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INTRODUCTION

An understanding of the origin and developmental history of the deposits underlying the site at Kinloch provides information on four counts. Firstly, the nature of the ground was probably a determining factor in the choice of that locality for settlement. Secondly, during the excavation of this type of mesolithic site it is necessary to be able to recognise the natural material in order to define the margins of any archaeological features. Thirdly, natural processes continuing after occupation may have resulted in the alteration or erosion of structures or features. Finally, and in contrast to the third point, observations on the deposits may show that little disturbance has occurred, and therefore, that much of the original evidence for human activity remains in place.

Accordingly, a number of separate studies were carried out to define the processes responsible for the formation of the site, and possible subsequent modification: the geomorphology and history of sea-level change of the area (Sutherland mf, 3:E11–G6); the sediments immediately underlying the site (Davidson mf, 3:B3–C1, Sutherland mf, 3:E11–G6, and Jordan mf a, 3:C2–D2) and the soil development in the area of the site (Davidson mf, 3:B3–C1, and Jordan mf a, 3:C2–D2). The ability of various procedures to differentiate features from naturally occurring sediments was examined by techniques such as soil micromorphology (Jordan mf b, 3:D3- D7), clast form analysis (Jordan mf c, 3:D8–D14), phosphate analysis (Hirons & Edwards mf b, 2:E1–E14; Lee mf, 3:E1–E10), and geophysical measurements (Maher & Watson mf, 3:A12–B2). The present chapter is a synthesis of these studies.

THE DEPOSITION OF SEDIMENTS UNDERLYING THE SITE

During the last major glacial phase the whole of Rhum was probably covered by ice flowing westwards from the Scottish mainland (Sutherland 1984). The ice flow was deflected to both the north and the south of the main mountain mass of the south of Rhum, such that in the Kinloch area the direction of ice movement was north of west. Glacial deposition deriving from this period is not abundant on Rhum, but along the north side of the Kinloch Glen, from near the head of Loch Scresort for approximately 1 km, the Torridonian Sandstone bedrock is masked by a variable thickness of drift, which thins out against the slope below 50m Rhum L.D. The archaeological site is located close to the eastern margin of this drift cover. Within the drift covered area there are only occasional rock outcrops, and the ground surface is generally smooth with low gradient slopes. An exception is immediately seaward of the site, where there is a small (1.5–2m) cliff cut into the drift by the sea. Beyond the drift margins, bedrock crops out extensively as marked benches and ridges, with a thin cover of peat and some drift in the intervening hollows. This latter type of terrain is typical of much of northern Rhum.

That glaciation was responsible for the emplacement of the drift in this area has been confirmed by analyses of the included clast form and the variations in lithology of those clasts. Thus, Sutherland (mf, 3:E11–G6) found that 12.5% of the clasts greater than 40mm length were of either schist (derived from the Scottish mainland) or of Mesozoic sediments (probably from the neighbouring sea bed). The upslope part of the drift cover is a very compact, poorly sorted, stony material, which has been interpreted as a till (Jordan mf a, 3:C2–D2; Sutherland mf, 3:E11–G6). Downslope in the area of the excavations, however, the upper layers of the drift have been modified by natural processes subsequent to deglaciation (as discussed below).

As the last ice sheet melted, the sea around Rhum became clear of ice earlier than the island itself because of rapid ice wastage resulting from calving of the ice sheet margins in the sea. Sea level at deglaciation was much higher than at present as a consequence of the isostatic depression of the earth's crust by the weight of the ice sheet. At the head of Loch Scresort, sea level at this time was approximately 35m Rhum L.D. (Sutherland mf, 3:E11–G6). During this period of high sea level, thin horizons of clay may have been deposited in hollows on the slopes; such sediments have been encountered at the base of the monolith pit (RH 1) in the Farm Fields area (Chapter 11, and below) and below peat in a bedrock hollow to the east of the excavations. There is no direct dated evidence on Rhum for the subsequent fall in sea level, but comparison with other areas along the west coast of Scotland implies that as the ice melted the sea fell rapidly, perhaps to below its present level (Dawson 1984; Sutherland 1984). These events most probably took place prior to 13,000 BP.

The downslope part of the drift cover in the area of the excavations is immediately underlain by sediments that differ from the till upslope. These sediments consist of a very compact, stony material which differs from the till in being better sorted with less fine material, the matrix is a coarse sand. Analysis of the clast form and roundness (Davidson mf, 3:B3–C1; Sutherland mf, 3:E11–G6) indicates that the sediment has been subjected to processes which have produced rounding and flattening, whilst the clasts have a preferred orientation of their long axes along-slope (Davidson mf, 3:B3–C1). These characteristics have been interpreted as indicating that the upper layers of the till have been subjected to reworking by marine processes. The thickness of the reworked layer is reported by Jordan (mf, 3:C2–D2) to increase as the slope is descended, with the maximum thickness of reworked sediment (1.8m) at the base of the slope.

Other modifications to the deposits in this area have been found in the form of an indurated horizon overlain by a gravel layer 0.5–0.1m thick, these gravels having silt cappings (Jordan mf a, 3:C2–D2). The indurated horizon is at a depth that increases from about 0.4m to 0.8m downslope. The induration and silt cappings are typical of periglacial modification (Fitzpatrick 1956). They can only have formed once sea level had fallen below the altitude of the deposits (ie below c.10m Rhum L.D.), and they may therefore be inferred to date from the Loch Lomond Stadial (11,000–10,000 yr BP), the last period when periglacial conditions were experienced at low altitudes in Scotland. Their presence at shallow depth in the deposits in the area of the excavation implies little erosion of the area of the site during the Flandrian ie the last 10,000 years.

A small shallow infilled channel (the watercourse) cuts across the eastern margin of the drift deposits. Excavated sections of this channel reveal the infill to consist of beds of organic and clastic sediments of Flandrian age. There seems little evidence for persistent streamflow during the Flandrian, and the initial formation of the channel may date to the Loch Lomond Stadial, for it has been demonstrated elsewhere in Scotland that many minor gullies and channels were eroded in unconsolidated sediments during the periglacial conditions of that period (Sissons 1976).

The deposition of, and modification to, the deposits underlying the site may therefore be summarised as follows. During the Late Devensian ice-sheet, glacial till was deposited in an irregular block along the north side of Kinloch Glen stretching about 1km inland from the head of Loch Scresort and reaching a maximum altitude of about 50m Rhum L.D. At the time of deglaciation sea level was relatively high, but a rapid fall occurred during which the downslope portions of the till were reworked by the sea, producing a poorly-sorted upper horizon. This is the material that directly underlies the area excavated. When sea level was low, periglacial conditions affected the deposits producing an indurated horizon at 0.4–0.8m depth and, possibly at this same period, a small channel was cut across the eastern margin of the deposits. The periglacial episode may be assigned to the Loch Lomond Stadial. Thus at the beginning of the Flandrian the essential features of the area around the Kinloch site had been established.

SITE MODIFICATIONS DURING THE FLANDRIAN

The principle natural changes to the area around the site during the Flandrian have been the infilling of hollows by peat, and the development of soil profiles on those areas not covered by peat. An additional factor to consider was whether the sea during the Flandrian ever encroached on the area of the site.

There is considerable minor local variation in the soils developed in the sediments underlying the site, resulting principally from variations in drainage (Davidson mf, 3:B3–C1; Jordan mf a, 3:C2–D2). Overlying the till a non-calcareous gley has developed, similar to the peaty gleys of the 'Kinloch' soil locality name (Ragg & Boggie 1958). The lower part of the site has revealed shallow gleys, gleyed podsols, podsols and iron-humus podsols. It is the last type that is found over the major part of the site, and a typical profile is given in Table 25 (from Jordan mf a, 3:C2–D2). The Mor-type humus found in the H horizon of the soils has infiltrated the gravels, declining in concentration with depth. This humus coats stones in the upper gravels, and it acts to obscure boundaries of texture and colour. The humus is relatively easily dispersed by water, and it may therefore be presumed to be mobile in the soil at present.

The small channel that crosses the site is infilled with sequences of organic, peaty material, together with poorly sorted sands, gravels and cobbles. The earliest dated material in the channel is mixed charcoal and hazel-nut shell from a soil horizon in the base with a radiocarbon age of 7140±130 BP (GU–2211). A peaty horizon overlain by slopewash elsewhere in the channel has been dated to 4260±70 BP (GU–2106). The dates indicate the long period during which the fill accumulated. The minerogenic horizons in the channel occur in discrete lenses with little down-channel continuity; they are poorly sorted, generally non-stratified and contain occasional groups of large clasts. They are apparently not due to normal sedimentation in such a small channel, and so are considered to be the result of the artificial infilling of the channel. It seems likely, therefore, that during the Flandrian the natural sedimentation in the channel has been a build-up of organic sediments, principally peat.

The evidence for sea level change during the Flandrian is sparse around the shores of Loch Scresort. On the south side of the loch there is a gravel terrace at an altitude of c. 11m Rhum L.D. Elsewhere around the Rhum coast the highest altitude to which presumed Flandrian marine deposits have been deposited is 8m Rhum L.D. at Harris, and 9.5m Rhum L.D. at Guirdil (Sutherland mf, 3:E11–G6). It was therefore thought probable that the maximum altitude for marine processes by the Flandrian sea in the area of Loch Scresort was 10–11m Rhum L.D. As the marine features surveyed are gravel ridges and terraces, the mean sea-level at the head of the sheltered Loch Scresort may have been 1–2m below those figures (*cf* Sutherland 1981).

Initially, it was thought (Sutherland mf, 3:E11–G6) that the base of the peat of the Farm Fields represented a seral contact from marine to freshwater conditions, but pollen analyses (Chapter 11) revealed no clear evidence of marine influence, and the basal radiocarbon date of 7800±75 BP (GU–2062) implies that peat formation started prior to the time when the Flandrian sea is likely to have reached its maximum altitude (ie after 7,000 BP, Sutherland 1984). The altitude of the base of the Farm Fields site (9.9m Rhum L.D.) may therefore be considered a maximum figure for quiet water sedimentation at the head of Loch Scresort by the Flandrian sea.

During the Flandrian, the natural processes acting in the area of the site have not resulted in any major disruption. Peat has infilled hollows, and soils have developed on the higher areas of drift. There is little evidence at breaks in slope of any significant downslope washing of material, and

Horizon	Thickness (m)	Description
		Grasses
H	0.02	Greasy, black well-humified (Von Post grade 7) peat. Abundant grass roots. Massive, soft.
B1	0.13	Very coarse sandy clay loam with abundant stones, rounded to sub-angular. Abundant roots. 10YR3/1 very dark grey-brown.
B2s	0.65	Loamy coarse sand with dominant stones rounded to subangular. 2.5YR3/2, dusty red. Moister and less organic than B1.
C	+	Slightly indurated gravels and cobbles with silt cappings in situ.

Table 25: A typical soil profile.

the preservation throughout the Flandrian of the periglacial features in the soils implies little site disturbance. The Flandrian sea did not rise to such an elevation that it transgressed the area that has subsequently been excavated, but the near coincidence in altitude of the lowest level to which artifacts have been traced and the uppermost level to which the sea may have risen (approximately 10±1m Rhum L.D.) suggests that a lower part of the site may have been truncated by the sea.

THE DIFFERENTIATION OF THE FEATURES FROM THE NATURAL SEDIMENT

A variety of artificial features were found during excavation: pits; scoops; possible stake holes. These were generally recognised from their fills of dark organic-rich material, but when examined in detail their margins were not clear due, in part, to the staining of the surrounding gravels by humic material during soil formation. Attempts were therefore made to characterise the feature fills and to compare them with the surrounding material in order to define the features more precisely.

Jordan (mf b, 3:D3–D7; mf c, 3:D8–D14) examined the differences between the fills and the surrounding sediments in most detail. He classified the stones within the features, as well as those in natural sediments, according to their form, roundness and mass. In addition, in a trial study, he examined the micromorphology of three fills. The clast analyses showed very considerable overlap between the characteristics of the fills and the natural sediments, both showing a large range of values for the parameters measured (axial measurements, roundness estimation, mass). However, they could be differentiated on the basis of sphericity and mean maximum length. In general, it could be concluded that the fills were not directly derived from the surrounding material but contained an additional angular component.

In contrast to the clast analyses, the examination of the micromorphology of the fills concentrated on their matrix. One section examined crossed the lower boundary of a feature and showed a much greater frequency of mineral matter outside the feature, with a transition over a distance of about 20mm. The matrix of the features was dominated by organic matter some of which may have been introduced after formation by the activities of worms. There were no notable structures in the matrix, although rare oriented and sorted coatings, domains and plugs suggest that some of the fine organic matter has been mobile in the features, and hence may have been introduced at a later date.

Attempts were also made to identify the features on the basis of geochemical or geophysical signatures. Phosphate surveys were carried out by Hirons and Edwards (mf b, 2:E1–E14) and Lee (mf, 3:E1–E10). These surveys covered only small parts of the site, and it was possible to define areas that clearly had higher concentrations of phosphates than the background for the area. However, the limited number of points sampled did not permit the identification of clear patterns which would assist in the interpretation of any correlations between feature occurrence and phosphate concentration. It was therefore not possible to address the problems as to what activities would give rise to phosphate concentrations, and what relationship such concentrations might be expected to have with particular features.

Geomagnetic surveys of the surface susceptibility, as well as the magnetic field (using both fluxgate and proton magnetometers), were carried out over both excavated and unexcavated parts of the site. Unfortunately, interpretation of the surveys over partially excavated ground was difficult due to the removal of a varying thickness of topsoil. The susceptibility pattern (Maher & Watson mf, 3:A12–B2) showed distinct areas of high susceptibility superimposed on a fairly low background. Individual highs were interpreted as arising from the presence of stones at the surface, but clusters of high points in the unexcavated areas were considered to represent true subsurface features (Maher & Watson mf, 3:A12–B2). The observations with the fluxgate and proton magnetometers produced results which were difficult to interpret and which had little correspondance with the susceptibility survey.

The attempts to develop techniques to characterise the observed features and differentiate them from the natural deposits have only been partially successful. All techniques were applied on an experimental basis, and further work would be necessary to assess their utility.

CONCLUSIONS

A number of factors relating to the location and formation of the site may be considered to have played a positive role in its selection as an occupation area. The presence of the underlying glacial drift has produced a relatively well drained area when compared to the extensive areas of irregular rock outcrop and intervening wet hollows on much of Rhum. The glacial deposits could also be excavated, and hence provide a more stable foundation for even simple structures. Loch Scresort is by far the most sheltered part of the Rhum coast, most of which is rocky and inhospitable with the few beaches being open to storm waves. An exception to this would have been the lower Kilmory Glen during the middle Flandrian where a relatively sheltered marine inlet would have existed. No detailed archaeological survey has been carried out in this area to date.

The site is unlikely to have ever been any further from the coast than it is at present, and for much of the middle Flandrian the sea would have been very close. It seems most probable that this, too, was a factor in the selection of the locality.

The evidence suggests that there has been little modification, due to natural processes, to the area of the site since occupation. The soil profiles preserve relict periglacial features, suggesting little total erosion, while at breaks of slope there is little build-up of slope-washed material. Thus the majority of the evidence that has not been susceptible to biological decay will have been preserved on site. Unfortunately, the slight positive nature of the relief of much of the area excavated has meant that there has been no development of a stratigraphic sequence corresponding to the various periods of occupation. An exception is the infilled channel (the watercourse), the full potential of which has still to be realised.