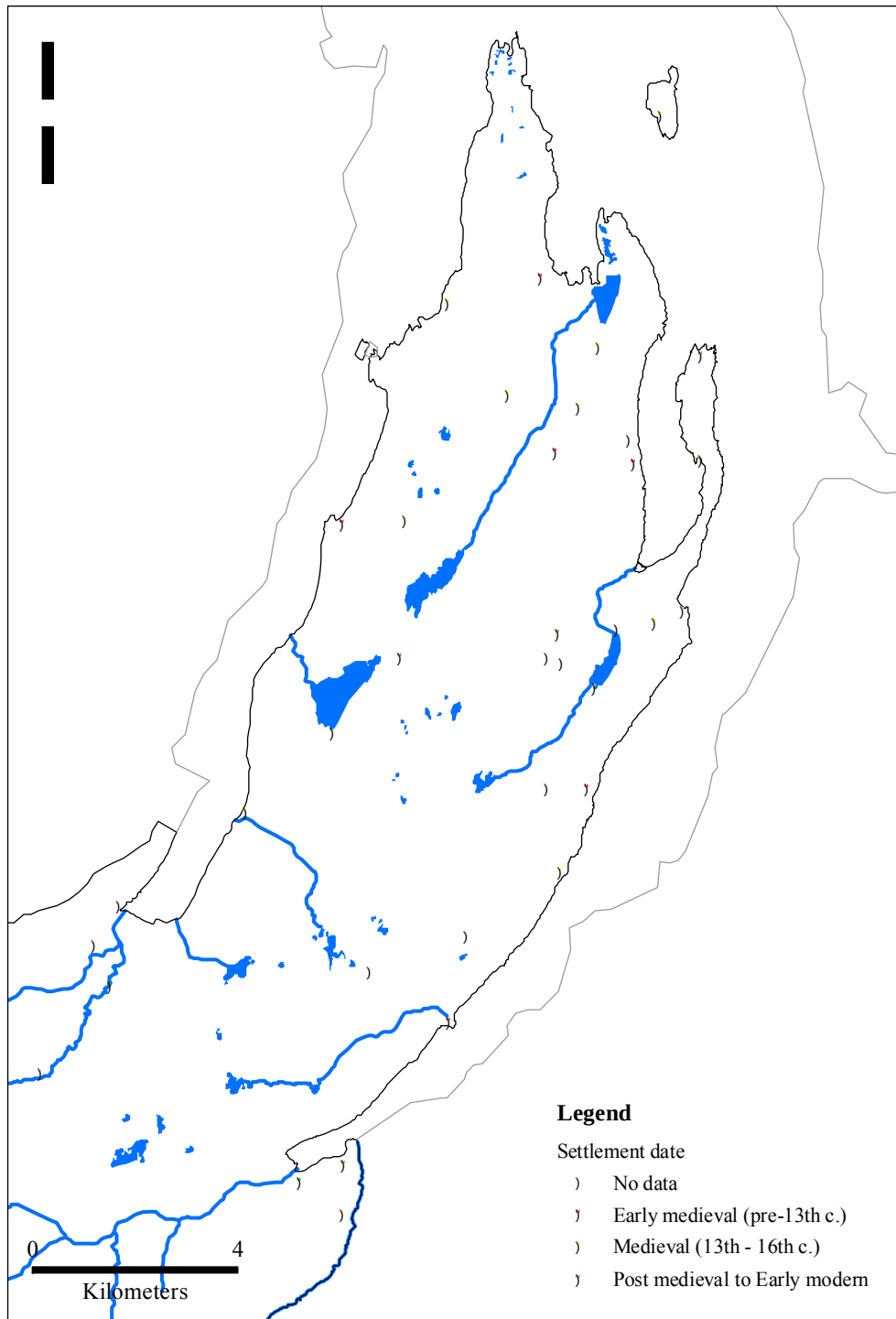


Figure 8. Settlement date according to first documented date (taken from the Ísleif database and various documentary sources).

The next wave of settlement fills in Vatnsfjarðardalur as well as the coastal edges of Mjólfjörður and Ísafjörður. Several farms are not possible to date, or are only mentioned in documents describing the post-medieval or (early) modern periods. These sites in particular may be reused in some capacity, becoming farms after a period as sheilings or early expansion sites (for example, Vatnsfjarðarsel). This working model must be used with caution, because it belies the complexities of

settlement dynamics and the extent to which land use can vary over time.

Seascape

Sea survey was introduced for the first time in 2007 as part of the survey 'package'. It was used primarily to assess the degree to which viewing the land from the sea would be useful in understanding the landscape better; particularly from the point of view of pre-modern communities whose attachment to the sea must have been far greater and more integrated into life than it is today. The sea survey used many of the same principles as the land survey – observation, perspective and in-the-field (on-the-sea) interpretation. Several new sites were located in this way, including the enclosure 527 and various cairns along the eastern shore of Vatnsfjarðarnes, such as 524.

Similarly, in order to understand the roles that cairns played in navigation at sea it was important to understand where the landing spots were located. This was done by assessing which routes from the sea to the shore were possible at different tides. Several landing spots were identified in this way. Correlations between them and other archaeological sites have only been assessed in a preliminary way, but at this stage the landing spots appear to be correlated to settlements and known archaeological sites with early histories. This suggests that at least one of the factors in the initial settlement location may have been connected to good boat-landing spots. Although this may seem obvious, the archaeological evidence for the correlation between early settlement sites and boat-landing sites is not particularly forthcoming and is often obscured by increased rates of sedimentation, higher sea levels and modern constructions on old landing places. For example, around Vatnsfjörður three to four possible landing spots were identified from the sea, perhaps accommodating different sea and weather conditions. Such a large number of landing sites could have perhaps involved a complex system of sea navigation and corresponding navigation markers on land.

Sea navigation in Iceland may have used a 'dead-reckoning' system based on the boat's position in relation to fixed features on land. This system uses not only human-made fixed markers, such as cairns, but the whole landscape, as well as the sun, moon and stars, depending on the boat's orientation and position on the sea. As such the change in orientation on the sea in order to sail around a reef may open up a new vista from which a 'direct reckoning' line to a cairn or a clearly differentiated natural feature is to be taken. Some cairns, which were particularly visible from the sea due to their silhouette on the horizon or their contrast with their background could have been used for sea navigation. In particular, Grettisvarða, site 561, seems to have potential as a sea marker, but only at certain places along the route into one of Vatnsfjörður's boat landing spots. In Figure 9 the view of 561 is clear from this particular position in the fjord, but after travelling a little further to the south the view of 561 was obscured as the cairn blended into its background. It is therefore likely that several markers were used to direct boats to landing places. This type of networked navigation has a multitude of possibilities that can only be understood by gaining practical experience and by interviewing local people with that knowledge. One of next year's objectives is to develop this approach more thoroughly and to identify fixed features on land that were used for navigation at sea.



Figure 9. Looking south on the western side of Vatnsfjörður bay. Gréttisvarða (A) can be seen, along with Vatnsfjörður (B) [VSF_survey_17_07_07_OA_004].

Movement

Movement, as has been outlined in previous reports (Aldred 2005; Aldred 2006), is an important method for developing an understanding of how landscape was incorporated into people's lives and their daily practices. These negotiations and practices are reflected in land-markers such as cairns and tracks. These relate to different types of activities, such as moving animals, going to and from church, neighbourly communications, and traversing longer distances between fjords or regions. Like navigation at sea, there are many different computations and networks that can be analysed using ground-based surface survey and mapping. Once links are made between features that are related to movement, a greater sense of regionality – a matrix of movement – can be explored. By developing a sense of regionality, we will be able to better understand everyday practices and the ways in which people ascribed meaning to landscape in more complex ways – beyond simply stating the existence of 'systems' of navigation. Landscape is not only a background – something on which things were inscribed – it also a material for action; it gave people a sense of identity that was recursively shaped. Movement in the sense discussed here is therefore a crucial element in foregrounding people's experience of the world around them. It connects both land and sea – although the sea has no tracks, it is possible to understand the commonly used navigation systems by analysing cairns that served as navigational markers from the sea. Movement, then, has several facets that allow us as archaeologists to explore how people in the past used and viewed their landscape and the ways in which activities varied between different generations of occupants.

Movement on land, as well as at sea, is an embodied practice which has directly traceable and tangible forms of inscription. Since these tangible forms can be

surveyed and recorded, and they permit us to traverse the landscape or seascape in the same way as people in the past, we can bring our own experience to an understanding of how these networks were created and how they functioned. The degrees of spatial variation, the form and construction of markers, as well as routes and directionality tell us about how people lived and worked the land. In this way, we can not only begin to understand very localised perspectives of a given landscape but we can begin to understand the possible relations between archaeological sites and their association with a particular piece of land; for example, why a monument is located where it is. These types of associations are of special importance if we are to understand past humans and their relationship with the landscape, as well as the ways in which that relationship changed over time. Marking land in a special way through the construction of monuments indicates intentionality and a particular cultural need, but one that is not in any way independent of topography or the available resources for construction.

The cultural or social forms behind the construction of a monument in a particular location are implicitly connected with the underlying *texture* of the landscape, a relationship that lies at the intersection of the nature:culture dichotomy. Variation or change in either the cultural or social forms or in natural conditions such as in the environment or climate have a huge affect on the ways in which people articulated themselves and therefore the conditions under which sites were made. These altering configurations are the essential ingredients in the study of the landscape and in the archaeology of this region. One approach we have used to improve our understanding of how people interacted with the landscape was to develop a typology of cairn morphology (see the section on cairns, above). It may be that variation in cairn construction reflects an intentionality that can contribute to our understanding of human-landscape relations, as is illustrated in the example below.

Between Sveinhús and Hálshús, on a low-lying outcrop, five cairns were surveyed. The cairns varied little in their construction (four were beehive-shaped and one was a natural stone with a small stone pile on top) but three of the five had collapsed, or rather, they may have been deliberately destroyed or left to decay and replaced by two newer cairns. The use of the same construction technique among these five cairns suggests that there was not much temporal difference between the upstanding and collapsed cairns (following the idea that different construction techniques indicate changes in how people were utilising or perceiving the landscape at different times). The displacement of three of the five cairns, however, suggests that there were localised and subtle changes in their location that enhanced the visibility of the newly constructed cairns in the landscape. A lack of difference in the morphology of the cairns suggests that this may have been done by the same person or group. Two of the beehive cairns were replaced by two others higher on the outcrop (see Figure 10, below, with 433 in the foreground and 430 in the background). The subtle variations in the placement of cairns suggests new perception of and interactions with the landscape that required new markings. These were probably related to other types of activities such as moving animals around the landscape or going to and from church. As this example suggests, subtle variations in location, or in cairn construction, tells us something about how people interacted with the land. In this project, we will therefore continue to use cairn typology and location to develop ideas about how people negotiated and perceived the landscape through time.



Figure 10. *Cairns on low lying outcrop [10_07_07_G1_004].*

Locality, visibility and landscape rooms

In order to explore the possible reasons why cairns were located in specific places, we decided to assess their visibility from particular locales in the landscape, such as other features and farms.

The concept of a ‘landscape room’ is based on the idea that at a given point in the landscape, the monuments and landscape features that are visible are symbolically connected to that point. The temporality of the monuments and landscape features is irrelevant to this study, since residual and older elements in the landscape continue to take on new meanings in their relation to newer features. We conducted visibility analyses at the main entrances of both the Viking and the medieval houses, the idea being that changes in the location of a house created a different type of ‘landscape room’: one which may indicate ideological associations between farm places and other features in the landscape. Visibility may also represent power relations, with the size and direction of a landscape room potentially indicating the extent to which visibility was an effective means to exert control and influence of power in a particular landscape context.

In the following example (Figure 11), we can see that the shift in occupation from the Viking Age house to the farm mound at Vatnsfjörður changed the shape and size of the landscape room. From the Viking Age house it was possible to see Sveinhús and Halshús, but from the farm mound it was possible to also see Þúfur. It is not possible to see Miðhús from either location. The implications of the landscape rooms suggest that inter-visibility between Vatnsfjörður and other sites may have had some importance. This idea will be developed further in subsequent years.

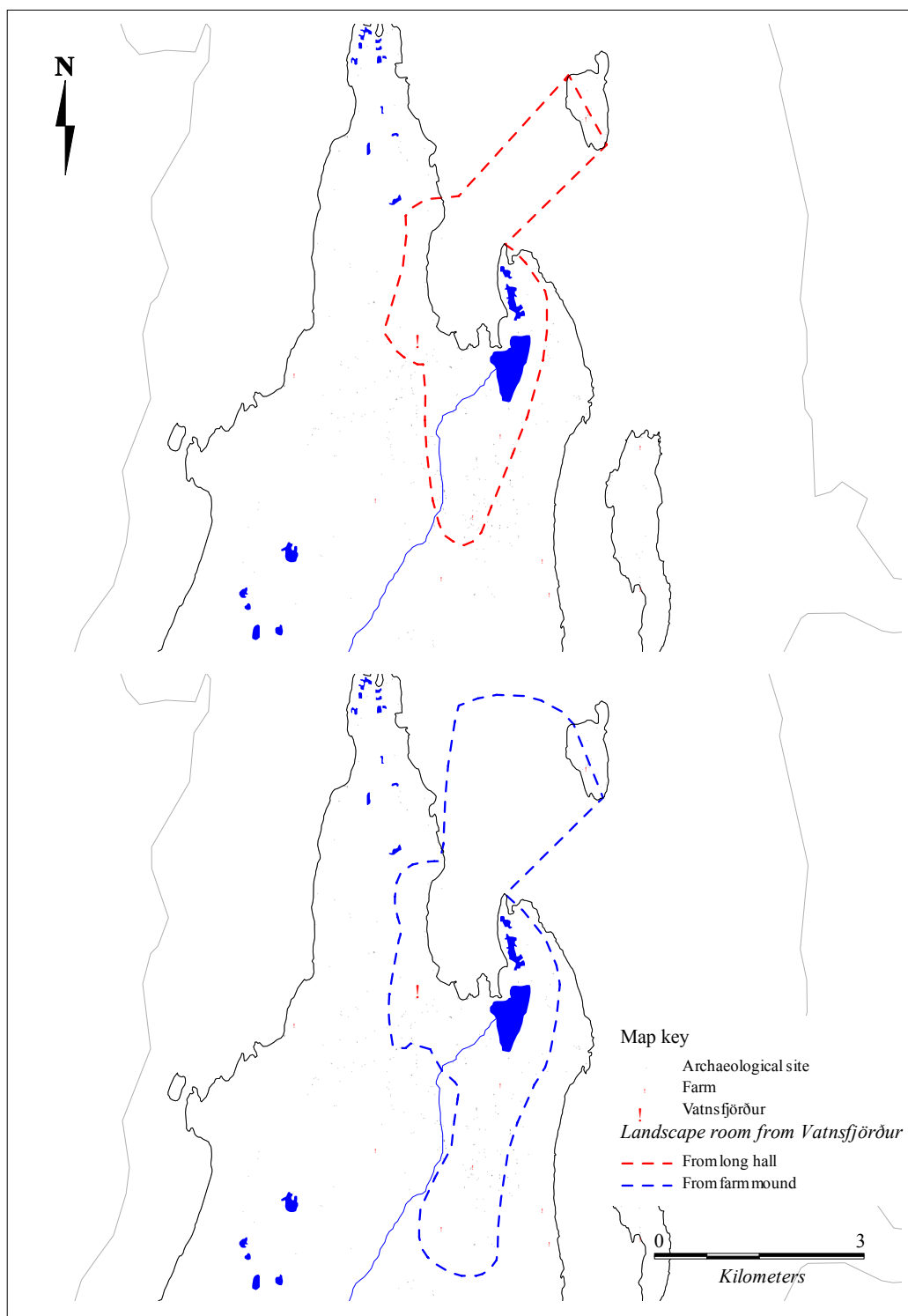


Figure 11. Landscape rooms from Vatnsfjörður: Viking Age house (top) and farm mound (bottom).

DISCUSSION

The discussion that ends this summary of the 2007 field season is perhaps a little premature given the amount of work left to do. However, the focus throughout this report has been on what the author believes to be the main subjects of interest in the Vansfjörður landscape: its regionality and its temporality. An issue that has not yet been explicitly discussed is landscape biographies – i.e. the stories that can be told in the small and often subtle variations that exist between different parts of the landscape. These themes perhaps need to be explained on a little further, and put into context against the objectives of the Vatnsfjörður project as a whole.

One of the main objectives of the Vatnsfjörður project is to understand what affect Vatnsfjörður had on the development of the landscape and what in turn influenced its location, economic practices, social standing, social relationships, and so on. The physical landscape clearly influenced the site's location, and probably also the decision to shift from the Viking site to the farm mound 100m further to the south. Environmental changes such the drop in sea level (see Jerry Lloyd, this report) and fluctuations in temperature (see Peter Langdon and Christopher Caseldine, this report), had a profound affect on both the physical landscape and the lives of the people who lived there. At the same time, the settlement at Vatnsfjörður clearly had an effect on vegetation cover and soil quality (see Douglas Bolender, this report). The cultural landscape, as it developed, included settlements and different forms of land use, routes and other monuments, all of which formed a religious landscape, an economic landscape, and a political landscape, in which Vatnsfjörður was an important regional centre.

All of these dimensions of Vatnsfjörður as a place of influence of the cultural and the natural landscape have a temporal dimension. In order to facilitate our understanding of Vatnsfjörður in the landscape we therefore need to understand its temporality from a number of different perspectives. One important dimension is provided by the archaeological information that is acquired through excavation and landscape survey, but historical sources, and the history of the changing environment, all contribute to our understanding of the temporality of the landscape. Temporality, then, can be approached in different ways. First, we can try to reconstruct a diachronic – period by period or chronological – assessment of Vatnsfjörður and its landscape. Second, building on the first, we can attempt to understand how time was perceived by people in the past and how that affected the subsequent development of the landscape. For example, to what extent did earlier *structures*, such as religious activities or farming activities and their physical manifestations in the landscape, influence how the cultural landscape subsequently developed? This explores the important idea of *a past in the past*.

Case study

If we take a closer look at the area of Vatnsfjörður, Sveinhús, Halshús, Þúfur and Miðhús in Vatnsfjarðardalur, we see a number of elements that can help us develop ideas connected to regionality and temporality. The area in question has been described in cultural terms already (farms, routes etc.). The topography and the land cover (as it is now) need some description as well. The topography of the area has

dictated the spread of cultural activity: a valley basin that gradually inclines towards the south, and with ridges running north to south, with a small stream that runs through the basin towards the shallow lake of Sveinhúsvatn (see Figure 12). The valley sides provide shelter for the farms that lie just below them: for example, Halshús, like the other farms, lies on a small shelf on the valley side, nestling into the ridge Reykjaðarháls. This character of settlement is inextricably linked to the surrounding natural topography; it was remarked by one of the students how the ridges give security, that they form an impenetrable boundary that encloses the settlement (Demelza Kooij pers. comm.). Further south, at the head of the valley, is Vatnsfjarðarsel. Although this farm (former shieling) lies on more open ground, it still retains a link with Reykjaðarháls. The coastal settlements maintain an even more important link with topography, given the limited availability of land. We should perhaps ask why the settlers in Vatnsfjarðardalur did not settle in the more open land in the middle of valley basin? Were issues of security dominating the choice of location, or was it the type of land available – flat and a little open to allow expansion but at the same time retain ‘security’ from the ridges? (We must also explore the possibility that the valley bottom may have been boggy and unsuitable for farming, while the hillsides may have been better drained and would have provided direct access to upland pastures. – *ed.*) Along the coast, there was probably a strong connection with landing spots, such as at Vatnsfjörður. Perhaps this was an issue for the initial settlement period, but during the secondary expansion there may have been a requirement for land that was secure, flat, and that allowed expansion of the farm for small scale cultivation and land improvement. Sveinhús may be an example of the later. Though it remains unproven so far, it is also possible that Sveinhúsvatn may have been a suitable place for harbouring when sea levels were higher. We can certainly envisage Vatnsfjörður and Reykjarfjörður as good landing spots based on their present-day qualities. In contrast Þufur, Halhús and Miðhús may have focussed on a need for flat and secure land.

Based on this preliminary assessment, the initial settlement of the area, including the establishment of Vatnsfjörður, was probably focused on sites that had good access to the sea, enough land to allow the farm to expand, good potential for land improvement, and shelter and security. Þufur may also have an early history, but not one that is connected to the sea. Sveinhús also displays similar characteristics, though as yet there is no concrete evidence for earlier occupation. According to its first documentation in written sources, it was not established until the medieval period.⁶ Subsequent farm establishment then perhaps took place at Halshús and Miðhús. The land between these farms in Vatnsfjarðardalur is of major interest as it is rich in sites, particularly in cairns. Having set the chronological scene, the discussion can now turn towards the other type of temporality that can be explored through the cairns.

There are 33 types of sites between the farms in this area, including sheep houses, enclosures, boat houses, fox traps, structures, tracks, and, most common of all, cairns. The cairns show some interesting spatial patterns when they are associated by their alignments and proximities with other cairns and when a typological analysis has been applied to them. For instance, there are clearly groups of cairns that are linked by their proximity as well as their construction, hinting at planned arrangements, maintenance

⁶ Though there is a suspicious looking area 100m north of the present farmhouse building (Christian Keller pers. comm.).

and repair of routes, and cairn chronology. For example, the routes between Vatnsfjörður and the farms that surround it are marked by networks of cairns, some of which clearly overlap. The analysis of associated cairns shows different levels of maintenance and use of the routes over time. For example, there appears to be several routes between Vatnsfjörður and Miðhús. Along one of these, going from Miðhús towards Vatnsfjörður, the sequence of cairns is as follows: conical, tower, collapsed cairn, tower, collapsed cairn, natural stone and natural stone. This arrangement, with its sequence of maintenance and repair, hints perhaps at a longer history of use than other routes. It also indicates changes in routes through the placement of cairns (this last point depends on whether it is clear that cairns have been deliberately destroyed or simply collapsed from exposure). (It is clear from looking at Figure 12 that some collapsed cairns are closely associated with a standing cairn that must represent a reconstruction or replacement, posing the interesting question of why the stones of the original cairn were not reused. Is it possible that building a new cairn was a symbolically significant act? Other collapsed cairns, which have not been reconstructed, could have collapsed after the route was abandoned and the cairns were no longer needed. – *ed.*)

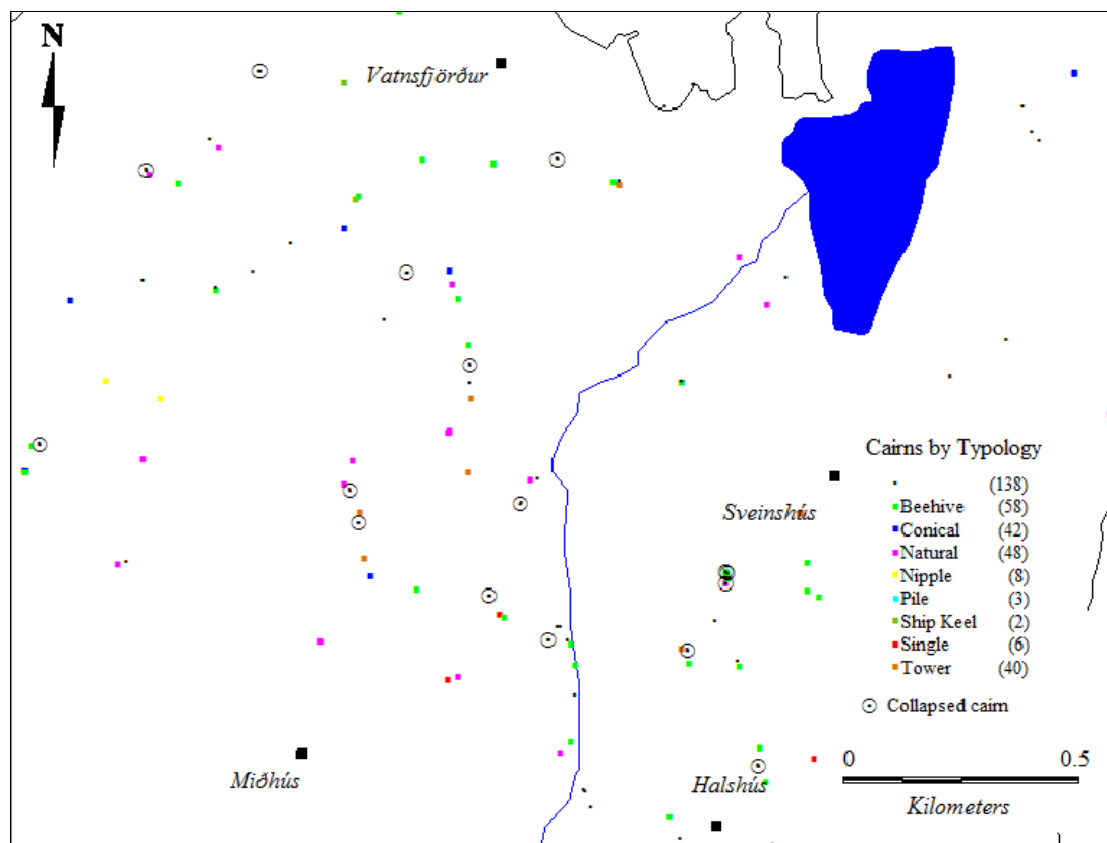


Figure 12. Cairns between Vatnsfjörður and Miðhús.

CONCLUSION

The landscape survey conducted in 2007 shed new light on the connections that people had with the land. In particular, our focus on the construction and maintenance of routes, and the placement of sites such as farms and cairns, gave us new insight into the ways in which the people who lived and worked around Vatnsfjörður interacted with the land and sea – essentially their localised world-view. At the other extreme we have another world-view, Vatnsfjörður as a regional centre, which had contact with places and people beyond the immediate area. The continued survey work will benefit these two divergent perspectives in two main ways that are linked by issues of temporality and regionality. First, it will allow us to explore the ways in which Vatnsfjörður exerted its power over the communities in the surrounding area and the greater area of the Westfjords, and the ways in which this power was resisted. Second, it will enable us to consider the ways in which this power changed over time, especially as Vatnsfjörður's power declined at the end of the post-medieval period. It is hoped that the waxing and waning of Vatnsfjörður as a central place and a place of power can be better understood when viewed in the context of changes in settlement patterns (e.g. establishment or abandonment of farms), changes in the routes that connected Vatnsfjörður to other farms, sheilings, and boat-landings, and changes in land use.

Acknowledgements

OA would like to thank Poul Balzter Heide, Christian Keller, and the field school students – especially Demelza Kooij and Patricia Edwards – for their contributions to the survey project.

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RECONSTRUCTION OF PAST CLIMATE IN THE VATNSFJÖRÐUR AREA: A PILOT STUDY

Peter Langdon (University of Southampton) and Christopher Caseldine (University of Exeter)

INTRODUCTION

The occupants at Vatnsfjörður over the past millennium would have been subject to a range of climates, and in order to fully comprehend the potential impacts of these on societal organisation and economic structure it is vital to understand the nature, timing and magnitude of past climatic variations. One of the best ways that this can be achieved is through the study of terrestrial archives, specifically utilising lake sediments.

Lake sediments represent high quality natural archives that possess a large range of potential palaeoclimate and palaeoenvironmental proxies that can be extracted. We aim to utilise a suite of proxies that will provide us with high resolution climate reconstructions coupled with detailed information on catchment and within lake processes.

METHODS AND RESULTS

Fieldwork

Initial short 'pilot project' gravity cores were taken from three sites in summer 2007: Neðra-Selvatn (N 65° 53.127, W 22° 32.292), Fremri-Selvatn (N 65° 51.941, W 22° 34.918) and Myfluguvatn (N 65° 47.703, W 22° 49.742). These sites were chosen for study because they are located in areas where there has been minimal catchment disturbance yet are still close to the Vatnsfjörður settlement. Additionally, the sites are quite different, allowing intra-site comparisons to be undertaken in terms of sensitivity to past environmental changes. Neðra-Selvatn is shallow (maximum depth <2.5 m) and macrophyte rich, whereas Fremri-Selvatn, situated within ~200 m of Neðra-Selvatn, is relatively deep (maximum depth ~20 m). Myfluguvatn is situated at 435 m above sea level, and is a higher altitude lake than the other sites, which are at ~135 m above sea level. It is also of relatively shallow depth (maximum depth 5.5 m), but may be more sensitive to climate change due to its more mountainous environment. Two cores were taken from both Neðra-Selvatn and Myfluguvatn, one being subsampled in the field at 1 cm slice resolution, the other being sealed and returned to the laboratory intact in the core tube. These cores were later split open and scanned for geochemical analyses using the latest generation ItraX facility at NOCS (Southampton University). Only one core was retrieved from Fremri-Selvatn due to time and weather constraints. This core was also subsampled in the field at 1 cm slice resolution. Each core taken was of the order of ~25-30 cm in length, and most had visible tephras within the stratigraphy. Early estimates suggest that the age of the sediments in the cores goes back c. 300-500 years.

Laboratory Analyses

The two cores brought back intact to the laboratory were split and analysed geochemically using XRF techniques with ItraX (in collaboration with Dr Ian Croudace at NOCS, University of Southampton). These data for Neðra-Selvatn and Myfluguvatn illustrate geochemical fluctuations within both cores, and also help identify clear tephra layers. One notable tephra layer in the Myfluguvatn core, which had been clearly visible to the eye in the sediment stratigraphy, was clearly picked out by the geochemistry at around 21.8-22 cm (see Figure 1). It is possible that this tephra layer, clearly the greatest ashfall event in the last few hundred years in this sequence, may be the same as has been identified at the site of Vatnsfjörður, which has tentatively been ascribed to the Hekla-1693 eruption. Further geochemical analyses on this tephra layer, plus a layer from Fremri-Selvatn at 2-3 cm depth, were undertaken on the Edinburgh microprobe by Dr Stefan Wastegård, of Stockholm University (see results in Tables 1 and 2. No conclusive correlations have as yet been made with these tephras, although the Fremri-Selvatn ash is clearly from Grimsvötn; this may be from the 1934 eruption, which had a westerly distribution. The major ashfall event in the Myfluguvatn core, at around 21.8-22 cm depth, is certainly not from Hekla-1693, as originally thought, but it could be from Grimsvötn (suggested by Prof. Andy Dugmore, who has noted some affinities with other historic eruptions, such as Öraefajökull 1362). This could be from the 1619 eruption, but more work needs to be done on these data. The data have been discussed with Prof. Andy Dugmore, and follow up work is ongoing. We also hope to analyse more tephras from the cores in the future, and to apply additional dating techniques.

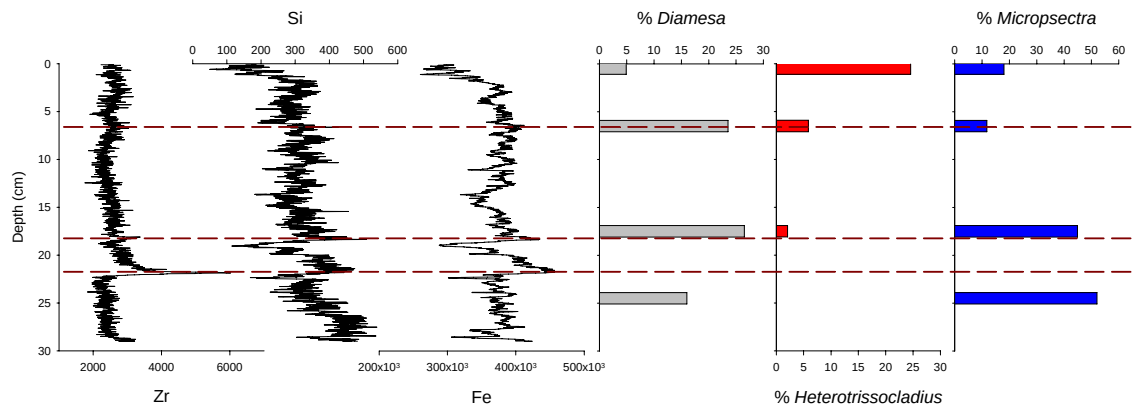


Figure 1. Plots showing selected ItraX geochemical data (Zr, Si and Fe) from the Myfluguvatn core, which illustrate (along with the X-radiograph – not shown) the presence of 2 (possibly 3) tephras, that are identified by the dotted lines. In addition, preliminary chironomid analyses are shown for 4 depths, illustrating changes in key taxa that are sensitive to climate changes over the core depth.

Loss-on-ignition (LOI) and spheroidal carbonaceous particle (SCP) analyses have been undertaken on each core, although the SCP work is currently inconclusive and will need to be developed further. Chironomid analyses as been undertaken on the Myfluguvatn core and work on the chironomids from the Fremri-Selvatn sequence will be undertaken later in 2008. Chironomids are recognised as the most accurate way of extracting quantitative summer temperature information from lake sediments.

Table 1. *Geochemical analysis of the core from Fremri-Selvatn.*

FREM 2-3
sample 11

Data Point	Na₂O	SiO₂	MgO	Al₂O₃	K₂O	CaO	TiO₂	MnO	FeO	Total
60 / 1 .	3.2039	49.568	4.6836	12.075	0.7242	8.9959	2.9736	0.1941	14.366	97.5442
52 / 1 .	2.9246	49.4102	4.8225	12.2509	0.5905	9.0654	2.7959	0.2153	13.3853	96.0272
58 / 1 .	3.1187	49.3454	4.6549	12.1973	0.7523	8.9607	3.3949	0.2117	14.1652	97.9053
56 / 1 .	2.8974	49.3073	4.6893	12.2262	0.5275	8.9611	3.4424	0.1529	14.1658	96.9046
57 / 1 .	2.8155	49.2636	4.8024	12.257	0.5704	9.0685	3.4771	0.272	13.4616	96.6346
55 / 1 .	2.8183	49.2415	4.5967	12.3275	0.5703	9.0677	3.3145	0.2554	13.9035	97.2336
59 / 1 .	3.0384	49.1316	4.7018	12.1536	0.6689	8.9832	3.4709	-0.0024	14.7797	97.769
53 / 1 .	2.951	49.0538	4.4795	12.1832	0.6751	8.9479	3.2953	0.3364	15.1288	97.6409
54 / 1 .	2.8753	48.9251	4.6792	12.1558	0.5604	8.8598	3.1027	0.2826	13.681	95.7315
Mean	2.96	49.25	4.68	12.20	0.63	8.99	3.25	0.21	14.12	97.04
1 sd	0.13	0.19	0.10	0.07	0.08	0.07	0.24	0.10	0.58	0.78

Table 2. *Geochemical analysis of the core from Myfluguvatn.*

MYFL 21.8-22 (2.3-2.5 density)

Slide 5,

Data Point	Na ₂ O	SiO ₂	MgO	Al ₂ O ₃	K ₂ O	CaO	TiO ₂	MnO	FeO	Total
50 / 1 .	4.607	70.0696	0.0966	14.7631	3.9293	1.1849	0.0977	0.2243	2.9948	98.3947
39 / 1 .	4.467	69.4888	0.0883	14.3146	3.3752	1.1508	0.1651	0.1477	2.8912	96.4612
40 / 1 .	4.6423	69.4739	0.0794	14.3723	3.8483	1.0368	0.2444	0.1959	2.8222	97.7834
45 / 1 .	4.5464	69.4428	0.0981	14.4689	3.976	1.2013	0.207	0.1256	2.9401	97.3284
38 / 1 .	4.6443	68.8643	0.1256	14.1536	4.2192	1.2438	0.1769	0.1916	2.8179	96.8345
49 / 1 .	4.6435	68.7272	0.1211	14.688	4.098	1.1927	0.2135	0.0853	3.1179	97.2417
46 / 1 .	4.5421	68.064	0.0929	14.2924	3.0085	1.1517	0.3544	0.1517	2.7727	94.7819
44 / 1 .	4.3566	67.15	0.1153	14.1905	3.6024	1.2035	0.1098	0.017	3.0791	94.2026
Mean	4.56	68.91	0.10	14.41	3.76	1.17	0.20	0.14	2.93	96.63
1 sd	0.10	0.94	0.02	0.22	0.40	0.06	0.08	0.07	0.13	1.45

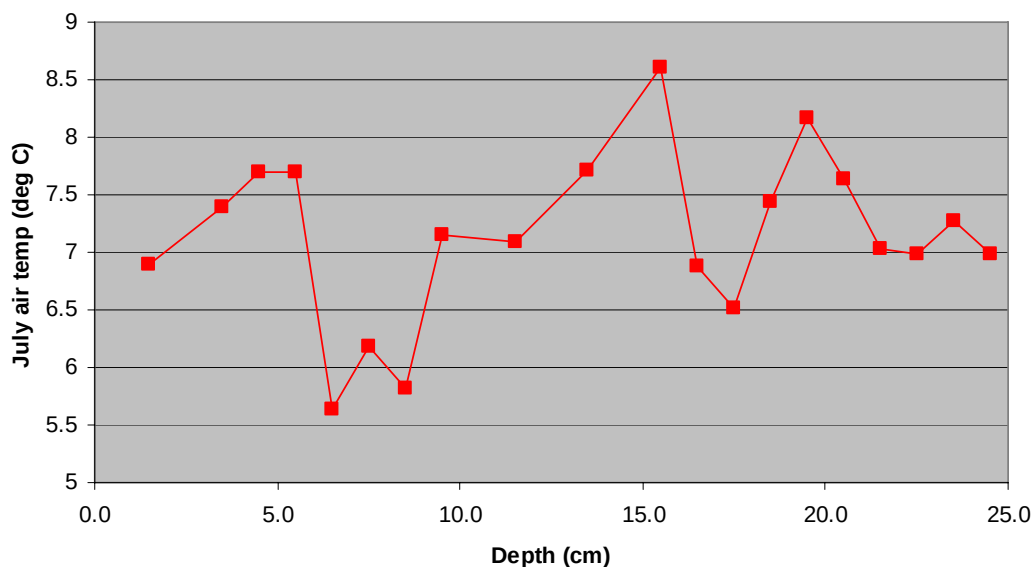


Figure 2. *Temperature reconstruction based on the chironomids in the Myfluguvatn core.*

The Myfluguvatn chironomid sequence has produced an excellent mean July air temperature reconstruction, which demonstrates that there is good potential for high resolution climate reconstruction for the area once the sequence can be well dated (Figure 2). For example, the dramatic drop in July air temperatures at a depth of 7-9 cm is associated with an influx of the coldest Icelandic stenotherms into the lake; these are then lost from the fauna by ~5 cm, when the temperature rises again. (These

temperature fluctuations would have had a profound impact on the productivity of the homefield at Vatnsfjörur and the surrounding farms, and the dates of these fluctuations will give us a better understanding of the environmental context for the economic decisions being made by the farmers of Vatnsfjarðalur at various points in its history. – *ed.*) It is hoped that dating by $^{210}\text{Pb}/^{137}\text{Cs}$ will be undertaken at NOCS later in 2008. Assuming this dating work can be done, we aim to publish the Myfluguvatn record in a special volume of *Hydrobiologia* on mountain lakes sometime in 2009.

Acknowledgements

The field work for this project was funded by the Vatnsfjörður Excavation Project by means of a special grant from the Medieval Westfjords Society. The rest of this work has relied on the hard work and goodwill of a number of people. Dr Stefan Wastegård is thanked for providing the tephra geochemistry data and Prof. Andy Dugmore is thanked for his helpful suggestions relating to tephra provenance. Southampton undergraduate dissertations provided the chironomid data from Myfluguvatn (Tom Crowford) and LOI data (Steven Smith). Dr Ian Croudace at NOCS provided the ItraX data and will help with the $^{210}\text{Pb}/^{137}\text{Cs}$ dating work later in 2008.

RECONSTRUCTION OF THE COASTLINE AT VATNSFJÖRÐUR USING FORAMINIFERA ANALYSIS OF SEDIMENTS FROM SVEINHÚSAVATN: A PILOT STUDY

Jeremy Lloyd (University of Durham)

In order to understand Vatnsfjörður's role in regional and overseas trade networks, we need to understand how the sea level at the site changed over the last 1100 years, and how this affected the shape of the shoreline and the use of landing places and harbours. The pattern of sea-level change varies across Iceland because of differences in the thickness of ice at the Last Glacial Maximum, which has resulted in differences in rates and amounts of crustal rebound following the melting of this ice sheet. It is therefore necessary to do a local sea-level study in order to reconstruct the coastline at Vatnsfjörður. A pilot study undertaken in July 2007 identified a series of relict coastal features and isolation basins in the Vatnsfjörður area at a range of altitudes suitable for sea-level reconstruction. In future, a detailed geomorphological map of the area will be produced using differential GPS survey. This map, in combination with an accurate sea-level curve for the past 2000 years, can be used to reconstruct the evolution of the coastline.

A key site for investigation is Sveinhúsavatn, which lies 1-2 m above present day mean sea level. In the past, when sea level was higher than at present, this lake will have been inundated. By collecting sediment cores from this lake and investigating the foraminifera and diatoms (plankton) preserved in the cores, it is possible to identify periods when the lake was connected to and isolated from the sea.

A short core was collected from Sveinhúsavatn in 2007 and a preliminary study of the foraminifera from the core was conducted at low resolution (Table 1; Figure 1). The changes in the foraminifera show that the lake was connected to the sea from 170-90 cm, then isolated from the sea from 70-10 cm, then partially connected to the sea (brackish lagoon) for the upper 10 cm of the core. We believe that the brackish water at the top of the core is due to recent disturbance of the lake by road building (the outlet of the lake runs under a road bridge and is now in the tidal zone), but the lower part of the sequence shows a clear change from a salt-water inlet to a fresh-water lake. It is now necessary to resample the lake for a full sediment sequence, to conduct a high resolution analysis of the foraminifera and diatoms, and to date the sequence in the core using ^{210}Pb dating and radiocarbon dating. The results of this study will determine when the lake was connected to the sea and could have served as a harbour for Vatnsfjörður, and when it was cut off from the sea.

Table 1. Preliminary analysis of foraminifera in Sveinhúsavatn (raw counts).

Depth (cm)	2	8	18	38	70	90	160
Ammonia beccarii tepida							2
Ammonia beccarii tepida						42	37
Ammonia beccarii limnetis						2	5
Buliminella elegantissima							1
Elphidium williamsoni	402	1			1	222	61
Elphidium excavatum					1	135	50
Elphidium incertum	12			1	1	20	17
Elphidium gerthi	15					6	4
Elphidium margeritaceum	3					2	4
Haynesina germanica	78					4	
Nonion depressulus						1	
Miliammina fusca			8			4	
Jadammina macrescens		1					
Test linings		9		1	4		
Total counted	510	11	8	2	7	438	181
Brackish lagoon	480	2	8	0	1	274	105
Normal marine	30	0	0	1	2	164	76

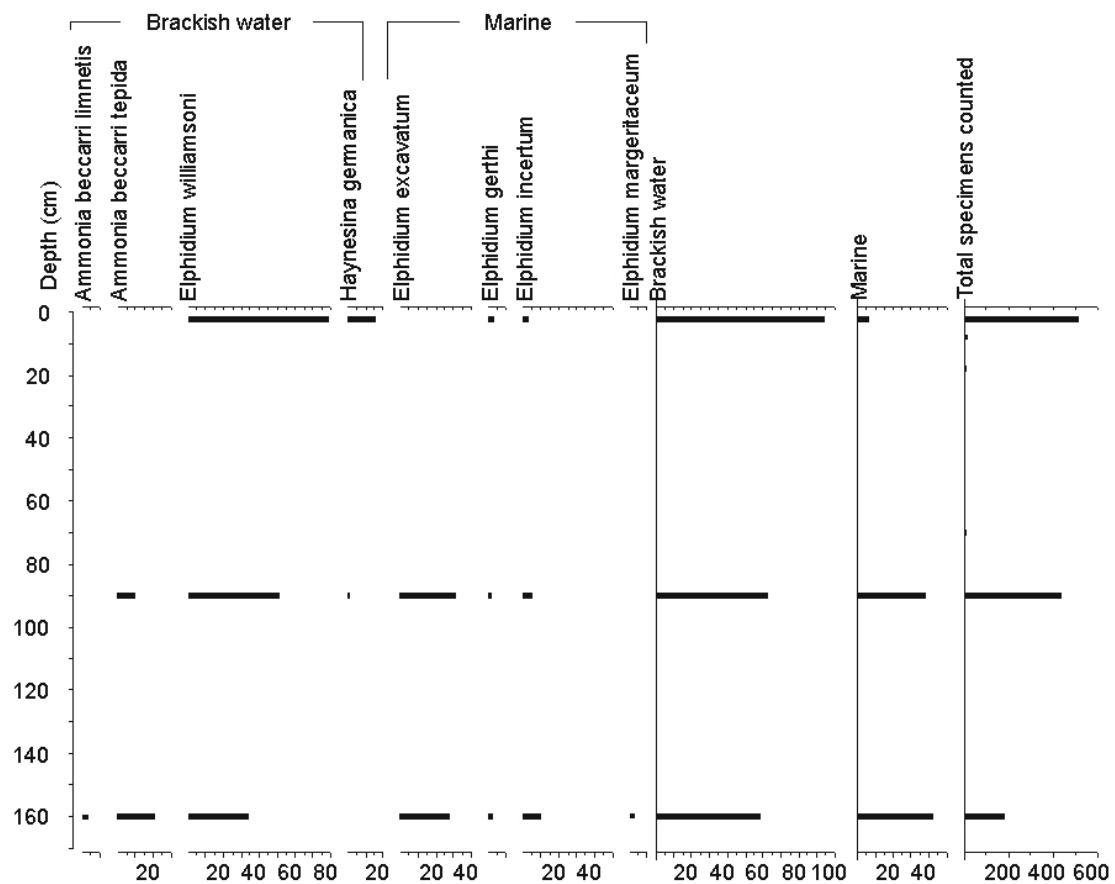


Figure 1. Foraminiferal assemblage from Sveinhúsavatn (only species of >2% abundance).

ARCHAEOLOGICAL EXCAVATIONS IN THE VIKING AGE AREA

Karen Milek (Fornleifastofnun Íslands and University of Aberdeen)

INTRODUCTION

In 2007, Areas 2 and 6 were reopened so that excavations could continue in and around the smithy, Structure 3, and the small building, Structure 4, which had been only partially excavated in 2006 (Milek 2007). In addition, a new area was opened up to the west of Structure 4, where an evaluation trench in 2006 had identified the walls of a structure (Area 14). This began with the stripping of a 5 x 18 m area to permit Brian Damiata and Krissy Larkin to conduct a GPR survey (see their report, this volume), and this was subsequently followed by the clearing of another 4 x 11 m area in order to capture all of Structure 7. This brought the total area of the new excavation to 134m².

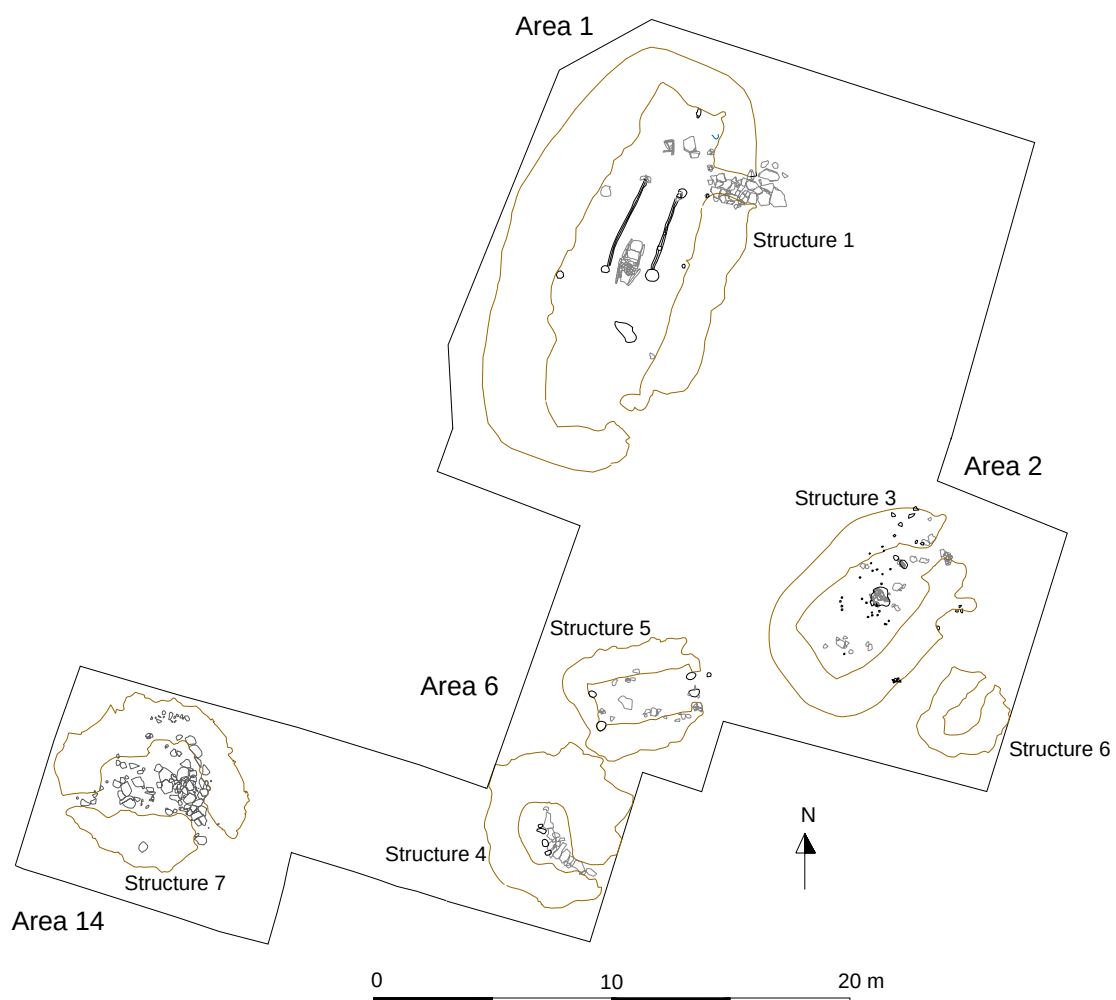


Figure 1. Plan of the Viking Age area at Vatnsfjörður, showing the buildings that have been excavated to date.

EXCAVATION STRATEGY

The excavation of the Viking Age area was directed by the author, with the able assistance of Astrid Daxböck, Elizabeth Pierce, Konrad Śmiarowski and Ramona Harrison. The excavation was staffed by the international group of students and volunteers taking part in the Field School in North Atlantic Archaeology. The excavation was conducted entirely by hand using the single context recording system, and followed the guidelines issued by the Institute of Archaeology, Iceland (Lucas 2003). The aeolian deposits that covered the site were excavated using a combination of trowelling and controlled hoeing and spading, and 25% of this material was dry sieved using a 4 mm standing screen. All of the underlying deposits were excavated by trowel, and were 25-100% sieved, depending on their apparent sterility or richness. Turf collapse deposits, for example, were 25% sieved, while midden layers and pit fills were 100% sieved. Floor layers were 100% sampled on a 50 cm² grid. Small bulk samples (100-200 ml) from each of these grid squares were taken for chemical analysis, and all the remaining sediment in each grid square was taken for flotation and wet sieving with 1 mm mesh. In addition, three micromorphology samples were taken from the floor of Structure 4, [7027], as a comparison to the micromorphology samples that were taken from the floors of Structure 3 and 5 in previous years.

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EXCAVATIONS IN AREA 2: STRUCTURE 3 – THE SMITHY

Astrid Daxböck (Fornleifastofnun Íslands) and Karen Milek (Fornleifastofnun Íslands and University of Aberdeen)

Structure 3 and the northeast corner of Area 2 were reopened in 2007 in order to complete the excavation of the smithy and its associated occupation deposits (see Milek 2005 and 2007 for information about earlier field seasons). Of particular importance for the 2007 field season was the complicated stratigraphic sequence in the northeast gable end, where an entrance was almost certainly located (no other entrance is visible in the walls), the clarification of the internal features of the building, including the hearth, and the construction techniques that had been used to build the walls. It was also vital to obtain more dating evidence for the building if possible, and to clarify its stratigraphic relationship with the sheet midden deposit on its northeast side, [6129], in which a Viking Age bead had been found in 2006. By the end of the 2007 field season, the excavation of this area was complete, and these issues were resolved.

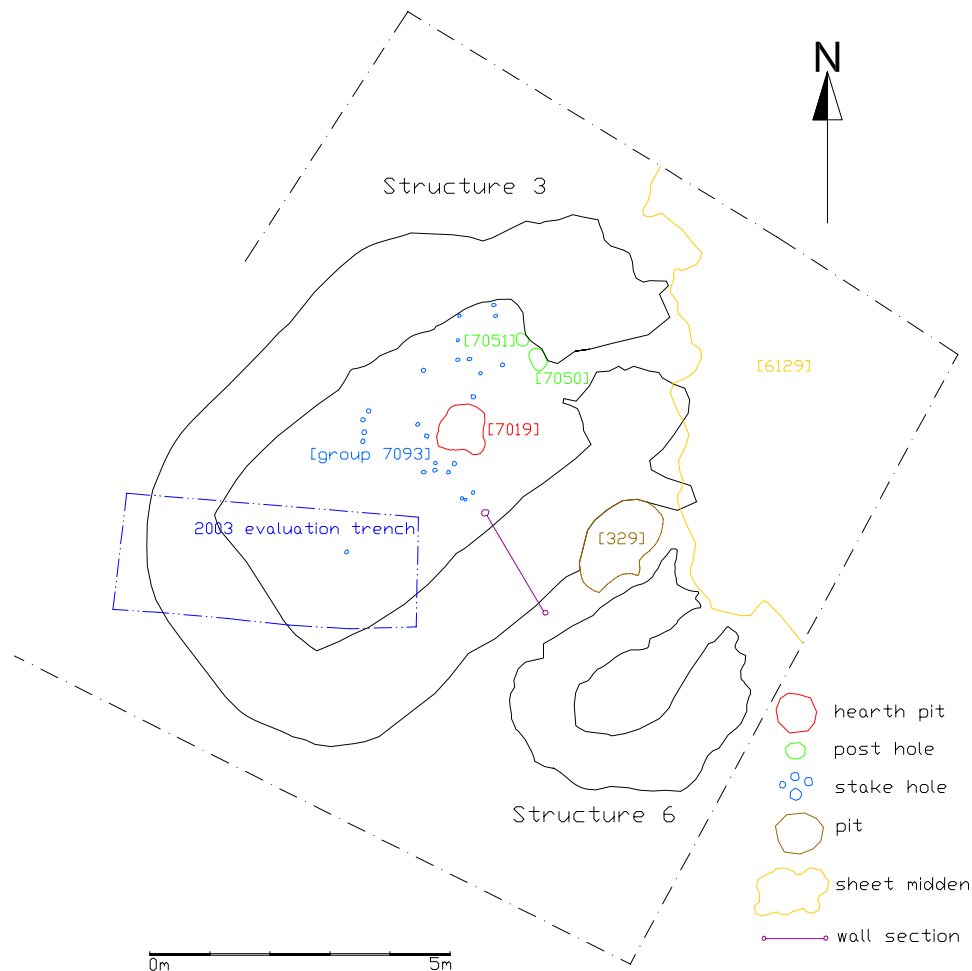


Figure 1. Plan of Area 2, showing the most important negative features such as the hearth pit, post holes and stake holes in Structure 3. The central pit [7019] is outlined in red, and the sheet midden that was located to the east of Structure 3 is shown in yellow.

In the area of the northeast gable, several deposits of silty reddish and orange burnt turf collapse ([6165], [7003], [7006], [7011] and [7024]) were excavated away, some of which contained occasional burnt bone fragments. These turf collapse layers belong to the abandonment phase of Structure 3, which had clearly been destroyed by fire (Milek 2007). The burnt bones in these burnt turf collapse layers may well have been embedded within the turf ever since it was cut – the result of sheet-middening activity, by which waste gets accidentally or intentionally spread around a settlement. Bone embedded in wall turves has also been observed in recently abandoned turf houses, for example (Milek 2006).

The removal of the remaining burnt turf collapse layers at the north gable end of Structure 3 finally revealed the narrow entranceway that had been eluding us for two years (see Figure 1). The wall turf felt very firm on either side of this entrance, which made us reluctant to remove any more of it, but it is clear from the plan that the original entrance must in fact have been slightly wider. It is possible that the base of the wall ‘melted’ outwards slightly when the structure burnt down.

A sunken, stone-lined fireplace was located slightly northeast of the centre of the house (see Figure 1). The cut of the pit for the fireplace, which had been dug into the underlying beach gravels, was 90 x 79 cm in diameter and approximately 84 cm deep. The uppermost fill of the hearth [6026] contained about 90% friable charcoal, some pebbles, and burnt bone fragments, and was c. 20 cm thick. This fill covered collapsed and fire-cracked rocks [7007], which were flat and angular shape, and which had originally lined the edges of the pit; it is clear that the fireplace continued to be used even after its stone lining had partially collapsed. Underneath the collapsed stone structure [7007] was a slag deposit [7012], which rested on the concave base of pit [7019]. This slag deposit can only have been the result of *in situ* iron working activities, and confirms what has long been suspected – that this structure was a smithy.



Figure 2. Fireplace in Structure 3. Left: The collapsed stone structure [7007] within the hearth pit. Right: After partial excavation, the edge of the hearth cut [7019] with the remaining rocks of the stone structure [7007] and on the northeast side the slag deposit [7012], which was covered by the collapsed rocks. Camera facing northeast.

Approximately 20 cm west of the hearth pit [7019], there was a shallow (c. 5 cm

deep), oval-shaped depression with a flat base, approximately 58 x 52 cm in size, which was filled with the friable charcoal deposit [7028]. According to records from 2006, this depression ([7029]) and hearth [7019] were both sealed with the charcoal deposit [6126] (Milek 2007: 36-37), which appears to be overspill from the hearth. Southeast of the hearth, a firm blackish-brown patch of turf [7121] rested directly on the natural soil. Several other small patchy floor deposits composed of turf or ash had already been excavated in 2006, all of which were overlain by the more substantial, charcoal-rich floor deposit, [6020]. It is possible that patches of turf and deposits of ash were used to fill holes in the floor and to make it even – a practice that was common in the early decades of the twentieth century (Milek 2006).

In the area around the hearth, there were clusters of small stake holes, three to five in a group (see Figure 1). The fills of these stake holes ([group 7090]) were silty, black, and somewhat mixed with sand, and they occasionally contained tiny fragments of burnt bone. These fills are probably composed of the same material as the black floor deposit that had overlain them, [6020], which could either have been pressed into the holes when the stakes were pressed in, or fallen into the holes when the stakes were taken out. The cuts themselves ([group 7093]) vary from round, oval to squarish in shape and have either a concave or pointed base. They were 2.5-10 cm in diameter and only 0.5-4.5 cm deep. It is not certain what made these stake holes, but it is possible that it was some sort of iron or wooden implement that had to be repeatedly thrust into the ground, such as the legs of a tripod or a lamp stand.

The post pads [group 7047] were distributed over the inside edges of Structure 3 and most of them were flat, rectangular and cracked. Several groups of post pads had already been removed along with the upper floor layers in 2006 (see Figure 4, Milek 2007); however, the stones lying within the evaluation trench that had been cut through the building in 2003 ([7032] and [7033]) had not yet been touched, because their association with the surrounding floor deposits was uncertain. Under post pad [7032] there was a patch of silty grayish turf [7053], and underneath post pad [7033] there was another patch of turf [7048], which overlay a small charcoal deposit [7049]. This charcoal deposit appeared to be the remains of one of the already excavated floor layers (e.g. [6020]). Post pad [7037] was on top of another small charcoal deposit [7122], while grey and thin turf [7124] lay under post pad [7038]. Only under post pad [7039], against the north end of the building, were two post holes uncovered (Figure 1). Post hole [7050] was oval and had a slightly flat to concave base of 35 x 20 cm in size. Its fill [7044] was very mottled, silty and organic and contained some burnt bone fragments and pieces of slag. The small, flat stones in the fill were probably intended to give the post further support. To the north of this post hole there was another post hole, [7051] (Figure 1). It was rounded, had a concave base 15 x 18 cm in size, and was filled with friable, organic, black material [7045] containing shell fragments. Both post holes were located along the inside of the northeast gable wall and could be associated with a possible entrance on this side of the smithy. Contrary to expectations, no further post holes were either underneath the turf collapse layers or under the post pads [7034], [7035] or [7036].

A small rounded pit with a concave base, ca. 20 cm in diameter and 11 cm deep, was on the outside of the northwest long wall of the smithy ([7126]). The fill [7125] contained slag, charcoal and some burnt bone fragments.



Figure 4. *Structure 3 after excavation and the dissection of the east corner of the southeast long wall. The pit [1719] is near the centre of the building. Note the reddened wall turf and underlying scorch marks. Camera facing southwest.*

Since a silty, dark greyish deposit seemed to underlie the walls, it was necessary to clarify whether this was an early floor deposit that pre-dated a later phase of wall. In order to answer this question, we decided to cut a section through the northeastern wall of Structure 3, but we excavated the component parts of the wall stratigraphically, in order to improve our understanding of how the wall had been constructed ([group 7015]). The wall foundation was made of an outer ([7017]) and an inner ([7022]) turf lining. Those deposits overlay the natural gravelly soil, as well a mottled, dark reddish and orange turf deposit [7026] at the northeast gable wall (obviously burnt). The stack of turf that formed the inner lining of the [7022] was dark grey at the bottom, where it lay on the natural soil, and where the turf must have been subject to reducing rather than oxidizing conditions when the smithy burnt down. The dark greyish silt deposit that had appeared to go ‘under’ the walls thus turned out to be the very bottom of the walls themselves, rather than an earlier floor layer. The outer and inner turf linings of the wall formed a depression in the core of the wall, which was filled with beach gravel and cobbles ([7016]) (Figure 5). The gravel component of the walls had probably been taken from the area immediately around Structure 3, which was surrounded by a shallow gully [6168]. A similar gully had been observed surrounding Structure 1 in 2005 (Milek 2005). The remnants of the wall foundation where it was sectioned on the east side of Structure 3 were 140 cm in breadth and only 15 cm in height.

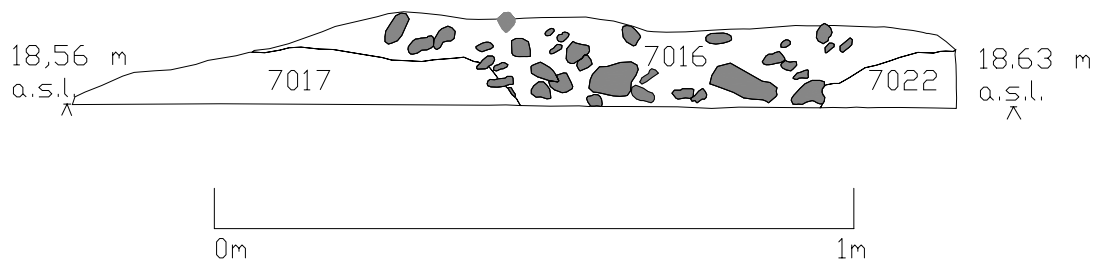


Figure 5. Southwest section of the east wall, Structure 3 [group 7015] showing the outer [7017] and inner [7022] turf lining, forming a basin which is filled with gravel [7016].

To the east of Structure 3 there was a c. 4 cm thick charcoal spread on the natural soil. This sheet midden, [6129], could not be excavated in 2006 because it underlay the turf collapse layers [7003] and [7024] (Milek 2007: 39). The full extent of this deposit is unknown, because it extends beyond the northeast limit of the excavation area. In 2006 a black polychrome glass bead with opaque eyes, find 31, was retrieved from this sheet midden layer (Figure 6). Elín Ósk Hreiðarsdóttir assigned it to the subtype of Callmer's type B, which gives the deposition of the sheet midden a *terminus post quem* of the tenth century (Gísladóttir 2007: 70; Milek 2007: 39). The deposit was 100% flotated and wet sieved with 1 mm mesh, but except for animal bone and teeth fragments (bone numbers 31, 42, 59 and 60), no further artefacts were found in it. The sheet midden lipped up against the walls of the smithy, and therefore its formation post-dates the construction of the building. Since it formed in front of the entrances to the smithy and Structure 6, the small building on the east side of the smithy (interpreted as a fuel storage room; see Figure 1), it is extremely likely that the sheet midden is associated with the use of these buildings, and formed as a result of people walking in and out of them, and depositing rubbish outside of them.



Figure 6. Find 31, a glass bead with opaque eyes which was found in the sheet midden [6129] in 2006.

After finishing the excavation in Area 2, the dissected part of the wall, the stone structure of the hearth, and the postpads were reconstructed in order to make them suitable for presentation to the public. Recently cut turf was used to reconstruct the inner and outer turf linings of the wall, and beach gravel for the core of the wall was acquired from the spoil of the Farm Mound Area, and from the beach next to Vatnsfjörður (see Figure 7). The original postpads had been marked when they were being recorded and removed so they could be put back in their original place. It was not possible to reuse the stones that had lined the hearth, however, because they were too cracked – probably as a combined result of heating during use, and freeze-thaw processes afterwards. Instead, stones of similar size and shape were found in the local vicinity and were used to reconstruct the hearth the way we think it probably looked

over a thousand years ago (Figure 7).



Figure 7. The reconstruction of Structure 3. Left: Students are working on the turf base of the wall. Right: The reconstructed central hearth (packed with gravel).

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EXCAVATIONS IN AREA 6: STRUCTURE 4

Konrad Śmiarowski and Ramona Harrison (Fornleifastofnun Íslands and City University of New York)

Structure 4 is a small building, consisting of a single room, in the southern part of Area 6. It is roughly rectangular in shape with internal dimensions of ca. 2.8 x 2.2 meters. The excavations of this structure began during the 2006 field season, when Area 6 was opened specifically to reveal this building clearly visible in the topography of the surface. During that season a complex series of turf wall and roof collapse deposits were excavated (Milek 2007), revealing the major outline of the building's walls, the entrance in the southeast corner, and disturbance to the north end that was probably caused by homefield leveling. In 2007, the last of the wall collapse deposits were removed and the structure was excavated in its entirety.

Description of the building

Structure 4 is a slightly sunken building, with gravel wall foundations. There is a stone pavement consisting of units [7009], [6051], and [7031] that stretched from the threshold of the entrance in the southeast corner to the middle of the room. These stones were flat basalt slabs ranging from size from c. 15 cm to over 50 cm.

Large boulders that were situated in at least 2 corners (SE and NE) seem to have been used to support the construction of the walls (Figure 1). The building's walls ([7136]) were constructed on the outer and inner sides with *strengur* turf, and the cores of the walls were filled with gravel (see Figure 3). All the walls of this building were constructed in similar manner.



Figure 1.
*Aerial view of
Structure 4.
The scale is
2m long and
points south.*

Upon completion of excavation of structure 4, a small trench (50 cm wide x 1m long) was cut across the northwest wall to investigate a charcoal deposit [7146] that extended slightly under the wall [7136] (Figure 2).



Figure 2. Trench in N wall of structure 4 showing the underlying sheet midden (black area in the center) and the construction of the wall. The gravel fill from inside the wall is already removed and the turf forming the inner and outer part of the wall edges is still unexcavated.

Careful removal of the various wall components during this operation allowed a better understanding of its construction method. This trench confirmed the construction method described above (Figure 3). After all the wall deposits [7136], [7140], [7141], [7142], [7144], [7145] and [7147] were removed within the trench, a sheet midden [7146] associated with the above mentioned charcoal deposit was uncovered and excavated, and micromorphology samples were taken.

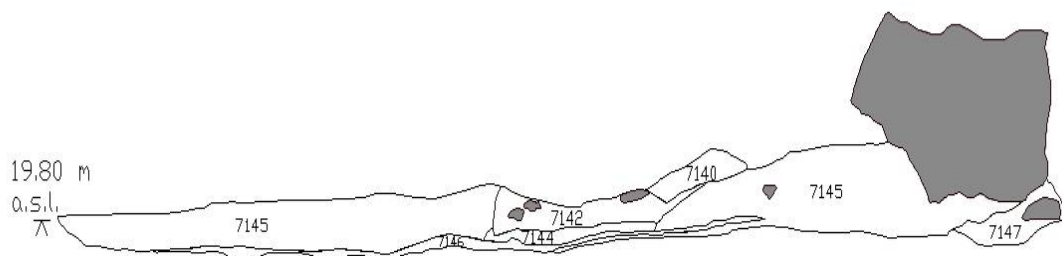


Figure 3. Section drawing of the northern of Structure 4. Note the turf outer lining of the wall [7145] and the gravel fill inside [7140], [7142], the turf infill [7144] and the underlying sheet midden [7146].

This kind of construction is unusual for Icelandic Viking Age structures that were

traditionally made of mostly turf, although it is similar to the construction technique used in Structure 1, the *skáli*, as well as in the smithy, Structure 3 (Edvardsson 2003; Milek 2007; Daxböck and Milek, this volume).

An interesting feature of this building was a cut [7138] in the eastern wall, the function of which was never ascertained (Figures 1 and 4). Its width was about 30-40 cm and it seems to have been added after completion of the wall construction. In one of the wall collapse deposits [7023] inside this cut (wall opening) a caprine mandible was found (either sheep or goat – it could not be identified to the species level due to the poor preservation) suggesting that this may have been some sort of opening through which refuse was thrown outside, although this may not have been its primary function. (In fact, if the mandible was associated with turf collapse material, it was probably not related to the building's primary use, but it could have been embedded in the wall (accidentally or intentionally), or it could have been part of a skull that was mounted over the opening. – *ed.*)



Figure 4. Structural cut [7138] in the eastern wall.

Another interesting feature of this structure is a partition within the building. It seems that none of the floor deposits [7013], [7014], and [7027] extended west of the center mid-line of the building, and even the pavement in all phases ([7009], [6051] and [7031]) has its western edge at this north-south dividing line (see description in the “Construction Phase” section, below). This was observed already in 2006, but in 2007 it became apparent that the interior west part of the structure was higher than the eastern half of the building, which was used for access and passage. The western part had not been raised, but the eastern half was slightly sunken (ca. 20-30 cm), and its surface gently rose along the pavement towards the exit in the southeast corner, where it became level with the outside ground surface.

No artifacts were found in the occupation deposits [7013], [7014], and [7027] that could shed a light on the function of the building, but the chemical and micro-

morphology samples of floor deposits will hopefully aid in our understanding of this structure. There were no features inside the structure that are diagnostic of function (e.g. no hearths, barrel pits, etc.).

When the excavation of this building was complete, a phase chronology was established using a Harris matrix. The building went through several construction, renovation and occupation phases, several of which are presented here in order of earliest phase to latest.

Building Phases

Construction Phase (oldest)

The first phase of the building was its construction. The natural ground surface consisted of gravel, silt and beach cobbles, overlaid with a thin layer of soil with grass and roots that were visible in the last days of the excavation as very thin layers of brown turf above yellow/white ones. Into this natural surface [6112] a small, trench like pit [7134] was dug to create the eastern, deeper part of the inside of the structure. The material from there, consisting of gravel and sand, was probably used for the building's wall foundations. A shallow gully outside the building could have been used as water drain (best visible on the east side), or it may have been created when gravel was dug out and used for the wall foundations. A similar hypothesis has been proposed for the shallow gullies that also ring Structures 1 and 3 (see Daxböck and Milek, this volume). Additional remnants of the construction phase are the postholes (ca. 20cm wide and 10cm deep) that are lined on a roughly north-south axis in the middle of the building (group 7129), also dug into the natural surface. They probably contained posts for roof construction (or they could have supported a bench or platform on the west side of the building – *ed.*). The opening in the building's east wall was created in the early stages of the building's occupation.

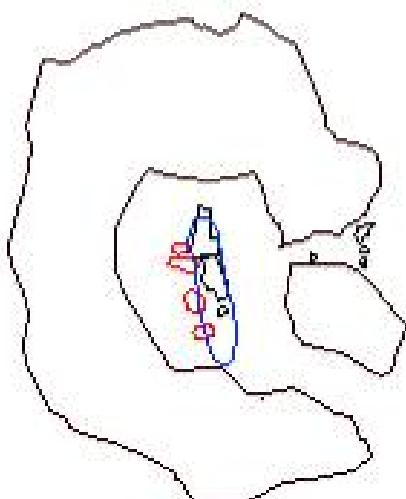


Figure 5. *Construction phase. Note the line of postholes (red, group 7129) placed alongside the small trench [7134] (blue) after it had been dug and filled with the flat stones [7031] (black).*

Occupation Phase I

As a part of the first construction phase the floor was partly paved [7031]. The paving

consisted of 2 large (ca. 75 cm long and 30-40 cm wide) flag stones in the center of the room, elongated on the north-south axis of the building towards the entrance, in the shallow trench ([7134]) mentioned above. Placing the stones in the ditch leveled the inside of the east side of the building to a relatively flat surface. The paved floor must have formed the main walking surface for the first occupation phase, on top of which the floor deposit [7027] formed. The floor layer was recorded on top of the pavement, on the unpaved walking surface of the building, and between the pavement stones covering most of the eastern part of the house. This was a friable deposit consisting of mottled silt with some charcoal and calcined bone mixed with natural pebbles. It was thick enough (from ca. 2mm to 5cm) to take undisturbed micromorphology samples with kubina tins, in addition to small bulk samples for geochemistry, and larger samples for flotation for botanical material and insects. The layer was 100% sampled in effort to try to extract as much information as possible about the composition of this floor and the use of the building.

Occupation Phase II

In phase II, after the initial use of the house, the pavement was repaired and enlarged and a new walking floor surface formed. The main stone paving [6051] was constructed at that time and was the widest and longest in extent of all recorded phases of structure 4. It stretched from the very threshold of the entrance in the SE corner almost all the way to the north wall (Figure 1). Floor deposit [7021], which consisted of silt and some trampled organic material, was associated with this phase, but unfortunately it was not thick enough to permit micromorphology sampling. It was only from 2 mm to 2 cm thick, and most of it was actually trampled between the paving stones, which formed the main walking surface at this time.

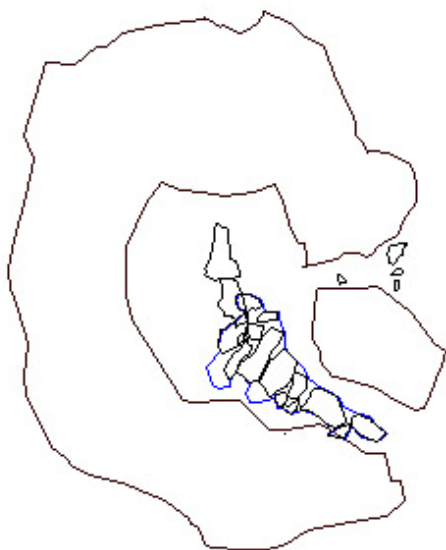


Figure 6. *Occupation phase II with floor layer [7021] (blue), the pavement [6051] and the first phase of the pavement in the center [7031].*

Occupation Phase III

This phase is associated with floor deposits [7013] and [7014], which were distinguished by a slight color difference. [7013] was a soft, mottled gray/brown

deposit consisting mainly of silt with a trace amount of organic material such as charcoal. It was c. 1-2 cm thick and was only spread around the pavement addition [7009]. It was directly above [7014], which was the main floor deposit for this phase. This deposit was black/brown silt mottled with turf and other organic materials, and was spread over the majority of the eastern side of Structure 4. The depth of this layer was c. 0.5-2 cm. Both floor layers probably represent a continuation of the same phase as they were associated with the last pavement addition [7009], which consisted of two large (c. 40-50cm) flat basalt stones. Together they formed an extensive, leveled walking surface.



Figure 7. Occupation phase III with floor deposit [7014] (green) and the pavement with addition [7009].

Abandonment phase (latest)

This phase comprises almost all of the collapse material excavated in 2006 (Milek 2007), as well as several contexts excavated at the beginning of the 2007 field season ([7005], [7010], [7018] and [7023]). Those contexts mainly represent wall and roof collapse, and consisted of turf, gravel and stones, without many artifacts associated with them. The only artifact found in the structure was an iron nail (find no. 56) from turf collapse deposit [6078], which was recovered during sieving in 2006.

The structure seems to have been abandoned completely, and not destroyed or filled with household refuse, as happened to many other Viking Age small structures after they fell out of use (Edvardsson and McGovern 2006). It is very likely that all of this happened when the whole farm complex moved away from the area of the site now called “the Viking Age Area”, possibly to the south west where the modern farm mound is now located. That would explain why no post abandonment deposits were found within Structure 4 except turf and roof collapse, the natural decaying process of the ruin, though the occupation of the farm still continued in different place. There are many unanswered questions about the abandonment of the Viking Age Area in Vatnsfjörður, but hopefully the results of radiocarbon dating, chemical soil analysis, and micromorphology will provide a better understanding of the site.

Modern activity

All the archaeology described so far was sealed by a tephra horizon that putatively dates to 1693, but which was disturbed in the north part of Area 6. This disturbance was probably a result of homefield flattening by heavy machinery during the mid-twentieth century to improve the productivity of modern hayfield. This activity had also flattened and spread the north wall of Structure 4, leveling and stretching the upper part of the wall by c. 1 m in the north-eastern direction.

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EXCAVATIONS IN AREA 14: STRUCTURE 7

Karen Milek (Fornleifastofnun Íslands and University of Aberdeen)

A very low earthwork that had been just barely visible on the ground surface was subjected to an archaeological assessment during the 2006 field season, and was found to contain the remains of a large stone-and-turf wall below the H-1693 tephra layer (Evaluation Trench 14; see Guðrún Alda Gísladóttir and Uggi Ævarsson 2007; see Figure 1). This new building (Structure 7) became the focal point for a large new excavation area during the 2007 field season (Area 14). Rather than excavating Structure 7 in isolation from the others, Area 14 was extended all the way to the western edge of Area 6 in the hopes that there would be stratigraphy between it and Structure 4 that would link the buildings to one another stratigraphically. Unfortunately, this plan was foiled, since there were no cultural deposits between Structures 4 and 7 – the ground between them was utterly sterile except for the small patch of charcoal [7040]. As a result, this new building cannot yet be tied into the stratigraphy of the rest of the site, and has its own floating Matrix.

This building had collapsed some time before the H-1693 tephra fell, and is therefore likely to be at least Medieval in date, but it cannot be dated precisely. The building itself is of a form unparalleled in Iceland (see description below), and there is so far only one artefact associated with it that might be considered diagnostic. This is a conical-shaped spindle whorl made of a reddish stone (find 46), which belongs to the Type A spindle whorls in the Bryggen sequence (Øye 1988; see Guðrún Alda Gísladóttir's finds report, this volume). These are usually considered to be Viking Age in date, although it is doubtful whether a precise spindle whorl chronology can be applied in the North Atlantic region, and this form might have continued to be used well into the Medieval Period. This object was found in the gravelly deposit [7123], which overlay a layer of turf collapse on the south and southwest sides of the building ([7143]), so there is also a chance that it is residual. Objects and bones strewn on the ground surface around a settlement so often become embedded in turf that is later used for building material, that objects found in turf collapse layers could in fact be much older than the use of the building. Nevertheless, it should be considered a good sign that the only diagnostic artefact so far found in association with the building is at least Medieval, and possibly Viking Age in date. No diagnostically later artefacts have been found in association with the building or its abandonment



Figure 1. *Trench 14, facing northeast. Possible turf wall with stone facings on both sides.*

deposits.

In the top soil layers [7000], [7001], and in a thick layer of turf collapse ([7008]) that came from a post-1693 turf building just south of the excavation area, there were small quantities of slag (30.6 g), a simple wound bead (find 37) that could be of any date, and nineteen sherds of mid-nineteenth to early twentieth-century ceramics. These are mostly industrial whiteware, but there is also some glazed red earthenware (find 32) and Chinese porcelain (find 1) (Gavin Lucas, pers. comm.; see the finds report for this area by Guðrún Alda Gísladóttir, this volume). The top soil above Structure 7 also contained glass vessel and window glass sherds dating to the nineteenth century, and at least two sherds of window glass that post-date 1900 (ibid.). The top soil layers infilled a narrow, intrusive modern trench or plough scar that unfortunately ran across the building from north to south (see Figure 2). This trench truncated the northern and southern walls of the building, but thankfully seems to have had a minimal affect on the floor layers. It is difficult to know for certain what caused this trench, but it is so narrow and even that it is possible that it was intended for laying cables. No cables or pipes were present when it was excavated, however.



Figure 2. *Structure 7 at the end of the 2007 excavation, facing east-northeast.*

During the 2007 field season, numerous layers of turf and gravel collapse material were removed from the inside and outside of the building ([7119], [7120], [7135], [7139], [7143], [7152], and [7150]), as were two small charcoal spreads ([7092] and [7040]). By the end of the field season, the building was fully exposed, revealing occupation deposits and a substantial stone pavement within the building, and small spreads or sheet midden deposits outside its northern and western walls.

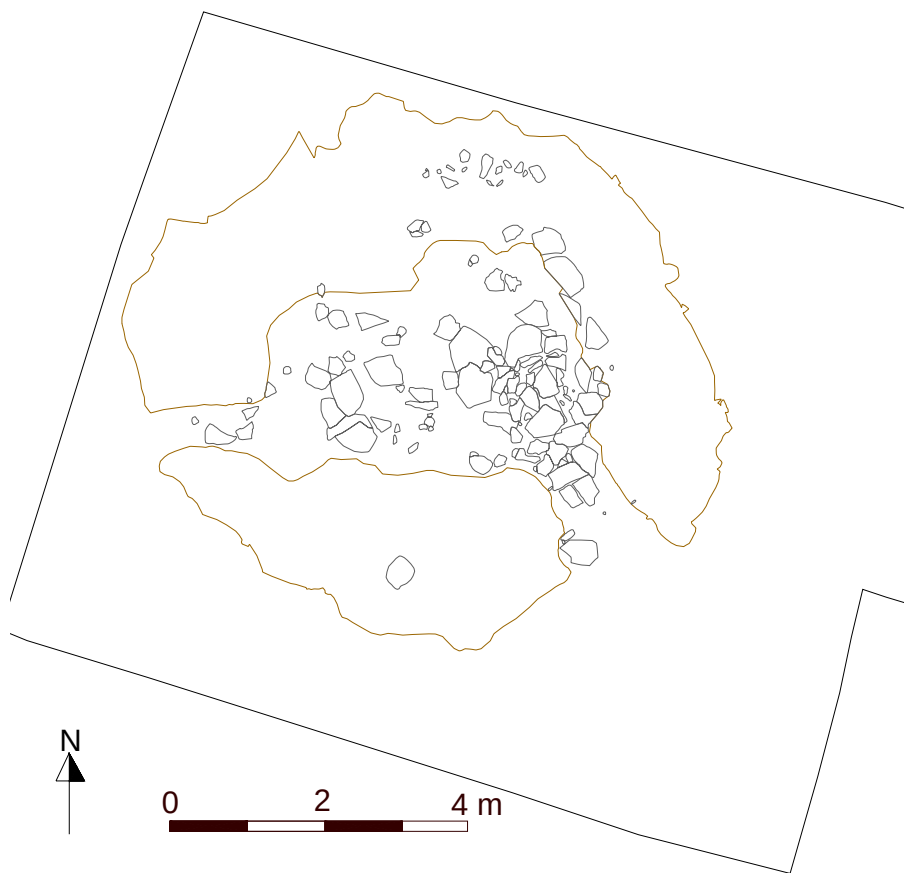


Figure 3. *Structure 7 at the end of the excavation, showing the stone pavement.*

Structure 7 is of a size and form with no known parallel in Iceland as yet (Figures 2 and 3). It is a rectangular building, with internal dimensions of about 3.1 x 4.4 m, and walls about 1.6 m thick. The eastern gable wall has a stone lining on its inner side, and there are two entrances: one on the eastern end of its southern long wall, and one in the middle of its western gable end wall. The dominant feature of the building is the substantial stone pavement that fills much of its inner floor area, and that is especially concentrated just within the southern entrance. The western gable is slightly upslope from the eastern one, and the stone pavement rises up the slope towards this entrance. The western entrance is quite narrow, and it is questionable whether it would have been of a practical width for people to walk through. It is possible that this building has a similar function to Structure 4, which also necessitated a narrow passageway through one wall (see Śmiarowski and Harrison, this volume).

Once the turf roof and wall collapse had been removed from the inside of the building, it was possible to see several negative features such as pits and post holes, and it was clear that the stone pavement represents only the last phase of a building with a complicated history. The soft, rather organic occupation deposit in the building is on the parts of the floor where there are no stones, as well as between stones, and in some places it is mixed with a little bit of charcoal and is skimming the tops of the stones. Against the walls, and here and there on the floor, there are spots of what

appears to be white wood ash. Since no hearth is as yet visible, this ash might either have been intentionally deposited on the floor (e.g. spread to keep the floor dry and clean, such as occurred in houses, cattle byres, and sheep houses in the early twentieth century; Milek 2006), or it might be coming from a hearth that remains buried below the flag stones. We look forward to continuing the excavation of this unusual building next year.

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ARCHAEOLOGICAL EXCAVATIONS IN THE FARM MOUND AREA

Uggi Ævarsson and Guðrún Alda Gísladóttir (Fornleifastofnun Íslands)



Figure 1. 'Stitched' aerial photograph of Structure [7500]. Cellar [7503] is on the bottom right of the picture. North is up. See Figure 2 for the scale.

INTRODUCTION

In the summer of 2006 several test-trenches were excavated into the farm mound area (FM) to evaluate its extent, preservation conditions, depth of occupation deposits, and its research potential for future excavation. The location of the trenches was both decided *ad hoc* and based on homefield maps from 1913 and 1920. By using those homefield maps it was possible to locate the remnants of the last turf dwelling house on the FM: a conventional turf house with timber-panelled front gables. This was originally called area 7, but has now been renamed 'area FM'. The farm house that was excavated in area FM (according to documentary sources) was built in 1884, and was lived in until 1906, when a new dwelling house was built in another place (outside of the excavation area). The turf house that was abandoned in 1906 was partly demolished but used as a store room and a smithy – for how long is not certain, but probably until the mid-twentieth century, as was common in many other homefields which were levelled in mid-twentieth century. The evaluation trenches demonstrated that the levelling of the farm mound had not effected the archaeology to any substantial depth. Good preservation of artefacts, bones, and structures was noted immediately below the surface.

By the end of the 2006 field season, the original evaluation trench 7 had become an area 70 m², partly revealing the final phase of the well-preserved remains of the nineteenth-century house. As a result of the evaluation it was decided to start an open area excavation on the farm mound in 2007.⁷

2007 FIELD SEASON

The season started on July 2, 2007 and lasted for four weeks. The crew had a base in Reykjanes, where they slept, ate and worked in the evenings – and relaxed in the great pool. The excavation on the farm mound was supervised by Guðrún Alda Gísladóttir, Garðar Guðmundsson, and Uggi Ævarsson, who were supported by Gunnhildur Garðarsdóttir and the fieldschool students. The weather was in general good: a lot of sun and very little rain.

After the evaluation of the farm mound in 2006, it was decided to aim at exposing the remains of the 1884 dwelling house, and the excavation area on the farm mound was enlarged from 70 m² to nearly 400 m². The 2007 season was split into 2 broad categories: the excavation of cellar [7503] within structure [7500], and the exposure and removal of post-abandonment deposits associated with the last phase of the stone- and turf structure [7500].

⁷ Guðrún Alda Gísladóttir and Uggi Ævarsson (2007) 'Evaluation of the farm mound area.' *Vatnsfjörður 2006. Framvinduskýrslur/Interim reports* (FS356-003096), 43-61.



Figure 2. Area FM, showing the main features at end of the 2007 field season.

Excavation strategy

The excavation method followed the FSÍ protocol, using ‘single context planning’ – the method by which every layer is peeled off one by one and recorded (photographed, planned, and levelled) and described individually and systematically. A Harris matrix was constructed on site, and finished during the post-excavation phase, so it is possible to reconstruct the sequences of the cultural layers on a piece of paper. Finds were categorized and bagged on site, but few samples were taken, since the work this year mainly involved cleaning. However, samples were taken from the *in situ* layers in the cellar [7503] and those layers that had the most potential for organic remains in the structure [7500]. Archaeoentomological samples were taken from contexts [7512], [7531] and [7536] (see report by Veronique Forbes, this volume). Large bulk samples for flotation and smaller bulk samples for geochemical samples were also taken from contexts [7504] [7512] [7515] [7516] [7526] [7526] [7527] [7528] [7531] [7536] and [7542]. All bones were collected, bagged and sent to the City University of New York for further analyses (see Albína Pálsdóttir et al., this volume). Magnetometry and electrical resistivity surveys were also conducted on the farm mound, west of the excavation area, though only magnetometry produced useful results (Figure 3). In 2008, when the excavation area is extended further west, it will be possible to test these results against what is actually below the ground surface.



Figure 3. *Brian Damiata using the magnetometer. The camera is facing north.*

In an attempt to get the broadest picture possible, it was decided to open up as largest an area as possible, given the manpower and time-frame available. The aim was to expose the whole structure, in all directions; however, the western outer longwall was not revealed in 2007. In 2008, one of our first priorities will be to uncover that wall, or what remains of it. A test trench (area 19) was excavated about 3 m west of the western edge of the excavation area, and revealed what appears to be a wall.

The archaeology on the farm mound was found immediately below the surface and most of the excavated deposits were post-abandonment and destruction layers: twentieth-century rubbish dumps, and stone and turf collapse from walls and roofs, which had been disturbed when the homefield was levelled.

Cellar [7503]

The main feature excavated this season was a cellar, which was even larger than the one excavated in 2006. The internal measurements were approximately 4 m long

(NW-SE) and 3.5 m wide. The cellar was most likely backfilled in one event to fill it up, though it was possible to distinguish several contexts. By far the largest deposit in the cellar was context [7504] – a backfill directly below the topsoil – which consisted of soil, big rocks and a large number of iron/metal objects dating to the twentieth century. After the removal of backfill [7504] a rather coarse pavement [7515] alongside the cellar walls came to light, but the middle of the room contained only soil [7523], and was not stone-lined. For the most part the stones of the pavement were sitting directly on natural gravel, but under the soil in the centre, [7523], there was a vague floor layer [7525] with ash patches [7526, 7527, 7528], which smeared into the stone lining along the walls.



Figure 4. *Backfill [7504] removed from cellar [7503]. Camera towards NE*

There were no sign of compacted material above the stone lining [7515], which suggests that the stones had not been walked on. Rather, it is possible that shelves or some kind of storage units were placed on the paving, which could have served as a foundation that raised the wood above the damp soil in order to prevent it from rotting. When the very thin floor [7525] was removed, a natural gravel was revealed. A slot trench was dug into the gravel in the north-eastern corner of the cellar, about 0.7 m deep, to make sure that no occupational deposits were under there.

Archaeoentomological samples were taken from layers [7515] and [7525] in cellar [7503], from underneath the wooden platform for the staircase in the NW-corner of the cellar. The insects found there are typical in locales where dried food is stored, and there were also many flies (Diptera) and the insects that live on these (see report by Veronique Forbes, this volume). In the thin floor layer [7525], in the center of the cellar, the samples yielded similar results, with the addition of fish scales and animal skin, suggesting that this was a storage place for dried meat and fish (ibid.)

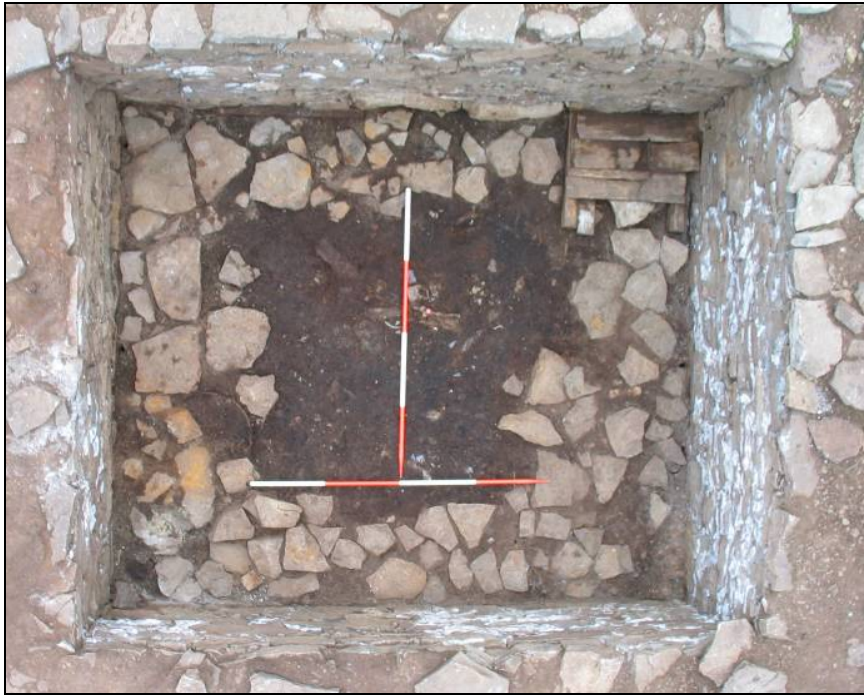


Figure 5. *Pavement [7515] in cellar [7503].*

The walls of the cellar were made of relatively small basalt stones, with a light grey concrete between the stones, but the stones had probably been plastered. The walls were not removed this season, but were photographed with a scale and drawn (digitized) in Autocad (see Figures 6 and 7).



Figure 6. *Photograph of the north wall of cellar [7503].*

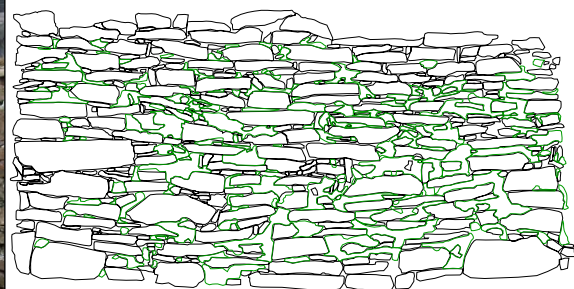


Figure 7. *Digitized image of the north wall. Stones are black while green represents concrete*

According to written sources,⁸ the ancient tunnels that were supposed to run between the church and the farmhouse are considered to be behind the southern wall of this cellar, so it will be interesting during the next field season to remove and excavate these walls. Although the cellar truncates earlier archaeology in the farm mound, it is actually a useful tool for assessing the deposits in the farm mound. It will produce a

⁸ Tryggvi Þorsteinsson (2006). *Á æskuslóðum við Djúp*. Vestfirski forlagið, Brekku Dýrafirði.

section – after the removal of the walls – of the farm mound, which will permit us to assess the depth and types of deposits on this part of the farm over time. Surprisingly, the cellar is not deeper than 1.7 m, which is shallower than one would have expected. However, it is quite possible that the accumulation of cultural layers will be thicker elsewhere on the mound.

Structure [7500]

The last phase of the farm house in the excavated area – a conventional turf house with timber-panelled front gables (built in 1884 and lived in until 1906) – was almost entirely exposed. After it was abandoned as a dwelling house, this turf house was partly demolished and was used as a store room and a smithy. One of the first priorities of the 2008 field season will be to finish exposing the entire house, including the western outer wall of structure [7500]. During the 2007 field season a great deal of soil was removed:

the topsoil plus the disturbed material that had been deposited when the homefield was levelled. By the end of the field season the layout of structure [7500] was becoming quite clear: the plinth, walls, outside pavements, cellars and rooms were becoming distinct. It was decided that naming and attributing function to the different rooms should wait until further excavation since the boundaries between them were still not crystal clear.

The house was obviously not demolished in one go because parts of it were used for a while as a storage room or a smithy, but this last phase had been taken down in a single episode. Furthermore, the cellar [7503] was filled with the same material [7504], soil and stones from the area which has been pushed around, probably by a machine digger when the ruins and the homefield was levelled.

One of the main structural features exposed in the 2007 field season – apart from the cellar – was the eastern long wall [7538], which was orientation N-S. The eastern side of this wall was quite massive, whereas the western side was a bit more diffuse. In front of this wall lay a well made pavement [7529]. An even nicer pavement [7521] lay at southern end of the building [7500], around the southeast corner and along the eastern side. A large amount of fragmented eggshell was found lying in between the basalt flagstones of this pavement, which have yet to be analyzed. According to the written sources, the pavement outside the house was, among other things, used to dry things on. Between the cellar [7503] and pavement [7521] on the south side, and wall [7538] and pavement [7529] on the north side, there was a gap that seems to have



Figure 8. *Cleaning the eastern outer wall [7529]. The camera is facing south.*

been an entrance. There might have been a step up made of wood, since there were some timber remains found in that area, and that would also explain the lack of stones in the area. The corridor that leads from the entrance lay straight west, past the cellar [7503], and kept going 'through' wall [6570], but had been blocked at some later stage. The interior design of the building will become clearer once the western outer wall has been exposed.

The very northernmost part of the excavation area, north of house, remains a mystery so far. There is a southwestern corner of a twentieth-century barn at the northernmost tip, but south of this is an area which seems to be out of phase; it might be older than the last phase of structure [7500].

DISCUSSION

Alongside the excavations at Vatnsfjörður, a landscape survey is being conducted, which is helping to contextualise the excavations in their broader cultural landscape (see report by Oscar Aldred, this volume). Much of the archaeology that is visible on the ground surface in Vatnsfjarðardalur is likely to date to the nineteenth and early twentieth centuries, and therefore is probably contemporary with the house excavated on the farm mound. It is a great opportunity to conduct research on the farm mound – where people lived – and to tie their lives to the environment outside the homefield using the data collected through the intensive landscape survey. The ultimate aim of the project is that the excavation and landscape research can go hand in hand so that the outcome will be a regional study, which takes into account not only the excavation in isolation, but also puts the dwelling place into a broader context.

The large area opened up during the 2007 field season provided an excellent start for the research on the farm mound at Vatnsfjörður, clarified the potential of the archaeology in this area, and set the stage for further work 2008. With most of the uppermost, disturbed layers cleared away now, it will be exciting to begin the 2008 excavation straight onto the archaeology itself.

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RESULTS OF GROUND-PENETRATING RADAR SURVEYS IN THE VIKING AGE AREA

Brian N. Damiata (University of California) and Krissy Larkin (University of Massachusetts)

INTRODUCTION

Reconnaissance ground-penetrating radar (GPR) surveys were conducted between July 2nd and 3rd, 2007, at the farm of Vatnsfjörður, northwest Iceland (Figure 1). The purpose of the GPR surveys was to assess the usefulness of the method to delineate buried archaeological features of interest. In particular, the electrical contrasts between soil and rocks are expected to produce good GPR signatures (i.e., reflections) under ideal conditions, which may indicate the presence of buried walls or foundations. Limited excavation conducted by the field school helped to “ground truth” the geophysical interpretations.

Summarized below are the results of the GPR surveys. Relevant information and processing results are provided in the appendices: Appendix A gives a brief overview of the GPR method, Appendix B contains the 2-D radargrams, and Appendix C presents the horizontal time-slice images that were produced by combining the radargrams.



Figure 13. Map showing the location of Vatnsfjörður.

GROUND-PENETRATING RADAR SURVEYS

Site Conditions

A flat-lying rectangular area covering 5 by 18 m was initially selected for survey by Dr. Milek. This area was subsequently expanded by the addition of a second rectangular area covering 4 by 11 m. Both areas were deturfed in order to expose the underlying soil. Previous GPR studies in other parts of Iceland have indicated that the highest quality data are obtained when the transmitting/receiving antenna lies directly on soil, as opposed to the natural condition, which typically is tall damp grass. Surveying on tall grass results in the poor coupling of the antenna with the ground surface, thus limiting the amount of electromagnetic (EM) energy that is pulsed into the subsurface.

A potential site condition that may affect data quality is the presence of groundwater or soil moisture. In general, the presence of water tends to attenuate the EM energy which limits the depth of penetration (see Appendix A). The soil within the survey area is an andosol, which has the capacity to absorb large quantities of water (>100% dry weight basis). The soil did not appear overly moist upon deturfing and there was no rainfall immediately prior to or during the two days of data collection. During surveying, the weather was mild with temperatures between 15 and 20 °C.

Equipment and Field Procedures

All data were collected using a hand-towed Mala Geoscience RAMAC system equipped with an X3M control unit (Figure 2). Two shielded antennas—800 and 500 megaHertz (MHz)—were utilized in separate surveys. In general, the 800 MHz antenna provides higher resolution but lower penetrating power as compared to the latter. As an example, at a depth of 1 m below ground surface (bgs) and assuming an “average” soil with microwave velocity of 0.07 meters per nanosecond [m/ns]), the two antennas provide vertical and horizontal resolutions of approximately 0.02/0.21 m and 0.04/0.27 m, respectively. For both surveys, the pulse rate was set to 0.02 seconds, which yielded a vertical scan at approximately every 0.02 m along the horizontal direction. The recording time window was set to 30 nanoseconds (ns) for the 800 MHz survey and to 63 ns for the 500 MHz survey.

An orthogonal grid was established based on a relative X and Y coordinate system and adopting a transect spacing of 0.25 m (Figure 3). Transects were oriented approximately southwest to northeast, parallel to the long dimension of the grid (i.e., a transect/profile is identified by its Y coordinate). Data collection along a given transect was guided by stretching a fiberglass measuring tape between the endpoints. The actual location, however, was determined by fiducial markers that were placed into the data stream by the operator at 1-m intervals, and assuming linear interpolation between markers. All transects were traversed in the same direction. In total, approximately 525 linear meters were covered for the 800 MHz survey, and 507 linear meters for the 500 MHz survey (note that transect Y = 9 m was traversed only in the former survey).



Figure 14. Photo of GPR equipment being used to survey the freshly deturfed Area 14.

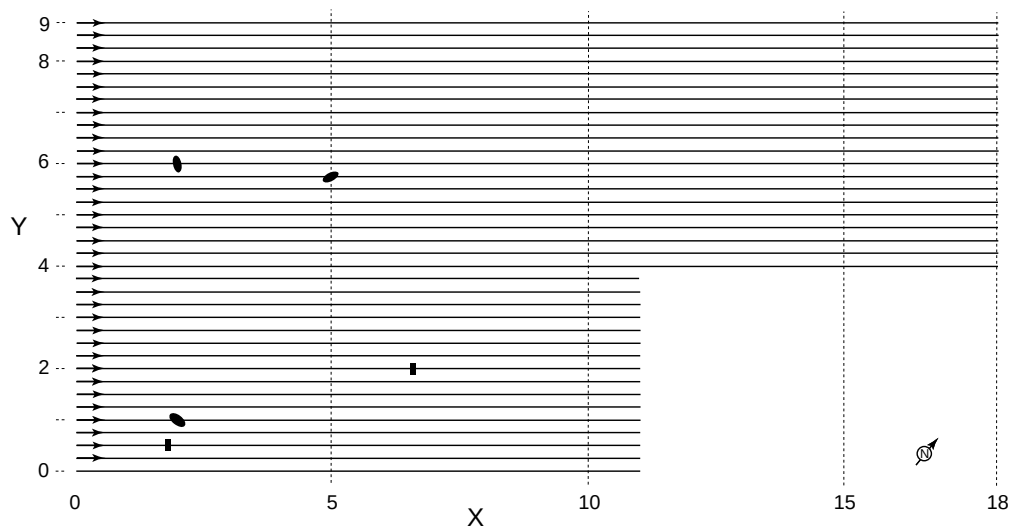


Figure 15. Schematic diagram of grid showing the location and orientation of transects (solid lines with arrows). Solid rectangles denote locations of wooden stakes. Solid ellipses denote rocks on the ground surface. The transect $Y = 9$ m was traversed only for the 800 MHz survey.

Data Processing

For each transect, three files were recorded: a header file (*.rad), a scan data file (*.rd3), and a marker file (*.mrk). Upon completion of the survey, the raw data were

uploaded from the GPR console to a laptop computer. The data were then processed using GPR Slice software (see www.gpr-survey.com; Goodman et al., 1995; Goodman et al., 2006; and Goodman et al., in press).

The scan data were initially corrected for location using the marker file and then resampled to produce 2-D radargrams (vertical profile) of recorded amplitude (i.e., two-way travel time of reflected EM energy). The depth scale was estimated ($\pm 25\%$) by assuming a velocity of 0.07 m/ns, as determined through analysis of hyperbolic reflections on various profiles. Next, the radargrams were combined to produce a pseudo 3-D data set. Horizontal time-slice images were then generated for various time (depth) windows to provide detailed spatial information on the location and estimated depth of reflectors. Although these images are presented with respect to depth bgs, the term time slice is retained throughout the report. Appendix B contains the processed radargrams for both surveys and Appendix C the processed time-slice images.

RESULTS AND INTERPRETATIONS

800 MHz Survey

Inspection of the processed radargrams (Figures B1 through B3, Appendix B) indicates the presence of various strong reflectors, as denoted by the light blue-red bandings that are superimposed over a darker blue background. These reflectors are discontinuous and the majority occurs within the upper 50 to 60 cm bgs, which infers an approximate maximum depth of penetration that can be achieved with this antenna subject to site-specific conditions. Alternatively, there may be a lack of reflectors below this depth or a particularly strong reflector, such as the bedrock surface, which prevents the transmission of EM energy although the discontinuous nature of the banding does not support this contention.

Figure 4 presents several processed radargrams for both the 800 and 500 MHz surveys (lower left and right, respectively), displayed in relation to the results of shallow excavation. The excavation revealed the presence of a stone pavement surrounded by turf walls (see report by Karen Milek et al., this volume). The wall on the southeastern side of the structure, however, is nearly completely gone. In addition, a narrow trench, probably of recent time, cuts through the walls and central floor deposits. The presence of the pavement stones is clearly evident on the 800 MHz radargram at Y = 5 m, which crossed directly over them. Rocks within soil are expected to produce strong reflections.

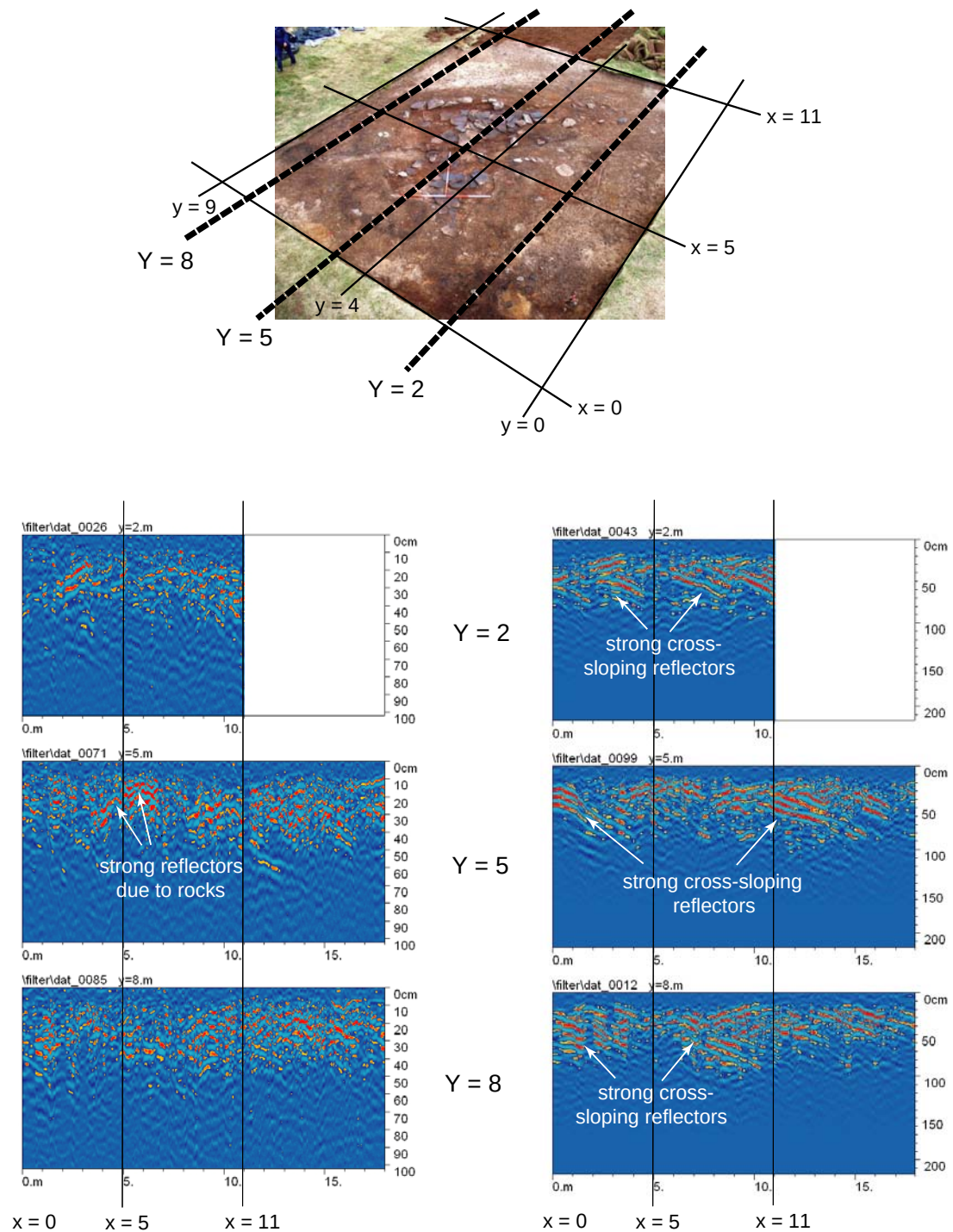


Figure 16. Processed radargrams displayed in relation to shallow excavation. Upper: Photo of shallow excavation with relative grid system superimposed (thin black lines) with coordinates given in meters. Bold dashed lines indicate the location of corresponding radargrams. Left: Processed radargrams for 800 MHz survey. The light blue-red banding indicates a strong reflector. Right: Processed radargrams for 500 MHz survey.

The pavement stones are more visually apparent in Figure 5, which depicts two time-slice images. The upper image overlays reflected energy between 12 to 18 cm bgs (i.e., combines the reflected energy from two individual time slices that were processed, b7 and b8, Figure C1), while the lower one overlays 57 to 63 cm bgs (b29

and b30, Figure C1). In these images, red denotes relatively strong reflected energy whereas light greenish and whitish areas indicate weak or absent energy. For the shallower time-slice image (Figure 5, Upper), there is a clear correspondence between two areas with strong reflections and the location of the rocks. The general triangular outline of the pavement stones lying to the north of the narrow trench is accurately delineated. In addition to the strong reflections noted above, there is another area—lying between Y: 8 to 9 m and X: 11 to 14 m—that is interpreted to contain a shallowly buried patch of rocks.

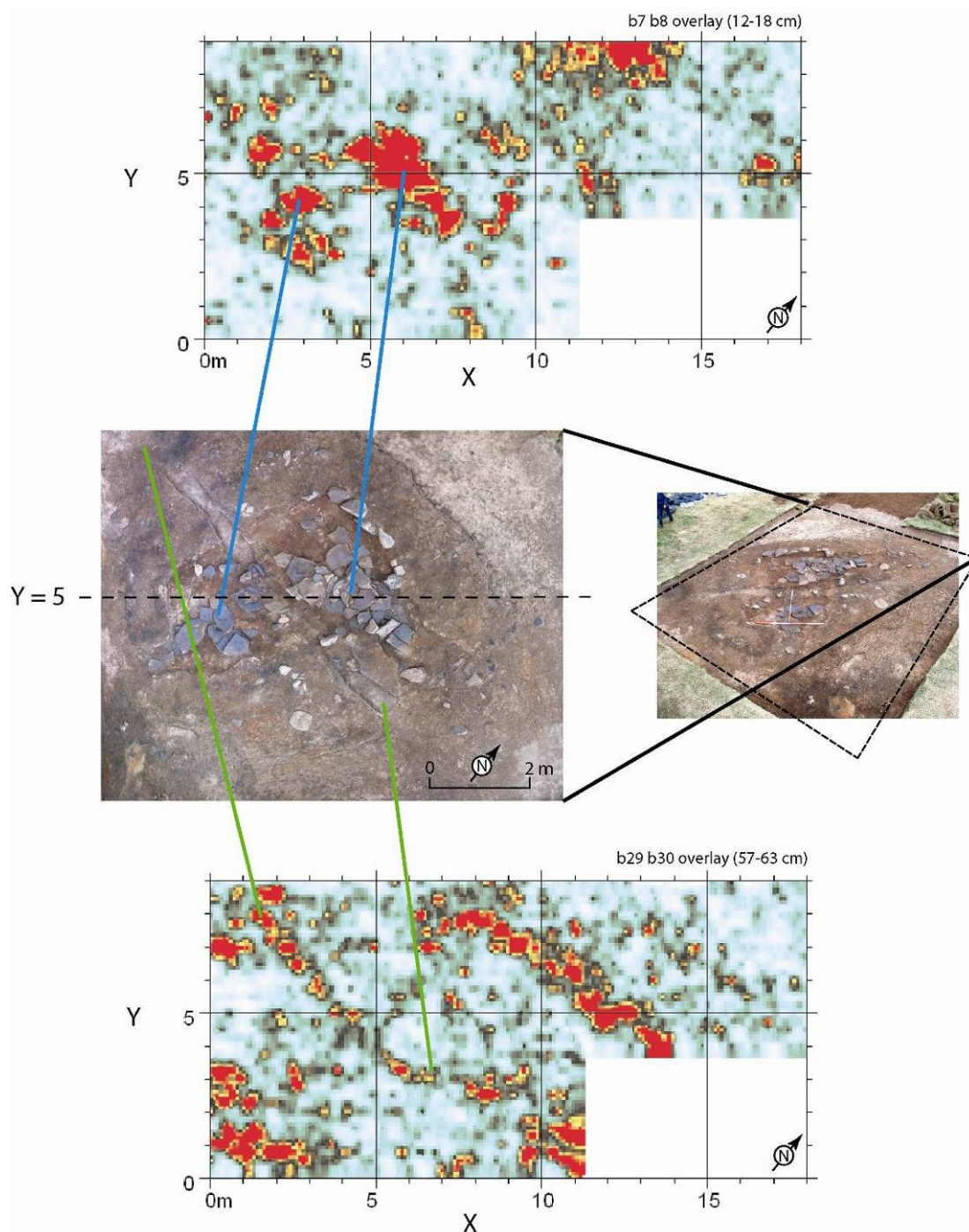


Figure 17. Time-slice images generated from 800 MHz survey displayed in relation to shallow excavation. Upper: Overlay image for 12 to 18 cm bgs. Middle: Photos of shallow excavation. Lower: Overlay image for 57 to 63 cm bgs.

For the deeper time-slice image (Figure 5, Lower), there are several areas with strong reflections, including two pronounced lineations. One of these corresponds to the narrow trench identified by excavation. This feature most likely is either a plough scar or a pipe buried in recent times. Inspection of the radargrams in Appendix B, however, does not indicate the presence of the latter given the lack of pronounced hyperbolic point reflections that would be expected with such a feature. The second lineation, which lies further to the north, is slightly north of the turf wall. It is not clear as to whether this lineation is anthropogenic (e.g., foundation stones) or geologic (e.g., gravel lens) in nature and is tentatively interpreted as the former based on interpretation of the 500 MHz data discussed below. Finally, the strong reflection occurring in the southern portion of the image (i.e., lower left-hand corner) is in the vicinity of the turf wall and is tentatively interpreted as foundation stones.

A general observation of all time-slice images indicates the presence of east-west trending lineations (see Figure C1, Appendix C). These lineations are more apparent below a depth of 40 cm bgs. At this stage, definitive interpretation as to whether all of these are anthropogenic (e.g., plough scars, foundation stones, etc.) or geologic (e.g., gravel lenses) cannot be made.

500 MHz Survey

Inspection of the processed radargrams (Figures B4 through B6, Appendix B) indicates the presence of numerous strong reflectors. The types of reflectors include short discontinuous, long continuous and cross-sloping (-cutting). The majority occurs within the upper 1 to 1.5 m bgs, which infers an approximate maximum depth of penetration that that can be achieved with this antenna subject to site-specific conditions.

Several processed radargrams, displayed in relation to the results of excavation, are depicted in Figure 4 (lower right). Distinct cross-sloping reflectors are noted that correspond to the location of turf walls which is interesting given that in surveys conducted elsewhere in Iceland, turf walls generally produce weak reflections. The orientation of profiles cross the turf walls at an oblique angle, as is noted by the greater separation distance between opposing reflectors for the radargram at Y=5 m—which crosses through the center—versus the radargrams at Y=2 and 8 m which cross closer to the edges of the structure.

Some caution is needed in interpreting strong continuous reflectors. Such a reflector is noted in the radargrams Y=0.25 to 1 m (Figure B4, Appendix B). In general, shallow discontinuous and cross-cutting reflectors are attributed to anthropogenic features, whereas long continuous reflectors usually are due to localized geologic conditions such as a distinct bedrock surface (i.e., no underlying alluvium) or an extensive patch of hard rock. In this case, the continuous reflector may be due to approaching and traversing over a turf wall at a small oblique angle.

Figure 6 displays two overlay time-slice images: b10, b11 (49 to 63 cm, Left) and b16, b17 (81 to 96 cm, Right). Comparison of the shallower image to the one from

the 800 MHz survey at similar depth (Figure 5, Lower), shows good agreement in terms of delineating the narrow trench and the corresponding strong linear reflection to the north. As expected, the image generated from the 800 MHz survey yielded higher resolution. The deeper image shows a continuance of the linear reflection noted in the shallower image. In addition, similar to the observation of the images from the 800 MHz survey, there is a general east-west trending of lineations (see Figure C2).

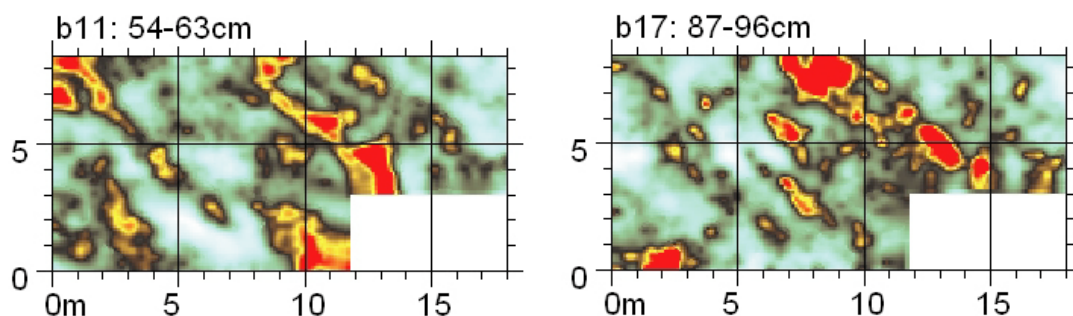


Figure 18. Time-slice images generated from 500 MHz survey. Left: Overlay image for 49 to 63 cm bgs. Right: Overlay image for 81 to 96 cm bgs.

SUMMARY AND RECOMMENDATIONS

Reconnaissance GPR surveys were conducted at the farm of Vatnsfjörður, northwest Iceland. The surveys were conducted to evaluate the usefulness of the method to delineate buried archaeological features of interest. Separate surveys were conducted using 800 and 500 MHz antennas. In general, the data quality was good, yielding maximum depths of penetration of approximately 0.5 m and 1 m bgs, respectively.

Based on comparison with results from limited shallow excavation conducted by the field school, the surveys were successful in delineating the presence of a central stone pavement within a turf structure. A narrow trench that cuts through the pavement was also delineated. In addition, turf walls and foundation stones may have been detected. Strong reflections from an area in the northern portion of the site infer the presence of rocks and possibly turf walls. Once the excavation of Area 14 is completed in 2008, the GPR results should be reevaluated in order to refine the interpretations and help guide the analysis of future surveys at the farm.

The future use of GPR at other locations on the farm should adopt similar recording parameters and field procedures as used here to ensure data quality. Future sites should be deturfed and a transect spacing of 0.25 m should be selected. In addition, surveying in both orthogonal directions should be considered.

Acknowledgements

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APPENDIX A: OVERVIEW OF GROUND-PENETRATING RADAR

Ground-Penetrating Radar (GPR) is an active non-destructive geophysical method that provides shallow subsurface information. In GPR, electromagnetic (EM) energy is pulsed through a transmitter antenna that is towed along the ground surface. As the energy travels through the subsurface and encounters distinct changes in electrical properties—specifically, the relative dielectric constant (E_R)—a portion is reflected back to the ground surface. It is the two-way travel time of the reflected energy that is detected by a receiver antenna and is presented as a radargram, as schematically illustrated in Figure A-1.

Of all the available geophysical methods, GPR offers the highest possible resolution for subsurface imaging. The ability to resolved buried features, however, depends on the center frequency of the transmitted EM energy. Relatively higher frequencies (e.g., 500 megaHertz [MHz]) have greater resolving abilities but at the expense of less penetrating power as compared to lower frequencies (e.g., 250 MHz). The method works best in electrically resistive environments (e.g., desert environment with dry sandy soils). In general, electrically conductive environments can severely attenuate the pulsed EM energy. The presence water with high dissolved solids as well as clay and silt which retain water, even in minor amounts, can effectively limit the depth of penetration to less than a meter.

The use of GPR should be considered whenever the target of interest provides a distinct contrast in relative dielectric constant (air: $E_R = 1$, water: $E_R = 81$, dry soil: $E_R = 4-6$, wet soil: $E_R = 10-30$; rock/bedrock: $E_R = 5-8$) as compared to the surroundings and is sufficient in size to be detected. Typical targets include:

- buried stone walls and foundations;
- graves;
- site specific stratigraphy; and
- soil thickness/depth to bedrock.

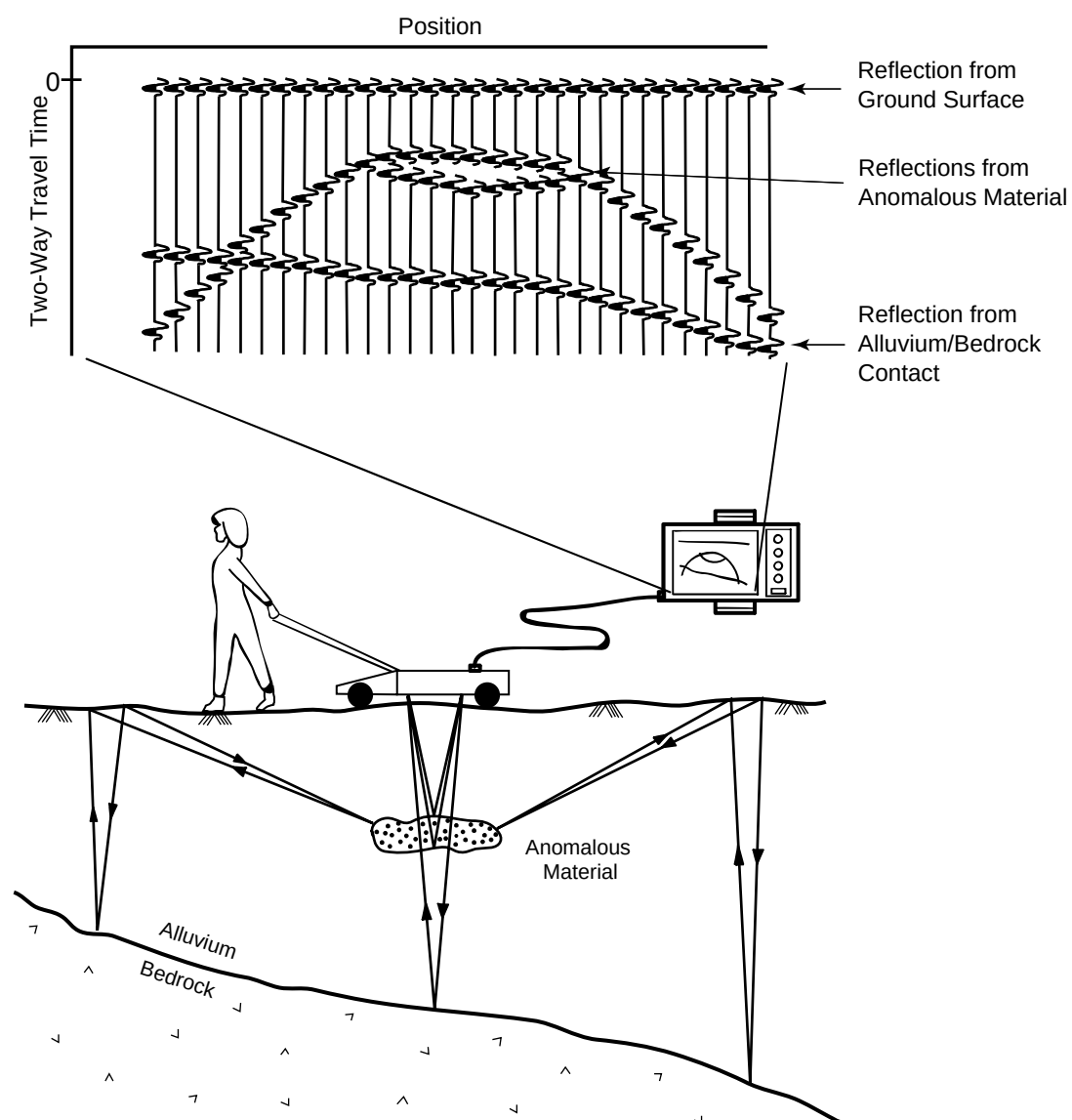


Figure A-1. Schematic diagram illustrating the principles of GPR.

APPENDIX B: RADARGRAMS

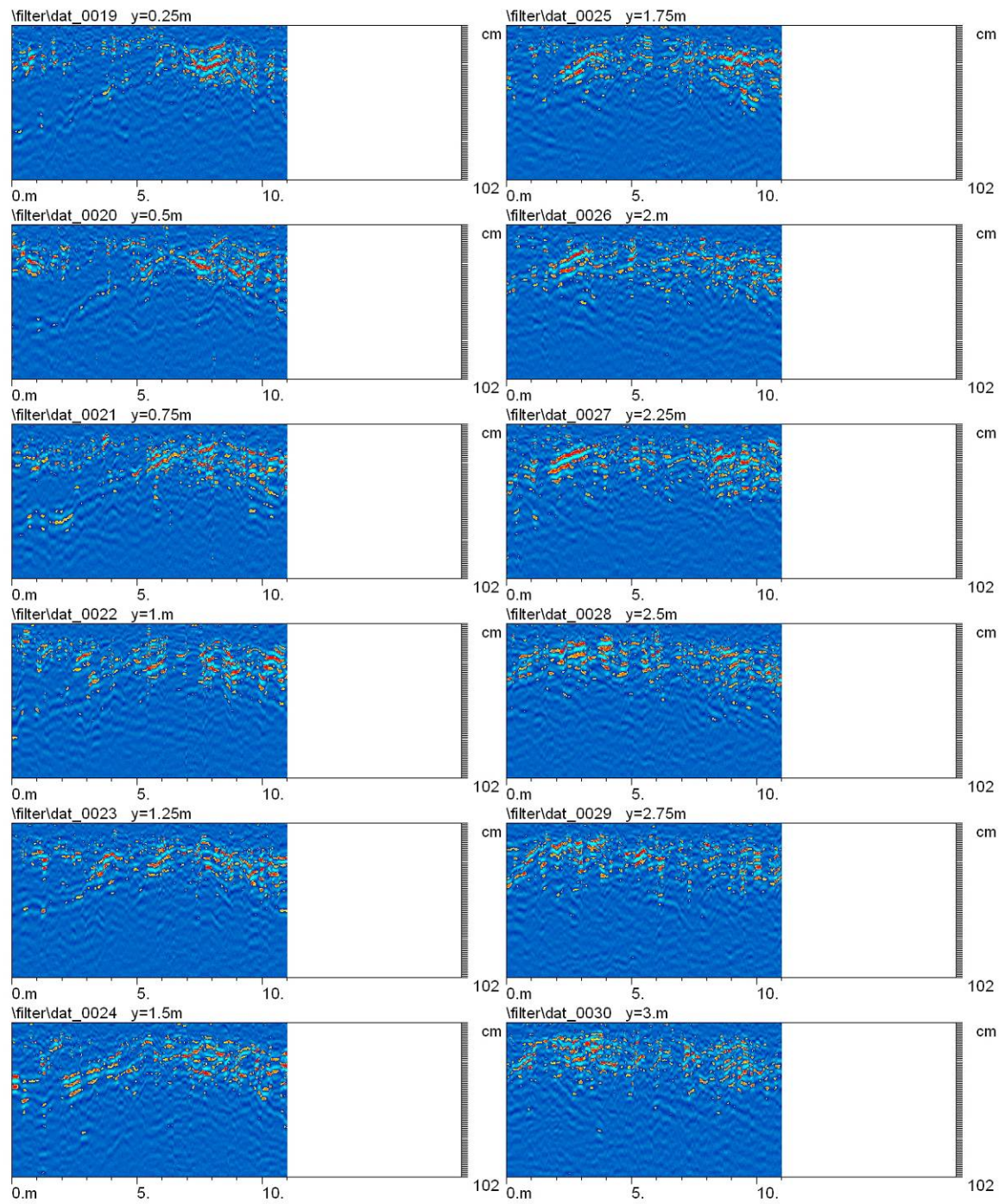


Figure B-1. Processed radargrams for 800 MHz survey, transects $Y=0.25$ to 3 m.

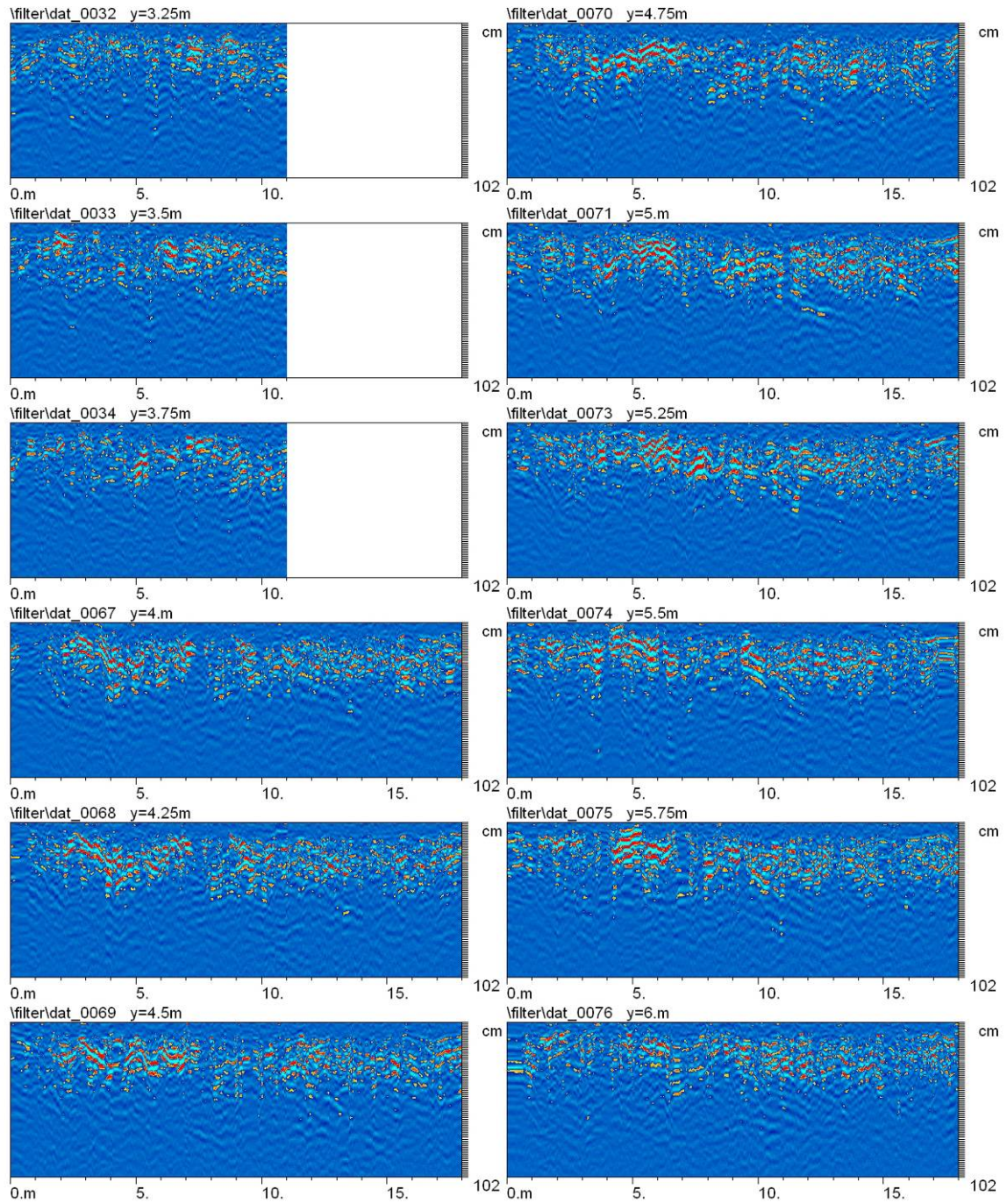


Figure B-2. *Processed radargrams for 800 MHz survey, transects $Y = 3.25$ to 6 m.*

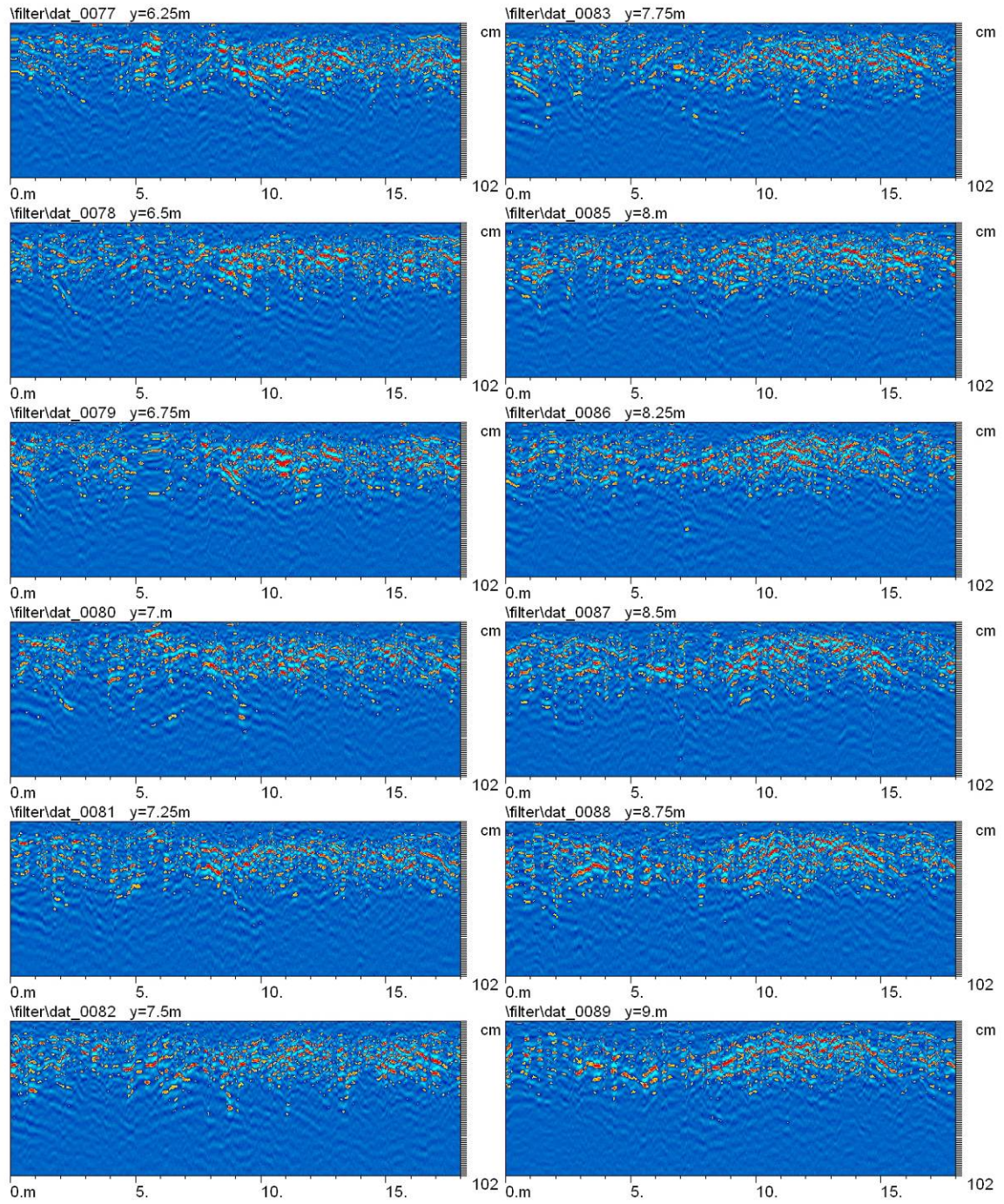


Figure B-3. *Processed radargrams for 800 MHz antenna, transects $Y = 6.25$ to 9 m.*

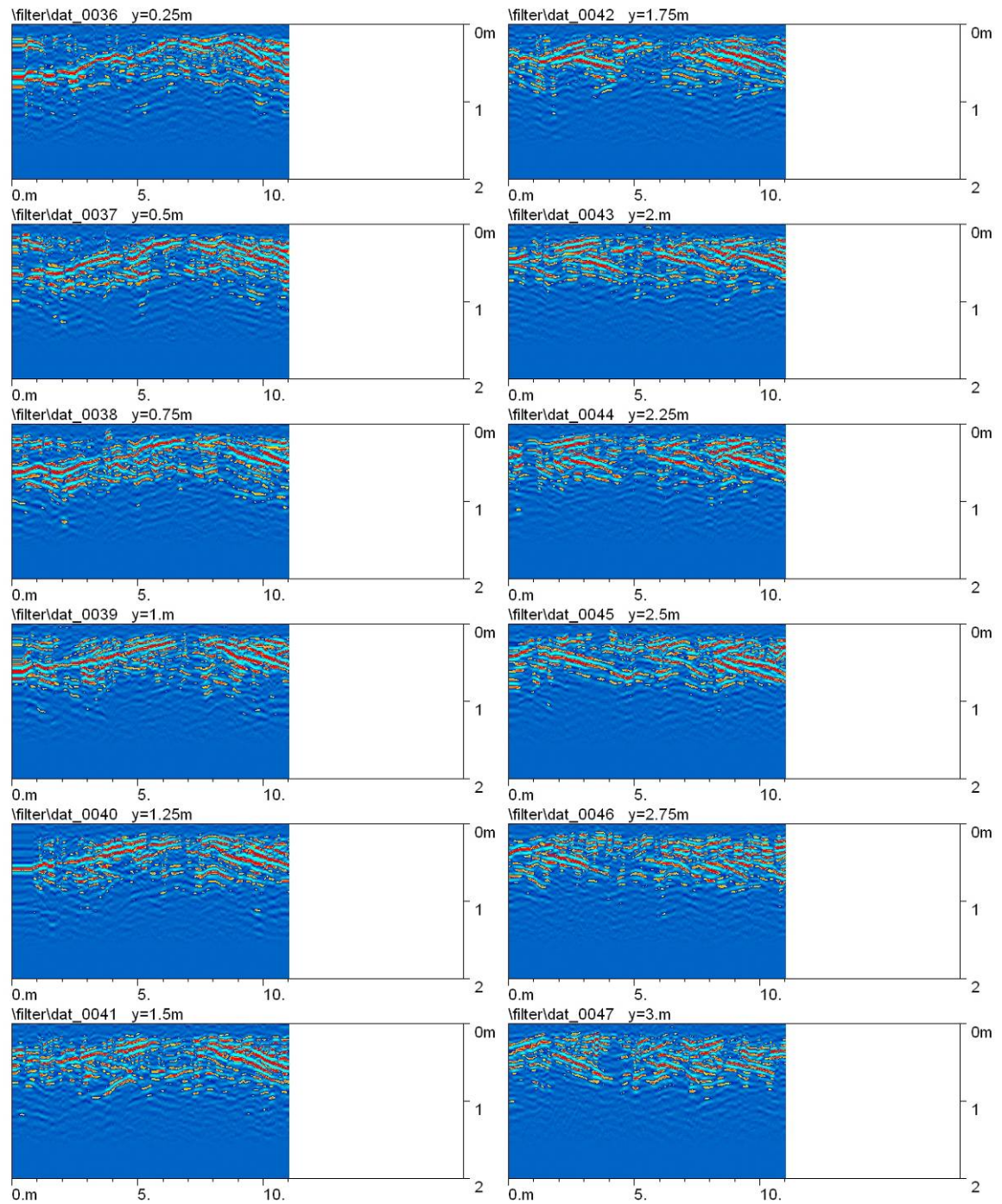


Figure B-4. Processed radargrams for 500 MHz survey, transects $Y = 0.25$ to 3 m .

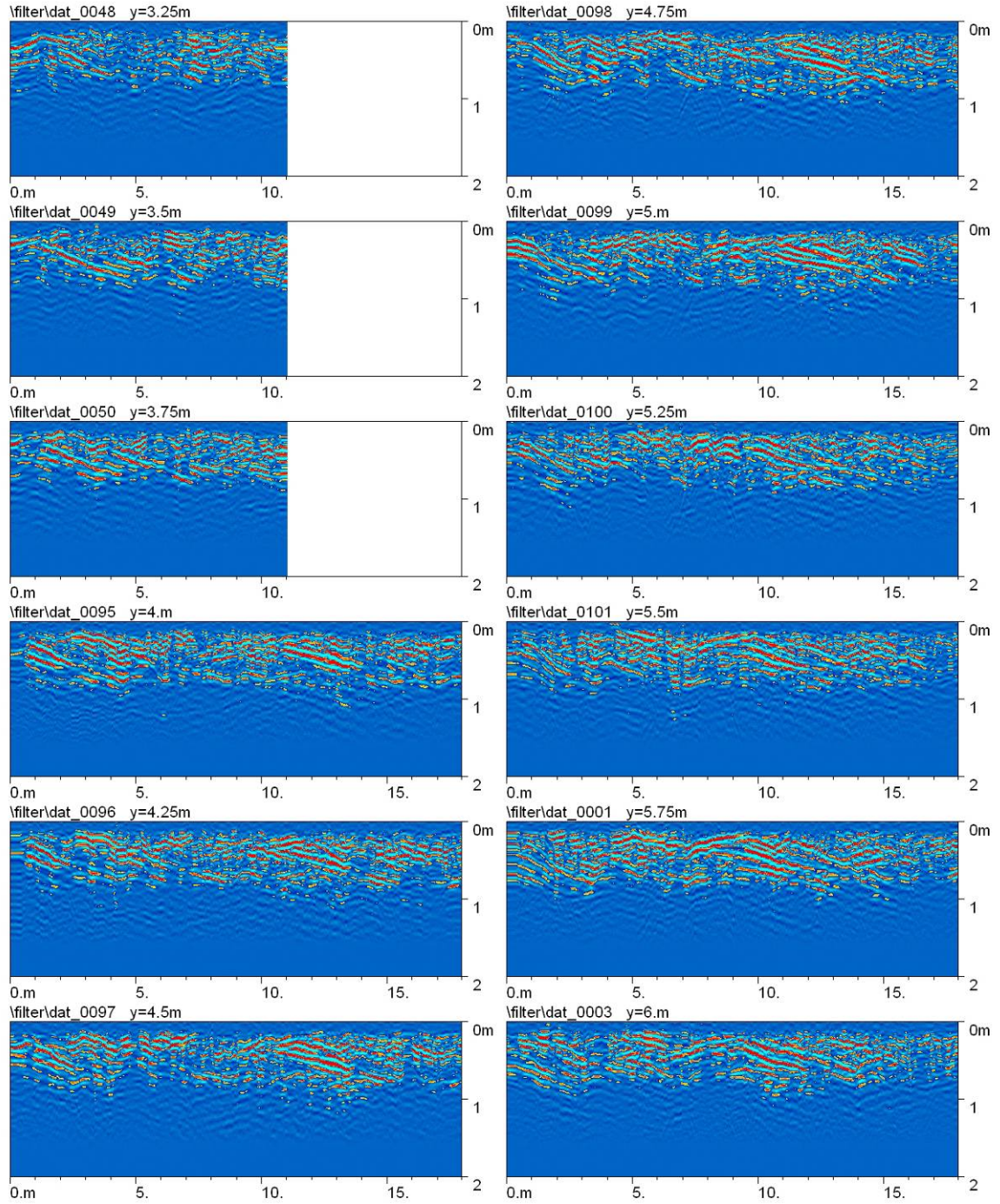


Figure B-5. *Processed radargrams for 500 MHz survey, transects $Y = 3.25$ to 6 m.*

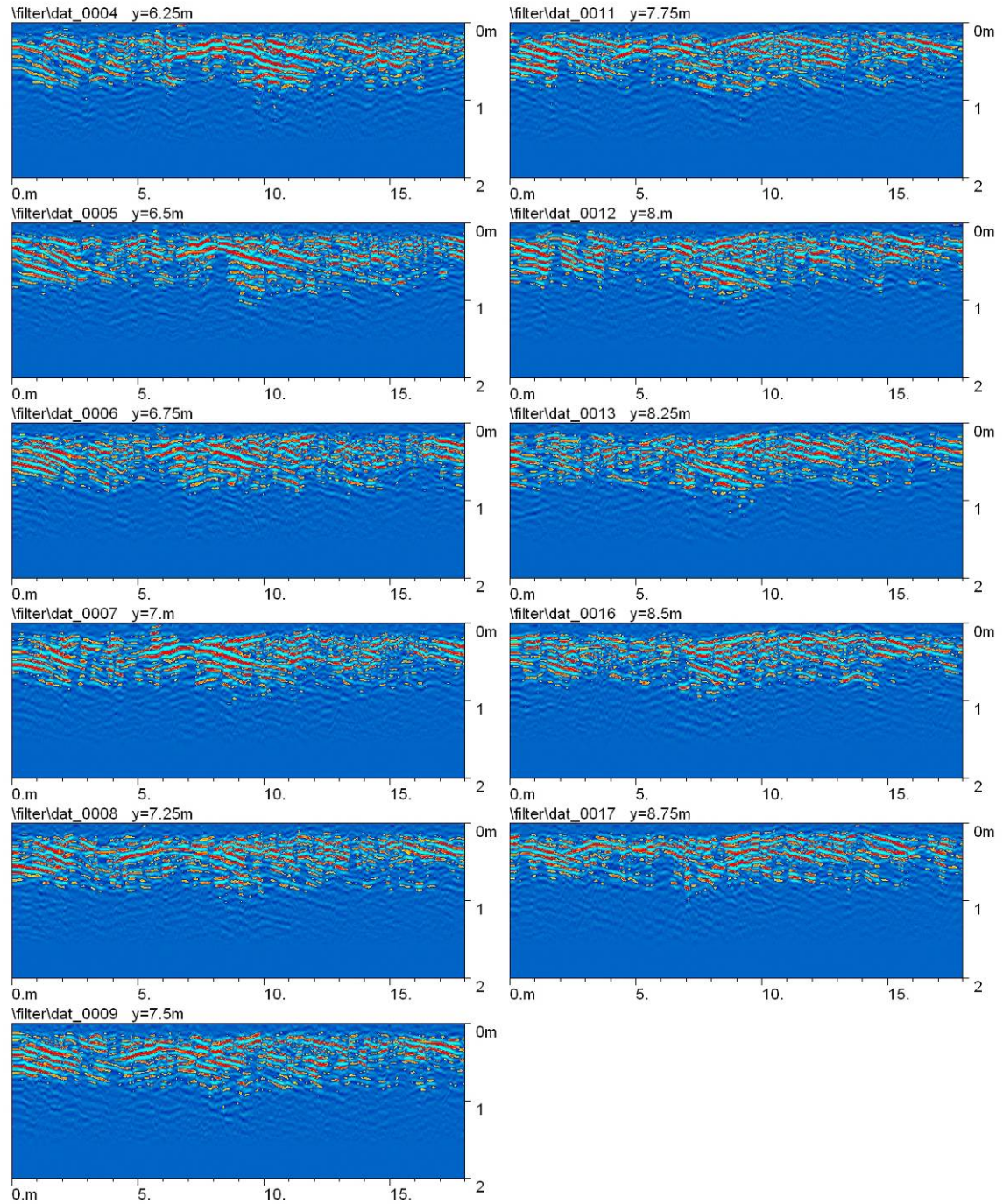


Figure B-6. *Processed radargrams for 500 MHz survey, transects Y = 6.25 to 8.75 m.*

APPENDIX C: TIME-SLICE IMAGES

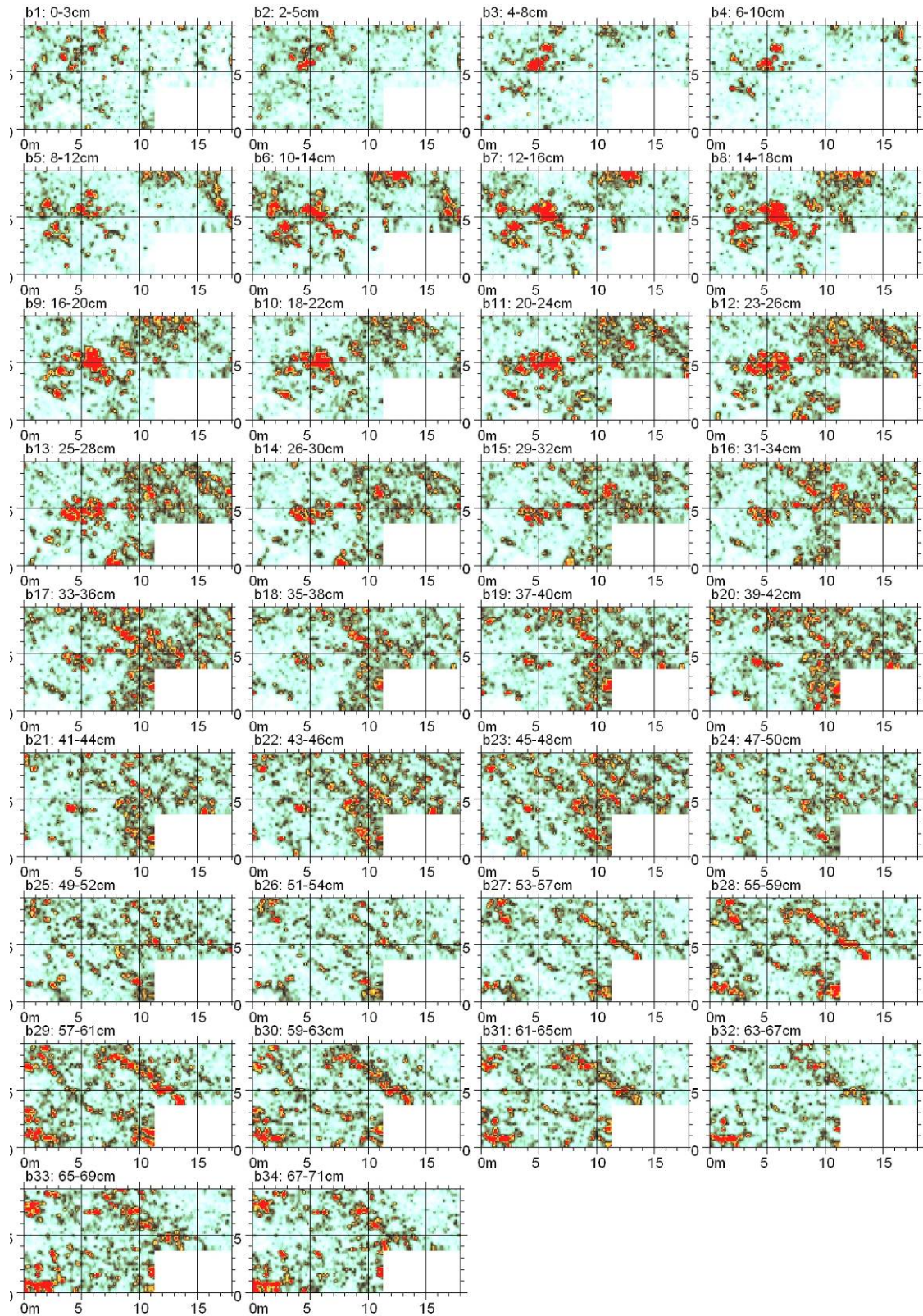


Figure C-1. *Time-slice images for 800 MHz survey.*

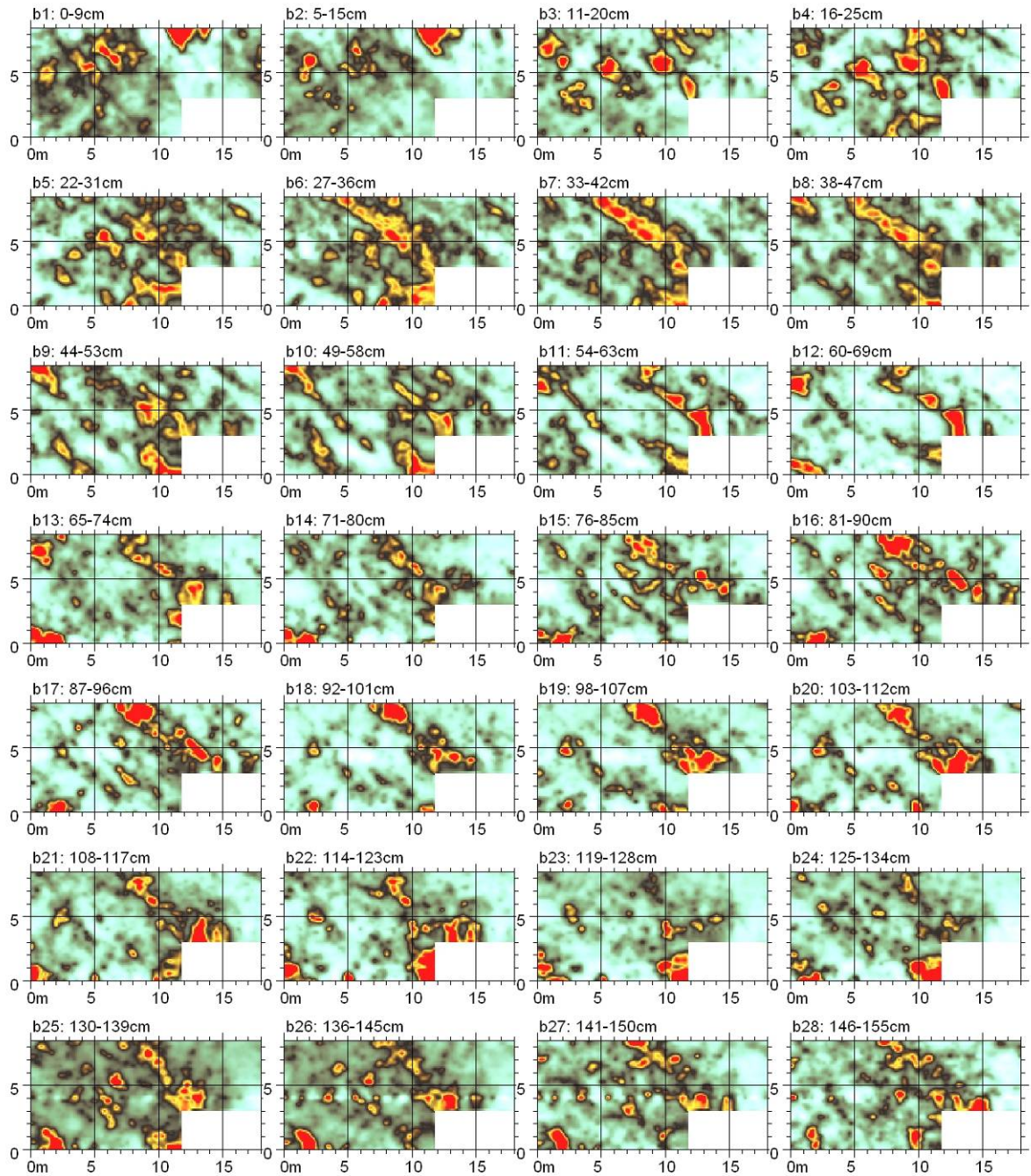


Figure C-2. *Time-slice images for 500 MHz survey.*

THE FINDS FROM THE VIKING AGE AREA AND THE WET MEADOW

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With contribution from Elin Ósk Hreiðarsdóttir (Fornleifastofnun Íslands) and Gavin Lucas (University of Iceland)

INTRODUCTION

In total 62 finds were registered in the 2007 finds database from Areas 2, 6, 14 and Area 18, which is in the wet meadow on the east end of the homefield, downslope from the Viking Age area. Of those, ten finds were discarded in the field or in the post-excavation process. Finds retrieved from heavy residue sieving are registered under 11 finds numbers. The find numbers include slag, but unworked animal bones are registered in a separate bone register. All finds were cleaned, dried, repacked and registered in the excavation database. Conservation work is carried out by the National Museum but finds are stored at the Maritime Museum of the Westfjords (Byggðasafn Vestfjarða), located in the town of Ísafjörður, and finds processing was completed there.

Most of the material from the site is metalworking slag (~6.6 kg listed under 19 finds numbers), followed by ceramics, iron, glass, wood, stone artefacts, and bone. Most of the finds from **Area 2** are slag from Structure 3, a smithy. It is mainly from a central hearth fill [6126, 7012] but also from small deposits and post hole fills. A considerable amount of slag had been retrieved from the building in previous years. Other find from the area is unworked wood, find 42. The finds from **Area 6** are all from Structure 4. They are predominantly slag found in heavy residue sieving, and interestingly a piece of worked whale bone, find 51, found under the north wall of Structure 4. Most of the finds come from **Area 14**. This material is chiefly ceramic and glass, but there is also slag, iron, stone and one burnt wood fragment. The excavation was mainly in the surface layers this field season as most of the work aimed at uncovering Structure 7. From **Area 18**, two finds are registered: wood fragments and an iron object.

The preservation at the site is average to poor. Iron objects are very corroded whilst copper alloys (retrieved in previous years) are very well preserved. Organic material seems almost absent in the assemblage and rather few bones (i.e. food waste) have come from those areas in general.

DESCRIPTIONS OF ARTEFACTS

Organic material

Wood fragments were found in Areas 2 and 14, finds nos. 42 [6167] from a turf wall of Structure 3 and 50 [7152] from turf collapse in Structure 7. Both finds need further analysis. The wood fragments (find no. 47) that were found in Area 18 also await

further analysis. Whalebone no. 51, which was found under the northeast wall of Structure 4, is very fragile and awaits cleaning, conservation and further analysis. The location of the bone under the wall makes it likely to have been a foundation deposit – a symbolic deposit associated with the construction of Structure 4. Bones have been found under walls in other Viking Age structures as well, such as the house at Aðalstræti in Reykjavík.

Iron

The iron objects found in the Viking Age area are very corroded and misshapen. Almost all of the iron finds are from Area 14, where Structure 7 is being excavated: find nos. 12, 15 and 33 from unit [7001], 16 from [7002], 49 from [7120] and 41 from [7160], all of which are post-abandonment deposits. The finds are diverse: nails, objects that need x-raying and await further analysis, and small unidentifiable fragments. The one iron object from Area 18, 41 [7401], also awaits further analysis.

Industrial debris – slag

Much less metalworking waste was retrieved this year than in previous field seasons, from which the total is around 6,663 kg.

The slag retrieved in 2007 was scattered through 10 contexts:

Slag find no	Context	Area	Slag find no	Context	Area
52, 53, 59, 62	6126	2	39	7044	2
17, 19, 22, 48	7001	14	60	7045	2
27	7011	2	56	7052	14
29, 40, 54, 61	7012	2	57	7124	2
55	7027	6	58	7146	6

The vast majority of the slag came from Area 2, Structure 3, the smithy (6.6 kg). From Area 6, 3 g of slag were recovered and from Area 14, 30.6 g, most of which came from the top soil [7001] and must be of recent date. Most of the slag recovered in previous years came from Structure 3 (total of 136.1 kg)⁹; the excavation of the smithy was completed in 2007.

Stone

Two stone objects were retrieved at the site, a manuport green jasper find (no. 38) from topsoil [7001] and a spindle whorl, find no. 46 (see Figure 1). It is finely and skilfully made of a reddish stone that could well be of local origin but awaits analysis. Its diameter is 43 mm; its exact thickness could not be decided because its



Figure 1. *Spindle whorl VSF07-046.*

⁹ See reports on Vatnsfjörður 2005, Adolf Friðriksson et al (eds) (2006) and Vatnsfjörður 2006, Karen Milek (ed.) (2007).

base is broken, but the fragment is 20 mm thick. The whorl has a central perforation (8 mm in diam.) and was found broken in two conjoining pieces. The whorl is conical shaped and can be categorised as Bryggen type A.¹⁰ A spindle whorl of type A was found in the floor deposit of the Viking Age house (Structure 1) at Vatnsfjörður in 2004 (VSF04-095), which was also of red stone.¹¹ This type of artefact is well known from Viking Age contexts in Iceland. The spindle whorl found in 2007 comes from a post-abandonment deposit [7123] – described as a gravel over turf collapse – of Structure 7, Area 14, and does strongly indicate ongoing activity at the site after this structure was abandoned.

Ceramics (identified by Gavin Lucas)

In total 19 sherds registered under 12 finds numbers were found in 2007. The ceramics were all retrieved during the cleaning of top soil deposits [7000, 7001 and 7008] in Area 14. The artefacts are mostly sherds of industrial whiteware, but glazed red earthenware (no. 32) and one sherd of Chinese porcelain (no. 1) is also present (see Figure 2a). The ceramic can all be dated to the mid-nineteenth to early twentieth century.

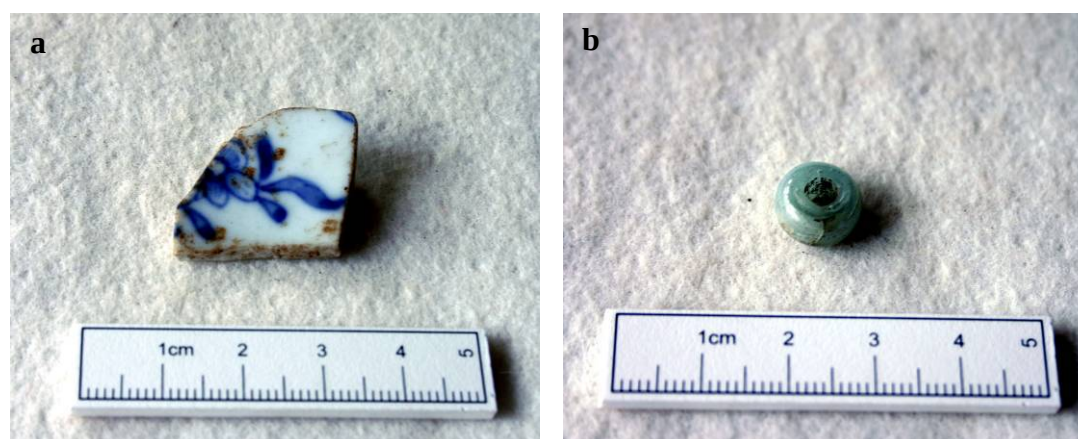


Figure 2. (a) *Chinese porcelain VSF07-001.* (b) *Glass bead VSF07-037.*

Glass (bead identified by Elín Ósk Hreiðarsdóttir; glass vessels and window glass identified by Gavin Lucas)

Nine glass finds were retrieved in 2007, which were registered under eight finds numbers. The glass was all found in top soil deposits [7001 and 7008] in Area 14. Most of the finds are glass vessel and window glass sherds dated to the nineteenth century, and at least two window glass finds, 3 and 13, are post-1900. One glass bead, 37, was also retrieved (see Figure 2b). It is a greyish-green coloured, simple, undecorated, wound bead. It is hard to date plain bead types like this one, as they have a long period of use, but considering the dates of other finds from the same top soil deposit [7001], it is likely to be of modern date. Beads of similar type from well-dated

¹⁰ Øye, Ingvild. *Textile equipment and its working environment, Bryggen in Bergen*, 38.

¹¹ Ragnar Edvardsson. *Fornleifarannsókn í Vatnsfirði við Ísafjarðardjúp sumarið 2004*, 8, 18.

Viking Age contexts would be of Callmer's type A (A341).¹²

Discarded finds

Ten finds numbers were discarded in the field or during post-excavation analysis when they turned out not to be artefacts: 7, 9, 14, 18, 25, 28, 31, 36, 43, and 44.

DISCUSSION

The context with the largest number of finds is the top soil layer [7001], chiefly in Area 14, which contains only modern finds. The second most finds-rich context was the hearth inside Structure 3, the smithy ([6126, 7012]), which contains only slag remains. The finds assemblage is not large, but it does include nice finds such as the Viking Age spindle whorl (46), the modern glass bead (37), and the sherd of Chinese porcelain (1). As discussed earlier, the spindle whorl was found in a post-abandonment deposit of a ruin that is likely to date to the Viking Age (Structure 7). The large amount of slag from the smithy area reflects, as before, considerable metalworking at the site, connected to the smithy.

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¹² Elín Ósk Hreiðarsdóttir. *Íslenskar perlur frá víkingaöld*.

THE FINDS FROM THE FARM MOUND AREA

Guðrún Alda Gísladóttir (Fornleifastofnun Íslands)

INTRODUCTION

The 2007 excavation season on the Vatnsfjörður farm mound recovered many thousands of objects that were recorded under 302 finds units (see the Finds Register, this volume), the processing, registration, and analysis of which is still ongoing. The finds register includes unworked animal bones and slag. Unworked animal bones are being analysed by zooarchaeologists at the City University of New York (see Albína Pálsdóttir et al., this volume). Finds were cleaned, dried, repacked, and registered in the excavation database. Conservation work is being conducted by the National Museum, but finds are stored at the Maritime Museum of the Westfjords (Byggðasafn Vestfjarða), in the town of Ísafjörður, and finds processing is being completed there.

The main excavation was in Area 7, which was enlarged from 70 m² to 400 m² in 2007. This extension began with a small test trench excavated 3 m west of the main area (Area 19), in which one piece of pottery was found. The enlargement of the area aimed at uncovering a dwelling house, a turf building that was built in 1884 and in use until the mid-twentieth century (from the year 1907 as storage and smithy). The finds retrieved this field season are from 34 units. The finds from ten units are still being processed [7514, 7515, 7518, 7520, 7521, 7530, 7531, 7532, 7535, and 7542] and three units have not been processed at all [7517, 7536 and 7543]. There are also several finds that are unstratified (retrieved during cleaning).

The excavation was mainly carried out on topsoil and post-abandonment layers this field season as most of the work aimed at uncovering the buildings. Preservation in these upper layers ranges from poor/average – excellent. Organic material is very well preserved but iron objects are heavily corroded.

The most artefact-rich units were the top soil layers [7501] and [7516], which were mixed and disturbed deposits of turf and stones, and the cellar fill [7504]. Those three contexts contained ~85% of the artefacts from the farm mound. Most of the finds were from the cellar (group [1703]). The cellar is part of the 1884 turf house construction and its dimension are ca. 3.5 x 3.8 m and ca. 1.6m deep (ca. 21.3 m³). It had been filled up with rubbish, probably when the house was demolished in mid-twentieth century. The artefacts were mixed in the fill from top to bottom without any visible changes or special concentrations. The largest object was a coal burning stove, find 799, which was in many parts and was very corroded. Not all artefacts from the cellar were kept, such as part of a bicycle, and samples were taken of wires (telephone wires and barbed wires), barrel hoops, and part of a chimney made of bricks and corrugated roof iron. A few deposits, including [7515, 7523, 7525 and 7533], were clearly related to the original activities in the cellar, and these contained a number of finds. In the northwest corner of the cellar was a wooden platform – structure [7533] – of which a sample was kept (find no. 619). This wooden construction is probably a foundation for a stair.

DESCRIPTIONS OF ARTEFACTS

The assemblage consists of diverse materials, and is dominated by ceramic, glass and iron but other materials include copper alloy, stone, textile (wool and nylon), wood, leather, rubber, plastic, cement, tar paper, bone, shell and cork.

The object types are also highly varied, as can be seen in the finds register. They include fragments of domestic objects such as cups, dishes, glasses, bottles, knives, lamps and scissors. A few items of woven textiles were present, including a probable hay-bag of very coarse material, fragments of machine-woven clothes and probable nylon stockings, and ropes. Structural and furnishing fittings of many sorts were found, which had originally been parts doors and windows. The assemblage also includes nails (mostly wire nails >1890), hinges, pierced strips for miscellaneous use, chains, staples, rivets and roves. Hasps and a lock are also present. Quite a few objects connected to agriculture and fishing are in the assemblage, including scythes of at least two types, fish hooks of different sizes, and net floats of different shapes and sizes. More personal belongings include buttons, belts and thimbles. Riding gear is also present, including a near-complete saddle, horse shoes, horse shoe nails and leather straps. There are also tools such as grinding stones, pliers, saws, whetstones – all tools needed on a self-sufficient farm.



Figure 1. Left: Toy car 07-657 and ball 07-658 (scale 10 cm). Right: Fish hooks 05-746 (scale 20 cm).



Figure 2. Left: Floats 07-625 (scale 10 cm). Right: Grinding stone 07-650 (scale 10 cm).



Figure 3. Left: Saddle 07-64 (no scale) . Right: Glass bottles, 07-544 (scale 10 cm).

DISCUSSION

In conclusion, most of the finds recovered in 2007 are from surface deposits and post-abandonment deposits, all of which post-date the last demolition of the 1884 house and the levelling of the farm mound in the mid-twentieth century. As a whole the assemblage reflect a broad range of typical objects that would have been common on a self-sufficient twentieth-century farmstead. The processing of the finds recovered in 2007 is still underway, but this preliminary assessment chiefly dates the finds from the late nineteenth to mid-twentieth century.

THE ARCHAEOFAUNA FROM VATNSFJÖRÐUR

Albína Hulda Pálsdóttir, Marjorie Gorsline and Thomas McGovern (Northern Science and Education Centre, City University of New York)

INTRODUCTION

The Vatnsfjörður archaeological project started in 2003. This report contains results of analysis of bones from 2003-2007. Analysis has been completed on the material recovered in 2003 and 2004, but has been only partially completed on bones from 2005-2007. This is the second preliminary report of the archaeofauna from the Vatnsfjörður excavation; analysis is still ongoing and the results presented here are by no means final. The Vatnsfjörður material dates to two time periods, the Viking Age and the early modern period (Milek 2007), and this report will compare and contrast these two distinct assemblages.

LABORATORY METHODS

Analysis of mammal and bird bones was conducted at the Hunter College Zooarchaeology laboratory by Albína Hulda Pálsdóttir and Marjorie Gorsline with assistance from Dr. Thomas McGovern. Fish bone identifications were done at the Brooklyn College Zooarchaeology laboratory with assistance from Dr. Sophia Perdikaris.

For distinctions between sheep (*Ovis aries*) and goat (*Capra hircus*) bones the standards of Boessneck are followed (Boessneck 1969), and bones that could not be securely identified to either species were placed in the “caprine” category. Measurements were done according to the metrical standard of Von den Dreisch (Driesch 1976) with digital calipers to the mm.

Basic data was recorded using the NABO Zooarchaeology Working Group (2004) *NABONE Zooarchaeological Recording Package (8th edition)*, a system that combines an Access database with specialized Excel Spreadsheets. The NABONE package allows application of multiple measures of abundance, taphonomic indicators, and skeletal element distribution and is the current standard record for Icelandic archaeofauna.

RECOVERY METHODS

The Vatnsfjörður archaeofauna was recovered by a mixture of hand collection and sieving. In the Viking Age area at least 25% of all contexts were sieved through a 4mm mesh with some complete contexts being sieved. Some contexts were also sampled for flotation, sieved through 2mm mesh, and bone recovered from the heavy residue. Recovery biases will be minimal for this part of the collection. On the modern farm mound bones were recovered by hand with some contexts sieved through a 4mm mesh and some floated through 2mm mesh and bones collected from

the heavy residue.

PHASING

For the purposes of this report the material has been split into three phases: the Viking Age farm, which includes all bones from Areas 1, 2, 6 and 14, the modern farm, with all bones from Areas 5 and 7, and contexts of unknown age, including surface contexts from the Viking Age area, bones without context information, and bones from test pits done outside the main excavation areas.

Table 1. Overview of species present.

		Viking Age farm	Modern farm	Unknown age
Domestic Mammals				
Cow	<i>Bos taurus</i>	73	56	9
Horse	<i>Equus caballus</i>	2	0	
Pig	<i>Sus scrofa</i>	25	3	5
Cat	<i>Felis domesticus</i>		1	
Sheep	<i>Ovis aries</i>	9	85	
Goat	<i>Capra hircus</i>	1	0	
Sheep/goat	<i>Ovca</i>	82	315	25
Total Caprine		92	400	25
	Total Domestic	192	460	39
Seals				
Harbor seal	<i>Phoca vitulina</i>	3		
Seal species	<i>Phoca species</i>	19	38	5
	Total Seal	22	38	5
Whales				
Great whale	<i>Large Cetacean</i>	2		
Small whale	<i>Small Cetacean</i>		1	
Whale species	<i>Cetacean</i>	3	4	1
	Total Whale	5	5	1
Other mammals				
House mouse	<i>Mus musculus</i>		3	
Mouse species	<i>Mus genus</i>		3	
	Total other mammals		6	
Birds				
Swan species	<i>Cygnus family</i>	2		
Goose species	<i>Anser genus</i>	1		
Eider	<i>Somateria mollissioma</i>		3	

White-tailed Eagle	<i>Haliaeetus albicilla</i>	3		
Ptarmigan	<i>Lagopus mutus</i>	2		1
Guillemot family	<i>Uria species</i>	5		1
Black Guillemot	<i>Cephus grylle</i>		1	
Puffin	<i>Fratercula arctica</i>	7	74	
Auk family	<i>Alcidae species</i>	1		
Domestic chicken	<i>Gallus gallus</i>		1	
Bird species indeterminate	<i>Aves species</i>	20		
	Total Bird species	41	79	2
Fish				
Cod	<i>Gadus morhua</i>	6		
Haddock	<i>Melanogrammus aeglefinus</i>	2		
Gadid species	<i>Gadidae</i>	3		1
Total Fish species identified		11		
Fish species indeterminate		22	696	5
	Total Fish species	33	696	6
Mollusca				
Mussel species	<i>Mytilidae family</i>	57	7	
Clam species	<i>Mya species</i>	12	19	
Snail species	<i>Gastropoda class</i>	2	0	
Mollusk species	<i>Mollusca</i>	45	2	3
	Total Mollusk Species	116	28	3
	Total NISP	409	1312	56
Unidentified				
Large Terrestrial. Mammal		76	61	8
Medium Terrestrial Mammal		142	188	9
Unidentified Mammal Fragments		1216	178	46
Unidentified Faunal Fragments		1504	438	83
Total number of fragments (TNF)		3347	2177	202

The number of identified specimens (NISP) from the Viking Age farm is still relatively small, but is now over the 300 NISP threshold informally adopted by NABO zooarchaeologists for generalized comparisons of taxonomic abundance. It should be emphasized that conditions of preservation are variable at Vatnsfjörður, and are generally better in the Farm Mound area than in the Viking Age area. Taphonomic processes, including both frost action and soil acidity (which varies from 4.8-6.5), certainly affected the Viking Age archaeofauna more strongly than the early modern-recent archaeofauna from the Farm Mound area (see discussion below). Many of the Viking Age mammal elements recovered are tooth fragments and burnt bone

(probably from hearth clearing), and there is probably some preservation bias favoring larger mammals and against fish bone preservation.

The domestic species present reflect the range found in other Viking Age excavations in Iceland, including both pig and goat bones (McGovern et al. 2007). The number of pig bones (mostly tooth fragments) from the Viking Age farm is much higher than that from the modern farm. Pigs become rare in Icelandic collections after the twelfth century. The modern collection fits with the present day farming practices in the area, which focus mostly on sheep farming with cattle kept for domestic use. No goats are present in the modern collection but one bone is present in the Viking Age fauna, which also follows the trend that is usually found in Iceland. Goats are not present in the modern farm collection and they are extremely rare in present day Iceland.

One cat bone is present in the modern farm material, and cat bones are usually very rare in Icelandic archaeofaunas. The bone had a pathology most likely caused by arthritis, which would have been extremely painful, but the cat lived with it for a considerable amount of time.

Seals can only be identified to species level on a restricted range of bone elements. The few seal bones that could be speciated in the Vatnsfjörður collection are from harbor (or common) seal, which still breeds in the immediate vicinity. Whale bone fragments probably mainly reflect craft production, and probably do not provide a readily quantifiable measure of actual whale meat consumption. Most whale bone fragments in the collections are heavily fragmented and are not identifiable to species.

The majority of fish bones from the modern farm mound have not been fully analyzed yet, only counted. More information about fishing practices at the modern farm will come to light when they have been finished for the next interim report.

The large terrestrial mammal category includes bones of the cattle/horse size, while the medium terrestrial mammal category includes bones of the sheep/goat/pig/large dog size. While no dog bones were identified, canine tooth marks were present on bone fragments of other species in both the Viking Age and modern faunas (Pálsdóttir and McGovern 2007).

In general both collections show a wide use of marine resources, although fish bones may be underrepresented in the Viking Age collection due to preservation issues (Edvardsson and McGovern 2005). The Vatnsfjörður area is far from being ideal for farming, and vegetation is not particularly lush. The inhabitants of Vatnsfjörður definitely made substantial use of local seal populations, sea birds, mollusks, fish and whales (probably from strandings) in all time periods.

Fish, sea birds, whales and seals make up around a third of the Viking Age fauna (even if fish bone preservation is variable). The marine component of the modern farm is even larger, making up almost two thirds of the fauna, with fish (mainly cod-family) making up over 50% of the early modern archaeofauna. This pattern of increasing deposition of fish bone *versus* domestic mammal bone is widespread in Iceland, and is not restricted to this site.

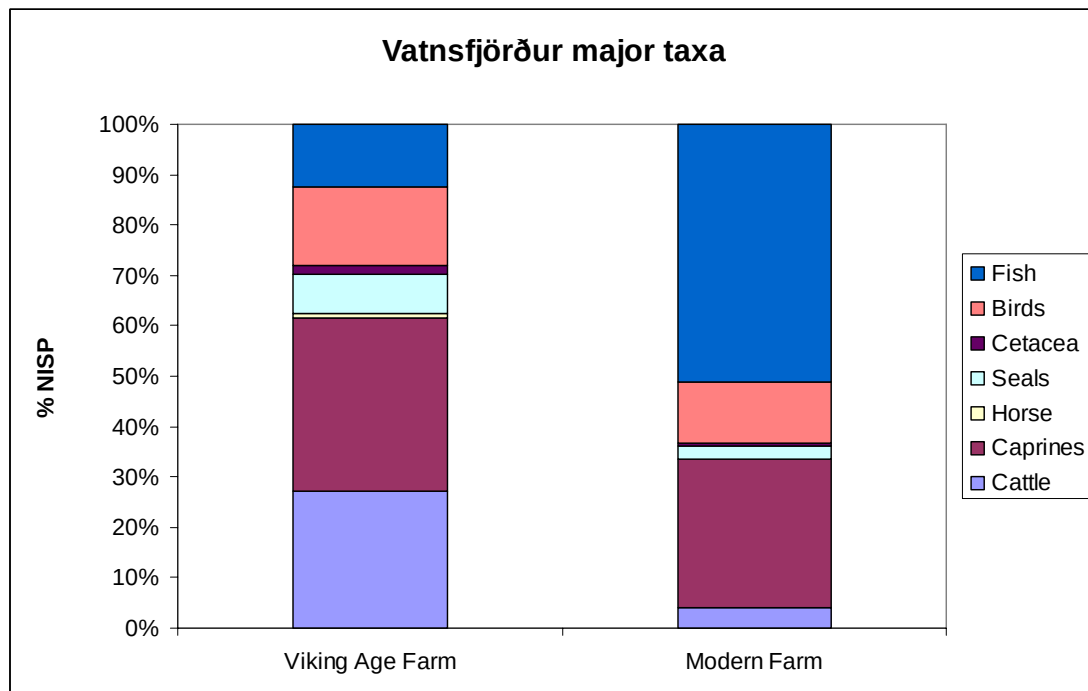


Figure 19. Major taxa represented in the Viking Age and Modern farm archaeofauna.

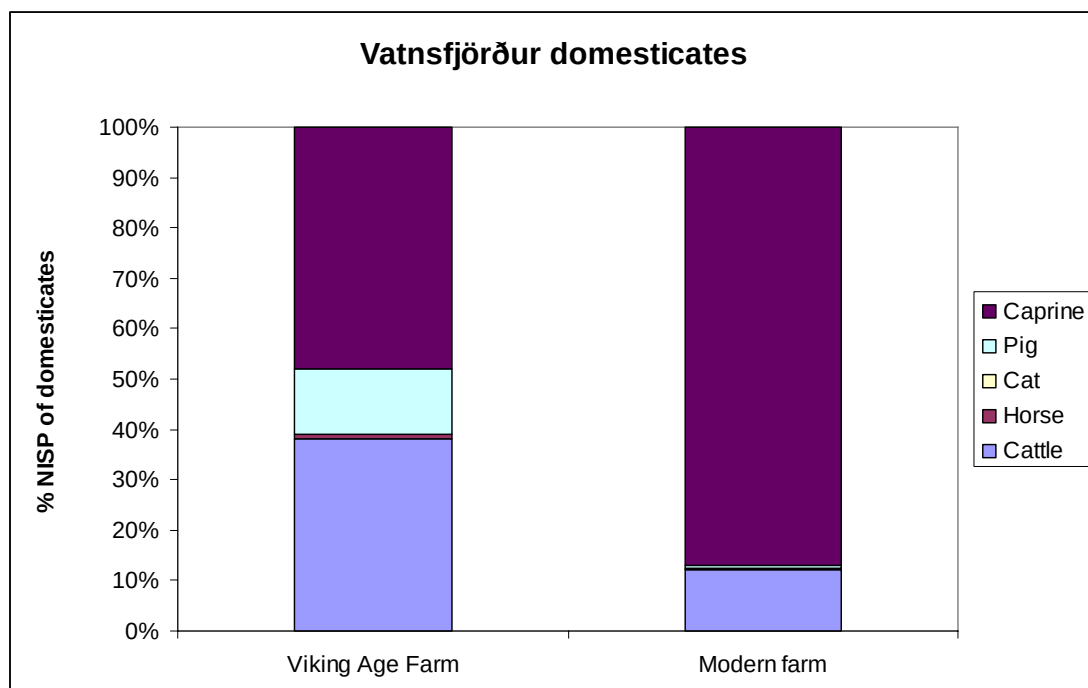


Figure 20. Viking Age and modern domestic stock percentages.

The caprine: cattle ratio of almost 1:1 in the Viking Age material may reflect some taphonomic effects but the substantial proportion of cattle is fairly typical of larger (and probably higher-status) sites in Iceland. The Viking Age Vatnsfjörður domestic mammal proportions resemble those of other parts of Iceland, and the percentage of

pigs and cattle again would tend to suggest higher status. The early modern archaeofauna resembles other Icelandic sites in the strong dominance of sheep and very secondary role of cattle stocking. While sample size issues still restrict what can be reasonably said about herding strategies in this interim report, the relative percentages of bones from very young (neonatal) animals can provide some indications (Table 2).

Table 2. *Percentage of neonatal bones at Vatnsfjörður.*

	Viking Age	Modern	Unknown period
Cattle neonatal	10%	22%	4%
Caprine neonatal	1%	1%	0%
Caprine foetal	2%	3%	0%
Seal sp. Neonatal	0%	53%	20%

As Table 2 indicates, there is a strong contrast in the relative abundance of neonatal calf bones *versus* newborn or late foetal lamb bones. In most Icelandic archaeofauna of all time periods, substantial numbers of bones of young calves (less than one month to up to two months old) have been identified, and this pattern is normally interpreted as reflecting a dairying economy operating within the constraints posed by northern climates. The difference in neonatal cattle percentages between Viking Age and Modern samples may reflect harsher taphonomic attrition in the Viking Age materials (neonatal bones are less mineralized than adult bone), but in any case the strong contrast is with the consistently far lower percentages of caprine (sheep or goat) lamb bones. While some young lambs might be still born or killed to preserve the health of an ewe with twins in a hard season, sheep were clearly being managed differently from cattle during both phases of the site.

The seal neonatal bones come from pups probably killed on land at rookeries in spring. Adult seals could have been taken at any time by clubbing, nets, or (in modern times) with firearms and harpoons. The high ratio of neonatal seal bones in the modern collection confirms ethnographic accounts of spring rookery hunting with clubs, but the absence (thus far) of neonatal seal bones from the Viking Age deposits seems to reflect vastly different hunting patterns.

The two Vatnsfjörður bird collections differ dramatically in variety: the modern collection is almost exclusively focused on puffin, while the Viking Age collection contains a mix of a wider range of marine (mainly auk-family) and terrestrial birds (mainly ptarmigan) (see Figure 3). The presence of eider in the modern assemblage is somewhat unexpected, as they are usually not taken for food in Iceland: down collection from eider nests is a significant source of income for Icelandic farmers. The presence of domestic chicken in the modern bone assemblage is also interesting. Chicken bones are rare in Icelandic archaeofaunas and all come from early modern layers.

The eagle bones likely indicate hunting to prevent predation rather than for food, as

eagles are known to prey on lambs and they can cause significant losses. There is also a possibility that the eagle bones have something to do with religious practices. The presence of swan is also interesting as there is a modern day taboo against hunting or eating swan in Iceland, though swan bones have been recovered from other Viking Age collections.

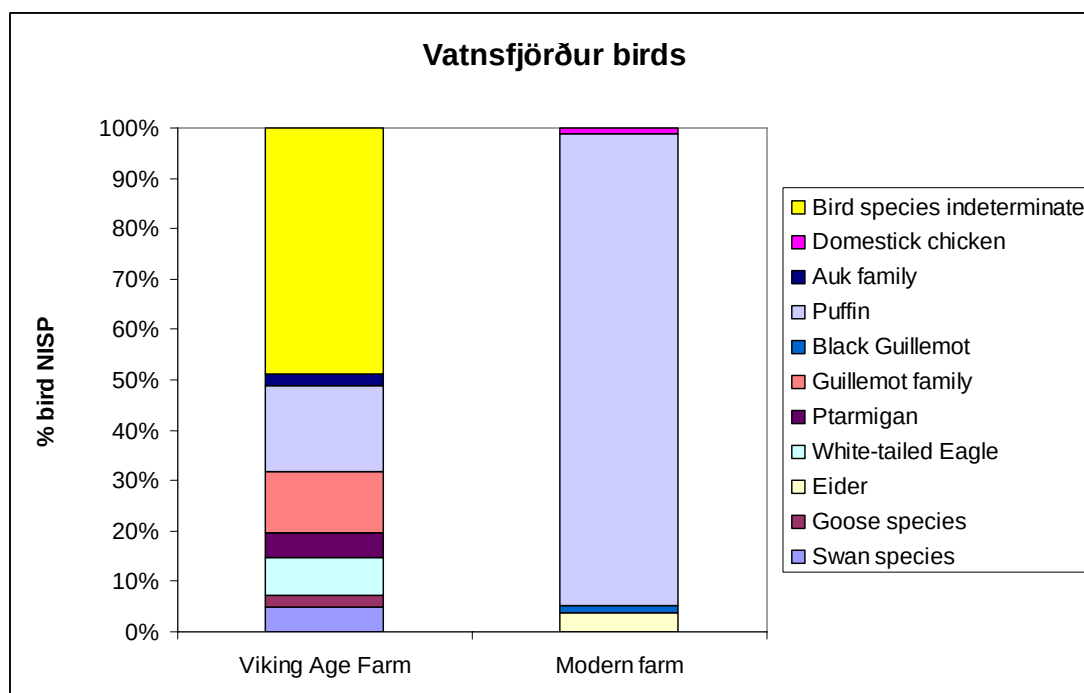


Figure 21. *Bird relative percentages.*

TAPHONOMY

As stated in the previous preliminary report, taphonomy is a major issue when it comes to interpreting the Vatnsfjörður Viking Age archaeofauna. Bone preservation at the Viking Age farm area is very poor due to the high acidity (pH as low as 4.8) and a coarse gravel substrate that is almost directly beneath the human occupation layers. The Viking Age occupation layers are also relatively thin, which causes very efficient water drainage at the site, and facilitates the leaching of phosphate and calcium from bone. The bones are also negatively affected by freeze-thaw cycles. The rate of identification in the Viking Age farm area is only 13%, while 70% of the bones from the modern farm mound can be identified to taxon. Preservation conditions would be expected to be much better in the farm mound, where the human occupation layers are much thicker (Edvardsson and McGovern 2005; Pálsdóttir and McGovern 2007). (The early modern bones have also had little time to degrade compared to the bones on the Viking Age part of the site, which have been exposed to freeze-thaw and leaching processes for 1000 years. – *ed.*)

The difference in bone fragment sizes in the Viking Age and the modern contexts could be the result of several different factors. Viking Age faunal assemblages

regularly contain “hearth cleaning” deposits characterized by highly fragmented and strongly burnt bone (usually associated with ash, fire cracked stones, and charcoal). In the Viking Age, the open long hall fire and similar smaller open hearths were widely used for disposal of scraps and processing debris, and these mixed deposits are often encountered either *in situ* or re-deposited in midden layers. Modern farms made use of closed stoves and tended to discard bones directly into middens, resulting in much lower rates of burnt bone and generally less fragmentation (Figures 4 and 5).

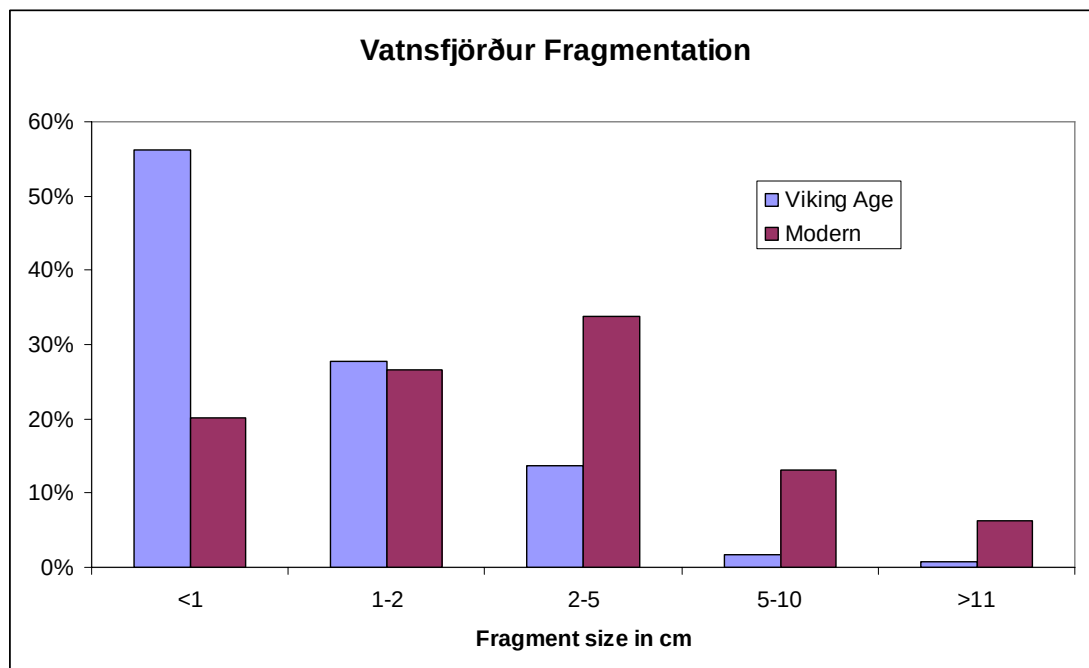


Figure 22. Comparison of bone sizes in Viking Age and early modern contexts.

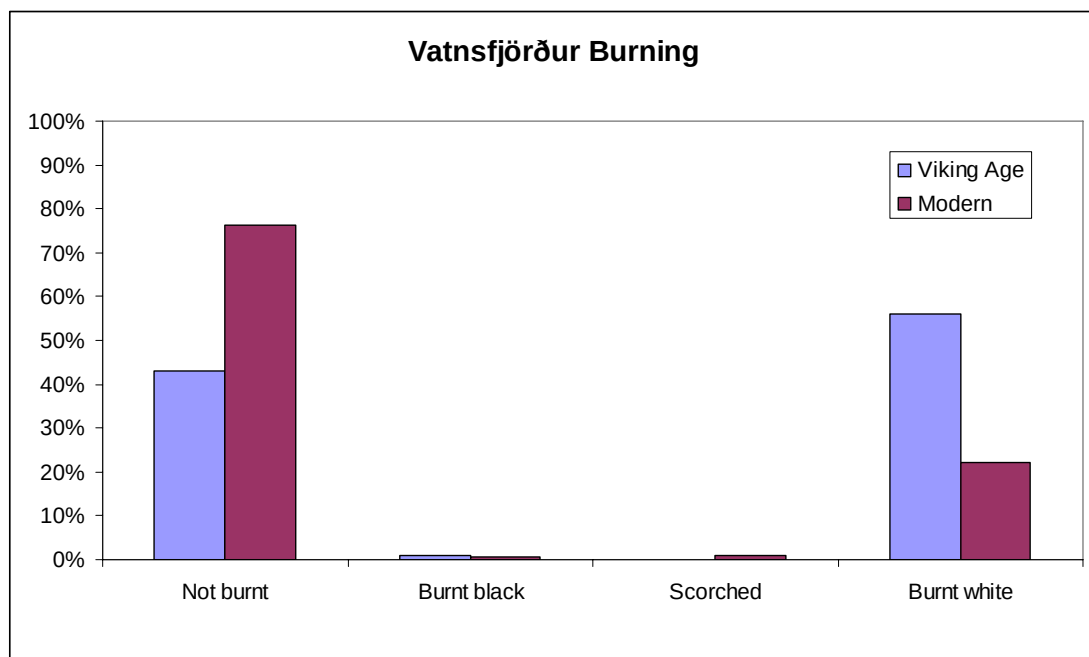


Figure 23. Comparison of the percentage of burnt bones in Viking Age and early modern contexts.

CONCLUSIONS

The Vatnsfjörður faunal assemblage presents great potential for comparisons across long periods in time, from the Viking Age to the near present. While taphonomy and sample size issues continue to limit final conclusions, the work done thus far is now beginning to allow a systematic comparison between major phases, and is beginning to permit us to place these archaeofauna from the West Fjords into a wider temporal and geographical perspective.

Acknowledgements

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ASSESSMENT OF BOTANICAL REMAINS FROM STRUCTURES 1 AND 3 IN THE VIKING AGE AREA

Dawn Elise Mooney (University of Cambridge)

INTRODUCTION

During excavations at Vatnsfjörður since 2005, it has been noted both by excavators and by those conducting preliminary archaeobotanical analyses that there is a significant differentiation between the archaeobotanical remains from the two largest Viking Age structures on site: Structure 1 (the *skáli*), and Structure 3 (the smithy). While in Structure 1 most of the archaeobotanical material appears to be wood charcoal, in the smithy there is much more burnt seaweed as well as charcoal. A preliminary assessment of the archaeobotanical remains from a midden dug into the side of Structure 1 (context 209) by László Ferenczi, Karlotta Ásgeirsdóttir and Garðar Guðmundsson in 2005 revealed an assemblage dominated by wood charcoal, but also containing some charred barley grains, charred chickweed, and uncharred buttercup and crowberry seeds, and a “significant amount of charred seaweed” (Milek 2005: 48). Continued analysis of this midden deposit in 2007 produced a similar seed assemblage (Table 1), but analyses by myself and students at the Field School in North Atlantic Archaeology have shown that much more seaweed was found in the samples from the smithy, while the middens associated with Structure 1 were dominated by wood charcoal.

Table 1. *The results of a preliminary assessment of plant remains in midden [209], adjacent to Structure 1 (analysis by Erin Williams, Dawn Elise Mooney, and Véronique Forbes).*

Species	Number of Charred Seeds	Number of Uncharred Seeds
<i>Hordeum</i> (barley)	6	0
<i>Spergula</i> (spurrey)	3	0
<i>Stellaria media</i> (chickweed)	103	0
<i>Ranunculus</i> sp (buttercup)	0	104
<i>Empetrum nigrum</i> (crowberry)	29	38

This distinction implies that seaweed is preferable for some reason as an industrial fuel, or that it has some other industrial purpose. Peculiarities such as these raise questions regarding the management of fuel resources at the site. Fuel use varies significantly from site to site in Viking Age Iceland, and as such each site must be analysed individually in order to understand the impact of locally available resources on fuel use. With this in mind, this research project aims to discuss the range of fuel resources used at Vatnsfjörður, with a particular emphasis on the use of marine resources such as seaweed and driftwood.

Fuel Use Questions at Vatnsfjörður in a Wider Context

After the colonisation of Iceland around 870AD, great changes were wrought on the landscape, the most dramatic of these being the decline of the Icelandic woodlands. In the *Íslendingabók*, Ari Þorgilsson writes that when the *landnámsmenn* arrived in Iceland, the country was “covered with forests between mountains and seashores” (Hermannsson 1930, p.60). Palynological studies have suggested that before *Landnám*, the lowland heaths of modern Iceland were woodlands of birch, willow and rowan, with a forest floor dominated by grass and sedge. In more exposed regions a heathland flora of crowberry, blueberry, heather and dwarf birch was prevalent (Einarsson 1963; & Hallsdóttir 1987, in Smith 1995). This botanical evidence, combined with place-name evidence, suggests that at the time of colonisation 65% of Iceland was vegetated. Today, woodland covers less than 1% of the island, and vegetation less than 25%. The settlers were farmers and the decline of Icelandic woodlands is attributed to their subsistence practices. The birch forests were cleared to make way for hay fields, and the wood itself used for cooking, heating, and to make charcoal for iron production (Rafnsson 1997). This deforestation resulted in large-scale soil erosion, as the short growing season and harsh climate meant that the natural vegetation recovered too slowly to regenerate the woodlands (Rafnsson 1997, Smith 1995).

One of the key assumptions in all analyses of woodland decline and environmental change in Viking Age Iceland is that fresh wood was in high demand as a fuel resource. However, several studies have suggested that this is not entirely the case. Also, as the forests became more depleted, the Icelanders must have relied on alternative fuel resources more and more. In reality, as stated in the introduction, archaeological studies have shown that there is much variation in the resources used for fuel in Iceland. Zutter (1992) identified peat as a major fuel source at Svalbarð in Þistilfjörður through the presence of ericaceous plant species in archaeobotanical samples from hearths at the site. Vésteinsson & Simpson (2004) identified a range of fuels including birch, willow, turf, peat and manure at Hofstaðir and Sveigakot, with turf being the staple fuel at both sites, and a similar range of fuels was identified at Aðalstræti 14-18 (Milek 2007). Archaeobotanical samples from a hearth at Reykholt in Borgarfjörður revealed a complete absence of wood charcoal, with animal dung and peat being preferred for fuel (Sveinbjarnadóttir 2004). “The problem of which fuels were used by Icelandic households in the past is central to many important questions about their economy, environment and lifestyle” (Vésteinsson & Simpson 2004 p.181). Consequently, this research project will discuss the social, functional and environmental aspects of fuel resources, with an aim to understanding the impact of fuel acquisition on social dynamics in Viking Age Iceland. Access to fuel resources would undoubtedly have played an important role in the prosperity or failure of sites in Iceland, and historical sources show that Vatnsfjörður was one of the most prosperous and powerful farms in Iceland (Edvardsson & McGovern 2005, Tulinius 2005).

SAMPLING FOR FUELS

In order to discuss the differences in archaeobotanical remains between Structures 1

and 3, it is necessary to conduct a direct comparison between the two buildings. These two structures were chosen for analysis on the basis of preliminary work conducted as part of a field school student project during the 2007 field season, and also because they provide the best possible contrast between areas identified as domestic (Structure 1) and industrial (Structure 3). With this in mind, the following samples were selected for analysis in this project:

Structure 1:

VSF 04 - Context [48] Samples <16-26> Floor
VSF 05 - Context [209] Sample <11> Midden
VSF 05 - Context [233] Sample <14> Hearth
VSF 05 - Context [245] Sample <20> Ember Pit

Structure 3:

VSF 06 - Context [6020] Samples <114-7, 119-21, 123-8, 131-5, 154, 157-62, 165, 167-8, 178> Floor
VSF 07 - Context [6126] Sample <8> Hearth
VSF 07 - Context [6129] Sample <48> Midden

These contexts were chosen firstly because they will give a precise comparison between not only the two structures but separate contexts within the buildings – it is vital to have such a comparison as otherwise any differences could be due to the context of the remains rather than a significant difference in terms of fuel choice. Secondly, this range of samples will allow for a wider window of analysis. For example, if quantities of seaweed were to be recovered from the midden samples but not from the hearths, we could conclude that seaweed was being burnt elsewhere on site for some other purpose.

PRELIMINARY RESULTS

At the time of writing, archaeobotanical analysis of the above samples is currently in progress. Preliminary work involved the sorting of one sample from each of the contexts, and the identification of wood charcoal fragments from the two hearths and the Structure 1 ember pit. A table of results is not given here, but will be available in the final write-up of this project (Mooney, forthcoming).

The *Skáli*

Analysis of the sample from the floor of Structure 1 revealed mainly wood charcoal, and as one would expect from a floor layer this was broken into very small fragments. Samples from the floor and the hearth yielded *Empetrum nigrum* (crowberry) seeds. Crowberries are small, tart berries which grow in heathland areas all over Iceland. The presence of these seeds serves to enforce the domestic nature of the structure; one can imagine one of the inhabitants snacking on a few berries then spitting the seeds into the fire or onto the floor. Disappointingly, although many seeds were found in the samples from Structure 1, very few remain identifiable. Due to post-depositional taphonomic processes, especially mechanical action relating to the thin soil, trampling and freeze-thaw action, the vast majority of the seeds present have lost their outer

coating, leaving the smooth, spherical inner part of the seed which cannot be identified even to genus level. This is unfortunate, but some seeds do survive and we must rely on these to give a picture of the Vatnsfjörður environment. So far the seeds identified include *Stellaria*, *Poa* and *Festuca* species, which are suggestive of a traditional homefield hay meadow environment. Interestingly, although no seaweed fragments were found in the hearth and only a few were present in the floor sample, there was a large quantity of seaweed recovered from the midden sample. This would suggest that seaweed is being burnt elsewhere on site and the Structure 1 midden is being used to dispose of the waste.

The Smithy

In Structure 3, large quantities of seaweed were found on the floor and in the midden, but surprisingly much smaller quantities were recovered from the hearth. Like in the Structure 1 midden, this suggests that seaweed is being burnt elsewhere on site. The large quantities of seaweed on the smithy floor could be explained by the fact that the smithy is believed to have burnt down – if seaweed was being stored here from some purpose this would present in the archaeological record as large quantities of burnt seaweed on the floor. Again, as in the *skáli* samples, the majority of the seeds recovered were unidentifiable. No crowberry seeds have yet been found in these samples, which reinforces the distinction between domestic and industrial contexts. The weed flora recovered from the smithy was similar to that of the Structure 1 assemblage, with the addition of *Carex* and *Ranunculus* species. These wetland flora could suggest the use of peat as fuel in the smithy, but this will not be clear as a significant factor until all the samples have been analysed.

Preliminary Wood Analysis

During the course of this research, wood samples from each of the contexts discussed will be analysed, with a view to identifying the species of wood. This will allow a distinction between local wood, which is mainly *Betula*, and driftwood, which is generally from coniferous species such as *Pinus* or *Picea/Larix* (Eysteinnsson & Blöndal 2003, Eggertsson 1993). So far the analysis of three charcoal fragments each from the two hearths and the Structure 1 ember pit have all yielded the same result. The fragments were all identified as *Betula pubescens*, which is the most common native wood in Iceland (Kristinsson 1986). This suggests that during the Viking Age the area around Vatnsfjörður was far more wooded than it is today, as the woodland present in the surrounding area in modern times could not have supported such extensive use.

CONCLUSION

The picture of fuel use and environment at Vatnsfjörður will become much clearer as this research progresses. With the lack of seaweed found in either hearth so far, perhaps it has another use, as a flux in metalworking, as a lye, for making salt to preserve food, as animal fodder, or as manure (Dickson 1999, Crawford 1999, Chapman & Chapman 1980). Analysis of wood charcoal from the smithy floor may

reveal the use of non-native wood in the construction of the building: driftwood is less common in Ísafjarðardjúp than on the Strandir coast to the east, and perhaps these large timbers had too high a value as building material to be used as fuel. In addition to these specific questions, when complete this research will give a clear picture of the flora present in and around the Viking Age homefield, which will give us a faithful reconstruction of the environment inhabited by the community at Vatnsfjörður.

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ASSESSMENT OF INSECT REMAINS FROM VATNSFJÖRÐUR

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INTRODUCTION

The summer season of 2006 was the beginning of the archaeoentomological analyses at the Vatnsfjörður site. Samples taken inside Viking Age buildings, excavated during the summers of 2005 and 2006, yielded a rather poor insect fauna. This included mostly outdoor species and staphylinids, which indicated the environment surrounding the site and general conditions within the buildings. Unfortunately, due to the small number and poor diversity of the preserved insect remains, no detailed interpretation could be achieved. Since samples analyzed for the previous report had been taken following a sampling and treatment strategy more suited for an archeobotanical analysis rather than an archaeoentomological one, it was not clear whether the low number and diversity of insects retrieved was due to methodological biases or to taphonomic processes. It was then recommended to take new sediment samples for insect remains inside Viking Age deposits, following the standard methodology used in archaeoentomology. This would allow a better assessment of the potential for an archaeoentomological analysis in the Viking Age area, by verifying to what extent the poor preservation of insect remains was due to sampling strategies and recovery methods (Forbes 2007).

It was also recommended to take samples from the farm mound, which is made up of deposits dating to the post-Viking Age occupation of Vatnsfjörður, as it was believed that the geographical setting of the mound – which is further from the fjord coast than the Viking Age site – as well as the dampness and depth of its deposits, would have provided better conditions for insect preservation (Forbes 2007: 93).

Following these various recommendations, new samples were taken in 2007 from Viking Age as well as twentieth-century contexts. The goal of this archaeoentomological investigation was to assess the potential for the archaeoentomological analyses of deposits dating from the two different occupation periods of the site and, ideally, to contribute to a better understanding of the changing relationship between humans and their environment in the Westfjords peninsula. This will be done by reconstructing Vatnsfjörður intra-site environments (sanitary and hygienic conditions inside buildings, activity areas) and the surrounding landscape. During 2007, insects were also collected from the surrounding environments using a series of traps. This modern collection provides baseline environmental information as well as aids in the identification of insects preserved from archaeological contexts.

METHODOLOGY

The following section is divided into two parts. The first concerns the collection of insect subfossils from archaeological and natural sediments. The second part relates to

the collection of modern insects that was undertaken during the 2007 summer season at Vatnsfjörður.

COLLECTION OF ARCHAEOENTOMOLOGICAL DATA

Data collection for the archaeoentomological analyses began by the collection of samples from sediment deposits. During the summer of 2007, a total of 23 samples were taken from contexts excavated at Vatnsfjörður, along with three samples taken off-site, to provide a comparison between entomological faunas from archaeological deposits and those from the surrounding natural environment.

Most archaeoentomological samples were taken from contexts deemed interesting from an archaeoentomological perspective (for example floor levels, midden deposits, hearth fill), and/or from deposits where insects remains were more likely to be preserved, i.e. in damp sediments providing anaerobic conditions. Thus, the sampling strategy was subjective, but as Perry *et al.* underlined, “there is little merit in wasting time and money on the examination of contexts where the actual or assumed information content is low” (Perry *et al.* 1985: 336). The sampling campaign focussed on contexts likely to yield interesting results. It is noteworthy that an attempt was also made to take samples from varied contexts, such as turf walls, wall and roof collapse, posthole fills, ash dumps and levelling layers, even if those types of contexts are not recognized as being particularly interesting for an archaeoentomological analysis. The goal of this was simply to test the potential of such contexts.

Samples taken off-site were from three different environments surrounding the excavation areas. These are the damp meadow in the lower homefield, east of the Viking Age area (T-5), the hay meadow in the lower homefield north-east of the Viking Age area (T-8), and the bog located in the upper homefield, next to the stone and turf boundary wall (T-9). These samples were all taken near modern insect traps, which were mapped using a total station (see next section and Figure 1).

Table 1 shows a list of all 26 samples with, highlighted in yellow, the 16 samples analyzed and which are the object of this preliminary analysis. Samples from floor levels (S-30, S-56, S-504, S-510, S-516), middens/dumps (S-49, S-116, S-519) and hearth fill (S-10) were treated first. Afterwards, it was decided to analyse at least one sample from each type of remaining context, to see which types of deposits were worth analysing, which would also help in planning future sampling strategies for archaeoentomology at Vatnsfjörður.

Table 1. VSF07 sediment samples for archaeoentomology.

VIKING AGE SITE			
Site	Area	Context	Sample #
VSF07	2	6126	10
VSF07	2	6129	49
VSF07	2	7022	18
VSF07	2	7044	43
VSF07	2	7045	44
VSF07	6	7025	56
VSF07	6	7027	30
VSF07	6	7140	95
VSF07	6	7141	97
VSF07	14	7120	105
VSF07	14	7151	116

FARM MOUND			
Site	Area	Context	Sample #
VSF07	7	7504	502
VSF07	7	7512	504
VSF07	7	7515	505
VSF07	7	7525	510
VSF07	7	7526	511
VSF07	7	7527	512
VSF07	7	7528	513
VSF07	7	7531	516
VSF07	7	7536	519
VSF07	7	7542	521
VSF07	7	7542	520

TEST TRENCH			
Site	Area	Context	Sample #
VSF07	18	7401	72

OFF-SITE			
Site	Area	Context	Sample #
VSF07	off-site	area of trap 5	T-5
VSF07	off-site	area of trap 8	T-8
VSF07	off-site	area of trap 9	T-9

Sediments samples were taken during the excavation using a clean trowel, with special care not to scrape the sediment, rather it was taken in small chunks, and placed in plastic bags. The volume of most samples was of around five litres (most samples of a smaller volume were from contexts which total volume was smaller than 5 l), which is recognized as being large enough to retrieve suitable numbers of insect parts for valuable interpretations (Buckland *et al.* 1992: 154; Kenward 1978: 12; Perry *et al.* 1985: 337).

The processing of sediment samples was done partly in the Laboratory of the Institute of Earth Sciences at the University of Iceland, Reykjavík, and also in the Environmental Archaeology Laboratory of Université Laval, Québec. The procedure used is the standard technique used by both archaeoentomologists and palaeoentomologists. It consists of disaggregating the sediments by hands over a 250µm sieve, and then separating the insect fraction from the rest of the organic matter remaining on the sieve, using a technique called “paraffin flotation”. By adding water to the mix of the organic fraction with an equal volume of paraffin (kerosene), insects remains are separated from the plant matter, as paraffin is lighter than water and will adhere to insect remains. It will therefore float to the surface and carry with it insect parts (Buckland P. I. 2000: 18; Elias 1994: 32). The light fraction, containing the entomological remains, was then placed in jars with ethanol, and kept in a refrigerator.

Observation on the light fractions was done under a binocular microscope. All identifiable Coleoptera, Siphonaptera (fleas), Phtiraptera (lice) and Hemiptera (true bugs) subfossils, as well as Diptera (fly) puparia (the final larval stage of flies, in which the metamorphosis into an adult occurs), were separated with forceps and put in separate vials with ethanol. A sample of mites was also kept.

The anatomical parts that are used for the identification of Coleoptera specimens are heads, pronota and elytra. These parts were glued on micro-palaeontology cards, to facilitate observations during the identification stage. The other fragments were kept

in ethanol. Identifications were undertaken using taxonomic keys and entomological publications, and also by anatomical comparisons with modern specimens. Modern insects used for identifications were those collected at Vatnsfjörður by the author, as well as specimens from the entomological collection located at the René-Martineau Insectarium of the Canadian Forest Service of Natural Resources Canada in Quebec City, Canada. The taxonomic order of beetles used in this analysis follows Ólafsson's *Íslenskt skordýratal (A Checklist of Icelandic Insects)* (1991).

COLLECTION OF MODERN INSECTS

It was also decided to undertake a collection of modern insects from Vatnsfjörður during the 2007 excavation, and to build a reference collection which will be housed at the Environmental Archaeology Laboratory of Université Laval, Québec. This collection will be useful not only in helping with the identification of archaeological specimens, but also to provide a picture of the insect fauna living at Vatnsfjörður at the present-day. This fauna may then be compared with archaeoentomological assemblages, in order to assess changes in the insect biodiversity at this location through time.

In order to trap insects from the varied environments around Vatnsfjörður, nine traps were installed at different locations. The precise location of each trap was recorded using a total station, illustrated in Figure 1.



Figure 1. Aerial photograph of Vatnsfjörður showing the locations of insect traps.

Two types of traps were used. Pitfall traps consisted of simple plastic containers placed in a hole dug in the ground, with the rim of the container level with the surface of the ground. Each container was filled with about two inches of sea water from the fjord (to allow preservation of dead insects), plus a little bit of vinegar (to keep the insects bodies soft) and a drop of dishwashing liquid (to break the water's surface tension). This type of trap allows the capture of insects that are crawling on the ground, as they simply fall into it and remain trapped in the salted water solution. Flight interception traps consisted of a net tightened vertically between two wooden posts, with a large container put in the ground under it and filled with the same salt water solution as that used for the pitfall traps. Interception traps are useful for catching flying insects, which fall into the container after they hit the net. Table 2 describes the nine traps and the environments surrounding them.

Table 2. *Description of the insect traps from Vatnsfjörður, July 2007.*

	Type	Environment
1	Pitfall trap	Damp grassland on the farm mound
2	Pitfall trap	Bumpy grassland area on the eastern slope of the farm mound
3	Pitfall trap	Hay meadow in the homefield between the farm mound and the Viking Age area
4	Pitfall trap	Holy grass (<i>Hierochloe orodata</i>) area in the homefield
5	Pitfall trap	Damp "buttercup meadow" in the lower part of the homefield
6	Pitfall trap	Shore
7	Interception trap	Shore
8	Interception trap	Hay meadow in the lower homefield
9	Pitfall trap	Bog in the upper homefield next to the old turf wall boundary

The insect traps were emptied every two days, and collected insects were stored in plastic jars of ethanol.

The mounting of this reference collection was done at the René-Martineau Insectarium of the Canadian Forest Service of Natural Resources Canada. At present, only specimens from the Order Coleoptera are mounted and identified, as these are the most useful in archaeoentomology. Beetles that could not be identified using the collection available at the Insectarium were taken to Reykjavík, where have been identified by comparison with Icelandic specimens from the insect collection of the Icelandic Institute of Natural History.

RESULTS

DESCRIPTION OF ARCHAEOENTOMOLOGICAL REMAINS

After the identification of archaeoentomological remains, the minimum number of individuals (MNI) for each taxon was calculated. For beetles, this was done using the number of heads, pronota and elytra. A total of 2310 individual insects were identified, from which 2140 are beetles. The beetle fauna spans nine different families. The following section describes insects that were retrieved from

archaeoentomological samples, with an emphasis on coleopteran remains, as they were the more numerous and also because most insects from other orders could not be identified to an appreciable taxonomic level.

Archaeoentomological remains dating from the Viking Age (9–11th century)

Analysed archaeoentomological samples taken from Viking Age deposits include sediments taken from the fill of a hearth (S-10), sheet middens (S-49 & S-116), floor levels (S-56 & S-30), turf walls (S-97 & S-18), turf collapse (S-105) and the fill of a posthole (S-43). The matrix of most analysed sediments samples was composed of silt with some sand and gravel. All of them also included roots. One sample, S-43, was found to be sterile, and is therefore not presented in Table 3. In most samples, the presence of unidentifiable coleopteran parts such as legs, abdomen parts and small unidentifiable broken fragments was noted.

Table 3. Identified insects from the Viking Age area at Vatnsfjörður.

	S-10	S-18	S-30	S-49	S-56	S-97	S-105	S-116	Total
COLEOPTERA									
Carabidae									
<i>Patrobis</i> sp.		3		3	4	7		1	18
<i>Calathus melanocephalus</i> (Linnaeus)						1			1
Carabidae indet.	1	2	1	9	2	3		2	20
Staphylinidae									
Staphylininae indet.		1							1
<i>Lesteva longoelytrata</i> (Goeze)			1						1
Aleocharinae indet.	2		1		2		1		6
Cryptophagidae									
<i>Cryptophagus</i> sp.							1		1
Curculionidae									
<i>Otiorhynchus nodosus</i> (O. F. Müller)		15	1	3		2		2	23
<i>Otiorhynchus</i> cf. <i>nodosus</i> (O. F. Müller)	1	8	2	5			1		17
<i>Otiorhynchus</i> sp.		2		1	1	1		1	6
Coleoptera indet.					1				1
Total	4	31	6	21	10	14	3	6	95

Identified insects recovered from Viking Age deposits were exclusively beetles. Four families are represented: ground beetles (Carabidae), rove beetles (Staphylinidae), silken fungus beetles (Cryptophagidae) and weevils, or snout beetles (Curculionidae).

Most ground beetles are polyphagous nocturnal predators or scavengers (Arnett Jr. and Thomas 2001: 35-36). When found in samples from archaeological sites, they can be very good indicators of surrounding environments. Specimens from the genus *Patrobis* were found in five of the nine analyzed samples, totalling eighteen individuals. The two species from this genus that are found in Iceland, *P. septentrionis* and *P. atrorufus*, are primarily taken from meadows, often in cultivated fields (Larsson and Gígja 1959: 29-30). Almost the same can be said about *Calathus melanocephalus*, which has been found in one sample, and which is also mostly

associated with grassy environments and is common on arable land in Iceland (Larsson and Gíjja 1959: 32, Lindroth 1963: 171).

The rove beetles are generally associated with decaying organic matter (Arnett Jr. and Thomas 2001: 276). The only staphylinid that could be identified to the taxonomic level of species is the Omaliinae *Lesteva longoelytrata*, which in Iceland is very common in grassy fields and is sometimes found in barns and stables (Larsson and Gíjja 1959: 71).

A single fragment of an individual silken fungus beetle from the genus *Cryptophagus* was recovered from sample S-105. This genus comprises fungus-feeders associated with mouldy materials (Buckland and Buckland 2006, Woodroffe and Coombs 1961: 179).

Weevils are the most numerous beetles in the Viking Age entomological assemblages. The 46 individual snout beetles recovered from analyzed deposits are all from the genus *Otiorhynchus*. *Otiorhynchus* species are flightless and feed on the green parts of plants (Arnett Jr. *et al.* 2002: 766 & 778). The species *O. nodosus* is very common in Iceland (Larsson and Gíjja 1959: 191), where it has been observed feeding on the leaves of sorrel (*Rumex acetosa* L.), dryad (*Dryas octopetala* L.) and clover (*Trifolium repens* L.) (Warner and Negley 1976: 251).

Archaeoentomological remains dating from the Modern Period (19-20th century)

Four of the five samples analyzed were composed of a very damp sediment made of a mix of silt and varied organic matter, including plant matter (wood, birch twigs, seeds, turf, bark and leaf remains) as well as diverse animal materials (fish scales, bones fragments, egg shells, down, feathers, hair and skin remains). These samples, taken from occupation deposits, were found to be the richest in insect remains, with assemblages showing a great diversity of species. The conditions for preservation seem to have been poorer in the deposit where S-519 was taken, which was interpreted as an ash dump. This soil matrix was composed of sandy/silty ash with stones, charcoal, concrete and bone inclusions, as well as unburned fish and mammal bones, egg shell fragments and a little bit of slag.

The entomological fauna identified from contexts dating to the Modern Period spans four orders of insects, including ectoparasites (orders Phthiraptera and Siphonaptera), beetles (Coleoptera) and true bugs (Hemiptera) (see Table 4). An appreciable amount of dipterous remains, mainly puparia, were also collected, but these were not counted nor identified, so they will not be properly discussed in this report.

Table 4. Identified insects from the Farm Mound Area.

	S-504	S-505	S-510	S-516	S-519	Total
PHTIRAPTERA						
Pediculidae						
<i>Pediculus humanus</i> Linnaeus				1		1
HEMIPTERA						
Hemiptera indet.	1	1				2
COLEOPTERA						
Carabidae						
<i>Nebria rufescens</i> (Ström)		4	4			8
<i>Notiophilus aquaticus</i> (Linnaeus)		1				1
<i>Notiophilus</i> sp.					1	1
<i>Patrobus septentrionis</i> (Dejean)		10	2		2	14
<i>Calathus melanocephalus</i> (Linnaeus)	1	20	15	2		38
<i>Amara quenseli</i>	2		1			3
Carabidae indet.		2	1		3	6
Dysticidae						
<i>Hydroporus nigrita</i> (Fabricius)	1	2	4			7
Dysticidae indet.				1		1
Hydrophilidae						
<i>Cercyon</i> sp.			2			2
Staphylinidae						
<i>Philonthus</i> spp.	2	7	8		1	18
<i>Creophilus maxillosus</i> (Marsham)		1				1
<i>Quedius mesomelinus</i> (Marsham)		8				8
<i>Quedius</i> cf. <i>mesomelinus</i> (Marsham)		19	1			20
<i>Quedius</i> spp.	1	12	1	9		23
Staphylininae indet.	3	6	8	1	1	19
<i>Omalius excavatum</i> Stephens	5	21	12		2	40
<i>Omalius</i> cf. <i>excavatum</i> Stephens	3				1	4
<i>Omalius riparium</i> Thomson		1				1
<i>Omalius</i> spp.		37	18	2		57
<i>Xylodromus</i> spp.	1	191	62	14	2	270
<i>Acidota crenata</i> (Fabricius)		2		1	3	6
<i>Lesteva longolytrata</i> (Goeze)		2	1			3
Omaliinae indet.		1	1			2
Athetini indet.		46				46
Aleocharinae indet.	30	161	99	29	4	323
<i>Stenus</i> spp.	7	7	6	9	1	30
Scarabaeidae						
<i>Aphodius lapponum</i> Gyllenhal		2			2	4
Anobiidae						
<i>Tipnus unicolor</i> (Piller & Mitterpacher)	2	186	127	3	1	319
<i>Tipnus</i> sp.		1				1
<i>Ptinus tectus</i> (Boildieu)			1			1
Cryptophagidae						
<i>Cryptophagus distinguendus</i> Sturm		17	2	1		20
<i>Cryptophagus pilosus</i> Gyllenhal		20	5			25
<i>Cryptophagus scanicus</i> (Linnaeus)		8	6			14
<i>Cryptophagus</i> sp.	1	55	26			82
<i>Atomaria</i> spp.	1	11	5	8	1	26
Lathridiidae						
<i>Lathridius</i> sp.	12	130	109	37		288
<i>Corticaria elongata</i> (Gyllenhal)	12	22	34	47		115
Curculionidae						
<i>Otiorhynchus arcticus</i> (O. Fabricius)	1	3	2		1	7
<i>Otiorhynchus nodosus</i> (O. F. Müller)	2	1	1		2	6
<i>Otiorhynchus</i> cf. <i>nodosus</i> (O. F. Müller)					3	3
<i>Otiorhynchus</i> sp.			1		1	2
<i>Tropiphorus obtusus</i> (Bonsdorff)			1			1
<i>Sitophilus oryzae</i> (Linnaeus)			1			1

	S-504	S-505	S-510	S-516	S-519	Total
SIPHONAPTERA						
Siphonaptera indet.	5	32	117	13		167
Total	93	1050	684	178	32	2037

Ectoparasites

Ectoparasites are parasites that live not in, but on the bodies of their hosts. Specimens from two insect orders corresponding to ectoparasites were recovered from Vatnsfjörður's samples: Phthiraptera (lice) and Siphonaptera (fleas).

Only a single individual of human lice, *Pediculus humanus*, was found inside S-516, which was taken from one of the occupation deposits. This ectoparasite feeds on human blood, and lives in human hair or clothes. They can be used as an indicator of past hygienic and health conditions, as *Pediculus humanus* may also be a vector of infectious diseases, such as typhus (Borror and White 1991: 108-109).

Fleas were more numerous than lice. The minimum number of individuals for each sample was calculated using the number of heads versus abdomens, and a total MNI of 167 individuals was obtained. All fleas were taken from floor levels, and they are clearly more frequent in the two samples corresponding to occupation deposits inside the cellar [7503]. All flea species feed on mammal or bird blood (Borror and White 1991: 308). These have not yet been identified to species. Nevertheless, it is possible to affirm that at least two different species are present in the assemblages, and hopefully these will be properly identified during further stages of the Vatnsfjörður archaeoentomological analysis.

Beetles

The ground beetles *Notiophilus aquaticus*, *Calathus melanocephalus* and *Amara quenseli* were present in archaeoentomological assemblages dating from the 20th century. In Iceland, these carabids live in relatively dry biotopes, preferring open environments with sparse vegetation (Larsson and Gíjja 1959: 14 to 18 and 32-42). *Patrobis septentrionis* is found in moist environments such as wet meadows, and is very common in homefields (Larsson and Gíjja 1959: 29). Eight specimens of *Nebria rufescens* were identified from occupation deposits in the cellar [7503]. This species, which in North America is mostly confined to margins of water courses (Arnett Jr. and Thomas 2001: 65; Lindroth 1963: 70), is known to live in almost all biotopes in Iceland, except in very moist or sterile environments (Larsson and Gíjja 1959: 14-15).

Eight specimens of the family Dysticidae or predaceous diving beetles were found in samples from floor levels. Beetles from this family are all associated with water. They are fliers that can migrate from habitat to habitat, and are predators or scavengers feeding on small aquatic animals (Arnett Jr. and Thomas 2001: 156). Seven *Hydroporus nigrita* were identified. This species is common in mountainous regions in Iceland (Larsson and Gíjja 1959: 49).

Two individuals from the genus *Cercyon* were found in S-510, which was taken from

the floor level in the cellar [7503]. These hydrophilids live in diverse habitats in Iceland, varying from marine littorals to synanthropic settings, where they can be found in animal manure or compost (Larsson and Gígja 1959: 124-126).

Rove beetles were found in every of the Modern Period contexts analyzed. *Philonthus* and *Quedius* specimens were recorded from all five contexts. Species from these two genera generally live in wet habitats, where they are found in varying decaying organic materials (Arnett Jr. and Thomas 2001: 393-397). Twenty-eight *Quedius mesomelinus* were identified. In Iceland this species is often found in hay waste, dung or compost, in or near human abodes (Larsson and Gígja 1959: 90-91). A single individual of *Creophilus maxillosus* was found inside the cellar [7503]. This predacious species feeds on maggots (Arnett Jr. and Thomas 2001: 393), and is found primarily in mammal dung in Iceland, but also on carrion (Larsson and Gígja 1959: 89). *Omalium* species are found in decaying matter and feed on freshly killed insects (Arnett Jr. and Thomas 2001: 337). *O. excavatum* specimens have been found in four of the five samples analysed from the farm mound. This species is the most common *Omalium* species in Iceland, where it is exclusively synanthropic, and chiefly found on compost (Larsson and Gígja 1959: 64). *O. riparium*, which was present in the cellar [7503], lives on seashores, where it is found under washed-up seaweed or on carrion (Larsson and Gígja 1959: 59). *Xylodromus* specimens were quite numerous in deposits from the farm mound, with a MNI of 270, and were only absent in the ash dump where sample S-519 was taken. The two species of this genus occurring in Iceland are synanthropic and chiefly found in old hay. They can live indoors, in stables and outhouses, or outdoors in fields (Larsson and Gígja 1959: 66), like *Acidota crenata*, which is also commonly found in Icelandic grasslands (Larsson and Gígja 1959: 70).

The Omaliinae species *Lesteva longolytrata*, which was present in samples from cellar [7503], lives in similar biotopes, but also occurs on moister grounds, and sometimes enters barns and stables (Larsson and Gígja 1959: 71). In addition, 323 individuals from the rove beetle subfamily Aleocharinae have been counted. This subfamily is the largest and the most taxonomically difficult of all Staphylinidae (Arnett Jr. and Thomas 2001: 358), and therefore it was not possible to identify these specimens to a lower taxonomic level. These very small beetles are found in various habitats, mainly on decaying plant or animal matter (White 1983: 116). Some *Stenus* specimens, which are associated with vegetation in general and occur in diverse habitats (Arnett Jr. and Thomas 2001: 381), were also recovered from every one of the 5 contexts. In Iceland, habitats where these species are found vary from very moist places like seashores and bogs to dryer biotopes like meadows and homefields (Larsson and Gígja 1959: 75-80).

One species from the family Scarabaeidae (scarab beetles) was identified. The dung beetle *Aphodius lapponum* was found in two cellar samples [7503] and the ash dump [7536]. In Iceland, this species is synanthropic and breeds in the excrement of mammal dung, with a preference for sheep dung (Larsson and Gígja 1959: 128).

The beetle family Anobiidae is represented in the farm mound assemblages by two species of spider beetles (subfamily Ptininae): *Tipnus unicolor* and *Ptinus tectus*. Many spider beetles species are pests of stored products, and their presence can indicate poor sanitary conditions in storage places (Bousquet 1990: 156; Campbell *et*

al. 1989: 326). Most ptinids feed on accumulated dried plant or animal material, as do their larva (Arnett Jr. *et al.* 2002: 247). In Canada, *Tipnus unicolor* (syn. *Epauloecus unicolor*) is recognized to feed on stored grain and moist animal skins (Campbell *et al.* 1989: 326). In Europe, the species has been found in various locations, including decaying timber, bird and mammal nests, stored cereals and hay (Buckland and Buckland 2006). In Iceland, it is a synanthrope, found in outhouses and similar locations, and Larsson and Gígja compare its biology as being similar to that of *Niptus hololeucus*, which feeds on different animal and vegetal materials, including flour, bread, oats, dead insects, and excrement (Larsson and Gígja 1959: 167). The species *Ptinus tectus* has been found inside warehouses in Europe, feeding on both vegetable and animal matter, and also, but more rarely, in bird nests and bats' roosts. It has also been found on stockfish, malt, stored spices and cereals, skin clothing and corn (Buckland and Buckland 2006). In Canada, this species has been recorded infesting dried vegetables and animal products, and it seems more likely to live in poultry and fish meal than in flour and cereals (Campbell *et al.* 1989: 335).

The silken fungus beetles (family Cryptophagidae) are fungus-feeders occurring in a wide range of habitats promoting fungal growths (Arnett Jr. *et al.* 2002: 339; Campbell *et al.* 1989: 147). Three species of *Cryptophagus* were identified from samples taken in the floor level of the cellar [7503]. *C. distinguendus*, *C. pilosus* and *C. scanicus* are all synanthropes living in mouldy hay. The latter, *C. scanicus*, can live in cooler environments than *C. pilosus* and *C. distinguendus*, which both live primarily in stables and sheep houses, so it is more likely to be found outdoors, in Icelandic fields (Larsson and Gígja 1959: 134-136). Specimens from the genus *Atomaria* were also recovered, and these are more evenly distributed amongst the 5 samples from the farm mound. Like *Cryptophagus*, *Atomaria* species found in Iceland are synanthropes living indoors, often in old hay (Larsson and Gígja 1959: 138-142).

The ecology of the Lathridiidae species is similar to that of the Cryptophagids. These beetles, commonly called the minute brown scavenger beetles, feed on fungi and are often found in stored products, thus being indicators of damp and mouldy conditions (Arnett Jr. *et al.* 2002: 395; Bousquet 1990: 129). The *Lathridius* species recovered from the archaeoentomological samples could not confidently be identified to species level, but they are likely *L. minutus*, which is the commonest *Lathridius* not only in North America but also in Iceland (Bousquet 1990: 137; Larsson and Gígja 1959: 144). *L. minutus* is exclusively synanthropic in this country, but it can fly quite far from inhabited places (Larsson and Gígja 1959: 144). In Canada, specimens have been recorded in the following stored products: moldy radishes, moldy coffee, hay, flour, wheat, oatmeal, cocoa, soybeans, liquorice and flax (Campbell *et al.* 1989: 289). The other lathridiids which were identified to species level are *Corticaria elongata* which has ecological requirements very similar to those of *Lathridius minutus* (Larsson and Gígja 1959: 146). Specimens of both *Lathridius* and *Corticaria* genera were distributed throughout all 5 analysed samples, except S-519 (the ash dump).

Twenty individual weevils were found inside four samples dating to the twentieth century. *Otiorhynchus* and *Tropiphorus* species live outdoors, and therefore are good indicators of the site's surrounding environment. Adults of species *Otiorhynchus arcticus*, *O. nodosus* and *Tropiphorus obtusus* feed on the green parts of plants. *O. arcticus* and *O. nodosus* are found in relatively dry localities in Iceland, including grasslands and heaths (Larsson and Gígja 1959: 190-191). *Tropiphorus obtusus* lives

in similar environments, but is more likely to be found in moister biotopes like meadows, and is often taken in cultivated areas (Larsson and Gígja 1959: 199).

The weevil *Sitophilus oryzae* (rice weevil) has a much different biology than preceding species, being an exclusive synanthrope and a very destructive pest of stored food products (Bousquet 1990: 100-101; Campbell *et al.* 1989: 227). In Canada, it is known to feed on rice, wheat, corn, rye, oats, barley, sorghum, kaffir seed, buckwheat and other grains and grain products (Campbell *et al.* 1989: 227). It requires higher temperatures and more moisture than other members of this genus, so in temperate climates, it can only survive in sheltered situations (Campbell *et al.* 1989: 227). In Iceland, it is chiefly found in grain stores, where it breeds. Adults in Iceland were observed feeding not only on grain, but also on beans, flour, yeast, bread, and apples (Larsson and Gígja 1959: 227). The species is macropterous and thus able to fly (Campbell *et al.* 1959: 227). A single *Sitophilus oryzae* individual was recovered in the entire archaeoentomological assemblage, found in S-510, a sample that was taken in the deposit interpreted as the floor level of the cellar [7503].

True bugs

Two specimens were identified from the order Hemiptera, commonly called true bugs. These insects have varying behaviours and ecological requirements – most live on the ground, but some live in water, while some are plant feeders and others are carnivorous (Borror and White 1991: 112). Specimens from Vatnsfjörður have not been identified to a lower taxonomic level so little can be said at the moment about the natural history and habits of these insects.

Archaeoentomological remains from Area 18

Area 18 corresponds to the extended trench that was dug by Ian A. Simpson in the damp meadow located in the lower part of Vatnsfjörður's homefield. Context [7401], which was composed of compacted peat with charcoal inclusions, was sampled for insect analysis. The matrix of the samples was made of various plant materials, including roots, bark, waterlogged seeds, megaspores and decaying plant matter. This deposit was roughly dated as a post-colonization event, and it is noteworthy that small peat samples were taken every 2 cm for dating, in order to better understand and date the formation of this organic accumulation.

This sample contained Arachnida (spiders and mites), Chironimids and Coleoptera parts, as well as a few fly puparia. All Coleoptera parts and fly puparia were kept, but only Coleoptera parts were identified. A lot of the beetle parts recovered from this sample were pale, indicating the presence of immature specimens in the deposits, suggesting that these species were probably breeding there. The peat provided very good preservation conditions for insects, as most parts recovered were whole.

The only carabid that could be identified to species was *Patrobus septentrionis*, which is found in Icelandic wet meadows and homefields (Larsson and Gígja 1959: 29). Weevils of the genus *Otiorhynchus*, are associated with grasslands and heaths in Iceland (Larsson and Gígja 1959: 190-191).

Table 5. Identified insects from Area 18.

	S-72
COLEOPTERA	
Carabidae	
<i>Patrobis septentrionis</i> (Dejean)	1
Carabidae indet.	1
Staphylinidae	
<i>Quedius</i> spp.	26
Staphylininae indet.	1
<i>Xylodromus</i> spp.	3
Omalinae indet.	2
Aleocharinae indet.	50
<i>Stenus</i> spp.	2
Anobiidae	
<i>Tipnus unicolor</i> (Piller & Mitterpacher)	1
Cryptophagidae	
<i>Cryptophagus</i> sp.	1
<i>Atomaria</i> spp.	5
Lathridiidae	
<i>Lathridius</i> sp.	17
<i>Corticaria elongata</i> (Gyllenhal)	20
Curculionidae	
<i>Otiorhynchus</i> sp.	2
Total	132

A number of staphylinids associated with decaying organic matter were found in this sample, including *Quedius*, Omalinae and Aleocharinae specimens (Arnett Jr. and Thomas 2001, White 1983). Two specimens of the genus *Stenus* were also recovered. A number of beetles which are exclusively synanthropes in Iceland associated with stored food products and/or moldy hay were also identified (*Tipnus unicolor*, *Cryptophagus*, *Atomaria* and *Lathridius* species, as well as *Corticaria elongata*) (Buckland and Buckland 2006; Larsson and Gíjja 1959).

Archaeoentomological remains from recovered from sample T-9 (off-site sample)

Sample T-9 was taken next to the trap number 9, which was located in the bog next to the old turf boundary wall in the upper part of Vatnsfjörður's homefield. The sediment was made up of very wet dark brown silt mixed with organic matter and a lot of roots. The sample was contaminated with modern mites and Diptera heads, and the presence of a few white worms was noted. Forty-three individual beetles were found in this sample.

The carabid *Patrobis septentrionis* and the weevil *Tropiphorus obtusus* are both outdoor species characteristics of meadowy environments in Iceland (Larsson and Gíjja 1959). The predaceous diving beetle *Hydroporus nigrita* is rather associated with aquatic environments in mountainous areas (Larsson and Gíjja 1959: 49). Most coleopteran specimens from this sample belong to the rove beetle family. Aleocharinae, *Quedius* and *Omalium* species are generally associated with decaying organic matter (Buckland and Buckland 2006, White 1983: 116), while the species *Lesteva longolytrata* and the genus *Stenus* are associated with vegetation and occur in a wide variety of habitats in Iceland (Larsson and Gíjja 1959: 71-79).

Table 6. Identified insects from the off-site sample T-9.

	Trap 9
COLEOPTERA	
Carabidae	
<i>Patrobus septentrionis</i> (Dejean)	1
Dysticidae	
<i>Hydroporus nigrita</i> (Fabricius)	2
Staphylinidae	
<i>Quedius</i> spp.	3
<i>Omalius excavatum</i> Stephens	4
<i>Omalius</i> spp.	2
<i>Lesteva longoelytrata</i> (Goeze)	3
Aleocharinae indet.	25
<i>Stenus</i> spp.	2
Curculionidae	
<i>Tropiphorus obtusus</i> (Bonsdorff)	1
Total	43

DESCRIPTION OF MODERN INSECTS

The mounting and the identification of all modern Coleoptera specimens collected around Vatnsfjörður's excavation areas during summer 2007 is completed. However, as the ecology and environmental distribution of each species has not yet been analysed, only a list of the species, with the number of specimens for each one, is shown here (Table 7). The environmental data related to modern Coleoptera will be properly analyzed and integrated in the archaeoentomological analysis during future stages of the research project.

Table 7. Modern Coleoptera collected at Vatnsfjörður, July 2007.

COLEOPTERA	
Carabidae	
<i>Nebria rufescens</i> (Ström)	4
<i>Patrobus septentrionis</i> (Dejean)	65
<i>Calathus melanocephalus</i> (Linnaeus)	53
<i>Amara quenseli</i> (Schönherr)	1
Dysticidae	
<i>Agabus bipustulatus</i> (Linnaeus)	1
Hydrophilidae	
<i>Cercyon littoralis</i> (Gyllenhal)	204
Staphylinidae	
<i>Quedius (Raphirus) fulvicollis</i> (Stephens)	30
<i>Quedius mesomelinus</i> (Marsham)	1
<i>Omalius excavatum</i> Stephens	9
<i>Omalius laeviusculum</i> Gyllenhal	38
<i>Omalius riparium</i> Thomson	7
<i>Lesteva longoelytrata</i> (Goeze)	3
<i>Mocyta fungi</i> (Gravenhorst)	391
<i>Atheta (Dimetrota) atramentaria</i> (Gyllenhal)	6
<i>Atheta (s. str.) graminicola</i> (Gravenhorst)	13
<i>Atheta (Bessobia) excellens</i> (Kraatz)	18
<i>Atheta (Thinobaena) vestita</i> (Gravenhorst)	14
<i>Boreophilus islandica</i> (Kraatz)	5

Scarabaeidae	
<i>Aphodius lapponum</i> Gyllenhal	2
Curculionidae	
<i>Otiorhynchus nodosus</i> (O. F. Müller)	5
<i>Tropiphorus obtusus</i> (Bonsdorff)	16
Total	886

DISCUSSION

This section will discuss the interpretation of the archaeoentomological data collected from Vatnsfjörður during the summer of 2007.

DISCUSSION OF THE INSECT FAUNAS FROM VIKING AGE DEPOSITS

Most beetles recovered from Viking Age deposits are non-synanthropic outdoor species that can be used for the reconstruction of Vatnsfjörður's immediate landscape at the time of settlement. Specimens of *Patrobus* and *Otiorhynchus nodosus* clearly dominate the archaeoentomological faunas, which indicate the presence of environments varying from wet meadows to rather dry grasslands in the vicinity of human abodes. Single specimens of both *Calathus melanocephalus* and *Lesteva longolytrata* also suggest the presence of grassy biotopes around the site.

As was suggested in 2007 preliminary analysis (Forbes 2007), it is very likely that the presence of outdoor species inside excavated buildings is due to the intentional transport of outdoor material such as hay and peat, for use as litter. Thus, such material would have been used at least in Structure 4, where such faunas have been preserved in floor deposits. The occurrence of a few specimens of staphylinids from the subfamily Aleocharinae inside those floor deposits also suggests the presence of at least some decaying organic matter inside Structure 3, which has been interpreted as a smithy.

The only synanthrope that has been identified from Viking Age deposits is the single specimen of a *Cryptophagus* species, which was preserved in turf collapse inside Structure 7. Even if this species indicates the presence of mouldy material, since it feeds on its associated fungi (Woodroffe and Coombs 1961: 179), it does not aid in our interpretation of this building as it was found in sediments which have been re-deposited.

One of the objectives of the investigation of Viking Age archaeoentomological faunas was to verify to what extent the poor preservation of insect remains analyzed from Vatnsfjörður 2005 and 2006 samples was due to the sampling strategy and the recovery methods employed. As was noted in 2005 excavation report, the substrate at the Viking Age site is rather gravely (Friðriksson *et al.* 2005: 64), and this, coupled with the proximity of the site to the shore and the shallowness of its deposits, may have prevented good preservation of insect remains.

Archaeoentomological samples taken in 2007 were collected and analyzed using the

best available methods. As the preservation state of entomological faunas recovered from these samples is similar to that of last year's remains, it seems clear now that the poor preservation is due more to the conditions in the sediments than to the methodology that was used to recover the insect remains. Most insect remains dating to the settlement period belong to robust species such as weevils and ground beetles, suggesting that smaller specimens were not preserved, resulting in biases in the archaeoentomological data. Moreover, the rhizosphere (the soil in the immediate environment of plant roots) is recognized as having a very destructive effect on insects remains (Kenward 1974: 18), and modern roots were present inside all of the analyzed Viking Age samples. The poor preservation conditions could explain why, even if analyzed samples taken from Viking Age deposits were of differing origins (hearth fill, floor levels, walls, turf collapse, sheet middens), the insect fauna they yielded show very little differences between each other. The low number and poor diversity of insect remains from deposits dating to the tenth century prevents the elaboration of detailed environmental reconstructions for this occupation period at Vatnsfjörður.

DISCUSSION OF THE INSECT FAUNA FROM 20TH CENTURY DEPOSITS

The preservation conditions were far better in the farm mound contexts than in those dating to the Viking Age, and this is probably due not only to the recent origin of these deposits, but also to their depth and moisture content. The insects faunas from the five samples analyzed allow the reconstruction of Vatnsfjörðurs' immediate and intra-site environments, as well as the identification of some specific activities.

To simplify the interpretation of archaeoentomological data, identified beetle taxa were separated into ecological groupings on the basis of their preferred habitats in Iceland, using primarily the data from Larsson and Gígja's work on Icelandic Coleoptera (Larsson and Gígja 1959) (see Table 8).

Table 8. Beetle taxa from Vatnsfjörður and their preferred habitat in Iceland.

Taxa	Habitat
Carabidae	
<i>Nebria rufescens</i> (Ström)	outdoor
<i>Notiophilus aquaticus</i> (Linnaeus)	outdoor
<i>Notiophilus</i> sp.	outdoor
<i>Patrobus septentrionis</i> (Dejean)	outdoor
<i>Calathus melanocephalus</i> (Linnaeus)	outdoor
<i>Amara quenseli</i>	outdoor
Dysticidae	
<i>Hydroporus nigrita</i> (Fabricius)	outdoor
Dysticidae indet.	outdoor
Hydrophilidae	
<i>Cercyon</i> sp.	diverse
Staphylinidae	
<i>Philonthus</i> spp.	wet habitat
<i>Creophilus maxillosus</i> (Marshall)	dung/carrions
<i>Quedius mesomelinus</i> (Marshall)	compost/manure
<i>Quedius</i> spp.	wet habitat
<i>Omalium excavatum</i> Stephens	compost/manure

Taxa	Habitat
<i>Omalius riparium</i> Thomson	outdoor
<i>Omalius</i> spp.	diverse
<i>Xylodromus</i> spp.	old hay
<i>Acidota crenata</i> (Fabricius)	outdoor
<i>Lesteva longoelytrata</i> (Goeze)	diverse
Athetini indet.	compost/manure
Aleocharinae indet.	compost/manure
<i>Stenus</i> spp.	diverse
Scarabaeidae	
<i>Aphodius lapponum</i> Gyllenhal	dung/carrions
Anobiidae	
<i>Tipnus unicolor</i> (Piller & Mitterpacher)	stored food products
<i>Tipnus</i> sp.	stored food products
<i>Ptinus tectus</i> (Boildieu)	stored food products
Cryptophagidae	
<i>Cryptophagus distinguendus</i> Sturm	old hay
<i>Cryptophagus pilosus</i> Gyllenhal	old hay
<i>Cryptophagus scanicus</i> (Linnaeus)	old hay
<i>Cryptophagus</i> sp.	old hay
<i>Atomaria</i> spp.	old hay
Lathridiidae	
<i>Lathridius</i> sp.	old hay
<i>Corticaria elongata</i> (Gyllenhal)	old hay
Curculionidae	
<i>Otiorhynchus arcticus</i> (O. Fabricius)	outdoor
<i>Otiorhynchus nodosus</i> (O. F. Müller)	outdoor
<i>Otiorhynchus</i> sp.	outdoor
<i>Tropiphorus obtusus</i> (Bonsdorff)	outdoor
<i>Sitophilus oryzae</i> (Linnaeus)	stored food products

Vatnsfjörður's surrounding environments

The ground beetles and the dysticids, as well as some of the weevils and rove beetles identified from the analyzed farm mound deposits, suggest the site's immediate landscape. The numerous specimens showing a marked preference for grassy biotopes (*Calathus melanocephalus*, *Otiorhynchus arcticus*, *O. nodosus*, *Acidota crenata* and *Lesteva longoelytrata*) indicates the presence of grasslands around Vatnsfjörður. A few specimens of species preferring much drier (*Amara quenseli* and *Notiophilus aquaticus*), and sometimes moister (*Patrobus septentrionis* and *Tropiphorus obtusus*) biotopes, were also encountered. A few species associated with aquatic environments, indicating the proximity of water courses and/or marine littoral, were also found, and these includes the small predaceous diving beetle *Hydroporus nigrita* and the rove beetle *Omalius riparium*. It seems then that during the Modern Period, Vatnsfjörður's landscape was quite similar to that of present-day, being characterised by a mosaic of different environments, including dry mountainous heathlands, grasslands and wet meadows, and the proximity of water.

Intra-site reconstructions

Floor deposit [7531] (S-516)

The occupation deposit [7531] was interpreted as being related to the use of the remains of the house that was built in 1884, after it had ceased to be used as a residential house, in 1906. The synanthropic insect fauna preserved in this deposit totals 178 individuals and suggests how this building was used after 1906.

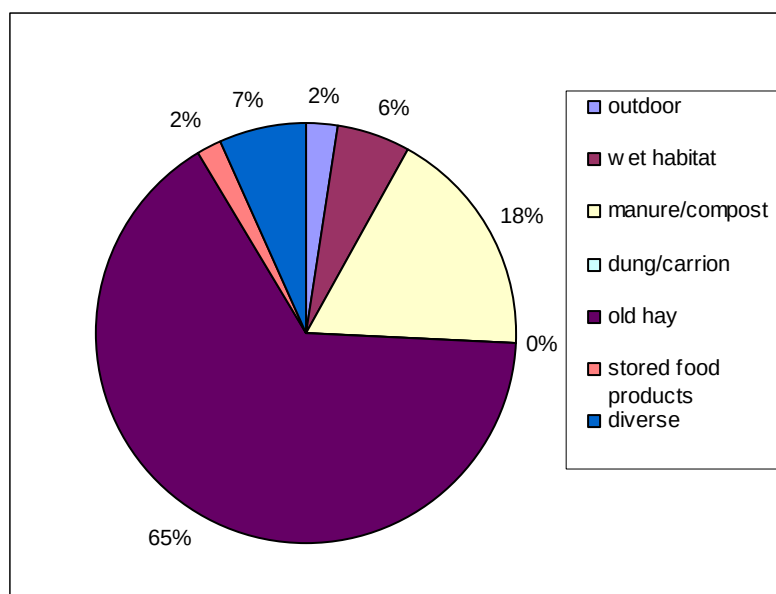


Figure 2. *Distribution of species from S-516 by preferred habitats.*

Beetles generally associated with stored hay are clearly the most numerous group in this assemblage, as shown in figure 2. These include fungus-feeders chiefly found on mouldy hay in Iceland (*Lathridius*, *Cryptophagus* and *Atomaria* species, as well as *Corticaria elongata*) and their predators (*Xylodromus* species). These beetles are very common in Icelandic farm buildings, since hay forms the basis of the survival of domestic animals and the same matter is also widely used in buildings as litter, to mask foul smells and to provide a comfortable surface to walk on (Buckland P. C. 2000: 149-150; Buckland *et al.* 1992: 163). But here, as species generally known as infesting stored hay total 65% of the whole fauna, it is reasonable to suggest that the floor level [7531] was related to hay storage activities. Moreover, the presence of species associated with compost and manure (*Quedius mesomelinus* and Aleocharinae species) can also be related to hay storage, since they probably colonized the sediment layer underneath the fodder, where fouler debris accumulated as the stored material started to decay. The high number of lathridiids (MNI of 84) suggests damp and mouldy storage conditions, and these conditions probably attracted *Quedius* specimens, whom prefer decaying organic matter in damp habitats.

In his work on beetles associated with stored hay, Smith stresses the importance of being careful when interpreting some archaeoentomological assemblage as being indicative of hay storage activities (Smith 1998). On the basis of experimental work

on beetle faunas from barns, hay stores, and middens, he demonstrates that the assemblages present in those three different contexts can be quite similar. Thus, it can be very difficult to relate assemblages from archaeological sites to one of these three environments, as beetles known to be associated with hay can occur in hay waste in middens, in hay used as litter in various rooms in farms, as well as in the fodder itself (Smith 1998: 69). Nevertheless, on the basis of the clear domination of species associated with mouldy hay in sample S-515, and the total absence of beetles associated with dung, carrion and other substances generally found within middens, it still seems very likely that the entomological fauna encountered in this deposit indicates hay storage activities.

The three specimens of *Tipnus unicolor* suggest the likely presence of stored food products, but probably in a very low quantity. Perhaps these pinids were infesting food debris lying on the floor of the building.

One specimen of human lice, *Pediculus humanus*, was identified from this deposit. Little can be said about the level of hygiene of the site inhabitants from only one specimen, but it is interesting to note that conditions necessary for the preservation of such soft-bodied arthropods occur in the farm mound. Thirteen fleas were also found in this sample. But as these have not been identified yet, it is impossible to say whether they were introduced in the deposit on human clothes, or if they were parasitizing rodents or other small animals infesting the hay stores. They could also have been living in the environments where the hay was cut.

Floor deposit [7512] (S-504)

The deposit [7512] represents a different use of the remains of the old turf dwelling house. This context was on top of the latter deposit [7531], and was interpreted as related to smithy activities, partly because of the charcoal and slag inclusions in the sediment matrix. This sample yielded an archaeoentomological fauna of 93 specimens.

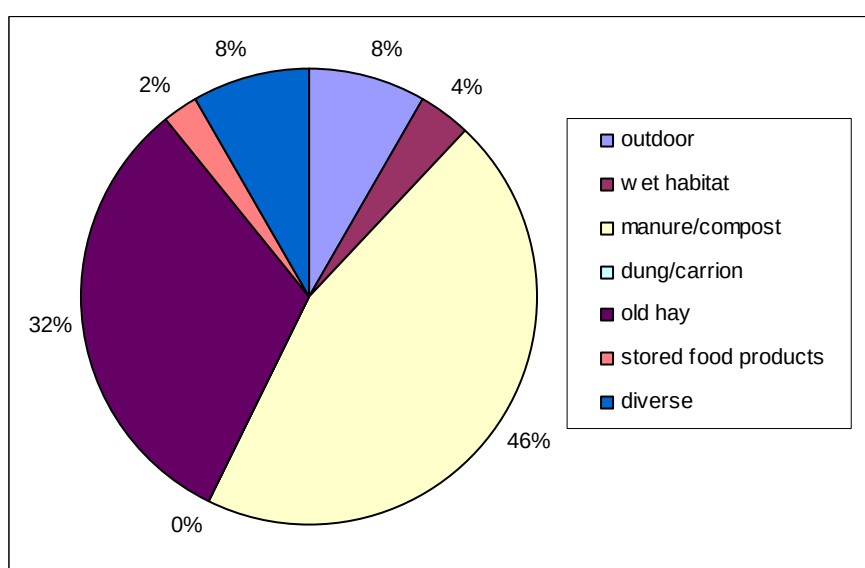


Figure 3. *Distribution of species from S-504 by preferred habitats.*

Once again, beetles associated with mouldy hay and decaying organic matter were present, as well as a small component of species associated with stored products, and a few fleas. The occurrence of these faunas shows that the different matters with which they are associated were probably present in the building, but it is difficult to evaluate in what proportion. In fact, the distribution of the archaeoentomological fauna by habitat preferences does not point to any particular environment or activity, so it is a challenge to suggest any specific use for this occupation level on the basis of the entomological evidence. Nevertheless, it is possible to suggest that this occupation deposit was related to activities not likely to attract a particular type of insect. Thus, smithy activities do not necessarily attract insects, so the archaeoentomological data does not contradict this hypothesis. Moreover, it is known that water is needed in smithies, and the single specimen of the dysticid *Hydroporus nigrita*, associated with water, may have been transported into the building along with water supplies.

The cellar [7503] (S-505 and S-510)

The two samples taken from the floor level (S-510) and from under a wooden structure located in the corner of the cellar (S-505) yielded a very substantive and diverse insect fauna. These deposits were deep, and were covered with a thick layer [7504] of rubbish, turf collapse, stones and other materials used to fill the cellar and level it after its abandonment. The occupation deposit [7525], from which sample S-510 was taken, was assumed to be a floor, but since the material that composed it was not very compact, it was later suggested that the cellar was used as a storage place, possibly with big containers placed on pallets. The sample S-505 may have been taken from under a pallet.

The matrix of the sediments of both samples was similar, composed of very wet clayish silt with an important component of organic matter, including birch twigs and pieces of wood, especially in S-505. A few charred and uncharred seeds were recovered while sorting for insect remains, as well as animal hair, fish skin and scales, feathers, egg shells and fish and mammal bone fragments. As shown in Figures 4 and 5, these two insect assemblages are quite similar in distribution, so they will be discussed together. Furthermore, they are related to the same occupation and use of the cellar [7503]. Afterwards, the small differences between the two samples will be discussed.

The main difference between assemblages from the cellar and those from the two occupation deposits described previously, is the high occurrence of beetles associated with stored food products. This fauna, which is represented by two species of spider beetles, *Tipnus unicolor* and *Ptinus tectus*, and one weevil, *Sitophilus oryzae*, totals respectively 44% and 45% of the two assemblages. As *Tipnus unicolor* and *Ptinus tectus* are exclusively synanthropic in Iceland, where they occur in outhouses and similar locations (Larsson and Gíjja 1959: 167-169), it is possible to affirm that the cellar [7503] was use for food storage purposes. As cellars usually provide wet and cool environments, the food that was stored in this location is more likely to have been animal or vegetable substances than cereals, because the latter needs to be kept in a hot and dry environment, such as those found in granaries. Moreover, the large amounts of flea remains that have been recorded from these deposits (a total of 149

individual fleas in the two samples), the presence of beetles often associated with carrion (*Creophilus maxillosus* and *Omalium riparium*), and the various animal elements contained in the sediment matrix, strongly suggests the presence of animal material in the cellar. Thus, it is very likely that the food stored in this room was dried fish or meat, given that 313 individual *Tipnus unicolor* and one specimen of *Ptinus tectus* were recovered from S-510 and S-505. *Ptinus tectus* have been observed on stored food of animal origin such as stockfish, poultry and fish meal (Buckland and Buckland 2006; Campbell *et al.* 1989:335), and according to Larsson and Gígja, in the Icelandic context, dried fish and mutton might be of special importance for this species (Larsson and Gígja 1959: 169). It is also interesting to note that fish hooks were found in the heavy residue from sample S-505, suggesting a use related to fishing activities for the cellar.

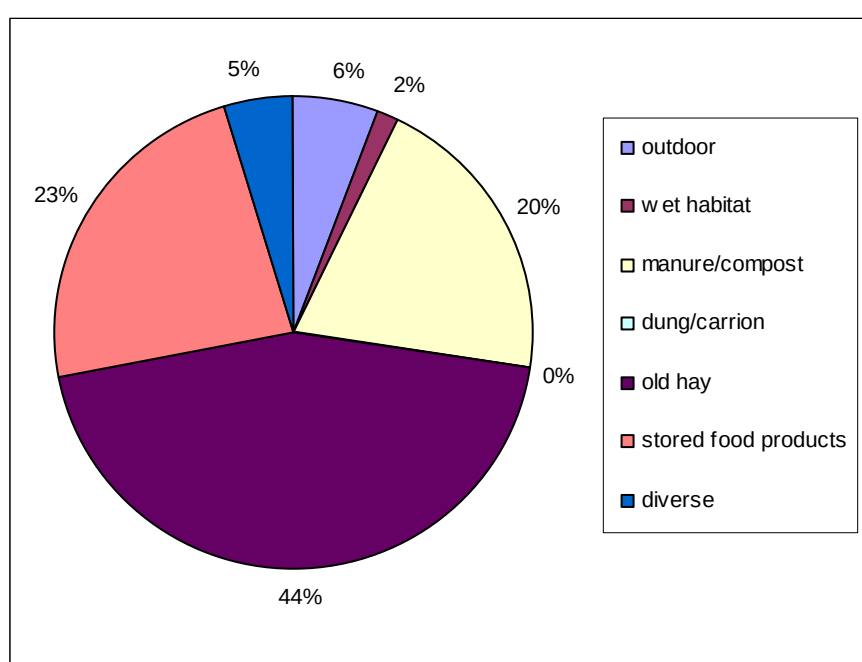


Figure 4. Distribution of species from S-510 by preferred habitats.

The high component of species associated with old hay in these faunas probably relates to the use of hay as litter, in an attempt to provide a dryer environment suited for storage activities. Nevertheless, the high number of pest of stored food products, of lathridiids and of species living in foul matter and wet environments indicates rather bad storage conditions inside the cellar.

A single specimen of the weevil *Sitophilus oryzae* was also found in sample S-510. This species is known as a very serious pest of stored cereals. As this species has very narrow ecological requirements, and is incapable of surviving in the outdoors in Iceland, its presence in the sample is therefore not a simple coincidence or accident. It suggests rather that some cereal products were stored in the vicinity of the cellar. As rice weevils can only breed in permanent grain stores, the single specimen originated from a store or granary close to the cellar, or it could have arrived there in imported cereals, thus indicating commercial activities.

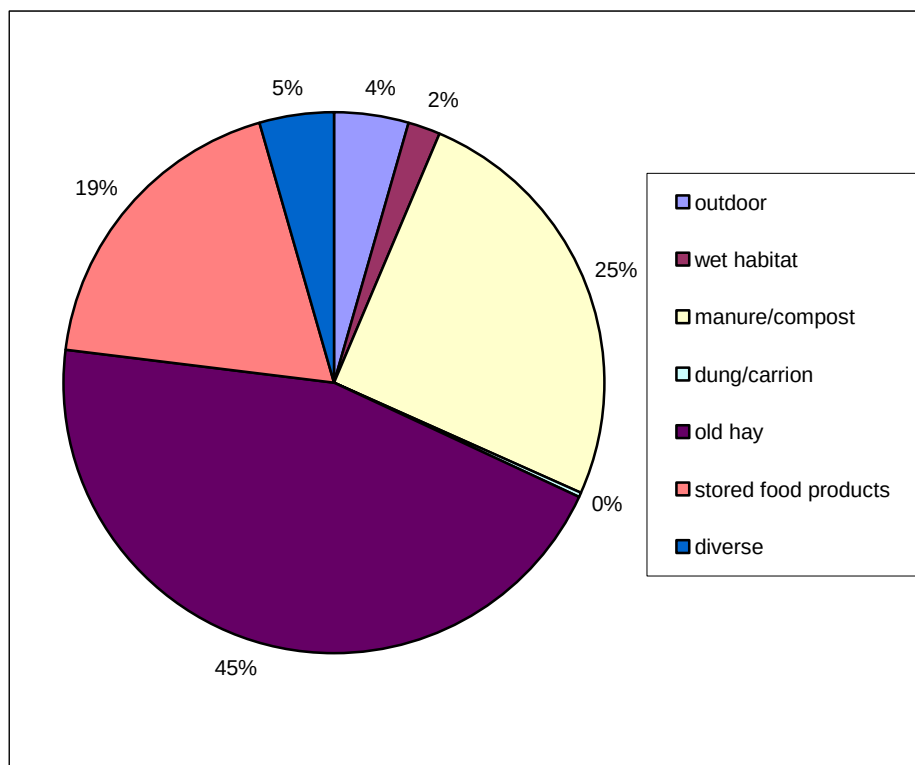


Figure 5. *Distribution of species from S-505 by preferred habitats.*

It is noteworthy that all species associated with dung and carrion (*Creophilus maxillosus*, *Omalium riparium* and *Aphodius lapponum*) and that a huge amount of fly puparia, were found under the wooden remains, in sample S-505, while only a few puparia were encountered in sample S-510. It seems very likely that some specific conditions attracted those insects. It is difficult to interpret this entomological evidence at the moment as the fly puparia are not identified. One hypothesis to consider is that a fresh animal carcass could have been located under the wooden structure, thus attracting flies and beetles feeding on maggots, such as *Creophilus maxillosus*.

The ash dump [7536] (S-519)

Thirty-two individual beetles were counted in the sample from the ash dump [7536]. A lot of broken unidentifiable beetle parts were noted, as well as a few mites. The poor preservation conditions in this deposit are probably due to its shallow depth, and to the sandy component of its matrix.

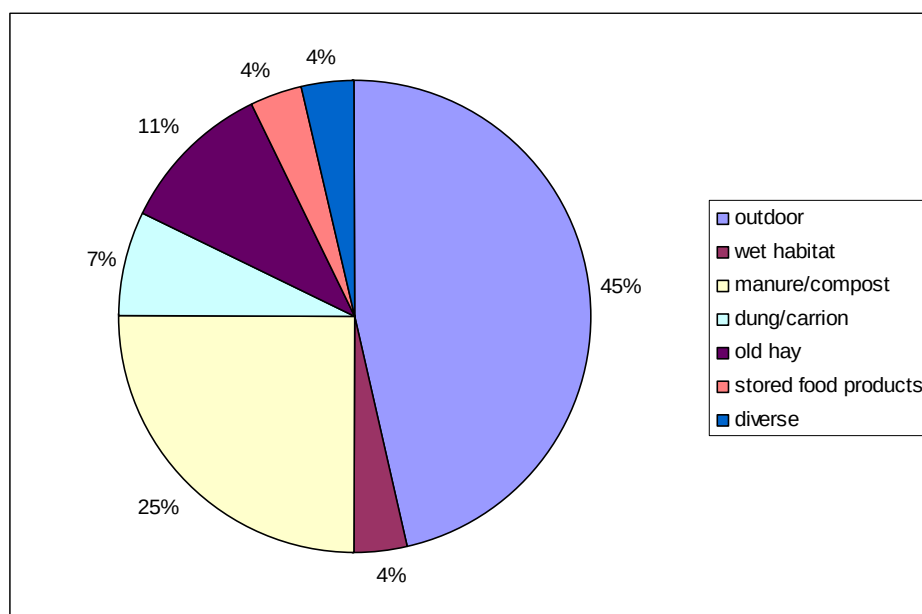


Figure 6. *Distribution of species from S-519 by preferred habitats.*

The predominance of insects associated with outdoor environments can be linked to the poor preservation conditions, which indicates preferential preservation conditions amongst the large robust carabids and snout beetles, and to the detriment of small taxa, as was the case in the Viking Age assemblages. It is also possible that identified carabids were attracted by arthropods living in the rubbish, and that they were there searching for food. Species associated with old hay, dung, carrion and stored food products may have arrived in the deposits along with house sweepings or in hay or food waste, and thus the ash dump [7536] does not necessarily correspond to their primary depositional environment.

DISCUSSION OF THE INSECT FAUNA FROM AREA 18

This archaeological context [7401] was a very compact peat accumulation, which resulted in very good preservation for the insect remains. The beetle fauna recovered from this deposit totals 132 individuals.

Surprisingly, synanthropes associated with old hay almost dominate the assemblage, forming 36% of the beetle fauna. Most of these beetles are lathridiids, which are known to fly from habitat to habitat, and are sometimes taken quite far from human abodes (Larsson and Gígjá 1959: 18). Thus, the presence of lathridiids in the sample could be due to the dispersive capacities of these species. Yet, it was suggested that the presence of charcoal inclusions in the peat was the result of fertilising the fields, so it was also possible for synanthropes associated with hay to have arrived there in food and hay waste used as manure. This hypothesis seems likely, especially because most ptinids found in stored food products in Iceland, like the single individual of *Tipnus unicolor*, have only been found indoors in this country (Larsson and Gígjá: 1959: 166-167).

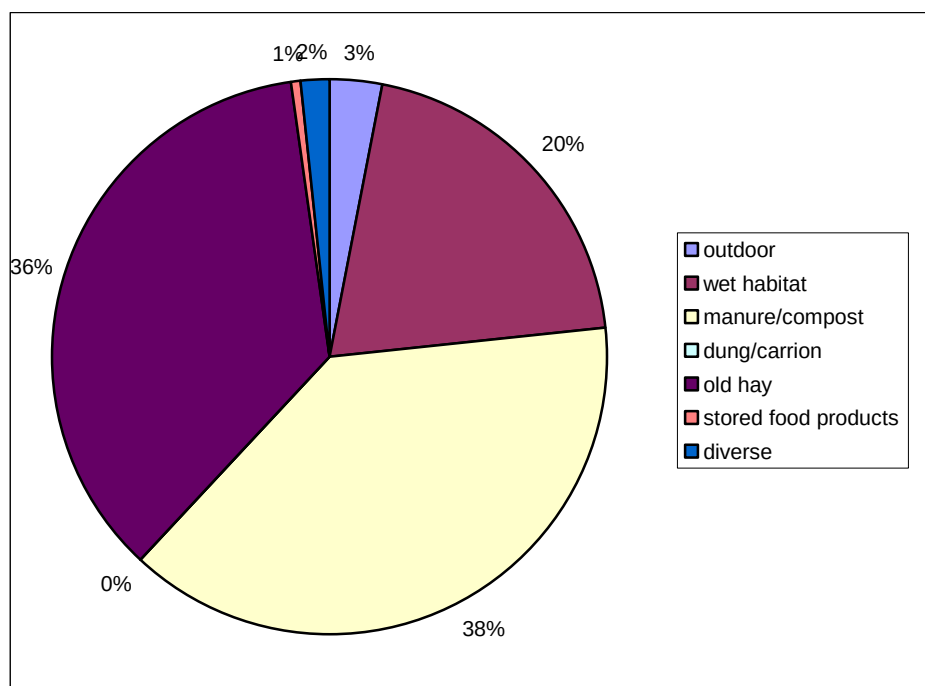


Figure 7. Distribution of species from S-72 by preferred habitats

DISCUSSION OF THE INSECT FAUNA FROM OFF-SITE SAMPLE T-9

The sample that was taken in the bog located in the upper homefield yielded a fauna of 43 individual beetles. This samples was apparently contaminated, since modern mites and fly heads were encountered during the sorting of insect fragments.

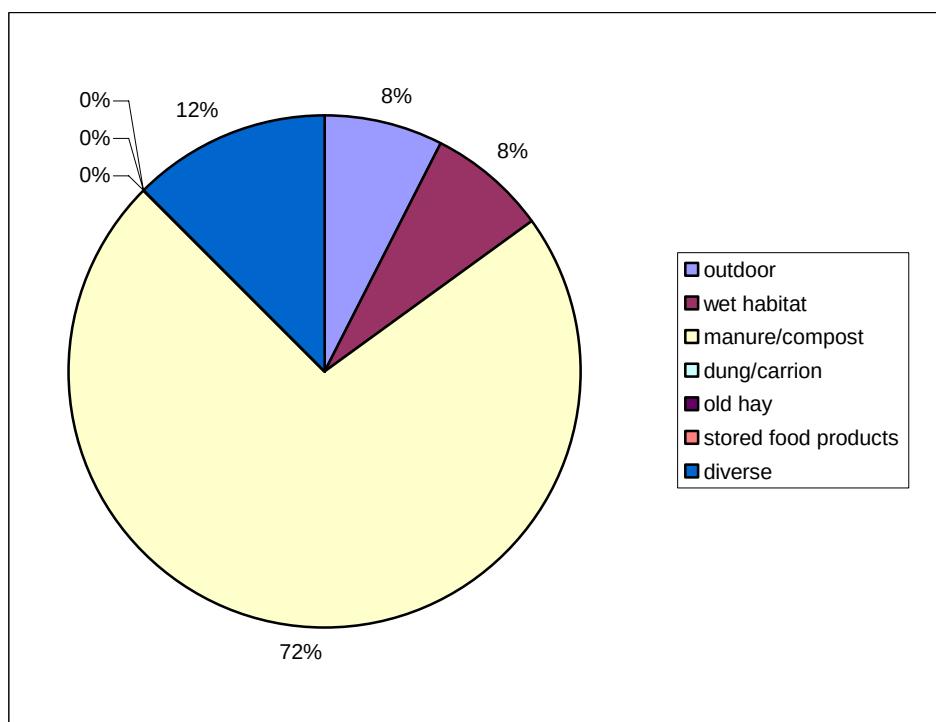


Figure 8. Distribution of species from T-9 by preferred habitats.

Contrary to sample S-72, no exclusive synanthropes were found in the beetle assemblage of this sample, and it was dominated by rove beetles associated with varied types of decaying organic matter. Outdoor species identified (*Patrobis septentrionis*, *Lesteva longoelytrata* and *Tropiphorus obtusus*) are characteristic of rather wet environments, such as wet meadows and grassy fields with luxuriant vegetation. The dysticid *Hydroporus nigrita*, as well as the *Quedius* species, also suggest a moist environment. Thus, one can affirm that the beetles recovered from this sample are representative of the environment from which the sample was taken.

METHODOLOGICAL CONSIDERATIONS

Even if it is now generally recognized that insects preserved in archaeological deposits are very good indicators of past ecological conditions (Kenward 1976: 16), it is important to stress that there can be some sources of errors for specialists working with this type of data. This is mainly due to the differing abundance and species richness of the fauna of different habitats, the fact that some taxa occur on a wide variety of habitats, resulting in the overlapping of differing habitats in some archaeological contexts, and also to the ability of some taxa to disperse and migrate over long distances (Buckland P. I. 2000:10-11; Kenward 1976:8; 1975:88; 1997: 136; 2006:1369). It is important to bear in mind that not all of the insects found in one deposit are necessarily autochthonous to it, i.e. that they were living in it (Kenward 1976: 14). Indeed, some specimens are likely to have arrived in archaeological deposits after having been transported by flight or by crawling, in the faeces and pellets of birds, or by wind (Kenward 1976: 9). There exists some means to distinguish the transported component of archaeoentomological assemblages (or “background faunas”) from insects whose presence in the archaeological deposits are the result of human activities (indicator faunas). For example, the presence of immature stages or of soft and pale insect parts suggests that the species was breeding in the deposits, thus probably being part of the indicator fauna. In some cases, the abundance of some taxa can also indicate that these insects were breeding in, or at least were attracted to, the depositional environment (Kenward 1976: 14-15). Moreover, except in a few cases, it is important to derive ecological data not only from single species but from groupings of species associated with a particular habitat (Carrot and Kenward 2001: 88; Kenward 1976: 9; Kenward and Carrot 2006: 1452).

Also, it is important never to use archaeoentomological data in isolation, but rather to always consider the archaeological context in which it was preserved, as well as all other evidence likely to indicate why the beetle taxa were present in the archaeological deposit (Hall and Kenward 2003: 127-128). As with any other specialists working on archaeological questions, it is desirable for archaeoentomologists and any projects primary archaeologists to work closely together and exchange ideas and data in order to provide a better, more complete, understanding of the deposits resulting from human activities on a particular site.

I believe that these different requirements were, to an appreciable extent, met in the context of this preliminary analysis of Vatnsfjörður’s archaeoentomological assemblages.

CONCLUSION

The objectives of the 2007 archaeoentomological analysis at Vatnsfjörður were 1) to assess the potential of this type of research for the two different occupation periods on the site; 2) to reconstruct Vatnsfjörður's immediate landscape at the time of settlement and during the Modern Period; 3) to investigate ecological conditions on the site, particularly inside excavated buildings; and 4) to potentially identify some activities and activity areas on the site.

The results of this preliminary analysis have clearly shown the excellent potential for insect analysis on sediments from the damp and deep deposits characterizing the farm mound. Thus, further archaeoentomological work on this part of the site is strongly recommended. As poor preservation conditions characterised most of the Viking Age deposits analyzed, it would be better, in the future, to sample only floor and midden deposits, as well as those composed of sediments very likely containing preserved insects remains. Unfortunately, the differing preservation conditions of the two main excavation areas at Vatnsfjörður makes it impossible to directly compare ecological reconstructions based on insects from the Viking Age and Modern periods.

Archaeoentomological data analyzed for this analysis allowed for the reconstruction of the environments that characterized Vatnsfjörður at the time of settlement and during the twentieth century. The beetle data recovered from Viking Age deposits suggests the presence of wet meadows and grasslands at Vatnsfjörður at this time. The diverse fauna preserved in archaeological sediments dating to the twentieth century indicates that the landscape surrounding Vatnsfjörður during the Modern Period was quite similar to present-day environments, characterized by the presence of dry heatlands, grasslands, and wet meadows, as well as water courses and the seashore in close proximity.

Little can be said about ecological conditions prevailing inside Viking Age buildings, but thanks to the archaeoentomological data obtained from samples dating to the twentieth century, it was possible to identify the presence of hay, compost and manure inside excavated buildings dating to this period, and to suggest that storage conditions were probably not very good inside the cellar [7503].

The analysis of entomological assemblages from the farm mound also allowed the identification of two activity areas, one for hay storage and one for food storage. It was also possible to affirm that Vatnsfjörður inhabitants were storing or importing cereal supplies during the twentieth century.

Acknowledgements

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A PRELIMINARY STUDY OF HOMEFIELD PHOSPHORUS VALUES AT VATNSFJÖRÐUR, VATNSFJARÐARSEL, AND SVEINHÚS

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INTRODUCTION

A program of coring, soil sampling, and soil phosphorus quantification of homefield deposits was conducted during the 2007 field season to assess the potential for a more intensive study of agricultural management and investment practices in the Vatnsfjörður area. Three farms were selected for the study: Vatnsfjörður, Vatnsfjarðarsel, and Sveinhús. Samples were collected on coring transects running through homefield areas. Soil phosphorus was measured using the Mehlich II extraction and colorimetric quantification (Bolender 2006; Terry, et al. 2000). The initial evaluation indicates preserved agricultural horizons and evidence for homefield enrichment at Vatnsfjörður and Sveinhús. Vatnsfjarðarsel has areas of elevated phosphorus but patterns of enrichment are significantly different from the two other farms.

METHODOLOGY

Soil Sampling Procedures

Soil samples were collected using an Oakfield hand core with a 1¼" diameter coring tube (compared to the standard 13/16"). Soil profiles from core sections were recorded in the field, noting soil type, inclusions, tephra layers, and the presence of any cultural material. Samples were taken from the soil cores based on natural stratigraphy and with respect to tephra layers. Samples were labeled and stored separately for analysis. Core-hole depth was measured against the depth of soil profile recovered in the core section. In general, there was a close correspondence between the reconstructed core profile and the actual depth of the core hole and in previous investigations a comparison of soil horizon depths between direct measurement in test trenches and extracted cores indicates that in-core soil compression is minimal and that soil profiles reconstructed from cores generally correspond closely to the depth of actual soil horizons (Steinberg 2002). Vatnsfjarðarsel proved an exception where the hummocky field resulted in large void spaces in soil profiles.

Mehlich II Soil Phosphorus Analysis

A Mehlich II based extraction adapted by the Hach Company for field testing was used to determine soil phosphorus levels (Bolender 2006; Mehlich 1978; Parnell and Terry 2002; Terry, et al. 2000). Mehlich II tests were conducted in Laboratory for Archaeological Chemistry in the Anthropology Department at Northwestern University under the supervision of Dr. Cynthia Robin. Phosphorus values are given

in milligrams per liter (mg/L) instead of parts per million (ppm). In Icelandic soils the Mehlich II extraction is closely correlated with total phosphorus levels determined by ICP-MS but here the original mg/L are retained to distinguish the test results from phosphorus levels determined by other methods. Linear regression statistics and model for a comparison between Mehlich II and ICP-MS (total digestion) for 40 samples from Langholt (Bolender 2006) are shown in Figure 1 and Table 1.

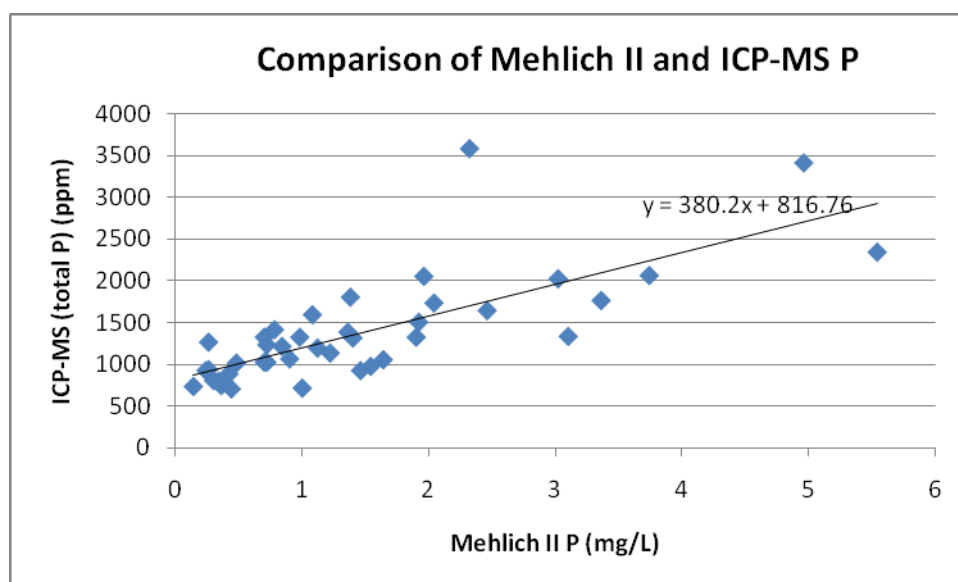


Figure 1. Comparison of Mehlich II and ICP-MS P.

Table 1. Linear regression of Mehlich II and ICP-MS P.

<i>Linear Regression Statistics, Mehlich II P and ICP-MS P</i>				
Multiple R	0.752			
R Square	0.566			
Adjusted R Square	0.554			
Standard Error	427.989			
Observations	40.000			
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	816.761	104.637	7.806	0.000
Mehlich II P	380.196	54.016	7.039	0.000

RESULTS

The soil samples have elevated phosphorus levels at all of the test sites (Table 2). Sample number, mean, and standard deviation are provided for all samples and for samples taken from homefield areas. At Vatnsfjarðarsel the homefield area was determined by the existing boundary wall. At Sveinhús samples from inside farm outbuildings, outside the homefield wall, and unsmoothed areas at the inside edge of

the homefield boundary were excluded from the homefield. At Vatnsfjörður coring profiles that exhibited no evidence for P enrichment at the northeast end of the coring transect were considered to be outside the boundaries of the traditional homefield.

Table 2. *Summary of Mehlich II phosphorus levels (mg/L).*

SITE	N	MEAN	SD
Vatnsfjörður (all)	25	0.903	0.798
Vatnsfjörður (homefield)	20	1.519	0.442
Sveinhus (all)	26	1.074	0.526
Sveinhus (homefield)	20	1.194	0.473
Vatnsfjarðarsel (all)	17	0.525	0.463
Vatnsfjarðarsel (homefield)	15	0.536	0.484
ALL	68	0.878	0.675

Vatnsfjörður and Sveinhús have significantly higher P averages than Vatnsfjarðarsel. When considering all samples taken from the two farmsteads they are not significantly different; however, a comparison of homefield samples shows a significant difference between the two farms despite the smaller sample size (Table 3). Both Vatnsfjörður and Sveinhús have enrichment patterns consistent with homefield deposits. While Vatnsfjarðarsel has enriched soils and a bounded homefield with better grass cover and deeper soils than the surrounding highland area, the enrichment levels and pattern clearly distinguish it from the other farms. Lower phosphorus levels and spatially inconsistent patterns of soil enrichment were associated with late medieval deposits (ca. AD 1300-1700) in the Langholt study (Bolender 2006) and may represent a late origin to the homefield at Vatnsfjarðarsel in addition to less intensive agricultural practices. The small pilot study demonstrates that significant differences between homefield intensification practices can be identified in the study area.

Table 3. *T-test of sample means among sampled farmsteads (parenthetical p values based on a comparison of samples taken from homefield areas).*

P(T<=t) two-tail	Vatnsfjörður	Sveinshús	Vatnsfjarðarsel
Vatnsfjörður	n/a	0.260 (0.031)	0.000 (0.000)
Sveinshús	0.260 (0.031)	n/a	0.001 (0.000)
Vatnsfjarðarsel	0.000 (0.000)	0.001 (0.000)	n/a

Stratigraphic Reconstruction and Dating of Homefields

The Vatnsfjörður area has one historical tephra layer tentatively identified as the Hekla 1693 eruption (Sigurgeirsson 2005). This layer was present at all of the sampled farms and well preserved at Vatnsfjörður and Sveinhús. While providing limited chronological resolution the presence of the tephra indicates that homefield

deposits have limited disturbance despite modern field leveling at the two sites and that a basic agricultural chronology is possible in the region.

Temporal differences in intensification practices were examined in two ways: a regression model of sample depth and sample phosphorus value and a comparison of pre- and post-1693 samples at individual farmsteads. At all farms there was a tendency for soil phosphorus levels to decrease with the depth of the sample. Again Vatnsfjörður and Sveinhús are distinguished clearly from Vatnsfjarðarsel. Vatnsfjörður and Sveinhús share identical slopes in the linear regression model (-0.044 mg/L per cm increase in depth from the surface) although the intercept is higher for Vatnsfjörður corresponding to the higher level of enrichment at the farm (Figure 2). At both farms the depth of soil sample significantly affected the phosphorus value and had a strong affect on the regression model (Vatnsfjörður, $r^2 = 0.257$; Sveinhús, $r^2 = 0.321$). These are non-negligible effects and indicate either a real change over time or the possible interference of modern enrichment activity on phosphorus levels in earlier horizons (see discussion below). At Vatnsfjarðarsel there was tendency for phosphorus values to decrease with increasing depth; however, this tendency was not statistically significant ($p = 0.07$) and the effect was marginal.

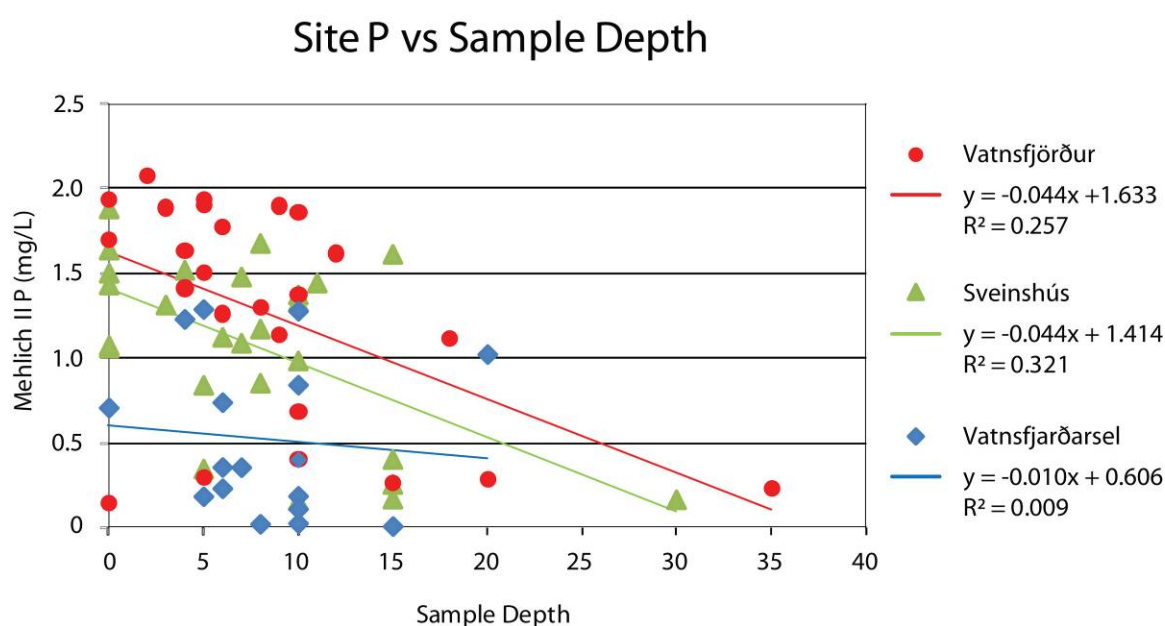


Figure 2. *Effect of sample depth on phosphorus value.*

Temporal change was also modeled by comparing the pre- and post-1693 samples where stratigraphic information was available. Overall the post-1693 soil horizons had higher P values than the pre-1693 horizons. Although sample sizes were small these differences were moderately significant at individual farms: Vatnsfjörður ($p=0.025$) and Sveinhús ($p=0.073$) (Table 4). At Vatnsfjarðarsel there were not enough samples with tephra layers to do a stratigraphic analysis.

Table 4. *T-test of sample means between pre- and post-1693 soil horizons (assuming unequal variances).*

	All Samples†		Vatnsfjörður		Sveinhús	
	POST	PRE	POST	PRE	POST	PRE
Mean	1.584	1.025	1.750	1.264	1.483	1.086
Variance	0.090	0.315	0.054	0.251	0.098	0.140
Observations	14	19	7	9	5	7
Df	29		12		10	
t Stat	3.681		2.569		2.000	
P(T<=t) two-tail	0.001		0.025		0.073	
t Critical two-tail	2.045		2.179		2.228	

† Includes Vatnsfjörður, Sveinhús, and Vatnsfjarðarsel.

One of the most significant complications in quantifying relict agricultural investments is the impact of modern farming activity, specifically fertilization, on phosphorus levels in lower horizons. Previous research in the Langholt region of Skagafjörður showed a diminishing but nonetheless significant effects of modern agricultural activity on buried horizons at a depth of up to 30 centimeters (Bolender 2006) (Figure 3). Preserved homefield horizons are shallow in the Vatnsfjörður area. In most cases soil cores only penetrated to 10-20 centimeters before arresting on rocky soils and modern farming enrichment may have a significant impact on medieval agricultural horizons.

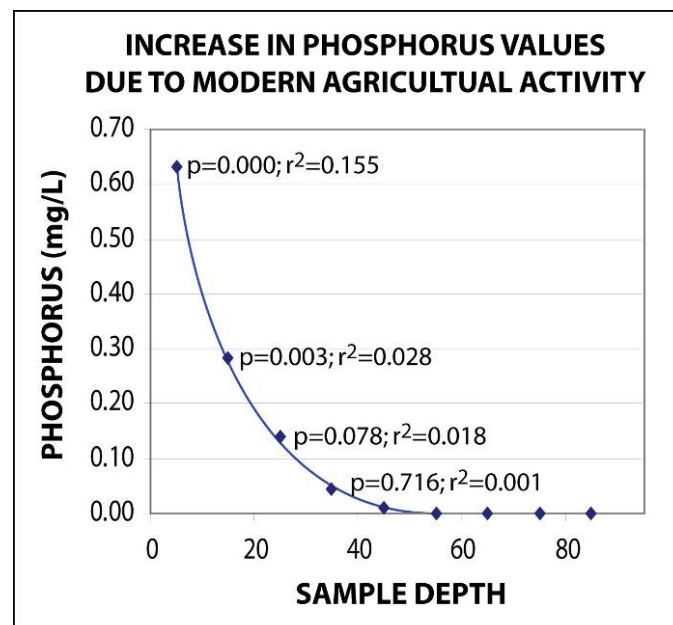


Figure 3. *Effect of modern agricultural enrichment on phosphorus values by depth in the Langholt region of Skagafjörður (from Bolender 2006).*

APPENDIX 1: SOIL SAMPLE REGISTER AND P VALUES

FARM	CORE#	SAMPLE#	SAMPLE DEPTH (cm)	MEHLICH II P (mg/L)	HOMFIEL D?	HORIZON
Sveinhús	206.01	1.2	8-17	1.678	YES	
Sveinhús	206.02	2.1	3-7	1.315	YES	post-1693
Sveinhús	206.02	2.3	7-10	1.480	YES	pre-1693
Sveinhús	206.02	2.4	10-15	1.333	YES	pre-1693
Sveinhús	206.03	3.1	0-8	1.061	YES	post-1693
Sveinhús	206.03	3.3	8-11	0.853	YES	pre-1693
Sveinhús	206.03	3.4	15-20	0.403	YES	pre-1693
Sveinhús	206.04	4.1	0-7	1.502	YES	
Sveinhús	206.04	4.2	7-11	1.089	YES	
Sveinhús	206.04	4.3	11-14	1.444	YES	
Sveinhús	206.04	4.4	15-20	1.614	YES	
Sveinhús	206.05	5.1	0-6	1.639	YES	post-1693
Sveinhús	206.05	5.3	8-14	1.173	YES	pre-1693
Sveinhús	206.06	6.1	0-8	1.882	YES	post-1693
Sveinhús	206.06	6.3	10-15	1.374	YES	pre-1693
Sveinhús	206.07	7.2	4-9	1.519	YES	post-1693
Sveinhús	206.07	7.4	10-14	0.985	YES	pre-1693
Sveinhús	206.08	8.2	6-10	1.124	YES	
Sveinhús	206.08	8.3	15-20	0.255	YES	
Sveinhús	206.08	8.4	30-35	0.165	YES	
Sveinhús	206.09	9.1	5-10	0.347	NO	
Sveinhús	206.09	9.2	10-12	0.159	NO	
Sveinhús	206.09	9.3	15-20	0.169	NO	
Sveinhús	206.10	10.2	5-10	0.841	NO	
Sveinhús	206.11	11.1	0-10	1.433	NO	
Sveinhús	206.12	12.1	0-10	1.075	NO	
Vatnsfjarðarsel	204.01	1.2	10-15	1.277	YES	
Vatnsfjarðarsel	204.02	2.2	10-15	0.181	YES	
Vatnsfjarðarsel	204.03	3.1	10-17	0.840	YES	
Vatnsfjarðarsel	204.04	4.2	10-15	0.020	YES	
Vatnsfjarðarsel	204.05	5.2	5-9	1.288	YES	post-1693
Vatnsfjarðarsel	204.05	5.4	10-20	0.105	YES	pre-1693
Vatnsfjarðarsel	204.06	6.2	6-10	0.736	YES	
Vatnsfjarðarsel	204.07	7.1	4-7	1.229	YES	post-1693
Vatnsfjarðarsel	204.07	7.3	10-15	0.397	YES	pre-1693
Vatnsfjarðarsel	204.07	7.4	15-20	0.002	YES	pre-1693
Vatnsfjarðarsel	204.08	8.2	6-10	0.352	YES	
Vatnsfjarðarsel	204.09	9.1	8-12	0.016	YES	
Vatnsfjarðarsel	204.09	9.2	20-25	1.021	YES	
Vatnsfjarðarsel	204.10	10.2	7-11	0.351	YES	
Vatnsfjarðarsel	204.11	11.2	6-10	0.226	YES	

FARM	CORE#	SAMPLE#	SAMPLE DEPTH (cm)	MEHLICH II P (mg/L)	HOMFIEL D?	HORIZON
Vatnsfjarðarsel	204.12	12.1	0-5	0.705	NO	
Vatnsfjarðarsel	204.13	13.1	5-10	0.179	NO	
Vatnsfjörður	205.01	1.2	5-10		NO	
Vatnsfjörður	205.02	2.2	5-10		NO	
Vatnsfjörður	205.02	2.3	10-15		NO	
Vatnsfjörður	205.02	2.4	20-25		NO	
Vatnsfjörður	205.03	3.1	0-6	0.143	NO	
Vatnsfjörður	205.03	3.3	10-15		NO	
Vatnsfjörður	205.03	3.4	20-25		NO	
Vatnsfjörður	205.04	4.2	6-12		NO	
Vatnsfjörður	205.04	4.3	15-20		NO	
Vatnsfjörður	205.04	4.4	30-35		NO	
Vatnsfjörður	205.05	5.2	5-10		NO	
Vatnsfjörður	205.05	5.3	15-20	0.258	NO	
Vatnsfjörður	205.05	5.4	35-40	0.230	NO	
Vatnsfjörður	205.06	6.2	5-10	0.290	NO	
Vatnsfjörður	205.06	6.3	20-25	0.281	NO	
Vatnsfjörður	205.07	7.1	3-8	1.886	YES	post-1693
Vatnsfjörður	205.07	7.3	10-15	0.681	YES	pre-1693
Vatnsfjörður	205.08	8.1	4-9	1.412	YES	post-1693
Vatnsfjörður	205.08	8.3	10-14	0.404	YES	pre-1693
Vatnsfjörður	205.09	9.2	6-9	1.776	YES	post-1693
Vatnsfjörður	205.09	9.4	9-12	1.133	YES	pre-1693
Vatnsfjörður	205.09	9.5	12-14	1.616	YES	pre-1693
Vatnsfjörður	205.09	9.6	18-23	1.118	YES	pre-1693
Vatnsfjörður	205.10	10.1	5-9	1.502	YES	post-1693
Vatnsfjörður	205.10	10.3	10-15	1.371	YES	pre-1693
Vatnsfjörður	205.11	11.1	2-7	2.074	YES	post-1693
Vatnsfjörður	205.11	11.3	9-14	1.898	YES	pre-1693
Vatnsfjörður	205.12	12.1	4-9	1.630	YES	
Vatnsfjörður	205.13	13.1	0-5	1.932	YES	
Vatnsfjörður	205.14	14.1	5-10	1.938	YES	
Vatnsfjörður	205.15	15.2	6-11	1.262	YES	
Vatnsfjörður	205.16	16.2	5-8	1.901	YES	post-1693
Vatnsfjörður	205.16	16.4	8-12	1.298	YES	pre-1693
Vatnsfjörður	205.17	17.1	0-6	1.695	YES	post-1693
Vatnsfjörður	205.17	17.4	10-15	1.860	YES	pre-1693

APPENDIX 2: CORING LOCATIONS

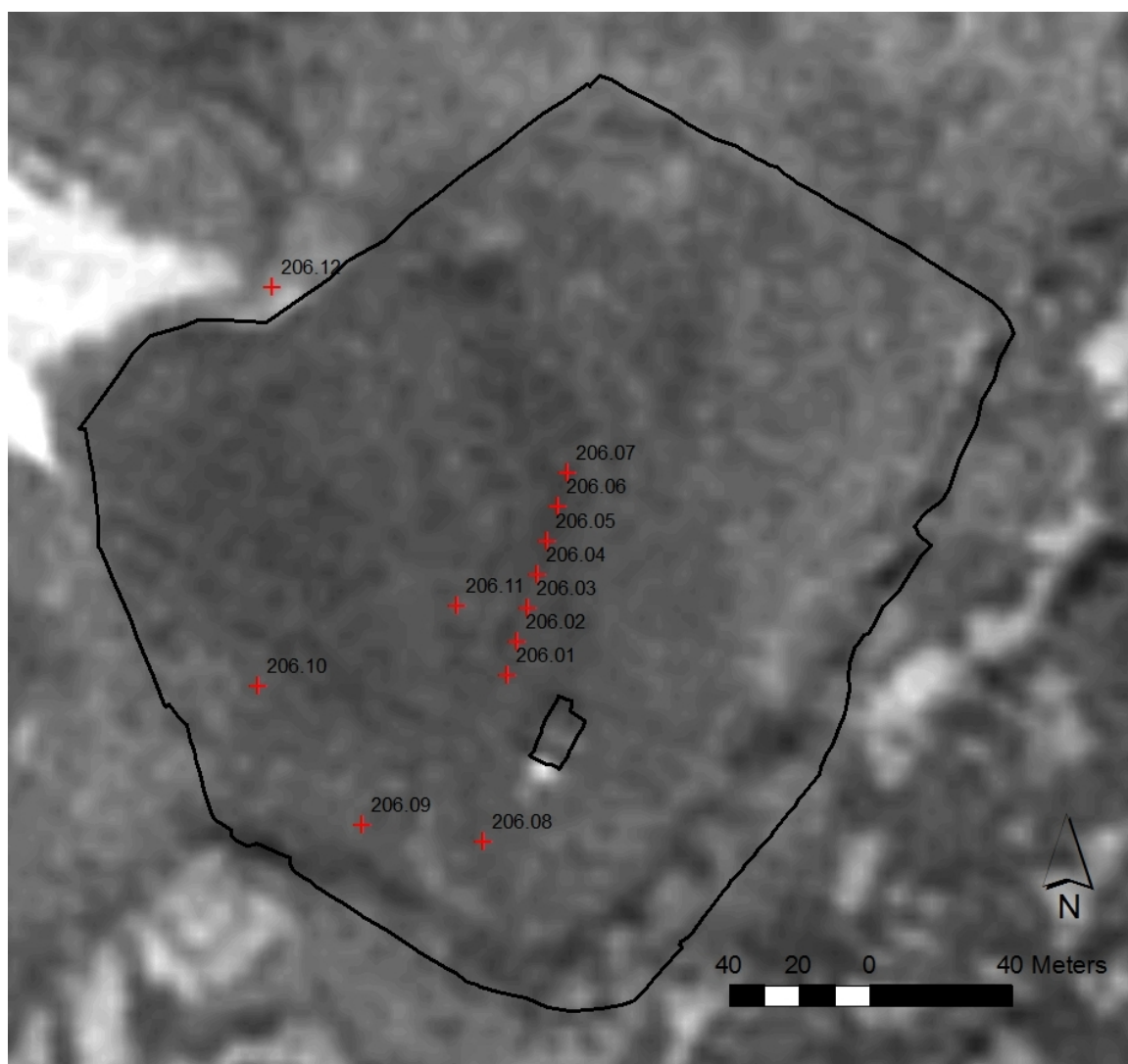


Figure A2-1. *Homefield and coring locations at Sveinhús.*

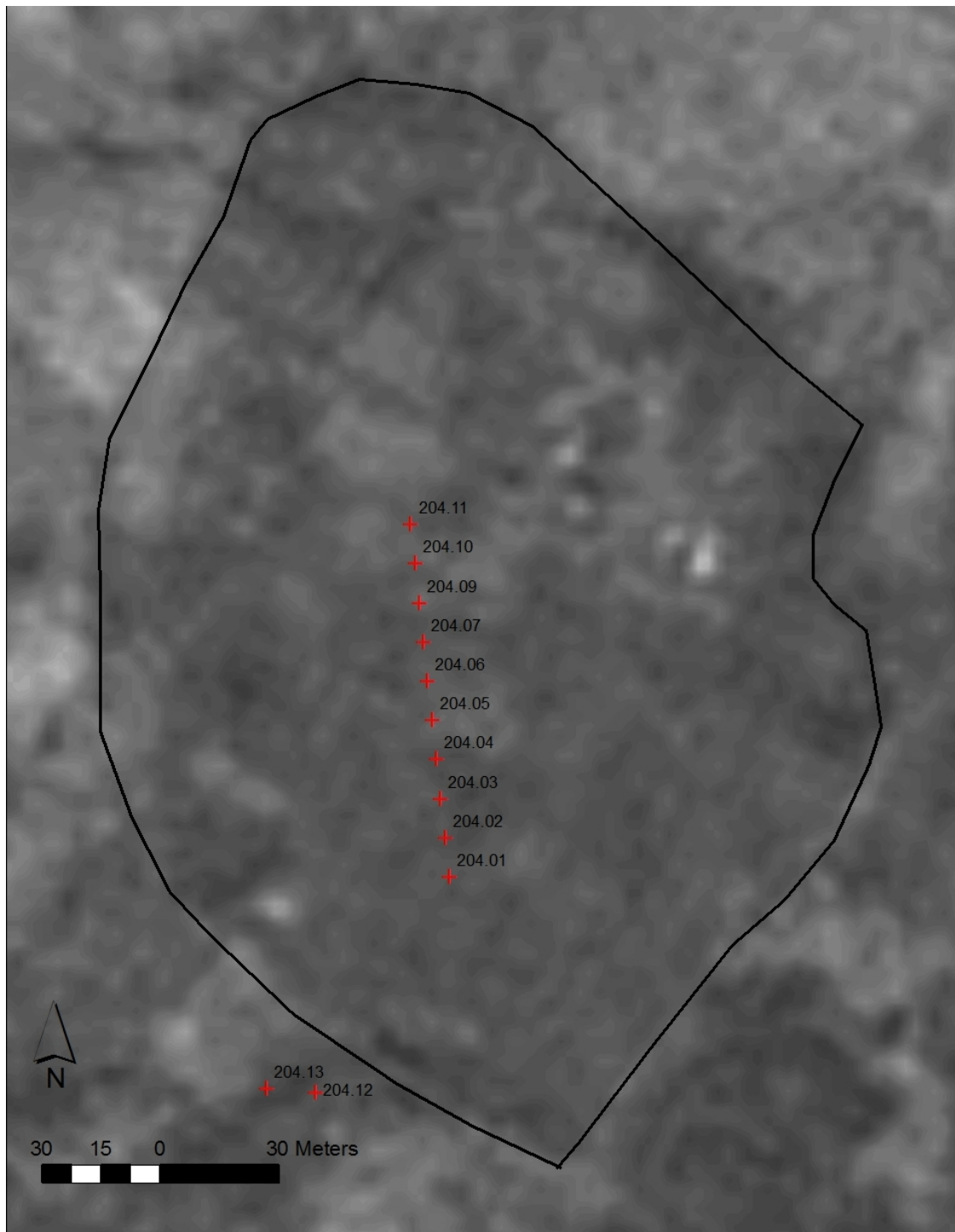


Figure A2-2. Homefield and coring locations at Vatnsfjarðarsel.

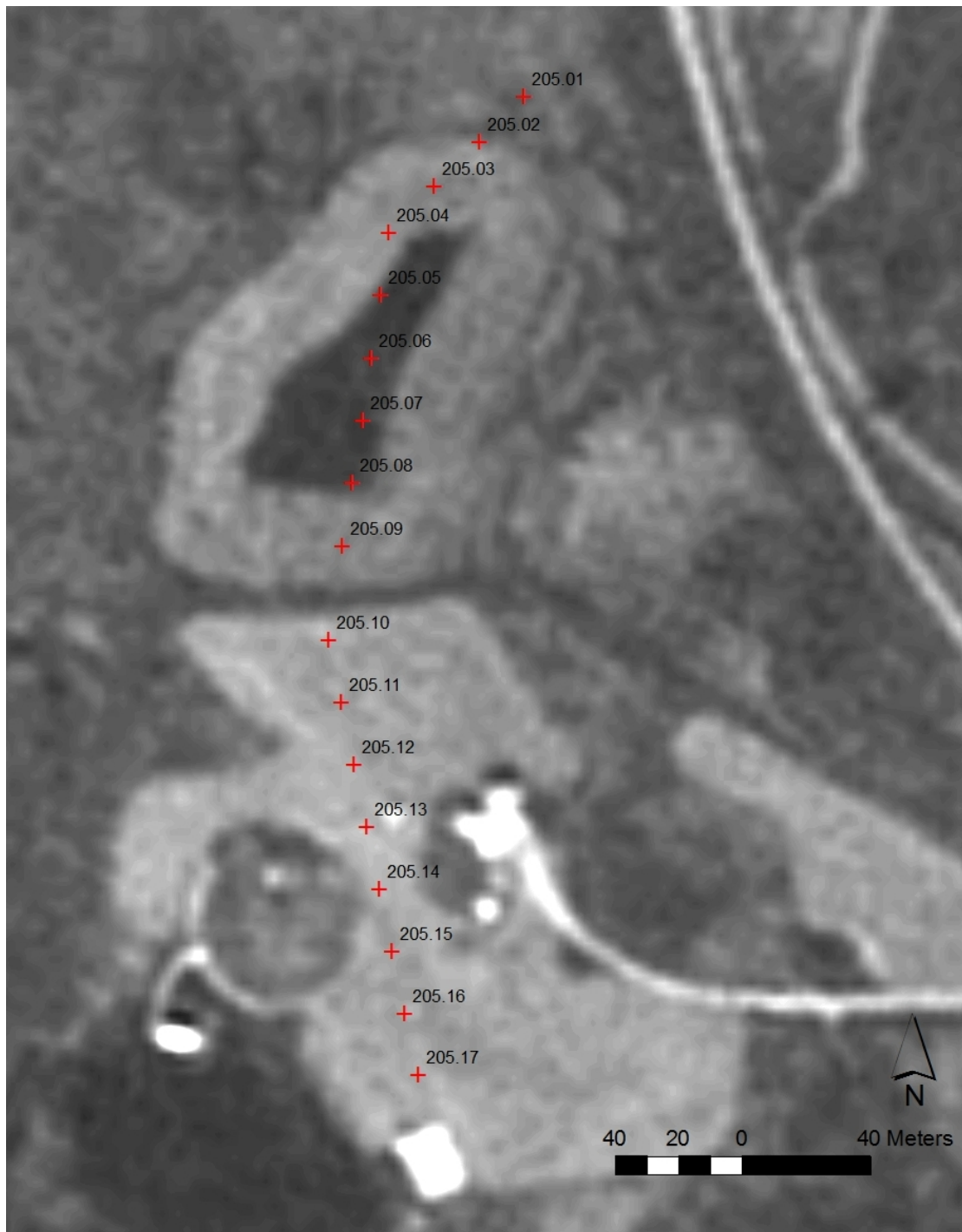


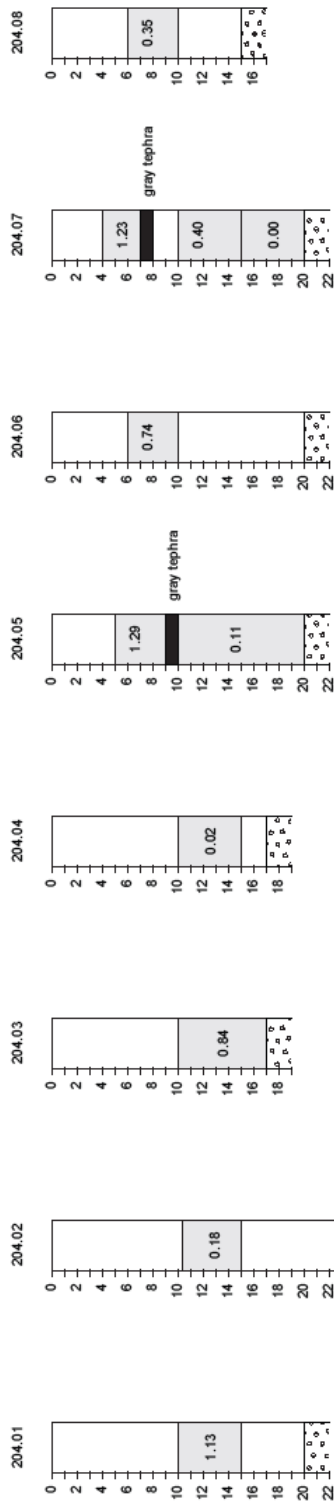
Figure A2-3. Homefield and coring locations at Vatnsfjörður.

SVEINSHÚS CORING PROFILES

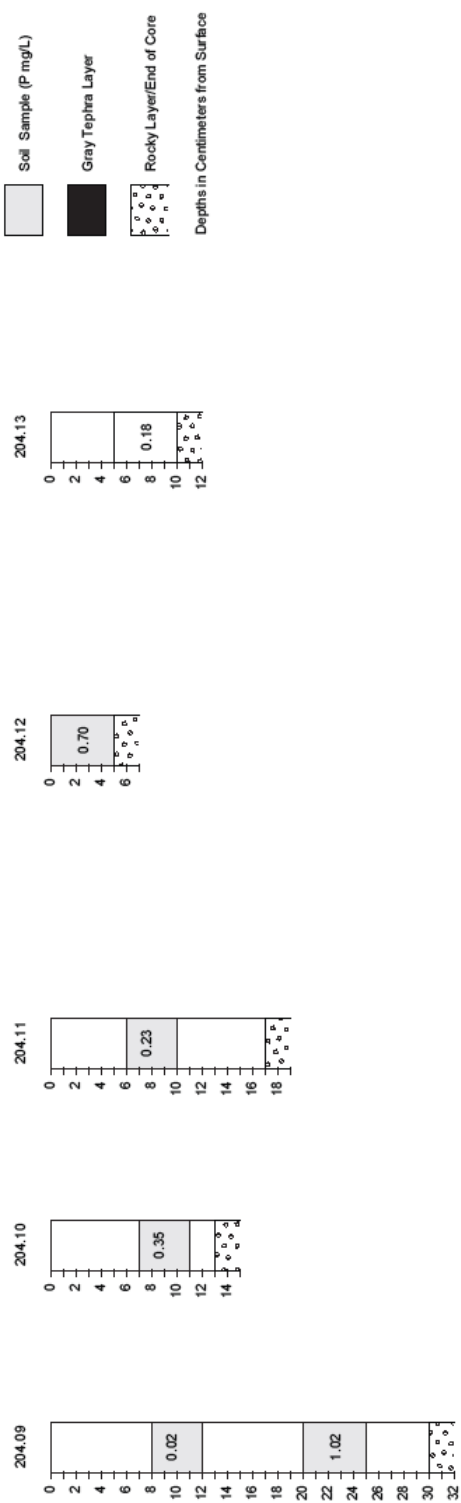


VATNSEIARÐARSEL CORING PROFILES

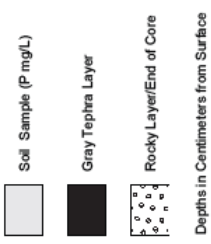
NORTH-SOUTH TRANSECT



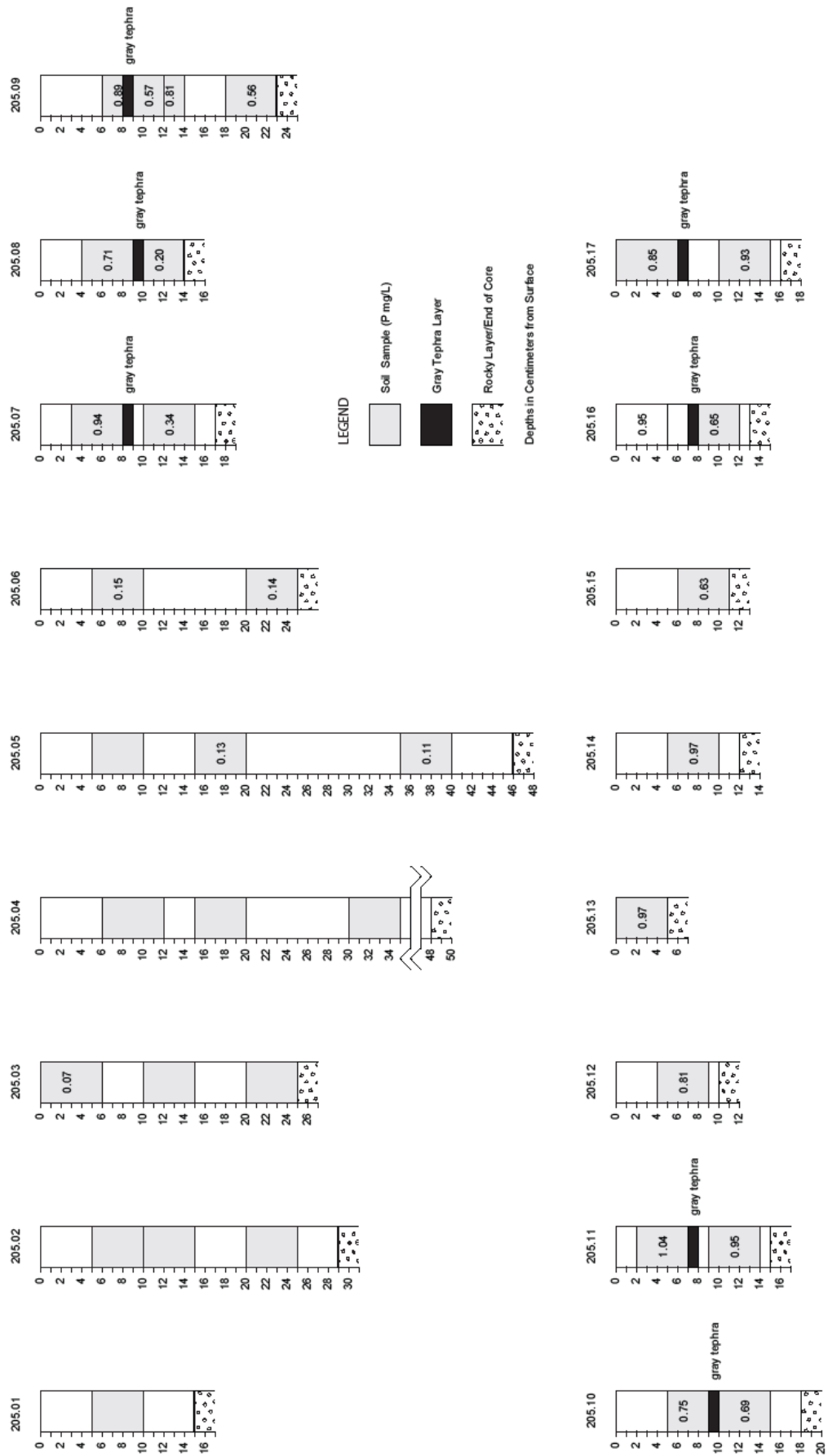
NORTH-SOUTH TRANSECT (CONTINUED)



CONTROL SAMPLES OUTSIDE FIELD BOUNDARY



VATNSFJÖRÐUR CORING PROFILES



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THE 2007 FIELD SCHOOL AT VATNSFJÖRÐUR: A STUDENT'S PERSPECTIVE

Todd Kristensen (Memorial University)

INTRODUCTION

The Field School in North Atlantic Archaeology promotes archaeological research in Iceland and exposes students to an interdisciplinary and international research project. The purpose of the following student perspective on the 2007 field season at Vatnsfjörður is: 1) to inform future students about project details, expectations, and the potential benefits of participating in the field school; 2) inform staff and project directors on those aspects of the field school that students found most beneficial, enjoyable, and informative as well as to offer suggestions to improve the student experience in future years; and 3) to communicate to supporting and participating institutions the value of the field school as a training ground for archaeologists interested in Icelandic and North Atlantic research.

Archaeological excavations and landscape survey have been conducted at Vatnsfjörður for five years. The 2007 field season represents the third year that a field school has operated in conjunction with the research project. The field school is offered as an accredited course with the University of Iceland, City University of New York, and the University of Oslo, while international students from other institutions can apply the field school course to their degree through credit transfer programs.

The student experience begins with the field school application which includes composing an essay and gathering reference letters. Successful applicants receive an introductory student manual and reading list to help prepare for the theoretical and methodological context of the field school. The inclusion of summary reports from previous excavations at Vatnsfjörður provides very helpful exposure to: the excavation and landscape survey programmes; orientation of the site and its location within the landscape; and the potential contribution of our upcoming fieldwork to future research. The archaeological field manual was invaluable as an introduction to excavation techniques and recording protocol. The initial recognition of architectural turf proved difficult for many students and this difficulty could be alleviated with photographs of stratigraphic profiles and turf ruins in the field manual accompanied by written explanations of criteria used to differentiate natural from cultural turf. A scheduled visit to archaeological museums in Reykjavík (eg. the Reykjavík 871±2 Exhibition at the Reykjavík City Museum) prior to departing for the field school would provide an excellent introduction to Viking Age archaeology as well as the importance of heritage education and public archaeology.

The reading list encompasses a variety of scales of archaeology in the North Atlantic from the regional development of Icelandic culture to the position of Iceland in Norse expansion, the translocation of Norse economy, and North Atlantic palaeoecology. Though the reading list was extensive, it is oriented heavily towards the Viking Age with few publications pertaining to the archaeology of Icelandic culture from the Middle Ages to the early 20th Century. Additional background knowledge on these

later time periods would be valuable especially since the excavation of 19th and 20th Century structures formed a major component of the 2007 field season. Several students had difficulty accessing publications which depended on local libraries and e-journal access. PDF copies of articles that were sent to students were much appreciated and it may be worth considering the creation of PDF files of book chapters that students had trouble locating.

The 2007 field school began upon arrival at the FSI headquarters in Reykjavík. After introductions, students packed gear and departed for Vatnsfjörður in the Westfjords. The following components of the field school will now be discussed in order as follows: Excavation Teaching Programme, Landscape Survey Programme, Post-Excavation Programme, and General Field School Conditions.

EXCAVATION TEACHING PROGRAMME

The Excavation Teaching Programme was divided into six stages: 1) Preparation for the excavation; 2) Introducing stratigraphy and how to record it; 3) Introducing archaeological units and how to record them; 4) Introducing excavation methods; 5) Beginning unsupervised excavation; and 6) Closing down the excavation.

Stage 1: Preparation for the excavation

Preparations began with a presentation of research objectives and their importance for determining excavation strategies. Field school staff explained the rationale behind site selection, topographic surveys, and the determination of excavation areas and techniques. The students were fortunate to work with a geophysics crew and learn the theory behind ground penetrating radar while observing basic methodology (ground preparation and walking radar transects) as well as principles of radar signal interpretation. Students also learned about the tools of archaeological fieldwork including digital cameras, surveying instruments, and the basic techniques of establishing a site datum, correlating elevations to an existing datum, and laying out a site grid. The introduction was comprehensive and went beyond the basic techniques of digging and screening.



Figure 1. *Brian Damiata and Krissy Larkin conducting GPR in transects.*

Stage 2: Introducing stratigraphy and how to record it

Field school students were fortunate to work with a several specialists in the field of geoarchaeology including geomorphology and micromorphology. Prof. Ian Simpson guided a practical session outlining the techniques of recording site profiles and interpretation of the geomorphological processes behind sediment formation in Iceland. Prof. Simpson reviewed sediment description criteria and explained how this information is used to construct stratigraphic matrices. This training was later supplemented by an in-depth look at micromorphology and the analysis of thin sections led by Dr. Karen Milek. Practical training in geoarchaeology was informative and interesting. Several students expressed interest in continuing their studies in this field through future courses and graduate research. Students were also introduced to a variety of site records including those for artifacts, features, samples, photograph registers, recording forms, and site context sheets.

Stage 3: Introducing archaeological units and how to record them

Site excavation began with clearing of vegetation, photographs, deturfing, cleaning, drawing, and taking elevation measurements. Exposed units from previous excavations in 2006 offered students an opportunity to see various stages of archaeological excavation. These units were used to help distinguish deposits, cuts, fills, features, and structures. Students also got a chance to see natural versus anthropogenic sediment in relation to Norse structures and midden deposits. Previously excavated units and completed context plans from 2006 provided good examples for comparison to current field work and helped emphasize the importance of standardizing field practices in multi-year projects.

Stage 4: Introducing excavation methods

This stage involved the basic techniques of trowelling, shoveling, and screening. Students learned how to identify Norse, Medieval, and later historic artifacts and how to properly record and store them for later analysis. Throughout the excavation, students refined their ability to interpret various archaeological contexts and construct Harris matrices to illustrate the relationship between site activities across space and through time.

Stage 5: Beginning unsupervised excavation

After sufficient training, students were expected to excavate and record their findings independently. Staff and graduate student volunteers provided feedback and instruction when necessary. The archaeological contexts that students worked in varied depending on the student's interests and the necessities of the field project as the field school progressed. The archaeological contexts varied from the Viking Age to the 19th and 20th centuries. The artifacts and excavation techniques were specific to each time period and it was valuable gaining exposure to both.

Stage 6: Closing down the excavation

Excavation ended in late July and the units were properly recorded and photographed before covering them in tarps and the original turf. In addition to preparing the site for excavations next year, students also learned about preparation of material for public display including reconstructions and general cultural heritage resource management. The role of archaeology in public heritage education is not a common component of field schools but an important and growing sub-field of the discipline. Students were enthusiastic about reconstructions at the site and much potential exists to expand this component of the field school and/or involve graduate students in the creation of public displays, archaeological reconstructions, and the design of posters, pamphlets, or books for public use.



Figure 2. *Viking Age components excavated in 2007.*

LANDSCAPE SURVEY PROGRAMME

A major component of the field school curriculum is the Landscape Survey Programme. This programme consisted of three sub-components as outlined below, all of them involving observation, recording, and analysis.

As previously mentioned, the initial sub-component was led by Prof. Ian Simpson and consisted of a small analysis of soils and the geomorphology of the immediate landscape surrounding Vatnsfjörður homefield. Prof. Simpson discussed soil and sediment formation processes in the context of both human settlement at the site and Icelandic ecology.

Prof. Christian Keller led the second sub-component that focused on a neighbouring farm site (Sveinhús). Students conducted an archaeological survey of the farm site and all associated ruins within the property boundaries. Individual structures were manually measured and mapped. A differential GPS was then used to record the boundaries of the earthworks and the maps created from these GPS surveys were

compiled to produce a detailed map of the ruins at Sveinshús. Emphasis was placed on the relationship between structures and the significance of their location on the landscape in relation to local resources.

The final and largest scale sub-component of the Landscape Survey Programme was led by Oscar Aldred. In small groups, students hiked across the landscape of Vatnsfjarðardalur documenting landscape markers, fishing stations, farm sites, and boundary walls. Oscar Aldred focused on the theory of landscape archaeology, including the incorporation of various scales of landscape use, movement across landscapes and seascapes, and changes or continuity in landscape use through time.



Figure 3. *Photograph taken during Landscape Survey Programme.*

The student response to the Landscape Survey Programme indicates that this was one of the field school's major strengths. Students gained an appreciation for Icelandic ecology and the local adaptation of Icelandic people to surrounding resources. The landscape perspective strengthened a general focus of the field school on the relationship between past and present landscapes and the impact of *landnám* and subsequent occupation on local ecology. The various scales of the three sub-components helped place the archaeology of Vatnsfjörður farmstead in a broader context of environmental adaptation and economic interaction.

Much potential exists to expand the Landscape Survey Programme and related components in future years. Students expressed interest in the relationship between landscape and seascape but gained exposure to maritime navigation and fishing primarily through field trips to a fishing museum and the site of a Basque whaling station. Lectures on the importance of coastal navigation, historic whaling, cod fishing, and the general utilization of coastal resources would be very interesting. The majority of students would also be supportive of a possible field trip to neighbouring Borgarey Island or along the coast, which could include lessons in maritime navigation and the use of coastal landscape markers.

POST-EXCAVATION PROGRAMME

Students engaged in a variety of laboratory analyses of site records and materials after returning from the field each day. Students learned how to digitize site and survey data, process artifacts and faunal materials, and analyze sediment and botanical samples. This instruction was supplemented by evening lectures on material recovery and curation, zooarchaeology, archaeobotany, and geoarchaeology. Valuable skills were acquired and students increased their exposure to a variety of sub-disciplines that contribute to archaeological reconstructions in the North Atlantic. Practical sessions involving these sub-disciplines provided hands-on training. The practical session included: aerial photograph analysis; analysis of micro-organisms in lake sediments; artifact conservation and processing; analysis of faunal remains; analysis of heavy residues and plant material; and soil and sediment analysis.

As mentioned, a series of lectures were presented on weekday evenings and weekends by staff and visiting researchers. This classroom component introduced students to a wide variety of topics relating to the reconstruction of Iceland's palaeoenvironment and archaeological record. According to general opinion, students found the lectures informative and pertinent to the field school. The opportunity to meet visiting researchers gave students a chance to network with specialists and establish professional contacts. If changes are made to the future lecture schedule, a number of students expressed an interest in learning more about local ecology (which native species of plants and animals were utilized), public archaeology, the Althing, other current research projects in Iceland, local history, and ethnographic records from the Westfjords. A small library of readings available in the lab was well used and offered students a chance to expand their knowledge of Icelandic and North Atlantic archaeology.

In addition to keeping a daily journal throughout the field school, students were expected to complete a group project that was presented at the end of the field season. The group projects consisted of an analysis and presentation of: artifacts from 2007; botanical material; faunal remains; survey work; and sediment thin sections from 2006. Students were enthusiastic about the projects but a number felt that preparation time was fairly short and project quality could have been higher if students were given more time to analyze materials and prepare the presentation. The journals were valuable for reflecting on the theories and methods learned that day. The daily journal was evaluated on a weekly basis and gave students an opportunity to provide feedback and address current concerns to the field school director.

GENERAL FIELD SCHOOL CONDITIONS

Students were housed in dorm-style rooms at the Reykjanes Hotel. Most people shared rooms with two to three other students. Considering the camping conditions of many field schools, the rooms were quite comfortable. Students were also fortunate to have cooked meals, access to a fixed lab for post-excavation work, classrooms for lectures, showers, washrooms, and a thermal pool for unwinding. The ample hours of sunlight left lots of time for evening hikes, socializing in the courtyard, and other

outdoor activities.

The daily schedule was fairly busy through the week but students had the opportunity to relax and/or go on optional field trips over the weekend. These excursions included a hiking trip to a large glacier, and visits to a relatively large coastal town in the Westfjords, a museum of sorcery and witchcraft, a 17th century Basque whaling station, and a country dance. These trips were enjoyed by all participants.



Figure 4. *Photograph of Drangajökull glacier during the first weekend field trip.*

Staff members and volunteers were helpful, considerate, and patient. Many students appreciated the willingness of staff to answer questions, cater projects and plans to stoke particular interests, and provide advice throughout the field school. All staff members and volunteers were knowledgeable and approachable.

The degree of student satisfaction with the field school was very high and reflects efforts made to expose students to a variety of sub-disciplines and to organize the Excavation Teaching Programme, Landscape Survey Programme, and Post-Excavation Programme. Eager students responded well to encouragement from staff and volunteers and ample opportunity exists to continue student involvement in Icelandic and North Atlantic research.

APPENDIX 1

REGISTER OF EXCAVATED UNITS

UNITS EXCAVATED IN THE VIKING AGE AREA: AREAS 2, 6, 14, 18 AND 20

Unit No	Group	Area	Type	Description
7000		14	Deposit	Turf on ground surface
7001		14	Deposit	Aeolian silt under surface turf
7002		14	Deposit	Dark brown lens; old land surface
7003		2	Deposit	Grey brown turf collapse at NW corner of Structure 3, Grid 889/1045
7004		6	Deposit	Rock associated with grey brown deposit/spill, Grid 874/1035
7005		6	Deposit	Red brown mottled turf collapse in north part of Structure 4 (against northern wall)
7006		2	Deposit	Blackish turf collapse in structure 3, NW corner
7007		2	Deposit	Stones inside hearth inside Structure 3
7008		14	Deposit	Reddish brown and black turf collapse, south of Structure 7
7009		6	Deposit	Later phase of stone pavement inside Structure 4?
7010		6	Deposit	Turf slide/collapse in north end of Structure 4 under [6419]
7011		2	Deposit	Turf collapse in NW corner of Structure 3
7012		2	Deposit	Slag and gravel under stone and charcoal [6126] in hearth inside Structure 3
7013		6	Deposit	Mixed deposit under pavement
7014		6	Deposit	Possible occupation layer in Structure 4
7015		2	Group	Part of NE gable of Structure 3; see section = [6167]
7016	7015	2	Deposit	[7015]=[6167] gravel layer; part of wall [6167]
7017	7015	2	Deposit	[7015]=[6167] turf layer; part of wall outer line
7018		6	Deposit	Turf block/fill in the "window" on E wall of Structure 4
7019		2	Cut	Cut of the pit for the hearth in Structure 4
7020		6	Deposit	Stone pavement inside Structure 4
7021		6	Deposit	Deposit associated with pavement in Structure 4
7022	7015	2	Deposit	Turf lining of E wall
7023		6	Deposit	Turf fill and collapse mix in the "window" of Structure 4 under [7018]
7024		2	Deposit	Turf collapse at NE end of Structure 3
7025		6	Deposit	Mixed trampled deposit under pavement in Structure 4
7026	7015	2	Deposit	Turf/base of east wall of Structure 3
7027		6	Deposit	Possible occupation deposit in Structure 4, under [7025]
7028		2	Deposit	Very shallow charcoal pit - south of hearth in Structure 3
7029		2	Cut	Cut of [7028]
7030		6	Deposit	Turf spilled/placed? Outside NE end of outside wall
7031		6	Deposit	2 Flat stones of pavement in Structure 4 under [7027] - floor layer
7032	7047	2	Deposit	1 Post pad in Structure 3
7033	7047	2	Deposit	Group of 5 post pads in Structure 3

Unit No	Group	Area	Type	Description
7034	7047	2	Deposit	1 Post pad in Structure 3
7035	7047	2	Deposit	2 Post pads in Structure 3
7036		14	Deposit	Grey layer/deposit in SW corner Area 14
7037	7047	2	Deposit	Post pad, Structure 3
7038	7047	2	Deposit	Post pad, Structure 3
7039	7047	2	Deposit	Post pad, Structure 3
7040		14	Deposit	Charcoal spread on top of [7002]
7041		6	Deposit	Turf trample under [7030]
7042				DELETED
7043		14	Cut	Cut filled with [7001]
7044		2	Deposit	Post hole
7045		2	Deposit	Post hole
7046	7047	2	Deposit	2 Flat stones - post pads
7047		2	Group	Group of post pads in Structure 3
7048		2	Deposit	Small turf deposit under [7033] stone A
7049		2	Deposit	Charcoal patch under [7048] and [7033] stone A
7050		2	Cut	Cut under [7044], natural gravel
7051		2	Cut	Cut under [7045], natural gravel
7052		14	Deposit	Grey spread with charcoal flecks
7053		2	Deposit	Grey round deposit, post hole?
7054		6	Deposit	Sheet midden under [7041], NW of Structure 4
7055				DELETED
7056				DELETED
7057				DELETED
7058				DELETED
7059	7090	2	Deposit	Stake hole
7060	7090	2	Deposit	Stake hole
7061	7090	2	Deposit	Stake hole
7062	7090	2	Deposit	Stake hole
7063				DELETED
7064	7090	2	Deposit	Stake hole
7065	7090	2	Deposit	Stake hole
7066	7090	2	Deposit	Stake hole
7067	7090	2	Deposit	Stake hole
7068	7090	2	Deposit	Stake hole
7069	7090	2	Deposit	Stake hole
7070				DELETED
7071	7090	2	Deposit	Stake hole
7072				DELETED
7073				DELETED
7074				DELETED
7075	7090	2	Deposit	Stake hole
7076	7090	2	Deposit	Stake hole
7077	7090	2	Deposit	Stake hole
7078	7090	2	Deposit	Stake hole

Unit No	Group	Area	Type	Description
7079	7090	2	Deposit	Stake hole
7080	7090	2	Deposit	Stake hole
7081	7090	2	Deposit	Stake hole
7082	7090	2	Deposit	Stake hole
7083	7090	2	Deposit	Stake hole
7084	7090	2	Deposit	Stake hole
7085	7090	2	Deposit	Stake hole
7086	7090	2	Deposit	Stake hole
7087				DELETED
7088	7090	2	Deposit	Stake hole
7089	7129	6	Deposit	Layer of gravel, silt and organic mix under [7031]
7090		2	Group	Group of stakeholes in Structure 33
7091				DELETED
7092		14	Deposit	Charcoal spread
7093		2	Group	Cuts of stakeholes in Structure 3
7094	7093	2	Cut	Cut of [7059]
7095	7093	2	Cut	Cut of [7060]
7096	7093	2	Cut	Cut of [7061]
7097	7093	2	Cut	Cut of [7062]
7098	7093	2	Cut	Cut of [7064]
7099	7093	2	Cut	Cut of [7065]
7100	7093	2	Cut	Cut of [7066]
7101	7093	2	Cut	Cut of [7067]
7102	7093	2	Cut	Cut of [7068]
7103	7093	2	Cut	Cut of [7069]
7104	7093	2	Cut	Cut of [7070]
7105	7093	2	Cut	Cut of [7071]
7106	7093	2	Cut	Cut of [7075]
7107	7093	2	Cut	Cut of [7076]
7108	7093	2	Cut	Cut of [7077]
7109	7093	2	Cut	Cut of [7078]
7110	7093	2	Cut	Cut of [7079]
7111	7093	2	Cut	Cut of [7080]
7112	7093	2	Cut	Cut of [7081]
7113	7093	2	Cut	Cut of [7082]
7114	7093	2	Cut	Cut of [7083]
7115	7093	2	Cut	Cut of [7084]
7116	7093	2	Cut	Cut of [7085]
7117	7093	2	Cut	Cut of [7086]
7118	7093	2	Cut	Cut of [7087]
7119		14	Deposit	Turf collapse in Structure 7- mottled dark brown
7120		14	Deposit	Turf collapse in Structure 7- orange brown
7121		2	Deposit	Turf patch in Structure 3
7122		2	Deposit	Charcoal patch in Structure 3
7123		14	Deposit	Gravel over turf collapse

Unit No	Group	Area	Type	Description
7124		2	Deposit	Turf patch under [7038] in Structure 3
7125		2	Deposit	Tiny charcoal pit with slag pieces, outside of the northern corner of Structure 3
7126		2	Cut	Cut of charcoal "pit"
7127	7129	6	Deposit	Fill of post hole [7128] under [7089]
7128	7129	6	Cut	Cut of post hole fill [7127]
7129		6	Group	Group of post holes with fill under [7089]
7130	7129	6	Cut	Cut for post hole
7131	7129	6	Deposit	Fill of post hole [7130]
7132	7129	6	Cut	Cut for post hole filled with [7089]
7133	7129	6	Cut	Cut for post hole filled with [7089]
7134		6	Cut	Small trench, under 7089
7135		14	Deposit	Yellow/orange turf collapse NW wall of Structure 7
7136	7137	6	Deposit	Part of wall in Structure 4. Gravel and turf mix
7137	7137	6	Cut	Group for wall section of Structure 4
7138		6	Cut	Cut for [7023] -- 'window flap'
7139		14	Deposit	Dark brown turf collapse outside of Structure 7
7140	7137	6	Deposit	Gravel fill for north wall -- possible construction
7141	7137	6	Deposit	Turf blocks of north wall of Structure 4
7142	7137	6	Deposit	Fill, gravel in wall
7143		14	Deposit	Orange and brown turf collapse south and southwest sides of Structure 7
7144	7137	6	Deposit	Mixed infill of turfwall of Structure 4 - N wall
7145	7137	6	Deposit	Turf wall of Structure 4 -- north wall -- inner and outer wall
7146	7137	6	Deposit	Charcoal sheet midden under wall
7147	7137	6	Deposit	Turf spill under sheet midden [7145] Structure 4
7148	7137	6	Cut	Cut for turf spill [7147]
7149				DELETED
7150		14	Deposit	Very thin dark brownish very mottled turf collapse
7151		14	Deposit	Sheet midden northeast of Structure 7
7152		14	Deposit	Orange and mottled brown turf collapse through possible entrance, south side of Structure 7
7153		20	Deposit	Testtrench between Structures 4 and 3
7154		20	Deposit	Compact turf collapse
7155		20	Deposit	Red turf collapse under [7154]
7156		20	Deposit	Thin layer of burnt turf collapse, under [7155]
7157		14	Deposit	Wall of Structure 7
7158		14	Deposit	Light yellowish/orange turf mix (on top of [7159] and [7160])
7159		14	Deposit	Light greyish brown very mottled turf with charcoal = sheet midden
7160		14	Deposit	Mid orange/brown turf collapse
7161		14	Deposit	Red brown turf under [7159], exposed by cut, south of Structure 7
7162		14	Deposit	Possible posthole-fill at the northern side of Structure 7, mixed silts and organic
7163		14	Deposit	Charcoal spread, NW of Structure 7
7164		14	Deposit	Dark brown soft organic silt, occupational deposit, Structure 7

Unit No	Group	Area	Type	Description
7165		14	Deposit	Thin charcoal spread, south of Structure 7
7166		14	Deposit	Dark red, reddish brown, very organic peat layer, south of Structure 7
7167		14	Deposit	Light greyish brown turf patch, SW of Structure 7
7168		14	Deposit	Fill of possible post hole in Structure 7, mixed silts and organic
7169		14	Deposit	Fill of possible post hole in Structure 7, mixed silts and organic
7170		14	Deposit	Light greyish brown turf layer under [7164] inside Structure 7, part of turf wall [7157]?
7171		14	Deposit	Light greyish and orange turf layer under [7159] and [7164], in entrance of Structure 7
7172		14	Deposit	Stone pavement of Structure 7
7173		14	Deposit	Fill of post hole in Structure 7, mixed silts and organic
7174		14	Deposit	Fill of possible large post hole in Structure 7, mixed silts and organic
7175		14	Deposit	Charcoal spread in NE corner of Structure 7
7176		14	Deposit	Fill of possible post hole in Structure 7, mixed silts and organic
7177		14	Deposit	Possible post pad, Structure 7
7178		14	Deposit	Possible post pad, Structure 7
7179		14	Deposit	Light greyish brown turf under [7157], part of wall [7157]?
7180		14	Deposit	Pinkish brown organic deposit, on top of [7164]
7181		14	Deposit	Possible second pavement in Structure 7 (or part of floor construction)? On beginning of western side of wall
7400		18	Deposit	Gravel layer underneath the top soil
7401		18	Deposit	Peat with charcoal inclusions under [7400]
7402		18	Deposit	Small gravel patch in peat [7401]

EXCAVATED UNITS IN THE FARM MOUND AREA

Unit No	Group	Area	Type	Description/Information
7500	7500	FM	Group	Turf and stone house built 1884
7501		FM	Deposit	Topsoil
7502		FM	Deposit	Collapse by levelling of homefield
7503		FM	Group	Cellar
7504	7503	FM	Deposit	Collapse inside cellar
7505		FM	Deposit	Stone collapse from eastern wall, on top of pavement
7506		FM	Deposit	Disturbed rubble in the house
7507		FM	Deposit	Turf collapse
7508		FM	Deposit	Turf collapse
7509		FM	Deposit	Turf collapse at W edge of wall, N end of ex.
7510		FM	Deposit	Fill in wall
7511		FM	Deposit	Turf collapse east of 'opening' to earlier phase
7512		FM	Deposit	Mixed layer within turf house
7513		FM	Structure	Stone pavement
7514		FM	Deposit	Large wood planks, possible structure in [7508]
7515	7503	FM	Deposit	Stone pavement of cellar floor
7516		FM	Deposit	Collapse stone, brick, turf, mottled
7517		FM	Deposit	Wooden planks + nails under [7508]
7518		FM	Deposit	Greyish brown turf collapse
7519		FM	Deposit	Disturbed + collapsed stones N of cellar [7503]
7520		FM	Deposit	Mixed layer of turf debris
7521		FM	Deposit	Turf collapse, line of rocks
7522		FM	Deposit	Wall collapse, turf + stone
7523	7503	FM	Deposit	Possible occupation surface in centre of cellar [7503]
7524		FM	Structure	Stone lining around cellar [6528]
7525	7503	FM	Deposit	A vague remains of floor in east of cellar [7503]
7526	7503	FM	Deposit	Patch of peat-ash in "floor" [7525]
7527	7503	FM	Deposit	Patch of wood-ash in floor [7525]
7528	7503	FM	Deposit	Patch of wood-ash in floor [7525]
7529		FM	Deposit	Pavement just east of long wall
7530		FM	Deposit	Turf collapse layer
7531		FM	Deposit	Floor cut by [6528]
7532		FM	Deposit	Turf collapse
7533	7503	FM	Structure	Wood planks in NW corner
7534		FM	Deposit	Turf collapse
7535		FM	Deposit	Turf levelling layer
7536		FM	Deposit	Ash layer
7537		FM	Structure	Row of flag stones, W part of corridor
7538		FM	Structure	Eastern outer wall of str. 7500 ATH VANTAR
7539		FM	Structure	Row of stones in E-side of E-wall, a bend
7540		FM	Deposit	Turf collapse pavement
7541		FM	Structure	Pavement at SE and S of Str. 7500
7542		FM	Deposit	Levelling layer made of turf further to the west part of the corridor
7543		FM	Deposit	Wall collapse west of structure 1. outside west wall
7544	7503	FM	Deposit	Walls of cellar
7545		FM	Deposit	Ash layer W str. 7500

APPENDIX 2

REGISTER OF FINDS

FINDS FROM THE VIKING AGE AREA: AREAS 2, 5, 14 AND 18

Find No	Unit	Area	X	Y	Object Keyword	Material Keyword	Qty Weight (g)	Qty Count
1	7000	14	0	0	Pottery	Ceramic	6,5	3
2	7001	14	895	300	Pottery	Ceramic	0,7	1
3	7001	14	895	300	Window	Glass	0,8	1
4	7001	14	898	300	Pottery	Ceramic	0,4	1
5	7001	14	890	305	Vessel	Glass	0,3	1
6	7001	14	895	300	Pottery	Ceramic	0,6	2
7	7001	14	890	300	Pottery	Ceramic	0	0
8	7001	14	890	305	Pottery	Ceramic	1,1	2
9					DELETED	DELETED		
10	7001	14	890	305	Pottery	Ceramic	9,1	1
11	7001	14	895	305	Pottery	Ceramic	0,6	1
12	7001	14	900	305	Nail	Iron	2,4	1
13	7001	14	890	310	Window	Glass	5,16	2
14					DELETED	DELETED		
15	7001	14	885	300	Nail	Iron	12,1	1
16	7002	14	0	0	Indeterminate	Iron	1,87	1
17	7001	14	890	300	Metalworking Waste	Slag	5,9	0
18					DELETED	DELETED		
19	7001	14	890	310	Metalworking Waste	Slag	1,1	0
20	7001	14	900	305	Window	Glass	0,39	1
21	7001	14	895	305	Window	Glass	0,67	1
22	7001	14	895	305	Metalworking Waste	Slag	20,7	0
23	7001	14	890	305	Pottery	Ceramic	4,8	2
24	7001	14	900	300	Vessel	Glass	0,5	1
25			0	0	DELETED	DELETED		
26	7001	14	895	305	Pottery	Ceramic	1,6	1
27	7011	2	884	1045	Metalworking Waste	Slag	0,6	0
28			0	0	DELETED	DELETED		
29	7012	2	889	1040	Metalworking Waste	Slag	0	0
30	7008	14	890	300	Pottery	Ceramic	3	2
31					DELETED	DELETED		
32	7008	14	890	300	Pottery	Ceramic	0,3	2
33	7001	14	885	305	Object	Iron	6,5	1
34	7008	14	890	300	Vessel	Glass	3,54	1
35	7001	14	885	305	Pottery	Ceramic	0,9	1
36					DELETED	DELETED		
37	7001	14	890	305	Bead	Glass	0,9	1
38	7001	14	885	305	Manuport	Stone	1,3	1
39	7044	2	889	10400	Metalworking Waste	Slag	10,9	0
40	7012	2	889	1040	Metalworking Waste	Slag	4450	0

Find No	Unit	Area	X	Y	Object Keyword	Material Keyword	Qty Weight (g)	Qty Count
41	7401	18	0	0		Iron	62,1	1
42	6167	2	889	1040		Wood	0	0
43					DELETED	DELETED		
44					DELETED	DELETED		
45	7160	14	895	305		Iron	18	1
46	7123	14	893,4	304,8	Spindle Whorl	Stone	21,55	1
47	7401	18	0	0		Wood	0	1
48	7001	14	0	0	Metalworking Waste	Slag	1,9	0
49	7120	14			Indeterminate	Iron	0,8	2
50	7152	14			Charcoal	Wood	0,4	1
51	7146	6	869	1035		Bone	0	1
52	6126	2	884	1040	Metalworking Waste	Slag	800	281
53	6126	2	884	1040	Metalworking Waste	Slag	500	0
54	7012	2	884	1040	Metalworking Waste	Slag	26	0
55	7027	6	873,75	1036,25	Metalworking Waste	Slag	1	1
56	7052	14	885	305	Metalworking Waste	Slag	1	1
57	7124	2			Metalworking Waste	Slag	1	3
58	7146	6			Metalworking Waste	Slag	2	5
59	6126	2	884	1040	Metalworking Waste	Slag	309	0
60	7045	2	874	1040	Metalworking Waste	Slag	3	6
61	7012	2			Metalworking Waste	Slag	27	7
62	6126	2			Metalworking Waste	Slag	519	295

FINDS FROM THE FARM MOUND AREA (INCLUDING BONES)

Find No	Unit	Group	Object Keyword	Material Keyword	Submaterial	Qty Weight (g)
501	7501		Unworked bone	Bone		4380
502	7501		Shell fragments	Shell		10
503	7504		Unworked bone	Bone		1377
504	7504		Shell fragments	Shell		10
505	7505		Unworked bone	Bone		480
506	7506		Unworked bone	Bone		17
507	7509		Unworked bone	Bone		19
508	7510		Unworked bone	Bone		7
509	7513		Unworked bone	Bone		46
510	7515	7503	Unworked bone	Bone		1554
511	7515	7503	Shell fragments	Shell		18
512	7516		Unworked bone	Bone		1465
513	7516		Shell fragments	Shell		113
514	7518		Unworked bone	Bone		17
515	7519		Unworked bone	Bone		45
516	7522		Unworked bone	Bone		43
517	7523	7503	Unworked bone	Bone		42
518	7525	7503	Shell fragments	Shell		17
519	7525	7503	Unworked bone	Bone		214
520	7530		Unworked bone	Bone		117
521	7532		Unworked bone	Bone		1
522	7534		Unworked bone	Bone		39
523	7536		Unworked bone	Bone		61
524	7545		Unworked bone	Bone		31
525	Unstratified/Cleaning		Unworked bone	Bone		18
526	Unstratified/Cleaning		Unworked bone	Bone		437
527	Unstratified/Cleaning		Unworked bone	Bone		575
528	Unstratified/Cleaning		Unworked bone	Bone		211
529	Unstratified/Cleaning		Unworked bone	Bone		44
530	7507		Unworked bone	Bone		26
531	7508		Unworked bone	Bone		19
532	7509		Shell fragments	Shell		5
533	7511		Unworked bone	Bone		55
534	7515	7503	Unworked bone	Bone		8
535	7501		Vessel	Glass		2100
536	7504		Vessel	Glass		5571
537	7505		Vessel	Glass		127
538	7507		Vessel	Glass		18
539	7508		Vessel	Glass		5
540	7509		Vessel	Glass		1
541	7510		Vessel	Glass		10
542	7511		Vessel	Glass		7
543	7515	7503	Vessel	Glass		195
544	7516		Vessel	Glass		532
545	7518		Vessel	Glass		67
546	7519		Vessel	Glass		14
547	7521		Vessel	Glass		190
548	7523	7503	Vessel	Glass		104
549	7525	7503	Vessel	Glass		18
550	7530		Vessel	Glass		25

Find No	Unit	Group	Object Keyword	Material Keyword	Submaterial	Qty Weight (g)
551	7531		Vessel	Glass		1
552	7532		Vessel	Glass		208
553	7533		Vessel	Glass		36
554	7504		Vessel	Glass		211
555	Unstratified/Cleaning		Vessel	Glass		107
556	7501		Window glass	Glass		791
557	7504		Window glass	Glass		2438
558	7505		Window glass	Glass		171
559	7507		Window glass	Glass		46
560	7508		Window glass	Glass		228
561	7511		Window glass	Glass		96
562	7509		Window glass	Glass		13
563	7514		Window glass	Glass		1
564	7515	7503	Window glass	Glass		205
565	7516		Window glass	Glass		1005
566	7518		Window glass	Glass		238
567	7521		Window glass	Glass		487
568	7523	7503	Window glass	Glass		118
569	7525	7503	Window glass	Glass		32
570	7530		Window glass	Glass		153
571	7532		Window glass	Glass		307
572	7542		Window glass	Glass		1
573	7542		Melted glass	Glass		10
574	7507		Button	Glass		1
575	7518		Button	Glass		1
576	Unstratified/Cleaning		Window glass	Glass		312
577	7501		Pottery	Ceramic		630
578	7504		Pottery	Ceramic		444
579	7505		Pottery	Ceramic		16
580	7506		Pottery	Ceramic		47
581	7507		Pottery	Ceramic		16
582	7510		Pottery	Ceramic		1
583	7511		Pottery	Ceramic		37
584	7512		Pottery	Ceramic		7
585	7513		Pottery	Ceramic		1
586	7514		Pottery	Ceramic		1
587	7515	7503	Pottery	Ceramic		222
588	7516		Pottery	Ceramic		333
589	7518		Pottery	Ceramic		16
590	7520		Pottery	Ceramic		21
591	7521		Pottery	Ceramic		83
592	7523	7503	Pottery	Ceramic		34
593	7525	7503	Pottery	Ceramic		100
594	7530		Pottery	Ceramic		11
595	7531		Pottery	Ceramic		34
596	7532		Pottery	Ceramic		93
597	7538		Pottery	Ceramic		34
598	7542		Pottery	Ceramic		98
599	Unstratified/Cleaning		Pottery	Ceramic		153
600	7501		Pottery	Ceramic		1
601	7504		Light socket	Composite	Ceramic and metal	408
602	7504		Clay pipe	Ceramic		11

Find No	Unit	Group	Object Keyword	Material Keyword	Submaterial	Qty Weight (g)
603	7505		Clay pipe	Ceramic		1
604	7509		Clay pipe	Ceramic		1
605	7510		Clay pipe	Ceramic		29
606	7516		Clay pipe	Ceramic		6
607	Unstratified/Cleaning		Clay pipe	Ceramic		15
608	7504		Object	Wood		70
609	7504		Net needle	Wood		33
610	7504		Barrel	Wood		676
611	7504		Handle	Wood		23
612	7504		Rope fastener	Wood		48
613	7504		Pin	Wood		8
614	7504		Stopper	Wood		71
615	7504		Object	Wood		563
616	7504		Object	Wood		330
617	7504		Barrel	Wood		1600
618	7504		Structural wood	Wood		3600
619	7533	7503	Structural wood	Wood		3100
620	7504		Object	Wood		16
621	7515	7503	Chest?	Wood		239
622	7525	7503	Object	Wood		1652
623	7523	7503	Handle	Wood		26
624	7530		Handle	Wood?		15
625	7504		Float	Cork		784
626	7501		Stopper	Cork		1
627	7504		Stopper	Cork		24
628	7532		Stopper	Cork		1
629	Unstratified/Cleaning		Stopper	Cork		1
630	7504		Paint brush	Composite	Wood, cu alloy, textile	83
631	7504		Cloth	Textile		
632	7505		Rope	Textile		
633	7507		Rope	Textile		
634	7510		Cloth	Textile		
635	7521		Cloth	Textile		
636	7532		Cloth	Textile		
637	7542		Cloth	Textile		
638	7501		Object	Leather		21
639	7504		Object	Leather		281
640	7515	7503	Strap	Leather		14
641	7516		Strap	Leather		109
642	7532		Object	Leather		15
643	7504		Saddle	Leather		340
644	7504		Saddle	Leather		x
645	7501		Pipe	Cement		500
646	7501		Whetstone	Stone	Schist	230
647	7501		Whetstone	Carborundum		66
648	7532		Whetstone	Carborundum		53
649	7501		Fish hammer	Stone		1037
650	7504		Grinding stone	Stone		9700
651	7504		Grinding stone	Stone		17250
652	7504		Brick	Ceramic		45650
653	7512		Brick	Ceramic		5600
654	7515	7503	Brick	Ceramic		3100

Find No	Unit	Group	Object Keyword	Material Keyword	Submaterial	Qty Weight (g)
655	7516	7503	Brick	Ceramic		12900
656	7516		Pipe	Ceramic		213
657	7516		Car	Plastic		102
658	7508		Ball	Rubber		33
659	7504		Mat	Rubber		144
660	7515		Linoleum	Linoleum		9
661	7532		Object	Rubber		5
662	7505		Coating	Tar paper		1
663	7518		Coating	Tar paper		4
664	7509		Battery	Metal		27
665	7505		Pipe	Ceramic		230
666	7504		Whetstone	Carborundum		75
667	7504		Object	Plastic		78
668	7501		Scythe	Metal	Iron	600
669	7501		Saw	Metal	Iron	197
670	7501		Object	Metal	Iron	1316
671	7501		Pincers	Metal	Iron	523
672	7501		Indet	Metal	Iron	2700
673	7501		Horse shoe	Metal	Iron	816
674	7501		Rivet/rove	Metal	Iron	100
675	7501		Structural fittings	Metal	Iron	354
676	7501		Knife	Metal	Iron	83
677	7501		Hinges	Metal	Iron	447
678	7501		Nail	Metal	Iron	768
679	7501		Wire	Metal	Iron	14
680	7501		Hasp	Metal	Iron	23
681	7501		Object	Metal	Iron	207
682	7501		Object	Metal	Iron	195
683	7501		Staple	Metal	Iron	1
684	7501		Oven	Metal	Iron	3200
685	7501		Stove	Metal	Iron	1700
686	7501		Lock	Metal	Iron	87
687	7501		Chain	Metal	Iron	97
688	7501		Scissors	Metal	Iron	80
689	7501		Slag	Slag		217
690	7501		Diverse	Metal	Iron	3200
691	7501		Pipe	Metal	Iron	319
692	7502		Scissors	Metal	Iron	43
693	7502		Nail	Metal	Iron	9
694	7505		Saddle bow	Metal	Iron	546
695	7505		Nail	Metal	Iron	80
696	7505		Object	Metal	Iron	39
697	7505		Object	Metal	Iron	47
698	7505		Fitting	Metal	Iron	49
699	7505		Screw	Metal	Iron	66
700	7506		Nail	Metal	Iron	17
701	7506		Fish hook	Metal	Iron	1
702	7507		Nail	Metal	Iron	26
703	7508		Nail	Metal	Iron	58
704	7509		Nail	Metal	Iron	18
705	7511		Nail	Metal	Iron	51
706	7511		Horse shoe	Metal	Iron	49

Find No	Unit	Group	Object Keyword	Material Keyword	Submaterial	Qty Weight (g)
707	7511		Structural fitting	Metal	Iron	48
708	7511		Bar	Metal	Iron	98
709	7505		Hoop	Metal		640
710	7516		Handle	Metal	Iron	300
711	7516		Object	Metal	Iron	
712	7516		Nail	Metal	Iron	1668
713	7516		Stove	Metal	Iron	540
714	7516		Horse shoe	Metal	Iron	900
715	7516		Structural fitting	Metal	Iron	280
716	7516		Hinge	Metal	Iron	140
717	7516		Hasp	Metal	Iron	4
718	7516		Object	Metal	Iron	61
719	7516		Oven	Metal	Iron	242
720	7516		Fastening	Metal		1027
721	7516		Slag	Slag		38
722	7516		Pot	Metal	Iron	716
723	7504		Indet	Metal	Iron	407
724	7504		Object	Metal	Iron	390
725	7504		Handle	Metal	Iron	249
726	7504		Weight	Metal	Iron	2170
727	7504		Object	Metal	Iron	456
728	7504		Saw	Metal	Iron	156
729	7504		Lid	Metal	Iron	587
730	7504		Object	Metal	Iron	109
731	7504		Pliers	Metal	Iron	337
732	7504		Object	Metal	Iron	117
733	7504		Horse shoe	Metal	Iron	174
734	7504		Staple	Metal	Iron	5
735	7504		Knife	Metal	Iron	15
736	7504		Scissors	Metal	Iron	73
737	7504		Rivet/rove	Metal	Iron	88
738	7504		Nail	Metal	Iron	358
739	7504		Lid	Metal	Iron	223
740	7504		Plane	Metal	Iron	203
741	7504		Slag	Slag		77
742	7504		Object	Metal	Iron	112
743	7504		Fitting	Metal	Iron	446
744	7504		Wire	Metal	Iron	53
745	7504		Stove	Metal	Iron	695
746	7504		Fish hook	Metal	Iron	217
747	7532		Pipe	Metal	Iron	403
748	7532		Nail	Metal	Iron	219
749	7523	7503	Fish hook	Metal	Iron	1
750	7523	7503	Object	Metal	Iron	147
751	7523	7503	Nail	Metal	Iron	22
752	7523	7503	Object	Composite	Iron and wood	60
753	7523	7503	Hoop	Metal	Iron	55
754	7522		Nail	Metal	Iron	1
755	7525	7503	Nail	Metal	Iron	30
756	7504		Scythe	Metal	Iron	5200
757	7504		Object	Metal	Iron	2900
758	7504		Lid	Metal		500

Find No	Unit	Group	Object Keyword	Material Keyword	Submaterial	Qty Weight (g)
759	7504		Bicycle	Metal		800
760	7504		Hoop	Metal		214
761	7504		Fastening	Metal		354
762	7504		Bar	Metal		500
763	7504		Paint brush	Composite	Iron,wood and textile	46
764	7504		Object	Metal		15
765	7542		Ball	Glass		13
766	7504		Lid	Metal		736
767	7501		Fitting	Metal		1
768	7501		Button	Glass		3
769	7501		Button	Plastic		1
770	7504		Fastening	Metal		30
771	7523	7503	Buckle	Metal		57
772	7525	7503	Button	Metal		1
773	7509		Object	Metal		19
774	7501		Object	Metal		26
775	7501		Object	Metal		29
776	7504		Knife	Composite	Iron, wood, cu-alloy	24
777	7516		Button	Metal		3
778	7516		Button	Glass		1
779	7516		Stopper	Metal		1
780	7504		Object	Metal		8
781	7504		Lamp	Metal		6
782	7516		Nail	Metal		8
783	7516		Button	Plastic		1
784	7532		Buckle	Metal		55
785	7505		Fastening	Metal		13
786	7504		Lamp	Metal		93
787	7516		Scrap	Metal		15
788	7505		Object	Metal		21
789	7505		Object	Metal		1
790	Unstratified/Cleaning		Object	Metal		1
791	7510		Thimble	Metal		1
792	7537		Thimble	Metal		1
793	7501		Object	Metal		1
794	7516		Coin	Metal		9
795	7516		Object	Metal		3
796	7507		Object	Metal		1
797	Unstratified/Cleaning		Button	Glass		1
798	Unstratified/Cleaning		Button	Metal		1
799	7507		Melted	Metal		9
799	7504		Stove	Metal	Iron	1
800	7504		Ornament	Metal		14
801	7532		Button	Plastic		1
802	0		Object	Bone	Whalebone	x

APPENDIX 3

REGISTER OF BONES

BONES FROM THE VIKING AGE AREA: AREAS 2, 6 AND 14

Bone No	Unit	Area	Quantity of Bags	Description	Analysed
1	7001	14	1	1 Burnt bone fragment	X
2	7001	14	1	2 Bone fragments	X
3	7001	14	1	2 Bone fragments	X
4	7001	14	1	3 Burnt bone fragments	X
5	7001	14	1	2 Bone fragments	X
6	7001	14	1	6 Burnt bone fragments	X
7	7001	14	1	1 Burnt bone fragment	
8	7001	14	1	1 Burnt bone fragment	
9	7001	14	1	1 Burnt bone fragment	X
10	7001	14	1	Bone fragment	X
11	7002	14	1	Tooth fragments	X
12	7002	14	1	2 Burnt bone fragments	X
13	7001	14	1	1 Burnt bone fragment	X
14	7001	14	1	Burnt bone fragments	X
15	6148	6	1	Very eroded bone	X
16	7001	14	1	Approximately 8 bone fragments embedded in soil	X
17	7001	14	1	Teeth	X
18	7008	14	1	2 Burnt bone fragments.	X
19	7001	14	1	1 Bone fragments	X
20	7006	2	1	Burnt bone fragments.	X
21	7001	14	1	Burnt bone fragments.	X
22	7000	14	1	1 Large bone fragments	X
23	6149	6	1	Small bone fragments	X
24	7001	14	1	Small bone fragments	X
25	7011	2	1	Small burnt bone fragments	X
26	7011	2	1	Sheep tooth, very poorly preserved	X
27	7008	14	1	2 Small bones	X
28	7001	14	1	Small burnt bones fragments	X
29				DELETED	
30	7012	2	1	1 Bone fragment bird	X
31	6129	2	1	1 Tooth in pieces	X
32	7001	14	1	Tooth fragment	X
33	6165	2	1	Burnt bone fragments	X
34	7023	6	1	Articulated caprine mandible	X
35	7001	14	1	Tooth ovca/burnt bone	X
36	7025	6	1	Bone fragment, very decomposed	X
37	7045	2	1	Shell fragments	X

Bone No	Unit	Area	Quantity of Bags	Description	Analysed
38	7052	14	1	Bone fragment	X
39	7044	2	1	Bone fragments	X
40	7052	14	1	Bone fragment	X
41	7001	14	1	Burnt bone	X
42	6129	2	1	Bone and tooth fragments	X
43	7135	14	1	Burnt bone fragment	X
44	7140	6	1	Burnt bone and tooth fragments	X
45				DELETED	
46	7012	2	1	Fish bone from hearth, Structure 3	X
47	7001	14	1	Bone fragment	X
48	7001	14	1	Bone fragment	X
49	7001	14	1	Bone fragment	X
50	7001	14	1	2 Bone fragments	X
51	6167	2	1	Burnt bone fragments	X
52	7001	14	1	Burnt bone, formerly F-007	X
53	7120	14	1	Tooth	X
54				DELETED	
55	7143	14	1	3 Burnt bone fragments	X
56				DELETED	
57	7152	14	1	Tooth	X
58	7139	14	1	Tooth fragments	X
59	6129	2	3	Burnt bone fragments, teeth fragments in residue of S-48, 2mm	
60	6126	2	1	Burnt bone fragments in residue of S-8, 2 mm	
61	7014	6	1	Burnt bone fragments in residue of S-16, 2 mm	
62	7025	6	1	Burnt bone fragments in residue of S-56, 2 mm	
63	7027	6	1	Burnt bone fragments in residue of S-31, 2 mm	
64	7027	6	1	Burnt bone fragments in residue of S-35, 2mm	
65	7027	6	1	Burnt bone fragments in residue of S-36, 2mm	
66	7028	2	1	Burnt bone fragments in residue of S-37, 2mm	
67	7052	14	1	Burnt bone fragments in residue of S-67, 2mm	
68	7089	6	1	Burnt bone fragments in residue of S-68, 2mm	
69	7090	2	1	Burnt bone fragments in residue of S-54, 2mm, from stake holes inside Structure 3	
70	7092	14	1	Burnt bone fragments in residue of S-53, 2mm	
71	7125	2	1	Burnt bone fragments in residue of S-73, 2mm	
72	7140	6	1	Burnt bone fragments in residue of S-95, 2mm	
73	7141	6	1	Burnt bone fragments in residue of S-97, 2mm	
74	7142	6	1	Burnt bone fragments in residue of S-99, 2mm	
75	7144	6	1	Burnt bone fragments in residue of S-106, 2mm	
76	7145	6	1	Bone fragments in residue of S-108, 2mm	
77	7146	6	1	Bone fragments in residue of S-107, 2mm	
78	7151	14	1	Burnt bone fragments in residue of S-117, 2mm	
79	7054	6	2	Burnt bone fragments in residue of S-45, 4mm and 2mm	
80	7044	2	1	Burnt bone fragments in residue of S-43, 4 mm	

BONES FROM THE FARM MOUND AREA

Find No	Unit	Area	Description	Analysed
501	7501	FM	8 bags in total	Partially
502	7501	FM	1 small bag	
503	7504	FM	2 bags in total	Partially
504	7504	FM	1 small bag	
505	7505	FM	1 bag	
506	7506	FM	1 bag	
507	7509	FM	1 bag	
508	7510	FM	1 bag	
509	7513	FM	1 bag	
510	7515	FM	1 bag	
511	7515	FM	1 small bag	
512	7516	FM	1 bag	
513	7516	FM	1 bag	X
514	7518	FM	1 bag	
515	7519	FM	1 bag	X
516	7522	FM	1 bag	
517	7523	FM	1 bag	X
518	7525	FM	1 bag	
519	7525	FM	1 bag	X
520	7530	FM	1 bag	
521	7532	FM	1 bag	
522	7534	FM	1 bag	
523	7536	FM	1 bag	
524	7545	FM	1 bag	
525		FM	Before excavation, cleaning, 1 bag	
526		FM	Clean up (895/240 SE), 1 bag	
527		FM	Cleaning west of structure 1. 1 bag	
528		FM	From cleaning	
529		FM	From cleaning under [7543]	
530	7507	FM	1 bag	X
531	7508	FM	1 bag	
532	7509	FM	Shell, 1 bag	
533	7511	FM	1 bag	
534	7515	FM	Bone fragments from flotation S-006, 1 bag	

NB. Fish bones have not been analyzed from these contexts.

APPENDIX 4

REGISTER OF SAMPLES

SAMPLES FROM THE VIKING AGE AREA: AREAS 2, 6, 14 AND 18

Sample No	Unit	Area	Grid	Quantity of Bags / Buckets	Sample Type	Notes
1	7000	14		1	Identification	2 Pieces of coal, 2 pieces of burnt wood
2	7001	14	898/300	1	Identification	7 Pieces of burnt wood
3	7001	14	895/300	1	Identification	Coal fragment?
4	7001	14		1	Identification	Burnt plant matter
5	7001	14	890/305	1	Identification	Charcoal and coal
6	7001	14	885/300	1	Identification	Coal, charcoal, seed
7	7001	14	905/305	1	Chemical	Chemical sample
8	6126	2	884/1040	1	Flotation	Flotation sample
9	7001	14	900/305	1	Identification	Burnt plant matter?
10	6126	2	884/1040	1	Entomology	Archaeoentomological sample
10	6126	2	884/1040	1	Entomology	Archaeoentomological sample
11	7002	14	900/305	1	Identification	Charcoal
11	7002	14	900/305	1	Identification	Charcoal
12	7012	2	884/1040	1	Identification	Slag
12	7012	2	884/1040	1	Identification	Slag
14	7001	14	895/305	1	Identification	Charcoal
14	7001	14	895/305	1	Identification	Charcoal
15	7014	6	874/1035	1	Chemical	Chemical sample
16	7014	6	874/1035	1	Flotation	Flotation sample
18	7022	2	889/1040		Entomology	Archaeoentomological sample
19	7023	4	874/1035	1	Chemical	Chemical sample
20	7025	4	874/1035	1	Identification	Bone for C14?
21	7025	4	874/1035	1	Chemical	Chemical sample
22	7027	6	874,25/1037,75	1	Chemical	Chemical sample, sq. 1
23	7027	6	874,25/1036,75	1	Chemical	Chemical sample, sq. 2
24	7027	6	874,25/1036,75	1	Chemical	Chemical sample, sq. 3
25	7027	6	874,25/1036,25	1	Chemical	Chemical sample, sq. 4
26	7027	6	873,75/1036,25	1	Chemical	Chemical sample, sq. 5
27	7027	6	873,75/1036,75	1	Chemical	Chemical sample, sq. 6
28	7027	6	873,75/1037,25	1	Chemical	Chemical sample, sq. 7
29	7027	6	873,75/1037,75	1	Chemical	Chemical sample, sq. 8
30	7027	6		1	Entomology	Archaeoentomological sample
31	7027	6	874,25/1037,25	1	Flotation	Flotation sample
32	7027	6	874,25/1037,75	1	Flotation	Flotation sample

Sample No	Unit	Area	Grid	Quantity of Bags / Buckets	Sample Type	Notes
33	7027	6	874,25/1036,75	1	Flotation	Flotation sample
34	7027	6	874,25/1036,25	1	Flotation	Flotation sample
35	7027	6	873,75/1036,25	1	Flotation	Flotation sample
36	7027	6	873,75/1037,25	1	Flotation	Flotation sample
37	7028	2	884/1040	1	Flotation	Flotation sample
38	7027	6		1	Micromorphology	Micromorphological sample
39	7027	6		1	Micromorphology	Micromorphological sample
40	7027	6		1	Micromorphology	Micromorphological sample
41	7040	14	901/305	0,5	Flotation	Flotation sample
42	7045	2	889/1045	0	Identification	Charcoal
43	7044	2	889/1045	1	Entomology	Archaeoentomological sample
44	7045	2	889/1045	1	Entomology	Archaeoentomological sample
45	7054	6	874/1040	1	Flotation	Flotation sample
46	7052	14	885/305	1	Chemical	Chemical sample
47	7052	14	885/305	1	Flotation	Flotation sample
48	6129	2		1	Flotation	Flotation sample
49	6129	2		1	Entomology	Archaeoentomological sample
50	7089	6	869/1035	1	Chemical	Chemical sample, Grid 1
51	7089	6	869/1035	1	Chemical	Chemical sample, Grid 2
52	7089	6	869/1035	1	Chemical	Chemical sample, Grid 3
53	7092	14		3	Flotation	Flotation sample
54	7090	2		1	Flotation	Stake holes
55	7098	6	874/1035	1	Chemical	Chemical sample, Grid 4
56	7098	6	874/1035	1	Chemical	Chemical sample, Grid 5
57	7098	6	874/1035	1	Chemical	Chemical sample, Grid 6
58	7098	6	869/1035	1	Chemical	Chemical sample, Grid 7
59	7098	6	869/1035	1	Chemical	Chemical sample, Grid 8
60	7098	6	869/1035	1	Entomology	Archaeoentomological sample
61	7098	6	869/1035	1	Flotation	Flotation sample
62	7122	2	889/1040	1	Flotation	Flotation sample
63	7121	2	889/1040	1	Flotation	Flotation sample
64	7124	2	889/1040	1	Flotation	Flotation sample
65	7401	18		1	Identification	Charcoal for dating and identification
66	7401	18		1	Identification	Peat for dating (20-22 cm)
67	7401	18		1	Identification	Peat for dating (22-24 cm)
68	7401	18		1	Identification	Peat for dating (24-26 cm)
69	7401	18		1	Identification	Charcoal for dating and identification (20-22 cm)
70	7401	18		1	Identification	Charcoal for dating and identification (22-24 cm)

Sample No	Unit	Area	Grid	Quantity of Bags / Buckets	Sample Type	Notes
71	7401	18		1	Identification	Charcoal for dating and identification (24-26 cm)
72	7401	18		1	Entomology	Archaeoentomological sample
73	7125	2	884/1045	1	Flotation	Flotation sample
74	7127	6	869/1035	1	Chemical	Chemical sample
75	7131	6	869/1035	1	Chemical	Chemical sample
76	7401	18		1	Identification	Peat for dating
77	7401	18		1	Identification	Peat for dating
78	7401	18		1	Identification	Peat for dating
79	7401	18		1	Identification	Peat for dating
80	7401	18		1	Identification	Charcoal for dating and identification
81	7401	18		1	Identification	Charcoal for dating and identification
82	7401	18		1	Identification	Charcoal for dating and identification
83	7135	14	895/305	1	Identification	Charcoal
84	7401	18		1	Identification	Peat for dating
85	7401	18		1	Identification	Peat for dating
86	7401	18		1	Identification	Peat for dating
87	7401	18		1	Identification	Charcoal for dating and identification
88	7401	18		1	Identification	Charcoal for dating and identification
89	7401	18		1	Identification	Charcoal for dating and identification
90	7401	18		1	Identification	Birch twig for dating
91	7135	14	890/310	1	Identification	Charcoal for identification
92	7401	18		3	Flotation	Flotation sample (40-42 cm)
93	7401	18		1	Flotation	Flotation sample (42-44 cm)
94	7401	18		1	Flotation	Flotation sample (38-40 cm)
95	7140	6	869/1035	1	Entomology	Archaeoentomological sample
96	7140	6	869/1035	1	Chemical	Chemical sample
97	7141	6	869/1035	1	Entomology	Archaeoentomological sample
98	7141	6	869/1035	1	Chemical	Chemical sample
99	7142	6	869/1035	1	Flotation	Flotation sample
100	7139	14		1	Identification	Charcoal
101	7120	14		1	Identification	Charcoal
102	7401	18		1	Identification	Peat for dating
103	7401	18		1	Identification	Peat for dating
104	7123	14		1	Identification	Charcoal
105	7120	14		1	Entomology	Archaeoentomological sample
106	7144	6		1	Flotation	Flotation sample

Sample No	Unit	Area	Grid	Quantity of Bags / Buckets	Sample Type	Notes
107	7146	6		1	Flotation	Flotation sample
108	7145	6		2	Flotation	Flotation sample
109	7145	6		1	Chemical	Chemical sample
110	7120	14		1	Identification	Shell?
111	7143	14	890/305	1	Identification	Charcoal
112						DELETED
113	7143	14	890/300	1	Identification	Charcoal
114	7120	14		1	Identification	Shell lining
115	7151	14	895/310	1	Identification	Charcoal from sheet midden
116	7151	14	895/305	3	Entomology	Archaeoentomological sample
117	7151	14	895/305	6	Flotation	Flotation sample
118	7151	14	895/305	1	Flotation	Charcoal cluster
119	7153	14		1	Identification	Charcoal
120	7153	14		1	Identification	Charcoal from turf collapse, south of Structure 7
121	7120	14		1	Identification	Charcoal
122	7120	14		1	Identification	Charcoal
123	7152	14	895/300	1	Identification	Charcoal, from outside of Structure 7
124	7157	14		1	Identification	Possible tephra, wall of Structure 7
125	7152	14	895/305	1	Identification	Charcoal
126	7401	18		1	Identification	Sample 1/3 from peat profile in wet meadow area
127	7401	18		1	Identification	Sample 2/3 from peat profile in wet meadow area
128	7401	18		1	Identification	Sample 3/3 from peat profile in wet meadow area
129	6126	2	884/1040	1	Identification	Charred plant material from residue of S-10, for identification?
130	7045	2	889/1045	1	Identification	Charred plant material from residue of S-44, for identification?
131	7008	14	885/300	1	Identification	Wooden remains, for identification or C14? Originally B-29

SAMPLES FROM THE FARM MOUND AREA

Sample No	Unit	Area	Vol. (L)	Quant. Bags/buckets	Description
1	7507	FM	0,25	1 bag	Unidentified sediment
2	7504	FM	0,75	3 bags	Archaeoentomology
3	7515	FM	0,25	1 bag	Unidentified seeds
4	7512	FM	0,25	1 bag	Archaeoentomology
5	7515	FM	0,25	1 bag	Archaeoentomology
6	7515	FM	0,25	1 bag	Flotation
7	7516	FM	0,25	1 bag	Egg shell on pavement [7521]
8	7526	FM	0,25	1 bag	Peat-ash
9	7527	FM	0,25	1 bag	Wood-ash
10	7525	FM	0,25	1 bag	Floor
11	7526	FM	0,25	1 bag	Peat-ash
12	7527	FM	0,25	1 bag	Wood-ash
13	7528	FM	0,25	1 bag	Ash
14	7525	FM	10	1 buck	Floor layer, bulk
15	7525	FM	0,25	1 bag	Floor layer, chemical
16	7531	FM	0,25	1 bag	Archaeoentomology
17	7531	FM	10	1 buck	Bulk for flotation
18	7531	FM	0,25	1 bag	Chemical
19	7536	FM	0,25	1 bag	Archaeoentomology
20	7542	FM	0,25	1 bag	Archaeoentomology
21	7542	FM	0,25	1 bag	Archaeoentomology

APPENDIX 5

REGISTER OF SITES SURVEYED

UID	Site ID	Type
265	1	Cairn
266	2	Cairn
267	3	Stone structure
268	4	Cairn
269	5	Cairn
270	6	Cairn
271	7	Cairn
272	1	Cairn
273	2	Cairn
274	3	Cairn
275	4	Cairn
276	5	Cairn
277	6	Cairn
278	7	Natural stone
279	8	Natural stone
280	9	Cairn
281	10	Cairn
282	11	Cairn
283	12	Cairn
284	13	Natural stone
285	14	Cairn
286	15	Cairn
287	16	Cairn
288	17	Cairn
289	18	Cairn
290	19	Cairn
291	20	Cairn
292	21	Cairn
293	22	Cairn
294	25	Mound
295	26	Sunken building
296	27	Cairn
297	28	Cairn
298	29	Cairn
299	30	Cairn
300	31	Shelter
301	3	Cairn
302	4	Track
303	5	Track
304	6	Cairn
305	7	Cairn
306	8	Cairn
307	9	Structure
308	10	Cairn
309	11	Cairn
310	12	Cairn
311	13	Cairn
312	14	Cairn
313	15	Cairn
314	16	Cairn
315	17	Cairn
316	1	Cairn

UID	Site ID	Type
317	2	Cairn
318	3	Structure
319	4	Cairn
320	5	Cairn
321	6	Cairn
322	7	Cairn
323	8	Cairn
324	9	Cairn
325	10	Cairn
326	11	Cairn
327	12	Cairn
328	13	Cairn
329	14	Cairn
330	15	Cairn
331	16	Cairn
332	17	Shelter
333	18	Cairn
334	19	Cairn
335	20	Cairn
336	21	Cairn
337	22	Cairn
338	23	Cairn
339	24	Cairn
340	25	Cairn
341	26	Cairn
342	27	Structure
343	28	Cairn
344	29	Peat cutting
345	30	Chanel
346	31	Structure
347	32	Structure
348	33	Structure
349	34	Structure
350	35	Track
351	36	Cairn
352	37	Peat cutting
353	40	Track
354	41	Track
355	42	Cairn
356	43	Cairn
357	44	Cairn
358	45	Cairn
359	46	Cairn
360	47	Cairn
361	48	Cairn
362	49	Cairn
363	50	Cairn
364	51	Cairn
365	52	Structure
366	53	Track
367	54	Cairn
368	1	Cairn
369	2	Cairn
370	3	Cairn
371	4	Bridge
372	5	Cairn
373	6	Cairn
374	7	Cairn
375	8	Linear feature

UID	Site ID	Type
376	9	Track
377	10	Natural stone
378	11	Cairn
379	12	Track
380	13	Wall
381	14	Cairn
382	15	Track
383	16	Cairn
384	17	Feature
385	18	Burial
386	19	Cairn
387	20	Cairn
388	1	Boat landing
389	2	Feature
390	3	Cairn
391	4	Natural stone
392	5	Structure
393	6	Cairn
394	7	Cairn
395	8	Pit
396	9	Feature
397	10	Wall
398	11	Cairn
399	1	Cairn
400	2	Cairn
401	3	Enclosure
402	4	Track
403	5	Track
405	6	Cairn
406	7	Cairn
407	8	Cairn
408	9	Track
409	10	Cairn
410	11	Cairn
411	12	Cairn
412	13	Cairn
413	14	Cairn
414	15	Cairn
415	16	Cairn
416	17	Track
417	18	Cairn
418	19	Cairn
419	20	Cairn
420	21	Cairn
421	22	Track
422	23	Cairn
423	24	Natural stone
424	25	Cairn
425	26	Cairn
426	27	Cairn
427	28	Cairn
428	29	Cairn
429	30	Cairn
430	1	Cairn
431	2	Cairn
432	3	Cairn
433	4	Cairn
434	5	Cairn
435	6	Track

UID	Site ID	Type
436	7	Cairn
437	8	Cairn
438	9	Cairn
439	10	Cairn
440	11	Cairn
441	12	Enclosure
442	13	Boundary wall
443	14	Stone structure
444	15	Cairn
445	1	Bridge
446	2	Shelter
447	3	Cairn
448	4	Cairn
449	5	Cairn
450	6	Cairn
451	7	Cairn
452	8	Cairn
453	9	Natural stone
454	10	Cairn
455	11	Cairn
456	12	Cairn
457	13	Structure
458	14	Cairn
459	15	Cairn
460	16	Cairn
461	17	Cairn
462	18	Cairn
463	1	Track
464	2	Cairn
465	3	Cairn
466	4	Cairn
467	5	Cairn
468	6	Cairn
469	7	Cairn
470	8	Cairn
471	9	Natural stone
472	1	Linear feature
473	2	Pit
474	3	Cairn
475	4	Cairn
476	5	Fox Trap
477	6	Cairn
478	7	Cairn
479	1	Structure
480	2	Cairn
481	3	Cairn
482	4	Cairn
483	1	Cairn
484	2	Cairn
485	3	Cairn
486	1	Cairn
487	2	Cairn
488	3	Natural stone
489	4	Cairn
490	5	Natural stone
491	6	Natural stone
492	7	Cairn
493	8	Shelter
494	9	Cairn

UID	Site ID	Type
495	10	Cairn
496	11	Cairn
497	12	Cairn
498	13	Cairn
499	14	Cairn
500	15	Cairn
501	16	Cairn
502	17	Cairn
503	18	Cairn
504	19	Cairn
505	20	Cairn
506	10	Fox trap
507	1	Track
508	2	Cairn
509	3	Cairn
510	4	Cairn
511	5	Cairn
512	6	Cairn
513	7	Track
514	8	Cairn
515	9	Natural stone
516	10	Natural stone
517	11	Track
518	12	Cairn
519	13	Cairn
520	14	Cairn
521	15	Cairn
522	16	Cairn
523	17	Cairn
524	1	Cairn
525	2	Cairn
526	3	Feature
527	4	Enclosure
528	5	Feature
529	6	Cairn
530	1	Stone wall
531	2	Stone wall
532	3	Feature
533	4	Stone wall
534	5	Cairn
535	6	Stone wall
536	7	Structure
537	8	Stone wall
538	9	Stone wall
539	10	Shelter
540	11	Cairn
541	12	Feature
542	13	Structure
543	14	Feature
544	15	Stone wall
545	16	Cairn
546	17	Cairn
547	18	Cairn
548	19	Cairn
549	20	Cairn
550	21	Cairn
551	22	Cairn
552	1	Structure
553	2	Stone wall

UID	Site ID	Type
554	3	Feature
555	4	Cairn
556	5	Cairn
557	6	Structure
558	7	Structure
559	8	Cairn
560	9	Boat house
561	10	Cairn
562	1	Cairn
563	2	Cairn
564	3	Cairn
565	4	Cairn
567	5	Turf cutting
568	6	Cairn
569	7	Cairn
570	8	Cairn
571	9	Cairn
572	11	Cairn
573	12	Cairn
574	10	Cairn
575	1	Shelter
576	2	Cairn
577	3	Cairn
578	4	Bridge
579	5	Cairn
580	6	Stone wall
581	7	Cairn
582	8	Cairn
583	9	Cairn
584	10	Cairn
585	11	Cairn
586	12	Cairn
587	1	Track
588	2	Track
589	3	Cairn
590	4	Shelter
591	5	Cairn
592	6	Cairn
593	7	Cairn
594	8	Cairn
595	9	Cairn
596	10	Cairn
597	11	Cairn
598	12	Cairn
599	13	Peat cutting