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Barabhas Machair: surveys of an eroding sandscape

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with contributions by
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1A. GEÀRR-CHUNNTAS

Tha bailtean Bharabhais air costa an iar Eilean Leòdhais anns na h-Eileanan an Iar, eadar brat-boglaich Mòinteach Bharabhais chun ear, agus a' mhachair agus An Cuan Siar air an taobh siar. Tha Machair Bharabhais (meadhan NB 351 513) air a bhith ga bleith fad co-dhiù ceud bliadhna, agus tha ùidh air a bhith aig arc-eòlaichean anns a' mhachair cha mhòr a cheart cho fada. Tha sgrùdaidhean agus cladhachaidhean thairis air an dà fhichead bliadhna mu dheireadh air tuineachaidhean fhoillseachadh, bho thràth Linn an Umha chun an latha an-diugh, ann an dealbh-tìre a tha air a bhith air a chleachdadh agus air ath-chleachdadh. 'S e seo a' chiad artaigil ann an sreath a bhios a' taisbeanadh toraidhean na h-obrach seo, a' toirt cunntas air toraidhean nan sgrùdaidhean agus toraidhean ciad rannsachadh aithriseach. Tha iad air an cruthachadh mar phàirt de phròiseact iar-cladhach aig a bheil taic bho Alba Aosmhor.

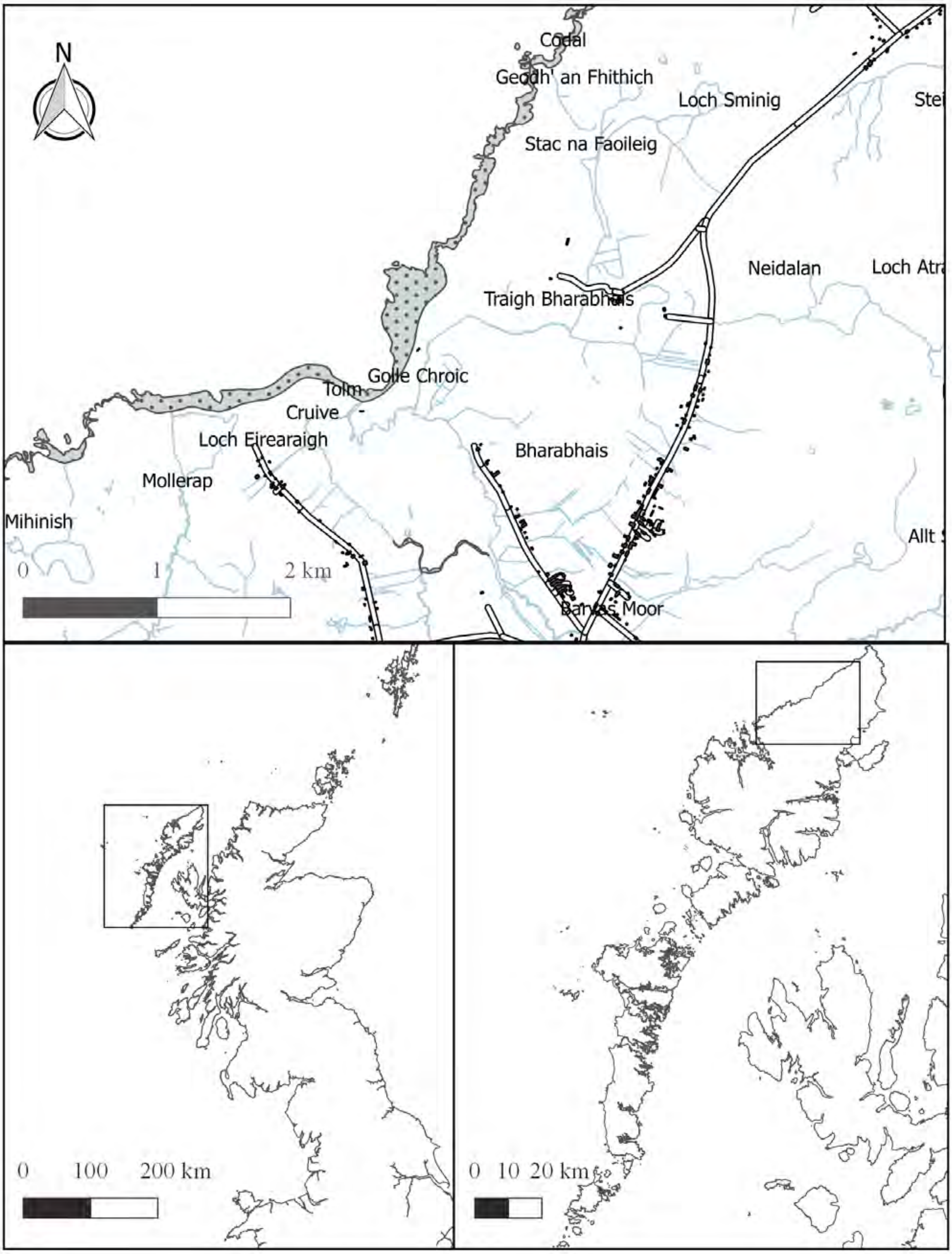
1B. ABSTRACT

The townships of Barabhas are on the west coast of the Isle of Lewis, in the Outer Hebrides between the blanket bog of Barabhas Moor to the east, and machair and the Atlantic Ocean to the west. The Barabhas Machair (centre NB 351 513) has been eroding for at least a century, and of archaeological interest for nearly as long. Survey and excavations over the last 40 years have revealed settlements from the Early Bronze Age to the present day, in a landscape that has been used and reused. This paper is the first of a series presenting the results of this fieldwork, reporting on the results of the surveys and on the results of initial documentary research, and has been produced as part of a wider post-excavation project supported by Historic Environment Scotland.

2. INTRODUCTION

The townships of Barabhas Iorach (NB 361 496) and Uarach (NB 365 507) (E. Lower Barvas and Upper Barvas) are on the western coast of the Isle of Lewis, in the Outer Hebrides (Illus 1). They lie on the edge of the Barabhas Moor, an expanse of blanket bog stretching 16km eastwards towards the town of Stornoway, and the modern village is located on the boundary between the peat of the moor and the shell sand of the machair to the west. The stabilised shell-sand plain of the machair forms a semi-circular area cut by two watercourses, Abhainn Bharabhais (Barvas River) and Loch Mor Bharabhais to the south, and Amhainn Thanndaigh (River Handay) to the north, and is open to the Atlantic Ocean to the west.

General sea level rise and isostatic readjustment in Scotland during the Holocene have had varying impacts around the coastline of Scotland. In the Outer Hebrides, the land is sinking, but the rate at which this is occurring is a matter of ongoing debate. J. Hansom (Dawson 2003, 10) suggests a figure of 0.7mm p.a. (after Carter 1988), to which must be added the eustatic rise in sea level. Ritchie (1985) suggested that Uist might have suffered submergence of between 3m and 5m since *c* 5164 BP, but there are no specific figures as yet for the Isle of Lewis. Despite this, it is clear that the shallow western coast of the island must



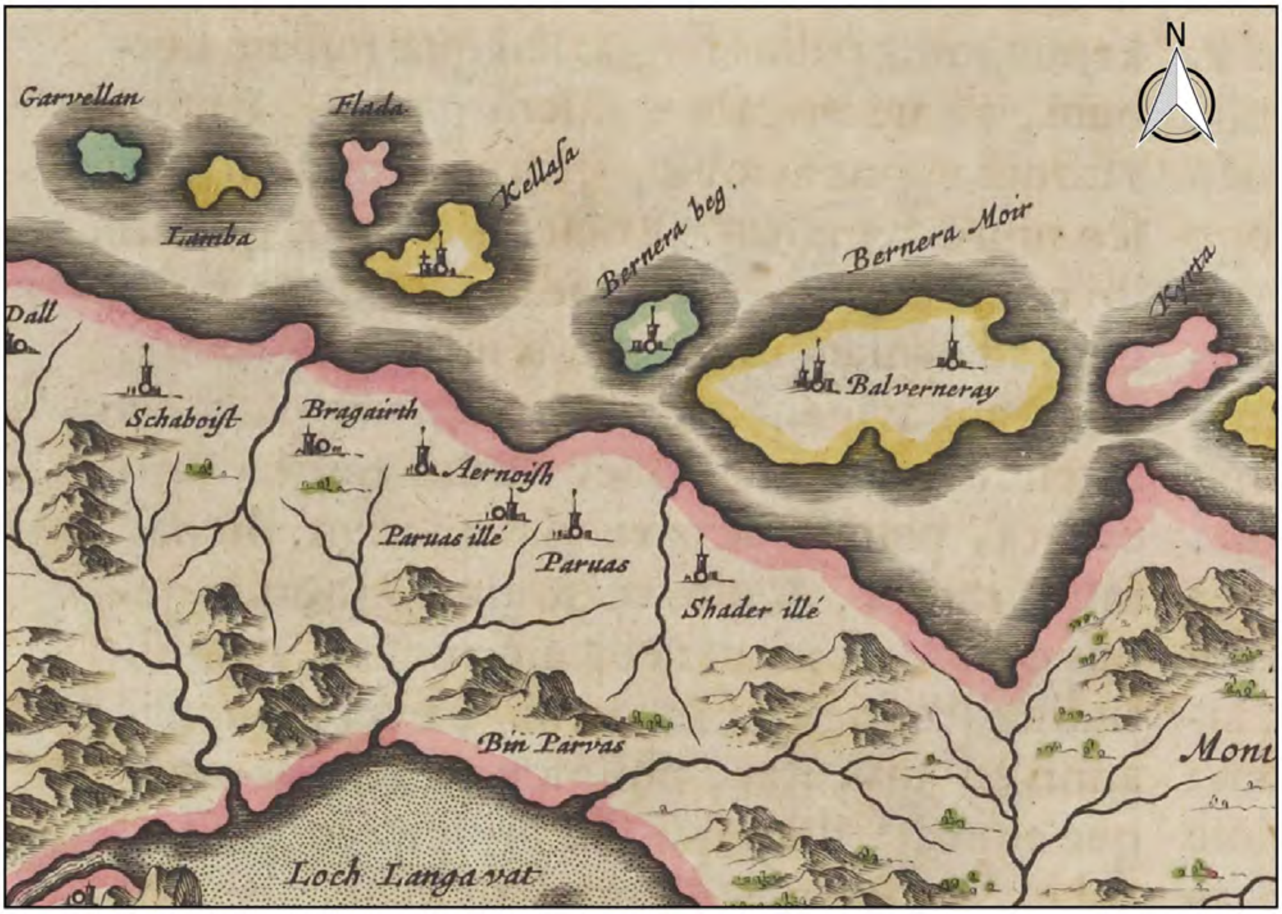
Illus 1 Location map

have changed significantly in shape and extent since prehistory.

The Barabhas Machair has suffered from documented aeolian and coastal erosion for over a century (see 3, Historical context) and has been a focus of archaeological activity for the last four decades. Rapid surveys, detailed mapping surveys, walkover finds collection and keyhole excavations over the last 40 years have provided a wealth of information about the development of settlement in this area, and how the remains of earlier settlements have been used and reused, from the Early Bronze Age to the present day. This article is the first of a series presenting the results of some of this fieldwork, here specifically the documentary research and surveys, and has been produced as part of a wider post-excavation project supported by Historic Environment Scotland. This article includes a report on the surface-collected lithics which were the bulk of the finds from walkover surveys carried out by the late Mark Elliott, conservator of Museum nan Eilean in Stornoway.

3. HISTORICAL CONTEXT

The historical spelling of the place-name Barabhas has been very variable. In this paper, the modern Gaelic spelling of Barabhas, as used on the most recent Ordnance Survey maps, is taken as the default, but in the discussion of historical sources, the original spelling, often 'Barvas', is used. Specific documentation relating to the township of Barabhas prior to the 18th-century estate records is scanty. In 1536, the parish church of Our Lady at Barabhas was one of several given by the Crown to Master Rodoric Farquhar Hectorissone (Reg. Sec. Sig., vol. x. fol. 122), following the death of the previous minister, Master Mertin M'Gilmertyne. Barabhas was presumably one of the four 16th-century, pre-Reformation parish churches of Lewis mentioned by Archdeacon Munro, in his description of 1549 (Munro 1774, 45). In 1566, the then parson of Barvas, Sir Patrick MacMaster Martin, was recorded on oath in relation to a legitimacy dispute between the Morisons of Ness, brieves of the island, and



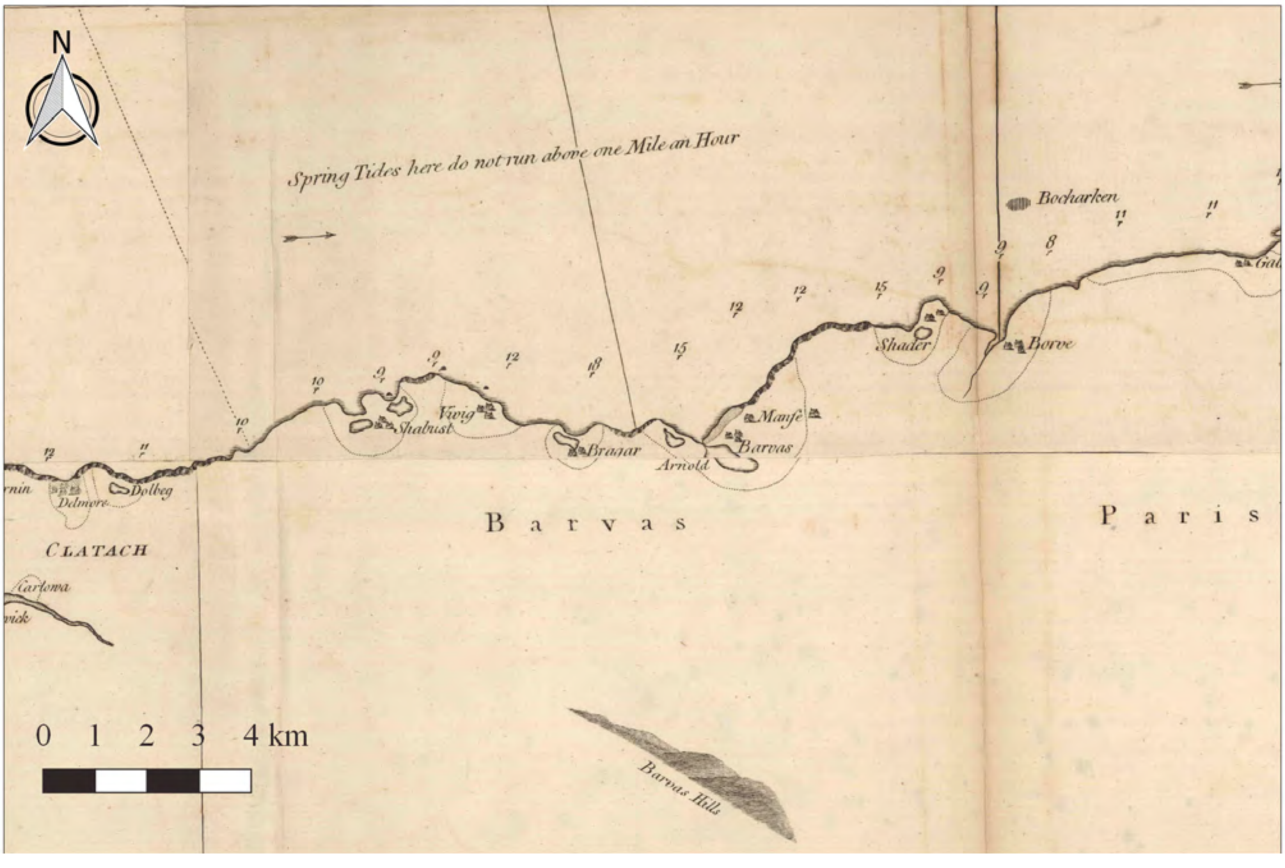
Illus 2 Blaeu's map, 1654 © National Library of Scotland

the MacLeods of Lewis, relating to the then heir of MacLeod (Thomas 1878, 512), a dispute which was to lead to the eventual loss of the island by the MacLeods. The names of these parsons suggests the possibility that they might have been father and son, supporting Thomas's (2008, 45–47) suggestion of hereditary ecclesiastical lineages in the Hebrides.

The earliest cartographic evidence for the two townships of Barabhas Iorach and Uarach is Blaeu's Atlas of 1654 (Illus 2), which suggests they were located further to the west than at present, closer to the sea and on the machair. The settlements are identified as Paruas illé and Paruas, near the hill of Bin Parvas. The name Paruas illé presumably refers to the presence of the church at Barabhas Uarach, assuming that 'illé' is derived from Gaelic 'cille' meaning 'church'. However, if this is the case, the two townships are shown in reversed positions, perhaps not surprising given the very high degree of distortion and inaccuracy of the map.

The 18th century saw a flurry of descriptions of the islands, starting with Martin Martin, in 1703. Martin, who was a native of the Inner Hebrides, included few statistics, but some interesting facts about Barabhas in his description. He commented on the local tradition of sending a man to cross the Barabhas River early on May Day morning, in order that a woman should not be the first to cross (Martin 1703, 7). This latter was believed to prevent the salmon coming up the river, and the salmon were clearly an important element of local subsistence. He also mentioned that the whole Isle of Lewis had lately suffered years of scarcity, and a famine in which the poor died of want (op cit 14).

Furthermore, Martin identified the late minister of Barabhas as Mr Daniel Morison, who had recently died at the age of 85 (op cit 11). This is the first documented post-Reformation appearance of the Morison family; Mr Daniel Morison, who was probably minister at Barabhas during a large part of the 17th century, is reputed to have been the grandson of the last brieve, or judge, of the Isle of Lewis (mentioned above), and his brother was minister of Stornoway (Thomas 1878, 522–3). It is interesting to note the continuing local prominence of the family, both the role of brieve and that of



Illus 3 MacKenzie's chart, 1776 © National Library of Scotland

minister demanding literacy and an accepted moral authority within the community. Daniel was succeeded by his son as minister, Allan (or Murdoch) Morison (op cit 523).

In 1776, a new and much more accurate survey of the Outer Hebrides, by Murdoch MacKenzie Snr, was published (NLS Map.Rol.a.3). This was a maritime chart (Illus 3), surveyed in the mid-18th century on behalf of the Admiralty (Laughton 1893, 160) in the aftermath of the 1745–6 Jacobite rebellion. The chart shows a very recognisable outline of the island, and indicates a settlement on the machair immediately to the north of Loch Mor Bharabhais, with a manse a little to the north of that. However, this is a maritime chart and therefore cannot be used as a reliable indicator of the extent and nature of settlement on the land; the buildings indicated are landmarks for sailors. The whole area is marked as the parish of Barvas, with the parish of Clatach to the west, in what is now the district of Carlabhagh.

Many 18th-century general descriptions of the islands, for example John Knox's (1787) summary of his journal on a trip for the Fisheries Society, provide no further details of Barabhas. Rev. John Walker's Report on the Hebrides (Walker 1764 and 1771 (2004), 39) gave the population of Barabhas parish (described as the united parishes of Barras & Ness – op cit) as 1,777 individuals, but we cannot be entirely sure of the accuracy of this figure, which is likely to have been based on church sources (op cit 24–7). He commented that there was no school in the parish (op cit 40), and then in his more general description of the Isle of Lewis, mentioned the cultivation of flax, and hemp (op cit 46–8) as well as barley (bere) and oats (op cit 42–3). The plough was a recent introduction, as were potatoes, which had only been cultivated in the last decade (ibid).

The *Old Statistical Account*, 1791–9 (263–73) also covered the parish of Barabhas. It claimed that the 1755 population 'by Dr Webster's list' (op cit 267) had been 1,995, and had risen by the time of the *Account* to 2,006 (ibid). All inhabitants were of the Established Church (op cit 268), and the parish church by the manse was a ruin to be rebuilt 'first summer' (ibid). There was no school, and no road from Stornoway, but one under construction 'has reached 5 miles' (op cit 272).

The first substantial surviving estate records also date from the 18th century. The estate records for the Isle of Lewis survive poorly, as a result of a number of historical accidents. It seems likely that any early estate records were destroyed during the 1745 rebellion, at which time they were being held by the McKenzies of Kintail, on the mainland (Thomas 1878, 514). Towards the end of the First World War, a fire in Stornoway Town Hall also destroyed further records (Stornoway Historical Society). Certainly no estate records are known to survive today from the period before the McKenzie occupation of the island in the 17th century.

The earliest surviving rental, the *Judiciall Account* of 1718 (E655/1/2 National Archive of Scotland), from the Forfeited Estates Records, lists Barabhas Uarach as a tack in the name of Donald McKiver (*sic*), who may be the same Donald McIver who held the tack of Bru at the same time. There were 20 tenants in Nether Barvas (ie Barabhas Iorach), which was identified as being in the parish of Cladach (*sic*) (stretching from Barabhas Iorach to Carlabhagh – see Illus 3, MacKenzie's Chart, 1776), all with different shares, and varying associated cash and kind rentals. No tacksman is indicated on this document, and the tenants appear not to have held a joint tack, but to have been individually responsible for their rentals to the factor. Then in 1726 (NAS E655/3/1), the rental indicates that Donald MacIver and Widow MacAulay held Nether Barabhas jointly, whilst Upper Barabhas was held by Donald Morison. The sum of the rentals for Barabhas Iorach (Nether Barvas) was nearly twice that of Barabhas Uarach (Upper Barvas) in both cases, a discrepancy which may be explained by the minister's glebe land being in Upper Barabhas.

The visit of James Hogg, the Ettrick Shepherd, in 1803, provides a further relatively detailed description of some aspects of the township itself (Hogg 1803, 107–18). Hogg stayed with the minister of the parish, in the manse (see Illus 5, first edition Ordnance Survey map) and gave a detailed description of aspects of the agriculture. He described the medieval church of St Mary (op cit 111) and a hill 'of small size from which he had seen sixty ploughs all going at one time' (op cit 111–12). These two descriptions are linked in his text, in a wider section describing the machair, and it would seem likely that the ploughed hill may have been Cnoc Mor (see Illus 5). The traditional holding of

Illus 4 Chapman's map, 1807–09 © National Library of Scotland

Nether Barabhas by multiple tenants may account for the comment by Hogg that tenants divided each rig by the number of tenants, rather than taking a whole rig and exchanging the land annually, leading to a complex patchwork of minute areas of cultivation (op cit 108), though it is not entirely clear in the text whether the comment applied to one of the two townships, or both.

The earliest surviving estate map is Chapman's survey of 1807–09 (Illus 4; Johnson 1821), just post-dating Hogg's visit, and showing township locations, boundaries and land use. This shows Nether Barvas eastwards and further away from the shore than was apparently the case on Blaeu's map and McKenzie's chart. The extension of the road across moor, clearly completed since Hogg's visit, formed what is now Loch Street. At this time, Nether Barvas appears to have formed one township with Brue (*sic*), to the south-west, according to the boundaries shown on the map. To the north-east of this is Upper Barvas, with the manse marked, and also for the first time the site of the 'Old Chapel', presumably St Mary's Church, about half-way between the manse and the shoreline. A mill is shown on Abhainn Thanndaigh. The map is primarily concerned with land use and wider township boundaries, and only shows the location of townships with small rectangular marks, not indicating individual buildings, and probably not showing all foci of settlement in the townships. Once again, the settlements are shown as in Barvas Parish, which stretches south and west to the boundaries of the Parish of Carloway (*sic*).

The *New Statistical Account* entry for Barvas Parish, written in the September of 1836 (141–50) gave the parish a rising population of 2,568 in 1821 and of 3,011 in 1831. By this time two roads led to the township, one to Stornoway, the other along the coast, but there were no bridges (NSA 149). A new church had been built 40 years earlier, in the centre of the village (not remarked by Hogg), and there was now a parochial school (op cit 150).

In comparison with all the earlier maps, the 1852 first edition of the Ordnance Survey map for Lewis, at a splendidly detailed six inches to the mile (Illus 5, sheet 8 covers Barabhas: Ordnance Survey

1853), seems to show virtually every structure then visible. This map was reputedly privately funded by the estate, and is one of the earliest Ordnance Survey maps from northern Scotland. The surveyor, Captain Burnaby, seems to have had an interest in archaeology and history, as there are many archaeological sites and finds noted on the map, and it serves as a useful base map for archaeological survey to this day.

By this stage, replanning of the townships had taken place. Two phases of planned crofting township are visible in Barabhas Iorach (called this for the first time). One of these, on the higher ground of the Cnoc Mor to the north of the loch, was largely abandoned by the time of the survey, and the houses, one per croft, were marked as ruins, with the roads marked as 'old road'. A second phase of settlement, much more densely occupied, stretched along the new north–south road, leading from the Stornoway road north along the coastline, with a small scatter of houses along the edge of Loch Mor Bharabhais. The date of the early, failed crofting settlement is not clear, but neither Barabhas Uarach nor Bru show this early planned settlement, and it may be that this reflects an early move by the estate to establish crofts on land which was directly within their control, rather than being sublet through a tacksman.

In Barabhas Uarach, the map does show evidence of earlier settlement, apparently unplanned. Roads and paths lead to the area of the manse and the adjacent school and church, and ruins are shown around the school house, in a group to the south of it, and in a cluster north of the manse at Tigh Thangaidh (*sic*). A substantial mill, with lades, a dam and a pool are shown on Allt Thatrabhat, in the location indicated on the earlier Chapman map. Dense occupation is shown along the new road parallel to the coast, which is about 500m inland from the earlier areas of settlement.

For the first time, the extent of the eroding sandy area of the machair was also shown on this map. It extended up to the edge of the old graveyard at Cladh Mhuire, across the whole slope north of the Amhainn Thanndaigh, but did not affect the

Illus 5 First edition Ordnance Survey map – sheet 8, 1853 © National Library of Scotland

Cnoc Mor in Lower Barabhas. The fluctuation of this erosion can be mapped onwards from this point, in the Ordnance Survey maps, and by the twentieth century, in aerial photographs (Cook 1999). This erosion appears to have increased from the 1950s, with a marked increase again in the 1980s (ibid).

The arrangement of parishes on this map matches the modern situation, with both parts of the township in the parish of Barabhas. Clearly, by the mid-19th century, the township had been significantly reorganised by the estate, into a pattern which it follows today, and the arrangement of the parishes had finally stabilised.

3.1 Discussion

The documentary sources for Barabhas, such as they are, highlight the importance of the township throughout the history of the island. Although the pre-Reformation parish structure is not clear, and the post-Reformation parishes varied in extent and number over time, one of them was always Barabhas. The medieval church dedicated to St Mary suffered neglect during at least one period, probably around the time of the Reformation, which coincided with a century of civil disruption on the island, when the church building became ruinous. There are no records of the medieval parish or its clergy in the Papal Archives (Thomas 2008, 28–60), but priests, parsons and ministers of Barabhas Church feature in the few surviving Early Modern records for the Isle of Lewis, as witnesses, educators and reformers, and the abandoned church building was replaced by later churches.

Barabhas Iorach and Barabhas Uarach, by the time they were first documented in the 17th century, were already divided and under two different forms of tenure. Blaeu's use of the name Barvas Illé for one of the two townships distinguishes them by the presence of the parish church, and it may be that this was the major factor underlying the physical and tenurial differences between the two townships. The pre-Clearance pattern of scattered clusters of houses in Barabhas Uarach (OS first edition, 6" to 1 mile, 1853) is not visible in Barabhas Iorach, which seems to have been reorganised and laid out to crofts at a relatively early date, obscuring cartographic evidence of any earlier settlement pattern.

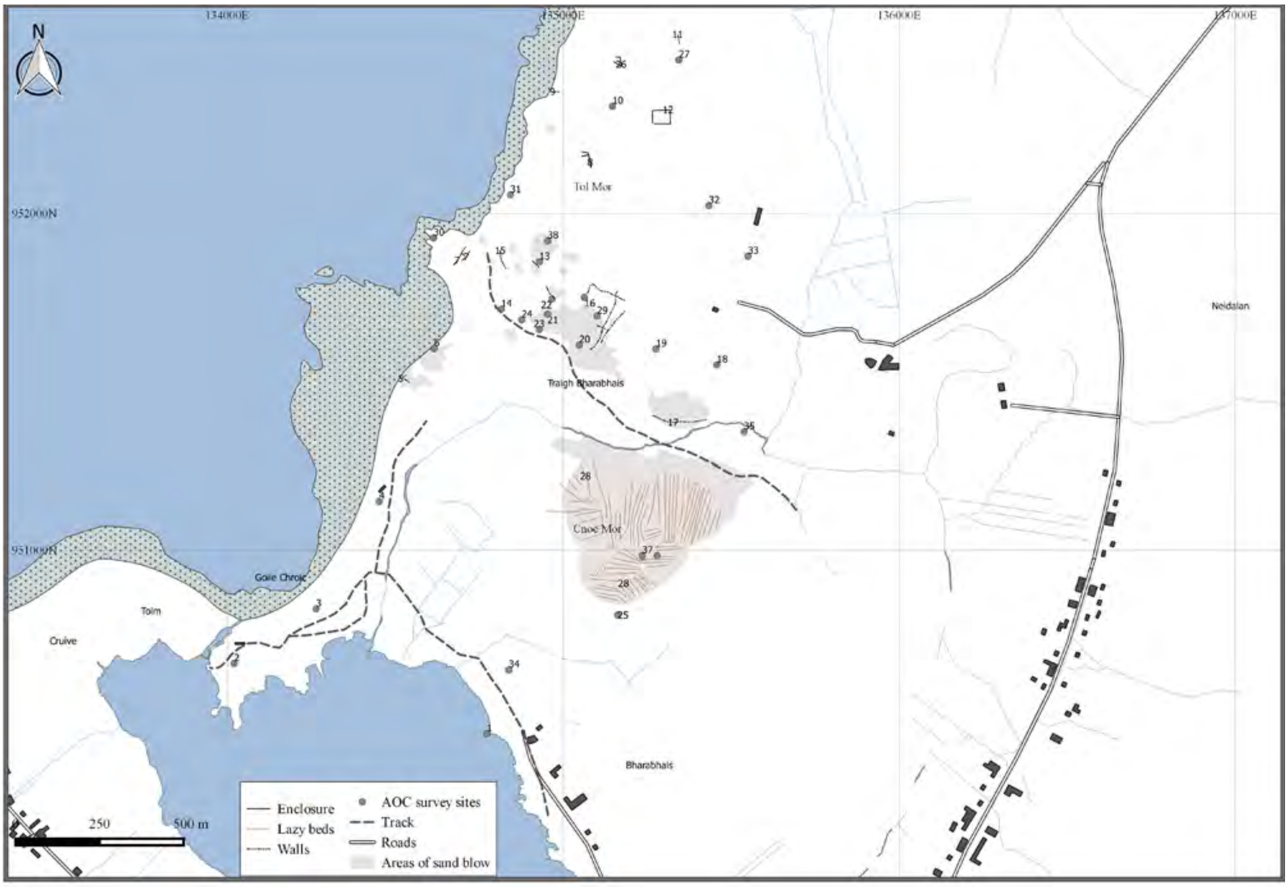
The estate records pick up the story of the machair at a point of great change in land use, and a sharp rise in the population of the township, from the 18th century onwards, and enhance our understanding of the mutability of this landscape. The northern township of Barabhas Uarach was held as glebe land, and a part of the proceeds of the tack would have provided the minister with his income, which is reflected in the relatively low rental paid for the tack (NAS E655/3/1). The complex and more variable arrangement for Barabhas Iorach shown in the same rental may be the explanation for the early attempt by the estate to rationalise this part of the landscape.

4. SURVEYS AND EXCAVATIONS

Machair Bharabhais has been the subject of archaeological fieldwork for four decades. Although this article focuses on the results of the various surveys carried out in the area, the excavations are also listed below, as they derived from, and inform the results of, the surveys. The detailed excavation reports will be published elsewhere.

4.1 1978 Coastal erosion survey

Systematic survey on the machair began in 1978, when a rapid walk-over survey of areas affected by coastal erosion in Lewis and Harris, directed by Trevor Cowie and Alan Lane, was funded by the Department of the Environment (Cowie 1983). This was a selective survey, focusing on areas where both archaeology and erosion had been reported (Cowie, pers comm), and a number of sites were recorded in the Barabhas area (see Appendix A, and Illus 6), ranging from stone structures and field walls of indeterminate age to the remains of middens. The sites were recorded as individual grid references, dots marked onto a paper map, and numbered in sequence of discovery. Surface finds were collected, allowing the dating of some of the sites, the earliest of which was Early Bronze Age, and the latest of which were Early Modern (Cladh Mhuire B96, and Barvas Old Manse B109).



Illus 6 Sites located during survey in 1999, after AOC Archaeology

The results of this survey are appended here (Appendix A), cross-referenced to the results of the 1996 and 1999 surveys (see below) and shown on the survey map (Illus 6).

4.2 1979 B1 and B2 excavation

Among the sites identified in 1978, two sites stood out as worthy of further action because of their relative rarity, and were subject to excavation the following year. One of these (Appendix A, B104; Illus 7) was prehistoric, Late Bronze Age to Early Iron Age in date, and is described elsewhere (Cowie & MacLeod Rivett 2010b; Cowie & MacLeod Rivett forthcoming a). The other (B97 Appendix A; Illus 8) was of Norse date (Cowie & MacLeod Rivett 2010c; Cowie & MacLeod Rivett forthcoming a). Both these sites were partially excavated in the summer of 1979.

One further actively eroding site appeared to be of potential significance and invited attention at the time. This was the apparent remains of an Iron Age and later settlement lying partially submerged close to the northern shore of Loch Mor Bharabhais (Illus 9). This could not be inspected in 1979 owing to high water level, but salvage excavation was subsequently undertaken in the summer of 1979 by Margaret and Gerald Ponting, who had been instrumental in the initial recording of the site (Ponting 1979).

4.3 1986–7 B3 excavation

In 1986–7, the discovery of a crouched burial led to excavation of a small Bronze Age cemetery inserted into the remains of an earlier Bronze Age building which produced Beaker pottery. This site, B 106 in the 1978 survey (Appendix A), had initially been identified as an undated prehistoric site. It was excavated as site Barabhas 3 (Illus 10), and proved to be one of the most important sites on the machair (Cowie & MacLeod Rivett 2010a), because of the international rarity of Beaker settlements (Parker Pearson 2012, 403).

Illus 7 Barabhas 1 (B1) – Late Bronze Age/Iron Age house

Illus 8 Barabhas 2 (B2) – Viking–Norse house

Illus 9 Iron Age site on Loch Mor Bharabhais © AOC Archaeology/HES

Illus 10 Barabhas 3 (B3) – Early Bronze Age (Beaker Period) house

4.4 1993 Rudh a'Bhiogair 1 excavation

In 1993, Richard Langhorne, curator of Museum nan Eilean in Stornoway, carried out an emergency excavation of eroding human remains at Rudh a'Bhiogair (Illus 11) (Langhorne 1993; Cowie & MacLeod Rivett forthcoming a). These were late Iron Age in date (Appendix C), and appeared to have been redeposited.

Illus 11 Rudh a'Bhiogair 1 – redeposited burial

4.5 1996 Rudh a' Bhiogair 2 excavation

In the early summer of 1996, GUARD excavated further eroding human remains at Rudh a'Bhiogair (Illus 12) (Stuart 1997; Cowie & MacLeod Rivett forthcoming b), under the Historic Scotland Human Remains Call-off Contract. Again, these were redeposited, and of Late Iron Age date (Appendix C).

4.6 1996 Coastal erosion survey

In 1996, Historic Scotland funded a survey of much of the coast of the Isle of Lewis, as part of a wider strategy to assess the impact of coastal erosion on the archaeological and paleoenvironmental resources of Scotland (Historic Scotland 1996). This work was carried out by Christopher Burgess and Michael Church (Burgess & Church 1997), and revisited Barabhas. The survey covered a much wider area than the earlier survey, following most of the coastline of Lewis, including areas of hard geology, and areas without reported archaeological remains. The results of the survey vastly expanded our knowledge of the archaeology of the island, picking up new types of site in areas which had previously been less visited, but provided such a volume of information that interpretation was not very detailed (op cit 398–417).

Machair Bharabhais was still a noticeably rich area of exposed archaeological remains (op cit 229–35), not least because the aeolian erosion of the area had progressed significantly since the earlier survey. However, it was now possible to put it into a wider context, as a focus within a coastal landscape in which both machair and areas of peaty soil were intensively used.

The results of this survey are cross-referenced to the 1979 and 1999 surveys, where possible, in Appendix A. As detailed descriptions of the sites were not included in this very rapid survey, it has not always been possible to make secure cross-references.

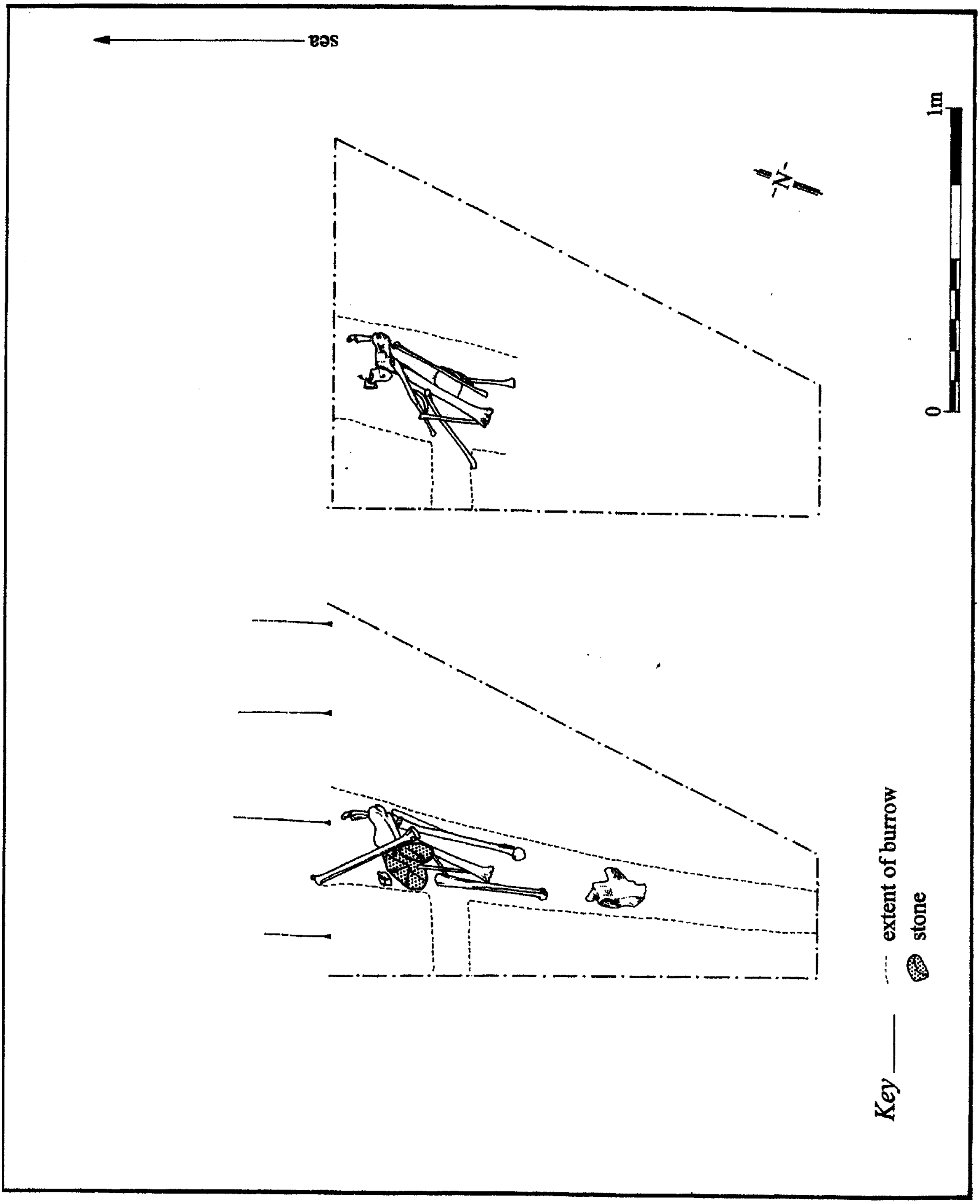
4.7 1999 AOC mapping survey

Site visits by the Western Isles Archaeologist (Mary MacLeod – the author) in 1998 revealed that aeolian erosion on the machair was active and progressing, and possible cist burials were beginning to be exposed. Historic Scotland therefore funded a detailed mapping survey of the machair by AOC Archaeology (Cook 1999), with a drawn and photographic record of visible archaeological remains, and a collection of finds associated with the sites (Illus 13). The aim of this survey was to inform longer-term archaeological and environmental management of the machair area.

The results of this survey are shown on Illus 6, and listed in the gazetteer (Appendix A). As the most detailed of the surveys, the site numbers from this are used as primary identifiers in this report, with cross-references to other numbering systems in brackets.

4.8 2000–1 Barabhas Machair project excavations

Over two summers, a team of professional archaeologists and local volunteers carried out small-scale excavation on sites on the machair which had been highlighted by the 1999 survey as particularly vulnerable (Illus 14). One of these, site 24 on Illus 6, proved to be the same site as that excavated as B1 in 1979 (MacLeod 2000; Bannon et al 2001; Cowie & MacLeod Rivett 2010b; Cowie & MacLeod Rivett



Illus 12 Rudh a'Bhiogair 2 – redeposited burial © GUARD/HES

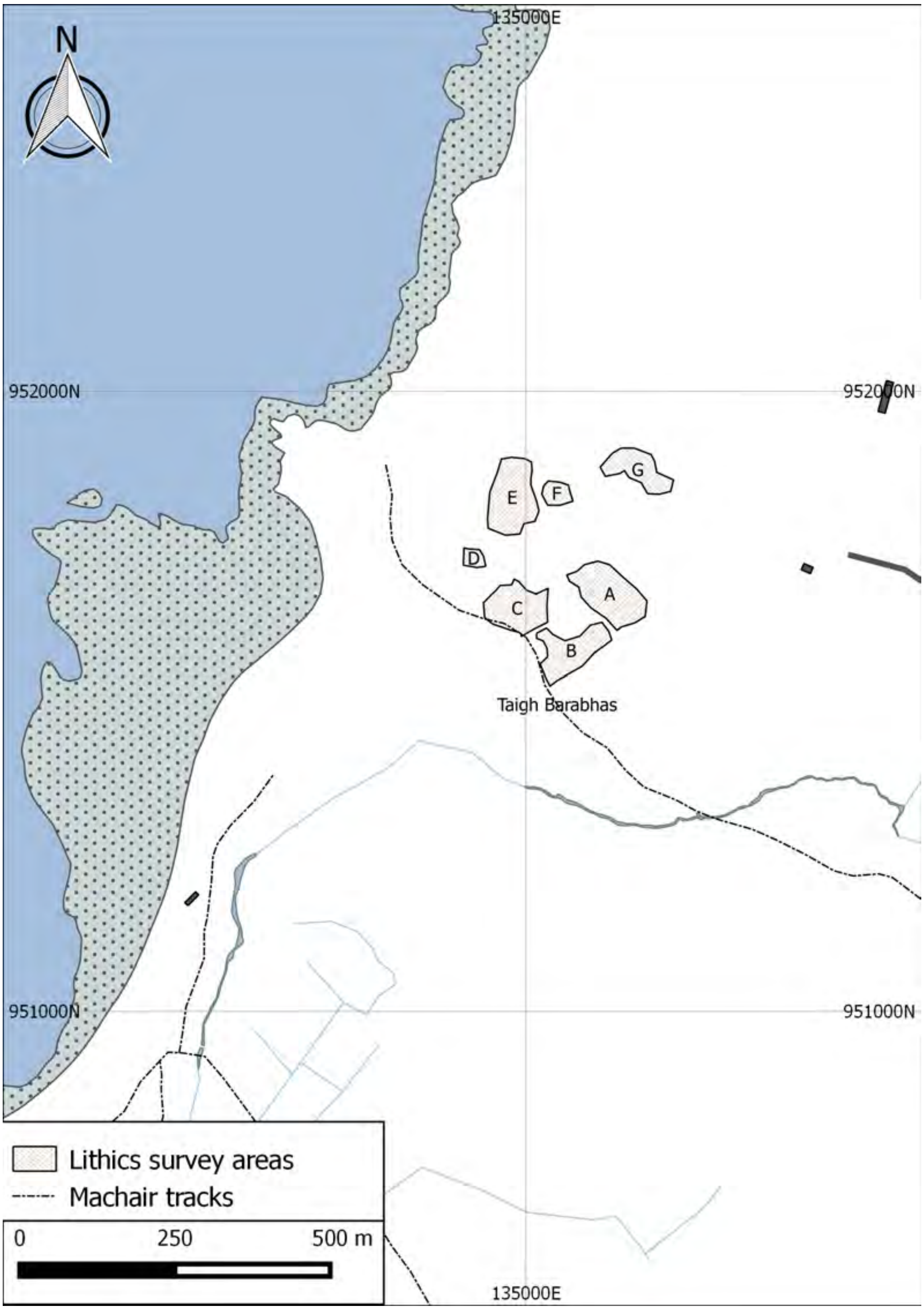
Illus 13 AOC mapping survey – working image ©AOC Archaeology/HES

Illus 14 BMP 2000–1 working image

2015, and forthcoming a); the other, F16 on Illus 6, was a group of Iron Age ritual structures including a long cist burial (MacLeod 2000; Bannon et al 2001; Cowie & MacLeod Rivett 2015 and forthcoming a). Both these sites were prehistoric, F21 being of Late Bronze Age to Iron Age date (see 4.2 above, 1979 excavation), and F16 being Mid–Late Iron Age (Appendix C).

4.9 2001–13 Machair erosion survey

Over a period of 12 years prior to his death in 2013, Mark Elliott, conservator at Museum nan Eilean Stornoway, with help from friends and family, carried out walkover surveys on the eroding prehistoric landscapes on the northern side of the Abhainn Thanndaigh (Illus 15). He systematically collected



Illus 15 Mark Elliott's erosion areas

lithics across the whole area, collecting all visible quartz, myelonite and flint, using hand-held GPS to provide a grid reference when he could identify a tool, and otherwise locating the finds by the erosion area, as identified on an aerial photograph (Illus 15). These finds have been analysed by Dr Torben Ballin in the report in Appendix B in this volume.

5. DISCUSSION

The various surveys and excavations that have been carried out on Barabhas Machair since 1978 have generated a wealth of information about the landscape, and its use and development over time. They have also been productive in mapping machair development, and informing land management in this very fragile ecological zone. However, attempting to bring together the information and synthesise a wider picture has not been straightforward. The aims of the four main surveys were disparate: in 1978, a focused and detailed survey of areas of known archaeological resource was carried out to locate eroding sites for excavation; in 1996, an extremely rapid general survey aimed to assess the island-wide impact of coastal erosion on archaeology; in 1999, the mapping survey was designed to inform the management of this area of machair alone; from 2001–13, the fieldwalking survey was concerned with the retrieval of finds alone. Coordinating this variety of information has been complex and at times problematic, as is clear from a consideration of the gazetteer (Appendix A). It has not always been possible to cross-reference sites because of different standards of description, and imprecisions in locations. For example, it only became clear that site 24 (Cook 1999, 18) was the same as Cowie's B104/ Barabhas 1 (Appendix A) during post-excavation, by which stage it had twice been subject to excavation (Cowie & MacLeod Rivett forthcoming a).

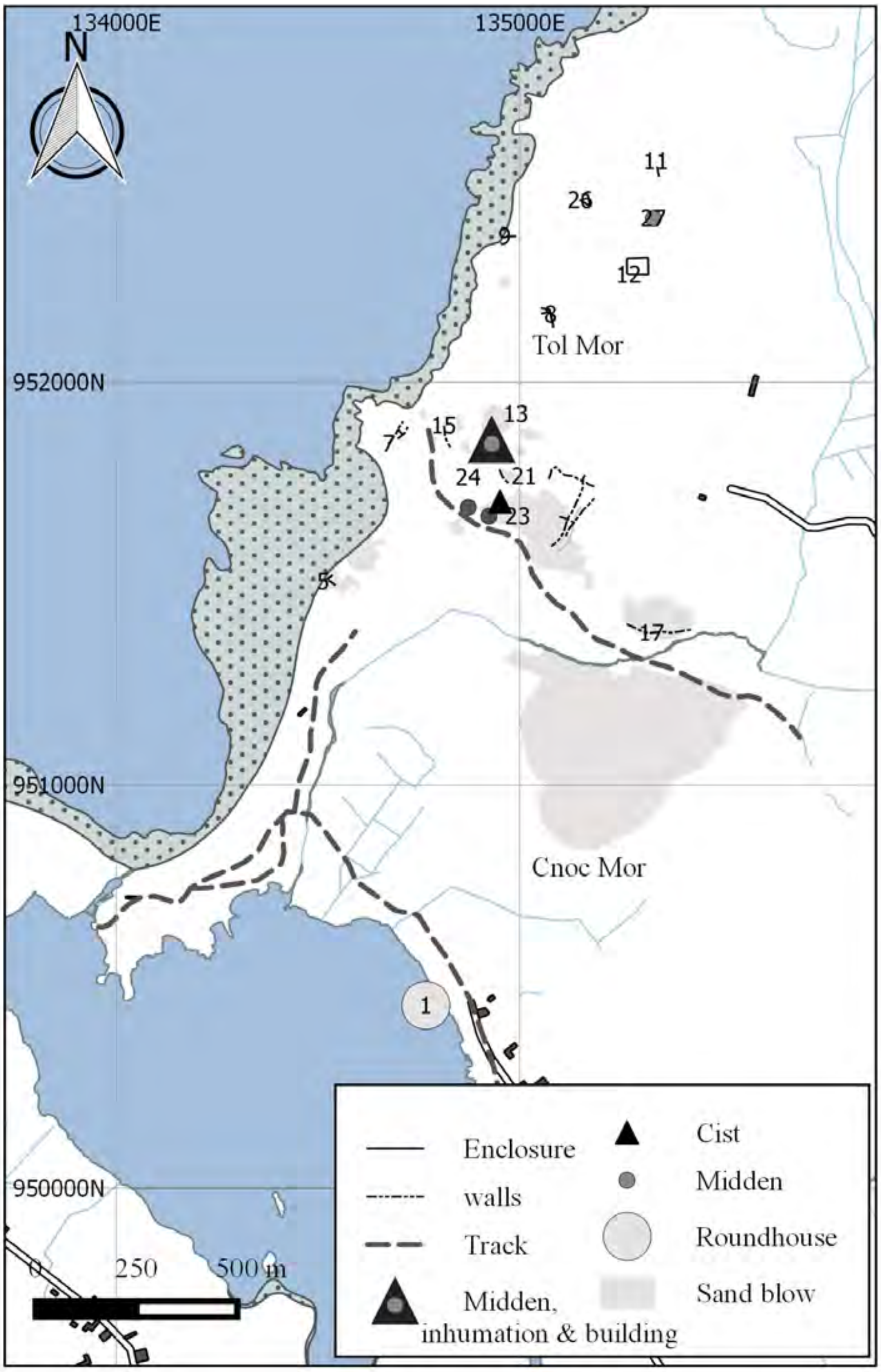
A further complication for survey, finds collection and synthesis is the extreme mobility of the machair landscape. When the overlying turf is broken, direct marine erosion and aeolian erosion can act on the underlying sand surfaces extremely rapidly. Deflation creates blow-outs, which act to funnel surface winds, exacerbating the erosion. Often the erosion only stops or slows because it has hit a more compact underlying surface, either a buried old ground surface or the subsoil. As the sand is blown away, finds drop downwards, creating a rich, conflated, multi-period archaeological deposit on the exposed surface. This process was evident in the variety of lithics found by the 2003–13 fieldwalking survey (Ballin, Appendix B). In such a mobile landscape, sites may appear and disappear within days, or in extreme conditions, hours; the machair was subject to innumerable gales and storms during this period, as well as a catastrophic hurricane in January 2005. Some sites that could not be located or cross-referenced during the process of analysis and report-writing may therefore either have been destroyed or reburied. In addition, the machair is still an agriculturally and industrially important landscape. Commercial sand extraction takes place centred around NB 351 519, and has certainly destroyed some sites, probably including the Norse/Medieval farm (see 4.2, B2) partially excavated in 1979 (Cowie & MacLeod Rivett 2010c; forthcoming a). Livestock, both sheep and cattle, graze the area, and in the past, overgrazing has exacerbated erosion problems.

The initial, 1978, survey (Appendix A) recorded for the first time the great extent of the archaeological deposits in the Barabhas Machair, and also their acute vulnerability and instability. As this survey was specifically orientated towards rescue excavation, sites were prioritised for more detailed description based on their research potential, and the wider landscape was described in more general terms. Three landscape areas were identified in this survey: Barvas Machair North (G. Tol Mor), Barvas Machair (G. Tol Beag) and Cnoc Mor. The former two were north of the Amhainn Thanndaigh and Allt Thatrabhat (River Handay), separated from each other by the cemetery, Cladh Mhuire, and the area of sand extraction to the west of the cemetery; Cnoc Mor was to the south of the river, north of the Loch Mor. Of the three, the Barvas Machair/Tol Beag area was identified as the focus of prehistoric settlement, and two sites on it were selected for further research, the Late Bronze Age/Early Iron Age site 24 (B104, excavated as Barabhas 1, Cowie & MacLeod Rivett forthcoming b), and the Viking Age/Norse site (B97, excavated as Barabhas 2, Cowie & MacLeod Rivett forthcoming a).

It is probable that the division of these landscapes is an artefact of erosion, and there is some evidence (see below 5.1 and 5.2) that the prehistoric landscape continues throughout the area, extending south to Loch Mor Bharabhais. However, evidence is lacking for continued use of the Tol Beag prehistoric landscape into the Middle Ages, as discussed below, and there seems to have been a significant landscape reorganisation at some point after the end of the Long Iron Age, justifying the discussion of the areas separately.

5.1 Tol Beag and Loch Mor: The prehistoric landscape (Illus 16)

The 1978 identification of the Tol Beag area of the machair as the focus of exposed prehistoric remains was confirmed both by the 1996 general survey (Burgess & Church 1997, 229–30) and the mapping in 1999. Between 1978 and 1999, erosion of this area had progressed significantly, with much



Illus 16 Prehistoric sites and landscapes

larger areas of open sand. As a result, elements of the landscape which were poorly understood in 1978, eg B105, which was identified as possible walling, became much clearer; in this case, a field wall intersected the remains of an earlier oval structure, site 22, in 1999 (Cook 1999, 19). Much of our understanding of this part of the landscape, therefore, comes from the later surveys, and site visits since that period.

The mapping survey revealed a landscape of rectilinear fields defined by walls (site nos 5, 7, 13, 15, 17, 20, 21, 22, 24, 26 and 29). The walls were not initially recognised as such, and the description of them as 'jumbled, non-coursed, stone clearance' (Cook 1999, 18) did not take into account the impact of the mobility of the landscape on their structure. It is very clear that not only were these walls, but that many of them were orthostatic, with large, edge-set stones at their base, for example site 17 (Illus 17). The relatively small amounts of stone in the field walls could be explained either by robbing for later constructions, or by the use of turf for one wall face, a traditional construction form in the island. Openings in the walls, eg at site 22 and near site 13, suggest routes through the landscape, both for livestock and people.

It was noted that some of the walls were located near to cairns, or incorporated cairns (Cook 1999, 18–19, sites 7 and 20 on Tol Beag, also sites 8 and 9 north of Cladh Mhuire on Tol Mor, and 28 on Cnoc Mor). The surveyors in 1998 saw no evidence that these were other than clearance cairns, and interpreted them as part of the agricultural landscape, as they did two separate cairns, sites 4 and 18 (ibid). The whole complex of field walls and cairns forms a field system of small, rectilinear fields around the prehistoric settlements on the south-facing slope of Tol Beag.

Within and relating to these field enclosures are a series of structures and settlement sites, some of which have been excavated, and others of which have produced dateable stray finds. The earliest site for which there is definitive dating evidence, site 13 (Illus 6), was identified as B106 in the initial survey and partially excavated in 1987 as Barabhas 3 (Illus 10). This is a two-phase, Early Bronze Age domestic building, producing Beaker pottery, with a later Bronze Age cemetery of four burials (see

Illus 17 Field wall site 17

Appendix C for dates) inserted into it (Cowie & MacLeod Rivett 2010a). This building is one of a small, but increasing and very important, group of Late Neolithic–Early Bronze Age settlements in the Outer Hebrides that have produced Beaker pottery from a domestic rather than a burial context (Parker Pearson 2012, 402–3, 411). The use of this style of pottery is now dated to *c* 2200 BC–*c* 1700 BC (ibid).

There is no evidence from the surveys for earlier Neolithic structures on the machair, though there are some Neolithic stray finds from the wider landscape (Appendix B). The existence of the stray finds suggests the possibility that such sites remain to be located beneath the machair, either under visible sites or in entirely different locations, but sea level rise may also have destroyed or inundated sites located nearer to the Neolithic shoreline.

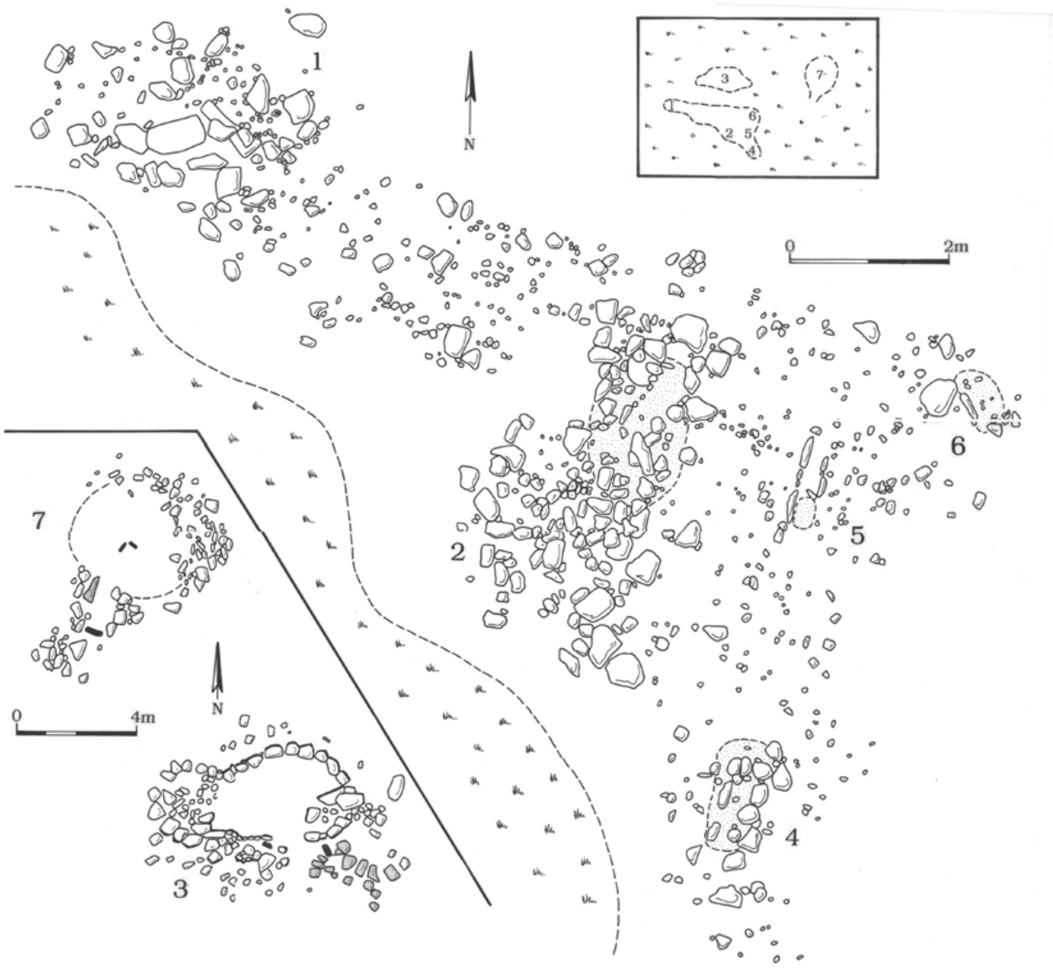
The later Bronze and Early Iron Ages are represented by a group of non-monumental domestic buildings. The damaged remains of a round house on a settlement mound (site 24, Illus 7), which suffered episodes of aeolian erosion and restabilisation during its use (Cowie & MacLeod Rivett 2010b, and forthcoming b) were excavated in 1979 as site B1. This site was very rabbit-damaged, and was not identified again in the 1996 and 1999 surveys, with the result that, misidentified as a cist (Cook 1999, 18), it was re-excavated in 2000–1 (MacLeod 2000; Bannon et al 2001; Cowie & MacLeod Rivett forthcoming b).

Illus 18 Site 16.3 under excavation

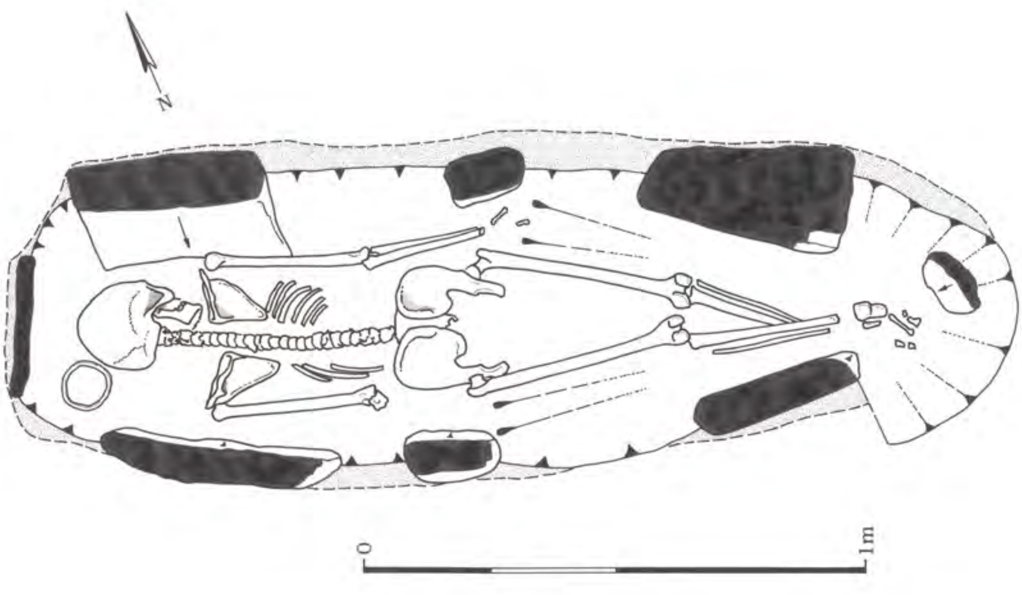
A small, oval building, 2.5 × 4m in size (site 16.3 Cook 1999, 18) (Illus 18), was excavated in 2000–1, and proved to be Iron Age in date, with a central hearth (MacLeod 2000; Bannon et al 2001; Cowie & MacLeod Rivett forthcoming b). A further building, site 16.7 (Illus 19) (Cook 1999, 12–18), probably Iron Age on the basis of its circular shape, and assumed to be domestic because of its hearth (ibid), was not excavated.

Around the field system, and associated with the buildings mentioned above, are some of the various cairns mentioned above in relation to the agricultural landscape (Illus 19). Excavation of one of these, site 16.2 (Cook 1999, 12; MacLeod 2000; Cowie & MacLeod Rivett forthcoming b) revealed elements of an internal structure, but no evidence of burial. It was associated with further structures, 16.1, 16.4, 16.5 and 16.6 (Illus 19), all of which were identified as cists (Cook 1999) but only one of which, 16.1, proved on excavation to contain a prone Iron Age burial (Illus 20, Appendix C) (MacLeod 2000; Cowie & MacLeod Rivett forthcoming b). Two others were parallel stone settings (Illus 21), into which small pits or scoops had been cut and refilled a number of times. This cluster of features seems to have had a ritual function or functions, and the possibility that others of the cairns in the wider landscape may also have had similar functions cannot be discounted.

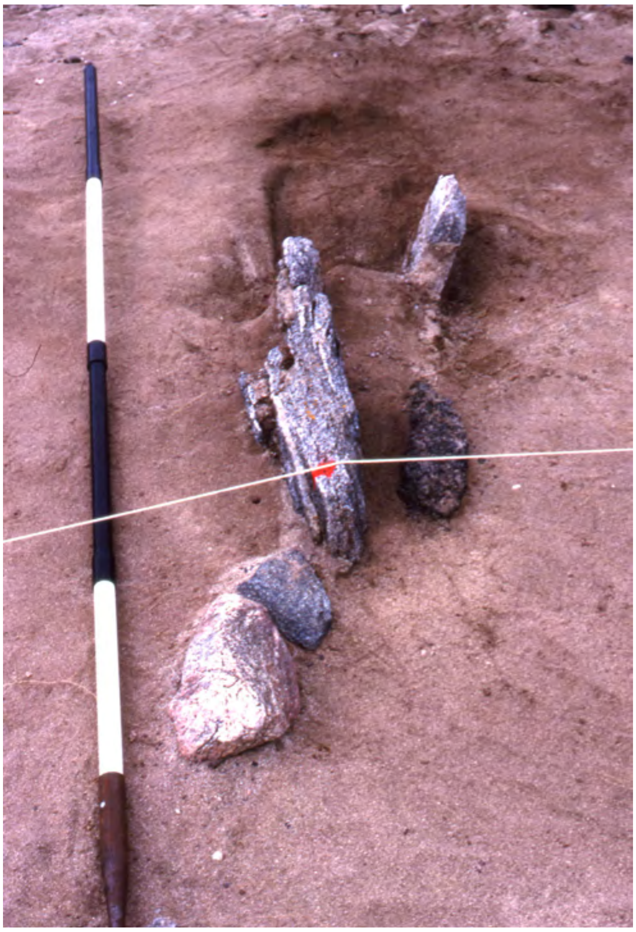
There remains a small, oval building, site 22 (Cook 1999, 10–19), 5 × 2.5m in size, which predates a field wall with a 3m-wide break in it adjacent to the building, which has apparently been constructed over it (Illus 22). The wall is on a north-west to south-east alignment, which suggests it is a continuation of the field system, site 20, which extends around the settlement and ritual site 16, discussed above. There is no conclusive dating evidence for this building, and no known stray finds from the area. The structure must, nonetheless, be prehistoric, and it may be very early given its stratigraphic position in relation to the wall. There is also no clear evidence for a hearth within the building, and it may never have had a domestic function.



Illus 19 Site 16 complex of sites



Illus 20 Skeleton in long-cist burial, site 16.1



Illus 21 Parallel stone setting, site 16.5

Illus 22 Site 22 with wall over it © AOC Archaeology/HES

This prehistoric landscape extends to the eroding coastline, and Rudh a'Bhiogair (site 30, Cook 1999; B101) which revealed amorphous areas of walling and possible structures in 1978, and was the site of two rescue excavations of human remains, in 1993 (Langhorne 1993) and 1996 (Stuart 1996). Both skeletons were dated to the Late Iron Age (Appendix C), and appeared to be redeposited. Local informants remember a long-cist cemetery eroding in this area just after the Second World War (John Murray, pers comm). Two parallel walls, site 7, noted in the 1999 survey (Cook 1999) appear to run across the neck of the headland, enclosing it, and separating it from the wider landscape.

One outlying prehistoric site, the small Iron Age house visible on the shore of Loch Mor Bharabhais when the water levels are low (Site 1, Cook 1999, 10, 18; B110, Ponting 1979; Ponting et al 1984), indicates the probability that the prehistoric landscape covers the whole of the Barabhas Machair. The level of the Loch Mor, which is controlled by sluices, is reputed to have been significantly lower in the first half of the 19th century (Kenneth Matheson, pers comm), and this site was probably on a small headland extending into the loch in the Iron Age.

This impression of a landscape in continual use and reoccupation from the Early Bronze Age onwards is reinforced by the large collection of lithics gathered on the Tol Beag area of the machair from 2000–13 by the late Mark Elliott, conservator of Museum nan Eilean. Early Bronze Age tools dominated the assemblage (Appendix B), but Neolithic, and possibly earlier, artefacts were also present. The assemblage was overwhelmingly of quartz, with significant amounts of myelonite and some flint, and there were hints that primary production was focused in one area (area B, Illus 15), whilst tool production was located in another (area C, Illus 15) in the vicinity of the settlement mounds 23 and 24 on which the Late Bronze Age–Early Iron Age site 24 (B104/B1) was excavated (Cowie & MacLeod Rivett forthcoming b). Interestingly, neither primary production nor tool-making seem to have been particularly associated with site 13, the Early Bronze Age building, emphasising the active use of a much larger landscape than the immediate environs of the obvious structures.

Although stabilised areas of machair still cover large parts of the archaeological landscape on the south-facing slope of Tol Beag, it appears very likely that the visible remains continue in the unexposed areas of the machair, forming a coherent, multi-period landscape, showing use and reuse of the same agricultural boundaries over long periods of time. It is probable that this prehistoric landscape continues as far south as the shore of Loch Mor Bharabhais.

Surprisingly, however, the south-facing slope of the Tol Beag landscape does not provide significant evidence for continued occupation into the Middle Ages, with the exception of the Church of St Mary, as discussed below (5.2). This may, of course, be due to erosion or cultivation, but the marked lack of medieval and later stray finds from this area seems to indicate major reorganisation of the settlement landscape at some point after the end of the Long Iron Age.

5.2 Tol Mor and Cnoc Mor: The historic landscapes (Illus 23)

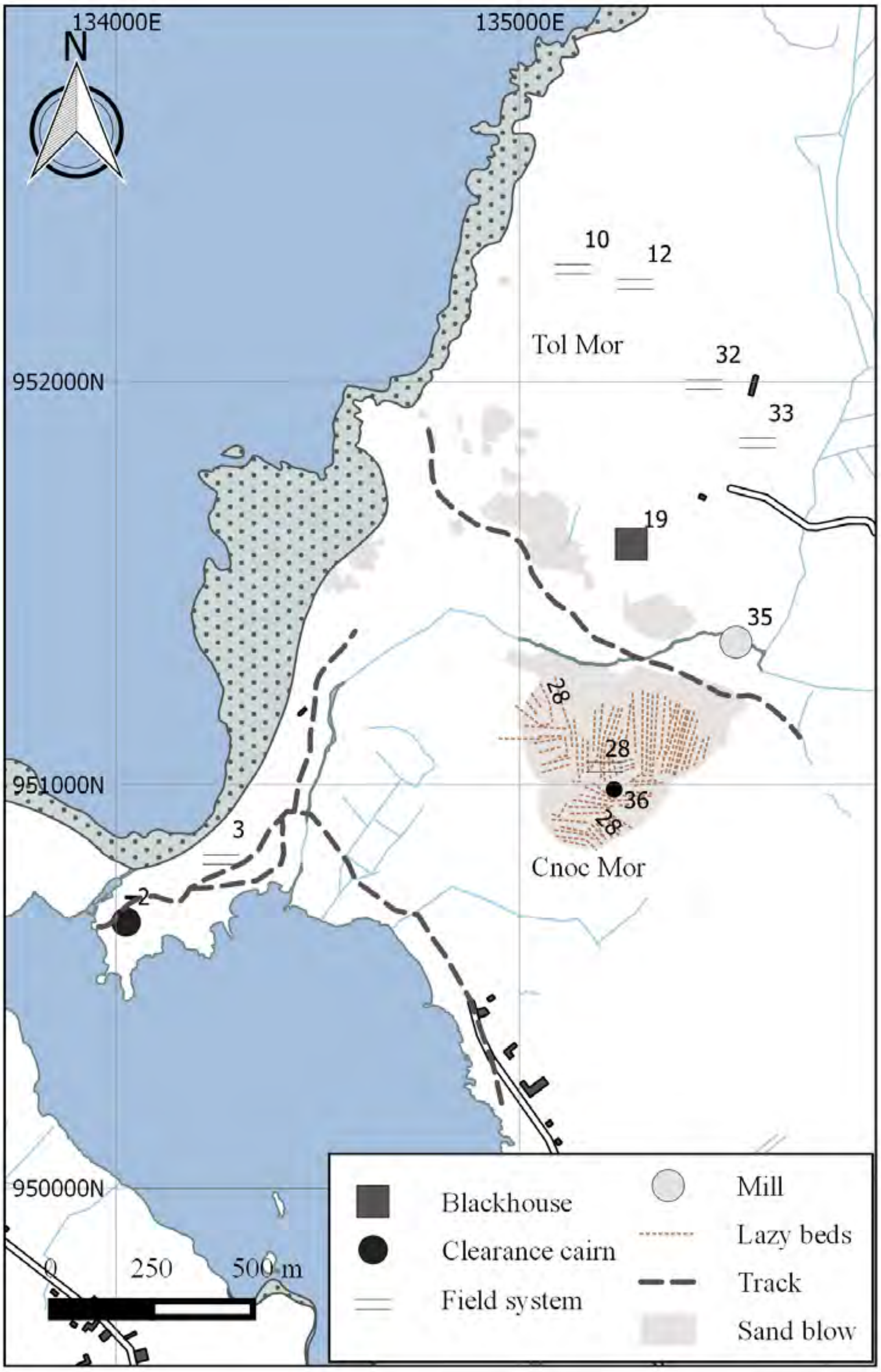
Both the prehistoric landscape of Barvas Machair/ Tol Beag, and the historic landscape of Barvas Machair North/Tol Mor fall within the former glebe land of Barabhas Uarach, an arrangement which is likely to have dated back at least to the 18th century and probably earlier. In contrast, Cnoc Mor is part of Barabhas Iorach, which has been historically held in a variety of forms of tenancy. These differences may underlie some of the contrasts in the character of the two historical landscapes covered by the surveys. Both the Tol Mor and the Cnoc Mor archaeological landscapes appear to be largely historical in date, though with hints of underlying prehistoric elements.

5.2.1 Tol Mor

The northern area, on Tol Mor (Illus 23), was identified in 1978 (Appendix A, B95) as having two phases of agricultural activity and settlement, the earlier represented by a large cleared area associated with field walls and stone clearance heaps, with a later landscape of field walls and enclosures overlying it. At the time, traces of similar features were located in smaller areas of erosion to the north of the burial ground which probably represented the continuation of the same agricultural complex.

The earlier phase of this landscape is site 10 in the 1998 survey (Cook 1999, 12), an extensive agricultural landscape of *feannagan,* long, narrow cultivation beds sometimes called 'lazy beds', which were built up with organic matter and sand to increase soil depth, and aligned downslope to improve drainage. These are overlain by a boundary wall running east–west which is shown on the first edition of the Ordnance Survey map (Illus 5). To the south of the boundary wall, sites 8, 9 and 11, all wall lines, belong to this earlier phase of use as well, as does site 27, an area of midden associated with later prehistoric or historic pottery. It is probably relevant to consider the Viking–Norse site B97 (Barabhas 2 – Cowie & MacLeod Rivett 2010c) in the context of this earlier historic landscape, located as it is at the southern edge, to the west of the cemetery; this site is in an area of sand extraction, and was not located during the 1999 survey. The cemetery, the site of the medieval Church of St Mary (see Illus 5), which was visible in 1803 when James Hogg visited (Hogg 1803, 111), lies on the southern edge of the historic settlement area of Tol Mor, on the boundary between the prehistoric settlement on the lower ground of Tol Beag, and the medieval and later landscape on the higher ground to the north.

The first edition map (Illus 5) pictures a later phase of this landscape, showing the land to the south of the boundary wall line as cleared of field boundaries and earlier houses, and containing four rectilinear enclosures, presumably stock pens, or small enclosed fields, or both. These are sites 8, 12, 32 and 33, the latter two of which were not located on the ground in 1998, and have since been cleared. It appears likely that the enclosure of the glebe land on Tol Mor, which must have happened in the late 18th or first half of the 19th century, involved the clearance of at least one settlement, and the reuse of stone in the construction of these later enclosures and the boundary wall. To the east of the glebe boundary wall, and outwith the survey area, the map shows a ruinous settlement identified as Tigh Thangaidh, which is still visible today. By the mid-19th century, then, the glebe land had been entirely cleared and rearranged, while the township land outwith the glebe retained the physical remains



Illus 23 Historic sites and landscapes

of a number of earlier, dispersed, post-medieval settlement foci.

Also outwith the Glebe boundary wall, at NB 359 513, are the remains of the Established Church School House, in use in the mid-19th century, and shown on the First Edition Ordnance Survey (Illus 5). Immediately to the north of the school house are the foundations of the church shown in use on the same map, which must have replaced the ruinous church of St Mary mentioned by Hogg (Hogg 1803, 111), the location of which is shown as Cladh Mhuire (the cemetery of Mary). Around the later church and school, ruinous buildings are shown on the map, and the foundations of these, with associated enclosure walls, are visible on the ground. This appears to have been another small settlement focus within the wider township of Barabhas Uarach, pre-dating the crofting township further to the east along the main road.

The remains of the Established Church Manse lie further to the north at NB 359 515, in an enclosed garden. These are shown on the mid-19th-century map with adjacent steading buildings, but the steading has been replaced by a very large, late-20th-century agricultural building, and the remains of the manse are now also an agricultural building. The manse itself may have been built in the 18th century or earlier. It was replaced towards the end of the 19th century by a much larger building, further east, at NB 363 514.

To the west of this area of settlement, at NB 355 513, the first edition map shows a mill on Allt Thatrabhat. Very faint traces of the mill pool and lade system can be seen on aerial photographs of the area, but the mill itself is no longer visible, due to the accumulation of wind-blown sand in this area.

5.2.2 Cnoc Mor

In Barabhas Iorach, south of Amhainn Thanndaigh, the Cnoc Mor is again a largely historical landscape. Focused around a corn-drying kiln with an adjacent enclosure (site 36, Cook 1999, 19) (Illus 24), a large area of strip cultivation (site 28, ibid) is defined by long linear areas of stone clearance, completely lacking in structure, and containing large amounts of very small stones, so definitely not walls. These amorphous features are the result of stone clearance from *feannagan*. Neither the structure nor the fields are shown on the first edition map (Illus 5), which maps, as discussed above (3.1) two phases of planned crofting settlement, the earlier abandoned. Neither of the phases of crofting settlement is on the same alignment as the field system on the Cnoc Mor, which clearly pre-dates the first layout of crofts in the township. The pre-crofting remains are therefore likely to be 18th century or earlier in date, a date supported by stray finds of medieval and early modern pottery in the area (CnES Sites and Monuments Record, site 7652), and may well be,

Illus 24 Site 36, corn kiln © AOC Archaeology/HES

in part, a physical representation of the multi-tenant township in Lower Barabhas which is documented in the 18th-century rentals (see 3, Historical context above).

As on Tol Mor, there are ephemeral suggestions on Cnoc Mor of an earlier landscape of a different pattern. Occasional areas of walling underlying and at a different orientation to the linear fields were noted in the 1996 survey, suggesting the possibility of an earlier field system of curvilinear enclosures (Burgess & Church 1997, 229), and a mound (site 37) and an eroding structure (site 25) were picked up during mapping in 1998 (Cook 1999, 19). In neither case is there any evidence to date the earlier sites.

The two modern landscapes shown on the first edition Ordnance Survey map are also interesting. The grid layout of the abandoned earlier landscape in Barabhas Iorach (Illus 5), and the generous size of the crofts, is in marked contrast to the settlement shown as occupied on the map, which is densely clustered along the lochside road and the main road running north to south parallel with the shore. Each of the crofts on the earlier landscape has only one or two buildings, most of which were ruinous when surveyed for the map, which suggests they may only have been occupied for a relatively short period, without time for the construction of additional outbuildings, or extra houses for family members. The early crofts are orientated north-east to south-west, whereas the later crofts, which relate to the occupied houses along the road, and are not shown on this map, are orientated north-west to south-east, and are much narrower. The two landscapes reflect a rationalisation of the landscape in accordance with Enlightenment ideals of improvement, but also an attempt by the estate to deal with the rapid population rise documented in the Statistical Accounts between the mid-18th century and mid-19th century (OSA 1791–9, 267; NSA 1836, 141–50).

6. CONCLUSION

It has been a fascinating exercise to attempt to draw together the variety of evidence deriving from surveys on the Barabhas Machair. This intensely vulnerable, easily cultivated sand landscape, which has been subject to erosion since prehistory, must always have been an area in which the past was visible in the present. The historic documentation has also emphasised that it was an important focus of the Lewis landscape, the location of high-status settlement, and relatively densely populated, reflecting the value of its agricultural land and fishing river.

Practically, the multiple surveys have allowed the ebb and flow of erosion and vegetation across the machair over the last four decades to be monitored, along with the exposure of the underlying archaeological landscapes. Each survey defined different priorities and parameters, and so provides different types and standards of information, which have been both a problem and a benefit. It has not been straightforward to cross-reference between the surveys, and where sites are missing between one survey and another, it is not always clear whether this is due to natural processes or the fallibility of analysis. The variety of approaches has, however, also yielded an enhanced level of interpretation, with both detail and synthesis, narrow and wider focus, which has made for a richer and more nuanced understanding of the development of the landscape than would have been possible with only a single survey.

The results provide a picture of long continuity, use and reuse of the area of the machair through prehistory from the Early Bronze Age onwards. Settlements, boundaries and burials referenced earlier uses of the same area, changing the functions, but not the topography in an environment where the stray finds evidence suggests that the whole of the machair landscape was actively used.

However, there are marked discontinuities as well; Neolithic settlement is lacking, despite the presence of Neolithic finds in the lithics assemblage, a pattern that parallels results from the SEARCH surveys in South Uist (Parker Pearson 2012, 411). The Early Bronze Age may have been a time of landscape reorganisation, and the reuse of the Early Bronze Age house for later burial indicates that it continued to serve as a landscape marker after its abandonment in favour of the later Bronze Age/Early Iron Age house to the east. Much later, settlement moved to higher ground, further from the shore, at some point after the end of the Long Iron Age, and enclosed fields were replaced by *feannagan,* two changes which may or may not have coincided. The location of Cladh Mhuire on the boundary between the prehistoric and historic landscapes suggests that it could have served both landscapes.

The historic settlements formed as a result of this move to higher ground appear to have persisted until the Early Modern period, if not later, in a landscape very different in its organisation and foci to the prehistoric landscape. Scattered small settlements are still visible as ruins in Barabhas Uarach, but a further, planned reorganisation is evident before the mid-19th century, in the creation of an early crofting landscape in Barabhas Iorach, and its rapid replacement by much more densely occupied settlement in both townships along the 19th-century road system by the 1850s.

In an environment that lies close to the margins of arable cultivability, the machair is a treasured resource, and through its use, the social, environmental and technological changes driven and suffered by the local community were, and are, played out. As such, there is huge potential for further work on Barabhas Machair; this report can be seen as an initial synthesis of the information available thus far. Machair landscapes are particularly vulnerable to climate change, both through sea level rise and extreme weather, and their archaeological importance as foci of prehistoric settlement is widely recognised (for example, Parker Pearson 2012). Inevitably, there will be further exposure of archaeological sites on the machair, and future research will change and enhance our understanding of its development.

APPENDIX A: SURVEY GAZETTEERS

In this gazetteer, an attempt has been made to bring together all the existing survey information, and to correct grid references and locations for sites as far as possible, where they are still visible on the ground. The methodologies of the surveys were very different; for example, grid references were worked out from the Ordnance Survey maps in 1978, while coastal monuments were entered on digitised Ordnance Survey base maps in 1997, and the entire landscape was mapped in relation to fixed base points in 1999. Errors and duplications therefore probably still remain. Between them, the authors were involved in all the surveys. The descriptions included in these gazetteers are taken from the original reports.

Table A1 Cross-referenced survey gazetteers

National Grid Reference (NGR)	Trevor Cowie & Alan Lane 1978	Christopher Burgess & Michael Church 1997	Murray Cook 1999
Checked and corrected where possible from site visits, maps and aerial images	From a draft prepared in 1995. The entries are arranged thus **Gazetteer no.** **Site name** **NGR** **Type of site** Description/remarks NMRS record no. (if any) References (if any) Museum (including accession nos if known) Date of site	This survey did not include detailed descriptions of the individual sites. Sites are therefore only included where a reasonable association based on location or personal knowledge can be made between them and either the 1978 or 1999 survey. Survey extended only to 100m from the coastline, except in exceptional circumstances.	This was a mapping survey which did not list grid references for individual sites. The identifications have therefore been made on the basis of **map location**, **description** and site visits.
NB 353 523 (centred)	**B95** **Barvas Machair North** **Deflation areas, field walls, cultivation, pottery scatters** Large areas of active erosion are present on the northern rim of Barvas machair. Apart from a few 'mesa' type knolls, the vegetated surface has been stripped to the original land surface directly overlying rock and till, on which there are numerous stretches of field wall and other more indeterminate walling, rectilinear features and traces of cultivation. Where the machair deposits still survive, the exposed faces (up to 1.5m in height) suggest that there have been earlier ephemeral phases of stabilisation. Altitude: between 30m and 40m contours. Centred NB 3536 5243: the original/underlying ground surface consists of dark gritty stony sand resting on greenish boulder clay, and has been exposed by erosion over a large area *c* 100m × 150m within which a few residual knolls of turf-capped windblown sand still survive. The area contains cultivation ridges (orientated roughly N–S), traces of several stretches of orthostatic field walls at various orientations, and also two low clearance cairns *c* 5m diameter. A stony area near the lazy bedding could be the amorphous remains of clearance or of indeterminate structures. A scatter of shell and abraded pottery probably represents spread of redeposited midden material. Undiagnostic sherds totalling 213.1g were recovered in 1978. Centred NB 3520 5210: this deflation area contains an indeterminate rectilinear structure and further stretches of field wall. Two phases of activity may be represented, the earlier represented by a large cleared area associated with field banks and stone clearance heaps, which are apparently traversed by a later series of field banks. Traces of similar features were located in smaller areas of erosion to the N of the burial ground and probably represent the continuation of the same agricultural complex. *Post-medieval/modern/unknown*	Outwith survey boundaries.	**8** **Enclosure** A clearance line with a right angle in its course and at least one internal division. Total length 40m, total width 20m. Associated with a buried soil. There was a noticeable difference in the amount of surface stone between the interior and exterior of the enclosure. The line of clearance incorporates two cairns. **9** Line of jumbled non-coursed stone clearance, located near or incorporating unstructured cairn. **10** **Cultivated landscape** A cultivated landscape comprising multiple lazy beds, clearance cairns and an earthen dyke. The landscape covers an area approximately 600m × 500m. The cairns are up to 10m long × 5m wide and 2m high, the dyke is around 600m long, 1.5m wide and up to 1m high. The cairns and the dyke have been augmented by recent clearance. **11** Line of jumbled non-coursed stone clearance. **12** **Enclosure** Rectilinear enclosure comprising grassy banks measuring 60m × 50m and up to 0.3m high (NMRS NB35SE 53.08). **26** **Enclosure** Line of clearance forming a sub-triangular shape measuring 30m wide and 30m long. **27** **Midden** Numerous pottery sherds all undecorated 2 undecorated rims & 33 pot sherds Late prehistoric/early historic pot **32** **Field system** Two rectilinear enclosures measuring in total 80m × 50m. Not located. (NMRS NB35SE 53.08.) **33** **Field system** Two rectilinear enclosures measuring in total 70m × 50m. Not located. (NMRS NB35SE 53.08.)

Table A1 *cont.*

National Grid Reference (NGR)	Trevor Cowie & Alan Lane 1978	Christopher Burgess & Michael Church 1997	Murray Cook 1999
NB 3533 5169	**B96** **Cladh Mhuire** **NB 3530 5173 but NB 3531 5173 on map** The site of Cladh Mhuire probably occupies a knoll within the burial ground, but no traces of the structure are visible. The extended cemetery is still in use. Altitude: *c* 30m. NB 35 SE 7 Martin 1716, 27; ONB 8B, 35–36; RCAHMS 1928, 10, no. 25 *Medieval/post-medieval/modern*	Outwith survey boundary.	Excluded.
NB 3516 5190	**B97** **Barvas Machair** **Settlement, midden, deflation surfaces** **Excavated in 1979 as B2** Large areas of active erosion are present N and NW of the burial ground (B96) where there are a series of well-developed dunes up to *c* 10m in height which have formed on an old ground surface directly overlying rock and till. Much rabbit activity was apparent. Midden material had been noted by the OS in a large hollow measuring *c* 50 × 40m within the dunes; when examined in 1978, there was a spread of redeposited midden material including pottery (totalling 269.5g), shell, bone and iron-working debris. This spread of unstratified material appeared to lie in bare sand on the original ground surface overlying till; elsewhere in the hollow, however, was what appeared to be an *undisturbed* bench of midden material associated with indeterminate but clearly structural stonework. Where exposed, the matrix of the midden was composed of reddish-brown sand with plentiful shell, especially limpet and winkle. In a further area which had been partially recolonised by plants, a line of stones suggested further structural material might still survive in situ. In view of the recovery of diagnostically Norse sherds, this site was investigated further in 1979 (=**B2**), since surface indications suggested the survival of only a remnant shelf of midden material, perhaps protected by some walling. In the event however, excavation revealed that the site was substantially more intact and richer in deposits than first suspected. The site can now be seen to consist of a mound of dense midden deposits up to *c* 1.5m thick, encapsulating at least two structures of indeterminate size and form. Partial excavation indicated that these were probably sub-rectangular with double-skinned walls, the cores being filled with turf and redeposited midden. Diagnostically, Norse pottery indicates a 10th/11th-century date. Although the contractors' operations have not as yet encroached on the area of the Norse settlement, the environs of this site have been altered radically as a result of recent sand quarrying by DH McLeod Ltd. The area requires urgent reassessment. NB 35 SE 16 Cowie 1979; Cowie & MacLeod Rivett forthcoming a *Viking/post-medieval/modern*	Area of sand extraction.	Area of sand extraction. Site not located.

Table A1 *cont.*

National Grid Reference (NGR)	Trevor Cowie & Alan Lane 1978	Christopher Burgess & Michael Church 1997	Murray Cook 1999
NB 348 520	**B98** **Barvas Machair** **Pottery scatter** According to NMS records, sherds of pottery and midden material are said to have been found in the general area NB 348 520, but no undisturbed deposits were located in 1978. Unknown	Not located.	Not located.
NB 351 517 (centred)		Outwith survey area.	**16** **Focus of domestic & funerary sites, excavated as BMP 2000–2001** 16.1 Cist Roughly sub-rectangular group of stones, measuring 2m wide, 2.4m long and up to 0.3m high, with a possible lower course surviving on the south side. There are also several possible disturbed cap stones. The structure is also covered by numerous quartzite beach pebbles. 16.2 Cairn Roughly sub-oval cairn with some putative structural elements surviving at the northern end and a spread of collapse at the southern end, measuring 4m long, 1.6m wide and up to 0.4m high. Traces of a buried soil are visible at the structure's northern end. 16.3 Structure A sub-oval enclosure of single stone measuring 4m long, 2.5m wide, and up to 0.6m high. Up to two courses of stone survive in the wall. The structure has a paved entrance at the south-east. The structure has been undermined at its western end. 16.4 Cist A series of edge-set stones forming a rough rectangle, measuring 1.4m long, 0.6m wide and up to 0.3m high. Traces of a buried soil are visible around the structure. 16.5 Cist A series of edge set stones forming a rough rectangle, measuring 1.2m long, 0.4m wide and up 0.2m high. 16.6 Cist Two edge-set stones, forming an 'L' shape, each stone is around 0.4m long and the width varies from 0.4m to 0.1m. There are traces of a buried soil to the north. 16.7 Structure A 'keyhole'-shaped structure measuring 5.5m long, 5m wide and up to 0.4m high. The structure has a small rectangular paved cell at its north-western end measuring 1.5m long × 1m wide. At the centre of the large cell lies two edge-set stones, forming one corner of a rectangle, measuring 0.5m × 0.5m, possibly a slot for a central post-hole. Cowie & MacLeod Rivett forthcoming b.
NB 3510 5170			**29** **Cist** A series of edge-set stones forming the corner of a rectangle measuring 1m long, 1m wide and up to 0.3m high.
NB 353 513 (centred)		Outwith survey area.	**17** Line of jumbled, non-coursed stone clearance.

Table A1 *cont.*

National Grid Reference (NGR)	Trevor Cowie & Alan Lane 1978	Christopher Burgess & Michael Church 1997	Murray Cook 1999
NB 3481 5196	**B99** **Barvas Machair** **Slab; pottery** An upright slab of stone was found at the foot of a 4m-high sand cliff in an area undergoing erosion to till/bedrock near the shore. It was not certain that the slab had been artificially placed, but a sherd of possible prehistoric pottery was recovered from here. Altitude: 10–20m. *Unknown*	**NB 35 SW 03** **Midden, kitchen**.	This may be site 31, which is not described in the report.
NB 3471 5192	**B100** **Barvas Machair** **Walling?** Emerging from the low dunes near the coast and running to the cliff edge, there is a 3m-long stretch of exposed walling, composed of edge-set boulders protruding from the sand directly overlying the till. Altitude: <10m. *Unknown*	**NB 3472 5191** Stone alignment, midden, shell.	7 Jumbled non-coursed stone clearance. See also NB 3480 5179 below.
NB 3470 5185	**B101** **Barvas Machair** **Walling?; boulder concentration** In an area deflated to the original ground surface, over till and bedrock, a short 1.5m stretch of drystone walling was located, with an upright stone at one end *c* 0.50m high. Differential lichen growth and the instability of the stone suggested that the upright had probably only recently been moved into position. A concentration of boulders in the area may represent a collapsed stone structure. A small amount of featureless pottery was recovered (11.1g). *Unknown*	**NB 35 SW 6** **Burial, bone, human**	**30** **Burials** Two skeletons excavated from a coastal promontory Rubh A'Bhiogair (site no. 30) (NMRS NB 35SW 6; Stuart 1996).
NB 3480 5179	**B102** **Barvas Machair** **Clearance cairn?** A circle of boulders and smaller stones *c* 3m × 2m lying on till with a slight covering of sand may be the deflated remains of a clearance cairn. Several other amorphous spreads of stone could reflect the severely deflated remains of clearance features. *Unknown*		7 Line of jumbled, uncoursed stone clearance.
NB 3480 5170	**B103** **Barvas Machair** **Stone settings** A pair of roughly horse-shoe-shaped boulder settings set in the machair sward: one was *c* 3 × 3m and open to the NW; a second semicircle of similar dimensions, composed of smaller edge-set stones open to the SW. *Modern/unknown*		**14** **Structure** An arcing line of single stones forming a semi-circular shape measuring 4m long and 4m wide, and up to 0.3m high.

Table A1 *cont.*

National Grid Reference (NGR)	Trevor Cowie & Alan Lane 1978	Christopher Burgess & Michael Church 1997	Murray Cook 1999
NB 3488 5168 or 349 517	**B104** **Barvas Machair** **Structure, midden deposits** **Excavated in 1979 as B1** Walking of Barvas machair in 1978 led to the discovery of a low grass-covered knoll badly truncated by erosion and badly disturbed by rabbit burrowing. Eroding out from a dark layer *c* 0.15m thick visible in the flanks of the knoll were fragments of pottery, bone, worked stone and quartz, and apparently, structural stonework, the possible site of a hearth and ashy material combining to suggest the survival of a truncated fragment of a once-larger domestic site, judging by the scatter of redeposited shell, bone and other debris littering the surrounding deflation surfaces. The coarse undecorated pottery appeared on the basis of fabric identification to be later Bronze Age in date. The main scatter covered an area of *c* 8m × 3m. Excavation in July 1979 revealed that as suspected the site was in a near-terminal condition, and as such the results were rather inconclusive (= **B1**). A structure of indeterminate original size and form enclosed the vestigial remains of a partly paved and peat-ash covered floor (*c* 5 × 4m in surviving area) from which were recovered a scatter of sherds, worked stone, bone, antler and shells. The available evidence suggests that the walling had consisted of a turf-and-sand core revetted by stonework; there may have been internal post-holes and a partition wall, but the extent of the rabbit disturbance frustrated the recovery of any meaningful picture of the internal features. The structure appears to have been affected by erosion in antiquity prior to a reocccupation which produced a similar range of artefacts. Truncation by wind erosion abetted by rabbit disturbance had thereafter reduced the site to its present condition. Cowie 1979; Cowie & MacLeod Rivett forthcoming b *Prehistoric/Bronze Age*	NB 3488 5170 a, b & c Stone alignment, 2 shell middens. Settlement mound.	**23** **Midden** Large mound rich in shells (limpets, winkles and oysters), animal bone (cattle, horse and fish), pot and slag. Measures 40m × 20m and up to 2m high. **24** **Midden and cist** Discrete concentration of shells (limpets, winkles and oysters), animal bone (cattle, horse and fish), pot and slag, with a possible long cist at its centre. Measures 40m × 30m. May be a continuation of site no. 23.
NB 3498 5177	**B105** **Walling?** Two amorphous scatters of boulders, *c* 7 × 4m, and *c* 6 × 0.5m, were located within deflated areas and probably represent collapsed stretches of field walls. *Unknown*		**22** **Bipartite structure** A dry stone structure with two cells, measuring 5m long and 2.5m wide. The structure has an internal division comprising large edge-set stones, and includes some edge-set stones within it walling. Associated with a line of jumbled, uncoursed stone clearance.
NB 3491 5171		NB 3491 5171 Prehistoric burial cist, chipped stone found.	**21** **Cist** Two edge-set stones at right angles to each other, forming a rectangle measuring around 0.9m × 0.6m and up to 0.3m. The site sits on the edge of an eroding buried soil.
NB 3513 5166			**20** **Enclosure** Line of jumbled non-coursed stone clearance forming a sub-rectangular enclosure with at least one internal division, surrounding site no. 16, element 3. Associated with a buried soil. Total length 180m, total width 80m. Incorporates at least one cairn within its length.

Table A1 *cont.*

National Grid Reference (NGR)	Trevor Cowie & Alan Lane 1978	Christopher Burgess & Michael Church 1997	Murray Cook 1999
NB 3490 5188	**B106** **Barvas (= Barvas Site 3)** **Structure, midden, burials** **Excavated in 1987 as B3** Small-scale excavations were carried out following the discovery by Mr P McFarlane of an eroding burial in a sizeable deflation area. The very tightly crouched, unaccompanied inhumation of a female lay in the remains of a shallow oval grave. The grave had been scooped into windblown sand and midden deposits, the latter apparently lying to one end of an eroding structure. Further work was carried out in 1987 to elucidate the nature of the eroding structure. Excavation revealed the truncated remains of a small house, with evidence of several phases of occupation and rebuilding associated with midden deposits producing domestic beaker pottery, worked quartz and bone. Following erosion of both the structure and the middens in antiquity, the site had apparently been used as a cemetery. Three unaccompanied crouched inhumations were discovered: one like that, found in 1986, had been placed in a pit scooped into the windblown sand and eroded midden surface; one lay in a very shallow scoop on the line of the wall of the earlier house, and the third had been deposited, apparently in a decomposed condition, within the structure. Extensive surface collections of flaked stone were subsequently recovered from the eastern portion of the same deflation area. NB 35 SW 4, NB 35 SW 5 Cowie et al 1986; Cowie 1987; Curtis & Ponting 1988 *Prehistoric/Neolithic/Bronze Age*		**13** **Midden** A discrete concentration of shell and bone 25m long and 20m wide, associated with a buried soil. This is one of the sites of T Cowie's excavation. Examination of rabbit burrows reveals approximately 0.2m depth of anthropic deposit (NMRS NB 35SW 4).
NB 3480 5189			**15** Line of jumbled non-coursed stone clearance.
NB 353 514 (centred)	**B107** **Tol Beag, Barvas** **Enclosure, indeterminate structures** On the stabilising slopes (to the E of an area of defunct sand quarrying) are the collapsed/deflated remains of indeterminate rectilinear structures in an area confused by much glacial detritus. The clearest is a boulder enclosure measuring *c* 25m across, some 30m N of the ford across the Handay River. *Unknown*		**18** **Cairn** NB 3539 5149 Linear roughly coursed cairn, approximately 4m long, 1m wide and up to 0.4m high. **19** **Settlement, enclosures** NB 3529 5152 A series of earth and stone dykes, between 5m and 10m in length, 1m wide and up to 0.6m high. Forming either the fragmentary remains of blackhouses or sheep pens (NMRS NB35SE 16).

Table A1 *cont.*

National Grid Reference (NGR)	Trevor Cowie & Alan Lane 1978	Christopher Burgess & Michael Church 1997	Murray Cook 1999
NB 351 513	**B108** **Cnoc Mor, Barvas, NB 353 512** **Cultivation strips, stone clearance** There is a major area of erosion on the gentle slopes of Cnoc Mor Barvas to the N and above Barvas. The machair is being stripped to the underlying rock and till surface and within this, former cleared areas are apparent as relatively boulder-free strips between straggling lines of boulder and stone. The area was cultivated until the recent past. No finds. *Modern*	NB 3510 5130 On the north-facing slopes of Cnoc Mor to the south of the (Handay) river is a complex field system with rectilinear fields that overlie the fragments of a curvilinear field system. At the centre of this field system is a rectilinear structure. It has been suggested that this settlement may date to the Norse period (pers comm M. MacLeod 1996) but equally it may date to the medieval or post-medieval period.	**28** **Field system** A series of 76 lines of clearance covering an area 450m long and 400m wide which form a set of linear fields between 6m and 12m wide. The fields are generally orientated down-slope and are centred around site no. 36.
NB 3481 5072		NB 3481 5072 Rigging	See above.
NB 3525 5100		NB 3487 5074a Enclosure, habitational, rectilinear, drystone	**36** **Corn kiln** This is a rectilinear structure measuring 12.5m long and 6m wide, the walls of the structure survive up to three courses high, but only project 0.4m above ground. The southern end of the structure contains many more stones, within which it is possible to see a circular chamber. There is an attached enclosure on the eastern side measuring 10m long and 6m wide.
NB 3525 5101		NB 3488 4052 Enclosure, rectilinear, drystone	See above.
NB 3487 5074		NB 3487 5074b Cairn	**37** **Mound** A sub-oval mound 13m long and 6m wide. From the surface of the mound were recovered fragments of burnt bone, slag and pottery. The mound itself has the trace of line of clearance running across its north-eastern tip.
		Not located.	**25** **Eroding structure** A line of dry stone walling up to three courses high is being exposed on the southern edge of the blowout on Cnoc Mor. The walling is around 20m long and up to 0.4m high. There are no traces of associated midden material.
NB 3589 5156	**B109** **Barvas Old Manse** **Coin hoard** A hoard of 12 18th-century half-pennies was found in the ruins of the Old Manse. NB 35 SE 22 *PSAS*, 94 (1960–61), 329 *Post-medieval*	Outwith survey area.	Outwith survey area.

Table A1 *cont.*

National Grid Reference (NGR)	Trevor Cowie & Alan Lane 1978	Christopher Burgess & Michael Church 1997	Murray Cook 1999
NB 3476 5044	**B110** **Loch Mor Barvas** **Structures, midden** The eroded remains of structures were exposed in 1976 as a result of lower than usual loch levels: within the remains of boulder-built walls, rescue excavation by Mr and Mrs G Ponting revealed hearths defined by edge-set slabs, paved areas. Considerable quantities of Iron Age pottery, worked stone and bone were recovered. Midden material being exposed by wavelet action on the adjacent shoreline contains shells, bones and pottery fragments. Owing to high water levels the site of the settlement was inaccessible in 1978, but pottery totalling 53.1g was recovered from the shore area. As a result of a further marked reduction in the loch level, it was possible to plan the remains of the structures in 1984. NB 35 SW 1 Cowie 1979, 46–7; Ponting et al 1984 *Prehistoric/Iron Age/Medieval/Post-medieval*	Not located – high water levels	**1** **Dwelling** An arcing line of single stones which would have formed a sub-circular structure measuring around 4m in diameter. The structure has a rectangular hearth (traces of peat ash were observed) roughly at its centre, measuring 1m × 1.2m. The structure has a paved cell to the north, measuring 2m long and 1.8m wide (NMRS NB 35SW 1). Finds Undecorated pottery and slag
NB 348 506	**B111** **Barvas Machair** **17th-century coins** Two copper coins were found on a surface disturbed by a sewage trench at NB 348 506: one was a coin of Louis XIII dated 1637, the other a 2d of Charles I dated to the 1640s. NB 35 SW 2 Cowie 1979, 47; Ponting, B. 1980, 43 *Post-medieval*		
NB 3458 5156			**6** **Gun butt** Oval dry stone structure 2m long, 1.5m wide and up to 0.7m high.
NB 3456 5150			**5** Line of jumbled non-coursed stone clearance.
NB 3447 5113			**4** **Cairn** Cairn of beach cobbles measuring 2.5m long, 1m wide, up to 0.4m high. In the absence of any positive evidence for a funerary function, assumed to be clearance cairns.
NB 3421 5071	**B112** **Loch Mor Barvas** **Indeterminate walling; boulder concentration** A short arc of walling, 1m long, composed of small boulders arranged in three courses. A nearby concentration of boulders in an oval scatter over an area *c* 3m × 3m, is probably simply the product of field clearance. *Unknown*	NB 3410 5073 Marine industry features	
NB 3420 5065	**B113** **Loch Mor Barvas** **Stone setting?, boulder concentration** An amorphous scatter of boulders, one of them set upright, occupy an area *c* 2m × 2m in a minor blow-out *c* 15m from the loch-edge. *Unknown*	NB 3411 5064 Cairn	

Table A1 *cont.*

National Grid Reference (NGR)	Trevor Cowie & Alan Lane 1978	Christopher Burgess & Michael Church 1997	Murray Cook 1999
NB 3388 5071	**B114** **Loch Mor Barvas** **Enclosure** An area *c* 40 × 80m is enclosed on three sides by walls of boulder construction. *Unknown*	NB 3391 5075 Dyke, stone and turf	**2** **Enclosure** Single grassy bank up to 1m wide, 90m long and up to 0.3m high.
NB 3348 5073	**B115** **Loch Mor Barvas** **Field wall** Turf-covered field wall of boulder construction, following a curving course over a distance of *c* 50m, on the edge of a rise. *Unknown*	NB 3385 5082 Dyke, stone and turf	**3** **Field system** Three parallel grassy banks 50m apart, up to 2m wide, 60m long and up to 0.5m high (NMRS NB35 SW 11).
			35 **Watermill** Not located (NMRS NB35SE 53.08)

APPENDIX B: THE ELLIOTT COLLECTION LITHIC ASSEMBLAGE

Torben Bjarke Ballin

B1 Introduction

Over a number of years, amateur archaeologist Mark Elliott, Lewis, surveyed seven areas within the general Barabhas dune system (machair) and collected all the archaeological finds he noticed (6,883 lithic and stone artefacts). This project was referred to as the Barabhas Erosion Project. Following Mark Elliott's untimely death, it was decided to include his finds in the wider Barabhas Machair Project (Mary MacLeod Rivett, Lews College, Stornoway, and Trevor Cowie, National Museums Scotland), where they will form a valuable supplement to the finds already reported on from this area.

The above-mentioned seven areas were selected when new deflation areas developed (for general discussion of machair archaeology, see Barber 2011) or, in one case, when an area was affected by sand extraction (Area F). The areas are:

- A – NGR: NB 3512 5169 (area of Iron Age site BMP 2000–1 F16)
- B – NGR: NB 3507 5160
- C – NGR: NB 3497 5167 (area of Bronze Age/Early Iron Age B1, F21)
- D – NGR: NB 3490 5174
- E – NGR: NB 3495 5185 (area of Beaker period site B3)
- F – NGR: NB 3515 5195 (area of sand extraction)
- G – NGR: NB 3504 5185

The author has previously reported on excavated and collected lithic and stone assemblages from parts of the Barabhas machair, such as:

- Barabhas 1 (Ballin 2010a)
- Barabhas 2 (Ballin 2010b)
- Barabhas 3 (Ballin 2010c)
- Barabhas 2000 (Ballin 2010d)
- Barabhas 2001 (Ballin 2010e)
- The Curtis Collection (Ballin 2010f)
- The Murray collection (Ballin 2010g)
- Comparative report (Ballin 2010h)

The present collection (the Elliott Collection) also includes a small number of additional lithic and stone artefacts received from Chris Murray, Lewis.

The purpose of the present report is to characterise the lithic and stone artefacts in detail, with special reference to raw materials and typo-technological attributes. From this characterisation, it is sought to date and discuss the finds. The evaluation of the lithic material is based upon a detailed catalogue of the lithic and stone artefacts from Elliott's survey, and in the present report the artefacts are referred to by their number (CAT no.) in this catalogue (an Access database). Artefacts in other raw materials recovered in connection with Elliott's work have been entered into the database (not included amongst the 6,883 artefacts mentioned above), but they do not form part of this report and its discussion.

It was initially intended to subdivide the report into a number of sections, each dealing with one area, but for a number of reasons this was decided against:

- Cursory initial inspection indicated that there is no significant difference between the various areas in terms of raw materials present and the typo-technology of the various sub-assemblages, and the finds were therefore characterised as one group, with minor compositional differences picked up in a subsequent discussion of the distribution of the lithic and stone artefacts (below). The material seems to be predominantly Early Bronze Age, supplemented by small numbers of Early and later Neolithic objects.
- The work turned out to be substantially more time-consuming than initially estimated, mainly due to the severe 'sand-blasting' (aeolian abrasion) of most artefacts. This made it difficult to identify and characterise the individual artefacts, and time had to be invested in the development of approaches which would allow these heavily abraded objects to de dealt with in a sensible manner that would allow the Elliott Collection to be compared to the other assemblages dealt with as part of the general Barabhas Machair Project.

This state of affairs added another aim to the production of the present report, and the processing of the Elliott Collection may be perceived partly as a case study in how to deal with lithic and stone artefacts recovered from dune systems, and which are heavily affected by aeolian abrasion.

Initially, it was also hoped that it would be possible to carry out GIS-based distribution analysis of the finds, but following the characterisation and cataloguing of the finds, quantification allowed an estimate to be made of how large a proportion of the assemblage was associated with grid references. It turned out that only *c* 2.5 per cent of all finds were gridded in connection with their recovery. Approximately half of these finds are tools (mostly arrowheads and scrapers). Although most of the arrowheads may have been gridded (due to their obvious shapes making them easily recognisable), only about one-third of the scrapers were dealt with in this manner, and very few other implements, not to mention the notable amounts of lithic waste, and the stone tools. Undertaking GIS-based analysis on this basis would most certainly produce a skewed and misleading picture.

However, the Elliott Collection still provides a valuable addition of lithic and stone artefacts from the Barabhas machair, allowing a more detailed picture to be produced of the Neolithic and, in particular, Early Bronze Age material culture on the Western Isles.

B2 The assemblage

During his survey of the Barabhas machair, Mark Elliott recovered 6,883 lithic and stone artefacts from seven different parts of the Barabhas dunes (Areas A–G). The finds are listed in Table 2. He also retrieved a number of other finds, such as 67 pottery sherds, six pieces of slag, two pieces of pumice, one furnace fragment, two pieces of shell, and 12 pieces of bone. These finds have been entered into the collection database, but they will not be characterised or discussed further in this lithics and stone report.

In total, 93 per cent of the assemblage is debitage, whereas 3 per cent is cores, and 4 per cent is tools. These ratios are approximations, as the abrasive effect of the wind and sand ('sandblasting') made it difficult to identify edge and surface modification, as well as other attributes, and small numbers of flakes and blades may be sandblasted cores and tools. Due to the available time and funding, it was decided only to record the greatest dimensions of the flakes, but all three dimensions of blades/microblades, cores and tools (see debitage, core and tool sections below).

The definitions of the main lithic categories are as follows:

- *Chips*: All flakes and indeterminate pieces the greatest dimension (GD) of which is ≤ 10mm.
- *Flakes*: All lithic artefacts with one identifiable ventral (positive or convex) surface, GD > 10mm and L < 2W (L = length; W = width).
- *Indeterminate pieces*: Lithic artefacts which cannot be unequivocally identified as either flakes or cores. Generally the problem of identification is due to irregular breaks, frost-shattering or fire-crazing. *Chunks* are larger indeterminate pieces, and in, for example, the case of quartz, the problem of identification usually originates from a piece flaking along natural planes of weakness rather than flaking in the usual conchoidal way.
- *Blades and microblades*: Flakes where L ≥ 2W. In the case of blades W > 8mm, in the case of microblades W ≤ 8mm.
- *Cores*: Artefacts with only dorsal (negative or concave) surfaces – if three or more flakes have been detached, the piece is a core, if fewer than three flakes have been detached, the piece is a split or flaked pebble.
- *Tools*: Artefacts with secondary retouch (modification).

GD: Greatest dimension. *Av. dim.*: Average dimensions.

The applied terminology of stone artefacts follows the nomenclature proposed in connection with the analysis of the assemblage from Barabhas 3, also Lewis (Ballin 2010c). The definitions, which follow Ballin Smith (1994), are mainly based on the character of the use-wear/damage, the character of the applied motion or force, and artefact size.

Hammering motion

Hammerstones: 1) fist-sized or slightly smaller/larger; 2) crushed ends.

Table B1 General stone artefact list

	Quartz	Quartzite (+ sandstone)	Flint	Mylonite	Other fine-grained	'Black rock'	Coarse-grained	Amphibole-bearing	Limestone	Total
Debitage										
Chips				1						1
Flakes	4,568	651	483	151	23	92	48	15	16	6,047
Blades	82	12	38	9		1	1			143
Microblades	5		6							11
Indeterminate pieces	179	2	13	6		7				207
Crested pieces	3	1	1							5
Platform rejuvenation flakes			1							1
Total debitage	*4,837*	*666*	*542*	*167*	*23*	*100*	*49*	*15*	*16*	*6,415*
Cores										
Split pebbles	12									12
Core rough-outs	2									2
Single-platform cores	15	4	2							21
Opposed-platform cores	1									1
Cores w two platf at angle	1									1
Discoidal cores, irregular	1									1
Irregular cores	23	2	4							29
'Flaked flakes'			2							2
Bipolar cores	37		85	7	2	2				133
Core fragments	4		1				1			6
Total cores	*96*	*6*	*94*	*7*	*2*	*2*	*1*			*208*

Table B1 *cont.*

	Quartz	Quartzite (+ sandstone)	Flint	Mylonite	Other fine-grained	'Black rock'	Coarse-grained	Amphibole-bearing	Limestone	Total
Tools										
Leaf-shaped arrowheads			1	1						2
Oblique arrowheads	1									1
Barbed-and-tanged rough-outs	7									7
Barbed-and-tanged arrowheads	13		4	6		1				24
Bifacial arrowheads	1					1				2
Backed knives	1									1
Scale-flaked knives	2		1							3
Discoidal scrapers	1		1							2
Short end-scrapers	17		57	18			1			93
Double-scrapers			4							4
Side-scrapers	2		13	4						19
End-/side-scrapers	1		4							5
Scraper-edge fragments	2		4	2		1				9
Piercers	3		2							5
Burins			1							1
Pieces w retouched notch(es)	1									1
Serrated pieces	1									1
Combined tools			2							2
Pieces with invasive retouch	3			1		1				5
Pieces with edge-retouch	22	1	18	2					1	44
Points	1							1		2
Hammerstones	1	2				1	1			5
Hammerstones, specialised	1	2								3

Table B1 *cont.*

	Quartz	Quartzite (+ sandstone)	Flint	Mylonite	Other fine-grained	'Black rock'	Coarse-grained	Amphibole-bearing	Limestone	Total
Hammerstones/anvils								1		1
Pounders	4	5					3	1		13
Pounders/anvils		1								1
Fabricators ('rods')	1									1
Discs							2			2
'Hollow stones'						1				1
Total tools	*86*	*11*	*112*	*34*		*6*	*7*	*3*	*1*	*260*
TOTAL	**5,019**	**683**	**748**	**208**	**25**	**108**	**57**	**18**	**17**	**6,883**

Light hammering mainly pushing/rotating motion

Pounders: 1) usually fist- to head-sized (smaller specimens are not uncommon); 2) pecked, faceted ends.

Grinders/pestles: 1) fist-sized or slightly smaller/larger; 2) finely pecked to ground/polished, rounded facet at one or both ends.

Pushing motion

Polishers: 1) fist-sized or slightly smaller/larger; 2) highly polished, striated, usually slightly concave/slightly convex faces, occasionally forming clear facets against the edges.

Rubbers: 1) usually too large to use in the same fashion as the above types – mostly head-sized or larger; 2) usually one ground/polished, striated, slightly convex face; used in connection with saddle querns, which have the same type of wear, but one concave face.

It should be noted that:

1. Hammerstones as well as pounders may have had flakes detached from their terminals, due to the applied force. However, the detachment of flakes from the ends is more commonly experienced in connection with hammerstones.
2. There is notable overlap between pounders and grinders/pestles, probably largely as a matter of degree of use, with grinders/pestles having been used more extensively, thus acquiring smoother work-faces. As a consequence, this group is simply referred to as pounders in the present report.
3. Pounders, grinders and pestles are generally perceived as having been used in connection with a vessel (a 'mortar'), whereas hammerstones did not require a vessel.
4. Small rubbers are distinguished from polishers by their usually convex face (never concave) – in some cases, the ground/polished face of a rubber may curve gently, but notably, up towards one end, probably as a consequence of the specific way they were moved across the working surface of a saddle quern.

As illustrated in Table B2 (covering the main flaked materials), there is a distinct difference between the composition of the quartz, flint and mylonite sub-assemblages. Primarily, the flint and mylonite assemblages have much higher tool ratios than the quartz assemblage (15–17 per cent compared to 2 per cent), whereas the quartz artefacts have a considerably higher debitage ratio (96 per cent compared to 72–80 per cent). Higher flint and mylonite tool ratios have been reported in connection with other lithic assemblages from the Western Isles (eg Ballin 2002; 2008; forthcoming), and are probably caused by two main factors: 1) due to the tendency of many quartz types to flake in an intricate way, or even shatter on impact, quartz tends to produce more waste per finished tool than flint and mylonite, and 2) due to the relative local scarcity of flint and mylonite (in conjunction with these raw materials' better flaking properties), flint and mylonite were considered more precious than quartz, and even very small pieces of these raw materials were transformed into implements, leaving less unmodified waste.

Although these general trends may be noticed throughout Neolithic and Early Bronze Age assemblages on Lewis (Ballin 2008), the specific ratios vary. This is due to a number of factors, such as 1) some assemblages have been sandblasted, whereas others have not; 2) some assemblages were recovered through excavation, whereas others were retrieved through surface collection; and 3) in terms of surface-collected assemblages, some lay collectors had a better 'eye' than others, and Mark Elliott was clearly able to recognise even very small pieces of worked quartz, flint and mylonite, resulting in greater debitage ratios and smaller tool ratios. In other Scottish assemblages (ibid), flint, for example, may have tool ratios of as much as *c* 20–60 per cent.

Raw materials – types, sources and condition

In total, 78 per cent of the lithic and stone artefacts were defined as more or less sandblasted. The sandblasting varies from lightly to heavily abraded, and some of the latter pieces have been so heavily affected that they are on the verge of becoming pebbles or cobbles again. The various raw material groups have different abrasion ratios and, for example, 78 per cent of the quartz artefacts have been defined as sandblasted, whereas the flint artefacts have an abrasion ratio of 81 per cent and the mylonite artefacts of 100 per cent.

This is due to two main factors, namely 1) that the different raw materials are more or less soft or hard; and 2) that the abrasive effect of the sandblasting is more notable on some raw materials than on others. Where for example sandblasting only affects the edges and ridges of flint, occasionally making it difficult to distinguish between sandblasting and traditional weathering (cortication *sensu* Shepherd 1972), sandblasting of mylonite is considerably easier to recognise, as the combination in mylonite of varying hard and soft layers gives sandblasted mylonite a decidedly ridged appearance – the hard layers survive, whereas the soft layers are worn away. In the same way, an analyst may find it easier to identify sandblasting of grainy materials, as the abrasion frequently wears away the softer cement between the (mostly hard quartz) grains, leaving a 'knobbly' surface, but some cements are resistant to wear, resulting in some grainy types of stone simply receiving a surface polish. In the latter case, it may be difficult to distinguish between grainy rock forms like quartzite and sandstone, which both consist of cemented quartz grains (quartzite being altered sandstone; Pellant 1992, 220).

Table B2 The distribution of raw materials by main artefact categories

	Numbers			Per cent		
	Quartz	Flint	Mylonite	Quartz	Flint	Mylonite
Debitage	4,837	542	167	96	72	80
Cores	96	94	7	2	13	3
Tools	86	112	34	2	15	17
TOTAL	5,019	748	208	100	100	100

Mainly due to the various effects of sandblasting, and the way this affects identification of the individual types of minerals and rocks, the decision was taken to operate with a number of more general categories, namely quartz, quartzite/sandstone, flint, mylonite, other fine-grained forms of rock, 'black rock', coarse-grained rock, amphibole-bearing rock, and limestone. These raw material types are defined in the following manner:

- Quartz: This category embraces not only milky quartz but also fine-grained quartz. As mentioned elsewhere (Ballin 2008), it may be difficult to distinguish between fine-grained quartz (mostly formed by the solidification of hydrothermal fluids) and the fine-grained basal quartzite of western Scotland (formed through metamorphosis of other rock forms), and it is possible that some of the collection's fine-grained quartzes are actually fine-grained quartzite.
- Quartzite/sandstone: Rock forms consisting of coarser grains of quartz, either forced together by pressure or cemented together.
- Flint: As discussed in a number of papers (eg Ballin 2014; Hardy et al forthcoming), many so-called flints found in western Scotland may actually be cherts (ie formed during other than the Cretaceous period), but to distinguish between flint proper (Cretaceous) and flint-like cherts (non-Cretaceous) it would be necessary to carry out analysis of the fossil fauna of the individual pieces, and in the present report, the term 'flint' covers flint proper as well as flint-like chert.
- Mylonite: In a recent volume on the material recovered at Northton on Harris (Phillips et al 2006), it was suggested that pieces from that site which were previously referred to as mylonite might be Staffin baked mudstone. However: 1) where baked mudstone from for example An Corran on Skye is generally monochrome (Saville et al 2012, figs 23–5), most pieces traditionally referred to as Western Isles mylonite (including the pieces from the Neolithic and Bronze Age levels at Northton) are notably stripy (Ballin 2002); and 2) some pieces from this category retrieved at Calanais, Lewis, were identified by geologist Dr Alan Hall, University of Glasgow, as 'typical mylonite' or possibly 'a tectonised amphibole' (Ballin forthcoming). In the present report it has therefore been decided to retain the term mylonite for these pieces (following Lacaille 1937), awaiting a more thorough and general future investigation of this group of raw material.
- Other fine-grained forms of rock: This group includes a number of different materials which are flint-like, but where colours and patterning diverge from the attributes usually associated with flint/chert. Some of these pieces are thought to be different forms of chalcedony (including one flake in jasper [CAT 6929] and one bipolar core in bloodstone [CAT 6652]), whereas others may be rare forms of chert.
- 'Black rock': The difficulties associated with the more detailed definition of dark pieces from Barabhas are generally caused by the sandblasted surfaces of these pieces. It is thought that the group includes a variety of raw materials such as dolerite, amphibolite and pseudotachylite.
- Coarse-grained rock: Although some coarse-grained pieces recovered from Barabhas are clearly identifiable as for example granite or gneiss, others have been so heavily sandblasted that they could only be identified as coarse-grained igneous or metamorphic rock. It was therefore decided to refer all coarse-grained rock forms to this general category. Some layered micaceous rock forms (eg some gneisses and schists, as well as some amphibole-bearing rock forms) occasionally split along sheets of mica, and following sandblasting they could easily be mistaken for flakes. These 'geo-facts' may be recognised by their usually regular oval outline and their two opposed entirely flat faces, where the standard dorsal and ventral faces of artefactual flakes almost always curve somewhat along their long axis.
- Amphibole-bearing rock: A total of 18 pieces clearly contained substantial amounts of amphibole, most likely hornblende. It is uncertain which specific rock form(s) they belong to, although some of these pieces are likely to be amphibolite.

- Limestone: This category includes a number of very different rock types, some of which are barely usable as toolstone, whereas others are flint-like and flake in a highly controllable manner. All these pieces were exposed to hydrochloric acid by the author, and all 'fizzed' more or less notably, showing that they contain calcareous matter. The best forms of limestone (in terms of flaking properties) from Barabhas are quite similar to the carboniferous limestone found at Lough Allen, Ireland (Driscoll et al 2013).

Most of these rock forms occur throughout the Western Isles, either as parts of the local rock formations (eg quartz), or as secondary deposits along the coast (eg quartz, flint and flint-like cherts). Mylonite is thought to have been formed in connection with tectonic processes along the main faultline of the Western Isles, and it was probably 'imported' from sources in eastern Lewis (cf Smith & Fettes 1979, fig 3; Fettes et al 1992). Pseudotachylite is a form of black glass formed in the same geological environment and by the same tectonic processes as mylonite, and it also occurs along the main faultline of the Western Isles (Fettes et al 1992, 136). The bloodstone core CAT 6652 (Illus 19–20) was definitely imported from the island of Rum in the Inner Hebrides (Wickham-Jones 1990), and this piece is presently the bloodstone artefact recovered furthest from its source.

Limestone is generally not associated with the Western Isles, for which reason the analyst consulted a number of geologists with specialist knowledge of the geology of the Western Isles and western Scotland. According to Dr Kathryn Goodenough, British Geological Survey, Edinburgh: 'There are no limestones recorded on Lewis. Most of the rocks of Lewis are far too old to contain fossils; the exception is the Triassic rocks of the Stornoway Formation, but they are sandstones and conglomerates. There are Mesozoic (largely Jurassic) fossiliferous limestones on Skye and some of the other islands of the Inner Hebrides, and that is the most likely source for your limestone fragments' (Goodenough pers comm). However, retired geologist Dr Jean Archer, resident in the Western Isles wrote: 'The only recorded limestone (Jurassic) material that I know of on Lewis comes from Tolsta where pebbles have been found in glacial till – probably deriving from the floor of the Minch Basin' (Archer pers comm). As in the case of the mylonite, more research is clearly needed to clarify the issue.

Traditionally, standard characterisation and discussion of a lithic assemblage would include the recording and characterisation of cortical surfaces, but in the present case the recorded numbers of primary, secondary and tertiary pieces do not accurately reflect the numbers of such pieces deposited in prehistory. In this report, 'primary' and 'secondary' means that cortical surfaces are identifiable (either full or partial dorsal cortex-cover), whereas the term 'tertiary' means that no cortex is present. The reason for the absence of cortex may be that these pieces are truly inner flakes, but it is thought that many tertiary pieces from Barabhas may be artefacts which have had their cortex removed by sandblasting of the dorsal surfaces.

Quartz and flint are equally hard materials (hardness 7 on Moh's scale; Pellant 1992, 25), and their various cortex ratios are therefore comparable, whereas mylonite is a considerably softer type of rock (comparable to other fine-grained metamorphic rock forms, such as baked mudstone and hornfels), and weathering tends to make its

Table B3 Reduction sequence of all unmodified and modified flakes and blades

	Quantity			Per cent		
	Quartz	Flint	Mylonite	Quartz	Flint	Mylonite
Primary pieces	300	137		6	22	
Secondary pieces	1,966	270	2	42	44	1
Tertiary	2,466	207	186	52	34	99
TOTAL	**4,732**	**614**	**188**	**100**	**100**	**100**

surfaces smooth and frequently somewhat powdery. This explains why practically all mylonite artefacts from Barabhas have been defined as tertiary and free of cortex. The different cortex ratios of quartz and flint (with notably more tertiary pieces amongst the quartz artefacts) are probably due to these two raw materials having been collected in the form of large (quartz) and small (flint) pebbles. The sizes of the largest quartz artefacts (cores; eg CAT 5252) suggest an original nodule size of up to 200mm, whereas the sizes of the largest flint artefacts (blades; eg CAT 6425), in conjunction with the curvature of the cortical surfaces, propose an original nodule size of *c* 40–60mm. As shown in (Ballin forthcoming), small pebbles have *relatively* more outer surface (cortex) than large pebbles. The fact that mylonite artefacts from other sites in the Western Isles (which have *not* been sandblasted) generally have low cortex ratios (Ballin 2008) suggests that this raw material may have been quarried from outcrops along the island group's main fault-line.

The three main fine-grained raw materials – quartz, flint and mylonite – have very different burnt ratios: *c* 3.5 per cent of the quartz has been recorded as having been exposed to fire, whereas twice as many flint artefacts (*c* 6.5 per cent) were recorded as having been burnt, and no mylonite pieces have been recorded as burnt. These differences are probably not real, but reflect a number of problems in terms of identifying these different types of raw materials as having been exposed to fire (Ballin 2008), and sandblasting may again play a part.

When characterising the quartz sub-assemblage, it was noticed that pieces with low-grade fire-crazing were less common amongst sandblasted pieces than amongst pieces not affected by sandblasting, whereas heavily crazed pieces with deep fissures were as easily identified within both groups (sandblasted/not sandblasted). This is demonstrated by the following figures: where the quartz assemblage as a whole has a sandblasting ratio of 78 per cent, only 47 per cent of the burnt pieces are sandblasted.

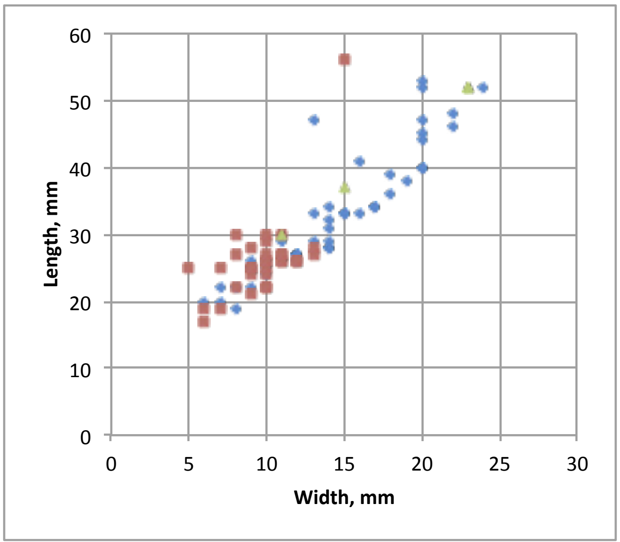
Debitage

In total, 6,415 pieces of debitage were recovered from the site. The debitage includes one chip, 6,047 flakes, 143 blades, 11 microblades, 207 indeterminate pieces, and six core preparation flakes (five crested pieces and one platform rejuvenation flake). The debitage category includes 75 per cent quartz, 10 per cent quartzite/sandstone, 8 per cent flint, 3 per cent mylonite, 2 per cent black rock and 0.2–0.8 per cent of a number of other categories, such as 'other' fine-grained rock, coarse-grained rock, amphibole-bearing rock and limestone.

The flakes and blades/microblades vary in size across the different raw material categories. As mentioned above, only the greatest dimensions of the flakes were recorded, but all three dimensions of the blades and microblades. Where 1,539 intact quartz flakes have an average GD of 34mm, both flint flakes and mylonite flakes (238 and 51 intact pieces, respectively) have an average GD of 22mm. The quartzite/sandstone flakes (155 intact pieces) are generally considerably larger, with an average GD of 43mm. The size of the flakes in other fine-grained materials is comparable to the flint and chert flakes, whereas the flakes in other more coarse-grained raw materials are comparable to the quartzite/sandstone flakes. It is thought that this difference is due to flakes in fine-grained raw materials generally having been used for smaller lithic (flaked) implements, whereas many coarse-grained flakes may mostly be waste from the production of stone (flaked, pecked and polished) implements like pounders, hammerstones, etc. Quartz forms an intermediate category which found use for both types of implements, the smaller lithic tools and the larger stone tools. Obviously, the size differences are also partly due to the different sizes of the collected/quarried pebbles/cobbles and blocks (see raw material section).

The dimensions of the blades and microblades of the three main flaked raw materials are: quartz (45 intact pieces): 33mm × 14mm × 8mm; flint (32 intact pieces): 26mm × 10mm × 6mm; and mylonite (4 intact pieces): 43mm × 18mm × 8mm. As shown in Table B8, the blades and microblades in the three main raw materials inhabit different parts of the diagram. The flint blades are the smallest, and form a cluster approximately L = 15mm to 30mm; the quartz blades form a cluster approximately L = 20mm to 50mm; and the mylonite blades cluster approximately L = 30mm to 50mm (two mylonite blades inhabit the same point: 52mm × 23mm). These clustering trends are mainly due to the maximum sizes of the procured pebbles, cobbles and blocks (see above).

Table B4 The main dimensions of all intact blades/microblades in quartz (blue), flint (red) and mylonite (green)



The quartz and flint blanks were clearly produced in different ways (see technology section), with quartz blanks predominantly having been manufactured by the application of hard percussion (46 per cent), whereas flint was reduced mainly by the use of bipolar technique (52 per cent) and mylonite mainly by hard percussion (Table B5). In total, 41 per cent of the quartz blanks, 28 per cent of the flint blanks, and 52 per cent of the mylonite blanks could not be defined in greater detail, as they were too fragmented to allow identification. In contrast to some of the excavated sites from the Barabhas area, sandblasting was the main factor preventing technological definition of the flakes and blades.

The technological composition of the quartz, flint and mylonite blades/microblades differs slightly from the technological composition of the three total assemblages (Table B5). The quartz blades are evenly distributed across hard and bipolar specimens; practically all flint blades are based on the application of bipolar technique, and the mylonite blades are mainly hard percussion pieces.

Although some of the site's blades are clearly 'proper' (ie intentional) blades, the bipolar blades are generally unintentional blades, that is, flakes which incidentally turned out longer than average, as it is not possible to base the production of 'proper' blades on bipolar technique. The production of 'proper' blades, with parallel lateral sides and dorsal arrises, requires the application of a sophisticated operational schema with prepared platforms and platform edges, and bipolar blades usually have curving lateral sides and dorsal ridges going in all directions. They also tend to be considerably thicker than 'proper' blades, and where the latter frequently have trapezoidal cross-sections, bipolar blades frequently have triangular cross-sections (so-called 'orange-segment blanks'). Three quartz blades are orange-segment pieces, and nine flint blades belong to this category.

The collection includes five crested pieces, three of which are in quartz (CAT 1023, 1024, 5855), whereas one is quartzite (CAT 4708) and one is flint (CAT 6287). Three are intact, with two quartz pieces measuring on average 42mm × 24mm × 12mm, and a quartzite specimen measures 27mm × 14mm × 6mm. One of the intact quartz pieces is a regular bilateral crested flake in quartz (Illus 25).

Table B5 Applied percussion techniques (unmodified and modified flakes and blades)

	Quantity			Per cent		
	Quartz	Flint	Mylonite	Quartz	Flint	Mylonite
Soft percussion			2			1
Hard percussion	2,186	93	55	46	15	29
Indeterminate platform technique	57	13	7	1	2	4
Platform collapse	138	17	16	3	3	9
Bipolar technique	433	321	10	9	52	5
Uncertain	1,918	170	98	41	28	52
TOTAL	**4,732**	**614**	**188**	**100**	**100**	**100**

Illus 25 Crested blade

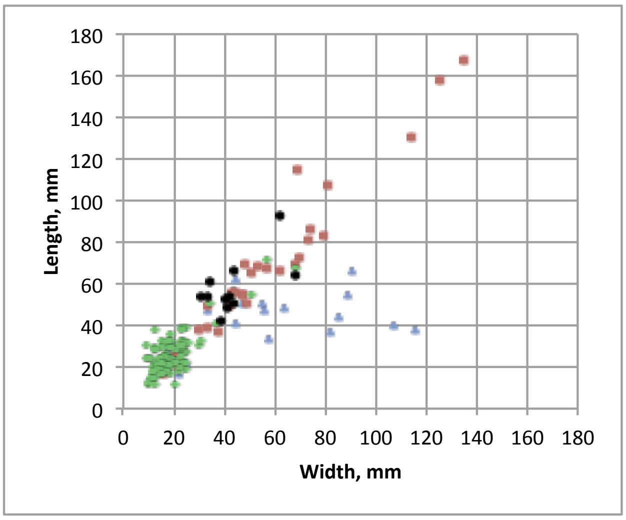
Cores

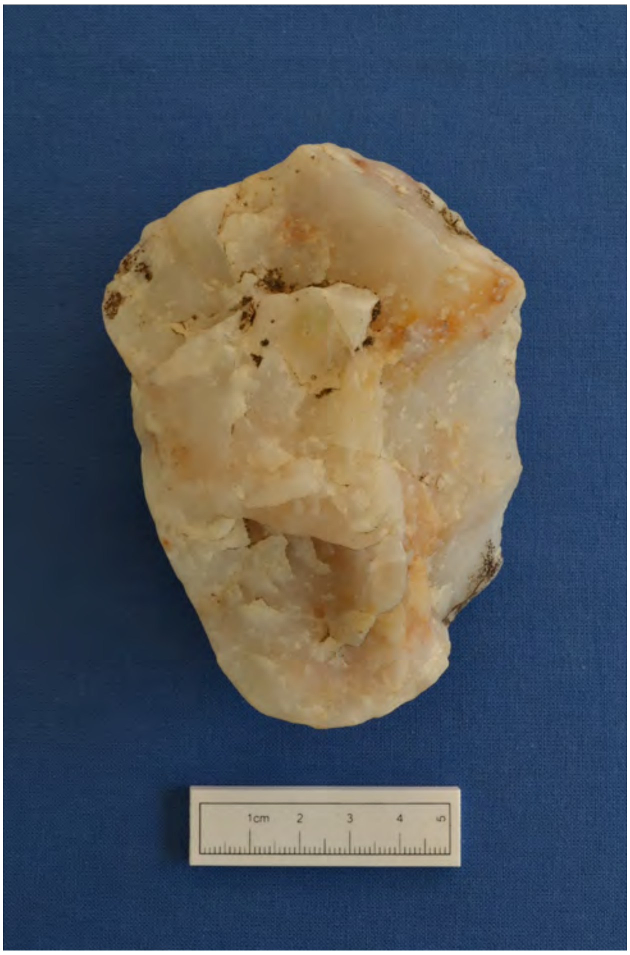
During Mark Elliott's survey of the Barabhas dunes, 208 cores were retrieved (Table B1): 12 split pebbles, two core-rough-outs, 21 single-platform cores, one opposed-platform core, one core with two platforms at an angle, one discoidal core, 29 irregular cores, two 'flaked flakes', 133 bipolar cores, and six core fragments. The core category includes 46 per cent quartz, 3 per cent quartzite/sandstone, 45 per cent flint, 3 per cent mylonite, 1 per cent 'other' fine-grained rock, 1 per cent 'black rock', and less than 1 per cent coarse-grained rock.

The dimensions (L × W × T) of cores are measured in the following ways: in the case of platform cores, the length is measured from platform to apex, the width is measured perpendicular to the length with the main flaking-front orientated towards the analyst, and the thickness is measured from flaking-front to the often unworked/cortical 'back-side' of the core. In the case of bipolar cores, the length is measured from terminal to terminal, the width is measured perpendicular to the length with one of the two flaking-fronts orientated towards the analyst, and the thickness is measured from flaking-front to flaking-front. More 'cubic' cores, like cores with two platforms at an angle and irregular cores, are simply measured in the following manner: largest dim. by second-largest dim. by smallest dim. The main dimensions of the four main core types recovered at Barabhas are shown in Table B6: split pebbles (early-stage bipolar cores), single-platform cores, irregular cores and bipolar cores.

Split pebbles: A total of 12 split pebbles in quartz were recovered from the site (CAT 1041, 2337, 3362–3, 4190, 4197, 4200–1, 5166, 5524, 5528, 5853). As shown in Table B6, three of these 'pebbles' are so large that they are technically cobbles (ie with a GD exceeding 64mm; definition according to Hallsworth & Knox 1999, fig 13). The average dimensions of these pieces are 62 × 46 × 31mm. The split pebbles are basically early-stage bipolar cores, and as shown in Table B6, the bipolar cores as a group are generally considerably smaller than the split pebbles, with the two categories more or less avoiding each other in the diagram. However, it should be taken into account that most (two-thirds) of the bipolar cores are flint specimens which were based on considerably smaller

Table B6 The dimensions of the four main core types (intact pieces) recovered in connection with Elliott's work at Barabhas: split pebbles (black), single-platform cores (blue), irregular cores (red) and bipolar cores (green)





Illus 26 Core rough-out

pebbles than the quartz bipolar cores. The average dimensions of the flint bipolar cores are 23 × 17 × 8mm whereas the average dimensions of the quartz bipolar cores are 32 × 23 × 13mm. However, this still supports the general notion of the split pebbles and the bipolar cores being the beginning and end of a shared reduction process, with the split pebbles being only slightly reduced or 'tested' pebbles and the bipolar cores exhausted waste products.

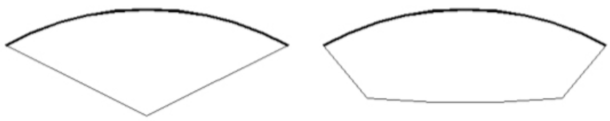
Core rough-outs: Like the split pebbles, the core rough-outs represent the first stage of a reduction process. However, where the former represent bipolar production, the latter represent the application of platform technique, with the final waste products being various forms of single-, dual- or multi-platform cores. Only two core rough-outs (CAT 1040, 5252) were recovered from the site, and both are based on quartz. CAT 1040 (104 × 70 × 50mm) has a cortical platform and an unprepared platform edge. It was attempted to prepare a crest, or guide ridge, along both flanks (Illus 26). The piece has one main flaking front and a cortical 'back-side'. CAT 5252 was initially split by the application of bipolar technique, following which it was attempted to transform several edges into platform edges by hard percussion. Several surfaces show hammer blows from attempts to split the core further.

Single-platform cores: The 21 single-platform cores recovered from the location include 15 specimens in quartz, four in quartzite or sandstone, and two in flint. Due to the differences in terms of the procured quartz/quartzite/sandstone and flint, as well as the different reduction techniques applied, the single-platform cores form three metric categories, namely 1) large, bulky quartz cores (Illus 27–31); 2) flat quartzite/sandstone cores (Illus 32–35); and 3) minuscule flint cores (Illus 36) (Table B6). The quartz cores measure on average 50 × 55 × 42mm; the quartzite/sandstone cores 37 × 91 × 77mm; and the flint cores 22 × 20 × 15mm.

Most of the quartz cores have cortical platforms, with some platforms being plain; the platform edges are generally either untrimmed or crudely trimmed. Although most cores display no surviving crests, or parts thereof, CAT 5521 shows that these cores were equipped with guide ridges prior to commencement of flake production. In this case, two opposed lateral crests were formed, joining at the core's apex. Attempts were made to start production by detaching the crests, but failed, as deep-step fractures occurred due to a fault plane running through the piece. It was subsequently abandoned. CAT 5854 displays crush-marks at its apex, suggesting that some single-platform cores were reduced by the application of an anvil. CAT 5167 is a highly regular, but unusual, piece. It has a cortical platform, and as it was worked along the entire circumference, using a consistently very acute flaking angle, it obtained the form of a flat-pointed disc (Table B7a).

During the examination of the lithic and stone assemblage, a new formal type was noticed (Table

Table B7 Single-platform core sub-types



Illus 27–31 Single platform cores

B7b). Four large flakes in quartzite or sandstone (CAT 216, 4698, 5526, 5869) had been modified by removing medium-sized flakes around their entire circumference, and these pieces were initially thought to be large discoidal scrapers. However, detailed characterisation of the pieces suggested that these objects are more likely to represent a new form of single-platform core. A key attribute in this connection is the character of the modification of the four pieces. Where it would be expected that a scraper would have had the notable spurs between the flake scars removed to smooth out the 'scraper edge', this had not been carried out in these cases, leaving denticulated edges. It is thought that these edges are almost certainly platform edges. Another important piece of evidence is the fact that three of the four pieces have had these medium-sized flakes detached by striking the cortical (dorsal) face of the flakes (apart from CAT 4698, which was worked from the ventral face), where scrapers would usually be modified by striking the ventral face. The defining attributes of this new type of single-platform core

Illus 32–35 ‘Flat’ single platform cores

Illus 36 Single platform cores in flint

('flat single-platform cores') is therefore: 1) based on large hard percussion flakes; 2) based on grainy materials like quartzite and sandstone; 3) cortical platforms (apart from the deviant form CAT 4698) like most single-platform cores in quartz (above); 4) oval outline; 5) flat (measured from platform to apex); and 6) the platform edges have usually not been trimmed, leaving denticulated platform edges.

As mentioned above, the two single-platform cores in flint (CAT 6533, 6680) are minuscule, and where CAT 6680 is long and slender (27 × 18 × 15mm), CAT 6533 is short and squat (17 × 22 × 14mm). The former was worked around the entire circumference, whereas the latter has a main flaking-front and a cortical 'back-side'. Both have plain platforms and irregular, untrimmed platform edges.

Opposed-platform cores: Only one opposed-platform core was retrieved from Barabhas, namely CAT 5530. It is in quartz, and it measures 18 × 24 × 23mm. It is a minuscule – and thereby unusual – quartz core with two plain, untrimmed platforms. This tertiary core is basically shaped like a small, squat cylinder.

Cores with two platforms at an angle: The only core with two platforms at an angle is CAT 5168. This core is also in quartz, but it is considerably larger, measuring 93 × 64 × 60mm. This fairly cubic core has two cortical untrimmed platforms, positioned at a more or less perpendicular angle to each other.

Discoidal cores: CAT 1035 is a relatively small (50 × 48 × 24mm), irregular disc, where one face was formed by detaching a single large flake, and the other by detaching a number of small flakes from various points of the circumference. It could be defined as an irregular core, but where many irregular cores have been reduced in a somewhat schematic fashion (forming the final product of of the reduction sequence single-platform core ⇒ dual-platform core ⇒ irregular core), CAT 1035 represents entirely unschematic reduction.

Irregular cores: The collection includes 29 roughly cubic irregular (or multi-platform/multi-directional) cores. These cores are defined as having been worked from three or more different directions (Illus 37–38). Twenty-three of these cores are based on quartz, whereas two are based on quartzite, and four are in flint. As shown in Table B6, the irregular cores from Barabhas are the largest recovered from the dunes, with the quartz and quartzite cores measuring on average measuring on average 76 × 63 × 48mm, whereas the considerably smaller flint cores have average dimensions of 21 × 20 × 13mm.

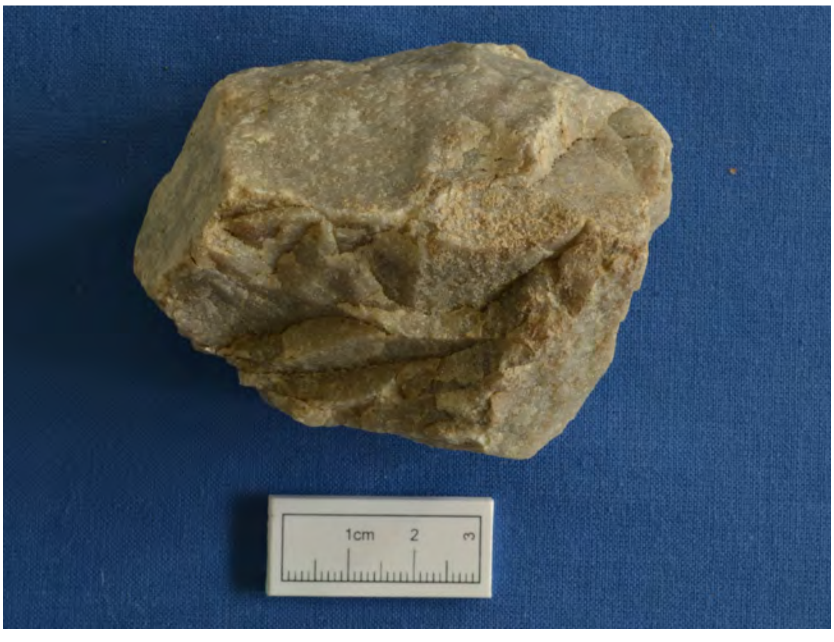
A number of irregular cores have attributes which show the history of these pieces. As mentioned above (discoidal cores), it is thought that most irregular cores probably represent the final stage of reduction sequences which began with single-platform cores, and where secondary platforms were added when they were required. Irregular cores CAT 222, 1539, 4192 and 4202 all have one main platform, where the other two or more platforms appear to be later additions.

CAT 5253 has surviving pecked or battered areas, and this piece is most likely a recycled quartz pounder. CAT 6433 appears to be a thick flint flake which was recycled as a multi-directional core. And quartz core CAT 4203 has crushed points, indicating that it may have been reduced on an anvil as well as by free-hand percussion.

'Flaked flakes': Two small objects in flint (av. dim. 22 × 18 × 9mm) were difficult to define typologically, as their surfaces are somewhat obscured by sandblasting, and as they do not fit any of the more common classes of cores. They are both based on flake fragments, and they appear to have had small flakes detached from either the ventral face (CAT 6313) or from both faces, suggesting that they may belong to the core type referred to as 'flaked flakes' (Ashton et al 1991). They may have been reduced by the combined use of platform technique and bipolar technique.

Bipolar cores: As mentioned above, the collection's numerically largest core category is the bipolar cores (Illus 39–44). A total of 133 bipolar cores were recovered from Barabhas, whereas the two second largest core categories – single-platform cores and irregular cores – only include *c* 20–30 pieces each. The split pebbles described above should be perceived as early-stage bipolar cores. The average dimensions of the quartz specimens are 32 × 23 × 13mm, whereas the flint specimens measure on average 23 × 17 × 8mm. The category also include seven bipolar cores in mylonite, two in other types of fine-grained rock (chalcedony and Rum bloodstone), and two in 'black rock'. One of the latter is a large core in dolerite, measuring 67 × 68 × 32mm, whereas the other non-quartz/non-flint bipolar cores correspond metrically to the quartz cores.

Table B8 shows the distribution of bipolar cores in quartz, flint and mylonite across unifacial and bifacial pieces, and across pieces with one reduction axis or two perpendicular reduction axes. The quartz assemblage includes more bifacial pieces

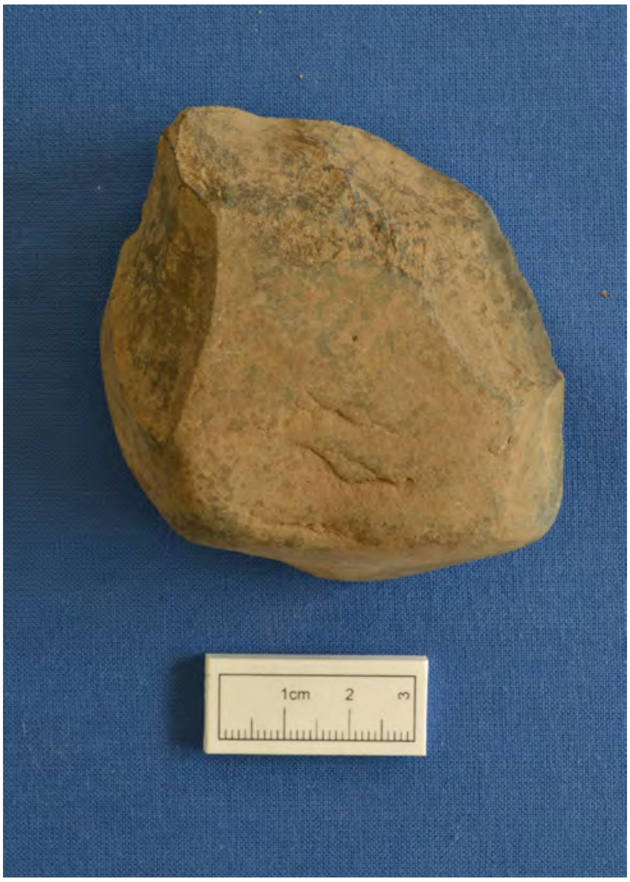


Illus 37–38 Irregular cores

Illus 39 Bipolar cores in flint

Illus 40 Bipolar cores in quartz

Illus 41 Bipolar cores in mylonite



Illus 42 Bipolar core, dolerite

Illus 43 Bipolar core in bloodstone (face 1)

Illus 44 Bipolar core in bloodstone (face 2)

(70 per cent) than the flint assemblage. This is probably due to the fact that the original flint pebbles were considerably smaller than the quartz pebbles (see raw material section), and that in many cases it was only possible to detach a few flakes from the flint pebbles, whereas the quartz pebbles allowed extended reduction sequences to take place. The flint and quartz assemblages have approximately equal proportions of pieces with one and two reduction axes. Pieces with two reduction axes have been reorientated to adjust the core shape and allow more flakes to be detached.

The bipolar cores in mylonite are all bifacial pieces with one reduction axis, but the numbers in Table B8 characterising the mylonite pieces are not directly comparable to the figures characterising the flint and quartz pieces, as 1) the mylonite is thought to have been procured by quarrying (resulting in very small numbers of pieces with cortex), whereas the other two raw materials were collected in the form of pebbles (with much cortex), and 2) with only seven pieces, the group of bipolar cores in mylonite is not statistically reliable.

Table B8 The distribution of bipolar cores in quartz, flint and mylonite

	Quantity			Per cent		
	Quartz	Flint	Mylonite	Quartz	Flint	Mylonite
Unifacial	11	36		30	42	
Bifacial	26	49	7	70	58	100
1 axis	33	73	7	89	86	100
2 axis	4	12		11	14	
TOTAL	**37**	**85**	**7**	**100**	**100**	**100**

Although several of the bipolar cores are clearly the exhausted remains of platform cores (CAT 4204, 6253, 6264, 6403, 6485), a substantial number of the bipolar cores were clearly based on thick waste flakes and flake fragments (CAT 5523, 6081, 6205, 6301, 6363, 6428, 6599, 6633, 6658, 6725, 6775).

Core fragments: Six indeterminate core fragments were retrieved in connection with Mark Elliott's fieldwalking survey of the Barabhas dunes. Due to the degree of fragmentation, in conjunction with sandblasting, it was not possible to characterise these pieces more precisely.

Four are in quartz (CAT 1037, 1542–3, 4194), one is flint (CAT 6281), and one (CAT 1541) is in a coarse-grained form of rock, probably granite. The core fragments in quartz and granite are relatively large, having a GD between 50mm and 76mm, whereas the flint specimen has a GD of only 16mm.

Tools

The assemblage includes 260 implements, which may be subdivided into 'fine' tools (231 pieces) based on flaked blanks, and 'coarse' tools (29 pieces) which tend *not* to be based on flaked blanks (although there are exceptions, such as the discs described below). The latter group may again be subdivided into implements based on raw pebbles/cobbles and identified by their robust use-wear (eg most hammerstones and pounders), and those shaped by the flaking, pecking or polishing (or a combination of these actions) of pebbles/cobbles (eg points and fabricators).

The 'fine' tools include: 36 arrowheads, four knives, 132 scrapers, five piercers, one burin, one notched piece, one serrated piece, two combined tools and 49 indeterminate implements with various forms of retouch. The 'coarse' tools include: two points, nine hammerstones, 14 pounders, one fabricator ('rod'), two discs, and one 'hollow stone'. The 'fine' tools are mainly (but not exclusively) based on various forms of fine-grained minerals or rock, whereas the 'coarse' tools are mainly (but not exclusively) based on various forms of coarse-grained rock (see raw material section). Quartz is a special raw material in this context, as it was used equally for 'fine' and 'coarse' tools.

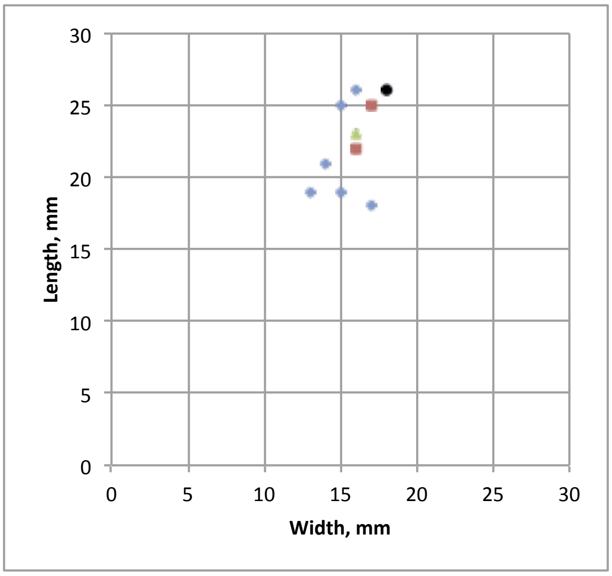
Fine tools

Arrowheads: The assemblage includes 36 arrowheads, namely two leaf-shaped arrowheads, one oblique arrowhead, seven barbed-and-tanged arrowhead rough-outs, 24 barbed-and-tanged arrowheads, and two indeterminate bifacial arrowheads. Twenty-two of the points are based on quartz, five are in flint, seven in mylonite, and two are in 'black rock' (either dolerite or pseudotachylite; CAT 5982, 6066). Table B9 shows the dimensions of the collection's intact arrowheads.

The two leaf-shaped arrowheads are based on flint (CAT 6025) and mylonite (CAT 6051). CAT 6025 (Illus 45) is intact, and it measures 23 × 16 × 3mm. It is drop-shaped, and it may have had slight lateral angles prior to sandblasting, that is, defining it as a form of later Early Neolithic kite-shaped arrowhead. CAT 6051 is the basal two-thirds of a leaf-shaped arrowhead. Both pieces have full invasive retouch of both faces.

CAT 5993 (Illus 45) is a heavily sand-blasted specimen, but it is most probably an oblique arrowhead of Clark's Type G (Clark 1934, figs 1–2; Ballin 2011, panel 1/fig 1). It is intact, and it measures 26 × 18 × 4mm. It has an approximately

Table B9 Intact arrowheads: black = leaf-shaped arrowhead; green = oblique arrowhead; red = barbed-and-tanged arrowhead rough-outs; blue = barbed-and-tanged arrowheads



straight base, and full invasive retouch of both faces. Due to the sandblasting, it is not possible to define the modification of the lateral sides in more detail.

The seven rough-outs for barbed-and-tanged arrowheads (Illus 46) were recovered from a discrete part of Area C (a scatter measuring 1m across), which the finder (probably correctly) interpreted as an arrowhead workshop. In addition to the rough-outs, this small sub-assemblage also includes eight simple flakes which may have been produced as blanks for the workshop's arrowheads, although it is not possible to prove or disprove this assumption. All pieces are quartz. The seven rough-outs include four early-stage drop-shaped pieces (CAT 5994–5, 5998) and four raw, fragmented barbed-and-tanged pieces (CAT 5996–7, 5999, 6000), which all have one roughly shaped barb and a tang, and which broke when attempts were made to form the points' second barb, removing one lateral side.

Based on the attributes of the pieces from this small workshop it is possible to suggest the following operational schema for the production of barbed-and-tanged arrowheads:

Illus 45 Leaf-shaped, oblique and bifacial arrowheads

Illus 46 Intact and fragmented rough-outs for barbed-and-tanged arrowheads

1. Small, suitably sized hard-percussion flakes were produced as blanks.
2. Small drop-shaped preforms were made by the application of invasive retouch.
3. These preforms were transformed into raw barbed-and-tanged rough-outs by adding first one barb (retouching one basal notch), and then another, forming the tang as part of this process.
4. Removing irregularities, making symmetrical and frequently aesthetically pleasing final barbed-and-tanged arrowheads.

The arrowheads include 24 barbed-and-tanged arrowheads, most of which are damaged to some extent (Illus 47–48). Seven intact pieces (Table B9) measure on average 22 × 15 × 5mm, defining them as relatively thick. Thirteen of these implements are in quartz (CAT 5984–5, 5990–2, 6016–22, 6024), with four being flint (CAT 6009–10, 6026, 6907), six mylonite (CAT 6011–5, 6206), and one is probably dolerite (CAT 5982). One of the quartz points belongs to the Kilmarnock sub-type, and it has a pointed tang. These pieces are thought to be relatively late within the Early Bronze Age period (Green 1980, 141). All other pieces belong to one or the other of the Sutton sub-types (ibid, 51), but as 1) it was difficult to define the individual points as to specific sub-type due to their having been exposed to extensive sandblasting, and 2) it has so far not been possible to demonstrate that these forms have any chronological or geographical relevance, no attempt was made to subdivide the category further. Most of these pieces have lost one or both barbs, the tang or the outermost tip, or a combination of those.

Five pieces (CAT 5984, 5992, 6016–7, 6022) have particularly long tangs, and CAT 6026 is a very plain piece based on a hard percussion flake and shaped by edge-retouch only.

Due to their fragmentary state, two pieces (CAT 5988, 6066) were defined as indeterminate bifacial arrowheads. They are both tip segments. CAT 5988 is quartz, whereas CAT 6066 is thought to be pseudotachylite (Illus 45).

Knives: The knives embrace two forms, namely one backed knife (CAT 3376) and three scale-flaked

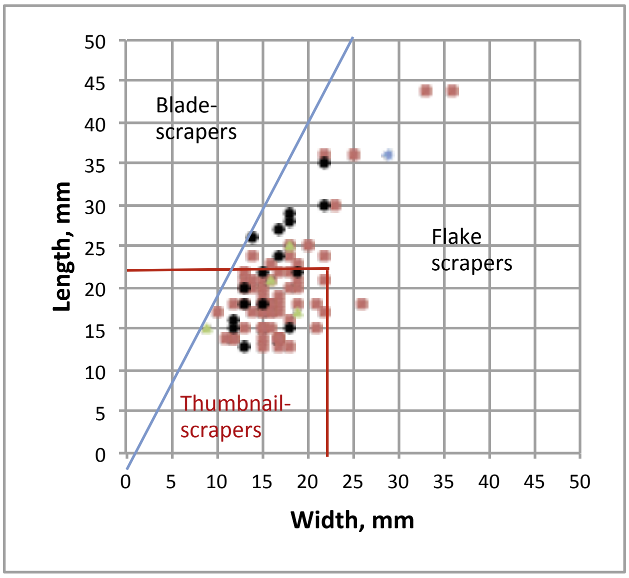
Illus 47 Barbed-and-tanged arrowheads in flint, mylonite and dolerite

Illus 48 Barbed-and-tanged arrowheads in quartz

Illus 49 Backed blade

Illus 50 Scale-flaked knife

Table B10 The dimensions of all intact scrapers: blue = discoidal scrapers; red = short end-scrapers; green = double-scrapers; black = side- and end-/side-scrapers. To give the readers a better overview of the scraper assemblage, both axes were defined as 0–50mm, excluding one exceptionally large end-scraper in quartz (CAT 5177), measuring 64 × 56mm. As shown by the diagram, none of the scrapers from Barabhas is elongated enough to be defined as a blade-scraper



knives (CAT 1043, 4714, 6467). Apart from one specimen in flint (CAT 6467), all knives are in quartz.

CAT 3376 is the distal fragment of a broad blade (W = 11mm) with highly regular backing of the right lateral side (Illus 49). It is in high-quality, translucent quartz. The three scale-flaked pieces form a very heterogeneous group, being based on one small (CAT 4714: GD = 23mm) and one large (CAT 1043: GD = 54mm) irregular flake (Illus 50), as well as one broad bipolar blade (CAT 6467: 34 × 13 × 5mm). In general, the scale-flaking has been kept to a minimum, only stretching as far onto the dorsal or ventral face as was deemed necessary

Illus 51 Thumbnail scrapers

Illus 52 Other scrapers

Illus 53 Large scraper in gneiss

in terms of providing a functional cutting edge (2–6mm).

Scrapers: In total, Mark Elliott retrieved 132 scrapers from the Barabhas area. They include two discoidal scrapers, 93 short end-scrapers, four double-scrapers, 19 side-scrapers, five end-/side-scrapers, and nine scraper-edge fragments (Illus 51–53). Twenty-three of the scrapers are quartz, whereas 83 are flint, 24 are mylonite, one is 'black rock' (probably dolerite), and one is gneiss.

As many as 70 pieces (or 53 per cent) have been labelled 'thumbnail-scrapers' (Illus 51) due to their minuscule size (see Table B10). In his analysis of the scrapers from Dalmore, slightly further south along the Lewisian west-coast, the author (Ballin 2002) suggested a maximum length of 23mm for Western Isles thumbnail-scrapers, but as shown by Table B10, at Barabhas a GD for this category of 25mm would probably have been more appropriate. However, the term 'thumbnail-scraper' is a very relative category, simply referring to quite small scrapers, and the group's dimensions vary from site to site and from region to region with the varying sizes of the available raw material pebbles, cobbles and blocks. One scraper is based on a blade (1 per cent), 112 on flakes (85 per cent), 17 on exhausted bipolar cores (13 per cent), and 2 are on indeterminate blanks (1 per cent).

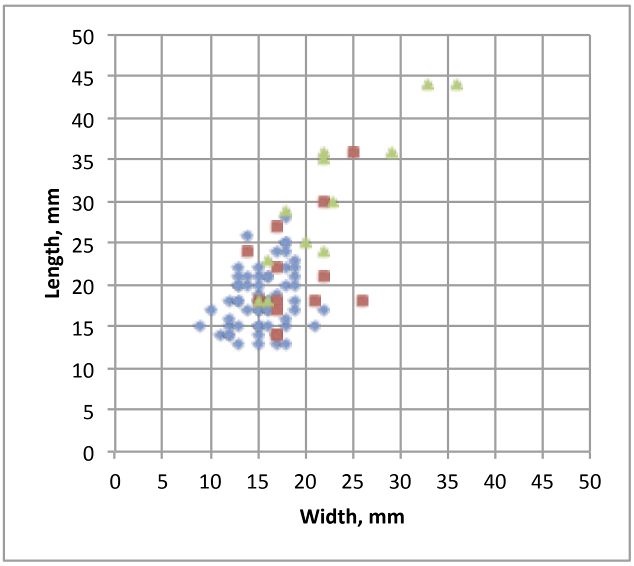
Although scrapers would most commonly be subdivided and dealt with by form (eg end-scrapers, side-scrapers, double-scrapers, etc), the scrapers of this assemblage are most sensibly dealt with by raw material (quartz vs flint/mylonite), as in this collection the raw material seems to have determined how the individual pieces were subsequently shaped. As shown in Table B1, all raw material categories are dominated by end-scrapers (*c* 70 per cent), supplemented by small numbers of discoidal, double, side- and end-/side-scrapers.

The main difference between the two raw material groups (quartz vs flint/mylonite) is that, due to the different sizes of the procured pebbles, cobbles and blocks, many quartz scrapers (and the specimen based on gneiss) are considerably larger than those in flint and mylonite (Table B11). The average dimensions of the two raw material groups (intact scrapers) are 33 × 25 × 10mm and 19 × 16 × 7mm, respectively. The greatest dimensions of the two groups (that is, including broken pieces) are 91mm and 36mm, respectively, indicating that the quartz scrapers were generally larger than indicated by the average dimensions of the intact pieces, as the large pieces broke more easily than the smaller ones.

As shown in Table B11, there is an overlap of the three main raw materials amongst the smallest scrapers, but, as mentioned above, most quartz scrapers are considerably larger than those based on flint and mylonite. Mylonite scrapers tend to be a fraction broader than the flint scrapers, with a small number of those scrapers being larger than the average flint scraper.

Although some of the smaller quartz scrapers are relatively regular pieces (eg CAT 4709), like most flint and mylonite scrapers, many of the larger quartz scrapers are quite irregular, due to the intricate flaking patterns of this raw material (eg CAT 4212). One medium-sized discoidal scraper (CAT 5863) as well as one large end-scraper (CAT 5247) and one large scraper-edge fragment (CAT 5521) were modified by striking a fully cortex-covered face, that is, by so-called inverse retouch.

Table B11 The dimensions of all intact scrapers: blue = flint scrapers; red = mylonite scrapers; green = quartz scrapers. To give the readers a better overview of the scraper assemblage, both axes were defined as 0–50mm, excluding one exceptionally large end-scraper in quartz (CAT 5177), measuring 64 × 56mm



Although the character of the struck edge of CAT 5863 and 5247 defines these two pieces as clearly scrapers, the thickness (27mm) and edge-character of CAT 5522 suggests that this could well be a fragment of a core like the 'flat single-platform cores' defined above.

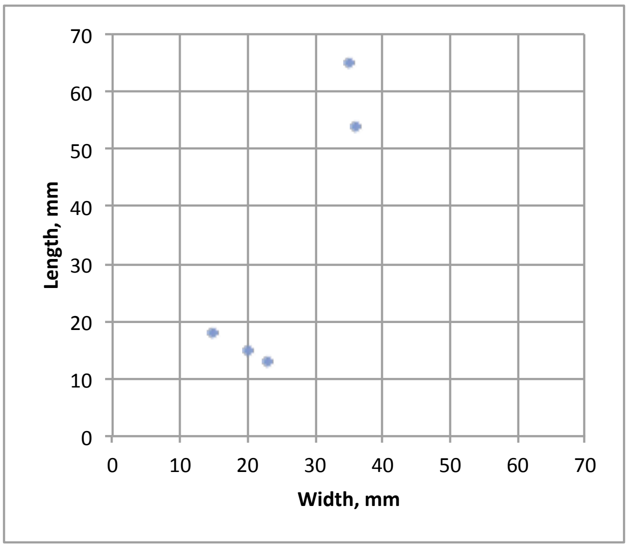
The scrapers in flint and mylonite, as well as the smallest quartz scrapers, appear to form a continuum, based on using small blanks in the most sensible manner. Most commonly, one of the shortest edges would be chosen as the location of the intended scraper edge and the piece would become an end-scraper, whereas at other times the scraper edge would be positioned on a slightly longer edge, and the piece would become a side-scraper. If the blank was deemed to have two short edges which could be modified into scraper edges, the pieces would become a double-scraper, and if the piece was fairly short, the two terminal scraper edges would meet and the piece would become a discoidal scraper. However, and importantly, the different formal types do not seem to represent individual mental templates, as also indicated by Table B11 in which the various scraper forms (apart from a small number of large 'outsiders') are joined in a single globular cluster.

Approximately one-quarter of all scrapers from Barabhas have acute scraper edges, which is a feature commonly associated with later Neolithic and, in particular, Early Bronze Age scrapers (cf Saville 2005, 110). Most of these pieces (two-thirds) are small thumbnail-scrapers.

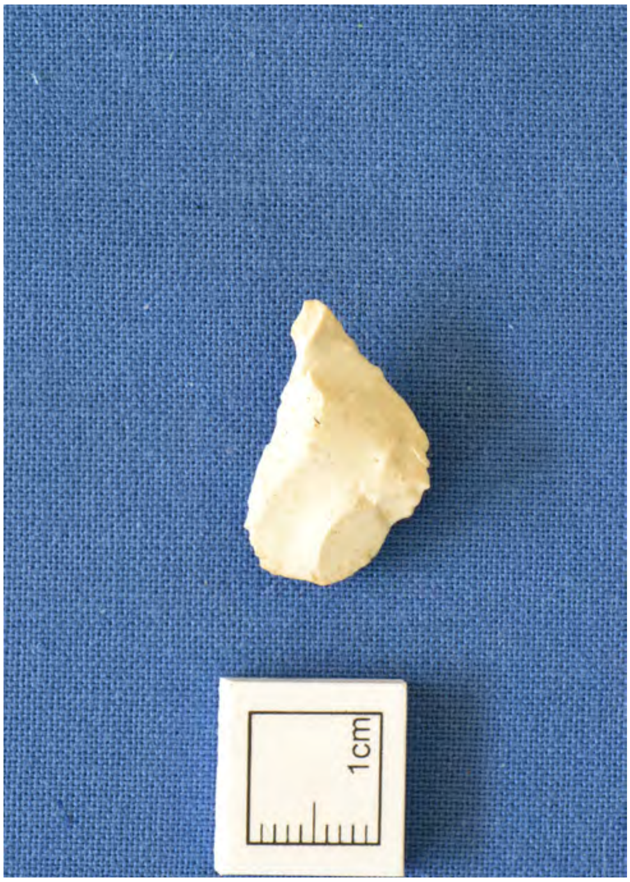
Nine scraper-edge fragments represent too small parts (in relative terms) of their parent pieces to be characterised more precisely.

Piercers: The collection's five piercers (Illus 54–55) include three pieces in quartz (CAT 2346, 4213, 5859) and two in flint (CAT 6724, 6981), and they form two distinct size categories (Table B12). The three smaller pieces (CAT 2346, 6724, 6981) measure on average 15 × 19 × 8mm, whereas the two larger specimens (CAT 4213, 5859) have average dimensions of 60 × 36 × 23mm. The smaller piercers are quite expedient pieces, formed on whichever blank was available by forming a tip on any suitable point or corner, whereas the two larger specimens have been more carefully shaped. They are both based on thick elongated flakes (technologically indeterminate due to sandblasting), and they both have a robust tip at one end. In the case of CAT 4213, this tip was formed by merging the two lateral sides by 'normal' (ie dorsal) retouch, whereas CAT 5859 is a slightly more sophisticated piece, where the tip was formed by merging the two lateral sides by neat invasive retouch of the ventral face.

Table B12 The dimensions of all intact piercers



Illus 54 Piercer, quartz



Illus 55 Piercer, flint

Burins: CAT 6261 is a small implement in flint (27 × 15 × 11mm), and it has been defined as an angle-burin (Illus 56). It was probably made on a robust blade, and it has a proximal burin edge. First, the piece was given a straight truncation across the proximal end, and then the left corner of this retouch was struck one or more times, forming a strong working edge. In addition, the piece has a curved retouch along the left lateral side, distal end, which may be a secondary working edge (scraper?), or it may be blunting to protect the user's fingers.

Notched pieces: CAT 5246 has been defined as a notched piece. It is based on a large bipolar or hard-hammer quartz flake (83 × 43 × 32mm) which split through the bulbar area (*Accident Siret*), and it has three notable notches, in three different edges. Each notch has a chord of *c* 15mm, and it is unknown which function this implement served.

Serrated pieces: One serrated piece was identified amongst the lithic artefacts, namely CAT 5534 (Illus 57). It is a broad hard-hammer flake (21 × 34 × 19mm), with worn and/or sandblasted serration along the distal edge. It is a relatively coarse serrated piece, with only *c* 3 teeth per cm. In comparison, some serrated flints from the Middle Neolithic site of Stoneyhill in Aberdeenshire had up to 17 teeth per cm (Suddaby & Ballin 2011).

Combined tools: Two small flints were defined as combined tools, namely CAT 6474 and CAT 6875. The former is the proximal end of a very neat scraper-knife on a regular broad blade with a width of 16mm. It has a regular convex, slightly acute scraper edge at the proximal end, and a cutting edge along its right lateral side formed by semi-invasive retouch which only stretches a short distance onto the dorsal face (2.5mm). The latter is an expedient piece based on a small indeterminate flake (22 × 11 × 5mm). A piercer tip was formed at the proximal end by crude bifacial retouch, and a straight to slightly concave retouch along the right lateral side has been interpreted as most likely a scraper edge. However, it cannot be ruled out that this is an expedient scale-flaked

Illus 56 Burin

Illus 57 Serrated piece

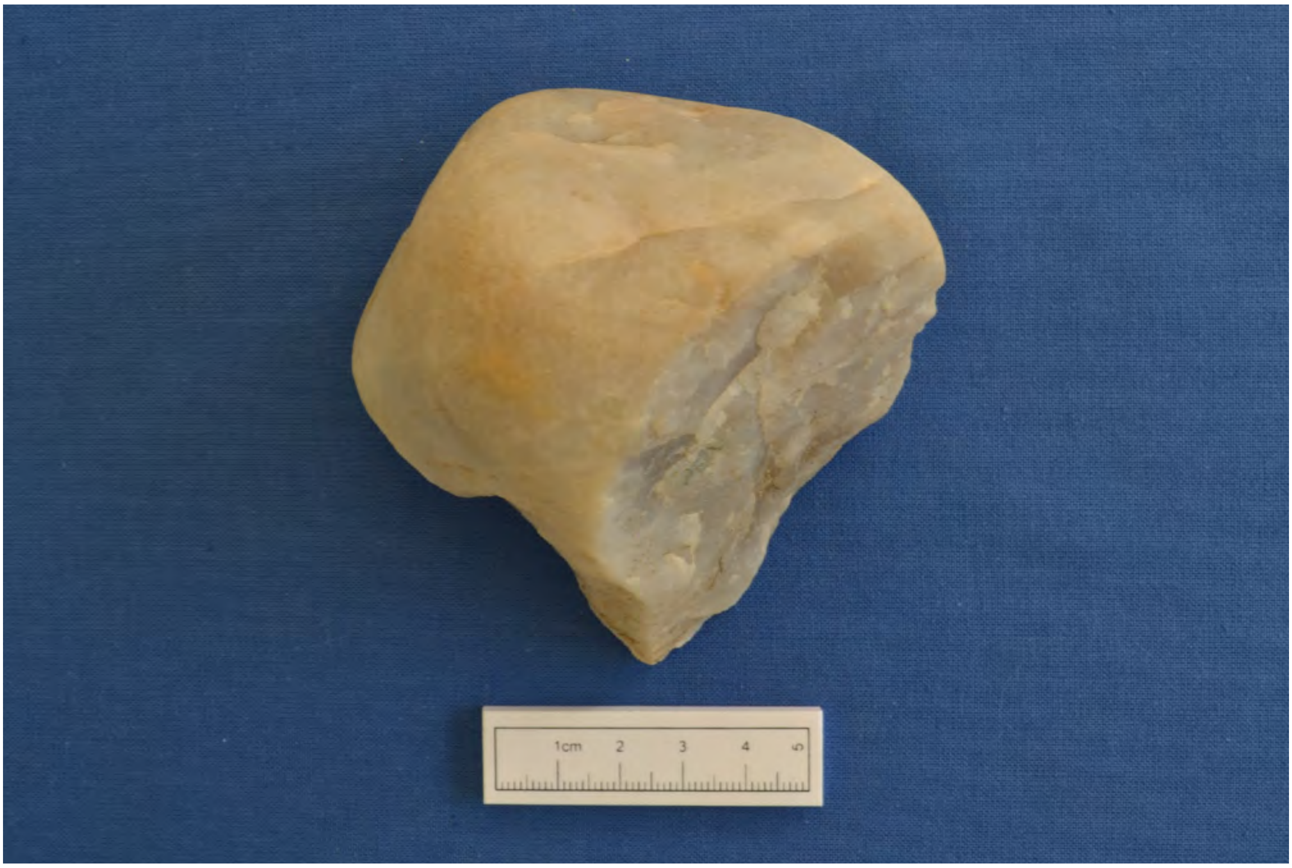
cutting edge similar to the one characterising CAT 6474.

Pieces with invasive retouch: This category includes five pieces; three are quartz (CAT 5187, 5536, 5860), whereas one is mylonite (CAT 6177), and one is 'black rock' (either very fine-grained dolerite or pseudotachylite). CAT 1552 may be the fragment of an arrowhead rough-out, whereas CAT 6177 may be the 'peeled-off' (frost action?) face of a finished arrowhead.

Pieces with edge-retouch: A total of 44 lithics were defined as pieces with simple edge-retouch. Twenty-two of those are in quartz, with 18 being flints, one is quartzite, two are mylonite, and one is limestone. Most (38 pieces) are flakes or flake fragments, with the remainder including four blades or microblades, one bipolar core, and one indeterminate piece. These pieces differ considerably in shape and size (greatest dimension 12–77mm), and it is thought that this tool group includes artefacts, or fragments of artefacts, with different functions.

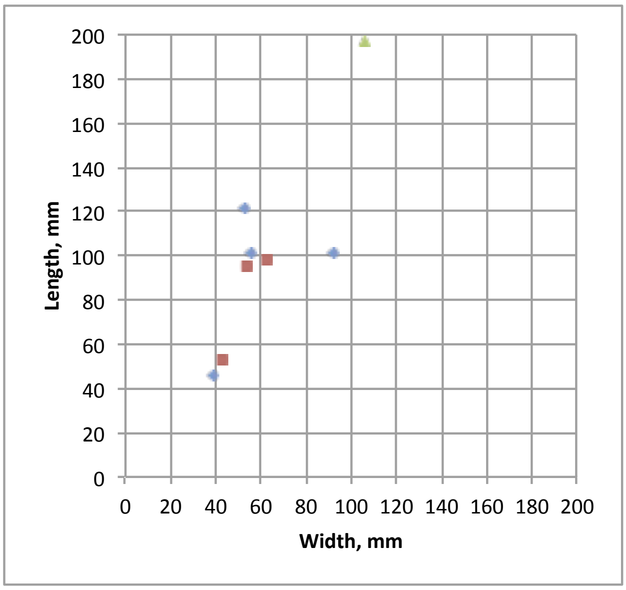
Coarse tools

Points: In terms of function, these pieces are related to piercers, but they are considerably larger and frequently based on simpler blanks and/or coarser raw materials. The defining attributes of the category are 1) a robust, shaped point at one end, and 2) a 'lumpy' handle-end, allowing the pieces to be used in a robust manner to either drill or chop holes in a variety of indeterminate materials. Two points were recovered from the Barabhas area, namely CAT 5245 (quartz) and CAT 4697 (amphibole-bearing material). The former (Illus 58) measures 87 × 85 × 55m, and it is based on an indeterminate piece, whereas the latter measures 120 × 71 × 41mm, and it is based on a large indeterminate flake. The quartz point had a point shaped by 'normal' retouch (ie retouch from the same face) of two merging lateral edges, whereas the amphibole-bearing piece had a point shaped by 'propellar' retouch (ie retouch from opposed faces).



Illus 58 Point

Table B13 The dimensions of all intact hammerstones: blue = plain hammerstones; red = specialised hammerstones; green = hammerstones/anvils



Hammerstones: This general category (Table B13) includes three sub-forms, namely plain hammerstones (five pieces: CAT 4701, 4703, 5250, 5525, 5980; Illus 59–60), specialised hammerstones (three pieces: CAT 4696, 5248–9; Illus 61), and combined hammerstones/anvils (one piece: CAT 4704; Illus 62). They are all based on the use of unmodified pebbles (<64mm) or cobbles (>64mm) (definition of pebbles and cobbles according to Hallsworth & Knox 1999, fig 13). CAT 5525 is a flake struck off a plain hammerstone as a result of robust use and force applied to one terminal. For definition of hammerstones, see above.

The standard hammerstones (Illus 59–60) vary considerably in size, with the smallest (CAT 4703) having a GD of 46mm, and the largest (CAT 4701) a GD of 121mm (av. dim.: 92 × 60 × 38mm); they tend to be notably elongated, although the outline of CAT 5250 is sub-triangular. They are based on a wide variety of raw materials, including quartz, quartzite, sandstone, gneiss and probably dolerite. The pieces from the present location generally have wear at both terminals (in the case of CAT 5250, all

Illus 59–60 Hammerstones

Illus 61 Specialised hammerstones

Illus 62 Hammerstone/anvil

three points), usually in the form of light crushing. Occasionally one or more small flakes were detached from the ends during use. CAT 5250 (Illus 59) has the fossil of a large shell at its main tip (also see pounder CAT 1544, below).

The specialised hammerstones (Illus 61) are elongated pieces (av. dim.: 82 × 51 × 43mm) with a notable point at one end, but in contrast to the 'points' described above, their working ends were clearly used for hammering and/or pecking. The two larger pieces are based on quartzite and the smallest piece is quartz. This category includes three pieces (CAT 4696, 5248–9), and where standard hammerstones are simply used pebbles/cobbles, these pieces are more sophisticated, shaped implements. They are all recycled bits of 'old' cobble tools, where the cortical parts of CAT 5249 display slight pecking over a relatively large area; CAT 5248 has remains of a pecked, faceted area and may be a cannibalised pounder; and CAT 4696 displays in a surviving cortical part a notably battered area which may be an early-stage anvil groove.

CAT 4704 is a very large cobble tool, or combined hammerstone/anvil (Illus 62). It is based on an elongated cobble (197 × 106 × 51mm) in an amphibole-bearing material. Its two opposed terminals are both heavily damaged by battering hard materials, and both ends have had large flakes detached as a result of use. One flake struck off one terminal runs two-thirds down the length of the piece. It is also obvious that the lateral sides of the piece were used for hammering, as one lateral side has had a series of small and medium-sized flakes detached. The piece is relatively flat, and both broadsides are characterised by having a notable anvil groove at the centre. Most likely these grooves were formed in connection with the bipolar ('hammer-and-anvil') splitting of fine-grained lithic pebbles (eg flint and mylonite).

Pounders: This general category (Table B14) includes two sub-forms, namely single-function pounders (nine pieces: CAT 217–9, 220, 1544, 4700, 4702, 5870–1; Illus 63–67), and combined pounders/anvils (one piece: CAT 5872; Illus 68). Like the hammerstones, they are all based on the use of

Illus 63 Pounder

Illus 64 Pounder – close-up with fossil

Illus 65–67 Pounders

unmodified pebbles (<64mm) or cobbles (>64mm) (definition of pebbles and cobbles according to Hallsworth & Knox 1999, fig 13). CAT 1545, 2341, and 4694–5 are flakes struck off pounders as a result of robust use and force applied to one terminal. For definition of pounders, see above.

The single-function pounders (Table B14; Illus 63–67) vary slightly less in size than the standard hammerstones (Table B13), with the two smallest (CAT 220, 4702) having a GD of 81mm, and the two largest (CAT 1544, 5870) a GD of 140–145mm. The category measures on average 106 × 72 × 51mm. The single-function pounders are elongated pieces, and like the hammerstones they also include a piece with a sub-triangular outline (CAT 5870). They are based on a variety of raw materials, including quartz, quartzite, sandstone and various coarse-grained types of rock. Most have wear at both ends, although the sub-triangular specimen has wear at all three pointed parts.

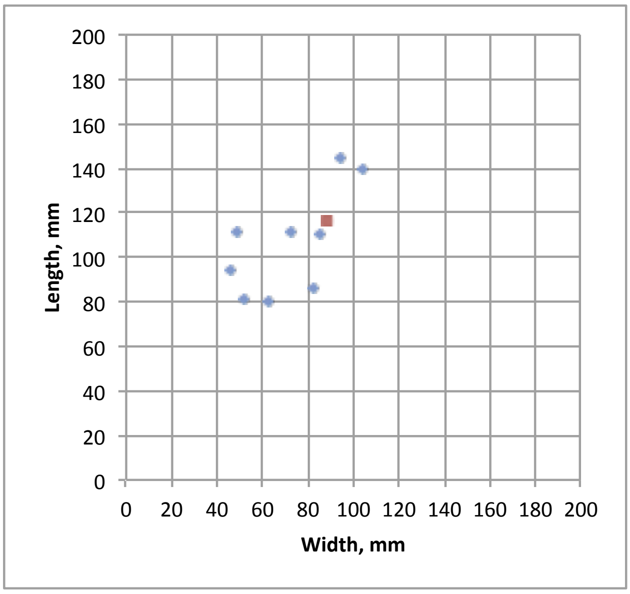
It is possible to sub-divide this category into stages, namely: 1) Lightly pecked, but without facets (CAT 220, 4702); 2) notably pecked with just notable facets (CAT 218, 1544, 5871); and 3) pieces with

Illus 68 Pounder/anvil

marked facets (CAT 219, 4700; also see pounder/anvil CAT 5872), basically defining them as pestles. CAT 217 and CAT 5870 display pecking combined with hammering, and the former has had several large flakes detached from either end. Several of these pieces also display light wear along the lateral sides. CAT 1544 (Illus 63–64) has a large fossil at one working end, probably of a shell. The fact that hammerstone CAT 5250 (Illus 59) has a similar fossil in the same location (at its main tip) indicates that the selection of fossil-bearing cobbles as blanks for pounders and hammerstones may have been deliberate. It is not possible to say what the specific (non-functional?) reason for this choice may have been. Pounder CAT 5871 (Illus 65) has a fossilised shell in its central part.

CAT 5872 is a large specimen (116 × 88 × 56mm) displaying fine pecking at either end, combined with notable facets (pestle). The presence of clearly visible peck-marks at the centre of either face defines it as a pounder/anvil (Illus 68). CAT 1544 (above) has barely visible peck-marks of a similar kind and might eventually have developed into a typical pounder/anvil.

Table B14 The dimensions of all intact pounders: blue = pounders; red = pounders/anvils



The four flakes struck off pounders as a result of use (CAT 1545, 2341, 4694–5) are based on quartz, granite and a type of amphibole-bearing rock (Illus 69). Their GD varies between 47mm and 102mm. CAT 2341 displays some unspecified pecking and battering, whereas the remaining three pieces all show significant wear at what must – prior to the detachment of the flakes – have been a terminal, as well as well-defined facets. They basically represent damaged pestles. The largest piece (CAT 4694) must originally have been a very large pestle.

Fabricators: CAT 1042 (Illus 70) is a rod-like robust fabricator in quartz, based on an elongated, thick bipolar flake (65 × 32 × 27mm). It has been shaped by retouch along the entire right lateral side, whereas along the opposite lateral side only the distal part of the edge has been modified as part of shaping the pointed working end of the piece. The pointed end shows robust rounded abrasion from heavy-duty use. In terms of its size and general shape/cross-section, the piece show similarities to the flint 'rods' first defined at Grimes Graves, south-east England (Saville 1981, 62) and later at Den of Boddam, Aberdeenshire (Saville 2011, 26); a small number of these pieces also display robust use-wear of their pointed ends. It has been suggested that the 'rods' may have been associated with quarrying activities, and the specific use of CAT 1042 is presently unknown.

Illus 69 Pounder flakes

Illus 70 Fabricator

Discs: Two discs (Illus 71) were recovered by Mark Elliott, namely CAT 223 and CAT 5981. The former is a small piece in diorite (diam: 40mm; th: 15mm), whereas the latter is a considerably larger piece made in mica-schist (diam: 90mm; th: 23mm), and it is missing parts of one side (approximately one-fifth to one-quarter of its circumference). They were both shaped by retouching their circumference, and particularly CAT 223 shows clear concave scars from the detached flakes. The larger piece may be a lid for a ceramic vessel (cf Ballin Smith 1994, 204), whereas the smaller piece may be a playing piece (cf various entries in Hamilton 1956; similar pieces from Jarlshof also inspected by the author in the stores of National Museums Scotland).

'Hollow stones': Only one 'hollow stone' (cf Ballin Smith 1994, 207) was recovered from the Barabhas area (CAT 221; Illus 72). It is one half of a fairly small piece (Diam: 70mm; Th: 28mm), and originally it probably had a roughly circular or oval outline. It has a man-made hollow in both faces, and the two hollows almost meet. The piece could have been a lamp or a pivot stone, but it is difficult to say which tool the maker intended to make if

Illus 71 Lid and possible playing piece

Illus 72 Hollow stone

the intention was to perforate the piece – had it not broken through the two hollows. It is based on a rough form of fine-grained volcanic rock, probably basalt rather than dolerite.

B3 Technology

This technological summary is based on information presented in the raw material, debitage, core and tool sections above. The flaked assemblage is composed of three main parts, namely quartz, flint and mylonite sub-assemblages, which were reduced by the use of hammerstones in a variety of raw materials, and to some extent by resting the flake/blade cores on anvils. It is thought that almost all quartz and flint was collected in pebble/cobble form (Table B3), probably from the local beaches, whereas the mylonite may have been obtained from sources along the main fault-line in eastern Lewis (see raw material section). The evidence suggests that the reduction of the quartz, flint and mylonite followed different operational schemas.

Basically, the present collection mirrors that of the Barabhas 3 excavation assemblage, as well as the assemblage collected by Ron and Margaret Curtis from the Barabhas dunes (mainly near Barabhas 3) (for technological details and discussion of these two collections, see Ballin 2010c; 2010f):

- Large quartz cobbles (GD up to *c* 200mm) were reduced with no or little initial preparation. Approximately 78 per cent of all technologically definable flakes are hard percussion flakes, and practically all hard-hammer blanks have cortical platform remnants. A small number of flakes display crudely rubbed platform edges. Very few bipolar quartz flakes were recovered. As at Barabhas 3 (excavation and Curtis Collection), the platform cores are generally considerably larger than the bipolar cores, suggesting that hard percussion was the preferred approach, with bipolar technique being applied to completely exhaust cores when they became too small to reduce further without the use of a supporting anvil.
- Small flint pebbles (GDs of 40–60mm) were reduced almost entirely by the application of bipolar technique, with 72 per cent of all technologically definable flakes being bipolar blanks. It is generally accepted, that small pebbles are ill-suited for platform technique (eg Finlayson 2000, 105; Callahan 1987, 63). A small number of larger-than-average pebbles were prepared and reduced by hard percussion.
- Mylonite was quarried, rather than collected, and it is thought that mylonite nodules may have been 'delivered' as relatively large, probably rather cubic, blocks. As a quarried raw material, mylonite generally has very little actual cortex, explaining its high ratio of tertiary pieces (99 per cent), where quartz and flint have much lower ratios (52 per cent and 34 per cent, respectively). However, as mentioned above, these figures may have been affected by the general sandblasting of the artefacts. Due to mylonite usually representing a relatively small proportion of Lewisian assemblages, it is presently uncertain whether mylonite cores were traditionally prepared or not. This raw material was predominantly worked by the application of hard percussion, although bipolar technique was used occasionally (61 per cent of the flakes are hard percussion; no platform cores were found, but seven bipolar cores were recovered).

Quartzite flakes may largely have been manufactured and used in the same way as quartz flakes.

Table B15 Proximal and distal fragments

	Quantity			Per cent		
	Prox	Distal	Total	Prox	Distal	Total
Primary + secondary	253	175	428	56	29	42
Tertiary	178	423	601	44	71	58
TOTAL	**431**	**598**	**1,029**	**100**	**100**	**100**

It is not possible to verify the statement above that '*practically all hard-hammer blanks [in quartz] have cortical platform remnants*' through the collection's finds database, as the site's blanks were only recorded as having full, partial, or no cortex, that is, the specific location of the cortex was not recorded. However, Table B15 was produced as a test of this impression-based statement, in which proximal and distal fragments with (primary + secondary pieces) and without (tertiary pieces) cortex were quantified.

Table B15 shows that approximately twice as many proximal fragments than distal fragments are cortical (56 per cent against 29 per cent) supporting the 'impression' stated above.

It is highly likely that all raw materials were exposed to some degree of core preparation, as regular crested pieces in quartz, quartzite and flint were recovered.

B4 Distribution and activities

The general distribution of lithic and stone artefacts across Areas A–G is shown in Table B16. The three main areas are Areas A–C (1,183, 2,683, and 2,254 pieces, respectively), with smaller sub-assemblages deriving from Areas E and G (330 and 354 pieces, respectively). Areas D and F only yielded small sub-assemblages (67 and 11 pieces, respectively).

One obvious trend is the distribution of material datable to the Early Bronze Age throughout the surveyed area, with approximately two-thirds of all barbed-and-tanged arrowheads deriving from Area C, and with small numbers of such points having been found in Areas A, B, D and E. A small group of barbed-and-tanged arrowhead rough-outs were retrieved from Area C, probably representing an arrowhead workshop (compare with the workshop from Dalmore, Lewis; Ballin 2008, 25). Two Early Neolithic leaf-shaped arrowheads (CAT 6025, 6051) were recovered from Area B and a Late Neolithic oblique arrowhead from Area E (CAT 5993). A number of post Mesolithic forms (indeterminate bifacial arrowheads, scale-flaked knives, combined tools, and pieces with invasive retouch) were scattered across the areas, although most were found in Areas A–C. CAT6261 is a likely burin and may therefore represent the earliest settlement presently identified in the Barabhas dunes; it was found in Area A.

As the Elliott Collection was recovered through fieldwalking rather than excavation, interpretation of minor differences between the individual areas should not be attempted, and nor should the presence of solitary specimens of types. However, as the sub-assemblages from Areas B and C are both equally numerous, numbering 2,683 and 2,254 pieces respectively, it is statistically acceptable to note a number of obvious compositional differences between them:

- The assemblage from Area B is slightly more numerous in terms of recovered blanks (in particular blades), as well as cores (in particular bipolar cores).
- The assemblage from Area C includes almost twice as many tools as that of Area B (arrowheads and scrapers are particularly numerous).

In terms of activities, this indicates that in Area B the settlers may have focused on primary production and in Area C on the manufacture and use of tools, although neither in an exclusive manner. A summary of the distribution is presented as Table B17.

The stone implements (most of which are hammerstones and pounders) were recovered throughout the Barabhas dunes. The distribution patterns follow those of the assemblage as a whole, with most of these pieces deriving from Areas A–C (although only three from Area B), and small numbers from the remaining areas.

The distribution of raw materials across Areas A–G is shown in Table B19. It is only possible to define a small number of statistically valid trends, such as a notably higher presence of mylonite in Area C (6 per cent) compared to Areas A and B (1–2 per cent), and a notably lower presence of quartzite/sandstone in Area B (7 per cent) compared to Areas A and C (12–16 per cent). The relatively lower amount of quartz in Area C (66 per cent, against 71–77 per cent in Areas A–B) is probably largely a result of the higher mylonite ratio. It is not possible to explain the higher mylonite ratio in Area C, but it is possible that the use of mylonite may have been more common in some prehistoric periods than in others, and that the ratio is therefore a result of the (unknown) specific chronological composition of the various sub-assemblages.

B5 Dating

The assemblage includes few diagnostic elements, with typo-technological attributes being the most important ones.

Typology

The most important diagnostic types are the site's barbed-and-tanged arrowheads and the well-executed, pressure-flaked thumbnail-scrapers. Together, these two implement groups form a package of typical Early Bronze Age forms (eg Butler 2005, 162, 166), but neither allows chronological specification within this period. Some barbed-and-tanged arrowheads (such as Kilmarnock points; see unpublished report on the lithics from Dalmore, Ballin 2002; also Green 1980, 51) are datable to more restricted parts of the Early Bronze Age, whereas the so-called Sutton points were ubiquitous throughout this period. Only one of the barbed-and-tanged arrowheads from the Barabhas dunes is a Kilmarnock point, namely CAT 5992 from Area E, whereas all other barbed-and-tanged pieces from the project are Sutton points. Seriation of barbed-and-tanged points listed in Green (1980, tables VI.8, VI.11 and VI.13) suggests that Kilmarnock points date to the later part of the Early Bronze Age (Table B19).

Two leaf-shaped arrowheads (CAT 6025, 6051) from Area B are datable to the Early Neolithic period in general (Butler 2005, 122). Only so-called kite-shaped pieces may be dated more precisely, namely to the later part of this period. One oblique arrowhead from Area E may belong to Clark's Type G (Clark 1934, figs 1–2; Ballin 2011, panel 1/fig 1), and these pieces are datable to the Late Neolithic period.

Two fragments of indeterminate bifacial points (CAT 5988, 6066), three scale-flaked knives (CAT 1043, 4714, 6467), one combined scraper-knife (CAT 6474), and five pieces with invasive retouch (CAT 1552, 5187, 5536, 5860, 6177) are all datable by their scale-flaking to post Mesolithic times, but it is not possible to date them more precisely within this broad period.

One burin (CAT 6261) indicates that the Barabhas dune system may have been visited in pre-Neolithic times. Although one should not exaggerate the presence of a single burin, the fact that it is a relatively sophisticated piece – an angle-burin produced by striking a truncation – makes it possible that this piece may even be of a pre-Mesolithic date. In Scotland, Mesolithic burins tend to be fairly simple pieces, formed by striking a break facet, whereas late Upper Palaeolithic burins tend to be more complex pieces, based on striking a prepared truncation (cf Saville & Ballin 2009; Ballin et al 2010; Ballin et al forthcoming).

Technology

The blades are mostly bipolar pieces and not 'true' (intentional) blades based on a well-defined operational schema. Although a small number of mainly hard percussion blades were recovered, the ratio of platform flakes to platform blades (*c* 98:02), suggests that the industry is a flake industry, and that the blades may simply be flakes which incidentally turned out slightly longer than intended. Flake industries are generally datable to the very latest part of the Late Neolithic period and the Bronze Age.

Table B16 Distribution of debitage, core and tool types by area

	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Unstrat.	Total
Debitage									
Chips			1						1
Flakes	999	2,378	1,994	59	284	7	326		6,047
Blades	21	70	43		6		3		143
Microblades	1	5	4				1		11
Indeterminate pieces	82	80	31	2	8		4		207
Crested pieces	3		1				1		5
Platform rejuvenation flakes	1								1
Total debitage	*1,107*	*2,533*	*2,074*	*61*	*298*	*7*	*335*		*6,415*
Cores									
Split pebbles	1	3	5		2		1		12
Core rough-outs	1				1				2
Single-platform cores	3	7	6		3	1	1		21
Opposed-platform cores					1				1
Cores w two platf at angle			1						1
Discoidal cores, irregular	1								1
Irregular cores	4	12	10		2		1		29
'Flaked flakes'	2								2
Bipolar cores	30	57	41		3		2		133
Core fragments	2	3	1						6
Total cores	*44*	*82*	*64*		*12*	*1*	*5*		*208*

Table B16 *cont*

	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Unstrat.	Total
Tools									
Leaf-shaped arrowheads		2							2
Oblique arrowheads					1				1
Barbed-and-tanged rough-outs			7						7
Barbed-and-tanged arrowheads (B-a-Ts)	1	5	15	1	2				24
Bifacial arrowheads		1	1						2
Backed knives		1							1
Scale-flaked knives	1	1	1						3
Discoidal scrapers		1					1		2
Short end-scrapers	8	30	42	1	7		5		93
Double-scrapers	1		3						4
Side-scrapers	1	2	11		3		2		19
End-/side-scrapers		5							5
Scraper-edge fragments	1	4	3		1				9
Piercers	1		2				2		5
Burins	1								1
Pieces w retouched notch(es)				1					1
Serrated pieces					1				1
Combined tools		1	1						2
Pieces with invasive retouch		1	2		1		1		5
Pieces with edge-retouch	10	11	18		2		3		44
Points			1	1					2
Hammerstones			2		2			1	5
Hammerstones, specialised			1	2					3

Table B16 *cont*

	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Unstrat.	Total
Hammerstones/anvils			1						1
Pounders	4	3	4			2			13
Pounders/anvils						1			1
Fabricators ('rods')	1								1
Discs	1		1						2
'Hollow stones'	1								1
Total tools	*32*	*68*	*116*	*6*	*20*	*3*	*14*	*1*	*260*
TOTAL	**1,183**	**2,683**	**2,254**	**67**	**330**	**11**	**354**	**1**	**6,883**

Table B17 Distribution of the main artefact categories by area

	Quantity								
	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Unstrat.	Total
Debitage	1,107	2,533	2,074	61	298	7	335		6,415
Cores	44	82	64		12	1	5		208
Tools	32	68	116	6	20	3	14	1	260
TOTAL	**1,183**	**2,683**	**2,254**	**67**	**330**	**11**	**354**	**1**	**6,883**

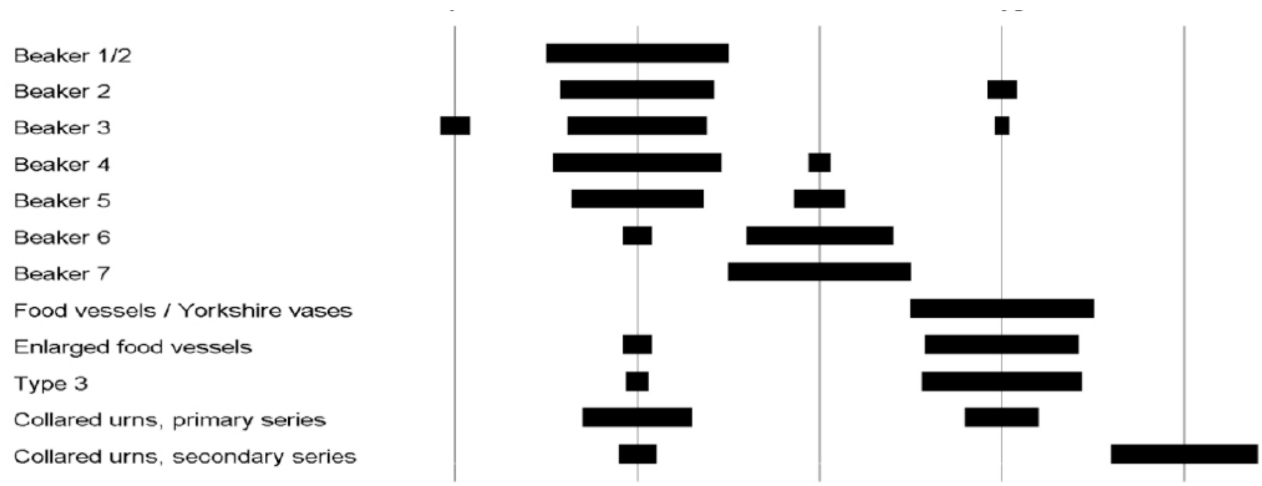
	Per cent								
	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Unstrat.	Total
Debitage	93	94	92	91	90	64	95		93
Cores	4	3	3		4	9	1		3
Tools	3	3	5	9	6	27	4	100	4
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table B18 Distribution of raw materials by area

	Quantity								
	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Unstrat.	Total
Quartz	839	2,051	1,496	51	265	6	311		5,019
Quartzite/ sandstone	183	190	260	7	22	4	17		683
Flint	120	305	267	2	33	1	20		748
Mylonite	22	37	135	1	7		6		208
Other fine-grained		15	8	2					25
'Black rock'	14	56	32	3	2			1	108
Coarse-grained	2	23	31		1				57
Amphibole-bearing		4	14						18
Limestone	2	3	11	1					17
TOTAL	**1,182**	**2,684**	**2,254**	**67**	**330**	**11**	**354**	**1**	**6,883**

	Per cent								
	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Unstrat.	Total
Quartz	71	77	66	76	80	55	88		73
Quartzite/ sandstone	16	7	12	10	7	36	5		10
Flint	10	11	12	3	10	9	5		11
Mylonite	2	1	6	2	2		2		3
Other fine-grained		1	<1	3					<1
'Black rock'	1	2	1	4	1			100	2
Coarse-grained	<1	1	1		<1				1
Amphibole-bearing		<1	1						<1
Limestone	<1	<1	1	2					<1
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table B19 Seriation of barbed-and tanged sub-types in relation to pottery styles



B6 Summary/conclusion

In connection with Elliott's survey of the Barabhas dunes, a total of 6,883 lithic and stone artefacts were recovered from seven different parts of the Barabhas dunes (Areas A–G). Most flaked lithics are in quartz (5,019 pieces), supplemented by artefacts in flint (748 pieces), mylonite (208 pieces), and less common raw materials, such as a solitary piece in Rum bloodstone (Caps 19–20). Artefacts traditionally referred to as 'stone tools' (hammerstones, pounders, etc), as well as waste from the production of those, include raw materials such as quartz, quartzite, sandstone and a number of coarser materials. It is thought that nearly all the quartz and flint, as well as most so-called 'stone' raw materials, was procured from pebble/cobble deposits along the local shore, whereas the mylonite may have been quarried along the main faultline running through the eastern parts of the Western Isles. As much as 78 per cent of the lithic and stone artefacts have rounded edges as a combined effect of wind and sand movement in the dune area ('sand-blasting'), where only 7 per cent of the excavated assemblage from Barabhas 3 (Ballin 2010c) had suffered this effect. Between 3.5 per cent and 6.5 per cent of the flaked material is fire-crazed, and it is thought that the different burnt ratios reflect a number of problems (mainly relating to the sandblasting of the artefacts) in terms of identifying these different types of raw materials as having been exposed to fire (Ballin 2008).

The three main artefact categories – debitage, cores and tools – make up approximately 93 per cent, 3 per cent and 4 per cent, respectively. The quartz, flint and mylonite sub-assemblages are quite differently composed, with the flint and mylonite artefacts having a considerably larger tool ratio than the quartz artefacts (15–17 per cent against 2 per cent). This may be due to quartz producing more waste per finished tool as a result of intricate fracture patterns, or it may be due to flint having been considered a more precious raw material and preferred for tools. The tool ratios of the Elliott Collection are generally considerably lower than those of most other Western Isles assemblages, probably as a combined effect of negative and positive factors: the sandblasting has made the recognition of retouch much more difficult than in excavated, 'non-blasted' assemblages, and Mark Elliott probably had 'a good eye', allowing him to recognise and recover many small pieces of sandblasted lithic waste which would have been missed by other collectors.

Overall, 6,415 pieces of debitage were retrieved, with chips being absent, whereas flakes make up 94 per cent, blades/microblades 3 per cent, and indeterminate pieces 3 per cent. In addition, six core preparation flakes were found. The quartz blanks were mainly detached by the application of hard percussion (78 per cent of technologically identifiable pieces), whereas the flint blanks were mainly detached by the application of bipolar technique (72 per cent of technologically identifiable pieces). Mylonite was mainly worked by the application of hard percussion (61 per cent of technologically identifiable pieces). Usually, quartz assemblages would include a relatively large number of indeterminate pieces (in the case of Barabhas 3 *c* 10 per cent; Ballin 2010c), due to the intricate fracture pattern of the local quartz, but the present assemblage includes much fewer such pieces than expected (*c* 4 per cent). This is probably again due to the sandblasting of the assemblage, where heavily abraded indeterminate pieces in quartz may be difficult to distinguish from quartz pebbles.

The 208 cores recovered by Elliott include 12 split pebbles (early-stage bipolar cores), two core rough-outs, 21 single-platform cores, one opposed-platform core, one core with two platforms at an angle, one discoidal core, 29 irregular cores, two 'flaked flakes', 133 bipolar cores and six core fragments. Quartz and flint cores are equally common (96 pieces and 94 pieces, respectively), supplemented by small numbers of cores in other raw materials. The composition of the quartz cores and flint cores (platform cores : bipolar cores) differ considerably, but corresponds well to the composition of the respective debitage assemblages. Approximately half of the quartz cores are platform cores, with three-quarters of the flakes and blades having been defined as hard-percussion pieces; nine-tenths of the flint cores are bipolar cores, with three-quarters of the flakes and blades being bipolar specimens. The slightly lower than expected number of quartz platform cores is probably due to some platform cores having been transformed into bipolar cores during the reduction process.

During the characterisation of the Elliott Collection, a new core type was defined ('flat single-platform cores'): they are defined by the following elements: 1) they are based on large hard percussion flakes; 2) they are based on grainy materials like quartzite and sandstone; 3) they have cortical platforms; 4) they have an oval outline; 5) they are flat (measured from platform to apex); and 6) the platform edges have usually not been trimmed, leaving denticulated platform edges.

A total of 260 tools were retrieved from the site, and they were divided into 'fine' tools (231 pieces) based on flaked blanks, and 'coarse' tools (29 pieces) which tend *not* to be based on flaked blanks (although there are exceptions). The latter group may then be subdivided into implements based on raw pebbles/cobbles and identified by their robust use-wear (eg most hammerstones and pounders), and those shaped by the flaking, pecking or polishing (or a combination of these actions) of pebbles/cobbles (eg points and fabricators).

The 'fine' tools include: 36 arrowheads, four knives, 132 scrapers, five piercers, one burin, one notched piece, one serrated piece, two combined tools, and 49 indeterminate implements with various forms of retouch. The 'coarse' tools include: two points, nine hammerstones, 14 pounders, one fabricator ('rod'), two discs, and one 'hollow stone'. The 'fine' tools are mainly (but not exclusively) based on various forms of fine-grained minerals or rock, whereas the 'coarse' tools are mainly (but not exclusively) based on various forms of coarse-grained rock. Quartz is a special raw material in this context, as it was used equally for 'fine' and 'coarse' tools.

Most of the arrowheads are barbed-and-tanged points of the Sutton Type, supplemented by two leaf-shaped and one oblique arrowheads, as well as one barbed-and-tanged point of Kilmarnock Type. A number of barbed-and-tanged rough-outs probably represent a small arrowhead workshop. The knives are mainly scale-flaked pieces. More than half of the scrapers are so small (≤ 23mm) that they have been defined as thumbnail-scrapers. One burin seems out of place, as this tool type is generally associated with pre Neolithic industries.

The lithic industry dominating the Elliott Collection is a flake industry. The three main flaked raw materials were reduced in different ways, probably largely due to the different sizes and shapes of the procured pebbles, cobbles and blocks. Quartz was reduced mainly by hard percussion, supplemented by bipolar technique to completely exhaust worn platform cores. Preparation of the cores practically never occurred. The flint was reduced almost entirely in bipolar technique. And mylonite was reduced predominantly by the application of hard percussion. The production of blades in flint included standard operational elements such as core preparation, trimming and platform rejuvenation. The absence of platform cores in mylonite makes it impossible to define the operational schema associated with the production of mylonite blades in any detail.

As mentioned in the report's introduction, the lack of general gridding while recovering the artefacts prevents detailed distribution analysis being carried out. However, there are some general trends. In terms of chronology, Early Bronze Age elements have been found in all areas and probably dominate all areas notably. In terms of activity, differences in the composition of the three largest sub-assemblages (Areas A–C) indicate that in Area B the settlers may have focused on primary production and in Area C on the manufacture and use of tools, although neither in an exclusive manner. Due to the fact that the collection was obtained through fieldwalking rather than excavation, it is not possible to offer a valid explanation as to why the mylonite ratio of the Area C assemblage is three to six times as large as those of the Area A and Area B assemblages.

Typo-technologically, diagnostic elements suggest that the Elliott Collection is heavily dominated by material dating to the Early Bronze Age, although supplemented by finds from the Early and later Neolithic periods. A solitary burin suggests that the location may have been visited in pre-Neolithic times.

APPENDIX C

Table C1 Radiocarbon dates

Site	Sample	Material	Context	Context description	Depositional context	Uncal BP	Calibrated 1-sigma (68.2%)	Calibrated 2-sigma (95.4%)	δC[13] rel. to VPDB ‰
BMP 2000–1	SUERC 51204	Cattle bone	002	Dark brown compact sandy loam with bone and a few limpets	Primary	1391 ± 35	621–664 AD	593–681 AD	–22.1
	SUERC 51202	Red deer bone	011	Dark brown/black silty loam, containing bone and pottery	Primary	2010 ± 35	47 BC – 24 AD	105 BC–71 AD	–22.2
	SUERC 51203	Red deer bone	022	Dark brown fill of stone feature F16.4 containing burnt bone, pot and charcoal	Primary	3236 ± 35	1597–1588 BC (4.8%) 1532–1450 BC (63.4%)	1611–1435 BC	–21.6
	SUERC 51193	Red deer bone	032	Compact mid-brown sandy loam with few inclusions. Some small fragments of bone	Secondary – mound construction F16.2	1395 ± 35	621–662 AD	588–678 AD	–21.7
	SUERC 51201	Red deer bone	045	Compact dark brown sandy loam. Some small fist-sized stones and heat-cracked pebbles, some burnt bones. F16.2	Primary	2087 ± 35	162–129 BC (22.4%) 120–45 BC (45.8%)	200–36 BC (92.8%) 31–20 BC (1.3%) 11–2 BC (1.3%)	–21.8
	SUERC 51194	Red deer bone	069	Brown soil inside structure F16.3. Fire-fractured stones, very few flecks of charcoal.	Secondary	1433 ± 35	600–650 AD	564–659 AD	–21.7
	SUERC 51196	Sheep/goat bone	090	Black, compact soil with orange clay/ peat ash and burnt areas. Spread out from central hearth in F16.3	Primary	1426 ± 35	605–650 AD	570–660 AD	–22.6
	SUERC 51195	Cattle bone	096	Brown silty sandy soil around hearth stone setting in F16.3	Primary	1500 ± 35	538–611 AD	430–493 AD (15.6%) 530–642 AD (79.8%)	–21.8
	SUERC 51205	Goose bone	117	Fill of cut (118), showing pottery and bones on the surface	Primary	1877 ± 35	76–170 AD (60.1%) 194–210 AD (8.1%)	62–230 AD	–14.7
	SUERC 51200	Cattle/red deer bone	121	Central hearth, F 24, concentration of burnt deposits	Primary	3234 ± 35	1595–1589 BC (3.1%) 1531–1449 BC (65.1%)	1611–1433 BC	–21.9

Table C1 *cont.*

Site	Sample	Material	Context	Context description	Depositional context	Uncal BP	Calibrated 1-sigma (68.2%)	Calibrated 2-sigma (95.4%)	δC^{13} rel. to VPDB ‰
B1	SUERC 44265	Red deer phalanx	055	Thin dark grey/black sandy deposit representing remains of original floor	Primary	3170 ± 26	1491–1480 BC (13.1%) 1456–1419 BC (55.1%)	1498–1409 BC	–21.2
	SUERC 44266	<6m cattle pelvis	092	Compact black layer. Use of floor surface	Primary	3178 ± 26	1493–1475 BC (21.1%) 1461–1426 BC (47.1%)	1500–1412 BC	–20.7
	SUERC 43760	Charred grain – hordeum	045	Deep pink peat-ash, very dense in shells, especially limpets	Secondary	3088 ± 30	1412–1371 BC (40.5%) 1346–1316 BC (27.7%)	1429–1292 BC (94.2%) 1278–1271 BC (1.2%)	–22.1
	SUERC 43761	Charred grain – hordeum	055	Thin dark grey/black sandy deposit representing remains of original floor	Primary	3078 ± 30	1405–1369 BC (31.2%) 1358–1315 BC (37.0%)	1419–1268 BC (95.4%)	–24.5

Table C1 *cont.*

Site	Sample	Material	Context	Context description	Depositional context	Uncal BP	Calibrated 1-sigma (68.2%)	Calibrated 2-sigma (95.4%)	δC¹³ rel. to VPDB ‰
	SUERC 43765	Charred grain – hordeum	009	Sandy midden contained within hollow outwith walls and above paving. Midden outside structure	Secondary	698 ± 30	1272–1299 AD (59.8%) 1371–1379 AD (8.4%)	1262–1310 AD (74.8%) 1360–2388 AD (20.6%)	–23.4
	SUERC 44267	<2 yr cattle calcaneum	022	Midden; scarred with ploughmarks	Secondary	744 ± 26	1259–1283 AD	1225–1287 AD	–21.9
	SUERC 44268	Red deer metatarsal	035	Midden. Compact sticky sandy loam, red brown peat ash, organic content	Secondary	1021 ± 26	993–1024 AD	972–1041 AD (94.5%) 1109–1116 AD (0.9%)	–21.8
	SUERC 43881	Charred grain – hordeum	040	Upper surviving fill (core) of double-skinned wall	Secondary	824 ± 30	1188–1198 AD (8.3%) 1207–1259 AD (59.9%)	1164–1265 AD	–23.8
B2	SUERC 43766	Charred grain – hordeum	045	Sandy midden layer	Secondary	720 ± 30	1265–1290 AD	1228–1302 AD (90.2%) 1367–1383 AD (5.2%)	–25.3
	SUERC 43767	Charred grain – hordeum	046	Blown sand with lenses of midden. Noticeable quantities of burnt material	Secondary	803 ± 30	1219–1261 AD	1179–1275 AD	–24.2
	SUERC 44272	Immature cattle calcaneum	049	Very dense winkle deposits in sandy matrix	Secondary	673 ± 20	1283–1299 AD (45.8%) 1370–1380 AD (22.4%)	1277–1310 AD (58.5%) 1360–1388 AD (36.9%)	–22.1
	SUERC 43768	Charred grain – hordeum	049	Very dense winkle deposits in sandy matrix	Secondary	758 ± 30	1228–1233 AD (4.8%) 1239–1280 AD (63.4%)	1220–1284 AD (95.4%)	–25.0 assumed
Rudh a'Bhiogair 1	SUERC 38647	Human bone – left radius	SK1	Rescue excavation of eroding burial – Langhorne 1993	Secondary	1325 ± 30	656–692 AD (54.9%) 749–764 AD (13.3%)	650–723 (74.5%) AD 740–771 (20.9%) AD	–19.8

Table C1 *cont.*

Site	Sample	Material	Context	Context description	Depositional context	Uncal BP	Calibrated 1-sigma (68.2%)	Calibrated 2-sigma (95.4%)	δC^{13} rel. to VPDB ‰
Rudh a'Bhiogair 2	SUERC 38656	Human bone – left radius	SK7	Rescue excavation of eroding burial – Stuart 1996	Secondary	1350 ± 25	651–676 AD	640–695 AD (90.7%) 702–706 AD (0.5%) 747–765 AD (4.2%)	–19.9
B3	SUERC 38651	Human bone – left radius	SK5	First season, rescue excavation of crouched burial in shallow scoop	Primary	3180 ± 30	1494–1472 BC (23.3%) 1465–1427 BC (44.9&)	1508–1408 BC	–19.4
	SUERC 38649	Human bone – left radius	026 (SK3)	Crouched burial under stone slabs, inserted in earlier building	Primary	3275 ± 30	1607–1571 BC (30.4%) 1560–1548 BC (9.3%) 1540–1506 BC (28.5%)	1626–1493 BC (93.2%) 1476–1461 BC (2.2%)	–19.6
	SUERC 38648	Human bone – left radius	106 (SK2)	Crouched burial inserted in earlier building	Primary	3300 ± 30	1612–1531 BC	1664–1651 BC (2.3%) 1642–1501 BC (93.1%)	–19.4
	SUERC 38650	Human bone – left radius	144 (SK4)	Crouched burial inserted in earlier building	Primary	3160 ± 30	1491–1480 BC (9.1%) 1456–1411 BC (59.1%)	1499–1391 BC	–19.7
BMP 2000–1	SUERC 38652	Human bone – left radius	034 (SK6)	Long cist burial	Primary	1755 ± 30	240–264 AD (20.3%) 275–333 AD (47.9%)	176–190 AD (1.2%) 212–387 AD (94.2%)	–20.3

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