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The Development of Neolithic House Societies in Orkney

Investigations in the Bay of Firth, Mainland, Orkney (1994–2014)

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View of the Bay of Firth study area from the east with the southern slopes of Wideford Hill in the foreground. To the west the Hills of Heddle and Cuween create a boundary with western Mainland and the Stenness–Brodgar monument complex. The Brodgar isthmus can be seen top left (Craig Taylor).

This book is dedicated to
Alasdair Whittle

And the memory of
Judith Robertson

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Front cover: Knap of Howar, Papa Westray (Colin Richards)
Back cover: The hills of northern Hoy dominate Mainland, Orkney (Colin Richards)

HISTORIC SCOTLAND ALBA AOSMHOR

Contents

Acknowledgements

This monograph charts the second phase of fieldwork undertaken to investigate the Neolithic of Mainland, Orkney, the first having been described in *Dwelling Among the Monuments* (Richards 2005) and the third in *Building the Great Stone Circles of the North* (Richards 2013). Initially, the project was funded by the University of Glasgow (New Initiatives Fund), and later by the British Academy, the Society of Antiquaries of Scotland, Orkney Islands Council, The Russell Trust, the University of Manchester and the Glasgow Archaeological Society. The project was also sponsored by Orcargo (and we thank David Laidlow for his enthusiasm and generosity) for several years. However, it was only with funding from Historic Scotland that the research reached a level that enabled a transformation of the project into the substantial form as reported in this volume. For this support we are indebted to Patrick Ashmore for initiating funding and subsequently Rod McCullagh who not only managed this project over many years but showed both great enthusiasm and patience for which we are most grateful. We are also very grateful to Lisa Brown at Historic Scotland for her help and guidance at the publication stage of this volume.

During the entire project we have worked in conjunction with the local community in a variety of ways and a number of people have been pivotal in this capacity. Bryce Wilson, former director of Tankerness House Museum, Kirkwall, Mainland, Orkney, always considered a formal relationship between our project and Orkney Museums to be essential. Consequently, Tom Muir participated in all our excavations and provided expert advice and great friendship and we cannot thank him enough. The late Anne Brundle always took great interest in our work and her enthusiasm was contagious. Even as a reporter Sigurd Towrie consistently visited the excavations and communicated our results to the island community through the *Orcadian* newspaper, and now as editor, he continues to report and promote island archaeology in a highly knowledgeable and exciting manner. He too has become a valued friend and we thank him for his long-term interest and commitment to disseminate our results. Throughout the duration of the project we have been fortunate enough to have the friendship, knowledge and support of the Regional Archaeologist Julie Gibson. During her tenure, and under her guidance, Orcadian archaeology has gone from strength to strength and is now a model for the entirety of Scotland. We cannot thank her enough for her continual enthusiasm and kindness. Andrew Appleby has always been an enthusiastic supporter of both our project and Orcadian archaeology in general and we thank him for his support. Caroline Wickham-Jones always provided valuable advice (especially when a hint of Mesolithic archaeology appeared) which is much appreciated. Virtually all the excavations comprising this project have required top-soil removal by expert machining, which for over twenty years has been provided by the finest JCB operators in Orkney, Ally Miller, and more recently Terry Todd and we thank them for their generosity and professionalism. Finally, a particular debt is owed to Donald Kirkpatrick for his consistent patience, support and friendship.

The theme of this volume revolves around a modification of Claude Lévi-Strauss' concept of *sociétés à maisons* and since the start of the project its theoretical orientation has been a major topic of discussion. Consequently, the following people are thanked for valuable discussions: Richard Bradley, Kenny Brophy, Giles Carey, Gabriel Cooney, Vicki Cummings, Jane Downes, Mark Edmonds, Seren Griffiths, Andy M. Jones, Siân Jones, Duncan Garrow, Dan Lee, Lesley McFadyen, Tom Muir, Mike Parker Pearson, Josh Pollard, John Raven, Niall Sharples, Antonia Thomas, Julian Thomas and Alasdair Whittle.

A number of people also gave complete access to their unpublished excavations and for this generosity we would like to thank Dan Lee and Antonia Thomas (Ha'Breck, Wyre), Mick Miles and Diana Coles (Green, Eday) and Nick Card (Ness of Brodgar, Mainland). Colin Renfrew kindly allowed access to his Quanterness archive at the University of Kent, and permitted the reproduction of photographs of his excavation in 1973.

Hugo Anderson-Whymark, Adam Stanford and Craig Taylor kindly provided a range of excellent photographs and they are warmly thanked.

Although of long duration, this project was constantly producing unexpected results right up to its conclusion in 2014. Consequently, it was exciting and fun to direct. It began in March 1994 when Adrian Challands and the two authors went to Orkney to undertake a gradiometer survey at Deepdale, Stromness. As the results of this survey were inconclusive, it was decided to shift the focus to a new study area taking in the coastal zone of the Bay of Firth. A year or so earlier, at an open evening arranged by the late Anne Brundle at Tankerness House Museum in Kirkwall, Mr Ronnie Flett had brought in a number of objects to be identified which included a broken macehead and several worked flints. When asked where this material came from, he explained that it had been collected from a corner of a field which lay directly below Cuween Hill chambered cairn. The name of this farm was Stonehall where we went on to work from 1994 to 2000. Our fieldwork at Stonehall was highly enjoyable, not least because of the interest, enthusiasm and kindness of Ronnie Flett and his wife Mabel. We cannot thank them enough.

Overall, the new study area seemed to fulfil the necessary requirements of possessing a good range of Neolithic settlement, with the additional bonus of associated chambered cairns. The following account is based upon the results of a prolonged period of fieldwork where seven Neolithic settlements were examined which spanned the entirety of the Neolithic period (*c.*3600–2000 cal BC). It is fair to say that the results of this research have substantially altered our understanding of the nature of habitation during the Orcadian Neolithic.

The Bay of Firth area in central Mainland, Orkney, is very fertile and the pasture tends to be ploughed and reseeded on a 5–8 year cycle. This allowed fieldwalking to be undertaken and we would like to thank both Scott Harcus and Ken Watson for allowing us to wander across the lands of Quanterness and Rennibister respectively. As good fortune would have it, the settlements at Crossiecrown and Wideford were located on the land of both farms and again we are indebted to both Scott and Ken, and their respective sons, William and Alastair for their permission and great interest in our work.

As the project progressed, a degree of reflexivity was required to accommodate the unexpected material being discovered. For example, our early aim of examining forms of settlement contemporary with Barnhouse had to accommodate a much wider chronological spread with a substantial component of habitation being of mid–late 4th millennium cal BC date. Between 1998 and 2006 Jane Downes undertook several projects examining early Bronze Age barrows and burial practices including Varme Dale, Rendall, which produced mid-4th millennium cal BC settlement evidence which is incorporated into this volume. Jane wishes to thank the landowner at Varme Dale (the late) Mr Fraser.

In 2013–14, in conjunction with Christopher Gee, a new site at Brae of Smerquoy was investigated on the lands of Billy Sinclair who we cannot thank enough for his enthusiasm, warmth and permission to work on his land. We would also like to extend this gratitude to Billy's neighbour, Mr John Brody for his interest, help and kindness during the fieldwork and excavation. Our particular thanks also go to the late Eoin Scott, who was extremely interested in the Redland sites and a good friend to Orkney archaeology. His interest extends in the current landowner Mr Robbie Tulloch and we thank him for enthusiastic support (and patience) of the investigation of the Muckquoy site and field survey in the surrounding area.

The important role of Jane Downes, Siân Jones and more recently, Christopher Gee in the project cannot be overstated, nor can the help of many students from the Universities of Glasgow, Manchester and University College Dublin who took part in the large excavations at Stonehall (co-directed by Colin Richards, Richard Jones and Siân Jones) and Crossiecrown (co-directed by Nick Card and Jane Downes) and the subsequent post-excavation work. Equally, the great help of University of the Highlands and Islands students and support of numerous local volunteers and others who came from further afield, especially in regard to Smerquoy (co-directed by Christopher Gee, Colin Richards and Mairi Robertson) is kindly acknowledged.

The contributions of supervisors Kenny Brophy, Martin Carruthers, Adrian Challands, Norma Challands, Stuart Jeffrey, Andrew M. Jones, Angus Mackintosh Judith Robertson, Mary Harris and Lesley McFadyen at Crossiecrown and Stonehall are gratefully acknowledged. Richard Jones is grateful to Lorna Campbell, Lorna Sharpe, Lesley Farrell, Chris Connor and Gert Petersen for their assistance in many different ways throughout the project. At the project's archiving stage in Glasgow, (the late) Anne Brundle gave much helpful advice, and several students were involved, especially Kristjana Eyjclfsson and Elizabeth Pierce, in that process.

The Wideford Hill excavations received funding from Historic Scotland and Orkney Island Council. The initial

persistence of Richard Chatterton undoubtedly led to the discovery of the unknown area of the Wideford settlement and we are very grateful for his tenacity. The two periods of excavation were undertaken in variable conditions by a highly enthusiastic team for no huge reward (apart from the amazing archaeology) and we really appreciate the help of Nick Card, Martin Carruthers, Adrian Challands, Richard Chatterton, Stuart Jeffrey and Angus Mackintosh. Jane Downes and her students also joined in the excavations along with Tom Muir of Orkney Museums.

For Knowes of Trotty Jane Downes thanks the excavation co-director, Nick Card, and fieldworkers Paul Sharman, Adrian and Norma Challands, Alastair Wilson, Jakob Kainz, Roy Towers, Marion Chesters, John Chesters, Kathleen Ireland, Katy Chalmers, Mary Harris, (the late) Judith Robertson, Alastair Wright, Naomi Woodward, Matt Jones, Ann Johnston, Sean Mullan and Tom Whalley for their hard work and enthusiasm in the survey and excavation. The late David Coombs, and Keith Maud, of the University of Manchester collaborated in the first year of survey at the site and it was a pleasure to work with them. Many thanks also go to Alison Sheridan and the National Museums of Scotland for their very generous support; Regional Archaeologist Julie Gibson, and Rod McCullagh of Historic Scotland for their advice and help. As always, Frank Bradford took some wonderful photographs which are much appreciated.

Varme Dale was excavated as part of the Orkney Barrows Project, generously funded by Historic Scotland. Site director Jane Downes acknowledges the support of Julie Gibson, Orkney Archaeological Trust, and (the late) Anne Brundle and Tom Muir of Orkney Museums. Thanks go to the fieldwork team: Biddy Simpson, Tom Ullathorne, Danny Hind, Sue McCabe, Cathy Pink, Adrian Challands, Julie Roberts, Camilla Priede, Norma Challands, Leslie Macfadyen and Matilda Webb. Pat Wagner co-ordinated the environmental analysis at Sheffield University.

The Ramberry Head sites were reported by the landowner, Mr Scott Harcus who subsequently gave permission for excavation. These sites would have remained undetected without his keen eye and great interest and we thank him for his support. Excavations occurred in the spring of 2005 and were conducted by Colin Richards, Adrian Challands and the late Judith Robertson.

More recently, the Brae of Smerquoy was investigated on the lands of Billy Sinclair. Smerquoy was funded by grants from the Orkney Island Council and University of Manchester, and ORCA kindly supplied equipment. Billy Sinclair, Peter Brigham and the University of Manchester generously provided support with radiocarbon dating, as did the Orkney Archaeology Society, and we very much appreciate the support of Andrew Appleby. Of the many people who either volunteered or helped at Smerquoy, we would like to thank Hugo Anderson-Whymark, Andy Boyer, Peter Brigham, Mary-Anne and Andy Buntin, Robbie Cant, Giles Carey, Norma and Adrian Challands, Mr and Mrs Cullen, Vicki Cummings, Mr and Mrs Davis, Michael Ferguson, Alistair Foden, Kim Foden, Martin and Mansie Gee, Joyce Gray, George Gray, Seren Griffiths, Anne Johnston, Catherine Kriisa, Christopher Leask, Neil Leask, John Leith, Mark Littlewood, Ragnhild Ljosland, Dani Lord, Danny Muir, Tom Muir, Mick Page, Alan Price, Georgie Ritchie, Jeanne Rose, Mary Saunders, Lorraine Sharpe, Michael Sharpe, Kenneth Stander, Roy Towers, Joanna Wright and Peter Woodward. Seren Griffiths and Ben Geary are particularly thanked for their environmental and botanical advice and work at Smerquoy.

Muckquoy, Redland, was fieldwalked in the spring of 2013 by Colin Richards, Mairi Robertson and members of the Orkney Archaeological Society. Concurrent geophysical survey was undertaken by Christopher Gee and James Moore, and topographic survey by Mark Littlewood. Further geophysical survey and excavation occurred in the summer of 2013 and the team consisted of Christopher Gee, Alan Price, Dave Rae, Colin Richards, George Richie, Mairi Robertson and Roy Towers.

As can be imagined, the post-excavation component of this project was considerable involving a large number of specialists in different location and we thank all of them for their help in bringing this research to a satisfactory conclusion. In this vein Richard Jones thanks David Sneddon for the initial recording of much of the pottery at Stonehall, Jane Sievewright for the pottery drawings, Shane Donatello who carried out the phosphate determinations at Stonehall, and Lorna Campbell for preparation of many of the ceramic thin sections. For the experimental work he is primarily indebted to Bill Brown, Ken Ryan, Stephanie Durning, Fiona Stephens and John Irwin. In Orkney he is grateful to Andrew Appleby and Tom Muir for their assistance and advice. Finally, he is grateful to Ann MacSween and Alison Sheridan for advice and encouragement.

Andrew Meirion Jones would like to thank (the late) David Peacock, David Williams, Gemma Tully and Sandy Budden for help or assistance over the course of the project. Lara Maritan extends thanks to Emrys Phillips and the

British Geological Survey at Edinburgh for access to its collection of rock thin sections, Allan Hall for advice and assistance with the photomicroscopy and Lesley Farrell and Leonardo Tauro for kindly preparing thin sections. Anna Staples (née Mukherjee) and Richard Evershed are grateful to Jim Carter, Ian D. Bull and Rob Berstan for their technical assistance and the NERC for funding the Bristol node of the Life Sciences Mass Spectrometry Facility. The Wellcome Trust is thanked for providing a Bioarchaeology PhD studentship for Anna Mukherjee (061666/Z/00/Z). David Lawrence thanks Nick Card for providing background information on the Ramberry project and for the skeletal reports on the Knowes of Trotty and Loth Road, and Alison Sheridan for discussing the technique of carbonate dating as applied to cremated bone.

Alison Sheridan thanks Dr Kathy Eremin (formerly of NMS) for undertaking analysis of the Stonehall bead. Effie Photos-Jones is grateful to Allan Hall for commenting on an earlier draft of the section on haematite, and John Brown is gratefully acknowledged for the information on the recent hematite finds on Mainland. In relation to Chapter 16 Charles French thanks Julie Miller and Brian Pittman of the McBurney Geoarchaeology Laboratory, Department of Archaeology, University of Cambridge, for the manufacture of the thin sections, and Karen Hartshorn (then of the same Department) who carried out the basic descriptions and analyses of three thin section profiles (1–3) as part of her M. Phil dissertation in 1999.

The major task of illustration and artefact photography for this project was undertaken by a range of people including Hugo Anderson-Whymark, Anne Bankier, Steve Bellshaw, Adrian Challands, Ann Clarke, Crane Begg, Amanda Brend, Thomas Desalle, Christopher Gee, Patricia Voke, Lorraine McEwan, Michael Sharpe, Jill Sievewright, Antonia Thomas and Joanna Wright. Archiving this project was a major task that was effectively undertaken by Irene Garcia Rovira, and she has our warmest thanks. Alasdair Whittle and Vicki Cummings kindly read and commented on various elements of this text.

There have been so many people involved in this project some will have slipped through our net, however, we thank all those who have generously given their time and worked on what has been a highly enjoyable and exciting project in so many ways since its inception in 1994. Unfortunately, one of the people we worked with at Ramberry Head (Chapter 8), Judith Robertson died unexpectedly in 2007. Judith was a lovely person and great archaeologist, and it is fitting that this book is dedicated to her memory.

Finally, we thank Tara Evans, Julie Gardiner and Clare Litt at Oxbow for their considerable assistance and patience in bringing this volume to fruition.

Since before going to study archaeology at university, one of the authors (CR) became obsessed with the Neolithic period and was especially inspired by the writings of Alasdair Whittle. Significantly, some of Alasdair's early research was based in the Northern Isles (although it was Shetland!). Since that time he has become a good friend and continued to provide a range of stimulating books and papers on the British and European Neolithic. Consequently, we would like to also dedicate this volume to you too Alasdair.

Colin Richards, Manchester
Richard Jones, Glasgow

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CHAPTER THIRTEEN

The Coarse Stone from Neolithic Sites around the Bay of Firth: Stonehall, Wideford Hill, Crossiecrown, Knowes of Trotty and Brae of Smerquoy

Ann Clarke

13.1 Stonehall

Throughout the three areas of Neolithic settlement examined at Stonehall, cobble tools of various types were in continuous use. Certainly within the excavated areas, Skaill knives do not appear to have been made or used, despite their common use at the nearby sites of Wideford Hill, Smerquoy and Crossiecrown. Neither do stone discs occur in any great quantity, again showing contrasts with the other sites within the Cuween-Wideford area. Significantly, these patterns of use are maintained between the early and late Neolithic occupation of the site revealing a certain consistency of stone tool production and the practices to which they relate (Fig. 13.1).

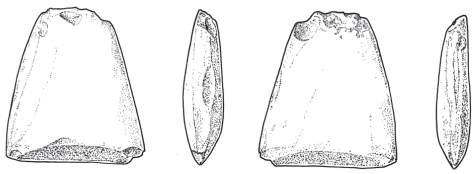
One notable difference between the early and later phases is the singular use of smoothers, grinding stones and grinding slabs in the earlier Neolithic at Stonehall Knoll and Stonehall Meadow. These items were found in both internal and external deposits and the concentration on the Knoll must indicate a manufacturing base within and around House 3. In contrast the Stonehall Farm late Neolithic settlement mound did not produce this array of tools. This disparity is most likely a chronological feature as accumulated evidence from Early Neolithic sites indicates an emphasis on the use of stone tools for grinding during this period in contrast to the lack of such tools in the later Neolithic phases (see below).

The unusual Structure 1 at Stonehall Farm is notable for its 'cleanliness' as the only stone tools found here were the cache in the cavity below the flagstone [645] (see Fig. 6.17). This collection of a fine quartz axe, a Knap of Howar grinder, and four fine knapping hammers together with the products of flint knapping clearly represents a special deposit. Another Knap of Howar grinder was found in the wall core deposits of this structure.

13.1.1 Artefact types

Axes (Total =10)

From Stonehall there are five complete axes, four broken across the width and one possible rough-out. Two of the axes are fine miniature examples (SFs 87 and 6410), the former made of micaceous mudstone and the latter a grey volcanic rock. Both are of a similar size and each has been ground all over to shape. The other small axe (SF 7035) is made of siltstone and a fresh break indicates it would originally have been a very light grey colour. It is quite stubby in form and given the multiple grinding facets on one face it was most likely reground from a larger axe fragment. Another fine piece is the quartz axe (SF 2658), which is part of the cache of objects in the floor of Structure 1, Stonehall Farm (see below). This unusual axe has been formed by flaking and grinding. Rough pecking and/or flaking is present on the butt end and sides whilst the blade end, though carefully ground, has a blunt, rounded edge; interestingly, this feature of deliberate blade blunting is shared with the other four known quartz axes in Orkney (Clarke 2011). The other complete axe (SF 2678) is also made of the grey volcanic rock and has been ground all over to a near polish. Some pecking



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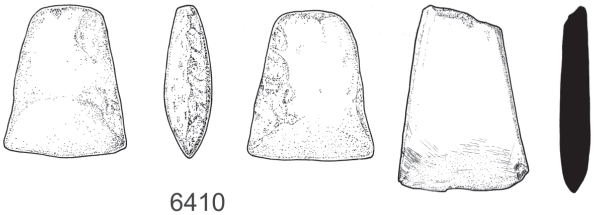

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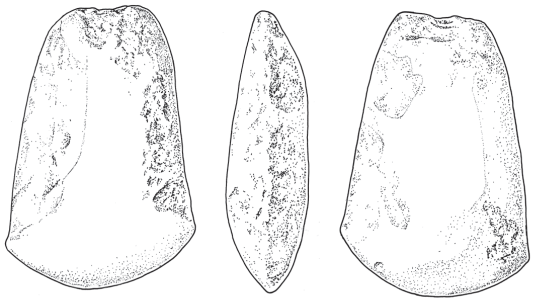

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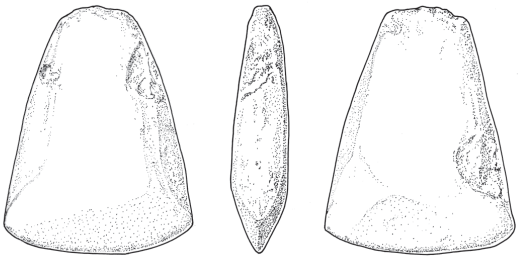

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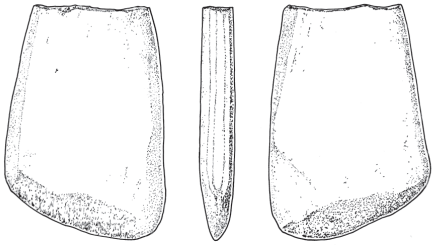

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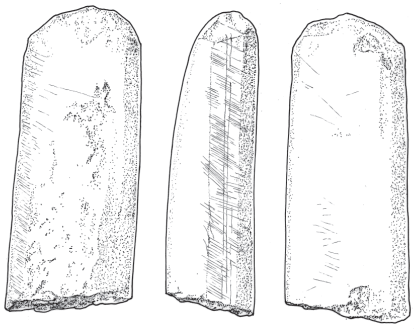

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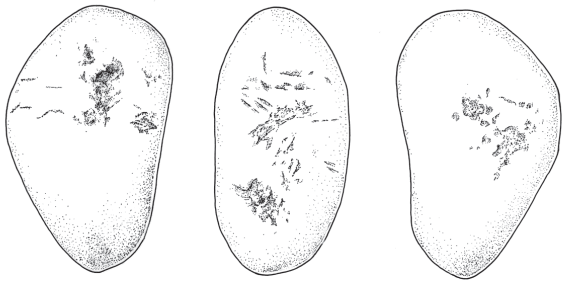

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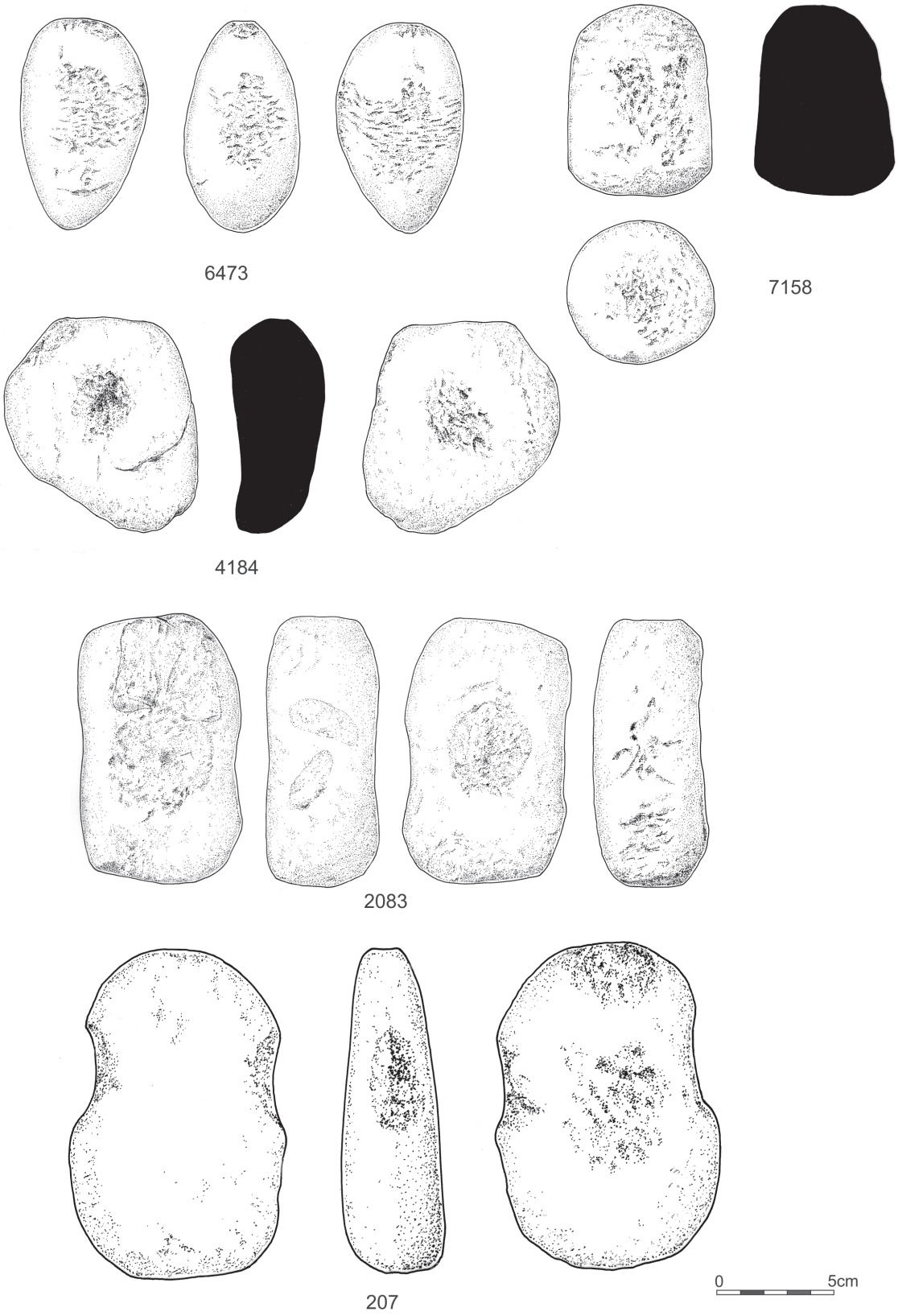


Figure 13.1 Worked stone from Stonehall. *Continues p. 448.*

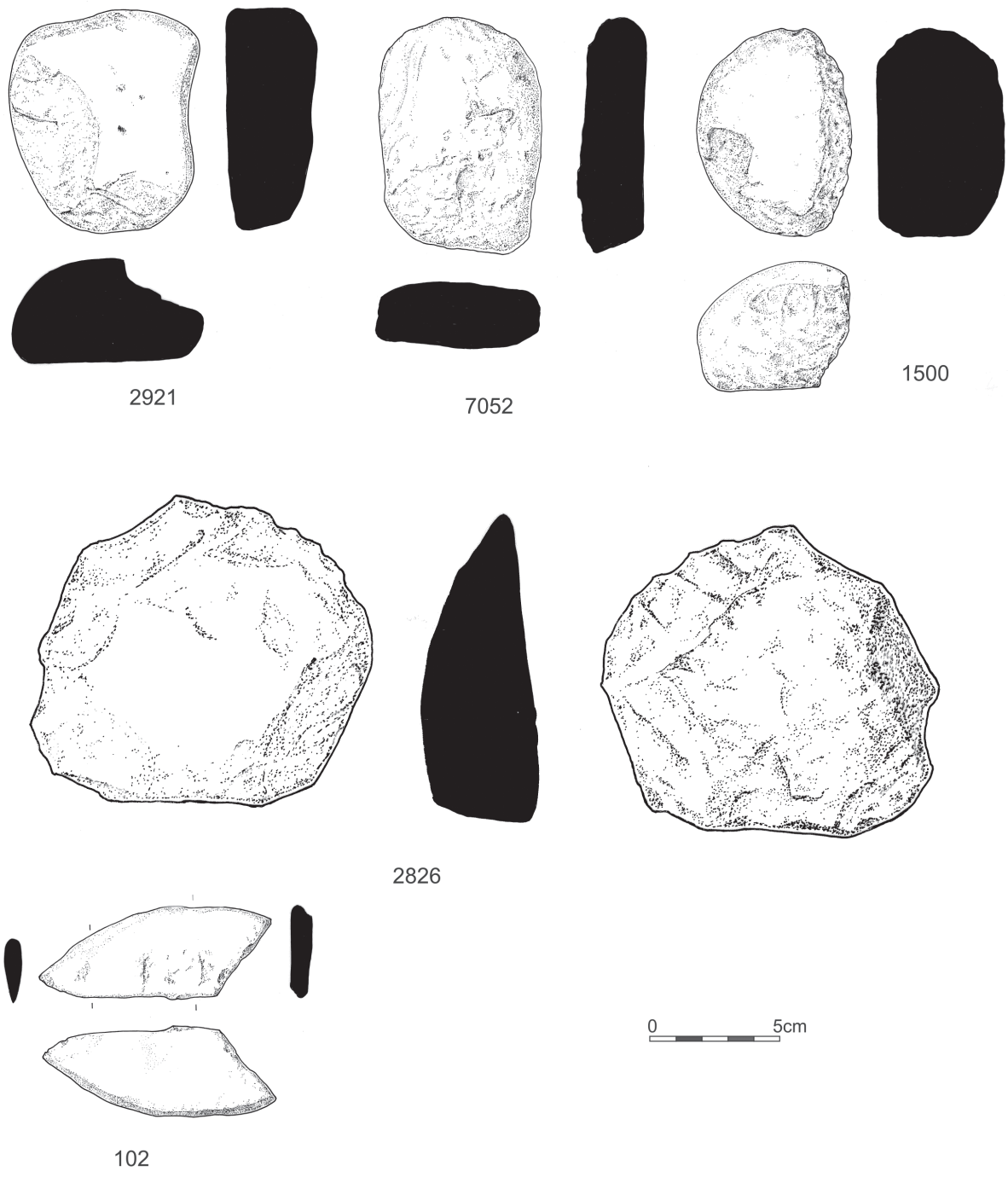


Figure 13.1 Worked stone from Stonehall, continued.

down the sides and associated friction polish indicate that this axe would originally been hafted though the lack of damage on the finely-ground blade would suggest that it was not used for heavy work. Of the broken axes (SFs 7011, 2155, 880, 691) the latter is the most interesting since it is the butt-end of a chisel-like axe, for instance, it is narrower than a regular axe with straighter sides and a thick cross-section. The unusual grey-coloured banding of this fine-grained micaceous sandstone was clearly selected as appropriate for this axe. A finely shaped axe of micaceous siltstone (SF 7011) is broken at the butt end. Finally, there is a possible axe rough-out (SF 1511) which is really just a lump of volcanic rock which has been roughly flaked to a curved blade end and thick butt

Table 13.1 Artefact types from the excavated trenches at Stonehall (Headings are trench letters followed by: Interior = I; Exterior = E; Wall = W; TS = Topsoil; T = Total).

	AI	AE	CI	CW	CE	BI	BW	BE	EE	FE	Z	TS	T
Axe				1		1		2		1	2	3	10
Faceted cobble	1		1					2				1	5
Facially pecked cobble		1	2		1	3			2		1	3	13
Faceted & Facially pecked cobble		1				1		2			2		6
Plain hammerstone			2		1			1				2	6
?Polisher											1		1
Smoother		1	3	1	1						1	1	8
Grinding slab			1		1								2
Grinding stone			1		1							1	3
Knap of Howar grinder						1	1						2
Ground stone knife		1						1					2
Stone disc								1			2	2	5
Flaked cobble					1						1		2
Flakes	1	1	1		3	2		1					9
Total	2	5	11	2	9	8	1	10	2	1	10	13	74

without any subsequent grinding or polishing. Present evidence suggest that this raw material only occurs in archaeological deposits in artefactual form such as axes or stone balls, for example, at Barnhouse (Clarke 2005a) and Braes of Ha'Breck.

The axes are scattered across the site and only one, the quartz axe (SF 2658), is associated directly with a structure being deliberately deposited with other artefacts in the cavity below the flagstone [645] in Structure 1. The rough-out (SF 1511) was associated with the wall collapse of House 2 on Stonehall Knoll so its original circumstances of deposition are not clear. The rest of the axes are not associated with structures being found either in the topsoil of Stonehall Farm (Trench B) and Stonehall Knoll (Trench C) (SFs 2155, 691, 880) in positions outwith the structures, or else in a midden (SF 6410). There is also an unstratified axe from Stonehall Farm (SF 2678) and one from the topsoil at Stonehall Meadow. The latter was directly over an area of red midden [002], which is associated with a working area (identified in Trench A) beyond the entrance of House 3.

Cobble Tools (Total = 31)

These tools have been divided into four main types on the basis of the patterns of use wear left on the surface. They comprise facially pecked cobbles (Total = 13); faceted cobbles (Total = 5); faceted and facially pecked cobbles (Total = 6); and plain hammerstones (Total = 6). These tool types have been discussed in more detail elsewhere (Clarke 2006) and none of the cobble tools from Stonehall show any deviation from the norm.

Of interest is the cache of stone tools found deposited beneath the large slab [645] in Structure 1, Stonehall Farm, which amongst other types included one faceted and facially pecked hammerstone (SF 6350) and three facially pecked hammerstones (SFs 2656, 6349; 6473). These are in fact the nicest and most well-formed of all the cobble tools on site; they retain a hard rolled cortex indicating that they were collected on the beach. They also have a fresh appearance in comparison to many of the other tools presumably because they have been protected from the elements in the underlying cavity. They have been heavily used in comparison to other cobble tools on the site and the traces of linear pecking on the faces of three of the cobbles (SFs 6349, 6350, 6473) indicate their use as hammerstones in flint knapping particularly using the bipolar technique.

Indeed most of the cobble tools were most probably used in flint knapping given the number of cobbles with pecking on the faces. Other functions such as the processing of a soft, possibly vegetable, matter may be indicated by SF 1666 which has a discolouration on the narrow facet as if from the substance being worked. Other cobbles bear quite heavy circular indentations (SFs 4184, 2083) on opposite faces which may be from their use as an anvil whilst on another large cobble tool

(SF 207) the heavily pecked indentations on the sides are most probably notches for hafting. A pestle-like form (SF 7158) with pecking in the centre of the rounded end facet looks like it may have been used in a stirring and grinding motion in a mortar.

There is an additional quartz pebble (SF 7195) which appears to have been used for rubbing/polishing on each flat face. A further 66 cobbles were collected on-site which had no signs of wear. These are catalogued but not included in Table 13.1.

Ground stones (Total = 15)

The assemblage breaks down into: Smoothers (Total=8), Grinding stones (Total = 3), Grinding slabs (Total= 2) and Knap of Howar grinders (Total = 2). The smoothers all have single faces which have been worn flat and smooth. In most cases the original cobble face has been worn either lightly, for example, SF 1744, or else more heavily with defined edges (SF 7052). Three of the smoothers have been made on split cobbles whereby the broken face becomes the working face and is very flat and smooth (SFs 2921, 1500). These tools were most probably used by rubbing the worked face on a flat surface. Striations are visible on only one fragment indicating that the material being worked was soft; a possibility may be the preparation and softening of cured or dried hides.

The grinding stones differ from the smoothers because they appear to be the base stones upon which a substance was worked. They are fragments of flat, circular cobbles with faces which have been worn smooth, either flat or concave, and which have some pecking in the centre to provide purchase for the substance being worked. Both grinding slabs are large blocks of stone but one (SF 2881) may have a similar function to the grinding stones (see above) since it bears a face worn to a smooth concave profile with pecking in its centre. The other slab bears a different wear pattern (SF 2807) having a band of smoothing, 45mm wide, running down the length of one face. The slight concavity in the profile and the striations running down the length suggest it may be for grinding axes or possibly bone tools too.

Two artefacts resemble a particular type of grinder which was first found during excavations at the Knap of Howar (Ritchie 1983) and subsequently found at Pool (Clarke 2007a) and Tofts Ness (Clarke 2007b). Their characteristics are a domed upper face with a flat base usually with pecking over the upper surface and in the centre of the lower flat face. One piece, SF 2657, from the cavity below the flagstone [642] set in the floor of Structure 1 at Stonehall Farm, is most similar to a Knap of Howar grinder though the flat base bears a shallow, pecked groove as well as a spread of pecking. The other, SF 6141, was recovered from the wall core of Structure 1 (thus predates its construction) and has been used for smoothing and grinding although the worked face is irregular in cross-section.

With the exception of the Knap of Howar grinders, which are both from Stonehall Farm, the greater majority of the other three tool types are present on Stonehall Knoll. These include six of the smoothers, the two grinding slabs and two of the grinding stones. Another grinding stone was from the topsoil of Stonehall Farm (Trench E) and single smoothers from Stonehall Meadow (Trenches A and Z). The interior of House 3 on Stonehall Knoll had three smoothers, a grinding stone and the banded grinding slab indicating the probable use of the structure for processing and manufacturing activities.

Ground stone knives (Total = 2)

The two ground stone knives are made of flat pebbles of micaceous siltstone. One (SF 702) has simply been ground bifacially to form a sharp edge. Striations are visible along this edge as well as a red discolouration which may be a stain from the substance being worked. The other knife (SF 102) is more carefully shaped with grinding and narrow facets along the back edge. The working end is pointed and ground sharp. A damaged end which was re-ground over the break indicates that the tool was carefully curated.

Stone discs (Total = 5)

The stone discs are all simple tabular pieces of sandstone chipped around the edge to shape a sub-circular outline. They are 100mm–170mm in diameter and are thus at the smaller end of the size range of stone discs from other Neolithic sites such as Pool (Clarke 2007a).

Flaked cobbles (Total = 2)

The two flaked cobbles have had their edges modified by flaking. A tabular form (SF 2826) has been bifacially flaked around most of the perimeter to form a long chopping edge whilst the other (SF 7001) has been flaked all over one face leaving a rough edge.

Flakes (Total = 9)

The flakes are all simple primary flakes of black micaceous sandstone. Most look as though they are simple spalls from larger slabs or else from hammerstones. None look as though they can be classed as Skaill knives as they do not appear to have been deliberately manufactured

as part of a flaking industry. Of course, this does not preclude their being used for similar practices, *e.g.* butchery.

13.2 Wideford Hill

A total of 145 pieces of stone were collected on site, just under half of which were simply cobble fragments and spalls from the working area (Table 13.2). The stone tool assemblage is comprised of a variety of forms and is dominated by cobble tools, ground stone, Skaill knives and axes.

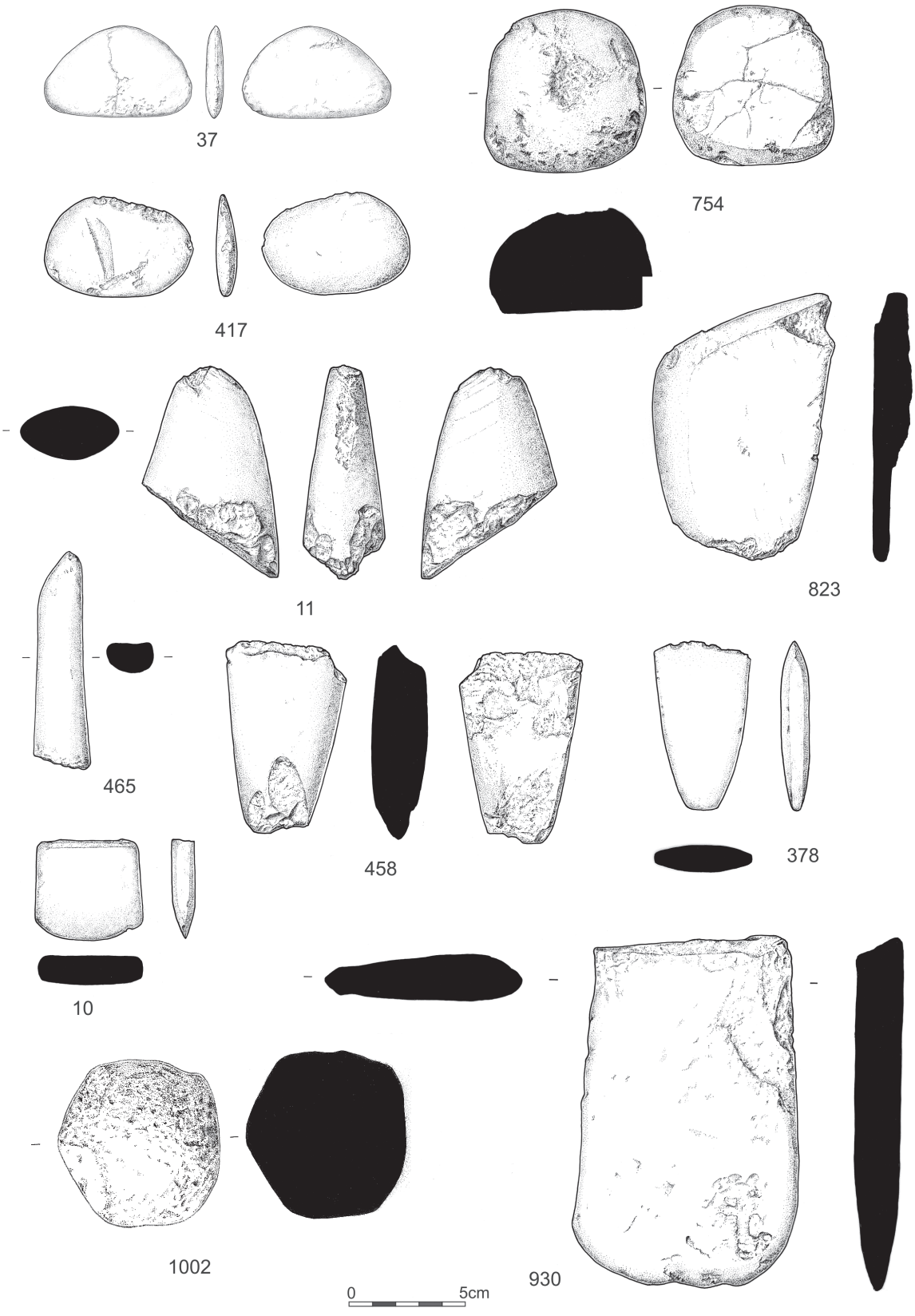
Cobble tools of various types are the most common tools in the assemblage. A range of use wear traces including pecking, grinding and faceting are evident on the cobbles indicating the different uses to which the cobbles were put (Table 13.3). Some of the smaller faceted hammerstones and facially pecked cobbles were most likely to have been used as knapping hammerstones associated with the production of the flaked lithic assemblage (Clarke 2006). The group of six pounder/grinders is of interest as these particular tools are more common to Bronze Age and Iron Age sites in Scotland. However, two of the group bear close comparison with the pounder/grinders from Knap of Howar, both in their size, smoothly ground facets, and the presence of a patch of pecking in the centre of one worn face (SFs 3, 43) (Ritchie 1983, fig 18). The other four pounder/grinders from Wideford Hill have similar wear patterns to those above but bear additional heavy damage over the original smooth facets (*e.g.* SFs 13, 510) in the form of heavy flaking and it would appear that these tools were re-used as heavy duty hammerstones after their original use as grinders.

A large flaked hammerstone is of interest (SF 1009). It has been used for heavy work in such a fashion as to leave both ends with heavy bifacial flake damage. Its use as an anvil is indicated by the presence of two characteristic patches of pecking, one linear and the other circular in plan on one face.

There are just two stone discs and these are barely passable examples of the type. One is a fragment of laminated sandstone that has been roughly bifacially flaked to shape. The other is a fragment of a flat cobble that has been bifacially flaked to form a rough curved edge.

Table 13.2 Wideford Hill: coarse artefacts and context type.

	Over Stonehouse 1 (105)	Work area (rammed stone surface)	Stonehouse 1	Pre-Stonehouse 1	Timber structure 3	Unstratified
Flaked stone bar	1					
Cobble tools		35	2	1		1
Stone disc		2				
Skaill knife		10				
Axe		5				
?Grinding stone				1		
Ground stone		2	1			
Ground edge tool		2	1			1
Edge tool		1	2			
Finger tool		1				
Countersunk pebble		1				
Knap of Howar grinder		1				
Stone ball			1			
Flaked hammerstone			1			
Ground and polished quartz cobble			1			
Pumice		1				
Flaked quartz		1	1			
Total artefacts	**1**	**61**	**10**	**2**	**0**	**2**
Unused cobbles		3				
Cobble frags		27	1	3	3	
Spalls		29				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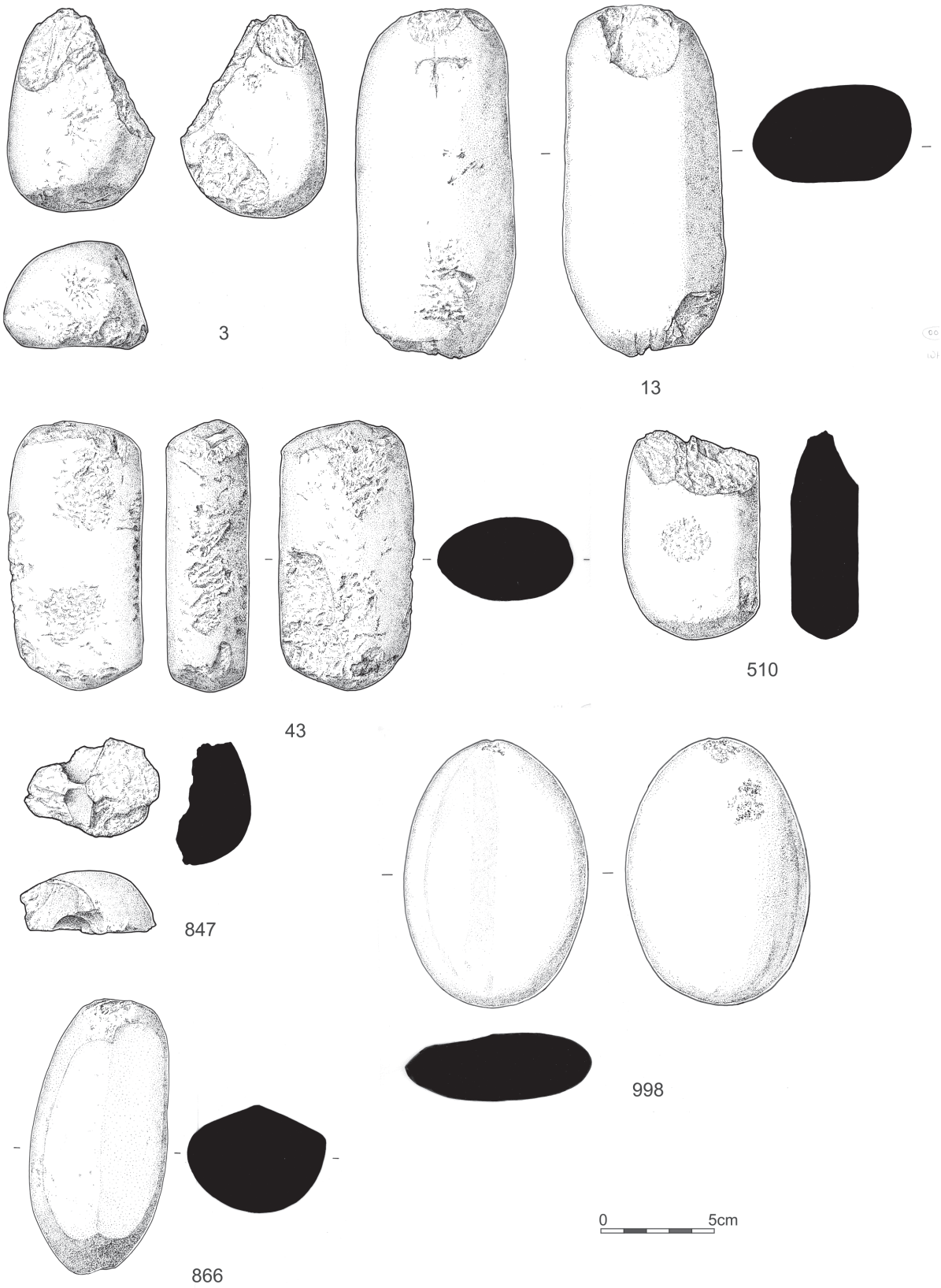


Figure 13.2 Worked Stone from Wideford Hill.

The ten Skaill knives have clear detachment marks where the flake was deliberately removed from the parent cobble (Clarke 2006). They differ from those pieces from the site defined as spalls (Table 13.2) since these have no detachment marks and are less regular in form and were most likely detached from the cobble by heat damage. The Skaill knives are primary, occasionally secondary, flakes of micaceous sandstone. None of the Skaill knives have been modified by the retouching of an edge and neither are there any clear traces of use wear on the edge of the flake in the form of breakage, flaking or rounding.

A fragment of a small counter-sunk pebble (SF 847) bears two steep-sided hollows, each with a smooth interior, worn onto opposite faces with just 4mm separating them. Although a countersunk pebble of a similar thickness was found at Knap of Howar (Ritchie 1983, fig. 17, SF 216), the hollows are formed in a very different way to the example from Wideford Hill being shallow and pecked to shape.

Evidence for grinding on the tools dominates the non-cobble tool part of the assemblage and in most cases the grinding has developed on the surface of the tool whilst it was used. However, one tool (SF 866) of a very unusual and distinctive form may have been shaped deliberately prior to use. It is an oval cobble of fine-grained micaceous sandstone and one face has been entirely re-shaped by grinding to form two very smooth, flat faces that have been worn at an angle to each other and which form a rounded longitudinal bevel where they meet. The tool is very symmetrical in form and it was most likely shaped prior to use though for an unknown purpose. It is doubtful whether the surface of this cobble would have been altered in such a symmetrical fashion if it had been worn solely by the use of the tool.

Another very finely shaped piece is the flat cobble of quartz (SF 998) that has been shaped to form fine, highly polished bevels down both faces of one long side. Further alteration to this cobble includes a highly polished face with visible striations and a shallow, wide channel running the length of the cobble again highly polished and with striations. The bevelled edge resembles the blade end of an axe, but its location down a long side and the concave area of smoothing suggests that this cobble has been formed through use rather than in order to shape it deliberately. The putative grinding stone (SF 964) is simply a large, flat sandstone cobble, since broken, with traces of light grinding and possible pecking. The lack of significant wear traces would indicate that the stone was not in heavy use as a grinder or anvil.

The four ground edge tools are thin, flat pebbles. On one (SF 37) light unifacial grinding on part of one edge has formed a light bevel with heavy striations that follow the curve of another edge. Two of the other ground edge tools bear no striations though parts of the edge appear to have been ground to a sharp edge. A further putative ground edge tool has only light traces of wear. Two other tools (SFs 307, 823 have simply been ground on the edges to concave or convex profiles. The Knap of Howar grinder (SF 754) is typical of its type both in size and form. Here a cobble has been broken to form a flat face, which has subsequently been worn flat by grinding. Unidirectional striations are present on this worn face together with the characteristic patch of light pecking in the centre.

The three 'edge tools' are also simple flat pebbles of black micaceous sandstone that bear light flaking along parts of an edge as if having been used in a light 'chopper' fashion. In this manner the flaking damage along the edge would have been caused incidentally through the use of the tool rather than as deliberate flaking in order to modify the edge. One tool (SF 417) has light unidirectional striations on one face indicating that the edge would have been used in a back and forth 'slicing' action though the working edge would be considered too blunt to function as a knife. The finger tool (SF 465) is a simple narrow pebble with some pecking on one end.

The five axes all from the rammed stone surface [002], are varied in form and represent various levels of manufacturing stages and finish. One (SF 11) is a probable axe roughout. It is a broken cobble of banded mudstone with some pecking on the narrow end and side to form a facet and some flaking on a broken edge, which may be an attempt to thin the blank. Banded mudstone was also employed for an axe (SF 578) of which just the butt survived; some reflaking or flake damage was present on the butt end. Another axe (SF 458) of fine-grained sandstone is larger than SF 378 and is damaged on the butt and blade ends. Less care has been taken in the manufacture of this axe since one of the faces has been more finely ground and polished than the other which is flatter and ground over a rougher face; this may be an unfinished axe or, more likely, there was no need to polish one face either because it was not intended to be shown or the method of hafting required one rough face. The other two axes are more finely shaped and finished, in particular the chisel axe (SF 10) of siltstone which though just a fragment displays regular parallel sides and has been finely finished by grinding and polishing. The other fine axe (SF 378) of siltstone has a narrow butt

splaying out to a wide curved blade and is finely ground and polished all over.

One very heavily worked piece is the stone ball (SF 1002). This is a rounded cobble that has had its entire original cortical surface worn away by pecking. It appears to have been shaped by turning the cobble constantly whilst pecking with the tool. There are occasional patches of grinding over some of the pecked areas. The ball is not completely round; rather it has a broad band of faceting around the middle, a rounded facet on one face and four facets on the opposite face that form a rough cone.

The flaked stone bar (SF 930) is just a single example of the type. Made on a tabular slab of micaceous sandstone, it has been flaked around the perimeter to shape a tapering rectangle with a curved end and a fine asymmetrical, elliptical cross-section. Some notching on the thicker side at the break indicates that this stone bar was originally hafted. The whole tool is much abraded from exposure to the elements and this has formed a very smooth surface.

Context and Function

Most of the stone artefacts (80%) were found in the rammed stone working area [002] east of Stonehouse 1. There would appear to be no significant differences between the types of tools found in the working area and those found outwith it (Table 13.2) and consequently neither chronological nor functional differences can be inferred between the different contexts. Within the working area there appear to be a few distinctive episodes of deposition. Within a general plot of worked stone on the rammed stone surface (Fig. 2.34a) interesting depositional difference are present. For instance, the smaller cobble tools form a general scatter right across the area and this is in contrast to the group of five pounder/grinders that are found in a spread to the west of the working area. Not only do all the pounder/grinders from the site appear here, but they are also the dominant cobble tool form in the group. To the east of this grouping is a concentration of the four hammerstone flakes as well as the two ground-edge tools, a single edge tool, an axe, and the finely shaped ground stone. Further to the east another concentration is found, this time of four Skaill knives, three cobble tools and the countersunk pebble.

Though the numbers are small, the fact that the groupings are composed of specific tool forms – pounder/grinders; hammerstone flakes and edge tools; and Skaill knives – makes it most likely that these reflect distinctive events on the rammed stone working area. Either these are the locations for specific activities or they were discrete dumps from processing activities that were carried out elsewhere and brought to the area to consolidate the rammed stone floor. Another factor to consider is the significant number of broken stones, including cobble fragments and spalls, which have been incorporated in the working area (Table 13.2). Only a small percentage of these are fragments of cobble tools, and the rest are spalls or pieces of unused cobbles, some of which may be a result of heat damage to sandstone cobbles. It is hard to escape the conclusion that cobbles were deliberately broken up in order to provide material to consolidate this external working area.

In general, the stone tools from the working area are in good condition, however, the axes, pounder/grinders and stone discs are the most fragmented tool groups. Some of the pounder/grinders have been heavily flaked over the original ground ends and perhaps the damage had formed when they were used to break up the cobbles in order to provide the material to stabilise the working area. The fragmented axes and stone discs and the scattered nature of their distribution suggest that these were brought in and broken up to be dumped and incorporated with the cobble fragments in the working area. In contrast, the smaller cobble tools such as the faceted and/or facially pecked hammerstones and the tools with grinding tend to be complete specimens and this may indicate that these tools were actually used on the working area itself. In this respect the group of Skaill knives and the group of edge tools could possibly indicate the processing of soft substances, perhaps butchering (Clarke 1989). As has been mentioned before, several of the hammerstones may have been used as flint knapping tools and a plot of these with the flints (Fig. 2.34a and c) shows that both types have a similar wide scatter though no particular concentrations of activity. A distribution map of the flints, by type, may help to clarify how these tools were used on the working area (see Chapter 12).

Not very many tools are associated with Stonehouse 1 itself though it is of interest that three of the most interesting stone artefacts come from here. Both the finely shaped and polished quartz cobble (SF 998) and the flaked hammerstone (SF 1009) are from [159] the fill of a channel running under the length of the Stonehouse 1 west wall core. The stone ball (SF 1002) is from the upper floor of Stonehouse 1 together with a putative ground edge tool fragment.

The only tool that can confidently be assigned a Bronze Age date is the flaked stone bar which comes from [105] overlying Stonehouse 1. These artefacts come

from domestic Bronze Age contexts at Tofts Ness, Bu and Skaill (Clarke 2006) and recent excavations at Bronze Age barrows such as Linga Fiold have also demonstrated the presence of these flaked stone bars in funerary contexts (*ibid.*). What is perhaps surprising is that only one such tool was found at Wideford Hill. Flaked stone bars often occur in quite large numbers, especially when associated with structures. Instead, this single example of may have been discarded due to breakage within the field it was being used in and this may in turn imply that the early Neolithic stone-built house at Wideford Hill had become incorporated within a Bronze Age field system.

Orcadian Context

The stone assemblage from Wideford Hill shares some similar characteristics with the other early Neolithic assemblages from Orkney, specifically the dominance of cobble tools in the assemblage and the small number, if even present, of Skaill knives and stone discs (Table 13.4). This is in contrast to the later Neolithic stone assemblages such as at Pool and Skara Brae where Skaill knives occur in their hundreds and large stone discs are frequent (Clarke 1996). The evidence from these stone tool assemblages would indicate that there were particular storage and food processing activities that differed between these periods and this is most likely linked to the changes in ceramic form (see Jones 1999a; 2002).

Table 13.4 Stone assemblages from Orcadian 4th millennium cal bc sites (BH Barnhouse; SH Stonehall; WH Wideford Hill; KOH Knap of Howar).

	BH	WH	SH	KOH
Cobble tools	67	39	31	15
Stone discs	-	2	5	-
Skaill knives	9	10	9	6
Knap of Howar grinders	-	1	2	3
Facially ground (smoothers)	14	-	8	-
Side ground cobbles	3	2	-	-
Ground edge/knife/spatulate	3	2	2	-
Finger tool	7	1	-	-
Other ground stone	1	1	-	-
Grinding stone	-	1	3	-
Grinding slab	2	-	2	-
Quern	-	-	-	2
Axes	11	4	8	1
Maceheads	4	-	-	-
Knap of Howar borers	-	-	-	6
Stone balls	6	1	-	-
Multi-hollowed stones	6	-	-	-
Counter-sunk pebbles	-	1	-	1

With regard to the other tool types the assemblage from Wideford Hill bears the closest similarity with the other early Neolithic Orcadian sites in the Bay of Firth area, such as Knowes of Trotty, Smerquoy and Stonehall. Interestingly, it also has similarities with Barnhouse (Clarke 2005a). At some of these sites the proportion of stone tools that has been used for, or altered by, grinding is significant (Table 13.4). An instance of bifacial grinding along long edges occurs on SF 6015, a sandstone slab from Barnhouse which, though not producing an artefact of such regular form as the quartz piece from Wideford Hill, is the nearest comparison available from anywhere in the Northern Isles. Artefacts of quartz with polish are also present at Barnhouse.

A stone ball from Wideford Hill is of similar proportions to those from Barnhouse, averaging 70mm–80mm in dimensions with a flattened base. The ball from Wideford Hill was made of grey micaceous sandstone whilst those from Barnhouse were of a grey volcanic rock, a material seemingly reserved for the manufacture of stone balls and axes. Similar contexts of deposition for this artefact form are also noticed at these sites. At Barnhouse two of the stone balls were from features just external to the wall and entrance of Structure 8 whilst one was from the floor of House 4. At Wideford Hill the stone ball is associated with the occupation of Stonehouse 1.

The assemblage from Knap of Howar is different in its lack of ground stone though the six distinctive borers from this site would indicate a specific activity being carried out here (and see Smerquoy below). These early Neolithic sites most likely shared the same basic processing activities that made use of cobble tools and Skaill knives whilst specific manufacturing activities involving grinding varied between sites. At some late Neolithic sites there are single finds of, for example, Knap of Howar borers and Knap of Howar grinders (Pool, Tofts, Links of Noltland, Crossiecrown) and the occasional finger tool or spatulate piece but in general there is little evidence for grinding or ground stones in the later Neolithic assemblages (Clarke 2006).

The chisel axe, though broken, is similar in dimensions to the butt end of a chisel axe from Stonehall, and one from surface collection at Muckquoy, though at the former it was found associated with late Neolithic material. A surviving blade end of an axe from Barnhouse (SF 3025) also has similar width and thickness dimensions.

13.3 Crossiecrown

Earliest Occupation

The few artefacts from this phase are all from the levelling material and early midden layers. They are undiagnostic of any particular period and comprise a few Skaill knives, chipped slabs and a stone disc and two plain hammerstones.

The Red House period

The most varied stone assemblage from Crossiecrown comes from the Red House (Fig. 7.30b; Table 13.5). As well as numerous Skaill knives, stone discs and cobble tools there are also some single examples of other artefact types such as a stone mortar, an axe, a Knap of Howar grinder and a sculpted stone. The Skaill knives and stone discs are found in every type of context, particularly the construction and wall core layers as well as a significant number from floor and hearth contexts. Of note is that six of the total seven stone discs with heat damage are from the floor and hearth contexts of the Red House suggesting that cooking was carried out in this area and this is further supported by the association of two stone discs with a deposit of pottery in pit [463]. Other significant artefact deposits are the igneous speckled axe (SF 63) (Fig. 7.31), and two facially pecked cobbles from the southern recess, the former from the floor and the hammerstones from an ashy deposit. The mortar (SF 85) was found in the right-hand cell (Fig. 7.24) and the sculpted pieces on the floor.

The Grey House period

As well as having the same artefact types as the earliest occupation, and clearly overlapping with the late occupation of the Red House, this period also includes three other different types of cobble tool, a smoother and a flaked stone bar. The smoother is of an undeveloped type consisting simply of a cobble with a lightly worn cortical face. The flaked stone bar is of a standard size and shape but the rounding of the sides suggests that it may have been utilised in a different way to the rest of this type – perhaps in a construction context. The artefacts are found variously associated with the midden, construction and collapse of buildings of this period, though of note are three tools: a metamorphic faceted cobble; a facially pecked cobble; and a faceted and facially pecked cobble (see Fig, 7.40), all found in the east recess [437] of the Grey House.

Post-Red and Grey House period

The assemblage from the final period of occupation at Crossiecrown, which judging from the radiocarbon dates runs into the early Bronze Age, has been divided into several context types: the midden over the Red House; the hollow [213] (Table 13.6) representing a late house structure; the rubble; and the later soil deposits to determine whether there were any differences in the context of deposition (Table 13.7). There is a significant change in the composition of artefact types during this phase with the introduction of flaked blanks: flaked stone

Table 13.5 Distribution of stone artefacts in the Red House at Crossiecrown.

	Construction	Wall core	Drain	Loam around orthostat	Midden	Layer	Floor	Hearth	Cell 35	N recess	S recess	Pits	Box
Skaill knives	3	8	1	6			9	2		2	2	1	3
Stone discs	1		1	3			5	2				2	
Facially pecked cobble					1	1	1				2	1	
Faceted and facially pecked		1											
Plain hammerstones				2								1	
Ground stone					1								
Mortar									1				
Knap of Howar grinder				1									
Sculpted stone							1						
Axe											1		
Chipped slab							1						

Table 13.6 Distribution of stone artefacts in the post-Red House occupation of Crossiecrown.

Artefact type	H1 midden	Hollow	Rubble	Soil
Skaill knives	18	5	9	9
Faceted cobbles	2	0	1	0
Facially pecked cobble	0	0	2	1
Faceted and facially pecked	1	3	1	0
Plain hammerstone	2	2	1	0
Smoothers	1	1	0	0
Necked hammerstone	0	1	0	0
Ground stone	0	1	0	0
Flaked stone bars	3	1	5	2
Flaked cobble	0	0	1	0
Ard point	0	1	0	0
Axes	1	0	0	0
Flakes	1	1	0	0
Chipped slab	1	0	0	0

bars; ard points and flaked cobbles. Also appearing at this time are stone flakes, necked hammerstones and the developed forms of smoothers made on split cobbles. Stone discs are lacking in these deposits whilst Skaill knives and cobble tools remain common. There are no obvious differences in artefact deposition between the different contexts, with the deposits over the Red House having a similar assemblage to those in external contexts.

Middens

Although the Trench 1 upper middens, Trench 2 external layers and the middens of Trench 3 are difficult to relate stratigraphically, the evidence from the stone tools would suggest that these contexts are relatively late in date. Equally, they almost certainly post-date the main occupation of the Red House and this is derived from comparison with the upper midden stone tools (Table 13.6). There are clear similarities in the composition of the assemblages from the different areas most notably in the presence of a combination flaked stone bars, ard points or flaked cobbles in all areas. Necked hammerstones and smoothers from the middens are also present at this later time.

Summary

The Crossiecrown stone assemblage indicates two main periods of use which concord with the Neolithic dwellings

Table 13.7 Distribution of stone artefacts in the later occupation of Crossiecrown.

Artefact type	Phase 5	T2 external layers and topsoil	T1 Upper midden and topsoil	T3 midden and topsoil
Skaill knives	41	58	40	9
Stone discs	0	3	10	0
Faceted cobbles	3	2	1	1
Facially pecked cobble	3	3	1	0
Faceted and facially pecked	5	1	1	1
Plain hammerstone	5	7	5	1
Smoothers	2	5	4	0
Necked hammerstone	1	2	1	0
Ground stone	1	1	1	0
Flaked stone bars	11	4	6	1
Flaked cobble	1	1	5	1
Ard point	1	1	0	0
Axes	1	0	1	0
Sculpted stone	0	1	0	0
Flakes	2	4	1	1
Chipped slab	1	0	4	0

and the Bronze Age artefacts found stratigraphically above the occupation of the Red House and in the middens and external layers elsewhere on the site (Fig. 13.3).

As well as Skaill knives, stone discs and various cobble tools, the Red House contains artefact types clearly associated with late Neolithic occupation. The Knap of Howar grinder, named after the early Neolithic site at which it was first identified (see above), has since appeared at other sites in later Neolithic contexts such as Pool and Tofts Ness as well as Crossiecrown. Their earlier presence at Stonehall and Wideford Hill indicates a late 4th–early 3rd millennium cal BC date for occupation at Crossiecrown (confirmed by radiocarbon dates). The mortar too is common to the late Neolithic, *e.g.* at Skara Brae, Barnhouse and Pool. The sculpted piece is still a relatively unusual artefact to find (see Fig. 13.4) though such three-dimensional pieces are most probably indicative of a late Grooved ware date as supported by the presence of the spiked objects from the latest Neolithic phases at Pool (Clarke 2006; 2007a).

The artefacts which are traditionally linked specifically with the Bronze Age are the flaked stone bars, ard points and flaked cobbles. Here, it must be noted that although single objects from late Neolithic contexts have previously

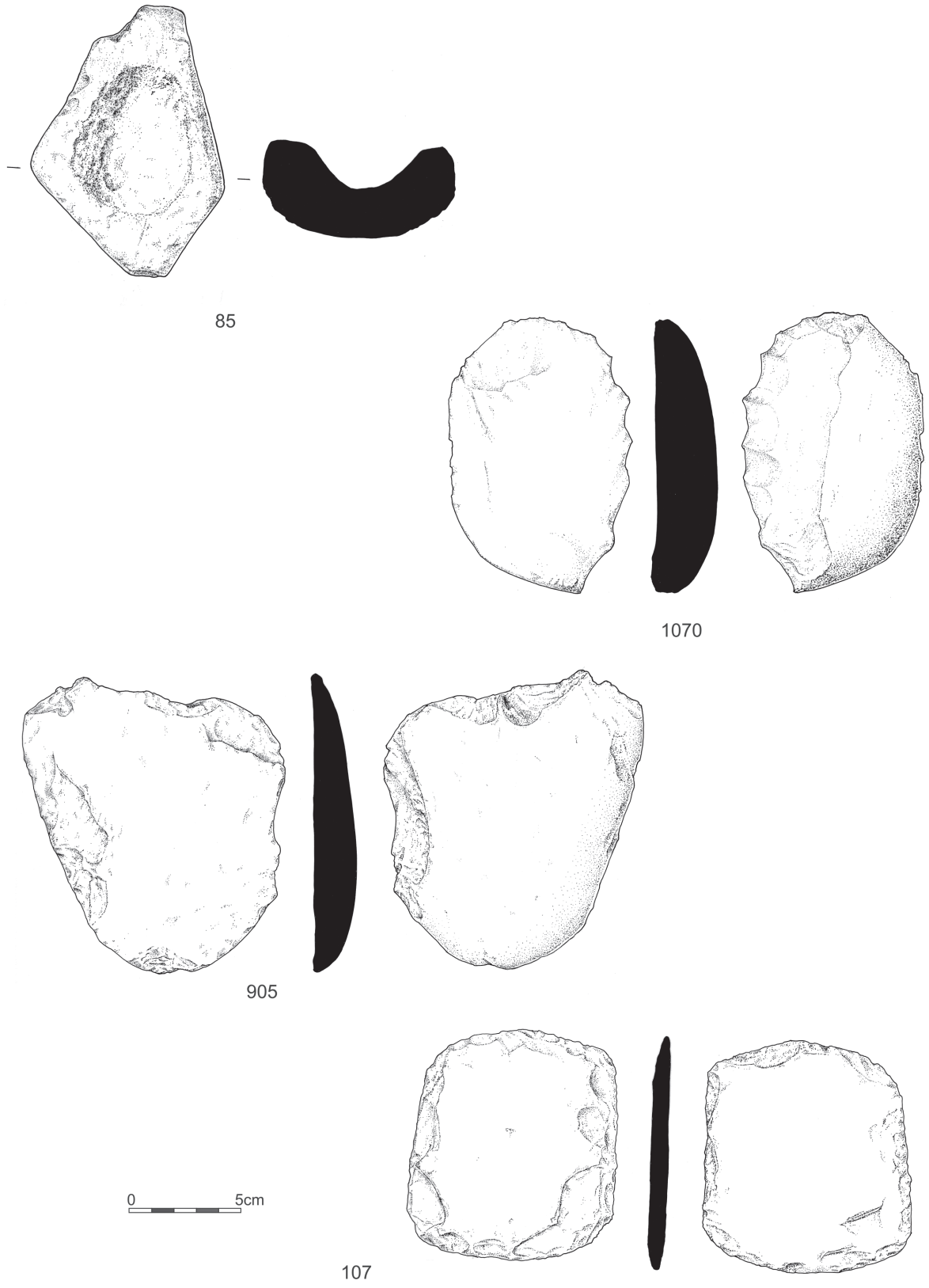
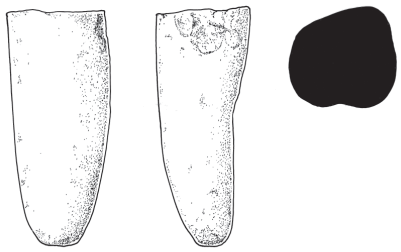


Figure 13.3 Worked stone from Crossiecrown. Continued pp. 460–462.



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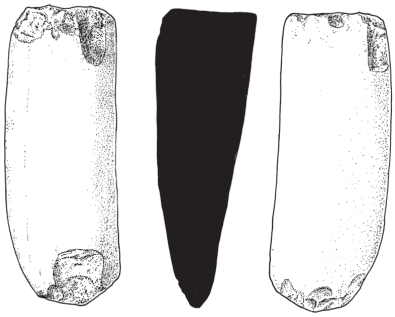

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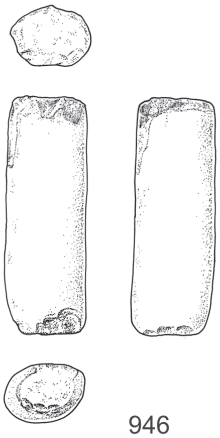

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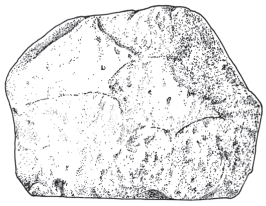

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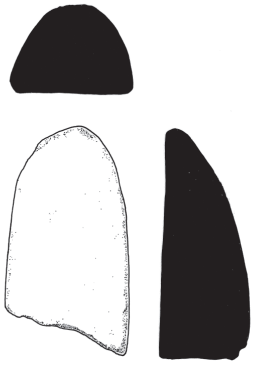

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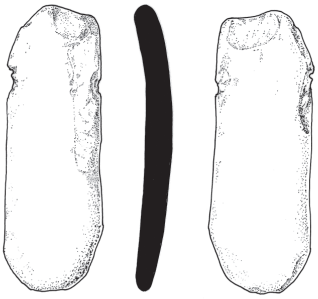

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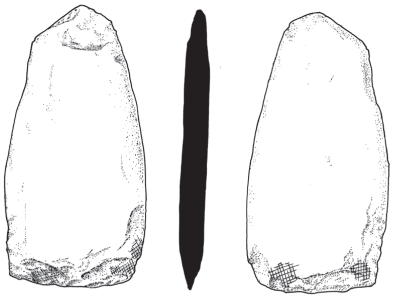

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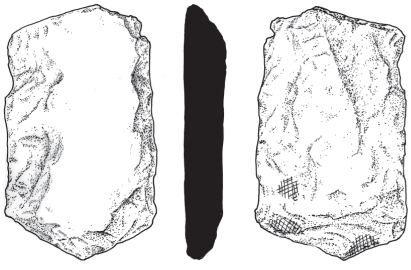

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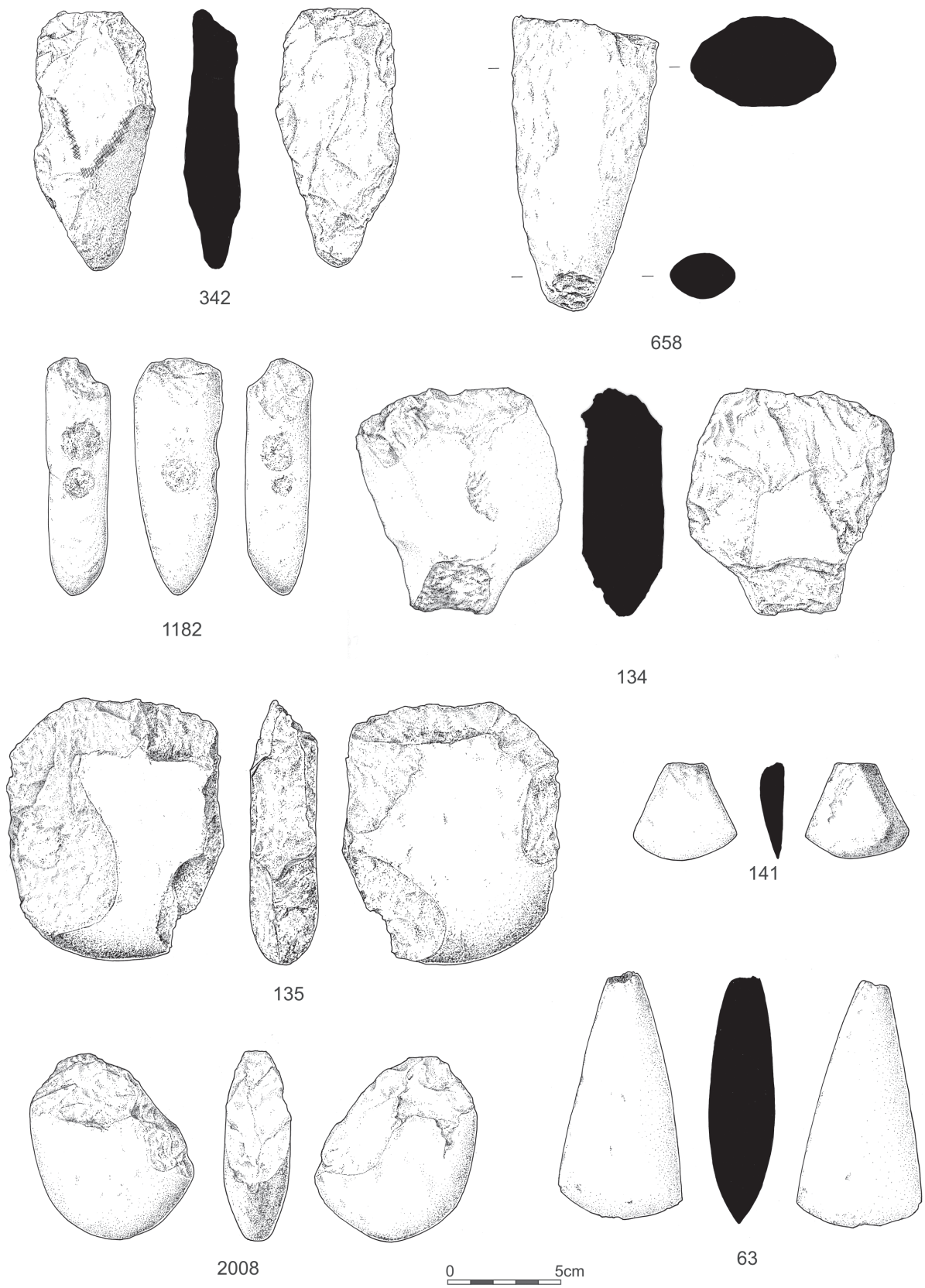

Figure 13.3 Worked stone from Crossiecrown, continued.

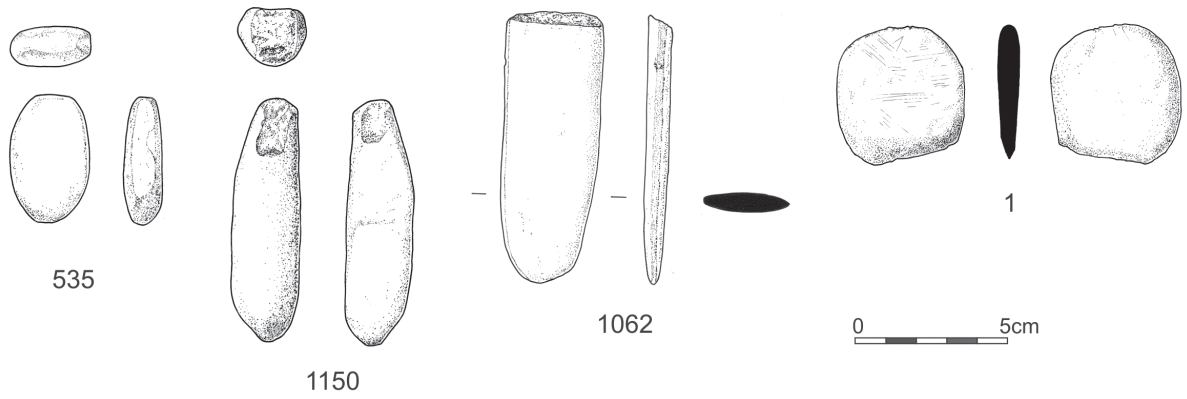

Figure 13.3 Worked stone from Crossiecrown, continued.

been termed as flaked stone bars or flaked cobbles, for example, at Pool (Clarke 2007a) and Links of Noltland (Clarke 2006), (and at Crossiecrown itself there is a possible flaked stone bar from the Grey House period), they tend to be of a smaller size or of a more irregular manufacture than those more numerous and standardised artefact forms from the Bronze Age which clearly constitute an 'industry'. All three of these tool types were found in the Bronze Age phases of Tofts Ness, Sanday, and Skaill, (east) Mainland. Flaked stone bars and ard points are also common to funerary deposits of this period being found around the kerbs of several burial mounds in Orkney (Clarke 2006), particularly Linga Fiold (Downes forthcoming) and Quoyscottie (Hedges 1977). Other tools which may be late Neolithic or Early Bronze Age in date are the necked hammerstones and smoothers since, with the exception of one lightly worn smoother, the rest of these tools appear in the post-Red House deposits and in the external layers associated with stone artefacts of the Bronze Age.

The continued use of some tool types from the Neolithic through to the Bronze Age is common too. In particular, Skaill knives, stone discs and the various forms of cobble tools have a long period of use and the evidence from Tofts Ness and now supported by that from Crossiecrown indicates that where these tools are used in the early 3rd millennium cal BC they continue to be used in later 3rd and early 2nd millennia cal BC phases of the same site (Clarke 2006).

Artefact types

Skaill Knives (Total = 211)

Skaill knives form the greater part (60%) of the assemblage. These simple flake tools have been dealt with in great detail elsewhere (Clarke 1989; 2006). Suffice it to say that the assemblage of Skaill knives from Crossiecrown bears similar characteristics to other large assemblages. It is comprised mainly of primary flakes from cobbles of micaceous sandstone and in most cases the original flake edge has been kept for the work. There is retouch on the edges of just three flakes (SFs 2030, 1070, 905) usually in an irregular fashion to thin an edge. A large percentage of the flakes, 22%, bore edge damage in the form of flaking, rounding or denticulation indicating that these flakes were damaged through use. In summary the Skaill knives are tools which are quickly and easily made from an accessible resource of beach cobbles. Some experimental use of these flakes has pointed to their facility as butchering tools as not only were they able to be used as knives and choppers but the edge damage patterns on the experimental knives were very similar to those left on the prehistoric tools (Clarke 1989). The evidence from some sites such as Skaill Bay shows close physical associations between Skaill knives and butchering waste, in this case deer and whale bones (Richards *et al.* forthcoming).

Stone discs (Total = 30), Chipped slabs (Total = 8)

The stone discs are made of the finely laminated black micaceous sandstone, some in cobble form and the rest as slabs. They have been flaked around the edge to form a sub-circular outline or in six cases a distinctive oval outline. There are four discs which have a distinctive straight edge (SFs 455, 321, 544, 2005); on two pieces the natural straight cobble edge remains unflaked whilst on the other two discs the straight edge has been caused by breakage prior to flaking.

The discs vary in size between 70mm to 300mm in diameter reflecting closely the size range for the stone discs

from the Neolithic phases at Pool, Sanday. Another feature of these discs is the presence of a red discolouration around the edges caused by heat, or alternatively, a black, sooty deposit located around the perimeter. At Crossiecrown seven discs had been affected by heat in this way indicating their use as pot lids whilst the pot was over a fire.

The chipped slabs are also made on cobbles or slabs of the black micaceous sandstone but they are more irregular in form and thicker than the stone discs. One (SF 107) has been shaped to a quadrilateral form whilst another (SF 174) is a tear-drop form.

Cobble tools (Total = 67)

As with the Stonehall assemblage (see section 13.1), the cobble tools from Crossiecrown will be dealt with only summarily. An additional cobble tool type has been recognised at Crossiecrown giving five main tool types: facially-pecked cobbles (Total = 14); faceted cobbles (Total = 11); faceted and facially-pecked cobbles (Total = 12); plain hammerstones (Total = 26); necked hammerstones (Total = 4).

The necked hammerstones are an unusual form of cobble tool. They are formed from elongated cobbles which have been broken across the width. The broken face has subsequently been used as a platform from which flakes have been removed but only from a fifth to a half of the total perimeter. The reason for this flaking is not known; in no case does it alter the outline of the platform significantly and neither does it alter the profile of the tool by making the flaked end significantly narrower so it appears unlikely that this flaking was to enable the tool to be hafted. However, a facet which has been ground down one side of SF 1206 may indeed be to facilitate hafting. The opposite ends of these tools have been worked to rough facets (SFs 946, 1082) or flaked through use (SF 1146).

The most likely function for many of the rest of the cobble tools must have been as flint knapping hammerstones (SF 787) or else as grinders (SF 8) especially where a face has been worn smooth too (SF 1163). A further 66 cobbles were collected on site but bore no obvious traces of use wear.

Smoothers (Total = 12) and Knap of Howar grinder (Total = 1)

The smoothers are similar in form to those from Stonehall. Seven of them are made on whole cobbles utilising the original flat face. On two of these, striations are visible running across the width of the tool. On SF 1076 the face has been worn flat and smooth as well as single ground facets on the end and side. The other five smoothers have been made on split cobbles with the fractured face forming the working surface (*e.g.* SF 1104).

The Knap of Howar grinder (SF 330) has been affected by weathering, most likely indicating a degree of residuality, and the original cobble surface of the upper face has been destroyed. The base, however, is flat and smooth with a spread of pecking in the centre and to one side. The presence of this tool, the currency of which seems to run from the mid 4th–early 3rd millennium cal BC, in conjunction with the 'Unstan ware' sherd may provide additional evidence for an earlier Neolithic settlement component at Crossiecrown.

Flaked stone bars (Total = 23)

These flaked stone bars conform to the general pattern of characteristics identified on those tools from other sites (Clarke 2006). They are made on slabs or flat cobbles of black micaceous sandstone and have been flaked around the edges to shape. Most of the flaked stone bars are broken but the indications are that they tend to be longer and narrower than the flaked stone bars from Tofts Ness (Clarke 2007b).

There are no traces of notching, pecking or friction wear on the sides of these tools to indicate that they may have been hafted in a particular manner but this information may have been lost because of the high breakage component. The exception (SF 108) has some flaking on either side towards the butt end which could have facilitated hafting. Wear traces in the form of smoothing and rounding on the working end are present on a few pieces (*e.g.* SFs 1137, 365, 342).

Ard points (T=2)

The surviving working tip of an ard point (SF 658) was found in the external layers of Trench 2. The wear traces are obscured by abrasion but there is some light flaking from the tip as if through use. Another possible ard point is made on a cobble (SF 1182). The butt end has been squared by flaking and the opposite end makes use of a natural pointed end. On either side a pair of deep circular hollows have been pecked and there are single patches on the faces presumably to facilitate hafting. Such notching is unusual on ard points though it has been observed on several examples from the Bronze Age Shetland sites of Sumburgh (Downes and Lamb 2000) and Catpund (Ballin Smith 2005).

Flaked cobbles (Total = 8)

These cobbles have been flaked around the perimeter to form a chopper-like edge. They all vary in the amount and

location of flaking, for instance, SF 134 has been flaked over most of one face and then along part of one edge on the opposite face, and SF 135 has been bifacially flaked around most of the perimeter. A quartz cobble (SF 2006) has been flaked over other wear traces, which suggests it was a re-used faceted and facially-pecked cobble. Despite the prepared chopper edge there are no wear traces to suggest these cobbles were used at all, as opposed to the flaked cobbles from Bronze Age Tofts Ness which were quite heavily rounded over the chopping edge (Clarke 2007b).

Axes (Total = 3)
A finely-shaped axe of a speckled igneous rock was found in the southern recess of the Red House (SF 63). It has been ground all over to shape and the blade end is asymmetrically curved. The sides bear pecking most likely to facilitate hafting. A miniature axe of volcanic rock (SF 141) has been shaped by grinding. It is asymmetrical in cross-section as one side remains in its original thick pebble edge. A possible unfinished axe or roughly-shaped piece comes from the rubble infill of the Red House. It has been made on a split quartz cobble and flaked to shape. The blade is not sharp but obtuse in angle and there are traces of polishing over the flake scars.

Ground stone (Total = 4)
This group comprises four pebbles of fine-grained micaceous sandstone which have been shaped by grinding in different ways. Two tools were most likely ground through use; SF 1150 is a ground-end tool with small flakes around the edge of the ground area and SF 535 has a narrow flat facet ground on one end and down a side. The other two pieces have been ground deliberately to shape and in these cases (SFs 1 and 1062) an acute blade-like edge has been formed by grinding.

Sculpted stone (Total = 2)
The most obvious sculpted stone was found on the floor of the Red House (SF 532). It is a block of coarse-grained sandstone shaped by a series of grooves. A flat face has been formed which is most probably the base. On one face three deep grooves have been channelled diagonally across the surface and on the opposite face a larger groove has been channelled diagonally from top to bottom. This piece is asymmetrical in form. The grooved form of decoration has not been observed before on other sculpted objects which tend to be decorated with knobs or spikes (Clarke 2006). Another sculpted stone (SF 184) from the floor [006] of the Red House utilized an unusual concave-based natural triangular-shaped stone (Fig. 13.4). The form had been enhanced through use on the concave edge, possibly as a shaft-smoother.

The final sculpted piece is much less obvious as it appears to have been heavily damaged by heat or weathering. This rough-looking lump (SF 687) may have had three knobs made on it originally but these are not clear and it is difficult to determine whether it is an intentionally sculpted piece or not.

Mortar (Total = 1)
The mortar (SF 85) is a classic Neolithic form being made on a block of sandstone, diamond-shaped in plan. A round-based hollow, oval in plan has been pecked into one face and the interior has subsequently been smoothed through use.

Flakes (Total = 10) and Core (Total = 1)
The flakes are distinguished from the Skaill knives because they are larger, thicker, usually secondary and present a more irregular edge. The core is a large cobble from which irregular flakes have been removed from multiple platforms. Given the irregularity of the flakes it is unlikely that they were produced deliberately – either for the flake or to shape a blank. They just seem to have been produced incidentally during the reduction of a core, however, this process in itself suggests the manufacture of an as yet unknown object.

Comparison of worked stone with other Orcadian sites

There are few similarities between the stone assemblages of Stonehall, Wideford Hill and Crossiecrown. Crossiecrown has a standard late Neolithic Grooved ware assemblage of numerous Skaill knives and stone discs and cobble tools as seen at Skara Brae, Mainland, Links of Noltland, Westray and Pool, Sanday, as well as the individual objects such as the Knap of Howar grinder, the mortar and the sculpted piece. In contrast, Stonehall does not have the Skaill knives, nor the large numbers of stone discs though Knap of Howar grinders are present in late 4th millennium cal BC contexts (*e.g.* Stonehall Farm, Structure 1). One point of similarity is in the presence of smoothers at both sites though their circumstances of deposition are quite different. At Stonehall they were in use during the earlier Neolithic and were clearly linked with the grinding slabs and stones as part of a processing area. In contrast, at Crossiecrown the smoothers are not associated with structures but instead occur in external layers in association with artefacts of a Bronze Age date.

The Stonehall assemblage is much more similar to that

of Barnhouse most notably in the lack of Skaill knives and stone discs, though Stonehall does not have the greater variety of tool types which is present at Barnhouse. There is an emphasis on the use of grinding stones at both sites most particularly in the use of smoothers (the Barnhouse stone report refers to these tools as Facially Ground Cobbles) though the wear patterns are slightly different with several of the smoothers at Barnhouse having a slightly skewed profile whilst others have a light gloss on the working face. Neither of these wear patterns were present on the smoothers from Stonehall. A chisel-shaped axe was found at Barnhouse and the field surface at Muckquoy (see Chapter 9) as well as Stonehall.

The Crossiecrown assemblage is similar to other late Neolithic sites such as Pool (Clarke 2007a), Tofts Ness (Clarke 2007b), Links of Noltland (Clarke 2006; McLaren 2011) and Skara Brae (Childe 1931a; Clarke 2006). The presence of flaked stone bars, ard points and flaked cobbles in the external middens indicates the continuation of occupation well into the 2nd millennium cal BC. At Tofts Ness, the Bronze Age levels were clearly marked by the introduction of these tool types whilst Skaill knives, stone discs and various types of cobble tool continued in use from the Neolithic as they do at Crossiecrown.

One unusual aspect of the Crossiecrown assemblage is the presence of the flakes, core and necked hammerstones. Such artefacts have only been noted before at the site of Links of Noltland, Westray where they are present across the site. Up until the recent excavations there has been no phasing to help in dating these tools but Links of Noltland has traces of habitation dating from the late Neolithic to the early Bronze Age (Moore and Wilson 2011). At Crossiecrown the necked hammerstones are found in the external contexts associated with the Bronze Age stone tools but it is not clear whether these can be dated as late as the Bronze Age or whether they are indeed of a late Neolithic/early Bronze Age date.

13.4 The Knowes of Trotty

A total of 19 stone artefacts were found during excavation of the Neolithic house in Trench B at the Knowes of Trotty (Table 13.9) including a finely ground axe of micaceous siltstone, two Knap of Howar grinders, two sharpening stones, an anvil, three stone discs (two putative), several cobble tools, a ground stone tool and three structural slabs. Several other stone finds were collected but these were mainly spalls or thin slabs which were produced naturally through weathering or breakage and they are not included in this report.

Figure 13.4 The sculpted stone (SF 184) from the floor of the Red House (Nick Card).

Table 13.8. Knowes of Trotty stone artefacts and context type.

	Structure	External working area	Unstratified
Axe		1	
Knap of Howar grinder	1	1	
Sharpening stone	2		
Anvil	1		
Stone disc	3		
Structural slab	3		
Cobble tool		5	1
Ground stone		1	

The artefacts

The broken axe (SF 280) has a curved butt with a finely ground facet and one side is ground to a square cross-section whilst the opposite side is rounded, however, they are of a similar dimensions (Fig. 3.19). This axe was found in the external working floor [263] to the east of the house.

There are two Knap of Howar grinders (Fig. 3.21), one of which (SF 135) has been very finely worn. The base of this tool is extremely smooth and polished and slightly convex in section with the characteristic spread of pecking in the centre of the face. The domed upper face is pecked over the surface. Its dimensions of 69mm long and 49mm thick make this amongst the smallest of this tool type to be found so far in Orkney though the grinders from Wideford Hill and Stonehall are of similar dimensions. The other grinder (SF 299) is of a less classic form but it has a fractured face forming the working face. There is no pitting in the centre of this

worn face and neither has the domed face been pecked to shape. However, there is some flaking from the flat face down one side that has altered the outline of the original cobble. This grinder is rather more elongated in shape than the more usually circular tools.

Two sharpening stones are of interest. Both are made from slab fragments of micaceous siltstone. One (SF 88) has a single narrow U-shaped groove worn on one face and the other stone (SF 53) has smoothly worn sides with some striations that could have been made by a metal or flint edge (Fig. 13.5). On this latter piece there is also a shallow but wide concavity worn along the length of the stone. The wear on these tools resembles that which is found on used pumice (*e.g.* Barnhouse) and it is possible that the light, soft rock was selected for similar work, such as smoothing, burnishing or bone working, in the absence of pumice which would have been available from some parts of the Orcadian seashore. In this respect a rounded lump of vesicular volcanic rock (SF 286) that was found in the working area [301], may have been used for some kind of smoothing or rubbing; though there were no obvious wear traces on this tool, some grey staining or concretions on the flat face may indicate that some substance was being processed using this as a tool. A cuboid block of stone (SF 67) has been used as an anvil; on two faces there are areas of coarse pecking as if from a large hammer.

A number of cobble tools were found, including two plain hammerstones; a faceted and facially pecked cobble and a hammerstone flake all of which were undistinguished in terms of wear traces. Two additional fragments (SFs 259 and 151) conjoined to form an elongated pebble but weathering had destroyed any obvious wear traces. There were also three possible stone discs (SFs 53, 57, 168), all of which are fragments. The discs are from the house structure, and as these have little evidence for deliberate shaping they could just be natural fragments of flagstone of which there were quite a number in Trench B.

A fragment of a possible ground stone tool (SF 284) was found in the working area [311]. This thin pebble of black micaceous siltstone appears to have been ground unifacially to create a sharp edge. However, not much of this tool survives to determine the extent of alteration.

Finally there were three slabs that may be structural. Two (SFs 25 and 144) are fragments of flagstone that have traces of chipping around a surviving edge to form a concave and convex edge. The other (SF 306) is an unworked, rectangular slab of fossiliferous flagstone which was found on the floor of the structure and may have been used as some kind of base or rest for another object.

Context

The stone tools from the Neolithic house in Trench B include a Knap of Howar grinder from the collapse and decay of the structure after the first phase of use [121]. The other grinder was from the external working area [308]. The sharpening/smoothing stone (SF 53) was found together with two possible stone discs in [122], the material into which wall [101] was built. The other sharpening stone was found in a part of the west wall of the building which was disturbed through stone robbing. Finally, the anvil and the other putative stone disc were from the uppermost turf and topsoil layers [06/08].

The assemblage of stone artefacts from the external working area differed from those from the rest of the site by its dominance of cobble tools. An axe and a Knap of Howar grinder were also recovered. The tools were mainly in a fragmentary and abraded condition and the conjoining pebble fragments indicate a degree of mixing of the deposits. Stone artefacts from the rammed stone working area [002] at Wideford Hill were similarly damaged and they may have been used and deposited in the same way as at Knowes of Trotty.

The evidence from the stone tools is typical of an early Neolithic site based around the structure and external working floor – this is demonstrated by the dominance of cobble tools, presence of ground stone, the absence of flake tools such as Skaill knives, the small ground stone axe and, to a certain extent, the Knap of Howar grinders. Such an assemblage is characteristic of sites from the earlier Neolithic such as Wideford Hill, Knap of Howar, Stonehall Meadow and Stonehall Knoll (see also Clarke 2006).

It should not be forgotten that the Knowes of Trotty excavations covered Bronze Age burial mounds. In this context, a complete axe was recovered from Bronze Age burial contexts in Trench F (SF 15). This axe has been ground all over to form a squared butt with faceted sides and an asymmetrically curved blade end. In respect of shape and size this axe is almost identical to that from Mousland, Stromness (Downes 1994, 145, and see Clarke 2011 for other examples of axes in Bronze Age contexts). The axe is usually considered a Neolithic form, especially numerous in deposits from the earlier Neolithic. At present it is uncertain how it may have functioned in Bronze Age ritual; perhaps it was made in the Neolithic, held as an heirloom (see Chapter 9) and reused in the

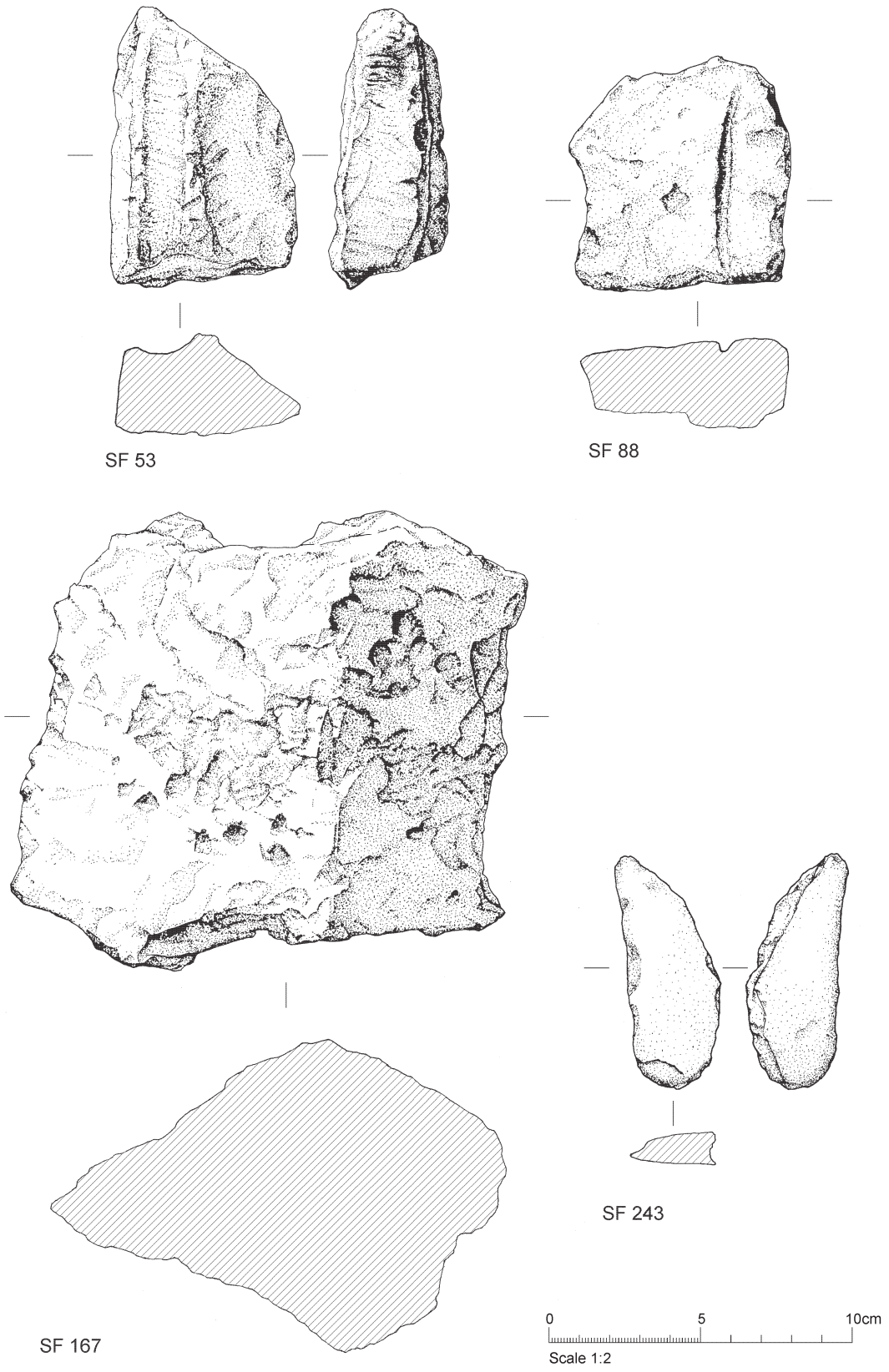

Figure 13.5 Worked stone from Knowes of Trotty.

Table 13.9 Stone tools from Smerquoy excavation 2013.

	Trench 1	Trench 2	FW
Skaill knives	6	13	
Anvils	4	1	
Axe		1	1
Macehead	1		
Flaked hammerstones	4		
Plain hammerstones	3		1
Faceted cobbles	1		1
Faceted cobble/polisher	1		
Facially pecked cobbles	2		
Smoother	1		
Polisher	1		
Knap of Howar Grinder	1		1
Ground end tool	2		1
Ground end tool blank	3		
Chopper edge tool	1		
Incised? pebble	1		
Opposed hollowed stone			1
Stone Disc	1	2	
Worn pumice	1	1	
Flaked stone bars	1		1
Total	35	18	7

2nd millennium cal BC. Given the close proximity of the early Neolithic settlement it is possible that it could have been rediscovered centuries later, however, the similarities to the axe from Mousland may indicate that axes were indeed being manufactured and used in the Bronze Age, perhaps confined to mortuary ritual.

13.5 Brae of Smerquoy

The overall settlement complex at Braes of Smerquoy is a subject of on-going fieldwork, and although with 'incomplete' post-excavation work, the fieldwalking and excavation assemblages recovered up to 2013 can be nonetheless compared with those from the other sites in this volume. During 2013, the bulk of fieldwork concerned Trench 1 and concentrated on the interior and very immediate environs of a single structure known as the Smerquoy Hoose. The second trench (Trench 2) lies further upslope and judging from recent fieldwork (July 2014) can be recognised as representing an earlier timber component of the settlement complex.

A wide range of stone tools were found at Smerquoy despite the small size of the excavated area (Table 13.9). Skaill knives, cobbles tools, and stone discs were present as well as a number of pieces of ground stone, a polissoir and anvils. The stone structure had double the number of tools from Trench 2 and these included all the cobble tools found that year as well as the range of ground-end tools and anvils.

Although most of the stone tools came from the Smerquoy Hoose, the fact that the upper layers relate to a secondary period of occupation apparently occurring several hundred years after the initial inhabitation (see Chapter 10) means chronological clarity is an issue. For example, the presence of a flaked stone bar (SF 712, [002]) as well as one found during fieldwalking (FW 19) confirms subsequent activity dating to the Bronze Age in the immediate area. Whether this activity merely involved working the soils with the stone mattocks or deposition within the ruined Smerquoy Hoose, or more substantial nearby Bronze Age occupation is not known at present (a flaked stone bar was also found at Wideford Hill raising the same issues – see above). Nor is it known just how many of the other cobble tools could be linked with this later activity rather than the Neolithic occupation of the structure. There is some indication that the house was filled with later Neolithic material just prior to a fragment of a cushion macehead made of gneiss (SF 29) being buried in clay fill that sealed the northwest entrance.

There are three ground-end tools with a series of complex wear patterns, two of which (SFs 303 and 304) were found together at the base of pit [312] (see Fig. 4.21). A third was unstratified being recovered from ploughsoil (Fig. 13.6). The most common and noticeable feature is the rounded ground facets that have been worn on one or both ends of the pebbles. These pieces have also then been used as borers leaving light undeveloped wear patterns around the tool tip from grinding and twisting the pebble to depths of between 9mm and 13mm. On one piece (SF 304) both ends have been used in this manner whilst the other two pieces differ slightly: on SF 303 the end opposite the ground borer end bears distinctive angled facets on either side of the ground angled end as well as a sharp ridge formed by bifacial grinding down one side; the unstratified piece (Fig. 13.6) bears ground facets on opposite faces at the other end – on one side two facets form a distinctive ridge with striations running along the length of the pebble. A further three unused pebbles were identified as probable blanks for use as ground-end tools because of their size and shape. There are two Knap of Howar grinders; the unstratified piece is a classic example of its type (Fig. 13.7); the other (SF 36) is less heavily ground on the lower face and with no central pecked dimple, yet appears to have been pecked to shape a domed upper face.

Figure 13.6 Unstratified ground end 'finger' stone tool from Trench 1, Smerquoy (Christopher Gee).

Figure 13.7 Unstratified 'Knap of Howar' grinder from Trench 1, Smerquoy (Christopher Gee).

Other notable artefacts are the five anvils with traces of linear indentations pecked in one or two patches on the surface of a cobble. These were most likely used as anvils for the reduction of flint nodules using the bipolar technique.

The two axes are small and made from sedimentary rock. The axe collected during fieldwalking (A8) is damaged and burnt but still retains ground facets down both sides (Fig. 13.8). The other from Trench 2 (SF 285) appears unfinished as it is simply a flat triangular pebble with traces of grinding down both sides and along part of blade, none of which are quite heavy enough to considerably alter the profile of the edges. The presence of a block of medium to coarse-grained sandstone in Trench 1 with traces of use as a polissoir indicates that axes were ground to shape in the immediate vicinity.

Figure 13.8 Broken sandstone axe recovered from fieldwalking in 2010 (Christopher Gee).

13.5.1 Comparisons

The assemblage from Smerquoy, though small, shows clear similarities to those from other early Neolithic sites with respect to the presence of ground-end tools (Barnhouse and Baes of Ha'Breck), Knap of Howar grinders (Knap of Howar, Wideford Hill, Stonehall, Knowes of Trotty, Braes of Ha'Breck and Crossiecrown), a polissoir/grinding stone (Barnhouse, Braes of Ha'Breck and Stonehall) and small ground and faceted axes (Braes of Ha'Breck, Knowes of Trotty, Wideford Hill and Stonehall). In particular, the recent excavations at the Braes of Ha'Breck, Wyre (Lee and Thomas 2012; Farrell *et al.* in press), have produced a much larger assemblage of stone tools but essentially similar in composition to that from Smerquoy, particularly with regard to the ground-end tools/Knap of Howar borers. Hopefully, future work on both these sites will be able to explore the use of these tools and perhaps compare them to the use of the ground edge or spatulate type tools occurring at other Neolithic sites.

Table 13.10 Ramberry Head: stone artefacts by site.

	Site 1	Site 2
Plain hammerstone	2	2
Pounder/grinder	-	2
Faceted cobble	1	-
Smoother	-	1
Skaill knife	1	1
Ard point	1	1
Incised slab	-	1
Notched slab	-	1
Pumice	3	-
Flint	5	1

13.6 Ramberry Head

Site 1

The stone assemblage from Ramberry Head burial cairn (Site 1) is small but varied and includes coarse stone, flint and pumice (Fig. 13.9; Table 13.10). The cobble tools are simple forms, worn by pecking, flaking and faceting. The Skaill knife bears some light traces of use wear. The ard point is a fine specimen with a squared butt and pointed working end (SF 17; Fig. 13.9). It was flaked from a larger block of black micaceous sandstone; there was no additional surface pecking to shape or strengthen the tool, which is sometimes present on other tools of this type. Wear traces that are visible over one face indicate that this ard point had been used prior to deposition.

Only two pieces of pumice had traces of wear and this was simply in the form of lightly worn faces. The flints from the site were undistinguished; just chunks or small inner flakes, one of which appeared burnt. A small barbed-and tanged arrowhead of mottled grey and white flint was found on the surface some 22m to the east of the trench.

Context

The three pieces of pumice were all from the primary layer [002]. The faceted cobble was incorporated into the cobble (sea-stone) setting [006] around the cist slab and another plain hammerstone came from [009] adjacent to this cobble setting and it is possible that it too was originally part of it. The ard point formed part of the outer ring of stones [017] encircling the central setting, as did the Skaill knife [018] and a small flint flake [014]. The remaining three pieces of flint and a plain hammerstone were unstratified. The barbed-and-tanged point cannot be directly associated with this ring cairn.

Site 2

Cobble tools were the most common stone artefacts including two plain hammerstones, two small pounder/grinders and one possible smoother. This latter tool made use of a long, spatulate-shaped pebble and may have been used lightly on one end as a smoother. The single Skaill knife appears to have light traces of use wear along the distal end. The ard point (SF 30; Fig. 13.9) is similar in manufacture and shape to the example from Site 1, but this one has not been used.

The incised slab (SF 46; Fig. 13.9) bears groups of around four scratches set in parallel lines with one group forming a possible chequerboard pattern. The slab is damaged at one end and appears to have truncated a possible notch. A single flint flake exhibits a prepared flat platform.

Context

There is nothing of special interest to say about the context of these tools. Most of them (the two pounder/grinders, Skaill knife, incised slab, notched slab and flint flake) came from the ploughsoil or the degraded rubble [031] directly underneath. The two plain hammerstones and possible smoother came from the rubble dumps of the earlier phases.

The ard point has perhaps the most interesting context being placed along with the arc of large stones [043] in the centre of the rubble-filled structure.

Discussion

The stone assemblage from Site 1, though small, is quite varied for a 2nd millennium cal BC funerary context in Orkney. More usually the stone tools form discrete assemblages of particular artefact types. Thus, flaked stone bars and ard points are most often associated with the kerbs, or occasionally the mound material of the burial cairns whilst other types of stone tools including cobble tools are less common and when present, for example, at Linga Fiold, are usually associated with activity in areas around and beyond the cairns themselves (Clarke 2006, 105). At Linga Fiold too, there was an indication that the cobble tools did not have the wear traces typical of those used for processing in domestic settings and instead these cobbles were most likely used to shape the construction slabs (*ibid.*, 107).

At Ramberry Head Site 1 the ard point could be interpreted as having been deliberately placed in or on the encircling stones in an imitation of burial cairn kerb deposits.

Figure 13.9 Worked stone from Ramberry Head.

The means of deposition of the other stone artefacts is less clear, particularly since they appear to have derived from a 'domestic' occupation rather than as a result of activity associated with the funerary rites. Certainly, at least two of the cobble tools have been redeposited in the cobble setting, but the presence of flint, pumice and the Skaill knife is less easy to interpret and it may be that they are derived from an earlier, perhaps Neolithic, occupation deposit.

The small stone assemblage from Site 2 can also be interpreted as being from a 'domestic' occupation of the Neolithic to Bronze Age though the notched slab and incised slab are rather at odds with any prehistoric period. The ard point most definitely has a Bronze Age date and its deposition over the arc of stones within the structure is reminiscent of placing such tools on the kerbs of burial cairns (see above).

The proximity of these sites to Crossiecrown is of interest. It is probable that the Grey and Red Houses were occupied late into the 3rd millennium cal BC, while stone assemblages from the middens and soils of the final occupation dated to the 2nd millennium cal BC (Chapter 10) exhibited a clear change in composition with the introduction of flaked stone bars, flaked cobbles, ard points and a developed form of smoother made on split cobbles. Skaill knives and cobble tools of various forms continued in use from earlier periods. It is with the latest 2nd millennium cal BC period of occupation at Crossiecrown that the Ramberry head stone assemblage is consistent. This is also matched to some extent by the late 3rd–early 2nd millennium cal BC component of the Muckquoy

Figure 13.10 Cobble tool from 2013 fieldwalking at Muckquoy, Redland (Hugo Anderson-Whymark).

fieldwalking assemblage (see Chapter 9) which also includes some nice examples of cobble tools (Fig. 13.10).

13.7 Conclusion

The rich assemblages of stone tools from each of the above sites demonstrate that stone was used for tools in a variety of activities. In the early Neolithic stone was employed in a number of ways linked to grinding – polissoirs to grind and shape the axes; flat cobble smoothers; Knap of Howar grinders with their distinctively-shaped forms and wear traces; Knap of Howar borers and ground-end tools which were clearly used to make perforations in an as yet unknown material; ground-edge or spatulate tools with an emphasis on shaping an acute edge; as well as a range of miscellaneous ground stone pieces. There is growing evidence from the recent excavations that some element of specialism exists within these site assemblages. For example, at Stonehall there are distinctive cobble smoothers; at Wideford Hill there are pounder/grinders; and at Smerquoy there are the ground end tools.

During the later Neolithic the use of grinding seems to decline. Whether this reflects a difference in manufacturing activities, or locations, or that other materials were used for tools is not yet understood. A more limited range of stone tools came into use including Skaill knives which most likely are indicative of butchering. Large assemblages of these flakes are associated with midden deposits at Crossiecrown, Pool, Skara Brae and Links of Noltland. Stone discs are also linked to middens at the above sites and also intimately associated with the hearth at Crossiecrown (see Chapter 7).

APPENDIX ONE

The Pumice from Stonehall and Crossiecrown

Ann Clarke

13.1.1 Description

The pumice from each site is of the usual type found on prehistoric sites in the Northern Isles: a brown-grey in colour with small vesicles. Just one piece, from Stonehall (SF 2088) has large vesicles, which form an open, honeycombed appearance (Fig. 13.1.1). Although there were no definite signs of wear on this particular piece it is likely that pumice of this texture was used for extremely coarse work.

The pumice must have been deliberately collected from the beach where it was washed up in strands of seaweed, and then brought to the site for use. At Crossiecrown most of the pumice pieces show signs of having been used though the wear patterns are not standardised enough to suggest that generally it was used for specific tasks. Overall, the wear is light, comprising a single worn face (SF 480) with a slightly skewed, concave or convex profile and these pieces may have been used for preparing soft materials such as leather or smoothing the curved surface of unfired pottery (Barrowman 2000). Just one piece (SF 480) has remnant grooves around the faces and these are U-shaped, about 5mm deep and 8mm wide at the top suggesting the shaping and smoothing of narrow cylindrical objects such as bone points or narrow wooden shafts. Another piece from Stonehall has a distinctive wear pattern (SF 7132) and this has a deep concave profile worn on one face.

Most of the pumice from Crossiecrown was found in the upper midden/ occupation deposits (Table 13.1.1)

Figure 13.1.1 Pumice SF 2088 from Stonehall (Richard Jones).

and a further three pieces were from the north recess and floor deposits of the Red House. At Stonehall there were no significant deposits of pumice.

Other Neolithic pumice assemblages from Orkney are similar in composition to that of Crossiecrown. At Barnhouse (Clarke 2005b) and Pool (A Smith pers. comm.) those pieces with simple worn faces are the dominant form. Both sites had grooved pieces and at Barnhouse, with the exception of two pieces with narrower, shallower grooves, the remainder fall within the size range of those on the Crossiecrown piece (SF 480).

Table 13.1.1 Crossiecrown pumice by context.

Phase	Context	Pumice total
Topsoil	001	1
Upper midden/occupation	002	11
4 – N recess	10	1
4 - Floor deposit	11	2
		15

Table 13.1.2 Stonehall pumice by context.

Trench	Description	Context	Pumice total
A	External midden	002	1
	Platform clay	16	1
B	Occupation layer	301	1
	External midden	503	3
C	Wall collapse in H3	3033	1
			7

APPENDIX TWO

The Black Stone Bead from Structure 1, Stonehall Farm

Alison Sheridan

Subsequent to the hearth being replaced by a cist in the centre of Structure 1 at Stonehall Farm (Figs 6.8 and 6.9), a number of 'special' objects were buried within the upper floor deposits [519]. One of these objects was a chunky disc-shaped black bead (SF 2520; Fig. 13.2.1).

The bead of blackish stone is approximately circular in plan with straight to slightly bowed sides. It has an hourglass-shaped perforation that is roughly central on one face and slightly eccentric on the other, the drill having entered the bead at a slight angle on this side. The rotation of the drill has left circular ridges in the bore-hole. The surfaces are smooth and have been polished to a low sheen. External diameter 26.2–27.5mm; perforation diameter *c*.3.4mm at centre, 5.7mm and 6.4mm respectively at outer edges; thickness 10.3mm. There is ancient chipping to the edge of the bead on both of its flat sides, and one ancient shallow chip scar at the edge of the perforation on one side, but there are no obvious signs of use-wear to the perforation, and the bead may not have been worn or used (or at least suspended on a cord) for very long. There are a few short, shallow, multi-directional striations on each of the flat surfaces, which probably relate to the initial shaping of the bead through grinding.

The stone used to manufacture the bead is a fairly soft laminar material, slightly warm to the touch, and this led the excavators to speculate whether it was jet. The bead has a 'stony' texture rather than the fine-grained woody texture that is often visible macro- or microscopically in jet and its laminar structure is similarly not a characteristic of that material. The fact that it has a low to negligible zirconium content and a relatively high iron content (as revealed through non-destructive compositional analysis using X-ray fluorescence spectrometry (XRF) confirms the non-jet identification; such a compositional signature is more characteristic of materials in the cannel coal to shale 'family' of rocks. There are no deposits of cannel coal as such in Orkney, but Jurassic deposits of oil shales and cannel coals are known from Caithness and Sutherland (*e.g.* the Brora oil shales). However, it is suspected that this bead does *not* represent an exotic import to Orkney; there is nothing in its simplicity of shape to link this bead to the Neolithic beads found on mainland Scotland, some of which are known to have travelled considerable distances (Sheridan and Davis 2002), Several types of black stone are known to outcrop in Orkney, and among these the carbon-rich, finely laminated Devonian siltstones and mudstones would seem to offer the most plausible candidates for the raw material.

Beads of various substances – but principally of bone and marine ivory – are known from Neolithic contexts in Orkney, from both domestic (*e.g.* Skara Brae) and funerary contexts (*e.g.* Isbister). Four chunky black stone beads from Skara Brae were previously analyzed (by Mary Davis, using XRF) and, like the Stonehall bead, were similarly demonstrated not to be of jet.

Figure 13.2.1 The black stone bead from Structure 1, Stonehall Farm (Hugo Anderson-Whymark).

APPENDIX THREE

The Haematite and Related Iron-rich Materials

Effie Photos-Jones, Arlene Isbister and Richard Jones

13.3.1 Introduction

We present here the small but interesting assemblage of 21 objects of haematite and other iron-rich materials, 21 objects found at Crossiecrown and a few more at Stonehall. Unfortunately, more recent objects, including a knobbed-shaped artefact, discovered during fieldwalking at Muckquoy, are not included. The aim is to describe the finds, characterise them mineralogically and chemically and to assess their suitability and evidence for use as pigments. The potential sources of these materials on Orkney are also reviewed. Whereas some of the finds from Crossiecrown were recognised on first examination as likely to be haematite or goethite, there were several cases at both sites that were more difficult to identify macroscopically; chemical analysis proved helpful in identifying specimens whose iron content was too low to be classed as a ferruginous material, but at Crossiecrown that still left a few specimens, some of which were surface finds, that could be classified as bog iron or even iron slag. For this reason the finds at Crossiecrown are labelled neutrally as iron-rich products (IP). Some terminology is introduced below.

Isbister (2000) has set the scene by outlining the early published evidence of haematite on Orkney, mainly from Skara Brae, its use as a pigment and its possible mystical and medicinal roles. Having examined various finds and using both haematite from Creekland Bay, Hoy and mined Cumbrian haematite, she reported the results of pigment/paint producing experiments, including the effects of temperature on the colour (see also Isbister 2009 with colour illustrations). Exploring how the fine faceted surfaces were created, it emerged that surfaces had produced an abundance of highly coloured pigment/paint, in sharp contrast to their very dark surface appearance which would also have no adhering pigment. While such surfaces may have had secondary uses, such as polishing leather (Clarke and Maguire 1989, 25; Ritchie 1995, 18), Isbister's experiments demonstrated that they were primarily used for their quality pigment, and she argued that the significant process that modified the raw material and created the artefact should not be overlooked (Isbister 2000, 192).

13.3.2 Terminology

Haematite: ferric iron oxide mineral, Fe_2O_3, includes a very hard and fine-grained crystalline variety, mainly coloured black, steel-blue or purplish-grey in the field, that may give a bright or sub-metallic lustre (specular iron ore), particularly when polished or worked for pigment. It gives a red streak.

Goethite: hydrated ferric iron oxide, FeOH, is an iron mineral that can be very similar in appearance to haematite but is duller and browner and gives a yellow-brown streak.
Red ochre: is a 'pigment' name for the soft earthy forms of iron-rich materials that are generally mixed with clays. It does not have to be natural.
Iron pan: concentration of ferric iron oxy-hydroxides found in soil and usually of natural origin.
Iron seepages: iron-rich spring-water with deposits of ferric iron oxy-hydroxides formed by oxidation (bacterially mediated) of ferrous iron in solution. Deposits are usually reddish-brown.
Limonite: earthy poorly crystallised or amorphous ferric iron oxy-hydroxide that is essentially goethite with molecular water, $FeOH.nH_2O$.
Bog iron: an impure iron deposit that develops in bogs, consisting mainly of hydrated iron oxides.

13.3.3 Methodology

All the material was examined by eye and magnifier. The presence of metallic iron was tested with a simple magnet. EPJ streak tested thirteen samples on a porcelain plate to reveal colours ranging from pale yellow to deep red as a means of differentiating between haematite and other iron-rich minerals. A sample of crystalline haematite from the mine at Muirkirk in

Figure 13.3.1 The wet abrasion method demonstrated on a white quartzite stone showing micronised pigment production from the surfaces of a nodule of crystalline haematite from Bay of Creekland, Hoy. In the process the nodule is very finely striated, faceted and polished (Copyright: Arlene Isbister).

southern Scotland was used as a standard for the typical deep red streak of haematite.

Many of the finds were analysed mineralogically by powder X-ray diffraction (XRD) (Phillips 1050/35 instrument (Department of Geology, Glasgow University) with vertical goniometer and a Co Kα Fe-filtered radiation source; scanning speed 1° 2θ/min; scan range 0–60° 2θ) and for semi-quantitative elemental composition by portable X-ray fluorescence (pXRF) with a Niton XL3t instrument. The samples selected for XRD consisted of ground powder packed into a cavity in a ceramic mount. Simple heating experiments were carried out to confirm conversion of hydrated ferric iron minerals to haematite.

To develop experiments, Arlene Isbister utilised her sizable collections of haematite and goethite from the Florence Mine at Egremont, Cumbria (*e.g.* kidney and pencil ore, massive compact and botryoidal haematite and specularite) and sources from Bay of Creekland (*e.g.* black, steely and purplish-grey lumps and nodules, some botryoidal). Examining and working the raw material in both its 'pure' whole state and the form it was most likely found in, *i.e.* as weathered beach finds, expanded knowledge of the material and enabled development of previous experiments. Preliminary comparisons in shape, size, colour and surface texture were drawn between the finds and the unmodified and experimental material. Wet and dry streak tests of the finds were taken on white quartzite pebbles.

Wet Abrasion Method

Experimental context

Some preliminary painting experiments were carried out: small fragments were crushed to powder, a few drops of water were added and the paint was applied by brush to either experimental brickettes made of modern red clay or pots made and fired at Stonehall (see Chapter 11.5). Alternatively, pigments were prepared using a technique that removed a fine layer of pigment particles from the nodule face. This was achieved by rubbing down a nodule's face in a drop of water on a hard stone that had the added advantage of dispersing the pigment and binding it to any mineral 'impurities' which produced a tacky paint or a pigmented stone surface; the presence of an organic binder was found to be superfluous (Isbister 2000, 193).

The *wet abrasion method* reduces the pigment particle size and creates a finer more cohesive paint; in the process the hard haematite nodule is lightly faceted and polished, and often marked with the finest striations, producing the same use-wear as observed on many of the finds. This is evidently a very economical and resourceful means for the Neolithic inhabitant to acquire quality polychromatic pigment materials, particularly over an extended period; an abraded nodule is easily stored, can produce various rich colours, is portable and unlike the former method is very unlikely to be gone after one session (Isbister 2000, 194). The comparison is not unlike the long use obtained from a water colour pan (when only the small amount required is made up at a time), and the crushing up of that same pan and using it quickly and crudely. Some other *wet abrasion method* experiments were carried out using haematite with gum/resin binders; and sample dry and aquarelle crayon tests on stone were taken (see Fig. 13.3.1).

Historical context

Traditionally, artists employed the age-old technique of muller and grinding slab to create their pigments which is largely similar in effect to the above *wet abrasion method*. The stone muller and slab reduced the pigment material to a state of fineness and optimized pigment dispersion in a binder or medium. (Mortar and pestle was only required for the initial breaking up of very hard materials.) The technique is recommended by early writers for obtaining the highest quality pigment and colours. The main process involved moving and rotating by hand, a muller (cone-shaped porphyry or a pebble stone sliced in half to provide a flat smooth surface) on pulverized pigment, wetted with water, across a stone grinding slab. This was done for lengthy

Table 13.3.1 Haematite and related iron-rich materials at Crossiecrown. Continued p. 478.

IP (SF)	Location (coordinates)	Context	XRD ID (%Fe content determined by pXRF)	Description	Streak
1	Topsoil	001	Haematite/quartz (>50)	Nodule of black haematite with bright lustre. Near all surfaces have been rounded and worked smooth with deep and fine striations visible on all surfaces. Upper slim facet and orthogonal facet show metallic lustre through much use. Similarly shaped and sized nodule observed at Creekland Bay (CB). Max. dimension 3cm. (Figs 13.3.3b, c)	Pale red (cf IP6), but deep red in wet streak test
1 bis	Tr 1	001	(>50)	Amorphous brown lumps of bog iron	Not tested
2 (221)	House 1	026	Goethite/quartz (>50)	Roughly rhomboid lump of black iron ore, goethite, massive in form and with compact crystalline structure; two surfaces have been roughly smoothed. Similarly shaped and sized nodule observed at CB; 8×6.5×4cm. Fig. 13.3.3a	Dark yellow
3	Midden area close to House 1	122	Goethite/quartz (>50)	Large black heavy lump of iron ore crudely worked/ smoothed on two orthogonal surfaces; max. dimension 10.5cm. Fig. 13.3.3a	Dark yellow but changed to deep red on heating to 600˚C for 2 hours
4	(113/106)	001	Haematite/quartz (>50)	Dull, purple-grey reddish lump of compact crystalline haematite with two orthogonal surfaces rubbed down flat/smooth and another rubbed. Similarly shaped and sized nodule observed at CB. 4.5×3×2.7cm.	Bright deep red like Muirkirk standard
4 bis	(113/106)	001	Haematite/quartz (>60)	Fragment of dark haematite with two smoothed facets parallel to each, one of them with striations, and two other facets; max. dimension 3cm, thickness 1.6cm; Fig. 13.3.3d (>60)	Bright deep red like Muirkirk standard
5	Midden area by House 1 (121/108)	002	Haematite (>50)	Fragment of black botryoidal haematite with lustrous shiny appearance. Four surfaces rubbed down; the underside and long orthogonal side surface worked extensively flat/smooth, showing fine striations. 4.5×3.5; max. thickness 1.3cm. Figs 13.3.3b, c	Deep red
6 (189)	Feature NE of House 1	025	(8)	Rounded weathered nodule with large fresh black crystals visible in the broken section; 7×5×4cm	Grey; but crushing with muller on slab gives mid to dark brownish colour suggestive of the presence of manganese as well as iron oxides (although XRF indicated <0.5% Mn).
7	(119/109)	001	Haematite (>50)	Thin rectangular fragment of black botryoidal haematite which joins 5 above has one well smoothed surface; 3×2×0.5cm	Not tested
8	Plough soil (118/109)	001	(>50)	Sandstone ?sea pebble with remains of black hematite vein (now only 2mm thick) which has been rubbed down to give an excellent smoother; similar size piece forming haematite veinlet on half sandstone pebble observed at CB. 3×2×2.8cm Fig. 13.3.3d	Pale red, but yellow on wet streak
9	Tr 1 spit 1	002	(>50)	Rectangular, rhomboid of fibrous 'pencil ore' of dark grey haematite, with longest surfaces and point partially rubbed down. Top and front stained red; side and underside stained brown. 2×1.7×1cm; Fig. 13.3.3b	
10	(118/106)	topsoil	Quartz/goethite, feldspar (>50%)	Amorphous lump of iron-rich material; max. dimension 8cm; Fig. 13.3.3d	
11 (766)	Tr 2 ext.	454	Not analysed	Nodule of black haematite with botryoidal exterior; other main surface has been rubbed down very smooth; very similar pieces observed at CB; max. dimension 3cm; thickness 1cm; Figs 13.3.3b, c	
12	(113.6/104)	topsoil	(4)	Amorphous fragments of iron-rich material	
13	Tr 3	Topsoil	Not analysed (>50)	Dark dense pebble with one smoothed surface; max. dimension 4cm and max. thickness 2cm	
14 (550)	2	001	Goethite, pyrite/quartz (>50)	Roughly rounded, dense and heavy fragment; weathered rusty looking brown surface. Bog iron? Fig. 13.3.3d. One surface 4cm long has probably been deliberately smoothed; max. dimension 6cm	
15	(120/112)	002	Feldspar, clay/quartz, dolomite, siderite, kaolin, haematite (10% Fe, 1% Ti)	Small powdery lumps of bog iron. Acceptable as a pigment.	

Table 13.3.1 Haematite and related iron-rich materials at Crossiecrown, continued.

IP (SF)	Location (coordinates)	Context	XRD ID (%Fe content determined by pXRF)	Description	Streak
16 (570)	Tr 2	003	(>50)	Amorphous grey-brown lump with metallic feel on outer smoothed surface; 3×2.5×1cm	
17 (643)	Tr 2	425	(45)	Roughly rectangular shaped lump of iron-rich material, metallic feel (but not magnetic), coarse surfaces; 6×3×2cm	
18 (676)	Tr 2 ext	142	(>50)	Lump of black haematite with two worked smoothed surfaces, orthogonal to each other; one surface with visible striations from use; max. dimension 3cm; Fig. 13.3.3b	
19 (735)	Tr 2 ext	001	(>50)	Amorphous black fragment with smoothed outer surface; iron slag? but not magnetic. Max. dimension 4cm	
20 (765)	Tr 2 ext	145	(30??)	Amorphous, brown, dense fragment, metallic feel but not magnetic; max. dimension 4cm	
21 (817)	Tr 2 ext	458	(10)	Small amorphous fragment of orange iron-rich sandstone; max. dimension 1.5cm	

periods of time until the desired finely-ground material was achieved (Mayer 1991, 188). The technique was first detailed by Cennino Cennini, a 14th century painter and an authority on the painting techniques of the day. To obtain rich or translucent reds, purples and oranges, he ground the purest and hardest 'crystalline' haematite forms, and in particular 'specular iron-ore', the same type he used for making burnishers and not the amorphous earthy varieties. Cennini reports:

> Pound this stone in a bronze mortar at first, because if you broke it up on your porphyry slab you might crack it. And when you have got it pounded, put on the slab as much of it as you want to work up, and grind it with clear water; and the more you work it up, the better and more perfect color it becomes.
>
> (Thompson 1933, 25)

It would appear that the Crossiecrown inhabitants did not have to use their mortar to crush their haematite. They could use a technique more suited to their needs and means which combined the two-step process described by Cennini, into an innovative one-step process which could also transform the haematite into finely ground, highly coloured and optimally dispersed pigment material; it was possibly similar in quality and colour to the historic technique still used by fine artists today.

13.3.4 Results

13.3.4.1 Crossiecrown

The descriptions and identifications are given in Table 13.3.1; Fig. 13.3.2 shows the results of the streak tests. The assemblage includes very hard and heavy, crystalline haematite and goethite, some in botryoidal forms and largely coloured black and grey, rather than the more common red and yellow ochres. Most of the finds were assessed as potential pigments and many displayed evidence of such production. The striking characteristic of many of these lumps, such as **IP1**, **5**, **11** and **18** (Figs 13.3.3a–c) among others, is the presence of one or more very finely striated and polished faceted surfaces that, on close inspection, reveal clear evidence of pigment-producing modification and *wet abrasion method* techniques. Streak tests, experimental work and observations on the majority of wear-facet surfaces indicate that various saturations of red, orange, purple and yellow pigment material could have been produced.

Of the samples analysed mineralogically five were identified as haematite (**IP1**, **IP4bis, IP5**) or likely to be haematite (**IP4**, **IP7**); they would probably be joined by **IP8**, **IP9**, **IP11**, **IP18** on the basis of elemental composition and appearance. The rest were goethite (**IP2**, **IP3**) or goethite as the major constituent with quartz and pyrite as the minor ones (**IP14**). Amorphous non-crystalline ferruginous constituents are likely to be present in **IP15** having a dark brown colour and, uniquely among the finds examples analysed chemically, a notable titanium content; only **IP15** had a weak magnetism, all the rest had none.

Two main varieties of crystalline haematite predominate: a purplish-grey type (**IP4**, **IP4bis**) and a shiny-black type (**IP1, IP5, IP7, IP11**). Judging from the XRD results, **IP4bis** has considerably more crystallinity than either **IP1** or **IP5**, which would appear to correlate with Cennini's description that the purest mineral form of haematite has

the outward 'colour of purple or turnsole' (*ibid.*, 25). **IP9**, unique in the group, is an example of 'needle' or 'pencil ore'. Many pieces from Bay of Creekland are similar to the finds in shape (rhombohedral crystal habit), streak, size, colour and surface texture. Not only does this imply a 'potential' source for the finds but it can also reveal the amount of pigment use that finds were put to. Several unmodified pieces were employed in experiments.

Weathering can affect the surface appearance of primary iron oxides such as haematite. For example, both the finds and the unmodified lumps show similarities in their surface weathering, unlike the pristine material sourced from Florence Mine. However, working the Hoy material for pigment, using the wet abrasion method, dramatically changed tarnished surfaces into 'specular' (metallic or sub-metallic) or lightly sparkling faceted surfaces. Several unmodified pieces were cracked open with a hammer and it was notable how their glittery grey and purplish inner surfaces matched the outward appearances of the high ore-grade Cumbrian material. Working with haematite from the Middle Stone Age of southern Africa, Ian Watts also reports that weathering can change the surface of the mineral giving a highly oxidized patina and dark brown surface appearance, but a fresh surface exposure of highly crystalline haematite would reveal a steely-grey, iron-black or blue grey colour (Watts 1998, 279).

There appears to be no difference in how the two main varieties of haematite were modified; none have been fashioned to any particular form, which is the same for nearly all other haematite finds from local sites (Isbister 2000, 192). Many feature rubbed flat and smooth-faceted surfaces from prolonged pigment production use, most likely from the earlier described *wet abrasion method* (*e.g.* **IP4**, **IP4bis**, **IP5**, **IP7**, **IP8**). However, it is worth noting that it might be easy to presume that the naturally shiny-black type has been 'overtly' polished due to some other secondary use, when, more than likely, its high polish is only inherent to its type. After all, these finds, which are particularly hard, have 'polish' across even unworked surfaces *i.e.* not only on the facetted faces and can be observed on **IP11**. The purplish grey type is much duller in comparison, yet the pieces show the same worked surfaces. This suggests, and is supported by shiny black pieces from Bay of Creekland, that variability in raw material or haematite type need not imply a different mode of use (Watts 1998, 415).

The colour of haematite pigment varies greatly depending on its particle size. When the hardest, crystalline haematite is broken down and pulverised, the colour of the particles (coarse to fine), go from silver-

Figure 13.3.2 Streak test on ceramic plate of samples (top row) left to right: M=Muirkirk standard, Crossiecrown IP1, IP2, IP3, IP4, IP5; (bottom row): IP6, IP7, IP8, IP10, IP14, IP5, IP21.

Figure 13.3.3a Crossiecrown haematite IP3 and IP2.

Figure 13.3.3b Crossiecrown haematite: top row IP1, 5, 9; lower row IP 11, 18.

Figure 13.3.3c Crossiecrown haematite IP1, 5 and 11 showing very finely striated and polished faceted surfaces that, on close inspection, reveal clear evidence of pigment-producing modification and wet abrasion method techniques.

Figure 13.3.3d Crossiecrown haematite: top IP8, 10; bottom IP4bis, IP14.

grey, to near black to dark brown to brown-red to red. As indicated by Cennini (Thompson 1933), the quality of grinding, dispersion of pigment to water (or binder), and crystallinity and mineral impurities all affect whether haematite materials can produce rich colours, such as deep reds, purples and oranges. The brightest colours are achieved when the purest haematite is in its finest red form, or approximately 3 microns and finer in particle size. Its characteristic red or orange-red colour is then displayed as the smaller grains scatter red light (Bowles *et al.* 2011, 247).

Pigment prepared from **IP7** was an effective paint on a pottery surface: the paint layer was stable and had a deep rich red colour. By striking contrast, **IP21**, having a soft orange texture, was able to give a streak with ease to either stone or pot but it was fugitive; when applied as a paint the colour was weak and, on drying, rubbed off (Fig. 13.3.4). In her experiments, Isbister (2000) found that alternate facets on a single nodule could produce different colours, and, for example, the distinctive facet on **IP1**, similar to that on examples from Skara Brae, could have been created when the nodule was pulled along a carved stone groove, infilling the area with wet pigment. Those varieties slightly less hard than **IP1**, such as the purple-grey type, might also have been used similarly on a grooved pot.

IP5 and **IP7** jigsaw together, forming one of the largest haematite finds that has been heavily modified. Breakage more than likely occurred due to the thinning effects of prolonged use. It is estimated, from unmodified similar pieces, that the front and back have been rubbed down extensively using the *wet abrasion method*, the longest side of **IP5** by possibly at least a centimetre. Striations on each surface side vary and all are almost imperceptible to the naked eye; with magnifier they are most pronounced on the underside and least so on the botryoidal surface. Experiments show that the hardest of black haematite (Mohs scale 7–7.5) such as this requires wet abrasion on the hardest and coarsest of sandstones to produce any quantity of pigment. During one session, much wet, fine red pigment would have been produced, opaque or transparent, thin or viscous depending on the liquid used as well as the weight and time applied by the maker. The resulting surface facet would have been further striated and polished; however in one short session, due to the particular hardness of the material, little obvious modification would have occurred to its face. The earlier comparison to the prolonged use that a water colour pan gives serves correct in this context, because even the very

small and well-worn rubbed haematite nodule would be perfectly proficient at producing finely micronized pigment for various applications.

Several pieces, particularly **IP9** and **IP4bis**, show possible use as 'crayons' *i.e.* that a small pointed area has been overtly rubbed or directly applied on stone as dry or aquarelle crayoned marks. **IP4bis** is also the only find with scored striations from rubbing, on one of its well smoothed surfaces. Experiments show that this may indicate the nodule face was rubbed down for pigment, partially wetted, scratching its face in the process; or it is possible the same technique was applied to a vertical, flat stone surface, such as a wall as it created aquarelle painted areas. Both finds show that they could have lightly scored and eloquently 'crayoned' and 'painted' a design on a vertical stone surface which supports Arlene Isbister's previous suggestion regarding how the now fragmented and faintly incised wall designs from Skara Brae (and indeed other similar Orcadian megalithic art) were originally produced (Isbister 2000, 194; Bradley *et al.* 2001, 54, 65).

Further experiments have shown that the *wet abrasion method* achieves brighter and more saturated colours and even finer pigment material when employing viscous binders or mediums instead of water which has delivered some interesting results. Equally, the finest nodule surfaces are created when these viscous media (such as gum or resin) are employed. This cushions the grinding process while simultaneously binding the pigment, allowing finer pigment particles to scatter creating rich or highly saturated orange-red pigment material (Isbister 2009). However, it is important to note there are other variables which can affect the overt smoothness of a facet, such as surface texture of the sandstone and the pressure applied to the process. For example, rubbing down the very hardest haematite materials in water can give a similar surface facet to one created by a viscous material; but with plain water, in most applications, a brighter colour is not achieved.

The *wet abrasion method* was also employed to explore pigment colour and optimal saturation that was potentially exploited from the finds. Preliminary experiments specifically using gum of turpentine from pine resin had some unexpected results. Two experimental test pieces were each rubbed down in gummy turpentine and the material was thinly smeared on fragments of white glazed pottery to test colour saturation and brightness. One produced a highly saturated pure orange saffron colour and the other a translucent deep crimson or blood red. Their vividness, particularly that of the orange was unexpected as was the

Figure 13.3.4 (Modern) pot made of Orcadian clay showing painted decoration using haematite (left band) and iron-rich sandstone (right band) after firing at 500°C for 3 hours.

sparkling shimmer the colours emitted when placed in direct sunlight. The same shimmer was absent in other light, including artificial light. Water-soluble tree gum, a traditional water colour binder, was also used which produced satisfactory matt colours, brighter than those rubbed down in water but without the translucency and sparkle of the water-resistant turpentine.

In the above context, gum of turpentine may only appear as an artist material but it may be relevant that pine sap and its associated products have a longer history as a powerful antibacterial in Britain.[1] Similarly haematite is also a healing agent for the body and some medicinal and symbolic associations have been previously discussed (Isbister 2000, 194–95; 2009). It is feasible that they were employed together not only for artistic reasons but for medicinal ones too. After all, both agents have physiological properties that stop bleeding and they share a potent symbolism still referred to today: the sap or resin, the tree's blood (Stross 1997, 177–86) and haematite the Earth's blood, when mixed together and applied to a wound may have provided a powerful healing concoction. Equally, the highly saturated 'crystalline' colour applied to the skin or any other surface may have held a highly sensory presence. We return to this issue in the Discussion section.

Some years ago, Arlene Isbister observed various orange-red pigment materials from the William Watt Skara Brae collection at the Orkney Museum, one of which could tentatively be said to look similar to a hardened resinous material mixed with finely ground haematite. However no analysis of these materials has yet

Table 13.3.2 Iron-rich materials at Stonehall.

SF	Trench	Context	Provisional ID (%Fe content determined by pXRF)
6434	B	521	Roughly shaped fragment of iron-rich material, dark grey and dense; max. dimension 4cm (30)
8013	C	4004	Small fragment of orange iron-rich sandstone; max. dimension 2cm; (5).

been reported and whether the piece does or does not contain resin of course would not imply it was not used with pigments at Crossiecrown or Skara Brae. George Petrie appears to describe a similar hard resinous material when he refers to a large 'mass' of red haematite pigment 'resembling a brick in form' (Petrie 1867, 210).

13.3.4.2 Stonehall

At Stonehall the situation is different as there are no examples of black crystalline haematite (Table 13.3.2). **SF634** from the Farm site (Trench B) with an iron content of 30% may be impure goethite or alternatively a fragment of haematite that was partly worked, discarded and then heavily weathered. The other finds are small orange fragments of sandstone with a low but varying iron content. At least a dozen small finds (especially in Trench C (the Knoll) and Trench Z (the Meadow)) were initially labelled as ochre but subsequent examination indicated they were fragments of sandstone with a few percent of iron. Usually soft in texture, they streaked well but were wholly inadequate as pigments for painting.

13.3.5 Sources of haematite and related iron ores on Orkney

These mainly occur on Hoy at locations in the northern part of the island such as the Bay of Creekland (haematite, limonite and goethite: Mykura 1976, 119; Wilson *et al.* 1935, 151–52). There, veins are associated with a west-north-west fault, which can be traced inland and were worked by the Carron Company around 1765, in the field above the cliff, or near the Kirk, as reported by Low and Fleming (MacGregor *et al.* 1920, 216–17). Although it was available in great quantities (Low 1879, 4), apparently the economic venture was not a success, largely because the veins were not of workable breadth, however a quantity of ore raised was sufficient to be detailed as 'Orkney Ore' in published iron ores used at Carron in 1768 (Wilson *et al.* 1935, 152).

As already mentioned, Isbister (2000, 193) found at the Bay of Creekland quantities of haematite along the sandy shoreline, the majority of which was probably drawn in by the sea's undertow, from the eroded lining joints in the fractured seaward beds. However she also located on the rocky foreshore other pieces, in particular a palm-sized piece of black, botryoidal haematite (*c.* 9 × 7 cm) wedged between the large sandstone rocks, which, by its shape, looked to have 'grown' *in situ* (see Fig. 13.3.5). It was apparent that a very black glossy shine had formed on its upper surface where water percolated.

There are other occurrences on Hoy at the Candle or Burn of the Sale, lying close by the major Bring fault line (red-stained soils with minute crystals of haematite and goethite: Wilson *et al.* 1935, 151–52; Heddle 1901, 90; at Lead Geo (bog iron ore (with psilomelane): Heddle 1901, 109; MacGregor *et al.* 1920, 216–17) and in the south as at the east shore of Aith Hope (red haematite specimens: Heddle 1901, 89–90). Occurrences of haematite, not *in situ* but as lumps usually on the beach, on Mainland have recently been discovered by Christopher Gee at Redland north of Finstown (see now Fig. 9.36), which in terms of proximity is most relevant to this study, and around Deer Sound (at Deerness, Comely, and near the Hall of Tankerness) (John Brown, pers. comm.).

Better understanding of the geology of the known sources combined with these new discoveries on Mainland may help us map the bigger picture of the whereabouts of even small quantities of these iron ores, sources that were sought across Orkney during the Neolithic. According to geological research, it would appear that haematite can form as either a product of volcanic activity, forming precipitates during submarine volcanism, or subaqueous deposition of material from volcanic vents; and also abundantly as sublimates in the clefts of volcanic cones and in cavities of lava streams. Equally relevant is the apparent association between the fine-grained, platy habit of haematite and its formation in hydrothermal conditions (Bowles *et al.* 2011, 249–51; Geikie 1882, 67–68, 598–99).

Clearly, this work in Orkney would require further study, but for now it is interesting to note that where Orkney's geological vents are located (Mykura 1976, 97, 103–104), which are often associated with principal folds and fault systems (Wilson *et al.* 1935, 8, 13; Mykura 1976, 10), there appears to be a correlation with the known haematite sources or some significant archeological finds of haematite. Of the eight or so vent area locations reported by Mykura and Wilson nearly all

appear to be so associated. For example, of the above-mentioned Hoy sources, the north-west area behind the Bay of Creekland hosts a cluster of five volcanic orifices: three vents and two volcanic plugs. Another vent is just north of the Candle of the Sale and the remaining other two on Hoy are close by the reported haematite at Aith Hope in the south-east. Of the three vents on South Ronaldsay, two are a few miles from Isbister chambered tomb, where a unique shiny black haematite axe head was found as part of a hoard (Ritchie 1995, 54); the outcropping of haematite found recently in east Mainland by Deer Sound and by St Peter's Bay is well within the vicinity of the west coast Deerness vent. The Harra Ebb, near Yesnaby on Mainland's west coast, has six small crypto-vents and, although no haematite has been reported there, it cannot be ignored that Skara Brae is only a few miles north along the coast line where Childe and Paterson (1928, 268) report its presence and Isbister (2004; see also Callander 1930, 99) estimates around fifty pieces from the early and 1970s excavations. In addition Childe (1931, 137) and Callendar (1930, 99) acknowledged the presence of haematite nodules in the Old Red Sandstone on Mainland and presumed its collection by the villagers; this is possibly similarly to how AI found nodules, including an (*in situ)* specimen at the Bay of Creekland.

Finally, one other vent is recorded, in association with a monchiquite dyke, on the shore of the Bay of Firth at Rennibister (Wilson *et al.* 1935, 180) that is but a mile or so from our assemblage of iron minerals at Crossiecrown. It is particularly significant in terms of this study as it associates the area with particular geological activities, including possible hydrothermal conditions that might have contributed to the formation of high-grade haematite and goethite deposits in the Bay of Firth area; it also provides a possible new context for the recent discovery of haematite at Redland.

13.3.6 Discussion

The pieces of haematite/goethite at Crossiecrown constitute an exceptional assemblage that is unique among recently excavated sites on Orkney. A wide-ranging assemblage such as this is unusual and demonstrates evidence for some of the techniques once used to prepare pigment, for example the earlier described *wet abrasion method*, and as such exhibits archaeological potential for further practical application and interpretation. The corresponding finds at Stonehall are much more limited.

It seems likely that samples of Orcadian haematite

Figure 13.3.5 Palm-sized specimen of shiny, black, botryoidal haematite (c.9 × 7 cm) found in situ between the sandstone boulders at Bay of Creekland on Hoy (Copyright: Arlene Isbister).

may be easily confused with well-crystallised dark goethite which resembles but is not hematite. The iron nodules rich in goethite should not be under-estimated as a source of red pigment, although to what extent they produced a 'desirable red' requires further investigation. The colouring matter found in the paint pots of stone and whale bone at Skara Brae was shown by analysis to consist of powdered haematite (Childe 1931, 137) but it is not possible to say whether the powder was either ground up haematite or goethite which had been heated and converted irreversibly to haematite. Heating to a temperature of *c.*250°C in a domestic hearth for a few hours would be sufficient for the reaction to take place (Gualtieri and Venturelli 1999).

Turning to the known sources of iron minerals on Orkney, Hoy features strongly in the literature in part because the ores there comprising haematite in association with limonite and goethite have been exploited in recent times. There is furthermore frequent reference in Table 13.3.1 to visual similarity between individual pieces at Crossiecrown and those found (by AI) at the Bay of Creekland on Hoy. But in the light of recent discoveries mentioned above (including the Bay of Firth's association with possibly the only geological vent on central Mainland that might have contributed to the deposition of iron minerals in the area), its occurrence in the form of lumps on the NW side of the Bay of Firth, if confirmed by further prospection, is highly significant because it offers a potential near-local source. To take that argument a step further, the relatively high frequency of haematite finds at Crossiecrown may signify the presence

of outcrops close to the site whose weathering has yielded lumps that have accumulated near the coast. There are as well other local ferruginous materials such as bog iron, inferior in quality to haematite or goethite, which may have been noticed either *in situ* or as lumps owing to their colour. Both the size of **IP3** and the indications of the first working of its surfaces are suggestive that this was a large lump found perhaps in the course of walking or travelling near the settlement.

The contrast with the comparable situation elsewhere is striking: no haematite at Wideford Hill or Knap of Howar has been reported; Barnhouse yielded a single fragment (Clarke 2005a, 327), as did Pool in phase 3.1 (Clarke 2007, 387–88). On the other hand, at Rinyo lumps of polished and striated haematite were found in chambers A and D (Childe and Grant 1939, 29), and the haematite axe head from Isbister and quantities from Skara Brae are mentioned above.

Nevertheless, it would appear that even during Neolithic times Hoy's iron ore deposits would have been plentiful, given the island's prolific geological past and associated iron ore veins, and was probably collected as described above. However, along with other likely Mainland sources including the west Mainland coast, by Skara Brae and Deerness in the east, there is in principle little reason to doubt, given the new indications, that the inhabitants of Crossiecrown did not have access to a considerable amount of iron ore minerals on the shores of the Bay of Firth and in their wider locality.

Further experimental work is called for. The shape of nodules and their facets' surface texture are fashioned not only by the wet medium employed to grind down the pigment material but also by the surface qualities of the 'grindstone'. Likewise stone surfaces become smoothed from repetition of the described techniques. The stone mortar excavated from Crossiecrown and selected cobble stones (see Chapter 13.3) might be examined for associated use-wear, bearing in mind that wet pigment production techniques need not leave staining on grindstones. Pigment preparation techniques should be explored in light of further examination of the material and in association with finds from other sites. And finally, in relation to the role that stones played in traditional medicine in the Scottish Highlands and Islands (Beith 2004, 144–46), it is possible that haematite could have been regarded as a magical stone having curative properties, as already alluded to in the section above on Crossiecrown. Writing in the 16th century and relying heavily on ancient sources, Agricola believed that was the case: 'Haematite is so-called either because it is the color of blood, as Galen rightly believes, following Theophrastus; because it stops the flow of blood; or because, having been ground on a wet whetstone, it imitates a bloody juice' (Bandy and Bandy 2004, 86), and furthermore 'Physicians use haematite since it dries and is astringent. The powder, after the mineral is completely pulverized in a mortar, reduces roughness of the eyelids, a disease the Greeks call τραχωμα, when mixed with egg and smeared on the inflamed lid. If mixed with water it stops bleeding from an open vein. It is beneficial in the treatment of all ulcers. The powder reduces all fleshy growths' (*ibid.*, 88). Returning to a Scottish context, two related points may be added; first the role of the blacksmith as someone traditionally endowed with magical and healing powers and second the link between him and the raw materials he sought. The blacksmiths who worked the early bloomery iron furnaces in Scotland and Ireland were accustomed to searching for bog iron ore; the precursors of these crude ores were the iron seepages whose colour in streams or springs would have been a dramatic bright red (Photos-Jones and Hall 2011). The symbolic association of this natural material with human blood would have been clear enough.

Note

1. For example, several early 19th-century doctors revived this antibacterial medicine with much success which is reported to have had prior long use in Britain and Ireland. They prescribed spirit or oil of turpentine, taken internally, and were successful in treating, to name but a few conditions: childbed and typhus fevers and chronic rheumatism and dysentery; topically they cured extensive scalds and burns (Spratt 1830, 29–31); whereas its resin was used in the composition of medicinal plasters and its raw form, pine sap, was then used as ointments and plasters by farriers (*ibid.*, 17 and 19).