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AKUREYRI MUSEUM

Gásir Post Excavation Reports – Volume 2

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Uppgrefti á Gásum lauk sumarið 2006 en síðan þá hefur verið unnið að úrvinnslu og er það verk langt komið þó enn vanti herslumuninn á að lokið hafi verið við nauðsynlegar rannsóknir á hinum gríðarmikla efnivið sem safnaðist við uppgröftinn. Árið 2009 kom út safn skýrslna um hinar ýmsu rannsóknir sem eru hluti af úrvinnslunni[1] og hér á eftir fylgir önnur slík, en einnig hafa komið út sérstakar skýrslur um dýrabeinagreiningu en hún er hlutfallslega fyrirferðarmest af einstökum þáttum úrvinnslunnar og auk þess hluti sérstakrar doktorsrannsóknar Ramonu Harrison við City University of New York.

Í þeim skýrslum sem hér birtast er greint frá mikilvægum niðurstöðum úr sérfræðigreiningum á brýnum og leðri; rannsóknum á örformgerð og skordýrum auk þess sem niðurstöður kolefnisaldursgreininga eru birtar. Þær síðastnefndu gefa mikilvægan stuðning við vitnisburð gjóskulaga og gripa um tímasetningu hinna uppgröfnu leifa á Gásum og sýna að umsvif á staðnum hafa verið mest á 13. og 14. öld. Einkum er nú orðið mjög skýrt að Gásir hljóta að liðið undir lok mjög skömmu eftir aldamótin 1400 en enn eru ekki öll kurl komin til grafar með upphaf staðarins. Þótt brýni og leðurgripir láti ekki mikið yfir sér gefa slíkir gripir mjög mikilvægar vísbendingar bæði um verslunartengsl, erlend menningaráhrif og um starfsemi á staðnum; það er til dæmis athyglisvert að leðurviðgerðir og e.t.v. leðursmíði hafi farið fram á Gásum, en sú niðurstaða bætist í vaxandi flokk vísbendinga um margskonar iðnað á Gásum.

Það er sérstaklega ánægjulegt að birta hér sérfræðiskýrslur eftir unga íslenska fornleifafræðinga sem eru að sérhæfa sig á sviðum sem hingað til hefur þurft að leita til erlendra fræðimanna með. Sigrid Juel Hansen hefur sýnt með rannsóknum sínum á íslenskum brýnum að miklu meira má lesa út úr þessum luralegu gripum en áður var talið og greining hennar á brýnunum frá Gásum varpar bæði ljósi á hin sterku verslunartengsl við Noreg á síðmiðöldum og hvernig brýni voru flutt inn í blokkum sem síðan voru klofnar á Gásum til dreifingar um sveitir landsins. Hrönn Konráðsdóttir er doktorsnemi við Háskóla Íslands sem hefur sérhæftr sig í greiningu skordýra úr jarðlögum og fornleifum. Rannsókn hennar liggur

[1] H.M. Roberts ed. 2009, *Gásir post-excavation reports.* Volume 1, Reykjavík: Fornleifastofnun Íslands, FS423.

til grundvallar fjölmörgum mikilvægum ályktunum, bæði um notkun einstakra húsa, um nánasta umhverfi Gása, um innfluttan varning eins og korn, um að kvikfé hafi verið rekið á fæti til Gása, en sú niðurstaða kemur einmitt vel heim og saman við niðurstöður rannsókna Ramonu Harrison á dýrabeinum, og um geymslu og vinnslu ýmiskonar efna í búðunum. Sólveig Guðmundsdóttir Beck birtir hér áfangaskýrslu um örformgerðarrannsóknir sínar á gólflögum úr búðunum á Gásum en þær varpa skýru ljósi á notkun búðanna, sem hefur verið árstíðabundin, og styður aðrar vísbendingar um hvar fólk hafðist einkum við og hvar umferð var minni. Þá benda niðurstöður hennar til að mór hafi verið aðaleldsneyti þeirra sem höfðust við í búðunum.

Frá upphafi hefur verið unnið eftir úrvinnsluáætlun og hún endurskoðuð í ljósi nýrra niðurstaðna jafnharðan og þær berast. Sérfræðirannsóknum á gripum er að stærstum hluta lokið, megninniðurstöður dýrabeinagreiningar liggja fyrir en það sem útaf stendur eru einkum smásæjar rannsóknir á efnum sem geta varpað ljósi á innflutning og iðnað.

Alþingi hefur frá upphafi styrkt rannsóknirnar á Gásum en 2010 fékkst ekki styrkur og hefur það dregið verulega úr hraða úrvinnslunnar en þó hefur eftir föngum verið reynt að halda verkinu áfram svo að ekki slitni uppúr. Grátlegt væri ef þessi mikilvæga rannsókn dagaði nú uppi þegar svo lítið vantar upp á að henni megi ljúka.

Part One

Thin Section Micromorphology of Samples from Gásir

Sólveig Guðmundsdóttir Beck

Thin Section Micromorphology of Samples from Gásir

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Introduction

As the excavation at Gásir is now finished extensive post excavation work is underway. Artefact conservation and classificaton, study of faunal and insect remains, analysis of industrial residues and myriads of other detailed analyses of samples and data are important in order to understand the full extent of all the different activities that took place at this important trading site. Micromorphology is one of the methods being used to achieve this goal. Micromorphology is the microscopic study of soils and sediments where the component parts, or contexts, remain undisturbed. A 30 µm thick thin section is mounted on a glass slide and analyzed with a polarizing microscope. Such sections can provide information which is usually not visible to the naked eye such as soil texture, distribution of micro-artifacts, pedoturbation and microstratigraphy (Rapp and Hill, 2006). In rooms and areas within the trading booths at Gásir, that could be suggested as dwelling and/or meeting spaces, extremely complex sequences of floor deposition, repeated hearth placement and re-use were recorded. In a few areas where an especially complex build up of materials was observed samples were taken for micromorphological analysis (Roberts et al 2006). Initial observations and analysis of these samples are the main focus of this report.

Sampling

The micromorphology samples were taken from three bulk sections in the years 2005 and 2006 by Dr. Karen Milek. The samples were removed from the soil in Kubiena tins, rectangular aluminum boxes, to make sure the soil structure remained intact and then wrapped securely to prevent loss of water during storage and transport (figure 1). The sampling method is described in Courty et al. (1989).

Five samples were taken in 2005 from

Figure 1 - Samples 05-06 to 05-08 taken in central living area [1766], picture taken to the west.

Figure 2 - Samples 05-39 and 05-40 taken in central living area [2396], view to the south.

two bulk sections where floor deposits are thought to have accumulated in a possible central living area. Samples 05-06 to 05-08 (figure 1) were taken from an area about 3 m east of booth [2397]. Samples 05-39 and 05-40 (figure 2) were taken from an area about 2 m east of booth [2396]. Weather there was roofing over these areas is unclear.

In 2006 five samples 06-34 to 06-38 were taken from a bulk section in booth [2397] in the southwest corner of area A (figure 3). Three distinct occupation phases were identified inside the booth (figure 4). Phases 1 and 3 were sequences of trampled floors and peat ash layers indicating possible seasonal occupation periods. Samples 05-35, 05-36 and 05-38 were taken from phase 1 and samples 06-34 and 06-37 were taken from phase 3. A stonebuilt hearth was in the north corner of the booth but it seems to have been in use only during phase 1. Phase 2 was a clear episode of sand, turf collapse and stone deposition, indicating a short period of temporary disuse or seasonal abandonment. No samples were taken from that sequence.

Figure 3 - Bulk section in booth [2397], hearth clear in the north corner.

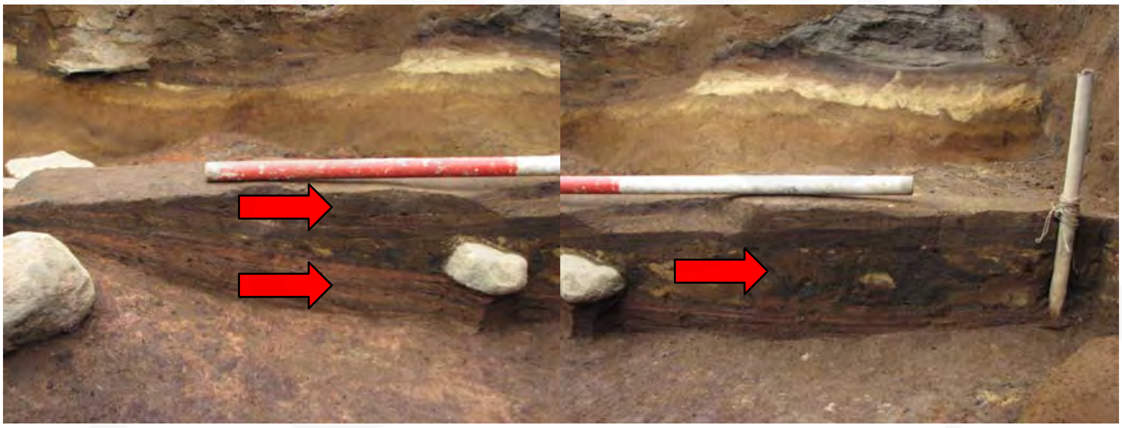

Figure 4 - North-south bulk section in booth [2397], pictures taken to the east, phase 1 bottom left arrow, phase 2 right arrow, phase 3 top left arrow.

Methodology

The samples were processed at the Laboratory of Mineralogy, Petrology and Micropedology at Ghent University in Belgium. The methods used at Ghent University are a compilation of more than 40 years of experience of the Soil Thin Section Laboratory under the direction of Prof. George Stoops. Detailed descriptons of sample preparations and their development can be found in the paper *Guidelines for Preparation of Rock and Soil Thin Sections and Polished Sections* by Clement A. Benyarku and Prof. George Stoops (2005). A general description of the process can be read below.

To begin the process water is completely removed from the soil blocks by air drying or acetone replacement. Samples are impregnated with unsaturated polyester resin under vacuum and must be given five to six weeks to allow gradual gelling and polymerisation. Full curing to hard plastic blocks is achieved by heating the samples for 5-7 days at 40°C in an oven. Sections of the hardened blocks are then fastened with resin to glass slides and presectioned to about 2 mm with a trimsaw. The sections are then ground down to 30 µm or less on a automatic abrasive disk. Finally the thin sections are covered with thin glass cover slips also attached with resin.

The thin sections were first examined with the naked eye and then analysed with a polarization microscope at magnificatons ranging from x40 to x400 in plane-polarized light (PPL), cross-polarized light (XPL) and oblique-incident light (OIL). The sections were described using standardised descriptive terminology provided by Bullock et al. (1985) at x40 magnification.

Preliminary Analysis

Thin section 36

Thin section 36 has already been analysed and described (figure 5). A summary of important features and preliminary interpretation can be seen in table 1. A detailed thin section description can be found in appendix 1.

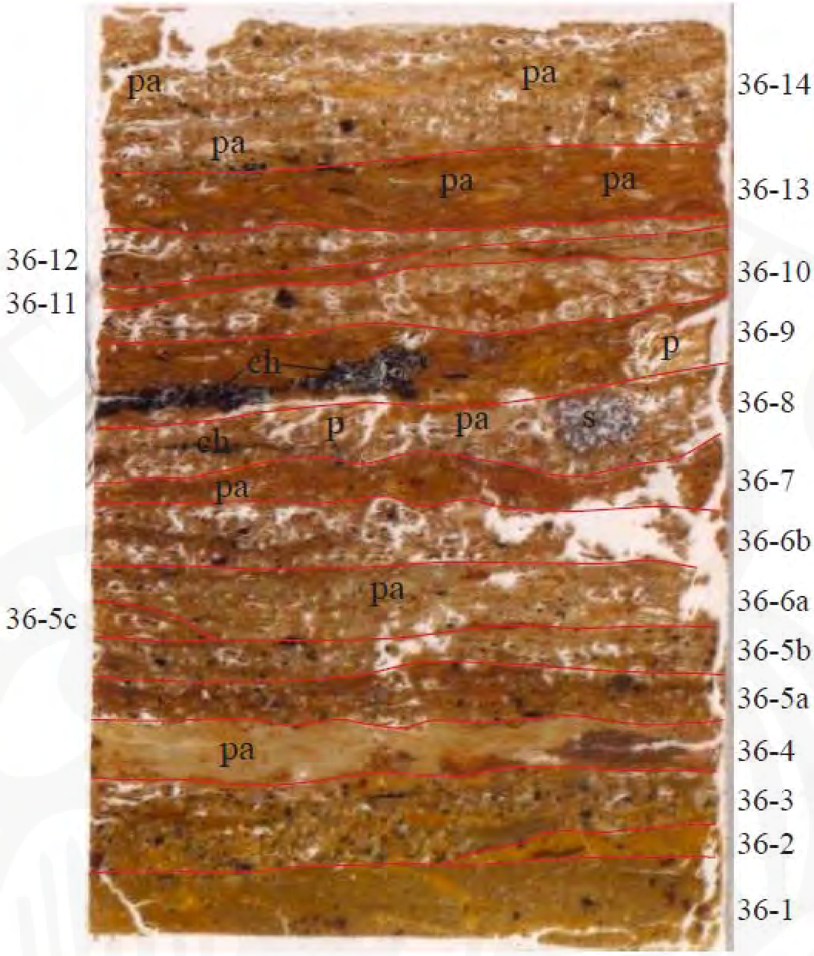

Figure 5 – Thin section 06-36 from phase 1 in booth [2397], pa = peat ash, p = peat, ch = charcoal, s = non-metallurgical slag,

Thin sections 6, 7 and 8 (figure 6)

Thin section 6: About 4 layers were identified. This section will most likely not be examined further as preliminary analysis indicated extensive reworking of the soil. Bottom layer 1 is heavily reworked silt loam with globules of melted silica, diatoms and phytoliths. Soil rich in peat/peat ash. Layer 2 is a reworked sandy soil with little if any anthropological inclusions. Layer 3 (context [1851]) is a lens of silt loam rich in gray plant and/or turf ash, heavily reworked by worm action evident by large worm channels and excrement. Pockets and lenses of undisturbed peat ash, at different burning stages and mineral content, and globules of melted silica are common. Layer 4 (context [1840]) is seemingly pure silt loam.

Thin section 7: About 12 layers were identified with boundaries much clearer than in section 6. The layers are all mixtures of silt loam and sandy silt with pockets and lenses of peat and/or peat ash in different stages of burning and decomposition. The bottom four layers (context

Context	Important Features	Interpretation
36-1	Thickness +7 mm, lower boundary unknown, matrix mostly composed of silt, small crystal fragments (mostly plagioclase), tephra grains and volcanic glass, slight iron staining of groundmass <2%, organic staining rare, a few lenses and pockets of material similar to 36-2 within layer, no anthropological inclusions.	Natural soil, most likely reworked by soil organisms.
36-2	Thickness 1-4 mm, lower boundary clear, irregular, sedimentological, upper boundary of 36-2/36-3 the same, matrix mostly natural redish brown silty clay loam (see 36-1) compacted crumb structure, peds weakly to moderately stained with iron 2-5%, no anthropological inclusions.	Natural soil, most likely heavily reworked by soil organisms.
36-3	Thickness 4-9 mm, lower boundary of 36-3/36-1 is diffuse to clear, irregular sedimentological, matrix mostly composed of silt, lava and tephra fragments, crystal fragments (mostly plagioclase) and volcanic glass, very few anthropolocial inclusions most likely from layer 36-4 or immediate area. Mild iron-staining within peds similar to peds in 36-2, 5-10%, layer has been disturbed towards the left of the thin section where it is a mixture of layers 36-1, 36-2 and 36-3, iron staining mostly concentrated in that area.	Natural soil, disturbed, possibly by soil organisms or human activity, possible levelling layer, vegetation cover most likely removed during the contruction of the building.
36-4a	Thickness 4-5 mm, lower boundary clear, wavy anthropic, rare organic staining, rich in phytoliths and diatoms with their structure mostly intact (structure loss at 800°C), still some charred organic material present.	Virgin floor, peat ash, well burned at low temperature, most likely one dumping event.
36-4b	Large aggregate in lense 36-4a towards the right end of the thin section, heavy organic staining, burned soil and organic material dark brown to black in PPL, bright orange in OIL, diatoms and phytoliths mostly intact, no identifiable wood charcoal fragments.	Burned soil and plant material, most likely poorly burned peat, low temperature.
36-4c	Large aggregate in lense 36-4a towards the right end of the thin section, mild organic staining, rich in non-metallurgical slag, slag mostly melted/deformed phytoliths and diatoms (structure loss at 800°C).	Peat or herbaceous plant ash, possibly burned at temperatures within the range of a cooking fire.
36-5a	Thickness 3-5 mm, lower boundary clear, wavy/irregular anthropic, some sand and tephra grains show signs of rubification around the edges and/or the whole way through (dark/blackish red and glittery in OIL), matrix consists of burned soil fragments (rubified/orange brown in OIL), volcanic glass and melted silica, small crystal and volcanic rock fragments and tephra grains, all plant and organic material is burned black and/or decomposing with longer strands aligned strongly parallel to boundary, phytoliths, diatoms and non-metallurgical slag (melted silica) are mostly in small pockets and thin lenses of peat ash (see description 36-4a).	Floor layer, made up of materials discarded and/or spread from the hearth and natural soil, fuel most likely peat and possibly plant material.
36-5b	Thickness 2-3 mm, lower boundary diffuse to clear, seen best in OIL due to rubification of layer 36-5a, straight to mildly wavy anthropic, orange-red iron and brown organic staining of matrix very mild, phytoliths, diatoms and non-metallurgical slag (melted silica) are mostly in small pockets and thin lenses of peat ash (see description 36-4a), wood identified mostly bark (phlobaphene containing tissue), aggregates (2-5%) are dark brown badly burned peat fragments (bright orange in OIL, diatoms and phytoliths visible within) and rubified soil aggregates and sandgrains that also show heavy rubification in OIL.	Floor layer, made up of materials discarded and/or spread from the hearth and natural soil, fuel most likely peat and possibly plant material.
36-5c	Thickness 1-2 mm, only about 12 mm in length in thin section, lower boundary clear, straight to wavy anthropic, for description and features see 36-5b.	Floor layer, possibly truncated, very similar to 36-5b and 36-6.
36-6a	Thickness 3-6 mm, lower boundary diffuse, irregular anthropic, hard to identify lower boundary as layer 36-5b is very similar to 36-6, 20-30% of layer is lenses and/or pockets of peat ash (see description 36-4a), a few small aggregates of decomposing unburned peat (spongy, redish brown, diatoms clear), one large badly burned peat aggregate (redish brown (PPL), bright orange (OIL), layered, diatoms visible), plant remains mostly roots and leaves or unidentifiable, small fragments of bark/phlobaphene containing tissue visible, only a burned fragment of fungal sclerotia indentifiable in the burned organic matter, red iron and brown organic staining of matrix very mild.	Floor layer, made up of materials discarded and/or spread from the hearth and natural soil, layer could be 1-2 lenses of similar material but it´s hard to tell as layer has possibly been partially reworked by worm action and possible frost weathering.
36-6b	Thickness about 5 mm, lower boundary clear, a few sand grains show signs of burning <2% along side clear burned soil aggregates 2-5% of matrix = rubified in OIL, plant material moderately to strongly decomposed, wood fragments mostly bark/phlobaphene containing tissue, aggregates of unburned and slightly burned decomposing peat 2-5%, very mild organic staining, chambers most likely worm holes/channels, organic staining very mild.	Floor layer, layer could be 1-2 lenses of similar material, mixture of soil, fragments of burned soil, decomposing plant material and peat ash, reworked by soil organisms and possibly modified by frost weathering.
36-7	Thickness 2-5 mm, lower boundary clear, wavy anthropic, a mixture of natural soil, burned soil fragments and peat ash with pockets and lenses of pure peat ash (see 36-4), lenses strongly parallel to boundary, diatoms and phytoliths mostly intact in pockets and lenses of peat ash, a few globules of melted silica and deformed diatoms and phytoliths scattered within the layer, no identifiable plant material.	Floor layer, made up largely of materials discarded and/or spread from the hearth and natural soil, fuel most likely peat and possibly plant material.
36-8a	Thickness 4-6 mm, lower boundary clear, wavy anthropic, layer contains; slithers of decomposing unburned peat (10-20%) = strongly decomposed plant/organic material and partially intact phytoliths and diatoms, a lens (5-10%) of charred black peat about 0,5 mm in thickness with visible (<2%) phytoliths and diatoms and a clear lens of clean peat ash (see 36-4a) about 1-1,5 mm in thickness with a sharp wavy anthropic boundary 10-20%, wood fragments mostly phlobaphene containing tissue or bark, plant remains moderately to strongly decomposed, mild organic staining.	Floor layer, very similar to 36-7, possibly been reworked by soil organisms and/or modified by frost weathering.
36-8b	Large vesicular globule of melted redish black non-metallurgical slag.	Non-metallurgical slag, melted silica.

36-9a	Thickness 6-7 mm, lower boundary clear, relatively smooth anthropic, mixture of burned soil and peat ash with gray, grayish- and blackish-brown pockets and lenses of pure peat ash (see 36-4a), lenses strongly parallel to boundary, diatoms and phytoliths mostly intact in pockets and lenses of peat ash, a few globules of melted silica and deformed diatoms and phytoliths scattered within the layer, no identifiable plant material, 3-4 subangular aggregates of dark redish brown burned soil, ultra fine, bright orange and dotted in OIL <2%.	Floor layer, largely made up of materials discarded and/or spread from the hearth, peat ash lenses in a mixture of soil, burned soil fragments and peat ash.
36-9b	Thickness 1-4 mm, 27 mm in length in thin section, boundaries clear, irregular wavy anthropic, black lens of charred peat/organic material within 36-9a (<550°C), no rubification of grains or matrix, black with a glittery aspect in OIL, most aspects of the lens are masked by charred organic material.	Most likely a single dumping event of charred peat on the floor of the pit.
36-10	Thickness 3-5 mm, lower boundary clear, mildly wavy anthropic, mixture of peat ash, unburned decomposing peat fragments (2-5%) and soil, small lens of peat ash (see 36-4) 2-5%, organic material moderately to strongly decomposed, diatoms and phytoliths are mostly in pockets and lenses of peat ash but also in small amounts in the matrix, their silica sceletons mostly intact although globules of melted silica can be found scattered in the matrix and within the peat lenses, very mild organic staining	Floor layer, very similar to 36-9a, possibly been reworked by soil organisms and/or modified by frost weathering.
36-11a	Thickness 1-2 mm, about 2,5 cm long in thin section, lower boundary clear, mildly wavy anthropic, organic staining rare, small fragments of burned soil and organic material.	Floor lens of peat ash very similar to 36-4a, most likely a single dumping event.
36-11b	Thickness 1-2 mm, about 2,4 cm long in thin section, lower boundary clear, mildly wavy anthropic, with <2% small pockets/lenses of 36-11a, very mild organic staining, small fragments of burned soil and organic material.	Floor lens of peat ash, most likely a single dumping event.
36-12	Thickness 1-4 mm, lower boundary clear, mildly wavy anthropic, fine matrix a mixture of silt, burned soil, pockets and lenses of peat ash, traces of volcanic glass, crystal fragments and sand and tephra grains, diatoms and phytoliths mostly in one lens of peat ash (see 36-4a and b) but also in trace amounts in matrix, larger tephra grains and sand particles are rubified in OIL (<2%) due to burning, wood fragments mostly phlobaphene containing tissue or bark, two slightly charred fungal sclerotia within layer, burned bone fragments <2%, organic staining rare.	Floor layer, largely made up of materials discarded and/or spread from the hearth, peat ash lenses in a mixture of soil, burned soil fragments and peat ash, upper section of the layer is more porous possibly due to frost weathering or disturbance from soil organisms.
36-13	Thickness 5-6 mm, lower boundary clear, mildly wavy anthropic, massive compacted layer made up of a mixture of burned soil and peat with lenses and patches of peat ash (see 36-4 and 36-11a and b), very little identifiable organic material, all wood fragments phlobaphene containing tissue or bark, larger sand and tephra grains show rubification due to fire <2%, small lens of yellowish brown silt with black tephra grains and small crystal fragments, 0,5 mm in thickness close to upper boundary, matrix shows no rubification, dark gray in OIL, while larger black tephra grains are glittery orange, 2-5%.	Floor layer, largely made up of materials discarded and/or spread from the hearth, peat ash lenses in a mixture of soil, burned soil fragments and peat ash.
36-14	Thickness + 12 mm, lower boundary clear, mildly wavy anthropic, upper boundary unknown, diatoms and phytoliths mostly intact in lenses and patches (see 36-4a), lenses 200-1000 µm in thickness, very mild organic staining, fine matrix a mix of phytoliths, diatoms, tephra grains, volcanic glass and small crystal and lava fragments, larger lava fragments show slight rubification due to burning, two larger aggregates of redish black burned soil 5-10%, bright orange and black in OIL.	Floor layer, largely made up of materials discarded and/or spread from the hearth, peat ash lenses in a mixture of soil, burned soil fragments and peat ash, little compaction by trampling.

Table 1 – Thin section 36, preliminary interpretation

[1851]) are clear as iron panning has accumulated at the boundaries between layers. Iron staining of groundmass is common. Worm activity is evident in layers 5,7, 9 and 12. In layers 6 to 11 there are lenses and pockets of pure peat ash, melted silicates, charcoal and some burned bone. Signs of rubification are visible here and there in the soil and in larger sandgrains.

Thin section 8: About 11 layers were identified. Layer 1 is silt loam reworked by worm action with pockets of peat ash and fragments of charcoal and melted silica. Layer 2 is a mixture of silt loam, peat ash, bone and charcoal with a large basalt fragment within layer, most likely tholeiite. Layer 3 is composed of many dark and blackish brown lenses of poorly burned peat or turf and poorly and well burned peat ash. Layer has possibly been truncated. Layer dark gray, black and dark brown in OIL, patches of rubified material within. Layers 4, 5, 7, 8 and 9 very smiliar to layer 1. Layer 6 is sandy silt with a few sand grains showing signs of rubification. Few anthropological inclusions. Layers 10 and 11 are silt loam rich in blackish brown peat ash. Worm activity is present. In the upper layers there is little sign of rubification but a few flecks and sandgrains here and there in the lower layers.

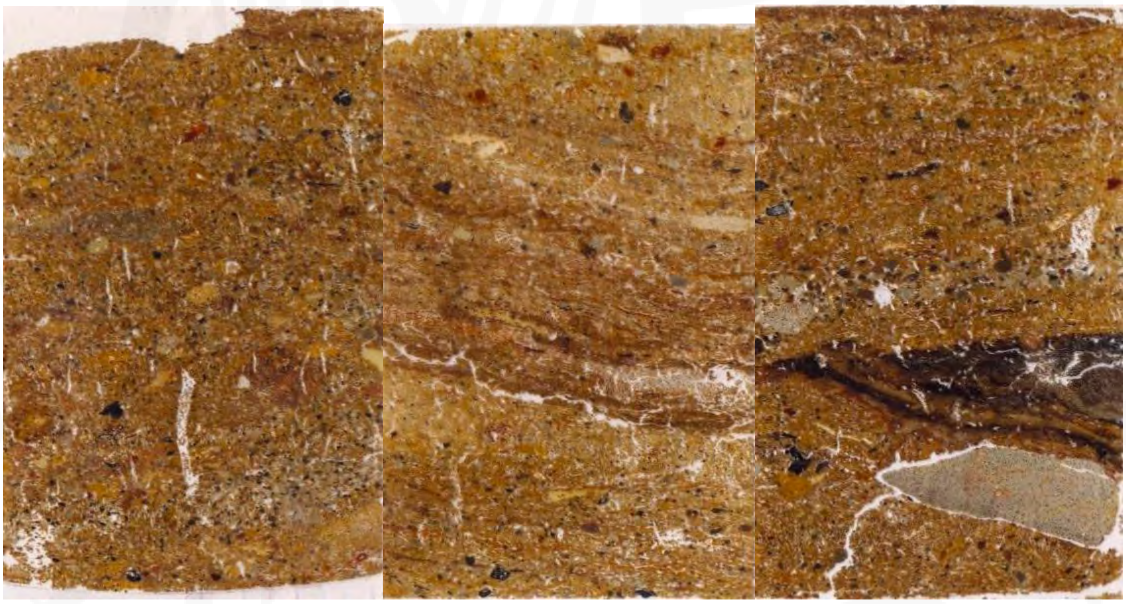

Figure 6 - Thin sections 05-06 (left), 05-07 (center) and 05-08 (right) from central living area [1766] east of booth [2397]

Thin sections 39 and 40 (figure 7)

Thin section 39: About 8-10 layers identified in section. Layer 1 (context [2201]) is mixed silt loam with peat ash and/or organic rich turf ash lenses and fragments as well as some burned soil and decomposing organic material. Layers 2-4 (context [2176]), see thin section 40.

Layers 5 and 6 (context [2164]) are silt loam mixed with a little peat ash and charcoal. Possible trampling surface at upper boundary. Layers 7-10 (context [2125]) are layers of organic rich turf ash and/or peat ash lenses, fragments of unburned bone, charred plants (wood) and calcined bone. Also some unburned plant/wood remains and a few lenses rich in silica slag. Very mixed layer with little or no evidence of trampling.

Thin section 40: About 11 layers identified in thin section. Layers 1 and 2 (context [2253]). Layer 1 is reworked orange brown silt loam. In layer 1 there are a lot of fungal spores but little or no charcoal fragments. Layer 2 is similar to [2259] but more compacted and blackish brown in OIL due to organic staining and/or ash, charred slightly rubified peat and or plant material present. Possibly compacted. Layer 3 (context [2259]) is sandy silt loam, soil mostly unburned but burned soil mixed in here and there. Lenses and pockets of peat and/or peat ash within the soil. Layer is rich in plant material, burned wood and a few small fragments of burned bone. The only layer with many large fragments of wood charcoal. Little or no compaction is detectible. Layers 4, 5 and 6 (context [2201]). Layer 4 is a lense of peat ash, blackish brown with large fragments of charred peat. In layer 5 most visible phytoliths and diatoms are intact. Burned soil (bright orange layer in OIL) clear in the layer as well as.large fragments of calcined bone and globules of melted silica. No compaction. Most likely peat ash or organic rich turf ash. Layer 6 contains about 30% charred peat and a large redish black fragment of unburned peat <30-40%. Layers 7 and 8 (context [2189]). Layer 7 is a mixture of peat ash and burned soil. Material ranges from pure silica lenses to badly charred/burned peat along with pockets of melted silica. Little or no compaction. A few large fragments of charred peat. Layer 8 is a mixture of peat ash and/or turf ash with fragments both laterally and horizontally aligned to boundary. No compaction. Possibly disturbed. Layer 9 (context [2185]) is badly burned black peat fragments along with lenses of peat ash and charcoal fragments. Mild iron staining. Layer 10 (context [2176]) is made up of many dumps of peat ash at different burning stages with one large inclusion of completely burned plant ash. Within the layer are large fragments of grass phytoliths and a few diatoms from at least four dumping episodes. Possible truncation at lower boundary 2176/2185. Layer 11 (context [2164]) is sandy silt mixed with melted silica and a few aggregates of peat ash. One large pocket of melted silica with a few damaged but recognisable diatoms present.

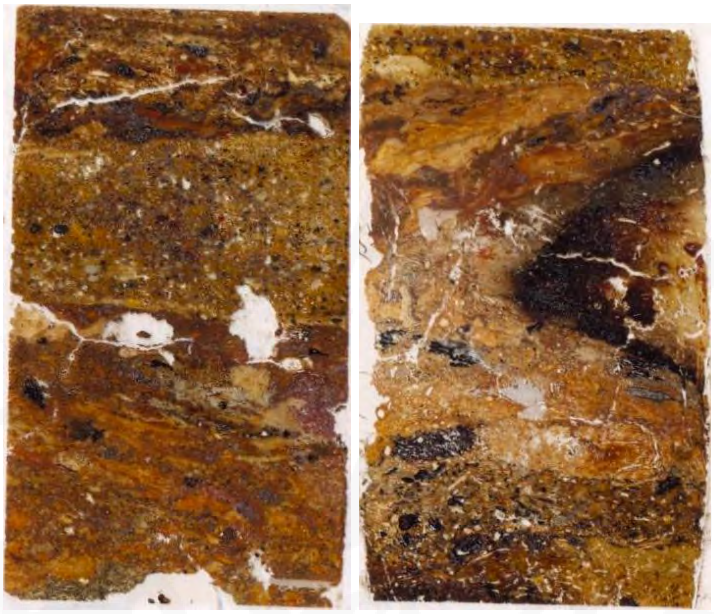

Figure 7 -Thin sections 05-39 (left) and 05-40 (right) from central living area [2396] east of booth [2396]

Thin sections 34, 35, 37 and 38 (figure 8)

Thin section 34: About 17 layers, mostly floor layers, were identified. The layers are mostly brown and dark brown sand and silt loam lenses about 2 – 10 mm in thickness. Charred plant and/or organic material within the layers is very fragmented and mostly unidentifiable. Some sandgrains and tephra in the fine matrix show signs of rubification due to burning. A few unburned peat fragments, peat ash lenses and pockets were identified.

Thin section 35: About 12-15 layers were identified although boundaries were unclear possibly due to rapid accumulation and similarity of material as most of the lenses are peat ash lenses with most phytoliths and diatoms intact. A significant amount of unburned peat was identified within the layers and plant material in different stages of burning as well as burned soil.

Thin section 37: (smilar to 34): About 10 layers were identified of sand and silt loam with very little identifiable plant and organic material. All charcoal is very fragmented and unidentifiable although one birch fragment was identified in layer 6. Diatoms and phytoliths are mostly intact although in layers 5 and 8 they are mostly in the form of melted silica due to burning. Compaction due to trampling is clear as dark lines at boundaries. Little rubification of soil matrix is evident compared to section 34

Thin section 38: About 12 layers were identified of sand and silt loam with pockets and lenses of peat ash, melted silica and unburned peat fragments. Little rubification of the soil due to burning.

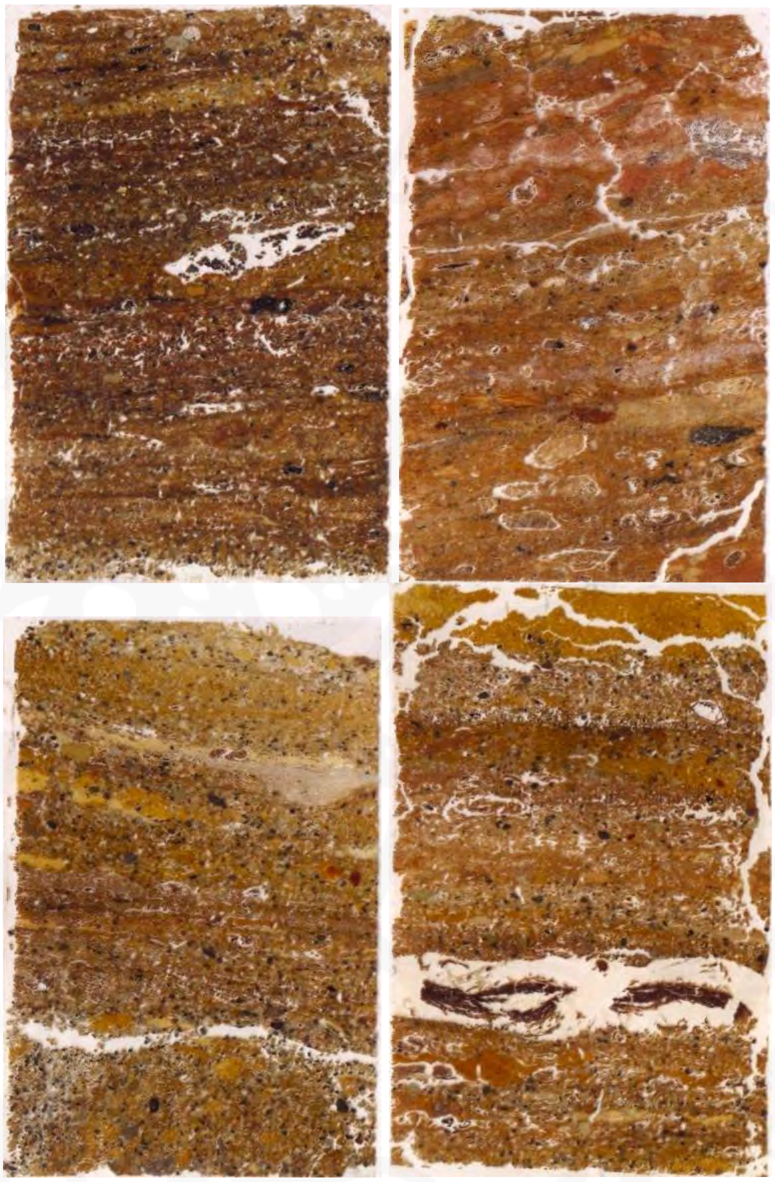

Figure 8 - Thin sections 06-34 (top left), 06-35 (top right), 06-37 (bottom left) and 06-38 (bottom right) from floor sequences in booth [2397]. Samples 35 and 38 from phase 1 and samples 34 and 37 from phase 3.

Conclusions and Further Analysis

In the preliminary analysis about a 110 layers were identified within the 12 thin section samples. Fortunately little disturbance or mixing of layers by soil organisms has taken place in most of the contexts which makes detailed analysis easier. Within booth/pit house [2397] floor layers are fairly clear and are comprised mostly of soil and peat ash lenses or mixtures of the two. The layers are fairly thin and little trampling or organic staining is evident which could suggest short term habitation. Charcoal and plant remains are small and fragmented and little or no wood charcoal has been positively identified. The main fuel appears to have been peat. Within the peat ash sceletons of diatoms and phytoliths are mostly intact which would suggest low temperature burning mostly within the range of a cooking fire.

In the central living areas the soil accumulation is more complicated and has been disturbed in places by soil organisms like worms. In the area east of booth/pit house 2396 there seem to be fuel and soil dumps rather than actual floor layers as they are irregular and little if any trampling is evident. In the area east of booth/pit house 2397 there might be floors in the upper sequence but iron panning at almost every boundary might suggest they were more likely formed outside rather than under a proper roof. Truncation low in the section suggests that before the upper sequence was formed there might have been some sort of cleaning event. The layers underneath the truncation suggest that previously there might have been a building or a shelter as there seem to be floor layers more like the ones in pit house [2397] on top of fairly natural soil.

Further analysis will include a detailed description and interpretation of the remaining thin sections as can be seen in table 1 and appedix 1. Important aspects and inclusions within the contexts will be photographed for emphasis and to aid in the final presentation of the data. A detailed report will be presented at the conclusion of the project.

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Appendix 1 – Thin Section Descriptions, section 36

	Structure		Groundmass						Porosity						Biomin.		Organic Matter							Inclusions					Pedofeat.	
Context and Microstratigraphic Unit	Microstructure	Dominant Orientation/Distribution of Basic Components	Texture Classification	Sorting	Coarse/Fine Ratio (50 µ)	Coarse/Fine Related Distribution	Nature of Fine Mineral Material (PPL & OIL)	Birefringence Fabric (XPL)	Compund Packing Voids	Chambers	Channels and Vughs	Spongy Voids	Vesicles	Planar Voids	Phytoliths	Diatoms	Amorphous (dark brown to black)	Amorphous (light brown to light reddish brown)	Plant remains (<1mm)	Plant remains (1-10 mm)	Wood (<1mm)	Fungal Sclerotia	Fungal Spores	Charcoal (< 1 mm)	Charcoal (1-10 mm)	Bone	Non-metallurgical slag	Aggregates	Amorphous and Cryptocrystalline (iron pans)	Excremental
36-1	massive to weakly platy structure	unoriented, random	silt loam	poor	10:90	porphyric	brown, dotted	undiff. to weakly crystallitic	■		+			■■	+		■	■												+
36-2	compacted crumb structure	unoriented, random	silty clay loam	moderate	5:95	porphyric	redish brown, dotted	undiff.	■■					■	■	+	+	+											■■	
36-3	poorly developed subangular blocky with patches of crumb sturcture	unoriented, random	sandy silt loam	unsorted	25:75	porphyric	brown, redish brown, dotted	undiff. to weakly crystallitic	■■		■■			■■	+	+	■	+						+		+	■		■■■	
36-4a	massive with a few planar voids	unoriented, random, elongated phytoliths/ diatoms moderately horizontal	silt	good	0:100	porphyric	pinkish gray (PPL), silver gray to gray (OIL)	undiff.			+			■■	■■■■■■■	■■■■■	■							■■	■■					
36-4b	weakly developed subangular blocky, peds very to ultra fine	unoriented, random	silt loam	poor	20/80	porphyric	dark brown (PPL), dotted, bright orange (OIL)	undiff.	■■■					■■■■	+	+	■■■							■■■■						
36-4c	massive with a few compound packing voids	unoriented, random	silt loam	moderate	5/95	porphyric	pinkish dark brown (PPL), dotted, orange light brown (OIL)	undiff.	■■						■	+	■							■			■■■■■■			

36-5a	very weakly to moderately developed subangular blocky to very fine granular	mostly unoriented, random, elongated particles horizontal	silt loam	unsorted	10/90	porphyric	dark brown (PPL), dotted, matrix orange brown/rubified (OIL)	undiff. to weakly crystallitic	▪▪	▪▪		+	▪▪	▪▪▪	▪▪	▪		▪				▪▪		▪		
36-5b	weakly to moderately developed subangular blocky to spongy (rare), peds very to ultra fine	mostly unoriented, random, elongated particles horizontal	silt loam to sandy silt	unsorted	15/85	porphyric	gray to brown, dotted (PPL), gray to grayish brown dotted with bright orange silt and sand grains/ burned soil (OIL)	undiff. to weakly crystallitic	▪	▪▪	+	▪▪	▪▪	▪▪▪	▪▪	+	+	▪	▪		+	▪		▪▪	▪▪	+
36-5c	weakly to moderately developed subangular blocky to spongy (rare), peds very to ultra fine	mostly unoriented, random, elongated particles horizontal	silt loam to sandy silt	unsorted	15/86	porphyric	gray to brown, dotted (PPL), gray to grayish brown dotted with bright orange silt and sand grains/ burned soil (OIL)	undiff. to weakly crystallitic	▪	▪▪	+	▪▪		▪▪▪	▪▪	+	+	▪				▪		▪▪		
36-6a	weakly to moderately developed subangular blocky to spongy (rare), peds very to ultra fine	mostly unoriented, random, elongated particles moderately to strongly horizontal	silt loam	unsorted	2/98	porphyric	gray to brown/redish brown, dotted (PPL), silvergray, yellowish brown/brown, dotted w.bright orange silt + sand (OIL)	undiff. to weakly crystallitic	▪	▪	+	▪▪	▪▪	▪▪▪▪▪▪	▪▪▪	+	+	▪	+	+	+	▪		▪	▪▪	+
36-6b	spongy structure, peds irregular, very to ultra fine	mostly unoriented, random, elongated particles strongly horizontal	silt loam	unsorted	2/98	porphyric to mildly enaulic	grayish br., brown (PPL), silvery gray, yellowy brown to dark brown, speckled w.bright orange flecks (OIL)	undiff. to weakly crystallitic	▪	▪▪		▪▪▪	▪▪	▪▪	▪	▪	+	▪▪	▪▪			▪	▪	▪	▪▪	▪
36-7	massive, lensed	unoriented, random, elongated particles moderately to strongly horizontal	silt loam	poor	2/98	porphyric	redish brown, redish dark brown (PPL), silvery gray, yellowish brown, bright orange (OIL)	undiff. to weakly crystallitic	▪	▪	+		+	▪▪▪▪	▪▪	▪	+	+				▪		▪		

36-8a	moderately to well developed subangular blocky to granular, very to ultra fine	unoriented, random, elongated particles moderately to strongly horizontal	silt loam	unsorted	5/95	porphyric to enaulic	gray, brown, redish brown	undiff. to weakly crystallitic	■■	■		■■■		■■■	■■■	■	■	■	■■	■■	■		■			■	+
36-8b	vesicular	strongly horizontal	n/a	n/a	n/a	n/a	redish black (PPL), glittery black, bright orange (OIL)	undiff.					■■■■■■■■													■■■■■■	
36-9a	massive, lensed	unoriented, random, elongated particles moderately to strongly horizontal	silt loam	poor	2/98	porphyric	redish brown, redish dark brown (PPL), silvery gray, yellowish brown, bright orange (OIL)	undiff. to weakly crystallitic	+	■	■			+	■■■	■■	■	+	+				■	■	+	■	+
36-9b	spongy, very fine to ultra fine slightly elongated peds horizontal	unoriented, random, elongated particles moderately to strongly horizontal	n/a	unsorted	n/a	enaulic	black (PPL), black with a glittery aspect, no rubification (OIL)	undiff.	■■■	■		■■■■		■■	+	+							■■■■■■■	■■■		+	
36-10	poorly developed subangular blocky to crumb, very to ultra fine	unoriented, random, elongated particles horizontal	silt	poor	2/98	monic to porphyric	grayish brown, redish brown, dark brown	undiff.	■■	■■ ■		■■		■■■	■■■	■■	■	+	■		■		■	■		■	■
36-11a	massive	unoriented, random	silt	moderate	2/98	porphyric	pinkish gray, dotted (PPL), silvergray to gray, bright orange patches (OIL)	undiff.							■■■■■■	■■■■	■						■			+	
36-11b	massive	unoriented, random	silt	good	0/100	porphyric	redish dark brown (PPL), silver gray, bright orange (OIL)	undiff.							■■■■	■■	+	+					■			+	
36-12	moderately to well developed subangular blocky to granular, very to ultra fine	unoriented, random, elongated particles moderately to strongly horizontal	silt loam	unsorted	10/90	porphyric	dark brown (PPL), silver gray, light brown, bright orange (OIL)	undiff. to weakly crystallitic	■■■	■■		■		■■	■■■■	■■	■	+	■		+	■			■	■	

36-13	massive, lensed	unoriented, random, elongated particles moderately horizontal	silt	poor	2/98	porphyric	dark brown, dark redish brown, yellowish orange brown, grayish brown, dotted (PPL), yellowish brown, silver gray, bright orange (OIL)	undiff. to weakly crystallitic	▪	+			▪▪▪▪	▪▪▪	+	+			+	▪	▪		+	
36-14	moderately developed subangular blocky to granular, peds very to ultra fine	unoriented, random, elongated particles mildly to strongly horizontal	silt loam	poor	2/98	porphyric	gray and grayish brown, dark brown, dotted (PPL), gray, silver gray w.mild yellowish brown + bright orange flecks (OIL)	undiff. to weakly crystallitic	▪▪	▪▪	▪▪	▪▪	▪▪▪▪	▪▪▪	▪	+	+	+	+	▪		+	▪	+

+ precent in trace amounts, ▪ < 2% ▪▪ 2-5%, ▪▪▪ 5-10%, ▪▪▪▪ 10-20%, ▪▪▪▪▪ 20-30%, ▪▪▪▪▪▪ 30-40%, ▪▪▪▪▪▪▪ 40-50%, ▪▪▪▪▪▪▪▪ 50-60%, ▪▪▪▪▪▪▪▪▪ 60-70%

- floor deposits

Part Two

Radiocarbon Certificates – Gásir Area A (Trading booths)

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RADIOCARBON DATING CERTIFICATE

18 November 2009

Laboratory Code	SUERC-26450 (GU-20151)
Submitter	Tom McGovern Dept. of Anthropology Hunter College CUNY 695 Park Avenue NYC 10021 USA
Site Reference	Gasir
Context Reference	2414
Sample Reference	GASOVCAMO2414
Material	Bone : Mandibular Molar
δ^{13}C relative to VPDB	-20.9 ‰
Radiocarbon Age BP	745 ± 35

N.B. 1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

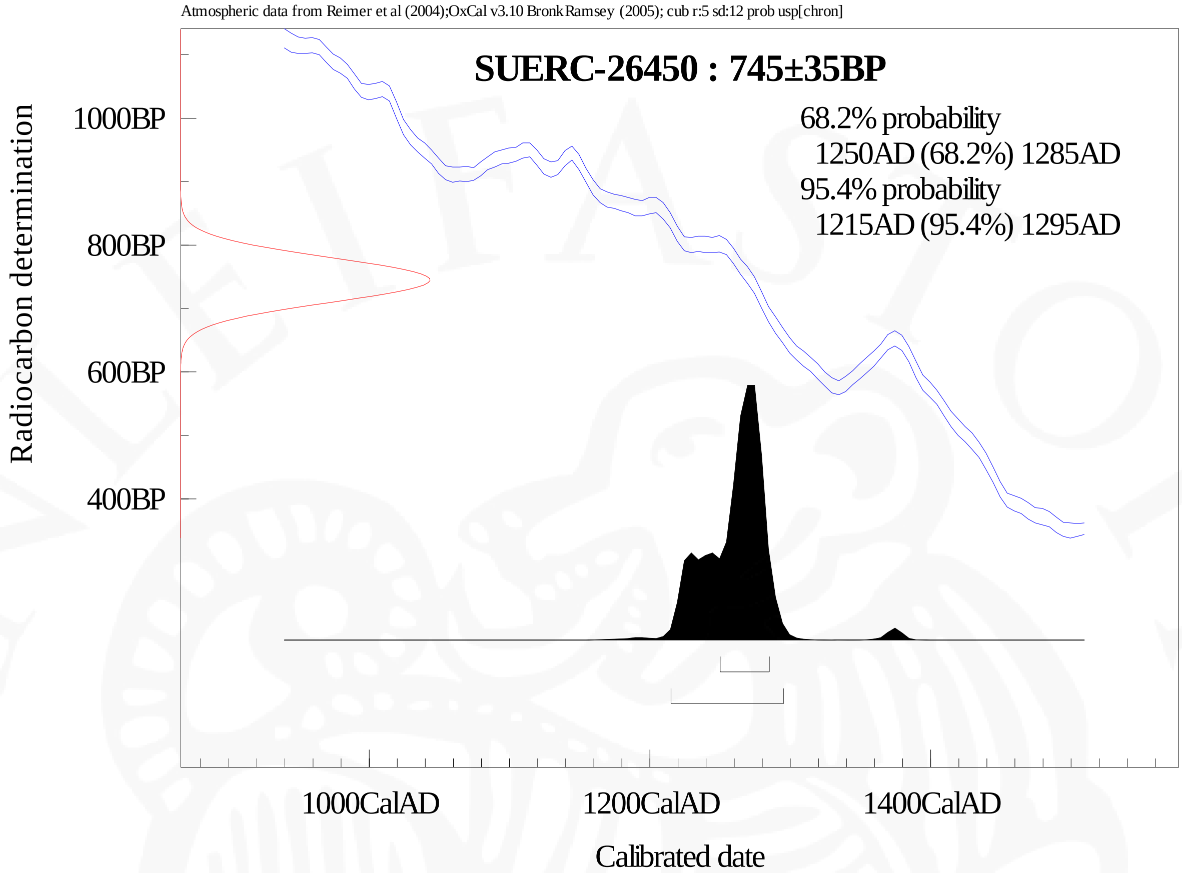
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

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Laboratory Code	SUERC-26451 (GU-20152)
Submitter	Tom McGovern Dept. of Anthropology Hunter College CUNY 695 Park Avenue NYC 10021 USA
Site Reference	Gasir
Context Reference	537
Sample Reference	GASBOSULN537
Material	Bone : Ulna
δ^{13}C relative to VPDB	-21.7 ‰
Radiocarbon Age BP	565 ± 35

N.B. 1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

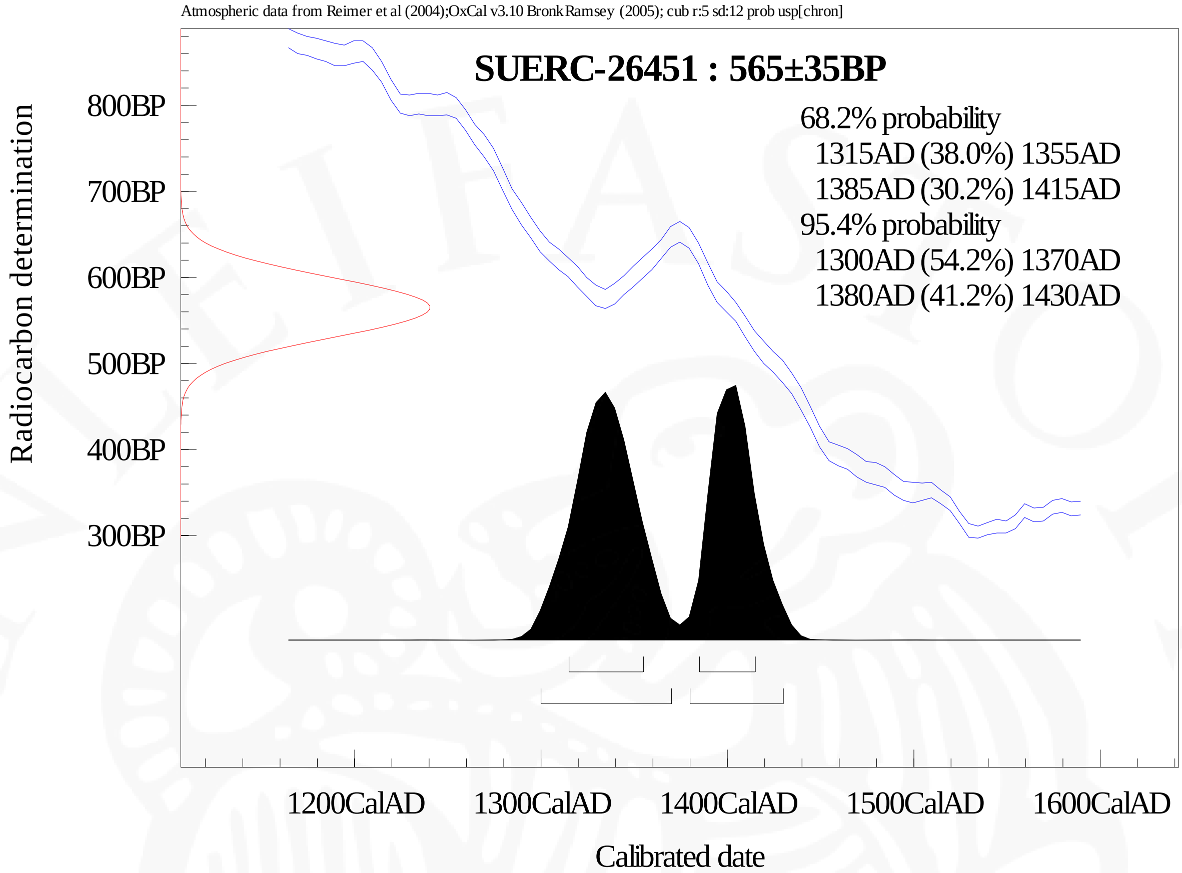
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



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Laboratory Code	SUERC-26452 (GU-20153)
Submitter	Tom McGovern Dept. of Anthropology Hunter College CUNY 695 Park Avenue NYC 10021 USA
Site Reference	Gasir
Context Reference	1557
Sample Reference	GASOVCAINN1557
Material	Bone : Innominate
δ^{13}C relative to VPDB	-21.1 ‰
Radiocarbon Age BP	640 ± 35

N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

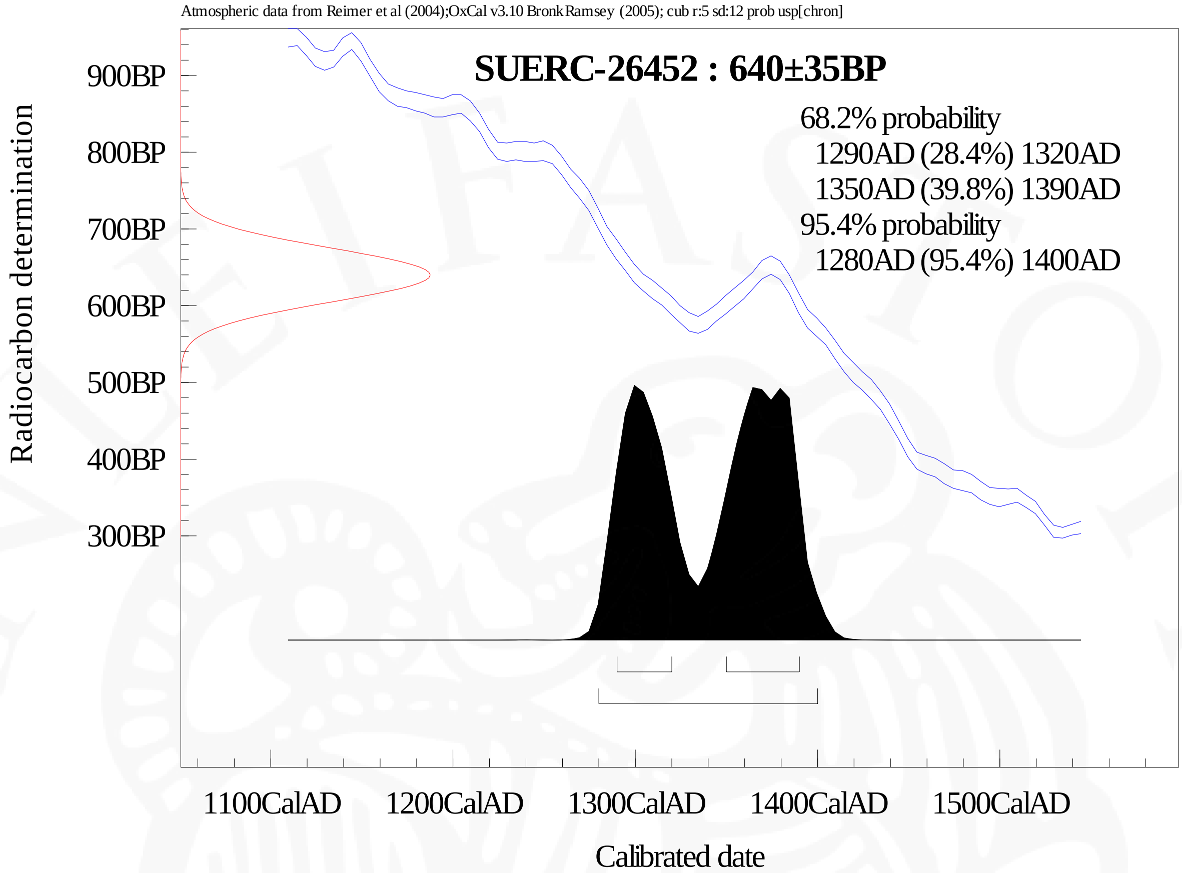
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

18 November 2009

Laboratory Code	SUERC-26456 (GU-20154)
Submitter	Tom McGovern Dept. of Anthropology Hunter College CUNY 695 Park Avenue NYC 10021 USA
Site Reference	Gasir
Context Reference	1978
Sample Reference	GASBOSCAL1978
Material	Bone : Calcaneus
δ^{13}C relative to VPDB	-21.6 ‰
Radiocarbon Age BP	810 ± 35

N.B. 1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

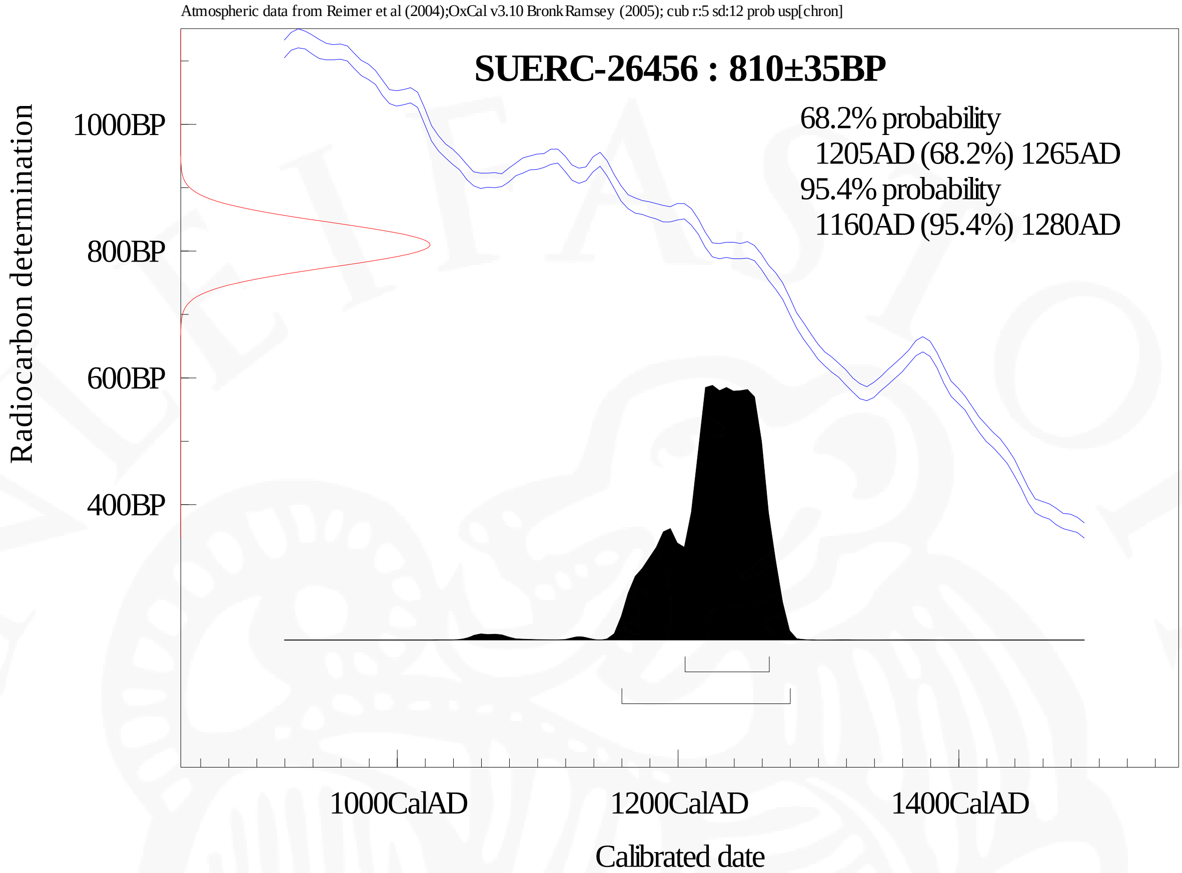
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



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18 November 2009

Laboratory Code	SUERC-26457 (GU-20155)
Submitter	Tom McGovern Dept. of Anthropology Hunter College CUNY 695 Park Avenue NYC 10021 USA
Site Reference	Gasir
Context Reference	2856
Sample Reference	GASOVCAMO2856
Material	Bone : Maxillary Molar
δ^{13}C relative to VPDB	-21.0 ‰
Radiocarbon Age BP	645 ± 35

N.B. 1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

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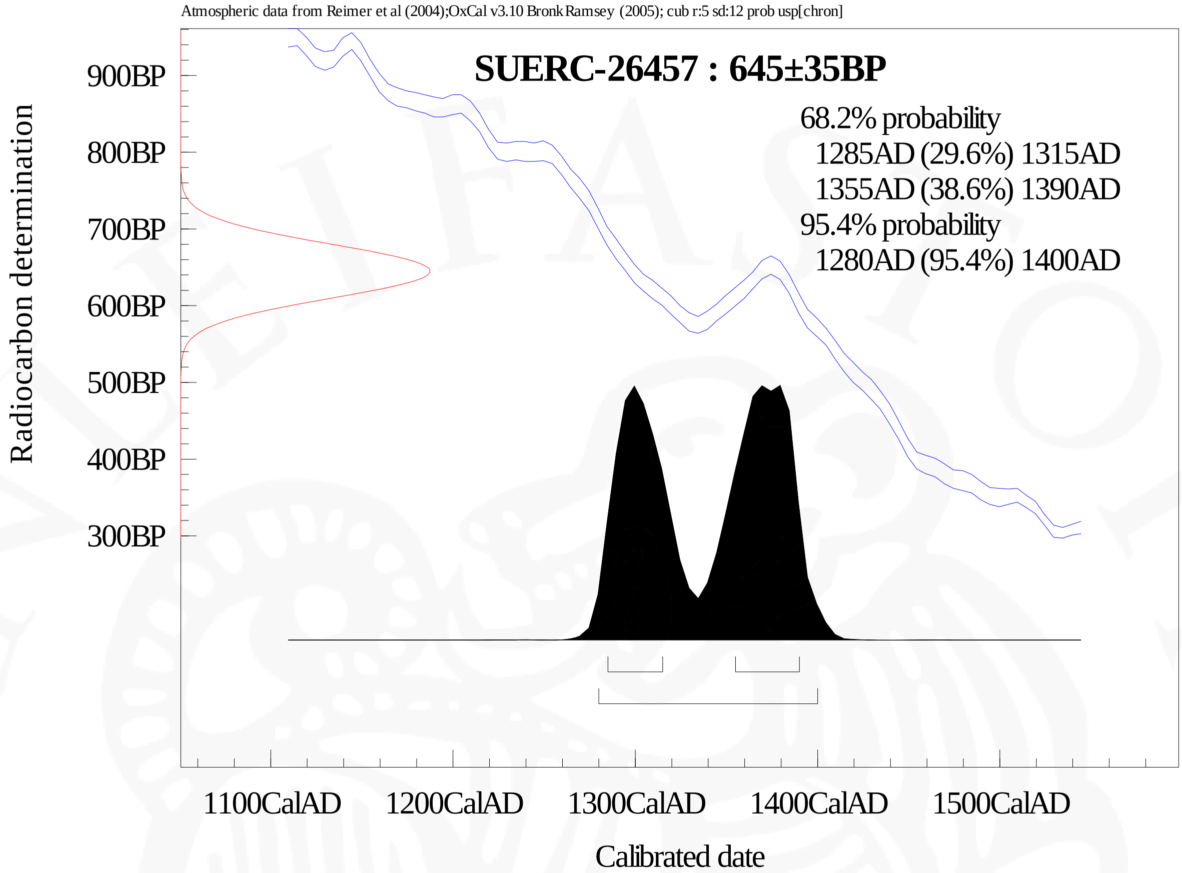
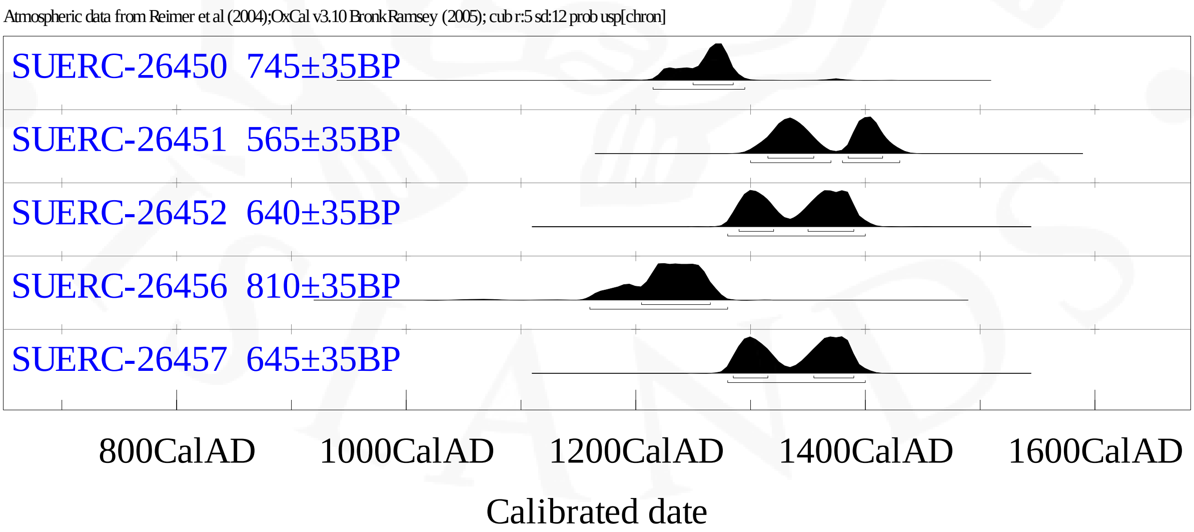
Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot





Part Three

Radiocarbon Certificates - Gásir Area B (Churchyard)

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RADIOCARBON DATING CERTIFICATE

10 February 2009

Laboratory Code	SUERC-22079 (GU-18014)
Submitter	Tom McGovern Dept. of Anthropology Hunter College CUNY 695 Park Avenue NYC 10021 USA
Site Reference	Gasir Area B
Sample Reference	GASOVCAMAN5003 Sample 2
Material	Bone : Mandible
δ^{13}C relative to VPDB	-20.3 ‰
δ^{15}N relative to air	To follow
C/N ratio(Molar)	
Radiocarbon Age BP	645 ± 30

N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

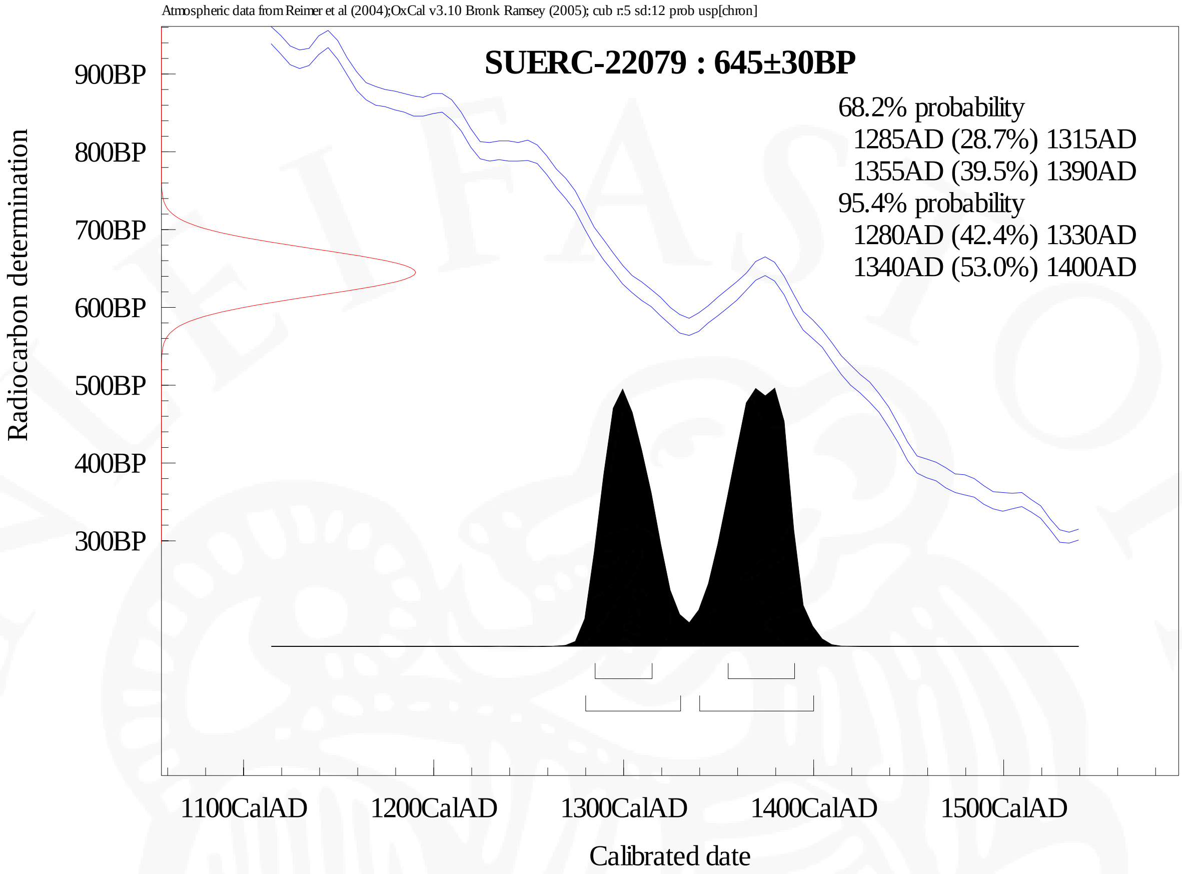
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

10 February 2009

Laboratory Code	SUERC-22080 (GU-18015)
Submitter	Tom McGovern Dept. of Anthropology Hunter College CUNY 695 Park Avenue NYC 10021 USA
Site Reference	Gasir Area B
Sample Reference	GASOVCAPH5126 Sample 4
Material	Bone : PH1 distal
δ^{13}C relative to VPDB	-20.3 ‰
δ^{15}N relative to air	To follow
C/N ratio(Molar)	
Radiocarbon Age BP	765 ± 30

N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

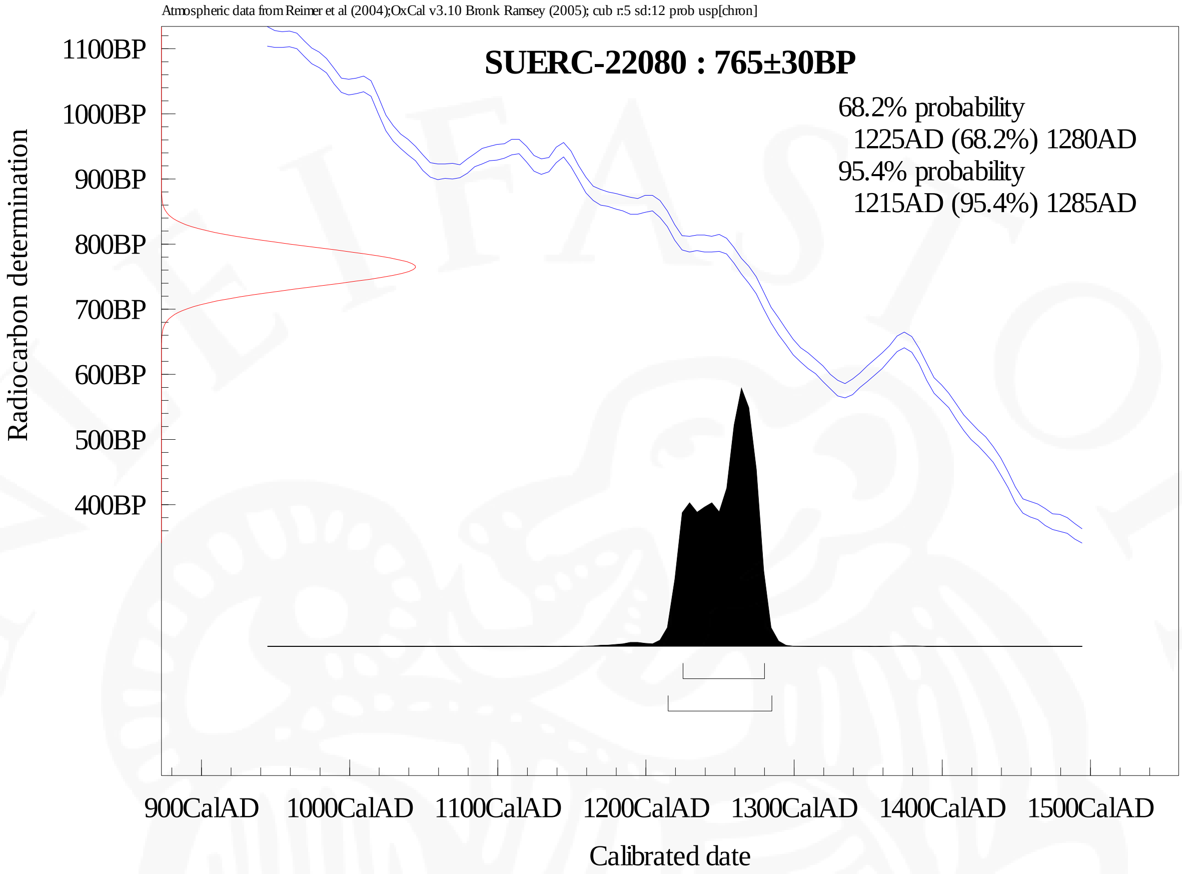
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

10 February 2009

Laboratory Code	SUERC-22081 (GU-18016)
Submitter	Tom McGovern Dept. of Anthropology Hunter College CUNY 695 Park Avenue NYC 10021 USA
Site Reference	Gasir Area B
Sample Reference	GASBOSMO5192 Sample 6
Material	Tooth fragments : Bos molar
δ^{13}C relative to VPDB	-22.2 ‰
δ^{15}N relative to air	To follow
C/N ratio(Molar)	
Radiocarbon Age BP	760 ± 30

N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

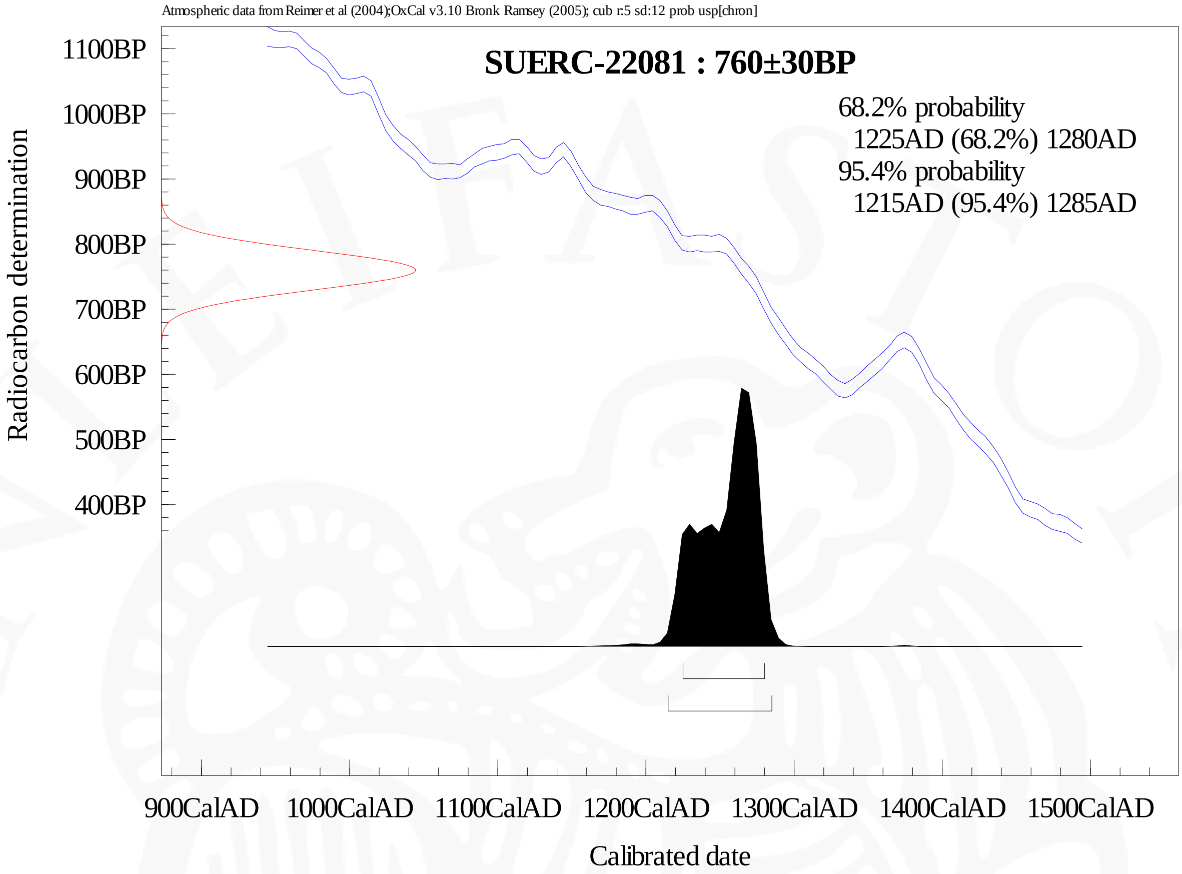
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

10 February 2009

Laboratory Code	SUERC-22082 (GU-18017)
Submitter	Tom McGovern Dept. of Anthropology Hunter College CUNY 695 Park Avenue NYC 10021 USA
Site Reference	Gasir Area B
Sample Reference	GASBOSFEM5224 Sample 9
Material	Bone : Bos femur, distal
δ^{13}C relative to VPDB	-21.5 ‰
δ^{15}N relative to air	To follow
C/N ratio(Molar)	
Radiocarbon Age BP	765 ± 30

N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

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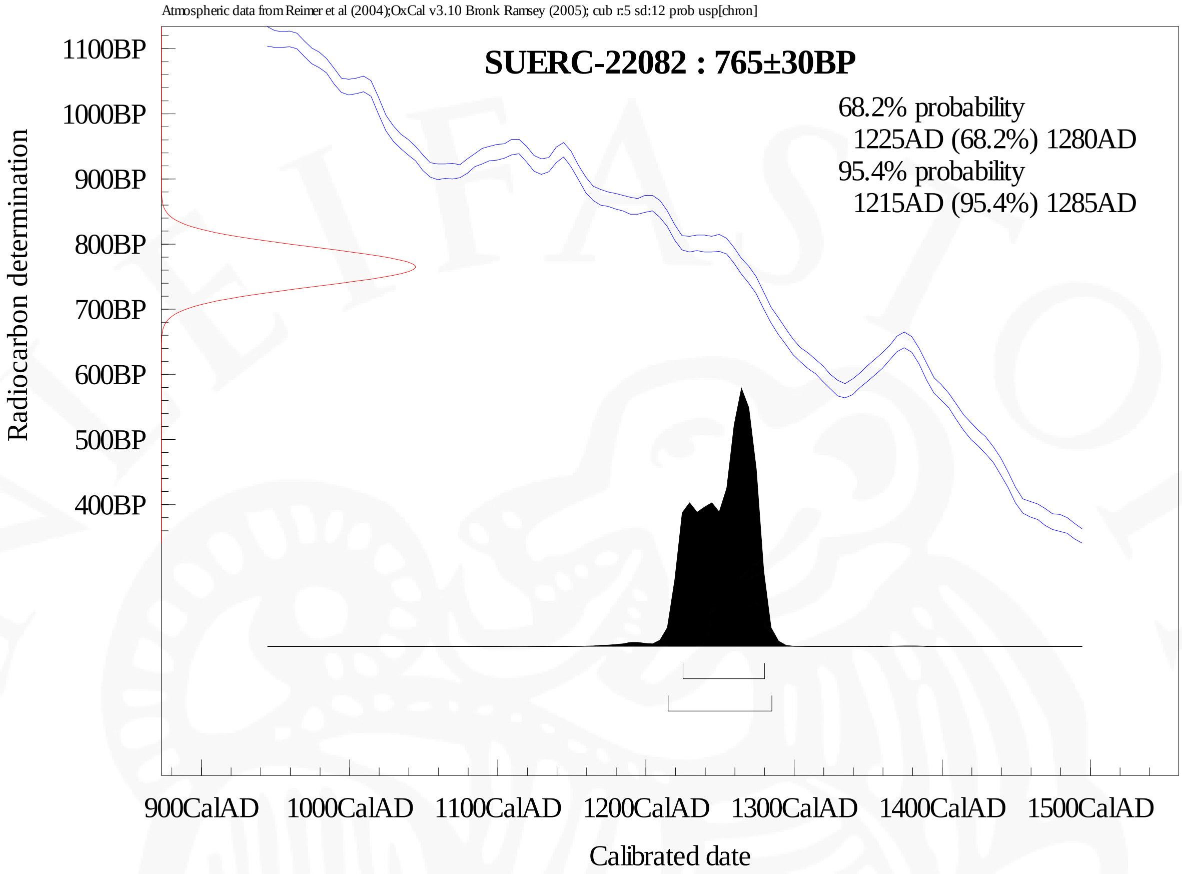
Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

10 February 2009

Laboratory Code	SUERC-22083 (GU-18018)
Submitter	Tom McGovern Dept. of Anthropology Hunter College CUNY 695 Park Avenue NYC 10021 USA
Site Reference	Gasir Area B
Sample Reference	GASOVIHUM5146 Sample 10
Material	Bone : OVI HUM
δ^{13}C relative to VPDB	-20.8 ‰
δ^{15}N relative to air	To follow
C/N ratio(Molar)	
Radiocarbon Age BP	830 ± 30

N.B. 1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

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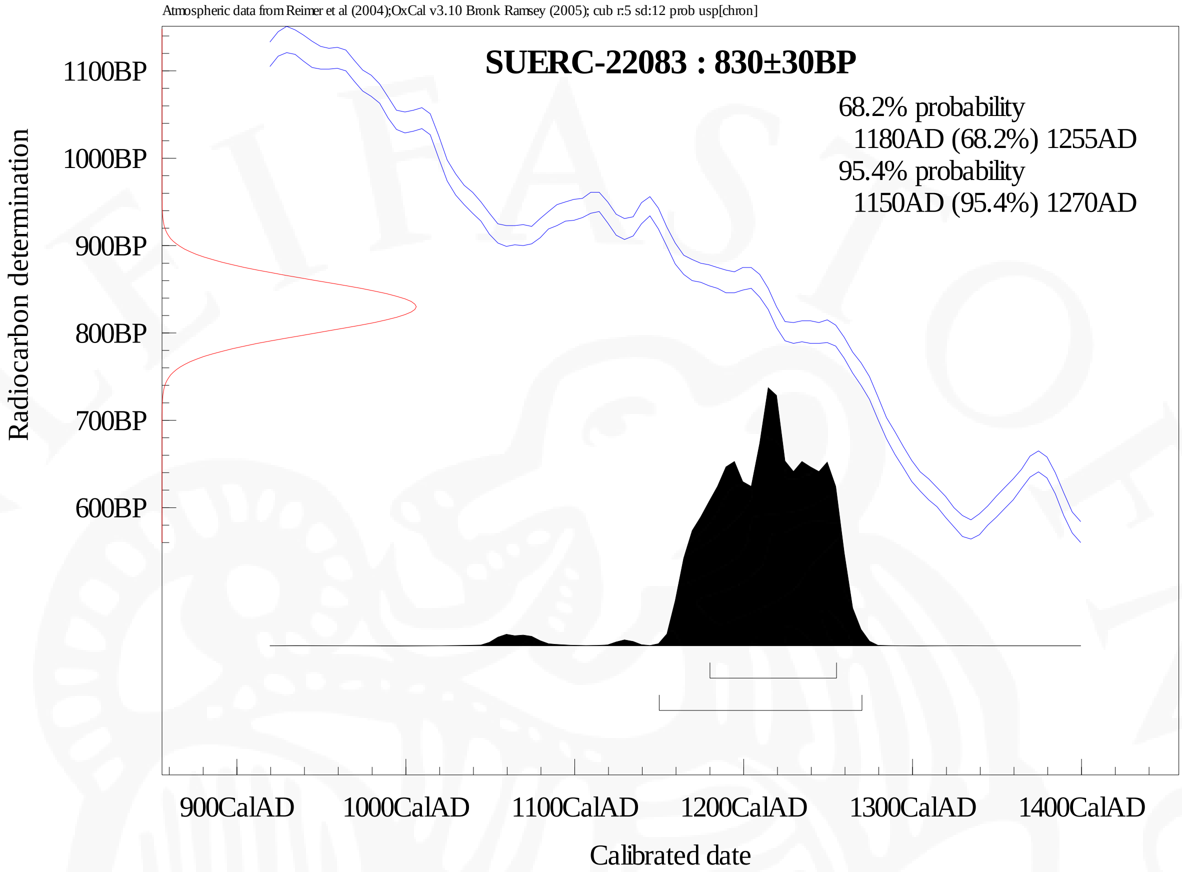
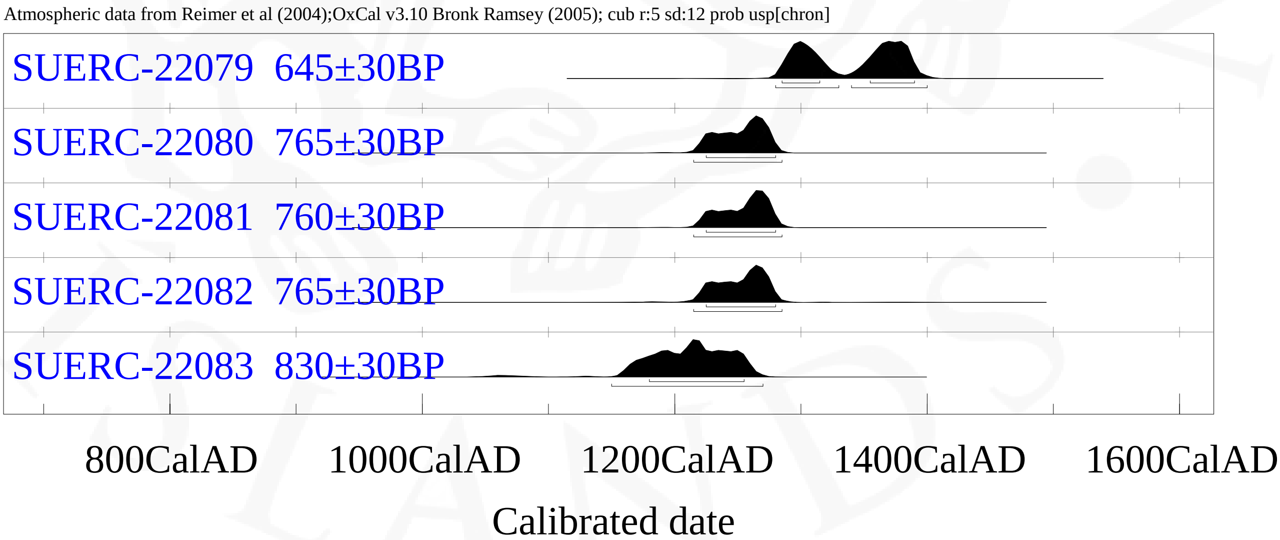
Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot





Part Four

Summary of Leather artefacts from Gásir

Quita Mould - June 2010

Summary of Leather artefacts from Gásir

Quita Mould - June 2010

Introduction

To date 28 bags of leather have been examined from Gásir. A further six bags (GAS05 x 4, GAS06x2) have yet to be seen and were not part of the package sent for examination recently (June 2010). The leather examined comes from 19 individual contexts and the material needs to be correlated with context data before a report can be completed. The leather comprises principally of shoes of turnshoe construction, four fragments of strap and a very small quantity of waste leather produced when manufacturing or repairing leather goods were also present. A single piece of what appears to be felt was also noted (GAS03< 195> context 838).

The shoes

Shoe parts were found in 13 contexts, all came from shoes of turnshoe construction, many with rands between the sole and the upper lasting margin seams. Turnshoe construction was used almost exclusively throughout north-western Europe during the medieval period. It is likely that 16 shoes are represented by the parts found, where sufficient was preserved, the shoes appear to be of adult size. The better preserved shoe parts showed that the footwear comprised shoes of below or at ankle height. The shoes had one-piece uppers, at least one shoe was fastened with a drawstring (GAS04<11> context 1376) and two laced at the side (GAS04 <12> context 1376, <192> context 1542). These shoe styles were common in England occurring together in the early-mid 13th century in the city of London for example (Grew and de Neergaard 1988, 18). Shoes of these two styles are present at Bergen occurring together in the large assemblage from the Gullskoen site from the 12th century onward with the side-lacing style predominating from the end of the century onward (Larsen 1992). There is every reason, therefore, to believe that these shoes date from the later 12thto the mid 13th century. Individual shoe parts (e.g. GAS04<193> context 1558, <194> context 1571) have secondary cuts indicating that they had been cut up in order to salvage re-usable leather for repairs before being thrown away. No repair patches have been found so far. The shoes were well made, often with heel stiffeners and top bands, the side-lacing shoes having lace-hole linings. The shoe uppers are made of bovine leathers (calfskin) and sheep/goatskins with soles of cattle hide. It should be born in mind that shoes made of semi-tanned skins (in this case likely to be sheep/goatskins and fish skins) are rarely preserved in the archaeological record and that the leather described here is vegetable tanned and, therefore, likely to have been imported though whether as ready-made items or as hides and skins is uncertain. While it may be more likely that the shoes were imported as manufactured items, the occurrence of a small amount of secondary waste leather, produced when cutting out pattern pieces and trimming them to size during the manufacture and repair of leather goods, suggests that some leatherworking was undertaken at the site. At the least this leatherworking appears to have taken the form of repairs from salvaged (recycled) leather, while the presence of a single hide edge (GAS03<186> context 362) provides limited evidence that hides and skins may also have been available. Objects of semi-tanned hides and skins made by the local population are unlikely to be recovered under anything other than exceptional conditions.

References:

Grew, F. and de Neergaard, M. (1988) **Shoes and Pattens,** Medieval finds from excavations in London: 2 London HMSO

Larsen, A. J. (1992) **Footwear from the Gullskoen area of Bryggen.** The Bryggen Papers Main Sereis vol 4 Scandinavian University Press

Part Five

Archaeoentomological work on samples from Gásir in Eyjafjörður

Hrönn Konráðsdóttir

Archaeoentomological work on samples from Gásir in Eyjafjörður

Hrönn Konráðsdóttir BA. MSc. *Archaeoentomologist*

Project aim

The aim was to assess the potential of the sample material collected during the Gásir excavation in regard to the insect remains. Most of it had already been floated at the Institute of Archaeology in Iceland but some samples were still unprocessed. Sample material from two seasons, 2002 and 2006 were used for the analysis. These two seasons were chosen because the 2002 samples were already floated and the 2006 material had not been tampered with so there was a possibility of checking if the processing methods would have an influence on the recovery of insect remains. The samples which were used were chosen from a variety of contexts that were believed to have the best potential, based on experience. The agenda was both to look at the potentiality of the material in general as well as the different archaeological contexts to see which of them would yield the best results.

Methods

The material from the 2002 excavation had been floated with water in an oil barrel and the residue was already dried and kept in bags in the storage. On the other hand the 2006 material was floated with paraffin flotation by the author as described by Coope and Osborne (1968), with slight variations, which is thought to be the best method to recover insect remains from archaeological layers. The work then consisted of sorting the material and identifying the insect remains. The fact that the 2002 material had been floated made it possible to sort and identify the fauna from more samples than if they had not been processed, but on the other hand this caused some concern as to the quality of the material. The danger with the method used is that some of the exoskeletons are quite heavy and would fall to the bottom and get lost as well as the method involves drying the floatant which makes the exoskeletons more fragile.

Fifteen samples from the 2002 material and seven samples from the 2006 season were sorted and identified for this report. They were chosen firstly according to the potentiality of the material from which they came and secondly an attempt was made to analyze material from various types of contexts to compare them.

The insect remains were identified by the author at the Icelandic Institute of Natural History with the aid of the modern insect collection. One specimen was taken to the University of Edinburgh and identified with the assistance of Dr. Eva Panagiotakopulu as the collection in Iceland did not suffice for the identification of this specimen.

Results from the 2002 samples

The number of individuals from the whole collection was quite low for this many samples, only 311 specimens in all 15 samples but the number of species on the other hand was quite good, 49 in all and many of them were of special interest in the archaeological context. The methods of flotation might be the cause of the low number of individuals as all but this will be discussed in more detail later in the report. The size of each sample floated varied greatly, but it was not measured exactly and seems to have been rounded off to the next 10 litres. This makes it quite difficult to draw any conclusions on how much impact the amount of material has on the number of individuals and causes some concern as to the comparability of the samples. Table 1 lists the samples that were analyzed, the stated sample size and a short context description for each sample.

Sample nr.	*Size (L)*	*Context description*
1	30	Fill of hearth
2	10	Hearth material
3	20	Peat ash
5	20	Sand with twigs
7	30	Wet grey pit fill
8	10	Wet orange/grey pit fill
9	20	Lens of fish bone
10	10	Peat ash
11	10	Charcoal
12	10	Waterlogged fill
13	10	Trampled surface
15	30	Floor including organics
19	30	Floor including organics
27	10	Waterlogged deposit
28	10	Waterlogged deposit

Table 1. Sample size and description of the contexts that they came from.

All waterlogged and wet samples were analyzed as they usually have the greatest potential for preservation of organic remains. All floor layers were also analyzed as they were thought to yield interesting results in relation to the rooms that they came from. In addition samples from a hearth, peat ash layers, a sandy layer, a layer with a lot of fish bones, and a charcoal rich sample were analysed to address the potential of these contexts. As could be expected the results were various. Following is the account of species of insects recovered from the 2002 samples.

Species	***1***	***2***	***3***	***5***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***15***	***19***	***27***	***28***	***Sum:***
Coleoptera																
Carabidae																
Nebria rufescens (Ström.)										1			1			2
Trechus obtusus Er.											1					1
Trechus sp.							1									1
Bembidion bipunctatum (L.)											1					1
Bembidion grapii Gyll.					1		2	1			1					5
Patrobus septentrionis Dej.								2			1	2	2			7
Trichocellus cognatus (Gyll.)												1				1
Pterostichus diligens (Sturm)								2				2	2			6
Pterostichus nigrita (Payk.)							1									1
Pterostichus sp.		1		1												2
Calathus melanocephalus (L.)							1					2				3
Amara quenseli (Schön.)					1						1	1	2	2		7
Dytiscidae																
Hydroporus nigrita (F.)								1					1	1		3
Agabus bipustulatus (L.)								1					1			2
Catopidae																
Catops fuliginosus Er.												1				1
Staphylinidae																
Omalium laeviusculum Gyll.											1	1				2
Omalium riparium Thoms.					1											1
Omalium excavatum Steph.					1			1				2				4
Xylodromus concinnus (Marsham)							1	1			1	1				4
Stenus sp.											1		1			2
Lathrobium brunnipes (F.)												3				3
Lathrobium (s.l.) sp.														1		1
Bisnius sordidus (Grav.)					1											1
Philonthus sp.							1									1
Quedius mesomelinus (Marsham)					3							1				4
Atheta sp.								2		2		1	1			6
Oxypoda sp.							1				3		1			5
Oxypoda spp.												2				2
Elateridae																
Hypnoidus riparius (F.)					1		1					1				3
Byrrhidae																
Cytilus sericeus (Forst.)								1			1		1	1		4
Byrrhus fasciatus (Forst.)											1					1
Cucujidae																
Oryzaephilus surinamensis (L.)					3											3
Cryptophagidae																
Cryptophagus scanicus (L.)					1											1
Cryptophagus sp.				1							1	3				5
Atomaria sp.					1							1				2

Latridiidae																
Latridius sp.												1	1			2
Corticaria sp.					2	1							1			4
Ptinidae																
Tipnus unicolor (Pill. & Mitt.)				1												1
Ptinus tectus Boield.					1											1
Scarabaeidae																
Aphodius lapponum Gyll.			1	2	3	1	3	1	2		1	2	3		1	20
Curculionidae																
Otiorhynchus arcticus (O. Fabricius)	1	3	1	5	13	1	5	4	4	7	2	6	6	3		61
Otiorhynchus nodosus (Müll.)	1		1	2	2	2	5	1	1	2	2	3	3	2	1	28
Otiorhynchus rugifrons (Gyll.)		1		1												2
Barynotus squamosus Germ.												1		1		2
Sitona sp.							1									1
Tropiphorus obtusus (Bonsd.)				1	2	3	2		1				2			11
Sitophilus granarius (L.)					2											2
Rhynchaenus (s.l.) sp.											1					1
Diptera																
Hippoboscidae																
Melophagus ovinus (L.) puparia					5		1				3	68				77
Sum:	2	5	3	14	44	8	26	18	8	12	23	106	29	11	2	311

Table 2. The number of individuals from each species in the samples analysed and sum of individuals.

The species were categorized into synanthropic (those species that live inside human habitat) and non-synanthropic (Table 3). They were also allocated habitat (Table 3), in accordance to BugsCEP eco-codes (Buckland and Buckland 2006) with the authors own interpretation backed up by the relevant literature, mainly Larsson and Gígja (1959).

Species	***Synanthropic***	***Habitat***
N. rufescens (Ström.)	no	eurytopic
T. obtusus Er.	no	heathland
Trechus sp.	no	eurytopic
B. bipunctatum (L.)	no	wetland
B. grapii Gyll.	no	heathland
P. septentrionis Dej.	no	wetland/meadow
Patrobus sp.	no	eurytopic
T. cognatus (Gyll.)	no	heathland
P. adstrictus Esch.	no	meadow
P. diligens (Sturm)	no	wetland
P. nigrita (Payk.)	no	moist / wetland
Pterostichus sp.	no	moist
C. melanocephalus (L.)	no	heathland
A. quenseli (Schön.)	no	sparse vegetation

H. nigrita (F.)	no	water
A. bipustulatus (L.)	no	water
C. fuliginosus Er.	yes	moist moulding refuse
O. laeviusculum Gyll.	no	seaweed
O. riparium Thoms.	no	seaweed
O. excavatum Steph.	yes	dung/foul
X. concinnus (Marsham)	yes	dung/foul
G. longipes (Mann.)	no	wetland
Stenus sp.	no	eurytopic
L. brunnipes (F.)	no	wetlands
Lathrobium (s.l.) sp.	no	wetlands
B. sordidus (Grav.)	yes	moulding refuse / dung
Philonthus sp.	no	eurytopic
Q. mesomelinus (Marsham)	no	moulding refuse
Atheta sp.	yes	eurytopic
Oxypoda sp.	no	eurytopic
Oxypoda spp.	no	eurytopic
Aleocharinae indet.	no	eurytopic
H. riparius (F.)	no	eurytopic
C. sericeus (Forst.)	no	eurytopic
B. fasciatus (Forst.)	no	moss
O. surinamensis (L.)	yes	stored grain
C. scanicus (L.)	yes	moulding refuse
Cryptophagus sp.	yes	moulding refuse
Atomaria sp.	yes	moulding refuse
L. pseudominutus (Strand)	yes	moulding refuse
Latridius sp.	yes	moulding refuse
Corticaria sp.	yes	moulding refuse
T. unicolor (Pill. & Mitt.)	yes	dry moulding refuse
P. tectus Boield.	yes	moulding refuse
A. lapponum Gyll.	no	dung
O. arcticus (O. Fabricius)	no	meadow
O. nodosus (Müll.)	no	meadow
O. rugifrons (Gyll.)	no	meadow
Otiorhynchus sp.	no	meadow
B. squamosus Germ.	no	meadow
Sitona sp.	yes	stored grain
T. obtusus (Bonsd.)	no	eurytopic
S. granarius (L.)	yes	stored grain
Rhynchaenus (s.l.) sp.	no	eurytopic
M. ovinus (L.)	yes	parasite

Table 3. Categorization of the species into habitat and whether they are synanthropic or not, from both seasons

The majority of the species were non-synanthropic although sample fifteen had quite a high percentage of synanthropic species. Figure 1 shows the percentage in each sample where this is apparent.

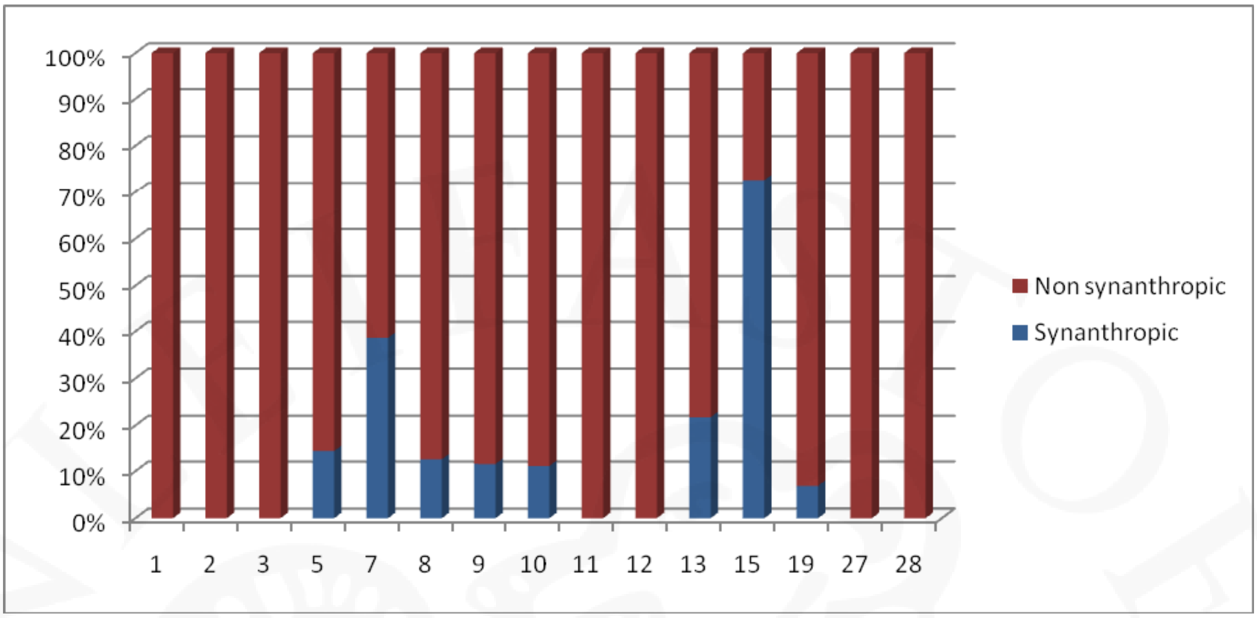


Figure 1. Percentage of synanthropic species in each of the fifteen samples.

The preferred habitats of the species in the samples were also set up as percentages (Figure 2) to get a clear picture of the species involved. Although it looks quite complex because of the variability of habitats it does give some idea as to the different composition of the samples. This will be discussed further in the results from each sample.

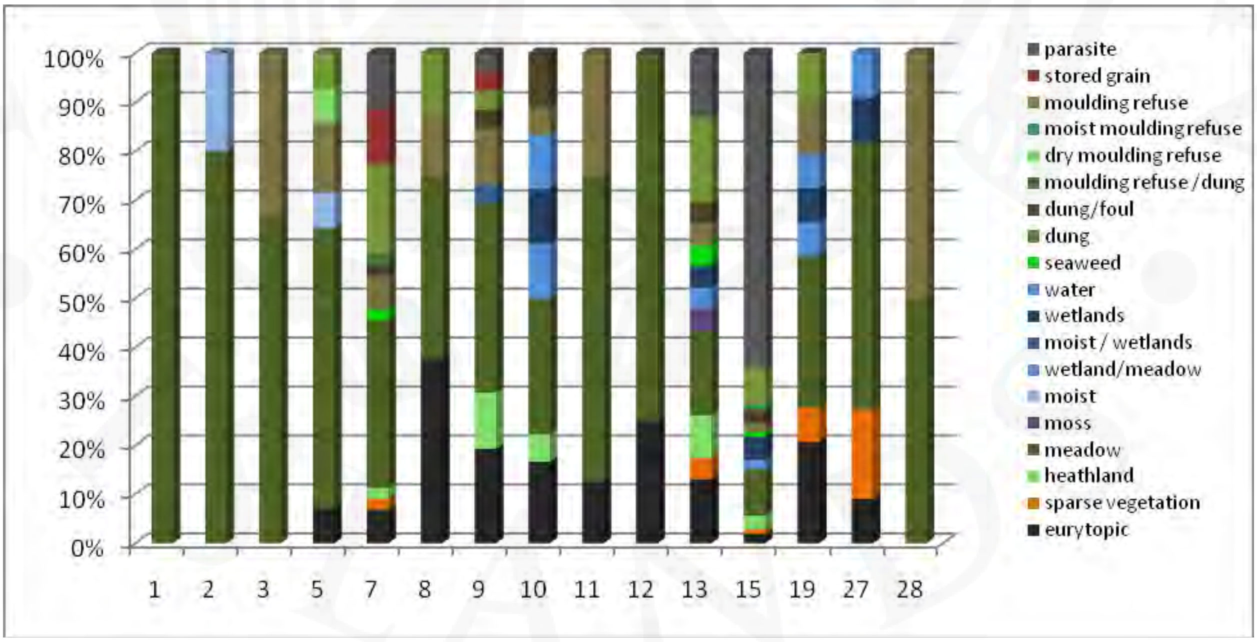


Figure 2. The preferred habitats of the species in each sample, as percentages.

Hearth material, samples 1 and 2

The heart samples were no smaller than most of the other samples but they did not yield much insect fauna. This was perhaps to be expected as the insects themselves do avoid this environment. But the reason could also be that the material from these two samples was quite fragmented because of charring, even up to the point that some of the insect remains could not be identified. The species were mainly of Otiorhynchus, which are all non-synanthropic and were found in most of the other samples as well. All the species of Otiorhynchus here are connected with rather dry grasslands (Larsson and Gígja 1959), but *O. rugifrons* has been especially connected with *Thymus* (blóðberg in Icelandic) (Larsson and Gígja 1959; Lindroth, Andersson et al. 1973), which is known to have been used to make tea and as a spice in Iceland (Bjarnason 1994).

Peat ash, samples 3 and 10

Two samples from peat ash layers were analysed and as expected most of the species found in them were ones that can be connected with peat. None of them were charred or burnt to any extent. This does raise questions on the subject of what is peat ash in the archaeological context. In most cases pink layers seem to be interpreted as peat ash but when analysed they do not have any burnt remains in them as one would expect. The question here is also whether or not these layers are of use for archaeoentomological analysis, because if they are simply some peat mix the faunal remains will in most cases represent the peat that they came from and this will not have much bearing on the interpretation of the site, although it might be of use to interpret the layer itself and where it came from. Sample 3 had very few insect remains, apart from species of Otiorhynchus. It contained one *A. lapponum*, or the dung beetle, which lives in animal dung, usually that of larger mammals (Larsson and Gígja 1959). It is therefore an indication of husbandry, although it can fly and will spread some distance from the dung itself.

Sample 10 held more insect remains, it also had *A. lapponum*, but both samples had only one individual and therefore it is difficult to draw any conclusions from this. As could be expected from a peat ash sample there were a few wetland species in it, *H. nigrita* is quite common in Iceland and is found in most kinds of water (Larsson and Gígja 1959). *A. bipustulatus* is a species that is found in standing water (Koch 1989) and *P. diligens* is quite common in the vicinity of stagnant or running water (Larsson and Gígja 1959). *B. grapii* on the other hand prefers drier biotopes(Lindroth, Andersson et al. 1973) and therefore there must have been some areas of sparse vegetation around the area. A few eurytopic species were in this sample but they will not be discussed to any extent, as they do not add to the interpretation of the sample. Two synanthropic species, *X. concinnus* and *O. excavatum,* were found in this sample, they both prefer plant waste and are often found in old hay (Larsson and Gígja 1959).

Sandy layer, sample 5

The sandy layer had quite a lot of wood shavings in it. Therefore it can be presumed that there was good preservation of organic materials and it did in fact have a medium rich insect fauna. Two synanthropic species were found in this sample, *T. unicolor* and Cryptophagus, which could not be identified to species level. Both live almost exclusively inside human habitat and feed on mould and manure but the former does not live in very wet conditions (Warsop and Skidmore 1998). This would suggest that the sample comes from a dry and heated environment. Two specimens of *A. lapponum* were in this sample and again they are evidence to the fact that there was livestock at the site. The rest of the species in this sample have been discussed before and are mainly weevils that are root feeders and live in most types of grassland (Larsson and Gígja 1959) as well as, in the case of *O. rugifrons*, on Thymus.

Wet fill, samples 7 and 8

Sample 7 was the second richest sample in number of individuals. The species in this sample are also very interesting, especially as some of them can be directly connected to trade. These are *O. surinamensis* and *S. granarius*, otherwise know as the saw-toothed grain beetle and the granary weevil. These species are not very common from excavated material in Iceland although they have been found in a few places, mostly in high status places as Bessastaðir (Amorosi, Buckland et al. 1992) and Reykholt (Buckland, Sadler et al. 1992) but these sites are quite later in time than Gásir. These species are uncommon in the country because they need quite warmer temperatures to breed and therefore they usually enter the country with grain from other countries traded in Iceland. The saw-toothed grain beetle cannot develop below 18°C and does not thrive below 22°C (Howe 1965), so it is highly unlikely that it would be able to sustain a population in Iceland especially in this era, when the houses were not heated to the extent that they are today. In addition *P. tectus*, also found in this sample is often connected with granaries and mills (Koch 1989), although it can be found inside houses feeding on both vegetable and animal matter of many sorts (Lindroth *et al.* 1973) and they are only spread by man as they are flightless themselves. A few other synanthropic species were in this sample, *A. lapponum*, the dung scarab was present and another species connected with livestock, *M. ovinus*, or the sheep ked was also found in this sample. The sheep ked is a ectoparasite on sheep and could have gotten there both with live sheep and with wool products, as they live in the wool. Four other synanthropic species were in this sample, *C. scanicus*, a minute mould beetle which feeds on fungal hypae and spores (Larsson & Gígja 1959) and the Staphylinidae *B. sordidus, O. excavatum* and *Q. mesomelinus* which all live in vegetable refuse and manure (Larsson & Gígja 1959) and the last has also been found in decaying seaweed (Larsson & Gígja 1959). Another seaweed dwelling species was recovered from the sample, *O. riparium*, which lives primarily on seashores under seaweed (Larsson & Gígja 1959; Lindroth *et al.* 1973). This is of course not surprising considering the location of the site as it is close to the sea and these individuals could therefore have come by any means into this sample. Two species from this sample have been interpreted as indicators of sparse vegetation and land degradation (Buckland *et al.* 1991), *B. grapii* and *A. quenseli*, but in this case their presence just suggest that there was sparse vegetation not far from the site. Other species in the sample have been discussed before and are indications of grasslands and Thymus plants.

The species in sample 8 have all been discussed before and will therefore only be summarized here. The sample was very different from sample 7 as it had both fewer individuals as well as much less diversity of species. The species from this sample are indicators of grasslands and Thymus with only one synanthropic species as well as the dung beetle which is present in almost all samples.

Lens of fish bones, sample 9

This sample was quite rich in comparison with the others and one of the species found in it has not been found in archaeological context in Iceland before. This is the Sitona sp., but unfortunately it could not be identified down to the species level, not with the help of the collection at the Icelandic Institute of Natural History nor at the University of Edinburgh. Only one species of Sitona has been found in Iceland before, *Sitona lepidus* Gyll., but only very localized at the south of the country near Ölfus (Erling Ólafsson pers. com.). It primarily lives on clover and can be a pest on clover crops (Lindroth 1957; Morris 1997). Other species of Sitona live in quite varied environments and can be found in different natural environments as well as contaminants or secondary pests of grain in temperate areas (Rees 2004). But without better identification not much can be said for sure about the presence of this Sitona in the sample. Other interesting species in this sample include *X. concinnus*, a staphilid that is synanthropic and found particularly in old hay (Larsson & Gígja 1959), *A. lapponum* and *M.*

ovinus, which have both been discussed earlier and are indications of livestock and sheep/wool. The natural fauna in this sample includes species that live in moist, medium and dry biotopes.

Charcoal layer, sample 11

The charcoal layer, as could be induced from the name had a lot of charcoal in it and as it seems, not much in the way of insect remains. The few individuals found were also in almost all of the other samples, three species of weevils and the dung beetle.

Waterlogged fill, sample 12

Waterlogged samples usually have well preserved organic remains and it is unfortunate that this sample did have so few insect remains. The ones found in this sample are all found in the Icelandic nature except for *Q. mesomelinus*, which is also commonly found near human habitat and lives in decaying vegetable refuse and dung (Larsson & Gígja 1959). The rest are the weevils that are present in almost all of the other samples and *N. rufescens* which is also know as blacksmith (járnsmiður) and is eurytopic (Larsson & Gígja 1959).

Trampled layer and floor layers, samples 13, 15 and 19

These samples were quite rich in species content, as is often the case with floor layers. There were two synanthropic species in the first sample, which feed on moulding refuse and there were also species connected with livestock, the sheep ked and the dung beetle. As in other samples the fauna was from various biotopes, from dry biotope like *A. quenseli* to ones that live on the seashore under seaweed, as *O. laeviusculum* (Larsson and Gígja 1959) There were also quite a few that live in moist areas, as well as one moss feeder, *B. fasciatus* and one that is usually found near rivers and lakes, *B. bipunctatum*.

Sample 15 was the only sample where synanthropic species are in majority and this is due to the large amount of *M. ovinus*, or the sheep ked, which was the majority of the individuals in the whole sample. It could be inferred from this that there were sheep kept in the house or perhaps woolworking. There were other eight synanthropic species in the sample, three of them could not be identified down to species level but within the genus they are all mould feeders (Larsson and Gígja 1959). Then there is *A. lapponum*, the dung beetle and two other species that are also found in manure, *Q. mesomelinus* and *O. excavatum*, although they are more commonly found in compost and vegetable refuse (Larsson and Gígja 1959).The other two, *C. fuliginosus* and *X. concinnus* prefer moist mouldy places, outhouses and old hay (Larsson and Gígja 1959). The rest of the species have mostly been discussed earlier and live in different types of environments, under seaweed on seashores, in all types of grass fields, in moist biotopes and also in dry biotopes. This is the only sample in which *L. brunnipes* was found, which is mostly found in swamps, bogs and all sorts of wetlands (Koch 1989).

Sample 19 had a similar number of individuals as sample 13 but quite different species. Only two species can be directly connected with human habitat, *A. lapponum* and species of Latridius, which are all synanthropic. But the non-synanthropic species are also of interest, there are two species that are found in waters of most types (Larsson & Gígja 1959), *A. bipustulatus* and *H. nigrita*, as well as one that is commonly found near water. This would suggest some water close by, or water being brought into the house from which this floor is. Other species in this sample have been discussed and it suffices to say that they vary from ones that live in rather dry and sparse vegetation and towards ones that prefer richer grasslands.

Waterlogged deposit, samples 27 and 28

There were surprisingly few insect remains in these two samples, only two individuals in the latter and eleven in the former. In addition to the weevils and *A. lapponum* that were also present in the other samples there were a few other species of interest in sample 27. There were both species that prefer dry biotopes as well as moist and in one case, *H. nigrita* which is found in various types of water although it avoids swift flowing water (Larsson and Gígja 1959).

Results from the 2006 samples

The samples from the 2006 season were chosen after the results from the 2002 season samples were known, the samples for this part of the research were therefore chosen with that in mind. Most of the samples were from floor layers, as they seemed to give the best results in the previous work. The samples were flotated in paraffin by the author in a controlled environment and it was hoped that this would provide better results than the already flotated samples. The total number of individuals was 99 from 29 species, which is unfortunately not notably better than the samples from 2002 despite the hope that the processing methods would play a role in this. On the other hand the samples were smaller which would probably mean fewer individuals but it also means that the comparison between the samples is much easier and more reliable (table 4). Seven samples were processed, the insect remains sorted out of them and identified to species where that was possible.

No	Context	L flotated	Description
06/03	2419	5	Floor-turf trample
06/05	2434	3	Floor
06/07	2441	5	Floor
06/17	2502	5	Occupation surface
06/23	2544	4	Floor
06/28	2586	5	Floor
06/43	2951	5	Occupation surface

Table 4. Samples from the 2006 season

All the samples were floor related. Four of them were from clear floor deposits and the others from occupation surface, which indicates that they must be from some sort of living quarters. The results were quite varied, ranging from 9 to 44 individual insects in each sample (table 5.).

Species	*03*	*05*	*07*	*17*	*23*	*28*	*43*
Coleoptera							
Carabidae							
Bembidion grapii Gyll.	1		1	1			
Patrobus septentrionis Dej.	1	1		2			
Patrobus sp.					1		
Pterostichus diligens (Sturm)			1				
Pterostichus adstrictus Esch.							1
Pterostichus sp.	1						
Calathus melanocephalus (L.)	1		1			1	
Amara quenseli (Schön.)	1		1				
Dytiscidae							
Hydroporus nigrita (F.)	2	1	1				
Staphylinidae							
Omalium excavatum Steph.						1	
Xylodromus concinnus (Marsham)		1					1
Geodromicus longipes (Mann.)						1	
Stenus sp.	2	1	1	1	1	1	1
Philonthus sp.	1						
Atheta sp.	2	1					
Oxypoda sp.				1			
Aleocharinae indet.			1				
Elateridae							
Hypnoidus riparius (F.)	1	1				1	
Cryptophagidae							
Cryptophagus sp.	2						
Atomaria sp.	3						
Latridiidae							
Latridius pseudominutus (Strand)	2						
Latridius sp.	4	1		1			
Corticaria sp.	14						
Scarabaedae							
Aphodius lapponum Gyll.	2	1	1	1		1	1

Curculionidae							
Otiorhynchus arcticus (O. Fabricius)			1		1	1	
Otiorhynchus nodosus (Müll.)	2	1	2	1	1	1	1
Otiorhynchus sp.			1				
Tropiphorus obtusus (Bonsd.)	1				1	1	
Diptera							
Hippoboscidae							
Melophagus ovinus (L.)		1					
Melophagus ovinus (L.) puparia	1			1		1	4
sum:	44	10	12	9	5	10	9

Table 5. Species list from the 2006 season with MNI count of insects.

As with the 2002 material the species were categorized into synanthropic species and non-synanthropic ones. They were also allocated a general habitat and the few species that were not in the 2002 material were added to the earlier list and can be seen in table 3. Graphs were made for the 2006 season in order to see more clearly the percentage of habitats within each sample and also whether the majority was synanthropic or not. Only two samples of seven had a majority of synanthropic species, which is not a lot considering that these samples are all from inside living areas. There are even two samples that have only non-synanthropic species, samples 7 and 23. Those are both floor samples, according to the excavation data. This could be just a coincidence or the reason might be that the floor was only used for a short while, not long enough to collect the types of insects that are connected with living areas.

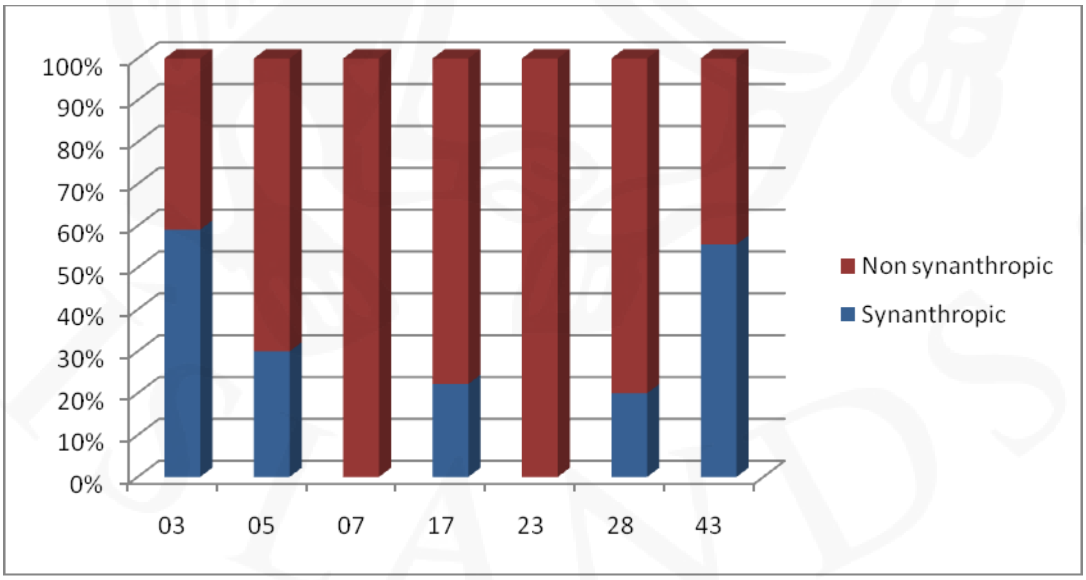


Figure 3. Percentage of synanthropic species in the samples from the 2006 season.

The habitats were not as varied as in the 2002 samples, but most of the same habitats were represented here as well. The natural environments range from water to sparse vegetation, but notably there are no species connected with seaweed and seashore habitats. There are also parasites, but only sheep ked, no human lice.

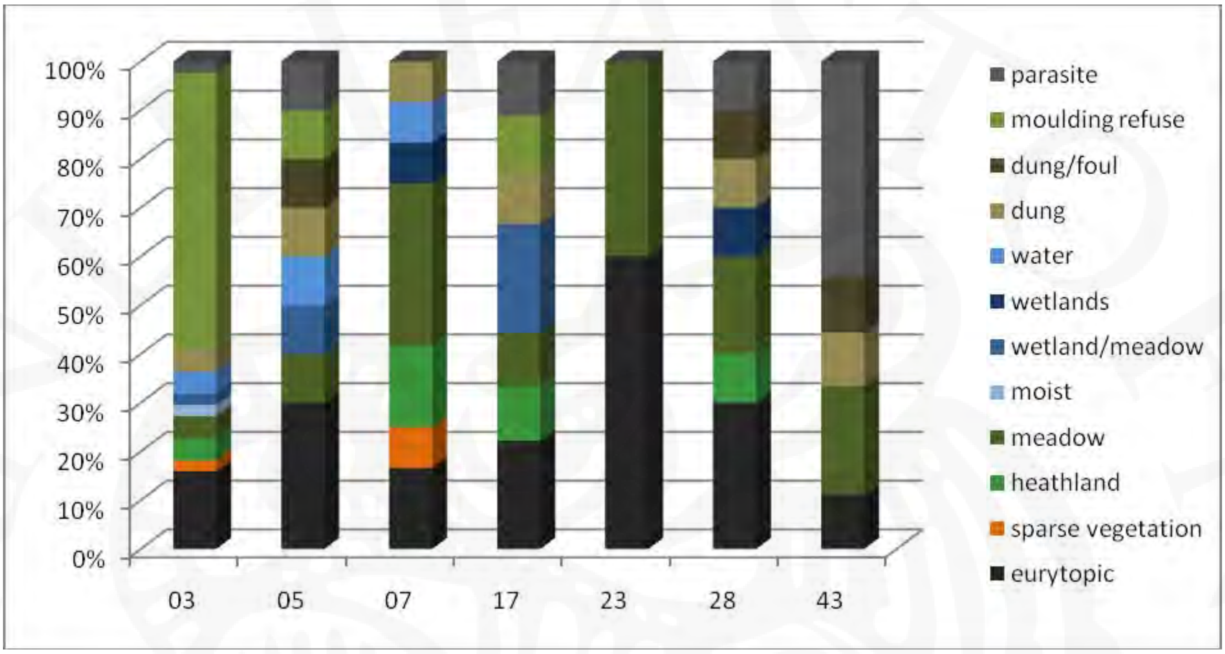


Figure 4. The preferred habitats of the species in each sample from the 2006 season, as percentages

Floor-turf trample, sample 3

Sample 3 was the richest sample in the whole 2006 collection with a lot of synanthropic species or almost 60% of the individual insects. The most common one were species of Corticaria, which could not be identified further, but all the types that have been found in Iceland are synanthropic and live in mouldy environments (Ólafsson unpubl.). Other minute mould feeding species in this sample were L. pseudominutus (Strand) and species of Latridius, Atomaria and Cryptophagus, which are all common in old hay and other moulding vegetable material (Larsson and Gígja 1959). There was also one sheep ked puparia in the sample, an indication of wool or sheep in the area, but as there was only one it is difficult to draw any conclusions from it.

The non-synanthropic species ranged from ones that prefer dry biotopes, as *A. quenseli* (Schön.) and *B. grapii* Gyll. to ones that live in water, as *H. nigrita* (F.). Other species have a variety of preferred environments, grassland, moist areas and meadows, which have all been discussed earlier. There were two *A. lapponum* Gyll., or dung beetles in this sample, which are an indication of large mammals in the area.

Floors, samples 5, 7, 23 and 28

These samples had a lot smaller collections than that previous sample and two of them had exclusively non-synanthropic species. This is quite unusual for floor layers as the humans occupying the space usually bring some synanthropic insects with them. Because of that the two samples with synanthropic species will be discussed first.

Sample 5 had only three synanthropic species. The first two are the small beetles, *X. concinnus*, which has been found in environments like stables, outhouses and old hay (Larsson and Gígja 1959) and Latridius, which is common in similar biotopes (Larsson and Gígja 1959). The third one was M. ovinus, or the sheep ked, which seem to be in most of the samples but in small numbers, which could indicate that there was some wool around, but again these are small numbers and therefore not very usable. The natural species were mainly ones that live in meadows and water.

Out of the 10 insects in sample 28 two were synanthropic. *O. excavatum* Steph. is mainly found in plant waste, but also in some cases on manure (Larsson and Gígja 1959). The other was a single sheep ked puparia. The natural species were ones that prefer grasslands and moist biotopes and there was also a single dung beetle in this sample. One species in this collection has not been discussed before, *G. longipes* (Mann.), which has often been found near water and occasionally near seawater (Larsson and Gígja 1959).

Sample 7 had 12 identifiable insects and all of these are common in the Icelandic nature. They have all been discussed earlier and indicate quite varied environment, everything from sandy localities with sparse vegetation to water and moist biotopes. There was also a single dung beetle found in this sample which is the only indication of humans in this floor layer. Sample 23 only had five species and only one individual of each. The ones that could be used for interpretation indicate grasslands and heaths (Larsson and Gígja 1959).

Occupation surfaces, samples 17 and 43

Interestingly both of these samples had the same number of individual insects, but of course not all from the same species. Sample 17 had two synanthropic species, the sheep ked and a minute mould feeding beetle. The other species were ones that indicate dry biotopes, meadows and moist localities, as well as one dung beetle which seems to be in almost all of the samples from 2006. Sample 43 had over 50% of synanthropic species, but this is mainly because there were four puparia of the sheep ked in it and only nine individual insects so the percentage of sheep ked seems quite high. There was one other synanthropic species, X. concinnus, which is often found in old hay. The natural species indicate moist or grassy environment with some large mammals around, as there was also one dung beetle in this sample.

Conclusions

The fact that *A. lapponum* was in almost all samples gives strong evidence too support the theory that there was livestock at the site. This is interesting because this was primarily a trading site and it raises questions of whether or not livestock was traded there or perhaps kept for use at the site. But as all the other evidence leads to the fact that there was no permanent residence at Gásir in this era the trading option seems more likely. The presence of *M. ovinus*, the sheep ked is no surprise but the fact that it is mostly in the form of the puparia in the 2006 material is interesting as it could indicate that these came from wool products rather than the sheep themselves as the puparia attach themselves to the wool and are notoriously difficult to get out and the adults do not live for long without their host. There might be one area where livestock was kept, where sample 15 was, as there was an unusual amount of adult sheep ked there, although this might also be where new wool was processed.

There were quite a few samples that contained fauna that is usually found near freshwater and this must suggest some sort of well or fresh water close by or brought to the site by some means, possibly for livestock as well as human consumption.

In general the floor layers and the trampled layer from the 2002 season yielded the best results, as well as one of the samples from the wet fill. This is not surprising as these are by experience often the best samples for archaeoentomological research. Charcoal rich layers and hearth material do not seem to be very useful for insect research, but they may be very useful for grain and seeds as there were quite a lot of them in these samples. Peat ash layers can be analysed and they often have quite a lot of insect remains in them, but the use of them is questionable as they have been shown to mainly represent the material from which they came. Therefore the focus for the 2006 samples was to look at floors and related objects. There was only time to finish 7 samples from this season as the sample processing of course took longer when the flotation was added. The samples did not have as many interesting species as the 2002 season and were not as rich in insect remains as had been hoped. There were some interesting aspects to these samples, for example almost all of them had some sheep ked and dung beetle in them, although it was in very small numbers. This clearly indicates that there was some husbandry in the area but there are no indications that any of these buildings were used as outhouses. It is more likely that the dung beetles came from the outside and the sheep ked came from wool.

The natural species in most of the samples range from sparse vegetation to moist and lush vegetation dwelling and these are all common biotopes in Iceland.

Gásir is a very interesting site, and the diversity of species is great, but the number of individual insects is usually small. This might be because of the seasonal or short time periods of which the buildings were in use, the fauna might not have had a chance to grow but were mainly coming into this environment with people and products. The grain beetles from sample seven are of special interest, as they indicate trade with whole grain products and the sitona from sample nine has the same sort of indications, this is not a natural species in Iceland until the 20th C so it must be imported. These sort of indications, even though they are small are very important clues for the interpretation of the site. Therefore it would be very interesting to go through more of the floors and organic deposits in search of more insect remains, even though these have already been flotated, as that does not seem to have a great influence on this material.

Acknowledgements

Many thanks go to Dr. Erling Ólafsson at the Icelandic Institute of Natural History for the use of the institutes entomological collection and discussions as well as to Garðar Guðmundsson at the Institute of Archaeology in Iceland for assistance with equipment and facilities.

Icelandic summary

Markmið þessa verkefnis var að skoða sýni sem tekin höfðu verið úr mannvistarlögum á Gásum og greina skordýraleifar úr þeim. Skoðuð voru sýni frá tveim árum, fyrst frá 2002, en þeim sýnum hafði verið fleytt og þau þurrkuð og síðan voru sýni frá 2006 skoðuð, en þeim hafði ekki verið fleytt. Ástæðan fyrir þessu var meðal annars til að kanna hvort mismunandi fleytingaraðferðir mundu hafa áhrif á útkomuna. Það var þó það lítill munur á niðurstöðunum með þessum tveim aðferðum að talið er að þetta hafi ekki markverð áhrif.

Sýni frá ýmsum gerðum af mannvistalögum voru skoðuð og virðist sem gólflög og önnur lífræn lög skili bestu niðurstöðunum. Því var einblínt á slík lög í seinni hluta rannsóknarinnar þar sem sýni frá 2006 voru skoðuð.

Niðurstöðurnar voru mjög áhugaverðar. Tegundafjölbreytileikinn var mikill, þó það væru oftast fá skordýr af hverri tegund. Taðýfill fannst í flestum lögunum, en sú bjalla lifir

eingöngu í taði húsdýra og jafnvel manna. Það má því draga þá ályktun að húsdýr hafi verið á svæðinu, en ekki endilega innanhúss því þessar bjöllur geta auðveldlega flogið. Í flestum sýnana frá 2006 var einnig kindalús sem kölluð hefur verið færilús hér á landi. Þetta voru reyndar í flestum tilfellum púpur færilúsarinnar. Fundur slíka púpna hefur einkum verið tengdur við ull og ullarvinnslu frekar en kindahald því púpurnar festa sig með límkenndum vökva í ullina og erfitt er að ná þeim úr. Hins vegar eru fullorðnar færilýs háðar hýsli sínum og fara því ekki ótilneyddar langt frá honum. Það má því telja víst að ull af einhverju tagi hafi verið til staðar í flestum þeim bygginga sem skoðaðar voru. Í einu sýni fannst nokkuð magn af fullorðnum færilúsum, og má telja að það gólf hafi verið notað fyrir kindur á einhverjum tíma, þó það sé einnig möguleiki að nýlega rúin ull hafi átt þar viðkomu.

Nokkrar sérlega spennandi tegundir komu úr þessum sýnum, þar má helst nefna Tannabjöllu og Grjónarana sem hafa að öllum líkindum ekki verið landlægar á Íslandi heldur hafa þær komið með innfluttri kornvöru. Þær þurfa nokkuð hátt hitastig til að fjölga sér og ekki eru líkur á því að slíkar aðstæður hafi veirð á Gásum. Auk þess fanst ein Sitona bjalla, en þær eru afar fágætar á Íslandi og hafa einungis fundist í Ölfusi og Reykjavík og í báðum tilfellum á 21. öldinni. Ekki er þó öruggt hvaða undirtegund þessi frá Gásum er, en hún er að öllum líkindum komin erlendis frá. Það lítur því út fyrir að verslað hafi verið með kornvöru á Gásum og að aðkomumenn hafi tekið með sér ýmsa óboðna gesti að heiman. Það væri spennandi að skoða fleiri gólflög, því þó niðurstöðurnar verði kannski ekki nýtanlegar til tölfræðirannsókna þá geta þær gefið mikilvægar upplýsingar um hátterni manna innan svæðisins.

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Part Six

Preliminary Analysis of the whetstone collection from Gásir.

Sigrid Cecilie Juel Hansen, May 2010

Preliminary Analysis of the whetstone collection from Gásir.

By: Sigrid Cecilie Juel Hansen, May 2010

The total amount of whetstones uncovered in Gásir during the 2001-2006 field seasons is 48 of which 5 were found in connection with the excavation of the church. The assemblage weighed close to 925 grams and showed remains of everything from very small to very large whetstone types.

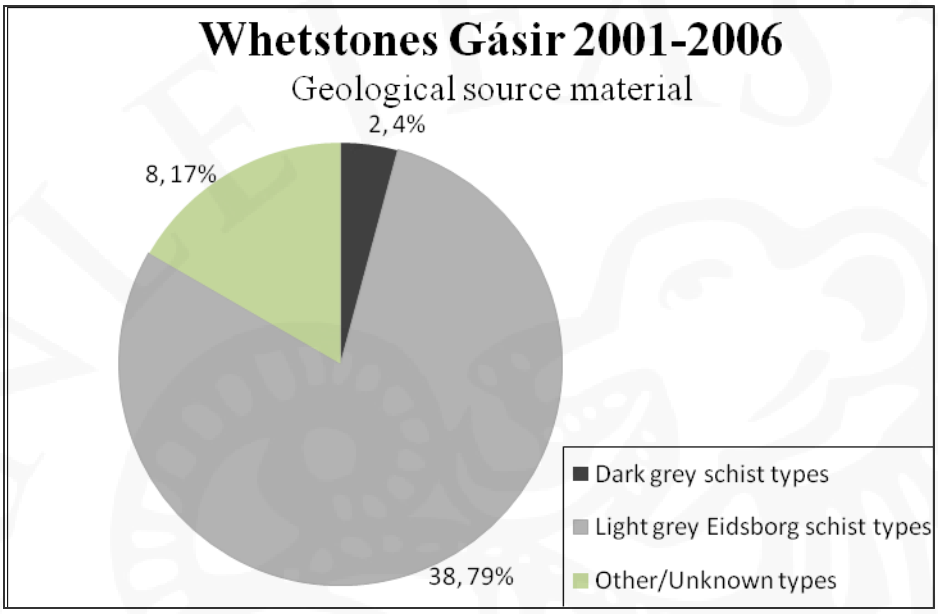
In Iceland, Norway and most of the North Atlantic and West-Scandinavian area, two types of micha schist were predominantly used as source material for whetstones from late Iron Age onwards. One is very light to mid grey and finely grained the other dark grey, sometimes with a purplish or blue tint and very finely grained. The light grey whetstone type has been provenience dated to the area around Eidsborg, Telemark in Norway. It has not been possible to accurately provenience date the dark grey whetstone type, which can be found geologically in a large belt crossing Scandinavia, Scotland and Ireland, but it is most likely originating from Norway as well (ref and more info see: Resi and Askvik 2008[2] and Hansen 2009[3]). These two types are often easily recognizable even on a macroscopic level. However, various factors such as weathering and post depositional precipitation (sooth, chalk, iron etc) can make the determination difficult.

These two main types are both present at the site, with a majority of the light grey Eidsborg schist type (79%) and only 4% of the dark grey schist type (GÁS: 05-269, 06-007) (PICTUREs 1-3 Very light grey Eidsborg types, 4-6 Mid grey Eidsborg types, 7 Dark grey type). It is a rather well established assumption that the dark grey schist type was primarily used in late Iron Age and early Viking Age and largely went out of use towards the end of the medieval period. With a collection mainly dating to the 14th century, this proportion between the two main schist types is therefore what could be expected. Some variety can be traced within the collection of light grey schist types, both concerned colour and composition of the stone. In general the ones ranging in the lighter end of the scale are also more loose grained, fragile and in some cases with small dark inclusions in the mineral structure (i.e. GÁS: 01-003, 02-125, 04-207 and 04-208) and the ones in the darker end of the scale are in general

[2] Resi, H. G., and Askvik, H., 2008: The Kaupang Finds Volume III C, *Whetstones and Grindingstones in the settlement; the 1956-1974 excavations*, Norske Oldfund XXIX, Kulturhistorisk Museum, Universitetet i Oslo. Oslo.

[3] Hansen , Sigrid Cecilie Juel, 2009: Whetstones from Viking Age Iceland - *As part of the Trans-Atlantic trade in basic commodities*, MA thesis University of Iceland, Reykjavík.

much harder (i.e. GÁS: 01-001, 01-012, 02-123, 03-295, 05-55 and 06-55). Ethnographic sources from the 19th and 20th century indicates that they have varying grinding quality, with the harder stones being of lesser quality than the lighter stones with dark inclusions[4].



An interesting aspect of this particular whetstone collection is the variety of other stone types, presumably utilized for grinding purposes. These stones have been grouped as "possible whetstones" and fall into two categories, some schistose types of likely foreign origin, all fragments (i.e. GÁS: 03-74 schistose fragments, 05-70 schistose fragment, 06-5104 dark grey schistose fragment) and some possibly Icelandic stone types, mostly fragments and a few grinding slabs[5] (i.e. GÁS: 02-161(part of a sample) sandstone grinding slab?, 03-35 bar shaped and 03-83 laminated slab). None of these stone types are showing clear signs of grinding and are mostly fragments, possibly cut off from whetstone production. The possible grinding slab, GÁS 02-161 (PICTURE 8) is the only one with potential grinding surfaces preserved.

In general the stone collection from Gásir provides many schistose types of which only a few have been grouped within the category "possible whetstones". Some could have been utilized as grinding slabs but are definitely all of poor quality as whetstone material. They look predominantly to be of foreign origin but this will need to be geologically determined.

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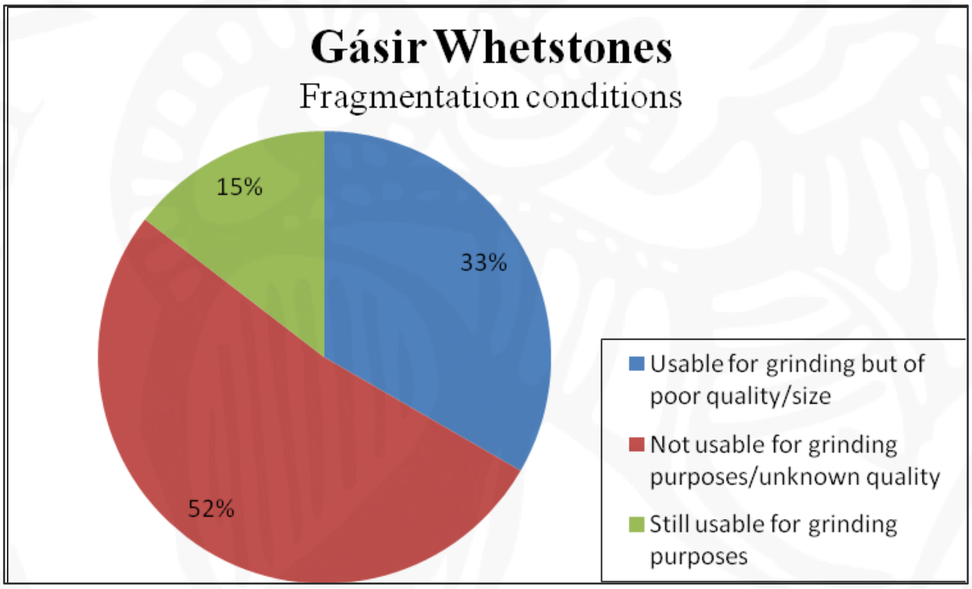
[4] Livland, Haakon, 1992. *Eidsborgbryner - Eksportvare i Telemark fra Vikingetid til våre dager*. Lårdal Bygdemuseum, p.67-68.

[5] A grinding slab is often a larger piece of whetstone material with no particular shaping, that has been put to use for grinding purposes. Often with a larger flat surface and more likely to be of other material than schist than the bar shaped whetstones.

Preservation conditions and fragmentation:

The whetstone assemblage is in general in a good or stable preservation condition, though some examples of the very light grey Eidsborg schist types are very fragile and highly fragmented (i.e. GÁS06-5131). This is common for whetstones of the very light grey schist type, which can largely be explained either as the effect of pre-depositional heat impact on the stone or conditions in the soil. The grinding surfaces are often completely deteriorated on this type of stones and it is difficult to determine whether the fragments are remains of used whetstones or production fragments. The mid grey Eidsborg schist stones and dark grey schist stones seems to be harder and have been preserved well at the site.



Overall, the collection contains very few whole usable whetstones. The complete examples are all rather small and of the types, rather connected to the personal belongings, than the medium sized scythe hones, commonly found in connection with domestic/farm sites.

Just over half the recovered whetstone collection are various fragments, preserved at sizes too small for continuing grinding purposes. Another third of the collection is preserved in a size that would allow for some sort of use but only as small pendant type hones or even less and only 15% are preserved in sizes still well usable for grinding purposes. Few of these larger, well usable, pieces are clearly remains of previous very large whetstones as for example GÁS05-055. This is probably the end piece from a very large whetstone, broken across the perforation hole running through the narrow sides of the stone (PICTURE 4). It has presumably had an iron pin or ring through it as remains of iron/rust are visible inside the hole.

Another interesting piece is GÁS04-208 of the very light grey schist type. This show signs of very extensive use with numerous grooves or cuts into the edges of both broadsides. This whetstone is at the preserved size rather small but could originally have been much larger. The many grooves into the sides of the stone indicated that during the last period of use, before finally discarded, it was used for grounding down damaged blades, conceivably to bring full use to a good quality whetstone.

Production fragments:

A considerable amount of the whetstone material recovered at Gásir (38%) is Eidsborg type schist fragments of various sizes, with no signs of grinding surfaces or grooves. In most cases remains of grinding surfaces are traceable, even in small fragments, if they have belonged to a used whetstone, and it is unusual to find such a large percentage of seemingly unused material. This could indicate that some sort of reworking of whetstone raw material took place at the site, presumably for redistributing the whetstone material in more usable shapes and sizes. Raw material blanks were exported from the Eidsborg region in dimensions of ca. 30x5x3 and this could be reworked to at least 6 standard medium shaped whetstones. Few larger examples with no signs of use were also found (i.e. GÁS 04-30), a medium sized whetstone of light to medium grey Eidsborg schist and with an unused surface. Looks like it could be a prefabricated whetstone for reselling at the given size or perhaps broken in one end and therefore not sold. Also GÁS 06-5129 (PICTURE 5), found in the church, is a very large fragment with no signs of use, indicating that it was most likely discarded in connection to whetstone production. The piece is very broad and almost resembling the width (4.8cm) of the raw material blanks, whereas most used whetstone bars are closer to 2.5-3 cm in width[6]. However, the number of possible production fragments found at Gásir is not substantial enough to prove large scale making and redistribution of whetstone material, but it strongly indicates that some sort of work on whetstone material must have taken place. In order to develop a stronger argument for such work or trade at the site, it is necessary to go systematically through heavy-fractions from all flotation samples. Small fragments of schist, concentrated in individual contexts would be a good indication of reworking of whetstone material, but this work still remains to be done at this site. Preliminary results from the Harbor site of Kolkuós[7] show a concentration of small fragments inside at least one of the booths and Gásir definitely has the potential to produce similar results.

[6] Hansen, Sigrid Cecilie Juel, 2009 Ch. 2.2

[7] Preliminary research results by Sigrid Hansen 2009, unpublished.

Spatial distribution, and implications for the stone types and use of material.

Most of the fragments and possible unfinished whetstone pieces at Gásir are of the darker and harder types. It is recommended that further analysis of spatial distribution is undertaken, especially possible production fragments.

Summary: The whetstone collection from Gásir is, quite in line with what could be expected, consisting predominantly of the light grey Eidsborg schist types and only a few of the dark grey very fine grained schist types, in addition of a few other stone types, both of possible foreign and Icelandic origin. The material is mostly well preserved but quite fragmented and most stones preserved in a size not or only hardly usable for continued grinding purposes. There is good evidence of some sort of whetstone redistribution at the site, both as small fragments or cut offs from cutting down larger whetstone blocks and a few larger unused whetstones of irregular shapes but well usable for grinding purposes.

Picture 1 GÁS04-208 (suggested for illustration)

Picture 2 GÁS05-5131, Very light grey schist type, fragile and with eroded surfaces

Picture 3 GÁS05-10 Whole whetstone, Small/pocket size, Light grey schist type

Picture 4 GÁS05-55 Front and side of the end piece of a very large whetstone, with remains of possible iron ring through the now broken suspension hole.

Picture 5 GÁS06-5129 Large fragment of unused whetstone material, probably production fragment.

Picture 6 GÁS04-30 Medium sized unused whetstone (with unfinished surfaces), perhaps intended for reselling?

Picture 7 GÁS05-269 Small fragment of the dark grey schist type

Picture 8 GÁS02-161 Grinding slab, possibly of sandstone?