TRUMBSVALIR (ÞINGEYRAR)

Two pollen samples from test trench K2 (KLI-2014-39)

Monasticism in Iceland

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1. Introduction

An aim of the Monasticism in Iceland 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. edible or medicinal plants (Kristjánsdóttir *et al*. 2014). As part of this investigative process, a suite of four pollen samples were acquired from bulk soil samples derived from two archaeological test trenches at Trumbsvalir (KLI-2015-39). Trumbsvalir is located c. 550 m north west of the modern church and farm at Þingeyrar on the north coast of Iceland and situated upon a sand and gravel spit (Is: *eyrar*) (Fig. 1). This report deals with the two samples derived from test trench 2 (K2).

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. Trumbsvalir (near Þingeyrar)

Þingeyrar is believed to have been the former site of a medieval assembly (Is: *þing*) established shortly after settlement in the late 9th century and a medieval monastery (c. AD 1112-1551) (Mehler & Coolen 2015). Very little is known of Trumbsvalir although *Trumshólar/Trumsalir* is mentioned in an inventory for Þingeyrarklaustur AD 1525 (Júlíusson 2014, 46-60). Unfortunately, the inventory does not provide any further information; be that human occupation, resources or livestock numbers. Evidence of structural remains is restricted to an incomplete *garður* (the wall of a home field) as well as some structural features encompassed by said wall (Kristjánsdóttir & Gunnarsdóttir 2014). Test trench K2 was situated within one of the internal structural features (Fig. 2). Based upon their position in relation to tephra strata in the K2 profile and artefactual evidence, both samples are thought to derive from the medieval period following AD 1104 (Table 1; Kristjansdóttir & Gunnarsdóttir 2014; Sigurgeirsson 2014).

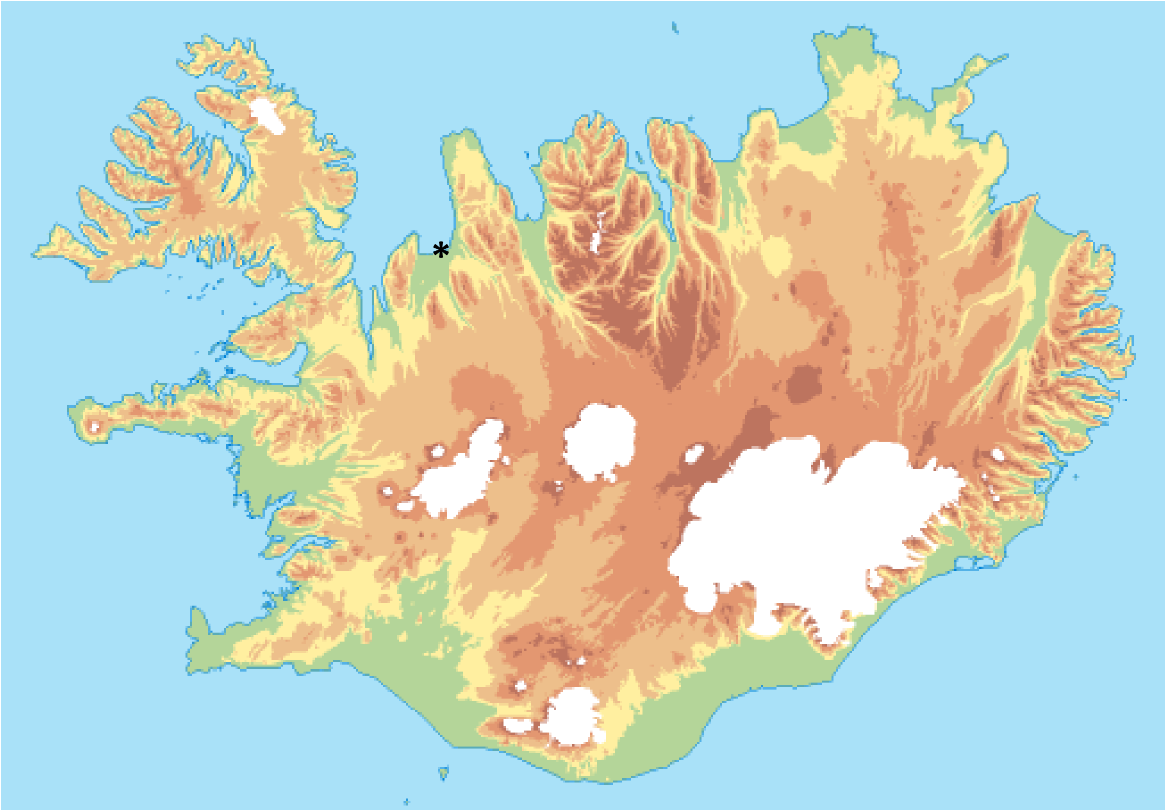

Fig. 1: The approximate location of Þingeyrar, Iceland.

Fig. 2: Trumbsvalir trenches K1 & K2.

3. Methodology

A 2 cm^3 sub-sample was taken from each of the two bulk samples acquired from the archaeological context at Trumbsvalir (Table 1.). 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).

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 (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; Tweddle *et al*. 2005). 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).

Field identification guides were used to identify the habitat associations of the various taxa 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). Fifty percent of the *Betula* spp. pollen grains counted were measured in order to distinguish between *Betula nana* and *Betula pubescens* (Karlsdóttir 2014). Indeterminate pollen is defined as material that was identifiably pollen but could not be assigned to a family, genus, species or –type of pollen due to taphonomic attrition. The identification of coprophilous fungi follows van Geel *et al*. (2003). The presence of charcoal was noted although no attempt was made to quantify it as the archaeological contexts from which it was derived were primarily composed of peat ash or soot.

4. Results

For the estimated minimum number of pollen grains surveyed per sample see Table 2. Given the dominance of *Betula* spp. pollen in both samples the standard count exceeded the specified 300 minimum count to ensure that the greatest range of species was represented in the analysis (Table 3). Pollen grain condition in sample 39-06 was generally poor but damaged pollen grains were identifiable. In contrast, pollen condition was better in 39-12 but in those instances where pollen was damaged, it was completely unidentifiable; reflected in the number of indeterminate pollen (Table 3). There is little difference in the range of the physical condition of *Betula* pollen grains as a percentage between the two samples (Figs. 3 & 4). Based upon the size of the *Betula* pollen grains, *Betula nana* is dominant in both samples (Figs. 5 & 6). Bryophyte and pteridophyte spores are identified in Table 4. Note that a single *Glomus* spore (mycorrhizal fungi) was identified in sample 39-06. Taxa and species that were not recorded in the standard count but were noted during rapid scanning are also identified in Tables 3 & 4. Both the standard and rapid scanning counting methods revealed the presence of coprophilous fungi in the two samples (Table 5). Charcoal was also present throughout both samples.

Table 1: Bulk sampling for test trench K2.

Bulk Sample No.	Layer No.	Approx. Depth (cm)	Description	Associated Artefacts	Date (tephra)
KLI-2015-39-06	3	50-60	Peat-ash (hearth?)	n/a	AD 1104 (Hekla) in turves (post AD 1104)
KLI-2015-39-12	4	60	Coals, soot, burnt bone	Spindle whorl, whetstone, nail, wood	AD 1104 (Hekla) in turves (post AD 1104)

Table 2: Estimated number of pollen grains surveyed per sample.

Bulk Sample No.	Pollen grains per sample
KLI-2015-39-06	14,440
KLI-2015-39-12	199,619

Table 3: Vascular plant pollen identified during standard and rapid scanning counts in samples KLI-2014-39-06 & KLI-2014-39-12 from test trench K2.

Latin	English	Icelandic	39-06 (standard)	39-06 (rapid)	39-12 (standard)	39-12 (rapid)
Angelica undiff.	Angelicas	Hvönn	1	-	-	present
Betula undiff.	Birch	Birki	162	present	224	present
Betula (non-triporate)	-	-	4	present	4	present
Caryophyllaceae	Campion & Catchflies	-	3	-	-	present
Silene vulgaris-type	-	-	-	-	-	present
Cerastium-type	Chickweeds	Músareyra, Fræhyrna	2	-	-	-
Cyperaceae	Sedge	Starir	72	present	49	present
Drosera rotundifolia	Sundew	Sóldögg	3	-	-	
Empetrum nigrum	Crowberry	Krækilyng	1	-	-	present
Equisetum	Horsetails	Elfting	-	-	3	present
Ericales	-	Lyng	1	-	-	-
Filipendula ulmaria	Meadowsweet	Mjaðjurt	1	-	3	present
Galium	Bedstraw	Maðra	-	present	-	-
Poaceae	Grass	Gras	28	present	33	present
Potentilla-type	Cinquefoils & Silverweed	Gullmura, Engjarós & Tágamura	-	-	5	present
Ranunculus acris-type	Buttercup	Sóleyjar	3	-	3	present
Rumex acetosa	Common sorrel	Túnsúra	6	-	1	present
Pinus-type (alien)	Pine	Fura	1	-	-	present
Plantago maritima	Sea plantain	Kattartunga	-	-	1	-
Sagina			-	-	-	present
Salix	Willow	Víðir	1	-	3	present
Sorbus aucuparia	Rowan	Reynir	-	-	3	-
Thalictrum alpinum	Alpine Meadow Rue	Brjóstagras	-	present	1	present
Vaccinium-type	Blaeberry	(Aðal)Bláberjalyng	-	-	-	present
Indeterminate			22	present	54	Present
Total no. of pollen grains surveyed			**311**		**383**	

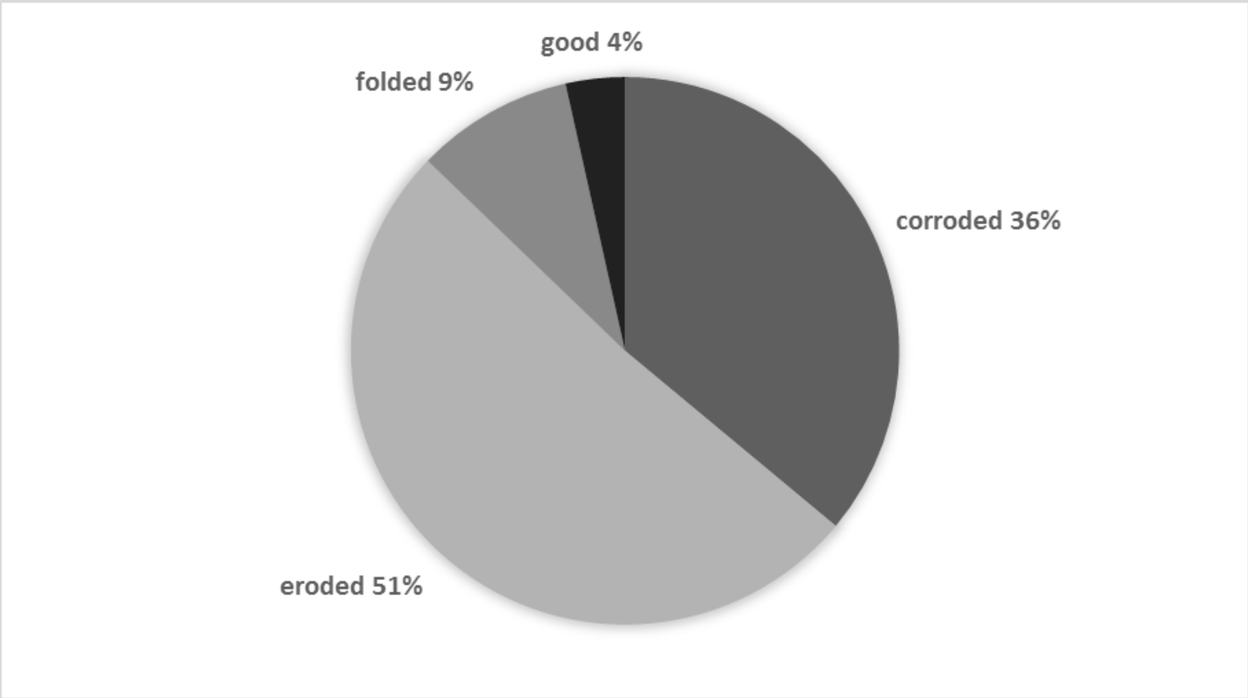

Fig. 3: Condition of *Betula* spp. pollen grains (no. 86) for sample 39-06 (K2).

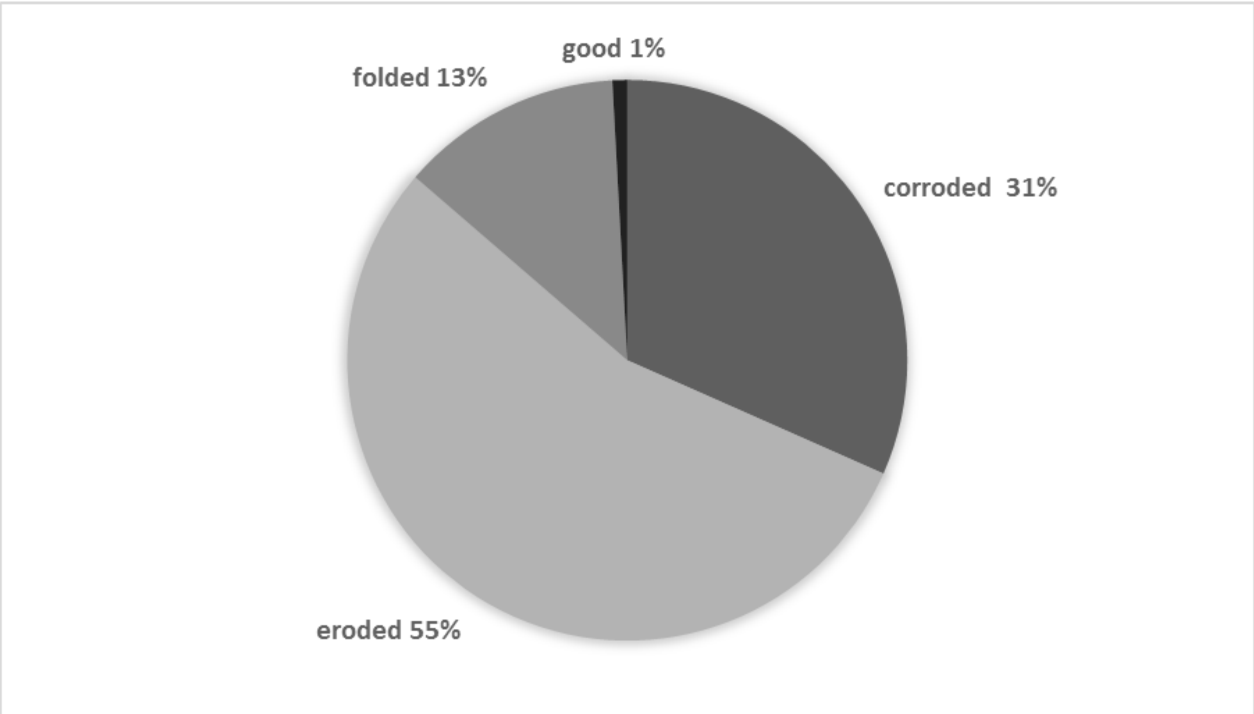

Fig. 4: Condition of *Betula* spp. pollen grains (no.117) for sample 39-12 (K2).

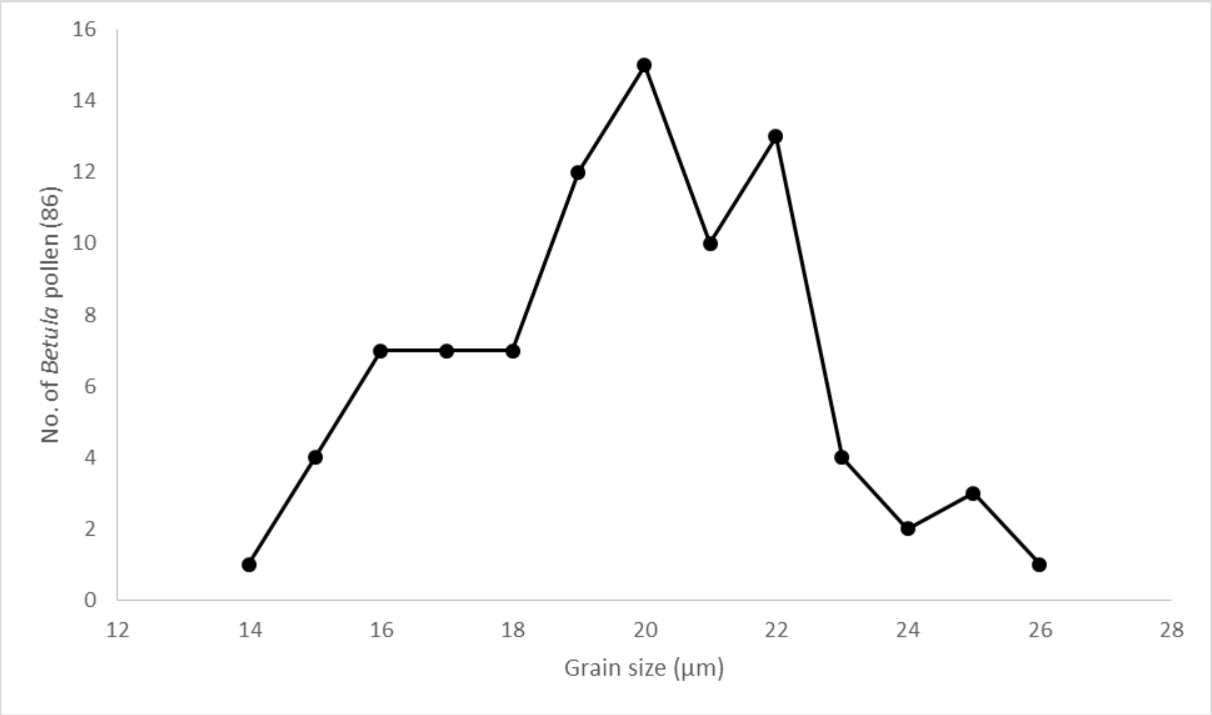

Fig. 5: *Betula* pollen grain size for sample 39-06 (K2).

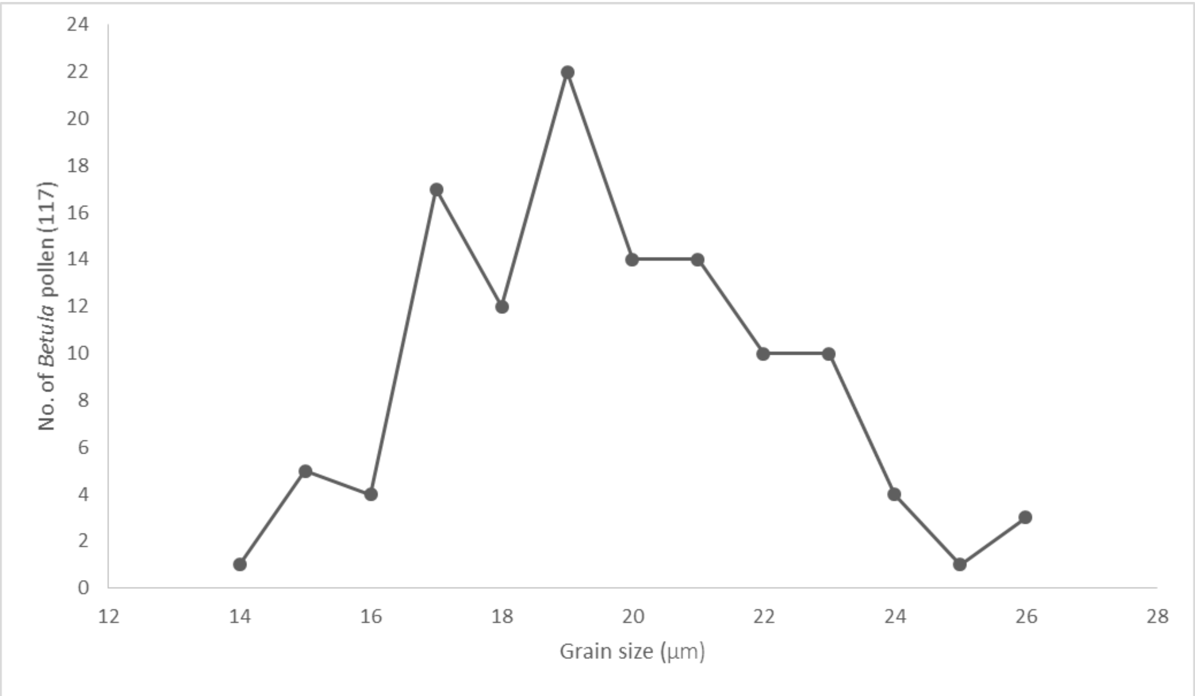

Fig. 6: *Betula* pollen grain size for sample 39-12 (K2).

Table 4: Bryophyte and pteridophyte spores identified during standard and rapid scanning counts in samples KLI-2014-39-06 & KLI-2014-39-12 from test trench K2.

Latin	English	Icelandic	39-06 (standard)	39-06 (rapid)	39-12 (standard)	39-12 (rapid)
Botrychium spp.	Moonwort	Mánajurt	-	-	-	present
Diphasium alpinum	Alpine clubmoss	Litunarjafni	2	-	-	-
Selaginella selaginoides	Lesser clubmoss	Mosajafni	-	-	-	present
Sphagnum	Sphagnum	Buramosar	67	present	2	present
Pteropsida (monolete) indeterminate	Fern	Byrkningar	27	present	243	present

Table 5: Coprophilous fungal spores identified during standard count in samples KLI-2014-39-06 & KLI-2014-39-12 from test trench K2.

Coprophilous fungi	No. of spores: KLI-2014-39-06	No. of spores: KLI-2014-39-12
Sordaria-type (HdV 55a)	1	25
Sporomiella-type	2	-
Total no. of spores	**3**	**25**

5. Discussion

The archaeological contexts at Trumbsvalir are situated above the AD 1104 Hekla tephra (Sigurgeirsson 2014). The artefacts associated with sample 39-12 place it within the medieval period (pre-1600), either older or contemporary with the monastery at Þingeyrar (Kristjánsdóttir & Gunnarsdóttir 2014). Nothing more can be said in relation to the date of the peat ash (39-06) that lies upon sample 39-12. In theory, based upon the archaeological data and tephrochronology of Trumbsvalir K2, the pollen record should mirror an ecology and environment that post-dates AD 1104.

This is a moot point; both samples are derived from material that had either been burnt directly i.e. the peat ash of 39-06, or had been mixed with burnt material i.e the soot, charcoal and burnt bone of sample 39-12. With regard to the former (39-06), the peat ash fuel is presumably derived from peats cut from a nearby wetland with the pollen contained within the peats actually of a much greater age than that of the archaeological context from which the pollen was extracted; given the predominance of *Betula*, most likely pre-settlement (AD 871). The latter sample (39-12) is more complex, its ultimate origin unknown. The fact that the soot in the sample includes macro-fragments of charcoal could suggest that wood was the primary fuel type, however, woody material can also survive in peats. It is also possible that the burnt material is mixed; derived form a range of sources.

For sample 39-06 the wetland environment of the peat cuttings is reflected in the presence of *Sphagnum*, *Drosera rotundifolia* and Cyperaceae although the strong *Betula* signal implies that it was a significant feature of the habitats surrounding the wetland. Pollen grain size suggests *Betula nana* was the dominant *Betula* species (Fig. 5). The remaining grazing intolerant species are suggestive of intermediary habitats e.g. *Angelica* spp., *Filipendula ulmaria* and *Salix*. Grassland (Poaceae) and apophytic associates (Caryophyllaceae, *Cerastium*-type, *Ranunculus acris*-type and *Rumex acetosa*) are also present. *Rumex acetosa* in particular suggests some degree of nutrient enrichment, perhaps explained by presence of coprophilous fungi. It is therefore possible that there are two palynomorph assemblages present; that derived from the cut peats (pre-settlement) and that which settled upon the peat ash following burning (post-settlement).

Betula pollen dominates the profile for 39-12, and as with 39-06, the pollen grain characteristics suggest that *Betula nana* was dominant (Fig.6). The signal for *Salix* is stronger and *Sorbus aucuparia* is present intimating a woodland component. Pteropsida (ferns) are also well represented (shade tolerant, indicative of a woodland understorey). Accounting for the limited range of shade intolerant taxa and species, the overall impression is one of a heath/scrub woodland. In light of this, the relatively high number of coprophilous fungi is surprising i.e. the presence of livestock (also apparent via the burnt bone in the bulk sample) should impinge upon woodland and create opportunities for shade intolerant and grazing tolerant taxa and species. This clearly not the case. It is therefore possible that coprophilous fungi was trampled into the floor layer following its deposition while the pollen data infers another pre-settlement assemblage derived from burnt peats.

Ultimately, the difficulty here for both samples is in distinguishing the characteristics of pollen material contemporary with the deposition of the floor and peat ash layers from those characteristics archived in the peat fuel. This is further compounded by the need to determine taphonomic impacts upon the pollen grains i.e. are certain species and taxa of pollen more resilient to incineration than others and how is the structure of the pollen grain affected by the naked flame? Analysis of *Betula* pollen grains from both samples shows little difference in the degree of damage inflicted upon the pollen grains taphonomically but notably, the bulk of the *Betula* pollen grains in both sampled are damaged (in varying degrees) (Figs. 3 & 4).

6. Conclusion

Unfortunately, the difficulties associated with distinguishing pollen derived from the fuel source from pollen deposited during a period contemporary with combustion and the laying down of the archaeological contexts limits interpretation. This is further compounded by the unknown taphonomic impact of fire upon pollen grains. All that can really be said is that a habitat matrix that once occupied the locale of Trumbsvalir comprised of peatland and scrub plant communities.

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