CHAPTER 18: INTERPRETATION AND DISCUSSION

PART 1: PROJECT REVIEW

18.1 METHODOLOGY

18.1.1 Tapestry excavation

The writer is grateful to Patrick Ashmore for suggesting the term 'tapestry' to describe excavations of this type. Following the project described here, tapestry excavations have been undertaken at the Viking site of Tuquoy (Owen 1993) and the Iron Age and Viking site at St Boniface (Lowe 1998), both in Orkney. Smaller-scale tapestry excavations were also undertaken by this writer at the broch site of Pool of Virkie, Shetland (Carter *et al* 1995). All of these sites are affected by coastal erosion and the principle benefit perceived in the use of tapestry excavations has been that the area of site exposed to the forces of erosion has not been increased by the excavation. However, one other advantage has emerged very clearly from these exercises and that is that the information yield from these exercises is enormous, in proportion to the actual costs of excavation. By providing cross-sections through the sites, tapestry excavations furnish evidence on chronology and 'process', albeit at the expense of revealing the full horizontal extents of structures and deposits.

The excavations at Buiston Crannog (Crone 2000) were conceived of as tapestry excavations and, in this case, a section across the width of the site was excavated down into the lake sediments. The intention had been to pursue the section faces outwards across each half of the site, excavating it in 1m strips. The principal advantage perceived in this approach was that of stratigraphic control. With no feature ever lying more than 0.5 m from two recorded section faces, the stratigraphic control over the site would have been without parallel. The complex stratigraphy of crannogs was the stimulus for seeking a high level of rigour in the excavation and recording of Buiston. However, the excavations quickly showed that the bulk of the crannog had already been removed and while the tapestry excavation revealed the nature of the construction of the crannog very clearly, it was equally clear that the gains to be anticipated in pursuing the tapestries across the site would not have justified the necessary expenditure. Here then were two further strengths of the tapestry excavation; firstly, that it facilitated re-evaluation of the project at a much earlier stage, and therefore at much less cost than would have been possible with traditional area excavation; secondly, the survival of the remaining deposits had not been compromised by the tapestry excavation over the extensive areas of the site which would have been exposed to oxygenated waters, had a full scale horizontal excavation been undertaken. Despite its early abandonment, the exercise none-the-less provided a full chronology for the surviving remains and revealed the full constructional and structural history of the site.

In summary, tapestry excavations are appropriate for deeply stratified sites with complex stratigraphies, where the conservation of the unexcavated remains is a high priority, or is particularly difficult because of the nature of those remains. Thus, they provide an ideal mechanism for sampling excavations on such sites, eg coastal erosion sites, urban assessment sites, etc.

18.2 SPECIALISTS RECOMMENDATIONS

Each of the specialists involved in this project was asked to make such recommendations as they thought necessary and useful for future exercises of this type and these are reported below.

18.2.1 Carbonised plant remains

G Jones (1987)

On site sampling

There are potential problems with the use of a Cambridge froth flotation machine. It has been demonstrated that certain categories of charred plant material, such as cereal chaff, pulse seeds and nut shell, do not always float and substantial losses may result (Jones 1981; 1983). The soils used in these trials ranged from heavy clays to light Mediterranean soils. It is possible that the midden deposits and sands of the Uist sites are such that they do not pose a problem for froth flotation but, until this proposition is tested, it should be recognised that it is not possible to say with any certainty whether the apparent lack of chaff (for instance) at these sites is real or due to the techniques used (but see Smith 1999, 332).

On-site bulk processing is necessary, however, in order to process large numbers of samples of adequate size. Fortunately there are machines which collect the sinking residue as well as the flot (see, for example, Kenward *et al* 1980). Small quantities of heavy residue can then be checked for plant remains (as well as small bones and artefacts) and sorted more completely if necessary (see Parker-Pearson & Sharples 1999).

Size and number of samples

Many of the Baleshare samples were too small for analysis with only twenty-seven contexts having thirty or more cereal items and only three having ten or more fruits and seeds of wild taxa (cf Hornish Point with seventy-one and twenty-three contexts respectively). This could be improved by taking larger samples – for Baleshare, for instance, doubling the sample size would approximately double the number of contexts with thirty or more cereal grains, but it would also double the processing time.

One way of obtaining larger samples but minimising processing time, is to aim for a standard quantity of plant remains rather than taking a standard weight (or volume) of deposit. If an estimate can be made of the quantity of plant material in the coarse flot sieve (barley grains would be an obvious guide at these sites) then the quantity of deposit processed can be adjusted accordingly. If there are very few grains in the sieve, it is often not worth processing the rest of the sample. On the other hand, if grains are very abundant, a small volume of deposit will often give a sufficiently large sample. More time can then be spent processing larger volumes of intermediate samples.

If a choice has to be made between sample size and number of samples then a large number of smaller samples is preferable especially when, as at the Uist sites, samples can be grouped into blocks for later analyses. This does, however, reduce the number of units considerably – only fourteen of the blocks from Baleshare and twenty-one from Hornish Point had thirty or more cereal grains while seven and seventeen respectively had ten or more fruits and seeds of wild taxa.

Off site analysis
It had been hoped that the contexts on the MCP would provide a useful summary of the plant remains from each site. However, only six contexts on the Baleshare MCP (nineteen for Hornish Point) had thirty or more cereal grains and no MCP contexts from Baleshare (four from Hornish Point) had ten or more seeds of wild taxa. [The MCP or 'maximum contigual path' (Barber 1986) was an interpretational device employed to target sample selection, but ultimately abandoned in the interpretation of these sites (ed)]

Clearly, it is necessary to analyse more samples than this from each site but this may become very time-consuming especially if larger samples are taken. Economies could be made, in the off-site study of the plant remains, at the expense of some loss of information. Given the rather uniform nature of most of the samples from these sites, it would be possible to 'scan' them, as they do at the York Environmental Archaeology Unit, where they have the much greater problem of dealing with waterlogged remains from an urban site (Hall pers comm).

For the Baleshare and Hornish Point samples, the most time-consuming operations are; (i) the examination of cereals, grain by grain, to determine whether the barley is hulled or naked, straight or twisted, indeterminate or simply too badly preserved to be sure whether it is barley or some other cereal; (ii) the subsequent counting of grains in these categories. It would be considerably faster to go through the sample picking out the wheat grains, chaff, seeds of wild taxa and other 'unusual' items. The quantity of barley and indeterminate cereal grains could then be estimated, say, by volume. This method would, however, fail to pick up any variations in the proportions of two-, to six-row barley and occasional naked grains might well go unobserved.

18.2.2 Pollen analysis

K Hirons (1986)

Although the following points are made specifically in respect of the current work at Loch Askernish, the observations have a more general relevance for future micro-fossil work in the Hebrides (see Gilbertson *et al* 1996).

More stratigraphic information is required from the lake at Askernish to test hypotheses about stratigraphical changes. It may be feasible to use rapid magnetic susceptibility equipment to help with these investigations.

More samples of background soils and sediments are required for chemical analysis. Any detailed study of sediment chemistry should take into account both the inherent variability of the machair sand (Ritchie 1967) and its susceptibility to rapid modification by sub-aerial weathering (Randall 1973). The mineralogical work should be extended further up the core to test hypotheses about carbonate inputs to the upper sediments.

Pollen data at both Balemore and Askernish should be supplemented by closer sampling to provide better pollen stratigraphic resolution.

Critical pollen identifications should be undertaken and means of relating these to specific geomorphological/anthropogenic problems considered.

The Askernish site should be supplemented with a site further back in the blacklands (cf blanket peat sites; Heslop-Harrison & Blackburn 1946). This would help to test hypotheses about the spatial distribution of Betula and Coryloid scrubland and would provide a comparison by provision of a site with perhaps more conventional indicators of anthropogenic impacts and mechanisms of clearance.

18.2.3 The terrestrial mollusca

N Thew (1987)

In future work in the Hebridean machair sites, samples of 6.2 kilos, where possible, should be taken for molluscan analysis and passed through a series of sieves down to 0.5mm.

Attrition of molluscs by human and animal trampling is something that can be looked for in future studies when samples are wet sieved rather than floated. This would help in the characterisation of deposits and, more particularly, of the boundaries between them. It is now evident that greater attention must be paid to sampling and the recording the layer-boundaries themselves, if we wish to understand the nature of both layer accumulation, and change from one layer to another.

18.3 RELATIVE ARCHAEOLOGICAL VALUE OF THE VARIOUS STUDIES

It seems both appropriate and helpful to continuing studies in the Hebrides to consider the relative value of the separate studies undertaken above for this archaeological project. It should at once be emphasised that these studies are, in the opinion of this writer, highly interesting in their own right and individually of great value to the separate professional areas of study that they embrace. Their value is neither in doubt nor in question. However, in the disbursement of limited archaeological funding the question to be addressed is not whether they are of value but whether they are of *archaeological* value in the sense that they address specific archaeological questions which are currently relevant to studies in the area.

Measured by this yardstick, the contribution of the snail analyses cannot be doubted. They clarified the natures of the several deposits, suggested refinement of the sub-division of blocks and provided bio-stratification markers for the Iron Age as well as highlighting the significant differences between the surface and the substance of individual deposits. This analysis was, we believe, the first attempt to use snails in the detailed interpretation of the microenvironments of sites. Furthermore, many of its conclusions are based on statistically inadequate samples. Therefore, the conclusions it offers must be treated with caution, until further work of this type establishes the strengths and weaknesses of the approach.

Conversely, we have not regretted our omission of the analysis of marine mollusca since nothing in the contemporary literature suggests that their analysis would assist in fleshing out the archaeological interpretations of the sites to any greater extent than that afforded by the simple observation of their presence.

The phytolith analyses provided a useful insight into the recycling of silica in these soils and suggests that the phytolith count is a sensitive indicator of settlement. Beyond this, however, their contribution is very limited. Their detailed study on future excavations in the machair cannot be recommended but phytolith analysis, used in surveys of the machair, should provide a powerful prospecting device.

The study of carbonised plant remains proved useful not only for the insights it provides into site economies but also for its observation of the 'contextual sensitivity' of such remains. Clearly, carbonised plant remains are closely interrelated with human activities. In future excavations in such sites, Dr Jones' recommendations for on-site evaluation with flexible sampling is clearly a *sine qua non*. The animal, bird and fish bone analyses, equally clearly, bear directly on questions of site economy and resource exploitation and are signally important. They have each indicated important archaeological questions which should be addressed by targeted sampling, again assisted by identification and evaluation in the field leading to flexible sampling, in pursuit of specific goals.

The regional studies, particularly the pollen analyses, are of limited, direct archaeological value. This is particularly true of the period after the major sand movements of the Late Neolithic, around 2400 uncal BC when the pollen signal of the machair vegetation seems to dilute or mask the signals from anthropic sources. However, used in the study of landscape formation (Hirons *infra*; Mannion *infra*; Whittington & Ritchie 1988, for examples) pollen studies may have a more significant contribution to make. It is disappointing to note from palynological studies in the Hebrides that the diagrams fail to portray anything of the dynamics of, for example, the Iron Age settlement of the area. This may be a common factor of all palynological studies but it is certainly exacerbated by the extreme catchment conditions of the Long Isle. Perhaps we shall one day evolve a set of practical or theoretical approaches that allow us to test the 'story-line' of the pollen profiles but until then we can have relatively little faith in them (see Taylor 1999; Brayshay 1999).

CHAPTER 18: INTERPRETATION AND DISCUSSION

PART 2: SITE FORMATION

18.4 INTRODUCTION

Any site is the sum of its deposits, if we take structures to be simply another form of deposit, albeit a rather special one. Archaeological sites are those which contain significant volumes of information on the human past. Archaeological sites and deposits are rarely completely anthropic in their formation; natural materials arrive into most deposits by means of purely natural, ie non-anthropic mechanisms. The role of the field archaeologist is to distinguish as clearly as possible between natural and anthropic effects in the formation process of the deposits and thence to approach the identification of the site's formation processes. This writer has argued elsewhere (Barber 1988) that deposits formed from soils should be interpreted in terms of three components; the natural soil matrix, the anthropic contribution and the non-soil but natural inclusions. Once the deposits' formation mechanisms are understood and a dating framework provided, the formation of the site, as an entity, can begin to be understood.

18.5 THE DEPOSIT: SOIL MATRIX, ANTHROPIC AND NON-SOIL NATURAL COMPONENTS

18.5.1 Soil matrix

The coastal environment in which these sites lie greatly simplifies at least one of these components, the natural soil matrix, which would be exclusively shell sand were it not for the introduction of other materials by human agencies. Every stone encountered in the machair soil was brought there by humans. Indeed, even the bulk of the soil organic matter (SOM) was almost entirely introduced to the site by humans and associated species, domesticated or not (see O'Connor 1997).

18.5.2 Soil organic matter (SOM)

Soil chemistry, pollen and phytolith microfossils, the recovery of carbonised and uncarbonised peaty nodules and the abundant presence of peat ash throughout the examined section, all indicate that peat is a major constituent of the anthropic contribution to the SOM of the soil matrix. This is consistent with the results from the analysis of later farm mounds from Orkney (Davidson *et al* 1983) and from Scandinavia (Bertelsen 1979). Davidson draws on the ethnographic evidence for recent agricultural practices in the Northern and Western Isles (Fenton 1978) to suggest that peat used, initially, as byre floor covering is the major source of the organic component of the soil matrices of farm mounds. The snail evidence from the Bronze and Iron Age deposits of the Hebrides seems to confirm this specific use. However, it is unlikely to have been the only use and possibly not even the greatest one. The exclusive use of peat for fuel, evidenced in the observed ash deposits, and the deliberate introduction of peat to wind blown sand to create plaggen soils are clearly evidenced in these sites also. Whatever it's functions, peat was introduced to these sites in very large quantities indeed and became the second most abundant component of the soil matrix.

Animal faeces are less easily identifiable on the site and their presence can only be deduced from other strands of evidence. Phytolith analysis revealed that phytoliths were present in soils forming the deposits of these sites in concentrations of 10^3 to 10^6 per cubic centimetre (cc) of soil. This contrasts strongly with the results from naturally formed modern A-horizons on machair in the Hebrides and elsewhere where 20 phytoliths per cc was a typical concentration. Analyses of modern analogues indicate that peat and faeces contain phytolith concentrations comparable with those observed on the site and we may conclude that these provide a large part of the SOM and are the principal sources of much of the silica contained in the soil matrix. However, these sources alone cannot account for the particular photolith suites detected and we must look to other sources, like decaying vegetation from food for man and beast, to account for the remainder.

The presence of animal bones on the site provides the clearest evidence for the slaughter of animals on site, while the byre floor material itself and the presence of marine prosobranchs, small shellfish brought on site attached to seaweed collected for fodder, provide further strands of supporting inference. The phytolith concentrations also indicate the general possibility that animal (including human), faeces form part of the anthropic contribution to the SOM of these sites.

18.5.3 The anthropic component

These sites are exceptional in that even the soil matrix has a large anthropic component but here we consider the artefacts and ecofacts that became part of each of the sites.

Macroscopic inclusions

The structures and structural elements of the sites are the main anthropic contribution on the macroscopic scale. Most of these were dug into existing deposits; the internal faces of the voids thus created being lined with stone facings. The need to transport to the sites all of the stone used in construction probably encouraged the re-use of stone and this probably gave rise to further re-working of deposits. It has certainly led to the palimpsest nature of the structures, most clearly visible at Hornish Point where virtually every structure examined was formed of parts of pre-existing features, together with newly built elements. The re-used rotary quern at Baleshare (Plate 17) is symptomatic of the general curation of stone for buildings.

Artefacts and ecofacts

The most common artefacts recovered from these sites are pottery and burnt stone, the latter comprising a significant proportion of some individual deposits. Otherwise, the artefactual contribution to the sites' formations is relatively slight, measured as a proportion of the volume of the deposits. However, the numbers of potsherds recovered, even from these small sampling excavations, are counted in the thousands. This richness of artefactual material is exceptional for Iron Age sites in Scotland from which potsherd totals, at best, are counted in the hundreds.

Ecofacts are also locally abundant within the sites. Not surprisingly, most contexts contained some marine shell and they constituted the greater part of some contexts. It is clear from their very abundance that these must be anthropic in origin even if some of them arrived on site by purely natural means. Butchery-, and food-waste, in the form of animal, bird and fish bone was similarly abundant, in contrast with most other Iron Age sites in Scotland. The high pH of the shell sand is the key factor in the preservation of bone and, indeed, of seashell and snails.

Summary

The materials of which the sites are formed comprise natural wind blown sand, principally shell sand. Clay-sized particles have been added to the shell sand. A large part of this addition comprises microscopic silicates derived from the decay of peat and faeces. The matrix also contains undecayed peat and other humified organic matter. Significant volumes of stone were imported for use in building and for heating water. Seashell, pottery and butchery and food waste of various types form smaller, but significant contributions.

18.5.4 The (non-soils) natural component

This element of the deposit contents is the most difficult to identify and quantify, for these sites. Some of the seashell will have been brought on site by, for example oyster catchers or other mollusc-eating birds. Very rough counts made by the writer on a somewhat *ad hoc* basis, revealed up to ten shells per ha on the current machair surface near the sites reported on here. Similarly, it is probable that the remains of bird species like thrush, starling, crow and rook became incorporated in these deposits on the deaths of birds living on the sites, quite independently of the sites' human occupants. Snails were incorporated into deposits partly as natural, *in situ* assemblages and partly as a result of the creation of specific ecological niches by humans, eg byre floor deposits.

In general, the non-soil, natural component of the deposits does not seem to have contributed significantly to the volume of the deposits.

18.6 SITE FORMATION PROCESSES

18.6.1 Introduction

The formation of these sites was dynamic and comprised the interplay of natural and anthropic forces adding material to the sites, reworking the materials on site and, from time to time, removing some materials from the site also. In the case of the anthropic contribution there is also, perhaps, a distinction to be drawn between deposits on the basis of the 'intentionality' of their formation. This complexity requires the definition of terms used in its description, not least because the term 'midden' as applied to these site-types has become rather misleading.

18.6.2 Terminology

There are few technical terms universally agreed in respect of sites and landscape forms in sand and to avoid confusion and, hopefully, to assist the reader some 'definitions' are offered here of words used in the following text.

Conflation

Following the deflation of sandy deposits, the anthropic component of these deposits, eg bone, shell, pottery, etc and in the context of these sites, including stone also, does not blow away but comes to rest on some arbitrary surface, forming a deflation deposit. These remains may be of different origins and dates but can become incorporated together, either in a new deposit of wind blown sand or by incorporation, by bioturbation, in the surface on which they come to rest. The resulting deposit is known as a conflation deposit.

Deflation

The process of deflation means the removal of sand by the force of the wind alone. Used as an adjective the term can refer to the resultant landforms, eg 'deflation hollow' or 'deflation deposit'.

Dump deposits or dumped deposits

Dumped deposits are characterised by their clear boundaries and the low volume of the individual contributions. They will have been formed in discrete packages, such as could be carried on or in a shovel or basket or, perhaps, wheelbarrow or cart. They need not contain any anthropic materials but often do so in considerable quantity. They usually display large scale heterogeneity coupled with small scale homogeneity, ie while the single deposits may be quite homogenous, there can be considerable diversity between the individual deposits making up one dump deposit.

Needham and Spence (1997) and McOmish (1996) emphasise intentionality as an important consideration in the definition of dumps and the categorisation of dumping activities. Intentionality can be confidently attributed to the removal of material from its original source. The act of gathering it together and moving it to its find-location (archaeological context) is a necessary precondition to the deposit's formation and cannot be other than deliberate. The difficulty subsists in demonstrating intentionality in its disposal. Was its final resting place selected as an act of human will? Structured deposition, a heavily overworked concept, presumably consists of deposits for which we can be sure that their final resting place was not only selected as an act of human will, but was selected to the conscious exclusion of all other places.

Midden

The term 'midden', of Scandinavian origin, is composed of the elements *møg* (muck) and *dynge* heap and simply means muck heap or dung heap (OED). In the late nineteenth century it came to be used as an abbreviation for 'kitchen midden'. The latter term was a useful archaeological descriptor but the archaeological abuse of the term 'midden' has devalued it and caused some confusion (see Needham & Spence 1997; McOmish 1996 for useful discussions). Here the term is reserved strictly for deposits that are interpreted as accumulations of refuse intended for reuse as manure. A

	Deliberate	Inadvertent
Dumped	**Primary dump**	**Midden-type deposit**
	Midden Made soils (Plaggen soils) Structured deposits	House floor
Reworked	**Distributed on fields**	**Redeposited by later building**

Table 49. Categories of deposits evidenced on the excavated sites

midden may contain dumped deposits and incorporate midden-site deposits.

Midden-site deposit
A midden-site deposit is a deposit whose matrix has been enriched with relatively large amounts of anthropic material, artefactual and ecofactual, where the material has not entered the deposit as a result of deliberate dumping. Rather, the anthropic material arrived in these contexts by some combination of loss (accidental dumping), abandonment (of butchery waste, for example, at the butchery site), or incidental discarding (littering).

These contexts can be quite extensive and where sufficiently extensive are perhaps best described as midden-soils, rather than deposits. This distinction is based on the probability that anthropic material has been incorporated into an existing matrix or was progressively included into a matrix being formed by natural processes. Midden-site deposits can be created where dumped or other deposits have been cultivated and manured but these deposits are termed 'cultivated deposits' in this report (*infra*).

Midden-site
A midden-site is a site composed principally of midden-site deposits, but contains other types of deposit as well.

Cultivated deposits
Virtually all of the deposit types encountered on this site existed in hybrid or mixed forms also; cultivation being the most frequent cause of their hybridisation. Dumped deposits or midden-site deposits were the most commonly cultivated deposit types. The resulting cultivated horizon (it could include more than one original deposit) was usually so heterogeneous that it was not possible, unambiguously, to identify the nature of the parent deposits. Further, there seems to be a spectrum, more or less continuous, embracing cultivated dumped or midden-site deposits, highly manured cultivated sands and plaggen soils.

18.7 PROCESSES OF ACCUMULATION

18.7.1 Natural sedimentation

Windblown sand is the major site-forming material on each of these sites. The process of its arrival is simply that of aeolian transport. Ritchie (1968) has shown that, in the absence of obstacles, like these sites, the high mean wind speed of the islands ensures that the transport of sand proceeds to the level of the local water table, thus creating the machair plain. Accumulations of humic matter in the vicinity of settlements facilitates the accretion of sand both by adhesion to soft wet humic material and, ultimately, by creating 'perched' water tables that, by keeping the sand wet, resist deflation.

The mere presence of walls and buildings can accelerate the processes of accumulation by providing nuclei for 'dune formation'; the wind blown sand coming to rest in the lee of the structures. Sand thus accreted, can in turn become stabilised by incorporation of dumped, humus-rich detritus from the structures and further trapping of blown sand may continue from that point.

18.7.2 Deliberate dumping

Our *a priori* suggestion that refuse dumping could be considered under a variety of headings seems to have facilitated a meaningful interpretation of the site deposits. The classification of Blocks used here distinguishes between dumped deposits, deposits that contain 'abandoned' or inadvertently dumped matter and reworked deposits of both types. In this there is a foreshadowing of Needham & Spence's (1997, 87) contention that, 'We attempt to judge the intentional *versus* the inadvertent and to see what archaeological manifestations are created by their interaction.'

The evidence recovered in this study, however, has indicated the significance also of the reworking of deposits, however formed. Table 49 proposes a set of relationships between dumped and reworked deposits and the intentionality or inadvertence of their deposition.

Primary dumps
Dumps of refuse seem best illustrated at Balelone where humus rich strata and dumps of peat ash, for example, were commonly observed. The coherence of the deposits, their homogeneity, small volume and the clarity of their boundaries, indicates that these strata represent single episodes of dumping and their size suggests that the materials dumped could have been the waste products of a single household. This material can be viewed as primary dump deposits. Jones' analysis of the distribution of carbonised plant remains supports this classification of the relevant Blocks.

It has been argued above that the passage into the probable wheelhouse at Baleshare was used as a 'deliberate' dump for, *inter alia*, a skinned calf carcass. Use of abandoned structures for waste disposal seems probable (see Matthews 1993, for example) and one may wonder whether the multiple pits within the wheelhouse at Sollas (Campbell 1991) also, are post-abandonment features associated with dumping.

Primary dumps in refuse pits
The mere existence of refuse pits is not *de facto* evidence for structured deposition. Rotting debris and faecal matter lying about on the ground surface would have attracted vermin and formed a reservoir of disease vectors. In the late twentieth century it is easy to forget that only fifty years ago various forms of blood poisoning, tetanus and related conditions could be contracted from relatively trivial wounds and commonly resulted in death. Burial of at least some forms of refuse was a necessity on long term settle-

ment sites. It may be supposed that among the materials most probably buried would be primary butchery waste, especially entrails and offal not kept for consumption, faeces and contaminated food.

Middens

Dumping of organic matter purely as waste disposal would have been an extremely short-sighted practice by machair residents given that machairs are severely deficient in humus. Some dump deposits on these sites constituted middening, or at least waste accumulation, for later distribution onto cultivated land. The vertical faces observed in the Balelone organic horizons, for example, are interpreted as evidence that middens of humic material from these locations had been dug out and, presumably, spread on cultivated areas.

Plaggen soils

Anthropic, or plaggen soils, are remarkable and consistent features of the prehistoric sites examined. These are considered in more detail elsewhere but the common, often abundant, presence of nodules of peat in the cultivated deposits indicates the possibility that peat was introduced directly to the machair sands to create fertile, arable soils. However, it is also possible that the peat arrived in the fields *via* byre floors or as ash and carbonised fuel *via* cooking fires. Whatever the mechanism of its introduction, the harvesting and delivery of peat to the sites represents a significant contribution to site formation process.

Structured deposits

Hill, from his study of Iron Age 'midden' deposits in Wessex, concluded that the original abundance of materials used on site is not reflected in the quantities surviving on archaeological sites and further that finds from later prehistoric sites are '...just as structured as those from graves or hoards.' (1995, 125). It is possible that some midden deposits, indeed that some middens are structured deposits. However, it is estimated that the roughly 70,000 tonnes of material in the Late Bronze Age midden at Baleshare rotted down from a total of something like 180,000 tonnes of freshly dumped refuse (I ignore here issues of the nature of the 'dumping'). It is hardly credible that this large mass of material was 'structurally' or ritually deposited.

There is at least one set of structured deposits at Hornish Point comprising the pits containing the partly articulated remains of one adolescent human and selected parts of two juvenile bovids and of two female sheep (Barber *et al* 1989, 775).

18.7.3 Inadvertent dumping

Midden-type deposits

Inadvertent dumping also seems to have occurred regularly, perhaps continuously, during the occupation of these sites. The deposits that have been styled 'midden-type' deposits are rich in domestic refuse but appear to have acquired this by incorporation from trample or by small scale abandonment of refuse close to structures. This could include small scale dumping of industrial by-products, or perhaps their simple abandonment at the production site.

House floors

Refuse has, similarly, become incorporated in some house floors, most probably by trample and by burial in shallow pits scooped out of the sand. In the case of Block 11 at Baleshare, black, humus rich levels interpreted as house floors were sealed under layers of clean sand apparently introduced to bury surfaces that had become noisome and unhealthy.

The house floors visible in the small structure at Baleshare had crisply clear boundaries, so clear that the writer wonders if anyone ever walked on them. The alternating bands of dark humic matter and white wind blown sand would surely have become very intermixed, had humans or animals walked on them. Perhaps these 'floor deposits' are in reality post-abandonment dump deposits that were occasionally buried with clean sand to discourage flies, suppress the associated smells, discourage vermin or remove a health hazard.

18.7.4 Reworked material

Manured cultivation areas

Middened material was spread on fields and ploughed-in to maintain or improve fertility and, on machair, to resist deflation. Given the proximity of large seaweed deposits on the nearby beaches it is probably necessary to point out here that seaweed would have contributed little by way of nutrients that the shell sand did not already possess. It would have helped to stem erosion but, unless burned and applied in great quantities, seaweed alone could not have made up the deficiencies of machair soils.

In considering middens as accumulations of mainly organic matter, ie 'provisional refuse' in Schiffer's terminology (1987, 64) Needham and Spence suggest that '...the practice of accumulating refuse does not automatically point to the practice of manuring' (1997, 84). But the practice of manuring *does* point to the fact that refuse was accumulated.

Reworked material, cultivated dumps

Deposits of all kinds were reworked by subsequent episodes of ploughing. The deep and highly stratified deposits on the south side of Hornish Point provide a particularly striking example of the process by which sand accretion coupled with repeated cycles of cultivation following dumping, midden-site deposit formation or extensive manuring led to rapid accumulations up to 2 m deep. These formed in periods of time so short that the radiocarbon method cannot resolve the chronology of the separate formation episodes. Indeed the radiocarbon method is only just capable of resolving between the earliest and latest episodes.

Reworking for new construction

Baleshare and Hornish Point both contain structures that are dug into the accumulated sediments of the site. Removal of the considerable volume of material needed to prepare the house-stances caused massive reworking of some deposits. At Baleshare this resulted in one significant radiocarbon dating reversal, ie the determinations identified younger deposits underlying older deposits. In the large farm-mound site type, of the Hebrides and Orkneys, this must be a relatively common phenomenon and should encourage caution in the interpretation of individual dates or of small numbers of dates from such complex sites. The radiocarbon-dating of

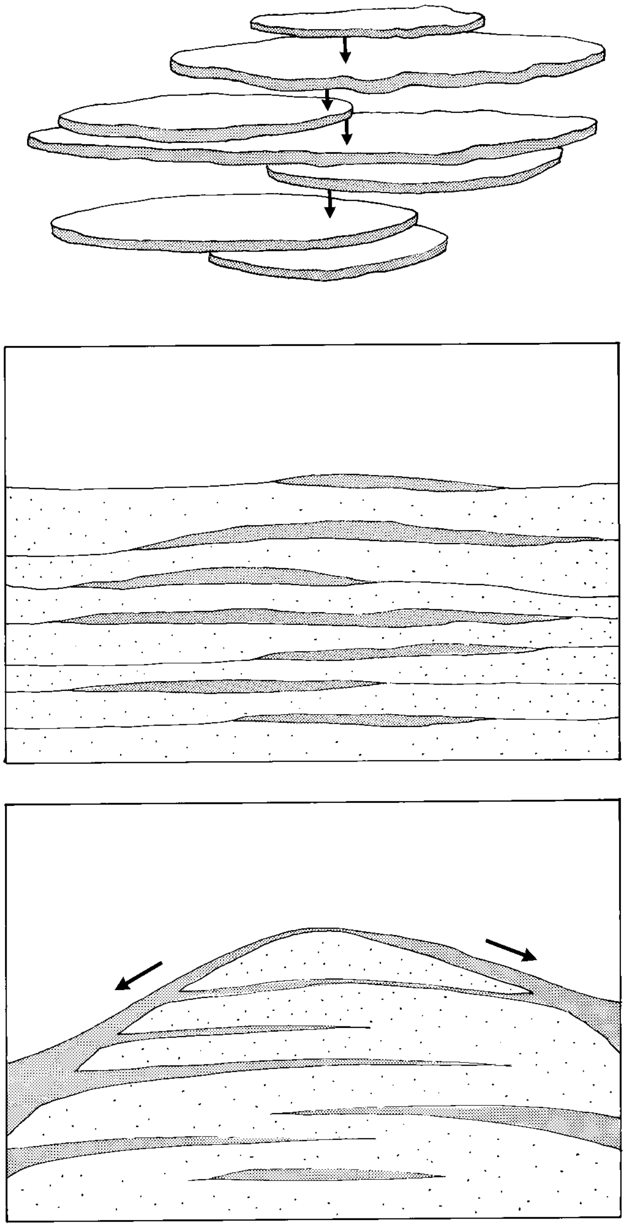

Figure 103. Margins of sites interdigitated with peat

the broch and associated features at Scalloway, Shetland provides a clear example of this problem (Sharples 1998, 83–8). Despite the use of twenty-four dates there is one inversion in each of the three periods identified among securely stratified contexts.

18.8 NEGATIVE ACCUMULATION: LOSS OF SEDIMENTS

18.8.1 The overall physical form of the sites

If the sites and their immediate environments were accreting sand at roughly comparable rates, we should expect to find the margins of each site interdigitated with the machair deposits (Figure 103). This expectation prompted the coring and trial pitting in the hinterland of Balelone, in an attempt to relate the site deposits to the surrounding landscape. However, observations at Balelone, at all the other excavated sites and the sites visited in the course of the initial surveys, has shown that all of the machair sites are roughly hemispherical or domical in form (Plate 9). This must necessarily mean that the machair around these sites has, itself, deflated (on more than one occasion) and, therefore, that the contiguous sand deposits are not contemporaneous with the juxtaposed site deposits. This observation is consistent both with Ritchie's model for the evolution of the machair and with the observation of early modern travellers, who like Martin Martin in 1703, saw not a blade of grass growing on the bare sand of the machair.

The erosion pits on the south edge of Balelone and the erosional slipping of a mass of strata at the northern end of the Hornish Point section also demonstrate that these bodies of deposits were episodically exposed to erosion on a scale large enough to isolate entire sites from their enveloping machair deposits.

18.8.2 Conflation horizons

At Baleshare, the presence of strata or surfaces spanning the full extent of the revealed section (Blocks 23 and the surface of Blocks 15 and 1, for example) indicate large scale erosional events. These isolated the sites from their machair hinterlands more than once during the sites' formation. These layers are conflation horizons and are particularly problematic for the archaeologist. They are formed by the following processes:

i) *Deflation*; Wind erosion of sandy deposits removes the sand particles of the deposits but the larger particles, including stone, artefacts and ecofacts cannot be removed by the wind and simply drop down the profile and lie, mixed together as a *conflated assemblage*, on the exposed deflation surface. The deflation surface may cut through deposits of different ages.

ii) *Stabilisation*; Erosion stops because strata are reached which resist further erosion, eg humus enriched deposits or the local water table. Vegetation invades the revealed surfaces and a biologically active A-horizon develops.

iii) *Conflation;* Bioturbation incorporates into the A-horizon the mixture of materials lying on the deflation surface, further mixing them with the contents of the deposits in which the new A-horizon has formed, the latter constituting a conflation horizon. Thus, the conflation horizon contains materials from each of the contexts removed by aeolian erosion as well as the materials in the contexts (usually more than one) forming the deflation surface. These are clearly not synchronous deposits. Their contents are diachronic and may contain strange juxtapositions of materials, sometimes sufficiently strange to invite the interpretation that they are ritual deposits or structured deposits.

18.8.3 Missing deposits

Smaller scale erosion is also well attested in the excavations. Plate 20 shows ard marks, revealed in underlying deposits.

The material that enters an ard mark at the time of its creation should be a mixture of the soil of the overlying deposit and that of the 'subsoil' into which it is cut. However, as Plate 20 shows, the material in these ard marks is significantly different from both the underlying and overlying strata. This is interpreted as indicative of the loss of the A-horizon, or surface soil, through which the cultivation took place. As noted above, summer drought exposes the cultivated soils of the machair to the hazard of wind erosion. It seems reasonable to conclude that droughty summers in the Bronze and Iron Ages may have led to the loss of exposed areas of the cultivated surface soils and very probably of the cultivated crops in those areas as well.

18.9 DEPOSITIONAL RATES AND PRESERVATION CONDITIONS

The quality of preservation of remains like animal bones or carbonised plant remains is affected by the rates at which they are incorporated into the sediments of the sites. Faster deposition at Hornish Point, for example, has resulted in a lower absolute volume of bones, per unit volume of sediment, but the quality of the preserved bones is much better than that of those from Baleshare. The same observation has been made about the relatively fragile carbonised plant remains (Jones *infra*).

In general, the conditions in these sites are excellent for the preservation of a wide range of archaeological materials. The high pH of the soils has ensured the survival even of the most fragile bones of bird and fish. These conditions should also facilitate the preservation of metals. Hammerscale was recovered from many of the deposits. This consists of small metallic scales dislodged from the surface of iron objects when these were hot-worked by hammering for forming and hammer-welding. The survival of these tiny scales indicates quite clearly that iron could and did survive on the site and that its absence from the sampled deposits is real and not just an artefact of preservation.

18.10 SUMMARY

The machair sites were formed by sand accretion, facilitated by human activities ranging from construction to refuse disposal and cultivation. Their formation was intermittent and they underwent episodes of major erosion, isolating the sites from the landscape mass of the machair sands. Areas of the sites were also subject to smaller scale erosion, particularly to the loss of cultivated topsoils. The implications of these observations for the chronologies of the sites are considered below. Despite the vigorous dynamics of their formation the sites are good preservational environments and the recovered artefactual and ecofactual material can be taken as truly representative of the original inputs to the deposits.

CHAPTER 18: INTERPRETATION AND DISCUSSION

PART 3: RADIOCARBON DATING

18.11 DATING THE SITES

18.11.1 Inherent problems

Despite their apparent wealth of suitable materials, the dating of Hebridean coastal erosion sites presents special problems. Radiocarbon dating of carbonised wood or charcoal, is rendered suspect by three factors which may on occasion act in combination. The first of these is the presence in these islands of significant volumes of driftwood which originated in the Americas or elsewhere, the growth of which may have been completed a considerable time before its deposition as charcoal (Dickson 1992).

The second factor is the possible inclusion of charcoal derived from peat. Peat ash is clearly visible in almost all of the exposed profiles, often containing unburnt peat particles, occasionally in association with charcoal. The woody stems of the Ericaceae or of *Myrica gale* or some of the *Salix* species are clearly visible in many peat cuttings on the islands and can be seen in the cut peats. Sub-fossil tree-stumps of pine are also locally abundant in the peat. There is therefore a danger that the charcoal from such contexts is carbonised sub-fossil wood from the peat deposits.

Even if the exotics and the peat-derived material can be identified and eliminated from dating samples, the heirloom status of construction timbers in these treeless islands poses a severe problem. Large timbers, such as those suitable for use as rafters or ridge-poles, are likely to have been conserved in the islands and to have assumed the status of heirlooms. In consequence, they are unlikely ever to have been discarded for use as firewood and, when consumed in accidental conflagrations, they may pre-date the currency of the structures they are found in by several centuries. Oral tradition in the isles tends to confirm this view in that members of the older generation can remember, or recall their parents or grandparents remembering the often lengthy, and invariably tortuous, history of their roof trusses. It must of course, be remembered that these comments may only apply to the periods which fall after the deforestation of the islands.

Smaller carbonised remains, seeds and fruits, etc are also susceptible to contamination from peat-derived material (Jones *supra*). It could be argued that the only reliable carbonised dating material is carbonised cereal grains from clearly identified and well understood contexts. However, relatively few contexts contained carbonised cereals and only a handful contained sufficient to provide the standard radiocarbon dates available to this project.

The radiocarbon dating of humic matter from these sites is also fraught with difficulties. Fragments of peat were found in large numbers in most contexts, some of them carbonised or partly carbonised. These alone rule out the possibility of using the soil organic matter (SOM) to date contexts, quite apart from the uncertainty arising from the unknown mean residence time of humus in these soils, or the potential relict carbonate effect of shell sand dissolved in humic acids.

18.11.2 Dating sea shell

Sea shells were available from most contexts and occurred in sufficient quantity to provide radiocarbon dates. However, radiocarbon dates of seashells are felt by some authorities to be somewhat older than the shells themselves because of the marine reservoir effect (Harkness 1983). This effect arises from the slow and uneven rates of incorporation and mixing of carbon isotopes in the oceans' waters. Thus, in oceanic areas characterised by the upwelling of deep water the radiocarbon content of the water is lower than the radiocarbon content of contemporaneous terrestrial materials. However others point out that the relative amounts of carbon isotopes (notably of ^{13}C and ^{14}C) fixed in the formation of marine bicarbonate, are different from the ratio in which they occur in terrestrial materials. They argue that the order of difference is such as to approximately cancel out the marine reservoir effect. In other words,

'.... the increase in ^{14}C activity due to isotopic fractionation during the formation of bicarbonate, and the decrease due to mixing with deep water, almost cancel. This has long been utilised in the dating of marine shells which are in close isotopic equilibrium with bicarbonate of the surrounding water.' (Tauber 1976).

This conclusion is apparently contradicted by experimental work undertaken in Australia (Huebbers 1978, A5.2). The radiocarbon dates of shells of four different species were compared with dates from charcoal from archaeologically associated contexts. In total ten pairs of dates were compared and in every case the shell dates were older than the charcoal dates. The differences ranged from 240 ± 141 to 1400 ± 114 years. Significant differences between species were noted, and *Hormomya erosa* (the rough beaked mussel) proved consistently to have the greatest errors, with a pooled mean error of 1360 ± 95 years. The scale of these errors was attributed to Hormomya's habitat; sheltered bays and lagoons, where relict carbonates leached from ancient shell sands on the coast become concentrated, in the absence of adequate circulation of tidal waters. These carbonates become fixed by the mollusca and produce dates over 1000 years too old (Heubbers 1978, A341–2).

There is clearly a danger that machair sands produce relict carbonates which enter the Atlantic, off the Hebrides, in solution. However, there are few sheltered bays or lagoons along the west Hebridean coastline and so the problem may not be as acute for these sites as it seems to be for the Australian sites noted above.

The calibration curve

It seemed clear that most of the prehistoric sediments on these sites would date to the first millennium BC, and this poses a further problem because the calibration curve is particularly flat and unvarying in the interval 800–200 BC (Baillie & Pilcher 1983). Single dates, or small numbers of dates from individual sites would not, therefore provide an adequate basis for intra-, and more particularly, inter-site comparisons.

Lab No.	Context No.	Block	Sample type*	Date bp	SD	Calibrated dates 1-sigma	2-sigma
Baleshare							
GU-1968	100	21	a	2045	50	166 BC–AD 16	200 BC–AD 57
GU-1975	29	24	a	2075	50	172–3 BC	348 BC–AD 48
GU-1972	2	5	a	2085	50	198–44 BC	351 BC–AD 46
GU-1964	1	6	a	2110	80	350–4 BC	390 BC–AD 54
GU-1962	46	4	a	2155	50	354–120 BC	380–72 BC
GU-1974	33	28	a	2210	50	385–203 BC	400–121 BC
GU-1960	42	2	a	2240	55	393–209 BC	400–131 BC
GU-2166	265	11	a	2250	50	394–211 BC	400–174 BC
GU-1970	212	19	a	2265	50	397–214 BC	407–200 BC
GU-2165	113	11	a	2320	50	406–386 BC	510–233 BC
GU-1963	239	15	a	2375	55	516–396 BC	761–380 BC
GU-1961	68	1	a	2390	55	752–399 BC	764–390 BC
GU-1965	127	18	a, b	2740	60	973–828 BC	1072–800 BC
GU-1971	148	26	a	2815	50	1072–904 BC	1209–833 BC
GU-1973	132	27	a	2910	50	1241–1014 BC	1314–935 BC
GU-1967	196	20	a, b	2970	65	1370–1054 BC	1410–976 BC
GU-1969	272	23	a	3030	50	1392–1135 BC	1430–1110 BC
GU-1966	280	22	a, b, c	3285	60	1686–1496 BC	1734–1430 BC
Hornish Point							
GU-2024	257	19	a	2170	50	357–128 BC	390–74 BC
GU-2015	3	13	a	2170	50	357–128 BC	390–74 BC
GU-2026	332	22	a	2185	50	362–172 BC	390–90 BC
GU-2016	16	10	a	2220	50	387–206 BC	400–126 BC
GU-2028	351	22	a	2270	50	398–233 BC	407–200 BC
GU-2025	272	19	a	2285	50	400–235 BC	410–208 BC
GU-2022	218	7	b	2310	50	405–380 BC	484–212 BC
GU-2023	231	8	a	2320	50	406–386 BC	510–233 BC
GU-2021	87	5	b	2325	50	407–387 BC	515–233 BC
GU-2018	33	12	a	2330	50	408–388 BC	733–234 BC
GU-2017	24	4	a	2335	50	409–389 BC	741–235 BC
GU-2019	37	9	a	2345	50	411–391 BC	752–263 BC
GU-2027	339	26	a	2370	50	509–396 BC	758–384 BC
GU-2161	79/464/465	27	a, b	2410	50	756–403 BC	767–390 BC
GU-2020	74	1	a	2500	50	789–446 BC	800–410 BC
Balelone							
GU-1802	339	9.00	not ID	2290	60	403–234 BC	483–210 BC
GU-1801	113	3	not ID	2330	70	411–382 BC	757–210 BC
GU-1803	166	4	not ID	2440	80	768–403 BC	800–390 BC
Newtonferry							
GU-2163	19	3	a	700	50	AD 1264–1377	AD 1220–1391
GU-2164	33	3	a	710	50	AD 1262–1285	AD 1220–1389
GU-2162	8	3	a, b, d	1150	70	AD 777–982	AD 680–1019
South Glendale							
GU-2159	108	Area 2	b, d	540	50	AD 1327–1427	AD 1297–1441
GU-2160	212	Area 2	b, c	550	50	AD 1325–1424	AD 1280–1440

*Table 50. Radiocarbon dates from marine shell. * a = periwinkle; b = limpet; c = cockle; d = razor*

18.11.3 Towards a dating strategy

The complexity of the larger sites was such that dating single events or structures would require a very large number of dates. It was, in consequence, decided to abandon the usual strategy of providing single dates for specific events and to try, rather, to provide a dating framework for each site by selecting samples which would date the depositional sequences, ie the Blocks, defined for each site. The dates of archaeologically significant events could then be arrived at by extrapolation. This strategy would also allow for the estimation of depositional rates for each Block which would help in their final interpretation.

Lab No.	Context No.	Block	Sample type	Date bp	SD	Calibrated dates 1-sigma	2-sigma
Baleshare							
GU-2554	146	15	*Hordeum* sp.	1970	80	92 BC–AD 126	197 BC–AD 226
GU-2555	42	2	*Bos* sp.	2260	80	401–208 BC	511–117 BC
GU-2558	1.03 & 139	18 26	*Bos* sp.	2900	140	1370–903 BC	1489–800 BC
GU-2556	various	22	*Bos* sp.	3360	80	1743–3480 BC	1883–3409 BC
Hornish Point							
GU-2550	various	5	*Hordeum* sp.	2160	80	363–95 BC	400 BC–AD 2
GU-2549	various	19	*Hordeum* sp.	2090	50	200–48 BC	351BC–AD 21

Table 51. Radiocarbon dates from bone and carbonised seeds

Lab No.	Block no.	Date bp	Pair?	Group?	
GU-1968	21	2045 ± 50			Period III
GU-1975	24	2075 ± 50	yes	yes	b
GU-1972	5	2085 ± 50	yes	yes	_ _ _ _ _ _
GU-1964	6	2110 ± 80	yes	yes	c
GU-1962	4	2155 ± 50	yes	no	_ _ _ _ _ _
GU-1974	28	2210 ± 50	yes	yes	b
GU-1960	2	2240 ± 55	yes	yes	
GU-2166	11	2250 ± 50	yes	yes	
GU-1970	19	2265 ± 50	yes	yes	
GU-2165	11	2320 ± 50	yes	no	_ _ _ _ _ _
GU-1963	15	2375± 55	no		a
GU-1961	1	2390 ± 55	yes		
GU-1965	18	2740 ± 60	no		Period II
GU-1971	26	2815 ± 50	yes	yes	
GU-1973	27	2910 ± 50	yes	no	
GU-1967	20	2970 ± 65	yes	yes	
GU-1969	23	3030 ± 50	yes	no	
GU-1966	22	3285 ± 60	no		Period I

Table 52. Baleshare. Pairwise analysis of the radiocarbon dates. NB: Phase IIIc consists of redeposited material

Lab No.	Block no.	Date bp	Pair?	Group?	
GU-2024	19	2170 ± 50	yes	yes	Phase III
GU-2015	13	2170 ± 50	yes	no	
GU-2026	22	2185 ± 50	yes	yes	
GU-2016	10	2220 ± 50	yes		
GU-2028	22	2270 ± 50	yes		
GU-2025	19	2285 ± 50	yes		
GU-2022	7	2310 ± 50	yes	no	Phase II
GU-2023	8	2320 ± 50	yes	yes	
GU-2021	5	2325 ± 50	yes	yes	
GU-2018	12	2330 ± 50	yes	yes	
GU-2017	4	2335 ± 50	yes	no	
GU-2019	9	2345 ± 50	yes	yes	
GU-2027	26	2370 ± 50	yes	yes	
GU-2161	27	2410 ± 50	yes	yes	Phase I
GU-2020	1	2500 ± 50	yes	yes	

Table 53. Hornish Point, Period II. Pairwise analysis of the radiocarbon dates

Should the dated networks prove internally consistent, ie consistent with the stratigraphy, we could be confident that the resolution of the dates was not hopelessly compromised by the variability in the ^{14}C content in the first millennium BC, or rather, by its lack of variability over most of that millennium. Analysis of the chronological sequence of dates could also be used to try to distinguish between events and processes and to indicate the phasing of the sites.

It was decided to use sea shells to construct the dating frameworks for the deep sites, and to date carbonised cereal grains, which had been reliably identified, to provide an estimate of the scale of the reservoir effect on the shell dates. In an attempt to limit other variables, like the inter-specific differences noted by Huebbers (1978) in carbon isotope fixation, the shells of periwinkle were used exclusively for dating wherever sufficient of them survived. Where an adequate weight was not retrieved, limpet shells were added to the total, and, in the few cases where even these did not suffice, cockle shells were also added.

18.11.4 Results

Tables 50 and 51 list the results of the radiocarbon dating programmes for seashell and other organics, respectively, for the sites of Balelone, Baleshare, Hornish Point, Newtonferry and South Glendale.

In the case of Balelone, no attempt was made to construct a dating framework. Preliminary dates from the earliest and latest strata on that site proved to span such a small period that radiocarbon dates of the intervening deposits would not be sufficiently precise to resolve between

SHELL				SEED/BONE			
Lab no.	**date**	**SD**	**13C**	**Lab No.**	**date**	**SD**	**13C**
Baleshare							
GU-1960	2240	55	1.54	GU-2555	2260	80	-22.5
GU-1963	2375	55	4.35	GU-2554	1970	80	-23.4
**	2780	50		GU-2558	2900	140	-22.5
(GU-1965	2740	60	1.36)				
(GU-1971	2815	50	1.72)				
GU-1966	3285	60	2.12	GU-2556	3360	80	-26.4
Hornish Pt							
**	2230	50		GU-2549	2090	50	-24.6
(GU-2015	2170	50	1.30)				
(GU-2025	2285	50	0.95)				
**	2320	50		GU-2550	2160	80	-23.9
(GU-2021	2325	50	1.17)				
(GU-2025	2285	50	0.95)				

*Table 54. Radiocarbon dates – the marine reservoir effect. ** indicates an interpolated date based on the pair of dates immediately below and their stratigraphic inter-relationships*

Very rapid	Rapid	Average	Slow	Very slow
100 (+) mm/Ry	30 mm/Ry	20 mm/Ry	5-10 mm/Ry	<5 mm/Ry

Table 55. Approximate sedimentation rates, in mm per radiocarbon year (Ry), for Balesharе and Hornish Point, based on radiocarbon determinations and the volumes of the excavated deposits

successive events. In any event, the extent of the first trial excavation at Balelone was so small and the results so tentative that the costs of a large dating framework would not have been justified.

In analysing the site chronologies of Baleshare and Hornish Point (Tables 52 and 53) the statistical procedures outlined by Long and Rippeteau (1974) were followed. The first hypothesis tested for each site was that all the dates represent separate estimates of the same age, ie that the accumulation of all the site deposits was a short lived process and that the dates represent a span of time which is not significant with respect to the precision of the analyses. The simplest test of this hypothesis is a test of the legitimacy of averaging all the dates using Chauvenet's rejection criterion for the exclusion of 'unaverageable' dates. This criterion suggests that dates with a probability of less than 1/2n of being included in the averaged distribution (group mean ± weighted standard deviation) may not be averaged.

Even a brief examination of the spread of dates from these sites shows that this is a trivial hypothesis and the statistics readily confirm this. The dates must therefore represent a number of events, the intervals between some of which must be significant in respect of the precision of the analyses. The next approach was therefore to list the dates in simple chronological order and to test the legitimacy of averaging adjacent pairs. Where consecutive pairs cannot be averaged legitimately, the interval between them is significant with respect to the precision of the radiocarbon dating method. Thus, we can say that there is a significant hiatus in the depositional sequence at this point. This process divided the sequence for Baleshare into four distinct groups of Blocks which have been treated as the main Periods of the site.

Once defined by this means, each event may be tested for non-coaevalness which allows us '...to evaluate whether a series of seemingly close radiocarbon dates represent an instant of time, or rather a duration of time significant with respect to the precision of analyses' (Long & Rippeteau 1974, 210).

Where a group of dates representing a single event, as defined above, are shown to represent a duration of time, there may well be archaeological grounds for dividing or subdividing the group. Similarly, archaeological grounds may exist for combining groups, but, in either event the duration of the events, and the gaps between successive events must be taken into account in the overall interpretation of the chronology.

18.11.5 Baleshare; chronology (*refer to Tables 50 and 51 for Lab Numbers*)

Period I

The first group consists of a single determination, 3285 ± 60 (GU–1966), for Block 22. This later Bronze Age Block is the earliest set of deposits investigated on the site, although there

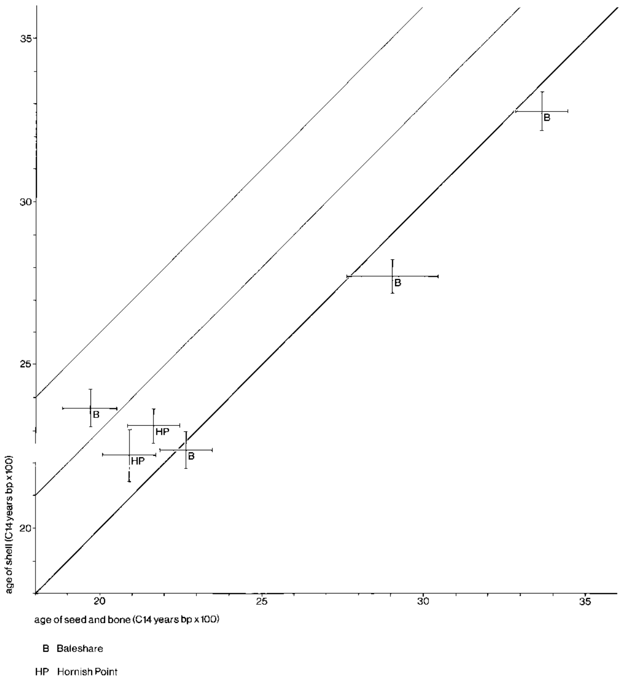

Figure 104. Calibration of the marine effect

are even earlier deposits beneath them. It constitutes the Period I excavated sequence for Baleshare.

Period II

The next group of determinations ranges from 3030 ± 50 (GU–1969) to 2740 ± 60 (GU–1965) and includes Blocks 23, 27, 20, 18 and 26, all dated. Block 17, undated, must also be included, on stratigraphic grounds. The inversion of the dates here (Block 26, dated to 2815 ± 50 [GU–1971], overlies Block 18, 2740 ± 60 [GU–1965]), is statistically without significance, as there are only 75 radiocarbon years between the determinations.

Block 25 is included in this phase, Phase 2, because of its similarities to Block 26, both are cultivation layers, and its differences from overlying Blocks, 16 and 15 which are both midden-site deposits.

Further analysis of the dates shows that Period II need not be further subdivided, on the grounds that all the dates it encompasses could be legitimately averaged together. This is hardly surprising, given that the four determinations involved span less than 200 years.

Period III

The determinations of the remainder of the Blocks follow each other in such close succession that it is legitimate to average each pair of dates, implying that the differences between them are not significant with respect to the precision of the analyses. Thus, Period III includes Blocks 15, 1, 19, 2, 28, 11, 24, 5, 21, 4 and 6, all dated, and, on stratigraphic grounds, the following undated Blocks; 16, 9, 12, 10, 8, 7, 14 and 3.

Further analysis shows that Period III can be subdivided into three phases, IIIa, containing Blocks 16, 9, 15, 29 and 1; Phase IIIb, containing Blocks 19, 2, 12, 28, 10, 8, 7, 11, 14, 21, 5, 24, and 3; Phase IIIc containing Blocks 4 and 6. The validity of these sub-divisions rests in part on the archaeological evidence. Were we to alter the order of analysis, from top-down to bottom-up, for example, the analysis would offer slightly different results.

18.11.6 Hornish Point; chronology

The Hornish Point determinations were analysed in the same fashion as those from Baleshare but with rather different results. It transpired that all of the successive pairs of determinations from this site can, in fact be legitimately averaged together. Thus, from the radiocarbon dated deposits there is no evidence for any interval in the depositional sequence which is significant with respect to the precision of the analyses. The site is thus considered to be all of one period, lasting some 330 radiocarbon years, measured between the means. There are no clear statistical grounds for grouping the Blocks into phases and this has been done solely on the basis of their archaeological interpretations.

18.11.7 Newtonferry; chronology

There are three dates from Newtonferry, two virtually identical dates calibrating to the thirteenth to fourteenth centuries and one to the Dark Age period between the late seventh and early eleventh centuries. The two medieval dates are consistent with the general character of the bulk of the deposits. These seem to comprise settlement debris and waste material. The context from which the Dark Age date is drawn lies at the base of the Block of medieval sediments. There is no *a priori* reason to dismiss the radiocarbon date as aberrant but neither was any diagnostically Dark Age material retrieved from the context. Given the possibility that two local burials were of Norse origin (see Chapter 8.1), it is not inherently improbable that some Dark Age activity took place at the site. Whether this constituted settlement may be doubted, given the paucity of the dated remains. More probably, this may have simply been a temporary anchorage at the head of a sheltered bay.

18.11.8 South Glendale; chronology

The radiocarbon dates from South Glendale indicate occupation in Area 2 sometime between the thirteenth and fifteenth centuries AD. The closeness of the two determinations suggests that despite the lengthy spans indicated by the calibrated range the occupation was probably of a single period and also probably quite short. However, the finds of post-medieval reduced wares in the uncontexted spreads on the deflation surface indicates that further activity, perhaps not associated with occupation, persisted at the site. Its use as a ferry terminus for traffic to Barra and the small isles to the south would account for these later artefacts.

Although untested by radiocarbon dating it is important to recall past surface finds of Beaker shreds. The undated and stratigraphically lower activity in the midden deposits of Area 1 has been described above as 'of prehistoric character'. The stratified assemblage of fifty-five potsherds is essentially undiagnostic as is the flint assemblage. However, on balance these confirm the excavator's interpretation of the fragmented and truncated remains as prehistoric, probably Early Bronze Age in date.

18.12 CALIBRATING THE MARINE RESERVOIR EFFECT

As noted above, the dating of these deep middens was undertaken using marine shell because it was ubiquitous (or relatively so) and allowed us to date the depositional sequence for the sites. A further set of ten samples of carbonised material or large mammal bone was submitted for dating in an attempt to quantify the scale of the marine reservoir effect. This effect should make dates from marine materials 'too old' by 405 ± 40 (Harkness 1983).

In the event, four of the samples failed to produce sufficient datable material and six dates were assayed; three of bone and one of carbonised seed from Baleshare and two of carbonised seed from Hornish Point (Table 51).

Ideally, the non-marine materials should have been selected from the contexts from which the shell dates were taken. However, this only proved possible with one of the samples from Baleshare. For the other four samples, material was selected from a stratigraphically close context or it was amalgamated from a number of such contexts. In the latter case we tried to ensure that the group of contexts selected lay between dated contexts which established that they had not been formed over a period of time which was significant in terms of the precision of radiocarbon dating. In such cases we estimated the *Interpolated Date* (Table 54) as the mean of the two dates whose source-contexts bracketed these newly sampled contexts.

The Blocks referred to in the tabulated data and below are groups of contexts, ie deposits, which are contiguous and which, it is believed, share a common formation process. It seems therefore, reasonable on archaeological grounds also, to average the dates that bracket them, or to interpolate between them on the basis of their mean sedimentation rates (Table 55).

The differences between the seashell and the bone and seed dates are presented in Table 54 and range from +121 to -405 years, ie the shell dates range from 121 years younger than expected to 405 years older than expected. This distribution is not what was expected on Harkness's model and the data were examined by a statistician to test the hypothesis that the differences between the determinations from the two classes of material (marine and terrestrial organics) are not significantly different from zero.

18.12.1 Statistical comparison of the radiocarbon dates from marine shell with those from terrestrial organic material

M Scott

The radiocarbon dates from Hornish Point and Baleshare were subjected to a Student's t-test to examine the significance of the differences between the radiocarbon dates obtained from marine shell and those from other organic materials, ie bone and carbonised barley. The results are presented in Figure 104.

The shell dates were matched with corresponding organic dates and the difference in age calculated (the standard deviations were not considered). A 95% confidence interval was constructed for the average difference between the shell and bone dates. This interval (-286, 123) includes 0, and thus we find that statistically there is no evidence of a difference between dates on the different materials.

There is a large spread in the results, the differences ranging between – 400 years to 120 years. The variation between the Baleshare dates is greater, with the bone dates being older and the seed date being younger by 405 Rys, a difference of *circa* 425 Rys. In both the samples from Hornish Point the seed date is younger by approximately 160 years.

Although the sample size involved is small, it would appear that the differences between the samples is not significantly different from zero and secondly that while the shell dates may be up to 300 years 'too old', some may be up to 100 years 'too young'.

18.12.2 The archaeological implications of the seashell calibration

Dr Scott's conclusion is rightly qualified by the small size of the sample on which it is based. Comparative dates from shell and terrestrial organics have been assayed from the site at St Boniface, Papa Westray, Orkney (Lowe 1998, 97). There the author simply applied the conventional correction for the marine reservoir effect (MRE) indicating perhaps that no reason had been encountered to do otherwise. Another comparative date is available from Dun Vulan where an auk skeleton was dated to 2330 ± 60 bp (AA–10498) and carbonised barley in the same layer was dated to 1905 ± 45 bp (AA–22911) (Parker-Pearson & Sharples 1999, Table 9.1).

However, on the basis of the dates from the sites reported upon here, the validity of routinely applying Harkness's 405 ± 40 correction factor must be questioned. We can be reasonably sure, for example, that the animal bone dates are free from MRE because their ^{13}C values are clearly those associated with terrestrial organisms (Table 54). It is generally agreed that molluscs selectively take up carbon isotopes and that, coincidentally, the differences in isotopic uptake just about cancels out the MRE. Australian researchers have shown that fossil carbonate, leached from geological deposits and concentrated in sheltered bays, affect the 14^{C} dates of molluscs from those bays, creating 'errors' of over a millennium (Gillespie & Polach 1976).

Drs G Cook of SURRC and A Dugmore of Edinburgh University and this writer have embarked on a research programme to explore this problem and its archaeological consequences. For now, the interpretation of the radiocarbon determinations from marine or mixed contexts must be treated cautiously. Whatever the uncertainties created by the marine reservoir effect, the relative sequence of the seashell radiocarbon dates from both sites is remarkably consistent.

Baleshare; internal consistency of the chronology

At Baleshare, two apparent inversions have been noted. Block 18 underlies Block 26 but postdates it by 75 radiocarbon years (Ry). The difference here is not statistically significant. Similarly, Block 24 underlies but is younger than Block 5, by a mere 10 Rys. However, Blocks 4 and 6 are apparently 'too old' by up to 110 Rys. In these cases the differences partly relate to the fact that these samples came from the top of conflation horizons. In practice both of these dates should be discounted.

Hornish Point; internal consistency of the chronology

The sequence at Hornish Point is much shorter in overall duration than that at Baleshare; 330 Rys as compared to 1240 Rys. Thus, given that contiguous separate deposits are more nearly contemporaneous there is a higher incidence of trivial reversals in the site's radiocarbon chronology. Block 26 is stratigraphically lower than Block 27 but is 40 Rys younger than it. The implication to be taken here is that the two Blocks are very nearly contemporaneous.

The 2 m deep series of deposits revealed in the southern half of the site were formed, on the radiocarbon evidence, over a period of, at most, 165 Rys. It subsumes two trivial dating inversions: Block 7 underlies but is 10 Rys younger than Block 8 while Block 8 underlies but is 15 Rys younger than Block 4. It is not impossible that these deposits have been disturbed, ie dug out from the area to the north into which the wheelhouses have been inserted, but the radiocarbon evidence cannot be cited in support of this possibility because the differences between the dates are too small to be significant with respect to the precision of the analyses.

Similarly, there are two dates each for Blocks 19 and 22 and the means of these pairs of dates are identical. Here again it is the near contemporaneity of the dumped deposits of Block 19 with the use of the structure of Block 22 which seems indicated.

Other chronological indicators

The use of artefacts in the dating of archaeological contexts is central to traditional archaeological methodology. However, in Scotland this is a tradition more honoured in the breach than the observance for studies of the greater part of the nation's prehistory. The gradual breakdown of typological dating in archaeology in general (partly as a consequence of the emerging radiocarbon chronologies) is exacerbated in Scotland by the paucity of typologically dateable material, in the first place, and the possible persistence of archaic features in that which does occur. At any rate, no suitable chronologically sensitive material can be shown to exist in these sites and it is probable that in the provision of radiometrically-dated, well-stratified assemblages of materials this project may contribute more to the study of the artefacts than the latter are likely to contribute to the site chronologies.

Nonetheless, the principal element of the artefact assemblage, the pottery, was subjected to a series of studies designed to explore its value as a chronological indicator. Firstly, an attribute analysis of the assemblage was undertaken and then various groupings of the assemblage based on a range of attributes were examined. The groups based on fabric and firing technology are those closest to traditional archaeological taxonomies and these are discussed further elsewhere in this volume (Chapter 10). Sherds of virtually all types occurred in contexts of all ages. While this was perhaps not surprising at Hornish Point, given the short duration of the site, it was certainly surprising at Baleshare where some 1400 Rys separate the earliest and latest features.

Lest the problem here was caused by the use of an analytical device which is too mechanistic, a traditional analysis of the assemblage was commissioned from Dr A Lane. This was based on a study of the rim, base and decorated sherds and interpreted in the light of Dr Lane's (1990) typology for later prehistoric pottery in the Hebrides. Like the first analysis, Dr Lane's was undertaken in ignorance of the stratigraphic record and like the first study it also failed the test for chronological sensitivity, ie pottery of all the types recognised by the analysts were found spread throughout the stratigraphic sequence (Chapter 10).

Finally, an analysis of the assemblages which was undertaken in full knowledge of the stratigraphic sequence produced groupings of sherd types which appear to be chronologically significant. However, the writer is convinced by this sequence of analyses that the typologies of Hebridean pottery, of all periods, are subjective constructs that are chronologically unreliable.

18.12.3 Depositional rates

The close dating of the deposits facilitates at least a rough determination of sedimentation rates over the excavated deposits. This is calculable in litres per annum for some areas of the excavated deposits. However, this would be a spurious accuracy, not least because we do not know how far back into the surviving deposits the individual contexts or Blocks may extend, ie we do not know how representative of the full deposits are the portions sampled in this exercise. Radiocarbon determinations for the tops and bottoms of sequences of deposits do at least provide an indication of the duration of the period over which they accumulated and this can be expressed in broad classes, five of which are used here, *viz* very rapid, rapid, average, slowly and very slowly. The operational definitions of these rates are set out in Table 55.

CHAPTER 18: INTERPRETATION AND DISCUSSION

PART 4: SITE INTERPRETATIONS

The interpretations offered here are based on the conclusions reached for each Block of strata and are couched in terms of the human activities, and where relevant the natural processes, which have contributed to the formation of these deposit groups. These interpretations are expressed solely in terms of the evidence from the sites themselves. Inter site comparanda and the wider implications of these interpretations are considered in Part 5.

The Blocks in each site are discussed in what is believed to be the order of their deposition, from earliest to most recent. The following should perhaps be read with the site descriptions in Volume 1 alongside.

18.13 BALESHARE

18.13.1 Period I

Block 22

The conclusion that this very extensive deposit (300 × 100 × 1 m) is a cultivated soil can be accepted with confidence. The presence in it of ard marks, at different levels throughout the deposit, suggest that it was an A-horizon being progressively deepened, mainly by wind blown sand deposition. Capture and retention of the sand was, no doubt, helped by the inclusion in the soil of manure. Indeed, without the organics from this manure the soil would not have been cultivable in any case. The anthropic materials included with the manure are typical of domestic refuse.

The distribution of pot-sherd sizes indicates that ploughing was continued over a relatively lengthy period, during which manuring continued, ie while many sherds were reduced to small fragments the addition of new material from the manure ensured that small numbers of larger sherds also survived. Given that the viability of the soil depended almost completely on the materials added by man, it is not unreasonable to view this as a plaggen-, or man-made-soil.

Coring revealed what has been interpreted as a settlement nucleus in the south-east of the cored deposit. It is noteworthy that, discounting the unknown volume of the deposit removed by the sea, the settlement drew upon at least three hectares of arable land and was capable of sustaining this with manures, implying that livestock were relatively abundant and probably seasonally confined, facilitating the accumulation of their manure.

18.13.2 Period II

Following a period of abandonment whose duration was roughly 200 radiocarbon years, the deposits of the next phase were formed. These form Blocks 23, 20, 27, 18, 26 and 25. The excavated tapestry did not reveal any structures associated with this period. However, Block 23 is separated from the other Blocks of this period by a deep ditch (Figure 23). The walls of the structure comprising Block 8 sit within this ditch, but at a relatively high level. It is not impossible, on the available evidence, that the ditch forms part of the activities of this period and the differences between the deep and highly stratified deposits on its north side and the single Block on its south side suggest that some significant demarcation of activities occurred at this point. If the ditch represents that demarcation, then the deposits of Block 9, the primary infilling of the ditch (Figure 24) probably belong in this period also but, on the available evidence it is not possible to confidently attribute Block 9 to either Period. It is therefore treated separately below.

The Blocks in this period fall into two groups on the basis of stratigraphy and of their constituents. The lower Blocks, 20, 23, and 27 were all interpreted in the field as windblown sands but proved to contain modest amounts of anthropic materials giving them IHI values of 7,000, 15,000 and 13,000 respectively. These contrast with the higher IHI values, ranging from 23,500 to 36,500 returned from the contexts of the stratigraphically higher group of Blocks.

Reoccupation and cultivation of marginal windblown sands

Post-excavation analyses suggest that Blocks 20, 23, and 27 were initially deposits of windblown sand, which were cultivated, and into which a restricted range of materials, in relatively small amounts, was introduced during manuring from farmyard middens. The condition of this material, particularly the potsherds, is such as to suggest that the material had already been reworked and redeposited before it became included in these Blocks. These then appear to represent an initial phase of cultivation of wind-blown sands which had accumulated above the Period I deposits. The low IHI values, and the snail evidence both suggest that this cultivation was intermittent and probably sited at some distance from the associated settlement. Peak sedimentation rates here are almost 2 m of deposits formed in a period of 120 Rys (16.7 mm/Ry). However, half of this figure would be more representative of the bulk of the deposits.

Dumping and cultivation in the vicinity of settlemen t

The stratigraphically earliest of these Blocks, 17, comprised a set of dumped deposits rich in burnt material. The high degree of heterogeneity in the contexts which comprise this Block and the richness, variability and condition of their contents suggest that it was a primary dump. It seems reasonable to assume that the structures or activities with which it was associated were sited nearby.

The overlying Blocks, 18, 26 and 25, seem also to have originated as dumped deposits but, unlike Block 17, these were subsequently cultivated. The balance of the evidence suggests that this cultivation was short lived. The existence of three distinct Blocks encourages us to suspect that cultivation was also intermittent because continuous cultivation would have resulted in a deepened A-horizon without internal horizonation.

Sedimentation rates are harder to assess for this group of Blocks because of the inversion of the dates of Blocks 26 and 18. If, however, we take the maximum duration represented in the radiocarbon dates and the maximum depth of deposits formed in the period, some 1.2 m of deposits formed in 170 Rys, ie just under 10 mm per annum (70 mm/Ry).

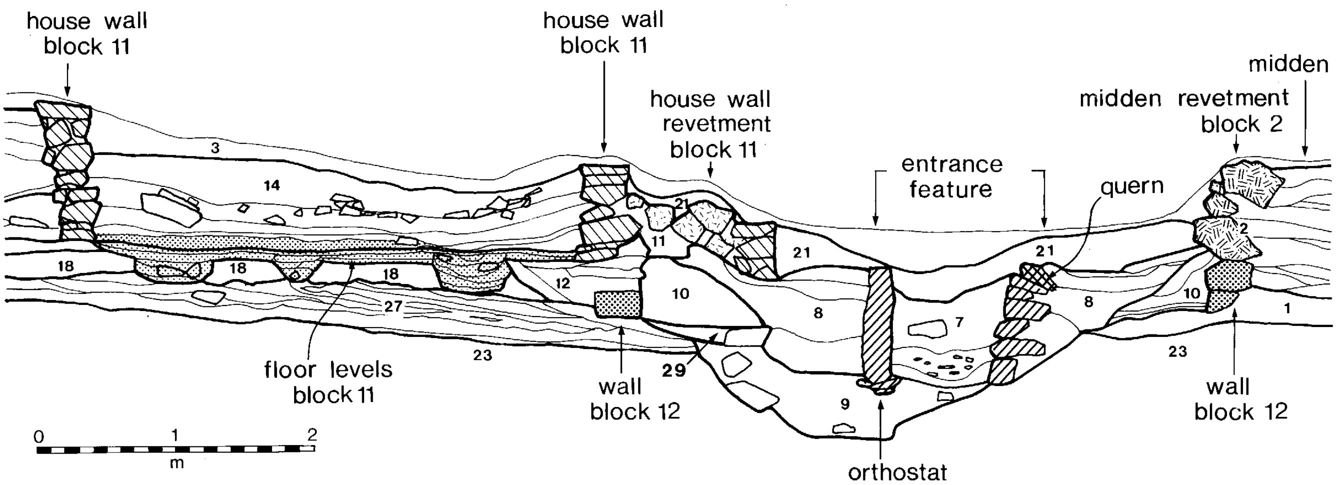

Figure 105. The major structural elements at Baleshare

Summary

Somewhat more than two centuries after the abandonment of the earliest excavated deposits, Period II opened with the intermittent cultivation of what were essentially wind-blown sands with some degree of manuring. The paucity of anthropogenic materials, indicative of low levels of manuring suggest that this cultivation was relatively small scale and distant from settlement. The area was accreting windblown sand throughout the period at relatively high sedimentation rates. We may, therefore, envisage this activity as the cultivation of areas of relatively open or lightly grass-covered sands on the margins of a settlement area.

With no break in deposition within Period II sufficiently lengthy to be resolved with the precision of the radiocarbon method, the settlement seems to have moved nearer to the excavated locus because there is an abrupt transition to dumped deposition of settlement detritus. This was also cultivated, intermittently, as it accumulated.

There are conflicts in the snail evidence for the deposits of this phase of activity which can be explained by consideration of the difference between the substance of deposits and their surfaces. A dumped deposit can contain the snail assemblage representative of its primary formation locus, ie material from a byre floor can contain the snails characteristic of that environment. Once dumped however, it will develop a grassland cover on its upper surface and acquire the snails appropriate to that environment. The admixture of the two assemblages over a period of time can lead to a misleading or uninterpretable pseudo-assemblage. When the dumped deposit consists primarily of household or other detritus which is free of snails, or nearly so, only the grassland assemblage formed on its surface will be recovered from the deposit. This will be equally misleading in its import for the deposit.

Period II, then, is represented by marginal cultivation associated with an initial recolonisation of the abandoned site followed by dumping and subsequent cultivation of materials in the vicinity of a settlement, which in the later phase has moved closer to the excavated area. This settlement must be assumed to have been lost to the sea because the coring did not reveal its presence inland.

18.13.3 Period III

The chronological analysis suggests that Period III can be subdivided into three phases, IIIa, containing Blocks 16, 15, and 1; Phase IIIb, containing Blocks 19, 2, 12, 28, 10, 8, 7, 11, 14, 21, 5, 24, and 3; Phase IIIc containing Blocks 4 and 6.

Introduction

The hiatus between Periods II and III extended over a minimum period of 350 radiocarbon years and yet, when it ended the differences in deposition between the north and south ends of the site mirror the differences evidenced in the Period II deposits, at least during the earliest phase, IIIa.

Phase IIIa

The deposits of this phase comprise Blocks 1, 16 and 15. Block 1 lies to the south of the ditch feature (Block 9) and with ard marks in its base it has been interpreted as a cultivated deposit. It is shallow, 0.10 to 0.30 m deep, and relatively extensive but it contains little in the way of anthropogenic material. Its IHI value of 5,000 is among the lowest from the site. The deposit is a dark brown loamy sand and the colour and texture suggest the possibility that this is a cultivated A-horizon that originally formed the surface of the Period II deposits. The paucity of anthropogenic materials suggests that, like the earliest deposits of Period II, Block 1 was a cultivated plot at some distance from its associated settlement.

To the north of the Block 9 Ditch the other two sets of deposits of this Phase, Blocks 16 and 15, are both midden-site deposits, ie deposits which had formed in the immediate vicinity of a settlement. Their southern end is truncated by the wall of the structure in Block 11 but this structure cannot be the source of the materials they contain. It survives as a segment of a simple circular hut created by building a stone lining inside a circular space cut into pre-existing deposits (Figures 25 & 26). The wall cannot have stood on its own and therefore, the use of this structure postdates the deposits of Blocks 16 and 15, into which it was cut. However, among the lowest of the deposits of Block 16, [252] consists of a spread of stones which could represent structural debris from the construction or destruction of a hut, which preceded that in Block 11. This is consistent with the radiocarbon dating evidence and could explain the nature of the differences between the northern and southern deposits of this phase. The deposits of Block 16 are strongly heterogeneous, lack ard marks (although, on the snail evidence they may have been briefly and infrequently cultivated) and contain large volumes of a wide range of materials (mean IHI value of 29,000). Thus, they have the characteristics of deposits accumulating in the immediate vicinity of a settlement structure.

The deposits of Block 15 are of very much the same character as those of Block 16, which they overly, but with an IHI value of 55,000 for the soil deposits, are if anything even richer. The excavated strip of deposits was crossed by some five ditch-like features whose nature and function could not be explored in the small exposure. None the less, their occurrence reinforces the interpretation that these represent deposits formed close to active settlements.

That the settlement with which these Blocks should be associated is missing does not weaken the interpretation offered here, even though it is freely admitted that the indications contained in [252] are far from conclusive evidence for a precursor to the hut in Block 11. If future excavations discount this possibility we should simply have to accept that the associated settlement lay to the seaward side of the excavated strip and is now lost forever.

Sedimentation rates for these deposits are extremely high. The difference between the earliest and latest radiocarbon dates is a mere 15 Rys during which a minimum of 0.50 m and a maximum of 1.55 m of deposits were laid down, implying sedimentation rates of 30–100 mm per annum.

Phase IIIb

Phase IIIb encompasses the Blocks of strata and walling associated with the group of structures close to the centre of the site (Figure 105). The close stratigraphic control afforded by tapestry excavation allowed us to unravel a sequence of at least three structures, of which only one was excavated to any extent. To the north of this complex, the deposits of this phase comprise a single midden-site deposit and a terminal conflation horizon. To the south, however, a series of Blocks of deeply stratified deposits were noted. The description which follows starts with the structures and deals then with the deposits to the south and north respectively.

Structure 1; The evidence for the existence of the structure referred to here consists of the ditch (Block 9) and the revetted space over it formed by the walls of Block 12 (Figure 105). Block 9 was filled with virtually sterile sand and over this an A-Horizon had formed (Block 29). Over this windblown sand (Block 10) accumulated between drystone walls (Block 12). These seem to mark a higher level extension to the structure, possibly revetting the deeper sediments to keep them from eroding down into the passageway, which it is assumed, ran along the ditch. Evidence for the actual structure itself has been removed by the insertion of Structure 2. The upper levels of the revetment walls (Block 12) have been slighted by and underlie Structure 4.

Structure 2; The evidence for this structure consists of a pair of parallel walls erected in a recut of the earlier ditch and revetted with redeposited sand (Block 8). The walls extend into the sand cliff and make between them a passage some 0.70 m wide and 0.90 m high (Figure 105). The outer face of the northern is demarcated by an orthostat and very slight signs of a socket at the foot of the corresponding position on the southern wall suggest that an orthostat brought the latter to a fair face also. This suggests that these are the outer ends of an entrance passage leading into the structure that is still preserved beneath the sand, or was when these excavations took place. There was no evidence for the roofing of this passage. Rather the space between the walls had been used as a primary dump, presumably after the abandonment of the structure.

The upper levels of the walls and the, by now infilled, passage were covered in a deposit of windblown sand which contains very little anthropic material. It is, in effect sterile. The revetment to the deposits of Block 2 and that found partly underlying the south wall of Structure 3 appear to be upper level revetments for this structure.

Structure 3; Only the rear part of this structure survived (Block 11), consisting of a chord of about one third of the area of the structure, assuming that it was originally circular, or roughly so (Figure 105). Its wall, one stone thick, was no more than a revetment to the deposits into which it had been cut. It survived to a height of 0.95 m. It contained three distinct floor levels, separated from each other by clean sand. Pits were found in each of the floor levels that contained burnt sand and carbonised peat and spreads of peat ash were also noted. No clear evidence was recovered for the function of this structure. It is assumed that it formed part of a domestic residence because the pit contents suggest that fires had been lit within it and because the floor had been kept clean.

Phase IIIc

The Blocks of this phase are both problematical. Block 4 is a human interment and the radiocarbon dated material associated with it is almost certainly derived. Block 6 is largely windblown sand in a conflation horizon and the radiocarbon-dated material is clearly derived from some other source. Whatever the original sources of the dated materials, the sub-block is of interest because, on the radiocarbon evidence, it bears witness to sediments that have been removed from this part of the site.

18.14 HORNISH POINT

18.14.1 Period I

The face of the site exposed by coastal erosion at Hornish Point was found to have relatively extensive spreads of masonry and structures lying in and in front of it. The examination of these was continued only to the current beach level but it was perfectly clear that structures and associated deposits underlie the current beach. The title ‘Period I’ has been applied to these, unexcavated structures to emphasise the fact that the chronological start point for the excavated sequence is an arbitrary one.

18.14.2 Period II, Phase 1

Block 1

The earliest deposits excavated at Hornish Point are those of Block 1, dating to 2500 ± 50 bp (GU–2020). It consisted of a series of deposits, dumped during a period of natural sand accumulation, and intermittently cultivated. The rate of natural sand accumulation was high, as the evidence from the snail analysis and the dilution of the anthropic inputs indicate. Some effort may have been made to contain the southward spread of these deposits by a revetment wall (Figure 45). However, it is not impossible that this wall (Block 7) was later associated with the deposits of Blocks 2, 3 and 8. The scale and character of the Block 1 deposits suggest that it was an infield area, receiving regular supplies of domestic refuse, albeit somewhat diluted by the accretion of windblown sand.

No clear evidence of the structures associated with this cultivation episode was recovered in the excavation. It is possible that these structures lay before the excavated face, and are lost to coastal erosion or lie behind the face and have yet to suffer that fate. Structural remains were noted beneath those excavated on the northern side of the site and it is most probably among these that we might seek the settlement associated with this phase of cultivation.

18.14.3 Phases II to IV – summary

Introduction

Some 130 Rys intervened before Block 26, a cultivated deposit, was formed at the northern end of the site. Dated to 2370 ± 50 bp (GU–2027), this is not significantly different from the initial dates from the deeply stratified series of deposits that comprise the site's southern end. This series covers the radiocarbon period 2325 ± 50 bp (Block 5) to 2170 ± 50 (Block 13), a span of some 140 Rys.

The structures of the northern end cover a similar span, *viz* 2370 ± 50 bp (Block 26 forming against and over the structure of Block 23) and 2230 bp (the average of the four dates from Blocks 19 and 22), a span of 140 Rys. However, there is an hiatus in the sequence of dates from the structures, which is significant with respect to the precision of the analyses and which is not mirrored in the soft deposits at the south end. This is the interval between 2410 ± 50 (Block 27) and the mean date of 2230, returned from the structures of Blocks 19 and 22.

18.14.4 Phase II

Blocks 2, 3, 5, 7, 8, 6, 4, 9, 23, 24 and 25

The first eight Blocks at the south end of the site (Blocks 2, 3, 5, 7, 8, 6, 4 and 9) have returned five radiocarbon dates the means of which cover a span of only 35 Rys. This short sequence is replete with chronological inversions but, given its short duration, these are of no statistical significance. Rather, the general implication must be that this substantial set of deposits was formed over a period too short for the dates of its component parts to be resolved from each other, given the precision of the radiocarbon method. It is probably safer to consider that these deposits formed over a very short period of time indeed, the best estimate of which is provided by the mean of the five determinations, *viz* 2327 ± 22 bp.

The wheelhouse structure of Block 23 (Figures 60 & 61) is contemporary with or slightly earlier than the deposits of Block 26. In practice it appears cut into the lower deposits of that Block and parts of its walling are overlain by the uppermost deposits. Block 23 is also overlain by the masonry structure and floor levels of Block 27 (Figure 66). Blocks 26 and 27 are dated to 2370 ± 50 and 2410 ± 50 respectively; an inversion of the observed stratification but one covering only a period of 40 Rys. It is not unreasonable to suggest that all three deposits are approximately contemporaneous, ie that they occurred over a time span too short to be resolved by the radiocarbon method. Making this assumption, we shall represent the approximate date of these events by the mean of the two radiocarbon determinations, *viz* 2390 ± 50 bp.

The structural fragments identified in Blocks 24 and 25 (Figures 62–64) were *in situ* when the deposits of Block 4 accumulated against Block 24, or, alternatively, the Block 24 structure was cut into the deposits of Block 4. However, the surviving wall head of Block 24 was overlain by the deposits of Block 9, the uppermost Block of the lower sequence. The structures in Blocks 24, 25 and 23 are infilled with Blocks 16, 17 and 19, respectively, and all of these are dumped deposits of one sort or another; Block 16 is structural debris, Block 17, rubble and midden-site deposits and Block 19, dumped deposits. All of these factors suggest that the structures of Blocks 24, 25 and 23 were in contemporaneous use or in use over a period of time too short to be resolved by the radiocarbon method.

While the radiocarbon determinations certainly do not prove the case, it is arguable on the basis of the assumptions made above that the deposits formed in Blocks 2, 3, 5, 7, 8, 6, 4 and 9 were formed while the wheelhouse of Block 23 and the associated structures of Blocks 24 and 25 were occupied and the deposits were formed, in part, of materials dumped from those sources.

18.14.5 Phase III

Blocks 15/18, 16, 17, 19, 21 and 22

The large wheelhouse of Block 15/18 (Figure 54) overlay and masked the masonry of Block 24. Its chronological position can only be inferred because of its distance from the recorded face and the major rubble dump which separated it therefrom. It is assumed here that the rubble infill between the wheelhouse and the recorded face is contemporaneous with the other major rubble and dump infills of Blocks 16, 17 and 19. The infill of boulders behind the Block 15/18 structure are integral to its stability and from this we deduce that this structure is contemporaneous with the infilling of the abandoned structures of Period 2. One of these infills, Block 16, subsumes part of Block 9, the uppermost of the first series of soil deposits on the south side of the site. In so far as this can be treated as a synchronic event, it implies that Structure 5 probably dates to the end of the first series of southern deposits.

There is an apparent hiatus of about 100 Rys between the first and second series of soil deposits on the south side of the site, between say 2327 (the mean of the first series) and 2220 ± 50 bp, the earliest of the dates from the second series. However, the mean of the two dates from the Block 19 infill is 2227 while that of the two dates from Structure 6, cut into Block 19 is also 2227. Clearly then, the sequence of events which comprised the infilling of the Period 2 structures and the erection of Structures 5 and 6 all occurred over a period of time too short to be resolved by the radiocarbon method. The stratigraphic and radiocarbon evidence then suggest that Structures 5 and 6 are roughly contemporaneous and that the materials recovered from the infill deposits came, at least in part from activities associated with the erection and subsequent occupation of these structures. Structure 6, Block 22 may have been associated with, or even the source of the undated dumped deposits of Block 21. At any rate these deposits are prehistoric in their associations and are not associated with the post-medieval blackhouse, Block 20 (Figures 56 & 57).

18.14.6 Phase IV

Blocks 10, 11, 12 and 13

The upper series of deposits on the south of the site comprise Blocks 10, 11, 12 and 13, and the stone wall of Block 14 which seems to have revetted the northern end of the Block 10 and lower Block 12 deposits. Two radiocarbon dates suggest that these deposits formed over a span of only 50 Rys, ie over a span to short to be resolved by the radiocarbon method. The date for these deposits are later, not significantly later than the dates from Structure 6 in Block 22 from which they may have derived, albeit that they are removed from it by the greater part of the length of the site. It is not improbable that they were formed in association with some further structure, possibly that whose presence can be deduced from the shallow depression in the current ground surface some short distance inland from the excavated area.

18.14.7 Summary of the prehistoric sequence at Hornish Point

The radiocarbon dates from Hornish Point form such a coherent sequence when considered simply as a numerical progression regardless of the events they represent, that their subdivision into Phases seems folly. However, the stratigraphic evidence, taken in conjunction with the dates, clearly indicates a sequence of main events, construction, abandonment, infilling and renewed construction of buildings and the successive deposition of associated soils. Even in the one structure of which sufficient remained to facilitate its analysis, Structure 5 (Blocks 15 and 18), it was clear that this incorporated elements of earlier structures and had itself been considerably modified during its use, albeit that the period of its use was quite short. Thus, we have stratigraphic and structural heterogeneity within a broadly homogeneous chronological framework. This suggests that settlement on this site may have been truly continuous.

In particular, the subdivision of the soils at the south end is relatively arbitrary. All were formed over a very short time and all comprised varying combinations of domestic refuse and windblown sand which were intermittently cultivated. This succession of surfaces would have been highly fertile because of their constant manuring with organic refuse. They could have supported cereal growing or may have been a kitchen garden plot supporting other vegetables.

At Hornish Point then, we appear to have had an early group of structures (Period I) which were unexplored, followed by a group of wheelhouse structures and associated dumped and cultivated deposits (Period II, Phase I), followed, in turn by a further group of wheelhouse structures and associated cultivation areas (Phase II), and a further set of cultivated deposits with which further but unobserved structures were probably associated (Phase III). Settlement on the site was probably continuous for a period of some 300 radiocarbon years.

18.14.8 The post-medieval blackhouse

Blocks 20 and 31

A blackhouse of characteristic Lewisian form had been cut into the settlement mound at its northern end (Figure 57). The interior did not contain any structural debris which suggests that its roof had been removed and any useful fixtures or fittings stripped out at the time of its abandonment. The primary butchering waste from a sheep was found among the infill deposits. This use of the sheltered space provided by an abandoned building for aesthetically unacceptable activities like butchery and waste disposal has many parallels among the contexts from both Hornish Point and Baleshare and, indeed, from prehistoric sites in general.

CHAPTER 18: INTERPRETATION AND DISCUSSION

PART 5: THE PHYSICAL ARCHAEOLOGY OF THE SITES

18.15 STRUCTURES

18.15.1 Prehistoric structures

Baleshare
The stone-built structures of Baleshare comprised:

i) Block 12; two revetment walls (Figure 27), dated to the period between 2260 ± 80 BP (GU–2555; an animal bone date from Block 2) and 2250 ± 50 BP (GU–2166; the shell date from Block 11).

ii) Block 8; subsequently, within the same interval, two walls of an entrance passage were inserted between these revetment walls (Figure 23).

iii) Block 11; finally, a house was dug into the deposits north of the northern revetment wall and partly overlying the latter (Figures 25 & 26). The abandonment of the house is not closely dated, but it underlies Block 6, dated to 2110 ± 80 BP (GU–1964).

Block 12: *the revetment walls;* It has been argued elsewhere that the revetment walls may have been a constructional device used in the building of the structure for which Block 8 provided an entrance.

Block 8: the entrance feature; This feature, it has been argued, is the entrance to a structure, possibly an aisled- or wheel-house. In the absence of further excavation little more can be said about it but the orthostats used to define the entrance terminals speak of some measure of architectural pretension.

Block 11: *the round house;* The only structure of which sufficient was exposed to characterise it, Block 11, seems to have been a simple round house, dug into pre-existing midden deposits. It did not contain any evidence for radial segmentation and is not in the wheelhouse tradition.

It contained a series of apparent floor levels in each of which pits had been dug. Carbonised peat formed a large component of the fills of these pits, especially of the pits of the first floor. The complete body of a neonatal lamb was buried in Pit [152], also in the first floor, together with part of a second neonatal lamb. This, together with the unusually high volumes of carbonised plant remains form the pits, and the absence of a hearth setting, suggests that this structure may have had a specialised function and was probably not a simple domestic structure.

If roofed, and no evidence for its roofing has been observed, it could have served as a smoke-house for smoking meat and fish. Open to the elements, it could have served as an animal pen, perhaps as a lambing stall. However, the clarity of the fragile layers of the floor levels militates against the latter suggestion because trample by animals would have greatly disturbed the sandy surfaces. Indeed, the clarity of their boundaries suggests that the layers may be dumped deposits with sand introduced either naturally or, more probably, to cover up stinking refuse.

Duration of use
Determining the duration of use of the structures is hampered by the anomalous shell date from the house floor of Block 11. If, instead, we take the animal bone date from this floor, 2260 ± 80 BP (GU–2555) and the date of 2240 ± 55 BP (GU–1960), from the midden-site deposits immediately underlying the revetment walls of Block 12, clearly the construction phase at Baleshare is of very short duration. These elements were built, used and abandoned in a period of time too short to be resolved by the radiocarbon method, even allowing for the fact that Block 11 was built after Block 12 had, itself, been abandoned.

Hornish Point
Structures 1, 2 and 3 (Blocks 23, 27 and 24 respectively) were the earliest structures revealed at Hornish Point, but they all overlay further structures and deposits.

Structure 1; Structure 1 (Figures 56 & 57) was erected after the deposits of Block 26 had begun to form, but before the dated context, [F339] had been laid down. This context was dated to 2370 ± 50 bp (GU–2027) and it provides a *terminus ante quem* for Structure 1. However, the structure cannot pre-date [339] by any significant interval given the rapid sedimentation of this site, and the coherence of Block 26. Thus Structure 1 can be said to date from roughly 2370 ± 50 BP (GU–2027).

Structure 1 is a radially segmented house, roughly half of which was uncovered. It contained four radial piers, three of them abutting the encircling wallface, the fourth standing free of it in its lower courses and keyed into it by a massive lintel about 1 m above the apparent floor level. The encircling wallface, which was one stone thick, was built from large slabs and was slightly corbelled, inwards. This corbelling was most probably employed for its resistance to the pressure of the surrounding deposits; the so-called 'horizontal arch' effect (Barber 1992). The internal diameter of the house, at floor level, was 7.5 m. This was a wheelhouse, one of whose piers has an aisle, separating it from the enclosing wall.

Structure 2; A drain running south-west from Structure 1 was incorporated into and blocked off by the wall of Structure 2. This implies that Structure 2 (Block 27) was built after Structure 1 had ceased to require a drain to assist its functioning. However, both structures could have overlapped in their use, or even been largely contemporaneous; Structure 1 functioning without its drain.

Only a fragment of Structure 2 survives, comprising an arc of walling, the circuit of which indicates a building roughly 8 m in diameter (Figure 66). It may have been part of a radially segmented structure but the evidence for its original form has been removed by coastal erosion. On balance, this was probably a wheelhouse also.

Structure 3; Structure 3 (Block 24) overlay Structure 2 and like the latter was fragmentary, indeed so ruinous is it that it is not possible to say whether it comprises parts of more than one building (Figure 62). Structure 3 is overlain by the structural debris of Block 16 and by the deposits of Block 4, the

Site/structure	Structure type	TAQ (BP)	TPQ (BP)	Probable	Calibrated dates 1-sigma	Calibrated dates 2-sigma	MRE-adjusted @ 2-sigma
Baleshare							
Structure 1	Revetment walls and ditched entrance (?)	2250 ± 55	2260 ± 50	2256 ± 37	393–214 BC	401–207 BC	AD 75–315
Structure 2	Entrance passage	2250 ± 55	2260 ± 50	2256 ± 37	393–214 BC	401–207 BC	AD 75–315
Structure 3	Circular structure	2110 ± 80		2110 ± 80	350–4 BC	390 BC–AD 54	AD 241–538
Hornish Point							
Structure 1	Wheelhouse	2370 ± 50		2370 ± 50	509–396 BC	758–384 BC	86 BC–AD 131
Structure 4				2350 ± 50	412–392 BC	753–264 BC	45 BC–AD 208
Structure 2				2350 ± 50	412–392 BC	753–264 BC	45 BC–AD 208
Structure 3	Wheelhouse?	2335 ± 50		2335 ± 50	409–389 BC	741–235 BC	41 BC–AD 220
Structure 5		2170 ± 50	2370 ± 50	2270 ± 35	395–235 BC	403–210 BC	AD 69–240
Structure 6	Circular structure	2270 ± 50	2370 ± 50	2320 ± 35	404–389 BC	411–264 BC	AD 5–210
Balelone							
Block 5	wall fragments		2330 ± 70	2330 ± 70	411–382 BC	757 -210 BC	86 BC–AD 242

Table 56. The absolute ages of the 'wheelhouse complex'

latter dating to 2335 ± 50 BP (GU–2017). The difference of 35 radiocarbon years between this and the derived date for Structure 1 implies that the first three structures were erected, used and abandoned within a time interval too short to be resolved by radiocarbon dating.

Structure 4; Structures 2 and 3 both underlay the small fragment of Structure 4 (Block 25) revealed at the foot of the excavated section (Figures 63 & 64). It is not impossible that its construction contributed to their destruction. Given the size of the exposure, it is not possible to indicate the nature or function of the structure of which it forms part but it is possible that this was rectilinear in plan.

Structure 5; Structure 5 comprises two Blocks, one of which, Block 18, lies seaward of the recorded section while Block 15, which makes up its southern end, is recorded in section. It was only in plan that it became clear that together these make up a single radially segmented structure (Figure 54). However, it was clear also that this structure was not of one build and that the 2 m high, corbelled vault of Block 15 had had a separate existence in a structure now lost either to the sea or to later clearance and rebuilding on the site.

Structure 5 overlies Structures 2, 3 and 4, whose destruction was a precondition of its erection. Its construction may have required little more that extending the pre-existing fragments of Block 15 and adding internal radial piers to a gap between other existing structures. Certainly, in plan and general appearance it has more than a little of the *ad hoc* about it.

While unequivocal evidence is wanting, it is possible that the rubble of Block 16 relates either to the new construction of Structure 5 or to the modification of the earlier elements that it subsumes.

The rubble and midden deposits of Block 17 overly Structure 5 and are, in turn overlain by Block 13, which has been radiocarbon dated to 2170 ± 50 bP (GU–2015). This provides a *terminus ante quem* for Structure 5, a *terminus post quem* for which is provided by the derived date for Structure 1, ie 2370 ± 50 BP (GU–2027).

Structure 6; Structure 6, (Block 22) comprises two sections of wall, interpreted as a circular structure, seen in section, and the deposits contained within it (Figure 59). The latter yielded dates of 2270 ± 50 BP (GU–2028) and 2185 ± 50 BP (GU–2026). It contained an apparent hearth and is interpreted as a simple domestic structure with post abandonment deposits. The dates provide a *terminus ante quem* and so Structure 6 predates the older of the two, ie it predates 2270 ± 50 BP. It post-dates the determination of 2370 ± 50 BP (GU–2027) from Block 26, which it overlies.

Other structural elements; Block 7 was identified as a revetment wall with associated deposits (Figure 45) from which a radiocarbon date of 2310 ± 50 BP (GU–2022) was returned. Block 14, identified as masonry could have been either a revetment wall or part of a structure (Figure 51). It lies between Blocks 9 (2345 ± 50 BP; GU–2019) and 10 (2220 ± 50; BP GU–2016). Both of these walls were constructed during the period within which the principal structures on the site were erected.

South Glendale

Pottery collected from this site in the past had included Beaker sherds (Shepherd & Maclean 1978) and although the bulk of the surviving midden proved to be medieval, this was underlain by deposits of prehistoric character. In these stake holes were noted which may have formed part of a tent, hut or shelter. However, ard marks and spade marks in the deposits suggest that more permanent structures may also have been used at this site, but are now lost to coastal erosion.

Balelone

The earliest structural remains at Balelone, in Block 5, are later than the radiocarbon dated deposits of Block 3, 2330 ± 70 BP (GU–1801), which they overlie. The remains consist of two un-interpretable pieces of masonry overlain by a thick curving wall fragment, the latter probably part of a round house, possibly of radially segmented type although no direct evidence for this was observed.

A group of postholes was noted in the base of Block 6, stratigraphically higher than Block 5, together with, but not demonstrably associated with a 1.1 m high drystone wall. The latter could have revetted the clear space within which the post-hole structure was erected. In any event, the stone structure of Block 5 seems to have been succeeded by the wooden structure of Block 6.

18.15.2 Medieval structures

South Glendale

A fragment of the corner of a rectangular structure was uncovered in Area 2, at South Glendale (Figure 70). Within the angle enclosed by its walls, an organic layer contained shells dated to 540 ± 50 BP (GU–2159), while a date of 550 ± 50 BP (GU–2160) was returned from material in the layer beneath this. These dates are indicative of use in the medieval period. Pottery from the deflation surface surrounding the site indicates use of the area in the medieval and post-medieval periods.

The walls, of which 2.3 m and 5 m lengths formed the surviving corner, were formed of inner and outer stone faces retaining a core of peat or peaty soil.

South Glendale's sheltered bay, within living memory, served as a ferry terminus for a service to the islands in the sound and to the small isles to the south. The structure may represent the home of a ferryman at an earlier date.

18.15.3 Post-medieval structures

Hornish Point

Block 20, at Hornish Point, consists of the greater part of a simple rectangular structure of 'blackhouse' type. It was internally divided by a row of low slabs set on edge and the southern part contained a central hearth defined by a circular setting of radially set, rounded pebbles (Figure 57). The structure consisted of an inner wallface, revetting the deposits into which the blackhouse had been dug. It is possible that the northern end was free standing. The structure was remarkable free of occupation debris and its attribution to the post-medieval period is based solely on its form.

Newtonferry

A right-angled setting of stone with two cetacean vertebrae was recorded west of the section line (Figure 72). This was interpreted, on the basis of its linearity as part of a medieval, or more probably post-medieval/pre-clearance house. A second such structure was noted in the isolated sand tallard (Figure 72). The midden deposits of Block 3 returned two radiocarbon dates roughly indicative of the medieval or early post-medieval period, *viz* 700 ± 50 BP (GU–2163) and 710 ± 50 BP (GU–2164) and it is not inconceivable that these structures are of this, or slightly more recent date.

18.15.4 Discussion

Bronze Age structures are rare in the Hebrides and none were observed in the excavated levels at Baleshare, albeit that the existence of stone structures was revealed by coring (see above). It could well be that Hebridean structures of this period were largely of wood or perhaps built of turves, as Crone has argued for the Neolithic structures at Carinish (Crone 1993), and so largely transparent to survey approaches. Structures of stone have been excavated at the Udal (Crawford nd) and at Killelan Farm, on Islay (Burgess 1976, 181) but these Early and Middle Bronze Age structures are curiously ephemeral and may represent no more than seasonal shelters. The later Bronze Age hut circle at Cul a Bhaile, on Jura (Stevenson 1984), like those at An Sithean, Islay (Barber & Brown 1984) and many more throughout the Inner Hebrides, represent more permanent settlement. The exposed and cored deposits of Bronze Age date at Baleshare represent extensive, manured, cultivated fields. It seems reasonable to anticipate that buildings found in association with them would also be of a permanent character, thus the field interpretation of the stone concentrations identified by coring as houses may well prove to have been correct. The examination of LBA settlements in the Islands should be a high priority for students of settlement in the Western Isles.

The Iron Age structures examined in these excavations are remarkable for their palimpsest nature and their very short chronologies. By their palimpsest nature is meant the extent to which subsequent buildings subsume elements of earlier structures, incorporating them intact or in greater or lesser degree of modification. Nowhere is this clearer than in the complex of structures at Hornish Point but even where the structures are less numerous, as at Baleshare, earlier buildings are founded upon or cut into by later buildings.

Within structures that are apparently single period or which functioned as single period occupations, there is much evidence of remodelling and rebuilding. This is clearest, perhaps, in the radial piers of the Hornish Point structures. Twentieth century expectations of the permanence of structures, lasting at least over periods of many decades and typically over several centuries, seem wholly inappropriate in the context of the Hebridean Iron Age. The Iron Age occupants seemed to have regarded their homes as dynamic envelopes rather than as lasting statements of some architectural ideal. For instance, House 401 at Cladh Hallan, South Uist was in use over a period of about half a millennium during which time it was rebuilt eight times (Parker-Pearson pers comm; Marshall *et al* 1998). Thus, the average duration of a structure on that site was about 55 years. Recent research suggests that this order of duration for a structure lies at the upper end of the range (Barber & Crone forthcoming). Dendrochronological analyses reveal durations as short as a single generation for individual prehistoric structures (ibid).

The rates of change in the dynamics of the architecture may have been heightened artificially by the accreting depositional environment in which these structures are set. Accumulating deposits around the buildings may have encouraged frequent modification for the simple reasons of ease of access or safety or the relative level of the water table. Whatever its genesis, the rapidity of construction, reconstruction and replacement have improved the resolution with which structures on these sites may be examined.

The chronology of their construction has proved somewhat surprising, at least to this writer, and before addressing the matter it may prove useful to offer a comment on the relevance and security of the dating samples. The matter of dating subsumes two topics; the duration and relative ages of the observed structures, on the one hand, and their absolute calendar age, on the other. The latter is considered later while their duration and relative ages are considered here. For the purposes of this discussion the raw radiocarbon determinations are cited throughout and all the dates are derived from seashell, unless otherwise stated.

The radiocarbon determinations have been shown to have a very high degree of internal consistency when judged against the stratigraphic record from the sites. This fact is interpreted as validation of the relative sequencing of the radiocarbon dates as well as supporting the taphonomic interpretation of the sites' formation processes. The taphonomy of the sediments has been rigorously addressed and the relationship between the samples and contexts, from which they are derived, is generally well understood.

The sequences of dates indicate astonishingly high sedimentation rates, particularly for the Iron Age sediments on the sites. Thus, even if there were some doubt about the relationship between an individual sample and its context, the high rates of sedimentation mean that the errors should be minimal, for all but conflation horizons. If, for example, a sample contained material from the overlying or underlying layers, the difference in date between contiguous layers is so small that the error thus introduced would be negligible. This is one of the benefits of dating the sedimentary sequence rather than seeking to date specific archaeological 'events'.

Table 56 sets out the dating evidence for the structures. Referring only to the mean dates of the determinations, all of the Iron Age structures from the three relevant sites were built, used and abandoned within a period of roughly 250 Rys and all three probably had structures in contemporaneous use over parts of this period.

In reality, the duration of settlement is probably significantly less than that indicated by the *termini* dates. Taking into account the sedimentation rates and the volumes of sediments separating the structures from the dated deposits, it seems likely that their chronology should be further compressed into the earlier part of the span. On balance, it is argued that the chronology of these Iron Age structures is compressed into one to one-and-a-half radiocarbon centuries following 2370 BP.

While the general applicability of this chronology to other comparable structures remains to be discovered, the fact that it applies to the three excavated sites with relevant deposits, at least raises this possibility and it is hoped that future work may help to elucidate this problem. The conventional chronology (Armit 1992, 127) envisages the construction of wheelhouses during the later centuries BC and into the first century AD, and seems to imply a duration of perhaps three to four calendar centuries, or more.

Very short chronologies are not a feature of machair settlements alone. A very short chronology has been proposed for the Early Historic crannog at Buiston, Ayrshire (Crone 2000). There, the chronology is securely founded on the dendrochronological analysis of many timbers from the houses and palisades of the site. Dr Crone has revealed a bewildering succession of building and re-building all taking place over a period of roughly 50 calendar years.

Barber & Crone (1993) have suggested that the site chronologies of crannogs may be fractal in their organisation, with multiple periodicity, on a macroscopic scale, being replicated by multiple rebuilding during each period of occupation and multiple replacement during the currency of single rebuilds. This theory seems equally applicable to the Iron Age farm mounds of the Hebrides and, in principle, may be a feature of all prehistoric settlement.

On crannogs, as on machair sites, preservation in rapidly forming deposits is a feature of site formation and the deep sediments provide sufficient resolution to reveal the structured chronology of the settlements. However, such sites are exceptional. Almost all other sites survive only as truncated and conflated assemblages of relict features, deposits and artefacts. In the absence of sequences of diagnostic artefacts, a regrettable feature of the earlier Iron Age periods, the sites can be misunderstood as single period sites, or where a single exotic occurs, the entire site can be dated to the currency of that artefact (Clarke 1971).

Poor chronological resolution, small numbers of radiocarbon dates and over-reliance on single, or small numbers of, diagnostic ('exotic') artefacts have bedevilled the study of the sites of the 'Castle Complex'. This matter is considered further below.

Given the brief phases of occupation implied by the short chronology, does the absence of settlements immediately before or after imply that the population left the islands? The coring evidence has shown that other settlement nuclei may exist in the preserved hinterlands of the sites. Furthermore, the presence of earlier and later sediments indicate use of the sites, even if settlements for these periods were not found. However, the chronology for Baleshare does display significant lacunae between the main periods, indicative of abandonment, and the possibility that the sites were abandoned between successive phases must also be considered. Given the fragility of settlement in the islands the possibility of occasional abandonment cannot be discounted.

The relative abundance of the bones of young sheep and cattle at Baleshare and Hornish Point indicates that the sites were occupied during the spring and early summer, and during the autumn and winter (Halstead *infra*). The real abundance of microscopic marine mollusca, introduced to the site on seaweed, suggests that the sites were occupied during the summer, when such mollusca are abundant. It further implies occupation during the winter, because seaweed gathered for fodder would be used during that season. The bird species represented on the site indicate collection, and probably consumption during the late spring and early summer (Serjeantson *infra*). Intensively commensal pig rearing implies continuous occupation of the sites throughout the year. In all then, these sites were permanent settlements occupied all year long or, at least there is no clear evidence to indicate seasonal use.

The structures of the wheelhouse complex at Hornish Point were all built, used and abandoned in a very short period of time: in raw radiocarbon determinations, between 2270 ± 35 BP and 2370 ± 50 BP. Dr Scott's report (Section 18.12.1) makes clear that the differences between matched pairs of samples from terrestrial and marine environments are not significantly different from zero. The number of matched pairs is small but even so, the results of her analysis counsels' caution in the use of the correction for MRE developed by Dr Harkness. This writer and others are currently researching this problem by dating a much larger sample of matched pairs of dates and we may be able to clarify this position in the next three to five years. Until then, the Scottish verdict of 'not proven'

Type of deposit	Hornish Pt	Baleshare	Total
Midden site	6	14	20
Dumped	9	2	11
Dumped and midden	0	1	1
Cultivated and midden	4	0	4
Cultivated	2	3	5
Structural	1	1	2
Totals	*22*	*21*	*43*

Table 57. Block types from which worked bone and antler have been recovered

should apply to the MRE correction factor of 405 years or thereto.

Clearly, this creates something of a problem for the absolute dating of the sites. Table 56 sets out the radiocarbon determinations and their calibrated ranges, for the structures at Baleshare, Hornish Point and Balelone. At the three-sigma level, these imply construction at Baleshare between 401 BC and AD 54; at Hornish Point between 750 BC and 264 BC and at Balelone between 757 BC and 210 BC (all in calendar years). It is vital to note that the excavated evidence and the primary analysis of the radiocarbon deteminations imply strongly that the construction on each site took place over a very short period within these ranges.

If we apply the 405-year MRE correction and recalibrate the determinations, at 2 sigma, we arrive at the ranges set out in the righthand column in Table 56. The dated structures lie apparently in the span 86 BC to 538 AD but mainly in the span 85 BC to AD 240. Unfortunately, the effect of calibration at the sorts of ages we are here considering is amplified by the topography of the calibration curve. Slightly earlier radiocarbon determinations calibrate early and are spread over 500 calibrated years. Conversely, if the determinations are slightly later, they calibrate late and the ranges within which they occur are spread over only two centuries.

The other major problem for the absolute dating of the sites arises from the fact that the calibrated date ranges, without adjustment for MRE, lie at the younger end of what Baillie & Pilcher (1983) have called the 'first millennium BC radiocarbon disaster'. Flattening of the calibration curve in the range roughly 200 to 800 BC (calendar years) spreads the radiocarbon determinations across the whole of the range. For example, four of the Hornish Point calibrated ranges and one of those from Balelone (Table 56) span roughly 750 to 200 cal BC. Correspondingly, the calibration ranges for dates at or just below the younger end of this range are 'compressed' into the interval 400 to 250 cal BC. Thus it is possible that all of the construction phases are roughly contemporary (other than as evidenced by stratigraphy) and date to a short period at or just before about 200 AD (calendar years).

In South Uist the emerging ceramic sequence sees coarse plain wares earlier than 400 BC with finger impressed decoration later and then cordon and incised decoration from the second century at the latest (M Parker-Pearson pers comm). On this basis, it is unlikely that the structures at Hornish Point are earlier than the second century cal BC. However, it is salutary to reflect that the pottery sequences for the Hebridean Iron Age are re-written on a site-by-site basis. There is at present nothing even approaching a consensus position. Our own attempts to test the rigor of taxonomies founded on attribute analysis and on traditional typological seriation indicate that neither approach generated classifications that were stratigraphically coherent (see 18.16.1 below).

Several writers have identified a date of approximately 200 cal BC as a key date for the architecture and pottery of the Hebrides. Armit, by and large would prefer to see the wheelhouses as earlier than this date while Parker Pearson (pers comm) thinks it unlikely that pottery from Baleshare, and by inference Hornish Point are earlier than 200 cal BC. We have at present no basis for selecting between these options. In reality, the significance of the 200 cal BC date may simply be that it is a toggle point that spits out dates either to the earlier period (750–250 or 400–250 all cal BC) or the later period (100 cal BC to AD 250). Thus, the dichotomy may prove an artefact of the calibration curve with little or no real world significance.

18.16 ARTEFACTS

18.16.1 Pottery

Dr Ann MacSween has reported above on the pottery assemblages from the sites examined in this project. Her work is in part a summary of the reports prepared earlier by the named contributors to her own report. The history of these studies is not without interest. When these excavations were undertaken and before the formal analysis of the pottery assemblages we provided Dr Peter Topping with some sherds from Balelone for elemental analysis of their clays. Topping's study (1987) included ceramic material from a wide range of sites in the Outer Hebrides and concluded in effect that all the pottery was produced locally. His results did not support any suggestion of local, regional or wide scale trade. A subsequent analysis of the larger mineral inclusions in the sherds

	Hornish Point		Baleshare	
Artefact type	**Sample No**	**No**	**Sample No**	**No**
Complete artefacts	H7, H12, H23	2	B14, B17, B18	3
Broken artefacts	H10, H11, H13, H14, H15	5	B1, B4, B5, B6	4
Broken points and awls	H1, H2, H3, H4, H6, H8	6	B3, B12	2
Offcuts and roughouts	H9, H19, H22	3	B7, B8, B9, B10, B13, B19	6
Fragments	H16, H17, H18, H20	4	B11, B15, B16, B20, B21	9
Utilised fragments	H5, H21	2	B2	1
Totals		*23*		*21*

Table 58. Baleshare & Hornish Point. Categories of worked bone and antler

Deposit type	Mean score
Structure	146.34
Ditch fill	500
Backfill	833.33
Cultivated windblown sand	1053.57
Dumped	1308.77
Midden site	1340.77
Cultivated midden/dump	2300
Conflation	2500

Table 59. Baleshare. Types of deposits with burnt stone

from all sites was undertaken by the late Geoff Collins, then of the BGS. This simply reaffirmed Dr Topping's conclusion that all sherds were locally produced.

The first analysis of the pottery assemblages, an attribute analysis, is detailed above (Chapter 9). We had agreed in advance of this analysis that its success would be measured by its goodness of fit with the stratigraphic details. Therefore, the taxonomies based on measured attributes were developed in ignorance of the chronological details of site phasing and radiocarbon dates. In all cases, regardless of the attributes selected and the weightings applied to them, the resultant taxonomies failed this test. Sherds of many classes commonly occurred in single contexts and sherds from individual classes were distributed almost randomly throught the stratified contexts. In almost all cases also, the resultant classifications were too fine grained and contained large numbers of groups and sub-groups.

The rim sherds and decorated sherds were then analysed by Drs Alan Lane and Ewan Campbell, also without access to details of site phasing and chronologies. This produced a taxonomy that was more manageable and more recognisably 'archaeological' in character. However, this also was remarkably unsympathetic to the site chronologies and failed the test of chronological coherence almost as convincingly as had the taxonomies resulting from attribute analysis.

Finally, Dr Ann MacSween, with access to the earlier reports and to the stratigraphic details and radiocarbon results, prepared the report presented above. It must be noted that where this report refers to Bronze Age or Iron Age pottery it does so by virtue of access to independent chronological information, not by virtue of information inherent to the potsherds themselves. While it is clear that there are many potsherds that can be identified unambiguously to say the Iron Age or Beaker sherds that are clearly Early Bronze Age in date, there is a great deal of pottery in these assemblages that cannot be attributed to any period with confidence. This conclusion is not without its significance.

The 'Laura Ashley school of archaeology'

A goodly proportion of processual archaeology is founded on the identification of patterns in the past (see the works of Binford for examples). However, the inherent weakness in developing a disciplined body of information from pattern identification is that the mere existence of a pattern does not establish its significance, much less test the truth of the causality it is usually said to imply. In the case of the Hebridean pottery, it is possible that pattern can only be detected by ignoring a very large component of 'noise' in the data set. That noise may have resulted from scale effects in the heterogeneity/homogeneity of the assemblages. This is a characteristic of the midden sites themselves. On a large enough scale, the site deposits and their contents can appear remarkably homogenous while viewed on smaller scales there is considerable heterogeneity in evidence. The writer has taken this to indicate, in the case of the sediments, that their formation is either largely random or, if originally deliberate, has been rendered random by re-working.

In the case of the pottery, we may wonder whether a large proportion of the sherds represent 'traditional' forms and fabrics with only a small part of the assemblage, perhaps the decorated vessels, used to express cultural value. MacSween has noted that the use of rows of impressed decoration, at Baleshare, is a continuation from later Early Iron Age ceramic ornamentation. Her conclusion is that the sequence for the area for the first millennium BC and into the first part of the first millennium AD is created by '…the addition of new decorative elements rather than the discontinuation of earlier styles as new ones developed.' This implies the formation of assemblages that may not be responsive to unilinear taxonomic analysis. Rather, they may prove more appropriately analysed by techniques based on the use of fuzzy mathematics.

18.16.2 Metalwork

No metal objects were recovered from these excavations and their absence would clearly be a significant factor both in determining the date of the onset of the local Iron Age and in gauging the status of the sites. However, the absence of evidence in this instance is certainly not evidence of absence. The worked bone and antler provide evidence for an extensive metal tool kit. This had contained awls, punches, coarse and fine saws, knives, hand-drills and bow-drills and cleavers or possibly axes, ie heavy, chopping tools. Similarly, the butchery marks on animal, bird and fish bone confirm the use of metal knives and choppers. One piece of antler had served as a handle or haft for the tang of an iron implement, probably a knife. Two potsherds bear the impressions of projected ring-headed pins (Plate 33). Thus, in the assemblages of the site there is abundant evidence for the use of metal tools.

In pursuit of the missing metal and assuming that in the later periods at least, this would be iron, the standard bulk samples were tested for the presence of iron hammer scale and other by-products of iron working. In all of the samples from Iron Age deposits that were examined, hammer scale was recovered while none was recovered from Bronze Age deposits and small pieces of ferrous slag were recovered from deposits of both periods. This was an unstructured test, not least because the samples had already been worked on for other purposes and the possibility of some cross contamination could not be ruled out. However, the results were sufficiently encouraging to suggest that samples should be collected specifically to test for the first presence of iron hammer scale on site. A suitable programme of sampling should give a close approximation to the on-site availability of iron and, spread over several sites might indicate the local initiation of the Iron Age.

Slag has also been recovered, from eleven of the twenty-eight Blocks at Baleshare and five of the sixteen Blocks at Hornish Point (Blocks 1–12 being treated as one

Block). The combined weight of slag from both sites is somewhat less than 1 kg (334.9 g from Baleshare, 566 g from Hornish Point). The slag from Baleshare comes from three Blocks which are essentially Bronze Age in date, Blocks 22, 23 and 17 and from eight Blocks which lie in the date range 2390 ± 55 BP to 2057 ± 50 BP, Blocks 2, 3, 5, 9, 15, 16, 19 and 24. It is assumed that the slag from the three earlier Blocks represents bronze working. Blocks 1–13, 19 and 22 at Hornish Point also produced slag and this lies in the date range 2500 ± 50 BP to 2170 ± 50 BP.

Bronze working is indicated by small amounts of slag from the earlier deposits at Baleshare. In the absence of ores of copper or tin in the islands it must be assumed that the bronze was introduced to the islands in metallic form and that the slag results from subsequent working or re-working and repair of existing artefacts.

Technology

The small amounts of slag from a small number of contexts in the Iron Age deposits, taken together with the rather more widespread distribution of hammer scale suggests that iron working was undertaken at these sites. There is no unequivocal evidence for the smelting of iron. Indeed the evidence for iron working on these sites is so similar to that from the Bronze Age deposits that it invites the conclusion that iron was imported to the sites in its metallic form and was subsequently re-worked or repaired on site. Thus, iron working on these sites was at the level of local blacksmithing. The absence of any finished objects of iron suggests that the metal was scarce enough to warrant heirloom status and it was not lightly discarded or lost.

18.16.3 Bone and antler

In contrast, objects of bone and antler were relatively frequently discarded or lost. A total of forty-three pieces of worked bone and antler has been recovered from Baleshare and Hornish Point. At the former, all but two of the twenty-one pieces were recovered from Phase III Blocks and these are broadly contemporaneous with the twenty-two pieces from Hornish Point. The concentration of these artefacts in the later phases again emphasises the differences between the earlier and later phases at Baleshare.

The nature of the contexts from which these artefacts have been recovered is of some interest (Table 57). Twenty pieces, just under half of the total, were recovered from midden-site deposits where they may have been discarded or lost. Twelve more come from dumped or dumped and midden-site deposits, where they were probably discarded deliberately. Cultivated midden-site deposits account for another four while five more were found in cultivated deposits to which they were probably introduced by manuring. Only two came from within structures. In general, and again allowing for a small measure of circularity in the logic, this distribution tends to confirm the definition of the Block types. It also makes the point that the resources, ie bone and antler, were sufficiently freely available not to have acquired heirloom status but to remain subject to casual loss and discard. Nonetheless, two pieces of antler (H9 and B10) were fashioned from older artefacts and may indicate that antler, at least, was somewhat harder to come by and so was somewhat more intensively used.

The bone and antler objects are principally pins, awls, points and spatulas (Table 58) and the majority are polished, some highly polished, from use. It is probable that they were used in leather working. The perforated antler plate from Hornish Point (H12; Figure 77c) could have functioned as a tensioning device for ropes on boats or tents.

Bone and antler artefacts were clearly fashioned on site, as the presence of the offcuts and rough-outs and fragmentary debris suggests. Their emergence after 2300 BP and their apparent association with skin working may be seen to support the tentative suggestion discussed above, that the emphasis in this period was on animal husbandry, at the expense of tillage. Certainly their proliferation after that time is indicative of some significant change in the agricultural economy of the site.

18.16.4 Lithics

If the bone and antler artefacts had their floruit in the later deposits on these sites, the use of chipped stone shows the reverse trend. Only the Early Bronze Age deposits at South Glendale produced a relatively large non-quartz assemblage consisting of eighteen pieces of flint and one piece of chert, while a further six pieces of flint were recovered from the deflation surface surrounding the site. The lithic assemblages from the other sites are small and the material is undiagnostic. Some sixteen pieces of flint and fourteen pieces of quartz were recovered from Baleshare of which only four come from the later, essentially Iron Age deposits. Only five pieces were found at Hornish Point and these are essentially uncontexted.

There is no known source of flint in the isles and the identification of a fossil belemnite suggests that it may have been imported together with flint, from Skye, the nearest source of both belemnites and flint. Presumably the availability of iron in the later periods obviated the need for knapped stone implements and killed off this trade.

18.16.5 Pumice

Some sixteen pieces of unmodified pumice have been recovered from the Phase I and II deposits at Baleshare while twenty-four pieces have come from the Phase III, Iron Age, levels of that site. Analysis suggests that all of the pumice is derived from a single volcanic system, albeit that it need not all be of the same date. Its concentration on these sites suggests that it may have been deliberately mined from beach or raised beach deposits. It was clearly identified, and exploited, as a resource, especially at Baleshare.

Fashioned objects are rare and only the perforated piece from Baleshare can be ascribed a function, that of net- or line-float. The other two modified pieces simply display worn surfaces and facetting from use as abrasives. The use of pumice as an abrasive in the preparation of skins might account for the relative abundance of this material in the later levels at Baleshare, at a time when animal husbandry may have become the predominant agricultural pursuit.

18.16.6 Burnt stone; burnt mound material

Writing in 1990 about burnt mound material from settlement sites in Scotland, this writer (Barber 1990, 92–6) noted its ubiquity on settlement sites of the Iron Age. However, deposits of burnt stones are but rarely mentioned in the literature and the accounts of its occurrence are under-represented in the Scottish literature. Owen & Lowe (1990, 84–6) have noted burnt mound material on the site of Kebister, Shetland while Lowe (1998, 77–8) has also noted burnt stones in Block 228 at St Boniface on Papa Westray, Orkney, also dating to the Iron Age. Hedges noted burnt material at Bu (1987, 18) while this writer made the same observation at East Shore broch, Shetland (albeit that this observation is not repeated in the published account of that site: see Carter *et al* 1995). Its absence, confirmed by the excavators from Neolithic midden sites like Links of Noltland, Skara Brae and Knap of Howar (see Barber 1990, 94) suggest that burnt mound material is an introduction of Bronze Age or later date. Radiocarbon dating of roughly seventy sites in Ireland and Scotland suggests that burnt mounds, *per se*, were introduced in the Early Bronze Age while accumulating evidence suggests that the appearance of deposits of fire shattered stones, or 'pot boilers' on settlement sites is principally an Iron Age phenomenon.

Analysis of the burnt stone component from Baleshare (*ibid,* 94–6) revealed that it occurred in 62% of the depositional blocks. An index was calculated, based on the product of the percentage of contexts in the block containing burnt stone and the average percentage of burnt stone in the context. These were averaged over block type and the results are presented in Table 59.

It seems reasonable to conclude from this and from field observation that the small amounts of burnt stone contained in structures, ditch fills and backfills of other features represent residual material. Conversely, the high proportions in midden and dump deposits have been concentrated by the dilution of other, mainly organic inclusions and the destruction of more fragile remains like pottery and macro-plant remains. The cultivated, dumped and midden site deposits were truly rich in burnt stone and this implies a reliance on the production of hot water by the immersion of roasted stones. The hot water was probably used for a range of functions including cooking, bathing and saunas or steam bathing and medicinal uses.

CHAPTER 18: INTERPRETATION AND DISCUSSION

PART 6: CULTURAL ARCHAEOLOGY; SOME INDICATIONS

18.17 SITE ECONOMY

18.17.1 Agricultural economy

These excavations have produced evidence for the agricultural economy indicative of the exploitation of three resource bases; arable agriculture, animal husbandry and hunting and gathering. The evidence for arable agriculture comes principally from the direct observation of cultivation marks in the soils and indirectly from the carbonised plant remains recovered from sieving and floatation.

At the site of Baleshare, some eleven of the twenty eight recorded Blocks from here have been interpreted as cultivated deposits or as deposits of some other character that had been, secondarily, cultivated. Of these, four (Blocks 1, 18, 20 and 22) contained ard marks with one (Block 20) also containing spade marks. Three (Blocks 25, 26 and 28) were interpreted as cultivated soils on the basis of some combination of soil colour, texture, extent, homogeneity, and inclusions (including the pot sherd size distribution). One, Block 23, was interpreted in the field as wind-blown sand deposits but the snail evidence suggests that this was also cultivated. Block 16 displayed the wavy lower boundary typical of obliquely cut ard marking while Block 24, principally a set of dumped and midden site deposits, and Block 27, principally wind blown sand, both also contained ard marks.

Block 22, in Phase I at Baleshare consists solely of a deepened plough soil in which successive levels of ard marking can be seen. Some seven of the eight Blocks in Phase II display some evidence of cultivation while only three of the nineteen Blocks in Phase III contain evidence of cultivation and two of these three simply present evidence for episodes of cultivation of dumped and midden site deposits. Thus, only one set of deposits (Block 1) can be said to be principally cultivated deposits.

It must be accepted that the ratio of 3:19 cultivated to non-cultivated deposits is misleading, because five of the remaining Blocks are structural and could not have been cultivated. Nonetheless, the sampled sediments indicate heavy reliance on cultivation of the site's deposits in the earlier phases of settlement, from say 3300 to 2300 BP. This was followed by a considerable reduction in the importance of cultivation in the later phase, say from 2300 to 2100 BP (in radiocarbon years).

At Hornish Point, only eight of the twenty seven interpretable Blocks have produced evidence for cultivation, all but one of them in the sedimentary sequence of Blocks 1 to 13 at the south end of the site. These dumped and midden site deposits were cultivated intermittently over the period 2500 bp to 2170 BP. The remaining Block (Block 26) dates to 2370 BP and evidence for its cultivation exists in the soil characteristics listed above; there were few if any convincing ard marks.

While the emphasis on cultivation reduced in the later phase at Baleshare, the southern part of Hornish Point seems to have continued in cultivation, intermittently, during the same period. Unlike Baleshare also, the area to be cultivated seems to have had a 'formal' existence in that it was restricted to the southern part of the site and demarcated by walls from time to time.

The sites at Baleshare and Hornish Point are truncated by the sea and we know that substantial parts of them have been lost to erosion. Thus, the validity of the pattern we observe at Baleshare may be questioned on the basis that deposits in some other part of the site may have formed part of the 'formal' fields of that site.

Plaggen soils

The later Bronze Age soils at Baleshare and those of the succeeding phase (Phase II) are plaggen, or man-made soils. They consist essentially of wind blown shell sand to which humus has been added to create a fertile, cultivable soil. The humus appears to have been manure, included in which are large volumes of domestic refuse and peat, many small nodules of which were visible in the exposed profiles and recovered in sieving and floatation. Adding humus to the sands is clearly the reverse of the current practice of adding sand to the peat to create the famous contemporary plaggen soil known as Lewisian black earths (Whittow 1977, 282–6). The cultivated areas at Hornish Point may have served only secondarily as areas of cultivation, their primary function being that of dumps or midden site deposits. Nonetheless they did function as cultivated areas and the soils that comprise them are plaggen soils.

In Britain, plaggen soils are well known from sub-Roman (MacPhail 1981), Dark Age (Barber 1981; Davidson & Simpson 1994, 68–71) and medieval (Romans in Barber 1981, 359) contexts and many examples of these dates are also known from European sites (Groenman-van Waateringe & Robinson 1988). However, instances of prehistoric plaggen soils have been noted. Davidson and Simpson (1994, 71–73) describe manuring systems giving rise to plaggen soils at Tofts Ness, Sanday, Orkney, as early as the Late Neolithic/Early Bronze Age period. By the later Bronze Age and the Early Iron Age periods, wind-blown calcareous sands had covered the area and these sands were stabilised and cultivated by the addition of ash and manures with 'enhanced' faecal matter (ibid). In one area of Tofts Ness turves and organic material had been imported onto the sands to facilitate cultivation (ibid). Dockrill reports plaggen soils of Bronze Age date from Scatness in Shetland (BA 1997, 5).

Groenman-van Waateringe (1988) has argued that the pollen assemblage from the soils of Elp (1300 – 800 bc, radiocarbon years) and similar sites in eastern Netherlands show evidence of plaggen soil formations. Sites in west Friesland occupied between 1200 and 700 bc) are said by Ijzereef (1981) to display signs of deliberate plaggen soil formation. Byre floor material was mixed with mineral sands from large pits, some of them 8 m and more in diameter, to be spread on the surrounding land. The presence of small, comminuted potsherds in the ard marks of those fields is at least indicative of manuring and multiple cultivation episodes (Barker 1985, 181–3). By 500 bc, the 'Celtic fields' at Vlassen were being fertilised by the deliberate addition of organic matter providing the first irrefutable evidence for plaggen soil formation (*ibid,* 186–7). By the end of the first millennium bc plaggen soils were being worked in northern Germany, at Flogeln (Zimmerman 1978, 149) and on Sylt, an island west of Jutland (Kroll 1975) and, no doubt elsewhere in northern Europe where pressure on land was forcing the intake of relatively infertile mineral sands.

Coined to describe the Netherlands medieval practice of mixing byre floor material and soil for spreading on fields, plaggen is not a precise term. Heavily manured soils, for example, seem to be those now argued for as the earliest European plaggen soils but these are qualitatively different from the *made* soils which occur in the later periods. In the former, land fertility is merely improved by the addition of missing nutrients but plaggen soils are wholly artificial and their fertility is an artefact whose very existence is conditional on human intervention. In this sense, the extensive, deepened and heavily manured top-soils of the earlier phase at Baleshare are probably not plaggen soils, *sensu stricto*, while the artificial Iron Age soils of the later phase clearly are.

Cultivation strategies

Prior to these excavations the writer was struck by the fact that the machair sites were formed in large part by humic material or humus-enriched sands. This seemed strange because the local hoarding of humic matter deprived the surrounding machair of the specific nutrient in which it is virtually totally deficient, *viz* humus. If the settlements were dependent on arable agriculture for their subsistence, this waste of humic matter seemed inexplicable.

Excavation of the later Bronze Age levels at Baleshare revealed what might be described as the anticipated situation. There, relatively large areas, at least 3 ha in extent were under continuous cultivation and their fertility was maintained by consistent manuring with midden material and peat.

Subsequently, at Baleshare and at Hornish Point, very much smaller areas were cultivated. Their linear exposures can be measured in tens of metres and their maximum area coverage amounts to only fractions of a hectare, based on the coring evidence. However, their humic content is much higher than that of the Bronze Age soils and in many instances cultivation was carried out directly on dumped deposits of byre floor material and domestic refuse. What this cultivation may have lacked in area it may have compensated for in intensity. Long term experiments at Rothamstead and Woburn have shown that the continuing use of manure can sustain fertility, even on sandy soils. Yields in the region of 1.5 to 2.5 tonnes per hectare have been sustained over a century (Catt 1994). In the terminal Bronze Age/earliest Iron Age deposits on the machair sites examined in this project, intensive cultivation, probably largely or exclusively of barley, was carried out in market garden sized plots whose fertility was maintained by constant manuring on a scale sufficient to produce true plaggen soils.

Later still, there is a marked reduction in the amount of cultivation revealed in the sediments at Baleshare. Acceleration in deposition rates may, by dilution of the evidence, have contributed to this apparent decline. However, these sedimentation rates are exceeded at Hornish Point without loss of the evidence for cultivation, albeit intermittent, in the contemporary deposits. Furthermore, at Baleshare some five of the later Blocks are characterised as midden-site deposits or dumped deposits. These deposits were a wasted resource because, cultivated *in situ* or spread on the machair sands, their humus could have produced useful crops. Their relative abundance seems to confirm the notion that the absence of cultivated areas in the later sediments represents a real change in agricultural economy after, say, 2300 BP, in shell-derived radiocarbon years.

Crops

Throughout the whole of the period from the later Bronze Age to the abandonment of these sites in prehistory, barley was the principal crop consumed, from which we conclude that it was the main cultivar. As Jones (*infra*) has shown, this was hulled barley of the six-row variety. A very little emmer wheat seems to have been grown, possibly as a contaminant of the barley crop. Because we cannot distinguish between the carbonised remains of wild seeds and fruits brought onto the site in or with fuel (peat), it was not possible to identify unambiguously, the weeds of cultivation or, indeed, other cultivars.

The distribution of carbonised macroplant remains throughout the excavated profiles shows that barley continued in consumption during the later, Iron Age phases at Baleshare and the coeval phases at Hornish Point. However, the distribution is so strongly correlated with deposit type that it cannot be usefully employed to explore the perceived change in agricultural economy in these later deposits. At both Baleshare and Hornish Point, carbonised seeds were recovered in large numbers from midden-site deposits and in relatively small numbers from windblown sand and from 'features', like structures, pits, etc. The main difference between the sites lies in the small totals from cultivated soils at Baleshare and the very large totals from the cultivated deposits at Hornish Point; 308 barley fragments against 3559, respectively. This difference is almost certainly caused by taphonomic differences. At Baleshare, the cultivated soils are mainly windblown sands to which midden material has been added, while at Hornish Point, it is mainly dumped and midden-site deposits that have been subsequently cultivated *in situ*. Thus, the richness of the midden-site deposits is reflected in the high totals from these cultivated levels. Furthermore, given the high sedimentation rates at Hornish Point, the episodes of cultivation become spatially separated as the body of deposits rapidly deepens. Thus, the individual deposits were not disturbed by the plough so frequently as were those at Baleshare. In consequence, the relatively fragile carbonised remains were also better preserved at Hornish Point.

Jones has shown that the carbonised plant remains discriminate powerfully between the deposit types, at the Block level. There is, of course, some small measure of circularity in this because, where plant remains were visible in the field, the fact of their existence contributed to the classification of the Blocks in which they occurred. However, they were, in this writer's experience, only rarely visible in the field and certainly their relative incidence remained unknown until after the floatation, sieving and sorting were completed. Thus, it is argued, they provide independent confirmation of the Block designations.

Yield

Mercer (1981, 232–3) argues that the unmanured fields at Butzer produce an average of 1.85 tonnes per hectare of emmer and argues that manuring might well double this yield. In fact, the Butzer soils are re-fertilised by the nutrient rich parent material brought into the plough soil at every ploughing and so the fields are not really unmanured (Romans pers comm). Nonetheless some improvement in yield would probably result from manuring, perhaps something of the order of a 50% increase is indicated by the Rothamsted experimental plots (Catt 1994, fig 10.1, 121) and something in the region of 2.5 tonnes per hectare of barley might not be wildly optimistic.

The three hectare extent of the later Bronze Age settlement at Baleshare might thus have provided say 7.5 tonnes per annum of which, allowing for wastage and retention of seed grain, might provide about 5 tonnes per annum, for consumption. Application of the Roman Army allowance of one third of a tonne per man per annum (Mercer 1981) indicates a population of fifteen persons. This is probably more indicative of twenty, or so, allowing for females, the very old and babies and small children whose requirements are somewhat less than those of a soldier on active service. While the reader will appreciate that these calculations are fraught with massive uncertainty, they still provide an indication of the scale of settlement likely to have been supported, accepting that errors of up to 50% may be involved. The use of other food resources and the land lost to the sea, both conspire to increase the estimate of the settlement's population and these factors will be discussed later.

The same rough calculations for the Iron Age deposits, allowing for more intensive cultivation, could be argued to indicate a population that was one third to half that indicated for the Bronze Age, perhaps six to ten persons. Clearly the same grave uncertainties apply to this estimate, albeit that at all periods the populations are likely to have been higher, not lower than the estimated figures.

18.17.2 Animal husbandry

Moderate numbers of animal bones have been recovered from these excavations. It is clear from these remains that cattle and sheep were the main domesticates, with sheep accounting for almost 60% of the identifiable anatomical units at Baleshare and Hornish Point and cattle representing 34% and 28%, pigs accounted for 6% and 12% respectively.

Halstead suggests that the severe cull of calves, evidenced on both sites, is a clear indication of a specialised dairy economy. The age-at-death pattern for sheep, on the other hand, reveals that they were principally kept for their meat and most killed off towards the end of their first year. The predominance of females among the adult sheep supports this view and suggests further that wool production was not the primary interest in sheep herding at this time.

The relatively high proportion of pig remains is somewhat surprising. In Early Christian Ireland, for example, the pig was as important or more important, in the diet of the population but there, at least, pig husbandry was closely related to the availability of mast, a relationship whose survival elsewhere into the medieval period is evidenced in the laws of pannage (Rackham 1980, 155). That the relationship was overtly known to the Early Christians is evidenced in the many annalistic references to good, or exceptional mast crops. Thirteen such references are to be found between AD 576 and AD 1310, in the *Annals of Inisfallen*, for example (MacAirt 1977). Pig husbandry, therefore in Ireland, and lowland Britain, was largely dependent on the availability of oak woodlands with their seasonal acorn 'crops'.

McCormick (pers comm) has suggested that pig husbandry in the Isles would have been limited by the absence of mast from the Hebrides and the damage their foraging would cause on the machair. While there is some doubt as to the status of Hebridean woodlands in the Bronze and Iron Ages (see Chapter 3.2.2) few would argue that oak woodlands existed in the islands during these periods. Pig husbandry must therefore have assumed something like the fully commensal role with which we are familiar from the more recent past, in post-medieval and early modern urban situations. If they did not actually keep their pigs in their parlours at least they kept them firmly penned or carefully herded. Foraging on the margins of machair-lochs, or in machair outfield, together with food supplement from domestic wastes, may have formed the husbandry strategy.

However, with one in eight anatomical units from Hornish Point identified as pig, there can be no doubt that pig husbandry was practised on a significant scale. Frequent farrowing, large brood size and highly efficient food-to-meat conversion make pigs an ideal 'emergency ration' and one that may have been needed in the marginal conditions of machair settlements. This alone may have encouraged the settlers to evolve appropriate husbandry practices. Parker Pearson *et al* (1996, 65) argue that the high percentages of pig present in 'midden' deposits at the broch site of Dun Vulan (first to third centuries AD) indicate the selection of joints of meat for the inhabitants and are proxy-indicators of high status (see, however, Gilmour & Cook 1998 for refutation).

The major constraint on the husbandry of sheep, cattle and pigs was, and remains, the problem of providing winter fodder. Here, uniquely, the climate of the machair was a positive help because frost is rare and snow even rarer. Thus there is some, limited, growth of grass all year round and animals can be left outdoors for the greater part of the winter. The evidence from the abundant byre floor material from these sites is that some beasts, possibly gravid animals or those still in milk,– were overwintered either indoors or sheltered among the standing buildings, and these animals must have been supplied with some form of provender.

The byre floor material observed on all the sites is almost exclusively peat derived and we may wonder what became of the barley straw resulting from the ubiquitous barley cultivation. Even in recent farming, some barley straw was fed to cattle (Lockhart & Wiseman 1983, 105) and it may be that it was used more extensively in the Bronze and Iron Ages.

At all five sites examined in this project there is clear, even abundant evidence for the harvesting of seaweed. At the largely post-Medieval settlement at Newtonferry this material was principally added to the fields. However, in the prehistoric deposits, peat, probably deposited *via* byre floors, seems to have provided the necessary organic material. At the earlier sites, the distribution of the microscopic mollusca suggests that seaweed was used as fodder. The observation of dental calculus, characteristic of seaweed eating, on sheep teeth (Halstead *infra*) supports this view, albeit that only a single instance of it was observed. There is then some support for the idea that seaweed was used as fodder in the overwintering of animals. Pain and Thew (*infra*) have noted that the use of seaweed seems to have increased markedly through time on the sites of Baleshare and Hornish Point. However, as we have noted a reduction in the area of land being cultivated through this period, it is unlikely that the principal use of the seaweed was for manuring fields and this further supports the idea that it was used as fodder.

The geomorphology of the machairs may also have helped to 'shorten the winter' by providing natural water meadows. The lochs at the landward margins of the machair are, even now, subject to great seasonal variation in extent, while the water table of the machair itself lies at or near the ground surface throughout the winter. Thus, areas of grass and the rootmass of the sward would have been maintained at temperatures above freezing, even during the coldest winters, and early spring grass production in these areas would have reduced the period over which fodder was necessary. Local access to the fodder source of the sea and the early grazing of the machair may have been potent factors in determining the location of the sites in and on machair. This is a siting which on many other grounds would seem most improbable and one that, long since, has been abandoned for the ecotonal strip between machair and blackland.

Apart from the evidence of the byre floor material, the presence of deciduous teeth of cattle and sheep, naturally shed, indicates the presence of calves on site, probably during the spring and early summer. These were found in dumped deposits; cattle in Blocks 5, 23 and 24, and sheep in Block 2, at Baleshare. The retention of the calves on site may provide support for the theory that cattle husbandry was orientated toward milk production. McCormick (1992) following Lucas (1989) argues quite convincingly that even in the recent past, the presence of the calf was necessary to enable the mother to let down her milk. Thus, calves and cattle may have been kept, separately but nearby, during the spring and early summer and for part of that time were housed at or near the excavated settlements. If this hypothesis is accepted, perhaps we can see some of the revetting and retaining walls as part of the penning necessary to achieve successful dairying. Clearly, further excavation would be required to explore this adequately.

McCormick (1992, 208) argues that dairy farming only really becomes a dominant husbandry strategy during the Dark Ages or at the earliest in the Irish Late Iron Age, ie the first few centuries AD, on the basis of evidence from Dun Ailinne, Co Kildare (Crabtree 1986). He, McCormick, suggests that it would be dangerous to '...project the existence of dairying further back into prehistory...' (ibid). Direct evidence exists for dairying at this time in Scotland. Radiocarbon dates from bog butter indicate that dairying was practised in Morvern in the mid-second to mid-third century AD and at Kyleakin, on Skye, a century later (Earwood 1991, 233).

On balance, the evidence from the machair sites suggests that dairying was practised in the Outer Hebrides almost a millennium earlier. Furthermore, given that all but one of the deciduous calf-teeth were found in the Blocks of the later phase at Baleshare we may also wonder whether the decline in the emphasis on cultivation is related to the rise in the importance of dairying. Halstead (*infra*) rightly observes that the small numbers of bones recovered from each of the sampled Blocks militate against direct comparisons of husbandry practices between Blocks or even between groups of Blocks. Thus, while acknowledging the slender basis for this hypothesis, it is offered here in the hope that future researchers may specifically address this problem.

18.17.3 The wildscape

Apart from the cultivated crops, dairy products, beef, mutton and pork the inhabitants of these sites also exploited the natural resources of the islands. The surviving evidence for this is largely the result of hunting and trapping animals, birds and fish and the collection of shellfish but the seeds and fruits and other parts of uncultivated vegetation were probably also gathered. The difficulty of distinguishing between such deliberately introduced 'weed' species and the weeds of cultivation or vegetable matter introduced to the sites in fodder or fuel has already been touched upon. Although drawn from a much later period, Margaret Bennett's *Plant lore in Gaelic Scotland* (1991) records some of the traditional uses of wild plants of the Hebrides. The stinging nettle *Deanntag* is often now observed on old midden sites because of its attraction to phosphate-, and nitrate-rich soils and it may well have flourished in such locations in the past from which nettletops could have been collected for soups and teas. Silverweed, whose pollen may occur but are included in the taxon *Rosaceae* was known to the Gael as *Brisgean* and, 'Before the introduction of the potato...[it]...was commonly boiled, roasted on a fire or dried and ground into meal for bread-making or porridge.' (*ibid,* 56). Similarly, white and pink stonecrop were considered a delicacy and, no doubt many other naturally occurring plant foods were exploited. Medicines for the treatment of scurvy included nettles and scurvy grass, both rich in ascorbic acid while fevers were treated with feverfew or a tea decocted from violets, while tansy was used in the treatment of worms. Dye plants included sundew, bog myrtle, yellow flag and lady's bedstraw while heather (*Calluna vulgaris*) was used as a dye, for roofing, as bedding and for tanning and brewing. The multiple uses of the ling heather may account for its relatively frequent appearances in pollen and macro-plant samples. Certainly, in the absence of oaks for 'tanbark' other sources of vegetable tannins must have been pressed into use. While we have no direct evidence for these uses of the vegetation of the ambient wildscape, it seems useful to recall their existence not least because their exploitation may always have been essential for the provision of trace elements and vitamins in a diet that otherwise lacked them.

In contrast, direct evidence for the exploitation of wild animals is provided by the recovery of bone and antler from the machair sites. Bones of red deer, roe deer, common seal and otter have been recovered from Baleshare and Hornish Point, albeit in small numbers. Serjeantson (*infra*) has noted that wild fowl were exploited as a casual, rather than a major resource. Fish, however, seem to have been rather more systematically exploited. Jones (*infra*) has noted the presence of sharks, large gadoids, wrasse, mackerel and a variety of flat fishes. These were identified from the retent of the 5 mm mesh sieves and examination of the smaller fraction would clearly expand the list of species taken and enhance our perception of the part played by fish in the prehistoric diet of these settlements. Jones suggests that the larger fish were taken on hand lines and the shoaling fish, probably by hand netting. Clearly boats were used in this process, albeit that no other evidence for their existence has been noted.

The paucity of the remains of wild animal species is not very surprising given the restricted landmass of the Uists and the restricted range of wild species available. However, the low level of exploitation of the bird population, especially the migratory fowl, is surprising, given their seasonal abundance and the ease with which the young, in particular, can be taken. The extensive cropping of the gannets of St Kilda, for example, may well have been a reaction *in extremis* to an extremely poor environment (a view shared by many who have tried to eat one) but at least it shows the potential input these creatures could have made. Perhaps further excavation will change this picture but, on the present evidence the failure to exploit the seasonal abundance of protein represented by the migratory fowl, suggests that although the domestic economy of the sites was a subsistence economy, it was not a poor one. Alternatively, perhaps the fowl were harvested but formed part of the 'invisible exports' of the sites.

18.17.4 Landholdings

The bones of the domesticated animals did not display any of the dietary deficiency diseases which confinement to the machair would have entailed (Chapter 2.3.1). This implies that the settlements each had access to the grazings of the central and eastern heath and moorlands. The large volumes of peat evidenced at the sites confirm rights of access and of exploitation. Each site also had access to the shore for shellfish, seaweed and fishing and it must be remembered that the contemporaneous shorelines probably lay up to 500 to 750 m west of their present positions (Chapter 2.2). Taken together these imply that the landholding of each site should be envisaged as a strip of land running from the sea, over the machair, up the eastern hillslopes and down the other side to the east coast. It is not impossible that the eastern moorlands were held in common but prudent husbandry, based it is assumed on herding, militates against this.

It is not surprising that the individual holdings ran across the ecological zones of the islands. It maximises access to the range of available resources and is a common response to areas of high ecological gradients, from the earliest times. The Neolithic fields at Ceide, Co Mayo (Mitchell & Ryan 1997, 185–6), the Bronze Age reaves on Dartmoor (Fleming 1988) and the medieval and post-medieval settlements of west coast Ireland (Mitchell & Ryan 1997) and Scotland all provide examples of landholdings of this type.

Landholding in the Hebrides in the Dark Ages seems to have been based on the davach (*dabhach*), of gaelic Celtic origin, and the ounceland (*tirunga*), of Norse origin. The term davach means a vat or tub and, applied to landholdings, may have meant the area of arable land which yielded sufficient seed to fill such a vessel, or perhaps which required a davach full of seed to plant (Jackson 1972, 116). Dodgshon (1981, 75), while acknowledging that the term may have been used originally as a measure of agricultural productivity, suggests that it could also represent the output from an area of land which contained other non-productive parts or that it might represent the disposable product available for taxation, from a given area of land. Oram (1987, 49) has noted that the davach of the west of Scotland and the Hebrides was transmuted to the Norse ounceland and, as such, contained twenty pennylands, in contrast with the eighteen pennylands in the ouncelands of the east and north of Scotland. He equates these twenty sub-units with the groups of twenty households which formed units for naval assessment and recruitment in the *Senchus Fer nAlban* (Bannerman 1974), and imputes a Goidelic origin to the *Dabhach*. This implies that while the davach became either, or both, a specific unit of areal measure or a conceptual, financial, instrument, its origins are to be sought in the simple hierarchical relationships of twenty households to one overlord.

It is to the first millennium BC that Bangor-Jones (1987) looks for the origin of the landholding systems which, to paraphrase him, subsequently acquired Goidelic and Norse nomenclature. In this context, the Bronze Age seems to be the period when land management systems, like the Dartmoor reaves first give evidence for large scale control and organisation of the British landscape. However, we have so little evidence for Later Bronze Age settlements in the Outer Hebrides that this phenomenon is simply not observable there. By the later half of the first millennium bc, on the other hand, the Iron Age sites investigated in this project indicate that settlements controlling east-west strips of land were in contemporaneous occupation for at least part of the duration of occupation at each site. This is evidence for land management on a significant scale. Even relatively simple geographical modelling, using Tiessen polygons, tends to confirm this observation (Armit 1992, Ills 12.8). There is, therefore, evidence for the existence of a settlement hierarchy, in which the machair sites function, generally at the level of family farms, or perhaps as clachans, small groups of up to three or four households, practising mixed arable and dairy husbandry.

18.17.5 Food storage and preparation

No evidence was recovered for the bulk storage of cereal grain, fish or meat. Experimental evidence from Butser suggests that beehive shaped storage silos made from straw ropes could contain just over 1 tonne of seed grain; these could have coped with the needs even of the Bronze Age levels of Baleshare. We need not, therefore, be too surprised at not recovering evidence for bulk storage.

It was noted that the tops of the rim sherds of Iron Age vessels of the larger size range are commonly ground flat. It is suggested that this results from the use of stone lids for the vessels. The use of lids on the vessels further implies that they were used for the storage of some commodity and their size and fragility militate against their routine use for cooking. They could have been used to store food but even fresh water for these porous sites must have required some form of container and, no doubt, a number of other commodities that could have been stored in these vessels, ranging from shellfish to milk.

Sherds of the smaller pottery vessels are predominantly soot-encrusted and seem often to contain food residues. It seems reasonable to conclude that these are simple cooking vessels. The abundance of fragments of heat shattered stone on the sites' deposits has been noted by Collins (*infra*) as has its co-occurrence with other domestic refuse. These seem no more than the pot-boilers characteristic particularly of Iron Age sites like Stackpole Warren in Pembrokshire (Williams 1990) and which this writer has also identified on broch sites in Scotland (Barber 1990, 92–6). Collins noted the deliberate selection of rock types other than gneiss for this function.

Even brief experience of heating gneiss in beach barbecue fires shows how this rock type disintegrates on roasting. While direct evidence for cooking troughs or pits is lacking, the abundance of heat shattered stone spalls demonstrates quite clearly that boiling of large volumes of water was routinely undertaken on the site. Of course, the uses to which the heated water could be put are many and varied, ranging from boiling large joints of meat through de-hairing skins to steam bathing or saunas.

Only one quern stone, the upper stone of a rotary quern was recovered from Baleshare. It was made from gneiss and where found, was re-used in the walling of the Block 8 entrance passage. This context dates from between 2260 and 2045 bp and the date of the quern is much more likely to lie closer to the earlier than the later boundary of this range. It provides evidence for the milling of barley, which, even had it been absent we might reasonably have anticipated. Bere bannocks and similar unleavened breads (Lerche 1975) were no doubt cooked on heated slabs beside the hearth.

Caulfield (1978, 137) suggests that replacement of the saddle type of quern by rotary types had taken place in the Hebrides before the brochs were built. The example from Baleshare does not contradict this hypothesis.

18.18 THE ATLANTIC SETTLEMENTS OF THE WESTERN ISLES

Dennis Harding described the settlers of the Atlantic Iron Age as a 'community of economy and culture' that could be clearly distinguished from the cultures of regions to the south and east with traditions that lay within the Hallstatt and La Tène mainstream of central and western Europe (1984, 206). In suggesting this he was giving voice to what can be described as the insular view of the Atlantic Iron Age. It is a feature of many papers written before Harding's 1984 paper and of virtually all papers written since, that discussion of the Atlantic Iron Age is confined to the sites attributed to the Atlantic Iron Age, virtually without reference to developments in Europe and in Britain south of Scotland's central belt. Harding (ibid) clearly includes Ireland in his Atlantic Iron Age suggesting that '...we should be emphasising the relationships between brochs, duns and Irish cashels or cathairs as regional variants on a similar theme..'.

Writing in 1990, Harding had asserted that '...what the Atlantic Iron Age emphatically is not is either 'peripheral' or 'marginal'...' and founded this assertion on two factors; firstly, that the resource diversity of the Atlantic zone would render settlement there non-marginal while social and cultural peripherality was avoided by the existence of a '...maritime continuum, at least from the Northern Isles to southern Ireland, if not from Scandinavia to the Iberian peninsula...' (*ibid,* 16).

In essence then, Harding suggests that the current typologies were too inflexible to encompass the heterogeneity of the group of monuments attributed to the Atlantic Iron Age and too parochial to embrace comparanda in Ireland and elsewhere on the Atlantic rim. He suggests that the Atlantic rim formed a 'maritime continuum' in which Scotland's Western Isles would have had a central rather than a peripheral role and he asserts that the settlements were not marginal.

In suggesting that 'We are out of the claustrophobic little net of Victorian typology...' in our studies of brochs and related structures, Hedges was more than a little optimistic (1990, 31). Harding had, in 1984, gone some way to agreeing with Hedge's proposition, at least in so far as he argued for the abandonment of formal typologies based on architectural detailing in favour of systems based on '...function within the settlement systems and economic strategies of Iron Age communities in Atlantic Scotland...' (Harding 1984, 206). However, by 1992, the confusing profusion of typologies was reduced to simplicity itself by Armit's declaration that sites previously described as brochs, galleried duns, island duns and forts were all in fact of one class, the class of Atlantic roundhouses (1992, 22).

Typologically coherent or not, the structures of the Atlantic Iron Age share a repertoire of architectural forms of which the most characteristic include deep narrow entrance passages with door jambs, bolt holes and guard cells, thick walled or sunken structures, intra-mural cells and galleries, scarcements and radial segmentation of the enclosed spaces. In varying combinations of all or parts of this list, these architectural symbols provide the syntactical elements of the semiotics of the structures of the Atlantic Iron Age (*sensu* Eco 1991, 1–13). The freedom with which their builders constructed 'statements' about themselves by selection of what they deemed appropriate syntactical elements is at the root of the failure of all attempts to provide classical typologies of these structures. The creation of the portmanteau class of Atlantic roundhouse is the final step towards the shedding of classical taxonomies and the acceptance that while homogeneous on one very large scale, the sites of this period in the north and west display such small scale heterogeneity that their further classification rapidly becomes meaningless. The continuing exclusion of the wheelhouses from this portmanteau class is illogical, based as it seems to be on the distinction between freestanding and dug-in structures, and these also should be seen as part of the more general scheme.

The chronology of Atlantic roundhouses of the Western Isles is very poorly understood. Largely on the basis of Orcadian evidence, Armit suggests that they were built over the period 400 BC to 100 AD, in calendar years (Armit 1992). The chronology of the wheelhouses of the Western Isles is equally poorly understood. Stevenson had attributed wheelhouses to the period between the third and seventh centuries AD, on the basis of a rather weak argument for a late date for projecting, ring headed pins, and of pottery stamped therewith (Stevenson 1955). Foster (1990, 153–4) has included the projected ring-headed pins in her Group C which she seems to date to the Middle Iron Age to Late Iron Age II (her terminology) which, in turn, she dates to the first half of the first millennium AD, though this is by no means clear. Rejecting Stevenson's dating, Armit (1992, 69–70) suggests that wheelhouses date to the period between the fourth or third century BC and the first century AD. Note, however, that this is based in part on radiocarbon dates from the sites of Baleshare and Hornish Point and should not be interpreted as independent support for the dates they indicate. Our reservations about the chronological sensitivity of projecting ring-headed pins must persist despite Euan Campbell's (1998) suggestion that they can be treated as chronologically sensitive indicators if only we can ignore the early, disputed dates from Dun Mor Vaul and the late dates already rejected by Armit, as deriving from secondary uses of brochs and wheelhouses.

Outside of the Western Isles, wheelhouses are said only to have been noted in Shetland, at Jarlshof and at Ward Hill (Armit 1992, 71) and are apparently absent from Orkney. However, this may be somewhat misleading. The secondary use of the broch at Howe, for example (Ballin Smith 1994, 84) involved the radial segmentation of the enclosed space in a fashion similar to the construction of wheelhouses. This writer has noted similar segmentation in the broch at the Pool of Virkie, but is of the opinion that there, the segmented interior was a primary feature of the broch. None the less, the absence of wheelhouse structures from Orkney may be more apparent than real. This writer has suggested elsewhere that the absence of small chambered tombs from the better lands in Orkney is an artefact of survival (Barber 1992, 29). Continuous cultivation has resulted in the removal of the smaller structures from the cultivated areas of Orkney leaving only the truly massive sites, like Maes Howe, while lesser sites survive only in the more marginal areas and islands of the archipelago. If, as the evidence from the current excavations suggests, the wheelhouses are farmsteads they may only have been built on the better land available and may, in Orkney, have been preferentially removed or slighted and concealed by ploughing.

18.18.1 Cognate structures and their relationships

Various authors have addressed the question of the origins of the Atlantic roundhouse and currently seek their predecessors within north and west Scotland, in the simple roundhouses of the early first millennium BC. Cellular structures with a clear central area, often containing a hearth, and surrounded by a series of cells of corbelled construction usually contained within an oval structure, occur from the Neolithic Period to the Dark Ages in the Northern and Western Isles. Houses 7, 8 and 9 at Skara Brae, Orkney and the houses at Staneydale and Gruting School, Shetland are Neolithic examples of this type (see Ritchie & Ritchie 1981, 36, for summary) while elements of radial segmentation can be seen even in the Neolithic houses at Knap of Howar, Holm of Papa Westray and Rinyo (ibid). The later, Iron Age, structures at a number of Hebridean sites are also described as cellular (Armit 1992, Chapter 7) and some cellular structures of dates ranging from the first to the eighth centuries AD also fall into this category (ibid). The so called 'Pictish' houses of Buckquoy (Ritchie 1977), Pool (Hunter 1990) and elsewhere in the Northern Isles are also of this general type.

The outstanding difference between cellular structures and the wheelhouse appears to be that the wheelhouse is a radially segmented circular structure while the cellular structure is oval or irregular in overall plan. The existence of a long and continuing tradition of cellular construction prompts the speculation that the wheelhouse is little more than a mid-first millennium BC rectification of the basic building style of the north and west of Scotland. It invites the further conclusion that there is a continuity of architectural tradition over this very long time span. However, it is important to be aware of the limitations that constrained the architectural possibilities of both areas. To begin with, wood was either not available or was in severely short supply and so providing roofs for structures presented grave difficulties. In practice earth and stone were the only constructional materials that were readily available and in neither area was the quality of the available stone ideal for building (contrary to common perception, the stone of the northern mainland and the islands is very weak in tension and is a poor building material). Thus corbelling emerged as the basic constructional technique.

This writer has shown elsewhere (Barber 1992, 18) that corbelled structures, when free standing, require an enclosing wall whose thickness amounts to some 60% or more of the width of the enclosed floor. Corbelled structures, if they are to provide sufficient head room for normal activities also need to be very high in proportion to the width of the floor. Thus relatively large volumes of stones must be used to acquire relatively modest volumes of internal space. Dry stone structures provide ideal mechanisms for the condensation of water vapour from moisture laden winds and, from personal observations on Ireland's south-west coast, can be damp or even wet, on a mild summer's day. Their permeability to winds is best demonstrated by their use as drying sheds for gannet carcasses on St Kilda, in the more recent past (Emery 1996, 182). The addition of a turf covering, held in place by an outer stoneface has been noted at corbelled structures of the Early Christian period in Ireland (at Reask, for example; Fanning 1981). This would have provided damp-, and draft-proofing but its existence, taken together with the common observation of drains in the floors of these structures, attests to their dampness. Armit observed midden packed into the upper parts of Wheelhouses 1 and 2 at Cnip which undoubtedly fulfilled the same function (1990, 84–5).

High, thick-walled, drafty and damp, freestanding corbelled structures clearly did not appeal to the Early Iron Age settlers of the north and west of Scotland. As noted above, the Hebrides have the second highest recorded mean wind speeds on earth and high humidity all year round. While occasional corbelled cells occur, the ubiquitous *clochain* of the Irish mid-, and south-west coasts was clearly inappropriate to the settlers of the Scottish north and west coasts and their exploitation of the principles of corbelling has led them along quite another path.

In the absence of adequate building material and especially in the absence of an adequate supply of timber for roofing, one response in the west and north of Scotland has been to create structures by digging them into appropriate sediments for shelter and damp-proofing and by creating within them smaller spaces that were individually roofed by corbelling, thus avoiding the need to roof a large void. Corbelling was also used in revetting the enclosing sediments, exploiting its 'horizontal arch' effect. Given the severe physical conditions and the equally severe limitations on constructional possibilities, the commonality of response in most periods from the Neolithic to the recent past is neither surprising nor indicative of continuity of tradition. Bronze Age cellular structures need not be seen as the evolutionary forebears of the 'cellular structures' of the Atlantic Iron Age, whether this description is restricted to Armit's use thereof or to the entire class of Atlantic round houses.

Harding has argued that the brochs and duns with diameters of less than fifty feet (roughly 15 m) were roofed (1984, 218–9). He suggests that apart from driftwood, supplies of timber may have been imported from the mainland or the inner Hebrides. Certainly, by the sixth century AD this was possible, with wattles from Mull and timbers from the mainland being imported to Iona, if Adomnan's *Life of Columba* is to be believed (Anderson & Anderson 1961). However, in the Iron Age Hebrides, timber would have been a scarce and valuable resource. The restriction of this resource to the brochs and duns may provide evidence for the lowly status of wheelhouses which had to use corbelled radial cells to reduce their dependence on large timbers.

This writer has suggested elsewhere that there are grounds for viewing the whole of the complex, including the wheelhouses, as providing evidence for social stratification (Barber 1985). Given the scales of difference in bulk, in enclosed areas, in enclosed volumes, in man-hours of work required in construction and in 'monumentality' these sites simply cannot have all served the same class of occupant. This statement is implicit to Fojut's conclusion that the answer to the question 'Is Mousa a broch?' must be yes but no other broch is a Mousa (1981, 227), implying that there is some stratification even within the restricted class of brochs. The emergence of nucleated settlements around many of the Orcadian and Shetland brochs like the Howe (Ballin Smith 1994) and Jarlshof (Hamilton 1956) suggests that some, at least, of the larger sites continued to serve as focal centres up to and perhaps after the advent of the Norse. That such developments apparently did not take place in the Western Isles is not without its significance for our understanding of social developments in this area.

18.19 SETTLEMENTS AND MARGINALITY

18.19.1 Marginality of cultivation

Harding's assertion (above) that the settlements of the Western Isles were not marginal is unsupported by any evidence. It may simply be an emotional rejection of an apparently unacceptable judgement made on the lives and conditions of Iron Age Hebrideans. However, that is not what is implied by the term marginality in its use here. Rather areas are deemed marginal if they incur a high probability of failure of the subsistence basis on which settlement depends. The work of Parry on the abandonment of Mediaeval farmsteads in the Lammermuirs, in the face of the deteriorating climate during the Little Ice Age, provides us with a potentially quantifiable definition of this type of marginality (Parry 1978).

Parry first established the limiting conditions for the growth of the main cereal crop, measured in day-degrees, centigrade above a given base (4°C), millimetres of potential soil water deficit and exposure, measured in wind rates in metres per second. Sites, or areas which lie at or close to these limiting conditions can be said to be marginal for cultivation. Parry identified the conditions under which two out of three crops would fail (at the 95% probability level), and he postulated that abandonment of settlement would necessarily occur at this level of marginality. Thus, marginality is a measure of settlement potential, not a value judgement. On this objective measure, the Western Isles is certainly and demonstrably marginal at the present time, and was perhaps more so during the Atlantic Iron Age (*pace* Harding).

However, resource diversity goes some way to limiting the affects of the physical marginality of their cultivation. Fishing, fowling and hunting were all practised, on the evidence of the current excavations. The reduction of the scale of agriculture to market gardening may well have been a response to the marginalisation of cultivation in the more severe climatic conditions of the Atlantic Period and the shelter provided by existing structures or by the mound of the sites' deposits could have made the difference between success and failure in bringing in a crop. However, the small scale of cultivation, limited hunting and gathering and the limited exploitation of domesticates for meat may be interpreted as supporting the idea that dairying had emerged as the principal subsistence strategy, ie that the secondary products revolution had at last reached the Hebrides.

18.19.2 Marginality of technology

The absence of metalwork, especially of iron, from the sites' deposits has been shown to be an absence of evidence rather than evidence of absence. Hammer scale attests to blacksmithing on these sites and the butchery marks of animal, bird and fish bone attest to the use of edged metal implements while the worked bone and antler prove the existence of a relatively extensive tool-kit. Therefore, the material marginality of these sites during the Iron Age period is not really a marginality of technology, but of resource availability.

The restriction on availability seems to have affected the whole of Scotland and to have persisted into the first millennium AD. Writing in the first quarter of the third century AD, the Greek historian Herodian observed that the people of Scotland valued iron as highly as gold (*Histories*, iii,14,7) and, for once, the archaeological and historical records seem in accord. Manning (1981) cites the report by Callendar and Grant (1934) on the excavations at the broch of Midhowe to show that some brochs suffer a similar mismatch of evidence for iron working but no surviving ironwork. In the case of Midhowe, large amounts of iron slag, indicative of iron smelting on site, were recovered. Indeed, Manning goes further (*ibid,* 57–61) by suggesting that the three hoards discussed by Piggott (1955) as the only undoubtedly 'native' hoards from Scotland were not in fact native but the possessions of auxiliaries or mercenaries gained in service in southern England.

In his listing of seventeen wheelhouses in the Outer Hebrides Armit (1992 Chapter 6) does not record a single instance of finds of iron objects or of slags or mould fragments associated with iron working. In contrast, three of the thirteen sites in his portmanteau class of Atlantic roundhouse (*ibid,* Chapter 5) contained some such evidence, *viz* Rudh a Duin, Vallay, fragments of an iron sword with scabbard; Dun a Ghallain, iron rivets, dirk and curved knife; Buaile Risary, rivets; in addition a whetstone was recovered from Eilean a Ghallain and triangular crucibles from Dun Barabhat and Buaile Risary. Excavated brochs in the Northern Isles have produced abundant evidence for iron smelting and iron working, as well as for the production of relatively high status bronze objects. The Howe (Ballin Smith 1994, 228–234) produced over 200 iron objects and almost 200 kg of slag, including nine plano-convex slag cakes together with fragments of furnace linings and tuyeres. Some five furnace bottoms were recovered from Crosskirk, together with further slags and some iron, the latter poorly preserved because of the adverse depositional environment, and two crucible fragments (Fairhurst 1984, 118–9). Similar assemblages were recorded from the broch at Bu (Hedges 1987).

It has been argued above that the chronologies of brochs, or Atlantic roundhouses and wheelhouses probably overlap significantly. This writer has argued elsewhere that these various structures may reflect an hierarchy of settlement with the broch placed higher than the wheelhouse in that hierarchy (Barber 1985). Given the presence of iron smelting on brochs and its absence from wheelhouses, we may wonder whether the control of the supply of iron was part of the mechanism by which political and social control was exercised by the broch occupiers, or some other 'overlords', over the farms of the wheelhouse dwellers. Legitimising the relationship between tenant and landlord by the gifting of equipment is characteristic of one of the forms of clientship practised during the later, Dark Age periods of Scotland and Ireland (Kelly 1988, 29). Charles-Edwards (1993, 522) comments on an early Welsh law on inheritance, that required that '...the youngest son gets the special homestead and eight acres and all the equipment and the cauldron and the wood-axe and the coulter'. This suggests that the gifting of equipment and its attendant obligations possibly extended over successive generations. Perhaps we should consider the relationship between the dwellers in brochs and those in wheelhouses as a precursor to base clientship. Extending 'known' Dark Age social institutions into the Iron Age is always dangerous but we do have some other indications in its favour. Among these the survival of the twenty pennyland ouncelands discussed in Chapter 18.17.4 may be noted.

The use of iron as a medium of exchange between tenant and landlord emphasises the scarcity of the raw metal and, even among the brochs, the volume of recovered iron objects is very small. The scarcity of ironwork and of high-status, ornamented bronzes on sites of the Early Iron Age in Scotland is also reflected in the distribution of artefacts bearing La Tène ornament. Such artefacts are found in a sparse scatter across the central belt of Scotland and into the Southern Uplands with none in the north or west of the mainland nor in the Hebrides (see Cunliffe 1978, fig 14:13, for a typical example). This contrasts with the Irish distributions of similar materials which show concentrations in the northern half to two-thirds of the country with few or none in the south (Raftery 1994, *passim*).

18.19.3 Marginality of culture

The Ritchies, among many other authors, have noted the profound changes in the archaeological record of Scotland in the middle of the first millennium BC, to which period they also attribute the introduction of P-Celtic (1981, Chapter 5). In neighbouring Ireland, save only for the linguistic change, the same scale of change is clearly detectable (Raftery 1994) and in the southern half of Scotland and northern half of Ireland these changes are associated with the cultural group characterised by the title 'La Tène' because the diagnostic artefacts of the period bear artistic motifs of the La Tène tradition. These Iron Age, possibly Celtic, peoples had emerged in central Europe as an identifiable archaeological cultural grouping designated the Hallstatt culture. In these islands, Hallstatt forms appear in bronze, in a limited range and without replacing the existing later Bronze Age implements. There is cause, therefore, to suggest that these Halstatt additions to an existing culture represent the arrival of influences and the diffusion of styles and ideas. However, the changes noted by the Ritchies (1981), including the alteration of language, introduction of a new technology, use of the technology to alter social control over landholding, and the evolution of new settlement forms, all seem to this writer to be explicable only in terms of an actual movement of some people.

This writer is aware of just how unfashionable this interpretation of events may prove, not least because of Raftery's recent exegesis on this subject (1994, 224). Despite changes to material objects and settlement forms some orders of magnitude greater than those observable in Scotland, despite the existence of a strong hagiographical tradition in support of invasion, despite the presence on Ptolemy's map of Ireland (arguably based on first century AD information) of the names of European tribes (Cauci and Menapii from north Europe, Brigantes from the north of England) and despite a long sanguinary history, replete with large-scale migrations, in the succeeding period, Raftery suggests that all the observed changes are due to the diffusion of ideas rather than the movement of peoples. It is not impossible that this is the correct interpretation of events and, certainly, invasions have been invoked in archaeological interpretations in the past to account for relatively trivial changes but to deny all possibility of invasion does not seem wise. Similarly, in the Outer Hebrides, it would not be wise to dismiss the possibility of invasion given the later movement of the Norse to that area (most of the placenames in the Hebrides are Norse in origin). However, the invocation of invasion to explain changes in material culture does not deny the observable continuity of indigenous people and the artefacts of their existences. MacSween (above) suggests that the considerable differences between the ceramic assemblages of the Bronze and Iron Ages arise by accumulation of new traits rather than by any single dramatic change. Similarly, we have noted above the continuity in architectural styles based on corbelling throughout the prehistoric period in the islands albeit that this can be attributed to the paucity of good building materials. However, the fact that we can explain change as incremental or continuity as imposed does not rule out the possibility, indeed the likelihood, of what the indigenes would have regarded as invasion even if we interpret that as no more than the alternation of one ruling elite with another.

18.19.4 Marginal but not meagre

The wheelhouses then may be seen as the habitations of farmers practising mixed dairy farming in a socially and politically managed landscape and receiving the necessary iron implements of their trade as part of their 'tenancy' or clientship agreement. The physical marginality and resource poverty of their environment facilitated their social and political control but their settlements clearly cannot have been at subsistence level. A subsistence level settlement produces all that it consumes, and usually, *vice versa* also. However, metalwork was brought to these sites as finished products, manufactured elsewhere. Thus some tradeable surplus must have existed and it is most probable that this comprised organic materials, amongst which butter and cheese are likely to have been included. Thus, although marginal, these sites were not individual subsistence settlements but formed part of a larger polity.