BÆR Í BORGARFIRÐI

Rapid scanning for cereals in sample KLI-2014-51-11

Klaustur á Íslandi

(Monasticism in Iceland)

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1. INTRODUCTION

An aim of the Monasticism in Iceland (Klaustur á Íslandi) archaeological project is to discern the development of a European institutional framework within Iceland and its impact on Icelandic society during the medieval period. Pollen analysis has the potential to provide an indication of plant species or taxa present in the vicinity of Icelandic monasteries during the medieval period; thereby allowing the archaeological context to be set within an ecological context (Whittington & Edwards 1994). This in turn can inform on land management practices within the immediate locale of the archaeology as well as allowing for the identification of species that may have been utilised for specific purposes in the past e.g. introduced edible or medicinal plants (Kristjánsdóttir *et al*. 2014). As part of this investigative process a pollen sample derived from a bulk sample from an archaeological context situated within the foundations of the modern church at Bær in Borgarfjörður was analysed.

Analysis of palaeo-ecological material was commissioned by Dr. Steinunn Kristjánsdóttir (Monasticism in Iceland Project) and the laboratory facilities were provided by the Faculty of Life & Environmental Sciences, University of Iceland.

2. BÆR, BORGARFJÖRÐUR (FIG. 1)

Bær is believed to have been the location of the earliest monastery to have been founded in Iceland in 1030 although it failed to establish itself in the longer term and was dissolved c.19 years later (Kristjánsdóttir & Gunnarsdóttir 2014). In 2014, renovation works uncovered archaeological remains beneath the foundations of the present church (Fig. 2) providing the Monasticism in Iceland project an opportunity to investigate them (Kristjánsdóttir & Gunnarsdóttir 2014). The findings of this report pertain to the pollen extracted from a bulk sample acquired from the lowermost context (120-130 cm) i.e. the oldest. This is described as a darkbrown floor layer. The only artefact was a horse tooth. At present there is no refined chronology available for the contexts at this site (Kristjánsdóttir & Gunnarsdóttir 2014). With regard to plants with utilitarian value, the field onion (*Allium oleraceum*) is present at Bær in the modern context, rare elsewhere in Iceland. It has been inferred that this species may have been introduced to the locale during the monastic period. *Allium*-type pollen has been found in association with monastic remains at Skriðuklaustur (Kristjánsdóttir *et al*. 2014).

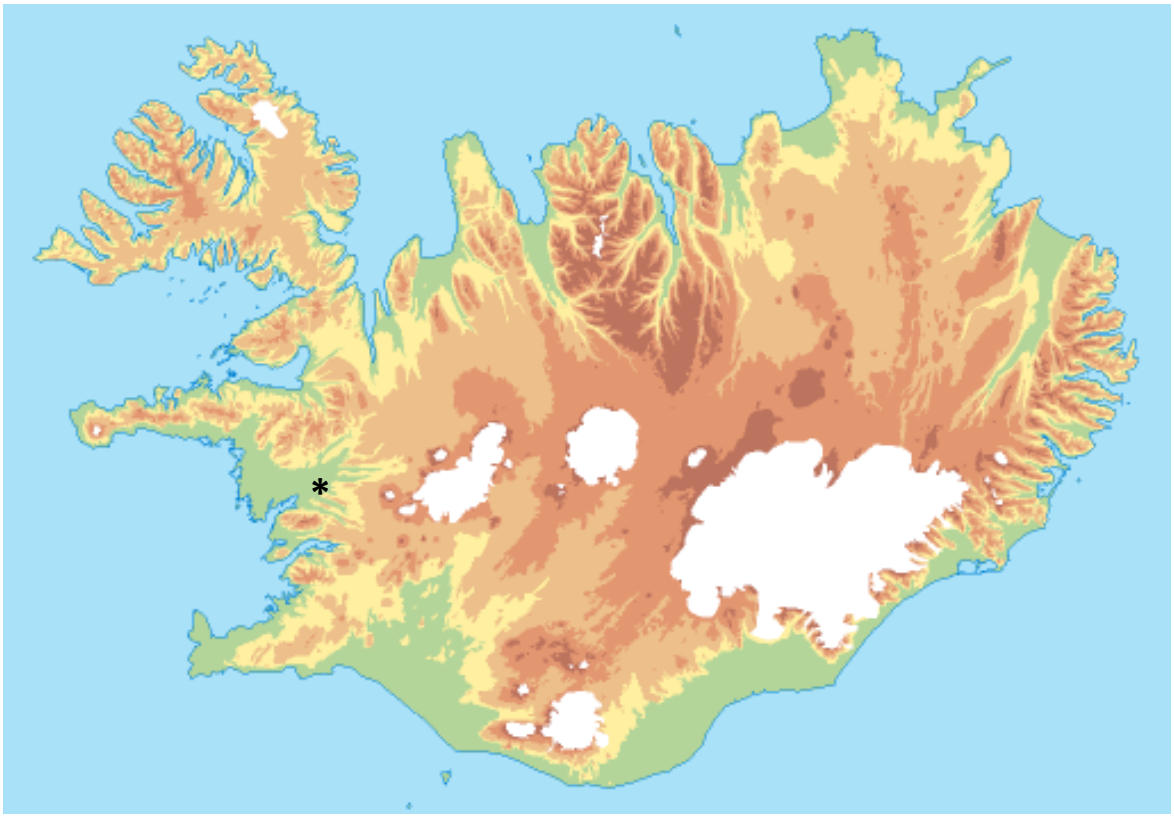

Fig. 1: The approximate location of Bær, Borgarfjörður, Iceland.

Fig. 2: Bærkirkja (Bær church), Borgarfjörður encircled.

3. METHODOLOGY

A 2 cm^3 sub-sample was taken from each of the two bulk samples acquired from the archaeological context at Bær. Volume of pollen samples was determined by displacement in 10% hydrochloric acid (HCl) (Bonny 1972). The samples were subjected to further treatments in 10% sodium hydroxide (NaOH), sieved (150 µm) and subjected to acetolysis mixture. After washing in 10% NaOH the samples were subjected to dense media separation using LST Fastfloat liquid with a density of 1.92 g/cm^3 to separate organic and inorganic components. One *Lycopodium clavatum* tablet (Batch No. 1031) was added to each sample (Stockmarr 1971). Each tablet contains c. 20848 spores and provides a control for the calculation of palynomorph concentrations. Pollen grains were slide mounted with silicone oil (Moore *et al*. 1991). Pollen counts were conducted using a light microscope at 400x magnification (at 600x and 1000x magnification for specific detail). A rapid scanning method was applied with the intention of identifying the presence of *Allium*-type pollen (Moore *et al*. 1991; Tweddle *et al*. 2005M; Kristjánsdóttir *et al*. 2014). All Poaceae pollen were also evaluated as potential *Hordeum*-type i.e. grain size >37 µm, annulus diameter >8 µm (Andersen 1978; Moore *et al*. 1991; Tweddle *et al*. 2005). Means of distinguishing *Hordeum*-type (barley) from *Leymus arenarius* (lyme grass) is based upon habitat context e.g. wetland, pasture etc. and follows Tweddle *et al*. 2005; Erlendsson *et al*. 2006; Vickers *et al*. 2011; Erlendsson *et al*. 2014. Coprophilous fungi were also counted as an indicator of livestock (van Geel *et al*. 2003; Cugny *et al*. 2010). Otherwise, the presence of vascular plant species and taxa was simply noted as was the presence of charcoal. Field identification guides were used to identify the habitat associations of the taxa found within the pollen sample (Rose 1981; Kristinsson 1986; Fitter 1987). Plant nomenclature follows Kristinsson (1986). Pollen and spore nomenclature follows Bennett (2007), amended to better reflect the Icelandic flora (Erlendsson 2007).

4. RESULTS

Vascular plant species and taxa present are listed in Table 1. No *Allium*-type pollen was encountered. Bryophyte and pteridophyte spores present are identified in Table 2. Only two coprophilous fungal spores were noted (*Sordaria*-type: HdV 55a). Charcoal was present throughout the sample. The number of Cerealia-type pollen identified in the sample is 75 (giving an estimated number of 2,843 Cerealia-type pollen grains in the sample in total based upon a control of 550 *Lycopodium clavatum*).

Table 1. Vascular plant pollen from Bær (KLI-2014-51-11).

Latin	**English**	**Icelandic**
Angelica undiff.	Angelicas	Hvönn
Achillea-type	Ox-eye daisy, yarrow, sneezewort	-
Avena-type	Oats	Hafrar
Betula undiff.	Birch/Dwarf birch	Birki/Fjalldrapi
Betula (non-triporate)	-	-
Brassicaceae	Brassicaceae	Krossblómmaætt
Caryophyllaceae	Campion & catchflies	Hjartgrasaætt
Calluna vulgaris	Heather	Beitilyng
Caltha palustris	Marsh marigold	Hófsóley
Cyperaceae	Sedge	Starir
Empetrum nigrum	Crowberry	Krækilyng
Equisetum	Horsetails	Elfting
Filipendula ulmaria	Meadowsweet	Mjaðjurt
Galium	Bedstraw	Maðra
Hordeum-type	Barley	Bygg
Lactuceae	Dandilions & hawkweeds	Fíflar
Lychnis viscaria-type	e.g. Alpine catchfly (L. alpina)	Ljósberi (L. alpina)
Poaceae	Grass	Gras
Potentilla-type	Cinquefoils & silverweed	Gullmura, engjarós & tágamura
Ranunculus acris-type	Buttercup	Sóleyjar
Rumex acetosa	Common sorrel	Túnsúra
Rumex acetosella	Sheep's sorrel	Hundsúra
Pinus-type (alien)[1]	Pine	Fura
Plantago maritima	Sea plantain	Kattartunga
Polygonum aviculare	Knotgrass	Blóðarfi
Salix	Willow	Víðir
Sorbus aucuparia	Rowan	Reynir
Thalictrum alpinum	Alpine meadow rue	Brjóstagras
Vaccinium-type	Blaeberry	(Aðal)Bláberjalyng

[1] *Pinus*-type represents a plant species that is a non- native in Iceland although it is commonly found in Icelandic pollen assemblages. Its presence is explained by wind-dispersal from the European continent or the British Isles (Björck *et al*. 1992).

Table 2. Bryophyte and pteridophyte spores from Bær (KLI-2014-51-11).

Latin	**English**	**Icelandic**
Diphasium alpinum	Alpine clubmoss	Litunarjafni
Selaginella selaginoides	Lesser clubmoss	Mosajafni
Sphagnum	Sphagnum	Buramosar
Pteropsida (monolete) indeterminate	Fern	Byrkningar

5. DISCUSSION

Both charcoal and the minimal amount of coprophilous fungi spores reflect the indoor setting of the archaeological context i.e. the floor of a building. The plant assemblage represented by pollen and spores (Tables 1 & 2) is generally typical for Iceland. Some plant species and taxa represented have utilitarian or medicinal value e.g. *Angelica* and *Filipendula ulmaria* (Kristjánsdóttir *et al*. 2014). Unfortunately, these are common, native plants in Iceland and it is impossible to ascertain whether or not they were introduced to the archaeological context through human agency or natural processes (Kristinsson 1986). Nonetheless, some species represented are notable i.e. 73 *Hordeum*-type (c.f. barley) and two *Avena*-type (c.f. oats).

With regard to the Icelandic pollen record, the presence of *Hordeum*-type pollen has been deemed a potential indicator of human settlement in Iceland during the 9th century (Edwards *et al*. 2011). Indeed, according to convention barley may have been grown throughout the island at this time (although perhaps restricted to high status farmsteads) (Ólsen 1910; Zori *et al*. 2013). Abandonment of cultivation, first in the north during the 12th century and then in the south-southwest by the 16th century has led commentators to suggest that cultivation became increasingly difficult due to the Little Ice Age and was replaced with imported grain from overseas (Ólsen 1910; Karlsson 2000; Byock 1981; Sveinbjarnardóttir 2010). This interpretation requires refinement but is sufficient for the purposes of this report.

With regard to Icelandic monastic contexts, *Hordeum*-type pollen has been identified at Reynistaður and at Viðey (Hallsdóttir 1993; Riddell & Erlendsson 2015). At Reynistaður (1295-1551) the pollen sample came from within an excavated structure dated by tephra to the period following 1300. The *Hordeum*-type pollen in question could be derived either from locally cultivated or imported grain. That the *Hordeum*-type pollen arose in association with grazing sensitive species e.g. *Filipendula ulmaria* within a grassland context lends itself to the

possibility that the material is of local origin. If this analysis is correct, it runs *contra* to convention that asserts cereal cultivation was abandoned in northern Iceland by 1300 (Riddell & Erlendsson 2015). At Viðey, *Hordeum*-type pollen derived from natural sediments revealed that barley arrived there coincident with the foundation of the monastery in 1226; cultivation persisted beyond 1500 (and perhaps interrupted by the dissolution of the monastery in 1539). Cultivation at Viðey has been connected with brewing beer but more notably, the strong association between cultivation and monasticism at Viðey is shared in common with European monasticism which is seen as an innovator with regard to agricultural practices (Hallsdóttir 1993; Hallgrímsdóttir 1993; Aston 2011).

At Bær, analysis of *Hordeum*-type pollen is inhibited by the lack of a cohesive chronology. In the absence of a standard pollen (rather than rapid scanning) counting method it is also difficult to make any confident assertions with regard to habitat context (Moore *et al*. 1991). However, it is with a reasonable degree of confidence that it can be assumed that the *Hordeum*-type pollen does represent barley rather than *Leymus arenarius* on the basis that Bær is both remote from the sea and the desert interior and that the pollen assemblage does not give any indication of a dry, eroded landscape (as favoured by *Leymus arenarius*). Furthermore, the *Hordeum*-type pollen in this instance has also been found in association with *Avena*-type pollen (c.f. oats). The occurrence of *Avena*-type in the Icelandic pollen record is relatively rare (Erlendsson 2009). Given its limited presence at Bær (2 pollen grains), *Avena*-type is possibly arising as a weed of the barley field rather than being cultivated for its own sake.

The question that now remains is whether or not the cereal in question is imported from abroad or cultivated within the immediate locale of Bær. Reference to historical sources gives no direct indication of either the import or cultivation of cereals at Bær (Magnússon & Víðalín 1925-1927; Sigurðsson *et al*. 1857-1976). A single entry in the *Diplomatarium Islandicum* VI (pp. 251-252) for 1480 makes reference to the payment of a fine by the farmer at Bær for committing a murder (Sigurðsson *et al*. 1857-1976). A portion of the penalty included 18 small barrels of "*miöl*" (no small sum, equivalent to the value of 1 cow). "Miöl" (modern Icelandic: *mjöl*) translates as "meal" which in the broadest sense can refer to any ground plant material but is most commonly used to refer to ground grain, in particular barley or oats (Árnarson 2002). Unfortunately this does not shed any further light on the origin of the ground meal. The archaeological context proffers no answer either as the structure merely provided a storage facility for the grain heads from which the pollen fell. In fact, the only means of testing this further would be to acquire a pollen sequence from natural sediments in the immediate vicinity

of Bær and search for Cerealia-type pollen deposited in a natural context. This would provide the added advantage of providing a dateable chronological sequence on the assumption that recognisable tephra layers are present. Bearing in mind that cereal pollen does not travel far from its source, one would then be able to conclude more confidently that cereals were grown at Bær at a given time in the past.

6. CONCLUSION

The only definite conclusion one can draw from the rapid scanning of pollen from Bær sample KLI-2014-51-11 is that cereal grain was present at Bær at some point in the past. Given a chronological framework, this site would be worthy of further, more detailed, palynological analysis.

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