Viðey Pollen Analysis: Sample KL-2014-28-031

Monasticism in Iceland

Scott Riddell & Egill Erlendsson
Faculty of Life & Environmental Sciences
University of Iceland
Autumn 2014

1. INTRODUCTION

The key aim of the Monasticism in Iceland project is to discern the development of a European institutional framework within Iceland and its impact on Icelandic society during the medieval period. As part of the investigative process, a pollen sample was acquired from a soil sample (KLI-2014-28-031) derived from an archaeological context on the island of Viðey, the site of a medieval monastic complex. Pollen analysis is able to provide an indication of plant species or taxa present during a period of the monastery's occupation of the island and thereby allows for 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. edible or medicinal plants (Kristjánsdóttir 2014). Laboratory pollen analysis was supported financially by the Monasticism in Iceland Project and the facilities of the University of Iceland (Faculty of Life & Environmental Science).

2. SAMPLE SITE

The island of Viðey is situated just off the northern shore of Reykjavík in south west Iceland (**Fig. 1**). The soil sample KLI-2014-28-031 was acquired from an archaeological context (Trench 3) at ISNET 93: E 361.233, N 409.776 at a depth of 100-200 cm (**Fig. 2**). The archaeological context is described as a peat ash mound comprised of charcoal, peat ash and burnt bone c. 2m deep. Fragments of clay tobacco pipes suggest that this is a post-reformation (AD 1551-1554) context (Kristjánsdóttir pers. comm.). Upper layers (above 100 cm) contained fragments of concrete that are attributed to the levelling of the area in association with a 20th century renovation of Viðeyjarstofa (Kristjánsdóttir pers. comm.).

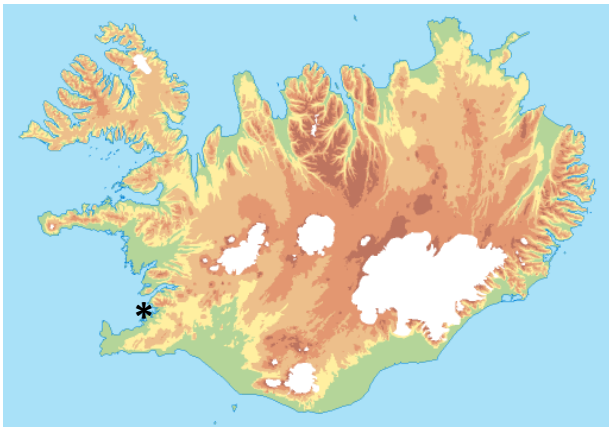

Fig. 1: Map denoting the general location of Viðey in Iceland (asterisk).

Fig 2: Trench 3 from where Sample KLI-2014-28031 was acquired

3. METHODOLOGY

An approximately 2 cm^3 sample was taken from the bulk sample acquired from the archaeological context. 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 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, 48-49).

Pollen counts were conducted using a microscope at 400x magnification (at 600x and 1000x magnification for specific detail). A minimum of 300 pollen grains were counted. In this instance, grass (Poaceae) pollen was found to be overly dominant and it was necessary to count beyond 300 grains in order to ensure sufficient pollen representation of other species (Moore *et al*. 1991). All Poaceae pollen were evaluated as potential *Hordeum*-type i.e. grain size >37 µm, annulus diameter >8 µm (Andersen 1978). Coprophilous fungi were counted as it has been shown that there is a relationship between spore concentration and grazing intensity (Cugny *et al*. 2010). Pteropsida and bryophyte spores (*Sphagnum*) were also counted. In order to maximise the opportunity to identify a range of plant species, especially those associated with cultivation, medicinal purposes or other utility, a rapid scanning method was applied following the standard count (Tweddle *et al*. 2005). This entailed examining an estimated minimum of 1500 pollen grains at 200x magnification.

Field identification guides were used to identify the habitat associations of the various plant species found within the pollen sample (Rose 1981; Kristinsson 1986; Fitter 1987). Plant nomenclature follows that of Kristinsson (1986). Pollen and spore nomenclature follows Bennett (2007) but is amended to better reflect the Icelandic flora (Erlendsson 2007). Indeterminate pollen is defined as material that was identifiably pollen but could not be assigned to a family, genus, species or –type groups of pollen. The identification of coprophilous fungi follows Van Geel *et al*. (2003). As the sample was acquired from a peat ash midden, no attempt was made to quantify charcoal.

4. RESULTS

In total, approximately 5480 pollen grains were surveyed from sample KLI-2014-28-031.

4.1 Standard Count

Given the dominance of grasses (Poaceae), the standard count proceeded beyond the identified 300 minimum in order to ensure the greatest potential for species diversity within the sample (**Tables 1, 2 & 3**).

Table 1: Vascular plant pollen identified in Sample KLI-2014-28-031 (Viðey), standard count.

Latin	English	Icelandic	No. of Pollen
Betula	Birch	Birki	45
Empetrum nigrum	Crowberry	Krækilyng	3
Poaceae	Grass	Gras	583
Cerealia	Cereals	Korn	1
Cyperaceae	Sedge	Starir	123
Chichorieae (Lactuceae)	Dandelions & Hawkweeds etc.	Fíflar	1
Cerastium-type	Mouse-ear	Músaeyra, Fræhyrna	6
Galium	Bedstraw	Maðra	3
Plantago maritime	Sea plantain	Kattartunga	1
Rumex acetosa	Common Sorrel	Túnsúra	16
Rumex longifolius	Northern Dock	Njóli	3
Ranunculus acris-type	Buttercup	Sóley	8
Filipendula ulmaria	Meadowsweet	Mjaðjurt	5
Potentilla-type	Cinquefoils & Silverweeds	Gullmura, Engjarós & Tágamura	1
Thalictrum alpinum	Alpine meadow rue	Brjóstagras	7
Indeterminate pollen grains			18
Total no. of pollen grains			**822**

Table 2: Moss and fern spores identified in Sample KLI-2014-28-031 (Viðey), standard count.

Bryophytes & Pteridopyhtes (Mosses & Ferns)	No. of spores
Lycopdium annotinum	1
Selaginella selaginoides	2
Sphagnum	44
Equisetum	29
Pteropsida (monolete) indeterminate	6
Total no. of spores	**82**

Table 3: Coprophilous fungi identified in Sample KLI-2014-28-031 (Viðey), standard count.

Coprophilous fungi	No. of spores
Sordaria-type (HdV 55a)	70
Sordaria-type (HdV 55b)	20
Sporomiella-type (HdV 113)	1
Podospora c.f. *curvispora*	1
Unidentified	5
Total no. of fungal spores	**97**

4.2 Rapid Scanning

Following the standard count a further c. 4660 pollen grains were examined using the rapid scanning method. In general, *Betula*, *Empetrum nigrum*, Cyperaceae, *Cerastium*-type, *Rumex acetosa*, *Rannunculus acris*-type and *Thalictrum alpinum* regularly occurred throughout the sample. *Sphagnum* spores and coprophilous fungi were also characteristic of the sample. The dominant taxon was Poaceae. Species that were not identified during the standard count are detailed in **Table 4**.

Table 4: Additional vascular plant pollen identified in Sample KLI-2014-28-031 (Viðey), rapid scanning.

Latin	English	Icelandic	No. of Pollen
c.f. Valeriana officinalis	Valerian	Garðabrúða	1
Plantago major/media	Greater plantain	Græðisúra	1
Drosera-type	Sundew	Sóldögg	1 (fragment)
Saxifraga stellaris/nivalis	Starry saxifrage Alpine snow saxifrage	Stjörnusteinbrjótur Snæsteinbrjótur	2

4.3 Further Observations

A number of pollen grains of *Betula* and *Empetrum nigrum* were corroded or broken, especially with regard to the latter species. Charcoal fragments were present throughout the entire sample.

5. DISCUSSION

5.1 Habitats

A pastoral context for the archaeology is inferred via the dominance of grass (Poaceae) pollen with coprophilous fungi indicative of grazing animals. This is further borne out by the presence of species such as *Galium*, *Rumex acetosa*, *Ranunclus acris*-type, *Thalictrum alpinum*; all species associated with grassland and grazed habitats (Edwards *et al.* 2011; Vickers *et al*. 2011). This interpretation is consistent with that presented by Hallsdóttir (1993) for Viðey for the period following AD 1226 where the pollen assemblage suggests that there is a progressive increase in grassland habitats. The strong presence of *Sphagnum* moss, the *Drosera*-type fragment and the amount of sedge (Cyperaceae) and *Filipendula ulmaria* could be indicative of wetland habitats. Previous studies at Viðey demonstrate that the pollen footprint for this habitat decreases over time following AD 1226 (Hallsdóttir 1993). Given that the source of the material is a peat ash mound, peat would also suggest the presence of a nearby wetland area. Birch (*Betula*) woodland may also be present in the area although the corroded nature of some of the birch pollen could suggest that the material was blown in from farther afield, especially given the absence of other woodland plant species (Gathorne-Hardy *et al*. 2009). Previous pollen studies suggest that woodland was eradicated on Viðey following AD 1500 (Hallsdóttir 1993).

The fact that the sample is derived from a peat ash mound cannot be ignored and it may be reasonably expected that following the deposition of this household waste that it would have been quickly colonised by a very specific suite of plants, among them *Plantago major* and *Rumex longifolius.* Identification of the *Plantago*-type (**Table 4.**) with *Plantago major* is suggested on the basis that *Plantago media* is a plant of calcareous grasslands (a habitat unknown in Iceland); it has never been recorded botanically in Iceland and has not previously been found in the pollen record (Rose 1981; Kristinsson 1986; Fitter 1987; Þórhallsdóttir 1996). In contrast, *Plantago major* is a plant of disturbed ground adapted to a range of soil conditions i.e. arable, trampled ground, urban, roadsides and is equally adapted to the conditions of a domestic spoil heap (Rose 1981; Kristinsson 1986; Fitter 1987). *Rumex longifolius* is another species associated with waste ground, dumps, urban, roadsides (Rose 1981; Kristinsson 1986). *Rumex longifolius* is probably an introduced species to Iceland (Kristinsson 1986; Þórhallsdóttir 1996). Depending upon the species, *Equisetum* may also be a feature of the spoil heap e.g. *Equisetum arvense* (Kristinsson 1986).

5.2 Utility & Medicinal Plants

A single *Hordeum*-type grain might suggest cultivation on Viðey and this cereal-type pollen has already been identified there for the 13th century (Hallsdóttir 1993). However, a single pollen grain is difficult to interpret and, given that Viðey is an island, the possibility that this grain is derived from the coastal plant lyme grass (*Leymus arenarius*) cannot be ruled out (Einarsson 1962; Hallsdóttir 1987; Edwards *et al*. 2011). With reference to Kristjánsdóttir (2014) the presence of both *Plantago major* and *Valeriana officinalis* are both notable with regard to their potential as medicinal plants associated with monastic gardens. *Valeriana officinalis* is of particular note as it has been previously recorded in the pollen record for Viðey (Hallsdóttir 1993). Given the chronological context, these two species could be surviving relics of an earlier monastic garden although it is worth noting that they both occur sporadically in other pollen assemblages for Iceland from the time of settlement c. AD 871 (Edwards *et al*. 2011).

It is perhaps also worth acknowledging the medicinal properties of *Sphagnum* moss, *Galium* and *Filipendula ulmaria* (Ayres 2013; Kristjánsdóttir 2014).[1] Unfortunately, as native plant species, *Sphagnum* moss, *Galium* and *Filipendula ulmaria* are commonly represented in pollen assemblages for Iceland and it is impossible to connect their presence specifically to medicinal practices and/or monastic traditions (Kristinsson 1986; Þórhallsdóttir 1996).

[1] *Sphagnum* is anti-sceptic, absorbent and has been used to staunch wounds at least as early as the Battle of Clontarf, Ireland, AD 1014 (Ayres 2013).

6. CONCLUSION

The representation of plant species in sample KLI-2014-21-031 suggests grazed grassland with wetland on the low-lying fringes perhaps somewhat akin to the present landscape. Birch scrub may also have been present although limited to areas free of grazing e.g. cliffs or more likely, originates from the nearby mainland. The peat ash mound itself represents a distinct habitat type and may perhaps explain the presence of species such as *Plantago major* and *Rumex longifolius*. Alternatively, with regard to the former species, utility may be recognised along with that of *Valeriana officinalis* as evidence of a medieval monastic garden; or at least relicts thereof.

REFERENCES

Andersen S.T. (1978) Identification of Wild Grass & Cereal Pollen, *Danmarks Geologiske Undersøgelse, Årbog*, 69-92.

Ayres, P. (2013) The Kindly *Sphagnum* Moss, *Field Bryology*, 110, 27-34.

Bennett, K.D. (2007) Data-handling methods for Quaternary microfossils, Queens University, Belfast, http://chrono.qub.ac.uk/datah/depthage.html (Viewed Nov. 2014).

Bonny, A.P. (1972) A Method for Determining Absolute Pollen Frequencies in Lake Sediments, *New Phytologist*, 71, 393-405.

Cugny, C., Mazier, F. & Galop, D. (2010) Modern & Fossil Non-pollen Palynomorphs from the Basque Mountains (Western Pyrenees, France): The Use of Coprophilous Fungi to Reconstruct Pastoral Activity, *Journal of Vegetation History & Archaeobotany*, 19, 391-408.

Edwards, K.J., Erlendsson, E. & Schofield, J.E. (2011) Is there a Norse 'footprint' in North Atlantic pollen records?, in Sigmundsson, S. (ed.) *Viking Settlements & Viking Society, Papers from the Proceedings of the 16th Viking Congress, Reykjavík & Reykholt, 16th-23rd August 2009*, Hið Íslenzka Fornleifafélag & University of Iceland Press, Reykjavík, 65-82.

Einarsson, Þ. (1962) Vitnisburður frógreiningar um gróður, veðurfar og landnám á Íslandi. *Saga*, 3, 442-469.

Erlendsson, E. (2007) *Environmental Change around the Time of the Norse Settlement of Iceland*, Unpublished PhD Thesis, University of Aberdeen, Scotland

Fitter, A. (1987) *Wild Flowers of Britain & Northern Europe*, Collins, London.

Gathorne-Hardy, F.J., Erlendsson, E., Langdon, P.G. & Edwards, K.J. (2009) Lake Sediment Evidence for Late Holocene Climate Change & Landscape Erosion in Western Iceland, *Journal of Paleolimnology*, 42, 413-426.

Hallsdóttir, M. (1987) *Pollen Analytical Studies of Human Influence on Vegetation in Relation to the Landnám Tephra Layer in Southwest Iceland*, Lundqua Thesis 18, Dept. of Quaternary Geology, Lund.

Hallsdóttir, M. (1993) Línurit yfir talningu frjókorna í Viðey, in Hallgrímsdóttir, M. (ed.) *Húsakostur Viðeyjarklausturs, Um byggð í Viðey fram á 18 öld*, Skýrslur Árbæjarsafns XXIX, Reykjavík, 182-184.

Kristinsson, H. (1986) *A Guide to the Flowering Plants & Ferns of Iceland*, Mál og menning, Reykjavík.

Kristjánsdóttir, S., Larsson I. & Åsen P.A. (2014) The Icelandic Medieval Monastic Garden – did it exist? *Scandinavian Journal of History*, 39 (5), 560-579.

Moore, P.D., Webb, J.A. & Collinson, M.E. (1991) *Pollen Analysis*, Blackwell, London.

Stockmarr, J. (1971) Tablets with Spores used in Absolute Pollen Analysis, *Pollen et Spores*, 13, 614-621.

Tweddle, J.C., Edwards, K.J. & Fieller, N.R.J. (2005) Multivariate statistical & other approaches for the separation of cereal from wild Poaceae pollen using a large Holocene dataset, *Journal of Vegetation History & Archaeobotany*, 14, 15-30.

Van Geel, B., Buurman, J., Brinkkemper, O., Schelvis, J., Aptroot, A., van Reenen, G. & Hakbijl, T. (2003) Environmental Reconstruction of a Roman period Settlement Site in Uitgeest (The Netherlands), with Special Reference to Coprophilous Fungi, *Journal of Archaeological Science*, 30, 873-883.

Vickers, K., Erlendsson, E., Church, M.J., Edwards, K.J. & Bending, J. (2011) 1000 Years of Environmental Change & Human Impact at Stóra Mörk, Southern Iceland: A Multi-proxy Study of a Dynamic & Vulnerable Landscape, *The Holocene*, 21 (6), 979-995.

Whittington, G. & Edwards, K.J. (1994) Palynology as a Predictive Tool in Archaeology, *Proceedings of the Society of Antiquaries Scotland*, 124, 55-65.

Þórhallsdóttir Þ.E. (1996) Áhrif búsetu á landið, in Grímsdóttir, G.Á. (Ed.) *Um Landnám á Íslandi – fjórtán erindi, Vísindafélag Íslendinga*, Reykjavík, 149-170.