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6.1 Introduction

Several pieces of pumice-like material were recovered from SFS work. All come from Applecross and the sea loch area. They are discussed in turn below. In addition, many of the beaches in the area contain a pumice-like material of unknown origin. Several samples of this were collected and analysed in more detail in order to try to shed light on the nature of this material. Although none turned out to be pumice this brief report is included here in the possibility that further work on similar samples might be stimulated, and also as a check on the superficial identification of pumice from archaeological sites.

6.2 SFS 147 Cnoc Na Celpeirein

Several pieces of material resembling dark grey pumice were recovered during the SFS Sea Loch Survey in 2002 from SFS 147, Cnoc na Celpeirein, a lithic scatter site of possible Neolithic origin, close to Plockton ([Section 2.2](#)). They are angular to sub-angular in appearance and resemble dark grey pumice recovered (by the author) from the dunes at Sand (Applecross) and the shore at Applecross Bay in 2001 and by Stephen Birch from Scalpay (see below).

Superficially, the pieces from Cnoc na Celpeirein resemble the dark grey pumice which occurs on archaeological sites throughout the west coast of Scotland ([Newton 1999](#)). Like pumice, they are less dense than water and float. However, analysis showed that this material is not volcanic, though it does appear to be natural (below).

6.3 SFS 20 Toscaig 2

A single sample, apparently of pumice, was collected from Toscaig 2, a cave of later prehistoric date. Although this dark grey material is vesicular, like pumice, it is denser than water and does not float. It is not, therefore, pumice.

6.4 SFS 4 Sand

6.4.1 A2B NW Spit 2, Context 1/2

As with the piece from SFS 20, Toscaig 2, this is dark grey and vesicular but it is denser than water and is not, therefore, pumice.

6.4.2 A2B NE Spit 9, Context 27

This light coloured sample also contains vesicles, but it too is denser than water. It appears similar to a small piece of light coloured material from the rockshelter at Sand. Originally, this piece was also identified as pumice, but geochemical analysis showed that it was largely composed of calcium and phosphorus; it was bone.

6.5 Natural samples

6.5.1 Collection

Pumice-like material forms a regional deposit on local beaches, stretching from Scalpay to Applecross and Sand, and to the Plockton area. Four representative samples from the Applecross-Scalpay area were analysed (see [Table 179](#), below).

Table 179

Sample	Description
APB 1	Collected from the storm beach at Applecross Bay 2001
Scalpay 1 and 2	Collected by Stephen Birch from a beach on Scalpay
Snd 3	Collected from sand dunes on the north side of Sand bay Applecross

Table 179: SFS samples of pumice-like material collected from local beaches for analysis

In addition, a fifth sample (Clet1) was collected from Clettnadal, on the island of West Burra, off the west coast of Shetland, and this was included in the analysis. Clet1 was recovered from buried coastal silty sand and the nearest radiocarbon date is 9190 ± 75 BP ([Edwards, pers comm](#); [Whittington et al 2003](#)). It seems unlikely that the site has been disturbed.

6.5.2 Initial Analysis

The samples were crushed and analysed on an electron microprobe. The thin sections showed that unlike pumice, the matrix of the material was black, whilst pumice glass is typically clear with a dark brown tint. Quantitative geochemical analysis showed that the material was not pumice, that is, not a silicate glass. Qualitative energy dispersive analyses (EDS) were also undertaken on the same samples and these showed the material did not contain any of the major elements normally associated with natural pumice. The most notable peaks were for sulphur and chlorine.

This technique did not have the resolution or the detection limits to identify accurately the composition or origin of the material. Also the then detector on the EDS was unable to identify light elements, such as carbon.

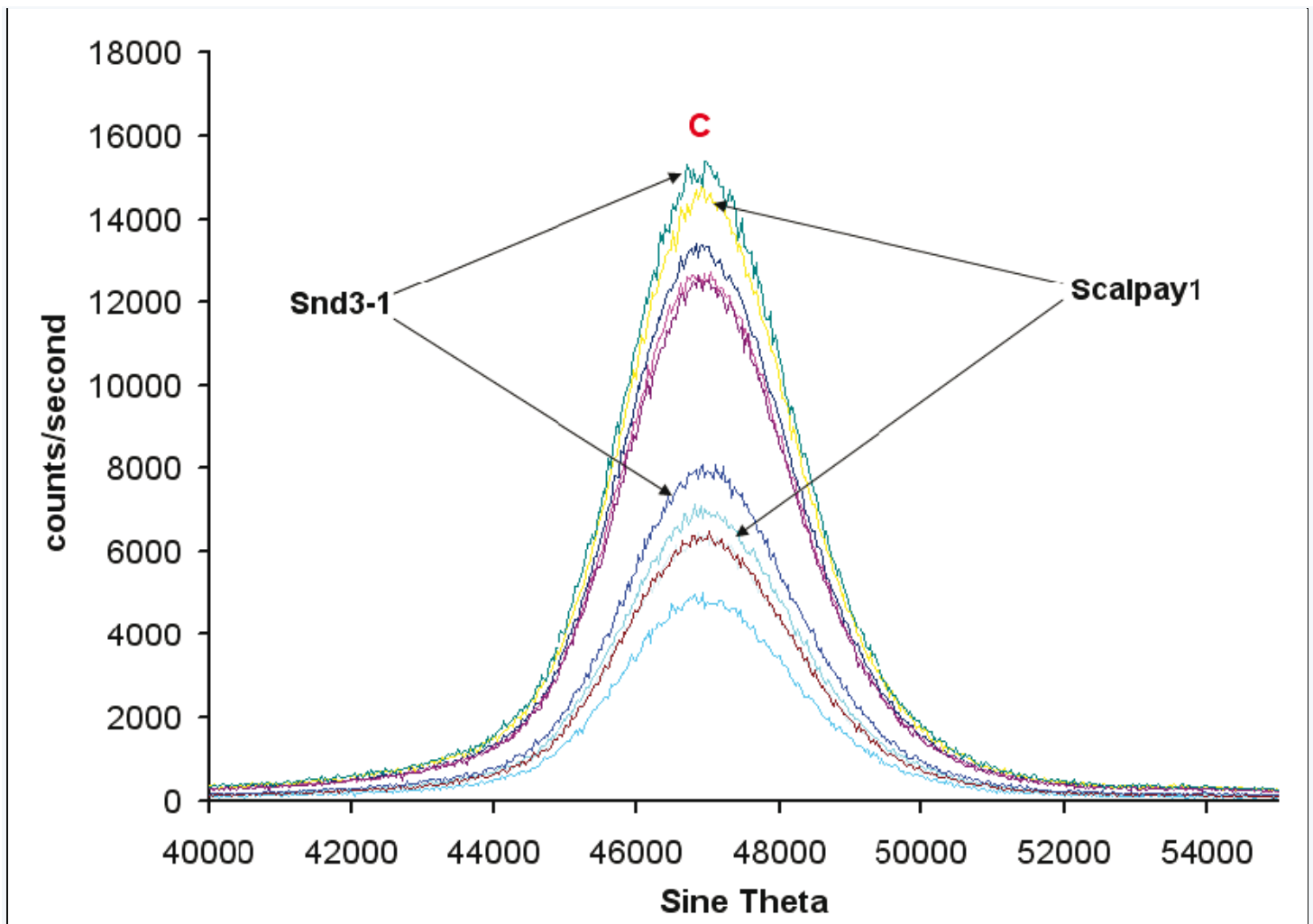
6.5.3 Detailed Analysis

In order to try and shed light on the nature of this material a new set of qualitative analyses was carried out using spectrometer scans of wavelength-dispersive spectrometers (WDS) of a Cameca SX100 electron microscope at the School of GeoSciences, University of Edinburgh. Not only does this produce X-Ray spectra with higher resolutions, but the higher peak to background ratio allows the identification of elements present in small quantities. These WDS analyses were carried out in conjunction with an improved EDS detector on the same instrument. Two sets of analyses were carried out on each piece in order to establish the heterogeneity of the samples.

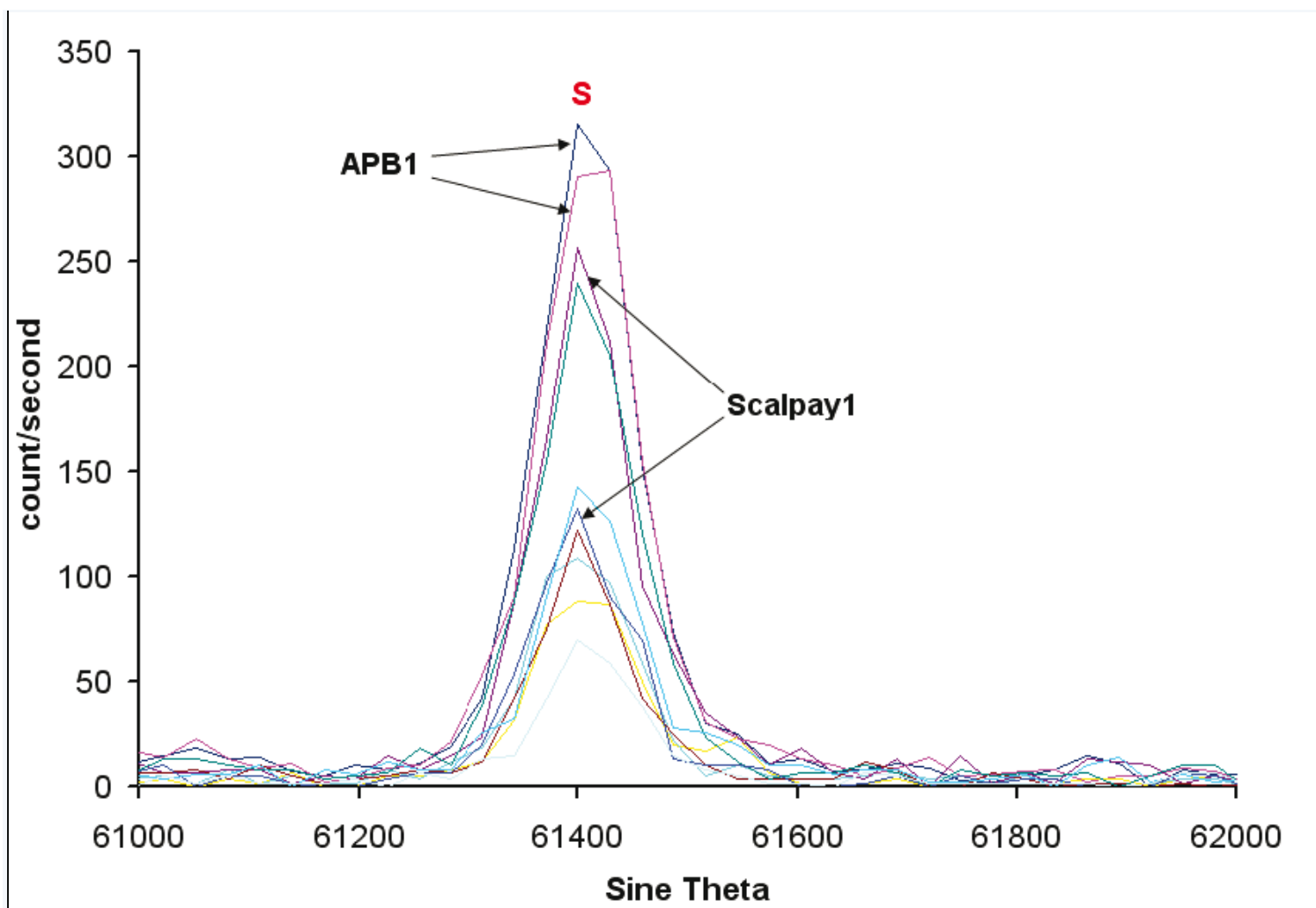
The new EDS and WDS analyses show that the pieces are predominately composed of carbon (see [Illustration 535](#), below). The amount of carbon varies and [Illus 535](#) illustrates that this variation is as much within the pieces as between different ones. This shows that the material is not homogeneous. Other elements which were identified include Si, Al, Na, Ca, S, Cl, Ti and Fe. Most of these are present in small amounts and like the carbon there are significant variations within a single piece. All of the samples contained some sulphur (see [Illustration 536](#), below), although most samples showed little consistency in abundances. Only the Clettnadal pieces had high concentrations of Na and Ca. Fe was only identified in very small amounts in one of the Clettnadal readings. Scan 2 of Clt1 and scan 1 of Scalpay 2 have particularly high Si and Al, but the other scans of the same pieces do not show the same pattern. It is difficult to interpret these results. The heterogeneity seen in only two scans of each piece mean that microanalysis is probably not the best technique for analysing this material. It is likely that a completely different technique will be necessary to identify the source of this material.

Illustrations 535 & 536

These illustrations can be found on p3 of the report.



Illus 535: WDS scan which demonstrates that the pieces are mainly composed of carbon, but are heterogeneous with major differences in abundances (counts/second) on successive scans of the sample (two examples are highlighted on the graph, but the same pattern is repeated in the other pieces). The electron beam of the microprobe is about 1 μm in the diameter.



Illus 536: Sulphur was present in all of the pieces analysed. One of the pieces collected from Applecross Bay contained the highest concentrations, although most pieces showed the same heterogeneity seen in the other elements, eg Scalpay 1.

These illustrations can be found on p3 of the report.

6.6 Conclusions

This pumice-like material is not a natural volcanic deposit, though the results show how easy it is to misidentify pumice. Ocean transported pumice, by definition, must be less dense than water. Therefore, samples that sink cannot be ocean transported pumice. This quick test ruled out the material from Toscaig 2 and Sand.

The dark grey material found at SFS 147 Cnoc na Celpeirein and on the present beaches at Applecross, Sand, Scalpay and Plockton does float, but it is still not pumice. Pumice is composed of clear silicate volcanic glass, whilst this material comprises dark material, with sulphur and chlorine being the identifiable constituents. These are unlikely to be the most numerous components of the substance, but yet more detailed work is needed to identify what these are. Only in this way will the origin and age of this interesting deposit be established.

The material is essentially a hard carbon foam, with smaller amounts of other elements, notably Si, Al, Ca, Cl, Na and S, which are present in varying concentrations in the pieces. No P was found in any of the samples, suggesting that this material is not the result of cooking or cremation activity. The pieces also show considerable geochemical heterogeneity. Perhaps the best method with which to identify them is to carry out carbon isotope analyses, as this may yield valuable information on the source of the carbon, which comprises most of the material in all samples.

The similarities between the Applecross/Scalpay material and the 9500 year old piece from Cleitnadal also suggest that it is unlikely that they were produced by human activity. It is difficult to imagine what human activity could have produced this material in Shetland at this time.

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