Palynological and Vegetational Changes associated with the Deposition of Saksunarvatn Ash in the Faroe Islands

Flogsáðfrøðiligar og gróðrarligar broytingar í sambandi við botnseting av saksunarvatnsøsku í Føroyum

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Úrtak

Saksunarvatnsøska stavar frá eini íslendskari keldu (eldgos um 8930-9060 BP) í einum parti av Grimsvatnaøkinum. Væntandi kundi verið, at tað hevði havt árin á gróðurin, at setlagið í Føroyum er so ógviliga tjúkt í støðum (upp í 45 cm). Tjúktin á øskuflónni er tó treytað av staðarfrárenningarháttunum av jarðarmating og áløgufokusering. Kortini kundi tefran havt við sær, at gróðurin broyttist, og hetta er kannað við háloysnisflogsáðfrøði á støðum í tveimum ólíkum oyggjum (Streymoy og Suðuroy), har tefrutjúktin kundi vera ávikavist 1,0-6,7 cm. Eisini er borið saman við tilfar um flogsáð frá Saksunarvatni og úr Hovi (eisini í Streymoy og Suðuroy), sum Jóhannes Jóhansen hevur útvegað.

Flogsáðfrøðiligar broytingar og, sum niðurstøða av teimum, gróðrarligar broytingar sum fylgja av øskuavfallinum innan flogsáðfrárenningarøkini í Føroyum verða umrøddar, við teimum sterkastu sjónligu árinunum í Hagamýru (Suðuroy), har wetter-gróðrarøki kunnu hava verið 'køvd' av øsku, og soleiðis kann íkastið av flogsáð av samsvarandi floru vera minkað. Á sama hátt eru vatntaxa eisini minkað. Í hvussu so er flogsáðfrøðiliga, og møguliga gróðrarliga, skundar henda tilgongdin undir turrlendi og hægri taxa.

Abstract

Saksunarvatn ash derives from an Icelandic source (eruption *ca.* 8930-9060 BP) in part of the Grimsvötn complex. The massive nature of the deposit as found in Faroese sites (up to 45 cm in thickness) might be expected to have had an impact on the vegetation. The thickness of the ash layer, however, is contingent upon site catchment processes of erosion and sediment focusing. Even so, the tephra could still have resulted in changes to vegetation and this is examined by high resolution palynology at sites from different islands (Streymoy and Suðuroy), where tephra thicknesses of 1.0-6.7 cm respectively were found. Comparisons are also made with the pollen data from Saksunarvatn and Hovi (also located on Streymoy and Suðuroy) produced by Jóhannes Jóhansen.

Palynological, and by inference vegetational changes consequent upon the fall of ash within the pollen catchment areas of the Faroese sites are mooted, with the strongest apparent effects at Hagamýra (Suðuroy), where wetter habitats may have become 'choked' with ash, thus diminishing the pollen contributions of associated flora. Similarly, the aquatic taxa are also reduced. Palynologically at least, and arguably vegetationally, this process favours dry land and taller taxa.

Introduction

Saksunarvatn ash derives from an Icelandic source within the Grimsvötn volcanic complex. It is known from Iceland, the Faroes, Shetland, Orkney, Norway, Germany and the Greenland ice sheet (Waagstein and Jóhansen, 1968; Mangerud *et al.*, 1986; Birks *et al.*, 1996). It was first reported

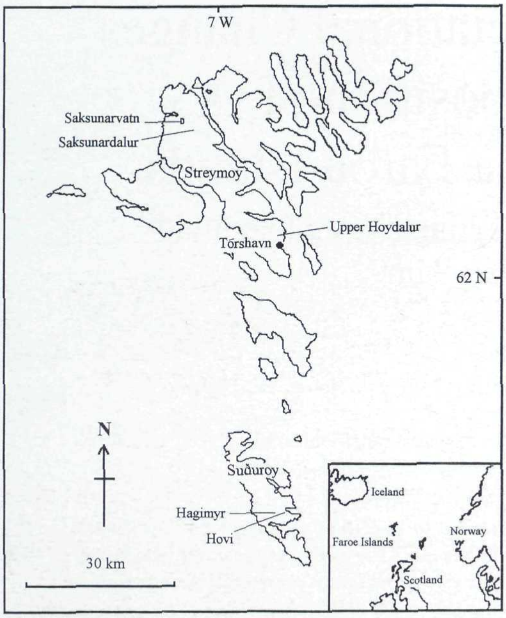

Fig. 1. Map of the Faroe Islands showing sites mentioned in the text.
Mynd 1. Kort av Føroyum, ið vísir støðini, sum eru nevnd í tekstinum.

from the palaeolake site of Hoydalar, Streymoy (Fig. 1) by Waagstein and Jóhansen in 1968 (cf. Jóhansen, 1975). The ash takes its name from the site of Saksunarvatn, Streymoy, from which the Geological survey of Denmark had extracted a core of 36.75 m depth in water of about 15.0 m in 1972 (Jóhansen, 1978; 1982; 1985). The basin was not bottomed, but the eponymous ash formed a 45 cm layer from 29.85-30.30 m.

Published geochemical data on the ash may be found in a variety of sources (e.g. Waagstein and Jóhansen, 1966; Mangerud *et al.,* 1986; Birks *et al.,* 1996). Under the ordinary light microscope, the tephra appears predominantly to consist of light brown glass shards of irregular shape. The latest age estimates for the ash layer, based on AMS (accelerator mass spectrometry) radiocarbon dating of terrestrial plant macrofossils from Kråkenes, western Norway, is 8930-9060 BP (9930-10,010 cal BP) (Birks *et al.,* 1996). This range is close to the original estimates of 9140±160 BP at Hoydalur (Jóhansen, 1975) and 9000 BP at Saksunarvatn (Mangerud *et al.,* 1986).

Although a distal tephra (Edwards *et al.*, 1994), the massive nature of the Saksunarvatn ash as found in Faroese deposits, where it forms visible layers (compared to the invisible dusting found in Norway), might be expected to have had an impact upon local vegetation. Pollen data in direct association with the Saksunarvatn ash are, however, rare (but see Rundgren, 1997) and have been lacking, hitherto, from the Faroes. The tephra-palynology/vegetational relationship is examined here using high resolution pollen data from new sites on the Faroese islands of Streymoy and Suðuroy (Fig. 1).

Previous pollen studies from Faroese sites containing Saksunarvatn ash

Data are available from three published current or former lake basin sites – Saksunarvatn and Hoydalar on Streymoy and Hovi A on Suðuroy. Close examination of the pollen diagrams reveals that with the possible exception of Hoydalar, the pollen spectra do not have an intimate association with the ash layer, i.e. they are not located contiguously with, or within, the visible tephra-laden stratum as depicted on the

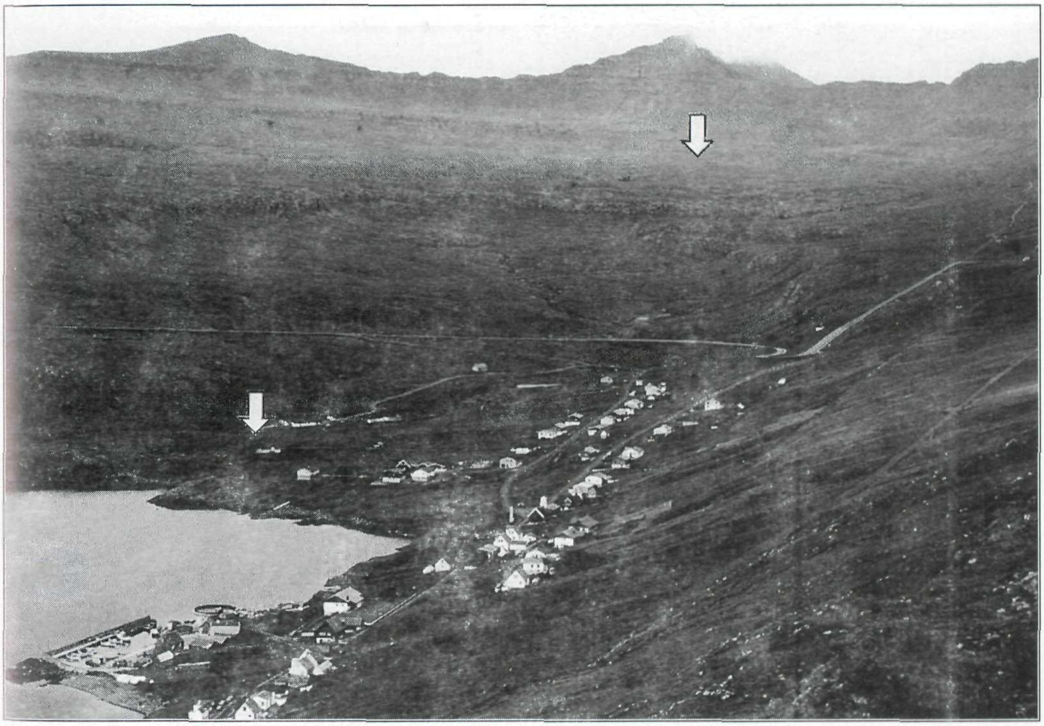

Fig. 2. Hovsdalur. Jóhansen's site of Hovi A (lower arrow) is now a peat bog lying at 12 m above sea level. The site of Hagamýra (upper arrow) is about 185 m above sea level at the valley head.
Mynd 2. Hovsdalur. Staðið hjá Jóhansen, Hovi A (tann niðari pílurin), er nú mómýra, sum er 12 m yvir sjóvarmálanum. Hagamýra (tann ovari pílurin) er um 185 m yvir sjóvarmálanum, har dalurin er hægstur.

stratigraphic columns.

At Saksunarvatn (Jóhansen, 1982) the 45 cm thick ash layer is followed by rising curves for *Juniperus, Plantago maritima* and *Selaginella* and falling curves for Ericaceae and *Sedum.* The trajectories of these curves, however, were set prior to the appearance of ash in the stratigraphy.

The Hoydalar profile (Jóhansen, 1975) is reported as containing the ash layer at 651 cm (*Ibid.*: 374) and 652 cm (*Ibid.*: 375). Its thickness is not recorded and cannot be read accurately from the pollen diagram, but it can perhaps be assumed to be (≤1.0 cm. It is impossible to tell from the pollen diagram whether samples 78 and 79 (assuming that samples were numbered from the top of the profile [*Ibid.*, his Table 3]) are contiguous to the ash layer. Jóhansen does not say that they are. If they are, and allowing for the preceding behaviour of the pollen curves, the ash layer may have been followed by an expansion in Cyperaceae and reductions in *Plantago maritima* and *Isoetes echinospora.*

At Hovi A, the longer of two profiles

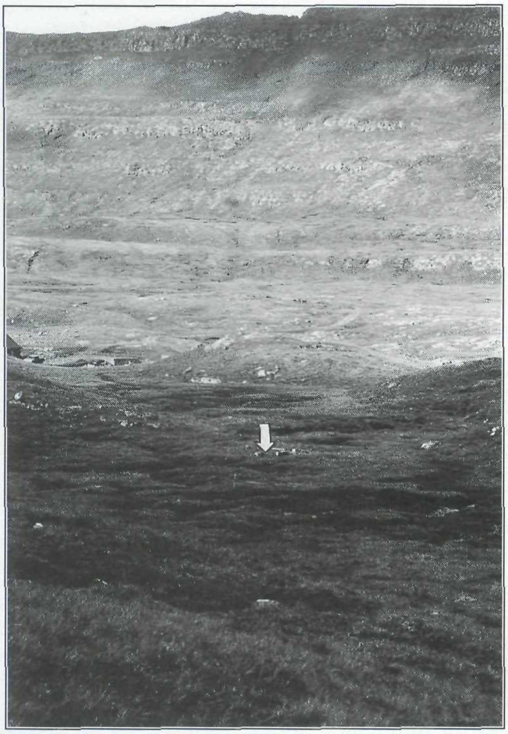

Fig. 3. The site of Hagamýra. The core site is indicated by the arrow.
Mynd 3. Hagamýra. Kjarnastaðið er víst við pílinum.

from the site, the ash layer is recorded 'At the depth of 800 cm' Jóhansen, 1982: 123). There is a superficial impression of increases in (*Betula, Huperzia selago, Caltha* and Apiaceae) and falls for *Salix,* Poaceae, Cyperaceae and *Sedum.* The pollen and spore spectrum (sample 32) which follows the ash layer does so at a marked interval from it, and it cannot be assumed that changes in microfossil content are anything other than an artefact of coarse sampling and concomitant graphical presentation

The new sites

Three new sites were investigated (Fig. 1). Two of these (Hagamýra and Ovaru Hoydalar) were sampled in July 1991 by Russian corer (Jowsey, 1966) of 8 cm diameter; a monolith was obtained in May 1998 from an excavated peat section at the third (Saksunardalur).

Hagamýra

This is a long narrow valley mire, with steep flanks, located at ~185 m above sea level and 130 m southeast of the reservoir dam, in the cirque-shaped valley head of Hovsdalur, 1.5 km west of the site at Hovi on Suðuroy (Figs 2 and 3). The visible black ash layer (Fig. 4) was 6.7 cm in thickness and sandwiched between clayey gyttja deposits between 208.5 and 215.2 cm below the peat surface. The general surface of the site consisted of raised areas of peat, pools, and it appeared to be drained by an intermittent stream. It was not clear if some peat cutting had taken place in the distant past.

Ovaru Hoydalar

This former lake basin (Fig. 5) is located at around 30 m above sea level and is one of a series of palaeolakes to the north of Tórshaven. It lies 0.5 km west of Jóhansen's Hoydalur site. The visible black ash layer (Fig. 6) was 1.6 cm in thickness and was sandwiched between a clayey gyttja at 249.5-251.1 cm below the cut and drained peat surface. Peat cutting last took place around the year 1920. Only a small depth of sediment either side of the ash layer was sampled.

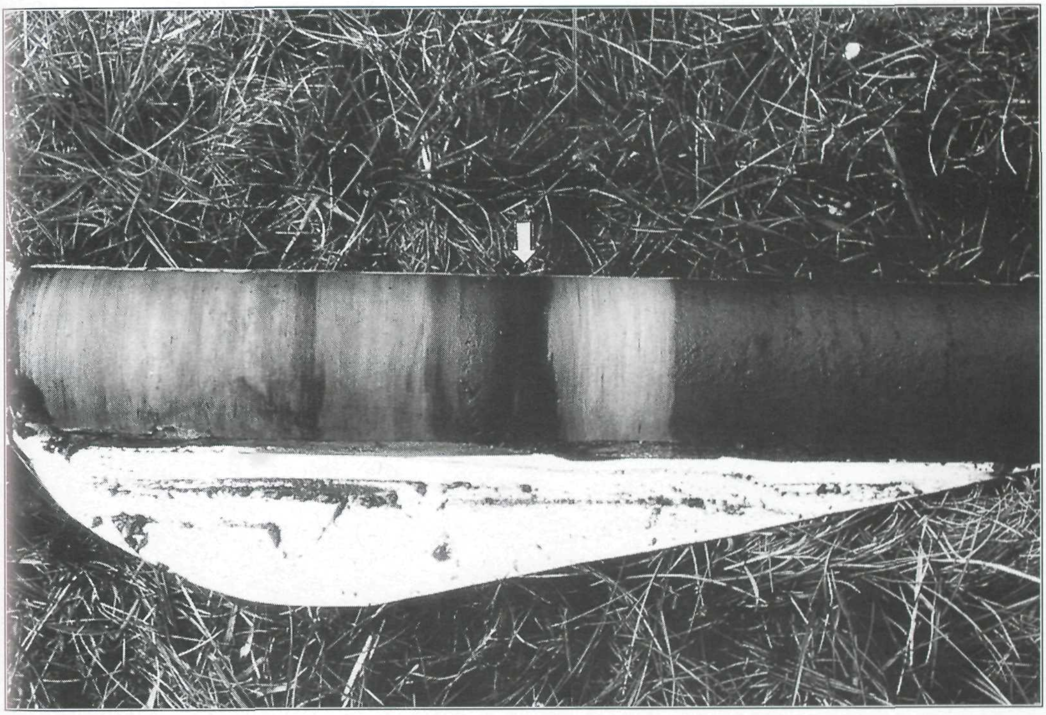

Fig. 4. The Hagamýra core. The top of the core is to the left and the lower tephra (arrowed) is the Saksunarvatn ash layer.

Mynd 4. Hagamýrukjarnin. Tað hægsta á kjarnanum er vinstrumegin, og tann lægra tefran (víst við píli) er saksunarvatnsøskuflógvin.

Saksunardalur

This is a short monolith collected from an excavated section of blanket peat in the valley of the same name. It lies at an altitude of about 85 m above sea level and is 4.0 km southeast of Saksunarvatn. The visible black ash layer was 1.0 cm thick and was underlain by black humified peat. Above the ash layer was a brownish clayey layer 1.7 cm in thickness and this was overlain by black humified peat.

Laboratory methods and the presentation of results

High resolution sampling with contiguous 2-10 mm thick layers has been conducted across the Saksunarvatn ash deposits of the three sites. Beyond the close-sampled sequences, sample thicknesses of 10 mm were employed with variable sampling intervals. Samples were pre-treated with standard KOH, HCl, HF and acetolysis methods (Faegri and Iversen, 1989). Tablets containing *Lycopodium clavatum* spores were added to volumetric samples in order to allow the estimations of paly-

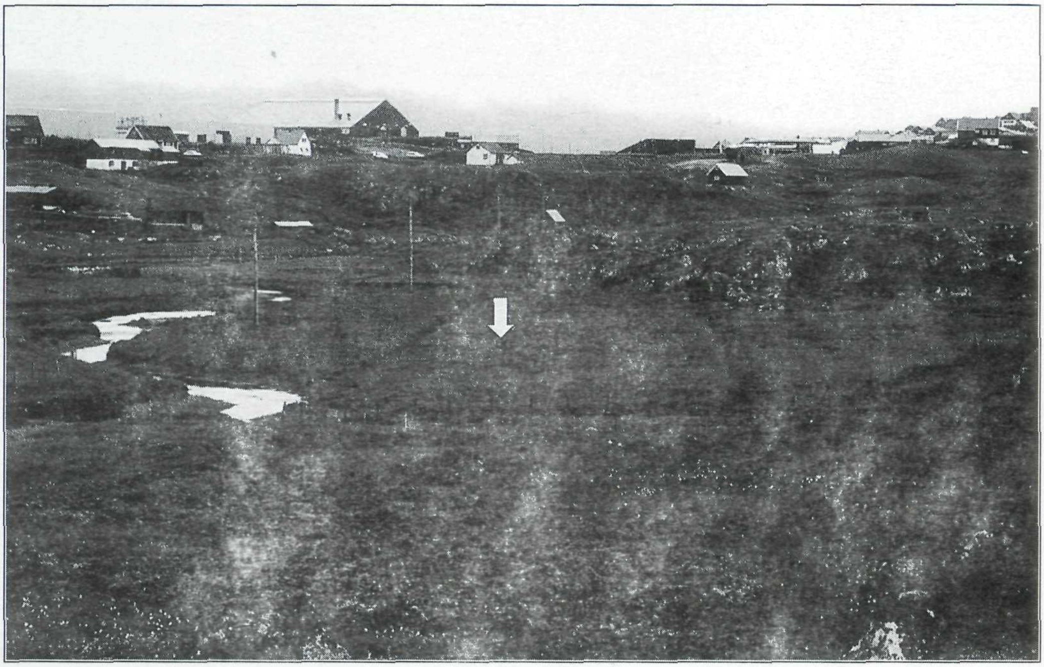

Fig. 5. The site of Upper Hoydalur. The core site is indicated by the arrow.
Mynd 5. Ovaru Hoydalar. Kjarnastaðið er víst við pílinum.

nomorph concentrations (Stockmarr, 1971). Computation and diagram construction were aided by the computer programs TILIA and TILIA.GRAPH (Grimm, 1991).

Pollen and spore diagrams (Figs 7-11) show percentage values for selected taxa and concentration data for total identifiable palynomorphs. The basic pollen sum is total land pollen (TLP) excluding taxa considered to represent off-island species (i.e. *Pinus sylvestris, Ulmus, Quercus, Fraxinus excelsior, Alnus* and possibly *Corylus avellana*-type). Of these taxa, only *P. sylvestris* at Hagamýra, where it reaches 39.8 % of TLP and 70.1 % of TLP excluding the arboreal pollen (AP) of alien species, is of any major consequence.

Discussion

Hagamýra

General considerations

The lower and upper margins of the ash layer are superficially sharp, but close examination reveals not only a slight diffuseness, especially at the top, but also a marked lessening upwards in apparent tephra density. These effects are presumably a response to some surface turbation of sediments (the boundary diffuseness) which is normal in lake sedimentary basins, and redeposition of tephra from the catchment slopes (the

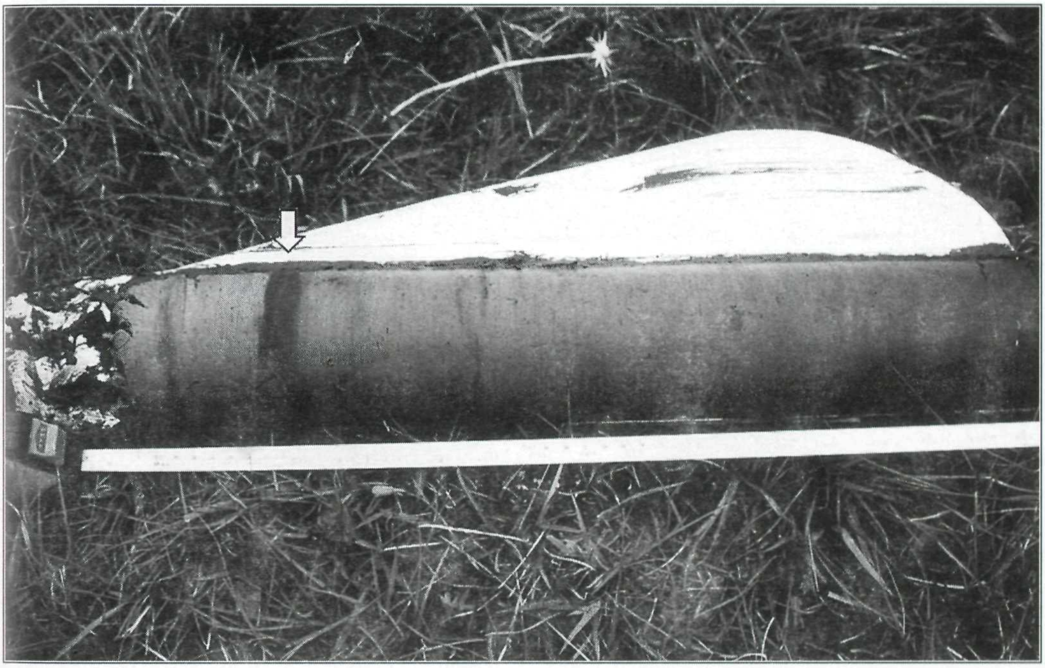

Fig. 6. The Upper Hoydalur core. The top of the core is to the right and the Saksunarvatn ash layer is indicated by the arrow.

Mynd 6. Kjarnin í Ovaru Hoydølum. Tað hægsta á kjarnanum er høgrumegin, og saksunarvatnsøskuflógvin er víst við pílinum.

lessening in density). In the case of the lower boundary, there would probably have been increased catchment runoff over the tephra-covered surface of much of the landscape immediately after the air-fall of ash. It may be the case that the pollen samples from within the base of the tephra (215.1 cm) and certainly above it from within the tephra (at 208.6 cm) should be viewed cautiously with regard to inferences of vegetational change and that palynological patterns arising from adjacent and contiguous samples should be taken into account. The pollen and spore spectrum within the base of the ash layer may, in fact, be reflecting changes consequent upon the deposition of the Saksunarvatn ash.

The total palynomorph concentrations decline in the base of the tephra stratum, remain low within it and in the organic deposit immediately overlying the top of the visible ash layer. Concentration data are difficult to interpret because, in the absence of tight chronological control of sediment accumulation rates, the concentration data (grains cm^{-3}) may be a function of changes in sedimentation rather than in pollen production. The decline in concentrations at the base of the ash is likely to be a sedimentation effect because of the sudden inputs of tephra over perhaps a brief period. It seems unlikely that real ash-fall effects on

HAGAMÝRA: percentages

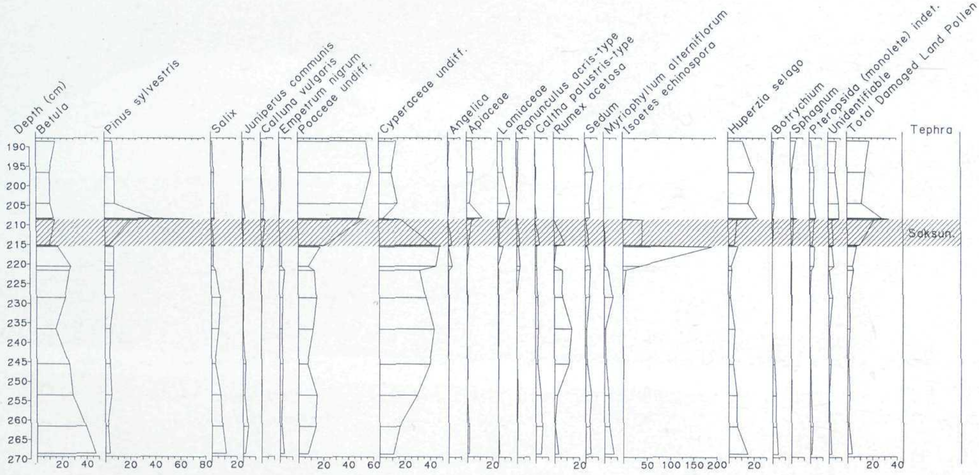

Fig. 7. Pollen and spore diagram of selected taxa from Hagamýra. Percentage values are expressed as TLP minus alien AP. Total identifiable palynomorph concentrations exclude alien AP.

Mynd 7. Flogsáð- og grókornstrikumynd av úrvaldum taxa úr Hagamýru. Virði í prosentum eru lýst sum TLP minus fremmant AP. Í samanløgdu palynomorfkonsentratiónunum, sum kunnu eyðmerkjast, er fremmant AP ikki tikið við.

vegetation and flowering would be so sharp across all taxa. In such circumstances, the pollen percentage values would become important for the purposes of floristic change. Support for this interpretation may come, in part, from the sudden rise in *Pinus sylvestris* percentages at the top of the ash layer. Notwithstanding what has been said above regarding the basal ash pollen spectrum (where the low Scots pine percentages may indicate that ash-fall took place outside of the *Pinus* flowering season), this could be taken as indicating that the flowering of local plants was diminished by the ash-fall (leading to reduced pollen production and incorporation in sediments), and allowing off-island pollen to increase its percentage representation in the Faroese pollen rain. The concentration data do not entirely support this argument. Values for *P. sylvestris* (not shown diagrammatically) are lowered during the early phase of tephra deposition (from 2366 grains cm^{-3} at 215.3 cm to an estimated 207 grains cm^{-3} at 215.1 cm), as indeed they are close to the top of the visible ash layer (502 grains cm^{-3} at 208.8 cm, 1852 grains cm^{-3} at 208.6 cm and 1984 grains cm^{-3} at 208.4 cm). The total identifiable palynomorph concentrations excluding alien AP follow a similar pattern (Fig. 8), but they show a marked fall in the base of the clayey gytjja (13,865 grains cm^{-3} at 208.6 cm) compared with the top of the obvious ash layer (3774 grains cm^{-3} at 208.4 cm). The fact, however, that the *P. sylvestris* concentrations are restored to ap-

HAGAMÝRA: percentages

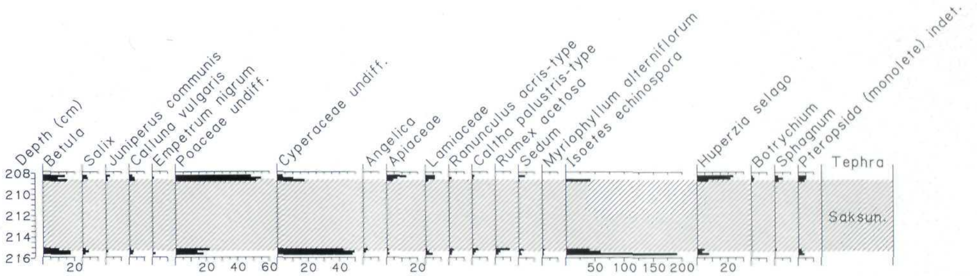

Fig. 8. Pollen and spore diagram of selected taxa from the Saksunarvatn ash zone, Hagamýra. Percentage values are expressed as TLP minus alien AP. Total identifiable palynomorph concentrations exclude alien AP.
Mynd 8. Flogsáð- og grókornstrikumynd av úrvaldum taxa úr saksunarvatnsøskuøkinum í Hagamýru. Virði í prosentum eru lýst sum TLP minus fremmant AP. Í samanløgdu palynomorfkonsentratiónunum, sum kunnu eyðmerkjast, er fremmant AP ikki tikið við.

proximately pre-ash levels close to the upper boundary of the ash, whereas total palynomorph concentrations remain depressed, does suggest that vegetational and/or flowering changes were taking place in the pollen cachment area of Hagamýra. The subsequent increases in total palynomorph concentrations from 204.5 cm (i.e. well above the ash zone), are still at somewhat reduced levels from those in the gytjja below the ash (Fig. 7). Although the clayey gyttja here may have accumulated at a faster rate than the gyttja beneath the ash, leading to reduced palynomorph concentrations, the percentage data are showing marked changes which probably reflect changes in catchment vegetation.

Environmental change

The full length of the pollen profile (188-269 cm; Fig. 7) displays sharp falls in Cyperaceae, *Caltha palustris*-type and *Rumex acetosa* above the upper margin of the ash layer and increases in taxa such as *Pinus sylvestris,* Poaceae, Apiaceae and *Huperzia selago.* Although the values for *Isoetes echinospora* above the ash are similar to those immediately below its basal margin (Fig. 8), the subsequent disappearance of the taxon is notable. In terms of percentage pollen representation, the post-ash sustained decline in *Betula* pollen is possibly related to the ash-fall.

The adverse fortunes of Cyperaceae and *Caltha palustris*-type may be due to wetter habitats becoming 'choked' with ash as runoff focused tephra-laden material into stream channels and pools. *Rumex acetosa* may have suffered from its frequent occurrence in damp habitats including streamsides. Alterations in water chemistry and translucence in the former lake basin of pre-peat Hagamýra, probably resulted in the eclipse of *Isoetes echinospora* and *Myriophyllum alterniflorum.* Poaceae, Apiaceae, *Botrychium lunaria* and *Huperzia*

OVARU HOYDALAR: percentages

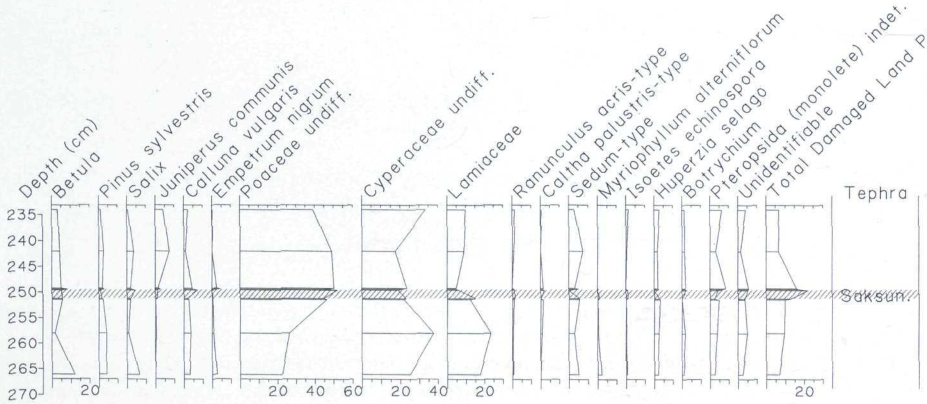

Fig. 9. Pollen and spore diagram of selected taxa from Upper Hoydalur. Percentage values are expressed as TLP minus alien AP. Total identifiable palynomorph concentrations exclude alien AP.

Mynd 9. Flogsáð- og grókornstrikumynd av úrvaldum taxa úr Ovaru Hoydølum. Virði í prosentum eru lýst sum TLP minus fremmant AP. Í samanløgdu palynomorfkonsentratiónunum, sum kunnu eyðmerkjast, er fremmant AP ikki tikið við.

selago may have benefited from their growth in drier grasslands, at least in terms of their percentage contributions to the pollen and spore rain if not vegetationally.

The fall in *Betula,* if related to ash-fall (birch values were already on a downward path through the profile), may be due to the direct impact of tephra upon birch communities (cf. Blackford *et al.* 1992), but the Saksunarvatn ash, with a SiO_2 content of around 50 % is not especially acid. With regard to the falls in *Betula* pollen well before Saksunarvatn ash times at all of his sites, Jóhansen (1982; 1985) evokes a change from subarctic to an oceanic climate in explanation. This, however, is for a decline in supposed *Betula nana,* not in tree birch species. Pollen size measurements at Hagamýra favour tree birch, but if there was increased oceanicity around the Faroes during the period covered by the Hagamýra pollen diagrams, then there is no reason why this would not have had a deleterious effect upon, for instance, *B. pubescens.*

Ovaru Hoydalar

The ash layer at this site is of denser appearance at its base than at the top, which reinforces the notion that only the base of the ash layer derives from aerial input, while the rest results from catchment runoff into the former lake basin. The pollen profile (Fig. 9) covers 234-266 cm and presents a more muted picture than was the case at Hagamýra. Poaceae increases at the start of tephra deposition and Lamiaceae falls; Cyperaceae appears to have been declining prior to ash deposition. At the top of

OVARU HOYDALAR: percentages

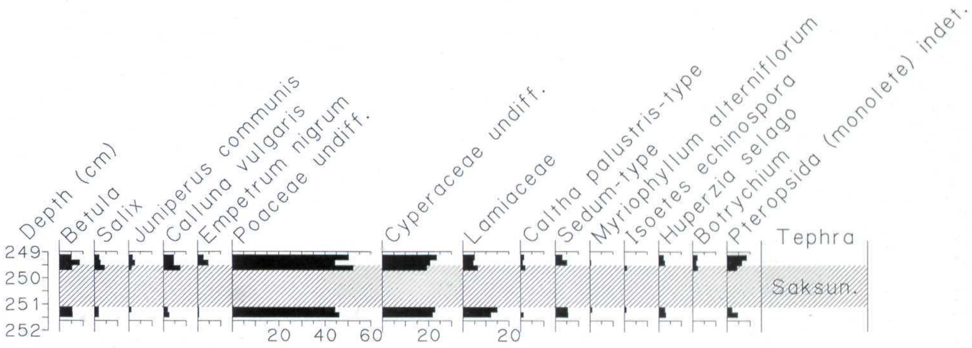

Fig. 10. Pollen and spore diagram of selected taxa from the Saksunarvatn ash zone, Upper Hoydalur. Percentage values are expressed as TLP minus alien AP. Total identifiable palynomorph concentrations exclude alien AP.
Mynd 10. Flogsáð- og grókornstrikumynd av úrvaldum taxa úr saksunarvatnsøskuøkinum í Ovaru Hoydølum. Virði í prosentum eru lýst sum TLP minus fremmant AP. Í samanløgdu palynomorfkonsentratiónunum, sum kunnu eyðmerkjast, er fremmant AP ikki tikið við.

the thinning tephra band (only 1.6 cm thick), *Salix, Calluna vulgaris, Empetrum nigrum, Botrychium* and *Pteropsida* have increased representation (Fig. 10). This pattern is evident from both percentage and concentration data.

It seems that the tephra-fall may have enabled taller plants to thrive, perhaps by allowing them a flowering advantage over taxa with a lower architecture. Thus Poaceae, *Calluna vulgaris, Salix* and *Botrychium* seem to do well. Lamiaceae (and Cyperaceae *if* its decline is tephra-related) may have suffered from growth in damper areas where the choking effects of tephra might be expected to have most impact, though *Caltha* is not reduced. The aquatics *Myriophyllum alterniflorum* and *Isoetes echinospora* are not well represented anyway, but the former taxon is reduced.

Total identifiable pollen and spore concentrations excluding alien AP are reduced from 28,289 grains cm^{-3} at 251.4 cm, to 15,849 grains cm^{-3} in the spectrum immediately below the tephra layer, a figure similar to that within the top of the tephra (16,137 grains cm^{-3} at 249.6 cm). The next spectrum (249.4 cm) is further depressed to an estimated 11,290 grains cm^{-3}.

The apparent smaller impact at Hoydalur may be due to the more restricted range of habitats and topographic units around the basin. The variation in slopes is considerably less than at Hagamýra and much of the Hoydalar pollen may derive from areas which did not suffer from prolonged tephra deposition. The fact that the ash layer is considerably thinner at the Streymoy site

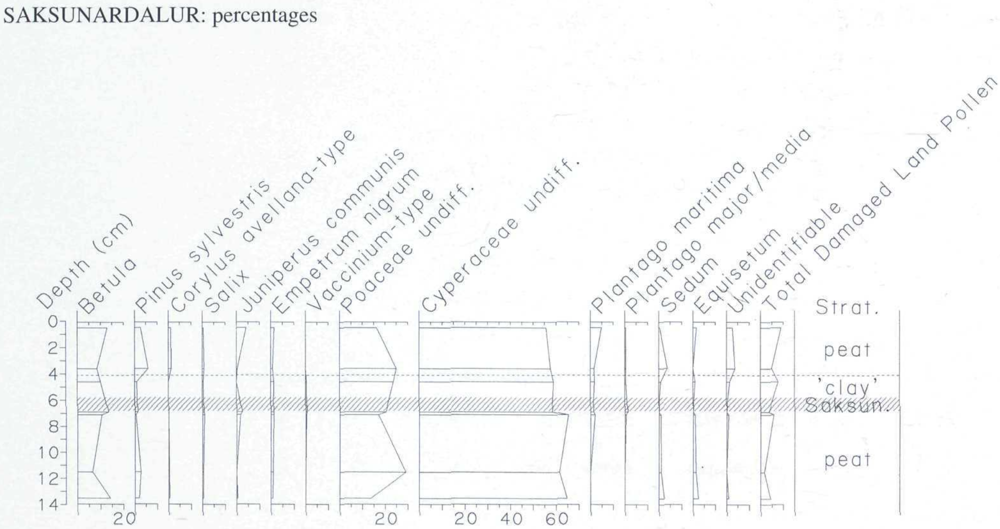

Fig. 11. Pollen and spore diagram of selected taxa from Saksunardalur. Percentage values are expressed as TLP minus alien AP. Total identifiable palynomorph concentrations exclude alien AP.

Mynd 11. Flogsáð- og grókornstrikumynd av úrvaldum taxa úr Saksunardali. Virði í prosentum eru lýst sum TLP minus fremmant AP. Í samanløgdu palynomorfkonsentratiónunum, sum kunnu eyðmerkjast, er fremmant AP ikki tikið við.

probably reflects a smaller lake catchment area with less energetic inputs from streamflow or sheetwash processes.

Saksunardalur

The pollen profile covers the monolith thickness of 14 cm (Fig. 11). Statistically acceptable counts of pollen were not recovered from the top of the ash layer, although estimates of pollen concentration from five levels within and around the visible ash layer show a marked reduction (with a lowest concentration of 241 grains cm^{-3} at 6.1 cm).

There are intimations of reduced Cyperaceae at ash-fall which might indicate a restriction in wetland habitats from which Poaceae may benefit initially. It would seem unwise to speculate further. The vegetational communities shown in the Saksunardalur diagram are rather complacent and this lack of sensitivity, apart from the problems of pollen recovery, may be a function of both a restricted pollen catchment area and its lack of habitat diversity.

Conclusions

The different thicknesses of the Saksunarvatn ash at the sites investigated (Table 1) are probably due to varying lake catchment area characteristics rather than to differing abundances of tephra falling from the distal ash plume. The layer from within the lake at Saksunarvatn was 45 cm compared to only 1 cm at Saksunardalur only 4 km to the southeast. The latter site was a blanket peat with probably little, if any additions of tephra from upslope mass movements. The basin of Saksunarvatn, with its large

Site	*Thickness of ash layer (cm)*
Saksunarvatn, Streymoy	45.0
Saksunardalur, Streymoy	1.0
Hoydalur, Streymoy	≤ 1.0
Ovaru Hoydalar, Streymoy	1.6
Hovi A, Suðuroy	≤ 1.0
Hagimýra, Suðuroy	6.7

Table 1. *Thickness of the the Saksunarvatn ash layer at pollen sites in the Faroe Islands*
Talva 1. Tjúkt á saksunarvatnsøskuflónni á flogsáðstøðum í Føroyum.

drainage area (~13 km^2) relative to its small current surface area (0.078 km^2), and its steep gulleyed sides, would have experienced considerable surface runoff (Mangerud *et al.*, 1986; cf. Jóhansen, 1978). Tephra deposited as ash-fall on the slopes of the catchment would have been redeposited into the lake basin, adding perhaps 44 cm to the ~1 cm of tephra which seems to have represented the aerial component as indicated at nearby Saksunardalur. Similar processes of redeposition into lake bodies is evident at Hagamýra and to a lesser extent at Ovaru Hoydalar. These sites have the added evidence of diffuse boundaries and a lessening upwards of tephra densities as ash becomes mixed and/or combined with organic accumulations. The erosional inputs of pollen and spores is also demonstrated by the increased values for damaged and damaged unidentifiable pollen in spectra at or after the ash layer.

It is not possible to infer the time period involved in tephra deposition with any accuracy; it is likely to vary greatly according to lake catchment properties. Some 5 radiocarbon years only, based on straight-line extrapolations from dates either side of the ash layer, and ignoring problems of dating imprecision, would apply to the 45 cm of ash at Saksunarvatn. A period of 1000 ^{14}C was suggested for 37.5 cm of Saksunarvatn ash (basal 20 cm of massive ash overlain by a tephra/gyttja admixture) at Torfadalsvatn, northern Iceland, although it is inferred that tephra there caused a transitory (*c.* 100 ^{14}C year) change in vegetational succession, with expansions in *Salix* and Poaceae (Rundgren, 1997).

Palynological, and by inference vegetational changes consequent upon the fall of ash within the pollen catchment areas of the Faroese sites are mooted, with the strongest apparent effects at Hagamýra, where wetter habitats may have become 'choked' with ash, thus diminishing the pollen contributions of associated flora. Similarly, the aquatic taxa are also reduced. Palynologically at least, and arguably vegetationally, this process favours dry land and taller taxa. Major palynological changes in spectra either side of the ash layer, not necessarily those within or apparently adjacent to it, may be indicating the vegetational changes in the catchment area. Mixing of sediment may thus be causing difficulties in inference and it may be necessary to accept the more circumstantial evidence of gross changes from sediments not in intimate contact with the ash.

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