CHAPTER 1: BACKGROUND TO THE WESTERN ISLES PROJECT

1.1 INTRODUCTION

Hebridean sites of the coastal sand cliffs and associated machair, or sandy plain have been known for many years. Artefacts and ecofacts of various types have long been collected from archaeological sites in the eroding sand-cliffs of the machairs of the Outer Hebrides (Plate 1, and see Beveridge 1911, 227–39, for example). The then Office of Works commissioned the excavation of a series of machair sites, on South Uist, in 1965, in advance of the establishment there of the rocket range. Later, in 1978, HBM commissioned a survey of the coastal sites (Shepherd & Shepherd 1978) and a list of over 100 was compiled. This survey was complemented by Cowie's survey of the coastal sites of Harris and Lewis (pers comm) to provide a database of sites at risk from coastal erosion, in the Outer Hebrides. More recently, Historic Scotland has commissioned surveys of the coastal strip 50 m deep in several areas while the work of SEARCH, the Sheffield University archaeological programme in the Hebrides has added many more sites.

Early in 1983, personnel of the then Central Excavation Unit (CEU) of Historic Scotland's predecessor (SDD Ancient Monuments) revisited very nearly all of the coastal sites then known in the Long Isle, with the specific task of identifying those at immediate threat from coastal erosion and of assessing the feasibility of their excavation or preservation. Some thirty-two sites were seen to be undergoing active erosion. About one third of these could not be excavated cost-efficiently because they were overlain by high dunes, in some cases the overburden being as high as 15 m (Plate 2). A further third were not available for examination because the owners' consents were not forthcoming. In virtually all such cases the owners were engaged in attempts to stabilise the calcareous shell sand deposits in which the sites lay. Since this meant that the sites were also in the process of being stabilised, their preservation seemed likely, at least in the short term, and they could be removed from the 'sites at immediate risk' category.

Nine sites remained which were being actively eroded but preservation was not being pursued, and where excavation was feasible. These sites were of two morphotypes; sites exposed in roughly vertical sand-cliffs (Plate 3) and sites exposed over relatively large horizontal areas of sand deflation (Plate 4). The problems of erosion and its prevention were clearly greatest in deflation sites, and these arguably merited immediate attention. However, the vertical exposures offered sections through the sand-cliff sites which could be examined without increasing the area of the site exposed to further erosion. It was, therefore, decided to examine one sand-cliff site along its exposed face to;

i) record and sample its deposits and retrieve primary archaeological information

ii) to examine its relationships with the machair deposits in which it sat, and most importantly,

iii) to gain experience in the excavation of such sites before contemplating a larger-scale exercise.

The site selected for this preliminary examination was that at Balelone in North Uist (Figure 1) which was investigated in 1983. The writer was invalided for the year in which this site was excavated and the project was managed for CEU by Mr M Brooks and the site supervised by Mr P Strong. The archaeological information retrieved at Balelone is presented in Chapter 4.

Investigations conducted in parallel with the excavation revealed that the site did not extend inland from its exposure in the sand-cliff for more than about 10 m (Figure 9). Furthermore, the level of its uppermost layers dropped from about 1 m to more than 5 m below the current ground surface, over that distance. At Balelone, the site has largely been removed by the sea and excavation of the surviving segment is unlikely to repay the considerable costs involved, despite the real wealth of artefactual and settlement evidence revealed in the site's eroding face.

The Balelone excavation was designed to explore the problems associated with the excavation of deep midden sites with complex stratigraphy and the not inconsiderable problems of excavation in sand. Although the latter are commonly lamented in print (Crawford 1978) suggestions for their resolution seem rarely to have been published. The trial excavation concentrated on the erosion face, which was cleaned, recorded and sampled. Two squares, 2 m by 2 m, were excavated behind the face to provide larger samples.

Balelone demonstrated that the length and apparent wealth of the exposed faces were not reliable indicators of the surviving areal extents of the sites. Furthermore, the sampling strategy proved inadequate and simple dressing of the erosion face did not reveal, until a late stage in the project, that large pieces of the face had become detached from the main deposit and slipped downwards. Clearly, a new approach was called for. A structured approach was decided upon, aimed firstly at establishing the three-dimensional extent of each of the sites to be examined. On the basis of the information thus gained, it was proposed that sampling excavations be conducted on a small number of sites; four sites were in fact sampled (Figure 1). The information then available would, it was felt, facilitate a realistic appraisal of the likely archaeological benefits to be gained, and an equally realistic estimate of the likely costs involved in larger-scale excavations at these sites. These factors could then guide the final selection of one site – or of a small number of sites – for fuller excavation. It was also felt that if these sampling excavations were carried out within a rigorously defined research framework, they could also be used to establish and refine relevant research questions and thereby guide research design for any subsequent excavation.

1.1.1 The coring programme

The importance of establishing the three-dimensional extents of the sites has been noted above. To facilitate this process, a 10 m grid was imposed on each site over an area of 100 × 100 m with the midpoint of one face of the grid aligned on the centre of the exposed midden deposits (Figures 18, 37, 67 & 72). The south-west corner of each grid square was treated as the origin from which the grid squares were numbered. Each of the grid intersections was levelled with respect

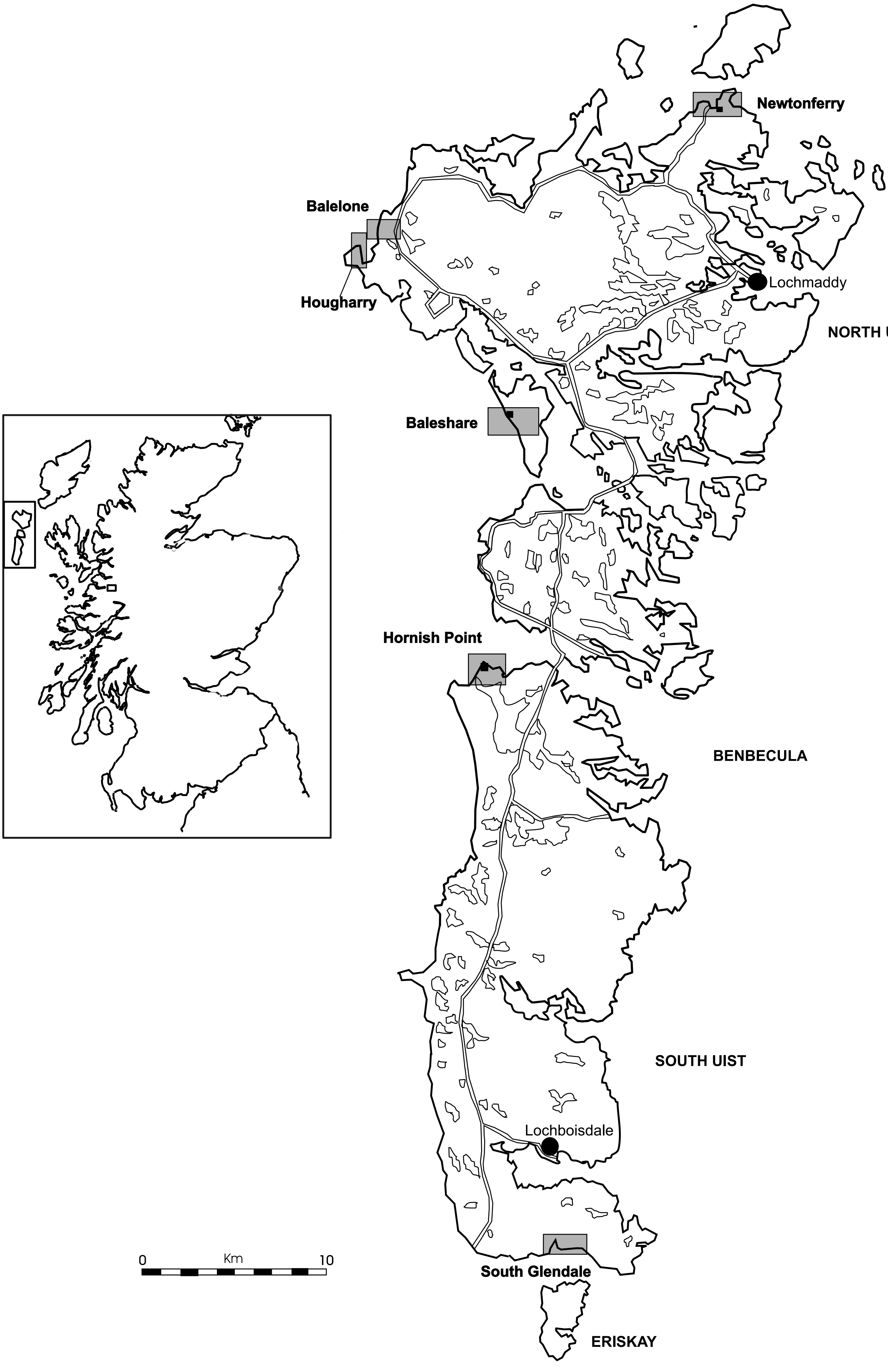

Figure 1. Location map

Plate 3. *Sandcliffs at Baleshare, prior to excavation*

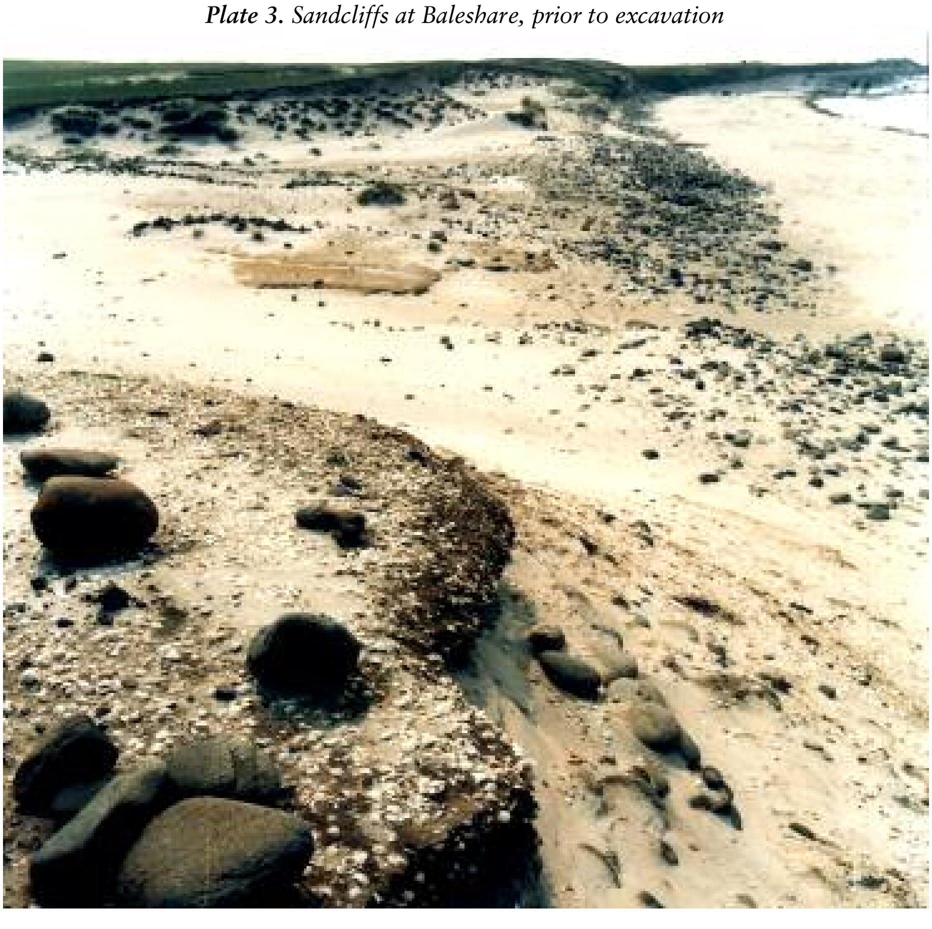

Plate 4. *Deflation surfaces on Ensay, Sound of Harris*

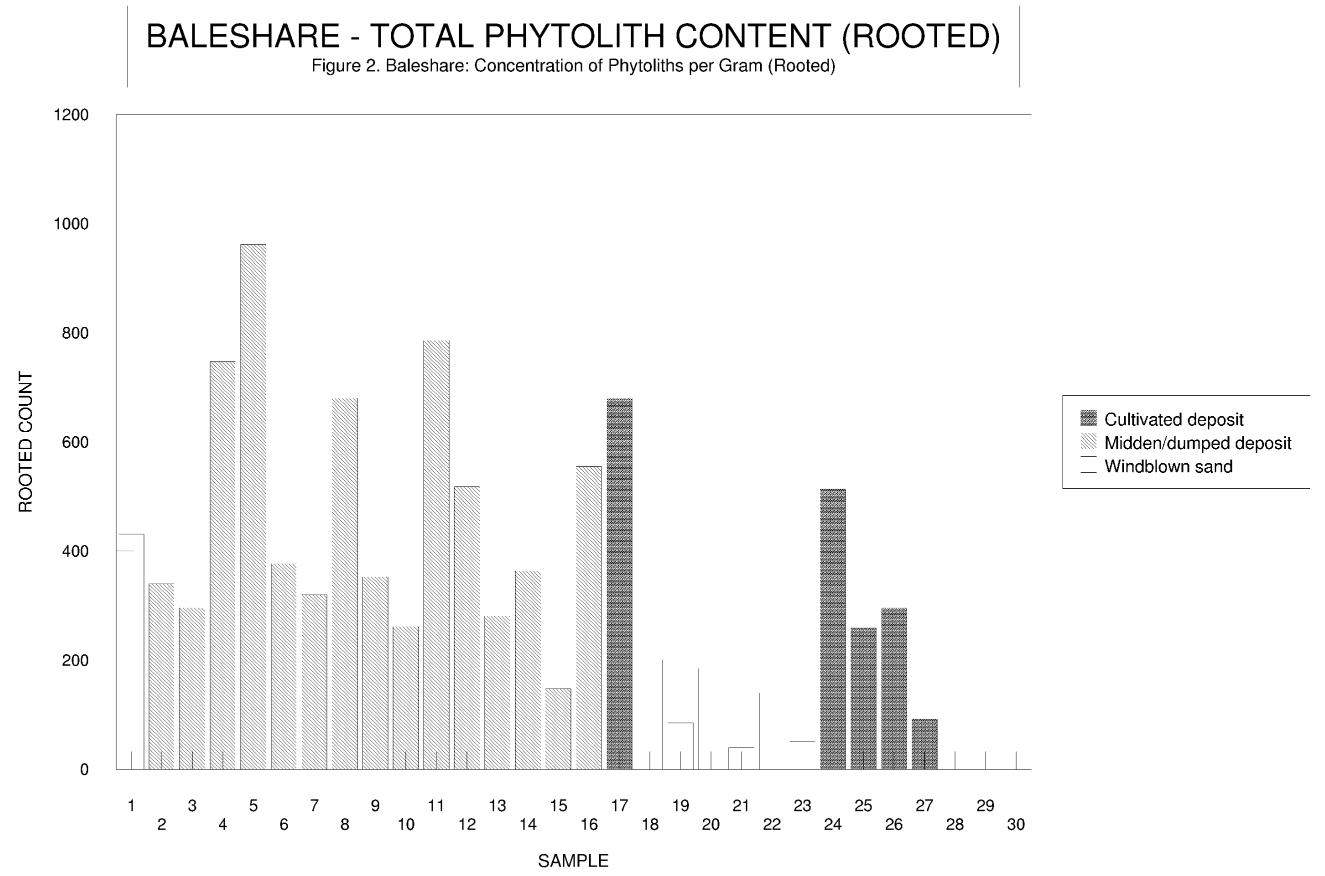

Figure 2. Results of the coring exercise at Baleshare indicating the location of structures at the south-west end of the midden

to a local temporary datum. Topographical surveys of the gridded areas were then undertaken.

Bucket augers were used to core the sites at the grid intersections (Plate 5). Two sizes of auger-head were used, 110 mm and 150 mm, and both proved very successful in retrieving material without collapsing the sides of the core hole, even when this descended for up to 6.5 m through loose sand. (The writer is most grateful to Professor W Ritchie for recommending their use and for advice on this problem.) The water table defined the lowest depth that could be cored successfully because wet sand was not retained in the bucket-heads. Although unsuitable for applications requiring fine resolution because of the disturbance to the retrieved material, the bucket augers revealed the levels of the top and the bottom of the midden deposits without ambiguity. This was achieved with minimal disturbance to the deposits, with roughly one part in six thousand of their volume being disturbed. The coring began at the grid intersections immediately behind the exposed face and was extended, thence, back into the grid until at least two successive intersections along a grid line were cored without revealing midden material. The grid was enlarged as necessary for those sites which extended beyond the initial grid.

At Baleshare (Figure 18) however, the size of the site was such that coring outwith the surveyed grid was concentrated along two axes projected from the grid. Material retrieved from the coring was recorded, although it was virtually unstratified, because it was hoped that its horizontal distribution might reveal something of the location of activity areas within the midden. The results of this coring operation are discussed by site below.

Baleshare Upper and Lower

The site at Baleshare, on the island of the same name, off the west coast of North Uist, proved the most extensive of the cored sites (Figure 18). Coring suggested that it consists of two midden deposits, separated by relatively clean sand. The upper midden, visible along an 80 m stretch of the eroding sand cliff, extended inland for 30 m, in a rough semi-circle. The lower midden lay at the foot of the eroding sand cliff. It extended 320 m along the coast and 110 m back from it. These correspond to the Iron Age (upper) and later Bronze Age (lower) middens, revealed by tapestry excavation, while the relatively clean sand between them is a cultivated, windblown sand (Figure 19).

The augers retrieved anthropic materials including shell, bone, pottery, slag and stone. The distribution of these materials gave an indication of the spatial organisation of the sites, including the location of structures within them. At Baleshare, for example, there seems to be a settlement nucleus at the south-west end of the lower midden which yielded relatively large quantities of bone, shell and pottery (Figure 2). Stones prevented coring in some parts of the area. These are likely to have been structural stone, because isolated stones tend to be moved aside by the auger, or to deflect the auger but do not usually stop its progress.

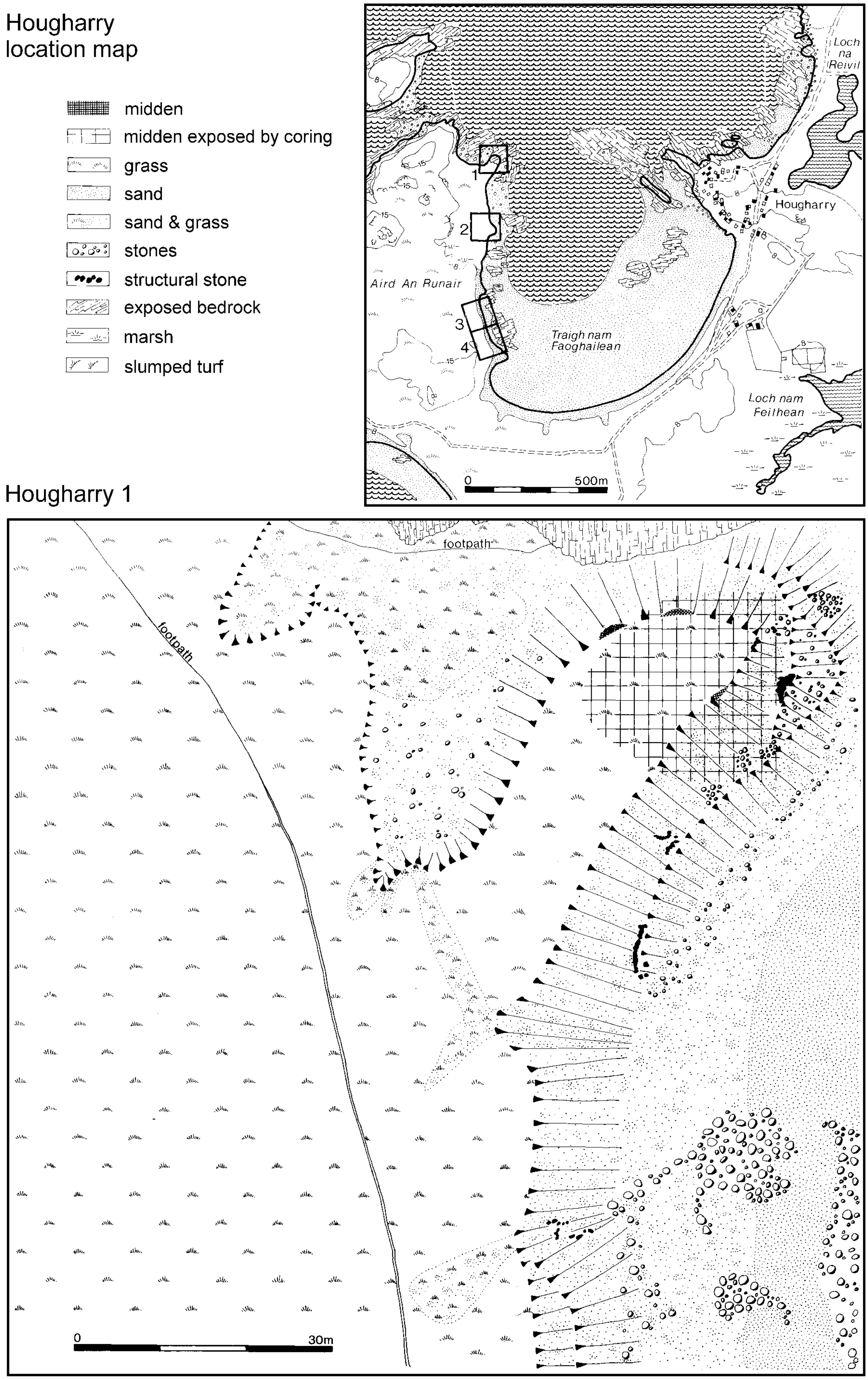

Figure 3. Hougharry: location map and plan of Site 1

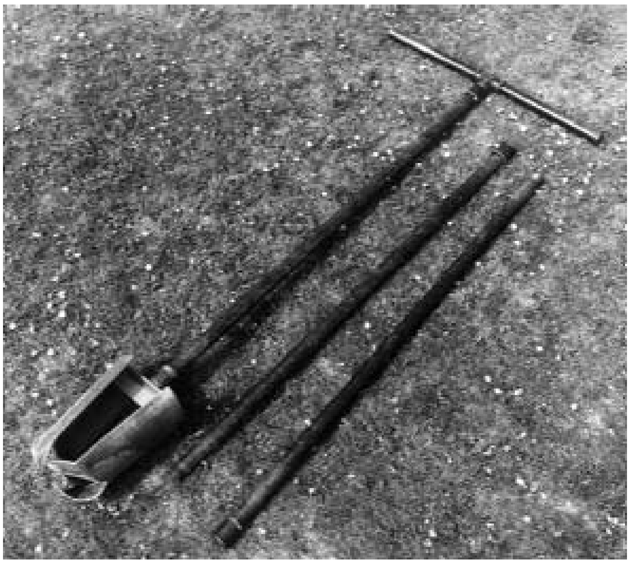

Plate 5. Bucket augers

Hornish Point

The surviving deposits at the site of Hornish Point, on the north-west of South Uist, covered a roughly rectangular area, 60 m along the coast by 30 m inland (Figures 37 & 38). Coring indicated that a nucleus of structures existed in, and immediately behind, the central and northern parts of the erosion face. Subsequent excavation confirmed this, at least in the area of the erosion face. The retrieved materials and the observable fragments of structures suggested that this was an Iron Age site.

South Glendale

The deflation site of South Glendale (Figure 67) lies on the north-west side of an isolated bay on the south coast of South Uist. Deposits were found within an area measuring 50 m by 30 m but had been badly fragmented in antiquity and extensively deflated in the recent past. They now survive as a very small margin of *in situ* deposits, on the west, with a large spread grading eastwards from deflated deposits to simple spreads of anthropic materials.

Coring did not reveal any evidence of structures. Clearly, very little of this set of deposits survives. The Shepherds (1978) record this as a Beaker Period site and a single sherd of Beaker pottery was collected from the site during this phase of the survey.

Newtonferry

The site of Newtonferry (Figures 72 & 73) lies on the north coast of North Uist, on the east shore of the head of Port Nan Long. It is a deflation site with deposits exposed over large areas. In some areas, especially on its northern side, the deposits seem to have been completely removed by aeolian erosion leaving spreads of shell, potsherds, slag and other anthropogenic materials. The coast is very fragmented in this area with an isolated talard, a grass covered, vertical-sided, sand hillock, still standing within an area of general deflation. From this area tongues of erosion lead south and east into the machair. Anthropic materials are visible over most of the deflation surface and coring has extended and unified the area of archaeologically significant deposits. These cover an area of 130 m by 50 m and are truncated by the modern beach along their irregular northern margin. Apparent structural elements which may have been hearths or kelp burning stances or cists were noted, albeit no longer *in situ*. A larger, apparently rectangular structure was contained within the talard and may have contributed to the latters' survival. The latter seemed clearly post-medieval but the Shepherds identified this site as a Beaker Period site, or rather, as a site containing Beaker Period deposits.

Hougharry Sites 1 to 4

Four sites are located opposite the modern village of Hougharry, along the western sand-cliff margin of Aird An Runair, North Uist (Figures 3 & 4).

Site 1 lies at the outermost point of the western arm of the bay and consists of two separate elements, a very small part of a structure, possibly a wheelhouse, high in the dune-face at the north-east corner of the site, and south of this some elements of structural stone at a lower level. Both are associated with a small, roughly circular area of midden deposits, about 30 m in diameter. It is probable that these deposits are merely the surviving rump of a site which, if the observable structure was roughly central, may have measured 80 m by 50 m, or more.

Site 2 was visible as a ledge of organic deposits containing anthropic materials near the foot of a steep sand-cliff some 5 m to 6 m high (Figure 4). This was a relatively extensive series of deposits measuring roughly 120 m by 80 m.

Sites 3 and 4 could only be examined in the vertical exposures at the foot of the sand-cliff (Figure 4). A combination of deep deposits of overlying sand and a high water table, perched on the archaeological deposits, defeated attempts at coring these sites.

The materials retrieved from Sites 1 and 2 at Hougharry were not inconsistent with an Iron Age date for these deposits.

1.1.2 The 'tapestry' excavations

The results of the coring exercise are summarised in Table 1. It was clear that the sites at South Glendale and Hougharry 1 were heavily truncated. Hougharry 2, 3 and 4 are buried, in part, under very deep sand deposits and their excavation is likely to prove wholly uneconomical. Baleshare and Hornish Point are extensive, both horizontally and vertically, while Newtonferry extends over a large area, but is relatively shallow. It was decided to examine four of these sites, representative of the span of the erosional gradient. Two sand-cliff sites were selected, Baleshare and Hornish Point, and two deflation sites, Newtonferry and South Glendale. Tapestry excavations were proposed for the sand-cliff sites, and in a modified form, for Newtonferry, while a traditional, open-area excavation was decided upon for South Glendale.

Tapestry excavation, the excavation of a strip of deposits along an exposed face, was the preferred method of investigation because, as noted previously, it did not expose any more of the site to erosion than had previously been exposed. Tapestry excavation evolved in Switzerland, in the excavation of highly stratified deposits on lake-dwelling sites. In essence, tapestry excavation is the recording of a vertical strip through the site's deposits.

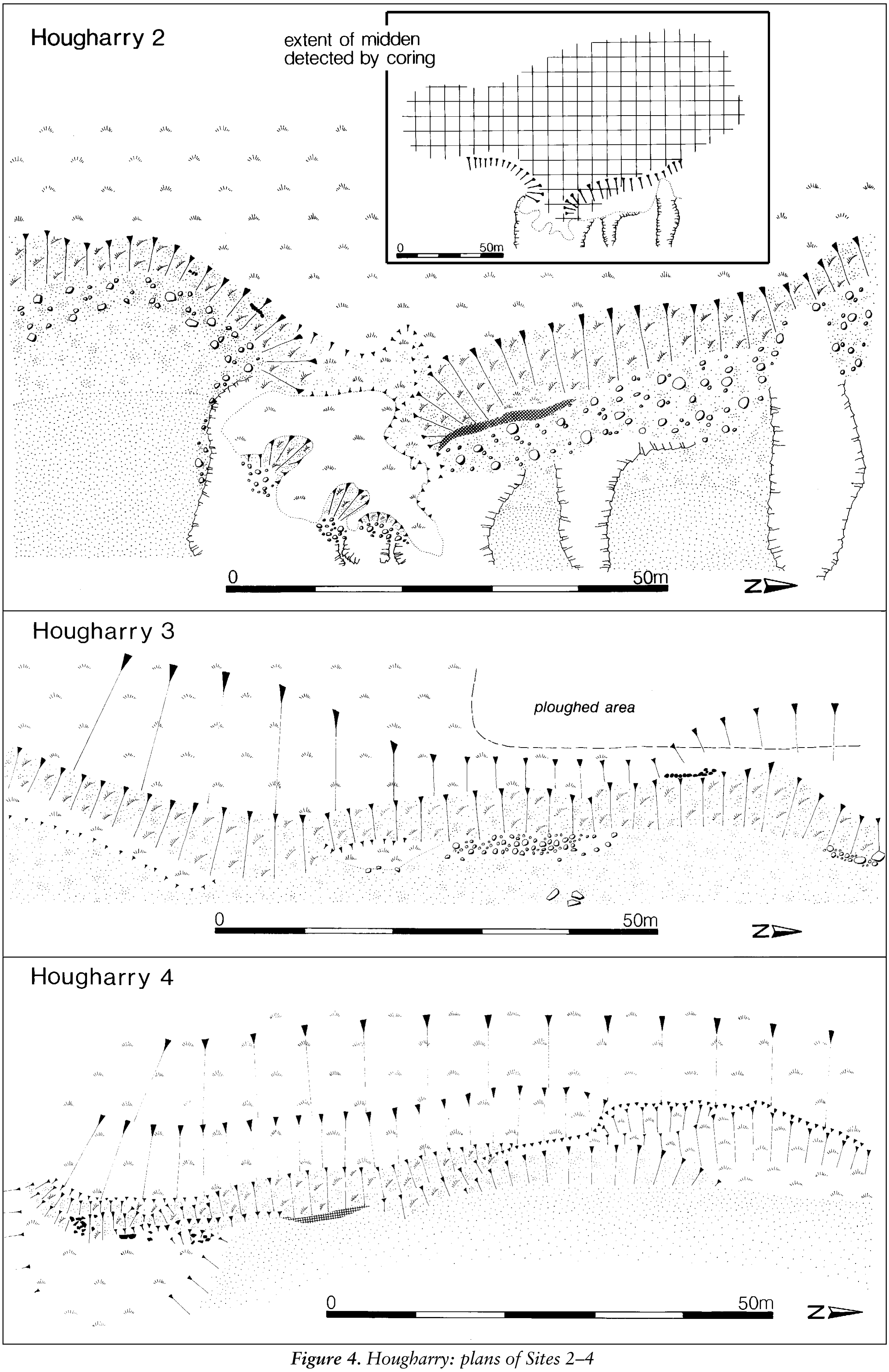

Figure 4. *Hougharry: plans of Sites 2–4*

Site	Length	Width	Depth of deposits	Depth of overburden
Baleshare (upper)	80	30	3.0	0.2 - 4.4
Baleshare (lower)	320	110	1.0	
Hornish Point	60	30	1.5	0.3 - 3.6
Newtonferry	130	50	2.0	0.2 - 1.8
South Glendale	50	30	0.3	0.1 - 1.3
Hougharry 1	30	30	1.3	0.4 - 2.2
Hougharry 2	120	80	1.0	0.4 - 4.3
Hougharry 3 & 4				>4.0
Balelone		10	1.0	0.9 - 5.1

Table 1. The maximum extents of the cored sites (measurements in m). The depth of deposits at Hornish Point is not the maximum depth because the cores were blocked by the palimpsest of structures in the deepest area of the site

The advantages of tapestry excavation include the following:

i) Excavated materials are never more than 0.25 m from a recorded face.

ii) The area of site exposed to further erosion is not increased.

iii) The section offers the opportunity to examine the full, or nearly full, history of the site along the section line.

In practice, the following procedure was observed;

i) Debris and loose material was cleared away from the face of the deposits and the lower boundary located by digging down to the foot of the deposits.

ii) To prevent collapse of the final sections, a stepped face with risers of no more than 1m high and treads significantly wider than 1m was created. Thus, even if one face collapsed it should not cause the collapse of the face beneath it (the angle of repose of the sand was measured at roughly 45%).

iii) The treads were cut along the tops of individual layers, ie they were not horizontal along the face of the sites, only at right-angles to it. This simplified recording and facilitated the merging of the separately recorded faces.

iv) The material removed this far was simply shovelled away. Recovered artefacts and ecofacts were treated as 'unstratified'.

v) The vertical faces were now recorded.

vi) A strip 0.50 m wide was excavated layer by layer, down each face; all artefacts and ecofacts were recovered and all deposits were extensively sampled.

vii) Finally, the resulting sections were recorded again.

viii) The site was backfilled to something close to its original shape.

1.2 EXCAVATION METHOD

1.2.1 Stratigraphic recording

The sites at Baleshare, Hornish Point and Newtonferry were investigated by tapestry excavation. South Glendale was excavated horizontally, but its recording and sampling were conducted in the same way as those of the other three sites. At the sand-cliff sites, the exposed faces were first made vertical, with as many steps as safety and the stability of the deposits required. The vertical sections were first drawn by the site supervisors and then checked by the stratigraphic assistant, after which they were again checked by the project director. The stratigraphic record compiled on site was computer 'washed' using a Basic program, drafted by the writer. Errors and omissions were listed, and the record was amended on site.

1.2.2 Soil description and sampling

Each deposit was described by one of the team of soil-science students (undergraduates and graduates) using the methods and nomenclature of the Soil Survey Handbook (Hodgson 1976). This group were also responsible for taking the Routine Soil Sample (RSS), a sample of approximately 2 kg (min, 500 g), which was sub-sampled for pH, loss on ignition and qualitative phosphates; tests undertaken by the processing crew in the field. A further sub-sample, of approximately 50 g was heat sealed for future use in pollen analysis, should the need arise. The remainder of the sample was dried and stored, as a voucher sample.

A second sample, the 'standard bulk sample', of approximately 20 kg was collected from every context which had sufficient material. This was coarse sieved, through 5 mm mesh, into a Cambridge froth flotation tank. The flot from this was captured in 1 mm and 300 micron meshes, and dried and stored. The retent of the coarse sieve was sorted and the materials added to the finds inventory for the sampled context.

Samples were also collected for specific purposes, ie purposive samples. These included samples for radiocarbon dating, soil thin-sectioning, etc.

1.2.3 Excavation

A tapestry, a slice 50 cm wide, was removed down the prepared face. The deposits in the slice were removed in stratigraphic order, and all sieved through a 5 mm mesh. The retained materials were sorted by category into pot, bone, stone, macroplant, slag, sea shell, snail shell and other. This sorting was undertaken, off-site, but in the field, by the processing crew.

The documentation of the sampling, sorting of the finds from the coarse sieving and the processing of the Standard Bulk Samples, together with all the related recording were undertaken by the processing crew, under the control of Ms D Lehane. This freed the excavating teams from all work except the actual recording of the sections and excavation of the tapestries. This proved, in practice, a most cost-effective measure. The sorting of finds, etc was undertaken by volunteers and fell somewhat short of perfection. Each specialist subsequently found other materials included with that specific to their interests and some late arrival of material was inevitable. Although frustrating to the specialists this did save them the tedium of sorting through everything themselves, and was considerably cheaper than either having specialists, or technicians sort the material.

1.2.4 Data management

The various sets of records relating to each site were finally brought together in a database. It had been intended that this stage be reached in the field, but this was not possible and it was completed on our return to Edinburgh.

1.3 OBSERVATION AND INTERPRETATION

1.3.1 Interpreting the record

The excavation methods outlined above concern the recording of observations made in the field. That these entail some low-order interpretations is obvious, but not of demonstrable relevance. An attempt has been made throughout this project to separate that which is principally observation from that which is principally interpretation. As a first step in this process a distinction has been drawn between units of record and units of interpretation.

1.3.2 Units of record

The transition from units of record (recorded observations) to units of interpretation took place in the field. The strata, units of record, were organised into groups, on the basis that their appearance and contents suggested a common mechanism of sedimentation. Each group, called a Block, consisted of a sequence of interrelated deposits whose interpretation implied a similar depositional mechanism and history, ie a similar taphonomy. These blocks are the basic units of interpretation. The descriptions and analyses of the sites and their contents are described in terms of these blocks. They are based mainly on the colour and texture of the soil matrices and thin microscopic inclusions.

1.3.3 Units of interpretation: the field interpretation

An interpretation was offered on site for each Block, or where time prohibited, this interpretation was written at the start of the post-excavation process, but at a time when the information available to the site supervisor was still restricted to his own field observations; the results of the work of the processing crew were not known to him. These interpretations, termed 'field interpretations' are listed with the Block descriptions. They are based mainly on the colour and texture of the soil matrices and their macroscopic inclusions.

Material	No. of samples	Mean pH	Standard deviation
Windblown sand	12	7.09	0.12
Cultivated soil	16	7.19	0.2
Sheep dung (machair)	17	7.61	0.39
Cattle dung (machair)	10	7.65	0.35
Sheep dung (moorland)	6	7.19	0.29

Table 2. Acidity (pH) of a range of modern deposits from the Long Isle. The animal dung was collected from machair-grazed and moorland-grazed animals

1.3.4 Testing interpretations

The first test of the field interpretation is that afforded by an analysis of the anthropogenic component of the deposits in the Block, together with some consideration of the nature of the soil matrix in which they lay.

Depositional diversity index
The anthropic component consists of all artefacts and of those ecofacts whose deposition was determined by the actions of man. Some nine categories of material were considered under this heading; bone, pot, seashell, snail, macroplant, stone, slag, burnt stone and pumice. These occurred in various combinations of varying amounts in each context. It was decided to calculate a single index, a diversity index, to represent the range and variety of anthropogenic materials, taking into account their value as indicators of human activity and their presence per unit volume of the context, ie their deposition rates. This quantity was termed the 'Index of Human Interference' and its definition and use are described below.

Soil: colour and texture
The natural soil matrix of the area was wind blown sand. Deposits displaying characteristics other than those of wind blown sand provide evidence of additions of material. In the absence of evidence for natural agencies of deposition, it is assumed that all, or very nearly all, the additional material was brought to site, deliberately or inadvertently, by human activities. The most readily observable differences were in colour and texture. In general brown coloration was interpreted as indicative of the addition of organic matter to the soils, the darker the colour the greater the addition. Similarly, enhancement of the finest fraction of particle size was interpreted as the addition of material, notably peat ash or decayed organic matter, possibly including peat. These factors were further assessed, in the field, by measuring the pH, relative phosphate level and the loss on ignition (LoI) of sub samples of each of the routine samples (see above).

Soil: pH, phosphates and LoI, modern analogues
Measurements of the pH, phosphate level, loss-on-ignition and particle size distribution of some 61 modern samples were undertaken to provide data on natural sources of input to the machair soil, as well as baseline measurements of these variables in wind blown sands. The results, for pH are listed in Table 2 and show that windblown sand alone, has a mean

pH of 7.09 ± 0.12, while modern cultivated soils display a mean of 7.19 ± 0.20; the latter information is from published sources. Phosphate values for these materials were uniformly high.

The pH, phosphate level and LoI were routinely assayed for every context. Values, for pH lower than that evidenced in the windblown sand were interpreted as indicative of the addition of acidic material, eg peat. Low phosphate levels were interpreted as indicative of dilution of the naturally high concentrations, by the addition of material by man, while high loss on ignition values are indicative of the introduction of soil organic matter, possibly as peat or as animal dung or faeces.

Units of interpretation: the archaeological interpretation

When the full inventory of materials retrieved and the results of the routine soils analyses became available, they provided a first test of the field interpretation. The refined interpretation is recorded, as the 'archaeological interpretation' in the Block descriptions (Chapters 5–9).

Units of interpretation: the conclusion

Work undertaken by the specialists refined our perceptions of the materials from the various contexts and this information was incorporated into a final set of Block interpretations which are recorded as 'Conclusions', in Chapters 4–8 and form the basis from which the sites are interpreted.

1.3.5 Presentation of the observations, interpretation and conclusions

The volume of information returned from these tapestry excavations has necessitated the use of a number of information synthesising techniques, like the diversity index (the IHI below). It has also required an approach to presentation of the data and their interpretation which differs slightly from normal practice. The traditional 'structures' report has been eschewed in favour of a simple presentation of site data (Chapters 4–8) with their interpretations specifically identified and, where possible, tested. Where interpretations have changed, after testing or the integration of further information, the 'new' interpretations have been presented and the reasons for the changes are noted. This approach has allowed for a more highly synthesised form of reporting than is possible with conventional structures reports.

Emphasis on the transition from units of record (the features and contexts) to units of interpretation has also been formalised by the use of Blocks, ie there is a hierarchy of interpretative units. The simultaneous emergence of what is essentially this same mechanism in several English units provided the basis for a conference held in November 1992 (Barber 1993). In the editorial of that publication, this writer identified the common approaches to the interpretation of complex, deeply stratified sites (*ibid,* 1–2) and nothing further need be added here.

1.3.6 The calculation of the diversity index (IHI)

A diversity index, the index of human interference or IHI, was formulated to encapsulate the range, quantity and depositional rate of anthropic materials in individual deposits. To begin with, the weights of the materials were first recorded and these were converted to volumetric equivalents by dividing them by the density of the material of which they are composed. The densities were calculated by experiment, by measuring the displacement of industrial methylated spirit by known weights of the individual materials. The resultant values, although approximate, are adequate to the present need. In the case of pottery sherds, the weight was not recorded, rather the number of sherds was used in the calculation and the weighting factor adjusted accordingly.

Weighting factors were used in an attempt to allow for the relative values of the various materials as indicators of human activity. Thus the number of potsherds was multiplied by 16, while the volume of stone present was multiplied by 1. The probability of survival of the material was also considered, and carbonised macroplant material, for example was heavily weighted, because field observation showed that it is quickly removed by the wind, and thus probably greatly under represented in the sites' deposits. Thus, macroplant remains were given the highest weighting, × 90; slag, × 10; animal bone, × 9 and sea-shell, × 4. Stone is included with anthropic materials because it cannot have been incorporated into the machair deposits other than by human activities.

The IHI for each context IHI_f is the sum (Σ) of the volume of the material, VOL_m, divided by the volume of the context, VOL_f, and the result multiplied by the weighting factor for that material W_m, thus:

$$IHI_f = \Sigma\,(VOL_m/VOL_f) \times W_m$$

This quantity was calculated for every context, of known volume, which contained anthropogenic material.

The stratigraphic blocks, as defined by the excavator, are interpreted as coherent sets of strata of similar origin and depositional mechanics. If this is correct the IHI's for each Block ought to be relatively similar, ie their deviation from the mean IHI for the Block ought to be small (less than 2 × σ), and greater variance should be observed in the range of the Block mean IHI's. In somewhat simpler language what is implied here is that the variability of the finds from within any single Block ought to be relatively small and certainly smaller that the variability of the site as a whole, if our interpretation of the blocks as indicative of particular phases of human activity is correct.

To examine this hypothesis the IHI's for every context in each Block of the Baleshare site, were first calculated. Then the mean and standard deviation of the IHI's for each Block and for the whole site were also calculated. These data are available in the archive, and summarised in Table 3. Some six Blocks, 1,12, 21, 22, 25 and 28 have only one IHI value each and these are excluded from further analysis. Of the remainder, in practice, only six Blocks, 7, 10, 18, 20, 26 and 27 could be accepted as coherent. With the exception of Block 27, for which 10 IHI values could be calculated, all of these have three or two values. Thus their coherence may be attributed, in some degree, to the smallness of the sample size.

Each Block was then examined to try to evaluate the source of the high standard deviation and in a majority of cases this was found to be due to one or two extreme values, some of which could be dismissed on archaeological grounds. One such sample is [146] in Block 15 at Baleshare. This was

Block	Standard deviation	Mean	Index
2	20121.36	20306.94	19.82
3	8928.23	20305.53	8.80
5	27022.55	15581.06	26.62
6	13958.67	10870.77	13.75
7	27856.07	27856.07	27.45
8	6714.44	5231.50	6.62
10	1019.77	3642.66	1.00
11	147951.10	87171.70	145.77
14	10528.06	12374.27	10.37
15	87550.76	44170.04	86.26
16	38714.69	28926.61	38.14
17	28748.39	35535.34	28.32
18	21310.70	28067.38	21.00
19	13662.76	15592.92	13.46
20	2959.51	12891.45	2.92
22	12364.61	16005.30	12.18
23	5429.93	6761.66	5.35
24	299985.22	110479.96	295.56
26	17379.15	23566.39	17.12
27	10546.71	15142.51	10.39
Population	101497.76	34867.10	

Table 3. The IHI values from the Baleshare Blocks

a localised concentration of macroplant remains which was given a separate context number in the field to highlight the non-random nature of the sample. Thus the volume of soil from which it came is virtually the same as the volume of the remains and the calculation of the IHI is consequently heavily biased. When these extreme values are deleted, the coherence of the IHI values for contexts within individual blocks is relatively well demonstrated.

1.3.7 Harris matrices

The strata within each Block are described in terms of the Harris matrix (Harris 1979). The numbers, in bold, represent the context numbers and are correlated with the tabulated data of results from each context. The vertical axis in the normal Harris matrix is not scaled. It merely represents the shortest branching display of the stratigraphic relationships for a given body of strata. Thus for example, if the matrix shows [10] under [8] this need not mean that [8] physically overlies [10] because [8] could overlie some other context which in turn overlies [10]. The position of the numbers in the table reflects the most efficient demonstration of their gross chronological relationships. For each site a matrix of its Blocks is also presented.