THE UNIVERSITY *of* EDINBURGH

‘*It rained a lot and nothing much happened*’

Settlement and Society in Bronze Age Orkney

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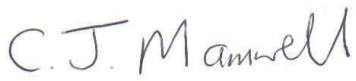
Declaration

I hereby confirm that this is an original study conducted independently by the undersigned and that the work contained herein has not been submitted for any other degree or professional qualification. All research material has been duly acknowledged and cited.

Signed: 

C. J. Mamwell

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Abstract

This thesis addresses the question of an impoverished record for the Orcadian Bronze Age. It presents the first comprehensive synthesis of this period, which is overshadowed by its neighbours.

Factors that influenced the formation of the archaeological record in Orkney are investigated. The effects of agricultural improvement on archaeological survival, not previously examined in detail in an Orcadian context, are shown to have been particularly significant. It is found that destruction of sites of all periods took place on a large scale, especially in the 19th century, and that this went largely unrecorded, which has not hitherto been fully appreciated or understood. Critical evaluation of the chronology and scale of land improvement is shown to be of particular importance in understanding archaeological distributions of Bronze Age evidence. Areas of archaeological survival of Bronze Age relict landscapes in largely marginal areas are identified and the implications of site densities in these landscapes are examined. The apparently high density of Bronze Age occupation in these marginal areas may be a result of population pressure or social control.

Burial-related evidence is examined in light of the changing burial practices in the late 3rd millennium BC and thereafter. The exotic artefactual assemblage, especially metalwork, in both funerary and non-funerary contexts, is examined to discover possible explanations for its nature.

Typologies of Bronze Age settlements are proposed and their developmental trajectories and relationships are investigated. It is found likely that some at least of Orkney's numerous broch sites could be the culmination of a multi-period settlement with roots in the second or third millennia BC. It is proposed that excavation of such sites may identify remains of the 'missing' high-status sites of the Orcadian Bronze Age.

The chronology, function and distribution of burnt mounds, and their relationship with settlements and funerary sites is examined. It is found that

there is an association between burnt mounds and settlements, and burnt mounds and funerary sites, in Orkney's relict landscapes, and that this relationship may be applicable to the wider Orkney landscape.

A dearth of excavated and published sites, lack of diagnostic artefact assemblages and concomitant lack of chronological resolution are found to present difficulties in treating 'the Bronze Age' as anything other than a unitary period in Orkney. Understanding of Bronze Age Orkney suffers from limited excavation. There are no obvious high-status settlements and an absence of artefact types found contemporarily elsewhere in the British Isles. The current paradigm of the fragmentation of society at the end of the Neolithic inferred from this is examined and the evidence found to be equivocal. Alternative explanations for the apparent discontinuity exhibited at some sites towards the end of the 3rd millennium cal BC are explored. Recommendations for future research are made.

Lay Summary

This thesis addresses the question of the poor archaeological record of the Orcadian Bronze Age. It presents the first comprehensive synthesis of this period, which is overshadowed by its neighbours. Things that affected the recording of archaeological sites in Orkney are investigated. The effects of agricultural improvement on these sites, not previously looked at in Orkney, are important. Many sites were destroyed without being recorded especially in the 19th century.

Understanding when land improvement happened is shown to be of particular importance in understanding areas where Bronze Age sites survive, which are often on poor quality land that has not been used very much for farming in the modern period. The apparently high density of Bronze Age sites on this poorer land may be a result of population pressure.

The way people buried their dead changed from during the late 3rd millennium BC and unusual finds, especially metalwork, from both burials and other locations, are examined.

The types of settlements and houses that were built during the Bronze Age are investigated. Many of Orkney's brochs may be built on top of older sites, and this could partly explain why there are no obvious high-status sites in the Orcadian Bronze Age.

The date, purpose and distribution of burnt mounds, and their relationship with settlements and burial sites is examined. Burnt mounds and settlements, and burnt mounds and burial sites, may be positioned close to each other in the poorer land where they currently survive, and this may have been the case in the rest of Orkney. There are few excavated Bronze Age sites in Orkney and it is difficult to date the Bronze Age closely as there are not very many radiocarbon dates for excavated sites.

There are no obvious high-status settlements and very few finds of the kinds common in the Bronze Age elsewhere in the British Isles. It is currently

thought that there is a breakdown of society at the end of the Neolithic because of this, but there is evidence both for and against this viewpoint. There may be other reasons why some settlement sites are abandoned at the end of the Neolithic. Recommendations for future research are made.

This thesis is respectfully dedicated to the memories of:

Anne Kirkness Brundle

27th April 1958 – 18th January 2011

and

Professor Magdalena Stefania Midgley

4th November 1952 – 21st July 2014

'They lived regarded and died regretted'

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The late Anne Brundle, Curator of Archaeology at Orkney Museum was both a professional colleague and a personal friend, with an encyclopaedic knowledge of both the Museum's collections and all things Orcadian, always happy to answer obscure queries. I must also thank her for providing me with the title of my thesis; sadly she did not live to complete her own PhD. Thanks are also extended to Anne's family for permission to reproduce one of her illustrations, and an extra mention to Anne's father, Peter Leith, for ensuring that I shall never forget the correct pronunciation of the Dyke of Sean.

My particular thanks go to my first supervisor, the late Professor Magdalena S. Midgley, who, when approached from out of the blue with a research proposal, was kind enough to not only agree to meet but then to accept me as her student. My first recollection of Magdalena is of her emerging from a Porsche wearing a black leather jacket: our future relationship was secured when it transpired that we both had a cat called Ginger. I cherish fond memories of our meetings and lunches together and greatly valued her support and advice.

My most heartfelt thanks to my supervisor for my final year Professor Ian Ralston for his help and encouragement without which this project would not have been finished: he has been the pilot guiding the rudderless and foundering ship into a safe harbour. Admittedly the first time a final draft of a 'finished' chapter came back from him with 164 comments on areas that required amendment, clarification and further research was a little disconcerting, but he was always right and he made me think – thank you Ian!

Lastly, but by no means least, I would also like to thank my partner Dave Lawrence for his support and encouragement and keeping me supplied with cups of tea and food at regular intervals, and providing some semblance of sanity.

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Conventions

All radiocarbon dates are quoted at 2 σ unless otherwise stated. Pre-1990 radiocarbon dates have been recalibrated using OxCal online, as have those quoted at 1 σ in the original publication. Errors have been increased on pre-1982 radiocarbon dates as advised by Ashmore (1998). Full details of the uncalibrated dates together with the version of OxCal and the calibration curve used may be found in Appendix 1.

List of Abbreviations

AMS	Accelerator Mass Spectometry
ASMS	Archaeological Sites and Monuments of Scotland series of surveys
DES	Discovery and Excavation in Scotland
EBA	Early Bronze Age
GIS	Geographical Information System
HER	Historic Environment Records
HES	Historic Environment Scotland
HS	Historic Scotland, the forerunner to HES
LBA	Late Bronze Age
MP	Member of Parliament
MBA	Middle Bronze Age
NMS	National Museums Scotland
NMRS	National Monuments Record of Scotland
NSA	New Statistical Account i.e. 2nd Statistical Account of Scotland

ON	Old Norse
ONB	Object Name Books of the Ordnance Survey
OS	Ordnance Survey
OSA	Old Statistical Account i.e. 1st Statistical Account of Scotland
ORCA	Orkney Research Centre for Archaeology
ORK	Prefix to the chambered tomb numbering system for Orkney used in Davidson & Henshall 1989; Henshall 1963
OSL	Optically Stimulated Luminescence
PTTL	Photo Transferred Luminescence
RCAMS	Royal Commission on the Ancient Monuments of Scotland
RCAHMS	Royal Commission on the Ancient and Historical Monuments of Scotland
ScARF	Scottish Archaeological Research Framework
SMR	Sites and Monuments Record
TL	Thermoluminescence
USF	Upper Stromness Flags
WHS	World Heritage Site

Key to parish abbreviations used in the tables in the appendices.

Abbreviation	Parish Name
BIHA	BIRSAY AND HARRAY
CRAB	CROSS AND BURNESS (SANDAY SOUTH)
EAR	EVIE & RENDALL
EDAY	EDAY
FIR	FIRTH
HOAG	HOY AND GRAEMSAY
HOLM	HOLM
KASO	KIRKWALL & ST OLA
LADY	LADY (SANDAY NORTH AND NORTH RONALDSAY)
OR	ORPHIR
PAWE	PAPA WESTRAY
RAE	ROUSAY EGILSAY AND WYRE
SAND	SANDWICK
SHAP	SHAPINSAY
SORO	SOUTH RONALDSAY (INCLUDES BURRAY)
STAD	ST ANDREWS AND DEERNESS (INCLUDES TANKERNESS)
STEN	STENNESS
STRO	STROMNESS
STRON	STRONSAY
WAFL	WALLS & FLOTTA
WEST	WESTRAY

Chapter 1 Introduction

1.1 Background to the research

There is a perception that Bronze Age Orkney has a poor archaeological record. Compared to other areas of the British Isles, and contrasted in particular to the Orcadian Neolithic, this view initially appears to be justified:

> *Compared with the architectural achievements of the fourth and earlier third millennium and those that were to follow in the first millennium, Orkney's Bronze Age seems a dull time and has certainly not left many monuments at which to marvel* (Ritchie 1995, 95).

The Bronze Age is very much the poor relation in Orkney's archaeological heritage, overshadowed by the preceding and succeeding periods. The majority of Bronze Age sites that have been surveyed or excavated are funerary in nature (e.g. Ballin Smith 2014; Dalland 1999; Downes forthcoming; Hedges, J. W. 1980; Hedges, M. E. 1977; Chapter 6) and there is little excavation or research literature concerned with non-funerary sites (e.g. Dockrill, Bond et al 2007; Hedges 1975; Toolis 2007a; Section 7.2; Table 7.1). Similarly the Bronze Age lacks syntheses: the most comprehensive previous review of the Orcadian Bronze Age is Øvrevik's (1985) 32-year-old, 19-page, chapter in Renfrew's *Prehistory of Orkney,* which, together with a ten-page chapter[1] in *Prehistoric Orkney* (Ritchie 1995, 86-95), remains the most frequently quoted source for the period (e.g. Downes 2005, 28-32; Farrell 2009, 59-67; Wickham-Jones 2006, 90-8 & 2015, 93-102).

The Orcadian Neolithic presents a marked contrast, with major settlement sites that are central to British Neolithic studies e.g. Skara Brae (Childe 1931a; Clarke & Shepherd in prep.), Rinyo (Childe & Grant 1939 & 1947), the Knap of Howar (Ritchie 1983a; Traill & Kirkness 1937) and Barnhouse (Richards 2005a). Orkney's chambered tombs are equally impressive and have been the subject of much research (e.g. Challands et al 2005; Childe

[1] Entitled 'A Prehistoric Recession?'

1956; Davidson & Henshall 1989; Renfrew 1979), whilst the henges of the Ring of Brodgar and Stones of Stenness (Renfrew 1979; Richards 2013; Ritchie 1976) are highly visible symbols of the pre-eminent Neolithic. The iconic status of the Orcadian Neolithic was reinforced in 1999, by the inscription of 'the Heart of Neolithic Orkney' on the World Heritage Site List and the concomitant focus engendered by its accompanying research agenda[2] (Downes et al 2005; Downes, Gibson et al 2013; UNESCO 1999). As Barclay (2000, 275 & 2001) noted, the 'luminosity' of the Orcadian Neolithic 'exercises a mesmeric effect'. This mesmeric effect is increasing, with the highly publicised ongoing excavation of the ceremonial complex at the Ness of Brodgar (Card et al 2017; Towers et al 2015 & 2017) and recent publications (e.g. Richards & Jones, R. (eds) 2016). The Neolithic inevitably overshadows other periods of Orcadian prehistory, particularly the Bronze Age.

Similarly the Orcadian Iron Age, with its 135 known brochs[3], e.g. Gurness (with its exceptionally complete village: Hedges 1987b) and the remarkable Minehowe shaft (Card et al in prep.; Harrison 2005), is equally impressive in terms of its monument record and continues to attract research and excavation (e.g. Ballin Smith 1994; Carruthers 2015 & 2016; Hedges 1987a, b & c; MacKie 2002; Romankiewicz 2011).

The end of the Neolithic is envisaged as:

> *… a period of social fragmentation and isolation which continues into the Early Bronze Age and is destined to last for the next thousand years* (Richards 1998, 531).

Orkney's Bronze Age has therefore been viewed as something of an anticlimax, especially since the commonest non-funerary Bronze Age sites in Orkney are burnt mounds (e.g. Hedges 1975; Chapter 9), which are 'individually, among the most boring sites with which a field archaeologist must deal' (Barber & Russell-White 1990a).

[2] In which the Bronze Age has a six-page summary (Card 2005a, 56-61).

[3] See Appendix 11.

My title comes from a light-hearted lecture given in 2004 by the late Anne Brundle, Curator of Archaeology at the Orkney Museum. After discussing the spectacular Neolithic sites, she memorably declaimed: 'The Bronze Age – it rained a lot and nothing much happened – let's move on!' So little attention has been paid to the Orcadian Bronze Age that it is difficult to know if this perception of low-key stasis is indeed the case or if it has simply become the accepted paradigm by default. It is the purpose of this thesis to investigate the issue and present a more balanced and nuanced account of the period in Orkney, in order to discover whether this view is valid and to analyse the reasons for it, questions that have not previously been addressed in any depth.

1.2 Definition of the study period

A starting point of c.2200/2150 cal BC is generally accepted for the Bronze Age in the British Isles (e.g. ScARF 2012a, 13-15), although there remains debate about what to call the period between the twenty-fifth and twenty-second centuries BC (e.g. Allen et al 2012, xxv-xxvi; Carlin & Brück 2012; O'Brien 2012). In recent years, a case has been made for the use of the term 'Chalcolithic' to distinguish this period when many innovations such as Beakers, metals and single graves were introduced (e.g. Needham 2012; Sheridan 2012a). Shepherd (2012, 164) considered that:

> *There <u>was</u> a Scottish Chalcolithic …. It is most clearly expressed in terms of the two principal novelties of the third quarter of the 3rd millennium BC in Scotland … metalwork and early Beaker graves (with non-funerary Beakers added to the picture).*

In Chalcolithic Orkney these 'principal novelties' are largely absent, with a complete lack of copper and a notable dearth of Beakers; the artefactual record of the succeeding Early Bronze Age in Orkney is similarly deficient in comparison with the rest of Britain with in particular a limited metalwork assemblage (Section 6.3.3) and an absence of developed forms of Beaker (Section 6.3.5). Some authors have even suggested that the Neolithic persists

in Orkney until c.2000BC (e.g. Card 2005a, 47; Farrell et al 2014, 232; Griffiths 2016, 254; Lee & Thomas 2012b, 17; Richards et al 2015).

For the purposes of this thesis and in order to facilitate comparisons with other areas of the British Isles I propose to follow the chronology outlined in the ScARF (2012a, 13-15) *Chalcolithic and Bronze Age Panel Report*:

- Chalcolithic c.2500/2450 – c.2200BC
- Early Bronze Age c.2200 – 1550BC
- Middle Bronze Age c.1550 – 1150BC
- Late Bronze Age c.1150 – 800BC

1.3 Study region

This thesis presents the results of a regional study of the Orcadian Bronze Age, following a tradition of archaeological syntheses within British prehistory, where boundaries are imposed to make sense of a complex environment by identifying regions that exhibit shared salient features. Such study regions may follow political boundaries (e.g. Childe 1935; Cummings & Robinson 2015; Driver 2013; Edwards & Ralston 2003; Evans 2008). Regions have alternatively been defined by significant landscape features such as watersheds, river catchment areas or mountainous terrain (e.g. Bevan 2004; Cockrell 2016; Mullin 2012; Olding 2016; Waddington 1999). Using the County of Orkney satisfies both approaches.

Islands and archipelagos present easily defined study regions, clearly demarcated by their coasts (e.g. Armit 1996; Broodbank 2000; Fleming 2005; Hunter 1996a; Parker Pearson 2012); Evans (1973) proposed that they could readily be used as laboratories to study cultural processes. Debate continues over the treatment of islands as 'same' or 'other' and the question of their isolation from, or connectedness to, the wider world (e.g. Broodbank 2008; Erlandson 2008; Fitzpatrick & Anderson 2008; Fleming 2008 & 2009; Terrell 2008), with some seeking to emphasise their connections within a wider region (e.g. Rainbird 1999 & 2007; Van de Noort 2006 &

2011). Whilst acknowledging that the sea may act as a highway rather than as a barrier in maritime communities[4] (Section 2.3.2), the core study region for the purposes of this thesis is limited to the islands of Orkney (Figures 1.1 & 1.2). Orkney is separated from Mainland Scotland by the Pentland Firth, whose strong tidal streams present considerable hazards to modern-day shipping (Sutcliff 1975, 169); crossing this stretch of water in prehistory would not have been a routine activity, neither would crossing the 69km of open water between Orkney and Shetland (Section 2.3.2). Although selected comparisons are made beyond the limits of the archipelago in this thesis, restricting the prime study area to Orkney – an archipelago of 70 islands totalling 975 km^2 (Section 2.1) – is clearly justified.

1.4 Aims and objectives

This thesis aims to discover if the Orcadian Bronze Age really was a 'dull' time of 'economic recession' (Ritchie 1995, 86 & 95) and to develop an explanatory framework for the existence of this perception. It attempts to address related research questions that have previously been identified, and particularly '*investigates the nature of Bronze Age settlement in Orkney*'. This open-ended research question was posed in the *Heart of Neolithic Orkney World Heritage Site Research Agenda* precisely because so little is known of the subject (Downes et al 2005, 128-31). In order to conduct this investigation in a comprehensive manner, aspects of two further research questions from the same agenda are also addressed, namely:

- *Investigation of the nature, date and function of burnt mounds*
- *A review of existing evidence relating to the Late Neolithic – Early Bronze Age in Orkney, together with targeted fieldwork/artefact-based research in order to investigate this poorly understood period.*

I therefore build a wide-ranging synthesis of archaeological evidence relating

[4] In the same way that in other regions rivers may serve as important waterways to link rather than divide (e.g. Coles 1994; Sherratt 1996, 219-20, fig. 3).

to Bronze Age settlement and society in Orkney,

- initially determining the processes by which the archaeological record in Orkney has been formed;
- to reassess the evidence from excavated settlements, burnt mounds, burials, boundaries and artefacts;
- attempting to identify biases in data collection and distributions that have been introduced and, in particular,
- to discover how this information relates to the recognition and recording of Bronze Age sites of different types (Chapter 3).

The exceptional quality of well-preserved Neolithic and Iron Age sites has led to a failure to comprehend the scale of loss of archaeological sites within the islands. I seek understanding of the mechanisms that led to site survival or destruction in Orkney and therefore conduct the first significant study of the effects of agricultural improvement on the Orcadian landscape and concomitant archaeological survival,

- to permit realistic assessments to be made of the scale of loss, how much survives, and why;
- to consider possibilities for the preferential survival of some types of site in an Orcadian context;
- to discover and evaluate the impacts of historical agricultural practices on the survival and detection of archaeological remains (Chapter 4).

Areas of (exceptional) Bronze Age survival are determined from these data to examine the implications of site densities and settlement patterns in such areas for the rest of the Orcadian landscape, where site losses have been proportionately much more serious (Chapter 5).

I examine and summarise burial-related evidence in light of the changing burial practices in the late 3rd millennium BC and thereafter (Chapter 6).

- I particularly examine the limited artefactual assemblage, especially metalwork, in both funerary and non-funerary contexts, to discover possible explanations for its nature.
- I attempt to discover any indications in the surviving burial record of wealth or social stratification and examine the implications.

The nature of Bronze Age settlement is defined and explored (Chapter 7):

- to investigate the developmental trajectory and chronology of Orcadian house forms;
- to develop – within the constraints of the limited numbers of absolute dates available – an evolutionary explanatory model for architectural changes;
- to examine and evaluate the evidence for the existence of differential status in the settlement record of the Orcadian Bronze Age.

Evidence for the 'fragmentation' of society (Richards 1998, 531) at the end of the Neolithic is evaluated and alternative explanations sought (Section 7.3).

- Chronological evidence for site abandonment is considered.
- Possibilities for continuity in the archaeological record are determined and compared with those for discontinuity.

The evidence for Bronze Age boundaries in the landscape and their chronology are critically examined.

- Treb dykes, postulated to have Bronze Age origins (e.g. Lamb 1983a) are also re-evaluated (Chapter 8).

The chronology, nature and function of burnt mounds in Orkney, and the possible relationships of burnt mounds with Bronze Age settlement and funerary sites, are investigated (Chapter 9).

- The question of the particular survivability of burnt mounds is considered and evaluated, in order to determine their usefulness (or otherwise) as proxy indicators of destroyed former Bronze Age settlements, as has been suggested elsewhere in the Northern Isles (e.g. Dockrill et al 1998; Hunter 1996a).

I finally aim to determine suitable directions for future research that might address at least some of the issues raised.

1.5 Methodology

The aims and objectives were accomplished via a thorough review of all available published and unpublished archaeological records relating to the period, including grey literature. Particular efforts were made to investigate non-archaeological historical and archival sources that are infrequently considered, such as agricultural records. The archaeological record from Bronze Age Orkney was interrogated to see what, if any, patterns emerged; all forms of surviving archaeological evidence were assessed, including excavation and survey records of settlements, burnt mounds, funerary sites and artefacts.

Site records were evaluated in a desktop assessment, initially interrogating the NMRS and the Orkney SMR, together with the Royal Commission *Inventory* (RCAMS 1946) and subsequent RCAHMS-sponsored surveys (e.g. Lamb 1980b & 1983b). Other sources consulted included surveys of particular monument categories (e.g. the Orkney Barrows Project: Downes 1997a; Downes & May 2005a & b), surveys conducted primarily for heritage management and coastline monitoring (e.g. Card 1998; Moore & Wilson 1998 & 2004), landscape studies (e.g. Hunter et al 1982; Lee 2012; Moore 2013) and grey literature relating to commercial archaeological fieldwork (e.g. Lawrence 2008; Sharman & Hollinrake 2007); information on otherwise unpublished sites was drawn from sources including *Discovery and Excavation in Scotland* (e.g. Braby 1996; Card 2014; Downes 1998a). The HERs of other regions were consulted for comparative material where

appropriate (e.g. Archwilio; Coflein).

Historical sources such as the First and Second Statistical Accounts of Scotland were examined for notes regarding early discoveries which are unrecorded elsewhere (e.g. Clouston, W 1927a, 134; Clouston 1845, 55-8) and for insights into the scale and scope of early agricultural improvement (e.g. Barry 1927b, 358-9; Clouston 1845, 61). Agricultural (e.g. HMSO 1948; Pringle 1874; Shirreff 1814; O'Dell 1939) and cartographic (e.g. ONB 1880; Mackenzie 1750) records were then compiled and used to assemble a picture of the pre-improvement landscape of Orkney with particular reference to land use, then to chart the progress of agricultural improvement across the County. Results from this exercise informed subsequent investigations of Bronze Age settlement and other archaeological distribution patterns.

An example of a database record sheet showing the basic data collected for each site is shown in Table 1.1 below; similar levels of basic data were collated for all sites. Site gazetteers, artefact catalogues and distribution maps were compiled for all classes of site and artefacts discussed here and these are contained in the Appendices, together with further information regarding the criteria influencing the inclusion of a particular site and the sources consulted in regard to each case. Site distribution maps were produced from this database, with distributions initially plotted by hand on Ordnance Survey 1:25,000 paper maps and overlays; distances between sites (e.g. Tables 9.1 & 9.5) were subsequently scaled from these maps. These large hardcopy plots were then transferred via Adobe Photoshop to electronic versions downloaded from Edina Digimap. Other cartographic sources (e.g. Mackenzie's (1750) charts and the six-inch 1st and 2nd edition OS maps) were consulted in paper map format and latterly via high-resolution digital copies and Edina Digimap downloads[5], which were used to produce some of the

[5] Following supervisorial advice at the commencement of this research in 2007 GIS was not used: many of the sources employed (e.g. Mackenzie 1750, or the 1st and 2nd edition OS maps) were not compatible with GIS (although historic OS maps are now available as GIS downloads via Edina Digimap this is a recent development). Compilation of some of the distribution maps in this thesis would have been less time-consuming via GIS, but it is not considered that this research has been otherwise affected.

illustrations in this thesis (e.g. Figures 4.11, 5.16 & 7.49). An extensive database of radiocarbon dates for Orcadian and other relevant Bronze Age sites was compiled (Appendix 1) and this was used to produce the chronological charts (e.g. Chart 6.1 & 6.2) incorporated in the text.

Site visits and landscape assessments were undertaken selectively along with area walkover surveys. These were aimed particularly at ground-truthing of landscape variables to achieve a proper understanding of geographical features and their interrelationships with the archaeological and historical landscapes. This did not extend to any attempt at a phenomenological approach. Orkney's major islands were visited, as were parts of the neighbouring regions of Caithness and Shetland, including Fair Isle at various dates between the start of this project in 2007 and 2016.

1.6 Summary

In attempting to determine whether 'it rained a lot and nothing much happened' and why this was believed, this thesis has become the first comprehensive synthesis of the Orcadian Bronze Age. It is the first detailed examination of the processes of agricultural improvement in Orkney to identify the impact that these factors had on the archaeological record, examining the scale and nature of the loss of the archaeological landscape over time in detail, in particular the impact on Bronze Age sites. Within the thesis, a development model for Bronze Age domestic architectural forms in Orkney is put forward. It attempts a new and holistic examination of the role of burnt mounds in relationship to settlements and funerary sites and in doing so provides a new perspective on the Orcadian Bronze Age. Key areas for future research are ultimately identified, along with suggestions as to how these might be addressed.

Table 1.1 Example of database entry sheet for Bronze Age funerary sites. (B=barrow; C= cist; Map number refers to distribution maps in Appendix 7)									
Map No.	**NMRS No.**	**Site Name**	**Grid Reference**	**Parish[6]**	**NMRS Class[7].**	**No. B**	**No. C**	**Notes**	**Reference if applicable**
3	HY20SE19	Hoy Kingie Lang	HY 2725 0053	HOAG	CA, C	1	1	Kerb cairn at 254mOD; Disturbed; N/T[8] contents	Robertson 2006
11	HY21NE30	Nistaben	HY 2994 1650	BIHA	C	0	1	2 crouched inhumations; ploughing; reburied	N/A
26	HY21NW2	South Seatter	HY 2339 1637	SAND	M	1	2	OBP/OK[9]	N/A
27	HY21NW5	South Gyran	HY 2425 1543	SAND	B	1	0	Destroyed: many cists removed	ONB 1880, OS1/23/17/153
28	HY21NW9	Gyron Hill	HY 2410 1574	SAND	B	1	1	Steatite urn; cremation	Watt 1885

[6] See list of abbreviations for key

[7] Site classification on Canmore: CA=Cairn; C=Cist; M=Mound; B=Barrow

[8] No trace

[9] Site visited as part of the Orkney Barrows Project and confirmed as barrow.

Chapter 2 Climate and environment

2.1 Introduction

Orkney is an archipelago of around 70 islands[10] (Figure 1.2) off the north coast of mainland Scotland, of which today only 16 support viable populations. Orkney lies at roughly 59˚degrees North[11], on the same latitude as Leningrad and the southern tip of Greenland (Berry 1985, 17). The total land area of Orkney is around 975 km² (HMSO 1957, 15). The largest island is the Mainland[12] and is home to the majority of the 21,349 population (2011 census). A further five islands are inhabited by amongst others, a small community of monks (Papa Stronsay), and single families (e.g. Auskerry). Many of the previously inhabited smaller islands were abandoned in the twentieth century e.g. Faray, an island which had a population of 83 in 1871; the last inhabitants left in 1947 (Leask 1985, 21).

2.1.2 Solid geology

Orkney's geology consists largely of sedimentary rocks of the Upper and Middle Old Red Sandstone (Mykura 1976, 8-9; Appendix 5). These are mainly comprised of the flagstones of the Middle Old Red Sandstone: the Caithness flagstone and the Upper and Lower Stromness Flagstones (ibid). Easy access to these flagstones has strongly influenced the formation of Orkney's archaeological record, since it is excellent quality building stone and

[10] No definitive total exists due to disagreement on the exact definition of an island.

[11] The islands lie between 58˚41′ N and 59˚24′ N latitude, and between 2˚22′ W and 4˚ 25′ W longitude (Berry 1985, 17).

[12] The Mainland is the name of the largest island of Orkney; it is incorrect to refer to it as either Mainland Orkney or the Orkney Mainland; it should also always be prefixed by the definite article. The boundary between the West and the East Mainland is Kirkwall. Islands to the north of the Mainland are known collectively as the north isles; islands to the south of the Mainland as the south isles. Locally this is subdivided into inner and outer north isles, based on proximity to the Mainland, and linked south isles (i.e. Burray and South Ronaldsay, since 1945 reached via the Churchill barriers). For simplicity's sake I will refer only to the north and south isles based on their geographical location in relation to the Mainland. Orcadians never refer to the rest of Scotland as the Mainland; to distinguish between the two the term mainland Scotland will be used.

splits easily along the original bedding planes into flat building blocks. Consequently, although in the early Neolithic some houses were timber-built (e.g. Farrell et al 2014; Richards & Jones, A. M. 2016), from the mid-4th millennium BC onwards the building material used overwhelmingly was stone (Figure 2.1). This stone is readily available along the coastlines in most parts of Orkney, where it breaks into building block sized pieces naturally by the action of the sea, and was comparatively easy to quarry in prehistory. There are some exceptions to this, notably in the island of Hoy, comprised of Upper Old Red Sandstone, and Eday, which has the Upper, Middle and Lower Eday Sandstone (Section 5.8). These gritty sandstones, known as freestones, are good building stone only if quarried and cut with steel tools, but were used in Orkney from the twelfth century AD onward, particularly where intricate carvings and mouldings were required (Mykura 1976, 122-3; Figure 2.2). Freestones are not however conducive to prehistoric quarrying or construction. Even when found eroded naturally by the sea they do not break into convenient shapes in the same way as the flagstones. This type of stone is rarely found in prehistoric contexts but, when found, appears to have special significance. Pieces recovered from the Neolithic complex at the Ness of Brodgar, Stenness (Section 7.3.4) were deliberately brought to the site from some distance away and elaborately peck-dressed and decorated (e.g. Towers et al 2015, 17 & 23).

2.1.3 Superficial (drift) geology

Orkney was covered by ice-sheets in the Devensian glaciation, which has generally smoothed and rounded the landscape from the rocky escarpments and scree which previously existed (Mykura 1976, 113-16). The exceptions are Fitty Hill, Westray, and most strikingly in the island of Rousay, where the ice scoured the escarpments leaving a distinct terracing effect. There were local glaciers in Hoy, in the Rackwick valley and the Cuilags (ibid). The Devensian glaciation left behind boulder clay, mostly along the low ground, and exposed in coastal sections from 3 – 10m deep (ibid). Much of this boulder clay is of good enough quality to have been used for pottery making (Mike Copper,

pers. comm.); and was likely used as a resource throughout prehistory. Additionally these boulder clays have recently been shown to contain significant amounts of good quality flint[13], particularly in the East Mainland and Northern Isles, derived from off-shore chalk (Hugo Anderson-Whymark, pers. comm.). Although it had been assumed that prehistoric flint was largely imported into Orkney, it now appears that the majority was locally sourced (ibid).

Orkney's soils are principally formed of drifts derived from the flagstones of the Middle Old Red Sandstone (the Thurso and Canisby associations), together with areas of windblown shelly sand (the Fraserburgh association), particularly in Sanday, North Ronaldsay and parts of Westray (Dry & Sinclair 1985, 4-8; Appendix 5). There is also the Dunnet association, derived from the Hoy sandstones, and large areas of peat, including blanket bog in some areas (ibid). The soils mainly consist of podzols, peaty podzols, calcareous and non calcareous gleys, which have been made fertile by cultivation (ibid). In the Bilbster Series of the Thurso association, which covers the West Mainland, Rousay and parts of Westray, total soil depth is usually in excess of 1 metre, although in some areas the soil coverage can be much less (ibid).

2.1.4 Climate

Orkney has a hyper-oceanic environment, described as 'warm and fairly dry' below 30m OD, but 'cool and moist' above that (Berry 1985, 18-24). The dominant environmental factor in Orkney is the wind: it is rare to have a completely calm day, and Orkney is the third windiest place in the UK[14]. Prevailing winds are mostly westerly to south easterly but rarely from the north east (Figures 2.3 & 2.4). Due to its North Atlantic Oceanic environment Orkney has a high rate of cooling with increase in altitude, as much as 0.8°C per 100m, compared to 0.5 – 0.6°C in less oceanic regions (Berry 2000, 51-

[13] In addition to the flint sources previously identified in North Ronaldsay and Swona (Wickham-Jones & Collins 1978).

[14] http://www.metoffice.gov.uk/learning/wind/windiest-place-in-UK (Shetland is the windiest place in the UK).

2). This has a marked effect on vegetation, for example heath plants that are found only above 1,000m OD in the Scottish Highlands grow at 100m OD in Orkney (Berry 1985, 53). Vertical cooling and an increased wind chill factor in the exposed hills causes an abrupt decrease in agricultural viability with altitude, such that the lowland/upland division in Orkney lies at approximately 50m OD (Berry 1985, 53 & 2000, 52). There is a narrow temperature range between winter and summer, with average maximum summer temperatures reaching around 16°C and average minimum winter temperatures of around 2°C (Figures 2.5 & 2.6). Average rainfall is around 1,038mm a year (Figure 2.7), whilst sunshine averages around 1,172 hours a year (Figure 2.8). Daylight varies from 18.5 hours at midsummer to just over six hours in midwinter (Figure 2.9). This gives a relatively short growing season for crops of about five to six months, contrasted with the seven to eight months in lowland England (Berry 1985, 20).

2.1.5 Climatic limitations

Due to the brevity of the growing season, Orkney is beyond the viable range for wheat cultivation. Barley however grows to 60°N (Briggs 1978, 268) and so has been the dominant cultivated cereal since the Neolithic (Bond 2007b & d; Dickson 1983; Hinton 2005; Lynch 1983). The change from the naked barley of the Early Neolithic to the hulled barley of the later Neolithic was probably climate related, since hulled barley survives better during storage and would be better adapted to damp Northern Isles conditions (Bond 2007b, 157; Briggs 1978, 394). Even so, Orkney is towards the limit of its range, and, with the vagaries of the Orkney climate, harvest can be uncertain even today. For example the winter of 2014/15 was exceptionally wet, followed by a cold, wet spring, and the wettest May in four decades (Vetterlein 2015). Spring barley was planted four weeks late and subsequently failed in many locations e.g. Westray and Papa Westray[15] whilst many farmers were unable to plant at all; at the same time cattle housed for

[15] http://www.nfus.org.uk/news/2015/october/first-emergency-shipment-straw-heads-westray

the winter could not be turned out due to lack of grass growth and waterlogged pastures[16] and the lack of fodder continued to cause major difficulties throughout the year[17]. There was also unusually high mortality during lambing, both of lambs but also amongst ewes in poor condition[18].

Since this crisis occurred in the twenty-first century there were no human deaths due to starvation, however historical records paint a very different picture. There were serious famines in Orkney[19] in 1634-5, when bitterly cold gales destroyed crops before they ripened: the starving population first ate their seed grain and livestock, then their dogs, and finally scavenged the shore for seaweed (Hume Brown 1904, 284-5 & 659-60). Some fled the islands or threw themselves in the sea in desperation, whilst others died in the fields: one minister and his servant went daily to bury the victims where they had fallen (ibid). It was claimed in a late eighteenth-century account that around 3 – 4000 people died in Orkney in these famines, although this is difficult to verify (Clouston, W 1927b, 286). Similarly the years 1695-99 were a time of nationwide famine in Scotland, known as 'King William's ill years', although the famine started somewhat earlier in the Northern Isles (Cullen 2010; Cullen et al 2006; Low 1927, 153-5; Smith 1984, 40-1).

Prehistoric Orcadians could be expected to have experienced similar kinds of sudden crisis, although they might not have been affected as quickly as historical crofters who had the added burden of rent to pay[20]. Tenant farmers under such conditions reach an economic crisis before reaching a subsistence crisis (Dodgshon 2005, 325). It is unlikely that short-term crises of this

[16] Personal observation; Radio Orkney feature broadcast on the 22nd May 2015.

[17] *The Orcadian*, 4th June 2015, 28.

[18] Radio Orkney feature broadcast on the 22nd May 2015.

[19] Also in Shetland and Caithness.

[20] Rents were paid in kind – in oats, bere (barley), meal, malt, butter and seal oil-which were stored in Kirkwall before export (despite the local famine conditions) (Hossack 1900, 120 & 127).

nature would recognisably appear in the archaeological record[21]. This is especially so since there are no particular indications in Orkney's palaeoenvironmental record of significant climatic events documented elsewhere (Section 2.2.3). Nonetheless it is clear that cereal cultivation must always have been a risky subsistence strategy in Orkney.

2.2 Bronze Age environment: landscapes

2.2.1 Introduction

There are a small number of environmental records available from Orkney that are thought to cover at least part of Bronze Age (Figure 2.10). Few of these records are associated with radiocarbon dates[22], while some of those which are available are unreliable (Farrell et al 2014, 233-4). Furthermore Orkney suffers from a lack of suitable sampling sites, together with hiatuses in sediment accumulation at some sites (ibid). The need for a more extensive programme of environmental coring in Orkney to resolve these issues has been highlighted (ibid), but the currently available information is summarised below.

2.2.2 Environmental records from Orkney

During the late 5th/mid-4th millennium BC Orkney's predominately birch-hazel scrub vegetation, with its grass and herb rich understorey, declined, a change associated with increased human activity (Davidson et al 1976; de la Vega Leinert et al 2000; Keatinge & Dickson 1979; Moar 1969). There is some suggestion that, in sheltered areas at least, there may have been some true deciduous woodland at the beginning of this period with quite a dense canopy that probably included oak (Bunting 1994; de la Vega Leinert et al 2007). Woodland loss appears not to have been completely synchronous across

[21] Nutritional stress and dietary deficiencies might be detected in human skeletal material (e.g. Lawrence 2012, 81, table 4); linking this to specific climatic/famine events would present considerable difficulties.

[22] See Appendix 1, Table A1.15.

Orkney (Farrell et al 2014), but by the Bronze Age (at least in the West Mainland, the location of the majority of the records: Figure 2.10) the landscape was already largely an open treeless, heathland environment, but with some relict stands of birch-hazel scrub (Farrell 2009, 217-14 & 295-9; Jones 1979; Keatinge & Dickson 1979). The other islands of Orkney have produced few pollen sequences but these show broad agreement with the West Mainland: birch-hazel scrub/woodland replaced by an open heathland environment (Bunting 1996; Farrell 2009, 351-4; Tisdall et 2013). At Whaness Burn, Hoy, patches of woodland, including Scots Pine, were present until the early 2nd millennium BC (Farrell 2009, 208-11; Section 7.12.2).

There is localised evidence for agricultural activity including grazing and cereal cultivation at a number of sites e.g. at Hobbister where animals were grazing on the fen in addition to the surrounding areas from the mid-3rd millennium BC onwards (Farrell 2009, 295-8 & 2015, 480; Figure 2.10, no. 7). There is further evidence at Hobbister and a number of other sites including Whaness Burn that the land was managed to improve grazing by burning heather to encourage new growth (Farrell 2009, 208-11; Figure 2.10, no. 23; Section 7.12.2).

At Blows Moss, South Ronaldsay (Figure 2.10, no. 25) grazing was taking place on the fen itself in the Early Bronze Age, but this activity moved to the drier fen edge and surrounding areas in the mid-2nd millennium BC (ibid, 351-4). Interestingly this was not a forced move: there is no indication that the surface of the fen became wetter at this time so as to prohibit grazing (ibid). Rather, it may be that there was a shift towards a more arable based economy, since there is an increase in evidence for barley cultivation from the mid to late 2nd millennium BC (ibid). Despite the evidence at Blows Moss that there was no increase in surface wetness here, it is at this time, in the mid-late 2nd millennium BC, that blanket peat formation took place at sites in Birsay and Harray[23] in the West Mainland (Keatinge & Dickson 1979). Prior

[23] Glims Moss, Mid Hill, the Burn of Rusht and the Braes of Aglath; see Appendix 1, Table A1.15 for radiocarbon dates.

to peat formation these areas were also being grazed, and here too the heather was controlled by burning to encourage new shoots (ibid, 593).

2.2.3 Bronze Age climate change

There is worldwide evidence for climate change both at the beginning and end of the Bronze Age, c.2250 cal BC and c.850cal BC, known as the 4.2ka and 2.8ka events (See Appendix 5, Tables A5.15 & 5.16 & references therein). During these climate events, which each lasted for several hundred years, there were severe droughts in North America, Africa, Asia and Southern Europe, whilst Northern Europe experienced periods of wetter and cooler conditions (ibid). In the British Isles within this broad pattern there are regional variations. In addition to the major wet shifts of c.2250 BC and c.850 BC, another significant wet shift at c.1550 – 1500 BC has been recorded at 31 ombrogenous mires in Scotland, Northern England and Ireland (Anderson et al 1998; Barber et al 2003; Charman et al 2006; Hughes et al 2000; Langdon & Barber 2005; Swindles et al 2007a & b; Tipping 1995). These sites also recorded a series of overlapping wet shifts broadly encompassing most of the 2nd millennium BC, indicating that local factors were important. Similarly seven other Scottish sites reflect the 2.8ka and 4.2ka events, but at other times also responded to purely regional variations (Langdon & Barber 2005). Local variations saw some sites enter a wet phase when others were entering a dry phase, with broader regional differences observed between north and south Scotland (ibid). It has been suggested that Scotland saw widespread upland abandonment, particularly towards the end of the 2nd millennium BC, due to climate change (e.g. Burgess 1985, 1989 & 1992). Others have found no evidence to support such a conclusion (e.g. Dark 2006; Tipping 2002; Tipping, Davies et al 2008, 2384-5). The problem remains of relating any or all of these climatic variations to possible effects on the human communities as then reflected in the archaeological record (e.g. Tipping et al 2012).

In Orkney there are as yet no palaeoclimatic reconstructions that take all the climate proxies into account. Many environmental sequences are poorly

dated, which makes it difficult to determine which, if any, climatic factors were influencing responses. Evidence for animals grazing on the surface of the fen at Blows Moss, South Ronaldsay during the Early Bronze Age (Farrell 2009, 352) probably suggests a fairly dry environment. Local variations may be more influential than national trends. It appears that in Orkney grazing activity in marginal areas increased during the 2nd millennium BC, with more intensive arable cultivation focused elsewhere in the landscape (ibid, 391), and this may reflect a shift in activities related to a changed ability to exploit different environments in response to such local changes. Whilst there is some evidence of slightly wetter conditions during the Late Bronze Age, this had no appreciable significant effect on human activity (ibid, 384). At both Hobbister and Whaness Burn there is some evidence for wetter conditions c.1030 – 800 cal BC, which may relate to the 2.8ka event (ibid, 214 & 299). This increased wetness appears to have affected only the bogs themselves and low-lying areas, since grazing continued in the vicinities of both of these sites and also around Blows Moss (ibid, 385-6). Cereal growing continued in the vicinity of both Hobbister and Blows Moss at the same time, suggesting that the wider landscape remained largely unchanged (ibid).

2.2.4 Aeolian erosion

Aeolian erosion and accumulations of blown sand have been a factor affecting soil development in both Neolithic and Bronze Age Orkney (e.g. de la Vega Leinert et al 2000; Tisdall et al 2013). At Mill Bay, Stronsay phases of storminess and sand accumulation over grassy heathland used for grazing were a regular feature, however it was noted that:

> *During the Bronze and Early Iron Age on Stronsay rather than climate deterioration leading to land abandonment the response appears to be changes in farming practices with varying levels of grazing intensity used to maximise resources* (Tisdall et al 2013, 214).

Change in prehistoric farming practices to cope with aeolian erosion is a pattern seen elsewhere in Orkney e.g. Tofts Ness, Sanday (Dockrill, Bond et al 2007; Section 7.3.5); and the Links of Noltland, Westray (Moore & Wilson 2011a; Section 7.6.3); both sites where continued settlement required the

deployment of sophisticated agricultural techniques (Section 8.2). Both of the latter sites were eventually sealed beneath a dune system, where a subsequent cycle of deflation exposed the archaeological remains; dune deflation has recently revealed another area of Bronze Age settlement at Cata Sand, Sanday (Cummings et al 2016; Section 5.5.3).

2.3 Bronze Age environment: seascapes

2.3.1 Introduction

Orkney has been an archipelago since the beginning of the Holocene (Bates, Nayling et al 2012; Shennan & Horton 2002); water transport has been important since the first arrival of settlers in the Mesolithic. The Neolithic 'farming package' that flourished in Orkney in the mid-4th millennium BC (e.g. Richards, Downes et al 2016, 230-2; Sheridan & Higham 2006 & 2007) also had to cross the dangerous waters of the Pentland Firth. Most remarkably, the Orkney vole, *Microtus arvalis orcadensis*, was directly imported into Orkney from Europe during a long-distance Neolithic voyage (Martínková et al 2013). It is clear therefore that by the late 3rd millennium BC the inhabitants of Orkney had had ample time to perfect their seafaring skills.

2.3.2 The sea as a highway

Island communities were traditionally linked, rather than separated, by the sea. Sea-faring skills were learnt from an early age in Orkney, with children 'messing about in boats', learning at an early stage boat-handling skills that would stand them in good stead in later life (e.g. Towsey 2002, 3-7). This is also true in prehistory, from the Mesolithic onwards:

> *The sea was important as a highway which both united and separated different areas and islands and it allowed for wider vistas and a clear sight of other lands* (Hardy & Wickham-Jones 2002).

Maritime links stretched widely. There are noted similarities in the prehistoric coarse stone tool assemblages of St Kilda with those of the Late

Neolithic and Bronze Age assemblages from Orkney and Shetland (Fleming 2009, 139). Similarly there is evidence intermittently throughout the Orcadian Bronze Age for contact with the rest of the British Isles in the form of exotic imports such as amber, gold and jet (e.g. Kirkness 1935; Petrie 1860; Sections 6.3.1 & 6.3.2), Shetland steatite funerary urns and domestic vessels (e.g. Forster 2011; Sharman 2009; Sections 6.3.4 & 7.6.3) and items of copper alloy (e.g. Cursiter 1908; Section 6.3.3): all of these items had to arrive in Orkney by boat. At a more local level, fishing, alongside the other hunter-gatherer resources of the sea and shore, was part of a mixed paleoeconomy (e.g. Dockrill & Bond 2009; Section 8.2). Significant numbers of deep-water fish, likely to have been caught up to 15km offshore, are present at Orkney sites from the Neolithic onwards (e.g. Nicholson 2007a & c; Wheeler 1983; Section 8.2), demonstrating the availability of suitable equipment and considerable skill in both fishing techniques and boat handling among the local population.

2.3.3 Seafaring techniques

Seafaring in the seas around Orkney most likely involved hide boats, which are lightweight, quick and comparatively easy to build, require no formal landing place and handle extremely well in surf (McGrail 2001, 182-3). All the raw materials necessary for their construction – cattle hide or sealskin, seal/whale oil or other animal fat for waterproofing the hide, enough timber to make a lightweight wooden frame – would have been available in Bronze Age Orkney. Ethnographic examples such as the *umiaks* of the North Atlantic, powered by paddles, are constructed from green, untreated seal or walrus skins dressed with seal oil and caribou fat, and remain waterproof for four to seven days of continuous immersion (ibid, 416-17; Figure 2.11). They are extremely efficient cargo carriers: a 10.7 – 13.7m long *umiak* can carry nearly 2 tonnes of cargo yet be easily carried when empty by its crew (ibid). Similarly numerous Scandinavian rock carvings depict probably Bronze Age boats (e.g. Coles 2000 & 2005); a reconstructed hide boat based on one

interpretation of these proved both very seaworthy and capable of carrying a one tonne cargo (Marstrander 1976).

The waters around Orkney and Shetland are notoriously dangerous, with extremely strong tidal flows and currents (e.g. Sutcliff 1975, 76 & 169). Seafaring would have required both courage and a high level of competence including knowledge of the tides, currents and weather patterns. The geography of the islands of Orkney, grouped closely together in two clusters divided by the Mainland (Figure 1.2) promoted such developments:

> *… the islands form an excellent example of an island nursery – where a favourable configuration of islands in close proximity actively encourages sea travel and communication* (Noble 2006, 109).

The Pentland Firth separating Orkney and mainland Scotland[24] is only 11km wide at its narrowest point (Figure 1.1), making line-of-sight navigation possible on a clear day; once across the Pentland Firth the coastline may be followed south or west. Similarly the 69km voyage to Shetland may be accomplished by line-of-sight navigation using Fair Isle as an intermediate marker, although since Orkney's low-lying islands are not visible[25] from Fair Isle the return journey would require steering relative to Fair Isle which would still be in view behind the vessel.

2.4 Conclusion

Although Orkney, with its geographical and climatic limitations, could be seen as an inherently marginal environment for human endeavour, it is clear from the archaeological record that settlement has flourished here for millennia. This was not accomplished without hard work. Orkney's soils are now man-made and are fertile only as a result of cultivation and enrichment (Sections 2.1.3 & 8.2). In compensation Orkney has the advantage of a ready

[24] Hints of Caithness contact come from sandstone and ceramic urns at Aucorn (Anderson 1883, 75) and Battle Moss that echo Orkney steatite forms (Sheridan 2007a, 171).

[25] Personal observation; but on a clear day in perfect weather the visibility at sea is approximated by the formula: D (km) = 3.8 √ H (where D = visibility distance in km, and H = the target height in metres (McGrail 1998, 277-8).

supply of good-quality building stone and, it is now known, viable quantities of locally-sourced flint, together with access to the natural resources of the sea and shore (Section 8.2). To a population accustomed to maritime activity the seaways provided links to other areas, perhaps most regularly with Shetland but also further afield (Section 2.2.2): Orkney's Bronze Age seafarers were clearly quite capable of undertaking voyages across treacherous seas, indicating that this was a people who were at home in their maritime environment.

As noted by Farrell (2009, 110-14 & 393-5), Orkney's palaeoenvironmental studies are poorly dated with limited coverage of areas apart from the West Mainland (Figure 2.10), but their authors have been unable to detect significant local responses to pan-European climatic events. Although Tipping (2008, 2110) was referring to sites in the northern and upland regions of mainland Scotland and not to Orkney, his conclusion is nonetheless apposite:

> *Settlement took place in spite of the many contemporary disadvantages and hardships to farmers. This interpretation requires a new paradigm whereby we replace the image of a once benign landscape turned hostile with that of an enduringly harsh environment but one in which people could and very successfully did carve out a place for themselves.*

Chapter 3: The formation processes of Orkney's archaeological record.

3.1 Introduction

This chapter presents an overview of the formation processes behind the archaeological record in Orkney and explores the limitations of that record. This will be followed in Chapter 4 by an overview of the archaeological destruction wrought by agricultural improvement, which leads in Chapter 5 to a review of pockets of archaeological survival and how this relates to the surviving Bronze Age landscape of Orkney.

The main resource for an archaeological enquiry in Orkney (and indeed the rest of Scotland) is the NMRS, accessed online via Canmore[26]. A search of 'archaeology only' sites in Orkney currently produces 4,457 responses for all periods from prehistoric to industrial monuments. Faced with this wealth of material, it is vitally important to understand the nature of the source(s). Canmore is a valuable tool, but the records retrieved during an online search must be approached with a critical awareness of the origins of the information accessed, for example the Name Books of the Ordnance Survey (Section 3.6.2) or the observations of the Royal Commission Investigators for the County *Inventories* (e.g. RCAMS 1946; Section 3.7.1). This section summarises and reviews the history of previous approaches to Orkney's archaeology to show how our current state of knowledge was achieved and the limitations that this history has imposed. This will focus where possible on Bronze Age sites where information is available, but also on sites of other periods where relevant: for example some chambered tombs are remodelled or reused in the Bronze Age (Section 6.2), similarly a number of Orkney's brochs may be multi-period sites with earlier settlement components (Section 7.15).

[26] https://canmore.org.uk/

3.2 Early literary sources

Orkney features briefly in classical sources in the first century AD (e.g. Salway 1981, 138-49; Stevens 1951) and is subsequently mentioned in a number of chronicles from the sixth to eighth centuries AD (e.g. Anderson 1922, vol. 1, 56-7; Anderson & Anderson 1961, 440-3). There is then literary silence until the twelfth century, when the pre-Norse inhabitants of Orkney are described in mythological terms in the *Historia Norwegia* (Ekrem & Mortenson 2003, 65), and the *Orkneyinga Saga* provides the first written reference to a specific Orkney site, when Earl Harald and his men take shelter inside Maeshowe at Yuletide 1153 (Barnes 1994, 189; Taylor 1938, 310), but this account preserves no record of the contents of the tomb; other prehistoric sites in Orkney are only mentioned obliquely[27].

Before the sixteenth century, the history of Britain was largely defined by foundation myths; the first substantial antiquarian work came with Camden's *Britannia* in 1586 (Parry 2007; Woolf 2007) which features Orkney, but only as a one-page summary of the known historical documentation (Gough 1806, vol 4, 526). To this period belongs the first, brief, account of Orkney's (Neolithic) antiquities in Jo Ben's 1592 *Descriptio Insularum Orchadiarum* (Johnston 1907; MacDonald 1936; Mitchell & Clark 1908, 302-24).

Scotland should have had its own equivalent of *Britannia*, when Sir Robert Sibbald received a Royal Commission in 1682 to produce a Scottish Atlas, one volume of which was to have dealt with antiquities (Withers 1996, 48-9). To this end Sibbald sent out requests for detailed information:

> *Fail not to take notice of … any ancient Monuments … provided they be Real and not Fabulous* (ibid, 67-9).

Sibbald's Atlas was never completed; however a lengthy contribution intended for the Orkney section was created c.1688 by the Rev. James

[27] E.g. the two known Thing sites in Orkney, Tingwall and Dingieshowe, are both on broch mounds (Marwick 1952, 121; Sanmark 2012).

Wallace and subsequently independently published (Wallace 1693; Withers 1996, 56 & 72). This is the first detailed and illustrated account of archaeological discoveries in Orkney (Figure 3.1), also notable for the first use in Orkney of the term 'Pight's Houses[28]' (Small 1883, 29-32) in relation to building ruins, together with the earliest description of Bronze Age cists eroding from both the Links of Skaill (Section 6.3.2) and the Sands of Rothiesholm, Stronsay, where a 'sepulchral urn[29]' was also recovered (ibid).

3.3 Antiquaries in the age of enlightenment

Antiquarianism thereafter became a respectable pursuit, with the work of notables such as William Stukeley (Piggott 1985) in the eighteenth century and the formation of the Societies of Antiquaries in both London and Scotland (MacGregor 2007; Pearce 2007; Smellie 1782); the first *Transactions* of the latter included an account of a visit to Orkney (Gordon 1792). Emphasis was very much on the discussion of artefacts presented at meetings (Marsden & Nurse 2007, 95-6) and the acquisition of such was the prime aim of some of the enthusiastic barrow diggers of the period (e.g. Douglas 1793; Smith 1856).

3.3.1 Orkney's first excavation and survey

Orkney was not exempt from enthusiasm for antiquarian pursuits, and the first record of an Orkney excavation comes from the visit of Sir Joseph Banks in 1772, who, together with the Rev. George Low, Minister of Birsay parish, opened a number of probable Bronze Age burial mounds in an extensive barrow cemetery at Skaill Bay, Sandwick (Low 1776 & 1879, intro; Lysaght 1972 & 1974; Figure 3.2; Section 6.3.2). Low's more detailed account of Bank's excavations together with accompanying illustrations were lost before publication (Goudie 1915; Low 1879, intro) and the barrow cemetery has

[28] 'The name Picts'-house, or Pights'-house, is indiscriminately applied in Orkney, as in other parts of Scotland, to all remains of buildings of great antiquity' (Petrie 1863, 32). Monteith (1845, 20) used this term in 1633 in Shetland.

[29] The urn appears to have been a large composite steatite urn of a type also recovered from Linga Fiold, Sandwick (see Sharman 2009, 44-6).

since been destroyed without further record (Section 4.9). Bank's party had nonetheless included a skilled surveyor, who made the first maps of both the barrow cemetery at the Links of Skaill and also the main sites of the Brodgar peninsula (Lysaght 1972 & 1974). Low also described a cemetery exposed by aeolian erosion in the Links of Trenabie, Westray; the majority of these remains appear from the grave goods to be Viking, but some features may have been Bronze Age barrows (Goudie 1915, 146-8).

The first attempt at any kind of systematic survey of Orkney antiquities comes from an unlikely source: the first *Statistical Account of Scotland*[30]. Compiled between 1791 – 1794 by Sir John Sinclair, this consisted of the responses to 171 questions addressed to the Ministers of every parish in Scotland (Withrington & Grant 1983, 39-49). Some enquiries were on antiquities, including:

> *Are there any barrows, or tumuli? Have any been opened? And what has been found therein?* (ibid).

These questions are well thought out for their time, and if answered diligently would have provided much valuable information. In the event not all Ministers shared Sir John's enthusiasm for statistical enquiry, and although most of the Orkney responses included an answer to the antiquity questions, these varied considerably in both detail and length. Even the best accounts simply comment on the large numbers of tumuli or Picts' houses in the district, and mention finds of bones or ashes etc., but locations are vague, and usually cannot be tied to a particular site (e.g. Anon 1927, 10; Izat 1927, 348-9; Watson 1927, 210). Nevertheless, there are useful snippets of information, including for example the only record of a destroyed souterrain in Shapinsay (Barry 1927b, 363-4; HY41NE12). An entry from the Rev. William Clouston of Sandwick, illustrates the level of detail that can be found in the better reports:

> *In digging for stones, in one of these tumuli was found an urn shaped like a jar, and of a size sufficient to contain 30 Scotch pints. It*

[30] Known as the Old Statistical Account or OSA.

> *contained ashes and fragments of bones. The colour on the outside was that of burnt cork, and on the inside grey* (Clouston, W 1927a, 134).

This urn is not recorded elsewhere, and although 30 Scotch pints (68 litres) is almost certainly an overestimate, it is a not dissimilar volume to the c.56 litre steatite urn recovered at Linga Fiold, Sandwick[31], or the urn described by Wallace (Small 1883, 29-30; Section 3.2.2). This account is also the earliest record of an Orkney tumulus being quarried for building materials and heralds further accounts of the destruction of Bronze Age and other monuments (Section 4.4.6).

3.4 From antiquaries to archaeologists: the nineteenth century

In early nineteenth-century England barrow digging became more methodical, with the work of notables such as Sir Richard Colt Hoare, whose *History of Ancient Wiltshire* set new standards for excavation publication, continued by Thomas Bateman's *Ten Years Diggings* (Bateman 1861; Colt Hoare 1812 & 1821; Marsden & Nurse 2007). Colt Hoare (1812, 19-23), recognising that there were different designs and construction methods in the sites he examined, attempted to create a monument typology, subdividing his barrows into twelve illustrated categories. This period also saw the publication of the enlarged edition of *Britannia,* which expanded the Orkney entry to six pages (Gough 1806, 526-32) but this is merely a synopsis of material already published elsewhere (e.g. Wallace 1700).

3.4.1 Early nineteenth-century Orkney

There is no Orcadian equivalent of Colt Hoare, and, although it appears that sites were being opened on an ad hoc basis, few records survive of antiquarian work during the first four decades of the new century. Barry's (1805) *History of the Orkney Islands* is typical of the accounts of the period;

[31] Estimated from description in Sharman (2009, 44-6), using the conical frustum formula: volume = $\frac{1}{3} \pi h (r_1^2 + r_1 r_2 + r_2^2)$.

in attempting to date the initial settlement of Orkney he was reliant on the extant texts (Section 3.2) and thus put the colonisation of Orkney sometime in the early 1st millennium AD (ibid, 68-77). He described numerous tumuli, probably largely Bronze Age barrows, but in general terms and without precise locations, although his account does convey the ubiquity of such sites in Orkney:

> *The numbers found here are considerable; seldom single, but two, or three, or more in the same place; all of a circular form and different in dimensions; placed, without any distinctions of hill or dale, by the sea, or inland … some* [contain] *urns with ashes, some stone coffins, in which the bodies have been deposited; and some, naked skeletons* (ibid, 94-5).

It would be fair to say that antiquarian enquiry stagnated in Orkney during the early nineteenth century; there appears to have been little local interest and Orkney seems to have been overlooked by antiquarians from elsewhere at this period, probably due to the logistical difficulties of visiting the islands. Most distinguished visitors were passing through Orkney on their way to somewhere else or as part of a more general tour and did little more than visit major Neolithic sites e.g. Sir Walter Scott in 1814 (Scott 1822, 428 & 1839a). This period saw however the first recorded excavation of what appears to have been a large burnt mound in Sanday (Wood 1826); the published description does not however include a detailed location and all the finds have been lost.

3.4.2 Local interest stirs (briefly)

It was not until 1837, with the foundation of the Orkney Natural History Society, complete with a museum in Stromness, that a local body emerged which took any interest in archaeology. The Rev. Charles Clouston, the first President of the Society, described some of the Society's excavations:

> *Barrows or tumuli are particularly numerous in Sandwick. I believe there are more than one hundred … Eight of these, situated on the common have been opened in the last year. A minute description of each would be tedious; but a brief account … must be interesting to the antiquarian* (Clouston 1845, 55).

The excavation descriptions are indeed brief (ibid, 55-8), but it appears likely that the 'eight on the common' are the largest barrows of the Linga Fiold cemetery; four of these were subsequently found to have been subjected to previous excavation (Downes 2005, 251). Interest in excavation and archaeology more generally appears to have waned and although papers were read at Society meetings only a very small selection was published, with few on archaeological topics (e.g. Charleson 1905). Little is known about the activities of Kirkwall's Antiquarian and Natural History Society, established in 1844, also associated with a museum. It too failed to publish and was defunct by 1858 and the museum contents sold; some items, including steatite and ceramic urns from probable Bronze Age funerary sites in Sanday, were donated to the museum of the Society of Antiquaries of Scotland (Anon 1864a, 15-16; Watters et al 1995, 3).

It is unfortunate that these societies were not active, since Orkney's agricultural revolution started to gather pace around the time of their foundation (Section 4.4) and massive land-use changes were occurring throughout Orkney, with concomitant destruction of field archaeology. An active local Society could have done much to fill some of the gaps in our knowledge; this role, however, largely fell to just one man, George Petrie (Section 3.5.3).

In the mid-nineteenth century there was a *New Statistical Account of Scotland* (NSA), which had broadly similar antiquities questions to the OSA. By far the best entry is that for Lady, Sanday in the form of a letter from Dr Wood describing in detail the relict prehistoric landscapes of barrows and settlement mounds at Tofts Ness (Section 5.5.1) and Els Ness (Section 5.5.2), otherwise largely unrecorded (Traill 1845, 134-42). Wood's pre-1841 letter is also notable for the first use of the Orkney dialect term, now in common archaeological usage, cramp[32], in his description of what is clearly an

[32] Fused glassy material created during the cremation process from a combination of elements used to fuel the pyre, and, whether deliberately or accidentally, often found fused to cremated bone (e.g. Callander 1936; Photos-Jones et al 2007). The word 'cramp' appears to derive from the dialect word *kram* or *krama* meaning a collection or heap of small objects,

extensive Bronze Age funerary landscape at Els Ness:

> *A number of the smaller heaps within the walls are formed of what the country people call cramp …* [it] *resembles the refuse from a glass-blowers furnace. It is of a reddish colour, and contains portions of a coarse glass, stones, and sometimes fragments of earthen vessels. The sea-weed, with which the shores abound, must have furnished the fuel. This by long heat would be reduced to kelp, and, by a continuance of the heat, and the admixture of sand and stones, would, in process of time, produce the cramp* (Traill 1845, 137).

The majority of the other respondents in the NSA answered antiquarian inquiries more briefly; but even the most minimalist of answers can hold useful information: for example, the NSA provides the only record of a probable souterrain at the Manse, South Ronaldsay (Gerard 1845, 193; ND49SE 13).

3.5 Archaeology emerges from chaos

The mid-nineteenth century saw attempts in the rest of Britain to place all the diggings that were taking place into a wider context and to inform the educated enquirer of nationwide developments in the now respectable discipline of archaeology (e.g. Akerman 1847, v). The Three Age system was published in English in 1849, revolutionising the emerging discipline of archaeology (Rowley-Conwy 2004; Worsaae 1849). The publication of Wilson's (1851) *Archaeology and Prehistoric Annals of Scotland* saw the first account of Orkney's archaeology set within a national context, including descriptions of Orkney's numerous Bronze Age barrows (e.g. ibid, 44-55). This period saw Orkney join the mainstream of archaeological enquiry, with visiting and resident archaeologists. Competence varied, but there is at least a sense of attempting to impose some kind of order, and increasingly a trend to publish what was found.

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such as small clods of earth, pieces of peat etc, with the phrase '*lyin' in a krama*' meaning crumbled or crushed (Jakobsen 1985, 459-60).

3.5.1 Lieutenant F. W. L. Thomas

The first detailed publication of Orkney's archaeological sites comes from Lt Thomas, the officer commanding HM Survey Vessel Woodlark, whose survey of the Brodgar peninsula records a number of sites, particularly barrows, since destroyed or much reduced by agricultural improvement (Thomas 1852). Thomas was the first to attempt a typology of Orkney's barrows, based on the classification in Akerman[33] (1847), and also excavated alongside other notables e.g. George Petrie, James Farrer and the Rev. Charles Clouston, using the officers and crew of his ship as his workforce. Thomas provided in many cases the only report of these excavations, and these are detailed for their time; including Bronze Age features such as barrows at Black Knowe, Rendall and Skae Frue, Sandwick (Thomas 1852, 90-5, 107-10 & 127-34). We also have Thomas to thank for the only illustration of one of Clouston's barrow excavations, and the only record of a series of sub-peat dykes at Hoxa, South Ronaldsay (ibid, 92-4, plate XV & 122-7; Section 8.4). He also records instances of the destruction of archaeological sites during the course of agricultural improvements, including some that are clearly Bronze Age barrows, and his language again emphasises the ubiquity of such sites:

> *… a man was actively engaged in opening tumuli, with no antiquarian interest, but with the view of employing the stones thus found to the erection of a farm-stedding [sic]. He had, as usual, turned up the coffins made of slabs of stone, with their accompaniment of burnt bones* (ibid, 122).

3.5.2 James Farrer MP

Sadly, although Thomas did maintain his interests in archaeology (Thomas 1866, 1868 & 1890), it was elsewhere, and Orkney was left to suffer the depredations of James Farrer MP, 'a notorious and sadly unmethodical antiquary' (Childe 1931a, 4). Farrer spent most of his summer recesses in Orkney, and 'excavated a considerable number of the Tumuli which abound

[33] He does not appear to have seen a copy of Colt Hoare's (1812, 19-23) more detailed work, but Akerman uses a similar if abbreviated classification system.

in the islands' (Petrie 1861, 353). Farrer's enthusiasm for excavation was not matched by a zeal for publication and his reports are minimalist at best (e.g. Farrer 1857a, b & c & 1861): the fullest accounts of his work are by others (e.g. Petrie 1856 & 1861). There remain an unknown number of sites that were 'Farrered' without record other than a passing mention by the Ordnance Survey (Section 3.6.2) some years later e.g. the extensive barrow cemetery at Ravie Hill, Birsay (ONB 1880, OS1/23/1/98, 101 & 102).

3.5.3 George Petrie

That we have any details about Farrer's excavations (e.g. that at Round Howe, Tankerness: Section 7.12.3) is largely due to the efforts of George Petrie (1818 – 1875). The quality of his work on chambered tombs – both recording Farrer's many excavations and conducting his own (e.g. Petrie 1856, 1861, 1863 & 1868a) – is detailed enough to enable modern reinterpretation (Davidson & Henshall 1989, 6) and this assessment holds true for his reports on Bronze Age sites, for example his detailed plans of the cist burials and steatite urns discovered at Oram's Fancy in Stronsay (Petrie 1870; Figures 3.3 and 3.4). A large collection of Petrie's unpublished work survives in Scotland's National Record of the Historic Environment, consisting of notebooks, drawings and correspondence along with Sir Henry Dryden's illustrations (from Petrie's sketches) of the excavation of many other Orkney sites; publication was abandoned on his death in 1875 (Hedges 1987c, 130-47; MacKie 2002, 242).

Petrie developed the first classification scheme for Orkney's monuments, sub-dividing the generic 'Pict's Houses' into three subtypes: Brochs; Barrows or Grave Mounds; and Pict's Houses, which he now realised were chambered tombs (Petrie 1861, 358 & 1927, 20). He still used the term 'chambered barrow' fairly interchangeably for chambered tomb, and 'tumuli' remains as a generic term for any substantial mound, which had to be opened to confirm its identity.

In summary Petrie's terminology (as used by him post 1859/1861) relied on

the following definitions:

- A *Tumulus* is a generic mound, which when opened may be either:
    - A *Pict's House,* which is a
        - *Chambered tomb/ chambered barrow*
    - A *Broch*
    - A *Barrow,* in the modern sense of a Bronze Age burial place

Petrie did not attempt to classify his settlement sites, being content with the generic descriptor *'ancient dwellings'* (e.g. Petrie 1868a).

Apart from his classification system, Petrie was also acutely aware that destruction on an epic scale was occurring, which only he appears to have cared about (Section 4.4.6). Petrie was struggling to record the evidence that was emerging in isolation, since apart from his collaborations with Farrer he had few contemporaries who engaged in debate on the islands' archaeology. Petrie's classification system was neither widely known nor adopted in Orkney at the time, and, having established to his own satisfaction that there were distinct types of sites, not least for the Bronze Age, his frustration at having to rely on second-hand reports by informants who still used 'Pict's House' indiscriminately is apparent (e.g. Petrie 1866c, 216).

3.5.4 The late nineteenth century

Excavations continued, with a number of interested lairds investigating sites on their lands; although most sites saw some publication, excavation methods had not greatly improved; emphasis was still on interesting mounds being selected and rapidly cleared to expose the walling and for the retrieval of relics, with a concentration on chambered tombs (e.g. Clouston 1885) and brochs (e.g. Watt 1882). Bronze Age excavation during this period was restricted to the recovery of chance cists and urns disturbed during ploughing etc. (e.g. Traill 1876; Watt 1878 & 1885), but these are few compared to the

scale of agricultural improvements at the time (Section 4.4). This period was however notable for the first recorded finds of Bronze Age metalwork in Orkney, again chance discoveries during peat cutting and agricultural improvement (Cursiter 1887; Section 6.3.3). There was certainly no work in Orkney at this period comparable with some of the great excavations further south (e.g. Pitt Rivers 1887, 1888, 1892 & 1898). The most important development in the late nineteenth century was not primarily archaeological; the Ordnance Survey arrived to make the first accurate maps of the County.

3.6 Mapping the county

Early maps of Orkney dating from the sixteenth to eighteenth centuries are, as might be expected, vague and inaccurate, and were largely attempts at navigational charts for seafarers (e.g. Adair 1682; de Nicolay 1583; Moll 1745). However this changed in 1750 with the publication of Mackenzie's hydrographic charts. Although again for navigation, they were not only reasonably accurate, but also included 'distant views of the land' including the township boundaries, known as hill-dykes[34] (Section 4.2.2). Mackenzie's (1750) charts thus provide the only County wide record of the pre-improvement landscape, showing township boundaries relatively unchanged from the preceding four centuries (Thomson 1996, xxii), but shortly largely to be swept away by a tsunami of agricultural improvement. They also provide a record of some sections of treb dyke, elements of which may have Bronze Age origins, considered below in Section 8.5.

3.6.1 The Ordnance Survey

1882 saw the publication of the 1st edition County Series six inch (1:10,560) and 25 inch (1:2,500) Ordnance Survey maps[35]. These maps included

[34] Large houses, churches and hill-dykes etc. were included as they could be landmarks when seen from the sea (Thomson 1996, xxii): Mackenzie was working in the days of sail when masthead observation would allow visibility further inland than is immediately obvious today.

[35] The survey work for these maps took place between 1878 and 1880.

antiquities[36], and were annotated with descriptions such as 'Pict's House', 'Tumuli' and 'Cists found'. Helpful though these are (in some case providing the only record of a find or of a subsequently destroyed site), they also had serious consequences for future archaeological survey by introducing biases that have been perpetuated. To fully understand this, the production processes of these maps have to be appreciated.

3.6.2 The Original Name Books

The military engineers who conducted the surveys were not required to record place-names; these were added later by teams of sappers[37], sent into the field with tracings of the original surveys and proforma record sheets. In addition to the place-names they were instructed to garner information about local antiquities: these record sheets were subsequently collated and bound for the Ordnance Survey archives as the Original Name Books[38] (Lamb and Turner 1991, 171-2). To this end they were required to consult three local 'authorities', who were often the minister, the laird and the schoolmaster (the three people who were least likely to have grown up in the district). The quality of the results depended on these informants and on the enthusiasm of the individual sapper: some were excellent, others much less so (ibid). A series of biases was thus introduced:

- The inclusion of archaeologically significant mounds relied on the ability of the OS surveyors to distinguish between natural and artificial hummocks.

- The compilers of the Name Books were required to add names for sites that had already been surveyed, not to add new sites to the maps.

- Any additional information on antiquities relied on the enthusiasm of

[36] At the instigation of the Society of Antiquaries of Scotland (Davidson 1986).

[37] Ordinary soldiers in the Royal Engineers.

[38] The full title was the Original Object Name Books, but they are also referred to as the Object Name Books, or simply as the Name Books. The English Name Books were destroyed in an air raid in WWII; the Scottish Name Books had already been transferred to Edinburgh (Lamb & Turner 1991, 171-2).

the individual sapper.

- The three authorities consulted may not have been local to the area and so may have been unaware of historic finds or the significance of a particular site.

Such factors probably explain the fate of Big How(e), close to the Stones of Stenness. In 1848 this was planned and recorded by Thomas (1852, 102 & plate XII) as 'a very large tumulus' around 38m in diameter, but it was not included on the 1st edition OS map. The initial omission was subsequently compounded by the lack of local 'authorities', since the sources for this area are the Rev. Mr Reid, Finstown, and J. Bruce Esq., Kirkwall[39] (ONB 1880, OS1/23/21/ 20). The only mention of its subsequent fate (and its recognition as a broch) comes from a note in 1923:

> *A prominent mound … On levelling it down about 20 years ago it was found to be a broch* (Cursiter 1923, 52).

That a site as substantial as Big Howe, previously surveyed and published, could be omitted from the 1st edition OS maps raises questions about the non-recognition of other, lesser sites. Certainly some conspicuous Bronze Age sites on the Brodgar peninsula went unrecorded by the Ordnance Survey although they too had been both planned and described in detail by Thomas (1852): neither the 'two obscure contiguous circles' (ibid, 98 & plate XII) i.e. the Wasbister Bronze Age double house (Card 2003; Section 7.4) nor the Bookan disc barrow (Thomas 1852, 97 & plate XII) were included in the 1st and 2nd edition OS maps. Similarly burnt mounds (Chapter 9) fared poorly with only 63 recorded at 47 sites (RCAMS 1946, vol. II) throughout Orkney, compared to the 297 burnt mounds at 252 sites now known (Appendix 8).

The Name Books are nevertheless a valuable but underused resource, largely due to the difficulties of accessing them: although now available online, they were until recently only available in person in Edinburgh. It is beyond the

[39] The Stenness entries are generally poor e.g. the Stones of Stenness are merely: 'Standing Stones, west of church. Applies to three ancient standing stones one of which is fallen. They are situated ¼ of a mile W. of the parish church' (ONB 1880, OS1/23/21/ 20).

scope of this thesis to undertake a full appraisal and comparison of all the sites therein described[40] but the ONBs for Orkney contain much useful information, including the otherwise unrecorded excavation/destruction of a number of brochs e.g. the Knowe of Skogar, Birsay (ONB 1880, OS1/23/1/153; HY22SE39) and the Knowe of Redland, Stromness (ONB 1880, OS1/23/22/28; HY21SE32). That such substantial sites as brochs could be so completely destroyed does not bode well for the survival of smaller, less obvious sites such as Bronze Age settlements, many of which comprise comparatively modestly sized individual houses (e.g. the Links of Noltland: Moore & Wilson 2011a; Section 7.6.3). Brochs may also be multi-period sites with Bronze Age components (Section 7.15), which can only be recognised following well-recorded excavation (e.g. Lowe 1998); the ONB 1880 entries can record a broch's existence but this provides merely another point on a distribution map.

Although there were problems with the Ordnance Survey mapping, it was nonetheless a major step forward; as the respective County Archaeologists for Orkney and Shetland noted:

> *The overall result was a remarkable achievement; the subsequent problems arose when the world of academic archaeology began to treat the material as definitive* (Lamb & Turner 1991, 171).

3.7 The early twentieth century

The new century did not immediately see any particular improvement in excavation standards, the emphasis remained on site clearance of interesting mounds (e.g. Charleson 1902, 1903 & 1904). The big advance in this period came with the first substantive survey of Orkney's archaeology, the work of the Royal Commission on the Ancient Monuments of Scotland.

[40] There are 8,746 entries in the Orkney Name Books, nearly a quarter of a million in all the Scottish Name Books.

3.7.1 Royal Commission Inventory of Orkney

In 1928 the Royal Commission started work on the Orkney and Shetland *Inventory*, the first systematic attempt to list and describe all 'Ancient and Historical Monuments and Constructions … from the earliest times to the year 1707' (RCAMS 1946, vol I, ix). This sounds promising but the brief was much more restrictive: to visit all the antiquity sites marked on the 6-inch OS map, but crucially not to look for new sites (Lamb & Turner 1991, 172). This was a major missed opportunity since it perpetuated both the deficiencies and biases introduced by the original OS mapping system and some of the blanks areas on the map unfilled in 1882 survived.

These limitations were compounded by a lack of resources, since despite the massive scale of the task, the majority of the Orkney survey was conducted by a single Investigator, John M. Corrie. He spent three seasons in Orkney from 1928 to 1930, cycling around the County in all weathers, with his maps rolled up in a tube attached to his bicycle frame (ibid; Reynolds 1984, 99-101). Corrie had some assistance in the form of Royal Commission architects G. Watson and C. S. T. Calder; after Corrie's health started to fail they completed the Orkney survey (ibid).

Corrie went beyond his brief wherever possible, investigating 'blank' areas on his own initiative, speaking to local enthusiasts, noting discoveries that were taking place at the time and then excavating on his own account (Corrie 1929 & 1931; ibid). For example the 63 burnt mounds at 47 sites recorded by the OS (Section 3.6.2) were increased to 179 burnt mounds at 140 sites (RCAMS 1946, vol. II). It seems that he would have liked to do much more; reading his notebook entries[41] he comes across as an active and enthusiastic archaeologist. Heroic though Corrie's survey undoubtedly was, the limitations imposed by the tight timescale and lack of resources meant that there remained gaps in the coverage.

[41] Dr. Raymond Lamb, when County Archaeologist, photocopied Corrie's notebooks for the Orkney SMR: the originals are in the RCAHMS archive in Edinburgh.

Substantial sites such as brochs and chambered tombs were well-recorded in the *Inventory* (Table 3.1) as were Bronze Age barrows, reflecting both their visibility during the survey for the 1st edition 1882 OS maps and the numbers of such sites already known from early excavations (Sections 3.4.1 & 3.4.2).

Table 3.1 A selection of sites recorded by the survey for the Orkney Inventory (RCAMS 1946) versus those recorded now. Source: RCAMS 1946 and Canmore; see Appendices 7, 8, 10 and 11 and Figure 7.2.

Site type	RCAMS 1946	Current total	% recorded by RCAMS 1946
Sites with burnt mounds[42]	140	252	56%
Individual burnt mounds	179	297	60%
Sites with barrows	162	246	66%
Individual barrows	548	728	75%
Bronze Age settlements	5	28	18%
Chambered tombs	66	89	74%
Brochs	124	134	90%

Bronze Age settlements[43] fared badly, which is partly accounted for by the lack of surface traces at eleven of the unrecorded sites, although the remaining twelve sites did have surface traces, and could theoretically have been recorded by the RCAMS Investigator (Table 3.2). The issues here are twofold: the limited resources and scope of the *Inventory* survey and the lack of recognition of site types. Seven of the 12 unrecorded Bronze Age settlements in Table 3.2 are double houses (see Section 7.4) a distinctive Orcadian Bronze Age house type (e.g. Buteux 1997c; Downes & Lamb 2000a) but one that was unknown at the time of the *Inventory*; similarly three oval houses went unrecorded, a type that was only recognised following Calder's (1956) work in Shetland[44]. The double house on Linga Holm was however marked as a tumuli on the 1st edition OS map of 1882 and included as a

[42] 'Sites with' for both burnt mounds and barrows indicates that the site was recorded under one reference in RCAMS 1946; more than one individual burnt mound or barrow may be recorded at a particular site. Burnt mounds are discussed in Chapter 9.

[43] Discussed in Chapter 7; see Appendix 12 for details and distribution maps.

[44] In Shetland Calder's (1956) survey identified fifty-four oval house sites of which only five featured in the Shetland *Inventory* (RCAMS 1946, vol. III) as cairns or indeterminate sites.

mound in the *Inventory* (RCAMS 1946, vol. II, 335, no. 993); whilst the double house at Bookan Wasbister (unrecorded by the OS: Section 3.6.2) was included as two probable burial cairns (ibid, 263, no. 707).

Table 3.2 The seventeen probable/possible Bronze Age settlement sites that are likely to have been identifiable from surface indications at the time of the survey for the Inventory (RCAMS 1946), indicating if they were recorded or not (See Figure 7.2 for site locations).

Site Name	Surface Indications	Recorded	Reference
Taing of Beeman	Double House	No[45]	Lamb 1987, 24, no. 109
Braebister	Double House	No	Lee 2012
Hesti Geo	Double House	No	Lamb 1989, 19,no. 53
Cantick Head	Double House	No	Lamb 1989, 19, no. 52
Holm of Faray	Double House	No	Lamb 1984, 21, no.86
Shelly Knowe	Double House	No	Dockrill, Gater et al 2007
Auskerry	Double House	No	Lamb 1984, 34, no.192
Rotten Loch	Oval house	No	Lamb 1989, 14, no.17
Kraa-Tooies	Oval house	No	Downes 1998c
Linga Holm	Oval house	No	Lamb 1984, 34, no. 212
Tofts Ness	Mound	No	Dockrill, Bond et al 2007
Peerie Hill	Roundhouse	No	Moore 2013, 150-5
Bookan Wasbister	Double House	Yes[46]	Card 2003 & 2005a, 61
St Boniface Church	Eroding mound	Yes	Lowe 1998
Linga Holm	Double House	Yes[47]	Lamb 1984, 34, no. 215
Round Howe	Known from report	Yes	Murray 2003
Berstness	Many mounds	Yes[48]	Moore & Wilson 2008a & 2009a

The limitations of the *Inventory* survey was compounded by heavy-handed editing for publication after Corrie's death in 1938, which saw many of his descriptions shortened, notably those of the burnt mounds, which Corrie had recorded in detail, but which were reduced to mere lists of locations (Lamb & Turner 1991, 172), whilst one pertinent monument category – treb dykes

[45] There are several other mounds in this area, one of which was recorded (RCAMS 1946, vol. II, 245, no. 635) but the double house was not.

[46] Recorded as two probable burial cairns (RCAMS 1946, Vol. II, 263, no.707).

[47] Recorded as a mound (RCAMS 1946, vol. II, 335, no. 993).

[48] A number of mounds were recorded in this area (RCAMS 1946, vol. II, 357, nos. 1049 & 1050): classification as to type and period has only been possible on excavation (e.g. Moore & Wilson 2008a & 2009a).

(Section 8.5) – were cut completely from the published version (Reynolds 1984, 102).

Corrie's use of local informants added depth to some of his descriptions; but limitations were caused by the passage of time. The sappers who compiled the Name Books in 1880 had spoken to the farmers who had made the initial discoveries or destroyed the mounds reported during 'improvements', or at least to their sons. Corrie half a century later was a further generation down the line, and information had been lost in the meantime. This is illustrated by the Name Book description of the 1866 excavation of the Knowe of Redland (Section 3.6.2), where information had previously been provided by three local farmers; by the time of Corrie's visit in 1928 (RCAMS 1946, vol. II, 327, no. 942) they were all dead.

3.7.2 The Orkney Antiquarian Society

With the formation of the Orkney Antiquarian Society in 1922 Orkney for the first time theoretically at least had a body concerned with the antiquities of the whole County, although the majority of papers in the Society's *Proceedings* relate to historical rather than archaeological research. There was also a considerable location bias in the published reports, in favour of the Mainland parishes (Figure 3.5) that were within easy reach of the few Society members who were interested in archaeology, which consequently led to uneven recording; only one primary report came from any of the other islands (Cursiter 1930). A number of Bronze Age cist burials and urns disturbed during ploughing were however recorded e.g. at Blows, Deerness (Marwick 1929a & c; Figure 3.6); Backakelday, Holm (Marwick 1928a; Figure 3.7) Lochside, Stenness (Greig 1931; Section 4.5.2) and Hundatown, Harray (Kirkness 1927), together with the peat-cutting find of a plate from a jet necklace (Kirkness 1935).

Some of these finds reached a wider audience, with publication in the *Proceedings of the Society of Antiquaries of Scotland* in addition to the

Society's own *Proceedings* e.g. another chance Bronze Age cist find at Castle, Rendall (Kirkness 1925a & b).

Marwick (1923a, 1924b, 1925a & 1927b) produced a series of papers on the antiquities of the North Isles, including much locally obtained information; whilst Fraser (1923, 1924, 1925, 1926, 1927, 1928 & 1929) did the same for some of the Mainland parishes. There are gaps in the coverage here also; Fraser, a native of Harray, examined only the West Mainland parishes that share a boundary with Harray; whilst Marwick's coverage of the North Isles excluded Eday, Westray and Shapinsay. Few members undertook active fieldwork but Robert Rendall for example conducted field walking over several years, collecting flints and pottery around Wideford Hill (Rendall 1931 & 1934a); a Neolithic site was subsequently located using his records (Richards & Jones, A. M. 2016, 17-18). The Royal Commission were working in Orkney at the same time, and members of the Society were consulted by Corrie in his search for local information (RCAMS 1946, vol I, xv). The Society was short-lived however, and was formally wound up in 1941.

3.7.3 H.M. Ministry of Public Buildings and Works

The inter-war years saw major archaeological sites being taken into Guardianship by the Commissioners of H. M. Works Department. This was a somewhat mixed blessing, since their prime aim was to clear and conserve sites for public display. Some sites fared better than others: Skara Brae for example had the benefit of excavation under archaeological supervision followed by prompt publication (Childe 1931a). In marked contrast the Brough of Birsay and the Broch of Gurness were both cleared and conserved for public display with little or no formal recording of the process (Hedges 1987b, 1-14; Hunter 1986, 17-18).

Other major excavation works around this period included prehistoric sites in Rousay, where the laird, Walter Grant, was an enthusiastic excavator who collaborated both with J. G. Callander, Director of the National Museum of Antiquities of Scotland e.g. at Midhowe (Callander & Grant 1934a & b), and

with V. G. Childe at the Neolithic settlement of Rinyo (Childe & Grant 1939 & 1947). Grant's excavations also included some of the many Bronze Age barrows on his estate (e.g. Grant 1933a & 1937), chance cist finds elsewhere in Orkney (e.g. Grant 1933b) and an unpublished burnt mound (Reynolds & Ritchie 1985; Figure 3.8).

Other major excavations of the period were Calder's work in Eday and the Calf of Eday, where, with the co-operation of the local laird, Major Harry Hebden, and the support of the Society of Antiquaries of Scotland, he excavated four chambered tombs and several other mounds (Calder 1937, 1938 & 1939).

The results in this period were however uneven; major sites were well-excavated for the time and promptly published; simultaneously sites were cleared for public display without record. There remained no established mechanism for recording or excavating sites that were being destroyed in the course of agricultural work, beyond the serendipitous efforts of private individuals (e.g. Craw 1931; Grant 1939b). The Neolithic and Iron Age sites conserved for public display during this period remain iconic, but none of the major excavated sites were Bronze Age, beginning the process of the overshadowing of the Orcadian Bronze Age by the more illustrious preceding and succeeding periods.

3.8 The post Second World War era

The Second World War had a substantial effect, as archaeological excavations were halted, and a number of sites demolished without record to make way for major airfields and military camps (see Section 4.5.3). The OS Archaeology Division expanded after the war and, for the revision of the OS maps, began a programme of resurveying all known antiquities, including recording sites from aerial photographs, research and field reconnaissance in advance of the survey. A Scottish section based in Edinburgh was added in 1958, which worked closely with the Royal Commission (Phillips 1980). The surveyors were in Orkney in the 1960s, however their brief was only to

resurvey sites that had already been included in the 1st edition maps, or had come to light since then, not to actively look for new sites; although extra sites that came to their notice as part of this process were included (Lamb & Turner 1991, 173). Thus the biases that characterised the original survey for the 1882 1st edition maps (Section 3.6.2) were once again reinforced rather than weakened.

The 1960s saw the beginning of what was to become a new trend in Orkney, the (largely university led) research excavation. The first of these projects were the excavations at Skaill, Deerness between 1963 and 1981; unfortunately after the excavator's death it was found that the surviving site records were minimal (Buteux 1997a). After this shaky start things improved, with major excavations from the 1970s onwards (e.g. Dockrill, Bond et al 2007; Hunter et al 2007a; Renfrew 1979; Richards 2005a).

The establishment of the Tankerness House (now the Orkney) Museum in 1968 meant that Orkney finally had a repository for all these newly excavated finds; although there was still no mechanism for dealing with chance discoveries. An ad hoc group of local enthusiasts attended chance cist finds and removed the contents; some of which were later published in summary (Hedges 1980). Archaeology in Orkney took another major step forward in 1978 with the appointment of the first County Archaeologist and the establishment of the Orkney SMR, and for the first time there was a locally-based authority to whom archaeological discoveries could be reported.

3.8.1 A revised Orkney Inventory?

There has never been a complete formal update to the original 1920s – 30s survey work of the Royal Commission (RCAMS 1946; Section 3.7.1), rather there has been a piecemeal approach. Some of the smaller islands were surveyed by a team from the University of Bradford (e.g. Hunter et al 1982 & 1984; Hunter & Dockrill 1982), whilst the new County Archaeologist initiated a programme of detailed survey work to update the newly established Orkney SMR, resulting in the publication of six new area surveys in the ASMS series

(Lamb 1980b, 1982, 1983b, 1984, 1987 & 1989). These surveys included the three most completely agriculturally improved landscapes in Orkney (Table 4.3): Shapinsay (96.5% improved), Sanday (94% improved) and the East Mainland (93.5% improved). Despite this high level of improvement and concomitant destruction of sites (discussed in Chapter 4), in all of these areas previously unrecorded prehistoric sites were discovered: 16 in Shapinsay (Lamb 1987); 30 in the East Mainland parishes of St Andrews & Deerness (ibid; Steedman 1986); and most remarkably 63 in Sanday (Lamb 1980b) plus an entire relict landscape of over 300 mounds at Tofts Ness, including burnt mounds and Bronze Age settlement sites (Section 5.5.1). Eight Bronze Age double and oval houses (Chapter 7) were identified for the first time as a result of the ASMS surveys (e.g. Lamb 1982 & 1989; Appendix 12, Table A12.2); but the major gap in these later surveys is that there was no coverage of the majority of the Mainland, apart from St Andrews and Deerness, or the islands of Flotta, Burray and South Ronaldsay.

Archaeological survey in Orkney since this date has continued to be a random affair, dependant on the source of the project funding rather than any overall strategy. These surveys have ranged from targeting coastal erosion zones (e.g. Moore & Wilson 1997a & 1999a; Section 4.7); identifying sites as a tourism resource (e.g. Moore & Wilson 2004); as part of a land management scheme (e.g. Card 1998 & 1999a); in advance of commercial development (e.g. Card & Gee 2014; Card & Reay 2014; Lynn 2012a) or, increasingly, community archaeology and undergraduate training projects (e.g. Lee 2012; Lee et al 2014). There has also, since the granting of World Heritage Site status to the Heart of Neolithic Orkney in 1999, been a series of geophysical surveys of the sites and their inner buffer zones, which has added to the list of known (but as yet unexcavated) sites (e.g. OCGU 2008 & 2009; Ovenden et al 2009).

Site-specific surveys have also taken place, most notably for the Bronze Age the Orkney Barrows Project (Downes 1997a), intended to inform the future management strategy of such sites; the emphasis here was however on re-surveying known sites rather than seeking out those previously unrecorded (Downes 2005, 47).

That there is much still to be discovered is clear from the new Bronze Age sites recorded by a few examples of small-scale walkover surveys e.g. three burnt mounds at Newark Bay, South Ronaldsay (Lawrence 2008); a burnt mound and several possible prehistoric mounds at Nether Mousland, Stromness (Lee et al 2014); and a double house and three burnt mounds at Braebuster, Hoy (Lee 2012). All of these are in areas that are 'blanks' on the 1st edition OS maps (Section 3.6.2), and so have effectively been ignored by all subsequent surveys.

3.9 Discussion: research implications

In summary, the main themes specific to the development of Orkney's archaeological record are:

Pre-sixteenth century

- Passing unreliable mentions in classical sources, Norse Sagas and Norwegian histories

Sixteenth century:

- Camden's *Britannia:* the first brief account of Orkney.
- Jo Ben's *Descriptio:* the first to mention archaeological sites.

Late seventeenth century:

- Wallace's *Description:* first to describe Bronze Age burials amongst other sites.

Eighteenth century:

- Mackenzie's 1750 charts: the first fairly accurate map of the County importantly showing land divisions.
- The first recorded 'formal' excavation of a barrow cemetery.

- George Low's accounts of antiquities and first publication of an Orkney site in a learned journal.
- The first limited antiquity survey in the Old Statistical Account.

Early-mid nineteenth century:

- Barry's *History*: general mentions of numerous Bronze Age barrows but without locational details.
- Limited outside interest apart from occasional tours.
- Local Natural History Societies formed but interest in archaeology appears short lived; no real attempt to develop excavation technique or classification.
- The New Statistical Account provides some reports of excavation unrecorded elsewhere.

Mid nineteenth century onwards:

- Lt Thomas completes the first detailed survey and description of Orkney's antiquities and attempts a barrow typology.
- Many more excavations but limited publication.
- Emphasis on clearing sites and recovering relics with little finesse.
- Petrie establishes his classification system.
- Major step forward with the detailed mapping of the Ordnance Survey, the first antiquity survey to attempt total coverage.

Early-mid twentieth century

- Local enthusiasm briefly grows with the short-lived Orkney Antiquarian Society.

- Chance finds recorded on an ad hoc basis.
- Work of the Royal Commission for the *Inventory*.
- Ministry of Works activities preparing sites for display, but no Bronze Age sites were included.
- The first professionally supervised excavations.
- Increasing publication and specialist reports.

Post Second World War

- Establishment of County Museum.
- Research excavations.
- Ad hoc reporting gives way to a County Archaeologist.
- Orkney SMR established.
- Some updating of the RCAMS 1946 *Inventory* but not universally.
- Selective field surveys.

The somewhat chequered history of excavation and survey in Orkney has to be borne in mind when considering site distributions. Although later surveys filled many gaps (Section 3.8), the fact remains that around 50% of Orkney, comprising the entire West Mainland, the East Mainland parish of Holm, and the islands of Flotta, Burray and South Ronaldsay (Figure 3.5), has not been archaeologically surveyed[49] since the compilation of the Orkney *Inventory* (RCAMS 1946), the limitations of which (Section 3.7.1) in turn perpetuated many of the omissions of the original surveys for the 1st edition six-inch OS maps of 1882 (Section 3.6). All of these surveys took place against a

[49] Rapid coastal zone assessments have been carried out in some of these areas, but these were limited to a 50 – 100m strip adjacent to the coast edge including the foreshore (Moore & Wilson 1997a & 1998).

background of agricultural improvement and unrecorded destruction, the implications and scale of which are discussed in Chapter 4.

Biases can be created by a number of factors apart from survey inconsistencies, including unrecorded destruction of sites and the varying research aims of many of the surveys conducted. Other factors may also come into play such as the differential destruction of sites in the areas of better agricultural land, or the deliberate destruction of a particular type of site for building material (Section 4.4.6). Until the appointment of a County Archaeologist in 1978, there was no local body which consistently recorded the destruction of Orkney's archaeology, and such records as do exist were gathered on an idiosyncratic basis. There was only periodically and for short lengths of time a local society that took an interest in such matters. It is only when comparing the scanty records of chance finds (as opposed to deliberate mound investigations) to, for example, Petrie's accounts of sites being destroyed without record (Section 4.9) that it becomes clear that a significant number of sites have indeed been lost. These factors will be discussed in Chapter 4.

Further biases have been introduced by the selection of sites for excavation during the nineteenth century. Mound opening was the order of the day, and the bigger the better:

> *Mr Farrer expressed a desire to open all the larger tumuli in the vicinity of the circle of standing stones … Mr. Balfour … suggested that a large tumulus … by the name of Maes-how … should be explored* (Petrie 1861, 353).

Since the biggest and most obvious mounds are brochs and chambered tombs, these are the sites that were most often targeted. From a modern standpoint, limited though some of the early records are, tombs and brochs have the advantage of being easily recognisable. For example, even though Barry (Section 3.4.1) did not realise at Quanterness that he was excavating a chambered tomb, his plan (Figure 3.9) makes its identity instantly obvious to modern eyes. Similarly brochs were recognised by antiquarians, and the finds were 'interesting' enough to be illustrated, or donated to the Society of

Antiquaries. Building on such antiquarian excavations, brochs and tombs have continued to be a subject of intense study, not just in Orkney but throughout Scotland; aided by the fact that it is often possible to identify these sites from surface appearance even when unexcavated (e.g. Davidson & Henshall 1989; Henshall 1963 & 1972; MacKie 2002 & 2007). Many prehistoric settlement sites however present as amorphous mounds with some structural stonework and could belong any prehistoric period (e.g. Lamb 1984, 33, nos. 188, 189 & 190; Section 5.4).

What must be strongly suspected throughout Orkney is that presence/absence of a site in a particular area has much more to do with differential survival, preferential excavation and recognition and the presence/absence of a detailed recent survey, rather than a true distribution pattern. It is impossible to state categorically that the current distribution pattern is a genuine reflection of the original distribution. It certainly cannot automatically be assumed that the site distributions on Canmore are a true reflection of the original occurrence of any site. The question of differential survival and its effect on distribution maps has been highlighted elsewhere (e.g. Halliday 2011; Stevenson 1975), however the issue has not been satisfactorily examined in Orkney. This will be addressed in Chapters 4 and 5, by an investigation of the scale of the unrecorded destruction of the archaeological record and an examination of areas with the potential for archaeological survival.

Chapter 4: Destruction without record

4.1 Introduction

Our perceptions of Orkney's archaeological remains are skewed by an implicit assumption that present distribution is a reasonably accurate reflection of past distribution. Faced with the excellent preservation typical of Orcadian sites, which can be a little overwhelming to archaeologists based in less favoured areas of the UK, it is an assumption that is too easily made. Destruction from coastal erosion is an obvious threat (e.g. Gibson 2012; Section 4.7). The issue of the deliberate damage done to the Orcadian landscape by man, particularly in the last 200 years, is however rarely considered in the archaeological literature. Some notable exceptions discuss survival issues specifically relevant to Orkney's Neolithic tombs (e.g. Davidson & Henshall 1989, 14-15; Fraser 1983, 235-6; Renfrew 1973, 132-7) but usually the survival question is given little consideration, ignored, or misunderstood, perhaps due to ignorance of the complex mechanisms involved (e.g. Hedges 1984a, 11-14; Land Use Consultants 1998, 67; Noble 2006, 104; Phillips 2003; Woodman 2000).

Some archaeological destruction has been caused by extraneous factors, such as Orkney's recurrent role as a major wartime base (Section 4.5.3). There have also been documented episodes of wanton destruction (Sections 4.7 & 4.8.2). Undoubtedly the major historical factor in the unrecorded destruction of Orkney's sites has been agricultural improvement. It has been noted that agricultural destruction is a major factor:

> *In the lowland zone – in effect the present day agricultural heartlands of the country – centuries of intensive farming have resulted in the reduction or obliteration of most of the upstanding archaeological monuments of the Bronze Age* (Cowie & Shepherd 2003, 151).

The implications of this observation have never been addressed in Orkney, because archaeologists are accustomed to thinking of agricultural destruction

in terms of intensive ploughing necessary for arable cultivation. The majority of farmland in Orkney is however improved pasture used for grazing livestock, or to produce silage for winter fodder. The limited arable acreage consists mainly of barley grown as a fodder crop. Although it is acknowledged that there is ongoing damage caused by ploughing to archaeological sites, particularly barrows (e.g. Downes 1997a), implicitly the image of green fields and grazing cattle gives the impression of an undisturbed landscape. There is no such thing as natural pasture in these islands at the present day. Orkney's grasslands are entirely manmade. The formation processes that the land underwent to go from unimproved heath to improved grassland are not fully appreciated by archaeologists. The stark contrast shown in Figure 4.1 between the improved and unimproved land on Wideford Hill highlights this clearly. This chapter examines in detail for the first time the historical factors that have influenced the formation of the modern Orcadian landscape. The techniques, timing and scale of agricultural improvements and their effects on archaeological survival are highlighted.

4.2 Orkney 1750 – 1830: an agricultural backwater

4.2.1 Introduction

In the rest of Scotland the first stirrings of agricultural improvement were felt soon after the Union of the Parliaments in 1707. Amongst the first Scottish improvers were MPs, who had observed English agriculture whilst travelling to Westminster and applied the techniques to their own estates (Symon 1959, 106-18). The pace of improvements gathered speed throughout the eighteenth century, with new crops introduced (notably turnips), new methods, agricultural publications and the formation of Societies of Improvers (ibid). Sir John Sinclair[50] MP campaigned successfully in 1793 for the establishment of a Board of Agriculture and became its first President (ibid, 142). He instigated a nationwide county by county agricultural survey,

[50] The same Sir John Sinclair as was responsible for the *Old Statistical Account* (OSA) (Section 3.3.1).

in which nearly everywhere in the UK provided impressive evidence of the pace of improvement (ibid).

4.2.2 Hill-dykes and commons

Orkney was an exception to this improving tendency. The 'backwardness' of Orcadian agriculture was thoroughly damned in the 1814 Board of Agriculture report, which gives us a description of an agricultural system little changed from medieval times:

> *The arable and waste lands are divided from each other by what is called here a hill-dike … Such fences are common through most of the islands, and are built of turf. They crumble down in the winter, are repaired again when the corn begins to rise, and all the proprietors, or their tenants, are compelled … to repair and keep up a part of the hill-dike, proportioned to the extent of their farms or properties … Very few inclosures have been made upon the infield or cultivated coast-side land, such frequently lying in run-rig and subject to common pasturage during the winter* (Shirreff 1814, 55-6).

Shirreff was describing the traditional Orkney system of 'townships[51]' comprised of infield arable with some better quality pasture around the steadings, separated from the common grazing by a hill-dyke[52] during the growing season. After harvest the '*grinds*' (ON gate) in the dykes would be opened and the animals allowed to forage over the infield land throughout the winter (Fenton 1978, 89; Thomson 2001, 316-7). This system had been subject to legal enforcement since the sixteenth century and had probably been in use much longer. The first written reference to a hill-dyke comes from 1519, whilst an act of 1614 specifies the fines applicable for any breach of the hill-dyke regulations (Barry 1805, 459-60; Clouston 1914, 92-4, 1919 & 1925; Leith 1927). Fortuitously these dykes were of a sufficient scale and

[51] The land within the hill-dyke was allocated by a complex system where an individual farm would have of rigs of land scattered throughout the township (known as rig and rendall or runrig), with rights to the common grazing outside the hill-dyke (see Clouston 1919).

[52] In Orkney 'hill' has two meanings: the first is the same as in common English usage, but it is also a generic term for rough uncultivated land, whatever the elevation. The expression 'taken out of the hill' means improving the land by ploughing/draining/fencing etc. Land need not be on a physical hill. The 'hill-dyke' does not therefore imply an upland location for this type of land division.

distinctive enough to feature as navigational aids in Mackenzie's (1750) charts, and these give us an invaluable picture of the pre-improvement Orkney landscape[53]. There were some areas of enclosed and improved land, but these were the exception: the hill-dykes shown on Mackenzie's (1750) chart define broadly the same township areas that appeared in the 1492 Rental (Thomson 1996, xxii). These township lands occupied prime positions and had been in cultivation for centuries, parts of them for millennia (Section 7.15). Inside the old township boundaries are therefore those areas where archaeological destruction occurred generally earliest and, since records are limited prior to the mid-late nineteenth century (Sections 3.2 – 3.4), will have gone unrecorded.

4.2.3 The implements of agriculture

The implements of agriculture in the eighteenth century had similarly been unchanged for centuries. In particular, the Orkney single-stilted plough was outdated compared to the ploughs that were being used elsewhere in the late eighteenth century. It was so light and ineffectual that it turned a furrow only three inches deep, and could be picked up and carried under the ploughman's arm (Alison 1927, 21; Liddell 1927, 76). The Orkney harrow was similarly outdated and still had wooden teeth (ibid). The situation was neatly summarised:

> *The implements used in carrying on the husbandry of Orkney are neither numerous nor of much importance* (Shirreff 1814, 52).

It might be thought that little in the way of archaeological damage could be done with such implements, illustrated in Figure 4.2 alongside the Orkney spade. In fact it was the spade that was responsible for the most damage, and that not necessarily inside the hill-dykes.

4.2.4 The scarified turf: pre-improvement destruction

It might be considered that the stability of the boundary between infield and

[53] See Table 4.3 below and associated Figures referred to therein.

outfield through time would protect surviving archaeological remains on the uncultivated common beyond the hill-dykes, but this is not the case. The commons were a valuable resource to manure the infield:

> *This practice of paring … the surface of grass and heath grounds in a state of common … has had an effect so destructive and extensive, as hardly to be believed without being seen … tracts of valuable green sward … have had their surface peeled off and carried away, leaving a space almost without soil or vegetation of any kind* (Shirreff 1814, 100-101).

This is not an aspect of pre-improvement agriculture that receives much attention. That this description is not an exaggeration is corroborated by both Sir Walter Scott during his visit to Orkney in 1814 (Scott 1839a, 275) and an almost identical account of conditions at the Ring of Brodgar nearly forty years later:

> *It must be observed that not only has the peat or turf been cut for fuel, but every layer of soil has been removed, as fast as it has formed, to serve as manure for the infield … a barren and desolate aspect … is produced by the paring of soil from the outfield, that is from all the land lying without the inclosures*[54]*, and the Ring of Brogar [sic] has had no sanctity with these barbarous depredators, as the broken and scarified turf will witness* (Thomas 1852, 103).

That this practice would have detrimental effects on archaeological sites is obvious, but quantifying these effects is harder. They would have been worse close to the townships. Shirreff (1814, 100) noted that the commons nearest the dykes were 'pillaged first'. Archaeological targets for such treatment would have included rich prehistoric midden and midden-enhanced soils associated with settlement sites (Section 7.1). Whilst we can assume that damage was done at an early date to archaeological sites we lack explicit accounts from that period. Reports from 1880 show however that this practice continued through the nineteenth century:

> ONB 1880, OS1/23/1/155 Knowe of Brenda (HY22SE 40): *A portion of this object has been removed for the purpose of top-dressing land.*

[54] Thomas uses the term inclosures for the township hill-dyke.

> ONB 1880, OS1/23/17/25 Swartland (HY22SE1): *The greatest part of it has been carried away recently for top dressing land.*

Land was still bearing the scars of the earlier use of this practice in 1874, when areas that were totally devoid of soil were brought into cultivation by the creation of new soils:

> *In some parts the surface soil had been so completely carried off … to restore which Mr. Scarth formed large compost heaps of black bog moss, mixed with quicklime, which, after being repeatedly turned over, were applied to the pared parts of the land as a thick top-dressing* (Pringle 1874, 50).

Damage could be done to barrows, and, more significantly, to their associated cremation cemeteries (Section 6.1.2). A fortuitous record of just such destruction survives, regarding the barrow at Skae Frue, Sandwick (HY21SE8):

> *Several bowl-barrows are near, and scattered about the moor are many lumps of cramp or vitrified stone, some of which are built into the hill dyke of the adjoining townland of Warbuster* (Thomas 1852, 110).

There were a number of barrows in this area, including another probable seven at Howan Wasbuster (HY21SE40). Cramp (Section 3.4.2) was recorded in 'considerable quantities' here in 1928 (RCAMS 1946, vol II, no. 711, 264-5), testifying to the significant damage to, if not complete destruction of, a large cremation cemetery during the course of turf paring activities. This cemetery may have been associated with a nearby substantial settlement site, covering an area of 5ha, detected by geophysical survey at Bookan Wasbuster (HY21SE18; GSB 2003; Robertson 2005) of which the only surviving surface traces at the present day are a Bronze Age double house[55] (Figure 4.3). Soil samples from test pits at this site proved difficult to interpret, with evidence for anthropogenic soils but these were completely unlike other known Bronze Age examples, and bore more similarity to soils identified elsewhere as coming from post-1850 agricultural intensification (Cluett 2007, 207-12).

[55] Double houses are discussed in Section 7.6

The deep anthropogenic soils expected around such a large settlement were absent; interpretation was further complicated by a ferrous object found below the anthropogenic soil horizon in one test pit (ibid). Cluett (2007, 209) concluded that the anthropogenic horizon was formed later than the Bronze Age but before 1850, on the basis that the land was not used for arable production until the 1970s. I would suggest however that the deep anthropogenic soils likely to have been associated with the Wasbister settlement had been removed to fertilise the infield of the nearby Westbuster township (Figure 4.3), in the same way as the destruction of the barrows described by Thomas (1852, 110). This paring away of the turf and soils would have the effect of 'zeroing the clock' by removing much evidence of prehistoric land management, and account for the presence of the ferrous object found sealed below the anthropogenic soil horizon by Cluett (2007, 207-12). The improvement process, from the heath shown on the 2nd edition six-inch OS map (1902) to the fenced, improved grassland of the 1960 OS map, is the likely explanation for the similarity of the anthropogenic soils at Wasbister to those of other post-1850 improved soils identified elsewhere by Cluett (2007).

4.2.5 The early improving lairds

Whilst most of Orkney continued to follow the old traditional ways, by the late eighteenth century some improving lairds bucked the general trend, but they were the exception e.g. the new owner of the island of Shapinsay in 1793:

> *Previous to his purchase, nothing was to be seen over its whole extent, but a dreary waste … Everything on this estate now happily wears a very different and more pleasing aspect … the lands are substantially inclosed, and judiciously cultivated with the English plough, many barren fields are, by cultivation, made fertile* (Barry 1927b, 358-9).

Most entries in the OSA (from which this account of Shapinsay is taken), present a picture of traditional hill-dyke and township agriculture (e.g. Malcolm 1927, 179) consistent with that described in 1814 (Section 4.2.2).

One of the first eyewitness accounts of deliberate destruction of an archaeological site for agricultural improvements was made c.1798 with regard to the demolition of the broch at the Loch of Tankerness (HY50NW3):

> *The wall is nine feet thick. Bones and shells … have been found in different apartments on the outside of the great wall. The minister, who considers modern inclosures, as more ornamental and useful in a country, rather than ancient ruins, has taken a great number of the stones of this building for inclosing his glebe* (Anon 1927, 10).

This illustrates another causative factor leading to destruction: quarrying for building materials and this is discussed in Section 4.4.6 below.

4.2.6 The kelp industry

Orkney's agriculture was backward for a reason: that reason was the kelp industry[56]. The period 1780 – 1830 was that of the great kelp boom, when significantly more money was made from the kelp industry than from cattle. Kelp employed 3,000 people, producing 2,500 – 3,000 tons annually which sold for an average of £9 a ton, at a time when a good cow sold for £2 (Thomson 1983, 13, 49 & 111). This would have been the perfect time for an Orcadian Colt Hoare to emerge – a kelp laird with antiquarian interests, his pockets filled with gold from his kelp shores, the islands abounding with interesting mounds. Sadly it was not to be; conspicuous consumption rather than academic endeavour was the order of the day. Landowners neglected their estates and spent their kelp profits on new townhouses and high living in Kirkwall:

> *Gentlemen have thus acquired from their bleak estates, sums of money, great beyond all former experience. This has gradually induced … [them] to draw together in Kirkwall … During winter, there are dancing assemblies and card assemblies alternately, every week* (Neill 1806, 7-8).

The kelp industry survived the end of the Napoleonic wars, as cheaper, and

[56] Seaweed gathered, dried and burnt under controlled conditions in a kelp pit, to produce good quality alkali for export to the glass, soap and dye industries. In Orkney the term 'kelp' referred to the finished product i.e. the solidified blocks of alkali, whilst the seaweed that was burnt to produce kelp was known as ware or tangles: see Thomson 1983.

better quality, imported barilla was initially kept out by import duties. The crash came in 1830 when these duties were suddenly removed, causing bankruptcies amongst some of the more profligate of the kelp lairds (Thomson 1983, 92-5). The interesting mounds that constituted a visible component of the archaeological record were shortly to be swept away in a wave of agricultural improvement.

4.3 Improvements commence: 1830 – 1870

4.3.1 Introduction

The kelp crash saw those landowners who escaped bankruptcy forced to turn to their estates as a source of income. Apart from a few areas where improvements had begun early, in 1830 the majority of the Orkney landscape very much appeared as it had in 1750, as described by Shirreff in 1814 (Section 4.2.2). In most parts a necessary prelude to improvement was the division of the common hill land and its allocation to individual holdings.

4.3.2 Division of the commons

At the start of the nineteenth century around 108,000 acres (43,700ha) of commons existed in Orkney[57]. The first division of these lands, in Stenness, was completed in 1815, although most commons were not divided until somewhat later. Details of the process are hard to come by for this period. The division was decided locally by the major landowners in each parish, and many of the records were destroyed when estates were broken up and sold. In 1927 for example many of the Earldom Estate records, going back to the sixteenth century, were destroyed, whilst the Shapinsay estate ledgers were burnt in 1962 (MacGillivray 2003, 22-5). The division of the commons seems to have been complete by the 1860s – 70s[58] (Thomson 1981a), and

[57] The legislation required to divide the commons had existed since the 1695 Commonty Act (Thomson 1981a, 73).

[58] See Appendix 4, Table A4.1 for approximate dates of division in each parish where known.

once the commons had been divided the process of improvement could begin.

4.3.3 A slow start

Even with the financial impetus to take action arising from the demise of the kelp industry, division of the commons and subsequent allocation to farmers took time, so that improvements inevitably got off to a slow start. Some few lairds were in a position to start at once, as they owned an entire island. Some islands, such as Shapinsay (Section 4.2.5) had already been improved for this reason. North Ronaldsay now followed suit. Here the island had been completely organised by the laird for kelp production, with small crofts and a population larger than the land alone could support (Thomson 1983, 96). Following the kelp crash of 1830 no time was wasted. In 1832 the island was divided into small farms, and the excess population of around 80 people was evicted and (in effect) deported to Eday (ibid; Tulloch 1974, 59-62; see Section 5.8.4).

The NSA provides a snapshot of the state of agriculture in the County in 1841. The picture varies considerably between different areas. In some places much of the land was still undivided, and the system of townships and hill-dykes prevailed e.g. in Westray (Armit 1845, 120), and in Evie and Rendall (Pitcairn 1845, 196-7). In contrast Lady Parish, Sanday, had seen great improvements in the previous 30 – 40 years, and it was predicted that a few more years would see the process completed (Traill 1845, 144). Similarly Sandwick was well ahead in the improvement stakes, with many farmers actively increasing their holdings. William Watt, Laird of Skaill, had by 1834 built seven miles (11km) of stone dykes to enclose his land and introduced new crops and farming methods (Irvine 2009, 159-60). By 1845 he is described as:

> *… by far the most extensive farmer in the parish and has for many years carried on an improved system of husbandry, enclosing and reclaiming waste land on a large scale, his last inclosure (sic) off the common, a few years since, including about 100 acres* (Clouston 1845, 61).

There were some technological innovations. Single-stilted ploughs had been

replaced by a two-stilted mould board plough, and, by the time of the NSA records, harrows had iron teeth (Anderson 1845, 21; Clouston 1845, 61). One of the obstacles to more efficient agricultural production, lack of access to markets, was also removed during this period. In 1833 a regular steamer service was established between Leith, Aberdeen, Wick and Kirkwall (Cormack & Cormack 1971, 12-13). For the first time Orkney cattle could reach the markets in the south directly, and this led to much improved prices and profits (Dennison 1884, 273; Smith 1845, 221) providing further stimulus to expand improved grasslands for cattle rearing.

4.4 The spirit of improvement is aroused: 1870 – 1902

4.4.1 Introduction

By 1870 all the commons had been divided (see Appendix 4, Table A4.1) and there was no longer any barrier to improvements. To properly comprehend 'agricultural improvements' we must engage with the phrase. We have an unrealistic view of nineteenth-century agriculture; a sepia tinted image of horse drawn ploughs and a timeless way of life in a countryside little touched by industry. That this was not the case can be judged from examining contemporary accounts and statistics.

4.4.2 The scale and speed of improvement

A good illustration of the mood amongst Orkney's landowning farmers in the late nineteenth century comes from a letter written in 1872 by Robert Scarth of Binscarth. In addition to reclaiming his own land (Section 4.4.4) he was factor for other Orkney estates and also the local agent for the Union Bank. This gave him a unique perspective on both farming and financial matters:

> *I believe that we have thousands of acres of waste land in the Mainland of Orkney capable of making a fair return for capital skilfully applied to its improvement, and this belief is, I have reason to think, now shared in by many of the so-called 'small lairds' near me, who formerly kept their savings hoarded in the bank at 2½ per cent, and would as soon have thought of throwing it into the sea as of*

> *laying it out for drainage or lime, or in any attempt to improve their waste lands. If they go on, these small lairds promise soon to become large lairds, for the greater part of them have large shares of the waste, and the late prices of stock have fairly opened their eyes to where the profit lies. The spirit of improvement is now aroused all around me, and instead of deprecating improvement and the laying out of money, as I often used to meet with, I now have small lairds, and even tenants, asking advice as to drainage and the improvement of their wastes* (Pringle 1874, 51).

Agricultural statistics are available from this period, and Table 4.1 below summarises the land use census returns at 5-year intervals from 1867 until 1995, from every farmer in Orkney. The early returns did not require area figures for rough grazing, only for the 'crops and permanent grass' i.e. the improved land. Rough grazing i.e. 'mountain and heath land used for pasture' is included from 1892, but it is unclear if this land had been fenced and possibly drained, or was still relatively undisturbed (O'Dell 1937, 206).

The figures that emerge are quite startling: in just 20 years from 1867 to 1887, an extra 12,725ha or 127 km^2 has been improved into the 'crops and permanent grass' category. The total land area of Orkney is around 975 km^2 (HMSO 1959, 15), so that over a tenth of the total land mass of Orkney had been improved in just 20 years. From a base line of 33,287ha in 1867 the cultivable land had jumped to 46,012ha by 1887: an increase of over 38%. The accuracy of these figures is borne out by contemporary reports of which this one from Rousay is typical:

> *Some farms have been doubled or trebled, by reclamation of waste lands, within twenty five years, and many small holdings taken out of the hill, where formerly there was nothing but stunted heath* (Farrall 1874, 97).

By 1882 around 90% of the agriculturally viable land in Rousay had already been improved[59].

[59] Rousay is an environmentally limited island, with only around 19.2km^2 (45%) of the island suitable for improvement, with the remaining 23km^2 consisting of upland heath and peat bog (See Section 4.9, Table 4.3 and Figure 4.19).

Table 4.1 Land utilisation in Orkney at 5 year intervals from 1867 – 1995[60] Total land area of Orkney c. 97,500ha				
Year	**Improved land (ha)**	**Rough grazing (ha)**	**Total land use (ha)**	**Reference**
1867	33,287	Not recorded		O'Dell 1939, 262
1872	36,382	Not recorded		"
1877	39,704	Not recorded		"
1882	44,757	Not recorded		"
1887	46,012	Not recorded		"
1892[61]	43,140	22,949	66,089	"
1897	43,106	25,185	68,291	"
1902	43,646	21,320	64,966	"
1907	43,514	22,058	65,572	"
1912	43,787	19,578	63,365	"
1917	44,006	24,648	68,654	"
1922	43,626	25,780	69,406	"
1927	43,564	27,716	71,280	"
1932	43,651	28,538	72,189	"
1937	44,067	28,734	72,801	HMSO 1939
1942	44,204	28,744	72,948	HMSO 1948
1947	42,988	26,728	69,716	HMSO 1952
1952	43,957	27,745	71,702	HMSO 1952
1957	44,526	27,811	72,337	HMSO 1959
1962	44,840	30,843	75,683	HMSO 1964
1967	45,803	33,515	79,318	HMSO 1969
1972	45,445	31,803	77,248	HMSO 1974
1977	44,933	31,334	76,267	HMSO 1978
1982	47,423	31,225	78,648	HMSO 1983
1987	48,256	28,384	76,640	HMSO 1988
1992	49,271	29,793	79,064	HMSO 1993
1995	51,518	29,085	80,603	HMSO 1996

[60] Yearly figures for individual counties are available from 1867 onwards. From 1996 Orkney is part of the Highlands & Islands district and figures are not readily available for Orkney alone. By 1995 grant-aided improvement had ended (Section 4.6.3) so the 1995 figure is a fair reflection of the current extent of improved land in Orkney.

[61] By 1892 all the commons were divided and allocated to individual farms, so were included on the returns. It is unlikely that 2,872ha of improved land went out of cultivation, the discrepancy is probably due to farmers subjectively classifying the quality of their own land and including poorer quality improved grassland in the rough grazing totals.

Table 4.2 (below) gives examples of the scale of improvements by 1874 on a sample of ten of the larger farms, for which figures are available. By this time all the commons in Orkney had been divided and allocated to individual farms (Section 4.3.2), enabling both the dramatic enlargement of existing farms e.g. Binscarth, Firth (Section 4.4.4) and the creation of completely new holdings, such as the 182ha of New Holland in Holm.

Table 4.2 Examples of improved land areas for ten Orkney farms (ha).			
Farm name & Location	**Area c.1860**	**Area 1874**	**Reference**
Huip, Stronsay	142	283	Pringle 1874, 23
Huntown, Stronsay	40	121	Ibid, 27
Mill of Ireland, Stenness	12	40	Ibid, 44
Binscarth, Firth	26	210	Ibid, 49 -50
Firth, no further details	0	61	Ibid, 50
Quanterness, Firth	101	202	ibid, 51
Saverock, Firth	24	121	Ibid, 51
Wideford & Inganess, St Andrews	24	259	Ibid, 52
New Holland, Holm	0	182	Ibid, 56
Carra, S Ronaldsay	0	121	Ibid, 58
TOTAL	**369**	**1,600**	

4.4.3 Methods of improvement

The process of improvement was both thorough and archaeologically destructive. Subsoil ploughing and deep drainage were the order of the day. Drains were solidly built of stone, to the pattern shown in Figure 4.4. Ideally they were cut four feet (1.22m) deep, 20 inches (0.51m) wide at the top tapering to 14 inches (0.36m) wide at the bottom, spaced at 10 – 15 foot (3 – 4.5m) intervals across the field (Farrall 1874, 73; Smith 1843, 6-9). In Orkney a convenient source for some of the stone needed for both the drains and enclosing dykes was by robbing out archaeological sites (Section 4.4.6 below). Once the land was drained the serious business of ploughing could begin.

The subsoil plough designed by James Smith in Deanston, Stirling in 1831 weighed 400 lbs (181kg), it was drawn by up to six horses and cut through the subsoil to a depth of 14 – 16 inches (0.36 – 0.41m) (Smith 1843, 18 & 23-5). This plough was heavy enough to throw aside any stones weighing less than 200lbs (90kg) (ibid). The inventor of this plough used it successfully to improve his 200 acres, and his description is instructive:

> *A common plough, drawn by two horses, goes before the subsoil plough, throwing out a large open furrow of the active soil; the subsoil plough following, slits up thoroughly and breaks the subsoil, and the next furrow of active soil is thrown over the last opened furrow of the subsoil; the stones brought to the surface by the subsoil plough being thrown aside on the ploughed part of the land by a lad, thus the work proceeds until the whole field is gone over. The lad should carry a bag of wooden pins, that he may mark the site of the large fast stones which the plough cannot throw out, and which must afterwards be dug out with the pick, and perhaps blasted* (ibid, 18).

Although, as this passage makes clear, stones encountered during subsoil ploughing were removed, by blasting if necessary, it is equally obvious that surface obstructions must be removed first. It is impossible to deep plough and drain land if that land is cluttered up, as in Orkney, with stone-built archaeological sites. It is rare in the old accounts to come across even a passing reference to the removal of obstructions; it is simply assumed that any obvious obstruction will be removed beforehand. These methods were expensive in labour and horsepower, and were beyond the reach of the smaller crofters, who often did not own a single horse (see Section 4.4.5). The use of subsoil ploughs is however documented in Orkney on the larger farms (Farrall 1874, 97), and, as the account from Binscarth shows (Section 4.4.4 below), the larger farmers also took drainage very seriously.

4.4.4 Large landowners: the Binscarth estate

By chance we have detailed records of the improvements at the Binscarth estate in Firth (Figure 4.5) and it can be seen what a devastating effect this type of total improvement had on the previous landscape and the archaeological sites it contained. In 1841 Binscarth farm consisted of 64 acres

(26ha) of cultivated ground and pasture within the old hill-dyke. The farm was then acquired by Robert Scarth (Section 4.4.1), who initiated the division of the commons (Malcolm 1845, 68; Pringle 1874, 49). By 1874 as a result of improving by draining, liming and enclosing the now-divided common land, Binscarth farm had increased to 520 acres (210ha) (Pringle 1874, 48-9).

The scale of the work required was impressive. For one bog, covering 60 acres (24ha), a 100 yard (91m) length of the main drain had to be cut 10 feet (3 metres) deep through bedrock at a cost of £100 (ibid). A network of stone-built smaller drains fed into this, which had to be repeatedly lifted and replaced due to blockages caused by iron panning. This problem was only cured when the entire area was 'deep trenched and thoroughly limed' (ibid). Following the drainage operations the entire farm was enclosed by stone dykes, and a twelve-acre (4.86ha) wood planted.

These improvements were complete by the time of the 1st edition six-inch OS map (1882), and Robert Scarth's large enclosed fields were shown quite clearly (Figure 4.6). The fields indicated by red dots on Figure 4.6 are the better quality and most thoroughly improved land. The NMRS Canmore screenshot of this area (Figure 4.7) shows that there are no known archaeological sites surviving on this land. The blue dots on Figure 4.6 indicate areas that were given basic improvement and fenced, but which, due to their more upland nature, were not suitable for more intensive use. It is here that the archaeological sites survive, and, as shown in Figure 4.8, there is an extensive Bronze Age funerary landscape. The aerial photograph (Figure 4.9) shows the distinctive landscape, with the large fields divided by stone dykes clearly visible, as is a barrow on the shoulder of the hill. Presumably the Bronze Age settlement sites to accompany these burial mounds were in the valley bottom or on the lower slopes and were obliterated in Robert Scarth's improvements. The only possible hint of any archaeological finds comes from the following comment, referring to the bog (above) whose drainage caused such problems:

> *Fine crops have been raised yearly on 60 acres, which was formerly a quaking bog, full of iron ore, and which in its natural state would not have summered a calf. In fact, the skeletons of several cattle, which had evidently perished in the bog, were found in draining it (*Pringle 1874, 49).

It is difficult to know what to make of these reports. Since the bog was drained by deep trenching and drains cut into the bedrock it very likely that archaeological layers in its vicinity had been disturbed.

Scarth is also noted to have created two completely new farms of 150 acres (61ha) each for tenants on other parts of his estate, each reclaimed from heath-land 'in precisely the same way as the improvements at Binscarth' (ibid, 50).

4.4.5 Methods of improvement: small tenant farmers

Smaller farmers could not afford the horsepower or specialized equipment to improve land in the same intensive way as large estates like Binscarth (Pringle 1874, 54-5), but deep trenching by hand was a method open to everyone, and it is clear that many people did just that. The evidence before the Napier Commission in 1888 from Rousay crofters who had been evicted from their holdings[62] and had had to start again on the hill land is striking (Thomson 2013, 321-30). These eight crofters had not only reclaimed all their own land, they had built the houses and other buildings that they required (ibid). The holdings were small, only around 10 – 14 acres (4 – 5.6ha), but only one of the eight crofters owned a horse, so that all land improvement was done by hand. Another example, at the top end of the scale of the smaller holders, comes from Kelton, St Ola, where the tenant had built new farm buildings and reclaimed 26 acres (10.5ha) of heathland (ibid, 330). This necessitated installing 30 chains (604m) of sub-surface stone drains and 15 chains (302m) of surface drains.

[62] See Thomson 1981b.

4.4.6 Sites as stone quarries

Newly reclaimed land had to be fenced with stone dykes, drained with stone drains, have new stone roads for access, and have stone houses and steadings built in order to work the land[63]. As a rule of thumb, Orkney dry stone dykes take one tonne of stone per metre of dyke, 1.2m high (Brian Omand, pers. comm.). It is clear that a colossal amount of both physical effort and materials were devoted to the 12,724ha improved between 1867 and 1887 (Section 4.4.2). It was necessary to extract new stone for this work, but it was also customary to quarry any convenient archaeological sites too: it has to be remembered that in Orkney from the 4th millennium BC onwards all settlement sites and Neolithic tombs were built from stone. The Name Book entries repeatedly record a depressing pattern of destruction, with a common theme of quarried sites:

> ONB 1880, OS1/23/17/112 Knowe of Geoso (HY21NW19): *The masonry has been removed for other use.*
>
> ONB 1880, OS1/23/17/178 Stackrue (HY21NE9): *there also appears to have been circular walls, but these have been carried away for other purposes.*
>
> ONB 1880, OS1/23/1/177 Knowe Of Smirrus (HY22SE17): *The stones used in building the farm house and offices at Howan were taken from the interior of this knowe.*
>
> ONB 1880, OS1/23/1/161 Knowe Of Forsakelda (HY22SE49): *composed chiefly of broken stones on the surface, and large boulders in the interior. A quantity of the latter have been removed for building purposes.*

As noted in Section 4.2.5, above the first recorded description of a broch being quarried for stone comes from 1798. Brochs have often been the first choice quarry site for the sheer quantity of stone conveniently available in one place. Oxtro Broch, Birsay (HY22NE4) was destroyed in 1847 for stone to extend the nearby farm of Boardhouse (ONB 1880, OS1/23/1/69; Petrie

[63] The most popular form of barbed wire was patented in the USA in 1874; it is unclear when it was first used in Orkney, certainly all the nineteenth-century accounts of improvements speak of building lengths of dykes. The expense of importing wooden fence posts along with the wire itself would hinder its use in Orkney even when readily available further south.

1874, 76-8). All that remains of the broch site, which had included a Pictish cist cemetery with a now lost symbol stone, is a sad little ring of stones in the field.

At least we know that these particular sites existed, even if they are now badly mutilated. It is also clear that much destruction went completely unrecorded, with this eye witness account of the destruction of tumuli or barrows in Sandwick from George Petrie in 1849 being typical:

> *A few years ago about a hundred of these* [tumuli or barrows][64] *were to be seen … [they] are fast disappearing before the agricultural improvements of the present age which appropriate and swallow up the materials of which these old sepulchral monuments are constructed, and what is more provoking still without any attention being given to preserve a record of their construction and contents (*Petrie letter to Daniel Wilson, quoted in Davidson & Henshall 1989, 15, my emphasis).

Nearly twenty years later the story was unchanged:

> *Picts' houses … are rapidly disappearing, being swept away to make room for agricultural improvements, and in a short time scarcely a vestige of these interesting remains of the early inhabitants of Orkney will be left* (Petrie 1866c, 225).

One of these Pict's houses was the broch at Taft, Greeny which was removed c.1866 for building stone:

> *Further examination of the structure of the passage was prevented by the removal of all the lintels and other stones suitable for building purposes. It is probable that the greater part of the stones used in the construction of all the other houses in the township of Greeny were taken from this broch, as the remains of the old steadings are of the same quality and character of stone. Supposing that eight farm-steadings were all built from this one broch, the wonder is that any vestiges of its structure should yet remain, and from this I conclude that it must have been a structure of the first magnitude* (Watt 1882, 450[65]).

[64] As discussed (Section 3.5.3 above) in Petrie's 1849 terminology 'tumuli or barrow' could be almost any type of site.

[65] Watt did not see the 'excavation' but records an account given him by David Stephen, the resident farmer. The ONB entry says the find was made 'when the spot was in the process of

The destruction of many other sites was going completely unnoticed without even a brief mention after the event as had been the case at Taft, but occasionally evidence of this appears in unlikely places. The nineteenth-century stables at Kirbuster Farm Museum, Birsay for example have a large extensively cup-marked stone[66] built into the side wall, of a size and style suggestive of a lintel from a Neolithic chambered tomb. There are no recorded sites nearby to explain the presence of this stone, and in fact Birsay is remarkably deficient in chambered tombs, with only one now known in the whole parish (see Appendix 10, Figure A10.1).

An added bonus from the destruction of a prehistoric settlement site would have been large quantities of the typical Orcadian prehistoric ashy midden (Section 7.1) with which to enrich the soil; the outcome was thus similar to that achieved by the destruction of barrows for 'top dressing of the land' (Section 4.2.4).

4.5 The twentieth century: 1902 – 1945

4.5.1 Introduction

Following the production of the 2nd edition six-inch OS maps (1902), the next major survey in Orkney was in the 1960s with the work of the OS Archaeology Division (Section 3.8.1). Obviously much had happened in the intervening period, some of which can be pieced together from the available agricultural statistics and contemporary reports. Most notably the first half of the twentieth century saw two world wars which also stimulated agriculture in the County.

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cultivation' (ONB 1880, OS1/23/1/173) i.e. the land was being improved. Fraser (1925, 22) records that prior to the 'recorded excavation' the site had been 'a convenient quarry for the district'.

[66] Thanks must be expressed to Neil Leask, custodian, Kirbuster Farm Museum, for drawing my attention to this stone.

4.5.2 The First World War

During the First World War in Orkney, as elsewhere, alongside military objectives the emphasis was on food production. Orkney had an enormous naval base in Scapa Flow and its associated service personnel to accommodate (Hewison 2000). Between 1912 and 1917 the area of improved land remained relatively stable (Table 4.1), probably reflecting the lack of manpower, with young men serving in the armed forces.

Agriculture in depressed post-war Britain suffered badly. Orkney however bucked the trend, with stable cattle prices and an owner-occupier revolution, as large estates were broken up and sold, the majority bought at reasonable prices by the sitting tenants[67] (Symon 1959, 222-39; Thomson 2001, 417-21). Land reclamation and very deep trenching for drainage continued. The discovery of six cists at Lochside, Stenness in 1931 (Greig 1931) was one result. The cists were found in an area under improvement shown as completely untouched on the 1902 map, at a depth of 0.5 – 0.61m below ground level, a depth which can be seen in Figure 4.10. This clearly shows the thoroughness with which agricultural improvement was still being undertaken.

4.5.3 The Second World War

The Second World War saw legislation compelling farmers to bring marginal land into cultivation, in an effort to boost food production: non-compliance led to eviction (Symon 1959, 254-60). In Quanterness, St Ola for example over 600 acres (243ha) were improved during the war years using 'huge modern mechanical drainers' (Hewison 1985, 83). No finds were reported during this process, but several badly damaged sites have subsequently been excavated in this area: the Neolithic/Early Bronze Age settlement at Crossiecrown (Card et al 2016; Section 7.5.4) and the remnants of a Bronze

[67] The price was generally set at equal to 20 years purchase i.e. 20 times the yearly rent, although often this was much reduced by the deduction of the amount of compensation the tenant would have been paid on vacating for improvements made during tenure (Thomson 2001, 420).

Age barrow cemetery together with an indeterminate prehistoric structure at Ramberry Head (Crozier et al 2016). Elsewhere in Orkney the situation was slightly different, since much agricultural land was expropriated by the War Department. No accurate figures exist for land taken by the authorities, but Orkney became in effect a military base. In addition to the fleet in Scapa Flow and the concomitant shore side installations, there were four military airfields, artillery and anti-aircraft batteries, radar installations, prisoner-of-war camps and around 40,000 military personnel (e.g. Dorman 1996; Hewison 2000; Lamb 2007). This amount of infrastructure required a great deal of land, and on this land were many archaeological sites: the airfields alone required in the region of 486ha of land (Lamb 2007). Since 'there was a war on' archaeological recording was not a priority[68], and an unknown number of sites were destroyed during construction works. Some we know existed, even if their destruction went unrecorded, for example a large and previously undiscovered site, of a size to be a broch, was removed by machine during the construction of Skeabrae airfield, together with a nearby souterrain (Marwick 1949, 236-9). Similarly at Hatston airfield a souterrain was discovered and destroyed, but in this case it was at least planned by the Ministry of Works first (ibid).

Less excusable was the damage done to known sites. Archaeological features seem to have been favoured locations for gun emplacements e.g. the concrete pillbox (HY31SE28) dug into the top of the Hillock Broch in Finstown (HY31SE4). Fields adjacent to Maeshowe chambered tomb were chosen as the ideal site for an army camp, which necessitated the bulldozing of much of an associated barrow cemetery (HY31SW12; Card 2005a, 58). In a similar vein the Ring of Brodgar and environs was used for military exercises. The henge ditch was employed as an obstacle in training the crews of Bren gun carriers[69]. None of the stones appear to have been damaged during the war,

[68] Although V. Gordon Childe (1942) surveyed the chambered cairns of Rousay in 1941 there was no programme of rescue excavation in advance of military construction in Orkney to compare with work elsewhere (e.g. Grimes 1960).

[69] Imperial War Museum photograph reference H10589 showing Bren gun carriers of the Ninth Battalion, Gordon Highlanders at the Ring of Brodgar, taken on the 18th of June 1941.

but the effects on the ditch deposits and the surrounding Bronze Age funerary landscape (e.g. HY21SE16 and HY21SE21; Section 6.1.4) have never been assessed.

4.6 Post-war grant aided improvement

4.6.1 Introduction

The Second World War emergency measures, introduced to increase food production, included large grants for bringing marginal land into production, together with livestock subsidies (Symon 1959, 255-8). In the post-war period, with rationing still in effect, these measures were continued and expanded (ibid, 263-5), whilst Britain's membership of the European Union brought further grant-aided stimulus (e.g. EEC 1986 & 1988).

4.6.2 Effects in Orkney

The effects can be seen in Orkney, where an extra 5,268ha of improved land was created in the forty-year period between 1947 and 1987 (Table 4.1). There are scant archaeological records from this period considering the amount of land then being improved for the first time. Occasionally finds came to light, and practices had obviously not greatly changed from earlier times, as when a Birsay farmer, in 1957, noted the recent (unrecorded) destruction of a 'great quantity of Pictish houses and stones', which produced quantities of ashy material, spread on the fields for fertiliser[70]. Substantial sites that had managed to survive thus far were now targeted for removal in the course of improvements. Quite by chance, an archaeologist heard of the imminent destruction of a mound at Bu, Stromness in the spring of 1977, which had so far survived as a large hillock in a cultivated field. An emergency five-week rescue excavation managed to record at least part of the subsequently destroyed broch (Hedges 1987a). The following year the destruction of Howe,

[70] Letter in the Orkney Library Archive dated 4th February 1957 from William Sabiston of Scutabreck, Birsay (OA ref D29/1/1). 'Pictish' here is used as a generic term indicating an antiquity of indeterminate age, rather than a Pictish settlement in the archaeological sense (Section 3.2).

another broch on the same farm, was delayed for several years to allow for a more extensive excavation (Ballin Smith 1994). Apart from these two brochs the only sites excavated in advance of, or discovered during the course of, the improvement of 5.27km² of land during this forty year period were the barrow cemeteries at the Knowes of Quoyscottie, Birsay (Hedges 1977) and Holland, St. Ola (Neil 1981); a probable 2nd/1st millennium BC settlement at Linna Breck, Birsay (Hedges 1978) and eleven cists excavated on an ad hoc basis between 1968 and 1978 (Hedges 1980). An unknown number of sites were destroyed during this period; the figure is impossible to quantify.

4.6.3 The last gasp of agricultural improvement

The final phase of major expansion into the remaining hill land came in 1988 with the implementation of the EEC 5-year *Agricultural Development Programme for the Scottish Islands*, during which land improvement works such as drainage and reseeding attracted grant rates of 60% and upwards (EEC 1986 & 1988; Land Use Consultants 1998, 68). These grants enabled very marginal land to be improved, which was not otherwise financially viable. In the period when these grants were available there was a significant impact on the landscape, with a further 3,262ha of land being improved between 1987 and 1995 (Table 4.1 above). Much of this land was very marginal for agricultural purposes, with areas such as moorland fringes and coastal machair being utilised, and parts have now been allowed to revert to their former state (Land Use Consultants 1998, 66 & 68). This is very obviously shown in Figure 4.1. Bronze Age burial monuments which had hitherto survived on this marginal land suffered severe damage during this period. Of the 697 individual barrows recorded by the 1960s OS revision (Section 3.8), some 147 had been completely destroyed by the time of the Orkney Barrows survey in the 1990s, many of them in the recent past (Downes 1997a, 5-6 & 2005, 46). That the majority of these sites were scheduled ancient monuments provided little protection, illustrated by the fate of the eleven barrows comprising the cemetery on Kirbister Hill (HY22NE14), already damaged in 1929, when traces of five destroyed cists

were recorded (RCAMS 1946, vol. II, 25-6, no. 53). The site was scheduled in 1937, but when the land was reclaimed in the early 1990s the entire cemetery was ploughed out (Tony Taylor, pers. comm.). Subsequently the landowner noticed large quantities of 'ashy material just like you'd take out of the fire' in the vicinity of the barrows (ibid), suggestive of quantities of cremation pyre debris.

4.7 An insidious enemy: coastal erosion

Agricultural improvement has been the main culprit in the wholesale destruction of archaeological sites in Orkney[71], but in the twenty-first century the majority of damage to the archaeological record by man is better controlled, and the main enemy now recognised is the sea (e.g. Gibson 2012).

Coastal erosion is affecting many hundreds of sites, for example all the coastal brochs[72] in Orkney are actively eroding. Some of these brochs may represent multi-period settlements with Bronze Age components, as is the case at St Boniface Church, Papa Westray (Lowe 1998; Section 7.15); without excavation there is no way of adequately assessing what is lost. Most sites destroyed by the sea are lost without record.

Bronze Age sites are undoubtedly amongst these: examples at least partly excavated in response to coastal erosion are limited, but have included barrows and cists e.g. Lopness, Sanday (Innes 2016) or Rapness Cairn I, Westray (Barber et al 1996; Section 6.1.2); burnt mounds at Meur, Sanday (Hambly 2014; Toolis 2007a; Section 9.3.2) and Yorville, Rousay (Dockrill et

[71] Although there have been some notable examples of destruction motivated by other reasons e.g. the Odin Stone and some of the Stones of Stenness in the nineteenth century (Hossack 1900, 398-400) and the Broch of Lingro, St. Ola in the twentieth century (reported in Rescue News March 1981, page 5; and in The Orcadian newspaper on the 26th February 1981, page 14). Similarly the Point of Buckquoy, Birsay, demonstrated by trial excavation in the 1960s/70s to be an extensive Bronze Age settlement occupied from the mid/late-3rd to mid-2nd millennium cal BC (Morris 1989, 71-107), was completely destroyed in the 1980s without any archaeological intervention in order to build a visitor car park for the Pictish/Norse site (Hunter 1986) on the Brough of Birsay (Anne Brundle, pers. comm.).

[72] Apart from Midhowe (Callander & Grant 1934b) and Gurness (Hedges 1987b), which are now protected by sea walls. See Appendix 11 for details and distribution maps.

al 2009) and the chance discovery of the probable Bronze Age settlement at Cata Sand, Sanday (Cummings et al 2016; Section 5.5.3).

Although there have been occasional funded coastal surveys to assess the extent of the problem (e.g. Moore & Wilson 1997a, 1998 & 1999a) these surveys have not been followed by further action. The majority of the sites recorded by such surveys consist of midden deposits and stone walling, which may be hard to assign to period in the absence of diagnostic artefacts or structures. In one such survey, of 287 sites recorded[73], 32% could not be even tentatively assigned to period (Moore & Wilson 1998, 11-12). This may lead to the introduction of biases in the archaeological record in favour of those sites that do have such features. For example a broch tower can be easily identified as such by the typical double-walled construction (e.g. Lynn & Bell 1987); an eroding Neolithic settlement site by the presence of Grooved Ware (e.g. Bond et al 1995); Viking/Norse and post-medieval sites by both artefacts and structural form (e.g. Wilson & Moore 1996). Other sites are less easy to identify, and this is true of the majority of Bronze Age sites, since Bronze Age pottery in Orkney is generally both undiagnostic and recognition of it hampered by the lack of known assemblages for comparative purposes (MacSween 2007, 281). Similarly whilst the presence in large numbers of certain type of coarse stone tools may suggest a Bronze Age date (Clarke 2006, 124-6) this would be unlikely to be obvious in a short section visible at an eroding midden site. In the absence of excavation all of these eroding sites are being destroyed without adding significantly to the archaeological record.

4.8 Case study: The island of Burray

4.8.1 Introduction

The island of Burray provides an excellent example of how a combination of factors stretching back for several centuries can bias the archaeological record as it now survives. Burray is one of the South Isles, now linked to the

[73] This survey included sites of all periods from the Neolithic through to the twentieth century, 144 of these were previously unrecorded sites.

Mainland by the Churchill Barriers but, pre-1945, a separate island, with an area of c.11km^2. The name comes from the ON *borga [r]-ey* literally the 'island of the stronghold[s]' (Marwick 1952, 167) in reference to the broch mounds visible from the sea[74]. The RCAMS 1946 *Inventory* entry for Burray records three definite and two possible brochs, a Neolithic chambered tomb (destroyed in the nineteenth century) and a Viking hoard of silver (RCAMS 1946, vol II, nos. 861-67, 293-6). There is a notable absence of other sites, for example there are no reported chance finds of cists or burials, no burnt mounds, and no 'indeterminate mounds'; evidence of a Bronze Age presence is lacking. In comparison the islands of Papa Westray and North Ronaldsay, both around 40% smaller then Burray, each have, in addition to brochs and chambered tombs, a number of burnt mounds (ten and seven respectively), together with numerous Bronze Age funerary sites[75].

4.8.2 Recent destruction

We now know that there is a concentration of prehistoric settlement on the east side of the island, in an area covered by sand dunes known as the North and South Links of Burray, shown in Figure 4.11. The farm associated with these links is the Bu of Burray; the 'Bu' place name indicates this to have been a high status Viking/Norse period settlement[76]. The Links are used for commercial sand quarrying by a landowner unsympathetic to both archaeology and the planning process. An extensive prehistoric settlement complex over several acres has been destroyed without record by this operation (Smith et al 1988). Finds retrieved from the debris left by the sand extraction dated from at least the Early Iron Age to the Pictish period, whilst further unmonitored quarrying revealed human remains (ibid; Hunter 1993; Lawrence 2005; Sharman 2005). Sand extraction continues on the site with

[74] Some of Orkney's brochs must have been standing to a considerable height in the Norse period and to Viking eyes were obvious strongholds. The broch of Mousa in Shetland (ON *Moseyarborg*) was reoccupied and used as a stronghold in the tenth century AD, in the twelfth century it withstood a siege (Taylor 1938, 311-2, 352-3 & 399).

[75] Papa Westray also has two Bronze Age settlements: see Appendices 7, 8, 10, 11 & 12 for details.

[76] ON '*bú*' - a substantial estate occupied by an important person (Marwick 1952, 240-3).

limited archaeological access and no monitoring (Brend 2010b; Robertson & Sharman 2006).

There is also likely to have been pre-Iron Age activity in the Links. A Neolithic presence nearby is attested by the chambered tomb (Davidson & Henshall 1989, 106-7, ORK7) around 1km to the north, which is the only definite evidence for pre-Iron Age activity in Burray (but see also Section 7.15). In addition to the Links, there are two areas of coastally eroding midden indicating settlement activity, a possible chapel site and the seventeenth-century St Lawrence's church (Figure 4.11).

4.8.3 James Stewart of Burray – an improving laird

It is improbable that the rest of Burray genuinely lacked prehistoric sites. The explanation for their absence lies in a combination of two apparently unconnected factors: the status of Burray as an important and wealthy (for Orkney) unitary estate, and to a lesser extent, the lack of a resident minister.

Burray has, so far as can be seen from the Rentals, always been one single estate, the head farm of which was at the Bu of Burray. It was a Crown estate, granted to the Bishopric of Orkney in 1494 (Clouston, J. S. 1927, 202) and by implication this would mean good quality land. By the early eighteenth century the island was in the possession of the Stewarts of Burray, who had built a fine house known as the Place of Burray at the site of the old Bu. A 1746 inventory of the estate, taken on the death of James Stewart of Burray, records luxury household goods unknown elsewhere in Orkney at that time (Marwick 1934). More importantly there was also one English plough, two Scots ploughs and a turnip drill plough, together with spares for the ploughs, quantities of carts, cartwheels, yokes and harnessing equipment (ibid). As discussed above (Section 4.2.3), the common Orkney plough at this time was single-stilted and largely ineffective. To have three modern imported ploughs, sets of spares, and a turnip drill at that time in Orkney was unheard of, and indicates both the wealth of the estate and the early improvement of the land.

Mackenzie's 1750 chart shows a total of around 61% of the available land,

largely comprising the eastern half of Burray, inside the hill-dyke, with rough heath on the west and in the island of Hunda (Table 4.3 below; Figure 4.17a). This is confirmed by a 1774 account, which states that more than half of Burray is 'either in corn grounds or laid down with rye grass' and notes that the Bu was the first farm in Orkney to be enclosed and improved (Low 1879, 39-40). The island was still one estate under the management of the factor for absentee landlord Lord Dundas (ibid). By the time of the 1882 1st edition OS map, agriculture had expanded west, along both the north and south shores, shown here in Figure 4.17b, with a further 11% of land improved. The modern map (Figure 4.17c) shows only a few patches of unimproved heathland remaining, with a total of 89% of the available land now improved (Table 4.3).

Large parts of Burray were therefore already improved by the mid-eighteenth century, and, considering the equipment at the Place of Burray in 1746 probably well before. It would not be expected that finds made during improvements at that time would have been reported, unless the landowner or the minister were interested enough to record them. James Stewart of Burray was locally noted for his quarrelsome nature, violent temper and murderous activities (Hossack 1900, 216-7); not for antiquarian interests.

The Minister for Burray, a possible source of records of any recovered archaeological material (e.g. the father and son Rev. Cloustons in Sandwick: Clouston, W. 1927a & Clouston 1845) lived in the island of South Ronaldsay and held a service in Burray only every two to three weeks. After the Burray church fell into disrepair c.1800 the minister ceased to even visit. This continued until the new church and manse were built in 1874 (Gerard 1845, 194-5; Lamb 2006, 41-2; Watson 1927, 211). The entries for Burray in both the OSA and the NSA are consequently minimal (Gerard 1845; Watson 1927).

In Burray therefore a series of factors have combined to make the island seem almost an archaeological desert. An early improving laird with no interest in antiquities and an absentee minister led to a lack of reporting of chance finds, and this has been compounded subsequently by a landowner with no regard

for archaeology but rather a desire to commercially extract sand. Burray provides an illustration of the dangers of taking the absence of sites on a distribution map at face value without an understanding of the underlying historic processes.

4.9 Conclusion

It is clear from the evidence presented in this chapter that the effect of man on the Orcadian landscape has been immense. Superficially Orkney has a well-preserved archaeological landscape, but the extent of historic destruction becomes obvious under informed scrutiny. The major destructive force over the last two centuries has been agricultural improvement, which destroyed archaeological monuments on an industrial scale.

The landscape of 1830 was substantially unchanged from the medieval period, with small townships within their hill-dykes shown on Mackenzie's (1750) chart. It is possible to estimate the amount of land enclosed within these hill-dykes to be around 286km^2 or 28,600ha (Table 4.3 below), representing around 32% of the available land[77]. This arrangement was completely swept away in the course the nineteenth century. By 1867, when agricultural statistics began to be recorded (Table 4.1 above), only around 4,687ha had been improved in addition to the areas inside the hill-dykes in 1750. This comparatively small increase over the course of a century reflects the slow start of agricultural improvement in Orkney (Section 4.3.3). However in the following twenty years an additional 12,725ha of land was improved, as the pace of change gathered momentum (Section 4.4). Improvement followed a steady upward trend, such that from 1867 to 1995 the improved land increased from 33,287ha to 51,518ha, an increase of 18,231ha or 182km^2 (Table 4.1 above).

[77] Islands with an area of under 2km^2 have not been included in these figures. Some of these islands were inhabited in 1750 but lacked a hill-dyke e.g. Eynhallow (Section 5.4) and Papa Stronsay, the majority of which was under cultivation (e.g. Lowe et al 2000 & 2001; the 1595 Rental: Peterkin 1820, 89; Taylor 1938, 183).

Table 4.3 Estimated total areas[78] and percentages of total area for improved/cultivated land inside the hill-dykes in 1750; land improved 1750 – 1882; land improved from 1882 – present day and area of remaining unimproved heath/bog. (Percentages rounded up/down and may not total 100%).										
Main islands (excludes c.71 km² comprising islands with area less than 2 km²)	**Total land area in km² with total area improved shown in brackets**	**Land inside 1750 hill-dyke km²**	**Land inside hill-dyke in 1750 as % of total**	**Area improved from 1750-1882 km²**	**Area improved 1750-1882 as % of total**	**Area improved post 1882 km²**	**Area improved post-1882 as % of total**	**Total heath/bog km²**	**Heath/bog as % of total area**	**Shown on Figure No.**
West Mainland N	192 (145.5)	58.5	30%	43.5	23%	43.5	23%	46.5	24%	**4.12**
West Mainland S	131.3 (92.3)	28.6	22%	30.55	23%	33.15	25%	39	30%	**4.13**
East Mainland	97.03 (90.73)	46	47.5%	29.61	30.5%	15.12	15.5%	6.3	6.5%	**4.14**
Hoy & N Walls (N)	116.28 (7.98)	6.84	6%	0.57	0.5%	0.57	0.5%	108.3	93%	**4.15**
Graemsay	7.41 (6.27)	3.99	54%	0.57	8%	1.71	23%	1.14	15%	**4.15**
Part N & S Walls	69.7 (17.63)	9.43	14%	4.51	6%	3.69	5%	52.07	75%	**4.16**
Flotta	6.97 (3.28)	2.05	29%	0.82	12%	0.41	6%	3.69	53%	**4.16**
Fara	3.28 (0.82)	0.41	12.5%	0.41	12.5%	0	0	2.46	75%	**4.16**
Burray	10.92 (9.75)	6.63	61%	1.17	11%	1.95	18%	1.17	11%	**4.17**
South Ronaldsay	44.07 (40.95)	19.11	43.5%	12.09	27%	9.75	22%	3.12	7%	**4.17**
Eday	22.68 (13.65)	4.83	21%	5.88	26%	2.94	13%	9.03	40%	**4.18**

[78] These figures have been obtained by plotting the land inside the 1750 hill-dykes as shown on Mackenzie (1750); the land improved from 1750 – 1882 as shown on the 1st edition OS map, and the post-1882 figures from the land shown as currently under cultivation and grass on the modern OS maps. The areas in km² were calculated by applying a grid to the finished maps, counting the relevant number of grid squares and converting to square kilometres. These figures hence provide an estimate of land use at the appropriate time.

Table 4.3 continued										
Main islands (excludes c.71 km² comprising islands with area less than 2 km²)	**Total land area in km² with total area improved shown in brackets**	**Land inside 1750 hill-dyke km²**	**Land inside hill-dyke in 1750 as % of total**	**Area improved from 1750-1882 km²**	**Area improved 1750-1882 as % of total**	**Area improved post 1882 km²**	**Area improved post-1882 as % of total**	**Total heath/bog km²**	**Heath/bog as % of total area**	**Shown on Figure No.**
Rousay	42.24 (19.2)	12.48	29.5%	4.8	11%	1.92	4.5%	23.04	55%	**4.19**
Egilsay[79]	5.12 (4.48)	0	0	1.92	37.5%	2.56	50%	0.64	12.5%	**4.19**
Wyre	3.2 (2.88)	1.92	60%	0.32	10%	0.64	20%	0.32	10%	**4.19**
Sanday	39.33 (37.06)	17.67	45%	15.39	39%	4.56	10%	2.27	6%	**4.20**
North Ronaldsay	7.41 (6.84)	5.13	69%	1.14	15%	0.57	8%	0.57	8%	**4.20**
Shapinsay	23.18 (22.42)	13.49	58%	7.98	34.5%	0.95	4%	0.76	3.5%	**4.21**
Gairsay	2.28 (1.14)	1.14	50%	0	0	0	0%	1.14	50%	**4.21**
Stronsay	31.97 (27.83)	21.39	67%	5.52	17%	0.92	3%	4.14	13%	**4.22**
Westray	39.84 (33.12)	21.6	54%	10.08	25%	1.44	4%	6.72	17%	**4.23**
Papa Westray	7.2 (5.28)	4.8	66.5%	0.48	6.5%	0	0%	1.92	27%	**4.24**
Orkney Total	**904 (590) km²**	**286 km²**	**32%**	**177 km²**	**20%**	**126 km²**	**14%**	**314 km²**	**35%**	**N/A**

[79] Mackenzie does not show a hill-dyke on his chart of Egilsay but this does not mean that the island was not inhabited or cultivated. Certainly Egilsay features in the 1595 Rental paying a substantial rent for such a small island of 9 lasts of bere and £20 in cash (Peterkin 1820), which implies a substantial area under cultivation. Probably the bulk of the land (1.92km²) shown as improved in 1882 was already in cultivation in 1750.

The current Orcadian landscape is consequently almost entirely improved, with the exception of some 314km^2 of rough heath and peat bog (Table 4.3) in largely upland areas which are either uneconomic or unsuitable for improvement[80].

The difficult question to answer is how much archaeological evidence has been lost through these and other activities. In light of the scale and the methods of improvement discussed in this chapter, and the propensity of sites to be quarried for building stone (Section 4.4.6), any figure for loss can only be speculative. Given the thoroughness with which agricultural improvements were carried out (Section 4.4), that there has been large-scale unrecorded[81] destruction is clear. In 1750 approximately 28,600ha of land was enclosed by the hill-dykes (Table 4.3), but by the time of the publication of the 1st edition OS maps of 1882 (the first comprehensive survey of Orkney and the first to include archaeological detail, however incomplete: Section 3.6), improved land totalled 44,757ha, an increase of over 16,000ha[82] (Table 4.1). Although the total of improved land then remained fairly static until work started on the *Inventory* (RCAMS 1946) in 1928 (itself somewhat limited in scope: Section 3.7.1), land used for rough grazing had increased by 4,767ha (Table 4.1) which is likely to have entailed further damage to sites (Section 4.4.2). There was then broadly a 50-year gap between the conclusion of the RCAMS (1946) *Inventory* surveys and the new surveys of the 1980s (e.g. Hunter et al 1982 & 1984; Lamb 1982 & 1989; Section 3.8.1), during which time an extra 4,189ha of land had been improved (Table 4.1). The coverage achieved by these later surveys was however incomplete, hence around 50% of Orkney has not been systematically surveyed since 1937 (Section 3.9), when the surveys for the *Inventory* (RCAMS 1946) were

[80] The figures in Table 4.3 are not adjusted to allow for areas that have been improved/partially improved or cultivated but have subsequently been allowed to relapse into heathland e.g. the Quandale area of Rousay (Section 5.6).

[81] Apart from occasional brief accounts in e.g. the OSA (Anon 1927, 10; Clouston, W 1927a, 134; Sections 3.3.1 & 4.2.5).

[82] Together with un unrecorded area of rough grazing, which may have been at least fenced and drained (Section 4.4.2).

completed (Section 3.8.1): between 1937 and 1995 a further 7,451ha of land was improved throughout Orkney (Table 4.1).

The scale of pre-1882 destruction, unrecorded apart from occasional brief accounts (e.g. Anon 1927, 10; Clouston, W 1927a, 134; Thomas 1852, 122), is difficult to quantify. The only point from which to start is Petrie's 1849 letter (quoted in Section 4.4.6), which states that upwards of 100 'tumuli or barrows' were being swept away in the parish of Sandwick. This means 100 mounds large enough to be obvious; Petrie's choice of words hint that these mounds contained significant structural stonework, which may suggest that he was not referring to 'barrows' in the modern sense:

> [The agricultural improvements] … *which appropriate and swallow up the materials of which these old sepulchral monuments are constructed* (Petrie 1849, quoted in Davidson & Henshall 1989, 15).

Sites that Petrie might have considered 'tumuli or barrows' in 1849 would have included large settlement mounds e.g. brochs, together with chambered tombs and Bronze Age barrows[83] (Section 3.5.3).

Table 4.5 below provides speculative numbers for the sites that may once have existed, based on Petrie's figures in Sandwick extrapolated to Orkney, for a range of site-types; it is apparent that a significant number of substantial sites are likely to have been destroyed. The resultant figures are at best indicative but even the most conservative result implies significant loss.

[83] Petrie refined his terminology c.1860 (Section 4.4.6) but in 1849 was still using the terms 'tumuli or barrows' to indicate a wide range of sites.

Table 4.4 Speculative estimates of original site densities in Orkney based on the possible permutations of sites that Petrie (writing in 1849) may have considered among his 100 'barrows or tumuli', which had been destroyed in the recent past[84]. See Appendices 7, 9 and 10 for site details.					
	Column A	**Column B**	**Column C**	**Column D**	**Column E**
Site type	**Current total of each site category recorded in Sandwick**	**Speculative original Sandwick total (Column A figure + 100 destroyed)**	**Percentage of surviving sites or combination of sites in Sandwick**	**Current total of each site or combination of sites recorded in Orkney**	**Projected original total of each site category or combination of sites in Orkney, extrapolated from the percentage survival rate in Column C**
(1) Brochs	9	109	8%	135	1,687
(2) Chambered tombs	5	105	5%	89	1,780
(3) Barrows	134	234	57%	728	1,277
(4) Brochs + Tombs	14	114	12%	224	1,867
(5) Brochs + Barrows	143	243	59%	863	1,463
(6) Tombs + Barrows	139	239	58%	817	1,409
(7) Brochs + Tombs + Barrows	148	248	60%	952	1,587

[84] Since Petrie's figure of 100 is likely to be an approximation and he failed to define mounds in terms of size or nature, this calculation has been made using varying combinations of possible sites and extrapolated for Orkney assuming that losses were similar and proportional to area. Rows (1) to (3) show estimates based on the assumption that Petrie's 100 sites were either (1) all brochs or (2) all chambered tombs or (3) all barrows. Rows (4) to (7) show estimates based on combinations of sites. Row (7) assumes that Petrie's 100 sites were comprised of all three site types and is hence the most conservative estimate of loss.

Petrie's 'tumuli or barrows' were those easily visible as substantial mounds, and his figures can have taken little or no account of the destruction of less obvious features; destruction which continued unabated a decade later:

> *I continually hear of graves having been opened in one place and a Picts-house broken into in another, and the whole removed and destroyed* (Petrie 1927, 29, written in 1859).

Sandwick was one of the parishes well ahead in improvements by 1845, since William Watt, the Laird of Skaill (Figure 4.24), was an enthusiastic early improver and had already made significant improvements by 1834 (Section 4.3.3). The old hill-dyke around Skaill House is shown in Figure 4.25 with the location of Skaill House marked. Figure 4.26 shows the known archaeological sites around Skaill House, and there are marked gaps that coincide with the area of Watt's early improvements (e.g. Clouston 1845, 61). There are very few reported sites within 1-2km of his home farm in any direction. It is noticeable that there are no burnt mounds recorded in this area, which, given the ability of burnt mounds to survive in improved landscapes (Section 5.7) is considered to be testament to the thoroughness of the Watt improvements rather than reflecting past distribution. Petrie's 1849 figures for destroyed sites in Sandwick almost certainly did not include the 'immense abundance' of tumuli which were visible at the Links of Skaill in the late eighteenth century (Lysaght 1972, 288; Section 6.3.2); these were likely to have already been destroyed during the course of Watt's pre-1834 improvements (Section 4.3.3). Apart from the five barrows excavated around the time of Sir Joseph's Banks' visit in 1772 (RCAMS 1946, vol. II, no. 718, 267-8; discussed in Section 6.3.2 below) there is no record of the fate of the rest; their position falls within the archaeologically-blank area noted on Figure 4.26, and today there are no traces of any archaeological sites at the Links of Skaill (Figure 4.27).

There are hints from elsewhere in Orkney that the 'immense abundance' of tumuli at the Links of Skaill was not unusual and that such sites were commonplace in other areas, for example Barry's (1805, 94-5) reference to the numerous groups of tumuli that could be found at a wide range of Orkney

locations (Section 3.4.1). A similar impression of both their ubiquity in Orkney, and that they were threatened with destruction, comes from Thomas (1852, 90):

> [There are] … *great numbers of barrows scattered throughout the islands; I imagine that at least two thousand might be numbered; and … half as many more have probably been removed or obliterated from within the inclosures … These barrows … may be seen upon the very top of a hill, or upon the brow, or halfway down, upon the moor, or by a burn, or by the sea side. They are single, or in confused groups.*

Any estimate based on Petrie's remarks (Table 4.5) also takes no account of earlier losses, and this factor presents a particularly difficult exercise in quantification. There is likely to have been significant unrecorded destruction taking place on the lands associated with the old Orkney townships and in their immediate vicinity (Sections 4.2.2 & 4.2.4). For example no surface traces remain and there was no local knowledge of the broch shown 100m to the south east of Skaill House on Figure 4.26, which was discovered by geophysical survey (OCGU 2008; Ovenden et al 2009, 126, fig. 2). This broch may well have served as a convenient stone quarry during the early seventeenth century, when several wings of the present Skaill House were constructed, or possibly earlier: Skaill House is on the site of a twelfth/thirteenth century Norse cemetery (James 1999) which was presumably associated with a nearby settlement.

As noted (Section 4.6.3) the Orkney Barrows Survey found that 147 previously recorded barrows had been destroyed in the 30 years between the 1960s – 1990s (Downes 1997a, 5-6 & 2005, 46). Between 1967 and 1995 a total of 5,715ha of land were improved in Orkney (Table 4.1); i.e. in the intervening 30 years one barrow was destroyed on average for every 39ha of land improved. The first record of Orkney sites comes from the surveys for the 1st edition OS maps of 1882 (Section 3.6), when these maps were produced approximately 44,757ha of land (Table 4.1) had already been improved in Orkney (Table 4.3). Assuming the same ratio of destroyed barrows per hectare of improved land (1/39ha) suggests that 1,148 barrows

were destroyed in the pre-1882 wave of improvement, which, added to the around 728 recorded from 1882 onwards, gives an Orkney estimated total of at least 1,876 barrows. The quantification of historic site destruction will be discussed in more detail in Chapter 5, in a consideration of archaeological survival throughout Orkney.

This history of archaeological destruction highlights the pitfalls of making assumptions about modern archaeological distributions without a thorough understanding of the formation processes of the archaeological record. Recognition of the impact of these processes however enhances our understanding of the nature of the archaeological and historic Orcadian environment.

Chapter 5 Archaeological survival in an improved landscape

5.1 Introduction

Most of the economically and agriculturally viable land in Orkney (around 65% of Orkney's landmass) has been subject to agricultural improvement (Table 4.3). This development of Orkney's modern agricultural landscape has been extremely destructive of archaeological remains (Chapter 4). This chapter builds on the evidence set out in Chapters 3 and 4, to highlight that Orkney's surviving archaeological distributions cannot be understood in isolation but must be set against its formation processes. Differing practices or underlying reasons must be considered in each area or island of Orkney for any real comprehension of biases, random or systematic differences between original, recorded and surviving archaeological evidence. Areas where Bronze Age sites may survive are examined below to illustrate this theme: these include upland areas now largely covered by blanket peat; coastal margins; small islands and other areas abandoned in the historic period and areas that are marginal for agriculture, hence remaining largely unimproved. Relict landscapes[85] are identified and the implications of surviving Bronze Age site densities in these areas considered in relationship to the rest of Orkney.

5.2 Upland/blanket peat areas

The majority of the unimproved land in Orkney lies in the upland zone, where blanket peat has developed from the mid/late 2nd millennium BC onwards (Section 2.2.2). Evidence for both Neolithic and Early/Middle Bronze Age settlement and land use in these areas will consequently largely

[85] 'Relict landscapes' is generally employed as a shorthand 'for the easy visibility and a particular limited form of survival of some types of archaeological data' (Fairclough 2011, 134); in this thesis the term is used in a similar shorthand sense to indicate areas where there is survival of a range of Bronze Age sites (both domestic and non-domestic) in a defined area of marginal/unimproved land.

remain invisible under peat of varying thickness (e.g. Whaness Burn: Lamb 1996; Section 7.12.2; sub-peat dykes: Sharman 2007c; Section 8.4.1). Remains exposed during peat cutting are only periodically mentioned in historic accounts and none of these were recorded in detail (e.g. Thomas 1852; Spence 1915); they are likely now to be obscured by re-growth of heather and peat.

There are no comprehensive palaeoclimatic reconstructions for Bronze Age Orkney (Section 2.2.3) and the upper altitude limit of Bronze Age (or indeed Neolithic) settlement is unknown. Modern arable cultivation and good-quality improved grassland is limited to the lowland zone below c.50m OD; the upper limit for agriculture (in terms of land improved for grazing) lies between c.75 – 100m OD, although due to Orkney's hyper-oceanic climate much of this land is inherently marginal and can very easily revert to bog (Berry 2000, 54). Post-medieval settlement concentrated in the lowland zone (e.g. Mackenzie 1750; Table 4.3) but gradually expanded in the nineteenth century and today most settlement sites still lie below 75m OD[86]. The highest known Orcadian Neolithic settlement, at Stonehall Knoll, is situated in the modern upland zone at 65m OD, albeit in a very sheltered location (Richards, Brophy et al 2016), whilst that at Smerquoy, St Ola, which had evidence of Early Bronze Age settlement (Gee et al 2016; Section 7.3.5) lies at 47m OD. Both sites are outside the area of early post-medieval settlement and were improved in the period between 1882 and 1902, as shown on the 1st and 2nd edition OS maps.

The enclosures and prehistoric house surviving under a shallow covering of peat at Peerie Hill, Sandwick (HY21NW60; Moore 2013, 97-9 & 150-5) however, lie on a comparatively exposed hilltop at 68m OD, 1.4km inland on the Atlantic coast[87]. The enclosures consist of large orthostats and smaller stones set in a low bank (ibid, 150-5), not dissimilar to some of the sub-peat dykes and enclosures known from elsewhere in Orkney and tentatively

[86] As shown on the Ordnance Survey 1:25,000 Explorer maps of Orkney.

[87] Site no. 28, Figure 9.17.

suggested to be of Bronze Age date (Section 8.4.1). Geophysical survey revealed a 16m external diameter roundhouse with stone-faced but midden-cored walls, which Moore (ibid) suggests may be a Late Bronze Age –Early Iron Age roundhouse; there may be a palimpsest of earlier structures on the same site.

The chronology of peat formation at Peerie Hill is unknown, but nearby environmental sampling sites may provide chronological clues. Land suitable for rough grazing was superseded by blanket peat formation at some sites in the West Mainland in the mid-late 2nd millennium cal BC and at others (in both the West Mainland and Hoy) in the late 2nd/early 1st millennium cal BC (Farrell 2009, 214 & 295-9; Keatinge & Dickson 1979; Section 2.2.2). The barrow at Mousland, Stromness lies 2km to the south of Peerie Hill, 1.2km inland at an elevation of 90m OD (Downes 1994a). Immediately prior to the construction of the barrow c.1951 – 1456 cal BC the soil consisted of acidic peaty humus, and the environment around the site was open heathland, primarily heather, interspersed with areas of grassland. Evidence for the burning off of vegetation (ibid, 147-50) is suggestive of rough grazing with periodic burning to control the growth of heather, as was observed at other Orkney sites of a similar date (e.g. Farrell 2009, 214; Keatinge & Dickson 1979; Section 2.2.2). Based on environmental similarities to other marginal Orkney sites, it appears likely that the Peerie Hill site became untenable for occupation towards the end of the 2nd/start of the 1st millennium BC, suggesting that the settlement itself may tentatively be assigned to the Middle/Late Bronze Age rather than the Early Iron Age.

The site at Peerie Hill illustrates the potential for Bronze Age settlement sites to survive in upland areas obscured by blanket peat. Further support for this premise comes from the possible Bronze Age settlement site exposed by peat cutting, associated with a burnt mound[88] and sub-peat dykes at Overbist,

[88] Burnt mounds in the Northern Isles are specialist buildings which are demonstrably Bronze Age; the dating evidence in support of this, their function, structural forms, implications for Bronze Age settlement patterns and their relationship with other Bronze Age sites, is discussed in Chapter 9. For the purposes of this chapter the presence of a burnt mound is taken as an indication of Bronze Age activity in the area under discussion.

Birsay, at an elevation of c.95 – 100m OD (Spence 1915; Section 8.4). Whilst it is clear that areas obscured by blanket peat have the potential for archaeological survival (e.g. Hobbister: Sharman 2007c), this potential will largely remain hidden: large-scale peat cutting no longer takes place in Orkney (personal observation), and in the absence of grant-aided schemes (Section 4.6.3) improvement of very marginal land is no longer financially viable.

5.3 Coastal margins

Coastal areas on the margins of the developed landscape may also provide limited areas of archaeological survival. Land on the coast is subject to salt spray and is more exposed than inland areas at equivalent height. As the coastline has receded due to erosion, historic settlement sites have often migrated further inland, leaving shoreline sites relatively undisturbed (e.g. along the Evie coast, where major farms of this district are set back from now-coastal eroding brochs (Figure 5.1), some of which may incorporate Bronze Age components: Section 7.15). A fenced margin is now usually left at the seaward edge to allow for further coastal erosion to take place without necessitating unduly frequent replacement of the field boundaries. This has created coastal strips where archaeological remains persist preferentially because of less intensive contemporary land use (e.g. Moore & Wilson 1997a & 1999a). At Cantick Head, South Walls for example, an array of Bronze Age sites survives in the coastal strip (Figure 5.2), including two double houses[89], barrows and a burnt mound. Similar survival is seen in the Westness area of Rousay, where prehistoric settlement and funerary sites survive on the coastal edge of an otherwise intensively improved area (Section 5.6). The unimproved coastal margin may be wide and can incorporate the more exposed headlands, leading to pockets of survival adjacent to intensively improved landscapes. In South Ronaldsay for example only around 7% of land (c.3.12km^2) is unimproved (Table 4.3) but this includes a small headland

[89] The double house is a distinctive Bronze Age form in the Northern Isles and is fully discussed in Sections 7.4 – 7.8.

in the southern tip of the island (Figure 4.17c). Survey here has identified 150 sites of archaeological interest in an area of c.60ha, including prehistoric settlement sites, field systems and earthworks, although none of these sites can be assigned to period (Hedges & Constantine 2011; Lillie et al 2010).

5.4 Small islands

Many of the smaller islands in Orkney are either no longer, or sparsely, inhabited (Section 2.1), and their potential for archaeological survival may be illustrated by three examples: Eynhallow, Auskerry and Linga Holm[90] (Figure 1.2). Eynhallow, an island with an area of around 62ha, has been uninhabited since 1851, when four crofting families, whose homes had been adapted from the remains of a twelfth-century monastery, were evicted to make way for sheep (Mooney 1923, 11). Since then the island has been used for rough grazing, leaving it as an unimproved landscape, with the exception of the infield around the monastery, which has since reverted to heath. The north east corner of the island has a relict landscape with two probable prehistoric settlement sites, a burnt mound, kerb cairns and a number of indeterminate mounds (Figure 5.3). A Bronze Age presence in Eynhallow is indicated by the funerary sites and burnt mound, suggesting that one if not both of the identified prehistoric settlement sites may also be of Bronze Age date. One of the settlement sites, Monkerhouse (HY32NE28), was the subject of a short excavation in the 1920s, which revealed a circular structure with an apparent hearth; but no diagnostic artefacts were recovered (ibid, 30-32; RCAMS 1946, vol. II, no. 614, 234). The subsequent occupation of the extant Norse monastery in Eynhallow by the crofters may have helped facilitate survival here[91] (cf. Section 4.4.6).

[90] These islands were chosen since they are the only small islands that each has at least two out of the three Bronze Age site types recorded: settlements, burnt mounds and barrows/cists. Other small uninhabited islands have only one type recorded e.g. Copinsay has a burnt mound (Figure 9.18); Cava and Fara have funerary sites (Figure 9.19); the Holm of Faray has a double house (Figure 9.20).

[91] The initial construction of the monastery of course required a source of stone; it may have arrived by boat as ready-dressed stone, or possibly the monastery was itself sited on a prehistoric site.

The similar sized (around 72ha) island of Auskerry lies in an exposed location on the eastern fringes of Orkney (Figure 1.2). It is a largely unimproved island, although the density of known sites suggests that it was well-occupied in prehistory (Figure 5.4). Historic settlement has been largely absent but there is evidence of early Christian activity in a chapel site, which may overlie earlier settlement (HY61NE1; Lamb 1984, 34, no. 194; Figure 5.4, no. 5); there are no records pertaining to its use. Auskerry is mentioned in the 1595 Rental (Peterkin 1820, 87), when the island was uninhabited but used for grazing; this was also its use in the eighteenth century (Anderson 1927, 297). Historic settlement began in 1867, when the newly built lighthouse was manned (Lamb 1984, 34, no. 194), the 1st edition OS map shows cultivation limited to c.0.36ha adjacent to the lighthouse; on its automation in 1961 the island was again abandoned until reoccupation in 1981 by a crofting family who use the island as rough grazing for sheep[92]. This unusual history has facilitated the high density of surviving archaeological sites (Figure 5.4). Bronze Age occupation can be demonstrated by the presence of a burnt mound and a double house, whilst a substantial prehistoric, possibly Pictish, settlement site 60m to the southwest of the chapel (ibid, no. 191) may indicate a high-status settlement, with possibly earlier origins (Section 7.15). The remaining nine probably prehistoric settlement sites cannot be assigned to period, but two of them lie within 120 – 180m of the burnt mound. No potential Bronze Age barrows were identified in Auskerry, but this does not preclude Bronze Age funerary activity: cists dug into the old ground surface (e.g. Greig 1931; Section 4.5.2; Figure 4.10) would not, in the absence of agricultural improvement, have been disturbed by later activity, hence would remain unrecorded.

Linga Holm, an island of around 62ha (Figure 1.2), is very similar in character to Auskerry; it too is an almost totally unimproved island with little occupation during the historic period, but with a high density of prehistoric sites (Figure 5.5). From at least 1595 to the end of the eighteenth century Linga Holm was uninhabited and used for seasonal grazing (Anderson 1927,

[92] http://isleofauskerry.com/

297; Peterkin 1820, 87); by 1841 a single family was in residence but only 'a small portion is under cultivation' (Rintoul 1845, 157) and the island had been abandoned by the time of the survey for the 1882 1st edition OS maps. Bronze Age settlement and funerary activity can be demonstrated by the presence of a double house and a probable Bronze Age oval house[93] (Figure 5.5), together with a barrow containing a cist, which had already been emptied without record when noted by the RCAMS (1946, vol. II, 335-6, no. 993). Other prehistoric settlements include a roundhouse[94], and a substantial, possibly Pictish, house, which Lamb (1984, 37, no. 213) compared to that recorded in Auskerry (ibid, 34, no. 191), together with a further prehistoric settlement site and several indeterminate mounds. The OSA records the presence of 'an old chapel in ruins' in Linga Holm (Anderson 1927; 319) but this cannot now be located (Lamb 1984, 37, no. 217).

Eynhallow, Auskerry and Linga Holm are primarily suited to rough grazing rather than arable cultivation; this is also the case at Whaness Burn, Hoy, a similarly marginal landscape exploited for grazing in the 2nd millennium cal BC (Lamb 1996; Section 7.12.2). The occupation of such landscape components in the Bronze Age might tentatively be linked to an increasing importance of sheep husbandry in this period (Section 8.2). The density of undisturbed prehistoric sites in these three small islands hints at the level of likely destruction in those other areas of Orkney more favourable to subsequent historic (and presumably prehistoric) settlement.

5.5 The relict landscapes of Sanday's headlands

Sanday is a low-lying island[95] differentiated from other areas of Orkney by both the absence of peat deposits and the presence of large areas of

[93] Oval houses may be Bronze Age by analogy with examples known from Shetland, discussed in Section 7.8.2.

[94] Which does not preclude a Bronze Age date (e.g. Tofts Ness, Sanday: Dockrill 2007c; Section 7.9).

[95] Most of Sanday lies below 25m OD and rises to a maximum of 65m OD in the south western peninsula (OS 1:25,000 Explorer Series Sheet 465).

windblown sand (Appendix 5, Figure A5.10). Sanday is the second most cultivated area in Orkney, with only 6% of land unimproved; 84% of the island was improved before 1882 (Table 4.3; Figure 4.20b); such early improvement usually contraindicates survival and hence the reporting of archaeological features (e.g. Section 4.8.3). The least favourable areas of Sanday for modern agriculture are the coastal peninsulas, partly due to their more exposed positions but also because of the accumulation of significant depths of windblown sand that protects underlying archaeological deposits (Figure 5.6). None of the peninsulas discussed here – Tofts Ness, Els Ness, Tres Ness and Spurness – were enclosed within the hill-dykes that defined the intensively-used land shown on Mackenzie's (1750) charts (Figure 4.20a)

5.5.1 Tofts Ness

The Tofts Ness peninsula extends to c.1.5km² of low-lying machair, with rough grazing at the northern end; the southern part contains the focus of historic settlement (Dockrill 2007a). An undisturbed archaeological landscape was revealed here in 1818:

> *The sand has lately blown away to the depth of nearly 20 feet* [6m][96]*, and has discovered the remains of buildings of a remote antiquity, inclosed by stone walls nearly half a mile in extent; some of the houses are very large, and roofed with stones of a prodigious size. There are circular tumuli, each containing three graves, none of which are more than four feet six inches in length* (Anon 1818, 271-2).

A subsequent account confirms the density of archaeological remains in the peninsula, and describes probable Bronze Age cists (Section 6.1.2) and kerb cairns:

> *The greater part of the Ness has been enclosed with a chain of forts, which were connected by a stone-wall. Within this wall, the ground has been covered with buildings of various sizes: circles of stone set on edge, with frequently an upright central stone, are still to be seen, and numerous graves lined with flat stones, and also surrounded by*

[96] Comparable erosion has occurred at the Links of Noltland in Westray (Moore & Wilson 2011a; Section 7.6.3) and Cata Sand, Sanday (Cummings et al 2016; Section 5.5.3).

> *small circles of stones … some of them contain human bones, others contain only ashes* (Traill 1845, 136).

Although the landscape that survives today at the Tofts Ness peninsula represents a fraction of that originally revealed in 1818, archaeological survival here remains impressive, consisting of nine large mounds and around three hundred smaller mounds, with dykes, banks and enclosures, the majority of which appear to be prehistoric, including settlements and chambered tombs (Dockrill 2007a, 1-7; Dockrill, Gater & Simpson 2007, 128-31; Stevenson 1980; Figures 5.7 & 5.8).

Mound 11 was the subject of excavation and proved to be a multi-period settlement site, with continuity of occupation from the Neolithic to the Early Iron Age (Dockrill, Bond et al 2007; Section 7.3.5). Mound 8, Shelly Knowe, is a Bronze Age double house and adjacent burnt mound, both of which are easily identifiable from surface traces; however associated settlement elements have been revealed by geophysical survey including a roundhouse around 27m to the north west of the double house, and an infield area of anthropogenic soils (Dockrill, Gater & Simpson 2007, 120-6; Figures 5.9 & 5.10). The Tofts Ness peninsula was nonetheless always marginal for settlement or agriculture and required significant continuing efforts to maintain the fertility of the soils (Dockrill 2007d; Section 8.2). A selection of other major monuments on the south of the peninsula (Figure 5.8) were investigated using walkover survey, geophysical survey, test pitting and soil analyses (Dockrill, Gater & Simpson 2007); the results are summarised in Table 5.1.

Table 5.1 Summary of mounds in the southern end of the Tofts Ness peninsula (Dockrill, Gater & Simpson 2007); shown in Figure 5.8	
Mound Number	**Description**
6	Funerary site/prehistoric settlement?
7	Prehistoric settlement
8	Shelly Knowe: burnt mound, double house, roundhouse
11	Excavated: multi-period settlement
20	Prehistoric settlement
21	Prehistoric settlement
22	Funerary/prehistoric settlement?
23	Prehistoric settlement
24	Burnt mound

Test pits were excavated into the anthropogenic soils associated with the infield area around the double house and roundhouse at Shelly Knowe (Areas X and Y, Figure 5.8) and radiocarbon dates obtained from both the bottom and the top of the enhanced soils; in each case the upper layers of the profiles consisted of windblown sand (Ambers 2007; ibid; Simpson, Dockrill, Bull et al 1998). In Area X, dates of 1980 – 1520 cal BC, and in Area Y dates of 1740 – 1520 cal BC and 1220 – 920 cal BC (ibid) show that anthropogenic soil formation associated with the double house began in the early-mid 2nd millennium cal BC. Enhanced magnetic responses around the fringes of Mounds 6 and 22, but a magnetically quiet core, suggested that these substantial mounds may have been chambered tombs that acted as foci for later settlement (Dockrill, Gater & Simpson 2007, 128-9 & 138). The four further prehistoric settlement sites identified included two set 65 – 120m from the burnt mound (Mound 24; Figure 5.8).Without excavation, most of the boundary features on the Tofts Ness peninsula cannot be assigned to period, although surface traces indicate some time depth to their construction (Dockrill 2007a, 6) whilst some overlie mounds thought to be chambered tombs (e.g. Mounds 2 and 3: Stevenson 1980; Figure 5.7) thus supporting a post-Neolithic date. Some of the banks (e.g. Bank 'B' west of Mound 7, Figure 5.7) have the box-like orthostatic construction seen in the

sub-peat dykes of Eday[97] (Dockrill 2007a, 6), which may be Bronze Age (Section 8.4.1). South of the excavated settlement site at Mound 11 a possible treb dyke survived, attributed to the Bronze Age (Lamb 1983a) but possibly Iron Age, as discussed in Section 8.5.1, especially since Mound 11 included Early Iron Age settlement components (Dockrill 2007c).

5.5.2 Els Ness

A comparable landscape to that at Tofts Ness was recorded on the Els Ness peninsula (Figure 5.6), with a similar arrangement of cairns and dykes:

> *… from Augmund's Howe, there may be traced the remains of a wall thickly studded with circular forts … enclosing fully a third of the whole Ness. … The enclosed space is literally covered with tumuli and heaps of ruins … these tumuli … contained burned stones, ashes, bones and sea shells. In some of them, were graves lined with flat stones. Throughout the Ness, there are several circles of stones, with, for the most part, a central stone also set on edge. None of these stones are more than two feet above the ground … all the circles measured nearly the same in circumference, about 36 feet* [11 metres] (Traill 1845, 136-7).

Much of this landscape was destroyed by agricultural improvement in the 1750 – 1882 period (Figure 4.20b) and no finds were reported, but one chambered tomb (Quoyness: Childe 1952), a possible tomb (Augmund Howe: HY63NE3) and around 37 barrows (Downes 1998e; HY63NE5 & HY63NE6) survive in the unimproved portion of the Els Ness peninsula (Figure 5.11). One double cist containing a flexed inhumation has been partially excavated (HY63NE 5), confirming the identification of some of the 'tumuli' as probable Bronze Age funerary sites[98]. Circles of stones with a central stone setting were also found at Tofts Ness, and four further examples somewhere near Kettletoft (Figure 5.6). By comparison with the Late Bronze Age example excavated at Tofts Ness (Dockrill 2007c, 46-8; Section 7.9) these may tentatively be identified as the remnants of roundhouses with stone facings to a turf-cored wall, the central stone representing the hearth. Traill (1845, 136)

[97] This construction method is also seen at Skirmie Clett in Wyre (Section 8.4).

[98] This is further supported by the large amount of cramp in this area: see Section 3.4.2

distinguished between tumuli with burials and those containing 'burned stones, ashes, bones and sea shells', which suggests midden deposits indicative of further settlement rather than funerary sites; some may have been burnt mounds.

5.5.3 Cata Sand and Tres Ness

The Tres Ness peninsula (Figure 5.6) was improved between 1750 – 1882 with no reported archaeological finds at this time (Figure 4.20c), although there are several surviving prehistoric sites including a chambered tomb and a broch on the fringes of the cultivated area (Figure 5.12). Tres Ness, in common with Els Ness, is connected to the rest of Sanday by a dune system, adjacent to a tidal bay known as Cata Sand. Deflation of the dunes revealed fourteen possible Bronze Age houses distributed along gravel banks and in the intertidal zone (Cummings et al 2016; Towrie 2015; Figure 5.12). These houses presented as circular stone spreads with dense scatters of coarse stone tools, including ard points and stone mattocks[99], along c.1km of coastline (ibid). Geophysical survey around a concentration of structural remains at Grithies Dune (Figure 5.12) indicated a further settlement focus of c.400m^2. Excavation exposed structural elements including hearths, drains and orthostats, with an artefact assemblage indicative of Bronze Age date (Cummings et al 2016).

The settlement at Cata Sand cannot at present be more closely dated than a general attribution to the Bronze Age and, due to the severity of erosion, little can be said about the structural forms present there. The apparently dispersed nature of the settlement may possibly be an artefact of differential survival, but it parallels that seen at the Links of Noltland (Section 7.6.3). A Late Bronze Age date for the abandonment of the Cata Sand settlement seems likely, based on the later dune formation: the dune system just to the north, at the Bay of Lopness (Figure 5.6), developed in the late 2nd/early 1st millennia cal BC (Sommerville et al 2007). It is notable that abandonment of

[99] Indicative of a Bronze Age date: cf. Clarke 2006, 124-6 & 2007.

the site at Links of Noltland with subsequent dune formation was approximately synchronous (Hamlet 2014, 286-7, Moore & Wilson 2013; Hazel Moore pers. comm.).

Cata Sand joins a growing number of sites exposed by recent dune deflation in Orkney. It is increasingly obvious that Orkney's dune areas should be regarded as possessing high archaeological potential, perhaps especially for Bronze Age domestic remains that will have trapped sand, accentuating dune formation (e.g. the Links of Noltland, Westray: Section 7.6.3).

5.5.4 Spurness

The surviving elements of the c.100ha prehistoric landscape at Spurness in the southern tip of Sanday (Figure 5.6) suggest a similar original density to that seen at aforementioned headlands. By 1882 the process of improvement had begun in the southern half of the peninsula (Figure 4.20b). The remainder of the peninsula was subsequently fenced and improvement commenced (Figure 4.20c), but this had been allowed to lapse into heathland by 1974, enabling a number of sites to survive there (Figure 5.13). These include one possible and three definite prehistoric settlements, two of which lie within 140m of a burnt mound (Hunter & Dockrill 1991, 28-9; Nichol 2012) together with a kerb cairn and a treb dyke (Section 8.5). Only the funerary site has been excavated, and dates to the early/mid 2nd millennium cal BC (Sharman 2007a). Prehistoric settlement is proven at three sites but is undated (Hunter & Dockrill 1991, 28-9; Nichol 2012); in the presence of other Bronze Age landscape components it seems reasonable to assume that at least one of the nearby settlements was Bronze Age in date.

5.6 Quandale and Westness, Rousay: contrasting survival

The extant pre-improvement landscape of Quandale presents a contrast in archaeological survival to the neighbouring heavily improved Westness area (Figure 5.14). The c.300ha of the Quandale area was within the Westside hill-dyke, and can be seen to be so on Mackenzie's 1750 chart (Figure 5.15). In

1845 all the Quandale crofts, and some of the Westness holdings, were cleared of their tenants and the whole area merged to form Westness Farm; the remaining tenants were cleared between 1848 and 1859 (Thomson 1981b, 46-9). Inner and Outer Westness contained the best quality land, and were laid out into large squared fields, divided by drystone dykes, which are strikingly obvious on the 1882 1st edition OS map (Figure 5.16). In Quandale, drainage was improved by the construction of 45 miles (72km) of open ditches and the land was enclosed by six miles (10km) of stone dykes (ibid, 48); this land was not further improved but used only as rough grazing, whilst the infield land around the empty crofts (still visible in 1882: Figure 5.16) was allowed to revert to heath.

This combination of rough grazing and highly improved land has created an interesting example of differential archaeological survival. The recorded archaeological sites in the Quandale zone are shown in Figure 5.17 and those in the Westness area in Figure 5.18. The contrast is striking: Quandale has large numbers of burnt mounds and barrows scattered throughout the district; in Westness, sites survive only along the coastal strip and on the unimproved heathland at higher altitude above the improved areas. No archaeological finds were reported from the Quandale/Westness area before or during the clearances. In Westness, apart from the coastal strip, the only known archaeological finds are flint scrapers, leaf arrowheads and a stone axe found in the field above Midhowe Broch in the 1930s (Anon 1935, 438; 1936, 359; 1938, 9). By the time of the 1st edition OS maps, the lands of Quandale had been uninhabited for nearly forty years and consequently the ONB of 1880 contain little witness information about the area, with only four tumuli marked and without further details[100]. In Westness there was effectively nothing archaeological left for the OS surveyors to map outside the coastal strip. Westness provides an example of early and total improvement, reminiscent of the total archaeological destruction seen in lands around

[100] These ONB 1880 entries are the burnt mounds of Knowe of Dale: OS1/23/16/23 (HY33SE15); Lower Quandale: OS1/23/16/32 (HY33SE27); Quoyalonga Ness: OS1/23/16/17 (HY33SE5) and the barrow at Upper Quandale: OS1/23/16/31 (HY33SE21).

Binscarth, Firth (Section 4.4.4). A further factor influencing archaeological survival is coastal erosion: the majority of the Westness sites (Figure 5.18) are actively eroding, with broch towers now sectioned by the sea (e.g. South Howe: Dockrill et al 2010), demonstrating considerable erosion here since the Iron Age. Any sites that were closer to the shore in the Bronze Age will have already been destroyed.

Quandale's relict landscape exhibits burnt mounds and barrows, interspersed with the ruins of nineteenth-century crofts, but prehistoric settlement sites are notably absent here (Figure 5.17). The neighbouring island of Eynhallow (Section 5.4) was cleared at the same period, and the cultivated land allowed to revert to heath in the same way, yet in Eynhallow, in addition to the burnt mound, kerb cairns and indeterminate mounds, two prehistoric settlement sites are known (Figure 5.3). Similarly in other areas discussed in this chapter, e.g. the Tofts Ness (Section 5.5.1; Figure 5.8) and Spurness (Section 5.5.4; Figure 5.13) peninsulas in Sanday, the well-preserved relict landscapes include burnt mounds, barrows and prehistoric settlement sites, some of which have been proven to be Bronze Age in date (e.g. Mound 11, Tofts Ness: Dockrill 2007b & c; Sections 7.3.5 & 7.9).

The crucial difference here may be the historic settlement pattern: none of the Sanday peninsulas are a focus for historic settlement, whilst in Eynhallow the twelfth-century monastery was occupied as a farm into the historic period; recycling of stone from prehistoric structures for building purposes, common elsewhere (Section 4.4.6), was unnecessary in these areas such that earlier settlement sites were not quarried for building stone. Contrastingly, in Quandale, it may be suggested that some at least of the nineteen crofts in the area (Figure 5.17) were built using stone reused from convenient prehistoric settlement sites. Many of these crofts were in their turn demolished and their fabric employed to construct some of the 10km of new stone dykes[101] erected after the Quandale clearances (Thomson 1981b, 48), any remnant prehistoric structures may have been finally destroyed for their stone during this period.

[101] A major undertaking, requiring around 10,000 tonnes of stone (Section 4.4.6).

Tentative support for this theory comes from the place-name evidence, particularly in the case of the house of Tafts, at the north end of Quandale. 'Tafts' is a corruption of ON *topt,* house-site*,* a common place-name element in Orkney, 'usually, if not always, found applied to a site where there are traces of prehistoric building' (Marwick 1952, 16). Tafts appears to have been the first historic settlement in Quandale[102], suggesting that it occupied the best land most likely associated with any prehistoric settlement site (Sections 7.1 & 7.15).

5.7 Extrapolations based on relict landscapes

There are thus pockets of archaeological survival in Orkney, despite the scale of agricultural improvement (Table 4.3). It is clear (Section 4.9) that the archaeological record is a poor reflection of original prehistoric site density. Extrapolating past site densities from current distributions has not been attempted for any class of sites of the Orcadian Bronze Age; or for other prehistoric sites in Orkney apart from chambered tombs (e.g. Childe 1942; Davidson & Henshall 1989, 14-15; Fraser 1983; Renfrew 1973, 132-7). Any attempt at reconstructing past settlement densities across Orkney based on the survival patterns discussed in Sections 5.2 – 5.6 can only be speculative; few of the relict landscapes have the full range of common prehistoric site types, as is shown in Table 5.2 below.

[102] First recorded in 1601 but stylistically argued to be considerably older (Clouston 1924, 12-14), Tafts was the most substantial dwelling in Quandale (hence its appearance on Mackenzie's (1750) chart as a navigational aid).

Table 5.2 Types of sites in each of the relict landscapes discussed above, together with cultivation status in 1750, 1882 and today.									
	Inside hill-dykes i.e. subject to cultivation in 1750	**Improved or under cultivation in 1882**	**Improved or in cultivation today**	**Barrows**	**Burnt mounds**	**Bronze Age settlement**	**Brochs**	**Other Prehistoric settlement**	**Chambered tombs**
Cantick Head	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Eynhallow	Yes[103]	No	No	Yes	Yes	Probably	No	Yes	No
Auskerry	No	No[104] (majority)	No[105] (majority)	No	Yes	Yes	No	Yes	No
Linga Holm	No	No	No	Yes	No	Yes	No	Yes	No
Tofts Ness[106]	No	No	Rough grazing	Destroyed	Yes	Yes	No	Yes	Destroyed
Els Ness	No	Yes (majority)	Yes (majority)	Yes	No	No	No	No	Yes
Tres Ness & Cata Sand	No	Yes	Yes	No	No	Yes	Yes	No	Yes
Spurness	No	Yes for c.50%	No	Yes	Yes	Probably	No	Yes	No
Quandale	Yes	No	No	Yes	Yes	No	No	No	No

[103] Eynhallow had 25 inhabitants in the late eighteenth century (Leslie 1927, 243) and probably had about the same in 1750, but did not have a hill-dyke.

[104] The lighthouse keepers were in residence by 1882 (Section 5.4).

[105] Most of the island is unimproved rough grazing (Section 5.4).

[106] Antiquarian accounts describe an extensive Bronze Age and Neolithic funerary landscape at Tofts Ness (Section 5.5.1).

Table 5.3 below shows the density of prehistoric settlement sites, definite/probable Bronze Age settlement sites[107], barrows and burnt mounds in the relict landscapes discussed in Sections 5.3 – 5.5. These figures are expressed as a ratio of sites to hectares, which is then extrapolated to the whole of Orkney, based on the 51,518ha of improved land recorded in Orkney in 1995 (Table 4.1). Few sites in these landscapes are closely datable. The extrapolations in Table 5.3 therefore unavoidably treat 'the Bronze Age' as a unitary period.

As can be seen from the calculations in columns E – F, there are considerable variations in numbers across Orkney when extrapolated from different relict landscapes. Row (8) of Table 5.3 indicates the overall mean numbers of sites extrapolated from all the relict areas, whilst rows (9) and (10) attempt to allow for possible distortions by removing areas potentially introducing skewing factors: row (9) excludes Quandale, since there are no settlements sites here but large numbers of surviving burnt mounds and barrows. Row (10) presents the mean numbers of sites based on Cantick Head, Eynhallow and Spurness, the only areas where all three Bronze Age site-types – definite/probable settlements, burnt mounds and barrows – are present. It is impossible to confirm which, if any, of these extrapolations gives the most accurate prediction of the number of sites that have been lost, but the averages presented in row (10) may be the closest acceptable approximation.

[107] Assuming that the presence of burnt mounds and barrows in both Eynhallow and Spurness implies that at least one of the prehistoric settlement sites is these two areas is also Bronze Age. 'Settlement site' is used as a generic term to indicate a site with at least one probable Bronze Age/prehistoric house; this term is used rather than 'house' since some of the sites in the relict landscapes and elsewhere are known to be multi-period and/or more extensive e.g. Tofts Ness (Dockrill, Bond et al 2007) or Wasbister, Stenness (Section 4.2.4; Figure 4.3) where the double house is the visible element of a settlement complex covering 5ha, of which no surface traces remain. In the relict landscapes discussed here and in subsequent chapters each discrete mound with evidence of domestic activity (see Section 7.1) is treated as a separate settlement. Similarly the term 'prehistoric settlement' excludes brochs (only present at Cantick Head).

Table 5.3 Estimated original numbers of prehistoric and Bronze Age settlements, barrows and burnt mounds in Orkney, calculated from the numbers of surviving sites in relict landscapes, extrapolated to the 1995 total of 51,518ha of improved land in Orkney. N.B. 'Prehistoric settlements' excludes brochs, present only at Cantick Head.

		Number of recorded sites and ratio/ha of sites in each area				Extrapolated total numbers across Orkney from the ratios in columns A - D			
Location used as basis for extrapolation	**Area (ha)**	**A: Identified or probable barrows**	**B: Burnt mounds**	**C: Total number of prehistoric settlement sites**	**D: Number of those in column C definitely or probably Bronze Age settlement sites**	**E: Barrows**	**F: Burnt mounds**	**G: Prehistoric settlement sites**	**H: No. of those in column G definitely or probably Bronze Age settlement sites**
(1) Cantick Head	60	4 (1/15ha)	1 (1/60ha)	2 (1/30ha)	2 (1/30ha)	3,434	857	1,717	1,717
(2) Eynhallow	62	2 (1/31ha)	1 (1/62ha)	2 (1/31ha)	1 (1/62ha)	1,662	831	1,662	831
(3) Auskerry	72	0	1 (1/72ha)	11 (1/7ha)	1 (1/72ha)	N/A	715	7,360	715
(4) Tofts Ness	150	Unknown	2 (1/75ha)	8 (1/18.75ha)	2 (1/75ha)	N/A	687	2,748	687
(5) Linga Holm	62	1 (1/62ha)	0	5 (1/12.5ha)	2 (1/31ha)	831	N/A	4,121	1,662
(6) Spurness	100	1 (1/100ha)	1 (1/100ha)	3 (1/33.33ha)	1(1/100ha)	515	515	1,547	515
(7) Quandale	300	23 (1/13ha)	10 (1/30ha)	0	0	3,963	1,717	N/A	N/A
(8) Average of 1 - 7	806	31 (1/26ha)	16 (1/50ha)	31 (1/26ha)	9 (1/90ha)	1,981	1,030	1981	572
(9) Average excluding no. 7	506	8 (1/63ha)	6 (1/84ha)	31 (1/16ha)	9 (1/56ha)	818	613	3,220	920
(10) Average of nos. 1, 2 & 6	222	7 (1/32ha)	3 (1/74ha)	7(1/32ha)	4 (1/56ha)	1,610	696	1,610	920

There are around 728 barrows, 297 burnt mounds and 28 probable Bronze Age settlement sites recorded in Orkney[108]. The figures from Table 5.3, row (10) suggest that of the order of 45% of barrows (728/1,610), 43% of burnt mounds (297/696) and 3% of Bronze Age settlements (28/920) once extant have been recorded. Cantick Head is the area with the widest range of surviving prehistoric sites of those discussed, despite being the area most constantly in agricultural use (Table 5.2); if Cantick Head is representative of the general density pattern within Orkney, then 21% of barrows (728/3,434), 35% of burnt mounds (297/857) and 2% of Bronze Age settlement sites (28/1,717) have been recorded. These figures appear high, but sites here survive only on the coastal margin (Figure 5.2). Since Cantick Head is only 0.5km across at its widest point this may reflect the original site distribution.

Barrows and burnt mounds are site types that have been recorded in relatively large numbers; a recording bias towards barrows has its roots in the antiquarian interest shown in such sites (e.g. Clouston 1845, 55; Low 1776). The survivability of burnt mounds in an improved landscape has been noted, as has their ability to be recognised (due to the visibility of fire-cracked stones in a blackened soil matrix) even when ploughed out, resulting in their possible usefulness as indicators of past settlement patterns (Barber & Russell-White 1990a; Hunter 1991 & 1996a). This will be discussed in Sections 9.5 and 9.7 below.

A conservative figure of 1,876 for the original number of barrows in Orkney may be extrapolated from known figures for losses in the 1960s – 1990s (Section 4.9); this is consistent in terms of scale order with the calculated averages in Table 5.3, excluding Cantick Head (row 1) and Quandale (row 7).

Brochs appear to occupy the prime, historically settled land, with 92% (124/135) situated inside the 1750 hill-dykes, a figure which rises to 97% (117/119) if Sanday's brochs are excluded (Section 7.15; Table 7.7; cf. Roberts

[108] See Appendices 7, 8 and 12. Quantifying Orkney's (non-broch) prehistoric settlement sites is beyond the scope of this thesis; Canmore (05/06/17) lists 214 settlements and 523 mounds and cairns, some of which are funerary but some may be settlements.

1996, figs. 2.6 & 3.4). The current distribution of brochs across Orkney in relationship to the land inside the 1750 hill-dykes is shown in Table 5.4: their mean density is 1/220ha of land improved in 1750.

Table 5.4 Estimates of Orkney's broch distribution/ha in relation to the prime land (indicated by the areas enclosed by the 1750 hill-dykes: see Tables 4.3 and 7.7). Islands where no brochs are recorded (comprising Eday, Egilsay, Fara, Flotta, Graemsay and Wyre) are not included.

Island or Area	Land inside the 1750 hill-dykes (ha)	No. of recorded Brochs inside the hill-dykes
West Mainland	8,710	59 (1/148ha)
East Mainland	4,600	12 (1/383ha)
Hoy, N & S Walls	1,627	6 (1/271ha)
Burray	663	4 (1/166ha)
South Ronaldsay	1,911	4 (1/478ha)
Westray	2,160	7 (1/308ha)
Papa Westray	480	3 (1/160ha)
Sanday	1,767	9 (1/196ha)
North Ronaldsay	513	1 (1/513ha)
Shapinsay	1,349	5 (1/270ha)
Gairsay	114	1 (1/114ha)
Stronsay	2,139	5 (1/428ha)
Rousay	1,248	8 (1/152ha)
Orkney Total	**27,281ha**	**124 (1/220ha)**

These locations potentially include some important Bronze Age settlements, since some brochs at least may be multi-period sites with Bronze Age components or direct antecedents (e.g. St Boniface, Papa Westray: Lowe 1998; discussed in Section 7.15). Apart from Cantick Head, however, none of the relict landscapes considered above have recorded brochs within them, which probably reflects their marginality.

Cross-checking against Cantick Head's (the only example relict area that was inside the 1750 hill-dykes) single broch gives a density of 1/60ha, suggesting an Orkney total of 477 brochs by the methodology used here, compared to the total of 135 brochs currently recorded. Brochs were extensively quarried for their stone (e.g. Oxtro Broch, Birsay: Petrie 1874, 76-8; Section 4.4.6), and it

is known from geophysical survey that they can be removed without trace or a mention in the historical record (e.g. Skaill, Sandwick: OCGU 2008; St Peter's Bay, St Andrews: Ovenden 2006); similarly there are examples where a brief notice mentions their total destruction (e.g. the Knowe of Redland: ONB 1880, OS1/23/22/28; Section 3.6.2). The figure of one broch/60ha at Cantick Head is very high compared to the averages in Table 5.4, which range from 1/114ha to 1/513ha, with an average for Orkney as a whole of 1/220ha. Similarly Cantick Head is the only example of a relict landscape with definite chambered tombs, of which it has two, giving a ratio of 1/30ha.When extrapolated to the entire area of Orkney this gives an estimated total of 1,717 tombs, compared to the 89 known examples, again a high total (but see Table 4.4). This may imply an unknown bias affecting this class of monuments or area, and it is possible that this also affects the totals for Bronze Age sites.

If any set of average figures (rows 1 – 10 in Table 5.3) gives even a poor approximation to ancient reality, then it is clear that very large numbers of Bronze Age (and other prehistoric) settlement sites have been destroyed without record in Orkney.

5.8 Differential survival case study: Eday

5.8.1 Introduction

Eday is one of the smaller islands of Orkney (Figure 1.2), 13km long and 4km wide at the widest point, with a total area of 22.68 km^2 of which 13.65 km^2 (60%) is improved land (Table 4.3). Eday is low-lying, with approximately 70% of the island below 50m OD, with a maximum height of 90 – 100m OD in the south west[109]. Modern (and historic) settlement concentrates in the eastern areas of Eday, especially in the southeast.

Examining the archaeological record of the island of Eday, two features stand out: one is the absence of brochs, and the other is the comparatively low ratio

[109] OS 1:25,000 Explorer Series Sheet 465.

of four barrows to ten burnt mounds (Figure 5.19). Recorded barrows in Orkney (728) outnumber burnt mounds (297) by 246%; the Quandale relict landscape shows broadly these same proportions (Table 5.3, row 7): on this basis Eday should have around 25 recorded barrows. Similarly, based on the average ratio from Table 5.4, Eday is predicted to have at least two brochs.

A comparison may be made with Eday's western neighbour, Rousay, which has a total area of 42.24km², of which around 19.2km² (45%) is improved land[110]. Much of the interior of Rousay is upland, steeply sloping from the coastal strip to an elevation of 200 – 250m OD; approximately 65% of the island lies at an elevation above 50m OD[111]. To remove a possible source of bias, the 300ha relict landscape in Quandale, Rousay with its 23 barrows and 10 burnt mounds (Section 5.6) has been excluded from the calculations in Table 5.5 and the following discussion; Eday lacks comparable relict landscapes.

Although Eday is geographically almost half the size of Rousay, its improved land area is 84% of Rousay's; theoretically Eday might be expected to possess broadly 84% of Rousay's total sites of all types, but as Table 5.5, Columns G and H show, this is not the case: Eday has around 35% of the total expected sites compared with Rousay, and strikingly, although at 83% it achieves near proportional equivalence with Rousay's burnt mounds, it has only 17% of the expected barrows. Similarly when extrapolated totals for the islands are compared (Table 5.5, Columns E and F), Rousay and Eday's percentages of recorded burnt mounds are not dissimilar at 64% and 55% respectively of the predicted total, but the largest difference is in the number of barrows, with only 9% of the number predicted in Eday are actually recorded there compared to 59% in Rousay.

[110] This total includes the 300ha of Quandale, which was inside the 1750 hill-dyke and subject to drainage and dyke building but subsequently allowed to lapse into heath (Section 5.6).

[111] OS 1:25,000 Explorer Series Sheet 465.

Table 5.5 Comparison of recorded and estimated numbers of a selection of sites in Eday and Rousay (excluding both the 300ha of the Quandale relict landscape and the sites contained within). Excluding Quandale, the total improved land in Rousay = 1,620ha, of which 948ha was inside the 1750 hill-dykes; total improved land in Eday = 1,365ha, of which 483ha was inside the 1750 hill-dykes (Table 4.3). Eday has 84% of Rousay's total of improved land. See Appendices 7-12 and Lamb (1982) for site details.

	Recorded numbers of sites		Estimated original site numbers (from ratios in Table 5.3, row 10, based on total improved land; broch estimates from Table 5.4 based on land inside 1750 hill-dykes)		Percentage of estimated original sites recorded (A compared to C; B compared to D)		Predicted number of Eday sites based on 84% of Rousay total from column A	Percentage of sites recorded (in Column B) compared to predicted number from Column G
Site Type and ratio used (from Tables 5.3 and 5.4)	**A: Rousay**	**B: Eday**	**C: Rousay**	**D: Eday**	**E: Rousay**	**F: Eday**	**G: Eday**	**H: Eday**
(1) Burnt mounds (1/74ha)	**14**	**10**	22	18	64%	55%	12	83%
(2) Barrows (1/32ha)	**29**	**4**	51	43	57%	9%	24	17%
(3) Brochs (1/220ha)	**8**	**0**	4	2	200%	0%	7	0%
(4) Bronze Age settlements (1/56ha)	**0**	**0**	29	24	N/A	N/A	N/A	N/A
(5) Prehistoric settlements (1/32ha)	**7**	**3**	51	43	14%	7%	6	50%
(6) Total of rows 1 - 5	**58**	**17**	**153**	**130**	**38%**	**13%**	**49**	**35%**
(7) Chambered tombs (N/A)	**18**	**8**	N/A	N/A	N/A	N/A	15	53%

There is no obvious reason why Eday should possess (proportionally) 83% of the total of burnt mounds expected in comparison with those found in Rousay, but only 17% of the number of barrows. Similarly although Rousay has an above-average total of brochs (compared to what the analysis in Table 5.4 would predict), this does not explain the absence of brochs in Eday. Neither Rousay (apart from brochs) nor Eday has particularly good survival of prehistoric settlement sites (Table 5.5, row 6). Although each has an excavated Neolithic site (Rinyo, Rousay: Childe & Grant 1939 & 1947 and Green, Eday: Miles 2013), together with a reasonable surviving number of chambered tombs (18 in Rousay and 8 in Eday), suggesting significant Neolithic populations, neither has known Bronze Age settlements, which we assume must have existed, based on the presence of burnt mounds and barrows.

Early (pre-1882) improvement to the land here seems to militate against reporting of sites (Section 3.9) but both islands have a similar early history of improvement: 40.5% of land in Rousay and 47% of land in Eday was improved prior to 1882 (Table 4.3). The majority of land in Rousay with agricultural potential was already improved by 1882, reflected in the mere 4.5% improved after this date; in Eday a further 13% of land was improved post-1882, leaving a total of 60% of Eday and 45% of Rousay as improved land. If early improvement alone influenced the lack of archaeological records then Rousay should fare worse than Eday; this is not the case.

Eday provides a very good example of how many and varied factors influence both settlement patterns and archaeological site survival. For such a small island, it has a complicated history of earlier settlement and use, explored further below.

5.8.2 Solid geology

Eday is one of the few islands in Orkney where solid geology is important. As discussed (Section 2.1.2), Orkney's solid geology is comparatively simple, mostly composed of flagstone formed from lake bed silts, which makes

excellent building stone. Eday is geologically different; the Eday beds are a gritty sandstone, formed from alluvial and aeolian sand (Mykura 1976, 80-9; Figure 5.20). This type of stone would have been extremely hard to work in prehistory since it does not split easily but can only laboriously be shaped into building blocks. Eday has areas of Upper Stromness Flags (USF) in the south and west, which split readily along flat bedding planes and is the preferred vernacular building material. There is also some Eday Marl in the North West, with alternate beds of a sandy siltstone and a gritty sandstone, the former suitable (but not ideal) for building use. Easily worked building stone is thus of limited availability in Eday and has therefore always been at a premium.

It is noticeable that the major areas of the early recorded settlements, shown by the townships as defined by hill-dykes, correspond with the areas of USF (Figure 5.20). All these early settlement areas are along the shore with access to the sea, and are possibly sited there for fishing, seaweed and transport but probably also to take advantage of building stone from coastal exposures. The only known Neolithic settlement site, at Green, in the south end of the island (Miles 2011 & 2012; Figure 5.19, no. 3) is situated very slightly east of the USF, but close enough to be within easy reach. All the excavated structures at Green are built of USF, together with water-worn beach cobbles[112].

The Eday burnt mounds are clustered on cultivable land on the coastal fringes (Figure 5.19): the prime area for prehistoric settlements and the focus of historic settlement. The surviving barrows and chambered tombs are on higher land down the spine of the island. Some of these tombs were quarried in the nineteenth century e.g. Eday Manse (Davidson & Henshall 1989, 117, ORK 16; Figure 5.19, no.25), which was largely destroyed in 1821 in pursuit of stone to build the adjacent parish kirk. Since easily accessible good building stone in Eday is scarce and stone-built archaeological sites are convenient quarries (Section 4.4.6), it is perhaps to be expected that little evidence of

[112] This is not explicitly mentioned in the interim reports but is visible in the published photographs e.g. Miles 2011.

prehistoric settlement would survive here.

The lack of brochs in Eday is puzzling; in other heavily improved areas of Orkney they survive well, even in islands where there has been early and comprehensive improvement (e.g. Burray: Section 4.8). Brochs were high-status sites, and their absence merits discussion. Brochs have an association with the best-quality land (defined by the township land inside the hill-dykes on Mackenzie's (1750) chart: Table 7.7; Section 7.15). As can be seen from Table 5.4 (above), although there is variation across Orkney, on average there is one recorded broch for every 220ha of the land inside the 1750 hill-dykes; on this basis Eday might be expected to have two brochs[113]. It is unlikely that an island the size of Eday lacked brochs, rather that they have been destroyed and their materials recycled. A broad indication of the most favoured location for a high-status settlement in historic times is the location of the 'gentleman's houses' on Mackenzie's (1750) chart. Eday has three: one, Carrick House[114], the laird's house, at the north end, at a site with the most sheltered landing place in Eday, and two in Greentoft Township at the south end of the island (Figure 5.19, nos. 27, 28 and 29). Greentoft (the name of both the township and one of the gentleman's houses) comes from the ON *grœn[a]topt*, a green area associated with old (usually prehistoric) buildings (Marwick 1952, 49). This is supported by the frequent finds of large building type stones whenever the field immediately to the south of Greentoft farm is ploughed (Lamb 1984, 13, no. 32). There are three burnt mounds close by (Figure 5.19, nos. 8, 9 & 10), indicating that this area is also likely to be a focus of Bronze Age activity. The second gentleman's house in the Greentoft Township was the Old Palace (Hebden 2008, 54), now called the Castle of Stackel Brae (HY52NE6). Trial excavation here has revealed a high-status medieval/post-medieval settlement site, which appears to have been established on the site of a prehistoric settlement, as yet undated (Brend

[113] Although other small islands lack brochs (i.e. Egilsay, Fara, Flotta, Graemsay and Wyre) Gairsay, one of the smallest islands at only 1.2km^2 with a total of 114ha of land inside the 1750 hill-dykes, has one broch (Appendix 11, Figure A11.6).

[114] Carrick is a seventeenth name for the new house built on the site of the earlier head house, the original (Norse) place-name is lost (Marwick 1952, 48-9).

2008 & 2009; Brend et al 2006). The likely locations for brochs in Eday would thus be at these 'gentlemen's house' sites, two of which are associated with prehistoric settlement. As is argued elsewhere in this thesis (Section 7.15), the localities occupied by brochs may have seen earlier settlement.

5.8.3 Superficial geology

Apart from the area covered by peat, the soils of Eday consist of glacial till deposits around the coastal fringes (Figure 5.21). These are deeper at the south end, and are composed of drifts derived from the flagstone and Eday beds, comprising podzols, peaty podzols, calcareous and non calcareous gleys of the Canisby association (Macaulay Institute 1981a). This is not dissimilar to other areas of Orkney, but the main distinction in both Eday and the Calf of Eday is the quantity and quality of the peat deposits. This is the only area in Orkney where peat has been cut and sold commercially, a practice first recorded in the sixteenth century (Hebden 2008, 146-8). The main nineteenth-century market for Eday peat was the Scottish distilleries, and this continued until stopped by the First World War. In 1925 peat cutting resumed on a much larger scale, concentrated in the north west of the island at the Red Head (ibid, 192-6; Figure 5.21). This was on an almost industrial scale, although the peat was still cut by hand. This industry devastated the peat beds at the Red Head and they were exhausted by 1939, when the operations switched to the west side (Figure 5.21), before finally ending in 1945. Peat cutting continued in Eday thereafter for the use of the islanders. There was some small scale commercial cutting from the Bomo moss on the east side of the island into the first decade of the twenty-first century but this too has now ceased (ibid, 246; personal recollection).

The peat cutting operations at the Red Head have left a landscape of rough heathland, revealing sub-peat dykes, a prehistoric settlement and a chambered cairn at the Muckle Hill of Linkataing (Davidson & Henshall 1989, 141, ORK35; Lamb 1984, 14, no. 39; Nayling 1983; Sharman 2007b; Sharman & Robertson 2007; Figure 5.19) and sub-peat dykes are known from other areas of Eday e.g. near Vinquoy chambered tomb (Fowler 1987, 12).

Sub-peat dykes (certainly prehistoric and some at least appearing likely to be Bronze Age: Section 8.4) are probably the remnants of larger systems, since much will have been destroyed during the cutting operations[115]. Similarly much of the large enclosure at the Fold of Setter (Lamb 1984, 16, no. 57; Section 8.4) and its associated sub-peat dykes have been destroyed since first recorded by Petrie (1927, 28) in 1859. The only find actually reported during peat cutting at the Red Head was of sherds from three Iron Age pots[116], found 1m below the surface in an undisturbed 1.4m deep peat bank (HY53NE34; Lamb 1984, 17, no. 62). There is no palaeoenvironmental data available from Eday on which to base an estimate of either the commencement or the rate of peat growth in this area. Speculatively[117], it can be suggested that if a further 1m of peat had grown in the approximately 2,000 years since the deposition of the pot (0.5cm/100 years), then the peat may have begun to accumulate c.800 BC. The nearby sub-peat prehistoric settlement at Linkataing, where a saddle quern was indicative only of a date from the Neolithic to the Iron Age (Sharman 2007b; Sharman & Robertson 2007), is likely to be at least Bronze Age in date but may be earlier. The sub-peat remains of Eday thus indicate that there was once extensive settlement in areas subsequently covered by the peat.

5.8.4 Early improvement influencing the lack of record

The laird responsible for the first improvements in the early nineteenth century was an absentee landlord, Samuel Laing of Papdale, Kirkwall. Under his ownership the south end of Eday around Greentoft was fenced and drained c.1824 – 1828, entailing the construction of 2,167 fathoms (nearly

[115] Peat cutting itself need not necessarily destroy sub-peat remains, but in order to extract peat there have to be peat roads, or in the case of the Red Head, a peat railway. These are constructed with the materials to hand, large stones being ideal to form secure footings, or to float railway sleepers.

[116] Orkney Museum accession no. 1982/210: 'at least three Iron Age pots - two flat based, one hanging' (Julie Cassidy, Orkney Museum, pers. comm.), no further information is available.

[117] Peat accumulation is not constant elsewhere in Orkney e.g. at Whaness Burn, Hoy the rate appeared constant from the third millennium cal BC to the 1st millennium cal AD, but appeared to accelerate from cal AD c.1070 onwards (Farrell 2009, 185-6).

4km) of stone dykes[118] (Hebden 2008, 87), likely provoking the robbing of earlier sites. At around the same time, the lands around Carrick in the north were improved. During this early period of improvement there was no resident Minister who might have taken an interest in noting archaeological finds unearthed locally: Eday was a joint charge with Stronsay and until 1834 the Minister visited only once every four weeks (Rintoul 1845, 166-7).

In 1832, new holdings were broken out on the west side of Eday by a group of families who had been evicted from their crofts in North Ronaldsay and deported to Eday (Tulloch 1974, 62; Section 4.3.3). Precise figures do not survive, but this influx involved around 80 people (White 1845, 105). The west side of Eday is exposed to Atlantic gales and is particularly uninviting for settlement. These forced settlers would have used any and all available stone to build houses for shelter as quickly as possible. New land would have been brought into cultivation as a priority. In 1848 Samuel Laing sold Eday to cover his debts. The new laird, Robert Hebden, was from Sussex and had no Orkney connections. He continued the improvements with more draining and enclosing of land, but as a further source of income put the quarrying of Eday sandstone at the Fersness quarry in the west side of Eday on a more industrial footing. This needed a new workforce, so in 1851 an arrangement was reached with the laird of North Ronaldsay for a further 31 people to be sent to Eday, again to poor uncultivated land on the west side (Hebden 2008, 116-17; Tulloch 1974, 62). This was a deliberate ploy beloved of lairds with an industry to staff: settlers were not given enough land to adequately support themselves and their families, so they were forced to work for their new laird in his quarry. They also had to build new houses for themselves and break out new land for subsistence agriculture. A further group of 13 North Ronaldsay settlers went to Eday in 1881, although this may have been voluntary (Tulloch 1974, 62). It is hard to imagine less conducive circumstances for any archaeological finds to be reported even if they were made.

[118] Requiring approximately 4,000 tonnes of stone (Section 4.4.6).

5.8.5 Discussion

Many factors conspired to make Eday appear deficient in archaeological sites (Table 5.5). The distinctive geology, with its limited supply of suitable flagstones for building, necessitated the recycling of building stone, which has limited site survival. The early initial improvements undertaken by an absentee landlord, with no resident authority figure taking an interest in any remains encountered compounded the lack of record from the early period. Further improvement by an influx of settlers forced to quickly break out new land also militated against survival and reporting. Peat cutting on an industrial scale denuded the Red Head area, with unrecorded damage and destruction of sub-peat remains.

By the time that the 1st edition OS maps of 1882 were being compiled, Eday had changed completely from the picture of the landscape and its subdivisions presented in Mackenzie's 1750 survey. Comparing the extent of settlement as indicated by townships defined by the hill-dykes in 1750 (Figure 4.18a), with the improved land shown in the 1st edition OS map of 1882 (Figure 4.18b) shows the extent of change. Just over 78% of the land in Eday that was suitable for improvement had already been improved by 1882, with the area in cultivation more than doubling between 1750 and 1882 (Table 4.3). This was accomplished on the orders of an absentee landlord and in haste by the North Ronaldsay deportees, who would have had priorities other than antiquarian interests. This seems to be reflected in the work of the Ordnance Survey for the 1st edition maps: the ONB 1880 entries for Eday are very poor, with few details about any of the sites that had been surveyed for the 1st edition OS map. The most detailed site description in the Eday ONB is merely:

> *Erd House Vinquoy Hill NE, Erd House Vinquoy Hill S On the north east end is to be seen the site of a small Underground house. Also on the south end are the remains of a middling large house with small chambers therein* (ONB 1880, OS1/23/4/36).

The 'middling large house' is Vinquoy Hill chambered cairn; this was

excavated by James Farrer MP and the laird of Eday in 1857 (Davidson & Henshall 1989, 168-9, ORK 53), which surprisingly is not mentioned. The site on the north east end is badly damaged but may also be a chambered cairn (HY53NE16; Lamb 1984, 9, no. 2). The one site marked on the map as a 'Brough' (ONB 1880, OS1/23/4/112) is another chambered tomb, Eday Manse (HY53SE7). There appear to be unrecorded sites in Eday, mentioned in general terms in the ONB general entry for the island but not planned by the OS surveyor:

> *There are the remains of three, or four, Broughs or Picts' buildings as they are more commonly called by the people, there are also underground houses, Funeral Piles and Standing Stones, what is called Funeral Piles consist entirely of an elliptical shaped mass of small stones which have apparently from their appearance been subjected to fire* (ONB 1880, OS1/23/4/86).

The 'funeral piles' are burnt mounds; the 'underground houses' marked as 'Erd houses' on the 1st edition OS map are now known to be chambered tombs[119]. The 'Broughs or Pict buildings', (apart from Eday Manse), are not marked on the 1st edition OS map, and the classification of these sites remains elusive. It is possible that in this general entry there exists the only record of the 'missing' brochs of Eday.

Despite all this, the Bronze Age sites that have survived reasonably well (Table 5.5) are burnt mounds (Figure 5.19), both in the south end of Eday in some of the better land, and also in the west side settled by the North Ronaldsay emigrants. This would seem to support the suggestion (e.g. Barber & Russell-White 1990a; Hunter 1991, 182-3, 1996a, 61) that burnt mounds may recognisably and preferentially survive in a heavily improved landscape; the significance of this will be further discussed in Section 9.5.

5.9 Conclusion

This chapter has highlighted major difficulties in reconstructing past site

[119] See Appendix 10, Table A10.1 for details of Eday's tombs.

distributions from limited surviving evidence; many and varied factors have contributed to site survival. Agricultural improvement has, as discussed in Chapter 4, been extremely destructive across Orkney; however there are pockets of general archaeological survival (Sections 5.3 – 5.6). The extrapolation of site density estimates from the few relict landscapes to Orkney as a whole (Table 5.3) suggests considerable potential variation in (projected) site numbers. The examples of Eynhallow, Quandale and Eday demonstrate the necessity of considering the historical and geological backgrounds in addition to the archaeological information in order to reach an informed opinion regarding site survival.

With the exception of Cantick Head, all of the landscapes discussed above survive because either they are covered by peat (Section 5.2), are remote locations such as small islands (Section 5.4) or are otherwise marginal for agriculture, such as Sanday's headland sites (Section 5.5); all of these areas were similarly marginal or less-favoured locations during the Bronze Age. Indeed, in the case of the excavated Mound 11 at Tofts Ness, much hard work was required on the part of the Bronze Age inhabitants to ensure the continued viability of the site (Dockrill 2007d; Section 8.2). That Bronze Age settlement included such marginal locations suggests that the more favoured areas of Orkney were comparatively densely populated at the same time.

The most obvious explanation for this exploitation of marginal areas is population pressure but the pattern of landscape use could be caused by social organisation. It is possible that access to the prime settlement areas was controlled and limited to some particular group; others may have had no alternative other than occupation of poorer locations. A similar model of land and resource control by a competitive elite has been suggested for the Iron Age in the Northern Isles (e.g. Dockrill & Bond 2015b, 493-7; Sharples 1984, 121-2; Section 7.15). Bronze Age occupation of marginal sites may hint that this hierarchical control of land dates from an earlier period.

Chapter 6 Burials and associated artefacts

6.1 Introduction

This chapter comprises a brief survey of the burial-related evidence from Bronze Age Orkney and an assessment of its significance. The nature of the transition between the end of the main phase of the Neolithic use of chambered tombs in the early 3rd millennium cal BC (e.g. Schulting et al 2010) and the development of distinctive Bronze Age burial practices is investigated. Evidence for use and/or remodelling of Neolithic chambered tombs during the Chalcolithic/Early Bronze Age is considered with regard to changing burial practices in the 3rd millennium BC. Artefacts from Orcadian burial contexts are evaluated in light of those from elsewhere in the British Isles, and the contrast between the few elite burials with high-status grave goods and the unaccompanied majority is analysed.

6.1.1 The limitations of the archaeological record

Whilst the burial record is that element of Orkney's Bronze Age about which most is known, there nonetheless exists a considerable bias in the number of individual archaeological records towards antiquarian accounts of variable quality (e.g. Clouston 1845, 55-8; Petrie 1856, 58-60; Thomas 1852, 107-10) and ad hoc excavations of chance finds (e.g. Greig 1931; Hedges 1980; Marwick 1929a), albeit the latter is now formalised under the terms of the Human Remains Call-Off Contract[120] (e.g. Duffy 2005; Innes 2016; Toolis 2004). There have been two modern excavations of Bronze Age barrow cemeteries, which both had limited aims: that at the Knowes of Quoyscottie, Birsay (Hedges 1977) was a rescue excavation in advance of agricultural improvement, whilst that at Linga Fiold, Sandwick (Downes 2005, 58-6, 251-86) was aimed at formulating a management strategy for these remains in the face of ongoing plough, rabbit and cattle damage at the site. A further important Bronze Age funerary site has recently come to light as a result of

[120] Excavation of chance finds of human remains funded by Historic Environment Scotland.

aeolian erosion at the Links of Noltland, Westray and is currently under investigation; it is closely associated with a Bronze Age settlement (Moore & Wilson 2011a; Section 7.6.3). Of these three cemetery excavations, only the Knowes of Quoyscottie has been fully published (Hedges 1977).

In compiling the database and distribution maps of Bronze Age barrows and cists (Appendix 7) it was necessary to consider a number of interpretation issues. The majority of surviving barrows have not been excavated and their designation as barrows relies primarily on observations in field survey. Reporting quality varies for antiquarian excavations, from comparatively detailed descriptions (e.g. Petrie 1856, 58-60) to the terse 'stone cist and ashes found' with an accompanying date recorded in the ONB and on the 1st edition OS maps (e.g. Rantan, Birsay: ONB 1880, OS1/23/1/14). Diagnostic artefacts were rarely recorded, and the majority of the human remains from these historic finds have been lost, making assignation to precise period difficult, but it is usually assumed that cremations and crouched inhumations in cists, within or without a barrow, are Bronze Age in date (cf. Downes 2005, 32-9). This assumption is challenged by the excavation at Howe, Harray of a 'typical Bronze Age' crouched inhumation in a cist, which dated to c.3083 – 2624 cal BC (Downes 2003b; Downes & May 2005b, 297-8), a late Neolithic determination that may cast doubt on attributions to the Bronze Age of other crouched inhumations from antiquarian excavations. Similarly, cremations associated with steatite urns (see Section 6.3.4 below) have been seen as definitively Bronze Age in date. The majority of dated steatite urns from Orkney are Bronze Age (Sheridan 2007a, 171-2 & 184), however there are also 1st millennium AD dates from samples associated with steatite urns containing cremations. One came from a chance find at Sebay, St Andrews, and another was found near Stromness in the eighteenth century, apparently from a cist within a barrow (Sheridan 2003a, 169, 2004a & c & 2006, 205). A steatite urn was also found along with cremated bones in one of a number of cists overlying the Broch of Oxtro in Birsay; one of these cists had a Pictish symbol stone for its cover (Petrie 1856, 59-60 & 1874, 76). There is therefore a degree of uncertainty in the distribution maps of probable Bronze Age

burial sites presented in Appendix 7; this issue persists even when early reports of burials considered to be unreliable have been excluded[121].

6.1.2 Synopsis of Bronze Age burial practices in Orkney

Bronze Age burials, certain and probable, are numerous in Orkney. Around 728 barrows and 297 cists are known; 199 of these cists were within barrows. This section presents an overview of the results from excavated Bronze Age burials where an account of the excavation, however limited, has been published[122]. Burial rites represented include both inhumation and cremation and the radiocarbon determinations available from Bronze Age burial contexts are shown in Charts 6.1 and 6.2 below. Inhumation was practised throughout the Chalcolithic and Bronze Age (Chart 6.2) whilst, as shown in Chart 6.1, the majority of the dates for cremation burials fall between c.2200 and 1300 cal BC. One of the cremations in the cist at Sand Fiold, Sandwick may however be later: a date of c.1000 – 800 cal BC was obtained from plant fibres[123] placed over the cremation, which was not itself directly dated (Dalland 1999, 404-8; Section 6.2.2), suggesting that cremation may have been in use into the first millennium BC and thus throughout the Bronze Age.

[121] The rationale behind the inclusion/exclusion of these reports may be found in Appendix 7.

[122] Summarised in Appendix 7, Table A7.3.

[123] Identified as a base layer of grasses directly over the cremation, with overlying sedge stems and leaves laid at right angles (Carter et al 1999).

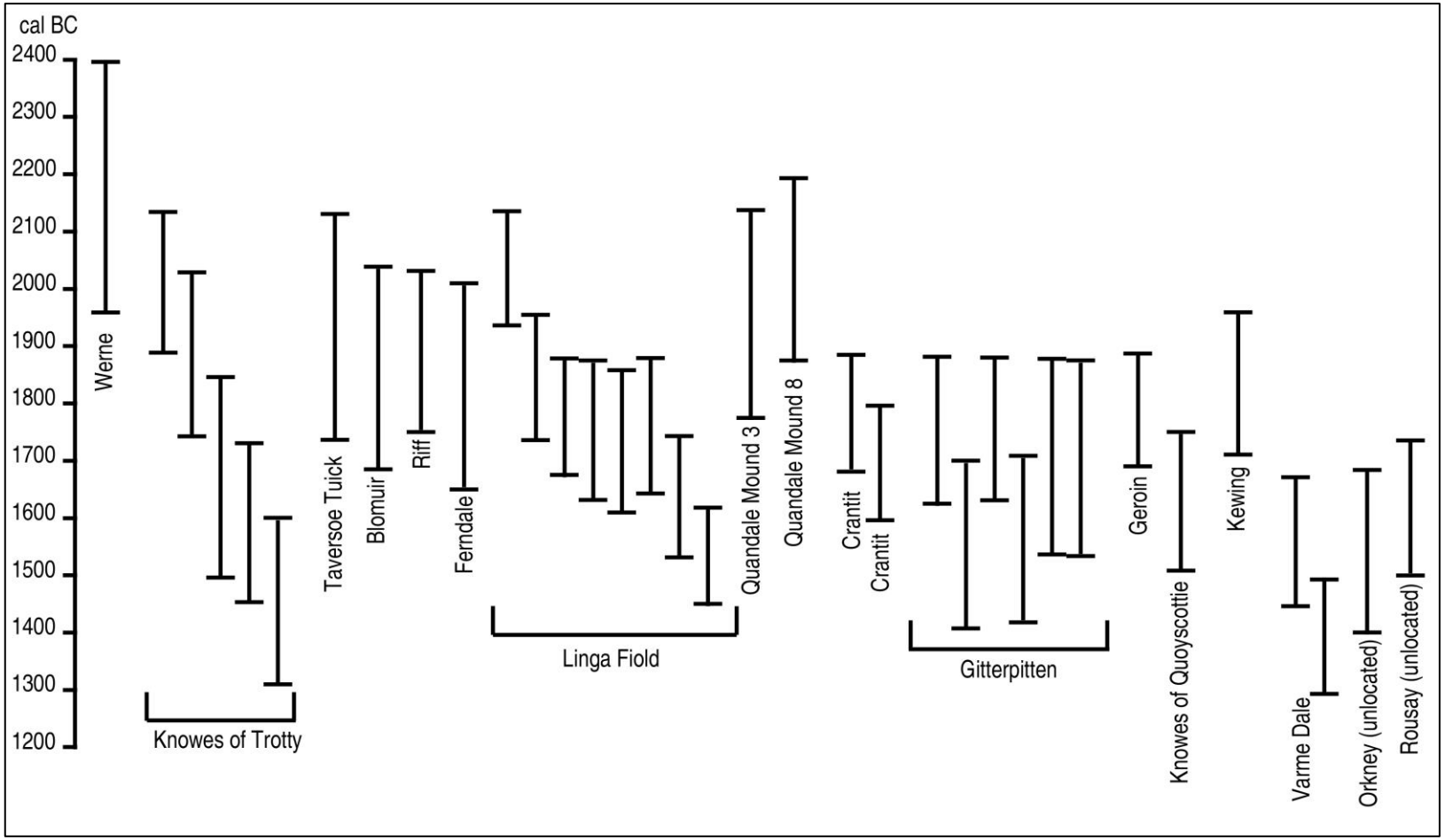

Chart 6.1 Radiocarbon dates obtained from Chalcolithic/Bronze Age cremated human bone from burial contexts in Orkney. See Appendix 1, Table A1.1 for details and references. (Excludes the cremations from the Links of Noltland for which full details are not yet available).

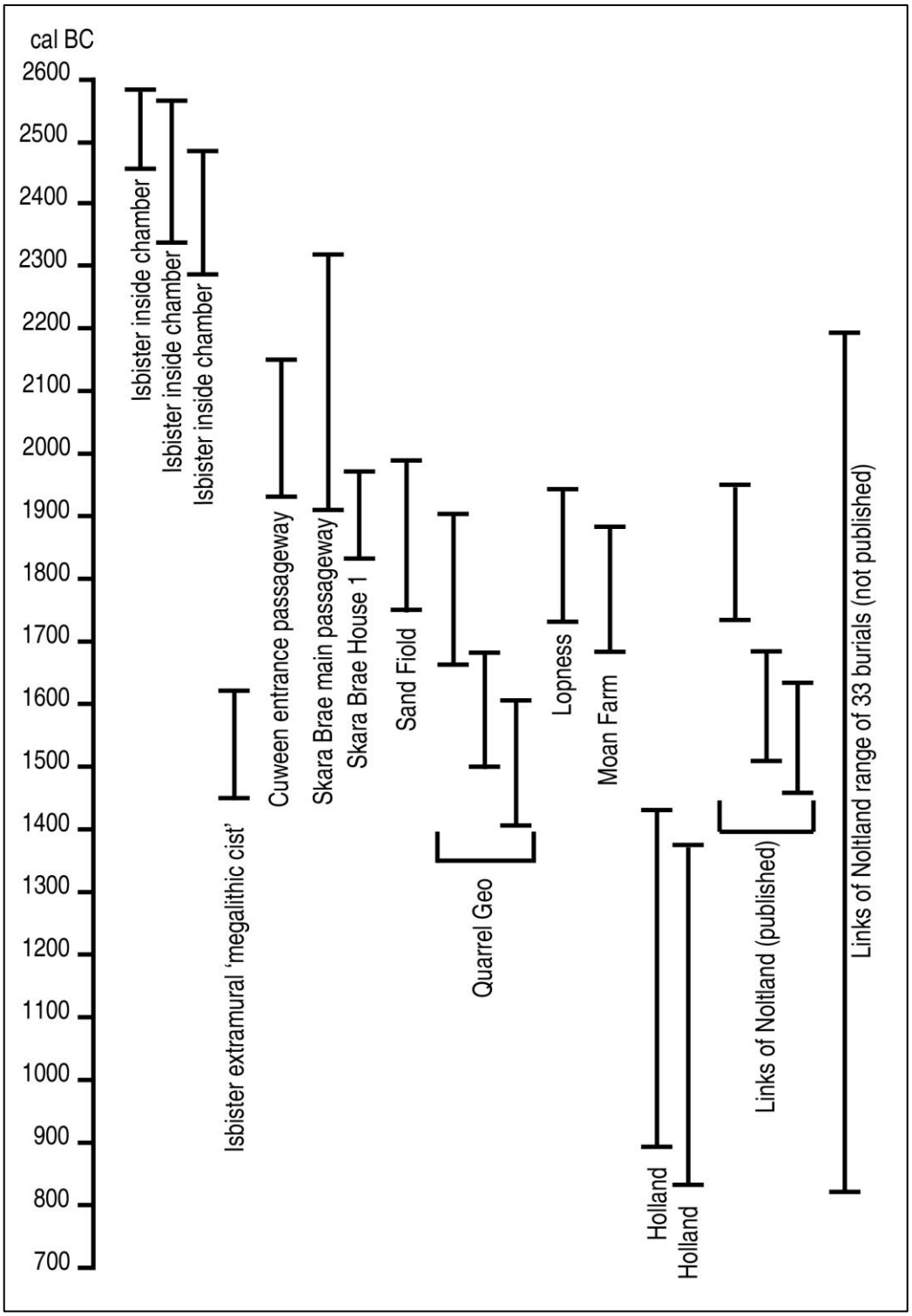

Chart 6.2 Radiocarbon dates from Chalcolithic/Bronze Age inhumations in Orkney. All direct dates of human bone, (see Appendix 1, Table A1.1 for details and references); includes two dates from Isbister that may be Late Neolithic rather than early Chalcolithic.

Recent excavations at the Links of Noltland, Westray, have uncovered a well-preserved inhumation and cremation cemetery with around 65 burials, including fifteen in a large reusable cist (Moore & Wilson 2010a, 2011b & 2013; Section 7.6.3). Results of radiocarbon assays for 33 of the 65 individuals in this cemetery range from 2200 – 1960 BC to 980 – 820 BC, and are reported to be evenly distributed across this range (Hazel Moore, pers. comm.; Moore & Wilson 2011a, 38). The radiocarbon dates are currently undergoing Bayesian modelling for future publication and details are not yet available of how these dates relate to individual inhumations or cremations, but there appears to be overlap in burial practices, possibly more so in the earlier part of the sequence (Hazel Moore, pers. comm.).

The majority of reported Bronze Age burials in Orkney, both cremations (e.g. Crantit, St Ola: Marwick 1924c; shown in Figure 6.1), and inhumations (e.g. West Puldrite, Rendall: Corrie 1929; shown in Figure 6.2), were found in cists. This may partly reflect reporting bias: cists impede and can damage the plough and have to be physically removed when encountered, therefore more likely to be reported; a burial lacking a cist or similarly robust container would not cause an obstruction and might easily be destroyed unnoticed, without report. Cists may contain several individuals, and cremations and inhumations have occasionally been found together in the same cist (e.g. Riff, Rendall: Downes & May 2005b, 298-9; Backakelday, Holm: Marwick 1928a). There are also examples of double or two storey cists e.g. Crantit, St. Ola (Cursiter 1910; Petrie 1866a & 1870, Section 6.2.2). In Orkney's acidic soil conditions unburnt bone frequently does not survive, resulting in cists lacking any human remains but which today are assumed to have contained inhumed remains that have decayed (e.g. Ballin Smith 2014, 110-14; Downes & May 2005b, 295-6). Historic records of the discovery of empty cists e.g. twelve in Northton, Birsay in 1866 (ONB 1880, OS1/23/1/173) or of cists containing only 'brown fatty earth' e.g. at the Knowe of Brenda, Birsay in 1860 (ibid, OS1/23/1/155) may represent such decayed inhumations but this is now impossible to verify; inhumation may consequently be underrepresented in the burial record.

The majority of cists (199 out of 297) have been found set on the natural ground surface and covered by a low barrow mound (e.g. Grant 1937); unobtrusive cists may have been placed into pits cut into the natural ground surface and probably were never covered by a barrow[124] (e.g. Greig 1931; see Section 4.5.2; Figure 4.10). The barrow itself may be composed largely of earth and turves, with or without a kerb (e.g. Mousland: Downes 1994a), it may be a cairn of stone (e.g. Bu, Rapness: Barber et al 1996; Figures 6.3 & 6.4), and it may contain multiple burials such as primary and secondary cists (e.g. Ferndale, Rendall: Duffy 2005).

Barrows may be found singly or in groups[125], sometimes forming extensive barrow cemeteries e.g. Linga Fiold (Downes 2005, 251-86) or the Knowes of Quoyscottie, Birsay (Hedges 1977). Both of these sites were cremation cemeteries containing, in addition to cist burials, individual cremations placed in pits clustered around the barrows; references in older accounts to the recovery of large quantities of cramp[126] in association with barrow cemeteries e.g. near Skae Frue, Sandwick (Thomas 1852, 107-10; Section 4.2.4) suggest that this was common. Inhumations may also be found under barrows (e.g. Corrie 1929; Neil 1981; Figure 6.2) but as yet no barrow cemeteries consisting entirely of inhumations have been excavated (although the majority of the 65 burials at the Links of Noltland are inhumations (Hazel Moore, pers. comm.; Moore & Wilson 2011a).

6.1.3 Referencing the past

At Varme Dale, Rendall, a thick deposit of charred cereal with an associated Early Neolithic radiocarbon date was sealed beneath a Bronze Age barrow, and it appeared that the substantial stone blocks utilised in the barrow kerb may have been taken from a nearby but unidentified Neolithic settlement (Richards, Downes et al 2016, 232). This sequence may be paralleled in the

[124] Following Downes (2005, 34) 'unobtrusive cist' is the accepted term for this type of cist in Orkney (e.g. Ballin Smith 2014).

[125] Where barrows exist alone others of the group may have been destroyed (see Chapter 4).

[126] Cremation pyre residue: see Section 3.4.2.

placing of a barrow over a levelled Neolithic house at the Knowes of Trotty[127]:

> *This trait is almost certainly a desire by these communities to draw power and authority to themselves and their emergent ancestors by emphasising origins, situating their burial monuments upon the remains of their 'founding-fathers'* (Downes et al 2016, 61).

There is a significant chronological gap between the two episodes of activity at Varme Dale: the Neolithic cereal deposit was associated with a date of c.3770 – 3620 cal BC (Richards, Downes et al 2016, 232), whilst the cremations recovered from the Bronze Age barrow have been dated to the seventeenth – thirteenth centuries cal BC (Downes 2003e). A substantial abandoned Neolithic settlement would probably have been visible as a mound even after the passage of 2,000 years, but how much significance might have been attached to its earlier status after such a hiatus is open to debate; it may rather represent the fortuitous reuse of a site with a convenient supply of accessible building stone.

The abandoned Neolithic settlement at Skara Brae (Section 7.3.3) also attracted burials in the late 3rd/early 2nd millennia cal BC: human bones found in the main passageway dated to c.2340 – 1915 cal BC (Petrie 1868a, 210; Thomas 2016, 93-4), whilst a crouched inhumation found in the sand deposits infilling House 1, about three feet (0.91m) above the hearth, dates to c.2024 – 1832 cal BC (Petrie 1868a, 210; Rick Schulting, pers. comm). The use of the passageway at Skara Brae for burial has echoes of the insertion of Early Bronze Age burials and cremations into the passageways at chambered tombs (e.g. Cuween, Firth: Sheridan 2005b; Section 6.2.1). Similarly, after the abandonment of the high-status settlement site at the Ness of Brodgar towards the end of the 3rd millennium cal BC (Card et al 2017; Section 7.3.4) Bronze Age cist burials were inserted into some of the backfilled structures (Marwick 1926). In addition to this interest in tombs and settlement sites, the henge at the Ring of Brodgar acted as a continuing focus into the Bronze Age.

[127] Although as discussed below (Section 6.3.1) it is equally possible that this earlier structure is a remodelled tomb not a house.

6.1.4 The Bronze Age funerary landscape surrounding the Ring of Brodgar

The henge at the Ring of Brodgar stands within a Bronze Age funerary landscape that demonstrates continued interest in the site most likely across the third millennium BC and beyond (Figure 6.5). Dating the construction and use of the Ring of Brodgar is problematic, with excavation limited to sections across the henge ditch (Downes, Richards et al 2013; Renfrew 1979, 39-43). Construction c.2600 – 2400 BC was suggested based on OSL dating (Downes, Richards et al 2013, 112-3) but the raw dates do not inspire confidence: two samples obtained from the base of the ditch produced dates of 3500 ± 800 BC and 3100 ± 600BC; other dates had similarly large error terms. The Stones of Stenness henge was probably constructed c.3020 – 2890 cal BC (Schulting et al 2010, 35-6). Henges elsewhere in Scotland have a long currency, and some Scottish henges were constructed in the late 3rd/early 2nd millennium cal BC (e.g. Broomend of Crichie, Aberdeenshire: Bradley & Clarke 2011, 19; North Mains henge, Perth and Kinross: Sheridan 2003a, 167). The henge at Pullyhour, Caithness contrastingly was constructed in the mid-2nd millennium BC and modified, with the addition of further banks and revetments, towards the end of the 2nd millennium BC (Bradley 2011, 122-6). Overall, then, there is no compelling reason to rule out construction, or at least modification, of the henge at Brodgar during the late 3rd/early 2nd millennium BC[128].

Very few of the mounds in the Brodgar landscape around the Ring have been excavated; those that have been were the work of James Farrer MP (Section 3.5.2). Plum-cake Knowe (Figure 6.5, no. 4) contained two cists with cinerary urns, one of steatite, together with cremated bones (Petrie 1856, 58-60). The excavation ended once it had attained a level about a metre above the surrounding ground surface, so, as Petrie noted, there may be a primary cist (and indeed further deposits) still to be found within this mound. The form of the steatite urn conforms to the type of Bronze Age urn found elsewhere in

[128] The chronology of the Ring of Brodgar is to be addressed by Bayliss et al (in press).

Orkney (RCAMS 1946 vol. II, no. 883, 305-6; see Section 6.3.4).

Farrer (1861 & 1862a, 18) also excavated the substantial mounds at Salt Knowe and Fresh Knowe (Figure 6.5, nos. 2 & 3); the former by sinking a central shaft and the latter with a trench across its northern end. Although these excavations penetrated to the subsoil beneath the mounds he found no funerary evidence in either case; both mounds were apparently entirely composed of a mixture of earth and stone (ibid). Petrie (1856, 59), who observed the excavation at Fresh Knowe, thought that it showed evidence of careful construction. That Salt Knowe is not a chambered tomb has been confirmed by ground penetrating radar (OCGU 2009). Rabbit damage and general erosion have also exposed a disturbed cist in the top of this mound; this feature was not noted by Farrer nor recorded by the Royal Commission (RCAMS 1946, vol. II, no. 884, 306), but was visible by 1966 (HY21SE14). Both Salt and Fresh Knowes remain enigmatic; their construction of stones and earth and the presence of a cist in the former are both typical features of Bronze Age barrow construction. There are a further ten probable Bronze Age barrows in the Brodgar landscape, nine of which form an extended cemetery to the south of the henge (Figure 6.5, nos. 6, 7 and probably 8); none of these has been excavated. Close to this barrow cemetery is the Comet Stone[129], a large standing stone on a low mound accompanied by the broken stubs of two other stones (Figure 6.5, no. 5); this has no obvious parallels from other sites in Orkney and the nature of this monument remains obscure. Elsewhere however Bronze Age cremations have been found associated with single/paired standing stones (e.g. Carlinwell, Angus: Johnson 2012).

Around 800m to the north west of the Ring of Brodgar, beyond the prehistoric boundary of the Dyke of Sean (Section 8.6; Figure 8.14), lies the unexcavated Bronze Age settlement of Bookan Wasbister, covering an area of c.5ha (Section 4.2.4; Figure 4.3). From this settlement the Ring of Brodgar

[129] Origin obscure: *Kummle* is an Orkney dialect term for a prehistoric burial mound (from ON *kuml,* a grave mound/marker); e.g. the place-name *Cumlaquoy*, the cattle fold at the mound (Marwick 1952, 133). If the name is genuinely old, then the corruption of *Kummle Stane* to Comet Stone would support the monument being a burial mound; this remains a tentative interpretation.

appears silhouetted on the skyline, framed by Plum-cake Knowe on the east and Salt Knowe on the west (personal observation), a perhaps deliberate choice of location emphasising the continuing importance of Ring of Brodgar in the Bronze Age.

6.2 The transition from chambered tombs to cists

6.2.1 Introduction

The main phase of Neolithic burial activity at chambered tombs ends c.2900 – 2800 cal BC (e.g. Armit et al 2016; Hutchison et al 2015; Lawrence & Lee-Thorp 2012; Schulting et al 2010) but there is evidence that some of these monuments continued to act as foci for burial activity during the Chalcolithic/Early Bronze Age. At some tombs the chambers remained accessible, allowing for the sporadic insertion of artefacts together with further animal and human bone (Table 6.1 and Chart 6.3 below). It is difficult to say how widespread this practice may have been, since the majority of Neolithic tombs in Orkney have been cleared with only limited recording[130] e.g. James Farrer's work at Quoyness, Sanday (Davidson & Henshall 1989, 154-8, ORK44), and much of the bone, both animal and human, from the tombs is no longer extant so that further dating programmes are not possible. There are however clear cases of later use. The entrance passageway at Cuween, Firth (Charleson 1902), for example, was sealed by a final inhumation c.2150 – 1930 cal BC (Sheridan 2005b), implying that the chamber was accessible until this date; the upper chamber at least at Taversoe Tuick, Rousay (Grant 1939b) appears to have remained accessible until somewhat later in the second millennium BC (Chart 6.3; see Section 6.2.3).

[130] Only eight of Orkney's 89 chambered tombs have been investigated in the modern period, the majority of which had already been disturbed: Quanterness (Renfrew 1979); Point of Cott (Barber 1997a); Isbister (Hedges 1983a); Banks (Lee 2011b & c); Holm of Papa Westray N (Ritchie 2009); Bookan (Card 2005b); Pierowall Quarry (Sharples 1984) and Roeberry (Lee & Thomas 2012a).

Table 6.1 Neolithic chambered tombs with some evidence of Chalcolithic/Bronze Age funerary activity either within the chamber or around the tomb. See Appendix 1, Tables A1.1 and A1.14 for details of radiocarbon dates and Appendix 10 for tomb locations.				
NMRS no.	**Site Name**	**Date cal BC 2 σ**	**Evidence**	**Reference**
HY21SE5	Unstan, Stenness		Barbed and tanged arrowhead[131] in passageway	Clouston 1885, 342
HY21SE41	Howe, Stromness		Beaker-possibly associated with tomb	Ballin Smith 1994, 24-5
HY31SW1	Maeshowe		Associated barrow cemetery, nine barrows (destroyed)	RCAMS 1946, vol. II, no. 887, 313-4
HY31SE1	Cuween Hill, Firth	2130 - 1930	Inhumation in passage	Sheridan 2005b
		2620 - 2345	Dog skulls in chamber	Sheridan 2005a
			'Secondary interments to west'; piece of steatite	Charleson 1902
HY33SE1	Midhowe, Rousay		Two inhumations, one in a cist (lost), 1.2m above chamber floor	Callander & Grant 1934a
HY40NW17	Crantit, St Ola	1890-1600	Associated cists with cremations; Section 6.2.2	Ballin Smith 2014
HY42NW1	Knowe Of Yarso Rousay		Beaker, Food Vessel, barbed and tanged arrowhead. Context uncertain, possibly from chamber, or from tomb backfill	Callander & Grant 1935, 334-5 Davidson & Henshall 1989, 79
HY42NW2	Taversoe Tuick, Rousay	2130 - 1740	Cists and cremations: remodelled tomb; See Section 6.2.3	Sheridan 2003a
HY53NE18	Calf Of Eday Long		Beaker: uncertain context	Davidson & Henshall 1989, 79
HY55SW2	Holm Of Papa Westray N		Beaker: external context close to outer kerb of cairn	Henshall 2009, 36; Ritchie 2009, 25
ND48NW10	The Nev, S. Ronaldsay		Cist with burnt bones inserted into top of tomb	RCAMS 1946, vol. II, no. 827, 287-8
ND48SE1	Isbister, S. Ronaldsay	2487 - 2292	Inhumation in chamber	Lawrence & Lee-Thorp 2012
		2581 - 2464	Inhumation in chamber	Armit et al 2016
		2571 - 2348	Inhumation in side chamber three	
		1620-1450	Inhumation in extramural cist	Lawrence & Lee-Thorp 2012
		2345 - 2007	Eagle bones in chamber	Sheridan 2005b
			Jet and albertite objects probably c 2200-1800 BC	Sheridan & Davies 2002, 815-16
ND38NW5	Roeberry, South Walls		Cist and cremations inserted into backfilled tomb	Lee & Thomas 2012a

[131] Barbed-and-tanged arrowheads have Chalcolithic/Early Bronze Age funerary associations elsewhere in Britain (e.g. the Amesbury Archer: Harding 2011).

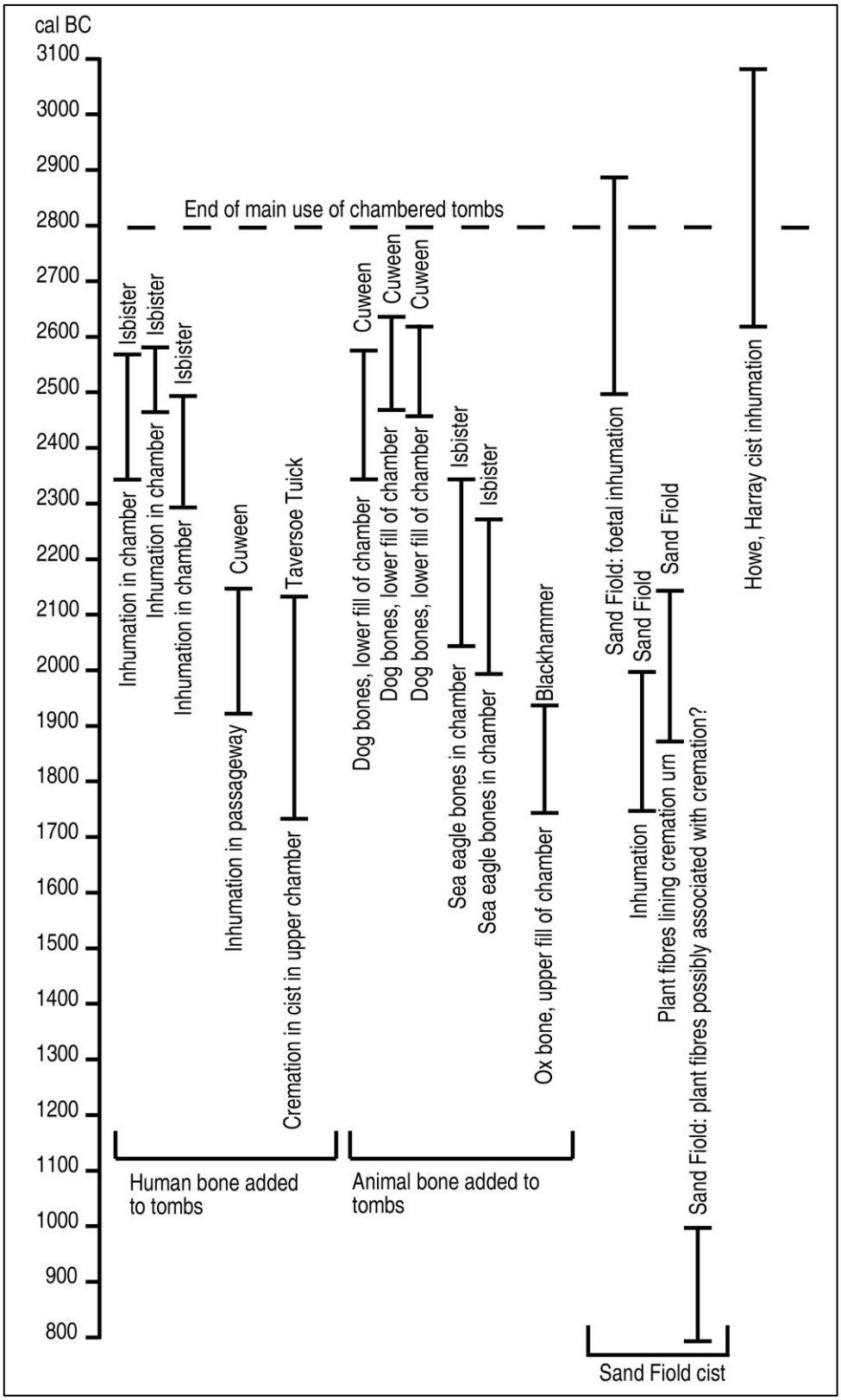

Chart 6.3 Radiocarbon dates for human burials and animal bone added to chambered tombs from c.2600 cal BC onwards, together with determinations for the burials at the Sand Field cist and the Howe Neolithic cist (See Table 6.1 above, Appendix 1, Tables A1.1 and A1.14 for details and references).

At Isbister, South Ronaldsay, three inhumations were added to the chamber in the twenty-sixth to twenty-third centuries cal BC, whilst sea-eagle bones were added c.2345 – 2007 cal BC (Armit et al 2016; Lawrence & Lee-Thorp 2012; Sheridan 2005b). Activity continued at Isbister with the insertion of a 'megalithic cist' containing three inhumations into the exterior wall of the tomb (Hedges & Haigh 1983, 302); one of these inhumations has been dated to the mid-2nd millennium BC (Lawrence & Lee-Thorp 2012). Whether this was a significant addition to the monument or simply the fortuitous use of an existing mound is open to debate. Meaningful discussion of the significance of the Chalcolithic/Early Bronze inhumations added to the monument at Isbister is hindered by a lack of contextual information regarding the assemblage of human bone, recovered during the tomb's amateur excavation in the 1970s (Lawrence 2006, 49 & 56; 2012, 89-94).

Elsewhere in Orkney, the mounds that covered chambered cairns also attracted attention as places for later funerary deposits, but these were often poorly recorded. At Cuween for example there were 'secondary interments previously brought to light at the west side of the cairn' (Charleson 1902, 734), but no further details were published. The chamber of the stalled cairn at Roeberry, Cantick Head, South Walls appeared to have been deliberately backfilled with earth and rubble into which three probable Bronze Age cists were inserted, two containing cremation burials (Lee & Thomas 2012a). The site was subsequently remodelled with the insertion of large central cist containing an inhumation, possibly in the Iron Age[132].

Maeshowe chambered tomb, contrastingly, acted as the focus for a Bronze Age barrow cemetery (RCAMS 1946, vol. II, 313-4, no. 887), which extended to nine barrows, since destroyed. There are also instances of sites where a Neolithic tomb has been reused and remodelled during the Bronze Age e.g. Taversoe Tuick, Rousay (Grant 1939b; Section 6.2.3); the recognition of these practices has been inhibited by the methods employed by early excavators.

[132] Radiocarbon dates are not yet available and phasing remains provisional (Lee & Thomas 2012a, 27-7).

The transition from inhumation in Neolithic chambered tombs broadly towards individual inhumations or cremations in barrows, cists or cemeteries may be bridged by some recently excavated sites, which appear in structural terms to represent a transitional form between a chambered tomb and a conventional Bronze Age cist; these have been recognized at e.g. Sand Fiold, Sandwick (Dalland 1999) and Crantit, St. Ola (Ballin Smith 2014; Section 6.2.2).

6.2.2 Transitional rock-cut tombs/chambers and reusable cists

At Sand Fiold, Sandwick, an intricate cist, complete with entrance passageway and seemingly designed to be re-usable, was constructed inside a 2.2m deep rock-cut chamber (Dalland 1999). This cist lay on the shoulder of a low hill overlooking the Links of Skaill, the site of a barrow cemetery to be discussed in Section 6.3.2 below. The cist contained both cremations and inhumations, and was used on several occasions: firstly c.2800 – 2500 cal BC for a foetal inhumation, c.2170 – 1880 BC for a cremation within a Food Vessel/Vase urn[133], c.1990 – 1750 cal BC for an inhumation, with a final cremation inserted c. 1000 – 800 cal BC (ibid, 404-8; Chart 6.3). To enable this periodic reuse over many centuries, Dalland (ibid, 407) argued that the cist's subsurface location must have been marked in some way at ground level. Possible structural parallels for the Sand Fiold arrangement come from a substantial rock-cut cist near Maeshowe, one end of which is described as having been stone-built with a 'door' (HY31SW26; Anon 1915). A further reusable cist has now been located in the Bronze Age cemetery at the Links of Noltland, Westray; it contained 15 burials thought to be successive (Moore & Wilson 2013).

Crantit, St. Ola (Ballin Smith 2014) is the findspot of a rock-cut tomb containing four inhumations, together with two separate external cists, one on each of the west and the south sides of the rock-cut chamber. Cremations in the western external cist have been dated to the first quarter of the second

[133] Placing the urn amongst the earliest of the dated Scottish examples (Sheridan 2003b, 205).

millennium BC, whilst the southern example contained unburnt human teeth suggesting a decayed inhumation; unfortunately however, dates could not be obtained for the inhumations from the main tomb (ibid, 29-30 & 136-7; Roberts & Lunt 2014). These inhumations and the rock-cut chamber in which they were found were thought most likely to be later Neolithic in date, possibly paralleled by the rock-cut Neolithic tomb at Banks, South Ronaldsay (Ballin Smith 2014, 128-9; Lee 2011b & c). Similarities between the design of the Crantit rock-cut chamber, with its four supporting pillars and walled lining, and Orcadian souterrains[134] were also noted (Ballin Smith 2014, 128). The Crantit tomb is in an area where several cists and a probable barrow cemetery (since destroyed) have been recorded in the past (Cursiter 1910; Marwick 1924c; Petrie 1866a). Two of these cists were described as of an unusual two storey construction (Cursiter 1910; Petrie 1866a); an antler mattock recovered from Cursiter's (1910) cist here has been radiocarbon dated to c.1780 – 1520 cal BC (Ballin Smith 2014, 137).

A significant number of cists in the same field as the Crantit tomb were destroyed in the 1920s. They were hit so often during ploughing that they posed a major hazard to the plough horses, and men were sent to probe for and destroy as many cists as possible (Anne Brundle, pers. comm.). Cursiter (1910, 215) earlier reported that the cist he excavated was found when 'in the course of laying down turnips, one of the horse's feet went down in a hole to the depth of his leg'. The south cist discovered at the 1998 Crantit excavation appears to have been a victim of the deliberate destruction episode of the 1920s: its lid was missing and the cist was full of topsoil (Ballin Smith 2014, 29).

It is however clear that the rock-cut Crantit tomb, though itself undated, is directly associated with a much larger Bronze Age cemetery. This may be an example of later burials focussing on a Neolithic tomb (as discussed in Section 6.2.1). Equally, the inhumations in the main rock-cut chamber at

[134] The 2nd millennium cal BC radiocarbon dates for the souterrain at Nessbreck (discussed in Section 7.11) were not available at the time of the publication.

Crantit remain undated and may be attributable to the Bronze Age.

A cist containing a Late Neolithic crouched inhumation at Howe, Harray (Downes 2003b; Downes & May 2005b, 297-8) was not rock-cut but utilised a natural cleft in the bedrock to form two sides of the cist. At nearby Geroin, 100m to the northwest, a cist containing a cremation dated to c.1890 – 1692 cal BC (Toolis 2004 & 2005b) may hint that this was another area of Neolithic funerary activity that acted as a focus for burial in the later period. The cists at Howe and Geroin were chance discoveries during ploughing and no further investigation of the surrounding area was carried out, so it is not possible to say definitely whether they were part of a wider cemetery.

6.2.3 Major remodelling of a Neolithic tomb: Taversoe Tuick

Taversoe Tuick, Rousay is a two storied Neolithic tomb that was first excavated by the landowner after its chance discovery in 1898, and then re-excavated in 1937 preparatory to its consolidation for public display (Grant 1939b; Reynolds 1985; Turner 1903). The lower chamber is partly rock-cut into the hillside and has its own entrance; the slab roof of the lower chamber partly supports the upper (Figure 6.6). The 1898 excavation found crouched burials and Unstan Ware Neolithic pottery in the lower chamber; the inhumations are now lost (ibid; Davidson & Henshall 1989, 163). The lower passageway is partially blocked by a large stone 0.30m high, which is bonded into the side walls forming a low threshold; between the external entrance to the lower passageway and this threshold stone were found at least two cremations under inverted urns; on the inner (chamber) side of this stone three further heaps of unburnt human bone were identified. Unfortunately all of these deposits are also now lost (Davidson & Henshall 1989, 161-63; Reynolds 1985, 122; Turner 1903, 77).

The upper chamber contained three cists set c.30cm above its floor on a layer of earth, each containing cremations, probably within clay urns (Reynolds 1985; Turner 1903). Portions of these cremations survive and have been dated to 2130 – 1740 cal BC (Sheridan 2003a; Appendix 1, Table A1.1). The

entrance passageway to the upper chamber was blocked at the time of its discovery; when this blocking was removed 35 stone disc beads and a pumice 'pendant' were found near the outer end of the passageway c.0.30m above the floor (Grant 1939b, plate LXVI). These disc beads find parallels in the Early Bronze Age (Section 6.3.2).

It is thus clear, despite the subsequent attrition of the record, that there was major Bronze Age activity at Taversoe Tuick. What appears to have been overlooked in Grant's (1939b) excavation report is the full extent of the remodelling that is described there. Grant noted a spread of cairn material outside the walls of the upper chamber (Figure 6.6, no. 6) and that:

> *A curious alley, clear of stones, and roughly bordered with boulders (not building slabs) leads though the stony area to the cairn's wall* (ibid, 158).

This 'curious alley' (Figure 6.6, no. 2) shows very clearly in the excavation photographs, as does the cairn material (ibid, plates LXIII & LXIV). The cairn material was subsequently ignored: Grant appears to have considered it as nothing more than a natural collapse of the tomb. It appears from the photographs and plans (ibid; Figure 6.6) however that major remodelling took place at Taversoe Tuick during the Early Bronze Age, including:

- Partial filling of the upper chamber during its use, or intentional backfilling later at the end of its primary use, with a layer of earth.
- Secondary construction of cists inside the upper chamber 2130 – 1740 cal BC.
- Blocking of upper passageway and deposition of the discs beads and pumice pendant.
- Destruction and levelling of the upper chamber sealing the cists.
- Remodelling of cairn material into a kerb (?) barrow.
- Insertion of cremations under inverted urns in the outer part of the lower passageway.

Taversoe Tuick thus underwent complete modification from Neolithic chambered tomb to Bronze Age burial place in the late 3rd/early 2nd millennium cal BC, and it appears likely that its upper chamber was still accessible until this date; and the lower chamber passage at least.

The threshold stone in the lower passageway, built as part of the original passageway construction, may have been part of a barrier to prevent e.g. animal ingress into the lower chamber during its primary use in the Neolithic[135]. The outer entrance to the lower passageway was subsequently covered by accumulated overburden but it is clear from the original description (Reynolds 1985; Turner 1903, 76-7) that the passageway itself had not been filled in; both the heaps of unburnt bone and the inverted cremation urns in the lower passageway were clearly visible when the tomb was first opened. The unburnt bone may have been a post-Neolithic addition to the tomb, as were the cremations; absolute dating has been rendered impossible by their loss. It appears then that the lower passageway, remaining accessible, was in effect functionally akin to a reusable cist during (probably) the Early Bronze Age.

6.3 Artefacts from burial contexts

A factor contributing to the perception of a generally impoverished Orcadian Bronze Age is the lack of burials accompanied by artefacts. Elsewhere in Britain, Chalcolithic and Early Bronze Age burials were commonly accompanied by at least a Beaker or an urn, but also sometimes items of equipment and personal adornment of copper and copper alloy, amber, jet and gold. The gold and other objects recovered in the nineteenth century from the excavation of the rich Wessex burials (Colt Hoare 1812) are well-known and have almost iconic status (e.g. Clarke et al 1985). Excavations of richly furnished burials (e.g. Fitzpatrick 2011; Needham & Woodward 2008; Needham et al 2006) and a recent major study of the grave goods from this

[135] There was no evidence for gnaw marks on the human bones at Isbister (Lawrence 2006) implying a barrier to prevent at least canine access to the tomb.

period (Woodward & Hunter 2015) reinforces the impression of wealth and status thus created. In Orkney very few grave goods have been recovered from Bronze Age contexts. Paradoxically however, among these few is one funerary context with goods of exceptional quality that show connections to the rich burials of Wessex: the Knowes of Trotty, Harray (Petrie 1860).

6.3.1 The Knowes of Trotty, Harray

At the Knowes of Trotty there are 16 known barrows placed in a double row and sited on drumlins, which have the effect of enhancing the appearance of the barrows themselves (Card & Downes 2002b, 4). A nineteenth-century excavation of a cist within the largest, Barrow 1, found cremated bone, together with four gold discs and 27 pieces of amber (Petrie 1860; Sheridan et al 2003, 177-78). Re-excavation of this cist (Figure 6.7) recovered further amber beads, an amber spacer plate and further fragments of gold and cremated bone (Card & Downes 2005; Card et al 2006). The radiocarbon dates associated with the cist attribute it to the late 3rd/early 2nd millennium BC. Dates from cremated human bone in a cist cemetery identified between the barrows show that it was in use from the nineteenth to the fourteenth centuries cal BC (Chart 6.1).

The cist from the largest barrow is of unusual design, with a pair of orthostats flanking the side panels in a manner reminiscent of Neolithic stalled tomb architecture (Figure 6.7). Neolithic settlement activity in the vicinity of the Knowes of Trotty barrows is indicated by the late 4th millennium cal BC house excavated 100m to the northeast, which appeared to be part of a larger settlement (Downes et al 2016), as well as by the presence of large quantities of flat slabs and midden material in the body of the cairn, believed to have been redeposited from an earlier settlement. The midden deposits were interpreted more narrowly as evidence that the cist had been built over a levelled Neolithic house (ibid, 60-2). An alternative interpretation might be that this cist was built into a remodelled Neolithic chambered tomb, broadly similar to Taversoe Tuick, considered above (Section 6.2.3).

The Knowes of Trotty gold discs were all originally slightly domed with a central hole, and had probably covered a low conical button or stud of perishable material (Eogan 1994, 21; Sheridan et al 2003, 178). Gold is rare in the British Isles at this period outside of Ireland, and the main concentration of this commodity is in the south of England, where it has been recovered largely from Wessex burial contexts (Eogan 1994, 24; Needham, Woodward et al 2015; Taylor 1980). The amount of gold recovered overall is very small, however, with only around 100g from all 17 rich Wessex graves (Needham 2015, 255); it is noteworthy therefore that the most complete of the Knowes of Trotty discs weighs c.1.78g (Sheridan et al 2003, 178). The complex geometric design on the discs is one of only a few examples with this level of detail on gold, and has similarities with that on objects from Bush Barrow, Upton Lovell and Clandon barrows in Wessex (Needham 2015, 259). Analysis of the Knowes of Trotty discs shows they were made from a high tin content gold, either from an unknown Scottish ore source, or produced in an experiment in alloying (Taylor 1983, 57). The discs themselves do not appear to have come from Wessex (Sheridan et al 2003, 179).

The amber at the Knowes of Trotty consists of components of a spacer plate necklace, together with flat prismatic V-bored objects, hooks and hook fragments thought to be dress ornaments which may have originally formed the fringe to a cape-like garment, itself possibly decorated with the gold buttons: a high status garment which may be compared with the gold cape from Mold, Flintshire (Sheridan et al 2003, 181 & 184). Subsequent re-excavation recovered further necklace components[136] from the backfilled cist (Card et al 2006, 41). The spacer plate necklace was an heirloom, already old and worn when deposited, and almost certainly came from Wessex (Sheridan et al 2015, 381). This status as an heirloom is matched in the biographies of spacer plate necklaces from Wessex itself. Many such necklaces are composites, incorporating parts of older necklaces that have been remade over time (ibid, 387-8). Dates obtained on the cremated bone at the Knowes

[136] See Appendix 2, Table A2.6 for details of all the amber pieces recovered during both excavations.

of Trotty (2130 – 1890 and 2030 – 1770 cal BC: Sheridan 2006 & 2007c) are comparable to those obtained for the Wessex 1 graves (Sheridan et al 2015, 387-8). The exceptional character of the Trotty amber is emphasized by the fact that only one other find of Bronze Age amber is known from Orkney: a single bead from a structure at Skaill, Deerness, that also yielded a socketed knife (Porter 1997, 109; Section 7.6.2). This richly-furnished burial from the Knowes of Trotty is thus exceptional within the Orcadian record in that not only is it among the richest Bronze Age burials in Northern Britain but also in indicating a link between Orkney and the rich graves of Wessex (Sheridan et al 2003, 181).

6.3.2 Links of Skaill, Sandwick

A similarly extensive, and probably rich, barrow cemetery once existed in the Links of Skaill, Sandwick (RCAMS 1946, vol. II, no. 718, 267-8). Aeolian erosion there has recurrently revealed cist burials since the late seventeenth century (Small 1883, 29; Section 3.2). Several barrows and cists were excavated in 1772 by Sir Joseph Banks and his party, in the company of the Rev. George Low (Low 1776 & 1879, intro; Lysaght 1972 & 1974; see also Sections 3.3.1 and 4.9). A plan made during Banks' visit shows a series of mounds across an extensive area of the Links (Lysaght 1972, plate 38). As Banks noted in his diary:

> *Immense abundance of tumuli commonly covered with stones on the whole face of the bray ashes or bones sometimes both in one coffin* (ibid, 288).

Banks opened at least one of these tumuli, probably two (ibid; Low 1776 & 1879, intro). Others were excavated around the same time by Robert Graham, Laird of Skaill:

> *I found human bone lying in the widest end, in the other a great many burnt bones, among which was about 200 small black beads, of which I have hereby sent you some; and among these beads was a piece of bone which I take to have been Ivory, but the colour much altered, & from a hole being in it we conclude to have been a locket* (Lysaght 1974, 228).

George Low was not present on this occasion but subsequently saw the beads and illustrated one (Figure 3.2); it appears to be a typical Bronze Age disc bead. He also, in a spirit of scientific enquiry, set some on fire[137]:

> *I have seen several of the beads, they are black, and seem to be made of a sort of cannel coal, they burn well, emitting a strong white flame, and a white cinder remains* (Low 1879, xxxvi-xxxvii).

There are around 30 finds of disc bead necklaces in Scotland. The dated examples are all attributable to the period c. 2200 – 1700 BC, and are mostly made of cannel coal or oil shale rather than jet, which are indistinguishable as materials without scientific analysis (Holden & Sheridan 2001; Hunter et al 1993; ScARF 2012a, 82). In Orkney a 'jet' belt ring and a V-bored button, now identified as albertite, came from a hoard likely to date to c.2200 – 1800 BC deposited outside Isbister chambered cairn (Davidson & Henshall 1989, 89; ScARF 2012a, 81-2; Sheridan & Davies 2002, 815-16). A single plate from a jet necklace, found during peat cutting in Tankerness, has been confirmed as jet by the NMS but is undated (Kirkness 1935; Anne Brundle, pers. comm.).

The 'ivory locket' found with the Skaill beads (Figure 6.8) is a type of flat, lozenge-shaped piece of antler or bone with comparanda from a number of Scottish sites e.g. Seafield West, Inverness (Cressey & Sheridan 2003, 67, illus 14, no 2). These items are consistently found in a burnt condition accompanying cremations, suggesting their interpretation as toggle fasteners for funerary garments; they date from the end of the third millennium BC to c.1600 BC (ibid; Sheridan 2007a, 175 & 177, fig 14.11). The Skaill toggle was noted as discoloured (Lysaght 1974, 228) suggesting that it had been on the pyre with the body. As it is almost identical to the Seafield West example, the

[137] Identification by burning is inconclusive: Thurnam (1871, 521-2) burnt a selection of jet and jet-like substances and recorded his results, however none of his descriptions matches Low's description above.

Skaill 'locket' should be assigned to the same category[138].

Unfortunately, Banks' 'immense abundance of tumuli' almost certainly became casualties of agricultural improvement in the early nineteenth century by William Watt, the seventh Laird of Skaill (Section 4.9; Figure 4.27); no record of their fate survives.

6.3.3 Metalwork

Bronze Age metalwork is extremely rare in Orkney, with fifteen items known, of which only ten have a secure provenance; of the remaining five examples, only one definitely comes from Orkney[139] (Figure 6.9). None of the pieces are associated with radiocarbon dates. All of Orkney's metalwork may have been imported as completed finished artefacts, since there is no conclusive evidence of metalworking[140]. Two provenanced finds are from burial contexts, both from cists: a razor from Laughton's Knowe, Holm (Piggott 1947) and a socketed knife from Little Crofty, Tankerness (Cursiter 1887, 341).

The 1916 Laughton's Knowe discovery of a cist containing a cremation, upon which lay a Class 1 copper alloy razor in a wooden sheath, was not reported until 30 years later by which time the cremated bone had been lost; no other details are preserved (Piggott 1947; RCAMS 1946, vol. II, no. 368, 106). Elsewhere in Scotland this type of razor is found deposited with cremations in Cordoned Urns (Piggott 1947). In lowland Scotland Cordoned Urns date to the first half of the 2nd millennium BC, but their distribution does not appear to extend to the Highlands and Islands (Longworth 1984, 81-4; Sheridan 2003b).

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[138] The letter describing the find and illustrating the Skaill toggle has been published (Lysaght 1974, 228). The archaeological significance of the quoted letters was not discussed because the paper was written by a biologist who was primarily researching the voyages and works of Sir Joseph Banks. The 'ivory locket' does not appear to have been previously noted as a funerary garment toggle.

[139] Full details of all Orkney metalwork is contained in the catalogue in Appendix 2.

[140] See Appendix 2.

A Late Bronze Age Thorndon type socketed knife was a chance find associated with a cist at Little Crofty, Tankerness (Coles 1960, 87; Figure 6.10a); details are sketchy and the knife may have been either within or beneath the cist; no other details of the contents of the cist are recorded (Cursiter 1887, 341). Thorndon type socketed knives seem to originate in southern England (Coles 1960, 46) and are part of the Ewart Park metalworking phase; an example from Nore Hill, Surrey has an associated radiocarbon date of 1020 – 820 cal BC (Needham et al 1997, 64 & 72). There are very few from Scotland[141], with a scatter up the east coast that may reflect the route taken from the south (Coles 1960, 46).

There are two other Thorndon type knives from Orkney; one from the Late Bronze Age phases of a settlement site at Skaill, Deerness (Porter 1997, 103; Section 7.6.2) and the other was found in a peat bog at Quoykea Moss along with a class II or bifid razor: Orkney's only Bronze Age hoard (Callander 1922, 356-8; Figure 6.11). This type of razor is generally found in hoards: the largest concentration comes from the Thames Valley and Wessex in southern England (Coles 1964, 120, 148-9; Piggott 1946). The Late Bronze Age examples continue into the Ewart Park phase e.g. at Flag Fen (Coombs 2001, 265). Since the Quoykea Moss razor is associated with a Ewart Park phase Thorndon type socketed knife it is more likely to be a late example, although it may have been an heirloom piece.

Orkney has two Early Bronze Age daggers, a class of objects the majority of which generally are found in graves; in Scotland there is a marked cluster in the eastern central region (Baker et al 2003, 109-12 & 116-23; Henshall 1968). Orkney's examples are however both from peat bogs: one from Flanders Moss, Rousay (Cursiter 1908; Figure 6.12), which is one of only 13 examples of its type in Britain, with a concentration in Scotland (Gerloff 1975, 58-63; Needham 2004, 226-31; Needham, Bray et al 2015, 24); the other, the Heathery Howes, Holm dagger (Cursiter 1887, 340; Figure 6.10b) is of a type

[141] There were only seven Thorndon types known from elsewhere in Scotland when surveyed by Coles (1960).

mostly found in rich burials in southern England and the Wessex area (Gerloff 1975, 70-3). The Flanders Moss dagger had been well-used before deposition: unlike the pristine examples found in graves, it was a 'working tool with hammered surfaces and much-whetted edges' (Henshall 1968, 177).

The remaining three securely provenanced pieces include the Middle Bronze Age Ditch Park Moss rapier (Cursiter 1887, 340; Figure 6.10c), found in a peat bog but now lost, which significantly extends the distribution of such rapiers northwards, since most finds come from southern Scotland (O'Connor & Cowie 1995, 345). The majority (over 85%) of rapiers from the British Isles have been found in wet contexts, particularly rivers; and as single finds rather than in hoards (Burgess & Gerloff 1981, 1 & 5).

The Middle Bronze Age Netherhouse spearhead and the Late Bronze Age Hobbister axe, both peat bog finds, are of types that are common elsewhere (Coles 1964, 108-9; Cowie & O'Connor 2006); the latter object, from an area where sub-peat dykes and probable barrows have been recorded (Section 8.4.1), is of a type whose closest parallels lie in Ireland (Cowie & O'Connor 2006). Another, if unusual, Late Bronze Age metal-related find is the Grotsetter yew-wood sword[142], found during peat-cutting lying horizontally with its edge upwards (Cowie & O'Connor 2007, 330-1; Stevenson 1958), suggestive of deliberate placement in the bog. The sword is a skeuomorph of a Late Bronze Age Ewart Park sword and has been radiocarbon dated to 953 – 798 cal BC (Sheridan et al 2002, 59); this determination is important in dating all Late Bronze Age Scottish metalwork (Sheridan 1999, 54). Yew is not native to Orkney, therefore either the wood or the completed sword must have been an import; perhaps an exotic prestigious display item before ending as a votive deposit (Sheridan et al 2002).

[142] In Orkney there is one other unusual Bronze Age wooden object deposited in a bog, the ox-yoke or swingle-tree found during peat cutting at White Moss in Shapinsay, radiocarbon dated to 1516 – 1253 cal BC at 2 σ (Anon 1866b, 398; Hedges et al 1995, 424; Sheridan 1999, 54).

6.3.4 Burials with vessels

The commonest artefactual finds in Orkney's Bronze Age burials are urns. The Northern Isles have distinctive ceramic and steatite urns, neither of which (with the exception of the Food Vessel/Vase Urn from Sand Fiold, Sandwick: Dalland 1999; Section 6.2.2) generally relate to the pottery traditions of the Scottish mainland (Sheridan 2003b, 211-13 & 2007a, 171-3). Radiocarbon dates for the use of both ceramic and steatite urns in Orkney range from the later 3rd to the mid-2nd millennium BC (ibid). Both types are commonly found with cremations, but there are also examples where an inhumation is present in the same cist as the urned cremation (e.g. Dalland 1999).

Clay urns from older excavations were usually fragmentary and contemporary descriptions of them are minimal. The urn from Quandale Mound 3 which contained a cremation was 8.5 inches (21.6cm) in diameter by 11 inches (28cm) high and is described as of 'flower-pot shape' (Grant 1937, 76). A plain, coarse ceramic urn also survives from a ploughed-out cremation lacking a cist, at Blomuir, Holm (HY40SE20). Some of the individuals in the large reusable cist at the Links of Noltland, Westray, were buried with pots (Moore & Wilson 2013; Section 6.1.1), but no further details are available.

Over 30 Orkney examples of urns made from Shetland steatite are known (Sharman 2009, 39). Steatite urns vary in size, including small e.g. Clestrain, Stronsay, only c.10cm tall (Callander 1931b, 102-3; Figure 6.13) and medium examples e.g. Blows, Deerness c.21cm tall (Marwick 1929a & c). The most impressive is the massive composite urn from Linga Fiold, Sandwick, 63cm tall by 39.5cm by 34.5cm wide at the mouth (Sharman 2009, 44-5). This vessel was constructed by joining two halves using cord threaded through holes drilled for the purpose (ibid). Also at Linga Fiold, steatite tempered pots were made with clay from a Shetland source. It seems likely that these ceramic and steatite urns were imported into Orkney from Shetland as complete vessels (Sheridan 2003b, 213).

The majority of Bronze Age steatite vessels have been recovered from funerary contexts, but there are examples from settlement sites. Sherds of five vessels were recovered from Tofts Ness, Sanday, for example, one of which resembled the cremation urn from Blows, Deerness (Smith, A N 2007b, 285). There is also a small but important assemblage of steatite vessel fragments from the Bronze Age houses at the Links of Noltland, Westray (Forster 2011; Section 7.6.3).

6.3.5 Food Vessel/Beaker hybrid pots in burial contexts

Decorated pottery from Orcadian Bronze Age funerary contexts[143] is limited to that from just three cists: Newhouse, Birsay (Marwick 1949), Redland, Stromness and Upper Bigging, Harray (Downes & May 2005b, 295-7). All three cists were chance finds and were otherwise empty, suggesting in each case that the pots had originally accompanied a since-decayed inhumation.

At Upper Bigging the pot (Figure 6.14) had a cord impressed motif and a decorated internal bevel (Downes & May 2005b, 295-7). Both this and the Redland pot are best classified as Food Vessel/Beaker hybrids since their shape, and in the case of Upper Bigging, internal decoration, are typical of Food Vessels, but the exterior decoration is Beaker-like (ibid).

The pot from Newhouse, Birsay (Marwick 1949, 239-40; Figure 6.15) was catalogued by Clarke (1970, vol. 2, no. 739, 369) as a Food Vessel and in form it bears closer resemblance to a Food Vessel than a Beaker. Again however, the external decoration is more reminiscent of some Beaker and Beaker-like Early Bronze Age pottery now known from the Northern Isles. Beaker sherds from midden deposits at the Links of Noltland for example are associated with a radiocarbon date of c.2265 – 1975 cal BC (Marshall et al 2016, 12 & 28). Other Early Bronze Age parallels for this basic incised design come from the Beaker pottery from the Braes of Ha' Breck, Wyre, (Figure 6.16), dated to

[143] Sherds of lozenge-decorated pottery from the cist at Lopness, Sanday are thought to be contamination from later deposits rather than associated with the inhumation (Innes 2016). A single possible Food Vessel rim sherd was recovered from a redeposited context at Roeberry, Cantick Head (Lee 2010; Section 6.2.1). No details are yet available from the Links of Noltland cemetery (Moore & Wilson 2011a; Section 6.1.2).

the late 3rd millennium BC (Sheridan 2013, 56-7; see Appendix 1, Table A1.14), and some of the pottery from Tofts Ness, Sanday (MacSween 2007, 263-82). Recently completed PhD research on Scottish Beaker pottery[144] may shed some light on this issue, and in particular whether any of the Beaker/Beaker-like pottery from Orkney[145] can properly be called Beaker, or whether it should instead be considered as part of a wider group of incised wares (Owain Mason, pers. comm.).

In Shetland, where there is a similar lack of Beaker pottery, Sheridan (2013, 59) has observed:

> *All the evidence points towards the initial appearance of the new, alien, Beaker ceramic tradition, followed by the emergence of a regionally-specific trajectory for its development.*

Sheridan (ibid, 56) concludes that the Shetland Beaker tradition has its roots in the Western Isles, whilst Orkney is on the edge of the Scottish mainland Beaker diaspora. The Ness of Gruting, Shetland, pottery however has a similar design and a similar late 3rd millennium BC date to the Beaker from the Braes of Ha'Breck, Wyre (ibid, 56-7), and links between Orkney and Shetland at this period are demonstrated by imports of Shetland steatite urns from the late 3rd millennium cal BC (Section 6.3.4); both island groups may have been participating in the same regional trajectory.

The three Food Vessel/Beaker hybrids from Orkney described above are undated. Elsewhere in Scotland Food Vessels are in use from c.2200 – 1520 cal BC (Sheridan 2004b, 249). It is unclear where the Orkney Beaker/Food Vessel hybrids fit within this pattern, but the similarities of the design of the Newhouse vessel (Figure 6.15) to the Beaker pottery from the Braes of Ha'Breck, Wyre (Figure 6.16), suggest a late 3rd millennium BC date is not unlikely.

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[144] Owain Mason, University of Edinburgh: *Dialogues, transitions and social preferences: reassessing the importance of Beaker pottery in Scotland.*

[145] Summarised in Appendix 7, Table A7.4.

6.3.6 The South Ronaldsay cup

A cup[146] 'dug up from the foundation of an ancient ruin in Ronaldshay, Orkney' (Anon 1860b, 485) is in the NMS. Anderson (1886, 48) cited the find location as South Ronaldsay, but provided no further information on the context (Figure 6.17). There is no evidence for a cremation associated with this cup but it is included for consideration here since elsewhere in the UK such cups are associated with cremations in urns, particularly Collared Urns (e.g. Longworth 1984, 50-56; Scott 1951, 79-82). Various forms of these cups, both decorated and plain, and with or without perforations or fenestrations, are known (Longworth 1984, 50-6; Gibson 2004, 270). Their function is a matter of debate, with suggestions for their use such as incense burners, ritual containers for strong alcoholic drink, or receptacles for carrying the flame to the cremation pyre (Gibson 2004, 277-9). They may even have been fired on the pyre itself (ibid 283-4). Scottish radiocarbon dates place these cups in the first half of the second millennium BC, and the South Ronaldsay example is of typical Scottish mainland style (Sheridan 2007a, 171 & 173-4). The South Ronaldsay cup is a strikingly decorative object – its quality being such that it was both part of the NMS *Symbols of Power* exhibition and illustrated in the catalogue (Clarke et al 1985, 298 & fig. 5.38). Its rarity in an Orcadian context strongly suggests that it too may be an exotic elite import.

6.3.7 Other artefacts with funerary associations

Apart from funerary vessels the commonest artefacts associated with burials in Orkney are stone implements, particularly coarse stone tools – although a miniature steatite axe found on the clay bedding around a cist containing a cremation within a barrow at Mousland, Stromness (Downes 1994a, 145) is paralleled by an 'almost identical' axe recovered from the ground surface surrounding a group of cists in the cemetery at the Knowes of Trotty (Downes 2005, 72). Petrie (1868b) illustrates and describes 'rude stone implements',

[146] Also known as accessory cups/vessels or pygmy cups, Gibson (2004, 270-71) suggests simply that the term 'cup' should be used.

which are in fact ard-points, found in burial contexts from various locations in Orkney. These were recovered from both outside the cist, but also from inside the cist accompanying the burial e.g. one from inside a cist in St Andrews, accompanying a cremation in a clay urn, another from inside a cist at Bookan, Sandwick (ibid; Anon 1885, 139) and one from a 'grave' at Whitehall, Stronsay alongside an inhumation and a fine stone battleaxe[147] (Evans 1897, 206; Fenton 1988; Petrie 1868b). Petrie (1868b) also records a rubbing stone or pestle placed inside the cist at a barrow near Kirkwall, whilst three cists at the Ness of Brodgar, Stenness each contained an inhumation accompanied by a water-worn stone (Marwick 1926; Section 7.3.4; Figure 6.18).

Agricultural implements of stone such as ard-points and mattocks are also commonly found deposited on barrow kerbs e.g. at the Knowes of Quoyscottie, Birsay (Hedges 1977); Linga Fiold, Sandwick (Downes 2005, 190-6) and Loth Road, Sanday (Sharman 2007a); this placement seems to be deliberate. Downes (2005, 194) suggests these implements may have played a preparatory role in the funeral rites – in modifying the ground for barrow construction or in cutting turves for the cremation pyre – hence they were polluted and could not be removed from the locality; they may also indicate the importance of agricultural practices in Bronze Age ideology (Downes 2000b, 126; Downes & Thomas 2013, 77). This cannot be the explanation for the presence of the rubbing stone or water-worn stones within the cists described above, or for the presence of the miniature axes; the deliberate placement of these items does however confirm their significance, particularly so when the majority of Orcadian Bronze Age burials are unfurnished.

[147] Another battleaxe (only recently recorded) was discovered during the destruction of three cists containing cremations at Cott, Stronsay in 1907, but its original position is unclear: (http://orkneystonetools.org.uk/themes/biographies/objects/battle-axe-cott-stronsay); the other Orkney examples are unprovenanced chance finds (e.g. Fenton 1988; Roe 1966). Few radiocarbon dates are associated with Scottish battleaxes (none of which are from Orkney) but those available fall within the first half of the second millennium BC (Sheridan 2007a, 175 – 6).

6.4 Discussion

Burial practices clearly changed in Orkney over the course of the 3rd millennium BC, from the chambered tombs whose main phase of Neolithic use appears to have ended c.2800 cal BC (Section 6.2.1; Chart 6.3) to the cist burials, which became increasingly common from c.2200 cal BC onwards (Charts 6.1 and 6.2). The limitation of the archaeological record is apparent in any attempt to chart sequential practices during the transitional period from chambered tomb to cist, with very few radiocarbon dates available from burial contexts to bridge the intervening six centuries (Chart 6.3).

Based on the available radiocarbon dates for Chalcolithic/Early Bronze Age activity at Orkney's Neolithic tombs and notwithstanding the limited nature of the archaeological record from the majority of chambered tomb excavations (Section 6.2.1), it is evident that the chambers and passageways at some Neolithic tombs were still accessible during the late 3rd/early 2nd millennia cal BC, accompanied by the continuing if sporadic deposition of both human and animal bone (Chart 6.3). What is not clear is the extent of this practice, due to the limitations of the available record (Section 6.1.1). At Isbister, South Ronaldsay, the currently available radiocarbon dates (Armit et al 2016; Lawrence & Lee-Thorp 2012; Chart 6.3) indicate a possible hiatus of around two to four hundred years between the end of the main Neolithic phase and possible Chalcolithic reuse of the tomb. Reuse after such a lengthy span might indicate some memory of earlier significance; it may indicate that later users of the tomb respected the earlier burials and added to the tomb rather than disturbing or clearing the contents. The remodelling apparent in the structural record at Taversoe Tuick (Section 6.2.3) contrastingly was deliberate, and perhaps more significant than simply the chance reuse of a convenient mound some centuries after its initial period of use. Rather than inserting later burials into an existing tomb, as was the case at Isbister, or into the entrance passageway, as at Cuween (Section 6.2.1; Chart 6.3), which seem to be activities respectful of Neolithic tradition, the remodelling at Taversoe Tuick is both dramatic and destructive of earlier arrangements.

Presumably any earlier burials or other deposits in the upper chamber were cleared to make way for the three cists identified; no earlier funerary remains were noted during the course of the excavation (Reynolds 1985; Turner 1903), and so their wholesale removal is likely. Contrastingly, the Neolithic burials in the lower chamber, along with their Unstan Ware pots, were undisturbed in the later period (ibid); the passageway into the lower chamber at Taversoe Tuick may however have served in effect as a reusable cist, akin to others newly constructed during this period as at the Links of Noltland (Section 6.1.2).

The use of a passageway at Skara Brae for burial in the late 3rd/early 2nd millennium cal BC (Section 6.1.3) may indicate that, as suggested by Downes et al (2016, 61) at other Neolithic settlement sites that saw Bronze Age funerary use, a desire to assume the power of the ancestors by emphasising origins. It could also be that the Skara Brae passageway was simply mistaken for the entrance passageway to a chambered tomb, and so was seen as an appropriate place to deposit further burials.

Rock-cut structures of varying type are another component of the record during this transitional period. The rock-cut cist at Sand Fiold appears to have been used from c.2800/2500 cal BC through to the early 1st millennium BC (Dalland 1999, 404-8; Chart 6.3) but at 700 – 900 year intervals, which might argue more in favour of the intermittent chance rediscovery of this site in an area which continued to attract funerary interest (e.g. the Links of Skaill: Section 6.3.2) rather than long term direct continuity of funerary practices here. There is another reusable cist now known from the Links of Noltland, which appears to have been used with some frequency probably during the 2nd millennium cal BC (Moore & Wilson 2013) although full details are not yet available; it seems to have been in use alongside a cemetery containing individual inhumations. The rock-cut tomb at Crantit (Ballin Smith 2014; Section 6.2.2) cannot be assigned definitively to period in regard to its original use but it continued to act as a focus for burial activity in the 2nd millennium cal BC and this arrangement may parallel the reusable cist/cemetery combination seen at the Links of Noltland. Alternatively it may

be an instance of a Neolithic tomb continuing to attract later satellite burials as was the case at other sites e.g. Cuween (Charleson 1902, 734; Section 6.2.1).

In a similar way, the monumental mound of Maeshowe chambered tomb attracted satellite barrows to its environs (Section 6.2.1) and the (probably) Neolithic henge at the Ring of Brodgar acted as a focus for Bronze Age funerary activity (Section 6.1.4), demonstrating perhaps a concern with origins and the continuing importance of the power and prestige of such major sites. Perhaps at such localities continued recourse to a key location was more important than the construction of richly furnished graves: the cremations in Plum-Cake Knowe near the Ring of Brodgar for example were accompanied by urns but nothing more (Section 6.1.3), although as Petrie 1856 (58-60) noted, it must be conceded that the primary burial here may not have been reached.

There is a marked contrast in the Orcadian Bronze Age burial record between the very few graves with exotic and unusual grave goods and the vast majority seemingly without artefacts, at least surviving inorganic ones. Apart from the burials with urns (Section 6.3.4), the various graves discussed above (Section 6.3) represent the entire corpus of furnished graves from Bronze Age Orkney[148]. In contrast to the rarely-encountered exotica, the inclusion of seemingly mundane implements of stone, such as ard-points, water-worn stones and pestles, in burial contexts is obviously deliberate (Section 6.3.7). Whether their presence originally related to the preparation of the ground prior to the construction of the barrow, or acted as a symbol of fertility, growth and regeneration (e.g. Downes 2005, 194) or whether such items had particular significance for the deceased in life are issues open to question, but the deposition of such major stone items is a commonly occurring phenomenon and must have been significant.

At the other end of the spectrum, the gold and amber from the Knowes of

[148] Details are not yet available on the accompanying artefacts in the cemetery at the Links of Noltland (Moore & Wilson 2013).

Trotty bear comparison with that encountered in the rich Wessex graves. The amber spacer plate necklace is even likely to have come from Wessex and shares the same heirloom status as many of the comparable pieces encountered in that region. The presence of gold and amber at the Knowes of Trotty undoubtedly enhanced the status of the deceased, and shows that, despite Orkney's perceived isolation, exotic artefacts nevertheless reached here and were incorporated into the funerary record. Since only the largest barrow at the Knowes of Trotty cemetery has been excavated, one can only speculate on the possible range of accompanying grave goods in the other fifteen barrows.

The jet-like disc bead necklace from the Links of Skaill is also an exotic item, since there is no source for jet or any jet-like material in Orkney; imported jet (from Whitby, Yorkshire) is known in Orkney although not in a burial context e.g. the peat bog find of a jet spacer plate in Tankerness (Section 6.3.2). Jet has the same electrostatic properties as amber and it is possible that objects crafted in such materials could have been 'a source, or a symbol, of power and prestige' (Shepherd 1985, 204). Jet spacer plate necklaces are now considered to be skeuomorphs of Irish gold lunulae, commissioned from the Whitby jet-workers, their patrons wishing 'to appropriate a little of their 'magic' as symbolically charged objects' (Sheridan & Davis 2002, 816). The single piece of jet spacer plate hints at the possibility that the Orcadian elite wished to use this likely heirloom to achieve the same ends.

The scarcity of metalwork, with only ten securely provenanced items spread throughout the whole of the Orcadian Bronze Age, inhibits meaningful conclusions. It is striking that the copper alloy razor from Laughton's Knowe came from a context which displays the tradition of the correct form of deposition i.e. in a cist with a cremation. This raises the question of whether the razor was indeed an imported item in its own right or if it arrived in the north with its owner as a personal possession. This perspective may be extended to the amber and gold at the Knowes of Trotty. This contrasts with the deposition of the two Early Bronze Age daggers, from Flanders Moss, Rousay and Heathery Howes, Holm, in peat bogs rather than in graves as was

more usual elsewhere (Henshall 1968). Both of these daggers are rare exotic imports, the Heathery Howes dagger in particular being of a type found in the rich Wessex burials (Gerloff 1975, 70-3). Half of Orkney's small assemblage of securely provenanced metalwork (Section 6.3.3) consists of prestige items (two daggers, a rapier and two razors); further links to southern England are suggested by the Quoykea Moss razor (Piggott 1946) and the Thorndon knives (Coles 1960, 46). In most areas of Bronze Age Britain, metal tools such as socketed axes, palstaves, chisels and gouges would have been of use in many day-to-day activities involving timber working and tree felling (e.g. Darrah 2004 & 2012; Goodburn 2004, 128-33; Van De Noort et al 2014, 302-3). In Orkney however, with its tradition of building in stone rather than wood it is harder to see an obvious practical function for such metal tools. Stone-working techniques, perfected during the Neolithic (Section 2.1.2; Figure 2.1), continued broadly unchanged throughout Orcadian prehistory: there is no evidence in Orkney of stone cut with metal tools until the 1st millennium AD (e.g. Figure 2.2). It seems likely that much Bronze Age metalwork had little local functionality in Orkney but existed as status items, perhaps more so than elsewhere.

The majority (seven out of ten provenanced pieces) of Orkney's metalwork was deposited in bogs, as was the Grotsetter sword (Section 6.3.3); there is a concentration of find locations in the East Mainland (Figure 6.9) and a noticeable lack in the West Mainland[149]. This bias may reflect the proportions of unimproved land at each location: 46% of the West Mainland is unimproved heath/peat bog compared to only 6.5% in the East Mainland (Table 4.3). It is possible that more votive deposits in watery locations await discovery: prime locations might include the West Mainland lochs of Stenness and Harray, either side of the Brodgar peninsula, a continuing focal point for both funerary and settlement activity in the Bronze Age (Section 6.1.4). Prehistoric deposition in a watery location usually only comes to light as that area is drained (e.g. Flag Fen: Pryor 2001, 52-73) or scraped for

[149] The West Mainland has a land mass approximately three times greater than the East Mainland (Table 4.3).

marl/soil (e.g. Duddingston Loch: Callander 1922): since the Lochs of Stenness and Harray reached their present levels in the 2nd millennium BC (Section 7.13.1) they have remained substantially undisturbed. It is also possible, given the importance of the sea in island communities (Section 2.3), that ritual deposits were made in the sea itself, a practice that appears to have had a wide currency in Bronze Age Britain (e.g. Needham et al 2013; 145-50).

Curiously, Orkney lacks classic Beaker pottery. Apart from the Food Vessel/Beaker hybrids (Section 6.3.5) there is nothing in Orkney to compare with the Beaker burials known throughout the remainder of Britain (e.g. Clarke 1970). The reasons for Orkney's non-adoption of the 'Beaker package' (including early metalwork and fancy archery gear) remain elusive. Needham (2007, 42-3) conceptualised the expansion of Beaker culture as a reinforcing circle, where the key phase depended on the indigenous response to Beaker groups. If this response was interest in either exploitation or interaction, then Beaker culture was drawn onward and consolidated into a cycle of expansion. If, on the other hand, the reaction was one of disinterest or rejection, then there was little or no Beaker implantation. Needham (ibid) concludes that the fact that Beaker groups brought metalworking technology with them was one of the most influential factors in the Beaker spread into regions that had not encountered metal before. If Needham's (2007, 42-3) reinforcing circle model is correct then it implies that the Orcadian community responded with disinterest to, if not outright rejection of, the approaches of the Beaker 'incomers,' but it is more likely that Beaker groups never reached Orkney directly. Although there is an example of an early Beaker burial at Achavanich, Caithness (Sheridan 2007b) there are few Beakers known to have been found in the north of Scotland (ibid; Clarke 1970, vol 2, 510-22; Suddaby & Sheridan 2006). It appears that Orkney rejected, if not the Beaker 'incomers', then the Beaker ideas including the new pottery styles, in much the same way as metalwork was not adopted at an early date here.

The steatite urns came from Shetland and required a dangerous voyage through difficult waters to acquire (Section 2.3.3). Steatite funerary urns are unique to Orkney and Shetland, and, as Sheridan (2007a, 172) noted:

> *It seems plausible that the regionally specific urn types seen in the Northern Isles reflect the desire to express a distinct identity/ies. The complexity, or sophistication, of the Orkney elite's expression of identity is demonstrated in the contents of the prominent barrows close to the Ring of Brodgar. Here … the elite chose to bury their cremated dead in the large, prestigious steatite urns that are found only in the Northern Isles.*

This suggests that, far from these steatite urns indicating isolation from mainland Scottish trends, the Orcadian Bronze Age elite made a deliberate choice to be buried in such vessels rather than in the clay urn forms common elsewhere. This may be part of a general rejection of outside influences in favour of a regional trajectory, with northern and insular connotations, which appears to have included closer ties with Shetland. This Shetland influence may also be seen in some of the domestic structures of the 2nd millennium BC, such as the double house (Section 7.8) and is possibly supported by some of the distinctive Beaker-like pottery seen in both Orkney and Shetland in the late 3rd millennium BC (Section 6.3.5).

Chapter 7 Settlement

7.1 The nature of Orcadian prehistoric settlement

'The basic settlement unit is the house' (Hunter 1971, 170). Settlement sites in prehistoric Orkney are recognised archaeologically by the presence of substantial permanent structures – 'houses[150]' – constructed from Orkney's easily accessible high-quality building stone[151] (Section 2.1.2), typically surrounded by rich black midden[152] deposits (e.g. Card et al 2016; Childe 1931a; Childe & Grant 1939 & 1947; Ritchie 1983a), and this has been the case since the discovery of Skara Brae in 1850, where:

> *... an immense "Kitchen Midden," apparently of great antiquity, was exposed to view. It ... consisted chiefly of ashes thickly studded with bones, shells, pieces of horns of the ox and deer, and fragments of charred wood* (Petrie 1868a, 201).

Debates over Neolithic transhumance (e.g. Barrett 1994, 132-53; Pollard 1999; Thomas 1991, 25-8, 1996 & 1999, 7-23; Whittle 1996) and regional variation (e.g. Barclay 2001 & 2003; Cooney 1996 & 2003; Gibson 2003) have largely bypassed Orkney. Narratives of a mobile British Neolithic cite Orkney as the exception to the pattern elsewhere (e.g. Thomas 1999, 9-10). The transhumance debate is also relevant to the Bronze Age. Brück (1999a &

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[150] I use 'settlement' in a restricted but generally recognised sense, referring to a house or houses together with any associated structures and infield area (e.g. Roberts 1996, 1-14). Use of the term 'house' has been questioned due to the baggage that comes with it (e.g. Brück & Goodman 1999), although it is a perfectly acceptable term due to the universal nature of the concepts expressed (e.g. Cooney 1999, 52-7). 'House' has not generally been a contentious term in Orkney (e.g. Downes et al 2016; Richards & Jones, R. (eds) 2016) and will be used here. Other terms such as 'dwelling' and 'farmstead' carry their own implications (e.g. Oliver 1987; Waterson 1990 & Weller 1982).

[151] Although timber houses dating to the mid-4th millennium BC have been identified in Orkney, these were replaced in stone by the late 4th millennium BC (Farrell et al 2014; Gee et al 2016; Richards & Jones, A. M. 2016).

[152] I follow the common usage of 'midden' in Orcadian archaeology (e.g. Card et al 2016; Dockrill & Bond 2009; Richards, Jones, R. et al 2016) as a general term for the on-site accumulation of refuse notwithstanding its potential complexities (e.g. Barber 2011; McOmish 1996; Needham & Spence 1996 & 1997; Shepherd 2016).

2000) proposed that in parts of Southern England[153] Early Bronze Age settlement sites, defined by the presence of a house (indicated in the lowlands by holes for timber posts and other negative features) with evidence of domestic activities at the same location, did not exist. Instead there was residential mobility over a wider landscape, accounting for finds of domestic artefact scatters and hearth debris at a range of sites without associated permanent settlements (ibid). The appearance of roundhouses and field systems suggests that sedentary farming was well established in lowland Britain by the Middle Bronze Age (Barrett 1994, 132-53; Brück 1999b, 2000 & 2007; Ellison 1981; Thomas 1991, 28 & 1999, 7-11). Elsewhere in Britain, north of a line between Aberystwyth on the west coast and the Wash in the east, there is evidence from the Early Bronze Age onwards of settlement sites with roundhouses, with early 2nd millennium cal BC Scottish examples including ring bank and earthfast timber post construction (Pope 2003 & 2015).

The geographical constraints of the Orkney archipelago impose severe limitations on settlement and subsistence patterns (Sections 2.1.4 & 2.1.5). There was little opportunity for either nomadic pastoralism or shifting cultivation. Upland areas[154] in Orkney tend to be suitable only for low-intensity grazing (e.g. Farrell 2009, 295-8; Keatinge & Dickson 1979, 593). Access to the resources of the sea remains an important consideration in island communities (e.g. Evans & Vaughan 1983; Nicholson 2007a, b & c; Wheeler 1983) and this enabled the successful exploitation of otherwise marginal coastal locations, with a mixed economic base providing sustainability especially in times of scarce resources (Dockrill & Bond 2009, 44). Primary human needs for survival include fresh water, food and shelter: the most desirable living places provide convenient access to these, and this has inevitably led to continuity of use, which has caused in some instances the development of tell-like mounds e.g. in Sanday and North Ronaldsay

[153] Comprising the Wessex region of Wiltshire, Dorset and Hampshire, together with the Thames Valley, Kent and Sussex.

[154] Above 50m OD in Orkney (Berry 1985, 53 & 2000, 52; Section 2.1.4).

(Davidson et al 1983 & 1986) or linear arrangements of successive structures e.g. Swandro, Rousay (Dockrill et al 2013 & 2014). Permanent settlement in Orkney necessitates reuse of agricultural land and this requires intensive manuring to both create and maintain soils suitable for arable cultivation, preventing soil exhaustion (e.g. Guttman et al 2004 & 2006; Simpson, I. A. et al 2007; Section 8.2). The middens that accumulated contributed significantly to agricultural activity. In addition to providing valuable manure to create a fertilised infield, they were, from the Neolithic onwards, both directly cultivated and used to stabilise windblown sand deposits (e.g. ibid; Dockrill & Bond 2009; Simpson et al 2006). Midden has also had structural functions in Orkney, and was used as wall core material from the Neolithic (e.g. Dockrill 2007b; Hunter 2007a) into the Late Bronze/Early Iron Age (Dockrill 2007c). The extensive midden deposits and enriched soils associated with permanent settlements accentuated motives for site persistence and became an inherited resource for succeeding generations (Dockrill & Bond 2009; Hamlet 2014).

The utilitarian exploitation of midden as a vital component in maintaining the viability of permanent agricultural settlements contrasts with the picture presented elsewhere in Britain, where large-scale midden sites developing in the Late Bronze Age have been interpreted as communal feasting or gathering places, associated with specialised activities such as craft production, cattle rearing, ritual or mortuary practices (e.g. Brück 2007; Lawson 2000; McOmish 1996; Needham & Spence 1996 & 1997; Needham et al 1996). Parallels for such practices come from Orkney in the 3rd millennium BC with evidence for selective and structured deposition of cattle bone and articulated red deer skeletons in the vicinity of settlements sites (e.g. Bond 2007a; Card et al 2017; Clarke et al forthcoming; Mainland et al 2014; Marshall et al 2016; Moore & Wilson 2011a; Richards et al 2015). There appears to be little evidence for continuity of such structured deposition on a substantial scale beyond the late 3rd millennium BC, although Downes (2005, 200) sees the incorporation of human excrement into the fertilised infield at Tofts Ness, Sanday as significant, since it:

> *… signals both the role of the person as an inseparable part of the continuous cycle of reproduction, and the inalienability of people and land.*

More prosaically, the addition of human manure highlights a need to exploit every available resource in maintaining viability of the Bronze Age soils (Simpson, I. A. et al 2007, 248), although the two explanations are not mutually exclusive.

This pattern of permanent stone-built houses and associated evidence for sedentary agriculture (Section 7.3) remains a constant feature of Orcadian prehistoric settlement from the 4th millennium BC onwards. Social changes occur such as can be envisaged from the development of new designs of houses (Section 7.4); the appearance of burnt mounds (Chapter 9); the advent of enclosed settlements (Section 7.12) and changes in burial practice (discussed in Chapter 6) but these need to be set against the background of the practicalities of the continued successful exploitation of Orkney's geographically circumscribed environment.

7.2 Limitations of the archaeological record

As discussed earlier (Chapter 1), Bronze Age Orkney suffers in comparison with more intensively researched periods, in particular the Orcadian Neolithic. There are 25 known (or probable[155]) Neolithic settlement sites (Figure 7.1), a not dissimilar sum to the 28 known (or probable) Bronze Age settlement sites (Figure 7.2), although the known Bronze Age sites are more evenly distributed across the landscape[156]. Disparity in favour of the Neolithic becomes apparent when comparing excavated Bronze Age settlement sites with their Neolithic counterparts: only five excavations of Bronze Age sites have been fully published (Table 7.1) compared with thirteen Neolithic sites (Table 7.2).

[155] Unexcavated sites are classified to a particular period on the basis of either visible physical characteristics or from artefacts collected during field walking or recovered from exposed erosion faces etc. See section 4.7 for a discussion of the biases this may introduce.

[156] See Appendix 12, Figures A12.1 – A12.6 for large-scale locations maps.

Table 7.1 Probable Bronze Age settlements[157] in Orkney indicating excavation status or survey type. 'Site number' refers to the sites shown on Figure 7.2. Bronze Age house forms (e.g. oval, double) are discussed below in Sections 7.6 – 7.10.
N.B. 'In post-excavation' indicates that the site is not yet fully published, but interim reports and grey literature may be available.

Site No.	Site Name	Description	Site Status	Reference
1	Point of Buckquoy, Birsay	Indeterminate (Section 4.7)	Excavation published	Morris 1989, 71-107
6	Crossiecrown, St. Ola	Multi-period (Section 7.5.4)	Excavation published	Card et al 2016
10	Site 5, Skaill, Deerness	Double House (Section 7.6.2)	Excavation published	Buteux 1997c
18	St Boniface, Papa Westray	Multi-period (Section 7.15)	Excavation published	Lowe 1998
23	Tofts Ness, Sanday	Multi-period (Sections 7.3.5 & 7.9)	Excavation published	Dockrill, Bond et al 2007
2	Linna Breck, Birsay	Oval house (Section 7.8.2)	In post-excavation	Øvrevik 1985, 146-9
3	Nessbreck, Corrigall	Souterrain (Section 7.11)	In post-excavation	Lee in prep
11	Round Howe, St Andrews	Enclosed roundhouse? (Section 7.12.3)	In post-excavation	Murray 2003
14	Hesti Geo, South Walls	Double House (Section 5.3)	In post-excavation	Lee & Thomas 2012a , 27-30
17	Links of Noltland, Westray	Multi-period (Sections 7.3.5 & 7.6.3)	In post-excavation	Moore & Wilson 2011a & 2013
21	Berst Ness, Westray	Multi-period (Section 7.9)	In post-excavation	Moore & Wilson 2008a & 2009a
7	Brae of Smerquoy, St Ola	Multi-period (Section 7.3.5)	Partly published/Ongoing excavation	Gee et al 2016
24	Cata Sand, Sanday	Indeterminate (Section 5.5.3)	Ongoing excavation	Cummings et al 2016
5	Brae of Muckquoy, Redland	Multi-period (Section 7.12.4)	Fieldwalking/trial excavation/ geophysics	Richards, Downes et al 2016
8	Loch of Tankerness	Oval house (Section 7.8.2)	Field survey/surface finds retrieval	Lamb 1987, 25, no. 113
4	Bookan Wasbister, Stenness	Double House (Section 4.2.3)	Field survey, geophysics	Card 2003 & 2005a, 61
9	Taing of Beeman, Tankerness	Double House	Field survey only	Lamb 1987, 24, no. 109;
12	Braebuster, Hoy	Double House (Section 7.12.2)	Field survey only	Lee 2012

[157] Not including the prehistoric settlement sites in the relict landscapes of Eynhallow (Section 5.4) and Spurness (Section 5.5.4), which have been assumed to be probably Bronze Age for the purposes of the extrapolations in Section 5.7, as explained in Section 5.7, Footnote 107.

Table 7.1 continued				
Site No.	**Site Name**	**Description**	**Site Status**	**Reference**
13	Whaness Burn, Hoy	Enclosed settlement (Section 7.12.2)	Field survey only	Lamb 1989, 13, nos. 10-14 & 1996
15	Cantick Head, S. Walls	Double House (Section 5.3)	Field survey only	Lamb 1989, 19, no.52
16	Rotten Loch, North Walls	Oval house	Field survey only	Lamb 1989, 14, no.17
19	Kraa-Tooies, Papa Westray	Oval house	Field survey only	Downes 1998c
20	Holm of Faray	Double House	Field survey only	Lamb 1984, 21, no. 86
22	Shelly Knowe, Sanday	Double House (Section 5.5.1)	Field survey, geophysics	Dockrill, Gater & Simpson 2007
25	Linga Holm	Double House (Section 5.4)	Field survey only	Lamb 1984, 34, no.215
26	Linga Holm	Oval house (Section 5.4)	Field survey only	Lamb 1984, 34, no.212
27	Auskerry	Double House (Section 5.4)	Field survey only	Lamb 1984, 34, no.192
28	Peerie Hill, Sandwick	Roundhouse (Section 5.2)	Field survey, geophysics	Moore 2011 & 2013

Relatively little attempt has been made to consider the different types of Bronze Age settlement, their inter-relationships and developmental history, consequently a number of issues remain to be resolved, and I seek to explore the following questions:

- Is there a dislocation in the settlement record at the Neolithic/Bronze Age transition as suggested by the apparent abandonment of sites such as Skara Brae (Childe 1931a) and Rinyo (Childe & Grant 1939 & 1947)?
- How securely can settlement sites be assigned to the Bronze Age in the absence of excavation (cf. the 'Bronze Age double house' type: Card 2005a, 61)?
- How does domestic architecture develop and change over time from the 'typical' late Neolithic house (e.g. Card et al 2016, 169) to the Iron Age roundhouse (e.g. Dockrill 2007c)?
- Is it possible to identify a 'typical' Bronze Age settlement in Orkney?
- Do settlement patterns change between the late 3rd millennium and early 1st millennium BC?
- Can a social hierarchy be identified between Orcadian Bronze Age settlements?

In examining these issues the limitations imposed by the available data set must be acknowledged. More than half of the sites in Table 7.1 identified as Bronze Age are so attributed on the basis of artefact scatters or morphological features identified during field survey which await confirmation by excavation (e.g. the 'double house': Section 7.7), whilst there is both poor preservation of structural remains and poor chronological resolution in the evidence from the majority of excavated sites. Four of the published excavated sites present particular problems: the Point of Buckquoy, Birsay (Morris 1989, 71-107) and St Boniface Church, Papa Westray (Lowe 1998; Section 7.15) were merely small-scale trial excavations and exposed only fragmentary structural remains; few structural remains survived from the Early Bronze Age occupation at Crossiecrown, St Ola (Card et al 2016; Section 7.5.4) and there were severe problems with the site records from

Skaill, Deerness (Buteux 1997c; Section 7.6.2). Similar problems with poor survival of structural remains exist at other sites such as Cata Sand, Sanday (Cummings et al 2016; Section 5.5.3), which also lacks close chronological resolution; whilst at the Brae of Smerquoy no structural remains survive from the radiocarbon dated Bronze Age occupation (Gee et al 2016; Section 7.3.5).

Tofts Ness, Sanday (Dockrill, Bond et al 2007; Sections 7.3.5 & 7.9) is the only fully published major excavation, which was accompanied by a programme of geophysical survey that investigated the wider landscape (Dockrill, Gater & Simpson 2007), together with innovative soil survey providing valuable insights into subsistence practices (e.g. Simpson 1998; Simpson, I. A. et al 2007; Section 8.2). Other important sites remain in their post-excavation phases, such as the Links of Noltland, Westray (Moore & Wilson 2011a; Section 7.6.3), where an integrated palaeo-landscape approach (e.g. Brend 2010a; Hamlet 2014; Simpson & Wilson 2011) of the kind pioneered at Tofts Ness (e.g. Dockrill & Bond 2009) has been employed, and the multi-period site at Berst Ness, Westray (Moore & Wilson 2008a & 2009a).

7.3 Continuity or change at the end of the Neolithic?

7.3.1 Introduction

A perception of a marked break in settlement at the Neolithic/Bronze Age transition has received broad acceptance – a view informed by Childe's (1931a) influential work at Skara Brae and Rinyo, Rousay (Childe & Grant 1939 & 1947) – and the fragmentation of society at the end of the Neolithic has become the current paradigm (e.g. Richards, Downes et al 2016, 243-6). This significant change appears, at first sight, to be supported by the excavated evidence. Twenty-one of the twenty-six sites with evidence of Neolithic settlement[158] (shown in Figure 7.1) have been excavated to varying

[158] The Stonehall settlement complex comprises three excavated areas of individual structures within 50-100m of each other: Stonehall Farm, Stonehall Knoll and Stonehall Meadow (Richards, Brophy et al 2016) and has been counted as one settlement site; the dates

degrees. Only four of these sites have evidence for continuity of occupation into the Early Bronze Age, whilst recovery of Beaker pottery from four more sites indicates late 3rd/early 2nd millennium BC activity in the vicinity of a Neolithic settlement (shown in Table 7.2 below). Two further sites, Muckquoy (Richards, Downes et al 2016; Section 7.12.4) and Smerquoy (Gee et al 2016), appear to have been occupied in the 2nd millennium BC but it is unclear if this reflects continuity from the Neolithic settlement at the same locations. The majority of examined Neolithic settlement sites were however abandoned by c.2900 cal BC, well before the end of the Neolithic (Chart 7.1; Table 7.2 below). Only the Ness of Brodgar (Card et al 2017) and Pool, Sanday[159] (Hunter et al 2007a) indicate abandonment during what would be considered the Chalcolithic in the rest of the British Isles, with Skara Brae, and possibly Stonehall Knoll, Firth having been abandoned at the Neolithic/Chalcolithic transition (Table 7.2).

It can be argued that, based on the excavated evidence (Chart 7.1; Table 7.2), this late 4th/early 3rd millennium cal BC discontinuity represented a greater fragmentation of society than has been suggested (e.g. Richards, Downes et al 2016, 243-6) at the end of the Neolithic. It is beyond the scope of this thesis to enter into a discussion of the possible reasons for this dislocation, but it is interesting to note that the main phase of burial activity at Neolithic chambered tombs also ends c.2900 – 2800 cal BC (e.g. Hutchison et al 2015; Lawrence & Lee-Thorp 2012; Schulting et al 2010; Section 6.2.1). Contrastingly, at least half of the Neolithic settlements that were demonstrably occupied c.2500 cal BC remained in occupation into the Early Bronze Age (Chart 7.2; Table 7.2). What this undoubtedly demonstrates, in the Orcadian context, is that rates of change and evolution in different types of evidence need not coincide.

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of abandonment differ for each area and these are shown in Chart 7.1 and Table 7.2. Similarly the Links of Noltland, Westray (Moore & Wilson 2011a) has several areas of both Bronze Age and Neolithic settlement altogether covering an area of 4ha but has been counted as one site.

[159] Neolithic occupation at Pool, however, was not continuous, with an earlier hiatus lasting around 100 years in the 28th/27th centuries cal BC (MacSween et al 2015).

There are important limitations to the dataset currently available in terms of evaluating abandonment at the end of the Neolithic. Abandonment at the Neolithic/Chalcolithic-Early Bronze Age boundary is supported by radiocarbon dating at just four sites: Skara Brae, Pool, Stonehall Knoll and the Ness of Brodgar (Chart 7.1; Table 7.2). Of these, the Ness of Brodgar (Card et al 2017) is the subject of ongoing excavation, whilst Skara Brae is in the process of definitive publication (Clarke & Shepherd in prep). For some excavations the published narrative shows that the area examined was substantially less than the entire site. For example Childe & Grant's (1939 & 1947) excavation at Rinyo exposed Neolithic structures extending to c.132m^2, with no evidence of a post-Neolithic component apart from sherds from one Beaker (Childe & Grant 1939, 26), but only 7% of the site has been examined (Mainland & Moore 2010) leaving a great deal of scope for undiscovered Bronze Age settlement, shifted slightly away from the excavated Neolithic structures (cf. the Links of Noltland: Moore & Wilson 2011a; Section 7.6.3). Furthermore, Rinyo was subject to early agricultural improvement (by 1882, Figure 4.19b), lying close to the 1750 hill-dyke, possibly just inside it (Figure 4.19a). Consequently removal of post-Neolithic structures and deposits may have occurred here (Sections 4.4.3 & 4.4), since on their discovery parts of the Neolithic structures were projecting through the turf (Childe & Grant 1939, 6).

Table 7.2 Neolithic settlement sites in Orkney and their excavation status showing radiocarbon dates for probable abandonment and sites with continuing activity in the Chalcolithic (Chalco.) c.2500/2450-2200 cal BC and Early Bronze Age (EBA) c. 2200 cal BC-1550 cal BC. Sites abandoned during the Neolithic/Chalcolithic transition are shown in bold. 'Beaker' indicates the presence of Beaker pottery. 'Site No.' refers to sites shown in Figure 7.1.

Site No.	Site Name	Chalco.	EBA	Beaker	Excavation Status	Abandoned by	Reference
8	Brae of Smerquoy, St Ola		Yes		Post-excavation	3360-3090 cal BC	Griffiths 2016; Gee et al 2016
9	Knowes of Trotty, Harray				Published	3360-3020 cal BC	Downes et al 2016; Griffiths 2016
12	Green, Eday				Post-excavation	3350-3020 cal BC	Griffiths 2016; Miles 2011 & 2012
11	Braes of Ha' Breck, Wyre			Yes[160]	Post-excavation	3340-2940 cal BC	Griffiths 2016; Thomas 2010 & 2011
7	Wideford Hill, St Ola				Published	3340-2930 cal BC	Griffiths 2016; Richards & Jones A M 2016
14	Knap of Howar, Papa Westray				Published	3330-2910 cal BC	Griffiths 2016; Ritchie 1983a
5	Barnhouse, Stenness			Yes[161]	Published	2890-2845 cal BC	Richards, Jones, A. M. et al 2016
6	Stonehall Meadow, Firth				Published	3360-2930 cal BC	Griffiths 2016; Richards, Brophy et al 2016
6	Stonehall Farm, Firth				Published	2890-2620 cal BC	Griffiths 2016; Richards, Brophy et al 2016
6	**Stonehall Knoll, Firth**				Published	**2630-2460 cal BC**	Griffiths 2016; Richards, Brophy et al 2016
1	**Skara Brae, Sandwick**				Partly published	**2550-2420 cal BC**	Childe 1931a; Thomas 2016, 93-4
17	**Pool, Sanday**				Published	**2460-2280 cal BC**	Hunter et al 2007a; MacSween et al 2015
4	**Ness of Brodgar, Stenness**	Yes		Yes	Ongoing	**2340-2200 cal BC**	Card et al 2017
18	Tofts Ness, Sanday	Yes	Yes		Published	Not abandoned	Dockrill, Bond et al 2007

[160] The Beaker pottery is associated with radiocarbon dates in the late 3rd millennium cal BC (Sheridan 2013, 56-7; Figure 6.18), and comes from the upper fills of a stone quarry associated with the Early Neolithic settlement at the Braes of Ha' Breck, which began to be backfilled in the mid-4th millennium cal BC (Lee & Thomas 2012b, 19; Thomas 2010). The Beaker may indicate the presence of Bronze Age settlement nearby.

[161] Described as 'one Beaker rim from an upper deposit beneath the topsoil' (Richards, Jones A.M. et al 2016, 197). There was no other evidence of Chalcolithic/Bronze activity at Barnhouse, but Early Bronze Age pottery was recovered from a pit 135m south east of Barnhouse, possibly associated with the removal of a standing stone (Challands, Edmonds et al 2005, 215).

Table 7.2 (continued).							
Site No.	**Site Name**	**Chalco.**	**EBA**	**Beaker**	**Excavation Status**	**Abandoned by**	**Reference**
19	Berst Ness, Westray	Yes	Yes		Post-excavation	Not abandoned	Moore & Wilson 2008a; H. Moore pers. comm.
20	Links of Noltland, Westray	Yes	Yes	Yes	Post-excavation	Not abandoned	Moore & Wilson 2011a
21	Crossiecrown, St Ola	Yes	Yes	Yes	Published	Not abandoned	Card et al 2016
22	Brae of Muckquoy, Redland	?	Yes		Evaluation only	Not abandoned?	Richards, Downes et al 2016
10	Rinyo, Rousay			Yes[162]	Published	Not dated	Childe & Grant 1939 & 1947
13	Stove Bay, Sanday				Evaluation only	Not dated	Bond et al 1995
15	Howe, Stromness			Yes[163]	Published	Not dated	Ballin Smith 1994
16	Dingieshowe, St Andrews				Antiquarian[164]	Not dated	Petrie 1874, 88-9; Stevenson 1946
26	Scapa Road, Kirkwall				Evaluation only	Not dated[165]	Aitken et al 2015; Strickland 2014
2	Garson, Stromness				Field walking only	N/A	Lynn & Bell 1988b
3	Deepdale, Stromness				Field walking only	N/A	Richards 2005b
23	South Seatter 1, Stromness				Field walking only	N/A	Richards 2005b
24	South Seatter 2, Stromness				Field walking only	N/A	Richards 2005b
25	Saverock, St. Ola				Field walking only	N/A	Gee 2016b; Richards & Jones, R. 2016, 15

[162] See Section 7.3.2.

[163] See Section 7.15

[164] See Section 7.15.

[165] Artefactual evidence here suggested both Neolithic and Iron Age occupation but there was no artefactual evidence to suggest a Bronze Age component and no radiocarbon dates were obtained.

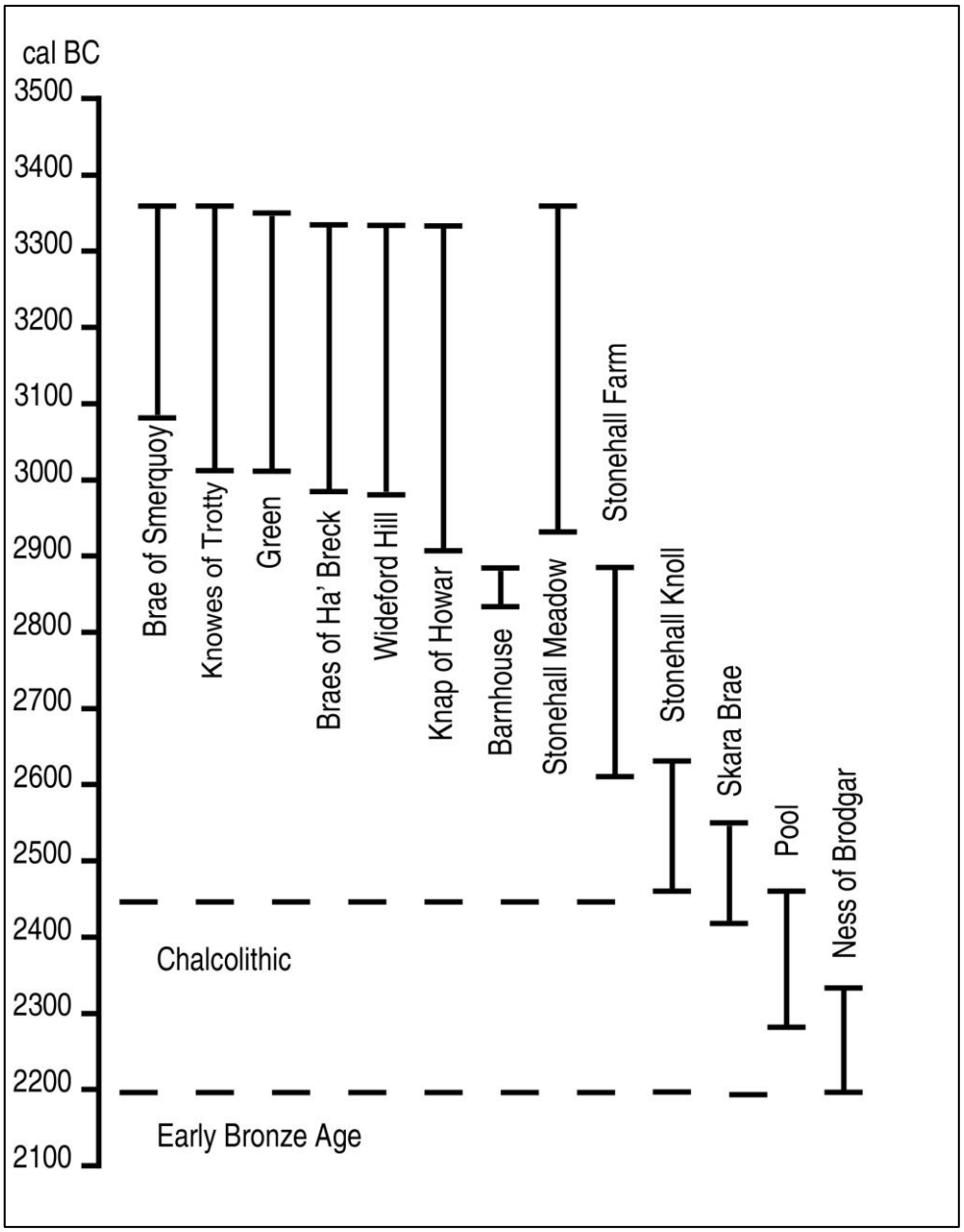

Chart 7.1 Estimates of abandonment dates for all radiocarbon dated Neolithic settlement sites in Orkney that do not exhibit continuity into the Early Bronze Age.

For details and references see Table 7.2 below.

Sites with continuity from the Neolithic into the Bronze Age are discussed in Section 7.3.5.

7.3.2 Limited excavation: missing the obvious?

The end of Neolithic settlement at Pool, Sanday occurred c.2460 – 2280 cal BC, and there was then an extended hiatus until settlement resumed in the early 1st millennium AD (Hunter et al 2007b, 518; MacSween et al 2015). As with many sites in Orkney (Section 4.7), Pool was discovered through exposure of its archaeological remains by coastal erosion, and the original extent of the settlement to seaward is unknown. Furthermore, although its excavation covered the bulk of the eroding coastal settlement mound, 'it included only a fraction of the extensive remains thought to lie to the NE … identified by geophysical survey' (Hunter 2007c, 16 & illus. 2.4 & 2.5). There is thus ample scope at Pool for Bronze and Early Iron Age settlement phases to have been lost to coastal erosion or to be located within unexcavated portions of the site. The Iron Age settlement at Pool directly overlies the Neolithic occupation, and included a souterrain constructed reusing one of the Neolithic structures (Hunter 2007b, 79): does this provide circumstantial support for the suggestion that the site was not in fact abandoned but shifted?

At Stonehall there was a clear overlap in the occupation of all three sites (Griffiths 2016, 275-8; Richards, Brophy et al 2016, 124) indicating continuity from the late 4th to mid-3rd millennium cal BC, and there is scope for undetected shifts of occupation. Geophysical survey concentrated on areas where the landowner had reported plough-disturbed archaeological remains (Stonehall Farm and Meadow) or where an obvious mound was visible (Stonehall Knoll); and excavation proceeded accordingly (ibid; Richards, Jones, R. et al 2016, fig. 6.3). The excavated Neolithic houses lie at 50 – 65m OD, in the upland area (Section 2.1.4); envisaging a shift downhill in the late 3rd/early 2nd millennium BC would not be unreasonable. The nearest recorded prehistoric settlement is the broch at Nether Bigging (HY31SE80), which lies 800m to the northwest of Stonehall at around 12m OD, and may be indicative of an area of Bronze Age settlement (Section 7.15). There is circumstantial evidence for continued settlement in the general area during

the Bronze Age provided by late 3rd/early 2nd millennium BC radiocarbon date for an inhumation in the passageway at Cuween chambered tomb (Sheridan 2005b; Section 6.2.1), positioned above Stonehall, and postulated to have been built originally as an adjunct of the Neolithic settlement (Richards, Brophy et al 2016, 91-2).

7.3.3 Skara Brae: shifting settlement in a wider landscape?

The desertion of Skara Brae, memorably described by Childe (1931a, 40-1 & 63-4), was ascribed to deposition of windblown sand which, although present to a degree throughout the occupation, appears to have increased catastrophically c.2550 – 2420 cal BC[166] (Clarke 1976a & b; Childe 1931a 63-4; Simpson et al 2006; Thomas 2016, 93-4). This dating reflects the samples available for assay, particularly limited since Clarke's (1976a & b) excavation was confined to two small trenches (Figure 7.3). Childe (1931a, 61-4) however identified a 're-occupation period' at Skara Brae, best observed in House 7, where there were four occupation levels interspersed with windblown sand, three to five foot six inches (0.91 – 1.68m) above the primary floor, associated with several 'perfectly normal Skara Brae hearths' (ibid) implying continued domestic activity at the site, perhaps after the conventional end-date suggested by the radiocarbon evidence[167]. Moreover, Early Bronze Age funerary activity at Skara Brae is demonstrated by radiocarbon dated human bones found in both the main passageway and in the sand infilling House 1 (Thomas 2016, 93-4; Petrie 1868a, 210; Rick Schulting, pers. comm; Section 6.1.3). There is further evidence of continuing activity nearby. Around 120m

[166] From preliminary Bayesian modelling as part of the *Times of their Lives* (TOTL) project (http://totl.eu) of the 149 radiocarbon dates now available from Skara Brae, including new dates from Clarke's excavation (Sheridan, Clarke et al 2012). The preliminary modelling results quoted by Thomas (2016, 93-4) came from pers. comms. by TOTL project members.

[167] It has been suggested that House 8, the 'Workshop', at Skara Brae (Figure 7.3), is a separate Bronze Age house built alongside a 'decaying settlement' (Downes & Thomas 2013, 83, fig. 4.3; Richards, Downes et al 2016, 246 & fig. 9.30) based on its unusual shape and perceived similarities to Bronze Age double houses, and this is discussed further in Section 7.8.2. This suggestion is not substantiated by the published stratigraphical and artefactual evidence; rather House 8 appears to be an integral part of Childe's 'Skara Brae III' period (e.g. Childe 1930, 160-1 & 172-3 & 1931a, 21-4, 49-4 & 94). A late Neolithic date for House 8 is supported by the current radiocarbon dates; further elucidation awaits final publication (Clarke & Shepherd in prep.).

west of Skara Brae lies a probably multi-period prehistoric settlement mound, with structural remains interspersed with windblown sand exposed in an erosion face and over c.850m² of deposits surviving on the landward side (Morris et al 1985). A deer butchery site located c.100m west of Skara Brae (Richards et al 2015) has an unclear relationship with this settlement mound[168] but both articulated and disarticulated red deer bones were recovered, together with over 200 Skaill knives as well as structural deposits, dated to the late 3rd millennium BC (ibid). Further evidence of late 3rd millennium BC activity and ploughsoil formation came from trial trenches around 45m west of Skara Brae (Romaniuk et al 2016, 2).

The abandonment of the core settlement at Skara Brae might be interpreted as a direct response to increased aeolian erosion by a simple relocation slightly further inland. The Bay of Skaill remained a focus of activity (Section 4.9; Figure 4.26) beyond the western sites already mentioned: around 700m to the south east of Skara Brae lie a probable broch and several areas of prehistoric settlement revealed by geophysical survey (OCGU 2008; Ovenden et al 2009, 126, fig. 2); and the Knowe of Verron broch (HY21NW22; Moore & Wilson 2001a) is 900m north of Skara Brae. Some brochs elsewhere (e.g. St Boniface Church, Papa Westray: Lowe 1998; Section 7.15) are known to overlie Bronze Age settlement; continuing settlement in the Bay of Skaill area may be inferred from the extensive Bronze Age funerary activity at the Links of Skaill and on surrounding higher ground (Section 6.3.2; Figure 4.26). Later settlement (e.g. Graham-Campbell 1976 & 1984; Griffiths 2006, 2007 & 2008, James 1999, Irvine 2009) illustrates the continuing importance of this area as a geographically favourable location into the second millennium AD.

7.3.4 The Ness of Brodgar

The final site where abandonment demonstrably occurs towards the end of the 3rd millennium BC is Ness of Brodgar, Stenness situated on the Brodgar peninsula between the Stones of Stenness and the Ring of Brodgar (Card et al

[168] Richards et al (2015) regrettably make no reference to Morris et al (1985).

2017; Towers et al 2015 & 2017). The site comprises numerous exceptionally large Neolithic structures with a rich artefactual assemblage, occupying an area of c.1.07 ha defined by enclosure walls, dating from the late 4th to the late 3rd millennium cal BC (ibid; Figure 7.4). The final decommissioning of the massive 'ceremonial' Structure 10, marked by the deposition of elements of around 400 head of cattle as the upper deposit in the infilling of the surrounding pathway, took place c.2340 – 2200 cal BC (in Model 1[169]) and the last dated activity, the deposition of articulated red deer skeletons[170] overlying the cattle bone, occurred c.2295 – 2125 cal BC (Card et al 2017).

Structure 10 itself appears to have been abandoned sometime prior to this deposition, since the last use of its central hearth, marked by the placing of a cattle skull and a pecked stone, occurred c.2550 – 2460 cal BC, following which the interior was filled with midden and rubble and the walls robbed of stone (ibid; Mainland et al 2014, 869). It may however have been the last building in use on the site, since the other buildings appear to have been abandoned by c.2800/2600 cal BC[171] and filled with midden (Card et al 2017), activities finding parallels with discontinuity at other Neolithic sites in the same period e.g. Barnhouse, Stenness (Richards, Jones, A. M. et al 2016; Table 7.2).

As Thomas (2016, 176 & 195) observed, the dates for the large-scale cattle deposit at the Ness of Brodgar would be considered Chalcolithic/Early Bronze Age elsewhere[172]. This deposit is associated with one sherd of incised

[169] Two models for the currently available radiocarbon dates are presented with equal weight (Card et al 2017): in Model 2 the cattle deposition takes place c.2460 – 2270 cal BC, however in this model there is then a gap of c.115 – 420 years before the deposition of the articulated red deer skeletons on top of the cattle bone (one of which produced an actual radiocarbon date of c.2205 – 2025 cal BC). The depositional consistency of the entire faunal assemblage is more suggestive of a single depositional event or events over a short period (Mainland et al 2014, 875), which would suggest that Model 1 provides the more likely scenario.

[170] Paralleled by the deposition of the red deer heap at the Links of Noltland c.2280 – 2130 cal BC (Clarke et al forthcoming; Marshall et al 2016, 26).

[171] This infilling occured c.2600 cal BC in Model 1 and c.2800 cal BC in Model 2 (Card et al 2017).

[172] It was noted (Card et al 2017) that the closest parallels come from the barrow at Gayhurst, Buckinghamshire, where the limb bones from 300 cattle were deposited c.2290 – 2010 BC

Beaker or Beaker-like pottery (Card et al 2017, 40) and a barbed-and-tanged arrowhead[173]. There is also evidence for Bronze Age funerary activity at the Ness of Brodgar, with the removal in 1925 of four Bronze Age cists[174], three containing inhumations (Marwick, J. G. 1926; Section 6.3.7). These were found alongside an incised stone (Figure 6.18) thought to have been disturbed from the area of Structure 8 (Thomas 2016, 134). This record hints at the intriguing possibility that the deposition of the cattle/red deer bone towards the end of the 3rd millennium cal BC (Card et al 2017) was related to Chalcolithic/Early Bronze Age funerary activity[175] on the site of the abandoned Structure 10. It may be that evidence of a central burial associated with the cattle/red deer bone deposit has been lost: much is likely to have been destroyed without record here since the whole of the Brodgar peninsula is shown as enclosed land on Mackenzie's (1750) chart[176] which was under arable cultivation in the mid-nineteenth century (Thomas 1852, plate XII). The use of an abandoned Neolithic site for Early Bronze Age burials finds parallels with Skara Brae (Section 6.1.3).

Activity post-dating the major animal bone deposits at the Ness of Brodgar is 'ephemeral' but many of the earlier structures continued to be robbed of stone and were infilled with rubble and midden (Card et al 2017).

(Chapman 2007; Towers et al 2010), or the 185 cattle skulls from Irthlingborough Barrow 1, Raunds, probably deposited c.2200 – 1920 cal BC (Allan et al 2011; Davies 2011).

[173] http://www.nessofbrodgar.co.uk/dig-diary-friday-july-21-2017/

[174] There are two reports of the find. The first (Marwick, H. 1925b) is a very brief report on an incised stone from details furnished at second hand. This report describes the cists as 'divided from each other by a single flag-stone' which has led to the assumption (Card & Thomas 2011, 15; Thomas 2016, xv & 134) that they are not burial cists but rather part of the underlying Neolithic structures (although there are examples of double burial cists separated by a single flag e.g. Backakelday, Holm: Marwick 1928a). The second report (Marwick, J. G. 1926) is much more detailed, and is taken from a description of the finds by the farmer who initially found and removed the cists. This account describes four separate cists lying parallel to each other, three of which contained inhumations accompanied by water-worn stones (Figure 6.18).

[175] Tentative further support for funerary activity in the area comes with the recovery (from a trench extension adjacent to Structure 10) of the base of a shallow-dished accessory cup of a rare type, other examples of which come from both Early Bronze Age barrows in the south of England and one of the Aubrey holes at Stonehenge (http://www.nessofbrodgar.co.uk/dig-diary-thursday-july-20-2017/).

[176] Brodgar Farm is in existence by 1563 (Marwick 1952, 112) suggesting that the surrounding area would have been in cultivation at an early date.

Geophysical survey indicates that the area currently under excavation comprises less than 10% of the total site (Card et al 2017, 3; Towers et al 2017, 30); it may be suggested that this stone was removed for other construction purposes in the immediate vicinity, which might be indicative of continuing occupation nearby. Three ard points and a number of flaked stone bars[177] found in the upper levels of the main excavation area (Anne Mitchell, pers. comm.) provide tenuous evidence of later cultivation of the accumulated Neolithic middens at the Ness of Brodgar as seen at other sites in the Northern Isles (e.g. Guttmann 2005; Guttmann et al 2004 & 2006). Coarse stone tools are however also found in Bronze Age funerary contexts (Section 6.3.7) so their presence here may be indicative of a larger (but no longer extant) cemetery associated with the four Bronze Age cists (Marwick, J. G. 1926) already recovered here.

7.3.5 Sites with continuity

A similarly limited data set is available (Chart 7.2 below) when considering continuity of occupation from the Neolithic into the Early Bronze Age and beyond, since of the four sites in Table 7.2 falling into this category, only Tofts Ness, Sanday (Dockrill, Bond et al 2007) and Crossiecrown, St Ola (Card et al 2016) are fully published. Whilst an interim report, some PhD research and popular articles are available for the Links of Noltland, Westray (e.g. Hamlet 2014; Moore & Wilson 2011a & 2013; Moore 2015a & b), the only published information available on Berst Ness, Westray is in the form of interim DES entries (e.g. Moore & Wilson 2006, 2007c & 2008a). Continuity cannot be conclusively demonstrated at the Brae of Muckquoy (Richards, Downes et al 2016, 247-53; Section 7.12.4): this site was dated only by artefacts retrieved during fieldwalking.

Similar problems exist at the badly plough damaged site at the Brae of Smerquoy, St Ola where a late 4th millennium cal BC house was excavated on

[177] Neither ard points nor flaked stone bars have been found in Neolithic contexts in Orkney and their presence in large numbers in an assemblage is generally indicative of a Bronze Age date, although they remained in use in smaller numbers into the Early Iron Age (Clarke 2006, 124-6 & 2007).

the eastern edge of an area of enhanced geophysical responses (Gee et al 2016). The lower and upper occupation deposits around the central hearth inside the Neolithic house were associated with radiocarbon dates of c.3360 – 3090 cal BC and c.2200 – 1940 cal BC respectively; another early 2nd millennium cal BC date came from a pit to the south of the this house (ibid, 79; Griffiths 2016, 262). There were no obvious post-Neolithic structural remains or artefacts recovered to account for the Early Bronze Age radiocarbon dates, and it appears likely that these determinations related to a robbed out/plough-destroyed Early Bronze Age structure. The large interval between these radiocarbon dates and the earlier series suggests discontinuity, although it is possible that structural remains may survive in the unexcavated part of the site. The Berst Ness promontory, Westray (Moore & Wilson 2008a & 2009a), an extensive prehistoric landscape comprising both funerary and settlement elements, may exhibit continuous occupation. Radiocarbon determinations from the buildings at Berst Ness currently range from c.3000BC to c.AD 800, but there are as yet no radiocarbon dates available for the intermediate phases, which are assumed to be Bronze Age on the basis of the finds assemblage that was recovered (Hazel Moore, pers. comm.).

Continuity of occupation occurred at Crossiecrown, St Ola, another badly disturbed site with limited excavation (Card et al 2016; see Section 7.5.3). Settlement, initially in the late 4th millennium BC, continued into the early 2nd millennium BC, although few structural remains from the later occupation survive (ibid). The two remaining sites, Tofts Ness (Dockrill, Bond et al 2007) and the Links of Noltland (Moore & Wilson 2011a) both exhibit continuity from the Neolithic until probably the 1st millennium BC, but present contrasting features.

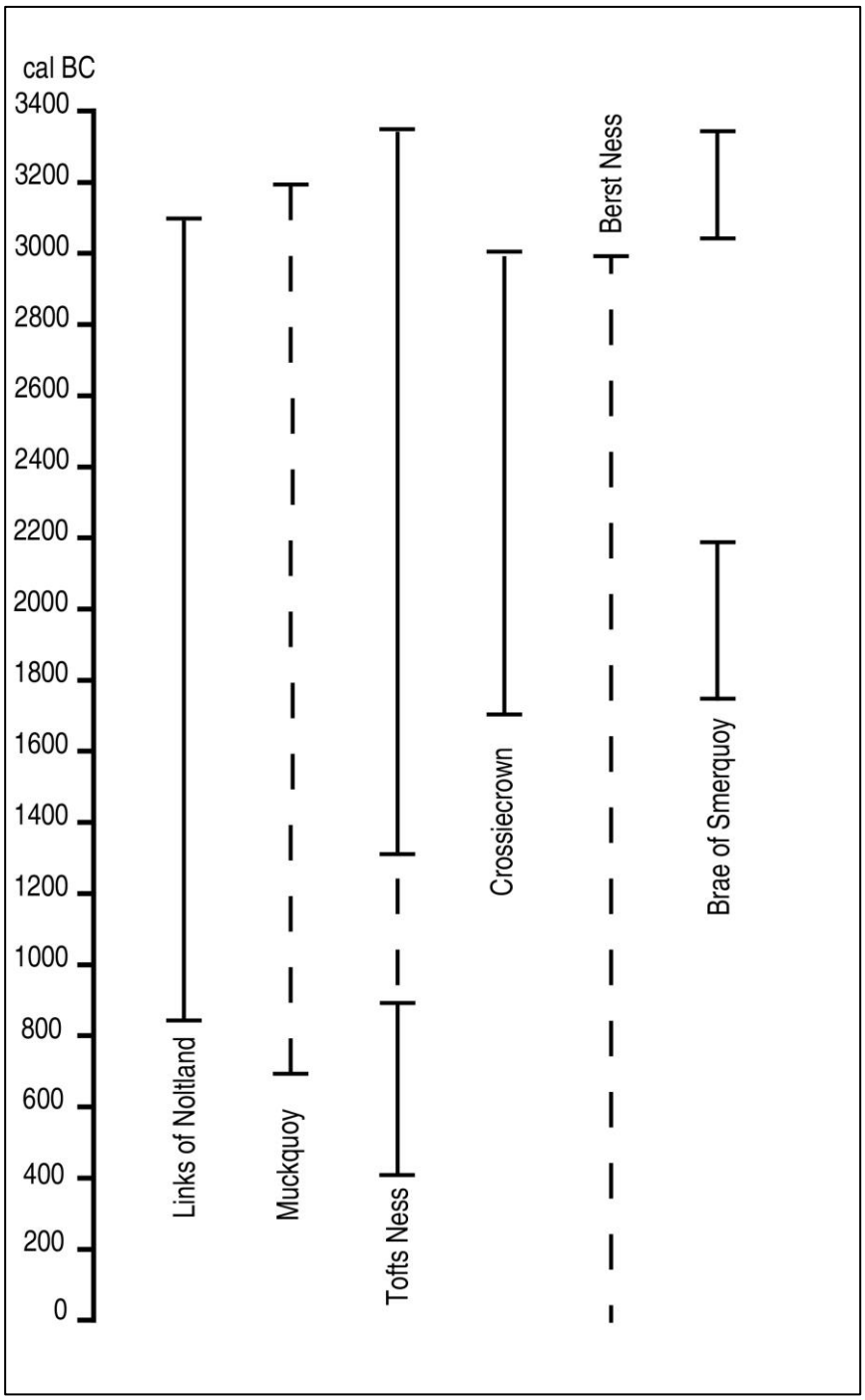

Chart 7.2 Orkney sites showing continuity of occupation from the Neolithic into the Bronze Age and beyond (dates later than the end of the 1st millennium BC not shown).

Solid lines indicate radiocarbon dates for occupation: these include dates obtained from midden and associated funerary (at the Links of Noltland) deposits, radiocarbon dates for Bronze Age structures are shown in Chart 7.4 below. Dashed lines are conjectural based on artefact assemblages.

The Brae of Smerquoy dates may not indicate continuity as discussed (Section 7.3.5).

Mound 11 at Tofts Ness, Sanday, one component of an extensive relict landscape (Dockrill, Bond et al 2007; Section 5.5.1) presents continuity in a localised area. Excavation focussed on two areas: the primary mound (Areas A, B, G and H shown on Figure 7.5), and a secondary area on the northern flank of the primary mound (Areas C – E and J on Figure 7.5). Radiocarbon dating[178] presented problems because of the limited samples available but Bayesian modelling of the primary mound sequence showed continuous occupation from the late-4th to the mid-2nd millennium BC (Ambers 2007, 145; Dockrill 2007d, 381-2; Outram 2007; Table 7.3). The structural sequence began in the late 4th/early 3rd millennium BC with a sub-circular building with casement style walls (Structure 1), which was subsequently remodelled (Dockrill 2007b, 18-24), and conformed to the design seen elsewhere in Neolithic Orkney (Section 7.5.1). Little survived of the Early Bronze Age Structure 2, which was too badly preserved to classify to type, but it was possibly of cellular form, with an entrance to the south and a passage on the south west (Dockrill 2007b, 24-9).

Table 7.3 Bayesian modelling of phase spans (where available) for the primary mound sequence at Tofts Ness, Sanday (Ambers 2007), dates are cal BC at 95% confidence.

Phase Number	Phase starts	Phase ends
Phase1	3350–2970 (3290–3150 at 68%)	3270–2910 (3120–2930 at 68%)
Phase 1.3	3110–2860 (3020–2890 at 68%)	2860–2600 (2810–2660 at 68%)
Phase 2	2820–2560 (2760–2600 at 68%)	2110–1690 (2010–1770 at 68%)
Phase 3	1880–1600 (1770–1640 at 68%)	1680–1440 (1630–1500 at 68%)

No radiocarbon dates were obtained for the Late Bronze Age Phases 4 and 5 (See Section 7.9) and only four dates from the Early Iron Age Phase 6 (both in the secondary excavation area on the northern flank of the primary mound), most of which fell in the 'Iron Age plateau' of the radiocarbon calibration curve (Ambers 2007; Dockrill 2007d). The gap between Phases 3 and 6 was bridged by two radiocarbon dates of c.1520 – 1310 cal BC and 900 – 790 cal

[178] See Appendix 1, Table A1.13.

BC obtained from post-excavation sampling of midden-enhanced soils on the eastern flank of Mound 11 (Simpson, Dockrill, Bull et al 1998), and it was considered that, together with the excavated evidence, it could be demonstrated that settlement at Mound 11 was continuous from the late Neolithic to at least the end of the Bronze Age (Dockrill 2007d). Interestingly, continuity at this site occurs on a peninsula that is considered to have been marginal for settlement (Dockrill 2007a; Section 5.5.1). The artefact assemblage throughout all phases consisted primarily of tools with little evidence for items of personal adornment, and was suggestive of 'a hardworking and fairly hard-pressed agricultural community' (Smith 2007a, 259).

The Links of Noltland, Westray are thought to have been occupied continuously from the early 3rd to the early 1st millennium cal BC (Hazel Moore pers. comm.; Moore & Wilson 2011b). Initial excavation concentrated on a Skara Brae-like Neolithic settlement at Grobust (Clarke & Sharples 1985); ongoing excavation exposed another six Neolithic structures located c.170m south west of Grobust, together with at least twelve Bronze Age structures, an extensive Bronze Age cemetery and a burnt mound, over an area covering 4ha (Moore & Wilson 2011a & 2013; Figures 7.6 & 7.7; Section 7.6.3). Details are not yet available from the Bronze Age phases, but (in contrast to Tofts Ness) the Neolithic settlement seems to have been high-status with a rich artefactual assemblage (Goring 2011; Moore & Wilson 2011a). Close chronological resolution of all phases awaits results from the radiocarbon dating programme but the artefact assemblage for both settlement and burnt mound indicates a Bronze Age date, and the associated funerary activity ranges from the late 3rd to the early 1st millennium cal BC (Moore 2015a; Hazel Moore, pers. comm.; Moore & Wilson 2011a; Section 6.1.2).

Significantly, the Bronze Age houses at Links of Noltland do not directly overlie the areas of Neolithic settlement, but rather consist of a number of discrete areas located 35 – 200m to the south and east of the Neolithic structures (ibid; Figures 7.6 & 7.7). Aeolian erosion at the site appears to have

intensified in the Bronze Age (Hamlet 2014, 286-7, Moore & Wilson 2013), which would explain shifts in location: the Bronze Age houses are generally positioned further inland than the more exposed areas settled in the Neolithic (Figure 7.6). Midden deposits that had accumulated during the Neolithic phases remained important and were both directly cultivated during the Bronze Age and spread to stabilise windblown sand deposits (Hamlet 2014; 287-323 & 353-4; Hastie 2011; McKenna & Simpson 2011; Moore 2015b; Section 8.2).

7.3.6 Discussion

Dating evidence suggests, as noted above (Section 7.3.1), that the late 4th/early 3rd millennium BC exhibits a more significant dislocation in settlement than that evidenced at the end of the Neolithic c.2500/2450 cal BC. The sites still occupied in the mid-3rd millennium are evenly divided between those where occupation continued and those that were abandoned (Table 7.2; Charts 7.1 & 7.2). We must be wary of the limitations of the data set: there are few excavated sites and the majority lack close chronological resolution, although important sites are in their post-excavation phases (Section 7.3.5; Table 7.2). Equally important is an awareness of the small excavated sample at some sites: for example the 7% excavated at Rinyo (Section 7.3.1) or the large unexcavated site adjacent, and of comparable size, to the extensive excavated site at Pool, Sanday (Hunter 2007c, 16; Section 7.3.2). Successive relocation of settlement within the same area, seen at the Links of Noltland (Section 7.3.5), resembles that suggested for the Bay Of Skaill (Section 7.3.3) and provides support to the possibility that areas of later occupation in the vicinity of other Neolithic sites may lie undetected, and at sites where their investigation is limited to serendipitously identified structural foci (e.g. Stonehall: Section 7.3.2) without geophysical survey of the environs, small changes in settlement location may be missed. Suggesting 'fragmentation' of society at the end of the Orcadian Neolithic (e.g. Richards, Downes et al 2016, 246) does not necessarily address the possibly different causative factors for abandonment. I argue that a distinction should be made

between cases where environmental factors made continued settlement at the same location untenable (e.g. aeolian erosion at Skara Brae: Section 7.3.3) and deliberate abandonment, where there are no archaeologically demonstrable environmental reasons why activity should not have continued, when sociopolitical factors may reasonably be implied. The most striking example of this type of deliberate abandonment comes in the decommissioning of Structure 10 at Ness of Brodgar in the late 3rd millennium cal BC (Section 7.3.4), although even here much of the rest of the site had already been abandoned for at least several centuries (Card et al 2017). The Ness of Brodgar is not however a 'normal' settlement site:

> *The exceptional architecture, the diversity of structures, and the evident size and spatial complexity of the Ness of Brodgar all emphasise its special character. Even the newly-discovered external midden mound may refer to themes of conspicuous consumption, status, and affluence* (ibid, 7).

Contrasting discontinuity at the high-status Ness of Brodgar with continuity at low-status Tofts Ness (Dockrill, Bond et al 2007; Section 7.3.5) or the more 'normal' Crossiecrown (Card et al 2016; Section 7.3.5) is not a like-for-like comparison. Such dislocation as did take place may have had a greater effect on the locales inhabited by the elites of society than on those at a lower level.

The fact that sites of lower status than that at the Ness of Brodgar are not obviously affected by end-of-Neolithic fragmentation perhaps challenges the implied Orkney-wide nature of such an event. Even envisaging a centralised authority at the monuments of the Brodgar peninsula, it is difficult to see why decommissioning the Ness of Brodgar would have a major effect on settlement elsewhere; the evidence for continuity at sites such as Tofts Ness, the Links of Noltland and probably Berst Ness suggest that it did not (Section 7.3.5). Neither can the deliberate decommissioning of the Ness of Brodgar be properly likened to the pragmatic abandonment of Skara Brae. Equally, there is scope for continued occupation beyond the excavated areas at several sites (Section 7.3.2).

Social changes did, however, occur: a snapshot of Orcadian structural forms (Section 7.5.1) and burial practices (Section 6.2) taken in the early third millennium BC would bear little resemblance to that of the early second millennium BC (although there is little apparent change in subsistence practices over this extensive period: Section 8.2). The available data set does not provide unequivocal evidence for widespread fragmentation at the end of the Neolithic; neither does it present a picture of uninterrupted stability. This may change with the publication of the Links of Noltland, where the Neolithic phases at least were high status (Section 7.3.5). Status differentiation in the Bronze Age was not necessarily absent; it may have been demonstrated by other means perhaps related to the increased attention to control of the landscape with physical boundaries, as perhaps seen at Whaness Burn (Section 7.12.2). There is also the possibility of high-status settlement sites as earlier unexcavated phases at some of Orkney's brochs, discussed in Section 7.15.

7.4 Orcadian Bronze Age domestic buildings

This section examines the evidence for Bronze Age domestic buildings in Orkney, their forms, functions and origins. In doing so, I reinterpret the results from excavations and surveys to draw out both essential and distinctive features of the houses of this period. In particular, I posit a new model for double house origins incorporating environmental factors and maritime links.

House forms may vary but need to provide shelter (walls, roof), heat (hearth) and living space (internal area). The manner in which these purposes are accomplished is, in part, culturally determined and the details provide clues to different communities' manner of living. Except at some Early Neolithic sites, Orcadian prehistoric house construction was primarily in dry-stone (Section 7.1), which will have required significant investment of effort and implies individual buildings may have had long durations. Few Orcadian sites dating from the late 3rd/early 2nd millennium BC onwards have been

excavated (Section 7.2; Table 7.1), consequently little is known about the post-Neolithic development of structural types. There are few radiocarbon dates available for the excavated structures on Bronze Age settlement sites, which, together with a general dearth of diagnostic artefacts, particularly impedes the meaningful discussion of changing settlement patterns over the period (Section 7.10). Further problems, as noted in Section 7.2, exist in the poor preservation of structural forms on many excavated sites, hindering typological discussion and adding to the difficulties of treating 'the Bronze Age' as anything other than a unitary period. In the Late Bronze Age the earliest true roundhouse in the Northern Isles appears at Tofts Ness, Sanday (Dockrill 2007c; Section 7.9), whilst limited evidence for Bronze Age oval houses comes from e.g. the Loch of Tankerness (Lamb 1987, 25, no. 113; Sections 7.8.1 & 7.8.2). The most distinctive structure of this period which is essentially restricted to the Northern Isles is the 'double house': paired sub-circular/oval buildings of unequal size with entrances facing each other across a paved area. There are two published examples: Skaill, Deerness (Buteux 1997c; Section 7.6.2, shown in Figure 7.8) and Sumburgh, Shetland (Downes & Lamb 2000a; Section 7.6.1; Figure 7.9); both these sites lack close chronological resolution. Further probable late 3rd/2nd millennium BC double houses are known from the Links of Noltland, Westray (Moore & Wilson 2011a; Section 7.6.3; Figures 7.10 and 7.11) and a number have been identified during field survey (Figure 7.2; Table 7.1).

It is not immediately obvious how the Orcadian double house developed from the preceding Neolithic house styles, but the form is also known from Shetland, where the development of the double house in the Middle/Late Bronze Age may speculatively be traced from Shetland-specific house forms of the late 3rd millennium BC, which do not have obvious Orcadian counterparts, and this hypothesis is discussed in Section 7.8 below. Although it has become axiomatic that the double house[179] in the Northern Isles was

[179] The term 'paired house' or paired structure' was formerly used (e.g. Buteux 1997c; Lamb 1987, 24, no. 109) but 'double house' is now accepted terminology and will be used throughout.

Bronze Age (e.g. Card 2005a, 61; Downes & Thomas 2013, 82-3), this view has recently been challenged by the suggestion that they developed in the Neolithic (Richards, Downes et al 2016, 245-6; Section 7.5). If substantiated, this has implications for the possible chronology of the examples identified only from field survey (Table 7.1).

A critical review of the evidence for the putative Orcadian Neolithic progenitors of the double house, the chronological security of accepted Bronze Age examples, and a consideration of the development of the double house form are all essential. An explicit model for double house origins incorporating environmental factors and maritime links is suggested below. Other house forms of the Orcadian Bronze Age are also discussed there.

7.5 Neolithic double houses?

7.5.1 Introduction

Orcadian Neolithic houses are standardly of two distinct forms, broadly successive in time: the oblong, internally divided 'Unstan type' houses of the 4th millennium BC, exemplified by the Knap of Howar, Papa Westray (Ritchie 1983a; Figure 7.12); but also the Braes of Ha'Breck, Wyre (Lee & Thomas 2012b; Figure 7.13); the Knowes of Trotty, Harray (Downes et al 2016), Smerquoy, St Ola (Gee et al 2016; Section 7.3.5) and Stonehall Knoll, Firth (Richards, Brophy et al 2016; Figure 7.14). These designs are followed by the 'typical' late 4th/early 3rd millennium house styles '… comprising cruciform interior spaces formed by recessed areas in the inner wall faces' (Card et al 2016, 169) with casement walls forming a sub-circular exterior as e.g. at Barnhouse (Richards 2005a; Figure 7.15), in the early phases at Skara Brae (Childe 1931a; Figure 7.3), and at Crossiecrown (Card et al 2016; Figure 7.16). The Orcadian sites proposed as Neolithic progenitors of the Bronze Age double house type (e.g. Card et al 2016, 169-71; Richards, Downes et al 2016, 245-6) all fail to convince from the available evidence, as is discussed below.

7.5.2 Possibility 1: Houses 1 and 6, Barnhouse, Stenness.

Richards, Downes et al (2016, 245-6) suggest that Houses 1 and 6 at Barnhouse may represent an early example of a double house dating to the late 4th/early 3rd millennia BC. In this proposed double house scenario, Houses 1 and 6 butted against each other with access between the two, but no obvious external access (ibid). Little trace remained of most of the wall circuit of House 1 (ibid, 107), so it is possible that an entrance to the 'double house' may have lain on the southern side of House 1. This juxtaposition is not the typical arrangement noted at Bronze Age examples of double houses, but may be paralleled by the two sequentially built and conjoined 4th millennium BC houses at Knap of Howar (Ritchie 1983a, Figure 7.12), or in the addition of House 5 to House 3 at Braes of Ha'Breck, Wyre (Lee & Thomas 2012b; Figure 7.13). The published site narrative (by the same authors who now advocate the new view) presents a number of more likely alternative interpretations regarding these two houses, including the demolition of House 6 prior to rebuilding of House 1 (Downes & Richards 2005, 107-12), such that the two buildings, far from forming a double house, may never have co-existed.

7.5.3 Possibility 2: Pool, Sanday.

The suggestion that Structures 8 and 9, in the early 3rd millennium BC phase at Pool, may also have been a double house (Richards, Downes et al 2016, 245) is not substantiated by the original excavation report (Hunter 2007a, 40-50). The two structures adjoined each other with Structure 9 built against the south-west casing wall of Structure 8 (ibid, 48-50). The relationship between them was confused but it is clear that they were two separate structures with no interconnecting access. Any resemblance to a double house is thus purely a coincidental by-product of their juxtaposition.

7.5.4 Possibility 3: Crossiecrown, St Ola.

The site at Crossiecrown (Card et al 2016) had suffered a high level of plough damage and disturbance, including historic stone quarrying for building purposes, with the structural remains surviving directly below the present-

day plough soil (e.g. ibid, 161; Anderson-Whymark et al 2016, 436-41; Jones 2016, 354). Two stone houses, the Red House (House 1) and the Grey House (House 2), were located on the edge of an extensive area of midden deposits identified by geophysical survey; radiocarbon dates obtained during the trial trenching of these middens spanned the period c.3270 – 2500 cal BC (Card et al 2016; Figure 7.16). Although the relationship of this Neolithic midden with the Red and Grey Houses is unclear, it was considered that (on the basis of the 'cloverleaf' shape of midden deposits on the geophysical survey, thought to have built up against house walls) the initial settlement at Crossiecrown in the late 4th millennium BC consisted of a cluster of four or five houses (ibid, 163-9; Griffiths 2016, 262). No structural remains of this putative early settlement were identified and it was suggested that the buildings of this phase were demolished and their materials recycled (ibid). Stylistically, both the Red and the Grey houses are typical examples of late 4th/early 3rd millennium BC structures (see Section 7.5.1 above), but they also faced each other across a paved area giving the impression of a double house (Card et al 2016, 169-71).

Considerable uncertainty exists, however, over the stratigraphic and chronological relationship between the two (ibid, 169-70 & 189-90). Inconsistencies between the photographic evidence and the published plans of the site (ibid, 188-9, figs. 7.36, 7.37, 7.38 & 7.40) suggest that the entrance identified by the authors into the Grey House may not have existed at the outset, but was rather a result of later disturbance and stone robbing, casting doubt on the 'double house' interpretation. There appear to be intrusive later structural elements in the area between the two houses, unrelated to either the Red or Grey Houses, and which may be connected with the Romano-British hair pin (Card & Downes 2000; Fraser Hunter, NMS, via Nick Card pers. comm.) discovered in the core of the north-west wall of the Red House, and implying unrecognised later occupation and disturbance. This find was omitted from the final published account (Card et al 2016) and so the question of how a Romano-British hair pin appeared in the wall core of a

building supposedly constructed in the 3rd millennium BC was not addressed in that report.

In light of such problems, it appears more likely that the Red and Grey Houses, rather than representing a Neolithic example of a double house, are more probably surviving structural elements from the larger four or five house Neolithic settlement postulated originally to have existed here. The site was still occupied during the first quarter of the second millennium BC, but little trace of this survived apart from a later hearth with an associated radiocarbon date of c.1980 – 1740 cal BC, unconnected to either the Red or Grey Houses (ibid, 190-3; Griffiths 2016, 262). Similarly, a small but important assemblage of Beaker pottery came from contexts dating to the late 3rd/early 2nd millennium cal BC, with Beaker and Grooved Ware apparently in use together in the later phases in the Red House, although caution is necessary as there was a high degree of mixing with earlier occupation levels in apparently well-stratified contexts (Card et al 2016, 193; Jones, A. M. 2016, 354; Richards, Downes et al 2016, 245). Although Crossiecrown cannot be considered a double house, it suggests that Neolithic house forms had a long currency in Orkney, with little change towards the end of the 3rd millennium BC from designs prevalent at the end of the 4th millennium BC. Settlement continued into the Early Bronze Age, and the presence of the much more recent Romano-British hair pin in a wall core suggests that the settlement at Crossiecrown may have had an even longer currency.

7.6 Excavated double houses in the Northern Isles: unambiguous examples

7.6.1 Sumburgh, Dunrossness, Shetland

The double house at Sumburgh (Figure 7.9) was excavated under less than ideal circumstances and site recording was limited (Downes et al 2000). The bulk of the artefact assemblage was undiagnostic but indicated occupation from the late 3rd/early 2nd until the early 1st millennium BC (Clarke 2000;

Downes 2000a; Sharman 2000). Further complications arose from evidence for the disturbance and contamination of deposits on site, with for example typically Norse artefacts found in Early Iron Age contexts (e.g. Sharman 2000, 66-7).

The earliest phase exhibited an ard-marked ploughsoil, over which a timber structure of indeterminate form was constructed (Downes & Lamb 2000b, 8-9). There are two radiocarbon dates[180] available for this phase, from charred wood and rope respectively, but both with too wide a date range to be helpful: the first from a possible hearth within the timber building of c.2335 – 1692 cal BC, and the second associated with the probable demolition of the timber building of c.2488 – 1398 cal BC (Downes & Lamb 200b, 10). The association of cord-impressed Beaker pottery[181] with the timber building does however suggest construction in the late 3rd/early 2nd millennium BC (Downes 2000a; Sharman 2000; Sheridan 2013, 49).

There appears to have been a hiatus between the Early Bronze Age timber phase and the later phases, indicated by the formation of an intervening ploughsoil (Downes & Lamb 2000b, 34), and it was not possible to date the commencement or duration of any of the subsequent phases, beyond assigning them broadly to the later Bronze Age or Early Iron Age on the basis of the artefact assemblage (ibid; Downes 2000b). Sometime in the later Bronze Age the stone-built 'North House' was constructed, which in its original form had a small annexe on its north east side (Downes & Lamb 2000b). The North House was remodelled and access to the annexe blocked; around the same time, the larger 'South House' was built, probably still in the later Bronze Age (ibid). The South House may have been a forecourt to the North House, with access provided to the latter only via an entrance through the southern wall of the South House (ibid, 15 & 25). Evidence for any such entrance is ephemeral, and it appears more likely that this was a paired house

[180] These dates have been recalibrated with increased errors (Ashmore 1998; Ashmore et al 2000): see Appendix 1, Table A1.16.

[181] In Shetland Beaker introduction appears likely to have occurred somewhat later than in the rest of the UK at around the twenty-third century BC (Sheridan 2013).

unit with entrances facing each other across a paved area. The South House, with its large central hearth, appears to have been domestic, whilst the remodelled North House lacked a hearth and may have had an ancillary role (ibid; Downes 2000b, 117-19). Both North and South Houses were further remodelled within the Late Bronze Age, when, although their respective roles changed, the double house configuration was retained (Downes & Lamb 2000b, 34). In this later phase the South House appears to have been used for storage and animal housing; the North House had three hearths in separate alcoves and may have been a cooking/working area. The North House was abandoned in the Early Iron Age and used as a dumping ground before final site abandonment occurred (ibid).

7.6.2 Skaill, Deerness, Orkney

At Skaill, Deerness initial excavations on Norse structures were expanded on an ad hoc basis to include nearby sites where stonework had been noticed, resulting in the discovery of Site 5 (Buteux 1997c). This consisted, in its final phase, of a double house aligned roughly north-south (Figure 7.8). After the original excavator's untimely death it was discovered that the site records were inadequate (Buteux 1997b). The upper level of an ard-marked ploughsoil identified in the nearby cliff-section was radiocarbon dated to c.1609 – 1232 cal BC (Limbrey 1997) and it appears that this ploughsoil extended across several locations at Skaill, notably beneath the Site 5 structures. The artefact assemblage could not be closely assigned to site phases, but was broadly indicative of a Middle/Late Bronze Age date for occupation with an Iron Age date determined for later midden deposits not associated with any structural remains[182] (Buteux 1997d; Lloyd-Jones 1997). Overall, a Middle, but more probably Late, Bronze Age date for the structures at Site 5 was suggested (Buteux 1997b).

Closely dating the development of the double house at Skaill is not possible. The larger, northern unit (Structure 1), was however built first with an east-

[182] Two Iron Age radiocarbon dates were obtained from Site 5 but there was no record of their context (Buteux 2007c, 29).

facing entrance, before the southern unit (Structure 2) was constructed, at which point Structure 1 was remodelled with a new entrance facing that of Structure 2 across a paved corridor, creating the double house (Buteux 1997c; Figure 7.8) Neither unit had an obvious hearth, and it was considered possible that rather than a domestic function they may have formed a conjoined byre/barn (ibid, 30). The artefact assemblage (Buteux 1997b, 27 & 1997d; Lloyd-Jones 1997) was however consistent with a domestic function for at least one, or possibly both, of the buildings[183]. There are also two unusual (in an Orcadian domestic context) finds from Skaill, which do not appear to be consistent with a barn/byre interpretation: a discoid amber bead of Bronze Age type had an uncertain association with Structure 2 (Buteux 1997b, 25; Porter 1997, 109) and a Late Bronze Age Ewart Park phase Thorndon type socketed knife, probably dating to the very early 1st millennium BC (Section 6.3.3), came from late occupation/midden deposits infilling Structure 2 (Buteux 1997b, 27 & Porter 1997, 103; Appendix 2). The inadequate site record (Buteux 1997b) hinders interpretation but it seems reasonable to suggest that one or both of Structures 1 and 2 may have fulfilled a domestic function for at least part of their use, although this role may have changed over time, as was the case at Sumburgh (Section 7.6.1). Occupation at Site 5 appeared to end in the Late Bronze Age, but there appears to have been a Middle to Late Iron Age site nearby, identifiable from artefacts contained in associated midden deposits (ibid 28-9).

7.6.3 The Links of Noltland, Westray, Orkney

The Bronze Age settlement phases at the Links of Noltland are not yet closely dated. Associated funerary activity ranges from the late 3rd to the early 1st millennium cal BC, whilst occupation at the site commenced in the early 3rd millennium cal BC (Moore & Wilson 2011a; Hazel Moore, pers. comm.; Sections 6.1.2 & 7.3.5). There are at least twelve probable Bronze Age

[183] The bulk of the artefact assemblage was not closely located; both houses were treated as a single unit during excavation and artefacts were simply recorded as coming from the 'main occupation phase' (Buteux 1997c, 24).

structures[184] including four double houses (e.g. Figures 7.10 & 7.11), oriented north-south, with some evidence of sequential development (Moore & Wilson 2011a, 24-8 & 2013). There was a recognizable pattern in the recovered evidence. The larger, northern, elements fulfilled a domestic function, whilst the smaller southern buildings lacked hearths but had features interpreted as non-domestic: one had a clay-lined floor; another had a large stone-lined tank (ibid). The double houses are dispersed rather than nucleated, separated from each other by distances of c.80 – 150m (Figures 7.6 & 7.7). Close contact with Shetland is indicated by a large assemblage of domestic steatite vessels, comparable to those known from Bronze Age sites in Shetland, with no evidence of on-site steatite working indicating that complete vessels were imported (Forster 2011). The closest comparanda for some of these vessels were with those from Structure 3 at Bayanne, Yell, which was occupied c.1600 – 1120 cal BC (ibid; Moore & Wilson 2014b).

It is reasonable to assign the double houses at the Links of Noltland to the 2nd millennium BC, and they probably continued in use until the abandonment of the site in the early 1st millennium BC, and may also be associated with the late 3rd millennium cal BC funerary activity (Section 6.1.2), but closer chronological resolution is not yet possible.

7.7 Dating double houses: a summary

The suggestion that double houses originated in the early 3rd millennium BC (Richards, Downes et al 2016, 245-6) is not convincing. There is no unambiguous evidence from any of the sites discussed (Sections 7.5.2 – 7.5.4) to support a Neolithic date for any Orcadian double house form. Problems of interpretation have arisen at these sites because of stratigraphic disturbance on sites with long occupation histories but relatively shallow archaeological deposits. The resemblance of Structures 8 and 9 in the Neolithic phases at Pool Bay, Sanday to a double house is merely coincidental and may be

[184] The structures have been numbered individually so a paired double house has two structure numbers. There are thus twelve structures but only four double houses, with other structures adjacent.

discounted (Section 7.5.2). The assignation of double house status at Barnhouse (Section 7.5.1) and Crossiecrown (Section 7.5.3) rests on poorly defined excavation evidence, ephemeral at best, and on the balance of probabilities neither should be classed as a double house.

Neither the double house at Sumburgh, Shetland (Section 7.6.1) nor that at Skaill, Deerness (Section 7.6.2) is closely dated, but both are most likely to have been constructed in the second half of the 2nd millennium BC and were abandoned by the Late Bronze Age/Early Iron Age. The double houses at Links of Noltland (Section 7.6.3) may have been in use throughout the 2nd millennium BC until their abandonment in the early 1st millennium BC, with construction as early as the end of the 3rd millennium BC a possibility (provisionally, following Hazel Moore, pers. comm; Moore 2015b; Moore & Wilson 2011a). Anthropogenic soil formation associated with the unexcavated double house at Shelly Knowe, Tofts Ness, Sanday is radiocarbon dated to the first half of the second millennium cal BC (Dockrill, Gater & Simpson 2007; Section 5.5.1). Although admittedly based on a limited and in some senses problematic sample, all the evidence suggests that the double house in the Northern Isles is predominantly a Bronze Age type, which was demonstrably in use from at least the mid-2nd to the early 1st millennium BC, and that its origins possibly lay somewhat earlier.

7.8 Development of the double house in the Northern Isles

This section considers the development of the double house form in the Northern Isles. There appears to be little in the Orcadian architectural record stylistically to link the houses of the 4th/3rd millennia BC (Section 7.5.1) with the double houses of the 2nd millennium, suggesting that the double house form did not develop in Orkney, but was influenced by designs from elsewhere. If this is the case then alternatives must be examined, the most likely of which is influence from Shetland, where a tentative progression towards the double house from earlier house forms may be suggested.

7.8.1 The development of the double house in Shetland

In stark contrast to Orkney, 'the Neolithic in Shetland remains largely a mystery' (ScARF 2012c, 79), and follows its own trajectory, possibly deriving its Neolithisation from Western Scotland, rather than via Orkney and Caithness; it bears little similarity to the Orcadian Neolithic (Sheridan 2012b, 10-12). Shetland has far better survival of relict prehistoric landscapes[185] than Orkney, which led to the identification of large numbers of 'stone age' houses (Calder 1950, 1956, 1961 & 1963). The majority of the excavated examples of these 'stone age' houses are now thought to be of Bronze Age date (Sheridan 2012b & 2013), and exhibit distinctive structural forms[186] which are not double houses: the 'oval house' (e.g. House No. 1 near Gruting School: Calder 1956; shown in Figure 7.17); the 'oval house with porch' (e.g. the Stanydale House: Calder 1956; shown in Figure 7.18) and the 'pincer-like courtyard' house (e.g. the Benie Hoose: Calder 1961; shown in Figure 7.19).

The oval house design may evolve from the Stanydale 'Temple' (Calder 1950; Figure 7.20) (which may not itself be domestic e.g. Mahler 2013) whose concave façade mirrors that of the Shetland heel-shaped cairns, possibly belonging to the period c.2500 – 1800 BC; this dating is supported by the presence of Beaker pottery here (Sheridan 2012b, 26-7). A radiocarbon date of c.2200 – 1980 cal BC associated with the construction of House 1 at the Ness of Gruting (Sheridan 2012b, 17-18; Figure 7.21) shows that the oval house was current by at least the Early Bronze Age.

The Stanydale House (Calder 1956), an example of the oval house with porch (Figure 7.18), cannot be closely dated, although construction in the late 3rd/2nd millennium BC is likely (Table 7.4). The oval house with porch design at Stanydale House forms an elegant link between the simple oval house,

[185] Shetland's economic focus has traditionally been the fishing industry, with a large proportion of rough grazing and less improved grassland and cultivated land than in Orkney (Fenton 1978, 1-10). This difference was noted in the nineteenth century: 'The Shetlander is a fisherman who has a farm; the Orcadian a farmer who has a boat' (Tudor 1883, 104).

[186] The terms used here are essentially descriptive; there is no definitive terminology for Shetland houses: cf. Downes 2000b, 119-23.

such as House No. 1, Gruting School (Figure 7.17), and the pincer-like courtyard house present at the Benie Hoose and Yoxie (Calder 1961; Figures 7.19 & 7.23). These latter two houses were approximately 130m apart and had similar pottery types; occupation of the Benie Hoose is associated with a radiocarbon date of c.1740 – 1520 cal BC (Sheridan 2005b & 2012b, 27). The mid/late 2nd millennium BC double house at Sumburgh (Downes & Lamb 2000a; Section 7.6.1) then appears to take this design to its logical conclusion, with two separate units in close proximity (Figure 7.9).

Dating these four Shetland house types is problematic due to very limited excavation and concomitant lack of radiocarbon dates, with some dating relying on artefact assemblages to give a broad 'Bronze Age' attribution: the available information is summarised in Chart 7.3 and Table 7.4 below. It is possible to discern a morphological progression in Shetland house form to provide a provisional evolutionary model towards the Bronze Age double house in Shetland, progressing from oval houses, to oval houses with porches, then pincer-like courtyard houses, then finally double houses. It should be noted however that until further excavated and dated sites are available the sequence outlined in Table 7.4 is speculative; there is no compelling reason why the double house should represent the final stage in a linear progression. Since the poorly-dated double house at Sumburgh (Section 7.6.1) is the only excavated example in Shetland closer chronological resolution of the development of the double house is impossible; it might equally represent a variation on a theme, and develop alongside both the oval house with porch and pincer-like courtyard houses.

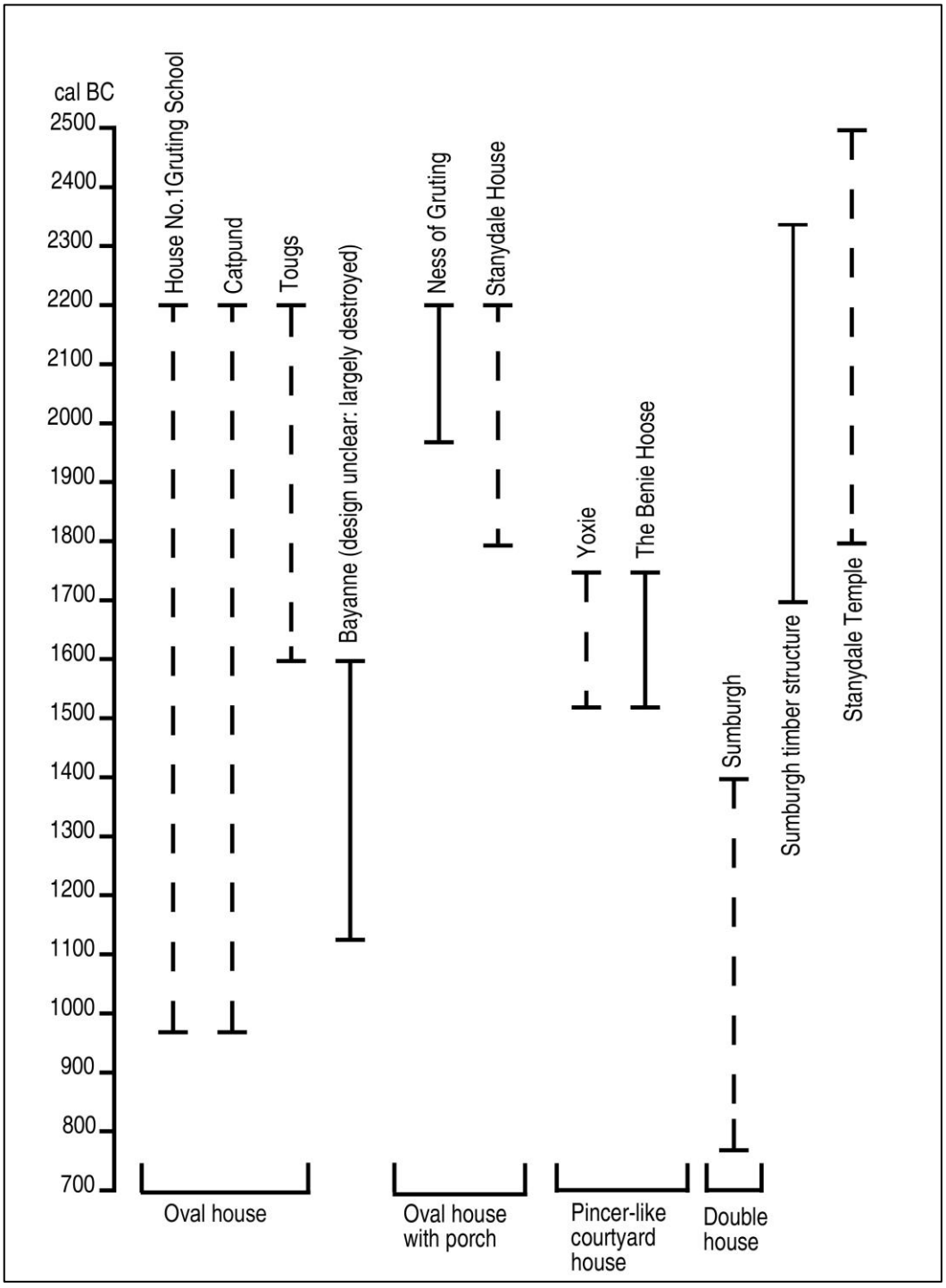

Chart 7.3 Chronology of Shetland houses, (including the Stanydale 'Temple' which may not be domestic). Solid lines indicate radiocarbon dates; dashed lines indicate conjectural dating based on artefact assemblages or associations. See text and Table 7.4 below for details.

Table 7.4. A provisional typology of Shetland houses dating from the 3rd to the 2nd millennium BC, in tentative chronological order.			
Site	**House type**	**Radiocarbon dates/other dating evidence**	**Reference**
Stanydale Temple, Sandsting (Figure 7.20)	Concave façade, oval exterior, similar in shape to oval house but may not be domestic	Beaker pottery in upper fill of posthole, ard points & flaked stone bars, suggesting late 3rd/early 2nd millennium BC activity, construction undated, possibly mid-late 3rd millennium BC?	Calder 1950; Clarke 2006, 119; Sheridan 2012b, 26-7 & 2013, 50-3
Scord of Brouster, House 1	Oval house	Problematic radiocarbon dates cover most of 3rd millennium cal BC, probably constructed in the early 3rd millennium	Whittle et al 1986
House 1, Ness of Gruting (Figure 7.21)	Oval house	Beaker pottery; construction radiocarbon dated to c.2200 – 1980 cal BC at 2 σ obtained from carbonised barley	Calder 1956; Sheridan 2012b, 17-18;
Wiltrow, Dunrossness (Figure 7.22)	Oval house	Incised pottery similar to the Ness of Gruting, many ard points & flaked stone bars; possibly late 3rd/early 2nd millennium BC?	Curle 1936; Sheridan 2013, 61
Tougs, Burra Isle	Oval house	Beaker pottery, ard points & flaked stone bars, possibly late 3rd/early 2nd millennium BC.	Hedges 1986
House 1 near Gruting School (Figure 7.17)	Oval house	Many ard points and flaked stone bars, late 3rd /2nd millennium BC?	Calder 1956
Catpund	Oval house	Many ard points and flaked stone bars, late 3rd/2nd millennium BC?	Ballin Smith 2005
Stanydale House[187] (Figure 7.18)	Oval house with porch	Beaker similar to the Ness of Gruting, many ard points & flaked stone bars, late 3rd/2nd millennium BC?	Calder 1956; Sheridan 2013, 56.

[187] Burnt animal bone from the Stanydale House and House 1 at the Ness of Gruting (from the same context as the carbonised barley, which acted as a control) were radiocarbon dated to investigate the 'old fuel' date offset from the use of peat as fuel (Schulting et al 2014). The Ness of Gruting samples indicated a significant offset of up 600 years cal BC, hence the uncontrolled date obtained from the Stanydale House (c.2574 – 2463 cal BC) is likely to be unreliable (ibid) and is not used as part of the model here.

Table 7.4 (continued).			
Site	**House type**	**Radiocarbon dates/other dating evidence**	**Reference**
The Benie Hoose, Whalsay (Figure 7.19)	Pincer-like courtyard house	Pottery residue date indicates occupation c.1740 – 1520 cal BC at 2 σ	Calder 1961; Sheridan 2012b, 27
Yoxie, Whalsay (Figure 7.23)	Pincer-like courtyard house	Pottery resembles that at the Benie Hoose, possibly of similar 2nd millennium BC date?	Calder 1961; Sheridan 2013, 60
Bayanne, Yell, Str. 3	Shape unclear: largely destroyed.	Occupation at least between c.1600 – 1120 cal BC	Moore & Wilson 2014b
Sumburgh (Figure 7.9)	Double house	Timber phases associated with Beaker pottery. Stone-built double house constructed Mid-Late Bronze Age. No radiocarbon dates for double house.	Downes & Lamb 2000a
House III, Jarlshof, Sumburgh (Figure 7.24).	Some similarities to the oval house at Wiltrow (shown in Figure 7.22).	Occupation c.1150 – 800 BC based on the presence of moulds for LBA metalwork	Hamilton 1956
House IVa, Jarlshof, Sumburgh (Figure 7.24).	Some similarities to the oval house at Wiltrow (shown in Figure 7.22).	Occupation c.1150 – 800 based on the presence of moulds for LBA metalwork	Hamilton 1956
House V, Jarlshof, Sumburgh (Figure 7.24).	Some similarities to the 'pincer-like courtyard house' design.	No diagnostic artefacts	Hamilton 1956

There are no absolute dates for the Bronze Age phases at Jarlshof, Sumburgh (Figure 7.24) although Late Bronze Age metalworking was associated with the later phase of Houses III and IVa (Coles 1960, 89; Curle 1933, 112-25; Hamilton 1956). The Jarlshof houses have elements of several Shetland house designs e.g. Houses II and III are reminiscent of the oval house at Wiltrow (Curle 1936; Figure 7.22) whilst House V, which had no diagnostic finds, has similarities to the pincer-like courtyard house (e.g. the Benie Hoose and Yoxie, Figures 7.19 & 7.23). The Late Bronze Age phases at Jarlshof suggest that earlier house styles, which appear to have developed in the first half of the 2nd millennium BC, remained in use in the late 2nd/early 1st millennia BC. Childe (1938) excavated in the northeast corner of the site at Jarlshof and identified midden deposits and associated structural remains separated by sand-blow events; radiocarbon dates associated with these middens place their formation c.1880 – 1440 cal BC (Dockrill & Bond 2009; Figure 7.25). Although the relationship of these middens with excavated structures in the south of the site is unclear, they are comparable with the date associated with the Benie Hoose (Sheridan 2005b). The occupation sequence at Jarlshof clearly extends back into the Early Bronze Age, and hints at the possibility that a more extensive (earlier) Bronze Age settlement may underlie the later structures, which were left in situ for public display.

Interestingly, considering the possible Neolithisation of Shetland from the Western Isles (Sheridan 2012b, 10-12) it is possible to envisage further influences in the late 2nd millennium BC: the Late Bronze Age 'terraced houses' with their shared walls at Cladh Hallan, Uist, the only examples of this design discovered in the Hebrides (Parker Pearson et al 2004, 64-82; Figure 7.26) also exhibit similarities with some of the Shetland houses. Although described as a 'terraced row' (ibid, 66), the general layout is reminiscent of the Late Bronze Age phases at Jarlshof (Figure 7.24) and House 401 bears a strong resemblance to the pincer-like courtyard house types of Shetland e.g. the Benie Hoose (Figure 7.19), which may hint that Shetland was influencing house styles in both the Hebrides and Orkney.

7.8.2 The development of the double house in Orkney

It is clear that in comparison with Shetland, prehistoric house forms develop differently in Orkney, where the main Neolithic forms (Section 7.5.1) are well known. The Links of Noltland, Westray (Moore & Wilson 2011a; Section 7.6.3; Figures 7.6 & 7.7) is the only excavated site where double houses are directly associated physically with Neolithic settlement. The Neolithic structures[188] present there (ibid) generally conform to 3rd millennium BC styles seen elsewhere in Orkney (discussed in Section 7.5.1) and do not provide obvious progenitors for double house development. It has however been suggested that the Grobust building[189], with its two areas of activity linked by a corridor (Figure 7.27a & b), might be a double house precursor (Moore & Wilson 2013, 18). Grobust is poorly dated but may have been occupied during the second half of the 3rd millennium cal BC (Moore & Wilson 2011a, 38-9) and was probably abandoned by c.2265 – 1975 cal BC with the infilling of the northern house (Clarke et al forthcoming; Marshall et al 2016, 12 & 28; Figure 7.27b). Grobust may have been abandoned around the same time as double houses began to be constructed at this site, but confirmation of this awaits the full planned radiocarbon dating programme (see Section 7.6.3). Although the overall design was unusual, many of the individual elements of the Grobust building are paralleled at both Skara Brae and Rinyo (Clarke & Sharples 1985, 66-69), suggesting that it may be a variation on an existing theme, rather than a double house precursor.

Superficially House 8 at Skara Brae externally resembles the Shetland oval house with porch design (Downes 2005, 25-7; Owen & Lowe 1999, 284; Figure 7.3), but as Childe (1931a, 50) noted, internally House 8 'approximates to the usual flattened oval plan'. The houses at Skara Brae exhibit a variety of forms, such that if House 8 were joined to the central corridor it would perhaps be unremarkable (Figure 7.3). Its physical separation from the other buildings compounds its apparent architectural differences. Unlike the

[188] Currently available radiocarbon dates for their occupation broadly cover the first half of the 3rd millennium cal BC (Moore & Wilson 2011a, 38-9; Appendix 1, Table A1.14).

[189] Excavated in the 1970s (Clarke & Sharples 1985, 69-70) but not yet published.

Shetland examples (e.g. the Stanydale House, Calder 1956; Figure 7.18) where the porch is clearly an integral part of the initial design, the porch-like structure of House 8 is a later addition, not bonded into the walls (Childe 1931a, 21-4). The addition of the porch to House 8 may have no significance other than a belated realisation of the practicality that an isolated building with a large kiln (ibid, 51) necessitated a sheltered doorway in order to prevent strong up draughts adversely affecting operations. As Childe (1931a, 23) pragmatically observed, the porch sheltered the entrance to House 8 from gales, a significant factor on Orkney's exposed Atlantic coast (Section 7.8.3). There does not appear, on present evidence, any obvious local developmental progression from the houses of the Orcadian Neolithic including House 8 at Skara Brae to the double house.

Owen & Lowe (1999, 284) observed that the structure inside the burnt mound at Liddle, South Ronaldsay (Hedges 1975; Section 9.3.2; Figure 7.28) bears a resemblance to the Shetland oval houses. No dates for the construction or use of this structure are available, but it was abandoned by the end of 2nd millennium cal BC, so construction/occupation in the Middle Bronze Age is thought likely (ibid). Field surveys have identified possible Bronze Age houses at several other sites in Orkney (Figure 7.2; Table 7.1; nos. 8, 16, 19 & 26) on the basis that they are oval individual structures and hence, by analogy with the Shetland oval houses may also be Bronze Age. At the Loch of Tankerness an oval house revealed during a drought was associated with other structures, including a burnt mound, whilst adjacent surface collection of ard points provided some artefactual corroboration of a Bronze Age date (Lamb 1987, 25, no. 113). At other examples (Table 7.1, nos. 16, 19 & 26) there is no evidence either to confirm or deny a Bronze Age attribution. These possible examples of Orcadian oval houses may be Bronze Age, but without excavation their form and date cannot be established. Further examples of possible oval houses come from Linna Breck, Birsay (Hedges 1978) which is not fully published but was initially described as two sequential hut circles, one with an annexe, associated with a field system (ibid); a subsequent summary illustrated an oval structure which may have

been a byre together with a fragmentary possibly oval house (Øvrevik 1985, 146-9). This site is not closely dated and is only assigned to the Bronze Age on the basis of its artefact assemblage.

It may tentatively be suggested that the double house form in Orkney was a Shetland transplant into Orkney soil. There is limited artefactual evidence for contact between Orkney and Shetland in the Neolithic (e.g. Ritchie 1968, 130) i.e. prior to the development of the double house form, but this changes in the Early Bronze Age, when steatite vessels and funerary urns provide radiocarbon dated evidence of frequent contact from c.2200 – 1880 cal BC onwards (e.g. Forster 2011; Sheridan 2002b & 2012b, 25-6; Section 6.3.4). Further support comes from similarities between the Beaker from the Braes of Ha' Breck, Wyre, and that from House 1 at the Ness of Gruting (both associated with late 3rd millennium cal BC radiocarbon dates) as well as the (undated) Beaker from the Stanydale house (Sheridan 2013, 56-8). Despite this evidence of contact between Orkney and Shetland from the late 3rd/early 2nd millennia cal BC examples of the oval house with porch (e.g. the Stanydale House: Calder 1956; Figure 7.18) and the pincer-like courtyard house (e.g. the Benie Hoose; Calder 1961; Figure 7.19) have yet to be identified in an Orcadian context.

It is not yet clear when the fully-formed double house appears for the first time in Orkney. The Bronze Age occupation phases at Links of Noltland lack close chronological resolution (Moore & Wilson 2011a; Section 7.6.3), but if double houses are present concurrently with the funerary activity c.2200 – 1960 cal BC (Section 6.1.2) they are considerably earlier than the only excavated Shetland example at Sumburgh (Downes & Lamb 2000a), which probably dates to the second half of the 2nd millennium BC (Section 7.6.1). The similarities of the steatite assemblage from the double houses at the Links of Noltland with that from Bayanne, Shetland, dating to c.1600 – 1120 cal BC (Forster 2011; Section 7.6.3) may conversely suggest a date more in keeping with the Sumburgh example. This issue is incapable of further resolution given the limited data set currently available.

7.8.3 Why a double house? Function and form

In the double houses at Sumburgh (Section 7.6.1), and the Links of Noltland (Section 7.6.3), one component appears to have fulfilled a specialist function (barn/byre, working area), whilst the other part was a domestic residence, and this is probably also true at Skaill (Section 7.6.2). In no case, however, is there evidence that both parts of the double house were definitely simply living space. This functional distinction also indicates some social force separating particular activities from the domestic sphere; variations between double houses may further hint at craft specialisations. The diffuse cluster of Bronze Age buildings at the Links of Noltland contrasts with the nucleation of Neolithic Orcadian settlements and may indicate a shift from a closely communal society to 'family-centred' units, each with its own infield area but retaining communal activities, possibly related to exploitation of particular environments or mutual protection.

As elsewhere, shelter appears to have been a motivating factor in the construction of houses in Orcadian prehistory. Pope (2003, 175-7) defined the 'functional optimum' for a house entrance (i.e. the orientation that provided the best compromise between shelter and light in the prevailing westerly winds of the British Isles), to be to the ESE and found that this corresponded well with the orientation of the majority of prehistoric roundhouses in her study[190]. This functional optimum is shown superimposed on the Kirkwall windrose in Figure 7.29, together with the orientation of some of Shetland's non-double house forms in Figure 7.30, whose general orientation is (also) in good agreement with Pope's (2003, 175-7) findings.

Entrances in the Shetland houses shown in Figure 7.30 tend towards the east, sacrificing light for increased shelter[191] perhaps because Shetland is even

[190] For a compelling rebuttal of the cosmological arguments surrounding entrance orientation see Pope 2007.

[191] An exception is the Stanydale 'Temple' (Calder 1950), where the entrance faces west, although this site is not necessarily domestic (e.g. Mahler 2013).

windier than Orkney (Section 2.1.4). The development in Shetland of the oval house with porch (e.g. no. 6 in Figure 7.30) would increase shelter but decrease available intramural light, perhaps suggesting that the pincer-like courtyard house (e.g. nos. 4 & 5 in Figure 7.30) might have developed to provide a sheltered area for activities requiring both shelter and good illumination.

Examples of the orientation of double houses in the Northern Isles are shown in Figure 7.31. Five of the nine examples (no. 4, 5, 6, 8 & 9 in Figure 7.31) broadly follow the 'functional optimum' position for the entrance of the northern house in each integral pairing, which also has the advantage of providing some shelter from westerly winds. The remaining four (nos. 1, 2, 3 & 7 in Figure 7.31) are oriented north – south, which would allow more light to enter the northern house and provide increased shelter from northerly winds, but this arrangement is less than ideal with winds from other directions, with the gap between the buildings funnelling the wind during westerly gales.

At the Links of Noltland the larger, northern buildings were probably domestic and the smaller, southern buildings non-domestic specialist structures (Moore & Wilson 2011a, 24-8); all of the double houses in Figure 7.31 (apart from that at Sumburgh: no. 3 in Figure 7.31) share the common factor that the larger house is oriented with its entrance away from the prevailing wind, perhaps corroborating the suggestion that the larger building of the pair was usually the domestic building. The exception comes from Sumburgh, Shetland but here the roles of the two buildings seemed to change, and in its Late Bronze Age phases the larger (and more exposed) south house was thought to be a byre (Downes & Lamb 2000b, 25-8). Perhaps convenience of access to the specialist building was more important than shelter for this building, although it might be noted in passing that good ventilation for cattle and in particular sheep housed indoors is vital if serious respiratory disorders are to be avoided (DEFRA 2003 & 2013); an entrance facing into the prevailing wind but partly sheltered by an opposing building would facilitate such ventilation.

The double house in which one component was used for livestock might be seen then as a practical arrangement in the Northern Isles incorporating shelter requirements, always important in a northern latitude with an exposed landscape and almost constant wind (Section 2.1.4); together with ease of access to a barn/byre/workshop area, and possibly aspects of good animal husbandry.

7.9 Roundhouses in Bronze Age Orkney

As discussed above (Section 7.8) the Northern Isles have their own distinct house styles in the 2nd millennium BC. Unlike elsewhere in Britain, where roundhouses are common from the Early Bronze Age onwards, such buildings do not apparently have widespread currency in the Northern Isles until the Early Iron Age (Armit 2003, 33-44), when massive-walled circular buildings appear e.g. Quanterness (Renfrew 1979) or Pierowall (Sharples 1984). There are now three excavated sites with Bronze Age examples of roundhouses in Orkney but of these only Tofts Ness, Sanday (Dockrill, Bond et al 2007) is fully published; Round Howe, Tankerness (Murray 2003; see Section 7.12.3 below) was largely destroyed in the nineteenth century; whilst two further roundhouses excavated at the multi-period site at Berstness, Westray are currently only broadly attributed to the Bronze Age on the basis of the artefact assemblage pending the radiocarbon dating programme (Moore & Wilson 2007c & 2008a; Hazel Moore pers. comm.). A further roundhouse at Peerie Hill, Sandwick identified from field survey (Moore 2013, 150-5) may be tentatively attributed to the Bronze Age on the basis of its relationship with the development of peat in the area (Section 5.2).

At Mound 11, Tofts Ness, Sanday (Dockrill, Bond et al 2007), where the settlement sequence commences in the late 4th/early 3rd millennium cal BC (Section 7.3.5), Structure 4, in Area C (Figure 7.5) comprised a probable Late Bronze Age roundhouse (Dockrill 2007d, 382; Figure 7.32). This roundhouse had internal and external diameters of approximately 8.75m and 14m respectively and structurally comprised two concentric stone walls retaining a

probable turf core, with an overall width of at least 2.25m (Dockrill 2007c, 46 & 79). The 60m² internal area[192] is comparable with Structure 6, the larger, probably domestic, element of the double house at the Links of Noltland (Figures 7.10 & 7.11). A small oval building (Area C, Structure 3; Figure 7.32) with a clay-luted stone tank set into a flagged floor, also relating to the Late Bronze Age phase, was identified c.4m to the south-east of the roundhouse, and interpreted as a specialised non-domestic building (Dockrill 2007c, 45-6). Parallels may be drawn between Structure 3 at Tofts Ness and the non-domestic southern components of the double houses at Links of Noltland (e.g. Structure 5 in Figure 7.10; Section 7.6.3).

No radiocarbon dates are associated with the Tofts Ness roundhouse (Structure 4), but the artefact assemblage was consistent with a Late Bronze Age date. A period of abandonment, destruction and sand-blow separates it from the subsequent construction of a much smaller Iron Age roundhouse (Structure 5: itself radiocarbon dated to c.770 – 410 cal BC), indicating the passage of time following the abandonment of Structure 4, and thus also supporting its Late Bronze Age attribution (Dockrill 2007c & 2007d, 382).

Although Tofts Ness has structural remains from several periods it is not a particularly helpful sequence to elucidate discussion of the development of house forms: its Early Bronze Age, possibly cellular, building (Structure 2: Dockrill 2007b, 24-9; Section 7.3.5) was poorly preserved, and there are no excavated structures linking this building with the Late Bronze Age roundhouse (Structure 4). The artefact assemblage indicates links between Shetland and Tofts Ness throughout the Bronze Age phases (MacSween 2007; Smith 2007b), but no double house was identified by excavation at Tofts Ness. There is however a double house identified by field and geophysical survey together with another roundhouse and a burnt mound located together at Shelly Knowe, around 264m to the east of Mound 11 (Dockrill, Gater & Simpson 2007; Section 5.5.1; Figures 5.8 & 5.9).

[192] Calculated values $A=\pi r^2$ based on an internal diameter of 8.75m for Structure 4.

7.10 Summary of Orcadian Bronze Age house types and development

Establishing a developmental sequence for Bronze Age domestic structures is hindered by the limitations of the archaeological record (Section 7.2; Table 7.1). There are few radiocarbon dates associated with excavated structural forms at settlement sites, and a number of sites may be only tentatively identified to this period on the basis of broad artefact attributions or associations. The available radiocarbon dates together with conjectural dates in other cases are shown in Chart 7.4 below.

Some of the distinctive Shetland house forms such as the oval house with porch (e.g. the Stanydale House: Calder 1956; Figure 7.18); and the pincer-like courtyard houses (e.g. the Benie Hoose: Calder 1961; Figure 7.19) are not currently known in Orkney. Contrastingly the double house, which in Shetland appears to develop as a progression from earlier house forms (Section 7.8.1), may have been present in Orkney possibly throughout the 2nd millennium BC at the Links of Noltland (Section 7.6.3), and more clearly by the mid-late 2nd millennium BC at Skaill, Deerness (Section 7.6.2). The only other definite Bronze Age house type in Orkney is the Late Bronze Age roundhouse (Structure 4) at Tofts Ness (Section 7.9), but there are no complete plans of excavated structures to bridge the gap between the Early and Late Bronze Ages, apart from the Nessbreck souterrain, discussed below.

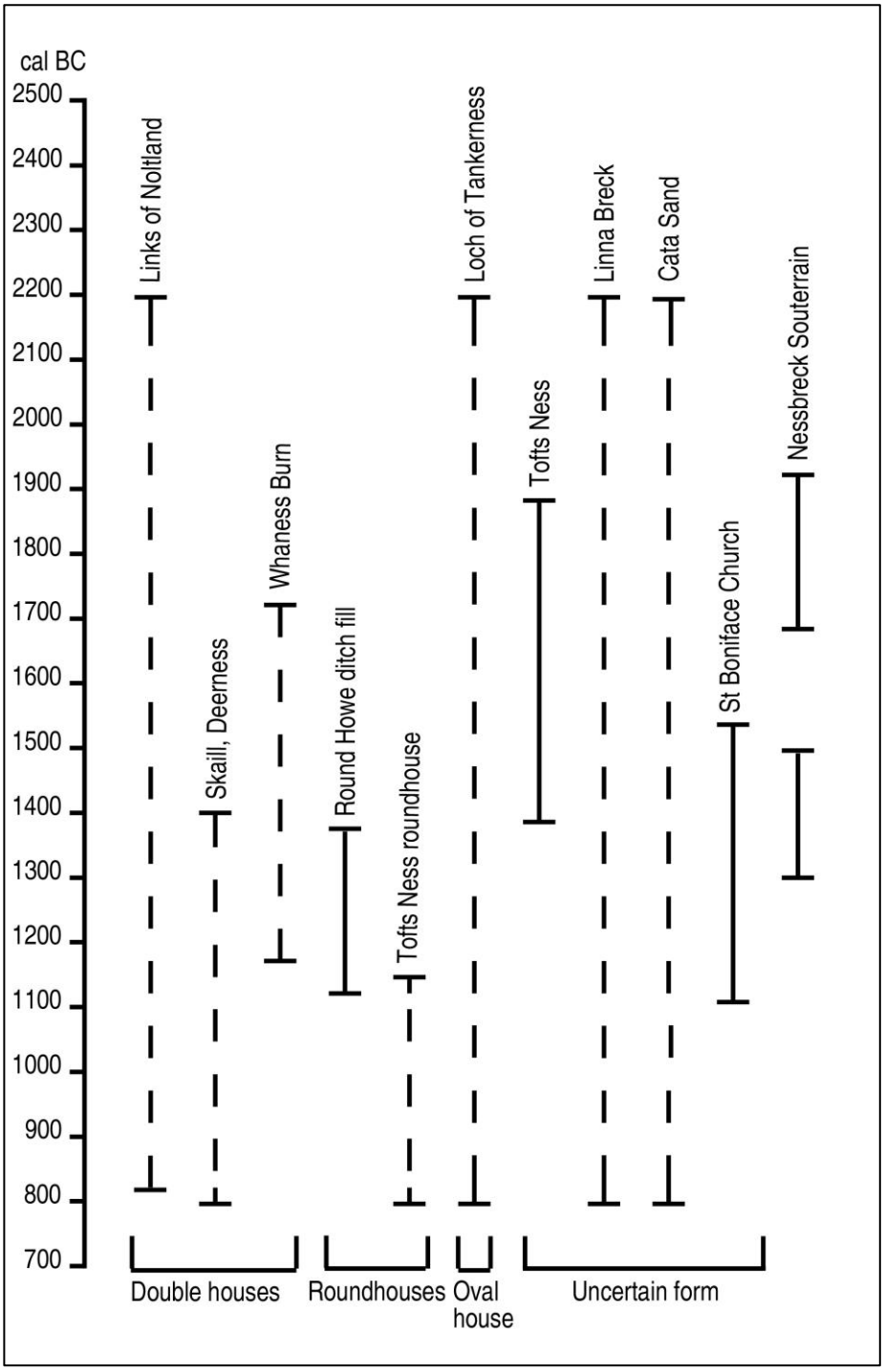

Chart 7.4 Chronology of Bronze Age domestic structures in Orkney together with the Nessbreck souterrain. Solid lines represent all the available radiocarbon dates for structural forms, dashed lines are conjectural based on artefactual assemblages or associations.

(See Appendix 1 for full details and references).

7.11 The Nessbreck Early Bronze Age Souterrain

There are around 40 known souterrains[193] in Orkney, consisting of a stone wall lined underground chamber, which may be rock-cut, with a roof supported by stone pillars, accessed by a passageway and in some cases steps (e.g. Kirkness 1928a & b & 1930; Haigh 1983; Marwick 1927a & c; Simpson D. D. A. et al 2007b; Thomas 1852). They appear to have existed as part of above-ground settlements (e.g. Ballin Smith 1994, 31-5; Haigh 1983) although in Orkney, as elsewhere in Scotland, their function(s) is open to debate, ranging from agricultural storage to ritual and religious usage (e.g. Armit 1999; Barclay 1980; Martin Carruthers pers. comm.; Simpson, D. D. A. et al 2007b; Watkins 1980). Human remains have occasionally been found in souterrains, most notably at Rennibister, Firth which contained the disarticulated remains of around 18 individuals (Marwick 1927c). Souterrains have also been found inserted into remodelled chambered tombs e.g. at the Knowe of Rowiegar, Rousay (RCAMS 1946, vol. II, 218-20, no. 578) and Howe, Stromness (Ballin Smith 1994, 31-5).

Until recently the dated examples have been incontrovertibly Iron Age (ibid; Martin Carruthers, pers. comm.; Hedges 1987a, 25-9) and the assumption has been therefore that all souterrains in Orkney may be safely assigned to that period. Recent developments have however shown this not to be the case, with the chance discovery and rescue excavation of the souterrain at Nessbreck, Corrigall, found when a void appeared in a recently seeded field (Robertson 2007; Figure 7.33). Despite its chance discovery the chamber deposits were found to be undisturbed and three radiocarbon dates[194] were obtained (all from charred barley), with two dates coming from the primary chamber floor deposits indicating use c.1900 – 1750 cal BC; whilst a secure date for the blocking of the entrance passageway indicated that the site was decommissioned c.1455 – 1395 cal BC (Lee in prep.). One of the last acts in the chamber was the placing of a structured deposit of water-worn stones,

[193] See Appendix 9 for site details and distribution maps.

[194] See Appendix 1, Table A1.14.

topped by an ard point, on the chamber floor. Three further radiocarbon dates in the range c.1940 – 1660 cal BC came from external pits and gullies which could not be stratigraphically related to the use of the souterrain, but activity at them was contemporary with the primary use of the chamber (ibid). The souterrain was cut into the bedrock, and abrasion on the floor together with the thinness of the floor deposits led to the suggestion that the chamber had been periodically cleaned during use (ibid). Analysis of the floor deposits supported the theory that they were in situ and had not been redeposited from an external source at a later date (ibid). Partial collapse or deliberate re-opening of the roof of the chamber however appears to have taken place in the Iron Age, indicated by the coarse stone artefact and anvil assemblage contained in the rubble re-blocking of the upper part of the chamber (ibid).

Nessbreck is in an area of intense prehistoric activity with two brochs, four barrow cemeteries and several individual barrows and cists within a 1km radius of the site (Figure 7.33). Geophysical survey around the Nessbreck souterrain suggests extensive anthropogenic activity, with some evidence that the souterrain may have lain towards the fringes of an enclosed settlement (ibid; Ovenden 2007; Figure 7.34). The secure Early Bronze Age radiocarbon dates for the use of Nessbreck souterrain represents a potential paradigm shift in our understanding of these sites. Although their functions remain elusive it is clear that in Orkney at least they cannot automatically be assigned to the Iron Age in the absence of absolute dating evidence.

7.12 Enclosed settlements

7.12.1 Introduction

Enclosed settlements (i.e. houses etc. with surrounding ditches, banks and/or palisades) are not a site-type that is commonly associated with Orkney until the appearance of brochs in the Iron Age, although the recent discovery of the enclosed Neolithic complex at the Ness of Brodgar (Card et al 2017; Towers et al 2015 & 2017) has challenged this assumption. There are also hints that

some of the promontory forts in the Northern Isles (Lamb 1980a) may have early origins (Section 7.13). Other than these types, there are only three known examples of enclosed settlements in Orkney that might date to the 2nd millennium BC; in each case there has been little or no excavation and the available dating evidence is tenuous.

7.12.2 Whaness Burn: an Orcadian fort?

At Whaness Burn, Hoy, a moorland fire burned off thick heather and the upper layer of the underlying peat in the Rackwick Valley revealing an extensive complex of sub-peat dykes, enclosures and settlement in the valley bottom, which displayed four distinct areas of activity[195] (Lamb 1989, 7-8 & 13, nos. 10-15; Lamb 1996; Figures 7.35 & 7.36). There was no excavation and the area is once more obscured by heather. Environmental analysis undertaken on a mire 500m south of the main enclosure at Whaness Burn A demonstrates human activity in the area during the 2nd millennium BC (Farrell 2009; Farrell & Bunting 2008).

Three radiocarbon dates thought to be reliably sequenced in relation to the vegetation evidence were obtained from the Whaness Burn mire cores (Farrell 2009, 158-9 & 185-6; Table 7.5). The dates were widely separated and although various chronological models were tested it was found that none had any advantage over linear interpolation and extrapolation (ibid). A degree of uncertainty therefore exists in the dating of the human activity in the valley, which may in turn be associated with the settlement site at Whaness Burn, but in the absence of excavation this cannot be conclusively demonstrated.

[195] When recorded by the County Archaeologist Dr Raymond Lamb in 1984 the individual sites were designated Whaness Burn A – D but they were subsequently renamed by the RCAHMS. To avoid confusion I will follow Dr Lamb's naming system in his published accounts (Lamb 1989, 7-8 & 13, nos. 10-15; Lamb 1996). Both sets of names are shown on Figure 7.36 along with their NMRS numbers.

Table 7.5 Whaness Burn radiocarbon determinations (Farrell 2009, 185)	
Laboratory reference : uncalibrated date BP	Calibrated radiocarbon date at 2σ
SUERC-17751: 3415 ± 38	1875 – 1618 BC
SUERC-17752: 1214 ± 38	AD 687 – 893
SUERC-17753: 987 ± 38	AD 989 – 1155

Peat formation began c.3020 cal BC at which stage there was some woodland present, dominated by *Pinus sylvestris* (Scots pine) (Farrell 2009, 208-11). Pine decline occurred around 1720 cal BC, following which there is consistent evidence of nearby human activity c.1720 – 1170 cal BC (ibid, 212-14). During this period, large herbivores grazed the valley bottom, which was periodically burnt, probably to control heather and encourage new shoots; there is no evidence of cereal cultivation (ibid). Pastoral activity had declined by c.1170 cal BC, which may indicate abandonment of the settlement as represented by enclosures A – D, followed by increased surface wetness of the mire at c.1030 cal BC (ibid, 214). From c.800 cal BC onwards the area became increasingly wet and the valley bottom was abandoned, although there are indications that the valley sides were exploited for rough grazing (ibid).

The main focus of activity in the valley was Whaness Burn A (HY20SW15; Figure 7.37). The enclosure here has internal measurements of 90m x 70m, enclosing an area of c.0.5ha, enclosed by a 4m wide bank, still surviving up to 0.8m high. This bank has an external ditch, 4m wide, beyond which was originally another 3m wide bank that survives to 0.6m high (Lamb 1989, 13, no.10). Lamb (ibid) considered that the inner bank probably had a stone core, but recorded no evidence to support this[196]. Stone-cored banks are seen elsewhere in prehistoric Orkney, for example at the Dyke of Sean, Stenness (Section 8.6). The enclosure is traversed by a burn which meanders through an inturned southern entrance and exits through a gap in the banks to the

[196] Lamb (1989, 8) compares the enclosure at Whaness Burn A with that at Fold of Setter in Eday (Section 8.4), where the 2m wide enclosure wall was stone-built. The enclosure at the Fold of Setter however lacked both the complexity and the settlement element recognized at Whaness Burn.

north (Figure 7.37). Inside the enclosure are the remains of several houses, including two that appear to be of typical double house form (Section 7.7), lending support to a possible 2nd millennium BC construction date, along with a number of other indeterminate mounds which may conceal structural remains, whilst a further similar mound was recorded outside the banks to the north east of the enclosure (ibid). Spread along the valley, the other three main recorded sites, Whaness Burn B (HY20SW4), C (HY20SW14: away from the stream course) and D (HY20SW16) are smaller enclosures together with possible houses (Lamb 1989; Figure 7.36). Traces of sub-peat dykes were found, suggesting that the whole valley up to the 60m contour on both sides of the stream was once in farming use: an area of around 150ha (ibid & Lamb 1996). The valley at Whaness has not been used for agriculture in the historic period; it is well outside the hill-dykes that defined the cultivated areas of Hoy in 1750 (Figure 4.15a). The 1st edition OS map shows the area as unimproved land, with a tumulus at the site of Whaness Burn B. Evidence of prehistoric subsistence farming here is limited to the environmental evidence discussed above. The former presence of large grazing herbivores is indicated by fungal ascospores, which are not species specific (Farrell 2009, 156-7 & 201), so it is not possible to define the type of animal husbandry. Analogy with similar marginal environments today suggests that sheep would be the most likely animal exploited, although some cattle breeds thrive on such rough grazing.

Absence of cereal cultivation from the valley during the Bronze Age was probably due to environmental limitations. There is still very little land suitable for arable in Hoy and where present this coincides (as is usual in Orkney) with the area of Upper Stromness Flags (USF) (Appendix 5, Figure A5.3). The extent of modern settlement and agriculture is restricted to low-lying coastal areas (Figure 7.38). The nearest surviving prehistoric settlement site to the Whaness Burn sites is the broch of Green Hill of Quoyness (HY20SW7; no. 3 on Figure 7.38), 1km to the north east, occupying the most favourable location nearby and possibly the main focus of prehistoric

settlement[197] in the wider area (see Section 7.15). The double house and burnt mounds at Braebuster (Lee 2012; no. 2 on Figure 7.38) form another Bronze Age settlement focus 3.6km to the northwest. The inhabitants at Whaness Burn are unlikely to have survived solely on animal husbandry with no arable component in their diets[198]. It is possible to envisage a compensatory regime at Whaness Burn where steps were taken to maximise the production of dietary fats such as by dairying, extraction of bone grease etc. (e.g. Outram 2003, 2004 & 2005). It seems more likely however that the Bronze Age inhabitants of Whaness Burn were part of a wider mixed farming system, with their cereals imported from elsewhere in the general locality. The absence of geophysical survey or excavation and the lack of association between the radiocarbon dates from the environmental cores and the settlement activity at Whaness Burn inhibit secure interpretation. The presence of unexcavated double houses however, considered likely to date from the 2nd millennium BC (Section 7.7), is consistent with the environmental evidence of human activity in the valley c.1720 – 1170 cal BC (Table 7.5). The enclosures and further sub-peat dykes, together with the environmental evidence for grazing herbivores, suggest that activity at Whaness Burn focussed on large-scale livestock husbandry over a wide area. It is less certain that the main enclosure at Whaness Burn A fulfilled a primary livestock handling function. No internal sub-divisions were observed, which suggests either that any livestock within were simply folded rather than handled for management purposes, or that such internal divisions were ephemeral in nature e.g. wooden hurdles. In the absence of large predators there would be little reason to enclose livestock for overnight protection (unless the predator was human), and in the absence of cereal cultivation there would be no requirement to enclose an area of infield arable land against the ingress of animals. Animals might be enclosed for other

[197] The nearest funerary monument is the Dwarfie Stane (HY20SW8; Figure 7.38, no. 7), thought to be a rock-cut Neolithic tomb, although the blocking stone was removed along with (presumably) the contents at an unknown date without record (Calder 1936; Davidson & Henshall 1989, 114-5).

[198] Humans are unable to digest protein in the absence of fat or carbohydrate: a diet consisting entirely of lean meat leads to protein starvation; carbohydrates are more efficient than fats in enabling protein to be digested (Speth & Spielmann 1983).

reasons e.g. to collect dung or for particular purposes e.g. at lambing time or for slaughter.

The large enclosure at Whaness Burn A (Figure 7.37) is unique in an Orcadian context and, as Lamb (1996, 55) observed:

> *Had the Whaness structure occurred on a summit in Western Scotland it might well have been called a fort.*

Its internal area is only around 0.5ha, rather small for a fort but not without precedent: over half of Britain's hillforts enclose an area under 1.2ha (Harding 2012, 8-14) and the majority of Scottish hillforts have an internal area of 0.24 – 1.2ha (Hogg 1984, 36-46), however both the topographical location and low height of the banks (0.6m and 0.8m: Lamb 1989, 13, no.10) would warrant exclusion from the Hillfort Atlas[199] (Ian Ralston, pers. comm.). Low banks might have been heightened by timber palisades: perhaps the pine decline in the valley c.1720 cal BC, which coincides with the commencement of human activity (Farrell 2009, 208-14), was caused by the felling of timber to construct such palisades?

The position on the valley floor at the eastern end of the Rackwick Valley is not obviously defensive but commands access between the valley and low-lying coastal land to the east. To the west, the Rackwick Valley culminates in Rackwick Bay, the only useful landing beach on the west side of the island (Figure 7.35). The Whaness Burn A enclosure may have been positioned to control the only convenient access to or from this landing. Such a substantial enclosure would require a larger population for defence than that suggested by the few house sites identified within the enclosure, which may imply a wider level of communal organisation, possibly requiring some local social/political hierarchy.

[199] http://www.arch.ox.ac.uk/hillforts-atlas-survey.html

Rackwick was one of the few areas of Hoy settled in the historic period, being recorded as a township in the 1492 Rental of Orkney and shown on Mackenzie's chart of 1750 (Thomson 1996, 72-3; Figure 4.15a). It continued to support a small crofting community well into the twentieth century, largely dependent on fishing but with some arable land and sheep husbandry (Fenton 1978, 451; Wenham 2003, 206-7). Shortage of land with agricultural potential elsewhere in Hoy (O'Dell 1939, 244) suggests that Rackwick was probably also a settlement focus in prehistory. A scenario may be envisaged where the enclosure at Whaness Burn A served as a place of refuge for both livestock and people in times of crisis, such as raiders landing at Rackwick Bay (Figure 7.35). The site at Whaness Burn A would have appeared imposing enough to discourage attack, and perhaps also to hinder further progress along the valley into the perhaps more densely populated areas with better agricultural land further east.

The preservation of the enclosed settlement at Whaness Burn is due to the unusual circumstance that a site suitable for settlement in the 2nd millennium BC has not continued in productive use into the historic period. The site itself is unlikely to have been unique, and its chance survival may suggest that further enclosed settlements of the period existed in Orkney during the later Bronze Age, as elsewhere in Britain, but have been destroyed by agricultural improvement. Further examples may yet survive under the extensive areas of blanket peat still extant in Orkney, particularly in the West Mainland[200], where remains found during peat cutting (e.g. sub-peat dykes, Section 8.4) suggest prehistoric activity.

7.12.3 Round Howe: a defended roundhouse?

Round Howe, St Andrews[201] (Card et al 2003; HY50NW8) is unique in Orkney in consisting (possibly) of a Middle Bronze Age roundhouse situated

[200] See Appendix 5, Figure A5.2.

[201] This site's primary name is Howe of Langskaill HY50NW8, however locally it is known by its alternative name Round Howe, the name which is used by the recent excavators. This site should not be confused with Howe of Langskaill HY51SW1 in St Andrews which is a burnt mound.

on a natural glacial mound which is in turn surrounded by a bank and ditch. The site is adjacent to another glacial mound known as Long Howe, which has a Bronze Age barrow at its eastern end (HY50NW51; Card et al 2005; Figure 7.39). To the east of Long Howe is the Iron Age metal working and ritual site of Mine Howe, radiocarbon dated from the late 1st millennium BC through the early 1st millennium AD (Nick Card, ORCA, pers. comm.; Card et al in prep; Harrison 2005).

In 1845 Round Howe was a substantial mound of truncated conical form, described as 16 feet (4.87m) high and 90 yards (82.3m) around the base (giving a diameter of 26m), surrounded by an 'embankment' 20 yards (17.3m) away (Smellie 1845, 179). Recorded around 1862 during unpublished excavation by James Farrer (Hedges 1987c, 79-80 & 134), Petrie's sketches (Figures 7.40 & 7.41) show a mound c.14 feet (4.27m) high[202] surmounted by structural remains to a height of two feet nine inches (0.8m), within a large pear-shaped banked enclosure measuring approximately 60m x 50m. These suggest either that a roundhouse stood on top of a natural mound or that the excavation revealed the top 0.8m of the walling of a broch surviving within the mound to a possible height of around 5m (Hedges 1987c, 79-80 & 134). Although Hedges (ibid) favoured the latter interpretation, Farrer employed a standard method of excavating broch sites: trench to find the walls and then empty the tower (e.g. East Broch of Burray: Petrie 1856). If Farrer had little understanding, Petrie was not troubled by the same problem; his plans of East Broch are accomplished and detailed[203]. A more credible explanation is that there was not a broch at Round Howe, but a roundhouse on top of a natural mound, hence Farrer's swift abandonment of the excavation.

Road construction through the mound in the late nineteenth century almost completely obliterated it; the only record of this event is in the ONB (1880,

[202] Smellie's (1845, 179) estimate of a height of 16 feet for the mound would be pre-excavation, whilst Petrie's sketches (Figures 7.41 & 7.42) show the height recorded during excavation, with the overburden covering the stonework removed.

[203] https://canmore.org.uk/site/9569/burray-east-broch-of-burray

OS1/23/23/81) entry, when Round Howe is described as a 'hillock through which a road has lately been taken' implying that the bulk of the mound was natural. It might be expected that something as substantial as the destruction of a broch would have been remarked upon more fully. The site was also damaged subsequently by a conifer plantation, which further confused an already mutilated location. Fortunately the 1960s OS revision took place before the plantation and preserves the only surviving record of the extent of the pre-forestry embankments (Figure 7.42).

Absence of a broch here was confirmed by excavation in 2002 (Card et al 2003). Prehistoric deposits, consisting of rubble and silty clay suggestive of rapid deposition, were located in one area (Trench Y: Figure 7.43) but had an uncertain relationship with activity elsewhere on the site, whilst the artefact assemblage included Iron Age pottery (Nick Card, pers. comm.; Murray 2003, 20 & 27).

Trench Z revealed that the central mound was glacial in origin, but had been encircled by a shallow ditch, the lower fills of which appeared to comprise quickly dumped rubble including stone tools and a stone trough (Murray 2003, 17-19; Figure 7.44). A radiocarbon date of 1380 – 1120 cal BC was obtained from carbonised barley from these lower fills, from a well-stratified and archaeologically secure context (Nick Card, pers. comm.; Table A1.1, Appendix 1). An outer bank, also observed in Trench W, overlay a peaty deposit and survived to 0.8m high and 7m wide. Peat continued to accumulate around the bank's base after its construction, indicating a damp environment. The area between the outer bank and the glacial mound was archaeologically sterile (Murray 2003, 23-4).

Another bank, not part of the outer earthworks, was found to consist of redeposited boulder clay with tip lines of stones (ibid, 23; Trench X: Figure 7.43). This bank was not shown on Petrie's plan (Figure 7.40), but it is however visible in much less mutilated form on the 1960s OS map (Figure 7.42). Since Farrer's excavation was swiftly abandoned, it may be that Petrie did not record the whole site in detail. If Round Howe's banks and ditches

were defensive, then it might be expected that the adjacent glacial mound of Long Howe would have been incorporated into the arrangement. Apart from the Bronze Age barrow at the eastern end of Long Howe, however, there are no other surface indications of ancient activity here (Figure 7.39).

Dating of activity at Round Howe to the Bronze Age rests solely on the radiocarbon date of 1380 – 1120 cal BC from the ditch encircling the glacial mound, which was probably associated with material derived from either the collapse or the demolition/remodelling of the putative roundhouse; and the Iron Age pottery recovered from Trench Y. It appears likely that Round Howe comprised a substantial Middle Bronze Age stone roundhouse on top of a glacial mound, surrounded by a shallow ditch. The whole was then encircled by an outer bank of redeposited boulder clay; at its eastern end, this rampart joined the shoulder of Long Howe. Other earthworks of uncertain date and function appear to have been present. The recent excavator commented on the banks as follows:

> *The construction technique of the bank is … reminiscent of the 'dump rampart' technique … The wide, low profile seems to negate any practical function, simply not presenting a serious obstacle to either livestock or people - indeed the possibility of any serious defensive function is further reduced by the fact that it is actually overlooked by the S end of Long Howe* (Murray 2003, 26).

This construction technique is also seen in Orkney at the promontory forts at the Ness of Onstan (Section 7.13.2) and Nether Bigging (Section 7.13.3). It may be seen too on a much larger scale at the Broch of Gurness, where the massive ramparts are stone-revetted dumps (Hedges 1987b, 62-3). The Round Howe banks were almost certainly higher when newly built, and may have been topped by some further barrier. Although the contour survey (Figure 7.43) shows Long Howe, at 22m OD, overlooking the site today, originally the top of Round Howe's glacial mound would have been slightly higher than Long Howe, at around 23m OD[204]. A roundhouse on top would have been both prominently and also practically sited, since the surrounding

[204] This takes 19m OD from the contour survey (Figure 7.43) as the baseline and adds the height of the mound of c.4.27m estimated from Petrie's sketches (Figure 7.41).

area is low-lying and appears to have been boggy when the site was occupied. The area enclosed by the banks at Round Howe is c.0.24ha (Figures 7.40 & 7.43), approximately 25% of which may have been taken up by the roundhouse-topped mound[205]. This is towards the bottom end of the scale for a Scottish hillfort and half the size of Whaness Burn A (Section 7.12.2). An available area of c.0.18ha would probably be sufficient to enclose a community's livestock in times of crisis[206]. In normal times, the area within the banks could have provided a sheltered enclosed area for sheep sorting, shearing or slaughter: activities commonly undertaken in summer or early autumn, when the ground would have been dry.

The single radiocarbon date from Round Howe places it around a millennium before activity commenced at Mine Howe (Nick Card, ORCA, pers. comm.); Iron Age pottery from dump deposits in Round Howe Trench Y suggests some unclear connection between the two, whether continuity of settlement or merely later activity. Round Howe itself remains enigmatic; it can at least now be said that it is not a broch, and that the building which once crowned it may, tentatively, be assigned to the Middle Bronze Age.

7.12.4 Muckquoy: enclosed settlement?

The site at Muckquoy, Redland, survives as a low mound in a cultivated field; fieldwalking there retrieved an artefact assemblage indicative of occupation from at least the 4th to 2nd millennium BC (Richards, Downes et al 2016, 247-53). A fragment of bronze bangle dating to the Late Bronze Age/Early Iron Age was also recovered from the site (Richards & Jones, R. 2016, 14), although the possible significance of this has not been further explored. Geophysical survey indicated a substantial settlement focus covering an irregular area of c.0.6ha surrounded by a linear feature that appeared to cut

[205] Scaled from Petrie's plan (Figure 7.40) on which the size of the enclosure broadly agrees with that depicted by the modern contour plan (Figure 7.43).

[206] When housed sheep require approximately 1.2m² each and cattle around 2.5m² each (https://www.agriculture.gov.ie/media/migration/farmingschemesandpayments/farmbuildings/farmbuildingspecifications/pdfversions/RecAnimalAreas.pdf accessed 14/12/16), 0.18ha could therefore physically accommodate 1,500 sheep or 720 cattle.

through earlier remains (Richards, Downes et al 2016, 247-53). Excavation found the boundary feature to consist of five concentric slots, each c.0.20 – 0.30m wide and 0.24 – 0.30m deep, with some evidence of small postholes; this was tentatively interpreted as the remains of multiple timber or wickerwork fencing encircling the site. It was considered on stratigraphic grounds that this act of enclosure probably took place in the early 2nd millennium BC (ibid), although this is rather speculative because the excavation area was limited and radiocarbon dating was not undertaken. Geophysical survey located another substantial (but unenclosed) settlement focus c.120m south west of Muckquoy, together with several smaller individual structures (ibid, 253, fig. 9.43), one a possible double house.

The enclosed area at Muckquoy is broadly comparable with that at Whaness Burn A, Hoy (Section 7.12.2), and double that at Round Howe (Section 7.12.3). It is not possible to draw inferences regarding the sequence of occupation represented at Muckquoy, although the bronze bangle hints that activity may continue into the late 2nd/early 1st millennium BC. Significant quantities of timber would have been required to enclose the site at Muckquoy, whenever this took place, perhaps an act of conspicuous consumption in Orkney's timber-poor environment, particularly if the enclosure did occur in the 2nd millennium BC, a time which saw the establishment of an open heathland environment throughout Orkney with concomitant loss of tree cover (see Section 2.2.2).

7.13 Promontory forts

7.13.1 Introduction

Promontory forts occur throughout Britain and Ireland, with notable concentrations on the coastline. Few have been extensively excavated and there are fewer dated examples, most of which are Iron Age[207], but there is also evidence of earlier activity in some cases e.g. Trevelgue Head, Cornwall

[207] See Appendix 6, Tables A6.3 – 6.8 and references therein for details.

(Nowakowski & Quennell 2011); Hengistbury Head, Dorset (Cunliffe 1987) and Dale Point, Pembrokeshire (Benson & Williams 1987). Lamb (1980a, 41-64) suggested that all the Northern Isles examples were Iron Age, based on similarities in design with that of Iron Age defended sites elsewhere in the British Isles, and conceptually imported rather than developing locally. Orcadian promontory forts have attracted little attention and limited excavation (e.g. Carter et al 1995; Hunter 1996b & 1997); there are no related radiocarbon dates, as summarised in Table 7.6 below. It is possible that these sites share previously unremarked relationships with the mid-late 2nd millennium BC settlement enclosures discussed above (Section 7.12).

Lamb (1980a) identified four distinct types[208] of promontory fort:

1) A simple promontory fort where earthworks, comprising probable stone-revetted earthen banks and ditches, cut off a lochside or coastal promontory e.g. The Ness of Onston, Stenness, Orkney (Lamb 1980a, 52-3 & 78) or the Brough of Stoal, Yell, Shetland (ibid, 48, fig. 17).

2) As (1) above, but with the addition of a standalone stone blockhouse[209] on the end of the promontory e.g. Ness of Burgi, Dunrossness, Shetland (ibid, 10-12; Mowbray 1936).

3) As (1) above, but with the addition of a broch on the end of the promontory e.g. Burland, Lerwick, Shetland (Carter et al 1995, 464-7; Lamb 1980a, 82-3).

4) A broch situated on a promontory that is cut off by substantial stone walled banks, foreworks and ditches e.g. Midhowe, Rousay, Orkney (Callander & Grant 1934b; Lamb 1980a, 19-21).

[208] Lamb (1980a) described the different site-types but did not number them; numbers have been allocated here for ease of reference.

[209] Shetland's blockhouses, also known as foreworks or gatehouses, can also be found as part of a broch but their role in broch development remains unclear e.g. Clickhimin, Lerwick (Hamilton 1968, 54-61; Simpson 1954, 21-6; MacKie 2002, 108-10).

Table 7.6 Excavated examples of Promontory Forts in Orkney and Shetland, not including type (4)			
Site	**Bank type (no dated examples)**	**Structures and dating**	**Reference**
Type (1) Simple Promontory Fort			
Nether Bigging , Stenness, Orkney	Stone revetted earthen dumps	Multi-period settlement?	Clouston 1926 & 1929
Point Of Onston, Stenness, Orkney	Stone revetted earthen dumps	None	Lamb 1980a, 78
Landberg, Fair Isle	Not excavated	Roundhouse: Iron Age pottery	Hunter 1996b & 1997
Type (2) Blockhouse and banks			
Ness Of Burgi , Dunrossness, Shetland	Stone revetted earthen dumps	Blockhouse: Iron Age pottery	Carter et al 1995,446-7; Mowbray 1936
Tonga, Scatness, Shetland	Earth/stone dump bank, rock-cut ditch	Blockhouse undated	Carter et al 1995, 430-45
Type (3) Broch and banks			
Broch of Burland, Lerwick, Shetland	Stone revetted earthen dumps	Broch not excavated	Carter et al 1995, 464-7

Lamb (1980a, 65-70) concluded that both types (1) and (2) lacked credibility as defended sites but were constructed as status symbols, predating brochs, which he suggested were built in response to a greater need for defence. Lamb (ibid, 54-64) further suggested a chronological development from simple promontory forts through blockhouse forts to brochs. There is some support for this progression from Clickhimin, Lerwick, where a Late Bronze Age enclosed settlement (Hamilton 1968, 25-31) was followed by a blockhouse, which may have been the entrance to a pre-broch ringfort (ibid, 54-61; Simpson 1954, 21-6; MacKie 2002, 108-10).

The relationship of the earthworks to the brochs at the type (3) sites has not been investigated, although banks at the Broch of Burland showed several episodes of construction and replacement (Carter et al 1995, 464-7), which indicates some chronological complexity; relationships with the broch remain unclear. At the few excavated type (1) – (3) sites the earthworks are simple dump banks usually with stone revetments (Table 7.6 and references therein). Broch construction can now be dated to c.390 – 200 cal BC at Old Scatness, Shetland (Dockrill et al 2006). If Lamb's (1980a, 65-70) linear progression is correct it suggests time-depth to the sequence, potentially indicating a Late Bronze Age origin for the type (1) sites. It may be noted that type (1) could be viewed as a form of land division exploiting natural promontory features i.e. an enclosure.

Orkney has no obvious type (2) or (3) sites, although there is some evidence that the brochs at Midhowe, Rousay (Callander & Grant 1934b) and Borwick, Sandwick (Watt 1882) had blockhouse-like structures (Hamilton 1968, 60; Lamb 1980a, 20). Only two Orcadian promontory forts have been excavated and these only partially: the Ness of Onstan (Lamb 1980a, 52-3), and Nether Bigging (Clouston 1926 & 1929), both on promontories in the Loch of Stenness. In the late 4th millennium BC the Loch of Stenness was a considerably smaller freshwater loch, with an extra c.100 – 200m of now-submerged land exposed with a rocky foreshore and extensive shallow wetlands (Wickham-Jones et al forthcoming). At this period therefore neither the Ness of Onston nor Nether Bigging was a promontory, and would not

become so until the inundation of the Loch of Stenness by rising sea levels c.2000 – 1500 BC (ibid; Bates et al forthcoming; Wickham-Jones et al 2008).

7.13.2 The Ness of Onston, Stenness

At the Ness of Onston (Figure 7.45) a double set of banks and ditches encloses an area of just under one hectare, just to the north of Unstan Neolithic tomb; the enclosure feature was noted but not investigated during the tomb's excavation (Clouston 1885, 341). In 1928 the banks survived to a height of 3 feet (0.91m) and the total surviving width of the earthworks was around 46 feet (14m) (RCAMS 1946, vol. II, 298, no. 873); much has been destroyed since by cultivation (HY21SE22; personal observation). In the 1960s sections were cut across the banks. No finds were recovered and no records survive other than a sketch on the back of the OS index card, which shows an earthen bank with stone revetments (Lamb 1980a, 52-3 & 78). Geophysical survey confirmed that ditch construction was complex and may have included walling and revetments, although there appears to be little evidence of activity within the enclosed area (Bates, Bates et al 2012). Sonar survey found no structural or activity evidence below the modern water level around the promontory (ibid). Since the ditches were shallow and cut only into the subsoil however, it was noted that any underwater traces could have eroded away (ibid).

Dating the site is problematic. It does not have any obvious connection with Unstan chambered tomb, and there are no known examples of stone-revetted earthen banks from Neolithic contexts in Orkney. It appears more likely that the construction dates to a point after the site became a promontory c.2000 – 1500BC (Section 7.13.1). Lack of obvious settlement evidence makes occupation unlikely. A livestock handling function is a possibility but the double bank and ditch construction seems excessive in that context; the bivallation is more suggestive of a defensive function, perhaps as a place where livestock could be protected in times of crisis (cf. Whaness Burn, Section 7.12.2).

7.13.3 Nether Bigging, Stenness

The Nether Bigging promontory, Stenness today is usually flooded and in such a chaotic state that nothing further can be made out on the ground. Geophysical survey conducted in the 1990s was inconclusive, but allowed the suggestion that the site was a multi-period settlement, with remains from the prehistoric to the Norse period (Grieve 1999, 70-5).

The sole excavation was by J. Storer Clouston, to investigate the supposed site of a potential castle *(kastali)* allegedly founded by the *Orkneyinga Saga* character Hakon Klo (Clouston 1926 & 1929). The site had been badly damaged both by stone quarrying and by the construction of a First World War seaplane base. Clouston's site plans and reports are somewhat confused (Figures 7.46 & 7.47). He appears to have excavated at the site twice: first (Clouston 1926) on the end of the Ness, and subsequently (Clouston 1929) in search of the outer defensive ditch and wall expected of a medieval castle. He described a ditch with a stone-revetted earthen rampart cutting off the neck of the promontory (Clouston 1929, 70-1). This is similar to the construction technique found at the Ness of Onston but the area enclosed is much smaller, around 0.12ha (Figure 7.46). At Nether Bigging however there were substantial remains on the point of the promontory. Clues on the date of the site can be drawn from Clouston's (1926) report:

- The site today is flooded by both rising loch water levels in the winter and by spring tides in the summer; the floors of the structures would be underwater in winter (ibid, 283). This would have been the case since modern water levels in the Loch of Stenness were reached c.2000 – 1500 BC (Bates et al forthcoming; Wickham-Jones et al 2008 & forthcoming).

- A waterlogged prehistoric-type midden was discovered which extends far below the present loch level; the 'curtain wall' of the 'castle' was said to be cut deeply through this (Clouston 1926, 286). Clouston (ibid) speculated that the curved form of the 'curtain wall' was due to it following the line of

an earlier wall, such as that of a broch, but flooding prevented the excavation reaching the foundations to test this.

- The finds were non-diagnostic: hammer-stones, pottery fragments, antler and animal bone (ibid, 296).

It is clear that there is a prehistoric, probably multi-period settlement site on the promontory (Figure 7.47). Before c.2000 – 1500 BC (Section 7.12.1), however, this site was neither a promontory nor flooded, suggesting that settlement was established before this date, when the site was dry land, although the earthworks were presumably constructed after the formation of the promontory. Clouston's dry stone 'curtain wall' then is likely to be prehistoric, with the midden built up against it (rather than a later wall cut through the midden, as in Clouston's (1926, 286) interpretation). The earthworks may have been constructed for defensive purposes, possibly in response to pressure on prime settlement sites around the Loch of Stenness in the face of rising water levels. The single ditch and stone-revetted earthen bank as described by Clouston (1929, 70-1) are comparatively weak as a defensive structure. The area enclosed is a comparatively meagre 0.12ha (Figure 7.46) but this would have provided enough space to temporarily house a reasonable number of livestock[210]. It is also possible both that the site was abandoned in the face of rising water levels and that the earthworks are unconnected to settlement at this location.

7.14 Discussion: enclosed settlements in Bronze Age Orkney

There is no clear evidence for enclosed settlements in Orkney (other than the Ness of Brodgar: Section 7.3.4) until possibly the early/mid-2nd millennium BC and even then evidence is rather tentative: Whaness Burn A, Hoy (Section 7.12.2) and, probably towards the end of the 2nd millennium BC, Round

[210] Around 1,000 sheep or 480 cattle (see Section 7.12.3, Footnote 206).

Howe, Tankerness (Section 7.12.3). The assignation of the enclosure at Muckquoy, Redland to the 2nd millennium BC (Richards, Downes et al 2016, 250; Section 7.11.4) is largely speculative, although this site was clearly a large multi-period settlement.

Elsewhere in Mainland Britain it is in the Middle/Late Bronze Age that enclosure is seen (e.g. Bradley & Ellison 1975; Brück 2007; Cowie & Shepherd 2003, 166-7; Haselgrove 2009; Needham & Ambers 1994), and in Ireland all the excavated examples of multivallate hillforts date to the late 2nd/early 1st millennium BC (Waddell 2010, 374-9; see Appendix 6, Table A6.2 & references therein). Whaness Burn A can only be loosely associated with the evidence of nearby human activity c.1720 – 1170 cal BC, although the presence of double houses inside the enclosure supports a 2nd millennium BC attribution, and the valley was abandoned due to peat growth at the end of the 2nd millennium BC (Section 7.12.2). The radiocarbon date of c.1380 – 1120 cal BC (obtained from the lower ditch deposits surrounding the natural mound at Round Howe: Section 7.12.3) appears to indicate that the enclosure was in existence comparatively early. If this date truly was associated with a roundhouse then it would be even earlier than the (unenclosed) Late Bronze Age example at Tofts Ness (Section 7.9).

It is unclear why these two sites should be enclosed when others were not: neither occupies a particularly good location for settlement which perhaps militates against the interpretation of their enclosure as indicative of high social status[211]. Enclosure appears unrelated to structural type, since unenclosed examples of both roundhouses (e.g. Tofts Ness: Dockrill 2007c; Section 7.9) and double houses (e.g. Skaill, Deerness: Buteux 1997c; Section 7.6.2) are known from Orkney.

Orkney's promontory forts remain enigmatic with a lack of excavation or dating evidence and it is not possible to confidently assign them to any specific period. Earthwork construction at both the Ness of Onston and

[211] Although it has been suggested that enclosure may not necessarily be a reliable indicator of a higher position in a settlement hierarchy (e.g. Brück 2007).

Nether Bigging probably post-dates the formation of the promontories as water levels rose after c.2000 – 1500BC (Section 7.13.1), but by how much is wholly uncertain. Whilst the initial phases at least of the multi-period settlement at Nether Bigging are earlier, possibly 3rd millennium BC (Section 7.13.3), as Lamb (1980a, preface) noted, without excavation the nature, chronology and function of these sites cannot be determined.

Although the evidence for enclosed settlement in the 2nd millennium BC is extremely limited, it seems likely that such sites existed in Orkney before the end of that millennium, which hints that Orkney was not isolated from the trend towards enclosure occurring elsewhere in Britain. Some sites that were enclosed in the Late Bronze Age may have developed into broch settlements, and this is discussed in Section 7.15 below.

7.15 Are there missing high-status settlements?

Notwithstanding Whaness Burn (Section 7.12.2) and Round Howe (Section 7.12.3), whose status in the absence of excavation cannot be confirmed, there are no obviously high-status settlement sites in the Orcadian Bronze Age (e.g. Øvrevik 1985, 131; Ritchie 1995, 95). This perception may be an artefact of limited excavation (Section 7.2; Table 7.1), for example the double house at Wasbister, Sandwick (Section 4.2.4) is associated with an extensive but unexcavated settlement site (Figure 4.3); its position overlooking the Ring of Brodgar which continued to act as a focus of funerary activity during the Bronze Age (Section 6.1.4) hints at its possible significance.

It is not until the late 1st millennium cal BC with the appearance of brochs[212]

[212] Orkney has around 135 known examples. Estimates of Orkney broch numbers vary: Petrie (1874, 93-4) was the first to attempt a survey and came up with 70; Cursiter (1923) added a further 24 sites; Hedges (1987c, 50-2) suggested 52 definite and 80 possible; MacKie (2002, ix-xi), who uses a very narrow definition, lists 36 definite and 109 possible; whilst the NMRS currently lists 32 definite and 118 possible brochs (Canmore search 17/12/15). It is impossible to reach a definitive figure, since the majority of these sites are unexcavated and some were only casually noted to be brochs during the course of their destruction e.g. Big Howe, Stenness (Cursiter 1923, 52; Section 3.6.2). See Appendix 11 for details and distribution maps.

(Dockrill et al 2006), that social stratification is clearly exhibited architecturally. Despite considerable debate over their classification, function, origins and precise dating (e.g. Armit 2000 & 2005; Gilmour & Cook 1998; MacKie 1994, 2002 & 2005; Parker Pearson et al 1996; Parker Pearson & Sharples 1999; Sharples 2005; Romankiewicz 2009 & 2011), there is some consensus that they are high-status settlement sites.

Sharples (1984, 121-2) envisaged brochs as resulting from competition between local lineage groups based on the control of land and agricultural surpluses. Dockrill & Bond (2015b, 493-7) suggested that those responsible for the construction of the Old Scatness broch, Sumburgh, Shetland developed from a Late Bronze Age/Early Iron Age elite; their initial prominence stimulated by competition for resources such as land in the face of deteriorating climatic conditions. The stratification of Iron Age society thus comprised a hierarchy running from simple roundhouses in marginal areas such as Tofts Ness to high-status broch settlements (ibid). This raises the question of what had happened to these elites between the end of the Neolithic (cf. the Ness of Brodgar: Section 7.3.4) and the appearance of the brochs in the late 1st millennium BC.

There has been little research into earlier beginnings to settlement on broch sites. There is a lack of evidence from good quality excavations: the investigation of numerous brochs in the nineteenth century throughout the Highlands and Islands were partial endeavours potentially not reaching the initial foundation deposits within them (e.g. Anderson 1874 & 1901; Dryden 1874; Farrer 1857c; Maxwell 1874; Petrie 1874). Many twentieth-century excavations, aimed primarily at conserving sites for public display, halted once the apparent 'broch level' was reached e.g. Midhowe and Gurness, both in Orkney (Callander & Grant 1934b; Hedges 1987b; MacKie 2002, 233); earlier levels were typically only investigated at the periphery of sites, as at Clickhimin and Jarlshof in Shetland (Hamilton 1956 & 1968). At Old Scatness, Shetland, a tourism-oriented project design required that the bulk of the broch and Iron Age village were left in situ and pre-broch phases were largely unexcavated (Dockrill 2015, 31-6; Dockrill & Bond 2015a, 16). In the

absence of obvious high-status Bronze Age settlements one factor to consider is the 'masking' effect of substantial constructions such as brochs over earlier remains occupying the same site. Evidence of pre-broch settlement however comes from four Shetland sites: Old Scatness (Dockrill et al 2015); Jarlshof (Hamilton 1956; Section 7.8.1); Clickhimin (Hamilton 1968) and East Shore (Carter et al 1995).

At Jarlshof Late Bronze Age settlement phases were exposed in limited areas (Childe 1938; Hamilton 1956; Figure 7.24). The Bronze Age occupation was clearly more extensive: radiocarbon dates associated with substantial midden deposits indicated that activity spanned the whole of the 2nd millennium BC and probably began earlier (Dockrill & Bond 2009; Sheridan 2012b; Figure 7.25). At Old Scatness Late Bronze Age anthropogenic midden-enhanced soils, together with artefactual evidence of Neolithic activity, were identified but only excavated in a small area where no structural remains were identified (Dockrill 2015, 31-6; Simpson, Dockrill & Lancaster 1998). Evidence of Bronze Age occupation comes from the brochs of Clickhimin (Hamilton 1968, 25-33; MacKie 2002, 110) and the mid-2nd millennium cal BC middens at the broch at East Shore (Carter et al 1995).

It seems inevitable, perhaps ironic, that in Orkney the first person to find evidence of earlier settlement beneath a broch should have been James Farrer (Section 3.5.2), who, in typical fashion, dug under the foundations of the broch at Dingies Howe, St Andrews and recovered pottery, including several sherds of Grooved Ware (Hedges 1987c, 146; Stevenson 1946; RCAMS vol. II, no. 625, 242-3). Farrer's excavation was never published and the remainder of the artefacts recovered were non-diagnostic in period terms (Anon 1892, 230; Stevenson 1946) so the nature and extent of earlier settlement is unclear. Pre-broch phases were identified outside the broch tower at Bu, Stromness, consisting of structural remains and coarse stone tools, primarily ard points and mattocks[213], but these were not fully excavated (Hedges 1987a, 2-10 & 39). Circumstantial evidence of potential Late Bronze

[213] Generally indicative of a Bronze Age date: Clarke 2006, 124-6.

Age activity comes from deep anthropogenic soils, the upper layers of which were dated to c.800 – 530 cal BC, located 50m east of a broch detected by geophysical survey at the Bay of Skaill, Sandwick (Cluett 2007, 102; OCGU 2008; Ovenden et al 2009). Similarly, deep midden-enhanced soils (as yet undated) have been detected around the brochs at the Cairns, South Ronaldsay (Carruthers 2012 & 2013; Desaille 2014; Saunders 2009) and those at Midhowe and North Howe in Rousay (Dockrill, Bond, Downes et al 2010; Moore 2013, 172-9).

The clearest example of extensive pre-broch settlement comes from St Boniface Church, Papa Westray, where an extensive mound, extending inland beneath the extant twelfth-century church, was cut though by coastal erosion enabling the full depth of deposits to be sampled (Lowe 1998). Much of the site had already been destroyed: only about a quarter of the broch tower remained (Figure 7.48) and the excavation consisted solely of rectifying the exposed erosion face. The coastal section showed a complex sequence of activity, with evidence of continuous settlement from the mid-late 2nd millennium BC onwards, including an Early Iron Age roundhouse, a broch and a late Iron Age/Pictish settlement, Norse occupation and a high-status ecclesiastical site[214] (ibid, 114-24).

Although some brochs thus do overlie Bronze Age settlement, it is unclear how far this model can be applied to other sites: there are excavated brochs where this is apparently not the case e.g. Howe, Stromness, where two Early Neolithic houses were followed by a Maeshowe type tomb beneath the broch, but no evidence of Bronze Age settlement was recorded[215] (Ballin Smith 1994, 25; Davidson & Henshall 1989, 52; Richards 1993, 72 & 89), although this might have been obliterated by the major levelling that occurred prior to the broch's construction (Lynn 2004). At Scalloway, Shetland, although there was some probably Bronze Age funerary activity, no pre-broch settlement phases were identified (Sharples 1998).

[214] See Table A1.12, Appendix 1 for radiocarbon dates and phasing at St Boniface Church.

[215] Evidence of a Chalcolithic/Bronze Age presence was limited to the recovery of fragments of two Beakers outside the tomb entrance (Ballin Smith 1994, 25).

Work in Shetland has indicated that brochs occupy areas of high agricultural potential or are in prime locations with good access to other resources (Dockrill 2002; Fojut 1982 & 2005) – those settings most desirable for occupation. Reflecting these prime locations, at both Scatness and Jarlshof the settlements continued into the Late Iron Age and were then taken over by Viking incomers (Dockrill & Bond 2009, 45-6). No such locational analyses have been published on Orkney's brochs, although a number of broch sites continued to act as foci for high-status ecclesiastical settlement sites: in a quarter of cases analysed by Lowe (1987, vol. 1, 287-313 & table 26, 387-8) brochs were definitely ecclesiastical foci, with the remainder falling into the probable/possible categories, as illustrated by St Boniface Church (Lowe 1998); similarly St Magnus' Cathedral, Kirkwall (founded c.1137) is adjacent to a probable broch (Lamb & Robertson 2005, 186), suggesting these examples at least were in prime locations.

Detailed analysis of broch locations in relationship to agricultural potential in Orkney is beyond the scope of this thesis. Proxy evidence for the prime historic (pre-improvement) locations for settlement exists however in the township settlements enclosed by their hill-dykes, shown on Mackenzie's 1750 charts (Section 4.2.2). It is instructive to compare the distribution of known brochs with the enclosed land within the hill-dykes on these charts, and it is striking that 124 (92%) of Orkney's 135 brochs are on land under cultivation in 1750 (Table 7.7 below). This total is slightly skewed downward by the large number of brochs in Sanday, only 56% of which are associated with historic settlement, but rises to 97% if Sanday is excluded.

It can be tentatively suggested that the association of brochs with townships is not coincidental, and that the historic settlement foci grew from the prime settlement locations occupied by the brochs, and inferentially before their erection by Bronze Age settlement sites. Tofts Ness (Dockrill, Bond et al 2007; Section 7.3.5) was always marginal for settlement, and the Links of Noltland (Moore & Wilson 2011a; Section 7.6.3), became increasingly marginal in the 2nd millennium BC, yet both these sites were occupied throughout the Bronze Age. Considering Orkney's geographical limitations,

environmental factors such as topography and shelter, access to light fertile soils, water and the sea play an important part in the selection of settlement locations (Chapter 2), and it would be counter-intuitive, even perverse, to suggest that the prime sites occupied by the brochs were entirely ignored in the Bronze Age yet marginal locations such as those just enumerated were settled.

Table 7.7 Number of brochs located inside the land enclosed by the 1750 hill-dykes compared to total broch numbers, shown on accompanying Figures 7.49 – 7.58 as indicated. (Islands not listed do not have any known brochs).

		Brochs inside the hill-dyke		
Island or Area	**No. of Brochs**	**No. Inside**	**% Inside**	**Figure**
West Mainland	61	59	97%	7.49
East Mainland	12	12	100%	7.50
Hoy	2	1	50%	7.51
North & South Walls	5	5	100%	7.51
Burray	5	4	80%	7.52
South Ronaldsay	4	4	100%	7.52
Westray	7	7	100%	7.53
Papa Westray	3	3	100%	7.53
Sanday	16	9	56%	7.54
North Ronaldsay	1	1	100%	7.54
Shapinsay	5	5	100%	7.55
Gairsay	1	1	100%	7.55
Stronsay	5	5	100%	7.56
Rousay	8	8	100%	7.57
Total	**135**	**124**	**92%**	
Total Excluding Sanday	**119**	**115**	**97%**	

Iron Age society in the Northern Isles has been envisaged as stratified, or at least unequal, with a hierarchy visible architecturally from simple roundhouses in marginal areas to high-status brochs (Dockrill & Bond 2015b). A similar case for an ascending hierarchy might be illustrated for the Neolithic from marginal Tofts Ness (Dockrill, Bond et al 2007; Section 7.3.5) through the more favoured location of the Neolithic settlement at Pool, Sanday (Hunter et al 2007a; Section 7.3.2) to the exceptional Ness of Brodgar (Card et al 2017; Section 7.3.4). It is not unreasonable to suggest that a similar hierarchy in settlement locations also existed in the Bronze Age. It may reasonably be assumed that there were settlement sites (currently largely invisible) at some of the more favoured locations which continued in use thereafter. Many of these may have been destroyed, but there is a propensity for settlements in Orkney to persist in the same locations, exploiting the accumulated midden of previous generations as an 'inherited resource' (e.g. Dockrill & Bond 2009; Sections 7.1 & 8.2), and it may be hypothesised that putative high-status Bronze Age settlements existed – in some instances at least – where brochs were later established.

7.16 Conclusion

This analysis of domestic settlement identifies important factors in the social evolution of Bronze Age Orkney. There is some dislocation between the Neolithic and Bronze Age that may be environmentally related at some sites (Section 7.3), although there was an earlier social upheaval in the centuries after 3000BC (Chart 7.1). The evidence for the fragmentation of society at the end of the Neolithic (e.g. Richards, Downes et al 2016, 243-6) is equivocal, with broadly equal numbers of sites exhibiting continuity and discontinuity from the mid-3rd to early 2nd millennia BC (Charts 7.1 & 7.2). It is possible to state that the distinctive structural forms of the Orcadian Neolithic (Section 7.5.1) did not persist into the late 3rd/early 2nd millennium BC, however there is a notable lack of excavated and radiocarbon dated evidence on which to base any analysis of changes in structural forms and settlement patterns in Bronze Age Orkney (Chart 7.4).

We can see likely increases in influence from Shetland, possibly associated with trade (evidenced from the Early Bronze Age onwards by the presence of steatite funerary urns: Section 6.3.4) or migration, in the appearance of the double house (Section 7.8). Although poorly dated in both Orkney and Shetland (Chart 7.3) the available evidence supports a Bronze Age date for this distinctive structural form (Section 7.7), with some limited evidence that the type may have originated in Shetland (Section 7.8.2). There appears to have been separation of the domestic sphere from some other activities, as evidenced by the differing functions of the two separate units of the double house (Section 7.8.3); this separation of function may also be seen in other non-domestic structures, most notably the burnt mounds, discussed in Chapter 9.

On the available data, all the identified Orcadian Bronze Age structural forms (the oval house, the double house and the roundhouse) may have been in use concurrently by the second half of the second millennium BC (Chart 7.4). Double houses may appear in the Early Bronze Age (Section 7.7) and the roundhouses (on the basis of the example at Tofts Ness: Dockrill 2007c; Section 7.9) in the Late Bronze Age; the oval house type remains undated (Section 7.8.2; Chart 7.4).

One tentatively identified factor, based on evidence for enclosure at a few poorly dated and largely unexcavated sites, may have broad implications: a need for community enclosure or defence, or for control over resources. Such control over land and resources has been implicated in the origins of the brochs (e.g. Dockrill & Bond 2015b, 493-7; Sharples 1984, 121-2), which in both Orkney and Shetland appear to occupy the most favoured areas for settlement, which are unlikely to have been ignored in earlier periods (Section 7.15). The apparent lack of high-status Bronze Age settlement sites in Orkney may be partly accounted for by the masking effect of later unexcavated broch settlements. The Early Bronze Age attribution of the souterrain at Nessbreck, Corrigall, a form that was current in Orkney until at least the Middle Iron Age (Section 7.11), may lend further support to the concept of continuity of settlement at possibly the same locations.

The inherited resource of midden-enhanced soils associated with permanent settlement (Dockrill & Bond 2009) appears to be an important factor in the choice of settlement locations, and in addition to the commencement of settlement enclosure there may be a move towards enclosing the landscape more generally during the Bronze Age. These issues are discussed in Chapter 8.

Chapter 8 Managing the landscape

8.1 Introduction

Chapter 7 discussed the settlement patterns and structural forms of Bronze Age Orkney and noted that in archaeological terms settlement in Orkney is particularly associated with the accumulation of midden deposits and enhanced soils from permanent agricultural activity (Section 7.1). Since the arrival of the Neolithic 'farming package' in the early/mid-4th millennium BC this activity has consisted of animal husbandry (of cattle, sheep/goats, pigs) and the cultivation of barley[216] (e.g. Bond 2007a, b, c & d; Dickson 1983; Nicholson & Davies 2007; Noddle 1983); the evidence for Bronze Age agricultural practices is discussed below (Section 8.2).

Animal husbandry alongside arable cultivation requires a mechanism for separating domestic and wild herbivores from growing crops. This may be achieved through physical barriers, close human supervision, tethering or seasonal transhumance. Seasonal movement of people and livestock to summer pastures, historically attested in Ireland and elsewhere in Scotland[217] (e.g. Bil 1997; Costello 2016) was never practised in the Northern Isles (ScARF 2012d, 92-3). Hill-dykes were used in Orkney to separate animals on rough grazing from crops (Section 4.2.2); cattle and horses could be tethered on patches of land below the hill-dykes, whilst in the late nineteenth century the division of the commons but the lack of fences also saw the tethering of sheep and pigs (Fenton 1978, 244-5 & 431-4).

Landscape enclosure with extensive field systems is a feature of the 2nd millennium BC in many parts of Britain (e.g. Bradley & Richards 1978;

[216] There is some evidence for the cultivation of einkorn wheat alongside barley in the Early Neolithic (Richards, Downes et al 2016, 230-2) but barley was the dominant cereal crop in Orkney from the Early Neolithic onwards; oats were not introduced until the Iron Age (Bond 2007d).

[217] Pollard (1999, 80-2) suggested seasonal transhumance may have taken place in the British Neolithic and may not have involved the whole community, with some, possibly the old and the very young, remaining at a lowland settlement whilst younger members of the group moved with the animals to the uplands.

Fleming 1978 & 1983; Fyfe et al 1998; Yates 1999, 2001 & 2007), developing in some areas from pre-existing boundaries (e.g. Brück 2000; Johnston 2005). This enclosure appears to have occurred somewhat earlier in Ireland, with the Neolithic[218] field system at Céide Fields, County Mayo (Caulfield 1978; Caulfield et al 1998; Guttmann-Bond et al 2016; Molloy & O' Connell 1995). Surviving examples of prehistoric enclosed landscapes in Scotland are largely in upland or island regions, comprising stone banks and boundaries associated with settlement, burial and clearance cairns dating from the 3rd to the 1st millennia BC e.g. An Sithean, Islay (Barber & Brown 1984); Drumturn Burn, North East Perthshire (NO15NE10; RCAHMS 1990, 46-9); Kilpatrick and Machrie North in Arran (Barber 1997b) and Lairg, Sutherland (McCullagh & Tipping 1998). In Arran land management practices changed at the end of the 3rd millennium BC, when the regular rectangular field strips of the Neolithic were replaced by longer boundaries in the 2nd millennium BC, which may have demarcated infield/outfield areas rather than individual fields (Barber 1997b, 45 & 144-9). Banks and ditches at Black Crofts, North Connell, Argyll, constructed in the mid-2nd millennium BC, were suggested to have been the Bronze Age equivalent of head-dykes dividing cultivated land from the rough grazing (Barrett et al 1976; Carter & Dalland 2005). The 3.4ha area of settlement sites and enclosure walls at the Scord of Brouster, Shetland, previously thought to be Neolithic (Whittle et al 1986) are likely to be mainly Early Bronze Age or later (Sheridan 2012b, 20; ScARF 2012b, 64), as are other Shetland examples (e.g. Calder 1956; Turner 2012; Turner et al 2004).

8.2 Subsistence practices

The evidence of man's exploitation of the landscape in Bronze Age Orkney is heavily skewed towards the investigation of the midden deposits and infield agricultural practices associated with settlement sites, particularly from

[218] Although it has recently been argued (Whitefield 2017) that there is no chronological evidence to support a Neolithic date for the Céide Fields, and they may have been established in the later Bronze Age.

Mound 11, Tofts Ness, Sanday but also the Links of Noltland[219] (e.g. Guttmann et al 2006; Hamlet 2014; Hastie 2011; McKenna & Simpson 2011; Simpson, I. A. et al 2007), both sites where there was continuity of occupation from at least the late 3rd to the early 1st millennium cal BC (Dockrill, Bond et al 2007; Moore & Wilson 2011a; Section 7.3.5). In the marginal environment of Tofts Ness, Sanday, the long-term viability of the site was linked to the mixed subsistence strategy adopted: intensive cultivation of six-row barley in a manured infield system, animal husbandry and exploitation of the natural resources of the sea and shore (Dockrill 2007d, 385-93; Figure 8.1).

The Neolithic middens at both Tofts Ness and the Links of Noltland remained an important resource during the Bronze Age phases when they were ploughed and directly cultivated, a practice also seen at sites in Shetland (Dockrill & Bond 2009; Guttmann 2005; Guttmann et al 2004 & 2006; Hamlet 2014, 287-323 & 353-4; Simpson, I. A. et al 2007). The infield areas around both sites were fertilised by the addition of midden and turf; animal manure was added at Noltland and human faecal material at Tofts Ness (where animal dung was most likely used as fuel[220]) (Hamlet 2014; 287-323 & 353-4; McKenna & Simpson 2011; Simpson, I. A. et al 2007). Such midden enhancement mitigated the worst effects of sand blow and nutrient depletion, enabling continued successful cultivation of the infield areas (ibid; Guttmann et al 2006). The high yields possible from intensive, almost garden-like, barley cultivation in the one to two hectares of anthropogenic infield soils at Tofts Ness were crucial to the site's long term viability, and these anthropogenic soils thus became an inherited resource for the inhabitants (Dockrill 2007d; Dockrill & Bond 2009; Simpson 1998; Simpson, Dockrill,

[219] The limitations of the archaeological record (Section 7.2) together with poor ecofactual preservation limits the information available from other Bronze Age sites in Orkney (e.g. Buteux 1997c; Card et al 2016; Lowe 1998; Morris 1989), which do not however contradict the results from Tofts Ness and the Links of Noltland.

[220] Using cow dung for fuel was a practice that continued into the early twentieth century in Sanday, much to the amusement of the rest of Orkney: 'I have been in Egilsay, and I have been in Wyre, but I've never been in Sanday where the coos shit fire' (Fenton 1978, 206-9; Spence 1925, 81).

Bull et al 1998; Simpson, I. A. et al 2007). This strategy enabled continuity of settlement until increasing sand blow, possibly a single event, covered the infield area with over a metre of sand causing its final abandonment in the mid-1st millennium BC (Dockrill 2007c, 72). The settlement at the Links of Noltland appears to have been abandoned in the late 2nd/early 1st millennium BC for the same reason (Hazel Moore pers. comm.; Moore 2015b).

Animal husbandry during the Neolithic and Bronze Age phases at Tofts Ness[221] primarily involved cattle and sheep, with small numbers of pigs (Nicholson & Davies 2007). Cattle were kept for non-intensive dairying and meat production, and sheep primarily for meat, with skins as a by product[222]; however sheep became increasingly important through the Bronze Age (ibid; Serjeantson & Bond 2007). Significantly, the mammal bones from all phases at Tofts Ness were split and fractured to enable marrow extraction, suggesting the maximum utilisation of available resources (Nicholson & Davies 2007, 195).

Fishing was important in all periods at Tofts Ness, including deepwater fishing from boats, but the Bronze Age phases saw more small fish from the littoral zone than other periods (Nicholson 2007a). Sea mammal bones were few, probably because seals and whales were butchered on the beach with only the products brought to the settlement (Nicholson & Davies 2007, 194-5). Shellfish, predominantly limpets likely to have been used as fish bait, were present in large numbers throughout the Bronze Age phases at both Tofts Ness and the Links of Noltland, but not the Neolithic phases, suggesting that fishing increased in importance over time (Moore & Wilson 2013; Nicholson 2007b, 227-8).

[221] No information regarding animal husbandry, and little information regarding hunter/gatherer resources, is as yet available from the Bronze Age phases at the Links of Noltland, although the large Neolithic assemblage was reportedly much the same as from other Orkney sites, with a predominance of cattle and sheep, with some pig, red deer, marine mammal and fish bone (Fraser 2011).

[222] The sheep at Tofts Ness are likely to have had little wool and be self-shedding like the Soay sheep of today (Nicholson & Davies 2007, 178; Ryder 45 – 9); sheepskin however is extremely warm and well suited to the harsh climate of the Northern Isles.

This may indicate that hunter-gathering became more important during the Bronze Age, perhaps in response to environmental factors, but possibly representing a wider cultural change. Stable isotope studies have shown that the Neolithic inhabitants of Orkney (in common with the rest of Neolithic Britain) adopted a largely terrestrial diet (e.g. Armit et al 2015; Cramp et al 2014; Lawrence 2012; Richards & Hedges 1999; Richards et al 2003; Schulting 1998 & 2004), whilst limited evidence from mid-2nd millennium cal BC Orkney indicates a mixed marine and terrestrial diet (Innes 2016; Lawrence 2012, 414-5 & 461-3), as in later prehistoric and early historic Orkney (e.g. Barrett, J. H. et al 2000; Barrett & Richards 2004; Richards et al 2006) and may imply a long-term change in society which began in the Bronze Age or a reversion to pragmatism from a peculiarity of the Neolithic.

Red deer were exploited as a minor food resource throughout the Neolithic and Bronze Age phases at Tofts Ness, indicating that there is likely to have been a stable breeding herd of red deer in Sanday at least (Nicholson & Davies 2007). This contrasts with the structured deposition of the red deer heap at the Links of Noltland c.2280 – 2130 cal BC (Clarke et al forthcoming; Marshall et al 2016, 26), where red deer seem to have been accorded special status, paralleled by a contemporary deposition of articulated deer skeletons or carcasses at the Ness of Brodgar c.2205 – 2025 cal BC (Card et al 2017; Mainland et al 2014; Section 7.3.4).

Both Tofts Ness and the Links of Noltland are in agriculturally marginal areas and each experienced similar problems during the course of the 2nd millennium BC in maintaining a viable settlement in the face of increasing aeolian erosion and deposition of sand (e.g. Hamlet 2014; 287-323; Simpson, I. A. et al 2007, 243-4). There are no detailed analyses from sites in more favourable locations available for comparison. The evidence from both Tofts Ness and the Links of Noltland shows communities working hard to survive in poor conditions, employing sophisticated coping strategies to maximise use of resources, including exploitation of the midden deposits that had accumulated during Neolithic settlement.

8.3 Enclosing the landscape

Marwick (1923a, 22) categorised three different types of Orcadian dyke:

(1) Hill dykes or '*feelie dykes*[223]': remnants of turf dykes built in historic times to separate grazing animals from the arable lands of the township (Section 4.2.2).

(2) Pickie Dykes[224]: a type of dyke that 'is thousands of years older' and consisted of strips of stones buried under the soil or peat (Section 8.4).

(3) Treb dykes[225]: a massive extant dyke from 'some intermediate period' which crossed a large area and was constructed of earth and clay noticeably 'different in character from the surrounding soil' (Section 8.5).

Faced with the twin problems of obliteration by agricultural improvement and obscuration by the growth of blanket peat, prehistoric land divisions in Orkney have generally attracted little attention. Problems of identification relate to lowland zone survival and to detection in the upland zone (defined here as land above 50m OD: Section 2.1.4). The majority of medieval and post-medieval land divisions shown on Mackenzie's (1750) charts, some of which may have incorporated prehistoric land divisions (e.g. the treb dykes in North Ronaldsay: Section 8.5), were largely destroyed by agricultural improvements of the nineteenth century[226]; it is likely that the majority of older land divisions in the lowland zone will have been similarly obliterated at that date. Upland (and some lowland e.g. Whaness Burn, Hoy: Section

[223] From the Scots *fail*-dyke, a turf dyke (Marwick 1952, 71).

[224] A corruption of Pict's dykes, used in the same sense as Pict's Houses as a generic term for an antiquity (Section 3.5.3).

[225] 'Treb' is a Sanday term, in other islands they are known as 'gairsty' e.g. the Green Gairsty in Rousay, from ON *garðstœði* dyke-steethe (Marwick 1923a, 22).

[226] Traces of only 24 hill-dykes in Orkney survived long enough to be recorded on the 1st edition OS maps of 1882 and no further such dykes have since been recorded (Canmore search on 7/10/16 using the term 'head dyke' which equates to the Orcadian term hill-dyke).

7.12.2) areas in Orkney are today largely covered in blanket peat, which appears to have formed mostly after the mid-late 2nd millennium BC (Section 2.2.2): detection of prehistoric field boundaries is therefore idiosyncratic, largely reliant on exposure during peat cutting (Section 8.4).

No evidence for barriers separating the infield from the outfield were identified during the excavation at Mound 11, Tofts Ness, but the wider relict landscape includes several possible land boundaries (Section 5.5.1). At the Links of Noltland, a field system was identified by geophysics to the north of Area 5 (Moore & Wilson 2011a, 17 & 23; Figure 7.6). A trial trench located over one of the field boundaries (STP5 on Figure 7.6) revealed a 40m length of earthen bank, 1.2m wide and surviving to 0.45m high, which overlay Neolithic structures and was dated by the associated artefact assemblage to the Bronze Age (ibid; Hamlet 2014, 143-52 & 288-90). A further 5m x 1.5m test pit to the east of the main Neolithic structures in Area 5 (STP4 on Figure 7.6) located what appeared to be a substantial collapsed stone bank which overlay windblown sand, but the full extent of this was not established and no dating evidence was recovered from it (Hamlet 2014, 142-3). It is unclear if this bank is part of a prehistoric field system, or relates to historic activity in the area[227].

8.4 Sub-peat dykes and enclosures

Marwick's (1923a, 22) 'Pickie' or sub-peat dykes have been recorded from a number of areas[228]; they were first noted in Orkney by Thomas (1852, 122), near Hoxa, South Ronaldsay:

> *We were shown many rude dykes which had been exposed when cutting off the peat from the surface: they stretch over the island in*

[227] There was extensive activity at the Links of Noltland relating to the kelp industry, which included numerous stone-lined kelp pits dug into the windblown sand overlying the excavated areas; on the approaches to the Links there are numerous 'steethes': broad dry stone dykes on which the kelp could be laid to dry (personal observation; see Thomson 1983).

[228] See Appendix 3, Table A3.1 for details and references.

> *several directions. From the shape and appearance they still retain; and from the indubitable fact that they saw the light of later days only when the turf was removed, there can be no doubt that these rugged boundaries were built before the growth of peat in this island.*

Petrie (1927, 28) recorded further examples in Eday in 1859, whilst others were later noted in Birsay (Spence 1915).

Two different designs of sub-peat dykes have been recorded. One method involved the construction of parallel lines of paired orthostats c.0.60 – 0.80m apart, with other orthostats set at right angles between them forming box-like sections; these were then topped with flat slabs, which supported further walling (Lamb 1984, 14, no. 14; Nayling 1983, 16-18). Examples of this type of construction come from a number of sites in Eday e.g. the Muckle Hill of Linkataing (ibid); Noup Hill and Den Trango (Lamb 1984, 14, nos. 42 & 43) and it appears to be widespread, with other examples noted from elsewhere in Orkney e.g. Helliar Holm, Shapinsay (Lamb 1987, 18, no. 68) and Cantick Head, South Walls (Lamb 1989, 19, no. 54). The same construction method was also recorded at Shurton Hill, Mainland, Shetland (Whittington 1978).

The second design consists of single lines of large boulders e.g. Noup Hill, Eday (Lamb 1984, 14, no. 41). These are associated with both sub-rectangular enclosures and other sub-peat dykes of exhibiting the box-like orthostatic construction technique (ibid, no. 42). The 'Picky Dykes' and enclosure (since destroyed) exposed by peat cutting near Overabist, Birsay were described as 'ragged lines of grey stones' (Spence 1915, 91-4) suggestive of the boulder construction method. A burnt mound[229] was recorded close to the farmhouse at Overabist by the Royal Commission (RCAMS 1946, vol. II, 35, no. 106); Spence (1915, 90) records a further site, described only as a mostly destroyed 'Pict's work', around 180m east of the farmhouse, associated with one of the enclosures. Similar examples of dykes composed of large earthfast stones infilled with smaller stones are found cutting off several headland areas of Fair Isle e.g. at Ullashield (Hunter 1996a, 44-9; Figure 8.2). Small cairns

[229] No. 65 shown on Figure A7.1 in Appendix 7.

appear on these dykes at intervals, and excavation proved one at least to be a burial cairn although no dating evidence was recovered (ibid, 81-2).

A substantial stone-built enclosure partially survives at the Fold of Setter, Eday (Lamb 1984, 16, no. 57). When first described in 1859 the Fold of Setter was associated with sub-peat dykes in an area of other prehistoric activity:

> *Beside a chambered tomb* [Braeside: HY53NE10] *... there is a circle of about 240 feet* [86m] *in diameter formed by a stone dyke seven feet* [2.13m] *across at the base. The dyke is almost concealed by peat or moss, and running in various directions up hill or down dale, other stone dykes may be traced, covered in some places by moss to a great depth. One large standing stone* [the Stone of Setter: HY53NE6] *near the circle is entire, while remains of many others are still visible* (Petrie 1927, 28).

The dimensions and construction of the enclosing wall at the Fold of Setter was corroborated by Farrer (1857a, 179), who implied that the landowner verified this by (an otherwise unrecorded) excavation.

The enclosure at Vestra Fiold, Sandwick consisted of a single line of large orthostats (up to 1.2m long) within a low ridge of earth, enclosing an irregular area of around seven acres (c.2.84ha). When first recorded it showed traces of internal divisions and contained a small mound (Clouston 1845, 54; RCAMS 1946, Vol II, 269, no. 728; Thomas 1852, 117); both of which have since been destroyed, together with the southern half of the enclosure.

At Skirmie Clett, Wyre (Figure 8.3) a series of interlinked enclosures lie in an area that has never been covered by peat, adjacent to a burnt mound (Lamb 1982, 34, no. 163; RCAMS 1946, vol. II, 239-40, no. 620; Figures 8.4 & 8.5). These enclosures exhibited different construction methods: coursed stone walling, in some places faced with orthostats (Figure 8.6); orthostats erected face-to-face against each other (Figure 8.7); parallel lines of paired orthostats supporting coursed walling, as seen in some of the sub-peat dykes (Figures 8.6 & 8.8); and single lines of orthostats (ibid). The latter method is used to subdivide enclosure A from enclosure F (Figure 8.4), whilst the other methods appear to be mixed along the length of the same wall (e.g. Figure

8.7). There may be an entrance to the main enclosure on the northern side of enclosure F and presumably there were internal entrances between the other enclosures, but these could not be definitely identified (ibid) The burnt mound lies to the south of the enclosure, together with a freshwater spring (Figure 8.4).

8.4.1 Dating sub-peat dykes and enclosures

No direct dating evidence exists for any of Orkney's sub-peat dykes: dating relies solely on circumstantial evidence. Environmental records from Orkney are poor and inadequately dated (Section 2.2.1). The inception of blanket peat growth in Orkney has not been modelled, although in some areas it commenced in the mid-late 2nd millennium BC (e.g. Keatinge & Dickson 1979; Section 2.2.2).

The complex of sub-peat dykes associated with the Whaness Burn A enclosed settlement (Lamb 1996; Section 7.12.2), is considered likely to be related to the environmental evidence of human activity in the valley c.1720 – 1170 cal BC (Farrell 2009, 212-14). At Hobbister, Orphir a Late Bronze Age socketed axe was found whilst turning cut peats, so that its precise origin within the peat is unknown (Cowie & O'Connor 2006; Section 6.3.3). Subsequent walkover survey identified four sections of sub-peat dyke and a possible sub-circular structure, located around 250m southeast of the axe's findspot, although it was considered equally likely that this structure was not an archaeological feature but rather resulted from disturbance and upcast from nearby peat cuttings (Sharman & Hollinrake 2007, 11-12). Four probable Bronze Age barrows were located within 250 – 350m of the sub-peat dykes further supporting a Bronze Age presence in the area (ibid, 14-16). Environmental analyses in the vicinity of the axe find indicate human activity from the end of the 3rd millennium cal BC, when there is some indication of grazing and cereal cultivation, continuing through the Bronze Age (Farrell 2009, 295-9 & 2015). The Late Bronze Age environment in the area consisted of wetlands surrounded by areas exploited for agriculture and rough grazing, with arable agriculture nearby; wetter conditions developed with the spread

of heath c.1130 – 880 cal BC (ibid). It is likely therefore that the sub-peat dykes identified in this area (Sharman & Hollinrake 2007) may be assigned to the Bronze Age, but closer chronological resolution is not currently possible.

The sub-peat dykes at the Muckle Hill of Linkataing, Eday (Nayling 1983, 16-18) may be associated with a nearby prehistoric settlement but could not be assigned to a specific period (Sharman 2007b; Sharman & Robertson 2007; Section 5.8.3). Spence's (1915, 91–4) identification of sub-peat dykes on the Birsay peat hill lie within 1–2 km of environmental sampling sites where blanket peat formation commenced in the mid-late 2nd millennium cal BC, preceded by human activity in the area (Keatinge & Dickson 1979). The association of a burnt mound (Section 9.1.1) with both the Birsay sub-peat dykes and the enclosure at Skirmie Clett (RCAMS 1946, vol. II, 239-40, no. 620) may lend support to a Bronze Age attribution for these features. The Bronze Age double house at Hesti Geo, Cantick Head, South Walls (Lee & Thomas 2012a, 27-30; Section 5.3) appears to be associated with sub-peat dykes of orthostatic construction (Lamb 1989, 19, no. 54), indicating a probable Bronze Age date for these dykes.

The Vestra Fiold enclosure has been assumed to be of Bronze Age date (Richards, Brown et al 2013, 129, fig. 5.9) but there is no unequivocal evidence to support this and the nearest other prehistoric features to it are Neolithic: it lies within 50m of the presumed quarry for the Stones of Stenness[230] and within 250m of a chambered tomb (Richards, Brown et al 2013; Richards, Downes et al 2013). A tenuous Bronze Age attribution for Vestra Fiold may be suggested by the orthostatic construction of the enclosure, which mirrors one of the construction techniques used at Skirmie Clett, Wyre.

The solid stone-walled construction seen at Fold of Setter, Eday (Lamb 1984, 16, no. 57) is unlike any of the other Orcadian enclosures or sub-peat dykes

[230] Constructed c.3020 – 2890 cal BC (Schulting et al 2010, 35-6).

except possibly Whaness Burn A, where it was suggested that the inner bank may have been stone cored (Lamb 1989, 13, no. 10; Section 7.12.2). A Neolithic parallel exists however in the enclosure at the Ness of Brodgar (Towers et al 2015).

8.5 Treb dykes

Treb dykes are massive linear earthworks largely of earthen construction but noticeably different in their make-up from the surrounding soil, enabling the course of some ploughed out examples to be traced (Lamb 1983a, 176; Marwick 1923a, 22-3). Local belief in North Ronaldsay holds that one of the treb dykes there (the Muckle Gairsty) has a clay core, but this could not be verified and the bulk of it is earthen in composition (Lamb 1983a, 176); however the treb at Hillhead, Sanday was composed of earth and clay (Marwick 1923a, 22). The majority of treb dykes do not have obvious quarry ditches associated with them, although the example at Graverend, Kirbuster, Stronsay has traces of a ditch on its south east side (Lamb 1983a, 177 & 1984, 26, no. 133).

Marwick (1923a & b, 1924b, 1925a & 1927b) noted but unfortunately did not map treb dykes in Sanday, North Ronaldsay, Rousay, Papa Westray and Stronsay; many of these no longer survive and their original locations are now unknown (Lamb 1983a). No further work on treb dykes was undertaken[231] until a number of new sites were recorded in the 1980s, the distribution of which is, with one possible exception, entirely confined to the North Isles (Appendix 3, Table A3.2 and references therein). It is unclear whether this is a genuine pattern or if it relates to a lack of identification elsewhere[232].

[231] J. M. Corrie's survey for the *Inventory* (RCAMS 1946) noted extant treb dykes but these were omitted in publication (Section 3.7.1); his notebook entries (photocopied in the Orkney SMR) are however brief and no more than a re-iteration of Marwick's (1923a & b, 1924b, 1925a & 1927b) published accounts.

[232] Although a number Marwick's contemporaries were publishing similar surveys of other parts of Orkney (Section 3.7.2) none of them recorded treb dykes, whether through lack of interest (Lamb 1983a, 175) or genuine absence is not clear. The majority of the recorded treb

The best-preserved examples of treb dykes come from North Ronaldsay, where two – the Muckle Gairsty and Matches Dyke – divide the island into three unequal parts: North Yard, Linklet and South Yard (Marwick 1923b, 54-5); these feature on Mackenzie's (1750) chart (Figure 8.9). The Muckle Gairsty is reminiscent of the *feelie* dyke in Fair Isle, which divides the island into two and may also be of prehistoric origin (see Section 9.5.3). The south western peninsula of Sanday has a central ridge reaching 60m OD, and the treb dykes here run perpendicularly from the shore and over the ridge (Lamb 1983a, 177). Similarly in Rousay the Green Gairsty runs straight up the slope from the cliff face at the shore to the 60m contour (ibid, 176-7; Marwick 1923a, 22 & 1924b, 16).

8.5.1 Dating treb dykes

No treb dykes have been excavated and no finds have been reported from their destruction where this has occurred, so dating is necessarily speculative. Apart from descriptive accounts (e.g. Marwick 1923a), the only published research remains a short paper by Dr Raymond Lamb (1983a), who suggested that treb dykes were attributable to the Bronze Age, a hypothesis which remains unchallenged (e.g. Downes & Thomas 2013, 80-2).

Lamb's (1983a) assignation of a Bronze Age date to this series of banks was based on a sequence of deductions, all of which must be sustained for his conclusion to be valid:

- Treb dyke locations bear no resemblance to any historic land divisions or land-based taxation divisions in Orkney.
- Orkney's historic land and taxation divisions are derived from Norse organisation.

dykes come from surveys by Dr Raymond Lamb for the ASMS series, which did not extend to most of the Mainland (Section 3.8.1).

- Norse taxation districts (the urislands[233]) were adapted from existing Pictish ecclesiastical land divisions, with each urisland possessing a Pictish chapel site.
- Pictish chapel sites are associated with Iron Age settlements, particularly brochs[234].
- The ecclesiastical administrative systems (i.e. the urislands) are therefore based on the existing Iron Age land divisions.
- Orkney's historic land divisions therefore reflect Iron Age land divisions.
- Since treb dyke locations do not reflect Orkney's historic land divisions they must be pre-Iron Age.

Further to these points, the treb dyke at West Thrave, Sanday, was cited as evidence of pre-Iron Age origins, as it 'runs underneath' the Braes of Gorn, a probable settlement mound similar to other (unspecified) sites in Sanday, which are 'at least as old as the Iron Age' (ibid, 177). The complex of mounds at the Braes of Gorn are however badly damaged by cultivation (Lamb 1980b, 17, no. 72; RCAMS 1946, vol. II, 41, no. 161) and neither their age nor any relationship with the treb dyke has been securely established.

The first two bullet points above are broadly correct: treb dykes do not reflect historic township divisions, as defined by the hill-dykes on Mackenzie's (1750) charts, although as Lamb (1983a, 177-8) notes some were used as convenient ready-made boundaries e.g. in Papa Westray and North Ronaldsay[235]. However, whilst Orkney's historic land-based taxation system is probably largely Norse (e.g. Marwick 1952, 191-204), the earliest surviving Rental dates from 1492 and as Thomson (1996, vii-xxvi) notes care should be exercised in projecting this back into pre-twelfth-century Orkney.

[233] An urisland relates taxation to the productivity of the land, one urisland = 18 pennylands of skat: see Marwick 1952, 191-204.

[234] There is some evidence in support of this as discussed in Section 7.15.

[235] Matches Dyke is a township division, but the Muckle Gairsty is not (Lamb 1983a, 177-8).

The remainder of the bullet points rehearsed above are much more problematic. The idea that urislands were part of a Pictish administrative system adopted by the Vikings has a long currency (e.g. Clouston 1917; Marwick 1952, 212; Thomas 1882); but others have argued convincingly (e.g. Andersen 1988; Gibbon 2007) that urislands were introduced in the thirteenth century as part of the establishment of the parish system in Orkney. The nature of the Pictish/Viking transition in Orkney is also open to debate (e.g. Crawford 1981; Lamb 1993; Ritchie 1977 & 1983b; Smith 2001) with scenarios ranging from peaceful coexistence to total annihilation of the Pictish population; not all such perspectives are consistent with the continuation of a land-based taxation system across this transition. The suggestion that Orkney's historic land divisions had Iron Age origins (Lamb 1983a, 178-9) cannot be substantiated. Consequently the argument that since treb dykes do not reflect these historic land divisions they must be pre-Iron Age (ibid) also falls.

Lamb (1983a) argued that the treb dykes indicated a stable and long-lasting system of land division, which ended as a result of social upheaval and disruption, probably at the end of the Bronze Age. The appearance of the brochs (with supposedly different land organisation, continuing into the Early Historic period) was seen as a response to this disruption (ibid, 179).

Whilst it appears reasonable to assign pre-Viking/Norse origins to the treb dykes (given their lack of correlation with historic land divisions, which are probably broadly Norse), and it is possible that they were constructed sequentially through time, there is no compelling reason, however, why at least some of these treb dykes should not relate to Iron Age broch territories. There are few areas where the treb dykes are well enough preserved to investigate this correlation more fully, but the examples on the south western peninsula of Sanday seem to bear more than a chance correlation with known brochs (Figure 8.10), while the locations of the trebs in North Ronaldsay (Figure 8.11) and Papa Westray (Figure 8.12) hint at a similar relationship.

Moore (2013, 160-1 & 214-16) suggests that the 700m length of dyke at

Brough Burn[236], Sandwick (HY21NW68; Figure 8.13), which in scale (it survives to 10m wide and 1m high) resembles a treb dyke, is rather an Iron Age boundary associated with the Broch of Borwick 400m to the south. Moore reasons (ibid, 161) that treb dykes were Bronze Age and of earthen construction (following Lamb 1983a), whilst the Brough Burn dyke has eroding orthostats that suggest it contained some internal structure, and further that there is 'a close visual relationship between broch and dyke' i.e. the dyke is visible on the skyline from the broch. Surface erosion of the Brough Burn dyke has exposed its construction to be of stony clay subsoil rather than earth (personal observation), which, together with the presence of orthostats, differs from the previously recorded treb dykes[237]. Orthostatic construction is seen however, as has been noted previously, in some of the sub-peat dykes and enclosures (Section 8.4), suggesting that this constructional technique may have been first used in the Bronze Age. If at least some treb dykes can be assigned to the Iron Age on the basis of their apparent relationship with broch territories (e.g. Figure 8.10), then the suggested association (Moore 2013, 160-1 & 214-16) of the Brough Burn dyke with the Broch of Borwick may be explained, whilst the differing constructional style may simply be a local variation.

8.6 The Dyke of Sean

A prehistoric boundary of different construction to either the orthostatic arrangements noted in sub-peat dykes or the earthen construction of the treb dykes appears in the linear stone-cored Dyke of Sean[238] (HY21SE68), at the northern end of the Brodgar peninsula (Downes, Richards et al 2013, 92-4; Figure 8.14). The Dyke of Sean bears no relation to the historic township boundaries depicted in Mackenzie's (1750) chart (Section 4.2.2) and although it reflects the Stenness – Sandwick parish boundary this is happenstance; it

[236] Brough Burn was first identified by the RCAHMS from an aerial photograph, and is classified as a post-medieval head-dyke (i.e. hill-dyke) (HY21NW68); this is incorrect since it bears no relation to the hill-dyke in this area shown on Mackenzie (1750) (Figure 7.4.9).

[237] Although the Muckle Gairsty may have a clay core (Lamb 1983a, 176).

[238] Pronounced Dyke of See-an (Peter Leith, pers. comm.)

was already a visible marker in the landscape at the time that boundary was defined[239]. The Dyke lies in an area of intense prehistoric activity (Figure 8.14), with the Ring of Brodgar and its associated Bronze Age funerary landscape (Section 6.1.4) to the southeast, whilst immediately to the northwest lie the Wasbister Bookan settlement complex (Section 4.2.4), a disc barrow (HY21SE3) and a burnt mound (HY21SE20).

The Dyke takes an uneven course across the narrow neck of land between the two lochs of Stenness and Harray, being set topographically along the lowest line rather than the shortest route; there is no obvious explanation on the ground for this choice. It survives to a maximum width of c.6m, with a stone core, which appears to be good-quality coursed walling (Figure 8.15). It has a clear, original entrance (personal observation; Figures 8.16 & 8.17) towards its western end.

It is tempting to see the Dyke of Sean as controlling access to the ritual landscape on the Ness of Brodgar (e.g. Downes, Richards et al 2013, 92-94). To modern eyes it does look like the Ring of Brodgar is on the inside of a space defined by that feature; whether this would be a view shared by the Dyke of Sean's builders is open to debate. There is no compelling reason, however, why the Dyke of Sean could not be related to the Bronze Age activity in the area. Today parts of the Dyke runs though boggy areas with localised standing water; before the Loch of Stenness reached its present level c.2000 – 1500 cal BC (Bates et al forthcoming; Wickham-Jones et al 2008 & forthcoming), which presumably resulted in raised groundwater levels in the low-lying areas between the Lochs of Harray and Stenness, the area traversed by this broad bank would have been dry land. This may support a construction date for the Dyke of Sean prior to this raising of the water table, but this does not preclude a construction date in the Chalcolithic/Early Bronze Age.

[239] This is common in Orkney; the western end of the Birsay – Sandwick parish boundary starts at the coast and proceeds eastwards through a series of marker points, all of which are prehistoric mounds including the Knowe of Gairsty (HY22SW2) and the Knowes of Yonbell (HY22SW13).

8.7 Discussion

The mixed agriculture subsistence strategy identified in Orkney from the late 3rd to the early 1st millennium BC, though supplemented by the exploitation of natural resources (Section 8.2), required sophisticated coping mechanisms in some of the marginal environments occupied during the Bronze Age. Livestock, with sheep increasingly important (Nicholson & Davies 2007), probably necessitated the construction of barriers to separate infield and outfield areas. Suggestions that some of the sub-peat dykes and enclosures were Bronze Age in date rest on loose associations with environmental evidence and chance finds (Section 8.4.1). Orkney's historic (pre-improvement) system of infields, hill-dykes and rough grazing (Section 4.2.2) would fit very well with the economic model proposed for Tofts Ness (Dockrill & Bond 2009; Figure 8.1), where access to a variety of resources was important. Evidence suggests animals grazed on the hills of the West Mainland at altitudes of c.90 – 120m OD prior to the growth of blanket peat from the mid-2nd millennium BC; and rough grazing in other areas of Orkney was exploited during the same period (Farrell 2009; Keatinge & Dickson 1979; Section 2.2.2). The enclosures with internal divisions at Vestra Fiold (RCAMS 1946, vol II, 269, no. 728) and Skirmie Clett (ibid, 239-40, no. 620) would appear eminently suitable to livestock handling and sorting. Both are undated, although Skirmie Clett exhibits a similar construction to the sub-peat dykes which are discussed above, and is associated with a burnt mound, lending some support to a Bronze Age attribution. The Fold of Setter, Eday (Lamb 1984, 16, no. 57), again possibly associated with nearby sub-peat dykes, could also have functioned as a livestock pen; its similarities to Whaness Burn A, Hoy (Lamb 1996; Section 7.12.2) may suggest an enclosed settlement whose internal features had been destroyed before the site was identified archaeologically.

It is obvious that treb dykes were land divisions of some importance. Surviving traces (e.g. the Muckle Gairsty: Lamb 1983a, 176 & 178; Figure 8.11) indicate that they must have originally been imposing, almost

monumental in scale: the eastern side of the Muckle Gairsty survives to 11m wide and up to 1.8m high (ibid). Although likely to be prehistoric in date, there is no unchallengeable evidence to assign them to period. They are totally different in both construction and scale to the stone-built sub-peat dykes and enclosures tentatively suggested to be of Bronze Age date because of their stratigraphic relationship to the accumulation of peat (Section 8.4.1). In the absence of secure chronological evidence, treb dykes cannot be assigned with certainty to the Bronze Age (*contra* Lamb 1983a). Whilst they may define territories based on access to the shore, their positioning relative to Iron Age monuments are suggestive of broch territories (Figure 8.10). This does not necessarily preclude a Late Bronze Age origin for some examples, since some at least of Orkney's brochs can be postulated to have developed from earlier settlement foci (Section 7.15). The earthen construction of the treb dykes may reference the value placed on the inherited resource of anthropogenic soils (cf. Dockrill & Bond 2009), but may simply have been the quickest way of building these features.

The Dyke of Sean remains enigmatic; the coursed stone construction, size and position on the Brodgar peninsula invite comparison with the Neolithic enclosures demarcating the buildings at the Ness of Brodgar. It appears to be unrelated in type to either the sub-peat dykes or the treb dykes and may have functioned in relation to the nearby monuments and/or communities in a manner different from either of the other series of dykes.

8.8 Conclusion

On balance, there is every likelihood that the subdivision of the landscape by dykes was a feature of at least some Orcadian landscapes during the Bronze Age. On the grounds of their relationship to the development of ombrogenous peatland in the later stages of the Bronze Age, the underlying sub-peat dykes are the best currently-known candidates. Contrastingly, the treb dykes, many now ploughed out, may not be restricted within prehistory to a single period. On current evidence, Lamb's (1983a) hypothesis, arguing back from the land

divisions of the Historic, via the Viking/Norse, periods, to the Iron Age, to suggest that they should date to the Bronze Age has been shown above to be open to challenge. Whilst it would be an advantage to be able to attribute the treb dykes to the Bronze Age, and some indeed may have been established then, there is a possibility that others served to delimit territories associated with brochs.

Chapter 9 Burnt mounds and their relationships with other Bronze Age sites

9.1 Introduction

Alongside the domestic and funerary architecture of Bronze Age Orkney there are burnt mounds, which appear to fulfil specialist functions albeit of uncertain nature (Section 9.2). Burnt mounds are ubiquitous throughout the Northern Isles (297 recorded from Orkney at 252 sites[240] and 346 from Shetland), and are common features elsewhere in the British Isles: a rapid interrogation of the relevant online databases produced 1,863 results for Scotland as a whole, 1,564 results for England, 686 results for Wales, 7,821 results for Eire and 429 results for Northern Ireland[241].

When excavated, burnt mounds universally consist of blackish mounds of fire-cracked stone, generally oval or of a distinctive horseshoe/kidney shape, surrounding a tank or trough. They are usually situated either in a wet area or with access to water[242] (e.g. Cressey & Strachan 2003; Ripper et al 2012; Russell-White 1990). Early excavators interpreted burnt mounds as cooking-places, with boiling troughs of water heated through the addition of hot stones (e.g. Cantrill & Jones 1906 & 1911); this became the accepted interpretation following O'Kelly's (1954) work on the Irish *fulachta fia*[243] (e.g. Cubbon 1965; Hodges 1955; James 1986). Alternative functions have since been advanced (Section 9.2). In the Northern Isles the tank is typically

[240] See Appendix 8 for details and distribution maps.

[241] See Note 5, Appendix 8 for details of the sources and search terms from which these figures were obtained.

[242] In Shetland only 22 of the 346 burnt mounds studied by Doughton (2014, 113-14) were more than 500m from a freshwater source and in the majority of cases (312/346) this was fresh running water. No such analysis has been conducted in Orkney; it would be difficult to establish due to the highly improved nature of the Orcadian landscape, with extensive ditching, drainage and rerouting of watercourses (Chapter 4).

[243] The Irish archaeological term for a burnt mound is *fulacht(a) fiadh* (singular), or the plural *fulachta(i) fia*.

constructed of stone slabs and the surrounding structures are also stone built and include complex features such as wells and corbelled cells (e.g. Hambly 2014; Hedges 1975; Moore 2015a & b; Figure 9.1). Their associated artefact assemblages (pottery, coarse stone tools and lithics) are broadly comparable to those found in other non-funerary Bronze Age sites (e.g. Ballin 2014; MacSween 1999 & 2014; McLaren & Hunter 2014).

This chapter reviews the current evidence for the dating, distribution, associations and functions of burnt mounds, critically reviewing the evidence from the Northern Isles to consider their place within the Bronze Age landscape of Orkney and potential utility for investigating past settlement.

9.1.1 Dating burnt mounds

Broadly speaking, the majority of radiocarbon dated burnt mounds in Britain are Bronze Age, dating from the late 3rd millennium to the early 1st millennium BC[244]. In Eire, whilst the bulk of radiocarbon dates fall into the same period, the range extends from the late 4th/early 3rd millennium BC to the 1st millennium AD[245]. Although *fulachta fia* start to be used in Neolithic Ireland, the main period of their use is nonetheless Bronze Age (Hawkes 2014); some at least of the very early Irish dates have been interpreted as related to possible ritual depositions of burnt stone rather than 'true' *fulachta fia* (e.g. Mossop & Mossop 2009). The radiocarbon dates from excavated burnt mounds in Orkney and Shetland range from the early 2nd millennium to the early 1st millennium cal BC, most falling in the 2nd millennium BC (Chart 9.1).

[244] See Appendix 1, Tables A1.2, A1.4, A1.6, A1.10 & A1.11 & references therein.

[245] See Appendix 1, Tables A1.8 & A1.9 & references therein.

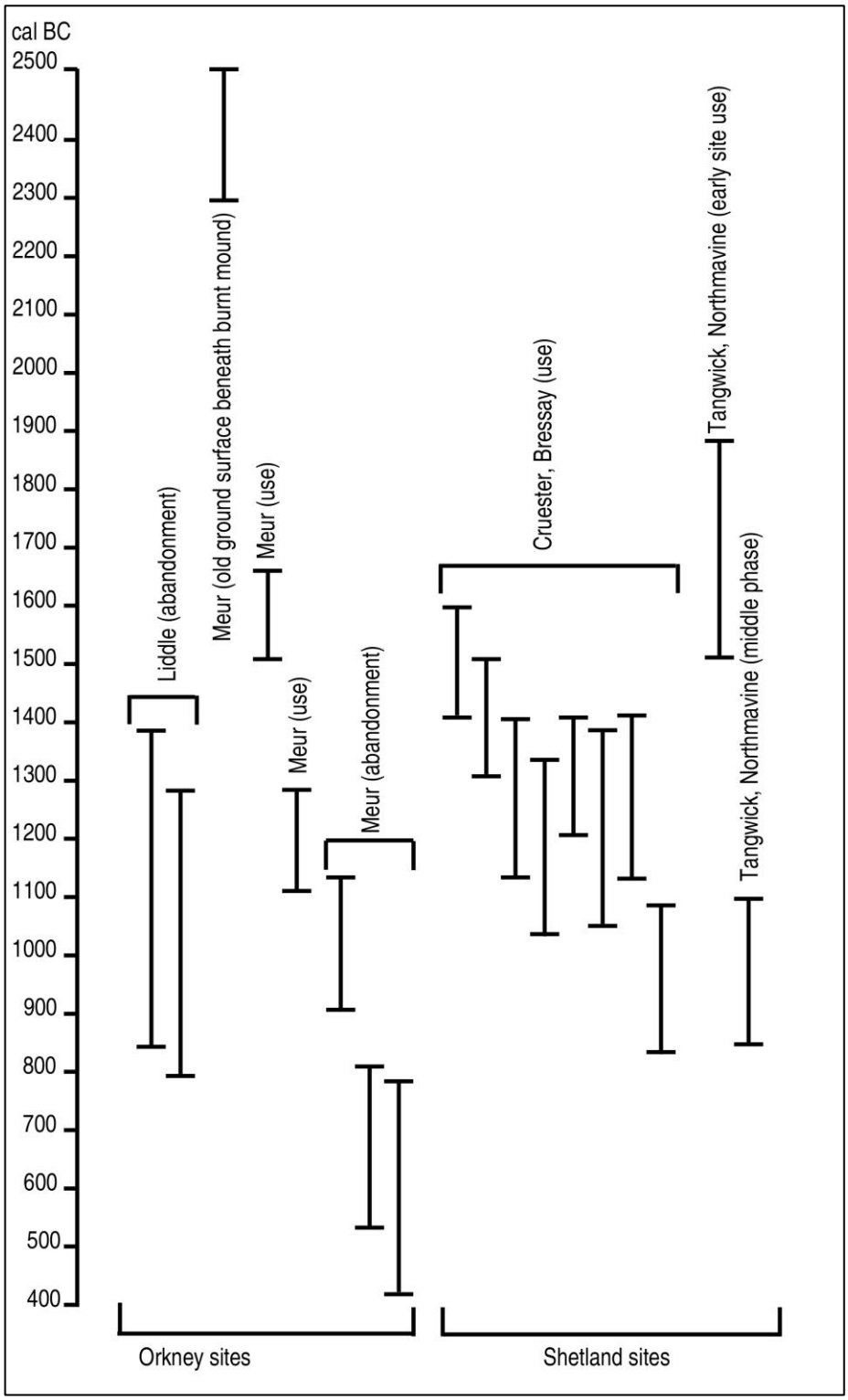

Chart 9.1 Radiocarbon dates from excavated Orkney and Shetland burnt mound sites (see Appendix 1, Tables A1.2 and A1.4 for details and references).

Luminescence dating techniques have been applied to burnt mounds in the Northern Isles, mostly as part of a doctoral research project on eleven burnt mounds[246], with samples obtained from test pits, burnt stone scatters and erosion faces (Anthony 2003). At Cruester, Shetland, the samples were taken as part of a wider excavation project, alongside a suite of radiocarbon dates (Ashmore 2014; Moore & Wilson 2014a). The luminescence dates are claimed to show burnt mound use from the late 5th millennium to the early 1st millennium BC in Orkney, and from the late 3rd millennium to the early 1st millennium BC in Shetland (Anthony 2003, 314-26). At Cruester, however, large statistical errors, taphonomic uncertainties and stratigraphic inversions of the luminescence dates meant that they were of little use in determining site sequence, which relied instead on the radiocarbon dates (Ashmore 2014).

For the majority of the TL-dated sites in Anthony's (2003) study no radiocarbon dates were available as a control. This presents a major problem: where multiple luminescence dates were obtained from any particular site, the results varied widely, even within a single context, by over one to two thousand years, with very large individual errors (at 1 σ) (see Appendix 1, Tables A1.3 & A1.5). The quoted date ranges for individual burnt mounds were produced by disregarding some outlying luminescence dates[247] to find a mean unit age. These were combined with the radiocarbon dates (where available) to construct box plots and probability density functions of both the combined Gaussian distributions and individual dates (Anthony 2003, 314-9). These calculations constitute a purely mathematical exercise of doubtful archaeological value. It would appear prudent to treat all the luminescence dates from Anthony's (2003) research with caution. The suggestion that this research has been important for burnt mound studies in the Northern Isles

[246] Some TL dates were obtained from Orkney burnt mounds in the 1970s when the technique was in its infancy (Huxtable 1975; Huxtable et al 1976) and these are unreliable: see Appendix 1, Table A1.3.

[247] There appears to be no justification for this discard, other than that the discarded dates do not generally agree with the other dates quoted for the unit. It is essentially a subjective judgement with a tendency to reinforce expectations. This approach was also adopted with TL, OSL and PTTL dates obtained for a burnt mound at Lady Glassary Wood, Kilmartin, which individually covered four millennia (Anthony et al 2001; See Appendix 1, Table A1.16).

since 'it has … expanded their temporal range beyond the Bronze Age' (ScARF 2012b, 53) is of dubious merit. The few radiocarbon dates for Orkney burnt mounds obtained by the same project were all late 3rd to mid-2nd millennium BC (Anthony 2003, 294 & 302; Appendix 1, Table A1.2), in line with other radiocarbon dates for burnt mounds in the Northern Isles (Chart 9.1), which place them securely in the Bronze Age. The case for burnt mounds being a feature of Early Neolithic (or indeed earlier) activities in Orkney thus remains to be made.

9.2 Function

Cases could be made for many uses of burnt mounds in Orkney as elsewhere. As Barber (1990b, 101) observed:

> *Boiling water[248] has many uses, and while cooking may be the most common of them it is certainly not the only one. There is no reason not to assume that some burnt mounds were used for bathing, washing, saunas and sweathouses and a range of semi-industrial functions of which we have as yet little indication.*

Irish literary sources, such as the seventeenth-century *Foras Feasa ar Éirinn*, with its detailed description of the mythical *Fianna*[249] and their end-of-hunt cookery techniques (Dinneen 1908, 329), informed interpretation of *fulachta fia* as seasonal cooking places for roving bands of huntsmen or warriors (O'Kelly 1954). O'Kelly's reconstruction experiment found that 100 gallons (454 litres) of water could be brought to the boil in 35 minutes by the addition of red-hot rocks, then kept boiling by the addition of an extra stone every few minutes; a leg of mutton was successfully cooked in this way (ibid, 117-23). This cookery technique, using a wooden trough, is recorded from the Hebrides in the eighteenth century (Jamieson 1822, vol 2, 172-3); whilst Scottish and Irish soldiers on campaign in the thirteenth and sixteenth centuries substituted a water filled cow's hide lashed to supports for the

[248] Although not all the burnt mound functions discussed here necessarily require the water to be boiling.

[249] The hunting band of the great Irish heroic figure Fionn Mac Cumhail (Finn McCool).

trough, but heated the water in the same way (Ffrench 1899, 43; Macaulay 1913, 17; Monipenny 1603, 388). Ethnographic examples of cooking with hot rocks, whether in an earth oven or to heat a container of water, exist worldwide (e.g. Campling 1991; Mead 1971, 213; Pearce 1919; Rappaport 1984; Wandsnider 1997) and have been widely inferred in prehistory[250] (e.g. Dering 1999; Ramseyer 1991; Saunders et al 2005; Sullivan et al 2001; Nakazawa et al 2009; Ramseyer 1991; Thoms 2009).

In a variation on the cooking hypothesis, Monk (2007) suggested that the fat that rises to the surface during cooking might be skimmed off and used as a secondary product for e.g. waterproofing. A similar method was employed to extract bone grease for use as a foodstuff by Native Americans (Binford 1978, 157-63; Leechman 1951).

Since nearly 8,000 Irish *fulachta fia* are now known (Section 9.1), the interpretation of all such examples as seasonal camps for roving wanderers seems unlikely. Recent work (e.g. Grogan 2005b, 138; Hawkes 2015) has suggested that *fulachta fia* were an important part of Bronze Age social life, with feasting among communal, possibly family, groups. A case has been made for an 'Atlantic Bronze Age Feasting Complex' based on the finds of Late Bronze Age flesh-hooks, cauldrons and spits from the British Isles and northwest Europe (Bowman & Needham 2007; Burgess & O'Connor 2004; Coles 1960; Gerloff 1986 & 2010; Needham & Bowman 2005). Burnt mound tanks 'could be likened to large-scale preparation vessels' (Moore & Wilson 2014a, 66) and could substitute for the cauldron in the preparation of a ritual feast. That the structures within which these tanks were set were confined spaces, coupled with the heat and steam generated by their use, does not seem particularly conducive to high status feasting activities, although consumption may have taken place in the open air, presumably only during

[250] The Bronze Age burnt mounds of Sweden however do not seem related to the those found in Britain and Ireland in either form or function (Ó Néill 2009, 184-5); although they are associated with prehistoric settlement they consist of discrete mounds of burnt stone lacking internal structures or troughs, containing large numbers of artefacts, whilst many also contain human bones (e.g. Larsson 1990; Noge 2009).

clement weather. Such feasting activities may also have had ritual components. For example heated rocks play a significant part in the intensely complicated rituals of the people of Papua New Guinea (Rappaport 1984). Here the ritual slaughter and cooking of pigs involved oven stones heated in special fires, constructed of ritually significant woods, with the heated stones considered as partaking of the supernatural power of this fire (ibid, 127-8). Such ritual elements may not be archaeologically identifiable.

Barfield & Hodder (1987), based on the lack of a domestic artefactual and ecofactual assemblage at the burnt mound at Cob Lane, Birmingham, proposed instead that burnt mounds were sweathouses or saunas, and quoted widespread ethnographic examples in support of this theory. They also observed (ibid, 376) that the small size of the structures associated with burnt mounds would create a sauna-like atmosphere during cooking even if that was not the primary purpose. The structures associated with the burnt mound at Ceann nan Clachan, North Uist (Armit & Braby 2002), lacked the central tank and were small with a constricted entrance, and so did not appear to fulfil the same function as burnt mounds elsewhere; consequently they were interpreted as a sauna or sweat lodge where water was poured over heated stones to create steam.

Early Irish literature contains many references to hot baths and bathing, with water heated by dropping hot stones into the tub (Lucas 1965, 66-72 & 78). Some of the earliest references to bathing in this way come from the *Táin Bó Cúailnge*, which probably draws on oral histories from the fourth/fifth centuries AD and may possibly reach back earlier (Dunn 1914; Jackson 1964; O'Curry 1861, 29–51); whilst the *Fianna,* in addition to their cooking pit, had a bathing pit heated with hot stones (Dinneen 1908, 379). The *Táin Bó Cúailnge* and other Irish epics also describe ritual healing baths containing unusual ingredients, such as dismembered cattle, bones and all (e.g. Dunn 1914, 278-9; Lucas 1965, 67-8).

Experiments have shown that a burnt mound trough may also be used to heat the wort necessary for brewing beer (Quinn & Moore 2007). Heating the wort

by dropping hot stones into the mash tun is a European technique in use since at least the Middle Ages; a sticky malted residue adheres to the stones which are then added to the beer during fermentation producing a distinctive taste (Jackson 1993, 239; Siedl 2011). Metalworking activities have been suggested in relation to burnt mounds e.g. (Briggs 1976, 278; White 1977) but a survey of sites throughout the British Isles found no evidence in support of this (Thelin 2007). Other possible applications (utilising hot water or steam) include felting, fulling and dyeing of cloth (Jeffrey 1991). Coles (1979, 198-200) hardened replica Irish Bronze Age leather shields in hot water and suggested that burnt mound troughs would fit this function perfectly. Analyses at eight recently excavated Irish burnt mounds suggested links with both textile production (cleaning wool and dyeing fibres), and tanning hide or cleaning animal skins (Brown et al 2016). It was suggested in this work that the location of Irish burnt mounds – in the vicinity of, but not within, settlements – supported their use for industrial-type processes (ibid, 285).

9.3 Excavated burnt mounds in the Northern Isles

9.3.1 Introduction

Burnt mounds (under the generic heading of 'Pict's Houses') were excavated in Orkney and Shetland in the mid-nineteenth century (e.g. Black 1856; Mitchell 1868; Petrie 1856, 61; Wood 1826), although they subsequently attracted little attention until the fieldwork of J. M. Corrie (RCAMS 1946; Section 3.7.1). Corrie recorded the destruction of burnt mounds at Hawill, St Andrews (ibid, vol. II, 245-6, no. 637) and Strathore, Shapinsay (ibid, 278, no. 789). Around the same time two burnt mounds in Rousay were partially excavated by Walter Grant (ibid, nos. 584 & 595, 225-6) but not published, although an illustration of this survives (Figure 3.8).

9.3.2 Excavations in Orkney

The first modern excavations of a burnt mound in Orkney were at Liddle,

South Ronaldsay[251], and Beaquoy, Birsay, in the 1970s (Hedges 1975). The oval building inside the burnt mound at Liddle contained a large stone tank and hearth, with an artefactual assemblage consisting of domestic pottery and stone tools (ibid; Figure 7.28). Importantly this was the first burnt mound in the Northern Isles to produce radiocarbon dates (Chart 9.1), showing its abandonment towards the end of the 2nd millennium BC; no dates were obtained for the initial use of the burnt mound. At Beaquoy, Birsay little survived of the burnt mound's structures although they were similar to Liddle, as were the finds. The radiocarbon dating of the latter site is unreliable[252], but the finds were thought to be Late Bronze Age in character (ibid).

Hedges (1975, 70-82) accepted that burnt mound tanks were used for cooking, but rejected the seasonal hunting camp theory, concluding that their structure, artefacts and distribution, this last coincident with the best agricultural land (see Section 9.7.1), supported the conclusion that burnt mounds were themselves the 'missing' permanent farming settlement sites of Bronze Age Orkney, and that by extrapolation this interpretation held good for Shetland too. This view however ignored the immediate location of the burnt mound at Liddle, the structures of which were cut into a layer of peat: the contemporary environs consisted of a sedge and reed-dominated swamp (Jones 1975; Tasker 1975), not a location typically conducive to a domestic dwelling. This interpretation has now been superseded, because Bronze Age domestic structures that are demonstrably not burnt mounds have been widely identified in the Northern Isles e.g. Sumburgh, Shetland (Downes & Lamb 2000a; Section 7.6.1); Skaill, Deerness (Buteux 1997c; Section 7.6.2); the Links of Noltland, Westray (Moore & Wilson 2011a; Section 7.6.3) and Tofts Ness, Sanday (Dockrill 2007d; Section 7.9).

[251] There are two burnt mounds at Liddle, designated Liddle I and II, but only Liddle I was excavated, the discussion here is of the excavated site at Liddle I.

[252] These unreliable dates were obtained for a secondary structure, not the burnt mound itself: see Appendix 1, Table A1.2, Footnote 1.

Since Hedges' (1975) work there have been two further burnt mound excavations in Orkney[253]. At Meur, Sanday, excavation of a burnt mound badly damaged by coastal erosion revealed a stone tank and a well-preserved corbelled well accessed by a stone stairway, together with underlying structural deposits (Hambly 2014; Toolis 2005a & 2007a). These included earlier phases of burnt mound activity dated to the mid-2nd millennium cal BC. Removal of the basal slab of the tank revealed a probably Late Neolithic well, sealed by a soil horizon dated to c.2472 – 2299 cal BC[254]. The Neolithic deposits were not further excavated but do not appear to be associated with the burnt mound activity and it is not clear if the well itself existed in isolation; no further details are yet available.

At the Links of Noltland, Westray, an exceptionally well-preserved burnt mound, currently in post-excavation, also had a 2.5m deep well accessed by a stone stairway, together with adjacent corbelled cells surviving with intact roofs; this mound was associated with Bronze Age settlement and funerary activity (Moore 2015a & b; Section 7.6.3; Figure 9.1). A ritual function was suggested for the burnt mound, perhaps related to its use as a sauna or sweat lodge, with access permitted only to a select few due to the restricted nature of the internal layout; other functions were also proposed, including communal feasting (ibid). The corbelled wells at both Meur and the Links of Noltland are reminiscent of underground structures known from Iron Age Orkney e.g. the 'wells' at the brochs of Gurness (Hedges 1987b, 35-6) and Midhowe (Callander & Grant 1934b, 454) or the probably ritual underground structure in the glacial mound at Mine Howe, Tankerness (Harrison 2005), although this need reflect nothing more than a simple engineering solution to the structural necessity of shoring the sides of the well against collapse.

[253] Plus limited recording of two sites subject to coastal erosion and commercial archaeological evaluations (e.g. Dockrill et al 2009; Lehane 1990b; Mamwell 2006 & 2008).

[254] http://scharp.co.uk/shoredig-projects/meur-burnt-mound/ accessed on 30/6/17.

9.3.3 Excavations in Shetland

The most comprehensive published excavations of burnt mound sites in the Northern Isles come from two sites in Shetland, at Tangwick, Northmavine and Cruester, Bressay, both of which have produced large artefact assemblages and reliable radiocarbon dates (Ashmore 2014; Moore & Wilson 1999b & 2014a; Chart 9.1). At Tangwick the finds included hammer stones, grinders and ard-points, together with the largest pottery assemblage so far from any Scottish burnt mound site: a maximum of 185 vessels (MacSween 1999; Moore & Wilson 1999b). Around 65% of the pottery showed spalling, which was interpreted as damage caused by immersion of the pots in the hot water of the tank[255], a theory supported by a lack of heavy exterior sooting (MacSween 1999, 218-9). The site was occupied during the second millennium BC (Chart 9.1), and the artefact assemblage, together with an absence of nearby settlement sites, led to the suggestion that it was a special cooking place, possibly for seasonal feasting activities (Moore & Wilson 1999b, 228-230). The same function was proposed for the burnt mound at Cruester, Bressay, Shetland, very similar in structure, finds and dating to Tangwick (Moore & Wilson 2014a), although at Cruester the pottery assemblage showed no spalling; here sooting on the vessels indicated they had been placed directly in fires (MacSween 2014). It was also suggested that communal feasting may have included bodily cleansing as part of rituals of transformation or purification whilst the 'otherworldliness' of the setting and remoteness from established settlements indicated liminality (Moore & Wilson 2014a, 65-7). Whether either of these sites was originally remote may be questioned: since they are both on the coast and actively eroding, any associated settlement might easily have been lost to the sea.

[255] The alternative explanation, that the spalling resulted from post-depositional salt crystallisation caused by repeated marine inundation of the site, was considered unlikely as it was suggested that this would result in a more random pattern of damage (MacSween 1999, 218); but this is not necessarily the case. Two types of pottery were identified in the assemblage: serving and storage vessels (Moore & Wilson 1999b, 230) and it is not immediately apparent why either of these types would be immersed in the tank; similarly neither of these types would be expected to be placed in a fire, hence the lack of exterior sooting. The practical difficulties of keeping a pot full of any type of foodstuff upright in boiling water would seem to militate against this interpretation and suggest that marine inundation might be a more likely explanation.

9.4 Summary

It is clear that burnt mounds could have had many possible uses, from the sacred to the mundane, none of which are mutually exclusive. Domestic cookery seems the least likely in the Northern Isles, due to the large amounts of fuel required[256]: a significant consideration in a treeless environment (Section 2.2.2). Experimental reconstruction of a simple hearth has shown that it is easy to boil liquid in replica prehistoric pots[257] set in the ashes or roast meat on adjacent stone slabs using a very small fire and only requiring small quantities of fuel (personal observation; Figure 9.2), which would appear a more rational cookery method.

The appearance of burnt mounds in the Early Bronze Age of the Northern Isles and their apparent abandonment by the early 1st millennium cal BC (Section 9.1.1) suggest that their function related to a Bronze Age-specific aspect of domestic or ritual life, one that may have changed towards the end of the period. If some pragmatic technological rather than a ritual function is sought, then we must consider observable differences in subsistence practices or technological applications which might necessitate the use of burnt mounds. The main changes in subsistence from the Neolithic to the Bronze Age in Orkney are an increase in the importance of sheep versus cattle, and the increasing importance of marine resources (Section 8.2); technologically, we see the appearance of copper alloy objects. Bronze Age sheep had little wool (Nicholson & Davies 2007, 178; Ryder 45 – 9) and there is as yet no evidence for textile production[258] in Bronze Age Orkney, but felting

[256] O'Kelly's (1954, 117-23) reconstruction experiment did not discuss the amount of fuel consumed. The Nunamiut Eskimo traditionally extracted bone grease using a 23 litre wooden container of water, boiled using hot stones; 29.6kg of heated stones were necessary to keep the bucket boiling for two hours, which required three backloads of firewood (the amount of bundled firewood that one adult could carry on their back) (Binford 1978, 157-63).

[257] These were made for the Ness of Brodgar open day and so were in Neolithic style, but were made of Orkney clay and fired using prehistoric techniques (Mike Copper, pers. comm.).

[258] The majority of identified Bronze Age textiles in the British Isles are produced from plant fibres such as nettle or more commonly flax (e.g. Cameron et al 2016; Symonds 2016) although there are some woollen examples known from the Late Bronze Age (Henshall 1950). The first evidence for flax in Orkney comes from the Middle Iron Age (e.g. Bell &

(requiring steam: Jeffrey 1991) or processing sheepskins remain possibilities. Evidence for weaving from Early Iron Age phases at Tofts Ness (Davies & Smith 2007, 331–4) suggests that sheep with fleeces had by then appeared and we might speculate that sheepskins lost importance in favour of woven goods, thereby contributing to the demise of the burnt mounds in the Northern Isles. Observations elsewhere (Thelin 2007) and the small volume of Bronze Age metal finds from Orkney (Section 6.3.3) suggest that metalworking was not a significant factor in the local economy and cannot be convincingly related to burnt mound use.

There is an archaeologically observable change in burial practices between the Neolithic and the Early Bronze Age (Chapter 6); similarly Iron Age mortuary practice in Atlantic Scotland takes many forms but is appreciably different from those of preceding periods (Tucker 2010, 343-8). The striking similarities between burnt mound troughs and the Bronze Age burial cists of the Northern Isles have largely escaped attention. It has been suggested (e.g. Downes 2005, 29-30; MacGregor 2008) that burnt mounds, although not involved in funerary rites, were also places of transformation, whether as cooking places or sweat lodges. There may have been metaphorical links between the activities at burnt mounds and changes in the state of the body (ibid). Doughton's (2014) research sought to recontextualise burnt mounds as places of transformation involving both fragmentation and elemental substances. Obvious similarities between cist and trough were noted (ibid, 81), but transformative processes were emphasised. Burnt stones, having undergone processes similar to cremation, were envisaged as powerful substances in their own right (ibid, 222-40); burnt stones have also been found directly deposited in funerary contexts alongside cremated bone (Downes 1994a, 147 & 151; Hedges 1977, 131-3; Section 9.9). A more obvious association between burnt mounds and burial practices, which has been largely overlooked, is washing of the corpse as part of the funeral rites.

Dickson 1989; Dickson 1994) and woollen cloth survives from the early 1st millennium AD (Gabra-Sanders 2001).

Washing the corpse following death is well-documented worldwide (e.g. Habenstein & Lamers 1960 & references therein). Like other functions, this may not be identifiable directly in the archaeological record but relationships between distributions of burnt mounds and barrows that might relate to such potential functions are discussed below (Section 9.9).

9.5 Burnt mounds in the Bronze Age landscape

9.5.1 Introduction

Burnt mounds are almost ubiquitous in the Bronze Age of the Northern Isles (297 burnt mounds in Orkney at 252 sites; 346 in Shetland: Section 9.1). Compared to Bronze Age settlement sites (of which only 28 are presently recorded: Figure 7.2), burnt mounds survive well in Orkney's improved landscape[259] (Section 5.7); this survival may be useful in indicating prehistoric settlement patterns (e.g. Barber & Russell-White, 1990a; Hunter 1991 & 1996a; Hunter & Dockrill 1990). Hunter in particular (1991, 182-3 & 1996a, 61) has suggested that in Fair Isle burnt mounds survived disproportionately well because their fabric, comprised of small fractured stones, was of no use in construction[260] and was hard to remove by hand, whilst the mounds themselves were too small to be a significant agricultural nuisance; this observation could reasonably be applied to improved landscapes elsewhere, although potential utilisation for road metalling might have been an issue[261].

In Shetland many more possible Bronze Age houses have been recognised since Calder's (1956, 1961 & 1963) surveys, which identified oval houses[262] in

[259] Extrapolations of the numbers of burnt mounds present in Orkney's relict landscapes to the rest of Orkney (Section 5.7, Table 5.3) suggest a survival rate of between 35 – 43% for burnt mounds, compared to a survival rate of 2 – 3% for Bronze Age settlement sites.

[260] Although burnt mounds in the Northern Isles do contain structural stone (e.g. Figure 9.1) this is buried under a mound of small heat-shattered stones and difficult to access.

[261] The burnt mound at Liddle had been partially removed for this purpose before the internal structures were discovered and reported (Hedges 1975, 39).

[262] Many, if not all, of these oval houses are likely to be Bronze Age (Sheridan 2013, 67; Section 7.7.1).

relict landscapes that also included burnt mounds, and some GIS analysis of the distribution of burnt mounds in relation to settlements sites and cairns has taken place (Canter 1998; Doughton 2014).

Canter's (1998) study, limited to the 222 burnt mounds, 158 oval houses and 200 cairns[263] of Mainland Shetland and adjacent small islands, concluded that burnt mounds were found in the same areas as oval houses and cairns, but he did not define his parameters more closely. A loose association of burnt mounds, prehistoric houses, burial cairns and field systems has been suggested for other areas of Shetland, but has not been subjected to detailed analysis e.g. Kebister, Tingwall (Owen & Lowe 1990 & 1999, 254-69) and South Nesting (Dockrill et al 1998). Doughton (2014, 119-20) considered 346 burnt mounds throughout Shetland[264], together with 432 possible Neolithic/Bronze Age settlement sites[265]; and found that exactly half of the burnt mounds were within 1,500m of a settlement, but did not examine distances more closely. This GIS survey was based on sites previously recorded in the NMRS and Shetland SMR and detailed field survey was outside the scope of the project; whilst 40 burnt mound sites (88 mounds) were visited (ibid, 16-18; 102 & 126 & fig. 5.18), only the known settlement sites close to these mounds were included in field visits and there was no prospection for new sites. In Ireland, Ó Néill (2009, 198-9) noted examples in some areas (e.g. Lisheen, Co. Tipperary) of roundhouses radiocarbon dated to the mid 2nd millennium cal BC within 200 – 250m of groups of burnt mounds with consistent radiocarbon dates; there were however instances where areas of c.1km^2 were stripped to the subsoil during road construction and burnt mounds were found without any house associations (e.g. Cherrywood, Co. Dublin). It was suggested that perhaps in these instances the burnt mounds were located within 'comfortable walking distance'

[263] Canter (1998) uses 'cairn' as a general term and does not distinguish between possible types of prehistoric cairn e.g. clearance or burial.

[264] Including Fair Isle, which is administratively part of Shetland.

[265] Since many of Shetland's Neolithic houses are now though to be Bronze Age, and many Shetland examples have remodelling and continuity of occupation Doughton (2014, 104) did not attempt to distinguish between the settlements of the two periods.

(suggested to be c.2km, or a 30 minute walk) from a number of houses, implying that 'their use had a social function beyond the immediate occupants of a house or settlement site' (ibid).

Two small areas of Shetland, West Burra (Hedges 1984b) and Fair Isle (Hunter 1996a), have been the subject of more detailed surveys. Some comparative information is available from Mainland Scotland (e.g. Blood 1989; RCAHMS 1993 & 1994). Further consideration is provided in the following sections.

9.5.2 West Burra, Shetland

In West Burra, an island with an area of around 6km^2, field observation in the 1980s raised the number of known prehistoric house sites in the survey area from 5 to 24, with both oval, double and roundhouses associated with burnt mounds, field systems and burial mounds[266] (Hedges 1984b, 41-3). Only one of these sites was excavated, at Tougs, West Burra, where an (undated) oval house was within 20m of a burnt mound dated to the late 3rd/ mid-2nd millennium BC (Hedges 1986, 12 & 27). Thirteen possible burial mounds were identified in the survey, of which eleven were within 600m of burnt mounds (Hedges 1984b, 49-50). Detailed spatial analysis is lacking in the published account[267] but the survey results relating to house types/locations are summarised in Table 9.1.

[266] Hedges (1984b) uses the term 'oval houses with annexes' rather than 'double house' but the structures he describes are double houses, not houses with porches. The 'roundhouses' are assumed to be Iron Age (ibid, 51) but this report was written before the excavation of the Late Bronze Age example at Tofts Ness, Sanday (Dockrill 2007c). 'Burial mounds' is used as a generic term for possible funerary monuments.

[267] The surveyor (Gordon Parry) was killed in an accident before he could complete his report and some of his records were subsequently lost; his surviving notes form the basis of the published account 'but Parry's typology anticipates conclusions which were never written down' (Hedges 1984b, 41). Neither the full site catalogue nor detailed distribution maps were published; neither were distances from houses to burnt mounds explicitly discussed.

Table 9.1 Summary of the results of the West Burra survey, with house types and distances to nearest burnt mounds. N.B. distances scaled from the maps in Hedges 1984b, no distances given in published account.			
Site Name (refers to the general survey area rather than to an individual site)	**House type and no. at each location (?) indicates possible house**	**Distance of houses to nearest burnt mound**	**No. of associated burnt mounds**
Bight of the Sandy Geos	2 x double houses	50 - 100m	2
Bruna Ness	1 x oval house	100m	5
Tougs/Sunnybank	2 x oval houses	20m - 120m	2
Lu Ness	4 x oval houses	100m	3
Minn	4 x double houses	125m - 200m	1
Southerhouses	3(?) x oval houses	280 - 350m	1
Loch of Sandwick	2 x oval houses	N/A	0
Craig	2 x oval houses	N/A	0
Gardins	1 x oval house	N/A	0
Meal	1 (?) x oval house	N/A	0
Easter Dale	1 x ?roundhouse	N/A	0
Atla Ness	1 x ?roundhouse	N/A	0
Total number of houses	**24**		

Fourteen of the sixteen burnt mounds[268] identified in the West Burra survey were associated with possible/definite Bronze Age houses (Table 9.1); although not all of the houses identified were associated with burnt mounds: at 8 of the 24 individual house sites (33%) no burnt mound was identified in the survey areas[269]. At the majority of houses (13/24, or 54%) at least one burnt mound was located within 200m of each house; whilst at 16/24 houses (67%) at least one burnt mound was located within 350m.

[268] The two exceptions were Papil, where a burnt mound was within 150 – 200m of a line of three possible burial mounds; and Setter, where the burnt mound stood alone (Hedges 1984b, 43 & fig. 3).

[269] The results of the surveys are presented as a set of insets superimposed on the map of Burra (ibid, fig. 1) and the areas discussed are a maximum of 500m x 750m; the published maps are very small with limited detail. The survey areas were referred to by name and the houses in each survey area were numbered i.e. House 1, House 2 etc.

9.5.3 Fair Isle

Fair Isle lies roughly halfway between Orkney and Shetland (Figure 1.1) and has a land area of c.8 km². The island is bisected by a drystone wall, which follows the line of an older *feelie*-dyke shown on Mackenzie's (1750) chart. This dyke is substantial[270], 8m wide and surviving to 2m high in places; it appears to have stone footings, with an upper composition of turf and earth, a combination suggestive of a prehistoric origin (Hunter 1996a, 41-3). The northern zone of Fair Isle is uninhabited and used for rough grazing, but the lower-lying, comparatively fertile southern zone is cultivated, and has been the focus of both modern and historical settlement (ibid, 137-8). Fair Isle lacks the easily quarried flagstones of Orkney (Mykura 1976, 66-9) so that building stone is at a premium, leading to the destruction and recycling of stone from monuments of all periods. Even in the uncultivated northern zone it was considered likely that there had been significant destruction of prehistoric structural remains in pursuit of building materials for sheep shelters and planticrues[271] (ibid, 11-13, 73 & 212).

Distinct zones of archaeological survival were identified (Hunter 1996a, 211-12). North of the *feelie*-dyke there are burnt mounds, settlement sites, field systems and burial monuments, whereas south of the dyke the majority of known surviving sites are burnt mounds (Figure 9.3). In the sheltered dale known as the Ferny Cup (Figure 9.3, no. 1) a relict landscape of likely Bronze Age date covering 1.7ha survives, comprising two double houses, positioned within 50-70m of two burnt mounds, associated with field boundaries and lynchets which consisted of deep anthropogenic soils with evidence of intensive manuring, probably with seaweed (ibid, 49-52 & 69-73; Figure 9.4). The Ferny Cup also contained probable post-medieval features considered likely to have been constructed using stone quarried from pre-existing structures (ibid, 73).

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[270] The closest comparanda in Orkney are the treb dykes (Section 8.5).

[271] Small walled enclosures commonly erected throughout the Northern Isles on small patches of otherwise uncultivated land, used for the cultivation of kail and cabbages (Fenton 1978, 100-5).

In Homisdale (Figure 9.3, no. 2), a possible double house lies within 150m of a burnt mound. Other sites in the area include a burial cairn, traces of field systems and stone settings and eight planticrues possibly deliberately sited in this area to take advantage of the readily available building stone provided by the (now destroyed) structural elements of the relict landscape (Hunter 1996a, 73-4 & 233-5). In Burrashield (Figure 9.3, no. 3), two burnt mounds survive alongside 20 small post-medieval rectangular foundations, together with traces of possible land divisions; there are no stone quarries in the vicinity and hence it was suggested that these post-medieval structures were constructed from stone derived from a destroyed prehistoric settlement focus (ibid, 74-6). This pattern was suggested for The Rippack (Figure 9.3, no. 4), an area of marginal land in the cultivated southern zone, where a burnt mound, cairns and traces of field boundaries implied that another prehistoric settlement focus once existed (Hunter 1996a, 76-7); appropriate structures are absent but two planticrues and possibly post-medieval structures may account for their loss (ibid & 73).

The Bronze Age relict landscape at the Ferny Cup (Figure 9.4), and probably the less well preserved example at Homisdale, suggests an association between burnt mounds, double houses and field boundaries which is very clear in sectors where monument survival is good. This is also hinted at by Burrashield, where a similar landscape may have been destroyed by quarrying in the post-medieval period (Hunter 1996a, 74-6).

9.5.4 Mainland Scotland

A pattern of burnt mounds within relict prehistoric landscapes can be seen in mainland Scotland. In Caithness and Sutherland the OS Archaeology Division discovered over 1,200 hut circles and field systems, closely associated[272] with 146 burnt mounds (Blood 1989, 137-8). In Sutherland, largely unaffected by modern agriculture following the

[272] The distance implied by 'closely associated' is not defined, but in the illustrated example of the relationship of burnt mounds and hut circles, the distances between the two are 75 – 90m (Blood 1989, fig.3).

eighteenth/nineteenth-century clearances, only five of the 121 burnt mounds were not associated with prehistoric settlements and field systems, suggesting a strong probability that they were contemporary features (ibid, 139-40). Detailed survey of the Strath of Kildonan, Sutherland supported this, with 38 recorded burnt mounds found to be associated[273] with 48 hut circles and field systems; furthermore burnt mounds were generally not found except in association with hut circles (RCAHMS 1993); this was also the case at Kilearnan Hill, Sutherland (McIntyre 1998) and the East Rhins of Galloway (Russell-White 1990, 71). At Stoneyburn Farm, Crawford and Lintshie Gutter, both in the Clyde Valley, burnt mounds and platform settlements dating to the late 3rd/mid-2nd millennium BC formed part of an extensive prehistoric landscape that also included burial cairns; burnt mounds were positioned within 240 to 300m of the burial cairns, and within 400m of one of the settlements (Banks 1995 & 1999; Terry 1995; see Appendix 1, Table A1.7). In Glennesslin, Nithsdale, Dumfries and Galloway, 235 burnt mounds survived but only seven hut circles, five of which were within 100 – 150m of burnt mounds; however burnt mounds also occupied the same areas as the historic settlements represented by shielings (RCAHMS 1994). As suggested for Fair Isle (Hunter 1996a, 61; Section 9.5.3), many of these shielings may have been built using stone recycled from prehistoric buildings, leaving only burnt mounds to indicate former prehistoric settlement foci.

9.5.5 Summary

From the foregoing evidence, it is reasonable to conclude that settlement sites are one component of the relict landscapes surviving in the marginal northern zone of Fair Isle, and in some areas are closely associated (within 100m) with burnt mounds (e.g. Ferny Cup: Hunter 1996a, 49-52; Figure 9.4), which also survive in large numbers in the southern cultivated zone (Figure 9.3). It is thus reasonable to suppose that the southern zone was also the

[273] Detailed figures for distances are not published and the accompanying distribution maps are at too small a scale to enable these distances to be accurately assessed (RCAHMS 1993, figs. 4 & 8).

focus of prehistoric settlement and is unlikely to have been ignored in favour of the comparatively inhospitable northern area. The pattern of former associations between structural types is more complex in other areas of Shetland, although in the limited areas where relict landscapes have been examined in detail (e.g. West Burra: Hedges 1984b & 1986; Section 9.5.2) burnt mounds are again closely associated with Bronze Age settlements at distances of 20 – 350m (Table 9.1). While Doughton's (2014, 119-20) observation that only 50% of all burnt mounds in Shetland[274] were within 1,500m of a recorded prehistoric settlement site is presently correct, it is possible that detailed field survey would reveal further sites: as noted (Section 9.5.2) the West Burra survey (Hedges 1984b) saw almost a fivefold increase in the recorded number of prehistoric settlements in an area of 6km^2. In Mainland Scotland burnt mounds appear to survive in association with broadly contemporary settlement sites in relict landscapes (e.g. Blood 1989; RCAHMS 1993 & 1994) but these relationships have not been subject to detailed spatial analysis. In such circumstances, however, Hunter's (1991, 182-3 & 1996a, 61) conclusion that burnt mounds can indicate areas of destroyed (or at best only partially-preserved) Bronze Age settlements is not unreasonable.

9.6 Interrelationships between burnt mounds and other Bronze Age sites in Orkney

9.6.1. Introduction

Burnt mounds, settlement sites and barrows survive in close proximity in Orkney's relict landscapes e.g. Cantick Head, South Walls (Section 5.3) and Spur Ness, Sanday (Section 5.5.1). The question of how burnt mounds functioned together with settlements in Orkney over the course of the Bronze Age is particularly difficult to address because of the limited excavation and radiocarbon dating of both settlement sites and burnt mounds here (Sections

[274] Including Fair Isle.

7.2, 7.4 & 9.1.1). The Links of Noltland, Westray (Moore & Wilson 2011a; Section 7.6.3) is the only settlement site where both a burnt mound and Bronze Age houses, in this case double houses, have been excavated although these elements are as yet imprecisely dated in this ongoing field project (Moore & Wilson 2011a; Hazel Moore pers. comm; Sections 7.3.5 & 7.6.3; Figures 7.6 & 7.7). Available radiocarbon determinations for individual houses and burnt mounds are few (Charts 7.4 & 9.1) but show that burnt mounds may be contemporary with all the currently identified Bronze Age house types in Orkney (Section 7.10).

9.6.2 Site catchment areas

To date, the limited research undertaken does not allow a clear association between burnt mounds and nearby settlement structures to be expressed in distance terms. In the few analyses of burnt mound distributions so far undertaken, the distances used as limits to indicate association between features vary: Doughton (2014, 119-20) used a 1.5km maximum radius (defined as 'local landscape space[275]') to indicate association with a settlement, but 500m as the distance to indicate association with a source of freshwater (ibid, 113-4). Canter (1998) did not define his parameters closely. Ó Néill (2009, 198-9) suggested that 2km might still represent an association. Hedges (1977) used 1km (Section 9.9); others imply that distances of around 100 – 150m indicate a close association (e.g. Blood 1989; Hunter 1996a; Sections 9.5.3 & 9.5.4). Site catchment analysis broadly defines the exploitation territory for hunter-gatherer groups as two hours' walk (c.10km) and for farming communities as around one hours' walk (c.5km) from the site, with the distance traversed on foot depending on the terrain (Higgs & Vita-Finzi 1970 & 1972). Flannery (1976) defined three concentric rings around Mesoamerican villages as indicating areas exploited

[275] Doughton (2014, 119-20) defined local landscape space as 1 – 1,500m following Rennell (2009, 108-10), because 'at this scale people can be recognised' whilst at distances beyond 1,500m 'people are blurry and individuals cannot be identified'. In fact individuals cannot be identified beyond c.200m (USMC 2008; personal observation).

for agriculture (2.5km radius), small game and wild plants (5km radius) and large game, construction materials and exotica (15km radius).

When considering Orkney the landscape creates natural boundaries, especially the coast. A catchment radius of 1.5km (Doughton 2014, 119-20) gives an area of 7km^2, almost exactly the size of Papa Westray, and approximately seven times the area of Eynhallow (Figure 5.3) or Auskerry (Figure 5.4). A 5km radius (e.g. Higgs & Vita-Finzi 1970 & 1972) gives an area of 78 km^2, which is greater than most of Orkney's islands[276] (Table 4.3) and nearly as large as the entire East Mainland. For the purposes of this study, with targets at high density (e.g. the six burnt mounds in Papa Westray: Figure 9.20) large radii seem unlikely to be relevant.

9.6.3 Function and distance

The assignation of a specific distance which might indicate an association is complicated by uncertainty over the function of burnt mounds within Bronze Age society (Section 9.2). The time and/or distance any individual might be prepared to travel to reach the locale of a burnt mound might vary with its function, which, as Barber (1990b, 101) noted, may not be the same for each burnt mound; furthermore an individual burnt mound may have been multi-functional.

Possession of a 'personal' burnt mound might indicate higher social status, with those of lesser status sharing a communal building. Everyday domestic cookery suggests that a burnt mound would be adjacent to the house it served; festival cookery sites might be positioned centrally to a number of houses or settlement foci but perhaps in relation to some special figure or landscape feature. Other utilitarian purposes might result in the burnt mound being close to a house, unless it was a shared utility. Dangerous or

[276] If distances over water are included these must allow for the dangerous currents around Orkney. For example the site catchment area for Eynhallow would theoretically include nearby islands (Figure 5.16); however the tidal races that form here are notoriously treacherous (e.g. Sutcliff 1975, 128) and it is unlikely that crossing them would be routine.

malodorous (e.g. preparing sheepskins) craft specialisations however might be sited further away. Rituals directly related to cremation or burial might imply proximity to funerary sites, or if related to the preparation of the corpse perhaps closer to settlements. 'Saunas' or bathing places might be utilitarian, ritualistic or religious; the latter might include a location adjacent to a priest/shaman's house or might be shared amongst a group, and sited intermediately. It is therefore reasonable to conclude that distances from houses and burial sites to burnt mounds could vary and not necessarily in direct relationship to status.

9.6.4 Quantifiable data

Two excavated Orkney sites provide quantifiable data regarding distances between features and on their possible associations. At the Links of Noltland, Westray (Moore & Wilson 2011a; Section 7.6.3), a burnt mound is positioned around 300m from the associated cemetery, with double houses 150 – 320m to the southeast of the burnt mound (Figure 7.6). It appears to occupy a position peripheral to the settlement but this does not preclude further houses to the north having been lost to coastal erosion, which would alter this perception.

Neither of the burnt mounds in the relict landscape of Tofts Ness, Sanday (Section 5.5.1) has been excavated but the settlement at Mound 11 (Dockrill, Bond et al 2007; Sections 7.3.5 & 7.9) was occupied throughout the Bronze Age, and there are a number of other probable and definite prehistoric settlements nearby. A Bronze Age double house lies adjacent to the burnt mound at Shelly Knowe (Dockrill, Gater & Simpson 2007; Figure 5.9). The 'catchment areas' of the two burnt mounds overlap at a radius of 500m (Figure 9.5).

Although of necessity somewhat arbitrary, the distances used to consider the relationship of burnt mounds with other Bronze Age sites in the remainder of this chapter are up to 100m; 101 – 250m and 251 – 500m; or in terms of gentle walking time, just over a minute, up to three minutes and up to six

minutes respectively. The relict landscapes (discussed in Chapter 5) will first be examined before proceeding to assess the evidence from the rest of Orkney.

9.7 Burnt mounds in Orkney's relict landscapes

Orkney's relict landscapes include several areas where upstanding remains are well-preserved and burnt mounds, definite/probable Bronze Age settlements[277] and Bronze Age funerary sites survive together (Table 5.2), alongside other prehistoric settlements sites, some of which may also be of Bronze Age date. The distances to the nearest burnt mound from each of these sites is shown in Table 9.2 and illustrated in the accompanying Figures (as indicated in Table 9.2).

The figures in Table 9.2 are based on very small samples, but it appears that there is considerable evidence in support of the premise that Bronze Age settlement sites are located in association with burnt mounds, although, with radii up to 500m, perhaps not especially closely. Considering the average of all the relict landscapes in Table 9.2 together, only 14% of definite/probable Bronze Age settlements are within 100m of a burnt mound but a further 43% are within 101 – 250m, however 86% of definite/probable Bronze Age settlements (6/7) are within 500m of a burnt mound. There is a poor correlation of burnt mounds with other prehistoric settlement sites[278] at 100m (only 12%), but this is better at 101 – 250m (a further 35%), whilst a total of 76% (13/17) are within 500m of a burnt mound. The proportional relationship of burnt mounds with barrows in these relict landscapes is similar to that noted for Bronze Age settlement sites, with no barrows within 100m but 50% within 101 – 250m and a total of 80% (24/30) within 500m of a burnt mound.

[277] See Section 5.7, Footnote 107.

[278] 'Other prehistoric settlements' indicates sites that cannot be assigned to period, and may therefore include further Bronze Age sites.

Table 9.2 Numbers and percentages of each site type which are recorded within the indicated distance of a burnt mound in the relict landscapes discussed in Chapter 5. The 250m and 500m radius distances for each burnt mounds are shown in the accompanying figures. 'Other prehistoric settlements' may include further Bronze Age sites: it excludes sites that can be assigned to period e.g. brochs

		Distance bands from each site type to nearest burnt mound, and the percentage of each site within each given distance band.			
Site name and Figure No.	**Site type**	**0 – 100m**	**101 – 250m**	**251 – 500m**	**Total within 500m**
Tofts Ness, Sanday Figure 9.5	Definite/probable Bronze Age Settlements (2 sites)	1 (50%)	0	1 (50%)	2 (100%)
	Barrows (none)	0	0	0	0
	Other prehistoric settlements (4 sites)	1 (25%)	2 (50%)	1 (25%)	4 (100%)
Cantick Head, South Walls Figure 9.6	Definite/probable Bronze Age Settlements (2 sites)	0	1 (50%)	0	1 (50%)
	Barrows (4 sites)	0	1 (25%)	1 (25%)	2 (50%)
	Other prehistoric settlements (none)	0	0	0	0
Eynhallow Figure 9.7	Definite/probable Bronze Age Settlements (1 site[279])	0	1 (100%)	0	1 (100%)
	Barrows (2 sites)	0	0	2 (100%)	2 (100%)
	Other prehistoric settlements (1 site)	1 (100%)	0	0	1 (100%)
Auskerry Figure 9.8	Definite/probable Bronze Age Settlements (1 site)	0	0	1 (100%)	1 (100%)
	Barrows (none)	0	0	0	0
	Other prehistoric settlements (10 sites)	0	2 (20%)	4 (40%)	6 (60%)
Spurness, Sanday Figure 9.9	Definite/probable Bronze Age Settlements (1)	0	1 (100%)	0	1 (100%)
	Barrows (1 site)	0	0	1 (100%)	1 (100%)
	Other prehistoric settlements (2 sites)	0	2 (100%)	0	2 (100%)
Quandale, Rousay, Figure 9.10	Definite/probable Bronze Age Settlements (none)	0	0	0	0
	Barrows (23 sites)	0	14 (61%)	5 (22%)	19 (83%)
	Other prehistoric settlements (none)	0	0	0	0

[279] Either or both of Eynhallow's two prehistoric settlements may be Bronze Age (Section 5.7, Footnote 107); in order to avoid bias it has been assumed that the site furthest from the burnt mound is the probable Bronze Age settlement.

Despite the fact that Orkney's archaeological record is demonstrably a poor reflection of the likely original prehistoric site density (Sections 4.9 & 5.7), which is likely to impact on burnt mound relationships throughout Orkney, zones likely to demonstrate more complete survival of features none the less demonstrate an association between burnt mounds and barrows, and burnt mounds and Bronze Age settlement sites within a 500m radius.

9.7.1 Burnt mounds and prime land

As shown in Table 5.2, the survival of the relict landscapes exhibiting a correlation between burnt mounds and Bronze Age settlement site locations relates to their location in marginal areas or on the fringes of cultivated areas. Hedges' (1975, 77-82) assertion that burnt mounds occupied the best agricultural land was based on two separate maps of Orkney, both at a scale of 1:800,000: one showing burnt mound locations (ibid, fig. 21) and the other showing Orkney's improved land in 1939 (ibid, fig. 22). Both the small scale and lack of superimposition between burnt mound locations and improved land made comparison of the two somewhat challenging. A more reasonable indication of Orkney's prime land may be inferred from the land within the hill-dykes on Mackenzie's (1750) charts (Section 7.15). Table 9.3 below and accompanying Figures show the relationship of burnt mound sites to prime land as defined in this manner.

Table 9.3 Number of sites with burnt mounds situated on the prime land indicated by the townships enclosed by the hill-dykes on Mackenzie's 1750 charts. (Areas from Table 4.3)						
				Sites with burnt mounds inside the 1750 hill-dyke		
Island or Area	**Shown on Figure No.**	**Area of land inside the 1750 hill-dyke (km$^{2)}$**	**Total no. of sites with burnt mounds[280]**	**Number**	**Percentage of total**	**No. of sites with burnt mounds per km^2**
West Mainland	9.11	87.1	73	42	58%	2
East Mainland	9.12	46	23	16	70%	2.87
Hoy & Walls	9.13	16.27	16	10	63%	1.6
Graemsay	9.13	3.99	0	0	N/A	N/A
Flotta	9.13	2.05	1	1	100%	2.05
Fara	9.13	0.41	0	0	N/A	N/A
Burray	9.12	6.63	0	0	N/A	N/A
South Ronaldsay	9.12	19.11	22	20	91%	1
Eday	9.14	4.83	10	8	80%	0.60
Rousay	9.14	12.48	23	20	87%	0.62
Wyre	9.14	1.92	2	1	50%	1.92
Sanday	9.15	17.67	24	20	87%	0.88
North Ronaldsay	9.15	5.13	6	5	83%	1
Shapinsay	9.16	13.49	7	7	100%	1.93
Gairsay	9.16	1.14	1	1	100%	1.14
Stronsay	9.16	21.39	15	14	93%	1.53
Westray	9.14	21.6	18	18	100%	1.2
Papa Westray	9.14	4.8	6	6	100%	0.8
Total/Average		**286km^2**	**247**	**189**	**77%**	**1.5**

Table 9.3 demonstrates that 77% of all sites in Orkney with burnt mounds are located on the prime land thus defined. There are quite wide variations in the average numbers contained by the eighteenth-century dykes, and the Mainland, particularly the West Mainland, generally has a poorer correlation of burnt mounds with prime land than the other islands. Even if this outcome were due to the lack of a recent survey (Section 3.9), the undertaking of which

[280] There are five small islands each with a single burnt mound where no hill-dyke is shown on Mackenzie (1750): Copinsay, Eynhallow, Egilsay, Auskerry and Papa Stronsay.

might theoretically increase the recorded numbers of burnt mounds on the prime land, this would not change the distribution of the 31 sites with burnt mounds located outside the prime land in the West Mainland (Table 9.3), and might also be expected to increase the numbers of burnt mounds recorded in marginal areas[281]. It thus appears that Bronze Age settlement, implied by the presence of burnt mounds, was more widespread throughout Orkney than the historic settlement indicated by the 1750 townships, and this disparity seems particularly marked in the West Mainland. Similarly, when the positions of the 28 known Bronze Age settlements are considered (Table 9.4), only 39% overall are located on the prime land as indicated by the 1750 hill-dykes, with a minimum of 25% in the West Mainland.

Table 9.4 Bronze Age settlement sites on situated on the prime land indicated by the townships enclosed by the hill-dykes on Mackenzie's 1750 charts.

			No. of Bronze Age settlements inside the hill-dyke in land under cultivation in 1750	
Island or Area	**Shown on Figure No.**	**Total no. of Bronze Age settlements**	**No.**	**Percentage**
West Mainland	9.11	8	2	25%
East Mainland	9.12	4	2	50%
Hoy & Walls	9.13	5	4	80%
Holm of Faray	9.14	1	0	0
Sanday	9.15	3	0	0
Westray	9.14	2	2	100%
Papa Westray	9.14	2	1	50%
Linga Holm	9.16	2	0	0
Auskerry	9.16	1	0	0
Total/Average		**28**	**11**	**39%**

This pattern echoes results from areas such as Whaness Burn, Hoy (Section 7.12.2) as well as Peerie Hill (Section 5.2) and the majority of the relict landscapes (Table 5.2); all areas that were outside the hill-dykes in 1750 but

[281] For example three burnt mounds recorded by recent survey in unimproved heathland outside the 1750 hill-dykes at Netherbigging, Sandwick; see nos. 4, 241 and 242 in Appendix 8, Table A8.1 and Figure A8.1.

occupied during the Bronze Age. This pattern may support the hypothesis of population pressure forcing expansion into more marginal areas or, alternatively, some form of social control (see Section 5.9), as well as indicating the scale of losses of Bronze Age settlement evidence within the better land of Orkney.

9.8 Burnt mounds and Bronze Age settlements in Orkney

There have been no notable studies published regarding relationships of burnt mounds with Bronze Age settlement sites in Orkney since Hedges' (1975) paper. As shown in Table 9.2 (above), there is some correlation between burnt mounds and definite/probable Bronze Age settlements sites in Orkney's relict landscapes. Tables 9.5 and 9.6 (below) however show that when all known Bronze Age settlement sites are considered, this correlation is poor: only 36% of all Bronze Age settlement sites (10/28) and 32% of all individual Bronze Age houses[282] (14/44) are within 500m of burnt mounds. Even excluding the 14 houses at Cata Sand (not yet known to be associated with any burnt mound but set in a currently-deflating landscape: Section 5.5.3) as a possible biasing factor, then only 47% of all Bronze Age houses (14/30) are within 500m of a burnt mound.

Double houses are the house type most likely to be associated with burnt mounds: 56% of known cases (9/16) have one within 500m (Table 9.5). Only five examples of oval houses are known, making comparison of numbers statistically suspect, but 60% are within 500m of a burnt mound. In comparison just 9% (2/23) of all other Bronze Age house types (excluding double houses) are within 500m of a burnt mound, or 22% (2/9) if those recently exposed by dune deflation at Cata Sand are also excluded.

[282] In Table 9.6 and the following discussion 'settlement sites' is used to indicate an area of settlement (as explained in Section 5.7, Footnote 107). 'Bronze Age house' refers to an individual recognisable house (that can definitely/probably be identified Bronze Age) e.g. the Links of Noltland (Section 7.6.3) with its minimum of four double houses is counted as one settlement site, but four houses.

Table 9.5 Numbers and percentages of each site type or house type which are within the indicated distance of a burnt mound in Orkney. (Details of Bronze Age settlements shown in Table 9.6 and accompanying Figures; details of other sites and distances in Appendix 13).

	Distance bands from each site or house type to nearest burnt mound, and percentage of each site within given distance band.			
Site or Bronze Age house type	**0 - 100m**	**101-250m**	**251 - 500m**	**Total sites within 500m**
All Bronze Age settlements sites (28 sites)	3 (11%)	2 (7%)	5 (18%)	10 (36%)
Individual houses of all types (minimum 44)	3 (7%)	3 (7%)	8 (18%)	14 (32%)
Individual houses of all types excluding 14 at Cata Sand (minimum 30)	3 (10%)	3 (10%)	8 (27%)	14 (47%)
Individual double houses (16 total)	2 (12%)	3 (19%)	4 (25%)	9 (56%)
Individual oval houses (5 total)	1 (20%)	0	2 (40%)	3 (60%)
Individual houses excluding double and oval houses (23 minimum)	0	0	2 (9%)	2 (9%)
Individual houses excluding double, oval and the 14 houses at Cata Sand (minimum 9)	0	0	2 (22%)	2 (22%)
Barrows (728 total)	8 (1%)	13 (2%)	25 (3%)	46 (6%)
Unobtrusive cists (Section 6.1.2) (98 total; excluding Noltland cemetery)	1 (1%)	6 (6%)	10 (10%)	17 (17%)
All other prehistoric settlements (excluding known Bronze Age and Neolithic sites)	14 (N/A)	44 (N/A)	42 (N/A)	100 (N/A)
As above but excluding those sites in the relict landscapes in Table 9.2	13 (N/A)	35 (N/A)	36 (N/A)	84 (N/A)
As above but also excluding brochs	11 (N/A)	32 (N/A)	29 (N/A)	72 (N/A)
Brochs (135 total)	3 (2%)	12 (9%)	12 (9%)	27 (20%)

Table 9.6 Probable Bronze Age settlements and the house types at each, with the distance to the nearest burnt mound in ascending order. Site numbers are as shown on the accompanying Figures 9.17 – 9.22 Grey shaded sites are those in the relict landscapes discussed in Chapter 5.

Site No.	Figure No.	Site Name	House type	Minimum No. of houses	Approximate distance to nearest Burnt mound	Reference
22	9.21	Shelly Knowe, Sanday	Double house	1	5m	Dockrill, Gater, Simpson et al 2007
8	9.18	Loch of Tankerness	Oval house	1	10m	Lamb 1987, 25, no. 113
4	9.17	Bookan Wasbister, Stenness	Double house	1	100m	Card 2003 & 2005a, 61;
17	9.20	Links of Noltland, Westray	Double house	4	150, 170, 260, 320m	Moore & Wilson 2011a & 2013
14	9.19	Hesti Geo, Cantick Head	Double house	1	230m	Lee & Thomas 2012a, 27-30
23	9.21	Tofts Ness, Sanday	Roundhouse + Indeterminate	2	300m	Dockrill, Bond et al 2007
12	9.19	Braebuster, Hoy	Double house	1	350m	Lee 2012
27		Auskerry	Double house	1	455m	Lamb 1984, 34, no.192
2	9.17	Linna Breck, Birsay	Oval house	1	500m	Øvrevik 1985, 146-9
16	9.19	Rotten Loch, South Walls	Oval house	1	500m	Lamb 1989, 14, no.17
18	9.20	St Boniface Church, Papa Westray	Indeterminate	1	600m	Lowe 1998
11	9.18	Round Howe, St Andrews	Roundhouse	1	700m	Murray 2003
28	9.17	Peerie Hill, Sandwick	Roundhouse	1	700m	Moore 2013, 150-5
15	9.19	Cantick Head, S. Walls	Double house	1	800m	Lamb 1989, 19, no. 52;
24	9.21	Cata Sand, Sanday	Indeterminate	14	1,000m	Cummings et al 2016
5	9.17	Brae of Muckquoy, Redland	Indeterminate	Unknown	1,000m	Richards, Downes et al 2016

Table 9.6 continued						
Site No.	**Figure No.**	**Site Name**	**House type**	**Minimum No. of houses**	**Approximate distance to nearest burnt mound**	**Reference**
9	9.18	Taing of Beeman, Tankerness	Double house	1	1,000m	Lamb 1987, 24, no. 109;
21	9.20	Berstness, Westray	Roundhouses	2	1,000m	Moore & Wilson 2008a & 2009a
6	9.17	Crossiecrown, St. Ola	Indeterminate	1	1,500m	Card et al 2016
7	9.17	Smerquoy, St Ola	Indeterminate	1	1,700m	Gee et al 2016
10	9.18	Site 5, Skaill, Deerness	Double house	1	2,000m	Buteux 1997c
19	9.20	Kraa-Tooies, Papa Westray	Oval house	1	2,200m	Downes 1998c
3	9.17	Nessbreck, Corrigall	N/A: souterrain	Unknown	3,200m	Lee in prep
13	9.19	Whaness Burn, Hoy	Double house	2	3,400m	Lamb 1989, 13, nos. 10 - 14
1	9.17	Point of Buckquoy, Birsay	Indeterminate	Unknown	4,800m	Morris 1989, 71-107
20	9.20	Holm of Faray	Double house	1	None in island	Lamb 1984, 21, no.86
25	9.22	Linga Holm	Double house	1	None in island	Lamb 1984, 34, no. 215
26	9.22	Linga Holm	Oval house	1	None in island	Lamb 1984, 34, no. 212

If burnt mounds are unequivocally associated with Bronze Age settlements and are more likely to have survived than the other structural indications of settlement and use, then every Bronze Age settlement in Orkney might be expected to have a burnt mound nearby, but this is clearly not the case (Table 9.6). However in Orkney's relict landscapes 86% of definite/probable Bronze Age settlement sites are within 500m of a burnt mound (Table 9.2). The surviving relict landscapes may not be representative of the former pattern of burnt mounds and other Bronze Age settlement evidence across Orkney as a whole, but there are no obvious reasons why this should be the case. A number of factors may provide explanations for the apparently 'missing' burnt mounds in the vicinity of the 64% (18/28) of Orkney's recorded Bronze Age settlement sites:

- Lack of recent field survey: this affects around 50% of the land area of Orkney (Section 3.9).
- In surveyed areas, the difficulty of identifying undisturbed burnt mounds in improved grassland or rough heathland/heather: although the burnt stone and black matrix of a burnt mound is obvious if disturbed, if undisturbed they can be to distinguish (e.g. Figure 9.23).
- Limited excavation: excavation of a settlement site only, without associated research on its environs e.g. lack of geophysical or field survey around excavated sites.
- Destruction by coastal erosion: in cases of settlement sites located close to the shore or actively eroding, an associated burnt mound may already have been destroyed.
- Obscuration by landscape changes: for example around settlement sites partially revealed by dune deflation a burnt mound may remain concealed; burnt mounds may be obscured by peat coverage or other factors e.g. modern buildings, even forestry (e.g. Round Howe: Section 7.12.3).

Table 9.7 below presents a synopsis of possible explanations for the absence of a burnt mound at each of the settlement sites in Table 9.6 that lacked a

burnt mound within 500m of its main structure. This shows that theoretically the absence of burnt mounds at all the affected sites may be explained; furthermore that the majority of sites (15/18) have multiple factors that could influence the non-detection/survival of a burnt mound at their locations.

With the exception of Quandale[283], all of the burnt mounds in the relict landscapes (Table 9.2) lie within 250m of either a probable Bronze Age settlement site or a prehistoric settlement site that has not been assigned to period. In the rest of Orkney there are a further 72 recorded unassigned prehistoric settlements within 500m of a burnt mound (Table 9.5). From this, it seems apparent that at least some of these 72 sites may have Bronze Age components.

[283] No settlement sites survive in Quandale as discussed in Section 5.6.

Table 9.7 Factors other than a genuine absence which may influence the lack of a burnt mound in proximity to a Bronze Age Settlement, as listed above. An 'X' in the column indicates that the identified factor applies to that particular site.					
Site Name	**No recent/extensive survey**	**Undisturbed pasture/heath/peat**	**Limited excavation**	**Coastal erosion**	**Other obscuration**
St Boniface, Papa Westray		**X**	**X**	**X**	
Round Howe, St Andrews		**X**	**X**		**X**
Peerie Hill, Sandwick		**X**	N/A		
Cantick Head, S. Walls		**X**	N/A	**X**	
Cata Sand, Sanday				**X**	**X**
Brae of Muckquoy, Redland	**X**	**X**	**X**		
Taing of Beeman, Tankerness		**X**	N/A	**X**	
Berstness, Westray		**X**		**X**	
Crossiecrown, St. Ola	**X**		**X**		
Smerquoy, St Ola	**X**	**X**	**X**		
Site 5, Skaill, Deerness		**X**	**X**	**X**	**X**
Kraa-Tooies, Papa Westray		**X**	N/A		
Nessbreck, Corrigall	**X**	**X**	**X**		
Whaness Burn, Hoy		**X**	N/A		
Point of Buckquoy, Birsay	**X**	**X**	**X**	**X**	
Holm of Faray		**X**	N/A	**X**	
Linga Holm		**X**	N/A	**X**	
Linga Holm		**X**	N/A	**X**	

9.9 Burnt mounds and funerary sites

The relationship between burnt mounds and barrows was examined by Melia Hedges (1977, 144), who accepted (following Hedges, J 1975, 77-82) the view that burnt mounds were themselves domestic houses[284], and suggested that there was a similarity 'beyond the bounds of chance' between the distribution of burnt mounds and that of barrow cemeteries, on the grounds that the latter were the burial places of the people who inhabited the former. Melia Hedges' (1977, 141, fig.7) accompanying distribution map[285] shows however that any association is manifestly weak. A more detailed survey of 14 of these barrow cemeteries with a view to supporting this assertion (Parry 1977) fails to convince: only three cemeteries had a burnt mound within 500m[286], in the other examples there was no burnt mound nearer than 1km. Closer scrutiny shows that only 46/728 of Orkney's recorded barrows (6%) and 17/98 of unobtrusive cists[287] (17%) are within 500m of a burnt mound (Table 9.5). These relatively modest figures suggest that burnt mounds and barrows do not have a particularly close relationship. Parts of the West Mainland (Figure 9.17) and the East Mainland (Figure 9.18) exhibit areas with barrows where burnt mounds appear to be absent and vice versa.

Barrows and burnt mounds appear however to be closely related in Orkney's relict landscapes with 80% of barrows (24/30) located within 500m of a burnt mound (Table 9.2); therefore there may be other factors involved, not least the likely widespread destruction of both types of sites. Both Barry (1805, 94-5) and Thomas (1852, 90) commented on the ubiquity of barrows in all locations throughout Orkney; the Orkney Barrows Project however found that the majority of recorded barrows were sited on hill slopes, ridges, false summits and terraces (Downes 2005, 55-6). This disparity in the barrow

[284] There are now 28 Bronze Age settlements known, of which 46% are within 500m of a funerary site; however 39% are over 1.2km away: see Appendix 13, Table A13.5.

[285] Relying on a broad brush approach rather than detailed analysis: the distribution map in support of this conclusion shows Orkney at a scale of 1:484,000 (Hedges 1977, 141, fig.7).

[286] At 60m, 200m and 500m (Parry 1977).

[287] Excluding the Links of Noltland cemetery as a possible distorting factor.

distribution as reported over 150 years may indicate that the extrapolations from relict landscapes (Section 5.7; Table 5.3) of likely original numbers of such sites prior to later destruction and removal are not an exaggeration[288]. Other factors may have biased the recording of barrows and burnt mounds in some areas, however, for example the antiquarian interest in opening barrows (Section 3.4.2), the failure of the Ordnance Survey in the nineteenth century to record burnt mounds (Section 3.6.1) or any combination of other factors, such as those influencing the record of Bronze Age sites in Burray (Section 4.8) and the poor survival/recording of barrows in the island of Eday as discussed above (Section 5.8).

There is thus only limited circumstantial evidence to suggest a possible direct association between burnt mounds and funerary sites. At Holland, St. Ola (Neil 1981) a group of mounds including both burnt mounds and barrows was disturbed by ploughing. Two cist burials, dated to the 2nd millennium BC (Chart 9.1) were excavated from one of the barrows; the primary cist was set into and sealed by a layer of burnt mound material, interpreted as having been redeposited from one of the nearby burnt mounds (ibid). This could be interpreted as a cist inserted into a pre-existing burnt mound; whether this was significant or simply a fortuitous reuse of a convenient mound is not clear; none of the other nearby mounds were excavated. Similarly, in a barrow at Mousland, Stromness, the basal deposit of cremated bone in the cist was overlain by pyre debris and capped by a closely packed layer of larger pieces of burnt stone, described as 'chips of sandstone similar to those commonly forming burnt mounds' (Downes 1994a, 147 & 151). The presence of 'considerable quantities' of burnt stone mixed with ash and cremated bone within the body of the one of the barrows at the Knowes of Quoyscottie was noted, and other barrows there also contained burnt stone (Hedges 1977, 131-3). The sources of the burnt stone at Mousland and the Knowes of Quoyscottie are unclear, although it may have been brought from burnt

[288] As the speculative figures for the original numbers of both burnt mounds and barrows show (Section 5.7; Table 5.3) recording/survival for barrows may be between 21% – 45% and for burnt mounds from 35% – 43% of original numbers.

mounds elsewhere. The nearest known burnt mounds at Mousland are 1.6km to the east, at Burn of Una (HY21SE36); and 0.8km south of Quoyscottie, at Beaquoy (HY32SW11). If, on the other hand, the stone was burnt as part of the cremation process it must have been deliberately added to the cremation pyre, then retrieved for use in the construction of the mounds. Alternatively the recovery of the burnt stone may indicate that the cremation pyre had been built on an area of bedrock, such that pieces of fractured rock were collected with the cremation pyre debris for deliberate inclusion. Either case might support the attribution of some ritual significance to burnt stone (cf. Doughton 2014, 222-40), but such inclusions of burnt stone within funerary sites have not been reported from other Orkney sites.

9.10 Conclusion

Burnt mounds are demonstrably predominantly of Bronze Age date in the Northern Isles (Section 9.1; Chart 9.1); but their functions, precise dates and significance remain obscure. All of the functions proposed for burnt mounds (Section 9.2) are plausible, and, as Barber (1990b, 101) has noted, there is no reason that all burnt mounds should have fulfilled the same function. The distribution patterns of burnt mounds and funerary sites present apparently contradictory evidence (Section 9.9): contra Hedges (1977, 144) burnt mounds are not widely recorded close to surviving Bronze Age funerary sites when the whole of Orkney is considered (Section 9.8; Table 9.5) but the reverse is none the less true within Orkney's relict landscapes (Section 9.7; Table 9.2; e.g. Figure 9.10) or at sites such as the Links of Noltland (Figure 7.6). It is clear that factors relating to differential survival and recording may have influenced distribution patterns (Section 9.9). If burnt mounds fulfilled a funerary function such as enabling the preparation of the corpse for burial through its ritual cleansing, this could have been carried out either close to the deceased's residence, at a communal site, or close to the site of burial, thus allowing the burnt mound to have been situated in a variety of different locations. Alternative functions related to hide processing, bathing, brewing or cooking might each present different imperatives for the location of that

activity and none lends itself readily to identification archaeologically.

The persistence of burnt mounds throughout the Bronze Age suggests they played a significant and integral role in Bronze Age society, and, as noted by Ó Néill (2009, 201) 'a large proportion of the contemporary population must have been reasonably familiar with the activities that took place there'. Chronological uncertainties hinder discussion of the role that burnt mounds played in relationship to settlement sites: on current evidence they may have functioned alongside all of Orkney's identified Bronze Age houses types (Charts 7.4 & 9.1), although double houses are more likely than other houses to be associated with a burnt mound within 500m (Table 9.5).

Function is likely to have influenced location in terms of distances from settlement sites; some burnt mounds appear to be linked to single houses, whereas others suggest either communal roles or a function which required, whether for ritual or practical reasons, the burnt mounds to be situated at a greater distance from domestic structures. Neither the appearance of burnt mounds in the Early Bronze Age nor their apparent decline at the end of the Bronze Age can be definitely linked to any Bronze Age specific, archaeologically detectable, pragmatic function (Section 9.4) nor to specific environmental changes (Section 2.2). The most significant (archaeologically detectable) cultural differences during this period are changes in funerary practices (Section 6.2.2), and it is possible that burnt mounds fulfilled a ritual purpose relating to Bronze Age funerary rites – whether relating to the preparation of the corpse or even the ritual bathing of the mourners – which then declined with the changing rites of the Iron Age (Section 9.4). Limited support for this suggestion may come from the burnt stones included in some Bronze Age burial contexts (Section 9.9), which may have ritual significance (cf. Doughton 2014, 222-40).

In the relict landscapes of both Orkney (Section 9.7) and Shetland (e.g. West Burra: Hedges 1984b; Section 9.5.2; Fair Isle: Hunter 1996a; Section 9.5.3) a relationship between burnt mounds and definite/probable Bronze Age settlement sites may be identified, with burnt mounds typically sited within

250m – 500m of settlement sites. This association also appears likely to hold true in some parts at least of mainland Scotland (Section 9.5.4), perhaps indicating a broad commonality of locational preferences in which reasonable proximity or convenience of access was desirable.

Ratios of burnt mounds to individual houses vary in the relict landscapes of both Orkney (Table 5.3) and Shetland; from one burnt mound to one Bronze Age house (e.g. Shelly Knowe, Sanday: Dockrill, Gater & Simpson 2007); the Loch of Tankerness (Lamb 1987, 25, no. 113); the Ferny Cup, Fair Isle (Hunter 1996a, 49-52; Section 9.5.3) and several of the West Burra, Shetland sites (Hedges 1984b & 1986; Section 9.5.2; Table 9.1), to at least four houses associated with one burnt mound e.g. the Links of Noltland (Moore & Wilson 2011a; Section 7.6.3) and some of the other sites in West Burra (Hedges 1984b; Table 9.1). This variation may be linked to localised social factors, possibly suggesting that the possession of a personal/individual burnt mound might have been indicative of status.

Where recorded Bronze Age settlements are not obviously associated with any burnt mound (Section 9.8; Table 9.6), there are possible reasons for this absence which can be related to aberrations in their survival and/or in archaeological recording strategies (Table 9.7). A genuine absence of a burnt mound near a given broadly-contemporary settlement could be related to the status, ambitions or occupation of the houses' inhabitants. Wholesale destruction of sites during the course of agricultural improvement (Chapter 4) is readily apparent from surviving distributional evidence, and the speculative extrapolations (Section 5.7) suggesting that only around 2 – 3% of Orkney's original Bronze Age settlements survive are plausible. Burnt mounds survive located preferentially on areas of prime land (as indicated by the 1750 hill-dykes) (Section 9.7.1; Table 9.3 and associated Figures): those areas that have been historically settled recurrently and consequently subjected to the earliest and most intense agricultural improvement, with concomitant site destruction. The survivability of burnt mounds in an improved landscape (e.g. Barber & Russell-White, 1990a; Hunter 1991 & 1996a) is borne out by the contrast between the results from the selected

relict landscapes and those from the wider Orkney landscape (Sections 9.7 & 9.8). Even if the majority of currently recorded Bronze Age settlements in Orkney genuinely lacked a burnt mound (Section 9.8), it nevertheless remains possible that every burnt mound in Orkney indicates the unrecognised or former presence of a Bronze Age settlement site placed within no more than 500m of it (see Section 9.7).

Chapter 10 Conclusion

10.1 Introduction

This thesis set out to address the question of whether Orkney's Bronze Age was impoverished in terms of its field evidence and artefactual records relative to neighbouring areas; or had a poor archaeological record as a result of either relative neglect by archaeologists or particular attrition to the evidence through subsequent land use. In doing so it provides the first comprehensive synthesis of the Orcadian Bronze Age.

All forms of surviving archaeological evidence recognized to date have been reassessed, including excavated settlements, burnt mounds, burials, land boundaries and artefacts. A review of the formation processes of the archaeological record in Orkney has been undertaken, and a number of biases have been identified. I have conducted the first thorough investigation of the impact of post-medieval agricultural practices on the survival of Orkney's archaeological sites. In particular, areas of relict landscapes with good survival of Bronze Age features have been identified and examined for insights into projected original site densities, with the results then extrapolated to the whole of Orkney. The significance of burnt mounds and their relationships with other Bronze Age sites has been examined, and their potential as proxies for the location of destroyed Bronze Age settlements has been explored for the first time in an Orcadian context.

10.2 Results

The formation processes of the archaeological record in Orkney have been found to be subject to a set of reinforcing biases.

- Prior to the 1878 – 80 surveys for the 1st edition OS maps (Section 3.6) coherent records are more or less completely lacking for large areas of Orkney, a period that saw the commencement of intensive agricultural

improvement and concomitant destruction of archaeological sites (Section 4.3 & 4.4).

- Biases persist, relating to the idiosyncratic recording of archaeological monuments during the surveys for the 1st edition OS maps; the work of the RCAMS (1946) perpetuated gaps in coverage in some areas, simply because no sites had been recorded there by the Ordnance Survey (Section 3.7.1).
- While some areas have seen more recent survey, around 50% of Orkney has not been systematically archaeologically surveyed since the surveys for the Orkney *Inventory* (RCAMS 1946) in the 1920s – 30s (Section 3.8.1).
- Prior to the last decades of the twentieth century archaeological records were made on an ad hoc basis. The antiquarian preference for opening impressive mounds led to a disproportionate concentration on brochs and chambered tombs, whilst the majority of sites, including many that are likely to have been Bronze Age, were removed without record (e.g. Petrie 1866c, 216; Sections 3.9 & 4.4.6).

This research has demonstrated that, contrary to implicit assumption, although *some* archaeological sites in Orkney have survived in an excellent state of preservation not *all* archaeological sites have done so. It thus follows that:

- Current distribution is not an accurate reflection of past distribution and does not directly indicate the original density of such sites.
- As I have shown in Chapter 4, destruction of archaeological sites took place, largely unrecorded, on – in figurative terms – an industrial scale throughout Orkney.
- The scale and thoroughness of agricultural improvements from the early-mid nineteenth century onwards (e.g. Smith 1843, 18) and their effects on archaeological survival have not hitherto been properly appreciated or understood by the archaeological community (Section 4.4).

- Through failing to engage with the mechanisms of this destruction the archaeological community has also failed to appreciate its impact on the archaeological record.
- Antiquarian accounts (e.g. Barry 1805, 94-5; Davidson & Henshall 1989, 15; Petrie 1866c, 225; Thomas 1852, 90 & 122) and agricultural records (e.g. O'Dell 1939; Farrall 1874; Shirreff 1814) provide corroboration for both the pre-improvement ubiquity of archaeological monuments and the speed and scale of destruction broadly contemporary with those accounts (Sections 4.4 & 4.9).
- This research has further shown that there are areas where exceptionally catastrophic unrecorded destruction has taken place, influenced by locally specific factors e.g. in the islands of Burray (Section 4.8) and Eday (Section 5.8).

This highlights the dangers of considering modern site distribution to be an accurate reflection of prehistoric distribution. I would suggest that the word 'distribution' should never be employed in an archaeological context in Orkney (or indeed elsewhere) without the qualifying prefix 'surviving'; or, perhaps more accurately (in the light of Chapter 3), as 'recorded surviving'.

This research has also shown that despite the large scale destruction of sites during agricultural improvements there are small pockets of survival where Bronze Age relict landscapes may be examined for clues as to original site densities (Chapter 5). Survival here can be attributed to their marginal locations and lack of intensive exploitation by man in the post-medieval period.

Key characteristics of Orcadian relict landscapes include:

- The majority are located outside the prime settlement areas (defined by the townships enclosed by the hill-dykes depicted on Mackenzie's (1750) charts: Table 5.2).
- All of these more marginal locations (e.g. the Tofts Ness peninsula: Section 5.5.1; Auskerry: Section 5.4) were densely occupied during the

Bronze Age, suggesting a concomitant high density of occupation in more amenable locations.

- Speculative extrapolations of original Bronze Age site densities across Orkney based on the numbers of sites identified within these relict landscapes (Table 5.3) support the findings of Chapter 4 regarding the scale of destruction. Only around 2 – 3% of Bronze Age settlement sites, perhaps 21 – 45% of barrows and 35 – 43% of burnt mounds are likely to have been recorded as a maximum: the large numbers of the latter two sites surviving in some of the relict landscapes (e.g. Quandale: Table 5.3, row 7) hints at much poorer survival elsewhere.

Burial-related evidence was examined and summarised in light of the change in burial rites over the course of the 3rd millennium BC; the limited artefactual assemblage was examined to discover any indications in the surviving burial record of social stratification and the implications.

Key characteristics of Bronze Age burials may be summarized as follows:

- Reusable cists may represent a transitional form (Section 6.2).
- Chambered tombs continued to attract sporadic attention in the Chalcolithic/Early Bronze Age (Section 6.2.1). This reuse may suggest that a memory of their earlier significance was preserved and that links with the past were important; conversely it may be a pragmatic appropriation of a convenient tomb, mound or location.
- At Taversoe Tuick, the destructive remodelling of the upper chamber in the Early Bronze Age contrasts with the apparently respectful use of the passageway to the undisturbed lower chamber as (in effect) a reusable cist (Section 6.2.3). This may imply some change in attitudes.

There was a rejection of interment in the types of funerary urn common in mainland Scotland in favour of steatite burial urns (Sheridan 2007a, 172; Section 6.3.4).

- This hints at a regional trajectory emphasising links with Shetland in preference to other influences.

Indications exist in the surviving burial record of wealth or social stratification, if not necessarily of the presence of social or political hierarchies.

- There is a marked contrast between the few burial sites with exotic grave goods indicative of prestige or high status, notably the gold and amber from the burial within Barrow 1 at the Knowes of Trotty (Sheridan et al 2003; Section 6.3.1) (which merits comparison with the rich burials of the Wessex region) and the majority of burials, which are unaccompanied.
- There may be selectivity in the individuals interred in mounds or other prominent locations (e.g. the large mounds surrounding the Ring of Brodgar: Section 6.1.4), related to status differences.

There is a notable dearth of metalwork, with only ten pieces securely provenanced to Orkney spread throughout the whole of the Bronze Age (Section 6.3.3); the majority (seven out of ten) were votive deposits recovered from peat bogs.

- This total includes several items that are rare elsewhere, notably the Heathery Howes dagger (Cursiter 1887, 340; Figure 6.9b), with its links to rich burials in the South of England/Wessex area (Gerloff 1975, 70-3). The high number of prestige items in Orkney's small collection of metalwork (five out of ten provenanced pieces: Section 6.3.3) suggests that some sections of society participated in wider trends.
- Explanations for this paucity/status dichotomy may lie in the lack of evidence for, or recovery of, votive deposits from watery locations both in and around Orkney. Such deposits may exist undiscovered, most obviously in the major lochs adjoining the Brodgar peninsula (a

Neolithic focus that remained important for Bronze Age funerary and settlement activity: Section 4.2.4 & 6.1.4), and in the sea.

- Limited utilitarian uses for metal woodworking tools in a largely treeless environment may have hindered the large-scale adoption of such technology.

The evidence in support of the current paradigm of the 'fragmentation' of society at the end of the Neolithic (e.g. Richards 1998, 531; Richards, Downes et al 2016, 243-6) is equivocal. Salient evidence includes:

- Based on the excavated evidence (Chart 7.1; Table 7.2) the most significant dislocation in the Orcadian Neolithic takes place in the late 4th/early 3rd millennium cal BC (Section 7.3.6), broadly synchronous with the end of the main phase of burial activity at Neolithic chambered tombs (Section 6.2.1), some centuries before the end of the Neolithic in the islands.
- Dislocation identified at some sites in the mid-late 3rd millennium BC may be environmentally related (e.g. aeolian erosion at Skara Brae: Section 7.3.3) and may thus not be directly pertinent to socio-political concerns.
- Broadly similar numbers of sites exhibit continuity as exhibit discontinuity over the late 3rd/early 2nd millennium cal BC, across the period for which fragmentation is claimed (Section 7.3.5; Chart 7.2).
- There is scope at some apparently abandoned Neolithic settlements for undetected shifts in occupation during the Early Bronze Age (e.g. the large unexcavated settlement focus at Pool, Sanday: Hunter 2007c, 16; Section 7.3.2), such that the apparent abandonment may be an artefact of the excavation strategy.
- Continuity at sites in marginal locations (e.g. Tofts Ness: Dockrill, Bond et al 2007) contrasts with apparent discontinuity at the high-status ceremonial complex at the Ness of Brodgar (Card et al 2017; Section 7.3.4), suggesting that all levels of society were not equally affected by such changes as did take place.

Meaningful discussion of the form and extent of Bronze Age settlement patterns and the development of domestic structures is inhibited by the paucity of published excavated settlement sites and concomitant lack of radiocarbon dates. This makes it difficult to refer to 'the Bronze Age' as anything other than a unitary period (Section 7.2).

As a result, at the present time:

- The identified Bronze Age house types – the double, oval and roundhouse – could all have co-existed (Chart 7.4).
- The double house is securely attributable to the Bronze Age (Section 7.7) but not closely dated in either Orkney or Shetland; it may be tentatively suggested that the adoption of this form in Orkney is a transplant of a Shetlandic structural form into Orkney soil (Section 7.8.1 & 7.8.2).
- There is evidence to support the introduction of roundhouses by the Late Bronze Age (Section 7.9); and possibly (albeit very tentatively) by the Middle Bronze Age at Round Howe, which may have been constructed prior to c.1380 – 1120 cal BC (Section 7.12.3).

There are hints that Orkney was not isolated from the trend towards enclosure occurring elsewhere in Britain during the Middle/Late Bronze Age (Section 7.14).

- Enclosed settlements may develop by the early/mid-2nd millennium BC.
- The large (possibly palisaded) enclosed settlement at Whaness Burn A, occupation of which is loosely associated with a radiocarbon date of c.1720 – 1170 cal BC (Section 7.12.2), suggests defence may have been a consideration by this period. Round Howe, Tankerness may represent a Middle Bronze Age example of defended roundhouse (Section 7.12.3).
- Promontory forts (Section 7.13) remain enigmatic and cannot be definitively assigned to period in the absence of excavation.

High-status settlement sites are conspicuous by their absence in the Orcadian Bronze Age.

- It may be suggested however that the prime settlement locations occupied by Orkney's 135 Iron Age brochs (Section 7.15; Table 7.6) would not have been overlooked in the Bronze Age, especially given the contemporary occupation of a wide range of marginal landscapes, as evidenced by the relict landscapes discussed in Chapter 5. Limited excavation hinders detailed discussion here; Bronze Age occupation may be suggested at some sites and can be demonstrated at a restricted number of others (e.g. St Boniface Church: Lowe 1998).
- The securely dated Early Bronze Age souterrain at Nessbreck, Corrigall (Section 7.11), a form that continued into at least the Middle Iron Age (e.g. Hedges 1987a, 25-9), lends some support to the suggestion of continuity of settlement at some locations, and the use of some categories of site over more extended timespans than is usually envisaged.

The foundation of successful subsistence practices in Bronze Age Orkney was the anthropogenic creation of deep fertile soils, which enabled the viability of settlements from the 3rd to the 2nd millennium BC and beyond (Section 8.2).

- The considerable effort expended by the Bronze Age populations of areas such as Tofts Ness (Dockrill 2007b; Dockrill & Bond 2009) and the Links of Noltland (Hamlet 2014; McKenna & Simpson 2011) to ensure the successful continuation of agriculture in these marginal locations provides circumstantial support to the premise that Bronze Age settlement in Orkney had spread beyond the prime settlement areas. Similalry only 39% of all recorded Bronze Age settlement sites are located on the prime historically settled land inside the 1750 hill-dykes (Table 9.4).
- The most obvious explanation for this exploitation of marginal areas is population pressure, but the pattern of landscape use could have been caused by social organisation, with access to the prime settlement

areas subject to some form of control (Section 5.9).The development of Iron Age competitive elites in the Northern Isles (cf. Dockrill & Bond 2015b, 493-7; Sharples 1984, 121-2; Section 7.15) may therefore have had earlier origins.

Sub-peat dykes and enclosures (Section 8.4) provide circumstantial evidence that Bronze Age settlement was widespread, although chronological data is largely absent.

- Management of the landscape by its subdivision with recognized boundaries was therefore important.
- Treb dykes (Section 8.5), whilst almost certainly prehistoric, cannot, *contra* Lamb (1983a), be attributed to the Bronze Age on the available evidence and are reinterpreted here as probably largely Iron Age, perhaps associated with broch territories, although this does not necessarily preclude their earlier development in some instances (cf. Section 7.15).

Burnt mounds are demonstrably Bronze Age in the Northern Isles (*contra* Anthony 2003; Section 9.1.1). Key points to be drawn from the record of burnt mounds include:

- On the limited available chronological evidence, they may have functioned alongside all of Orkney's identified Bronze Age house types (Section 7.10; Charts 7.4 & 9.1); although tentatively a closer link with double houses may be posited (Table 9.5).
- Their apparent persistence and ubiquity throughout the Bronze Age suggests they were an inextricable part of the pattern of site use that underpinned society.
- Their appearance and duration, corresponding with changing funerary practices at the beginning and end of the Bronze Age, may suggest they fulfilled a ritual or religious function, perhaps relating to the preparation of the corpse for burial or ritual bathing of the mourners, rather than a purely utilitarian one.

Burnt mounds may have fulfilled many other functions which need not have been mutually exclusive; the function of particular examples is likely to have influenced their location in terms of distances from settlement sites (Sections 9.2 & 9.6.3).

- Some burnt mounds appear to be linked to single houses.
- Others suggest either communal roles or a function that required, whether for ritual or practical reasons, the burnt mounds to be situated at a greater distance from domestic structures.

A relationship between the location of barrows and burnt mounds appears to exist in the relict landscapes of Orkney (Chapter 5).

- A total of 80% of barrows (24/30 examples) are located within 500m of a burnt mound in the relict landscapes (Section 9.7; Table 9.2).
- The incorporation of burnt stones into some burial contexts (e.g. Downes 1994a; Neil 1981; Section 9.9) provides limited circumstantial evidence of a direct association between burnt mounds and funeral rites.

In the wider Orkney landscape, however, this relationship between burnt mounds and funerary sites cannot be demonstrated.

- Only 6% of barrows overall are located within 500m of a burnt mound in the wider landscape (Section 9.9).
- This is likely to relate to issues of differential survival/recording of different classes of site, particularly in light of antiquarian reports which recount the ubiquity of barrows in all locations throughout Orkney (e.g. Barry 1805, 94-5; Thomas 1852, 90; Section 4.9).

Similarly, a relationship between Bronze Age settlement sites and burnt mounds exists in Orkney's relict landscapes:

- The majority (86%) of identified definite/probable Bronze Age settlement sites in Orkney's relict landscapes are located within 500m of a recorded burnt mound (Section 9.7; Table 9.2).

This relationship cannot be demonstrated elsewhere in Orkney:

- Overall 64% (18/28) of Orkney's recorded Bronze Age settlement sites do not have a burnt mound within 500m of them (Section 9.8; Table 9.6).
- Explanations for this dichotomy were advanced under five headings (see Table 9.7) including e.g. differential survival, lack of survey and identification issues; it was found that at least one of these factors was applicable at all 18 of the settlement sites which lacked a burnt mound, and that at 15 of the 18 sites multiple factors may have influenced the lack of, or the failure (to date) to detect, a burnt mound within 500m.

It nonetheless remains possible that the presence of a burnt mound in Orkney can be used as a proxy to indicate the past presence of a Bronze Age settlement site within 500m. This is not unreasonable since, as noted above, speculative extrapolations (Section 5.7) suggesting that only around 2 – 3% of Orkney's original Bronze Age settlements survive are plausible.

10.3 Areas for further research

It has become apparent during the course of the research conducted for this thesis that there is a limited data set on which to base analyses, and poor chronological resolution, especially relating to non-funerary aspects of the Orcadian Bronze Age. In improving both these circumstances, the ongoing excavation at the Links of Noltland, Westray (Moore & Wilson 2011a; Section 7.6.3) is exceptionally important and its publication may have the potential to elucidate a number of questions regarding the Neolithic/Chalcolithic/Bronze Age transition, the development and chronology of Bronze Age structural forms and the role(s) of burnt mounds within a settlement.

There are several areas where targeted survey supplemented by research excavation would be particularly beneficial. The enclosed settlement at Whaness Burn, Hoy (Section 7.12.2), should be a high priority for further research; not least to resolve the question of the possible appearance of enclosed and potentially defended settlement sites prior to the Orcadian Iron Age. A similar case could be made for the excavation of one of Orkney's promontory forts, particularly perhaps Nether Bigging (Section 7.13.3). Lidar survey might also disclose whether such sites are more widespread than they appear.

Treb dykes (Section 8.5) remain enigmatic. The surviving examples are increasingly reduced by agricultural activities. With the passage of time the opportunity for clarification of their chronology and function diminishes: their complete destruction without record threatens unless one of the better-preserved examples is selected for excavation, particularly aimed at recovering dating evidence from it. Aerial survey might help to disclose the locations and courses of the examples that have been lost unrecorded.

Sub-peat dykes have been identified in many areas of Orkney (Section 8.4) but not systematically recorded. A comprehensive survey and small-scale excavations aimed at recovering samples for radiocarbon dating and environmental reconstruction would elucidate their nature.

The well-preserved Dyke of Sean, Stenness (Section 8.6; Figure 8.14) lacks dating evidence that might place it in context in relation to the numerous sites of the Brodgar peninsula, including the Ring of Brodgar and its associated Bronze Age funerary landscape (6.1.4). In particular its relationship or otherwise with the nearby extensive (5ha) Wasbister Bronze Age settlement (Section 4.2.4) requires clarification by excavation.

The question of the 'missing' high-status settlement sites, particularly those that may be obscured by later structures such as brochs (Section 7.15), might be resolved by targeted recording and sampling of coastally eroding broch sites. Precisely this approach has been previously proposed as a cost-effective

response to the destruction of deeply-stratified extensive sites by coastal erosion by Lowe (1998, 209) following his work at St Boniface Church, Papa Westray but this has seen only very limited implementation (e.g. Dockrill et al 2010 & 2011).

10.4 Conclusion

This thesis has demonstrated that Orkney had significant Bronze Age settlement and associated activity but that comparatively few sites have been excavated and/or published. This, together with the monumentality of some Orcadian Neolithic and Iron Age remains, makes the Bronze Age sites appear trivial in comparison.

The luminosity of the Orcadian Neolithic (Barclay 2001) casts a long shadow from which the Bronze Age of the islands struggles to emerge. Arguably, this has led to an overemphasis on investigations of spectacular sites such as the Ness of Brodgar. There is no doubt that such deeply stratified remains can be highly informative but less well-understood periods and their interfaces also require greater research. Orkney possesses great resources for archaeological investigation but while research projects target ostentatious remains, the Bronze Age is destined to relative obscurity. As this thesis has shown, however, it was a period neither of unrelenting raininess nor incessant inactivity.

Bibliography

Abercromby, J 1902 The Oldest Bronze-Age Ceramic Type in Britain; its Close Analogies on the Rhine; its Probable Origin in Central Europe *Journal of the Anthropological Institute of Great Britain and Ireland*, 32, 373 – 97

Abercromby, J 1904 A Proposed Chronological Arrangement of the Drinking-Cup or Beaker Class of Fictilia in Britain *Proceedings of the Society of Antiquaries of Scotland* 38, 323 – 410

Abercromby, J 1912 *A study of the Bronze Age pottery of Britain and Ireland and its associated grave goods* Oxford: Clarendon Press (2 volumes)

Abernethy, D 1998 Kilmartin Glen (Kilmichael Glassary Parish) Cist/Cup marks; burnt mound *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 20

Abbott, J T & Frederick, C D 1990 Proton magnetometer investigations of burnt rock middens in West-Central Texas – clues to formation processes *Journal of Archaeological Science* 17, 535 – 45

Aberdeen, W 1769 A chart of the Orkney Islands (no publication details)

Adair, J 1682 The Mappe of Orkney with the harbours and Islands (no publication details)

Aitken, R, Reay, D & Strickland, J 2015 Kirkwall Health Campus, New Scapa Road, Evaluation *Discovery and Excavation in Scotland*, New Series Vol 16, Council for Scottish Archaeology, 129 – 30

Aitken, R & Somerville, L 2014 Towerhill Watching brief *Discovery and Excavation in Scotland*, New Series Vol 15, Council for Scottish Archaeology, 147

Akerman, J Y 1847 An Archaeological Index to Remains of Antiquity of the Celtic, Romano-British and Anglo-Saxon Periods London: John Russell Smith

Aldhouse-Green, M J 2004 *An archaeology of images: iconology and cosmology in Iron Age and Roman Europe* London: Routledge

Alexander, J 1982 The prehistoric salt trade in Europe *Nature* 300, 577 – 8

Alison, J 1927 Parish of Holme *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 17 – 25

Allan, A, Rault, J & Humble, J 2011 Barrow 1 *in* Harding, J & Healy, F (eds) *The Raunds Area Project A Neolithic and Bronze Age Landscape in Northamptonshire Volume 2 Supplementary Studies* Swindon: English Heritage, 158 – 184

Alldritt, D 2007 Identification and Analysis of Carbonized Plant Remains *in* Sharman, P *Excavation of a Bronze Age funerary site at Loth Road, Sanday, Orkney* Scottish Archaeological Internet Report 25, www.sair.org.uk, 14 – 15

Allen, C & Hopkins, D 2000 Bronze Age Accessory Cups from Lincolnshire: Early Bronze Age Pot? *Proceedings of the Prehistoric Society* 66, 297 – 317

Allen, M J, Gardiner, J & Sheridan, A 2012 Editors' preface *in* Allen, M J, Gardiner, J & Sheridan, A (eds) *Is there a British Chalcolithic? People, place and polity in the late 3rd millennium* Oxford: The Prehistoric Society/Oxbow Books (Prehistoric Society Research Paper no. 4), xxiv – xxvi

Ambers, J 1994 Stable Carbon Isotope Values for Tofts Ness, section 13.4, pp125 – 129 *in* Dockrill, S J, Bond, J M, Milles, A, Simpson, I & Ambers, J Tofts Ness, Sanday, Orkney. An integrated study of a buried Orcadian landscape *in* Luff, R & Rowley-Conway, P (eds) *Whither Environmental Archaeology?* Oxford: Oxbow Books Monograph 38, 115 – 32

Ambers, J 2007 Chapter 5 Radiocarbon analysis for Tofts Ness *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 143 – 52

Amesbury, M J, Charman, D J, Fyfe, R M, Langdon, P G & West, S 2008 Bronze Age upland settlement decline in southwest England: testing the climate change hypothesis *Journal of Archaeological Science* 35, 87 – 98

Andersen, P S 1988 The Orkney Church of the Twelfth and Thirteenth Centuries – a stepdaughter of the Norwegian Church? In Crawford, B E (ed) St. Magnus Cathedral and Orkney's Twelfth Century Renaissance Aberdeen: Aberdeen University Press, 56 – 68

Anderson, A O 1922 *Early Sources of Scottish History AD 500 to 1286* Edinburgh & London: Oliver & Boyd, 2 volumes

Anderson, A O & Anderson, M O 1961 (eds) *Adomnan's Life of Columba* London: Thomas Nelson & Sons Ltd

Anderson, D E 1998 A reconstruction of Holocene climatic changes from peat bogs in north-west Scotland *Boreas* 27, 208 – 24

Anderson, D E, Binney, H A & Smith, M A 1998 Evidence for abrupt climate change in northern Scotland between 3900 and 3500 calendar years BP *The Holocene* 8 (1), 97 – 103

Anderson, J 1845 Parish of Orphir *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy*, *Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 13 – 26 of the Orkney section (volume not continuously numbered)

Anderson, J 1872 Notice on the excavation of 'Kenny's Cairn' on the Hill of Bruan; Carn Righ, near Yarhouse; The Warth Hill Cairn, Duncansbay; and several smaller sepulchral cairns in Caithness *Proceedings of the Society of Antiquaries of Scotland* 9, 292 – 6

Anderson, J (ed) 1873 *The Orkneyinga Saga translated from the Icelandic by Jon A Hjaltalin & Gilbert Goudie* Edinburgh: Edmonston & Douglas

Anderson, J 1874 Notice of the Excavation of the Brochs of Yarhouse, Brounaben, Bowermadden, Old Stirkoke, and Dunbeath, in Caithness, with Remarks on the Period of the Brochs; and an Appendix, containing a Collected List of the Brochs of Scotland, and Early Notices of many of them *Archaeologia Scotica Transactions of the Society of Antiquaries of Scotland* 5, part I, 131 – 98

Anderson, J 1878 Notes on the Character and Contents of a large Sepulchral Cairn of the Bronze Age at Collessie, Fife, excavated by William Wallace, Esq., of Newton of Collessie, in August 1876 and 1877 *Proceedings of the Society of Antiquaries of Scotland* 12, 439 – 61

Anderson, J 1879 Notice of a remarkable find of bronze swords and other bronze articles in Edinburgh; with notes on bronze swords found in Scotland *Proceedings of the Society of Antiquaries of Scotland* 13, 320 – 33

Anderson, J 1881 *Scotland in Early Christian Times The Rhind Lectures in Archaeology for 1879* Edinburgh: David Douglas

Anderson, J 1883 *Scotland in Pagan Times The Iron Age The Rhind Lectures in Archaeology for 1881* Edinburgh: David Douglas

Anderson, J 1886 *Scotland in Pagan Times The Bronze and Stone Ages The Rhind Lectures in Archaeology for 1882* Edinburgh: David Douglas

Anderson, J 1893 Notice of a bronze sword, with handle plates of horn, found at Aird, in the island of Lewis *Proceedings of the Society of Antiquaries of Scotland* 27, 38 – 41

Anderson, J 1901 Notices of Nine Brochs along the Caithness coast from Keiss Bay to Skirza head, excavated by Sir Francis Tress Barry, Bart., MP, of Keiss Castle, Caithness *Proceedings of the Society of Antiquaries of Scotland* 35, 112 – 53

Anderson, J 1911 Notice of a hoard of bronze implements recently found in Lewis *Proceedings of the Society of Antiquaries of Scotland* 45, 27 – 46

Anderson, J 1927 United Parishes of Stronsay and Eday *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 294 – 331

Anderson, P 1992 *Black Patie The Life and Times of Patrick Stewart Earl of Orkney Lord of Shetland* Edinburgh: John Donald Publishers Ltd

Anderson-Whymark, H, Chatterton, R, Edmonds, M & Wickham-Jones, C 2016 Flaked Lithic Artefacts from Neolithic Sites around the Bay of Firth: Wideford Hill, Knowes of Trotty, Brae of Smerquoy, Stonehall, Crossiecrown and Ramberyy *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 413 – 44

Annable, F K & Simpson, D D A 1964 *Guide Catalogue of the Neolithic and Bronze Age Collections in Devizes Museum* Devizes: Wiltshire Archaeological and Natural History Society

Anon 1818 Intelligence from Various Parts of the Country *Gentleman's Magazine* September 1818, 270 – 2

Anon 1831 Narrative of Human Remains, a comb, & Co. which were dug out of the Burgh (or circular fort) of Burgar, in the Parish of Evie, Orkney, Communicated by A. Peterkin, Esq. in a letter to Dr. Hibbert, of which the following is an abstract *Archaeologia Scotica Transactions of the Society of Antiquaries of Scotland* 3, 44 – 5

Anon 1854 Meeting of May 9th 1853 Donations laid on the table *Proceedings of the Society of Antiquaries of Scotland* 1, 180 – 1

Anon 1860a Meeting of 10th January 1859 Donations *Proceedings of the Society of Antiquaries of Scotland* 3, 182 – 4 (includes Pl. XXII)

Anon 1860b Meeting of 2nd July 1860 Donations to the Museum *Proceedings of the Society of Antiquaries of Scotland*, 3, 480 – 9

Anon 1862 Meeting of the 8th April 1861 Donations to the Museum *Proceedings of the Society of Antiquaries of Scotland* 4, 185 – 8

Anon 1864a Meeting of the 12th January 1863 Donations to the museum & library *Proceedings of the Society of Antiquaries of Scotland* 5, 8 – 19 & plate I facing page 19

Anon 1864b Meeting of the 11th April 1864 Donations to the museum & library *Proceedings of the Society of Antiquaries of Scotland* 5, 300 – 03

Anon 1866a Tuesday 31st January 1865 Donations to the museum *Proceedings of the Society of Antiquaries of Scotland* 6, 41 – 8

Anon 1866b Meeting of 9th April 1866 Donations to the Museum and Library *Proceedings of the Society of Antiquaries of Scotland* 6, 395 – 401

Anon 1868 Meeting of 13th April 1868 donations to the museum and library *Proceedings of the Society of Antiquaries of Scotland* 7, 422 – 6

Anon 1870 Meeting of the 14th February 1870 Items exhibited to the meeting *Proceedings of the Society of Antiquaries of Scotland* 8, 304 – 12

Anon 1872 Meeting of 10th June 1872 Donations to the Museum and Library *Proceedings of the Society of Antiquaries of Scotland* 9, 532 – 40

Anon 1876a Meeting of 8th February 1875 Donations to the Museum and Library *Proceedings of the Society of Antiquaries of Scotland* 11, 121 – 3

Anon 1876b Meeting of 10th April 1876 donations to the museum and library *Proceedings of the Society of Antiquaries of Scotland* 11, 470 – 1

Anon 1876c *Catalogue of Antiquities in the National Museum of the Society of Antiquaries of Scotland New and Enlarged Edition* Edinburgh: Royal Institution, Princes Street

Anon 1880 Meeting of the 8th March 1880 donations to the museum and library *Proceedings of the Society of Antiquaries of Scotland* 14, 169 – 76

Anon 1881 meeting of 14th February 1881 Donations to the Museum and Library *Proceedings of the Society of Antiquaries of Scotland* 15, 105 – 12

Anon 1882a Meeting of 13th March 1882 Donations to the museum and library *Proceedings of the Society of Antiquaries of Scotland* 16, 144 – 56

Anon 1882b Meeting of 14th June 1882 List of the Articles acquired by the purchase committee for the museum and library 18th June 1881 to 3rd June 1882 *Proceedings of the Society of Antiquaries of Scotland* 16, 407 – 18

Anon 1883 Meeting of 12th March 1883 donations to the museum and library *Proceedings of the Society of Antiquaries of Scotland* 17, 277 – 85

Anon 1885 Meeting of 9th March 1885 donations to the museum and library and articles exhibited *Proceedings of the Society of Antiquaries of Scotland* 19, 132 – 9

Anon 1887 Meeting of 13th December 1886 Articles acquired by the purchase committee for the museum and library *Proceedings of the Society of Antiquaries of Scotland* 21, 7 – 13

Anon 1888 Anniversary Meeting 30th November 1887 *Proceedings of the Society of Antiquaries of Scotland* 22, 1 – 6

Anon 1889 Meeting of 10th December 1888 Purchases for the museum *Proceedings of the Society of Antiquaries of Scotland* 23, 7 – 23

Anon 1890a Meeting of 13th January 1890 Donations to the museum and library □*Proceedings of the Society of Antiquaries of Scotland* 24, 141 – 6

Anon 1890b Meeting of the 10th March 1890 Donations to the Museum and Library *Proceedings of the Society of Antiquaries of Scotland* 24, 379 – 82

Anon 1890c Meeting of the 12th May 1890 Donations to and purchases for the Museum and Library Proceedings *of the Society of Antiquaries of Scotland* 24, 443 – 50

Anon 1890d List of donations presented to the Society of Antiquaries of Scotland, MDCCCXXX – MDCCCLI *Archaeologia Scotica Transactions of the Society of Antiquaries of Scotland* 5, Appendix

Anon 1892 *Catalogue of the National Museum of Antiquities of Scotland New and Enlarged Edition* Edinburgh: Society of Antiquaries of Scotland

Anon 1895 Meeting of the 14th January 1895 Donations to the Museum and Library *Proceedings of the Society of Antiquaries of Scotland* 29, 63 – 7

Anon 1903 Meeting of the 11th May 1903 Articles and books acquired by the purchase committee for the museum and library *Proceedings of the Society of Antiquaries of Scotland* 37, 347 – 8

Anon 1905 Notes of the Month *The Antiquary* 41 (New Series 1, March 1905) 81 – 6

Anon 1907 Meeting of 13th May 1907 Donations to the museum and library *Proceedings of the Society of Antiquaries of Scotland* 41, 415 – 20

Anon 1909 Minutes of the meeting of 14th December 1908 including list of purchases and donations *Proceedings of the Society of Antiquaries of Scotland* 43, 8 – 23

Anon 1914 Meeting of 11th May 1914 Donations to the museum and library *Proceedings of the Society of Antiquaries of Scotland* 48, 370 – 2

Anon 1915 Finding of ancient burying place at Stenness, Orkney *Old Lore Miscellany of Orkney Caithness and Sutherland* VIII, part IV, 164 – 5

Anon, 1921 Meeting of 13th December Donations to the Museum *Proceedings of the Society of Antiquaries of Scotland* 55, 1 – 24

Anon 1927 Parish of St Andrews and Deerness *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 7 – 16

Anon 1933a Meeting of 12th December 1932 Donations to the museum *Proceedings of the Society of Antiquaries of Scotland* 67, 9 – 17

Anon 1933b Meeting of 10th April 1933 Donations to the museum *Proceedings of the Society of Antiquaries of Scotland* 67, 312 – 13

Anon 1934 Meeting of 12th March 1934 Donations to and purchases for the museum *Proceedings of the Society of Antiquaries of Scotland* 68, 190 – 3

Anon 1935 Meeting of 13th May 1935 Donations the museum *Proceedings of the Society of Antiquaries of Scotland* 69, 437 – 8

Anon 1936 Meeting of 13th April 1936 Donations the museum *Proceedings of the Society of Antiquaries of Scotland* 70, 358 – 61

Anon 1938 Meeting of 13th December 1937 Donations the museum *Proceedings of the Society of Antiquaries of Scotland* 72, 8 – 14

Anon 1949 Donations to and purchases for the museum 1948 – 9 *Proceedings of the Society of Antiquaries of Scotland* 83, 241 – 57

Anon 1950 Donations to and purchases for the museum 1949 – 50 *Proceedings of the Society of Antiquaries of Scotland* 84, 227 – 40

Anon 1951 Donations to and purchases for the museum 1950 – 51 *Proceedings of the Society of Antiquaries of Scotland* 85, 183 – 92 & plate 20

Anon 1985 Donations to and purchases for the museum, 1 April 1984 – 30 September 1985 *Proceedings of the Society of Antiquaries of Scotland* 115, 449 – 59

Anon 2008 *Bronze Age Necklace Unearthed* University of Manchester News online, www.manchester.ac.uk/aboutus/news/archive/list/item/?id=4214&year=2008&month=12

Anthony, I M C 2003 *Luminescence Dating of Scottish Burnt Mounds: New Investigations in Orkney and Shetland* University of Glasgow PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Anthony, I M C, Sanderson, D C W, Cook, G T, Abernethy, D & Housley, R A 2001 Dating a burnt mound from Kilmartin, Argyll, Scotland *Quaternary Science Reviews* 20, 921 – 5

Ap Simon, A M 1957 Archaeological Notes – Excavations at Burledge Camp, Somerset *Proceedings of the University of Bristol Spelaeological Society* 8 (1), 40

Archaeological Survey of Ireland The online database of the Irish (Eire) NMR at http://www.archaeology.ie/ArchaeologicalSurveyofIreland/

Archwilio The online database comprising the Historic Environment Records of the Welsh Archaeological Trusts: Clywd-Powys, Dyfed, Glamorgan-Gwent and Gwynedd at http://www.cofiadurcahcymru.org.uk/arch/

Armit, I 1996 *The Archaeology of Skye and the Western Isles* Edinburgh: Edinburgh University Press

Armit, I 1999 The abandonment of souterrains: evolution, catastrophe, or dislocation? *Proceedings of the Society of Antiquaries of Scotland* 129, 577 – 96

Armit, I 2000 Review of Parker Pearson, M, Sharples, N, Mulville, J & Smith, H 1999 Between Land and Sea Excavations at Dun Vulan, South Uist, Sheffield: Shefield Academic Press *Antiquity* 74, 244 – 5

Armit, I 2003 *Towers in the North The Brochs of Scotland* Stroud: Tempus

Armit, I 2005 The Atlantic Roundhouse: a Beginner's Guide *in* Turner, V E, Nicholson, R A, Dockrill, S J & Bond, J M (eds) *Tall Stories? Two millennia of brochs* Lerwick: Shetland Amenity Trust, 5 – 10

Armit, I & Braby, A 2002 Excavation of a burnt mound and associated structures at Ceann nan Clachan, North Uist *Proceedings of the Society of Antiquaries of Scotland* 132, 229 – 58

Armit, I, Dunwell, A, Hunter, F & Nelis, E 2005 Traprain Law: Archaeology from the ashes *PAST the newsletter of the Prehistoric Society* 49, 1 – 4

Armit, I, Shapland, F, Montgomery, J & Beaumont, J 2015 Difference in Death? A Lost Neolithic Inhumation Cemetery with Britain's Earliest Case of Rickets, at Balevullin, Western Scotland *Proceedings of the Prehistoric Society* 81, 199 – 214

Armit, I, Sheridan, A, Reich, D, Cook, G, Tripney, B & Naysmith, P 2016 Radiocarbon dates obtained for the GENSCOT Ancient DNA Project, 2016 *Discovery and Excavation in Scotland* New Series Vol 17, Council for Scottish Archaeology, 195 – 8

Armit, I, Swindles, G T & Becker, K 2013 From dates to demography in later prehistoric Ireland? Experimental approaches to the meta-analysis of large 14C data-sets *Journal of Archaeological Science* 40, 433 – 38

Armit, I, Swindles, G T, Becker, K, Plunkett, G & Blaauw, M 2014 Rapid climate change did not cause population collapse at the end of the European Bronze Age *Proceedings of the National Academy of Sciences of the United States of America* www.pnas.org/cgi/doi/10.1073/pnas.1408028111

Armit, J 1845 Parish of Westray *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy*, *Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 114 – 32 of the Orkney section (volume not continuously numbered)

Arz, H W, Lamy, F & Pätzold, J 2006 A pronounced dry event recorded around 4.2ka in brine sediments from the northern Red Sea *Quaternary Research* 66, 432 - 441

Ashbee, P 1978 Amesbury Barrow 51: Excavation 1960 *The Wiltshire Archaeological and Natural History Magazine*, 70/71, 1 – 60

Ashmore, P J 1974 Excavations at Summersdale, Orkney, by F G Wainwirght in July 1960 *Proceedings of the Society of Antiquaries of Scotland* 105, 41 – 2

Ashmore, P J 1996 *Neolithic and Bronze Age Scotland* London: Batsford

Ashmore, P 1998 Radiocarbon Dates for Settlements, Tombs and ceremonial Sites with grooved Ware in Scotland *in* Gibson A & Simpson D (eds) *Prehistoric Ritual and Religion*, Stroud: Sutton Publishing, 139 – 47

Ashmore, P J 1999 Radiocarbon Dating: avoiding errors by avoiding mixed samples *Antiquity* 73 124 – 30

Ashmore, P 2000 Dating the Neolithic of Orkney *in* Ritchie A (ed) *Neolithic Orkney in its European Context,* Cambridge: MacDonald Institute for Archaeological research, 299 – 308

Ashmore, P 2001 Settlement in Scotland during the second millennium BC *in* Brück, J (ed) *Bronze Age Landscapes Tradition and Transformation* Oxford: Oxbow Books, 1 – 8

Ashmore, P J 2003 Orkney burials in the first millennium AD *in* Downes, J & Ritchie, A (eds) *Sea Change: Orkney and Northern Europe in the later Iron Age AD 300–800,* Balgavies, Angus: The Pinkfoot Press, 5 – 50

Ashmore, P 2005 Dating Barnhouse *in* Richards, C (ed) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 385 – 88

Ashmore, P J 2009 Radiocarbon dates *in* Ritchie, A *On the fringe of Neolithic Europe: excavation of a chambered cairn on the Holm of Papa Westray, Orkney* Edinburgh: Society of Antiquaries of Scotland, 59 – 66

Ashmore, P 2014 Dating pp68 – 74 *in* Moore, G & Wilson, H Section 2: Excavations at Cruester Burnt Mound, Bressay, Shetland *in* Moore G, & Wilson H *Ebbing Shores Survey and Excavation of Coastal Archaeology in Shetland 1995 – 2008* Historic Scotland Archaeology Report No. 8, 54 – 84

Ashmore, P J, Cook, G T & Harkness, D D 2000 A Radiocarbon Database for Scottish Archaeological Samples *Radiocarbon* 42, Vol 1, 41 – 8

Aspinall, A 1973 *Archaeometry on Orkney: Magnetic Survey* Unpublished report

Atkinson, R J C 1984 The Beaker-Age Burial: The Bracer pp17 – 19 & 21 *in* Evans, J G Stonehenge – the Environment in the Late Neolithic and Early Bronze Age *and* a Beaker-Age Burial *The Wiltshire Archaeological and Natural History Magazine,* 78, 7 – 30

Atkinson, S, Mulville, J & Parker Pearson, M 1996 Cladh Hallan, Daliburgh (South Uist parish), Late Bronze Age and Early Iron Age houses and settlement, *Discovery and Excavation in Scotland* Edinburgh: Council for Scottish Archaeology, 108 – 9

Baillie, M G L & Munro, M A R 1988 Irish tree rings, Santorini and volcanic dust veils *Nature* Vol 332, 344 – 6

Baillie, M G L 1989 Hekla 3: how big was it? *Endeavour* Vol 13 (2), 78 – 81

Baillie, M G L 1998 Bronze Age myths expose archaeological shortcomings? A reply to Buckland *et al* 1997 *Antiquity* 72, 425 – 7

Baker, L, Sheridan, A & Cowie, T 2003 An Early Bronze Age 'dagger grave' from Rameldry Farm, near Kingkettle, Fife *Proceedings of the Society of Antiquaries of Scotland* 133, 85 – 123

Balabhadra nd Cow Power: Lessons 1, 2, 3 & 4 *in Anon, Cow Protection Book 1, ISKCON Ministry of Cow Protection and Agriculture*, 93 – 100, downloaded from www.iscowp.org on 5/01/09

Balasse, M & Tresset, A 2009 A key to the adaptation of Neolithic husbandry in the Orkneys: contribution of seaweed to the sheep diet at the Holm of Papa Westray, revealed through stable isotope analysis ($\delta^{13}C$ and $\delta^{18}O$) of teeth *in* Ritchie, A *On the fringe of Neolithic Europe: excavation of a chambered cairn on the Holm of Papa Westray, Orkney* Edinburgh: Society of Antiquaries of Scotland, 74 – 83

Balasse, M, Tresset, A & Ambrose, S H 2006 Stable isotope evidence ($\delta^{13}C$, $\delta^{18}O$) for winter feeding on seaweed by Neolithic sheep of Scotland *Journal of Zoology* 270 (1) 170 – 6

Balasse, M, Tresset, A, Dobney, K & Ambrose, S H 2005 The use of isotope ratios to test for seaweed eating in sheep *Journal of Zoology, London* 266 (3), 283 – 291

Balfour, J A (ed) 1910 *The Book of Arran* Glasgow: Hugh Hopkins & The Arran Society of Glasgow

Ballantyne C K & Dawson, A G 2003 Geomorphology and Landscape Change *in* Edwards, J E & Ralston, I B M (eds) *Scotland After the Ice Age Environment, Archaeology and History 8000 BC – AD 1000,* Edinburgh: Edinburgh University Press, 23 – 44

Ballin, T B 2014 The Lithic Assemblage pp80 - 3 *in* Moore, G & Wilson, H Section 2: Excavations at Cruester Burnt Mound, Bressay, Shetland *in* Moore G, & Wilson H *Ebbing Shores Survey and Excavation of Coastal Archaeology in Shetland 1995 – 2008* Historic Scotland Archaeology Report No. 8, 54 – 84

Ballin Smith, B (ed) 1994 *Howe: Four Millennia of Orkney Prehistory* Edinburgh: Society of Antiquaries of Scotland Monograph Series 9

Ballin Smith, B 1999 Crantit Kirkwall and St. Ola parish Neolithic chambered tomb and Bronze Age cists *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 67

Ballin Smith, B 2002 The Relentless Pursuit of the sea: Breckness, an eroding Orcadian Broch *in* Ballin Smith, B & Banks, I (eds) *In the Shadow of the Brochs The Iron Age in Scotland*, Stroud: Tempus, 163 – 176

Ballin Smith, B 2005a *Catpund: a prehistoric house in Shetland* SAIR 7, www.sair.org.uk

Ballin Smith, B 2005b Orcadian Brochs: Complex Settlements with Complex Origins *in* Turner, V E, Nicholson, R A, Dockrill, S J & Bond, J M (eds) *Tall Stories? Two millennia of brochs* Lerwick: Shetland Amenity Trust, 66 – 77

Ballin Smith, B 2014 *Between tomb and cist: the funerary monuments of Crantit, Kewing and Nether Onston, Orkney* Kirkwall: The Orcadian (Kirkwall Press)

Ballin Smith, B & Duncan, J 1998 Crantit, Kirkwall & St. Ola Parish *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 70

Ballin Smith, B & Petersen, G 2003 Brodgar, Stenness, (Stenness Parish) Late Neolithic settlement *Discovery and Excavation in Scotland* New Series Vol 4, Council for Scottish Archaeology, 102 – 3

Banks, I 1995 The excavation of three cairns at Stoneyburn Farm, Crawford, Lanarkshire, 1991 *Proceedings of the Society of Antiquaries of Scotland* 125, 289 – 343

Banks, I 1999 Investigating Burnt Mounds in Clydesdale during Motorway Construction *Glasgow Archaeological Journal* 21, 1 – 28

Banks, I, Duffy, P R J & MacGregor, G 2008 *Archaeology of Landscape Change in South-West Scotland, 6000 BC – AD 1400* Scottish Archaeological Internet Report 32, www.sair.org.uk

Barber, J 1990a Burnt mound material on settlement sites in Scotland *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 92 – 98

Barber, J 1990b Scottish burnt mounds: variations on a theme *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 98 – 102

Barber, J 1997a *The Excavation of a Stalled Cairn at Point of Cott, Westray, Orkney* Edinburgh: Scottish Trust for Archaeological Research

Barber, J (ed) 1997b *The Archaeological Investigation of a Prehistoric Landscape: Excavations on Arran 1978 – 81* Edinburgh: Scottish Trust for Archaeological Research

Barber, J 2011 Characterising archaeology in machair *in* Griffiths, D & Ashmore, P J (eds) *Aeolian Archaeology: the Archaeology of Sand Landscapes in Scotland* Scottish Archaeological Internet Reports 48, www.sair.org.uk, 37 – 53

Barber, J & Brown, M M 1984 An Sithean, Islay *Proceedings of the Society of Antiquaries of Scotland* 114, 161 – 88

Barber J, Duffy A & O'Sullivan J 1996 The excavation of two Bronze Age burial cairns at Bu Farm, Rapness, Westray, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 126, 103 – 120

Barber, J, Heald, A & Henderson, J 2005 Nybster (Wick parish) Atlantic roundhouse and outbuildings *Discovery and Excavation in Scotland*, New Series Vol 6, Council for Scottish Archaeology, 91

Barber, J & Russell-White, C J 1990a Preface to Part 2: Scottish Contributions *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 59

Barber, J & Russell-White, C J 1990b Bute and Islay, Kilearnan Hill, Craggie Basin, Kildonan, Sutherland *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 82 – 3

Barber, K E 1985 Peat Stratigraphy and climate change: some speculations *in* Tooley, M J & Sheail, G M (eds) *The climatic scene: essays in honour of Gordon Manley* London: Allen & Unwin 175 – 85

Barber, K E, Chambers, F M, & Maddy, D 2003 Holocene palaeoclimates from peat stratigraphy: macrofossil proxyclimate records from three oceanic raised bogs in England and Ireland *Quaternary Science Reviews* 22, 521–539

Barber, K E, Chambers, F M, & Maddy, D 2004 Late Holocene climatic history of northern Germany and Denmark: peat macrofossil investigations at Dosenmoor, Schleswig-Holstein, and Svanemose, Jutland *Boreas* 33, 132 – 44

Barber, K E, Chambers, F M, Maddy, D, Stoneman, R and Brew, J S 1994 A sensitive high-resolution record of late Holocene climatic change from a raised bog in northern England *The Holocene* 4, 198 – 205

Barcham, R C 1980 A lost radiocarbon date for Shetland *Proceedings of the Society of Antiquaries of Scotland* 110, 502 – 506

Barclay, A & Halpin, C 1999 *Excavations at Barrow Hills, Radley, Oxfordshire Volume 1: The Neolithic and Bronze Age Monument Complex* Oxford: Oxford University Committee for Archaeology, published for the Oxford Archaeological Unit

Barclay, G 1980 Newmill and the 'souterrains of southern Pictland' pp200 – 7 *in* Watkins, T Excavation of a settlement and souterrain at Newmill, near Bankfoot, Perthshire *Proceedings of the Society of Antiquaries of Scotland* 110, 165 – 208

Barclay, G J 1996 Neolithic buildings in Scotland *in* Darvill, T & Thomas, J *Neolithic Houses in Northwest Europe and Beyond Neolithic Studies Group Seminar Papers 1* Oxford: Oxbow Books Monograph 57, 61 – 75

Barclay, G J 2000 Between Orkney and Wessex: the Search for the Regional Neolithics of Britain *in* Ritchie A (ed) *Neolithic Orkney in its European Context,* Cambridge: MacDonald Institute for Archaeological research, 275 – 85

Barclay, G J 2001 'Metropolitan' and 'Parochial'/'Core' and 'Periphery': a Historiography of the Neolithic of Scotland *Proceedings of the Prehistoric Society* 67, 1 – 18

Barclay, G 2003 Neolithic settlements in the lowlands of Scotland *in* Armit, I, Murphy, E, Nelis, E & Simpson, D *Neolithic Settlement in Ireland and Western Britain* Oxford: Oxbow Books, 71 – 83

Barclay, G J 2009 Introduction: a regional agenda *in* Brophy, K & Barclay, G J (eds) *Defining a Regional Neolithic: the evidence from Britain and Ireland* Oxford: Oxbow Books, 1 – 4

Barfield, L H 1991 Hot Stones: Hot Food or Hot Baths *in* Hodder, M A & Barfield, L H (eds) *Burnt Mounds and Hot Stone Technology: Papers from the Second International Burnt Mound Conference Sandwell, 12th – 14th October 1990* Sandwell West Midlands: Sandwell Metropolitan Borough Council, 59 – 67

Barfield, L & Hodder, M 1987 Burnt mounds as saunas, and the prehistory of bathing *Antiquity* 61: 370-79

Barfield, L H & Hodder, M A 1989 Burnt mounds in the West Midlands: Surveys and Excavations *in* Gibson, A (ed) *Midlands Prehistory Some recent and current researches into the prehistory of central England* Oxford: British Archaeological Reports British Series 204, 5 – 13

Baring Gould, S 1899 Exploration of the Stone Camp on St. David's Head *Archaeologia Cambrensis* 16 (5th Series) 105 – 31

Barker, G 1983 The Animal Bones *in* Hedges, J W *Isbister A Chambered Tomb in Orkney* Oxford: British Archaeological Report British Series 115, 133 – 150

Barker, G 1985 *Prehistoric Farming in Europe* Cambridge: Cambridge University Press

Barker, L & Driver, T 2011 Close to the Edge: New Perspectives on the Architecture, Function and Regional Geographies of the Coastal Promontory Forts of the Castlemartin Peninsula, South Pembrokeshire, Wales *Proceedings of the Prehistoric Society* 77, 65 – 87

Barnes, M P 1994 *The Runic Inscriptions of Maeshowe, Orkne*y Uppsala: Institutionen för Nordiska Språk, Uppsala Universitet

Barnetson, L 1985 Faunal Remains, microfiche F1 – 11 *in* Holmes, N M McQ Excavations south of Bernard Street, Leith, 1980 *Proceedings of the Society of Antiquaries of Scotland* 115, 401 – 28 & microfiche 1, E1 – F11

Barrett, J 2011 Brough of Deerness, excavation *Discovery & Excavation in Scotland,* New Series 12, Council for Scottish Archaeology, 139 – 40

Barrett, J & Bradley, R 1980 *Settlement and Society in the British Later Bronze Age* Oxford: British Archaeological Reports British Series 83

Barrett, J, Hill, P & Stevenson, J B 1976 Second Millennium B.C. Banks in the Black Moss Of Achnacree: Some Problems Of Prehistoric Land-Use *in* Burgess C & Miket R (eds) *Settlement and Economy in the Third and Second millennium BC* Oxford: British Archaeological Report, British Series 33, 283 – 7

Barrett, J & Slater, A 2008 Brough of Deerness Excavation *Discovery and Excavation in Scotland* New Series Vol 9, Council for Scottish Archaeology, 134 – 5

Barrett, J C 1985 Hoards and related metalwork *in* Clarke, D V, Cowie, T G & Foxon, A *Symbols of Power at the time of Stonehenge*, Edinburgh: National Museum of Antiquities of Scotland & Her Majesty's Stationery Office, 95 – 106

Barrett, J C 1994 *Fragments from Antiquity an archaeology of social life in Britain 2900 – 1200 BC* Oxford: Blackwell

Barrett, J C, Freeman, P W M & Woodward, A 2000 *Cadbury Castle Somerset The later prehistoric and early historic archaeology* London: English Heritage Archaeological Report 20

Barrett, J C & Gourlay, R B 1999 An early metal assemblage from Dail na Caraidh, Inverness-shire, and its context *Proceedings of the Society of Antiquaries of Scotland* 129, 161 – 87

Barrett, J C & Ko, I H 2009 A phenomenology of landscape A crisis in British landscape archaeology? *Journal of Social Archaeology* 9 (3), 275 – 94

Barrett, J H (ed) 2012 *Being an Islander Production and Identity at Quoygrew, Orkney, AD 900 – 1600* Cambridge: MacDonald Institute for Archaeological Research

Barrett, J H, Beukens, R P & Nicholson, R A 2000 Diet and ethnicity during the Viking colonization of northern Scotland: evidence from fish bones and stable isotopes *Antiquity* 75, 145 – 54

Barrett, J H & Slater, A 2009 New Excavations at the Brough of Deerness: Power and religion in Viking Age Scotland *Journal of the North Atlantic* 2, 81 – 94

Barrett, J H & Richards, M P 2004 Identity, gender, religion and economy: new isotope and radiocarbon evidence for marine resource intensification in early historic Orkney, Scotland, UK *European Journal of Archaeology* 7 (3), 249 – 71

Barry, G 1805 *The History of the Orkney Islands: in Which is Comprehended an Account of Their Present State; together with the Advantages they Possess for Several Branches of Industry; and the Means by Which They May Be Improved* Edinburgh: Archibald Constable & Company; London: Longman Hurst Rees & Orme

Barry, G 1927a United Parishes of Kirkwall and St. Ola *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 29 – 61

Barry, G 1927b Island and Parish of Shapinshay (sic) *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 353 – 69

Barry, J 1845 Parish of Shapinshay (sic) *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy, Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 79 – 82 of the Orkney section (volume not continuously numbered)

Bartlett, D 1983 Analysis of pollen from neighbouring locations *in* Hedges, J W *Isbister A Chambered Tomb in Orkney* Oxford: British Archaeological Report British Series 115, 177 – 83

Bateman, T 1861 *Ten Years Diggings in Celtic and Saxon Grave Hills in the Counties of Derby, Stafford and York, from 1848 – 1858; with Notices of Some Former Discoveries, Hitherto Unpublished, and Remarks on the Crania and Pottery from the Mounds* (Facsimile reprint 1978 Buxton: Moorland Publishing Company)

Bates, M R, Nayling, N, Bates, R, Dawson, S Huws, D & Wickham-Jones, C 2012 A Multi-disciplinary Approach to the Archaeological Investigation of a Bedrock-Dominated Shallow-Marine Landscape: an example from the Bay of Firth, Orkney, UK *International Journal of Nautical Archaeology* 42 (1), 24 – 43

Bates, R, Bates, M, Dawson, S & Wickham-Jones, C R 2012 *Geophysical Survey of the Loch of Stenness, Orkney* downloaded on 20/09/12 from http://www.abdn.ac.uk/archaeology/profiles/c.wickham-jones/

Bates, R, Bates, M, Dawson, S & Wickham-Jones, C, forthcoming Marine Geophysical survey of the Loch of Stenness, Orkney in Card, N, Downes, J & Edmonds, M (eds.) *Landscapes revealed: Remote sensing around the Heart of Neolithic Orkney World Heritage Site* (Prepublication copy kindly supplied by 4th named author)

Batey, C 2003 Excavations at the Earl's Bu, Orphir, Orkney, c. 1859 – 1939 *New Orkney Antiquarian Journal* Vol 3, 15 – 71

Batey, C & Freeman, C 1986 Lavacroon, Orphir *Proceedings of the Society of Antiquaries of Scotland*, 116, 285 – 300, fiche 5: A3 – D9

Batey, C E 1993 A Norse Horizontal Mill in Orkney *Review of Scottish Culture* 8, 20 – 9

Bayliss, A, Bronk Ramsey, C, Cook, G & Van der Plicht, J 2007 *Radiocarbon Dates from samples funded by English Heritage under the Aggregates Levy Sustainability Fund 2002 – 4* Swindon: English Heritage

Bayliss, A, Cook, G, Bronk Ramsey, C, Van der Plicht, J & McCormac, G 2008 *Radiocarbon Dates from samples funded by English Heritage under the Aggregates Levy Sustainability Fund 2004 – 7* Swindon: English Heritage

Bayliss, A, Groves, C, McCormac, F G, Bronk Ramsey, C, Baillie, M G L, Brown, D, Cook, G T & Switsur R V 2004 Dating *in* Clark, P (ed) Swindon: *The Dover Bronze Age Boat* English Heritage, 250 – 55

Bayliss, A Healy, F, Whittle, A & Cooney, G 2011 Chapter 14: Neolithic Narratives: British and Irish Enclosures in their timescapes *in* Whittle, A, Healy, F & Bayliss, A *Gathering Time Dating the Early Neolithic Enclosures of Southern Britain and Ireland* Oxford: Oxbow Books, Volume 2, 682 – 847

Bayliss, A Marshall, P, Richards, C & Whittle, A in press The Late Neolithic timescape of Orkney: Islands of History *Antiquity*

Beck, C W, Loze, I B & Todd, J M (eds) 2003 *Amber in Archaeology Proceedings of the Fourth International Conference on Amber in Archaeology Talsi 2001* Riga: Institute of the History of Latvia Publishers

Beck, C & Shennan, S 1991 *Amber in Prehistoric Britain* Oxford: Oxbow Books Monograph 8

Becker, K 2010 *Rathgall, Co. Wicklow* Archaeology Ireland Heritage Guide No. 51, Dublin: Wordwell Publishing

Bedford, C H 1889 Notice of a Bronze Sword found on the estate of Waternish, Skye *Proceedings of the Society of Antiquaries of Scotland* 23, 258 – 61

Beeton, I 1893 *The Book of Household Management (Entirely New Edition Revised Corrected and Greatly Enlarged)* London: Ward, Lock & Bowden Ltd

Behringer, W 1999 Climatic Change and witch-hunting: the effect of the Little Ice Age on mentalities *Climatic Change* 43, 335 – 51

Bell, B & Dickson, C 1989 Excavations at Warebeth (Stromness Cemetery) Broch, Orkney *Proceedings of the Society of Antiquaries of Scotland* 119, 101 – 31

Bell, G D H & Kirby, E J M 1966 (cited without title) *in* Milthorpe, F L & Ivins, J D (eds) *The Growth of Cereals and Grasses* London: Butterworth, 308 – 19

Bell, W 1861 *A Dictionary and Digest of the Law of Scotland, with short explanations of the most ordinary English law terms Revised and corrected with numerous additions by George Ross Esq. Advocate* Edinburgh: Bell & Bradfute

Bennett, K D, Boreham, S, Sharp, M J & Switsur, V R 1992 Holocene history of environment, vegetation and human settlement on Catta Ness, Lunnasting, Shetland *Journal of Ecology* 80, 241 – 273

Benson D & Williams G H, 1987, Dale Promontory fort, *Archaeology in Wales,* 27, 43

Berry, R J 1985 *The Natural History of Orkney* London: William Collins & Sons Ltd

Berry, R J 2000 *Orkney Nature* London: Academic Press, Poyser Natural History Series

Berstan, R, Dudd, S N, Copley, M S, Morgan, E D, Quye, A & Evershed, R P 2004 Characterisation of 'bog butter' using a combination of molecular and isotopic techniques *Analyst* 129, 270 – 75

Beyneix, A 2012 Neolithic violence in France: an overview *in* Schulting, R & Fibiger, L (eds) *Sticks, Stones & Broken Bones: Neolithic Violence in a European Perspective* Oxford: Oxford University Press, 207 – 222

Bevan, B 2004 *The Upper Derwent: 10,000 Years in a Peak District Valley* Stroud: Tempus Publishing

Bianchi, G G & McCave, N 1999 Holocene periodicity in North Atlantic climate and deep ocean flow south of Iceland *Nature* 397, 515 – 7

Bibby, J S, Douglas, H A, Thomasson, A J & Robertson, JS 1991 *Land Capability Classification for Agriculture* Aberdeen: Macaulay Land Use Research Institute (2nd edition with minor corrections, 1st edition 1982)

Birch, S 2012 Broadford Medical Centre Watching brief, excavation and post-excavation analysis *Discovery and Excavation in Scotland* New Series Vol 13, Council for Scottish Archaeology, 115 – 6

Birks H J B 1982 Mid-Flandrian Forest History of Roudsea Wood National Nature Reserve, Cumbria *New Phytologist*, Vol. 90, No. 2 (Feb., 1982), 339 – 354

Bil, A 1997 *Shieling, 1600-1840* Edinburgh: John Donald Publishers Ltd

Binford, L R 1978 *Nunamiut Ethnoarchaeology* New York: Academic Press

Binford, M W, Kolata, A L, Brenner, M, Janusek, J W, Seddon, M T, Abbott, M & Curtis, J H 1997 Climate Variation and the Rise and Fall of an Andean Civilization *Quaternary Research* 47, 235 – 48

Bingham, S 1987 *The Everyman Companion to Food and Nutrition* London: J M Dent & Sons Ltd

Birrell, J 1992 Deer and Deer Farming in Medieval England *The Agricultural History Review* 40, II, 112 – 126

Bishop, N A & Knüsel, C J 2005 A palaeodemographic investigation of warfare in prehistory *in* Parker Pearson, M & Thorpe, I J N *Warfare, Violence and Slavery in Prehistory* Oxford: British Archaeological Report International Series 1374, Archaeopress, 201 –16

Bjorck, S and Clemmensen, L B 2004 Aeolian sediment in raised bog deposits, Halland, SW Sweden: a new proxy record of Holocene winter storminess variation in southern Scandinavia? *The Holocene* 14, 677 – 88

Blaauw, M, Van Geel, B & van der Plicht, J 2004 Solar forcing of climatic change during the mid-Holocene: indications from raised bogs in the Netherlands *The Holocene* 14, 1, 35 – 44

Black, D D 1856 Notice of the Excavation of a 'Picts House' on the farm of Stensall of Kergord, Zetland *Proceedings of the Society of Antiquaries of Scotland* 2, 452 – 54

Blackford, J J, Edwards, K J, Buckland, P C & Dobney, K 1996 Keith's Peat Bank, Hoy: Mesolithic human impact? *in* Hall, A M (ed) *The Quaternary of Orkney Field Guide* London: Quaternary Research Association, 62 – 8

Blackford, J J, Edwards, K J, Dugmore, A J, Cook, G T & Buckland, P C 1992 Icelandic volcanic ash and the mid-Holocene Scots pine (*Pinus sylvestris*) pollen decline in northern Scotland *The Holocene* 2 (3) 260 – 65

Blaeu, J 1654 *Orcadum et Shetlandiae Insularum accuratissima descriptio* Amsterdam: Blaeu

Blood, K 1989 Burnt mounds in Sutherland and Caithness *in* Bowden, M, Mackay, D & Topping, P (eds) *From Cornwall to Caithness: some aspects of British field archaeology; papers presented to Norman V. Quinnell* Oxford: British Archaeological Report British Series 209, 137 – 44

Blundell, J D & Longworth, I H 1967 A Bronze Age Hoard from Portfield Farm, Whalley *The British Museum Quarterly* 32, (1/2), 8 – 14

Blyth, T 1845 Parish of Birsay and Harray *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy, Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 149 – 56 of the Orkney section (volume not continuously numbered)

Bond, D 1985 Note: Eaton Camp *West Midlands Archaeology* 28, 41 – 3

Bond, G, Kromer, B, Beer, J, Muscheler, R, Evans, M N, Showers, W, Hoffmann, S, Lotti-Bond, R, Hajdas, I & Bonani, G 2001 Persistent Solar Influence on North Atlantic Climate During the Holocene *Science* 294, 2130 – 2136

Bond, G, Showers, W, Cheseby, M, Lotti, R, Almasi, P, de Menocal, P, Priore, P, Cullen, H, Hajdas, I & Bonani, G 1997 A Pervasive Millennial-Scale Cycle in North Atlantic and Glacial Climate *Science* 278, 1257 – 1266

Bond, G C & Lotti, R 1995 Iceberg Discharges into the North Atlantic on Millennial Time Scales During the Last Glaciation *Science* 267, 1005 – 1010

Bond, J M 1998 Ashes to the Earth: the Making of a Settlement Mound *in* Nicholson, R A & Dockrill, S J *Old Scatness Broch, Shetland: Retrospect and Prospect* Bradford: Department of Archaeological Sciences Research 5/North Atlantic Biocultural Organisation Monograph 2, 81 – 96

Bond, J M 2002 Pictish pigs and Celtic cowboys: food and farming in the Atlantic Iron Age *in* Ballin Smith, B & Banks, I (eds) *In the Shadow of the Brochs The Iron Age in Scotland*, Stroud: Tempus, 177 – 184

Bond, J M 2007a An articulated cattle skeleton from the late Neolithic midden *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A 2007 *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 195 – 202

Bond, J M 2007b Plant remains *in* Dockrill, S J, Bond, J M, Smith, A S & Nicholson, R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 154–69

Bond, J M 2007c The mammal bone *in* Hunter, J, Bond, J M & Smith, A N 2007 *Investigations in Sanday, Orkney Vol 1: Excavations at Pool, Sanday A multi-period site from Neolithic to Late Norse times* Kirkwall, Orkney: The Orcadian Ltd, 207 – 262

Bond, J M 2007d The Plant Remains *in* Hunter, J, Bond, J M & Smith, A N *Investigations in Sanday, Orkney Vol 1: Excavations at Pool, Sanday A multi-period site from Neolithic to Late Norse times* Kirkwall, Orkney: The Orcadian Ltd, 171 – 207

Bond, J M, Braby, A R, Dockrill, S J, Downes, J, & Richards, C 1995 Stove Bay: a new Orcadian grooved ware settlement *Scottish Archaeological Review* 9/10, 125 – 30

Bondevika, S, Mangerud, J, Dawson, S, Dawson, A & Lohne, O 2005 Evidence for three North Sea tsunamis at the Shetland Islands between 8000 and 1500 years ago *Quaternary Science Reviews* 24, 1757 – 75

Booth, R K, Jackson, S T, Forman, S L, Kutzbach, J E, Bettis III, E A, Kreig, J & Wright, D K 2005 A severe centennial-scale drought in mid-continental North America 4200 years ago and apparent global linkages *The Holocene* 15, (3), 321 – 328

Boreland, D 1996 Late Bronze Age Pottery from Haughey's Fort *Emania* 14, 21 – 8

Bourgeois, J & Talon, M 2009 From Picardy to Flanders: Transmanche connections in the Bronze Age *in* Clark, P (ed) *Bronze Age Connections Cultural Contact in Prehistoric Europe* Oxford: Oxbow Books, 38 – 59

Bourke, L 2001 *Crossing the Rubicon Bronze Age Metalwork from Irish Rivers* Galway: Department of Archaeology, National University of Ireland

Bowman, S & Needham, S 2007 The Dunaverney and Little Thetford flesh-hooks: history, technology and their position within the Later Bronze Age Atlantic Zone feasting complex *The Antiquaries Journal* 87, 53 – 108

Braby, A 1996 Geramount, Sanday (Lady Parish) Cropmark *Discovery and Excavation in Scotland*, Edinburgh: Council for Scottish Archaeology, 80

Bradley, R 1988 Hoarding, recycling and the consumption of prehistoric metalwork: technological change in western Europe *World Archaeology* 20 (2), 249 – 60

Bradley, R 1998 *The Passage of Arms Archaeological analysis of prehistoric hoard and votive deposits* Oxford: Oxbow Books

Bradley, R 2000 *The Good Stones A New Investigation of the Clava Cairns* Edinburgh: Society of Antiquaries of Scotland Monograph Series no. 17

Bradley, R 2005 *The Moon and the Bonfire An Investigation of Three Stone Circles in North East Scotland* Edinburgh: Society of Antiquaries of Scotland

Bradley, R 2007 *The Prehistory of Britain and Ireland* Cambridge: Cambridge University Press

Bradley, R 2011 *Stages and Screens An Investigation of Four Henge Monuments in Northern and North-eastern Scotland* Edinburgh: Society of Antiquaries of Scotland

Bradley, R & Clarke, A 2011 Excavations at Broomend of Crichie, 2005 – 7 *in* Bradley, R Stages *and Screens An Investigation of Four Henge Monuments in Northern*

and North-eastern Scotland Edinburgh: Society of Antiquaries of Scotland, 1 – 72

Bradley, R & Ellison, A 1975 *Rams Hill* Oxford: British Archaeological Reports British Series 19

Bradley, R & Lamdin-Whymark, H 2008 Northern Scottish Henges Project Excavation *Discovery and Excavation in Scotland* New Series Vol 9, Council for Scottish Archaeology, 106 – 7

Bradley, R & Richards, J 1978 Prehistoric fields and boundaries on the Berkshire Downs *in* Bowen, H C & Fowler, P J (eds) *Early Land Allotment* British Archaeological Reports British Series 48, 53 – 60

Braidwood, R J, Sauer, J D, Helbaek, H, Mangelsdorf, P C, Cutler, H C, Coon, C S, Linton, R, Steward, J & Oppenheim, A L 1953 Symposium: Did Man Once Live By Beer Alone? *American Anthropologist*, New Series 55, 4, 515 – 526

Brailsford, J 1938 Excavations at the promontory fort near Okehampton Station *Proceedings of the Devon Archaeological Society* 3 (2), 86 – 91

Bramwell, D 1983 Bird Bones from Knap of Howar, Orkney pp100 – 103 in Ritchie, A Excavation of a Neolithic farmstead at Knap of Howar, Papa Westray, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 113, 40 – 121

Brand, J 1703 *A New Description of Orkney, Zetland, Pightland-Firth and Caithness* Edinburgh: G.M.

Branigan, K 2000a The Earlier Prehistory of Barra and Vatersay *in* Branigan, K & Foster, P *From Barra to Berneray Archaeological Survey and Excavation in the Southern Isles of the Outer Hebrides Sheffield Environmental and Archaeological Research Campaign in the Hebrides Volume 5* Sheffield: Sheffield Academic Press, 319 – 33

Branigan, K 2000b The Later Prehistory of Barra and Vatersay *in* Branigan, K & Foster, P *From Barra to Berneray Archaeological Survey and Excavation in the Southern Isles of the Outer Hebrides Sheffield Environmental and Archaeological Research Campaign in the Hebrides Volume 5* Sheffield: Sheffield Academic Press, 334 – 45

Brend, A 2008 Stackelbrae, Eday, Excavation, *Discovery and Excavation in Scotland* New Series Vol 9, Council for Scottish Archaeology, 129 – 30

Brend, A 2009 Stackelbrae, Eday, Excavation, *Discovery and Excavation in Scotland* New Series Vol 10, Council for Scottish Archaeology, 129 – 30

Brend A 2010a Links of Noltland, Westray Geophysical Survey *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 11, 134 – 5

Brend, A 2010b Bu Sands, Burray, Orkney, survey *Discovery and Excavation in Scotland* New Series, Volume 11, 126

Brend, A 2010c Redland, Orkney, Geophysical survey*, Discovery and Excavation in Scotland* Council for Scottish Archaeology, New Series, Vol 11, 131

Brend, A, Moore, J & Robertson, J 2006 Stackbrae, Geophysics and coastal survey, *Discovery and Excavation in Scotland* New Series Vol 7, Council for Scottish Archaeology, 119

Bridgford, S D 1997 Mightier than the Pen? (An Edgewise Look at Irish Bronze Age Swords) *in* Carman, J *Material Harm archaeological studies of war and violence* Glasgow: Cruithne Press, 95–115

Briggs, C S 1976 Notes on the distribution of some raw materials in later prehistoric Britain *in* Burgess C & Miket R (eds) *Settlement and Economy in the Third and Second millennium BC* Oxford: British Archaeological Report, British Series 33, 267 – 82

Briggs, C S & Turner, R C 1986 Appendix: A Gazeteer of Bog Burials from Britain and Ireland *in* Stead, I M, Bourke, J B & Brothwell, D 1986 *Lindow Man The Body in the Bog* London: British Museum Publications, 181 – 195

Briggs, D E 1978 *Barley* London: Chapman & Hall

Brindley, A L 2007 *The Dating of Food Vessels and Urns in Ireland* Galway: Department of Archaeology, National University of Ireland, Galway, Bronze Age Studies 7

Brindley, A & Lanting, J N 1990 The dating of fulachta fiadh *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 55 – 6

Brindley, A, Lanting, J N & Mook, W G 1990 Radiocarbon dates from Irish Fulachta Fiadh and other Burnt Mounds *Journal of Irish Archaeology* Vol 5, 1989/90, 25 – 33

Brink, J W 1997 Fat Content in Leg Bones of Bison bison, and Applications to Archaeology *Journal of Archaeological Science* 24, 259 – 74

Brittain, M, Evans, C & Sharples, N 2013 *Excavations at Ham Hill, Somerset 2012* Cambridge: Cambridge Archaeological Unit University of Cambridge CAU Report No. 1159

Broodbank, C 2000 *An Island Archaeology of the Early Cyclades* Cambridge: Cambridge University Press

Broodbank, C 2008 Not Waving but Drowning *Journal of Island and Coastal Archaeology* 3, 72 – 6

Bronk Ramsey, C, Pettitt, P B, Hedges, R E M, Hodgins, G W L & Owen, D C 2000 Radiocarbon dates from the Oxford AMS system: *Archaeometry* Datelist 30 *Archaeometry* 42, 459 – 479

Brooks, R 2006 Appendix 11 Storm Analysis *in* Leslie, S 2009 *Kirkwall Strategic Flood Risk Assessment Project No: 1002804* Orkney Islands Council Report: www.orkney.gov.uk/Files/Planning/Development-and-Marine-Planning/Related-Planning-to-2014/Strategic_Flood_Risk_Assesment_Report_Sept_2009.pdf

Brooks, R T 1974 The excavation of the Rumps Cliff Castle, St Minver, Cornwall *Cornish Archaeology* 13, 5 – 50

Brophy, K 2015 Houses, Halls, and Occupation in Britain and Ireland *in* Fowler, C, Harding, J & Hofmann, D *The Oxford Handbook of Neolithic Europe* (Oxford Handbooks Online) DOI: 10.1093/oxfordhb/9780199545841.013.077

Brophy, K & Barclay, G J (eds) 2009 *Defining a Regional Neolithic: the evidence from Britain and Ireland* Oxford: Oxbow Books

Brophy, K, MacGregor, G & Ralston, I (eds) 2016 *The Neolithic of Mainland Scotland* Edinburgh: Edinburgh University Press

Brothwell, D 1977 On a mycoform stone structure in Orkney, and its relevance to possible further interpretations of so-called souterrains, *Institute of Archaeology Bulletin,* 14 (1977), 179-90.

Brown, A G, Davis, S R, Hatton, J, O'Brien, C, Reilly, F, Taylor, K, Dennehy, K E, O'Donnell, L, Bermingham, N, Mighall, T, Timpany, S, Tetlow, E, Wheeler, J & Wynne, S 2016 The Environmental Context and Function of Burnt-Mounds: New Studies of Irish Fulachtaí Fiadh *Proceedings of the Prehistoric Society* 82, 259 – 90

Brown, T 2008 The Bronze Age climate and environment of Britain *Bronze Age Review* Vol 1, Nov 2008, 7 – 22, accessed 01/12/08 at: www.britishmuseum.org/bronzeagereview/1

Brück, J 1999a What's in a settlement? Domestic practice and residential mobility in Early Bronze Age southern England *in* Brück, J & Goodman, M (eds) *Making places in the prehistoric world: themes in settlement archaeology* London: University College London Press, 52 – 75

Brück, J 1999b Houses, lifecycles and deposition on Middle Bronze Age settlements in Southern England *Proceedings of the Prehistoric Society* 65, 145 – 66

Brück, J 2000 Settlement, Landscape and Social Identity: the Early-Middle Bronze Age Transition in Wessex, Sussex and The Thames Valley *Oxford Journal of Archaeology* 19 (3), 273 – 300

Brück, J 2005 Experiencing the Past? The Development of a Phenomenological Archaeology in British Prehistory *Archaeological Dialogues* 12: 45 – 72

Brück, J 2007 The character of Late Bronze Age settlement in southern Britain *in* Haselgrove, C & Pope, R (eds) *The Earlier Iron Age in Britain and the near Continent* Oxford: Oxbow Books, 24 – 38

Brück, J 2008 The Architecture of Routine Life *in in* Pollard, J (ed) *Prehistoric Britain* Oxford: Blackwell, 248 – 67

Brück, J & Fokkens, H 2013 Bronze Age Settlements *in* Fokkens, H & Harding, A (eds) *The Oxford Handbook of the European Bronze Age* DOI: 10.1093/oxfordhb/9780199572861.013.0005 (Oxford Handbooks Online)

Brück, J & Goodman, M 1999 Introduction: Themes for a critical archaeology of prehistoric settlement *in* Brück, J & Goodman, M (eds) *Making places in the prehistoric world: themes in settlement archaeology* London: UCL Press, 1 – 19

Bryce, T H 1902 On the cairns of Arran – a record of explorations – with an anatomical description of the human remains discovered *Proceedings of the Society of Antiquaries of Scotland* 36, 74 – 181

Bryce, T H 1904 On the Cairns and Tumuli of the Island of Bute. A Record of Explorations during the Season of 1903 *Proceedings of the Society of Antiquaries of Scotland,* 38, 17 – 81

Bryce, T H 1933 Notice of a short cist at Fraga, Scatness, Shetland *Proceedings of the Society of Antiquaries of Scotland,* 67, 34 – 6

Bryson, R A, Lamb, H H & Donley, D D 1974 Drought and the decline of Mycenae *Antiquity* 48, 46 – 50

Buck, C E, Kenworthy, J B, Litton C D, & Smith A F M 1991 Combining archaeological and radiocarbon information: a Bayesian approach to calibration *Antiquity* 65, 808 – 821

Buckland, P C, Amorosi, T, Barlow, L K, Dugmore, A J, Mayewski, P A, McGovern, T H, Ogilvie, A E J, Sadler, J P & Skidmore, P 1996 Bioarchaeological and climatological evidence for the fate of Norse farmers in medieval Greenland *Antiquity* 70, 88 – 96

Buckland, P C, Dugmore, A & Edwards, K J 1997 Bronze Age Myths? Volcanic activity and human response in the Mediterranean and North Atlantic regions *Antiquity* 71, 581 – 93

Buckley, V (ed) 1990 *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications

Buckley, V 1991 Irish *fulachta fiadh*: an overview *in* Hodder, M A & Barfield, L H (eds) *Burnt Mounds and Hot Stone Technology: Papers from the Second International Burnt Mound Conference Sandwell, 12th – 14th October 1990* Sandwell, West Midlands: Sandwell Metropolitan Borough Council, 3 – 9

Buglass, J & Brigham, T 2008 *Rapid Coastal Zone Assessment: Yorkshire and Lincolnshire Whitby to Reighton* English Heritage Project 3729, Humber Archaeology Report No. 208, York: Archaeology Data Service (doi:10.5284/1000071)

Bull, I D, Simpson, I A, Dockrill, S J & Evershed, R P 1999 Organic geochemical evidence for the origin of ancient anthropogenic soil deposits at Tofts Ness, Sanday, Orkney *Organic Geochemistry* 30, 535 – 556

Bunting, M J 1994 Vegetation history of Orkney, Scotland; pollen records from two small basins in west Mainland *The New Phytologist* 128, 771 – 792

Bunting, M J 1996 The development of heathland in Orkney, Scotland: pollen records from Loch of Knitchen (Rousay) and Loch of Torness (Hoy) *The Holocene* 6 (2) 193 – 212

Bunting, M J, Tipping R & Downes, J 2001 'Anthropogenic' Pollen Assemblages from a Bronze Age Cemetery at Linga Fiold, West Mainland, Orkney *Journal of Archaeological Sciences* 28, 487 – 500

Burgess, C 1984 The Prehistoric Settlement of Northumberland: A Speculative Survey *in* Miket, R & Burgess, C *Between and Beyond the Walls Essays on the prehistory of North Britain in Honour of George Jobey* Edinburgh: John Donald Publishers Ltd, 126 – 175

Burgess, C 1985 Population, climate and upland settlement *in* Spratt, D & Burgess, C (eds) *Upland Settlement in Britain The Second Millennium BC and After* Oxford: British Archaeological Report British Series 143, 195 – 230

Burgess, C 1989 Volcanoes, catastrophe and the global crisis of the late second millennium BC *Current Archaeology* 117, 325 – 29

Burgess, C 1992 Discontinuity and Dislocation in Later Prehistoric Settlement: Some Evidence from Atlantic Europe *in* Mordant, C & Richard, A (eds) *L'habitat et l'occupation du sol à l'Age du Bronze* Editions du Comité des Travaux historiques et scientifiques, Paris, 21 – 40

Burgess, C 2003 *The Age of Stonehenge* Edison, NJ, USA: Castle Books (reprint of the 1980 edition)

Burgess, C 2004 Forty-Five Years' Researches in the Chronology and Ordering of the British Bronze Age: A Personal Memoir *in* Gibson, A & Sheridan, A (eds) *From Sickles to Circles Britain and Ireland at the Time of Stonehenge* Stroud: Tempus, 339 – 65

Burgess, C B & Colquhoun, I M 1988 *The Swords of Britain* Prähistorische Bronzefunde Abteilung IV, Band 5, München: C H Beck'sche Verlagsbuchandlung

Burgess, C, Dempsey, J, Gilmour, S & Jackson, A 1996 Gob Eirer (Uig parish) promontory fort, *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 111

Burgess, C B & Gerloff, S 1981 *The Dirks and Rapiers of Great Britain and Ireland* Prähistorische Bronzefunde Abteilung IV, Band 7, München: C H Beck'sche Verlagsbuchandlung

Burgess, C & Gilmour, S 1995 Garenin, Carloway, Isle of Lewis (Uig Parish) Stills; promontory fort; corn-drying kiln; cairn; *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 112

Burgess, C & O'Connor, B 2004 Bronze Age Rotary Spits: Finds Old and New, some False, some True *in* Roche, E, Grogan, E, Bradley, J, Coles, J & Raftery, B (eds) *From Megaliths to Metals Essays in Honour of George Eogan* Oxford: Oxford: Oxbow Books, 184 – 99

Burl, A 2000 *The Stone Circles of Britain, Ireland and Brittany* Yale University Press, New Haven and London

Burleigh, R, Matthews, K, Ambers, J & Kinnes, I 1981 British Museum Natural Radiocarbon Measurements XII *Radiocarbon* 23 (1), 14 – 23

Burley, E 1956 A catalogue and survey of the metalwork from Traprain Law *Proceedings of the Society of Antiquaries of Scotland* 89, 118 – 226

Burrow, E J, Knowles, A E W, Gray, W H & Gray, J W 1926 Excavations on Leckhampton Hill, Cheltenham, during the summer of 1925 *Transactions of the Bristol & Gloucestershire Archaeological Society* 47, 81 – 113

Burton, R 1876 *A New System of Sword Exercise for Infantry* Charing Cross, London: William Clowes & Son

Burton, R F 1987 *The Book of the Sword* New York: Dover Publications (reprint of the 1884 edition)

Buteux, S 1997a *Settlements at Skaill, Deerness, Orkney: Excavations by the late Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981* Oxford: Archaeopress, British Archaeological Report British Series 260

Buteux, S 1997b Introduction *in* Buteux, S 1997 *Settlements at Skaill, Deerness, Orkney: Excavations by the late Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981* Oxford: Archaeopress, British Archaeological Report British Series 260, 1 – 6

Buteux, S 1997c Site 5: Late Bronze Age Settlement *in* Buteux, S 1997 *Settlements at Skaill, Deerness, Orkney: Excavations by the late Peter Gelling of the Prehistoric,*

Pictish, Viking and Later Periods, 1963–1981 Oxford: Archaeopress, British Archaeological Report British Series 260, 24 – 37

Buteux, S 1997d Pottery phasing and discussion *in* Buteux, S 1997 *Settlements at Skaill, Deerness, Orkney: Excavations by the late Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981* Oxford: Archaeopress, British Archaeological Report British Series 260, 198 – 208

Cagney, L & Ginn, V 2008 *M3 Clonee-North of Kells Contract 2 Dunshaughlin – Navan Report on the Archaeological Excavation of Blundelstown 2 & 3, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Cagney, L & Ginn, V 2009 *M3 Clonee-North of Kells Contract 2 Dunshaughlin – Navan Report on the Archaeological Excavation of Roestown 1, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Calder, C S T 1936 The Dwarfie Stane of Hoy, Orkney: its Period and Purpose *Proceedings of the Society of Antiquaries of Scotland* 70, 217 – 236

Calder, C S T 1937 A Neolithic double-chambered cairn of the stalled type and later structures on the Calf of Eday, Orkney *Proceedings of the Society of Antiquaries of Scotland* 71, 115 – 54

Calder, C S T 1938 Excavations of three Neolithic chambered cairns – one with an upper and a lower chamber – in the islands of Eday and the Calf of Eday in Orkney *Proceedings of the Society of Antiquaries of Scotland* 72, 193 – 213

Calder, C S T 1939 Excavations of Iron Age dwellings on the Calf of Eday in Orkney *Proceedings of the Society of Antiquaries of Scotland* 73, 167 – 85

Calder, C S T 1950 Report on the Excavation of a Neolithic Temple at Stanydale in the parish of Sandsting, Shetland, *Proceedings of the Society of Antiquaries of Scotland* 84, 185 – 205

Calder, C S T 1956 Report on the Discovery of Numerous Stone Age House-Sites in Shetland *Proceedings of the Society of Antiquaries of Scotland* 89, 340 – 397 & plates 29 – 44

Calder, C S T 1961 Excavations in Whalsay, Shetland, 1954 – 5 *Proceedings of the Society of Antiquaries of Scotland* 94, 28 – 45

Calder, C S T 1963 Cairns, Neolithic houses and Burnt Mounds in Shetland *Proceedings of the Society of Antiquaries of Scotland* 96, 37 – 86

Calkin, P E, Wiles, G C & Barclay, D J 2001 Holocene coastal glaciation of Alaska *Quaternary Science Reviews* 20, 449 – 61

Callander, J G 1916 Notice of a jet necklace found in a cist in a Bronze Age cemetery, discovered on Burgie Lodge Farm, Morayshire, with notes on Scottish prehistoric jet ornaments *Proceedings of the Society of Antiquaries of Scotland* 50, 201 – 40

Callander, J G 1920 A hoard of Bronze Age implements found at Cullerne, near Findhorn, Morayshire *Proceedings of the Society of Antiquaries of Scotland* 54, 124 – 33

Callander, J G 1922 Three Bronze Age hoards recently added to the National Collection, with notes on the hoard from Duddingston Loch *Proceedings of the Society of Antiquaries of Scotland* 56, 351 – 64

Callander, J G 1923 Scottish Bronze Age Hoards *Proceedings of the Society of Antiquaries of Scotland* 57, 123 – 66

Callander, J G 1931a Some Orkney Antiquities, *Proceedings of the Orkney Antiquarian Society* Volume IX, Kirkwall, 17 – 20

Callander, J G 1931b Notes on (1) certain prehistoric relics from Orkney, and (2) Skara Brae: its culture and its period *Proceedings of the Society of Antiquaries of Scotland* 65, 78 – 114

Callander, J G 1934 The Bronze Age Pottery of Orkney and Shetland, *Proceedings of the Orkney Antiquarian Society* Volume XII, Kirkwall, 9 – 12

Callander, J G 1936 Bronze Age Urns of Clay from Orkney and Shetland, with a note on the vitreous material called 'Cramp' *Proceedings of the Society of Antiquaries of Scotland* 70, 441 – 52

Callander, J G 1937 Report on the Pottery, pp134 – 51 *in* Calder, C S T A Neolithic double-chambered cairn of the stalled type and later structures on the Calf of Eday, Orkney *Proceedings of the Society of Antiquaries of Scotland* 71, 115 – 54

Callander, J G & Grant, W G 1934a A Long Stalled Chambered Cairn or Mausoleum (Rousay Type) near Midhowe, Rousay, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 68, 320 – 50

Callander, J G & Grant, W G 1934b The Broch of Midhowe, Rousay, *Proceedings of the Society of Antiquaries of Scotland* 68, 444 – 516.

Callander, J G & Grant, W G 1935 The Knowe of Yarso, *Proceedings of the Society of Antiquaries of Scotland* 69, 325 – 51

Callander, J G & Grant, W G 1936 A Stalled Chambered Cairn, the Knowe of Ramsay, at Hullion, Rousay, *Proceedings of the Society of Antiquaries of Scotland* 70, 407 – 19

Callander, J G & Grant, W G 1937 Long Stalled Cairn at Blackhammer, Rousay, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 71, 297 – 308

Cameron, E, Harris, S & Mould, Q 2016 The textile and animal skin object *in* Jones, A M *Preserved in the Peat An extraordinary Bronze Age Burial onWhitehorse Hill, Dartmoor, and its wider context* Oxford & Philadelphia: Oxbow Books, 149 – 56

Campling, N R 1991 An earth oven from British Columbia, Canada *in* Hodder, M A & Barfield, L H (eds) *Burnt Mounds and Hot Stone Technology: Papers from the Second International Burnt Mound Conference Sandwell, 12th – 14th October 1990* Sandwell, West Midlands: Sandwell Metropolitan Borough Council, 93 – 5

Canmore: the online search facility of the Royal Commission on the Ancient and Historical Monuments of Scotland at http://canmore.org.uk

Canter, M 1998 Prehistoric Sites in the Shetland Landscape A GIS Study of Mainland Shetland *in* Turner, V (ed) *The Shaping of Shetland: Developments in Shetland Landscape Archaeology*, Lerwick: Shetland Times, 47 – 60

Cantrill, T C & Jones, O T 1906 *Note on the discovery of prehistoric hearths in South Wales Archaeologia Cambrensis* 61 (6th series vol. 6), 17 – 34

Cantrill, T C & Jones, O T 1911 Prehistoric cooking places in South Wales *Archaeologia Cambrensis* 66 (6th series vol. 11), 253 – 286

Capelle, T 1982 Erkenntnismöglichkeiten ur-und frühgeschichtlicher Bewaffnungsformen. Zum Problem von Waffen aus organischem Material *Bonner Jahrbücher des Rheinischen Landesmuseums in Bonn (Im Landschaftsverband Rheinland) und des Vereins von Altertumsfreunden im Rheinlande*. Band 182, 265 – 88

Capelle, T 1995 Anthropomorphe Holzidole in Mittel- und Nordeuropa *Scripta Minora Regiae Societatis Humaniorum Litterarum Lundensis* Lund 1995 – 1996:1, 1 – 68

Card, N 1998 *The Loft, Longhope, Orkney* Unpublished Survey for Farm Ancient Monument Survey Grant Scheme

Card, N 1999a *Fillets, Graemsay, Orkney* Unpublished Survey for Farm Ancient Monument Survey Grant Scheme

Card, N 1999b *New Holland, Holm, Orkney* Unpublished Survey for Farm Ancient Monument Survey Grant Scheme

Card, N 2002 *Linga Holm, an archaeological survey* Unpublished Survey commissioned by the Scottish Wildlife Trust

Card, N 2003 World Heritage Area Sandwick, Stenness parishes Geophysical survey *Discovery and Excavation in Scotland* New Series Vol 4, Council for Scottish Archaeology, 102

Card, N 2004 *Ness of Brodgar, Stenness, Orkney Excavation 2004 Data Structure Report* Unpublished report

Card, N 2005a History of Prehistoric Research and Assessment of the Prehistoric Period *in* Downes, J, Foster, S M, Wickham-Jones, C R & Callister, J (eds) The *Heart of Neolithic Orkney World Heritage Site Research Agenda* Edinburgh: Historic Scotland, 40 – 65

Card, N 2005b Excavation of Bookan Chambered Cairn, Sandwick *Proceedings of the Society of Antiquaries of Scotland* 135, 163 – 190

Card, N 2005c Knowes of Trotty pp177 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 6, Council for Scottish Archaeology, 165 – 81

Card, N 2006 Ness of Brodgar Excavation *Discovery and Excavation in Scotland* New Series Vol 7, Council for Scottish Archaeology, 126

Card, N 2007 Ness of Brodgar *Discovery and Excavation in Scotland* New Series Vol 8, Council for Scottish Archaeology, 147

Card, N 2008 Ness of Brodgar Excavation *Discovery and Excavation in Scotland* New Series Vol 9, Council for Scottish Archaeology, 136

Card, N 2009 Ness of Brodgar Excavation *Discovery and Excavation in Scotland* New Series Vol 10, Council for Scottish Archaeology, 139 – 41

Card, N 2010 Ness of Brodgar Excavation *Discovery and Excavation in Scotland* New Series Vol 11, Council for Scottish Archaeology, 129 – 30

Card, N 2011 Ness of Brodgar Excavation *Discovery and Excavation in Scotland* New Series Vol 12, Council for Scottish Archaeology, 140 – 1

Card, N 2012 Ness of Brodgar Excavation *Discovery and Excavation in Scotland* New Series Vol 13, Council for Scottish Archaeology, 139 – 41

Card, N 2013 Ness of Brodgar Excavation *Discovery and Excavation in Scotland* New Series Vol 14, Council for Scottish Archaeology, 144 – 5

Card, N 2014 Ness of Brodgar Excavation *Discovery and Excavation in Scotland* New Series Vol 15, Council for Scottish Archaeology, 151 – 3

Card, N, Carruthers, M, Downes, J, Robertson, J & Sharman, P 2006 *Mine Howe and Long Howe, Orkney Excavations 2005 Data Structure Report* Unpublished report

Card, N & Cluett, J 2004 Ness of Brodgar Stenness Parish Neolithic complex *Discovery and Excavation in Scotland,* New Series Vol 5, Council for Scottish Archaeology, 97

Card, N & Cluett, J 2005a Ness of Brodgar (Stenness Parish) Excavation *Discovery and Excavation in Scotland*, New Series Vol 6, Council for Scottish Archaeology, 100 – 101

Card, N & Cluett, J 2005b *Ness of Brodgar, Stenness, Orkney Excavation 2005 Data Structure Report* Unpublished report

Card, N & Downes, J 2000 Crossiecrown Kirkwall & St. Ola Parish *Discovery and Excavation in Scotland* New Series Vol 1, Council for Scottish Archaeology, 64 – 65

Card, N & Downes, J 2001 Mine Howe Environs (St Andrews and Deerness parish) Geophysical survey *Discovery and Excavation in Scotland* New Series Vol 2, Council for Scottish Archaeology, 71

Card, N & Downes, J 2002a Mine Howe Environs (St Andrews and Deerness parish) Iron Age ritual and metalworking complex: ?broch *Discovery and Excavation in Scotland* New Series Vol 3, Council for Scottish Archaeology, 87

Card, N & Downes, J 2002b *Knowes of Trotty, Harray, Orkney Excavation 2002 Data Structure Report* Unpublished report

Card, N & Downes, J 2005 Knowes of Trotty, Orkney (Birsay & Harray parish), Bronze Age barrow cemetery *Discovery and Excavation in Scotland*, New Series Vol 6, 2005, 97

Card, N, Downes, J & Edmonds, M (eds.) forthcoming *Landscapes revealed: Remote sensing around the Heart of Neolithic Orkney World Heritage Site*

Card, N, Downes, J & Gibson, C (eds) in prep *Mine Howe, Tankerness, Orkney – an Iron Age Complex*

Card, N, Downes, J, Murray, D & Sharman, P 2003 *Mine Howe and Round Howe Excavations 2002 Data Structure Report* Unpublished report

Card, N, Downes, J, Murray, D, Sharman, P & Whalley, T 2004 *Mine Howe, Orkney Excavations 2003 Data Structure Report* Unpublished report

Card, N, Downes, J, Murray, D & Sharman, P 2005 *Mine Howe and Long Howe, Orkney Excavations 2004 Data Structure Report* Unpublished report

Card, N, Downes, J, Richards, C, Jones, R, Challands, A, French, C A I & Thomas, A 2016 The settlement of Crossiecrown: the Grey and Red Houses *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 160 – 95

Card, N, Downes, J, Robertson, J & Sharman, P 2006 *Knowes of Trotty, Harray, Orkney, Excavation 2005 Data Structure Report* Unpublished report

Card, N, Downes, J & Sharman, P 2007 *Knowes of Trotty, Harray, Orkney, Excavation 2006 Data Structure Report* Unpublished report

Card, N & Gee, C 2014 East Mainland Walkover survey *Discovery and Excavation in Scotland*, New Series Vol 15, Council for Scottish Archaeology, 145

Card, N, Mainland, I, Timpany, S, Towers, R, Batt, C, Bronk Ramsey, C, Dunbar, E, Reimer, P, Bayliss, A, Marshall, P & Whittle, A 2017 To Cut a Long Story Short: Formal Chronological Modelling for the Late Neolithic Site of Ness of Brodgar, Orkney *European Journal of Archaeology* https://doi.org/10.1017/eaa.2016.29

Card, N & Ovenden, S 2004 World Heritage Area (Stenness Parish) Geophysical Survey *Discovery and Excavation in Scotland,* New Series Vol 5, Council for Scottish Archaeology, 97

Card, N & Reay, D 2014 Rennibister Farm Evaluation *Discovery and Excavation in Scotland*, New Series Vol 15, Council for Scottish Archaeology, 144

Card, N & Sharman, P 2006 *Ness of Brodgar, Stenness, Orkney Excavation 2006 Data Structure Report* Unpublished report

Card, N & Thomas, A 2011 Painting a picture of Neolithic Orkney: decorated stonework from the Ness of Brodgar *in* Cochrane, A & Jones, A M (eds) *Visualising the Neolithic: Abstraction, Figuration, Performance, Representation* Oxford: Oxbow Books, Neolithic Studies Group Seminar Papers 13, 111 – 24

Carey, G 2012a Rethinking the domestic architecture of Early Neolithic Orkney *The Posthole* 25, 6 – 13 (www.theposthole.org)

Carey, G 2012b *The domestic architecture of Early Neolithic Orkney in a wider interpretative context: some implications of recent discoveries* Unpublished MA dissertation, Archaeological Practice, Orkney College UHI, available online at: www.academia.edu/GilesCarey

Carey, G 2014 Around the houses. Towards a more robust interpretation and analysis of the Early Neolithic domestic settlement record in Britain – lessons from Orkney *Assemblage* 13, 39 – 62 (www.assemblage.group.shef.ac.uk)

Carlin, N & Brück, J 2012 Searching for the Chalcolithic: continuity and change in the Irish Final Neolithic/Early Bronze Age *in* Allen, M J, Gardiner, J & Sheridan, A (eds) *Is there a British Chalcolithic? People, place and polity in the late 3rd millennium* Oxford: The Prehistoric Society/Oxbow Books (Prehistoric Society Research Paper no. 4), 193 – 210

Carpenter, R 1966 *Discontinuity in Greek Civilization* Cambridge: Cambridge University Press

Carríon, J 2002 Patterns and processes of Late Quaternary environmental change in a montane region of southwestern Europe *Quaternary Science Reviews* 21, 2047 – 66

Carruthers, M 2007 The Cairns, Windwick Bay *Discovery and Excavation in Scotland* New Series, Volume 8, Council for Scottish Archaeology 145 – 6

Carruthers, M 2009 The Cairns, Windwick Bay Excavation *Discovery and Excavation in Scotland* New Series, Volume 10, Council for Scottish Archaeology, 137 – 8

Carruthers, M 2010 The Cairns, Windwick Bay Excavation *Discovery and Excavation in Scotland* New Series, Volume 11, Council for Scottish Archaeology, 128 – 9

Carruthers, M 2012 The Cairns, Windwick Bay Excavation *Discovery and Excavation in Scotland*, New Series Vol 13, Council for Scottish Archaeology, 137 – 9

Carruthers, M 2013 The Cairns, Windwick Bay Excavation *Discovery and Excavation in Scotland*, New Series Vol 14, Council for Scottish Archaeology, 142 – 3

Carruthers, M 2015 The Cairns, Windwick Bay Excavation *Discovery and Excavation in Scotland*, New Series Vol 16, Council for Scottish Archaeology, 133

Carruthers, M 2016 The Cairns, Windwick Bay Excavation *Discovery and Excavation in Scotland*, New Series Vol 17, Council for Scottish Archaeology, 134 – 5

Carruthers, M & Richards, C 2000 Stonehall, Firth Parish *Discovery and Excavation in Scotland New Series Vol 1,* Council for Scottish Archaeology, 64

Carter, S 1998a Soil micromorphology *in* Lowe, C *Coastal Erosion and the Archaeological Assessment of an Eroding Shoreline at St Boniface Church, Papa Westray, Orkney* Stroud: Sutton Publishing, 172 – 86

Carter, S 1998b 'Farm Mounds' and the Formation of Area 1 Sediments *in* Lowe, C *Coastal Erosion and the Archaeological Assessment of an Eroding Shoreline at St Boniface Church, Papa Westray, Orkney* Stroud: Sutton Publishing, 187 – 99

Carter, S & Dalland, M 2005 Bronze Age banks at the Black Crofts, North Connel, Argyll, a synthesis and re-assessment *Proceedings of the Society of Antiquaries of Scotland* 135, 191 – 212

Carter, S P, McCullagh, R P J & MacSween, A 1995 The Iron Age in Shetland: excavations at five sites threatened by coastal erosion *Proceedings of the Society of Antiquaries of Scotland* 125, 429 – 82, fiche 2: C7 – C14

Carter, S, Mills, C M, Powers, A H, Tipping, R & Tomlinson, P 1999 Plant remains from the cist pp387 – 99 *in* Dalland, M (ed) Sand Fiold: the excavation of an Exceptional Cist in Orkney, *Proceedings of the Prehistory Society* 65, 373 – 413

Caseldine, C J 1999 Archaeological and Environmental Change on Prehistoric Dartmoor – Current Understanding and Future Directions *Quaternary Proceedings* 7, 575 – 583

Caulfield, S 1978 Neolithic Fields: the Irish Evidence *in* Bowen, H C & Fowler, P J (eds) *Early Land Allotment* British Archaeological Reports British Series 48, 137 – 144

Caulfield, S, O'Donnell, R G & Mitchell, P I 1998 ^{14}C Dating Of A Neolithic Field System At Céide Fields, County Mayo, Ireland *Radiocarbon* 40 (2), 629 – 40

Cerón-Carrasco, R 1998 Fish bone *in* Lowe, C *Coastal Erosion and the Archaeological Assessment of an Eroding Shoreline at St Boniface Church, Papa Westray, Orkney* Stroud: Sutton Publishing, 149 – 55

Cerón-Carrasco, R N 2007 Fish remains pp39 – 40 *in* Toolis, R 2007 Excavation of a burnt mound at Meur, Sanday, Orkney *Scottish Archaeological Journal* Vol 29 (1), 31 – 49

Challands, A, Edmonds, M & Richards, C 2005 Beyond the Village: Barnhouse Odin and the Stones of Stenness *in* Richards, C (ed) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 205 – 27

Challands, A, Muir, T & Richards, C 2005 The Great Passage Grave of Maeshowe *in* Richards, C (ed) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 229 – 48

Chambers, F M & Blackford, J J 2001 Mid- and Late-Holocene climatic changes: a test of periodicity and solar forcing in proxy-climate data from blanket peat bogs *Journal of Quaternary Science* 16 (4) 329 – 338

Chambers, F M, Daniell, J R G & ACCROTELM Members 2010 Peatland archives of late-Holocene climate change in northern Europe *PAGES News* 18 (1) 4 – 6

Chambers, F M, Mauquoy, D, Brain, S A, Blaauw, M and Daniell, J R G, 2007 Globally synchronous climate change 2800 years ago: proxy data from peat in South America *Earth and Planetary Science Letters* 253, 439 – 44

Chambers, F M, Ogle, M I & Blackford, J J 1999 Palaeoenvironmental evidence for solar forcing of Holocene climate: linkages to solar science *Progress in Physical Geography* 23 (2) 181 – 204

Chapman, A, 2007 A Bronze Age barrow cemetery and later boundaries, pit alignments and enclosures at Gayhurst Quarry, Newport Pagnell, Buckinghamshire *Records of Buckinghamshire* 47, 83 – 211

Chapman, M R & Shackleton, N J 2000 Evidence of 550-year and 1000-year cyclicities in North Atlantic circulation patterns during the Holocene *The Holocene* 10 (3), 287 – 291

Charleson, M M 1898 Notes on Stone Implements and other Relics of the Early Inhabitants of Orkney, *Proceedings of the Society of Antiquaries of Scotland* 32, 316 – 24

Charleson, M M 1902 Notice of a Chambered Cairn in the Parish of Firth, Orkney *Proceedings of the Society of Antiquaries of Scotland* 36, 733 – 8

Charleson, M M 1903 Notice of the excavation of a Chambered Mound near Breckness, Stromness, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 37, 352 – 9

Charleson, M M 1904 Notice of some ancient burials in Orkney, *Proceedings of the Society of Antiquaries of Scotland* 38, 565 – 6

Charleson, M M 1905 *Orcadian Papers: Being selections from the proceedings of the Orkney Natural History Society from 1887 to 1904* Stromness: William Rendall

Charman D J 1994 Late-glacial and Holocene vegetation history of the Flow Country, northern Scotland *New Phytologist* 127, 155 – 68

Charman, D, Barber, K, Blaauw, M, Langdon, P, Mauquoy, D, Daley, T, Hughes, P & Karofeld, E, 2009 Climate drivers for peatland palaeoclimate records *Quaternary Science Reviews* 28, 1811 – 19

Charman, D J, Blundell, A, Chiverrell, R C, Hendon, D & Langdon, P G 2006 Compilation of non-annually resolved Holocene proxy climate records: stacked Holocene peatland palaeo-water table reconstructions from northern Britain *Quaternary Science Reviews* 25, 336 – 350

Charman, D J, West, S & Kelly, A 1995 Environmental Change and Tephra Deposition: the Strath of Kildonan, Northern Scotland *Journal of Archaeological Science* 22, 799 – 809

Chenery, C A & Evans, J A 2011 A Summary of the Strontium and Oxygen Isotope Evidence for the Origins of Bell Beaker individuals found near Stonehenge *in* Fitzpatrick, A P *The Amesbury Archer and the Boscombe Bowman Bell Beaker Burials at Boscombe Down, Amesbury, Wiltshire* Salisbury: Wessex Archaeology, Report No. 27, 185 – 90

Childe, V G 1930 Operations at Skara Brae during 1929, *Proceedings of the Society of Antiquaries of Scotland* 64, 158 – 91

Childe, V G 1931a *Skara Brae: A Pictish Village in Orkney* London: Kegan Paul, Trench, Truber & Co. Ltd

Childe, V G 1931b Final Report on the Operations at Skara Brae, *Proceedings of the Society of Antiquaries of Scotland* 65, 27 – 77

Childe, V G 1931c Skara Brae A 'Stone Age' Village in Orkney, *Antiquity* 5, 47 – 59

Childe, V G 1935 *The Prehistory of Scotland* London: Keegan Paul, Trench, Trubner & Co. Ltd

Childe, V G 1938 Excavations carried out by H.M. Office of Works in the Bronze-Age Levels at Jarlshof in 1937 *Proceedings of the Society of Antiquaries of Scotland* 72, 348 – 65

Childe, V G 1942 The Chambered Cairns of Rousay *The Antiquaries Journal* XXII, No. 2, 139 – 42

Childe, V G 1946 *Scotland before the Scots Being the Rhind Lectures for 1944* London: Methuen & Co.

Childe, V G 1952 Re-excavation of the chambered cairn of Quoyness, Sanday, on behalf of the Ministry of Works in 1951 – 2, *Proceedings of the Society of Antiquaries of Scotland* 86, 155 – 72

Childe, V G 1956 Maes Howe, *Proceedings of the Society of Antiquaries of Scotland* 88, 155 – 72

Childe, V G & Grant, W G 1939 A Stone Age Settlement at the Braes of Rinyo, Rousay, Orkney, (First report) *Proceedings of the Society of Antiquaries of Scotland* 73, 6 – 31

Childe, V G & Grant, W G 1947 A Stone Age Settlement at the Braes of Rinyo, Rousay, Orkney (Second Report), *Proceedings of the Society of Antiquaries of Scotland* 81, 16 – 42

Childe, V G & Paterson, J W 1929 Provisional report on the excavations at Skara Brae, and on finds from the 1927 and 1928 campaigns, *Proceedings of the Society of Antiquaries of Scotland* 63, 225 – 79

Christison, R 1881 On an Ancient Wooden Image, Found in November last at Ballachulish Peat-Moss *Proceedings of the Society of Antiquaries of Scotland* 15, 1880 – 81, 158 – 78

Church, M, Gilmour, S & Flitcroft, C 1998 Gob Eirer (Uig parish) promontory fort *Discovery and Excavation in Scotland*, 106

Church, R R & Lyman, R L 2003 Small fragments make small differences in efficiency when rendering grease from fractured artiodactyls bones by boiling *Journal of Archaeological Science* 30, 1077 – 84

Clapham, A R, Tutin, T G & Warburg, E F 1962 *Flora of the British Isles* Cambridge: Cambridge University Press

Clark, G 1947 Whales as an Economic Factor in Prehistoric Europe *Antiquity* 21, 84 – 104

Clark, P (ed) 2004 *The Dover Bronze Age Boat* Swindon: English Heritage

Clarke, A 1992 Artefacts of Coarse Stone from Neolithic Orkney *in* Sharples, N & Sheridan, A (eds) *Vessels for the Ancestors Essays on the Neolithic of Britain and Ireland in honour of Audrey Henshall* Edinburgh: Edinburgh University Press, 244 – 258

Clarke, A 2000 Coarse Stone Tools as Chronological Indicators *in* Downes, J & Lamb, R *Prehistoric Houses at Sumburgh in Shetland Excavations at Sumburgh Airport 1967 – 74* Oxford: Oxbow Books, 69 – 75

Clarke, A 2005 The Stone Tool Assemblage *in* Richards, C (ed.) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 323 – 338

Clarke, A 2006 *Stone Tools and the Prehistory of the Northern Isles* Oxford: Archaeopress, British Archaeological Reprt British Series 406

Clarke, A 2007 The Coarse Stone *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd,292 – 315

Clarke, A 2011 Does size matter? Stone axes from Orkney: their style and deposition *in* Davis, V & Edmonds, M (eds) *Stone Axe Studies III* Oxford & Oakville: Oxbow Books, 309 – 22

Clarke, A 2016 The Coarse Stone from Neolithic Sites around the Bay of Firth: Stonehall, Wideford Hill, Crossiecrown, Knowes of Trotty and Brae of Smerquoy *in*

Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 445 – 72

Clarke D L 1970 *Beaker Pottery of Great Britain and Ireland* Cambridge: Cambridge University Press (2 volumes)

Clarke, D V 1976a *The Neolithic Village at Skara Brae, Orkney, Excavations 1972-3: An Interim Report* Edinburgh: Her Majesty's Stationery Office

Clarke, D V 1976b Excavations at Skara Brae, a summary account *in* Burgess C & Miket R (eds) *Settlement and Economy in the Third and Second millennium BC* Oxford: British Archaeological Report, British Series 33, 233 – 50.

Clarke, D V 1977a Skara Brae Grooved Ware Settlement *Discovery and Excavation in Scotland*, The Scottish Group, Council for British Archaeology, 24

Clarke, D V 1977b Skara Brae, Mainland, Orkney Grooved Ware Settlement *Proceedings of the Prehistoric Society* 43, 395

Clarke, D V 1978 Links of Noltland, *Discovery and Excavation in Scotland* The Scottish Group, Council for British Archaeology, 18

Clarke, D V 1979 Links of Noltland, *Discovery and Excavation in Scotland* The Scottish Group, Council for British Archaeology, 77 – 8

Clarke, D V 1980 Links of Noltland, *Discovery and Excavation in Scotland* The Scottish Group, Council for British Archaeology, 25

Clarke, D V 1981 Links of Noltland, *Discovery and Excavation in Scotland* The Scottish Group, Council for British Archaeology, 25 – 6

Clarke, D V, Cowie, T G & Foxon, A 1985 *Symbols of Power at the time of Stonehenge* Edinburgh: National Museum of Antiquities of Scotland & Her Majesty's Stationery Office

Clarke, D V & Sharples, N 1985 Settlements and subsistence in the third millennium BC *in* Renfrew, A C (ed.) *The Prehistory of Orkne*y Edinburgh: Edinburgh University Press, 54 – 82.

Clarke, D V and Shepherd, A N (eds) in preparation *Skara Brae: a Full Compendium of the Site. From excavations in 1972–3 and 1977 and the Work of V G Childe and Other Scholars*

Clarke, D V, Sheridan, J A, Shepherd, A, Sharples, N , MacSween, A, Armour-Chelu, M, Hamlet, L, Bronk Ramsey, C, Dunbar, E, Reimer, P, Marshall, P & Whittle, A forthcoming The End of the World, or Just Goodbye to All That? Contextualising the Late Third Millennium cal BC Deer Heap at Links of Noltland, Westray, Orkney *Proceedings of the Society of Antiquaries of Scotland*

Clarke, L 2008a *M3 Clonee-North of Kells Contract 1 Klonee - Dunshaughlin Report on the Archaeological Excavation of Bracetown 1, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Clarke, L 2008b *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Boyerstown 2 County Meath* Unpublished

report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Clarke, L 2008c *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Boyerstown 5 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Clarke, L 2008d *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Boyerstown 7 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Clarke, L 2008e *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Boyerstown 8 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Cleary, R M & Hawkes, A 2013 The Excavation of Four Fulachtaí Fia and Iron Age Pits at Ballyadam, Carrigtohill, Co. Cork *Journal of the Cork Historical and Archaeological Society* 118, 1 – 38

Cleary, S E 2013 *Chedworth Life in a Roman Villa* Gloucester: The History Press

Close-Brooks, J 1976 New finds of late bronze-age spearheads from Scotland *Proceedings of the Society of Antiquaries of Scotland* 107, 310 – 13

Clouston, C 1834 Section IX The Orkney and Zetland Islands Route Sixth – Part I The Orkney Islands *in* Anderson, G & Anderson, P *Guide to the Highlands and Islands of Scotland including Orkney and Zetland, Descriptive of their Scenery, Statistics, Antiquities, and natural History: with Numerous Historical Notices* London: John Murray, Albemarle Street, 624 – 81

Clouston, C 1845 Parish of Sandwick *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy*, *Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 41 – 69 of the Orkney section (volume not continuously numbered)

Clouston, J S 1914 *Records of the Earldom of Orkney* Edinburgh: University Press for the Scottish History Society

Clouston 1918 The Old Chapels of Orkney Part II *Scottish Historical Review* 15, no. 59, 223 – 40

Clouston, J S 1919 The Orkney Townships *Scottish Historical Review* 17, no. 65, 16 – 45

Clouston, J S 1924 Old Orkney Houses III, *Proceedings of the Orkney Antiquarian Society* Volume II (Session 1923 – 1924), Kirkwall, 7 – 14

Clouston, J S 1925 An Orkney 'Perambulation' *Scottish Historical Review* 22, no. 87, 182 – 92

Clouston, J S 1926 An Early Orkney Castle *Proceedings of the Society of Antiquaries of Scotland* 60, 281 – 300

Clouston, J S 1927 (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office

Clouston, J S 1929 Three Norse Strongholds in Orkney *Proceedings of the Orkney Antiquarian Society* VII, 57 – 74

Clouston, J S 1932a *A History of Orkney* Kirkwall: W R Mackintosh

Clouston J S 1932b Tammaskirk in Rendall *Proceedings of the Orkney Antiquarian Society* X, 9 – 16

Clouston, R S 1885 Notice of the excavation of a chambered cairn of the stone age, at Unstan, in the Loch of Stennis, Orkney *Proceedings of the Society of Antiquaries of Scotland* 19, 341 – 51

Clouston, W 1927a United Parishes of Sandwick and Stromness *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 95 – 140

Clouston, W 1927b United Parishes of Cross and Burness, in the Isle of Sanday, and of North Ronaldshay (sic) including also the Parish of Ladykirk, in the Isle of Sanday, presently vacant *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 252 – 88

Cluett, J 2007 *Soil and Sediment-based Cultural Records and The Heart of Neolithic Orkney World Heritage Site buffer zones* University of Stirling PhD Thesis available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Clutton-Brock, J 1979 Report on the Mammalian Remains other than Rodents from Quanterness *in* Renfrew, A C *Investigations in Orkney* London: Society of Antiquaries, Reports of the Research Committee of the Society of Antiquaries of London 38, 112 – 134

Coates, J 2005 The Bronze Age Ferriby Boats: Seagoing Ships or Estuary Ferry Boats? *International Journal of Nautical Archaeology* 34.1, 38 – 42

Cochran Patrick, B W 1872 'Notices of some antiquities recently discovered in North Ayrshire *Proceedings of the Society of Antiquaries of Scotland* 9, 385 – 7 & plate 22

Cochran Patrick, B W 1880 Note on some Bronze Weapons, Implements and Ornaments *Proceedings of the Society of Antiquaries of Scotland* 14, 95 – 8

Cockrell, T F 2016 *The Don Valley in Prehistory: Upland and Lowland Developments and Interactions* University of Sheffield PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Coe, M D 1993 Pre-Conquest America *in* Cope, A (ed) *Swords and Hilt Weapons* London: Multi Media Books Ltd, 218 – 225

Coflein: the online search facility of the Royal Commission on the Ancient and Historical Monuments of Wales at http://www.coflein.gov.uk/

Coles, B 1990 Anthropomorphic wooden figurines from Britain and Ireland *Proceedings of the Prehistoric Society* 56, 315 – 333

Coles, B 1993 Roos Carr and Company in Coles, J, Fenwick, V & Hutchinson, G (eds) *A Spirit of Enquiry Essays for Ted Wright* Wetland Archaeology Research Project Occasional Paper No 7, 17 – 22

Coles, B J 1994 *Trisantona* Rivers: a landscape approach to the interpretation of river names *Oxford Journal of Archaeology* 13 (3) 295 – 311

Coles B 1998 Wood Species for Wooden Figures: a Glimpse of a Pattern *in* Gibson A & Simpson D (eds) *Prehistoric Ritual and Religion*, Stroud: Sutton Publishing, 163 – 175

Coles, J 1968 A Neolithic God-dolly from Somerset, England *Antiquity* 42, 275 – 77

Coles, J 1979 *Experimental Archaeology* London: Academic Press

Coles, J 2000 *Patterns in a Rocky Land: Rock Carvings in South-West Uppland, Sweden* Uppsala: Department of Ancient History and Archaeology, 2 volumes

Coles, J 2002 Chariots of the Gods? Landscape and Imagery at Frännarp, Sweden *Proceedings of the Prehistoric Society* 68, 215 – 46

Coles, J 2003 And on they went … processions in Scandinavian Bronze Age rock carvings *Acta Archaeologica* 74, 211 – 50

Coles, J 2004 Bridge to the Outer World: Rock Carvings at Bro Utmark, Bohuslän, Sweden *Proceedings of the Prehistoric Society* 70, 173 – 206

Coles, J 2005 *Shadows of a Northern Past Rock Carvings of Bohuslän and Østfold* Oxford: Oxbow Books

Coles, J 2006 Beacon on the Ridge. Rock Carvings at Kasen Lövåsen, Bohuslän, Sweden *Proceedings of the Prehistoric Society* 72, 319 – 40

Coles, J M 1960 Scottish Late Bronze Age metalwork: typology, distributions and chronology *Proceedings of the Society of Antiquaries of Scotland* 93, 16 – 134

Coles J M 1964 Scottish Middle Bronze Age metalwork *Proceedings of the Society of Antiquaries of Scotland,* 97, 82 – 156

Coles, J M 1969 Scottish Early Bronze Age metalwork *Proceedings of the Society of Antiquaries of Scotland,* 101, 1 – 110

Coles, J M, Coutts, H & Ryder, M L 1964 A Late Bronze Age Find from Pyotdykes, Angus, Scotland, with associated Gold, Cloth and Leather Remains *Proceedings of the Prehistoric Society* New Series Vol. 30, 186 – 198

Coles, J M & Harding, A F 1979 *The Bronze Age in Europe An introduction to the prehistory of Europe c. 2000 – 700 BC* London: Methuen & Co Ltd

Coles, J M, Heal, S V E & Orme, B J 1978 The use and character of wood in prehistoric Britain and Ireland *Proceedings of the Prehistoric Society* Vol 44, 1 – 45

Collins, G 1688 *The Chiefe Harbours in the Islands of Orkney* London: F. Collins

Collins, G & Moll, H 1693 *The Islands of Orkney* London: F. Collins

Colt Hoare, R 1812 *The Ancient History of South Wiltshire Volume I* London: William Miller (Facsimile edition 1975, Wakefield: E P Publishing)

Colt Hoare, R 1821 *The Ancient History of Wiltshire Volume II* London: Lackington, Hughes, Harding, Mavor & Lepard (Facsimile edition 1975, Wakefield: E P Publishing)

Comyn, D (ed) 1902 *The History of Ireland by Geoffrey Keating D.D.* Vol. I London: Irish Texts Society (volumes II – IV edited by Dinneen)

Connell, A 1846 Analysis of the Volcanic Dust which fell on the Orkney Islands on the 2nd September 1845 *The New Edinburgh Philosophical Journal* 40, 217 – 219

Connell, T 2009 *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Gainstown 2 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Conroy, D 2004 *Ox Yokes: Culture, Comfort and Animal Welfare* Paper given at the World Association for Transport Animal Welfare and Studies (TAWS) Common ground: moving forward with animals TAWS/TAA/BVA workshop held 15 April 2004, downloaded from www.taws.org/TAWSworkshop2004.htm on 5/01/09

Cook, J 1939 A Comparison of Stonehenge with Stone Circles of Stenness Area, *Proceedings of the Orkney Antiquarian Society* Volume XV, 53 – 59

Coombes, P and Barber, K 2005 Environmental determinism in Holocene research: causality or coincidence? *Area* 37, 3, 303 – 311

Coombs, D G 1988 A note on the rampart of the hillfort of Kelsborrow, Cheshire *Manchester Archaeological Bulletin* 3, 64 – 7

Coombs, D 2001 Metalwork *in* Pryor, F *The Flag Fen Basin Archaeology and Environment of a Fenland Landscape* Swindon: English Heritage, 255 – 98

Cooney, G 1996 Images of settlement and the landscape in the Neolithic *in* Topping, P (ed) *Neolithic Landscapes* Oxford: Oxbow books, 23 – 31

Cooney, G 1999 *Landscapes of Neolithic Ireland* London: Routledge

Cooney, G 2003 Rooted or routed? Landscapes of Neolithic settlement in Ireland *in* Armit, I, Murphy, E, Nelis, E & Simpson, D *Neolithic Settlement in Ireland and Western Britain* Oxford: Oxbow Books, 47 – 55

Cormack, A & Cormack, A 1971 *Days of Orkney Steam* Kirkwall: The Kirkwall Press

Corrie, J M 1929 A short cist at West Puldrite in the parish of Evie & Rendall, Orkney (including a report on the human remains found in the cist by Professor A. Low) *Proceedings of the Society of Antiquaries of Scotland* 63, 190 – 5

Corrie, J M 1931 Interesting Steatite Vessels Found in Orkney, *Proceedings of the Orkney Antiquarian Society* Volume IX, Kirkwall, 47 – 8

Costello, E 2016 Seasonal Management of Cattle in the Booleying System: New Insights from Connemara, Western Ireland *in* O' Connell, M, Kelly, F & McAdam, J H (eds) *Cattle in Ancient and Modern Ireland: Farming Practices, Environment and Economy* Newcastle Upon Tyne: Cambridge Scholars Publishing, 68 – 78

Cottar, C 2012 *The Western Stone Forts Project: Excavations at Dún Aonghasa and Dún Eoghanachta,* Two volumes, Dublin: Wordwell Ltd

Couch, J (ed) 1847 *Pliny's Natural History in thirty-seven books. A translation on the basis of that by Dr. Philemon Holland, ed. 1601* London: George Barclay

Cowen, J D 1951 The Earliest Bronze Swords in Britain and their Origins on the Continent of Europe *Proceedings of the Prehistoric Society* New Series Vol 17, part 2, 195 – 213

Cowen, J D 1967 The Hallstatt Sword of Bronze: on the Continent and in Britain *Proceedings of the Prehistoric Society* New Series Vol 33, 377 – 454

Cowie, T 1988 *Magic Metal: Early Metalworkers in the North-East* Aberdeen: Anthropological Museum, University of Aberdeen

Cowie, T 2004 Special places for special axes? Early Bronze Age metalwork from Scotland in its landscape setting *in* Shepherd, I A G & Barclay, G J (eds) *Scotland in Ancient Europe: The Neolithic and Early Bronze Age of Scotland in their European Context* Edinburgh: Society of Antiquaries of Scotland, 247 – 61

Cowie, T 2006a Fasach, Glendale, Skye metal detector find/casual find *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 7, 90 – 1

Cowie, T 2006b Breachacha House or Breachacha (New) castle, Isle of Coll, casual find *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 7, 28

Cowie, T 2007 Ardnave, Islay, chance find *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series vol 8, 39 – 40

Cowie, T & O'Connor, B 2006 Hobbister *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 7, 121

Cowie, T & O'Connor, B 2007 Late Bronze Age Swords from Scotland: some finds old and new in Burgess, C Topping, P & Lynch, F (eds) *Beyond Stonehenge: Essays on the Bronze Age in Honour of Colin Burgess* Oxford: Oxbow Books, 316 – 34

Cowie, T, Pickan, J & Wallace, C 2011 Bog Bodies from Scotland: Old Finds, New Records *Journal of Wetland Archaeology* 10, 1 – 45

Cowie, T G 1978 *Bronze Age Food Vessel Urns in Northern Britain* Oxford: British Archaeological Reports British Series 55

Cowie, T G & Shepherd, I A G 2003 The Bronze Age *in* Edwards, J E & Ralston, I B M (eds) *Scotland After the Ice Age Environment, Archaeology and History 8000 BC – AD 1000,* Edinburgh: Edinburgh University Press, 151 – 68

Cowley, D C 1998 Identifying marginality in the first and second millennia BC in the Strath of Kildonan, Sutherland *in* Mills, C M & Coles, G (eds) *Life on the Edge Human Settlement and Marginality* Oxford: Oxbow Books Monograph 100, 165 – 71

Cracknell, S & Smith, B 1983 Archaeological investigations at Mavis Grind, Shetland *Glasgow Archaeological Journal* 10, 13 – 39

Craddock, P T 1995 *Early Metal Mining and Production* Washington DC: Smithsonian Institution Press

Crane, P 1998 Porth y Rhaw *Archaeology in Wales* 38, 124 – 5

Crane P 1999 *Iron Age promontory fort to Medieval Castle? Excavations at Great Castle Head, Dale, Pembrokeshire, 1999,* Archaeologia Cambrensis 148, 86 – 145

Cramp, L J E, Jones, J, Sheridan, A, Smyth, J, Whelton, H, Mulville, J, Sharples, N & Evershed, R P 2014 Immediate replacement of fishing with dairying by the earliest farmers of the northeast Atlantic archipelagos *Proceedings of the Royal Society of London B*, 20132372, http://dx.doi.org/10.1098/rspb.2013.2372

Craw, J 1931 Underground building at Midhouse, Orkney: Two Urns found at Lintlaw, Berwickshire: and the excavation of a cairn at Drumelzier, Peebleshire *Proceedings of the Society of Antiquaries of Scotland* 65, 357 – 72

Craw, J H 1934 A Mound containing short cists at Trumland, Rousay, Orkney *Proceedings of the Society of Antiquaries of Scotland* 68, 68 – 70

Crawford, I A 1981 War or Peace – Viking Colonisation in the Northern and Western Isles of Scotland Reviewed *in* Bekker-Nilesen, H, Foote, P G & Olsen, O (eds) *Proceedings of the Eighth Viking Congress* Odense: Odense University Press, 259 – 69

Cree, J E 1928 Notices of a Bronze Axe and a fragment of a Tanged Dagger found near Gullane, East Lothian, and of a Food-Vessel from Gadder, Lanarkshire *Proceedings of the Society of Antiquaries of Scotland* 62, 229 – 31

Cree, J E & Curle, A O 1922 Account of the excavations on Traprain Law during the summer of 1921 *Proceedings of the Society of Antiquaries of Scotland* 56, 189 – 259

Cregeen E R 1960 Quinish *Discovery and Excavation in Scotland* Scottish Regional Group Council for British Archaeology, 22

Cressey, M & Sheridan, A 2003 The excavation of a Bronze Age cemetery at Seafield West, near Inverness, Highland *Proceedings of the Society of Antiquaries of Scotland* 133, 47 – 84

Cressey, M & Strachan, R 2003 The excavation of two burnt mounds and a wooden trough near Beechwood Farm, Inshes, Inverness, 1999 *Proceedings of the Society of Antiquaries of Scotland* 133, 191 – 203

Crockford, S J & Frederick, S G 2007 Sea ice expansion in the Bering Sea during the Neoglacial: evidence from archaeozoology *The Holocene* 17 (6), 699 – 706

Crofts, C B 1955 Maen Castle, Sennen: the excavation of an Early Iron Age promontory fort *Proceedings of the West Cornwall Field Club* 1 (3), 93 – 108

Crozier, R, Richards, C, Robertson, J & Challands, A 2016 Reorienting the Dead of Crossiecrown: Quanterness and Ramberry Head *in* Richards C & Jones, R

(eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 196 – 223

Cruden, S 1958 South Unigarth Earth House, Mainland, Orkney *Discovery and Excavation in Scotland* Scottish Regional Group Council for British Archaeology, 39

Crumlin-Pedersen, O & McGrail, S 2006 Some Principles for the Reconstruction of Ancient Boat Structures *International Journal of Nautical Archaeology* 35 (1), 53 – 57

Cubbon, A M 1965 Clay Head cooking place sites: excavation of a group of cairns *Proceedings of the Isle of Man Natural History and Antiquarian Society* 6, 566 – 596

Cucchi, T, Barnett, R, Martínková, N, Renaud, S, Renvoisé, E, Evin, A, Sheridan, A, Mainland, I, Wickham-Jones, C, Tougard, C, Quéré, J P, Pascal, M, Pascal, M, Heckel, G, O'Higgins, P, Searle, J B & Dobney, K M 2014 The changing pace of insular life: 5000 years of evolution in the Orkney Vole (*Microtus arvalis orcadensis*) *Evolution International Journal of Organic Evolution* 68 (10), 2804 – 20

Cullen, K J 2010 *Famine in Scotland: the 'Ill years' of the 1690s* Edinburgh: University Press, Scottish Historical Review Monograph

Cullen, K J, Whatley, C A & Young, M 2006 King William's Ill Years: New Evidence on the Impact of Scarcity and Harvest Failure During the Crisis of the 1690s on Tayside *The Scottish Historical Review*, 85 (2), No. 220, 250 – 76

Cumming, G A 1946 Flint core axe found on Fair Isle, Shetland *Proceedings of the Society of Antiquaries of Scotland* 80, 146 – 8

Cummings, V, Downes, J, Gee, C & Richards, C 2016 *Preliminary investigations at Cata Sand, Sanday, Orkney, 2016* Unpublished Report

Cummings, V & Robinson, G (eds) 2015 *The Southern Kintyre Project Exploring interactions across the Irish Sea from the Mesolithic to the Bronze Age* Oxford: British Archaeological Reports Ltd, British Archaeological Reports British Series 618

Cunliffe, B 1976 *Iron Age Sites in Central Southern England* London: Council for British Archaeology Research Report 16

Cunliffe, B 1987 *Hengistbury Head, Dorset, volume 1: the prehistoric and Roman settlement, 3500 BC - AD 500* Oxford: Oxford University Committee for Archaeology

Cunnington, M E 1907 Oliver's Camp, Devizes *The Wiltshire archaeological and natural history magazine* 35, 408 – 40

Curle, A O 1915 Account of excavations on Traprain Law in the Parish of Prestonkirk, County of Haddington, in 1914 *Proceedings of the Society of Antiquaries of Scotland* 49, 139 – 202

Curle, A O 1933 Account of Further Excavation in 1932 of the Prehistoric Township at Jarlshof, Shetland, on behalf of H M Office of Works *Proceedings of the Society of Antiquaries of Scotland* 67, 82 – 136

Curle, A O 1934 Account of Further Excavation at Jarlshof, Sumburgh, Shetland, in 1932 and 1933, on behalf of H M Office of Works *Proceedings of the Society of Antiquaries of Scotland*, 68, 224 – 319

Curle, A O 1936 Account of the excavation of an iron smeltery and of an associated dwelling and tumuli at Wiltrow in the Parish of Dunrossness, Shetland, *Proceedings of the Society of Antiquaries of Scotland* 70, 153 – 69

Curle, A O & Cree, J E 1921 Account of the excavations on Traprain Law during the summer of 1920 *Proceedings of the Society of Antiquaries of Scotland* 57, 153 – 206

Curle, C L 1982 *Pictish and Norse Finds from the Brough of Birsay 1934 – 74* Edinburgh: Society of Antiquaries of Scotland Monograph Series No. 1

Cursiter, J 1923 The Orkney Brochs, *Proceedings of the Orkney Antiquarian Society* Volume I, Kirkwall, 49 – 52

Cursiter, J W, 1882 Note of a Carved Stone Ball recently found in Orkney (A Cast of the Ball was exhibited) *Proceedings of the Society of Antiquaries of Scotland* 16, 295 – 6

Cursiter, J W, 1886 Notice of a Wood-Carver's Tool-Box, with Celtic Ornamentation, recently discovered in a Peat Moss in the Parish of Birsay, Orkney *Proceedings of the Society of Antiquaries of Scotland* 20, 47 – 50

Cursiter, J W 1887 Notice of the Bronze Weapons of Orkney and Shetland, and of an Iron Age deposit found in a cist at Moan, Harray, *Proceedings of the Society of Antiquaries of Scotland* 21, 339 – 46

Cursiter, J W, 1889 Notes on a Hoard of Silver Ornaments and Coins, discovered in the Island of Burray, Orkney *Proceedings of the Society of Antiquaries of Scotland* 23, 318 – 22

Cursiter, J W, 1898 Note on a Stone bearing an Incised Cross, from the Site of St Colm's Chapel, Walls, Orkney *Proceedings of the Society of Antiquaries of Scotland* 32, 50 – 2

Cursiter, J W 1908 Notices (1) of a bronze dagger, with its handle of horn, recently found in the island of Rousay, and (2) of an inscription in tree-runes, recently discovered on a stone in the stone circle of Stennis, Orkney *Proceedings of the Society of Antiquaries of Scotland* 42, 74 – 8

Cursiter, J W 1910 Notice of a Stone Cist of Unusual Type found at Crantit near Kirkwall, *Proceedings of the Society of Antiquaries of Scotland* 44, 215 – 17

Cursiter, J W 1930 Underground Chamber at Braebister, Hoy, *Proceedings of the Orkney Antiquarian Society* Volume VIII, Kirkwall, 51 – 2

Curtis, E 1930 *The North American IndianVolume 20*Norwood: The Plimpton Press

Curtis, N & Wilkin, N 2012 The Regionality of Beakers and Bodies in the Chalcolithic of North-East Scotland *in* Allen, M J, Gardiner, J & Sheridan, A (eds) *Is there a British Chalcolithic? People, place and polity in the late 3rd millennium* Oxford: The Prehistoric Society/Oxbow Books (Prehistoric Society Research Paper no. 4), 237 - 56

Cuthbert, O D 1995 *The Life and Letters of an Orkney Naturalist* Kirkwall, Orkney: The Orkney Press

Cuthbert, O D (ed) 2001 *A History of the Orkneys introduced by A Description of the Islands and their inhabitants by George Low (1747 – 1795)* Kirkwall, Orkney: Orkney Heritage Society

Dagless, N, Fitzpatrick, A P & Norcott, D 2011 Grave 1289: the Amesbury Archer *in* Fitzpatrick, A P *The Amesbury Archer and the Boscombe Bowman Bell Beaker Burials at Boscombe Down, Amesbury, Wiltshire* Salisbury: Wessex Archaeology, Report No. 27, 69 – 77

Dahl, S O & Nesje, A 1994 Holocene glacier fluctuations at Hardangerjøkulen, central-southern Norway: a high-resolution composite chronology from lacustrine and terrestrial deposits *The Holocene* 4 (3) 269 – 277

Dalland, M 1998 Radiocarbon Dating, Calibration and Statistical Analysis *in* Lowe, C *Coastal Erosion and the Archaeological Assessment of an Eroding Shoreline at St Boniface Church, Papa Westray, Orkney* Stroud: Sutton Publishing, 97 – 107

Dalland, M (ed) 1999 Sand Fiold: the excavation of an Exceptional Cist in Orkney, *Proceedings of the Prehistory Society* 65, 373 – 413

Dalrymple, C E 1884 Notes of the excavation of the stone circle at Crichie, Aberdeenshire *Proceedings of the Society of Antiquaries of Scotland* 18, 319 – 25

D'Amico, C 2005 Neolithic 'greenstone' axe blades from Northwestern Italy across Europe: A first petrographic comparison *Archaeometry* 47 235 – 52

Danaher, K & Lucas, A T 1952 Sweathouse, Co. Tyrone *Journal of the Royal Society of Antiquaries of Ireland* 82 (2) 179 – 80

Dark, P 2006 Climate deterioration and land-use change in the first millennium BC: perspectives from the British palynological record *Journal of Archaeological Science* 33, 1381 – 95

Darrah, R 2004 The reconstruction experiment *in* Clark, P (ed) *The Dover Bronze Age Boat* Swindon: English Heritage, 163 – 188

Darrah, R 2012 The reconstruction of the Dover Boat *in* Lehoërff, A (ed) *Beyond the Horizon Societies of the Channel and North Sea 3,500 years ago* Paris: Somogy Art Publishers, 44 – 9

D'Arrigo, R, Frank, D, Jacoby, G & Pederson, N 2001 Spatial response to major volcanic events in or about AD 536, 934 and 1258: frost rings and other dendrochronological evidence from Mongolia and Northern Siberia: comment on R. B. Stothers, 'Volcanic dry fogs, climate cooling, and plague pandemics in Europe and the Middle East' (Climatic Change 41, 1999) *Climatic Change* 49, 239 – 46

Dasent, G W 1894 *Icelandic Sagas, and other historical documents relating to the settlement and descent of the Northmen on the British Isles Vol II The Orkneyingers Saga* London: Eyre & Spottiswoode for HMSO (the Rolls Series)

Dasent, G W 1911 *The Story of Burnt Njal From the Icelandic of the Njals Saga* London & Toronto: J M Dent & Sons Ltd

Davidson, D A 1979 Chapter II: The Orcadian Environment and Cairn Location *in* Renfrew, A C *Investigations in Orkne*y London: Society of Antiquaries, Reports of the Research Committee of the Society of Antiquaries of London 38, 7 – 20

Davidson, D A, Harkness, D D & Simpson, I A 1986 The Formation of Farm Mounds on the Island of Sanday, Orkney *Geoarchaeology: An International Journal* Vol 1, No. 1, 45 – 60

Davidson, D A & Jones, R L 1985 The Environment of Orkney *in* Renfrew, A C (ed), *The Prehistory of Orkne*y, Edinburgh: Edinburgh University Press, 10 – 35

Davidson, D A, Jones, R L & Renfrew, C 1976 Palaeoenvironmental reconstruction and evaluation: a case study from Orkney *Transactions of the Institute of British Geographers* New Series Vol I (3), 346 – 61

Davidson, D A, Lamb, R & Simpson, I 1983 Farm mounds in North Orkney: A preliminary report *Norwegian Archaeological Review* 16:1, 39 – 44

Davidson, J L 1986 The collection of antiquarian information for the early Ordnance Survey maps of Scotland *Proceedings of the Society of Antiquaries of Scotland* 116, 11 – 16

Davidson, J L & Henshall, A S 1989 *The Chambered Cairns of Orkney,* Edinburgh: Edinburgh University Press

Davies, G & Smith, A N 2007 Bone and antler artefacts *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 325 – 379

Davies, S 2011 The animal remains from Barrow 1 *in* Harding, J & Healy, F (eds) *The Raunds Area Project A Neolithic and Bronze Age Landscape in Northamptonshire Volume 2 Supplementary Studies* Swindon: English Heritage, 667 – 91

Davies, W 1810 *General View of the Agriculture and Economy of North Wales* London: Richard Phillips

Davis, B A S, Brewer, S, Stevenson, A C, Guiot, J & Data Contributors 2003 The temperature of Europe during the Holocene reconstructed from pollen data *Quaternary Science Reviews* 22, 1701 – 16

Davis, M E & Thompson, L G 2006 An Andean ice-core record of a Middle Holocene mega-drought in North Africa and Asia *Annals of Glaciology* 43, 34 – 41

Dawson, S & Smith D E 1997 Holocene relative sea-level changes on the margin of a glacio-isostatically uplifted area: an example from northern Caithness, Scotland *The Holocene* 7, 1, 59 – 77

Dawson, S & Wickham-Jones, C R 2007 Sea level change and the prehistory of Orkney *Antiquity* 81, Issue 312, Project Gallery

Dawson, S & Wickham-Jones, C R 2009 *The Rising Tide: Submerged Landscape of Orkney Annual Interim Report March 2009* downloaded on 07/10/11 from: http://www.abdn.ac.uk/archaeology/staff/staff.php?id=c.wickham-jones

Dawson, S & Wickham-Jones, C R 2011 *Scapa Flow Landscape Partnership Report 25th August 2011 Scapa Flow Landscape Project – Submerged Landscape* downloaded on 20/09/12 from: http://www.abdn.ac.uk/archaeology/profiles/c.wickham-jones/

De la Vega, A C, Smith, D E, Keen, D H & Jones, R L 1996 Holocene Coastal Environment and Sea-Level Change in the Bay of Skaill, Mainland, Orkney *in* Hall, A M (ed)

The Quaternary of Orkney Field Guide London: Quaternary Research Association, 84 – 96

De la Vega Leinert, A, Keen, D H, Jones, R L, Wells, J M & Smith, D E 2000 Mid-Holocene environmental changes in the Bay of Skaill, Mainland Orkney, Scotland: an integrated geomorphological, sedimentological and stratigraphical study *Journal of Quaternary Science* 15 (5) 509 – 528

De la Vega Leinert, A, Smith, D E & Jones, R L 2007 Holocene coastal environmental changes on the periphery of an area of glacio-isostatic uplift: an example from Scapa Bay, Orkney, UK *Journal of Quaternary Science* 22 (8) 755 – 772

De Nicolay, N 1583 *Vraye & exacte description Hydrographique des costes maritimes d'Escosse & des Isles Orchades Hebrides avec partie d'Angleterre & d'Irlande servant a la navigation / Par N. de Nicolay D'auphinois Sieur d'Arfeville & de Belair* Paris: Gilles Beys

Déchelette, J 1914 *Manuel D'Archaéologie Préhistorique Celtique et Gallo-Romaine* Farnborough: Gregg International Publishers Ltd 1971 Facsimile reprint

DEFRA 2003 *Code of Recommendations for the Welfare Livestock: Cattle* downloaded from https://www.gov.uk/government/publications/code-of-recommendations-for-the-welfare-of-livestock-cattle on 19/5/17

DEFRA 2013 *Code of Recommendations for the Welfare Livestock: Sheep* downloaded from https://www.gov.uk/government/publications/code-of-recommendations-for-the-welfare-of-livestock-sheep on 19/5/17

DeMenocal, P B 2001 Cultural Responses to Climate Change During the Late Holocene *Science* 292, 667 – 73

Denford, G T & Farrell, A W 1980 The Caergwrle Bowl – A possible prehistoric boat model *International Journal of Nautical Archaeology and Underwater Exploration* 9.3: 183 – 192

Dennison, W T 1884 Remarks on the Agricultural Classes in the North Isles of Orkney *in* Napier Commission *Evidence taken by Her Majesty's Commission of Enquiry into the conditions of the crofters and cottars in the Highlands and Islands of Scotland Report with Appendices* Edinburgh: Neill & Company, Vol 5, Appendix LIX, 270 – 80

Dering, P 1999 Earth-Oven Plant Processing in Archaic Period Economies: An Example from a Semi-Arid Savannah in South-Central North America *American Antiquity* 64 (4), 659 – 74

Desaille, T 2014 The Cairns Geophysical Survey *Discovery and Excavation in Scotland*, New Series Vol 15, Council for Scottish Archaeology, 150

Dickson, C 1983 Appendix 9: Macroscopic Plant Remains from Knap of Howar Orkney pp 114 – 17 *in* Ritchie, A Excavation of a Neolithic farmstead at Knap of Howar, Papa Westray, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 113, 40 – 121

Dickson, C 1994 Plant Remains *in* Ballin Smith, B (ed) *Howe: Four Millennia of Orkney Prehistory* Edinburgh: Society of Antiquaries of Scotland Monograph Series 9, 125 – 39

Dickson, C 1999 The Plant Remains *in* Owen, O & Lowe, C *Kebister The four-thousand-year-old story of one Shetland Township* Edinburgh: Society of Antiquaries of Scotland Monograph 14, 229 – 44

Dickson, C & Dickson, J 2000 *Plants and People in Ancient Scotland* Stroud: Tempus

Dickson, C A & Dickson, J H 1976 Appendix 3 Macroscopic Plant Remains from the Stones of Stenness, Orkney, pp 40 – 43 *in* Ritchie, J N G The Stones of Stenness, Orkney *Proceedings of the Society of Antiquaries of Scotland* 107, 1 – 60

Dickson, J H 1994 *The yew tree (*Taxus baccata L.*) in Scotland: native or early introduction or both?* Scottish Forestry 48: 252 – 261

Dickson, J H 1978 Bronze Age Mead *Antiquity* 52, 108 – 13 & plate XVa

Dickson, J H 1992 Driftwood as a resource: North American driftwood, especially Picea (spruce), from archaeological sites in the Hebrides and Northern Isles of Scotland Review of Palaeobotany and Palynology, 73, 49 – 56

Dieck A, 1977 Die vorbronzezeitlichen Holzschwerter vom Vallenmoor bei Bramsche, Kr. Osnabrück, und ihre mitteleuropäischen und volkerkundlichen Parallelen *Nachrichten aus Niedersachsens Urgeschichte* vol. 46, Hildesheim 165 – 173

Dineley, M 2004 *Barley, Malt and Ale in the Neolithic* Oxford: John & Erica Hedges Ltd, British Archaeological Report S1213

Dinneen, P S (ed) 1908 *The History of Ireland by Geoffrey Keating D.D.* Vol. II London: Irish Texts Society

Dix, B 1983 *An excavation at Sharpenhoe Clappers, Streatley, Bedfordshire (Iron Age palisade, med rabbit warren)* Bedfordshire Archaeological Journal 16, 65 – 74

Dixon, P 1988 The Neolithic Settlements on Crickley Hill *in* Burgess, C, Topping, P, Mordant, C & Maddison, M (eds) *Enclosures and Defences in the Neolithic of Western Europe* Oxford: Archaeopress, British Archaeological Report International Series 403 (i)

Dixon, P 1994 *Crickley Hill Volume 1: The Hillfort Defences* Nottingham: Crickley Hill Trust/ Department of Archaeology, University of Nottingham

Dixon, P Bayliss, A, Healy, F, Whittle, A & Darvill, T 2011 Chapter 9 The Cotswolds *in* Whittle, A, Healy, F & Bayliss, A *Gathering Time Dating the Early Neolithic Enclosures of Southern Britain and Ireland* Oxford: Oxbow Books, Volume 1, 434 – 75

Dockrill, S J 1984 A Resistivity Survey at Tofts Ness, Sanday, Orkney *Proceedings of the Society of Antiquaries of Scotland* 114, 586 – 8

Dockrill, S J 1986 Resistivity Survey of two settlement sites at Tofts Ness, Sanday, Orkney *Proceedings of the Society of Antiquaries of Scotland* 116, 561 – 5

Dockrill, S J 1993 *The Human Palaeoecology of Sanday, Orkney with Particular Reference to Tofts Ness* Unpublished MPhil thesis, University of Bradford

Dockrill, S J 1998 Northern Exposure: Phase 1 of the Old Scatness excavations 1995 – 8 *in* Nicholson, R A & Dockrill, S J *Old Scatness Broch, Shetland: Retrospect and Prospect* Bradford: Department of Archaeological Sciences Research 5/North Atlantic Biocultural Organisation Monograph 2, 59 – 80

Dockrill, S J 2002 Brochs, economy and power *in* Ballin Smith, B & Banks, I (eds) *In the Shadow of the Brochs The Iron Age in Scotland*, Stroud: Tempus, 153 – 62

Dockrill, S J 2007a An Introduction to the Research *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 1 – 11

Dockrill, S J 2007b Mound 11: the Neolithic and Early Bronze Age *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 13 – 39

Dockrill, S J 2007c Mound 11: the Late Bronze Age and Early Iron Age *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 41 – 112

Dockrill, S J 2007d Discussion *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 381 – 395

Dockrill, S J 2007e Measurement of magnetic susceptibility of Neolithic tip deposits *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 253 – 55

Dockrill, S J 2015 The Pre-broch Sequences and Broch Construction *in* Dockrill, S J, Bond, J M, Turner, V E, Brown, L D, Bashford, D J, Cussans, J E M & Nicholson R A *Excavations at Old Scatness, Shetland Volume 2: The Broch and Iron Age Village* Lerwick: Shetland Heritage Publications, 31 – 63

Dockrill, S J & Bond, J M 2009 Sustainability and Resilience in Prehistoric North Atlantic Britain: the importance of a mixed Paleoeconomic system *Journal of the North Atlantic* 2, 33 – 50

Dockrill, S J & Bond, J M 2015a An Introduction to the Archaeological Excavations at Old Scatness *in* Dockrill, S J, Bond, J M, Turner, V E, Brown, L D, Bashford, D J, Cussans, J E M & Nicholson R A *Excavations at Old Scatness, Shetland Volume 2: The Broch and Iron Age Village* Lerwick: Shetland Heritage Publications, 1 – 29

Dockrill, S J & Bond, J M 2015b Old Scatness and its Implications for our Understanding of the Iron Age of North Atlantic Britain *in* Dockrill, S J, Bond, J M, Turner, V E, Brown, L D, Bashford, D J, Cussans, J E M & Nicholson R A *Excavations at Old Scatness, Shetland Volume 2: The Broch and Iron Age Village* Lerwick: Shetland Heritage Publications, 455 – 99

Dockrill, S J, Bond, J M, Downes, J & Mainland, I L 2010 The Mound of Brough, the Ditch NE of Midhowe and the Knowe of Swandro *Discovery and Excavation in Scotland*, New Series Vol 11, Council for Scottish Archaeology, 123 – 4

Dockrill, S J, Bond, J M, Downes, J & Mainland, I L 2011 The Mound of Brough, the Ditch NE of Midhowe and the Knowe of Swandro *Discovery and Excavation in Scotland*, New Series Vol 12, Council for Scottish Archaeology, 136 – 7

Dockrill, S J, Bond, J M, Downes, J, Mainland, I L & Maher, R 2012 The Knowe of Swandro Evaluation *Discovery and Excavation in Scotland*, New Series Vol 13, Council for Scottish Archaeology, 135 – 6

Dockrill, S J, Bond, J M & Maher, R 2013 The Knowe of Swandro Evaluation *Discovery and Excavation in Scotland*, New Series Vol 14, Council for Scottish Archaeology, 141 – 2

Dockrill, S J, Bond, J M & Maher, R 2014 The Knowe of Swandro Evaluation *Discovery and Excavation in Scotland*, New Series Vol 15, Council for Scottish Archaeology, 149

Dockrill, S J Bond, J M, Milles, A, Simpson, I & Ambers, J 1994 Tofts Ness, Sanday, Orkney. An integrated study of a buried Orcadian landscape *in* Luff, R & Rowley-Conway, P (eds) *Whither Environmental Archaeology?* Oxford: Oxbow Books, Oxbow Monograph 38, 115 – 132

Dockrill, S J, Bond, J M & O'Connor, T P 1998 Beyond the Burnt Mound: The South Nesting Palaeolandscape Project *in* Turner, V (ed) *The Shaping of Shetland: Developments in Shetland Landscape Archaeology*, Lerwick: Shetland Times, 61 – 82

Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A 2007 *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd

Dockrill, S J, Bond, J M, Turner, V E, Brown, L D, Bashford, D J, Cussans, J E M & Nicholson R A 2015 *Excavations at Old Scatness, Shetland Volume 2: The Broch and Iron Age Village* Lerwick: Shetland Heritage Publications

Dockrill, S, Downes, J & Bond, J 2009 Yorville, Rousay, Orkney (Rousay and Egilsay parish), cleaning and recording of coastal erosion site *Discovery and Excavation in Scotland* New Series Vol 10, Council for Scottish Archaeology, 135

Dockrill, S J, Gater, J A & Simpson, I A 2007 Beyond Mound 11: investigations within the Tofts Ness Landscape *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A 2007 *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 113 – 141

Dockrill, S J, Outram, Z & Batt, C M 2006 Time and place: a new chronology for the origin of the broch based on the scientific dating programme at the Old Scatness Broch, Shetland *Proceedings of the Society of Antiquaries of Scotland* 136, 89 – 110

Dockrill, S J & Simpson, I A 1994 The identification of prehistoric anthropogenic soils in the Northern Isles using an integrated sampling methodology *Archaeological Prospection* 1, 75 – 92

Dodgshon, R A 2005 The Little Ice Age in the Scottish Highlands and Islands: documenting its human impact *Scottish Geographical Journal* 121 (4), 321 – 37

Donaldson, A M 1986 Pollen Analysis pp 5 – 13 *in* Morris, C D & Emery, N The Setting for the Brough of Deerness, Orkney *Northern Studies* 23, 1 – 30

Donnelly, M & MacGregor, G 2005 The Excavation of Mesolithic activity, Neolithic and Bronze Age Burnt Mounds and Romano-British Ring Groove Houses at Gallow Hill, Girvan *Scottish Archaeological Journal* Vol 27 (1), 31 – 69

Dorman, J 1996 *Orkney Coast Batteries* 1914 – 1956 Kirkwall: The Orcadian Ltd

Doughton, L 2013 Transforming Space and Place in Bronze Age Shetland *in* Mahler, D L (ed) *The Border of Farming Shetland and Scandinavia Papers from the Symposium in Copenhagen September 19th – 21st 2012* Copenhagen: The National Museum of Denmark Northern Worlds, 35 – 46

Doughton, L 2014 *'A most curious class of small cairn' Reinterpreting the Burnt Mounds of Shetland* University of Manchester PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Douglas, J 1793 *Nenia Britannica: or, a sepulchral history of Great Britain; from the earliest period to its general conversion to Christianity* London: John Nichols

Douglass, R 1988 Mull Survey *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 21

Downes, J, 1994a Excavation of a Bronze Age burial at Mousland, Stromness, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 124, 141 – 54.

Downes, J 1994b Linga Fold, Sandwick parish, Bronze Age burial mounds *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 91 – 2

Downes, J 1997a *The Orkney Barrows Project: Survey Results and Management Strategy* Unpublished Report for Historic Scotland by ARCUS, University of Sheffield

Downes, J 1997b Linga Fiold, Lyking pp115 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 112 – 17

Downes, J 1998a Seven Knowes, Gitterpitten, Evie and Rendall Parish Survey and excavation of burial mounds *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 70

Downes, J 1998b Varme Dale, Gorn, Evie and Rendall Parish Survey and excavation of burial mounds *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 70

Downes, J 1998c Kraa-Tooies (Papa Westray parish) Survey of burial mounds *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 71

Downes, J 1998d The Ruff, Littlequoy Farm, Burray, South Ronaldsay Parish Survey and excavation of cairn *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 71

Downes, J 1998e Els Ness, Sanday, Lady Parish Survey of burial mounds *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 71

Downes, J 1998f Tor Ness, North Ronaldsay, Cross & Burness parsih Survey of cairns *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 69

Downes, J 2000a The Ceramic Sequence *in* Downes, J & Lamb, R *Prehistoric Houses at Sumburgh in Shetland Excavations at Sumburgh Airport 1967 – 74* Oxford: Oxbow Books, 60 – 5

Downes, J 2000b Architecture, Spatial Organisation and Material Culture *in* Downes, J & Lamb, R *Prehistoric Houses at Sumburgh in Shetland Excavations at Sumburgh Airport 1967 – 74* Oxford: Oxbow Books, 117 – 128

Downes, J 2003a Gitterpitten, Rendall pp162 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 4, Council for Scottish Archaeology, 154 – 66

Downes, J 2003b Howe, Harray pp162 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 4, Council for Scottish Archaeology, 154 – 66

Downes, J 2003c Quarrel Geo/Banks pp163 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 4, Council for Scottish Archaeology, 154 – 66

Downes, J 2003d Riff, Rendall pp163 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 4, Council for Scottish Archaeology, 154 – 66

Downes, J 2003e Varme Dale, Rendall pp163 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 4, Council for Scottish Archaeology, 154 – 66

Downes, J 2005 *Cremation Practice in Bronze Age Orkney* University of Sheffield PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Downes, J 2009 The Construction of Barrows in Bronze Age Orkney – an 'assuagement of guilt'? *in* Allen, M J, Sharples, N & O'Connor, T (eds) *Land and People papers in memory of John G. Evans* Oxford: The Prehistoric Society & Oxbow Books, 126 – 35

Downes, J forthcoming *Bronze Age Burials and Burial Rites in Orkney: an Account of the Linga Fiold Excavations, the Orkney Barrows Project and Rescued Bronze Age Burials*

Downes, J & Card, N 2002 Knowes of Trotty (Birsay & Harray parish) Bronze Age Barrow cemetery *Discovery and Excavation in Scotland* New Series, Vol. 3, 87

Downes, J & Foster, S M 2005 Boundaries of the Site and its buffer zones *in* Downes, J, Foster, S M, Wickham-Jones, C R & Callister, J (eds) *The Heart of Neolithic Orkney World Heritage Site Research Agenda* Edinburgh: Historic Scotland, 25 – 37

Downes, J, Foster, S M, Wickham-Jones, C R & Callister, J (eds) 2005 *The Heart of Neolithic Orkney World Heritage Site Research Agenda* Edinburgh: Historic Scotland

Downes, J, Gibson, J, Gibbon, S J & Mitchell, A 2013 *Heart of Neolithic Orkney World Heritage Site Research Strategy 2013 – 2018* Historic Scotland & Orkney College UHI, downloaded on 29/11/14 from: http://www.historic-scotland.gov.uk/hono-research-strategy-2013-18.pdf

Downes, J, Henderson, T & Lamb, J 2000 Excavation methodology *in* Downes, J & Lamb, R *Prehistoric Houses at Sumburgh in Shetland Excavations at Sumburgh Airport 1967 – 74* Oxford: Oxbow Books, 2 – 5

Downes, J & Lamb, R 2000a *Prehistoric Houses at Sumburgh in Shetland Excavations at Sumburgh Airport 1967 – 74* Oxford: Oxbow Books

Downes, J & Lamb, R 2000b Excavations *in* Downes, J & Lamb, R *Prehistoric Houses at Sumburgh in Shetland Excavations at Sumburgh Airport 1967 – 74* Oxford: Oxbow Books, 8 – 34

Downes, J & May, R 2005a Orkney Barrows Project: Excavation Reports *in* Downes, J *Cremation Practice in Bronze Age Orkney* University of Sheffield PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk, 287 – 93

Downes, J & May, R 2005b Unobtrusive cist sites excavated previously as 'rescue' *in* Downes, J *Cremation Practice in Bronze Age Orkney* University of Sheffield PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk, 294 – 99

Downes, J & Morris, C 1997 Hermisgarth, Sanday: the investigation of pyre settings and Pictish cist burials in Orkney *Proceedings of the Society of Antiquaries of Scotland* 127, 609 – 26

Downes, J & Richards, C 1998 Crossiecrown, Quanterness Kirkwall & St. Ola Parish *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 70

Downes, J & Richards, C, 2000 Excavating the Neolithic and Early Bronze age of Orkney: Recognition and Interpretation in the Field, *in* Ritchie A (ed) *Neolithic Orkney in its European Context,* Cambridge: MacDonald Institute for Archaeological Research, 159 – 68

Downes, J & Richards, C 2005 The Dwellings at Barnhouse *in* Richards, C (ed.) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 57 – 127

Downes, J, Richards, C, Brown, J, Cresswell, A J, Ellen, R, Davies, A D, Hall, A, McCulloch, R, Sanderson, D C W & Simpson, I A 2013 Investigating the Great Ring of Brodgar, Orkney *in* Richards, C (ed) *Building the Great Stone Circles of the North* Oxford & Oakville: Windgather Press/Oxbow Books, 90 – 118

Downes, J & Ritchie, A (eds) 2003 *Sea Change: Orkney and Northern Europe in the later Iron Age AD 300–800,* Balgavies, Angus: The Pinkfoot Press

Downes, J, Sharman, P, Challands, A, Voke, P D, Guttmann-Bond, E, McKenzie, J, Towers, R & Voke, P D 2016 Place in the Past: an early Neolithic house at the Knowes of Trotty barrow cemetery, Harray, Mainland, Orkney *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 41 – 63

Downes, J & Thomas, A 2013 Where mythical space lies: land ownership versus land use in the northern Bronze Age *in* Relaki, M & Catapoti, D (eds) *An Archaeology of Land Ownership* Abingdon: Routledge, 70 – 92

Driver, T 2013 *Architecture, Regional Identity and Power in the Iron Age Landscapes of Mid Wales The Hillforts of North Ceredigion* Oxford: Archaeopress, British Archaeological Report British Series 583

Dry, F T & Robertson, J S 1982 *Soil and Land Capability for Agriculture Orkney and Shetland* Aberdeen: The Macaulay Institute for Soil Research

Dry, F T & Sinclair, A H 1985 *The Soils of Orkney* Aberdeen: The Macaulay Institute for Soil Research, Technical Report No 2

Dryden, H 1874 Notes of the Brochs or "Pictish Towers" of Mousa, Clickemin, & co. in Shetland, illustrative of part of the series of Plans and Sections deposited in the

Library of the Society. (Plates XVII – XXII) *Archaeologia Scotica Transactions of the Society of Antiquaries of Scotland* 5, part I, 199 – 212

Drysdale, R, Zanchetta, G, Hellstrom, J, Maas, R, Fallick, A, Pickett, M, Cartwright, I & Piccini, L 2006 Late Holocene drought responsible for the collapse of Old World civilizations is recorded in an Italian cave flowstone *Geology* 34, 101 – 4

D S 1911 Orkney Mound-Lore *Viking Society for Northern Research: Old Lore Miscellany of Orkney Shetland Caithness and Sutherland* 4, 116 – 17

Du Gardin, C 2003 Amber Spacer Beads in the Neolithic and Bronze Age of Europe *in* Beck, C W, Loze, I B & Todd, J M (eds) *Amber in Archaeology Proceedings of the Fourth International Conference on Amber in Archaeology Talsi, 2001* Riga: Institute of the History of Latvia Publishers

Duffy, P R J 2005 *The Excavation of a Mound and Three Cist Burials at Ferndale, Rendall, Orkney* Scottish Archaeological Internet Report 16, www.sair.org.uk

Dugmore, A J, Larsen, G & Newton A J 1995 Seven tephra isochrones in Scotland *The Holocene* 5 (3), 257 – 266

Dunbar, L 2014 Queenamuckle Cairn, Rendall Excavation *Discovery and Excavation in Scotland*, New Series Vol 15, Council for Scottish Archaeology, 144

Duncan, J 1999 Cleuchbrae, Annandale pp112 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 110 – 15

Dunkin, D J 2012 *Water, Landscape and Bronze Age Society in S. England A Contextual Study: with special reference to 'Burnt Mounds'* University of Reading PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Dunn, J 1914 *The Ancient Irish Epic Tale Táin Bó Cúalnge 'The Cualnge Cattle-Raid'* London: David Nutt

Dyer, J 1971 Excavations at Sandy Lodge, Bedfordshire Bedfordshire *Archaeological Journal* 6, *9 – 15*

Dyke, A S & Savelle, J M 2001 Holocene history of the Bering Sea bowhead whale (*Balaena mysticetus*) in its Beaufort Sea summer grounds off southwestern Victoria Island, Western Canadian Arctic *Quaternary Research* 55, 371 – 9

Earwood, C 1991 Two Early Historic bog butter containers *Proceedings of the Society of Antiquaries of Scotland* 121, 231 – 40

EASE 1995 Orphir (Orphir parish), Prehistoric, Norse *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 103

Eastwood, W J, Tibby, J, Roberts, N, Birks, H J B & Lamb H F 2002 The environmental impact of the Minoan eruption of Santorini (Thera): statistical analysis of palaeoecological data from Gölhisar, southwest Turkey *The Holocene* 12 (4), 431 – 44

Edwards, K J, Buckland, P C, Blackford, J J, Dugmore, A J & Sadler J P 1994 The impact of tephra: proximal and distal studies of Icelandic eruptions *Muncher Geographische Auhandlungen* B12, 108 – 26

Edwards, K J & Ralston, I 1978 New dating and environmental evidence from Burghead Fort, Moray *Proceedings of the Society of Antiquaries of Scotland* 109, 202 – 10

Edwards, J E & Ralston, I B M (eds) *2003 Scotland After the Ice Age Environment, Archaeology and History 8000 BC – AD 1000* Edinburgh: Edinburgh University Press

EEC 1986 Council Regulation (EEC) No 1402/86 of 6 May 1986 introducing a common action for the encouragement of agriculture in the Scottish islands off the northern and western coasts with the exception of the Western Isles (Outer Hebrides) *Official Journal of the European Communities* L128, Vol. 29, 9 – 11

EEC 1988 Commission Decision of 8 March 1988 approving an agricultural development programme for the Scottish islands pursuant to Regulation (EEC) No 1402/86 (88/237/EEC*) Official Journal of the European Communities* L 105, Vol. 31, 23 – 4

Ekrem, I & Mortenson, L B (eds) 2003 *Historia Norwegie* (trans. Fisher, P) Copenhagen: Museum Tusculanum Press, University of Copenhagen

Elder, S 2008 *M3 Clonee-North of Kells Contract 1 Klonee - Dunshaughlin Report on the Archaeological Excavation of Raynestown 2, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Elder, S & Ginn, V 2009 *M3 Clonee-North of Kells Contract 1 Klonee - Dunshaughlin Report on the Archaeological Excavation of Johnstown 1, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Elliott, R & Ginn, V 2008a *M3 Clonee-North of Kells Contract 1 Klonee - Dunshaughlin Report on the Archaeological Excavation of Bennetstown 1, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Elliott, R & Ginn, V 2008b *M3 Clonee-North of Kells Contract 1 Klonee - Dunshaughlin Report on the Archaeological Excavation of Bennetstown 2, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Ellis, P 1989 Norton Fitzwarren hillfort: A report on the excavations by Nancy and Philip Langmaid between 1968 and 1971. *Proceedings of the Somerset Archaeological and Natural History Society* 133, 1 – 74

Ellison, A 1981 Towards a socioeconomic model for the Middle Bronze Age in southern England, *in* Hodder, I, Isaac, G & Hammond, N (eds), *Pattern of the Past: Studies in Honour of David Clarke* Cambridge: Cambridge University Press, 413 – 38

Ember, M & Ember, C R 1995 Worldwide Cross-Cultural Studies and Their Relevance for Archaeology *Journal of Archaeological Research* 3 (1), 87 – 111

Emerson, R L 1988 Sir Robert Sibbald, Kt, The Royal Society of Scotland and the origins of the Scottish enlightenment *Annals of Science* 45: 1, 41 - 72

Erbs-Hansen, D R, Knudsen, K L, Gary, A C, Gyllencreutz, R & Jansen, E 2012 Holocene climatic development in Skagerrak, eastern North Atlantic: Foraminiferal and stable isotopic evidence *The Holocene* 22(3), 301 – 12

Eogan, G 1965 *Catalogue of Irish Bronze Swords* Dublin: Stationery Office

Eogan, G 1967 The Mull ('South of Ireland') hoard *Antiquity* 41 (161), 56 – 8

Eogan, G 1983 *The Hoards of the Irish Later Bronze Age* Dublin: University College

Eogan, G 1984 *Excavations at Knowth (1) Smaller passage tombs, Neolithic Occupation and Beaker activity* Dublin: Royal Irish Academy

Eogan, G 1992 Scottish and Irish Passage Tombs: some comparisons and contrasts *in* Sharples, N & Sheridan, A (eds) *Vessels for the Ancestors Essays on the Neolithic of Britain and Ireland in honour of Audrey Henshall* Edinburgh: Edinburgh University Press, 120 – 7

Eogan, G 1994 *The Accomplished Art: Gold and Gold-Working in Britain and Ireland during the Bronze Age (c 2300 – 650 BC)* Oxford: Oxbow Books, Oxbow Monograph 42

Eogan, G & Roche, H 1997 *Excavations at Knowth (2) Settlement and Ritual Sites of the Fourth and Third Millennia BC* Dublin: Royal Irish Academy

Erdtman, G 1924 Studies in the Micropalæontology of Postglacial Deposits in Northern Scotland and the Scotch Isles, with especial reference to the history of the woodlands *Journal of the Linnean Society of London* 46 (311) 449 – 504

Erickson, C L 1999 Neo-environmental determinism and agrarian 'collapse' in Andean prehistory *Antiquity* 73, 634 – 42

Erlandson, J M 2008 Isolation, Interaction and Island Archaeology *Journal of Island and Coastal Archaeology* 3, 83 – 6

Eunson, G 1988 The Road-metaller in Westray *in* Spence, S (ed) *Old Orkney Trades Aspects of Orkney 8* Kirkwall: The Orkney Press

Eunson, J nd *Eight Acres and a Boat Two Hundred Years of Crofting in Fair Isle with the Eunsons, Irvines, Leslies, Stouts, Williamsons and Wilsons* Dundee: Dundee City Council Printing Services

Evans E E 1975 An archaeological miscellany *Ulster Journal of Archaeology* 38, 12 – 18

Evans, H 2008 *Neolithic and Bronze Age Landscapes of Cumbria* Oxford: Archaeopress, British Archaeological Report British Series 463

Evans, J 1897 *The Ancient Stone Implements, Weapons and Ornaments of Great Britain* London & Bombay: Longmans, Green, & Co

Evans, J 1956 *A History of the Society of Antiquaries of London* Oxford: University Press

Evans, J D 1973 Islands as laboratories for the study of cultural process *in* Renfrew, C (ed) The *Explanation of Culture Change: Models in Prehistory* London: Duckworth, 517 – 20

Evans, J G, Limbrey, S & Cleere, H (eds) 1975 *The effect of man on the landscape: the Highland zone* London: Council for British Archaeology Research Report 11

Evans, J G & Spencer, P 1977 The mollusca and environment, Buckquoy, Orkney, pp215 – 19 *in* Ritchie, A Excavation of Pictish and Viking-age farmsteads at Buckquoy, Orkney *Proceedings of the Society of Antiquaries of Scotland* 108, 174 – 227

Evans, J G & Vaughan, M 1983 Appendix 8: The Molluscs from Knap of Howar, Orkney pp106 – 14 *in* Ritchie, A Excavation of a Neolithic farmstead at Knap of Howar, Papa Westray, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 113, 40 – 121

Everton, R F 1975 The animal bones, Stokeleigh Camp *Proceedings of the University of Bristol Spelaeological Society* 14(1), 65 – 74

Fagan, B M 2000 *The Little Ice Age: How Climate Made History 1300 – 1850* New York: Basic Books

Fagan, B 2008 *The Great Warming: Climate Change and the Rise and Fall of Civilisations* London: Bloomsbury Press

Fahy, E M 1960 A hut and cooking- places at Drombeg, Co. Cork *Journal of the Cork Historical and Archaeological Society* 65, 1 – 17

Fairclough, G 2011 Protecting time and space: understanding historic landscape for conservation in England *in* Layton, R & Ucko, P *The Archaeology and Anthropology of Landscape* Abingdon: Routledge, 119 – 34

Fairhurst, H 1984 *Excavations at Crosskirk Broch, Caithness* Edinburgh: Society of Antiquaries of Scotland Monograph Series No. 3

Farr, H 2006 Seafaring as social action *Journal of Maritime Archaeology* 1, 85 – 99

Farrall, T 1874 On the Agriculture of the Islands of Orkney *Transactions of the Highland and Agricultural Society of Scotland* Fourth Series Vol VI, 68 – 99

Farrell, M 2009 *The environmental context of the prehistoric human occupation of Orkney, Scotland* University of Hull PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Farrell, M 2015 Later prehistoric vegetation dynamics and Bronze Age agriculture at Hobbister, Orkney, Scotland *Vegetational History and Archaeobotany* 24, 467 – 86

Farrell, M & Bunting M J 2008 Environmental Context of Prehistoric Social and Cultural Developments in Orkney – Whaness Burn Palaeoenvironmental investigation *Discovery and Excavation in Scotland* New Series Vol 9, 130

Farrell, M, Bunting, M J, Lee, D H L & Thomas, A 2014 Neolithic settlement at the woodland's edge: palynological data and timber architecture in Orkney, Scotland *Journal of Archaeological Sciences* 51, 225 – 36

Farrer, J 1857a Notes on the Bronze and Iron Remains dug up in a 'Pict's House' in the Holm of Eday, Orkney (Presented at last meeting to museum of the Society)

Communicated by John Stuart Esq. *Proceedings of the Society of Antiquaries of Scotland* 2 (1854 – 7), 178 – 9

Farrer, J 1857b Notice of the Antiquities of the Isle of Eday recently examined by James Farrer, of Ingleborough, Esq., MP, communicated by John Stuart Esq., Secretary *Proceedings of the Society of Antiquaries of Scotland* 2 (1854 – 7), 154 – 8

Farrer, J 1857c Notice of a 'Burgh', recently opened in the island of Burray, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 2 (1854 – 7), 5 – 6

Farrer J 1861 Letter to The Orcadian newspaper describing excavation of mounds at Stenness *The Orcadian* July 1861, 3, column 6

Farrer, J 1862a *Maes-Howe Notice of Runic Inscriptions Discovered During Recent Excavations in the Orkney*s, Edinburgh: R & R Clark, Edinburgh

Farrer, J 1862b The Knowe of Saverhough *Gentleman's Magazine* No. 213, 601 – 4

Farrer, J 1866 Notice of Recent Excavations in Chedworth Wood, on the Estate of the Earl of Eldon, in the County of Gloucester *Proceedings of the Society of Antiquaries of Scotland* 6, 278 – 83

Farrer, J 1868a Note of excavations in Sanday, one of the North Isles of Orkney *Proceedings of the Society of Antiquaries of Scotland* 7, 398 – 401

Farrer, J 1868b Note respecting various articles in bronze and stone found in Orkney, and now presented to the Museum, *Proceedings of the Society of Antiquaries of Scotland* 7, 103 – 5

Farrington, O C 1923 *Amber Its Physical Properties and Geological Occurrence* Field Museum of Natural History Department of Geology Leaflet No. 3, Chicago

Feachem, R W 1961 Unenclosed Platform Settlements *Proceedings of the Society of Antiquaries of Scotland* 94, 79 – 85

Fell, C I 1951 Socketed Bronze Axe and Gouge from Skye *Antiquaries Journal* 31, 72 & Pl XVb

Fenggui L, & Zhaodong, F 2012 A dramatic climatic transition at ~4000 cal. yr BP and its cultural responses in Chinese cultural domains *The Holocene* 22(10), 1181 – 97

Fenton, A 1963 Early and Traditional Cultivating Implements in Scotland *Proceedings of the Society of Antiquaries of Scotland* 96, 264 – 317

Fenton, A 1968 Plough and Spade in Dumfries and Galloway *Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society* 3rd Series, 45, 147 – 83 & plates I – VII facing page 183

Fenton, A 1972 *Early Yoke Types in Great Britain* A Magyar Mezogazdasagi Museum Kozlemenyu (Proceedings of the Hungarian Agricultural Museum) 1971 – 72, 69 – 75

Fenton, A 1978 *The Northern Isles: Orkney and Shetland* Tuckwell Press, East Lothian

Fenton, M B 1984 The nature and the source of manufacture of Scottish battle-axes and axe-hammers *Proceedings of the Prehistoric Society* 50, 217 - 243

Fenton, M B 1988 The petrological identification of stone battle-axes and axe-hammers from Scotland & Lists of identifications: Scotland, *in* Clough, T H McK & Cummins, W A *Stone axe studies volume 2 The petrology of Prehistoric stone implements from the British Isles* London: Council for British Archaeology Research Report 67, 92 – 132 & 230 – 45

Fereday, R P 1971 *The Longhope Battery and Towers* Stromness: W R Rendall

Ffrench, J F M 1899 Notes on the Family of Sherlock: chiefly gathered from the estate papers and other official documents *Journal of the Co. Kildare Archaeological Society and Surrounding Districts* 2, 33 – 47

Fitzpatrick, A 2009 In his hands and in his head: The Amesbury Archer as a metalworker *in* Clark, P (ed) *Bronze Age Connections Cultural Contact in Prehistoric Europe* Oxford: Oxbow Books, 176 – 188

Fitzpatrick, A P 2011 *The Amesbury Archer and the Boscombe Bowman Bell Beaker Burials at Boscombe Down, Amesbury, Wiltshire* Salisbury: Wessex Archaeology, Report No. 27

Fitzpatrick, S M & Anderson, A 2008 Islands of Isolation: Archaeology and the Power of Aquatic Perimeters *Journal of Island and Coastal Archaeology* 3, 4 – 16

Flannery, K V 1976 Empirical Determination of Site Catchments in Oaxaca and Tehuacán *in* Flannery, K V (ed) *The Early Mesoamerican Village* New York: Academic Press, 103 – 17

Fleming, A 1978 The prehistoric landscape of Dartmoor Part 1: South Dartmoor *Proceedings of the Prehistoric Society* 44, 97 – 123

Fleming, A 1983 The prehistoric landscape of Dartmoor Part 2: North and East Dartmoor *Proceedings of the Prehistoric Society* 49, 195 – 241

Fleming, A 1988 *The Dartmoor Reaves Investigating Prehistoric Land Divisions* Batsford, London

Fleming, A 1999 Phenomenology and the Megaliths of Wales: A Dreaming Too Far? *Oxford Journal of Archaeology* 18, 119 – 25

Fleming, A 2005 *St Kilda and the Wider World Tales of an Iconic Island* Cheshire: Windgather Press

Fleming A 2006 Post-processual Landscape Archaeology: A Critique *Cambridge Archaeological Journal* 16, 267 – 80

Fleming, A 2008 Island Stories *in* Noble, G, Poller, T, Raven, J & Verrill, L (eds) *Scottish Odysseys The Archaeology of Islands* Stroud: Tempus, 11 – 22

Fleming, A 2009 On the Islandness of St. Kilda *in* Allen, M J, Sharples, N & O'Connor, T (eds) *Land and People papers in memory of John G. Evans* Oxford: The Prehistoric Society & Oxbow Books, 136 – 46

Fletcher, M 1992 *Castle Steads, Bury* Unpublished evaluation report, North West Archaeological Surveys (cited in Smith et al 2010)

French, C 2016 The Micromorphological Analysis of Soils and Site Contexts at Stonehall and Crossiecrown *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 527 – 42

Fojut, N 1982 Towards a Geography of Shetland Brochs *Glasgow Journal of Archaeology* 9, 38 – 59

Fojut, N 2005 Any Closer Towards a Geography of Shetland Brochs? *in* Turner, V E, Nicholson, R A, Dockrill, S J & Bond, J M (eds) *Tall Stories? Two millennia of brochs* Lerwick: Shetland Amenity Trust, 166 – 71

Fojut, N & Love, P 1983 The defences of Dundarg Castle, Aberdeenshire *Proceedings of the Society of Antiquaries of Scotland* 113, 449 – 56

Forde-Johnston J, 1962 The Iron Age Hillforts of Lancashire and Cheshire *Transactions of the Lancashire and Cheshire Antiquarian Society* 72, 9 – 46

Forsayeth, G W 1913 Prehistoric Cooking-Places *Journal of the Royal Society of Antiquaries of Ireland* (6th series) 3 (2), 178 – 80

Forster, A 2011 Steatite Artefacts *in* Moore, G & Wilson, H *Shifting Sands Links of Noltland, Westray: Interim Report on Neolithic and Bronze Age Excavations, 2007 – 9* Historic Scotland Archaeology Report No. 4, 109 – 16

Fowler, P J 1983 *The Farming of Prehistoric Britain* Cambridge: Cambridge University Press

Fowler, P J 1987 The past in a foreign country *Proceedings of the Society of Antiquaries of Scotland* 117, 7 – 16

Fowler, P J 1992 *The Past in Contemporary Society Then, Now* London & New York: Routledge

Fox, C & Palmer, W M 1923 Excavations in the Cambridgeshire Dykes 2 The Fleam Dyke *Proceedings of the Cambridgeshire Antiquarian Society* 24, 28 – 53

Fox, C & Phillips, D W 1931 *Offa's Dyke: A field survey Sixth Report Archaeologia Cambrensis* 86, 1 – 74

Fraser, D 1983 *Land and Society in Neolithic Orkney* Oxford: British Archaeological Report, British Series, 117, 2 volumes

Fraser, J 1923 Some Antiquities in Harray Parish *Proceedings of the Orkney Antiquarian Society* I, 31 – 7

Fraser, J 1924 Antiquities of Sandwick Parish *Proceedings of the Orkney Antiquarian Society* II, 23 – 9

Fraser, J 1925 The Antiquities of Birsay Parish *Proceedings of the Orkney Antiquarian Society* III, 21 – 30

Fraser, J 1926 Antiquities of Stenness Parish *Proceedings of the Orkney Antiquarian Society* IV, 17 – 24

Fraser, J 1927 The Antiquities of Firth Parish *Proceedings of the Orkney Antiquarian Society* V, 51 – 6

Fraser, J 1928 The Antiquities of Rendall Parish *Proceedings of the Orkney Antiquarian Society* VI, 69 – 73

Fraser, J 1929 The Antiquities of Evie Parish *Proceedings of the Orkney Antiquarian Society* VII, 41 – 6

Fraser, S 2011 The Animal Bone *in* Moore, G & Wilson, H *Shifting Sands Links of Noltland, Westray: Interim Report on Neolithic and Bronze Age Excavations, 2007 – 9* Historic Scotland Archaeology Report No. 4, 40 – 52

Friedrich, W L, Kromer, B, Friedrich, M, Heinemeier, J, Pfeiffer, T & Talamo, S 2006 Santorini Eruption Radiocarbon Dated to 1627–1600 B.C. *Science* 312, 548

Frodsham, P (ed) 1996 Neolithic Studies in No-Man's land Papers on the Neolithic of Northern England from the Trent to the Tweed *Northern Archaeology The Bulletin of the Northumberland Archaeology Group*, 13/14

Froyd, C A & Bennett, K D 2006 Long-term ecology of native pinewood communities in East Glen Affric, Scotland *Forestry* 79 (3), 279 – 91

Fyfe, R M, Brück, J, Johnston, R, Lewis, H, Roland, T P & Wickstead, H 2008 Historical context and chronology of Bronze Age land enclosure on Dartmoor, UK *Journal of Archaeological Science* 35, 2250 – 61

Fyllingen, H 2003 Society and Violence in the Early Bronze Age: An Analysis of Human Skeletons from Nord-Trøndelag, Norway, *Norwegian Archaeological Review*, 36 (1), 27 – 43

Gabra-Sanders, T 2001 The Orkney Hood, re-dated and reconsidered *in* Walton Rogers, P, Bender Jørgensen, L & Rast-Eicher, A (eds) *The Roman textile industry and its influence. A birthday tribute to John Peter Wild* Oxford: Oxbow books, 98 – 104

Gaffney, C & Gater, J 2003 *Revealing the Buried Past Geophysics for Archaeologists* Stroud: Tempus

Gallagher, D 2008 *M3 Clonee-North of Kells Contract 5 Kells – North of Kells Report on the Archaeological Excavation of Derver 5 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Garner, D 2009 *Archaeological Evaluation Work at Woodhouse, Frodsham Interim Report* Cheshire West & Chester Council, accessed 05/01/12 at http://www.cheshirewestandchester.gov.uk/microsites/habitats_and_hillforts/hillforts/excavations/woodhouse_excavations_july_09.aspx

Garrow, G, Raven, J & Richards, C 2005 The Anatomy of a Megalithic Landscape *in* Richards, C (ed) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 249 – 59

Gasse, F 2000 Hydrological changes in the African tropics since the Last Glacial Maximum *Quaternary Science Reviews* 19, 189 – 211

Gasse, F & Van Campo, E 1994 Abrupt post-glacial climate events in West Asia and North Africa Monsoon domains *Earth and Planetary Science Letters* 126 (4) 435 – 56

Gear, A J & Huntley, H Rapid Changes in the Range Limits of Scots Pine 4000 Years Ago *Science* 1991 Vol 251, 544 – 7

Gee, C 2016a Bockan Burn Mound *Discovery and Excavation in Scotland*, New Series Vol 17, Council for Scottish Archaeology, 132 – 3

Gee, C 2016b Saverock Fieldwalking *Discovery and Excavation in Scotland*, New Series Vol 17, Council for Scottish Archaeology, 130

Gee, C, Richards, C & Robertson, M 2016 Local histories of passage grave building communities: Brae of Smerquoy *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 64 – 90

Gerard, J 1845 Parish of South Ronaldsay and Burray *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy*, *Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 191 – 5 of the Orkney section (volume not continuously numbered)

Gerloff, S 1975 *The Early Bronze Age Daggers in Great Britain and a Reconsideration of the Wessex Culture* Prähistorische Bronzefunde Abteilung VI, Band 2, München: C H Beck'sche Verlagsbuchandlung

Gerloff, S 1986 Bronze Age Class A cauldrons: typology, origins and chronology *Journal of the Royal Society of Antiquaries of Ireland* 116, 84 – 115

Gerloff, S 2010 *Atlantic Cauldrons and Buckets of the Late Bronze and Early Iron Ages in Western Europe* Prähistorische Bronzefunde Abteilung II, Band 18, Stuttgart: Franz Steiner Verlag

Gerrard, S, 1990 The Carew Castle Project, 1986-1990 *Fortress, the Castles and Fortifications Quarterly* 6, 45 – 50

Gerrard, J & Barrett, J 2009 Brough of Deerness Excavation, topographic survey *Discovery & Excavation in Scotland,* New Series 10, Council for Scottish Archaeology, 138 – 9

Gibbon, S J 2007 Medieval Parish Formation in Orkney *in* Ballin Smith, B, Taylor, S & Williams, G (eds) *West Over Sea Studies in Scandinavian Sea-Borne expansion and Settlement Before 1300* Leiden & Boston: Brill, 235 – 50

Gibson, A 2002 *Prehistoric Pottery in Britain and Ireland* Stroud: Tempus

Gibson, A 2003 What do we mean by Neolithic Settlement? Some approaches, 10 years on *in* Armit, I, Murphy, E, Nelis, E & Simpson, D *Neolithic Settlement in Ireland and Western Britain* Oxford: Oxbow Books, 136 – 45

Gibson, A 2004 Small, But Perfectly Formed? Some Observations on the Bronze Age Cups of Scotland *in* Gibson, A & Sheridan, A (eds) *From Sickles to Circles Britain and Ireland at the Time of Stonehenge* Stroud: Tempus, 270 – 88

Gibson, A 2010 Excavation and Survey at Dyffryn Lane Henge Complex, Powys, and a Reconsideration of the Dating oh Henges *Proceedings of the Prehistoric Society* 76, 213 – 48

Gibson, J 2012 *Rising Tides Revisited: The Loss of Coastal Heritage in Orkney* Kirkwall: Orkney Archaeology Society

Gibson, W J 1944 Mace-heads of 'Cushion' type in Britain *Proceedings of the Society of Antiquaries of Scotland* 78, 16 – 25

Gilbertson, D D, Shwenninger, J-L, Kemp, R A and Rhodes, E J 1999 Sand-drift and soil formation along an exposed North Atlantic coastline: 14,000 years of diverse geomorphological and human impacts *Journal of Archaeological Science* 26, 439 – 69

Gillespie, R 1991 A Note of Geoffrey Keating's Description of Fulachta *in* Hodder, M A & Barfield, L H (eds) *Burnt Mounds and Hot Stone Technology: Papers from the Second International Burnt Mound Conference Sandwell, 12th – 14th October 1990* Sandwell, West Midlands: Sandwell Metropolitan Borough Council, 69 – 70

Gilmour, S 2005 Complex Atlantic Roundhouses – Chronology and Complexity *in* Turner, V E, Nicholson, R A, Dockrill, S J & Bond, J M (eds) *Tall Stories? Two millennia of brochs* Lerwick: Shetland Amenity Trust, 78 – 96

Gilmour, S & Cook, M 1998 Excavations at Dun Vulan: a reinterpretation of the reappraised Iron Age *Antiquity* 72, 327 – 37

Glob, P V 1973 *The Mound People Danish Bronze Age Man Preserved* London: Book Club Associates

Glob, P V 1977 *The Bog People Iron-Age Man Preserved* London: Faber & Faber

Godwin, H 1956 Appendix. Report on the Peat Samples pp 169 – 72 *in* Childe, V G Maes Howe, *Proceedings of the Society of Antiquaries of Scotland* 88, 155 – 72

Gonfa, A, Foster, H A & Holzapfel W H 2001 Field survey and literature review on traditional fermented milk products of Ethiopia *International Journal of Food Microbiology* 68, 173 – 186

Goodburn, D 2004 Assembly and construction techniques *in* Clark, P (ed) *The Dover Bronze Age Boat* Swindon: English Heritage, 124 – 162

Goodfellow, A 1905 Underground Structure *Saga Book of the Viking Club Society for Northern Research* 4, 35 – 6

Gordon, A S R 1940, The excavation of Gurnard's Head, an Iron Age cliff castle in western Cornwall *Archaeological Journal* 97, 96 – 111

Gordon, E V 1957 *An Introduction to Old Norse* Oxford: Oxford University Press (2nd edition revised by Taylor)

Gordon, Principal 1792 Remarks made in a journey to the Orkney Islands by Principal Gordon of the Scots College in Paris, *Archaeologia Scotica Transactions of the Society of Antiquaries of Scotland* 1, 256 – 68

Goring, E 2011 The Figurine: a preliminary assessment *in* Moore, G & Wilson, H *Shifting Sands Links of Noltland, Westray: Interim Report on Neolithic and Bronze Age Excavations, 2007 – 9* Historic Scotland Archaeology Report No. 4, 104 – 6

Gorman, F, Lambie, E & Bowd, C 1993 Fieldwalking results, Arran *Discovery and Excavation in Scotland* Council for Scottish Archaeology, 79 – 80

Gorokhovich, Y 2005 Abandonment of Minoan palaces on Crete in relation to the earthquake induced changes in groundwater supply *Journal of Archaeological Science* 32, 217 – 22

Goudie, G (ed) 1915 Tour through the North Isles and part of the Mainland of Orkney in the year 1778 by Rev. George Low *Viking Society for Northern Research: Old Lore Miscellany of Orkney Shetland Caithness and Sutherland* 8, 131 – 54

Gough, R (ed) 1806 *Britannia: or a Chorological Description of the flourishing Kingdoms of England, Scotland, and Ireland and the Islands adjacent; from the earliest antiquity by William Camden, translated from the edition published by the author in MDCVII. Enlarged by the latest discoveries* London: John Stockdale, 2nd edition, 4 volumes (Facsimile reprint 1974, Georg Olms Verlag, Hildesheim, original pagination & volumes retained)

Graeme, A S 1914 An Account of the Excavation of the Broch of Ayre, St Mary's, Holm, Orkney *Proceedings of the Society of Antiquaries of Scotland* 48, 31 – 51

Grahame, T 1968 Animal Bones in Hamilton, J R C *Excavations at Clickhimin, Shetland* Edinburgh: Her Majesty's Stationery Office, Ministry of Public Building and Works Archaeological Reports No.6, 166 – 7

Graham-Campbell, J 1976 The Viking-age silver and gold hoards of Scandinavian character from Scotland *Proceedings of the Society of Antiquaries of Scotland* 107, 114 – 35

Graham-Campbell, J 1984 Two Viking-age silver brooch fragments believed to be from the 1858 Skaill (Orkney) hoard *Proceedings of the Society of Antiquaries of Scotland* 114, 289 – 301

Graham-Campbell, J 1995 *The Viking-Age Gold and Silver of Scotland* Edinburgh: National Museums Scotland

Graham-Campbell, J 2004 '*Danes*...in this Country': discovering the Vikings in Scotland *Proceedings of the Society of Antiquaries of Scotland* 134, 201 – 39

Grant, W G 1933a Excavation of a denuded cairn containing fragments of steatite urns and cremated human remains, *Proceedings of the Society of Antiquaries of Scotland* 67, 24 – 6

Grant, W G 1933b Further Burials at Blows, Deerness, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 67, 343 – 58

Grant, W G 1934 A Chambered Mound at Westness, Rousay, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 68, 71 – 3

Grant, W G 1937 Bronze Age Burial Mounds at Quandale, *Proceedings of the Society of Antiquaries of Scotland* 71, 72 – 84

Grant, W G 1939a An Earth-House at Gripps, Frotoft, Rousay, *Proceedings of the Society of Antiquaries of Scotland* 73, 273 – 75

Grant, W G 1939b Excavations on behalf of H.M. Office of Works at Taiverso Tuick, Trumland, Rousay, *Proceedings of the Society of Antiquaries of Scotland* 73, 155 – 66

Grant, W G & Wilson, D 1943 The Knowe of Lairo, Rousay, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 77, 17 – 26

Gräslund, B & Price, N 2012 Twilight of the gods? The 'dust veil event' of AD 536 in critical perspective *Antiquity* 86, 428 – 43

Grattan, J & Brayshay, M 1995 An Amazing and Portentous Summer: Environmental and Social Responses in Britain to the 1783 Eruption of an Iceland Volcano *The Geographical Journal* 161 (2) 125 – 34

Grattan, J & Charman, D 1994 Non-climatic factors and the environmental impact of volcanic volatiles: implications of the Laki fissure eruption of AD 1783 *The Holocene* 4 (1) 101 – 6

Grattan J P & Gilbertson, D D 1994 Acid-loading from Icelandic tephra falling on acidified eco-systems as a key to understanding archaeological and environmental stress in Northern and Western Britain *Journal of Archaeological Science* 21, 851 – 9

Grattan, J P & Pyatt, F B 1999 Volcanic eruptions dry fogs and the European palaeoenvironmental record: localised phenomena or hemispheric impacts? *Global and Planetary Change* 21, 173 – 9

Green, H S 1984 The Beaker-Age Burial: The Arrowheads pp19 – 21 *in* Evans, J G Stonehenge – the Environment in the Late Neolithic and Early Bronze Age *and* a Beaker-Age Burial *The Wiltshire Archaeological and Natural History Magazine,* 78, 7 – 30

Green, M 1985 A Miniature Bronze Axe from Tiddington, Warwickshire *Britannia* XVI, 238 – 241

Green, M 1987 A Votive Model Shield from Langley, Oxfordshire *Oxford Journal of Archaeology* 6 (2), 237 – 242

Greer, J W 1967 Midden circles versus Mescal pits *American Antiquity* 32 (1), 108 – 9

Greig, J C 1971 Excavations at Cullykhan, Castle Point, Troup, Banffshire *Scottish Archaeological Forum* 3, 15 – 21

Greig, J C & Cairns, R H 1967 Castlehead, Troup *Discovery and Excavation in Scotland* 1967, Scottish Regional Group, Council for British Archaeology, 16 – 17

Greig, W M 1931 Prehistoric Cemetery at Lochside, Stenness, *Proceedings of the Orkney Antiquarian Society* Volume IX, Kirkwall, 61

Grieve, S J 1999 *Norse Castles in Orkney* Unpublished University of Glasgow MPhil Thesis

Griffith, F M & Reed, S J 1998 Rescue recording at Bantham Ham, South Devon, in 1997 *Devon Archaeological Society Proceedings* 56, 109 – 31

Griffiths, D 2006 Birsay-Skaill Landscape Archaeology Project Topographical and geophysical survey, targeted excavation *Discovery and Excavation in Scotland* New Series Vol 7, Council for Scottish Archaeology, 122 – 3

Griffiths, D 2007 Birsay-Skaill Landscape Archaeology Project Geophysical and Topographical survey, selective excavation *Discovery and Excavation in Scotland* New Series Vol 8, Council for Scottish Archaeology, 144 – 5

Griffiths, D 2008 Birsay-Skaill Landscape Archaeology Project Geophysical and topographic survey and excavation *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 9, 132 – 3

Griffiths, S 2016 Beside the Ocean of Time: a chronology of early Neolthic burial monumnets and houses in Orkney *in* Richards C & Jones, R (eds) *The Development of*

Neolithic House Societies in Orkney Oxford: Windgather Press, Oxbow Books, 254 – 302

Grimes, W F 1960 *Excavations on Defence Sites, 1939 – 1945 I: Mainly Neolithic – Bronze Age* London: Her Majesty's Stationery Office

Groat, A G 1831 *Thoughts on Orkney and Zetland, Their Antiquities and Capabilities of Improvement; with Hints Towards the Formation of a Local Society for the Investigation and Promotion of These Objects; to which are Annexed Extracts from Curious Manuscripts, together with Useful Lists* (Not Printed for Sale) Edinburgh: by Neill & Co

Grogan, E 1999 *Mooghaun: the late Bronze Age hillfort at Mooghaun South* Dublin: The Discovery Programme

Grogan, E 2005a *The North Munster Project Volume 1: The later prehistoric landscape of south-east Clare* Dublin: Wordwell/The Discovery Programme

Grogan, E 2005b *The North Munster Project Volume 2: The prehistoric landscape of North Munster* Dublin: Wordwell/The Discovery Programme

Groenman-Van Waateringe, W, Kilian, M & Van Londen, H 1999 The curing of hides and skins in European prehistory *Antiquity* 73, 884 – 90

Grove, J M 2001 The initiation of the "Little Ice Age" in regions round the North Atlantic *Climatic Change* 48, 53 – 82

Grudd, H, Briffa, K, Gunnarson B E & Linderholm, H W 2000 Swedish tree rings provide new evidence in support of a major widespread environmental disruption in 1628 BC *Geophysical Research Letters* 27 (18), 2957 – 60

Grudd, H, Briffa, K R, Karlén, W, Bartholin, T S, Jones, P D & Kromer, B 2002 A 7400-year tree-ring chronology in northern Swedish Lapland: natural climatic variability expressed on annual to millennial timescales *The Holocene* 12, 657 – 65

GSB 1999a *Minehowe, Orkney, Report on Geophysical Survey 1999/131* GSB Prospection, Bradford Unpublished report

GSB 1999b *Stones of Stenness, Orkney, Report on Geophysical Survey 1999/55* Bradford, Unpublished report

GSB 2000 *Minehowe and Long Howe, Orkney, Report on Geophysical Survey 2000/51* GSB Prospection, Bradford, Unpublished report

GSB 2001a *Round Howe, Orkney, Report on Geophysical Survey 2001/85* GSB Prospection, Bradford Unpublished report

GSB 2001b *St. Ninian's Chapel, Orkney, Report on Geophysical Survey 2001/85a* GSB Prospection, Bradford Unpublished report

GSB 2001c *The Ness, St Peter's Bay, Orkney, Report on Geophysical Survey 2001/85b* GSB Prospection, Bradford, Unpublished report

GSB 2002 *Orkney World Heritage Site, Report on Geophysical Survey, 2002/61, Phase 1* GSB Prospection, Bradford, Unpublished report

GSB 2003 *Orkney World Heritage Site, Report on Geophysical Survey 2003/84, phase III* GSB Prospection, Bradford, Unpublished report

Guttmann, E B A 2005 Midden cultivation in prehistoric Britain: arable crops in gardens *World Archaeology* 37 (2), 224 – 39

Guttmann, E B, Dockrill, S J & Simpson, I A 2004 Arable agriculture in prehistory: new evidence from soils in the Northern Isles *Proceedings of the Society of Antiquaries of Scotland* 134, 53 – 64

Guttmann-Bond, E B, Dungait, J A J, Brown, A, Bull, I D & Evershed, R P 2016 Early Neolithic Agriculture in County Mayo, Republic of Ireland: Geoarchaeology of the Céide Fields, Belderrig, and Rathlackan *Journal of the North Atlantic* 30, 1 – 32

Guttmann, E B, Simpson, I A, Davidson, D A & Dockrill, S J 2006 The Management of Arable Land from Prehistory to the Present: Case Studies from the Northern Isles of Scotland *Geoarchaeology* 21, 1, 61 – 92

Habenstein, R W & Lamers, W M 1960 *Funeral Customs the World Over* Milwaukee: Bulfin Printer

Hageneder, F 2007 *Yew A History* Stroud: Sutton Publishing Ltd

Haigh, D 1983 A second earth-house at Grainbank, St. Ola *Proceedings of the Society of Antiquaries of Scotland* 113, 367 – 72

Haldane, J W 1966 Stokeleigh Camp, Somerset *Proceedings of the University of Bristol Spelaeological Society* 11 (1), 31 – 8

Haldane, J W 1975 The excavations at Stokeleigh Camp, Avon *Proceedings of the University of Bristol Spelaeological Society* 14 (1), 29 – 63

Hall, G R 1885 An account of the Gunnar Peak camp, north Tynedale, and of excavations in the ancient circular and other dwellings *Archaeologia Aeliana* 10 (2nd series), 12 – 37

Hall, M & Gingell, C 1974 Nottingham Hill, Gloucestershire *Antiquity* 48 (192), 306 – 9

Hall, V A 2003 Assessing the impact of Icelandic volcanism on vegetation systems in the north of Ireland in the fifth and sixth millennia BC *The Holocene* 13, 131 – 8

Hall, V A, Pilcher, J R & McCormac, F G 1994 Icelandic volcanic ash and the mid-Holocene Scots pine (*Pinus sylvestris*) decline in the north of Ireland: no correlation *The Holocene* 4 (1) 79 – 83

Halliday, S & Maloney, C 2002 A reassessment of Hackness Gun Battery: The Results of Excavations 1997 – 2001 *Scottish Archaeological Journal* 24 (2) 121 – 45

Halliday, S P 2007 Unenclosed Round-houses in Scotland: Occupation, Abandonment, and the Character of Settlement *in* Burgess, C Topping, P & Lynch, F (eds) *Beyond Stonehenge Essays on the Bronze Age in Honour of Colin Burgess* Oxford: Oxbow Books, 49 – 56

Halliday, S 2011 Pattern, perception and preconception: recognising regionality in Scottish Prehistory in Jones, A M & Kirkham, G (eds) Beyond the Core Reflections on Regionality in Prehistory Oxford & Oakville: Oxbow Books, 19 – 32

Hambly, J 2014 Meur, Sanday, Excavation *Discovery and Excavation in Scotland* New Series Vol 15, Council for Scottish Archaeology, 148 – 9

Hamilton, G 1845 Parish of Hoy and Graemsay *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy, Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 40 – 1 of the Orkney section (volume not continuously numbered)

Hamilton, J R C 1956 *Excavations at Jarlshof, Shetland* Edinburgh: Her Majesty's Stationery Office, Ministry of Works Archaeological Reports No.1

Hamilton, J R C 1968 *Excavations at Clickhimin, Shetland* Edinburgh: Her Majesty's Stationery Office, Ministry of Public Building and Works Archaeological Reports No. 6

Hamilton, M & Sharples, N 2012 Early Bronze Age settlements at Machair Mheadhanach and Cill Donnain *in* Parker Pearson, M (ed) *From Machair to Mountains Archaeological Survey and Excavation in South Uist* Oxford & Oakville: Oxbow Books, 199 – 214

Hamlet, L E 2014 *Anthropic sediments on the Scottish North Atlantic seaboard: Nature, versatility and value of midden* University of Stirling PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Hammer, C U, Clausen, H B & Dansgaard, W 1980 Greenland ice sheet evidence of post-glacial volcanism and its climatic impact Nature Vol 288, 230 – 35

Handford, S A (trans) 1981 *Caesar The Conquest of Gaul* Middlesex: Penguin Classics

Hannah, I C 1932 Philpots Camp, West Hoathly *Sussex archaeological collections: relating to the history and antiquities of the counties of East and West Sussex* 73, 157 – 67

Hansen, H R, Hector, BL & Feldman, J 2003 A qualitative and quantitative evaluation of the seaweed diet of North Ronaldsay sheep *Animal Feed Science and Technology* 105, 21 – 28

Harbison, P 1969a *The Axes of the Early Bronze Age in Ireland* Prähistorische Bronzefunde Abteilung IX, Band 1, München: C H Beck'sche Verlagsbuchandlung

Harbison, P 1969b *The Daggers and Halberds of the Early Bronze Age in Ireland* Prähistorische Bronzefunde Abteilung VI, Band 1, München: C H Beck'sche Verlagsbuchandlung

Harding, A 1993 Stone, Bronze and Iron *in* Cope, A (ed) *Swords and Hilt Weapons* London: Multi Media Books Ltd, 8 – 19

Harding, A 1999a Warfare: A defining Characteristic of Bronze Age Europe? *in* Carmen, J & Harding, A (eds) Ancient Warfare Archaeological Perspectives Stroud: Sutton Publishing, 157 – 73

Harding, A 1999b Swords, Shields and Scholars: Bronze Age Warfare, past and present *in* Harding, A F (ed) *Experiment and Design Archaeological Studies in honour of John Coles* Oxford: Oxbow Books, 87 – 93

Harding, A 2006 Facts and fantasies from the Bronze Age *Antiquity* 80, 463 – 65

Harding, A F 2000 *European Societies in the Bronze Age* Cambridge: Cambridge University Press

Harding, D W 2005 The Atlantic Scottish Iron Age: External Relations Reviewed *in* Turner, V E, Nicholson, R A, Dockrill, S J & Bond, J M (eds) *Tall Stories? Two millennia of brochs* Lerwick: Shetland Amenity Trust, 32 – 51

Harding, D W 2006 Redefining the Northern British Iron Age *Oxford Journal of Archaeology* 25, 61 – 82

Harding, D W 2012 *Iron Age Hillforts in Britain and Beyond* Oxford: Oxford University Press

Harding, P 2011 Finds from the Grave of the Amesbury Archer: Flint *in* Fitzpatrick, A P *The Amesbury Archer and the Boscombe Bowman Bell Beaker Burials at Boscombe Down, Amesbury, Wiltshire* Salisbury: Wessex Archaeology, Report No. 27, 88 – 103

Hardy, K & Wickham-Jones, C 2002 Scotland's First Settlers: the Mesolithic seascape of the Inner Sound, Skye and its contribution to the early prehistory of Scotland *Antiquity* 76, 825 – 33

Harkness, D D 1984 An evaluation of the radiocarbon dates measured for the Crosskirk Broch excavation *in* Fairhurst, H *Excavations at Crosskirk Broch, Caithness* Edinburgh: Society of Antiquaries of Scotland Monograph Series No. 3, 160 – 4

Harland, J & Parks, R 2009 The Fish Remains *in* Ritchie, A *On the fringe of Neolithic Europe: excavation of a chambered cairn on the Holm of Papa Westray, Orkney* Edinburgh: Society of Antiquaries of Scotland, 94 – 137

Harrison, S (ed) 2005 *Mine Howe Fieldwork and Excavations 2000 – 2005* Kirkwall. Orkney: The Orcadian, The Friends of Orkney Archaeological Trust Occasional Publication 1

Harry, R C 1993 Earl's Bu (Orphir parish) Norse horizontal watermill *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 104 – 5

Harvey, J E, Smith, D J, Laxton, S, Desloges, J & Allen, S 2012 Mid-Holocene glacier expansion between 7500 and 4000 cal. yr BP in the British Columbia Coast Mountains, Canada *The Holocene* 22(9), 975 – 85

Haselgrove, C 2009 *The Traprain Law Environs Project Fieldwork and Excavations 2000 – 2004* Edinburgh: Society of Antiquaries of Scotland

Haslett, S.K & Bryant, E A 2007 Evidence for historic coastal high-energy wave impact (tsunami?) in North Wales, United Kingdom *Atlantic Geology* 43, 137 – 47

Hastie, M 2011 The carbonised plant remains *in* Moore, G & Wilson, H *Shifting Sands Links of Noltland, Westray: Interim Report on Neolithic and Bronze Age Excavations, 2007 – 9* Historic Scotland Archaeology Report No. 4, 53 – 71

Hawkes A 2011 Medieval *fulachtaí fia* in Ireland? An archaeological Assessment *Journal of Irish Archaeology* XX, 77 – 100

Hawkes, A 2014 The beginnings and evolution of the fulacht fia tradition in early prehistoric Ireland *Proceedings of the Royal Irish Academy* Vol. 114C, 89 – 139

Hawkes, A 2015 Fulachtaí fia and Bronze Age cooking in Ireland: reappraising the evidence *Proceedings of the Royal Irish Academy* Vol. 115C, 47 – 77

Haynes, S, Jaarola, M & Searle, J B 2003 Phylogeography of the common vole (*Microtus arvalis*) with particular emphasis on the colonization of the Orkney archipelago *Molecular Ecology* 12, 951 – 6

Hazell, H 2000 *The Orcadian Book of the 20th Century* Kirkwall, Orkney: The Orcadian Ltd (Kirkwall Press)

Heald, A, Cavers, G & Douglas, C 2011 Nybster Broch *Discovery and Excavation in Scotland*, New Series Vol 12, Council for Scottish Archaeology, 119

Healy, F, Bayliss, A, Whittle, A, Allen, M J, Mercer, R, Rawlings, M, Sharples, N & Thomas, N 2011 Chapter 4 South Wessex *in* Whittle, A, Healy, F & Bayliss, A *Gathering Time Dating the Early Neolithic Enclosures of Southern Britain and Ireland* Oxford: Oxbow Books, Volume 1, 111 - 206

Hebden, R 2008 *Eday Orkney's best kept secret* Kirkwall: The Orcadian Ltd

Hedges, J W 1975 Excavation of two Orcadian burnt mounds at Liddle and Beaquoy, *Proceedings of the Society of Antiquaries of Scotland* 106, 39 – 99

Hedges, J W 1980 Short cists recently excavated at Lower Ellibister and other locations in Orkney, *Proceedings of the Society of Antiquaries of Scotland* 110, 44 – 71

Hedges, J W 1983a *Isbister A Chambered Tomb in Orkney* Oxford: British Archaeological Report British Series 115

Hedges, J W 1983b Trial excavations on Pictish and Viking Settlement at Saevar Howe, Birsay, Orkney *Glasgow Archaeological Journal* 10, 73 – 124

Hedges, J W 1984a *Tomb of the Eagles A Window on Stone Age Tribal Britain* London: John Murray

Hedges, J W 1984b Gordon Parry's West Burra Survey *Glasgow Archaeological Journal* 11, 41 – 59

Hedges, J W 1986 Bronze Age Structures at Tougs, Burra Isle, Shetland *Glasgow Archaeological Journal* 13, 1 – 43

Hedges, J W 1987a *Bu, Gurness and the Brochs of Orkney, Part I: Bu* Oxford: British Archaeological Report British Series 164

Hedges, J W 1987b *Bu, Gurness and the Brochs of Orkney Part II Gurness* Oxford: British Archaeological Report British Series, 164

Hedges, J W 1987c *Bu, Gurness and the Brochs of Orkney Part III The Brochs of Orkney* Oxford: British Archaeological Report British Series, 164

Hedges, J W & Constantine, B 2011 South Parish Environs Archaeological Research (SPEAR) Desk-based assessment, evaluation and survey *Discovery and Excavation in Scotland*, New Series Vol 12, Council for Scottish Archaeology, 138 – 9

Hedges, J W & Haigh, D 1983 Recent Work on the Site *in* Hedges, J W *Isbister A Chambered Tomb in Orkney* British Archaeological Report British Series 115, Oxford, 301 – 2

Hedges, M E 1977 The excavation of the Knowes of Quoyscottie, Orkney: a cemetery of the early first millennium BC, *Proceedings of the Society of Antiquaries of Scotland* 108, 130 – 55

Hedges, M E 1978 Spurdygrove, Settlement *Discovery and Excavation in Scotland,* Scottish Group, Council for British Archaeology, 17

Hedges, R E M, Housley, R A, Bronk Ramsey, C & Van Klinken, G J 1991 radiocarbon dates from the Oxford AMS System: *Archaeometry* Datelist 12 *Archaeometry* 121 – 134

Hedges, R E M, Housley, R A, Bronk Ramsey, C & Van Klinken, G J 1993a radiocarbon dates from the Oxford AMS System: *Archaeometry* Datelist 16 *Archaeometry* 35 (1), 147 – 167

Hedges, R E M, Housley, R A, Bronk Ramsey, C & Van Klinken, G J 1993b radiocarbon dates from the Oxford AMS System: *Archaeometry* Datelist 17 *Archaeometry* 35 (2), 305 – 26

Hedges, R E M, Housley, R A, Bronk Ramsey, C & Van Klinken, G J 1995 radiocarbon dates from the Oxford AMS System: *Archaeometry* Datelist 20 *Archaeometry* 37 (2), 417 – 30

Helama, S, Lindholm, M, Timonen, M, Meriläinen, J & Eronen, M 2002 The supra-long Scots pine tree-ring record for Finnish Lapland: Part 2, interannual to centennial variability in summer temperatures for 7500 years *The Holocene* 12, 681 – 88

Helms, M W 1988 *Ulysses' sail: An Ethnographic Odyssey of Power, Knowledge, and geographic Distance* Princeton, New Jersey: Princeton University Press

Helms, M W 1993 *Craft and the Kingly Ideal: Art, Trade and Power* Austin: University of Texas Press

Helms, M W 2009 The master(y) of hard materials: Thoughts on technology, materiality and ideology occasioned by the Dover boat *in* Clark, P (ed) *Bronze Age Connections Cultural Contact in Prehistoric Europe* Oxford: Oxbow Books, 149 – 158

Hencken, T C 1938 The excavation of the Iron Age camp on Bredon Hill, Gloucestershire, 1935 – 37 *The Archaeological Journal* 95, 1 – 111

Henderson, J 1994 The Glass *in* Ballin Smith, B (ed) *Howe: Four Millennia of Orkney Prehistory* Edinburgh: Society of Antiquaries of Scotland Monograph Series 9, 234 – 6

Henshall, A S 1950 Textile and Weaving Appliances in Prehistoric Britain *Proceedings of the Prehistoric Society* 16, (New Series) 130 – 162

Henshall, A S 1952 Early Textiles found in Scotland *Proceedings of the Society of Antiquaries of Scotland* 86, 1 – 29

Henshall, A S 1956 Appendix II: Pottery and Stone Implements from the Ness of Gruting, pp381 – 97 & plates 43 & 44 *in* Calder, C S T Report on the Discovery of Numerous Stone Age House-Sites in Shetland *Proceedings of the Society of Antiquaries of Scotland* 89, 340 – 397 & plates 29 – 44

Henshall, A S 1961 Appendix: The Finds, pp40 – 5 *in* Calder, C S T Excavations in Whalsay, Shetland, 1954 – 5, *Proceedings of the Society of Antiquaries of Scotland* 94, 28 – 45 & plates 5 – 7

Henshall, A S 1963 *The Chambered Tombs of Scotland, Vol I,* Edinburgh: Edinburgh University Press

Henshall, A S 1964 A Dagger-grave and other Cist Burials at Ashgrove, Methilhill, Fife *Proceedings of the Society of Antiquaries of Scotland* 97, 166 – 79

Henshall, A S 1966 A Food Vessel and part of a Jet necklace from Ardfin Forest, Jura, Argyll *Proceedings of the Society of Antiquaries of Scotland* 98, 317 – 8

Henshall, A S 1968 Scottish Dagger Graves *in* Coles, J M & Simpson, D D A *Studies in Ancient Europe: Essays presented to Stuart Piggott* Leicester: Leicester University Press, 173 – 195

Henshall, A S 1969 Clothing found at Huntsgarth, Harray, Orkney *Proceedings of the Society of Antiquaries of Scotland* 101, 150 – 59

Henshall, A S 1972 *The Chambered Tombs of Scotland, Vol II,* Edinburgh: Edinburgh University Press

Henshall, A S 2009 The Pottery *in* Ritchie, A *On the fringe of Neolithic Europe: excavation of a chambered cairn on the Holm of Papa Westray, Orkney* Edinburgh: Society of Antiquaries of Scotland, 35 – 8

Heritage Gateway: online database of English NMR and local SMR records at http://www.heritagegateway.org.uk/gateway/

Hewison, W S 1985 The Parish of Kirkwall and St Ola *in* Miller, R (ed) *The Third Statistical Account of Scotland The County of Orkney* Edinburgh: Scotish Academic Press, 70 – 88

Hewison, W S 1998 *Who Was Who in Orkney* Kirkwall: Bellavista Publications

Hewison, W S 2000 *This Great Harbour: Scapa Flow* Kirkwall, Orkney: The Orcadian Ltd, Kirkwall Press

Hibbert, S 1831 Memoirs on the Tings of Orkney and Shetland *Archaeologia Scotica Transactions of the Society of Antiquaries of Scotland* 3, 103 – 210

Hibbert, S 1857 Collections Relative to Vitrified Sites (Read to the Society December 12, 1831) *Archaeologia Scotica* 4, 280 – 97

Higgs, E S & Vita-Finzi, S 1970 Prehistoric Economy in the Mount Carmel Area of Palestine: Site Catchment Analysis *Proceedings of the Prehistoric Society* 36, 1 – 37

Higgs, E S & Vita-Finzi, S 1972 Prehistoric economies: a territorial approach *in* Higgs, E S (ed) *Papers in Economic Prehistory* Cambridge: Cambridge University Press, 27 – 36

Hill, J & Richards, C 2005 Structure 8: Monumentality at Barnhouse *in* Richards, C (ed) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 157 – 94

Hindmarch, E 2005 Auldhame (Whitekirk and Tyninghame parish), Early Christian cemetery *Discovery and Excavation in Scotland* New Series Vol. 6, 57 – 8

Hinton, P 2005 The Charred Plant Remains from Barnhouse and Maeshowe *in* Richards, C (ed.) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 339 – 357

Historic Scotland 1998 *Nomination of the Heart of Neolithic Orkney for inclusion in the World Heritage List* downloaded on 24/11/14 from http://whc.unesco.org/en/list/514/documents/

Historic Scotland 2006 *The Treatment of Human Remains in Archaeology* Edinburgh: Historic Scotland Operational Policy Paper 5

Historic Scotland 2007 *Investment Review Archaeology Funding Programmes Consultation Paper* Edinburgh: Historic Scotland

HMSO 1939 *Department of Agriculture for Scotland: Agricultural Statistics 1937* Vol XVI, Edinburgh: His Majesty's Stationary Office

HMSO 1948 *Department of Agriculture for Scotland: Agricultural Statistics 1939 – 44 Scotland* Edinburgh: His Majesty's Stationary Office

HMSO 1952 *Department of Agriculture for Scotland: Agricultural Statistics 1945 – 49 Scotland* Part 1, Edinburgh: Her Majesty's Stationary Office

HMSO 1959 *Department of Agriculture for Scotland: Agricultural Statistics 1957 Scotland* Edinburgh: Her Majesty's Stationary Office

HMSO 1964 *Department of Agriculture and Fisheries for Scotland: Agricultural Statistics 1961 and 1962 Scotland* Edinburgh: Her Majesty's Stationary Office

HMSO 1969 *Department of Agriculture and Fisheries for Scotland: Agricultural Statistics 1967 Scotland* Edinburgh: Her Majesty's Stationary Office

HMSO 1974 *Department of Agriculture and Fisheries for Scotland: Agricultural Statistics 1972 Scotland* Edinburgh: Her Majesty's Stationary Office

HMSO 1978 *Department of Agriculture and Fisheries for Scotland: Agricultural Statistics 1977 Scotland* Edinburgh: Her Majesty's Stationary Office

HMSO 1983 *Department of Agriculture and Fisheries for Scotland: Economic Report on Scottish Agriculture 1982 (Incorporating 'Scottish Agricultural Economics' and 'Agricultural Statistics, Scotland')* Edinburgh: Her Majesty's Stationary Office

HMSO 1988 *Department of Agriculture and Fisheries for Scotland: Economic Report on Scottish Agriculture 1987* Edinburgh: Her Majesty's Stationary Office

HMSO 1993 *Scottish Office Agriculture and Fisheries Department: Economic Report on Scottish Agriculture 1992* Edinburgh: Her Majesty's Stationary Office

HMSO 1996 *Scottish Office Agriculture, Environment and Fisheries Department: Economic Report on Scottish Agriculture 1995* Edinburgh: Her Majesty's Stationary Office

Hodder, M A 1990 Burnt Mounds in the English West Midlands *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 106 – 11

Hodder, M A & Barfield, L H (eds) 1991 *Burnt Mounds and Hot Stone Technology: Papers from the Second International Burnt Mound Conference Sandwell, 12th – 14th October 1990* Sandwell, West Midlands: Sandwell Metropolitan Borough Council

Hodges, H W M 1954 Studies in the Late Bronze Age in Ireland. I. Stone and clay moulds, and wooden models for bronze implements *Ulster Journal of Archaeology* 17, 62 – 80

Hodges, H W M 1955 The excavation of a group of cooking-places at Ballycroghan, Co. Down *Ulster Journal of Archaeology* 18, 17 – 28

Hogg, A H A 1942 The native settlement at Gunnar Peak *Archaeologia Aeliana* 20 (4th series) 155 – 74

Hogg, A H A 1984 *A Guide to the Hill-Forts of Britain* London: Paladin Books Ltd

Holden, T & Sheridan, A 2001 Three cists and a possible Roman road at Barbush Quarry, Dunblane, Perthshire *Proceedings of the Society of Antiquaries of Scotland*, 131, 87 – 100

Hossack, B H 1900 *Kirkwall in the Orkneys* Kirkwall: William Peace & Son

Holzhauser, H, Magny, M & Zumbuhl, H J 2005 Glacier and lake-level variations in west-central Europe over the last 3500 years *The Holocene* 15 (6), 789 – 801

Housley, R A, Walker, A J, Otlet, R L & Hedges, R E M 1996 Radiocarbon dating of the Lindow Man III Bog Body *in* Turner, R C & Scaife, R G (eds) *Bog Bodies New Discoveries and New Perspectives* London: British Museum Press, 39 – 46

HSE 2004 *Deer Farming* Agricultural Information Sheet no. 7 (rev), Health & Safety Executive

Hughes, P D M, Mauquoy, D, Barber, K E and Langdon, P G 2000 Mire-development pathways and palaeoclimatic records from a full Holocene peat archive at Walton Moss, Cumbria, England *The Holocene* 10 (4), 465 – 479

Hume Brown, P (ed) 1901 *The Register of the Privy Council of Scotland* Edinburgh: H M General Register House, Second Series Volume 3, AD 1629 – 30

Hume Brown, P (ed) 1904 *The Register of the Privy Council of Scotland* Edinburgh: H M General Register House, Second Series Volume 5, AD 1633 – 5

Hunter, F 1993 Four decorated antler mounts and a stone 'egg' amulet from Bu Sands, Burray, Orkney *Proceedings of the Society of Antiquaries of Scotland* 123, 319 – 336

Hunter, F J, McDonnell, J G & Pollard, A M 1993 The Scientific Identification of Archaeological Jet-Like Artefacts *Archaeometry* 35 (1), 69 – 89

Hunter, J 1868 Description of pit dwellings at Dilly-Mœnan and the Miaave Craig, Tarlair, near Macduff, Banffshire *Proceedings of the Society of Antiquaries of Scotland,* 7, 465 – 71

Hunter, J M 1971 The Social Roots of Dispersed Settlement in Ghana *in* Salter, C, L *The Cultural Landscape* Belmont: Duxbury Press, 168 – 78

Hunter, J R 1986 *Rescue excavations on the Brough of Birsay 1974 – 82,* Edinburgh: Society of Antiquaries of Scotland Monograph Series 4

Hunter, J R 1991 The Multi-Period Landscape *in* Hanson, W S & Slater, E A (eds) *Scottish Archaeology New Perceptions* Aberdeen: Aberdeen University Press, 178 – 95

Hunter, J R 1992 The survey and excavation of boat nausts at Hurnip's Point, Deerness, Orkney *The International Journal of Nautical Archaeology* 21 (2), 125 – 33

Hunter, J R 1994 'Maritime Culture': notes from the land *The International Journal of Nautical Archaeology* 23 (4), 261 – 64

Hunter, J R 1996a *Fair Isle The Archaeology of an Island Community* Edinburgh: The National Trust for Scotland, Her Majesty's Stationery Office

Hunter, J R 1996b The Landberg, Fair Isle (Dunrossness parish), Iron Age promontory fort, medieval building *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 94

Hunter, J R 1997 The Landberg, Fair Isle (Dunrossness parish), Iron Age promontory fort *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 68 – 9

Hunter, J R 2007a The Neolithic *in* Hunter, J R, Bond, J M & Smith, A N *Investigations in Sanday, Orkney Vol 1: Excavations at Pool, Sanday A multi-period site from Neolithic to Late Norse times* Kirkwall, Orkney: The Orcadian Ltd, 21 – 73

Hunter, J R 2007b The Iron Age *in* Hunter, J R, Bond, J M & Smith, A N *Investigations in Sanday, Orkney Vol 1: Excavations at Pool, Sanday A multi-period site from Neolithic to Late Norse times* Kirkwall, Orkney: The Orcadian Ltd, 75 – 120

Hunter, J R 2007c Introduction to the investigations *in* Hunter, J R, Bond, J M & Smith, A N *Investigations in Sanday, Orkney Vol 1: Excavations at Pool, Sanday A multi-period site from Neolithic to Late Norse times* Kirkwall, Orkney: The Orcadian Ltd, 9 – 19

Hunter, J R, Bond, J M & Smith, A N 2007a *Investigations in Sanday, Orkney Vol 1: Excavations at Pool, Sanday A multi-period site from Neolithic to Late Norse times* Kirkwall, Orkney: The Orcadian Ltd

Hunter, J R, Bond, J M & Smith, A N 2007b Overview *in* Hunter, J R, Bond, J M & Smith, A N *Investigations in Sanday, Orkney Vol 1: Excavations at Pool, Sanday A multi-period site from Neolithic to Late Norse times* Kirkwall, Orkney: The Orcadian Ltd, 515 – 22

Hunter, J R & Dockrill, S J 1982 The Island of Muckle Skerry *Proceedings of the Society of Antiquaries of Scotland*, 112, 518 – 24

Hunter, J R & Dockrill, S J 1990 Recent research into burnt mounds on Fair Isle, Shetland and Sanday, Orkney *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 62 – 8

Hunter, J R & Dockrill, S J 1991 *Loth Approach Road, Sanday, Orkney: an Archaeological Evaluation* Bradford University Archaeological Management and Consultancy Services Unpublished report

Hunter, J R, Dockrill, S J & McKinley, J I 1982 *The sites and monuments of Fara, Orkney* Bradford: University of Bradford School of Archaeological Sciences Occasional Paper No. 1

Hunter, J R, Dockrill, S J & McKinley, J I 1984 *The sites and monuments of Cava, Rysa Little, and Switha, Orkney* Bradford: University of Bradford School of Archaeological Sciences Occasional Paper No. 4

Hurl, D 1990 An anthropologist's tale *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 154 – 5

Hutcheson, A 1887 Notice of a Burial Place of the Bronze Age at Barnhill, near Broughty Ferry *Proceedings of the Society of Antiquaries of Scotland*, 21, 316 – 324

Hutchison, M, Curtis, N & Kidd, R 2015 The Knowe of Rowiegar, Rousay, Orkney: description and dating of the human remains and context relative to neighbouring cairns *Proceedings of the Society of Antiquaries of Scotland*, 145, 41 – 89

Huxtable, J 1975 Appendix II Dating – Thermoluminescence pp82 – 4 *in* Hedges, J W Excavation of two Orcadian burnt mounds at Liddle and Beaquoy, *Proceedings of the Society of Antiquaries of Scotland* 106, 39 – 99

Huxtable, J, Aitken, M J, Hedges, J W & Renfrew, A C 1976 Dating a settlement pattern by thermoluminescence: the burnt mounds of Orkney, *Archaeometry* 18 (1976), 5 – 17

Hydrographic Office 1925 *British Isles Pilot Volume VI* Washington: Hydrographic Office

Ingemark, D 2014 *Glass, alcohol and power in Roman Iron Age Scotland* Edinburgh: National Museums Scotland

Innes, C 1859 Opening Address, Anniversary meeting of 30th November 1857 *Proceedings of the Society of Antiquaries of Scotland* 3, 3 – 7

Innes, L 2016 *The Cist on the Foreshore at Lopness, Sanday, Orkney* GUARD Archaeology Ltd, www.archaeologyreportsonline.com, AR019

Irvine, J M (ed) 2006 *Blaeu's Orkneys and Schetland The Orkneys and Schetland in Blaeu's Atlas Novus of 1654 The map of Timothy Pont and the New Descriptions of Walter Stewart, as translated by Ian Cunningham* Surrey: James M Irvine

Irvine, J M 2009 *The Breckness Estate: A history of its Lairds, Tenants and Farms, and Skaill House*: Ashtead: James M Irvine

Izat, J 1927 Parish of Westray *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 339 – 49

Jackson, K H 1964 *The oldest Irish tradition: a window on the Iron Age* Cambridge: Cambridge University Press

Jackson, M 1993 *Michael Jackson's Beer Companion* London: Mitchell Beazley

Jakobsen, J 1985 *An Etymological Dictionary of the Norn Language in Shetland* Lerwick: Shetland Folk Society, 2 vols, 2nd edition (1st English ed. 1928 & 1932)

Jalut, G, Amat, A E, Bonnet, L, Gauquelin T & Fontugne, M 2000 Holocene climatic changes in the Western Mediterranean, from south-east France to south-east Spain *Palaeogeography, Palaeoclimatology, Palaeoecology* 160, 255 – 90

James, H J 1986 Excavations of burnt mounds at Carne, nr. Fishguard, 1979 and 1981 *Bulletin of the Board of Celtic Studies* 33, 245 – 65

James, H F 1999 Excavations of a medieval cemetery at Skaill House, and a cist in the Bay of Skaill, Sandwick, Orkney *Proceedings of the Society of Antiquaries of Scotland* 129, 753 – 78

Jamieson, R (ed) 1822 *Letters from a Gentleman in the North of Scotland to his Friend in London; containing the Description of a Capital Town in that Northern Country, with an Account of Some Uncommon Customs of the Inhabitants likewise An Account of the Highlands, With Customs and Manners of the Highlanders*. London: Ogle, Duncan & Co., 2 volumes

Jarrett, M G 1965 *Excavations at Maiden Castle, Durham, in 1956* Transactions of the Architectural and Archaeological Society of Durham and Northumberland *11 124 – 7*

Jeffrey, P 1991 Burnt mounds, fulling and early textiles *in* Hodder, M A & Barfield, L H (eds) *Burnt Mounds and Hot Stone Technology: Papers from the Second International Burnt Mound Conference Sandwell, 12th – 14th October 1990* Sandwell, West Midlands: Sandwell Metropolitan Borough Council, 97 – 106

Jeffries, J S, 1974 An excavation at the coastal promontory fort of Embury Beacon, Devon *Proceedings of the Prehistoric Society* 40, 136 – 56

Jennings, A E, Knudsen, K L, Hald, M, Hansen, C.V. & Andrews, J T 2002 A mid-Holocene shift in Arctic sea ice variability on the East Greenland Shelf *The Holocene* 12, 49 – 58

JNCC 2007a *Second Report by the UK under Article 17 on the implementation of the Habitats Directive from January 2001 to December 2006 Conservation status assessment for: H91J0: Taxus baccata woods of the British Isles* Peterborough: Joint Nature Conservation Committee. Available from: www.jncc.gov.uk/article17

JNCC 2007b *Second Report by the UK under Article 17 on the implementation of the Habitats Directive from January 2001 to December 2006 Conservation status assessment for: S1364: Halichoerus grypus – Grey seal* Peterborough: Joint Nature Conservation Committee. Available from: www.jncc.gov.uk/article17

JNCC 2007c Conservation status assessment for: H91J0: S1365: Phoca vitulina – Common seal *Second Report by the UK under Article 17 on the implementation of the Habitats Directive from January 2001 to December 2006* Peterborough: Joint Nature Conservation Committee. Available from: www.jncc.gov.uk/article17

Jobey, G 1967 Excavation at Tynemouth Priory and castle *Archaeologia Aeliana* 45, 33 – 104

Jobey, G 1978 Burnswark Hill, Dumfriesshire *Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society* Third Series, 53, 57 – 104

Jobey, G 1980 Green Knowe unenclosed platform settlement and Harehope cairn, Peeblesshire *Proceedings of the Society of Antiquaries of Scotland* 110, 72 – 113

Jockenhovel, A 1974 Fleischhaken von den Britischen Inseln *Archäologisches Korrespondenzblatt* 4, 329 – 38

Johnson, M 2012 Urned cremation burials at Carlinwell standing stone, Airlie, Angus *Tayside and Fife Archaeological Journal* 18, 1 – 13

Johnson, P G & Batey, C E 2003a Survey at the Earl's Bu, Orphir, Orkney, 1989 – 91 Geophysical work on a Late Norse Estate Complex *Scottish Internet Archaeology Report 4* www.sair.org.uk

Johnson, P G & Batey, C E 2003b Geophysical Survey at the Earl's Bu, Orphir, Orkney, 1989 – 91 *New Orkney Antiquarian Journal* Vol 3, 72 – 82

Johnston, A W 1903a The Earl's Bu and the Round Church Orphir *Saga Book of the Viking Club* Volume III Part II January 1903, 174 – 216

Johnston, A W 1903b Notes on the Earl's Bu (or Bordland) at Orphir, Orkney called Örfjara in the Sagas, and on the remains of the Round Church there *Proceedings of the Society of Antiquaries of Scotland* 37, 16 – 31

Johnston, A W 1907 Replies: Jo Ben (including note by R. St Clair & comment by Johnston on R St. Clair's note) *Viking Society for Northern Research: Old Lore Miscellany of Orkney Shetland Caithness and Sutherland* 1, 300 – 3

Johnston, A W 1915 Odal Law in Orkney and Shetland *Viking Society for Northern Research: Old Lore Miscellany of Orkney Shetland Caithness and Sutherland* 8, 47 – 59

Johnston, R 2005 Pattern Without A Plan: Rethinking The Bronze Age Coaxial Field Systems On Dartmoor, South-West England *Oxford Journal Of Archaeology* 24 (1) 1 – 21

Johnston, R 2008 Later prehistoric landscapes and inhabitation *in* Pollard, J (ed) *Prehistoric Britain* Oxford: Blackwell, 268 – 87

Jones, A, Cole, W J & Jones, R E 2005 Organic Residue Analysis of Grooved Ware from Barnhouse *in* Richards, C (ed.) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research 283 – 291

Jones, A & Richards, C 2005 Living in Barnhouse *in* Richards, C (ed.) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 23 – 56

Jones, A M 2016 Crossiecrown pp332 – 57 *in* Jones, A M, Jones, R, Tully, G, Maritan, L, Mukherjee, A, Evershed, R, MacSween, A, Richards, C & Towers, R 2016 Prehistoric Pottery from Sites within the Bay of Firth: Stonehall, Crossiecrown, Wideford Hill, Brae of Smerquoy, Muckquoy, Ramberry and Knowes of Trotty *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 303 – 412

Jones, A M, Jones, R, Tully, G, Maritan, L, Mukherjee, A, Evershed, R, MacSween, A, Richards, C & Towers, R 2016 Prehistoric Pottery from Sites within the Bay of Firth: Stonehall, Crossiecrown, Wideford Hill, Brae of Smerquoy, Muckquoy, Ramberry and Knowes of Trotty *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 303 – 412

Jones, K T & Metcalfe, D 1988 Bare bones archaeology: bone marrow indices and efficiency *Journal of Archaeological Sciences* 15, 415 – 423

Jones, R 2016 Ramberry Head pp396 – 98 *in* Jones, A M, Jones, R, Tully, G, Maritan, L, Mukherjee, A, Evershed, R, MacSween, A, Richards, C & Towers, R 2016

Prehistoric Pottery from Sites within the Bay of Firth: Stonehall, Crossiecrown, Wideford Hill, Brae of Smerquoy, Muckquoy, Ramberry and Knowes of Trotty *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 303 – 412

Jones, R, Challands, A, French, C, Card, N, Downes, J & Richards, C 2010 Exploring the Location and Function of a Late Neolithic House at Crossiecrown, Orkney by Geophysical, Geochemical and Soil Micromorphological Methods *Archaeological Prospection* 17, 29 – 47

Jones, R E 2003a Crossiecrown pp162 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 4, Council for Scottish Archaeology, 154 – 66

Jones, R E 2003b Stonehall pp163 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 4, Council for Scottish Archaeology, 154 – 66

Jones, R E 2003c Moan pp163 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 4, Council for Scottish Archaeology, 154 – 66

Jones, R E 2005a Skaill Bay, Cuween-Wideford Project pp177 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 6, Council for Scottish Archaeology, 165 – 81

Jones, R E 2005b Stonehall, Cuween-Wideford Project pp177 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 6, Council for Scottish Archaeology, 165 – 81

Jones, R E 2005c Wideford Hill, Cuween-Wideford Project pp177 – 8 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 6, Council for Scottish Archaeology, 165 – 81

Jones, R E 2005d Crossiecrown, Cuween-Wideford Project pp176 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 6, Council for Scottish Archaeology, 165 – 81

Jones, R L 1975 Appendix III Environment – pollen pp84 – 88 *in* Hedges, J W Excavation of two Orcadian burnt mounds at Liddle and Beaquoy, *Proceedings of the Society of Antiquaries of Scotland* 106, 39 – 99

Jones R L 1977 Appendix IV pollen identification pp149 – 50 *in* Hedges, M E The excavation of the Knowes of Quoyscottie, Orkney: a cemetery of the early first millennium BC, *Proceedings of the Society of Antiquaries of Scotland* 108, 130 – 55

Jones, R L 1979 Vegetational Studies *in* Renfrew, A C *Investigations in Orkne*y London: Society of Antiquaries, Reports of the Research Committee of the Society of Antiquaries of London 38, 21 – 30

Jope, E M 1986 Sample credentials necessary for meaningful high-precision 14C dating *Radiocarbon* 28 (3), 1060 – 4

Kaland, S H H, 1993 The settlement of Westness, Rousay *in* Batey C E, Jesch, J & Morris, C D (eds) *The Viking Age in Caithness, Orkney and the North Atlantic*, Edinburgh: Edinburgh University Press, 308 – 17.

Katz, S H & Voight, M M 1986 Bread and beer *Expedition* 28 (2), 23 – 34

Kavanagh, R M 1991 A reconsideration of razors in the Irish Earlier Bronze Age *Journal of the Royal Society of Antiquaries of Ireland* 121, 77 – 104

Keatinge, T H & Dickson J H 1979 Mid-Flandrian Changes in Vegetation on mainland Orkney *The New Phytologist* 82, 585 – 612

Keller, F 1866 *The Lake Dwellings of Switzerland And Other Parts of Europe* London: Longmans Green & Co (facsimile reprint)

Kelley, J C & Campbell, T N 1942 What are the burnt rock mounds of Texas? *American Antiquity* 7 (3), 319 – 322

Kelly, R S 1990 The excavation of a burnt mound at Graeanog, Clynnog, Gwynedd, in 1983 *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 116 – 126

Kelly, R S 1992 The excavation of a burnt mound at Graeanog, Clynnog, Gwynedd, in 1983 *Archaeologia Cambrensis* 141, 74 – 96

Kennett, D J, Kennett, J P, West, A Mercer, C, Que Hee, S S, Bement, L, Bunch, T E, Sellers, M & Wolbach W S 2009 Nanodiamonds in the Younger Dryas Boundary Sediment Layer *Science* 323, 94

Kirkness, W 1925a The Discovery of a Short Cist at Rendall, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 59, 236 – 7

Kirkness, W 1925b Notes on the Discovery of a Short Cist at Rendall, Orkney, *Proceedings of the Orkney Antiquarian Society* III, 79

Kirkness, W 1927 Report on the Discovery of two short cists containing cremated human remains at Hundatown, Orkney *Proceedings of the Society of Antiquaries of Scotland* 61, 238 – 40

Kirkness, W 1928a Underground Building at Dale, Harray, Orkney *Proceedings of the Society of Antiquaries of Scotland* 62, 155 – 61

Kirkness, W 1928b Dale, (Harray), and Other Kindred Structures, *Proceedings of the Orkney Antiquarian Society* VI, 59 – 67

Kirkness, W 1930 A pillared underground chamber at Biggings, Harray, Orkney *Proceedings of the Society of Antiquaries of Scotland*, 64, 222 – 32

Kirkness, W 1935 Notes on the Discovery of a Plate from an Early Bronze Age Necklace *Proceedings of the Orkney Antiquarian Society* XIII, 41.

Knight, R W, Browne, C & Grinsell, L V 1972 Prehistoric Skeletons from Tormartin *Transactions of the Bristol and Gloucester Archaeological Society* 91, 14 – 17

Korhola, A, Weckström, J, Holmström, L & Erästö, P 2000 A Quantitative Holocene Climatic Record from Diatoms in Northern Fennoscandia *Quaternary Research* 54, 284 – 92

Kristiansen, K 1998 *Europe before History* New Studies in Archaeology, Cambridge: Cambridge University Press

Kristiansen, K 2002 *The Tale of the Sword – Swords and Swordfighters in Bronze Age Europe* Oxford Journal of Archaeology 21 (4) 319 – 32

Kristiansen, K & Larsson, T B 2005 *The Rise of Bronze Age Society Travels Transmissions and Transformations* Cambridge: Cambridge University Press

Kristiansen, K & Suchowska-Ducke, P 2015 Connected Histories: the Dynamics of Bronze Age Interaction and Trade 1500 – 1100 BC *Proceedings of the Prehistoric Society* 81, 361 – 92

Kuniholm, P I 1990 Archaeological evidence and non-evidence for climatic change *Philosophical Transactions of the Royal Society of London* Series A, Mathematical and Physical Sciences, vol 330, no. 1615, The Earth's Climate and Variability of the Sun Over Recent Millennia: Geophysical, Astronomical and Archaeological Aspect, 645 – 55

Kuniholm, P I, Kromer, B, Manning, S W, Newton, M, Latini, C E & Bruce, M J 1996 Anatolian tree rings and the absolute chronology of the eastern Mediterranean, 2220 – 718 BC *Nature* 381, 780 – 3

Kyd, J G (ed) 1952 *Scottish Population Statistics including Webster's Analysis of Population 1755* Edinburgh: T & A Constable for the Scottish Historical Society

Kvideland, R & Sehmsdorf, H K (eds) 1988 *Scandinavian Folk Belief and Legend* Minneapolis & London: University of Minnesota Press

Laing, T E & Smol, J P 2003 Late Holocene environmental changes inferred from diatoms in a lake on the western Taimyr Peninsula, northern Russia *Journal of Paleolimnology* 30, 231 – 47

LaMarche, V C & Hirshboeck, K K 1984 Frost rings in trees as records of major volcanic eruptions *Nature* 307, 121 – 6

Lamb, G 2006 *The Place-Names of South Ronaldsay and Burray* Kirkwall, Orkney: Bellavista Publications

Lamb, G 2007 *Sky over Scapa* Kirkwall: Bellavista Publications

Lamb, H H 1967 Book Review of Carpenter, R 1966 Discontinuity in Greek Civilization *Antiquity* 41 (163), 233 – 4

Lamb R G 1980a *Iron Age Promontory Forts in the Northern Isles* Oxford: British Archaeological Reports British Series 79

Lamb, R G 1980b *The archaeological sites and monuments of Sanday and North Ronaldsay, Orkney Islands Area*, The archaeological sites and monuments of Scotland series No. 11, Edinburgh: Royal Commission on the Ancient and Historical Monuments of Scotland

Lamb, R G 1981a Note in the Orkney SMR regarding the observation of a treb dyke at Nebister, Sanday

Lamb, R G 1981b Note in the Orkney SMR regarding the observation of a treb dyke at Spaney Geo, Sanday

Lamb, R G 1982 *The archaeological sites and monuments of Rousay, Egilsay and Wyre, Orkney Islands Area*, The archaeological sites and monuments of Scotland series No.16, Edinburgh: Royal Commission on the Ancient and Historical Monuments of Scotland

Lamb, R G 1983a The Orkney Trebs *in* Chapman, J C & Mytum, H C *Settlement in North Britain 1000 BC – AD 1000 Papers presented to George Jobey Newcastle*

upon Tyne, December 1982 Oxford: British Archaeological Reports British Series 118, 175 – 84

Lamb, R G 1983b *The archaeological sites and monuments of Papa Westray and Westray, Orkney Islands Area*, The archaeological sites and monuments of Scotland series No.19, Edinburgh: Royal Commission on the Ancient and Historical Monuments of Scotland

Lamb, R G 1984 *The archaeological sites and monuments of Eday and Stronsay, Orkney Islands Area*, The archaeological sites and monuments of Scotland series No.23, Edinburgh: Royal Commission on the Ancient and Historical Monuments of Scotland

Lamb, R G 1985 Note in the Orkney SMR regarding the observation of a treb dyke at Howar, Smear Geo, Sanday

Lamb, R G 1986a Note in the Orkney SMR regarding the observation of a treb dyke at Bigland, Rousay

Lamb, R G 1986b Note in the Orkney SMR regarding the observation of a sub peat dyke on Linga Holm

Lamb, R G 1987 *The archaeological sites and monuments of Shapinsay, St Andrews and Deerness, Orkney Islands Area*, The archaeological sites and monuments of Scotland series No.27, Edinburgh: Royal Commission on the Ancient and Historical Monuments of Scotland

Lamb, R G 1989 *The archaeological sites and monuments of Hoy and Waas, Orkney Islands Area*, The archaeological sites and monuments of Scotland series No.29, Edinburgh: Royal Commission on the Ancient and Historical Monuments of Scotland

Lamb, R G 1990 Note in the Orkney SMR regarding the observation of a sub peat dyke at Mad Geo, Papa Westray

Lamb, R G 1993 Carolingian Orkney and its Transformation *in* Batey C E, Jesch, J & Morris, C D (eds) *The Viking Age in Caithness, Orkney and the North Atlantic*, Edinburgh: Edinburgh University Press, 260 – 71

Lamb, R G 1995 Papil, Picts and Papar *in* Crawford, B E (ed) *Northern Isles Connections Essays from Orkney & Shetland presented to Per Sveas Andersen* Kirkwall, Orkney: The Orkney Press, Kirkwall, 9 – 27

Lamb, R G 1996 Whaness Burn *in* Hall, A M (ed) *The Quaternary of Orkney Field Guide* London: Quaternary Research Association, 55 – 57

Lamb, R G 2003 Kirkwall *in* Omand, D (ed) *The Orkney Book* Edinburgh: Birlinn, 175 – 84

Lamb, R G 2005 'Where local knowledge is so valuable': nautical practicalities and the earliest Viking Age in Orkney *in* Owen, O (ed) *The World of the Orkneyinga Saga 'The Broadcloth Viking Trip'* Kirkwall: The Orcadian, 39 – 53

Lamb, R G & Ritchie, J N G 1985 Note in the Orkney SMR regarding their observation of a sub peat dyke on Vinquoy Hill in Eday, Orkney

Lamb, R G & Roberstson, J 2005 Kirkwall: Saga, History, Archaeology *in* Owen, O (ed) *The World of the Orkneyinga Saga 'The Broadcloth Viking Trip'* Kirkwall: The Orcadian, 160 – 91

Lamb, R G & Turner, V 1991 An Insular View? *in* Hanson, W S & Slater, E A (eds) *Scottish Archaeology New Perceptions* Aberdeen: Aberdeen University Press, 167 – 77

Lambeck, K 1995 Late Devensian and Holocene Shorelines of the British Isles and North Sea from models of glacio-hydro-isostatic rebound *Journal of the Geological Society, London* 152, 437 – 48

Lambert, C A 1964 Appendix IV The plant remains from Cist I pp178 – 9 *in* Henshall, A S A Dagger-grave and other Cist Burials at Ashgrove, Methilhill, Fife *Proceedings of the Society of Antiquaries of Scotland* 97, 166 – 79

LaMoreaux, P E 1995 Worldwide environmental impacts from the eruption of Thera *Environmental Geology* 26, 172 – 81

Land Use Consultants 1998 *Orkney landscape character assessment* Scottish Natural Heritage Review No 100

Lane, H C 1969 Markland Grips Iron Age promontory fort Derbyshire *Archaeological Journal* 89, 59 – 67

Langdon, P G & Barber, K E 2004 Snapshots in time: precise correlations of peat-based proxy climate records in Scotland using mid-Holocene tephras *The Holocene* 14 (1), 21 – 33

Langdon, P G & Barber, K E 2005 The climate of Scotland over the last 5000 years inferred from multiproxy peatland records: inter-site correlations and regional variability *Journal of Quaternary Science* 20, 549 – 66

Langdon, P G, Barber, K E & Hughes, P D M 2003 A 7500-year peat-based palaeoclimatic reconstruction and evidence for a 1100-year cyclicity in bog surface wetness from Temple Hill Moss, Pentland Hills, southeast Scotland *Quaternary Science Reviews* 22, 259 – 74

Lanting, J N 2004 Ross Island: Radiocarbon Dates and Absolute Chronology *in* O'Brien, W *Ross Island Mining, Metal and Society in Early Ireland* Bronze Age Studies 6, Department of Archaeology, National University of Ireland, Galway, 305 – 16

Lanting, J N & Brindley A L 1998 Dating Cremated Bone: the Dawn of a New Era *Journal of Irish Archaeology* 9, 1 – 7

Larsson, T B 1990 Skärvstenshögar – the burnt mounds of Sweden *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 142 – 53

Latimer, W T 1894 Sweat-House, near Eglish, County Tyrone *Journal of the Royal Society of Antiquaries of Ireland* 5th series, 4 (2), 180

Lawley, R & Garcia-Bajo, M 2010 *The National Superficial Deposit Thickness Model (version 5)* British Geological Survey Internal Report, OR/09/049, accessed 16/10/15 from http://www.bgs.ac.uk/downloads/start.cfm?id=1660

Lawrence, D 2004 *An Archaeological Watching Brief on works for the Dounby – Harray Junction Replacement Main* Unpublished report, Orkney Archaeological Trust Projects Unit

Lawrence, D 2005 An anthropomorphic carving from Pictish Orkney *Proceedings of the Society of Antiquaries of Scotland* 135, 309 – 18

Lawrence, D 2006 Neolithic mortuary practice in Orkney *Proceedings of the Society of Antiquaries of Scotland* 136, 47 – 60

Lawrence, D 2008 *Proposed Developments in Caithness and Orkney Archaeological Impact Assessment* Orkney Archaeological Trust Projects Unit, Unpublished report for Aquatera

Lawrence, D & Lee-Thorp, J 2012 New radiocarbon dates from Isbister, Orkney *Discovery and Excavation in Scotland* New Series Vol 13, 203 – 4

Lawrence D M 2012 *Orkney's First Farmers Reconstructing biographies from osteological analysis to gain insights into life and society in a Neolithic community on the edge of Atlantic Europe* University of Bradford PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Lawson, A J 2000 *Potterne, 1982-5: Animal Husbandry in Late Prehistoric Wiltshire* Salisbury: Trust for Wessex Archaeology

Layard, N F 1922 Prehistoric cooking-places in Norfolk *Proceedings of the Prehistoric Society of East Anglia* 3, 483 – 9

Leach, E 1977 Comment: A View from the Bridge *in* Spriggs, M (ed) *Archaeology and Anthropology: Areas of Mutual Interest* Oxford: British Archaeological Reports Supplementary Series 19, 161 – 76

Learmonth, P 1845 Parish of Stromness *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy, Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 26 – 39 of the Orkney section (volume not continuously numbered)

Leask, J R 1985 Eday *in* Miller, R (ed) *The Third Statistical Account of Scotland The County of Orkney* Edinburgh: Scotish Academic Press, 19 – 30

Lee, D 2008a *Quandale, Rousay: The biography of a landscape An interpretive landscape survey* Unpublished MA Archaeological Practice dissertation, Orkney College

Lee, D 2008b Outer Green Hill, Cantick, South Walls Excavation *Discovery and Excavation in Scotland* New Series Vol 9, Council for Scottish Archaeology, 137 – 8

Lee, D 2009 Roeberry Barrow, Cantick, Excavation *Discovery and Excavation in Scotland* New Series Vol 10, Council for Scottish Archaeology, 141 – 2

Lee, D 2010 Roeberry Barrow, Cantick, Excavation *Discovery and Excavation in Scotland* New Series Vol 11, Council for Scottish Archaeology, 132 – 3

Lee, D 2011a Roeberry Barrow, Cantick, Excavation *Discovery and Excavation in Scotland* New Series Vol 12, Council for Scottish Archaeology, 141 – 2

Lee, D 2011b *Banks Chambered tomb, South Ronaldsay, Orkney* unpublished ORCA Report

Lee, D 2011c Banks Chambered Tomb, South Ronaldsay, Orkney (South Ronaldsay parish), excavation *Discovery and Excavation in Scotland* New Series Vol 12, Council for Scottish Archaeology, 138

Lee, D 2012 Hoy and South Walls Landscape Project Measured, walkover and geophysical survey *Discovery and Excavation in Scotland*, New Series Vol 13, Council for Scottish Archaeology, 134

Lee, D in preparation *Souterrain at Nessbreck, Corrigall, Harray*

Lee, D, Moore, J & Carruthers, M 2014 Nether Mousland Survey *Discovery and Excavation in Scotland*, New Series Vol 15, Council for Scottish Archaeology, 153 – 4

Lee, D & Thomas, A 2012a *Roeberry Barrow, Cantick, South Walls, Orkney with excavations at Hesti Geo settlement 2011 Excavations* unpublished ORCA Data Structure Report

Lee, D & Thomas, A 2012b Orkney's first farmers. Early Neolithic settlement on Wyre *Current Archaeology* 268, 12 – 19

Leechman, D 1951 Bone Grease *American Antiquity* 16 (4), 355 – 56

Legge, T 2005 Milk use in prehistory: the osteological evidence *in* Mulville, J & Outram, A K (eds) *The Zooarchaeology of Fat, Oils, Milk and Dairying* Oxford: Oxbow Books, 8 – 13

Lehane, D 1990a Arran: Machrie North and Glaister *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 77 – 9

Lehane, D 1990b Gill Pier burnt mound, Westray, Orkney *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 80 – 1

Leith, P 1927 Hill Dike Agreement 1761 *Proceedings of the Orkney Antiquarian Society* V, 59 – 60

Leslie, J 1927 Parish of Rousay and Egilshay Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 241 – 5

Leuschner, H H, Sass-Klaassen, U, Jansma, E, Baillie, M G L & Spurk, M 2002 Subfossil European bog oaks: population dynamics and long-term growth depressions as indicators of changes in the Holocene hydro-regime and climate *The Holocene* 12, 695 – 706

Lewis, S 1834 *A Topographical Dictionary of Wales, Comprising the Several counties, cities, boroughs, corporate and market towns, Parishes, chapelries, and townships, with Historical and Statistical descriptions* London: S. Lewis & Co, Two Volumes

Lewin, P & Celoria, F 1958 Islay *Discovery and Excavation in Scotland* Scottish Regional Group, Council for British Archaeology, 12 – 14

Liddell, Rev. 1927 Parish of Orphir *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 65 – 86

Lillie, M, Page, N, Hedges, J, Constantine, B, Bunting, J & Farrell, M 2010 South Ronaldsay Excavation Project, Orkney (South Ronaldsay parish), excavation, palaeoenvironmental, fieldwalking and geophysical survey *Discovery and Excavation in Scotland* New Series Vol 11, Council for Scottish Archaeology, 127 – 8

Limbrey, S 1997 Soils and Cultivation Practices *in* Buteux, S *Settlements at Skaill, Deerness, Orkney: Excavations by the late Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981* Oxford: Archaeopress, British Archaeological Report British Series 260, 17 – 23

Limbrey, S & Evans, J G 1978 *The effect of man on the landscape: the Lowland zone* London: Council for British Archaeology Research Report 21

Linnane, S J 2008a *M3 Clonee-North of Kells Contract 2 Dunshaughlin – Navan Report on the Archaeological Excavation of Ballinter 2, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Linnane, S J 2008b M3 Clonee-North of Kells Contract 2 Dunshaughlin – Navan Report on the Archaeological Excavation of Cooksland 2, County Meath Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Linnane, S 2008c *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Gainstown 1 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Lindqvist, S 1942 The boat models from Roos Carr *Acta Archaeologica* 13, 235 – 42

Lloyd-Jones, J 1997 Pottery from Site 5 (Late Bronze Age and Iron Age) *in* Buteux, S 1997 *Settlements at Skaill, Deerness, Orkney: Excavations by the late Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981* Oxford: Archaeopress, British Archaeological Report British Series 260, 184 – 97

Logie, W 1845 Parish of Kirkwall and St Ola *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy, Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 1 – 12 of the Orkney section (volume not continuously numbered)

Longmuir, J & Donaldson, D (eds) 1880 *An Etymological Dictionary of the Scottish Language by John Jamieson. A New Edition, carefully revised and collated, with the entire supplement incorporated* Paisley: Alexander Gardner, Vol III (5 volumes published separately)

Longworth, I H 1983 The Whinny Liggate Perforated Wall Cup and its Affinities *in* O'Connor, A & Clarke, D V (eds) *From the Stone Age to the 'Forty-Five Studies presented to R B K Stevenson* Edinburgh: John Donald Publishers, 65 – 86

Longworth, I H 1984 *Collared Urns of the Bronze Age in Great Britain and Ireland* Gulbenkian Archaeological Series, Cambridge: Cambridge University Press

Lopatin, I A 1960 Origin of the Native American Steam Bath *American Anthropologist* 62 (6) 977 – 93

Lorliewicz, W 2012 Skeletal Trauma and violence among the early farmers of the North European Plain: evidence from Neolithic settlements of the Lengyel Culture in Kuyavia, north-central Poland *in* Schulting, R & Fibiger, L (eds) *Sticks, Stones & Broken Bones: Neolithic Violence in a European Perspective* Oxford: Oxford University Press, 51 – 75

Louwe Kooijmans L P 1993 An Early/Middle Bronze Age multiple burial at Wassenaar, the Netherlands *Analecta Praehistorica Leidensia* 26, 1 – 20

Low, G 1776 Extract of a letter from the Reverend Mr George Low, to Mr Paton of Edinburgh. Communicated by Mr Gough *Archaeologia* 3, 276 – 8 & plate XIII

Low, G 1813 *Fauna Orcadensis or The Natural History of the Quadrupeds, Birds, Reptiles and Fishes of Orkney and Shetland* Edinburgh: Archibald Constable & Co.

Low, G 1879 *A Tour through the Islands of Orkney & Schetland containing hints relative to their Ancient, Modern and Natural History Collected in 1774 by George Low author of 'Fauna Orcadensis' with illustrations from drawings by the author and with an Introduction by Joseph Anderson* Kirkwall, Orkney: William Peace & Son

Low, G 1927 United Parishes of Birsay and Harray *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 148 – 66

Lowe, C 1987 *Early Ecclesiastical Sites in the Northern Isles and Isle of Man: An Archaeological Survey (2 vols)* University of Durham PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Lowe, C 1994 George Petrie and the 'brochs' of Papa Westray *Proceedings of the Society of Antiquaries of Scotland* 124, 173 – 87

Lowe, C 1998 *Coastal Erosion and the Archaeological Assessment of an Eroding Shoreline at St Boniface Church, Papa Westray, Orkney* Stroud: Sutton Publishing

Lowe, C 2002 *Golgotha Monastery, Papa Stronsay, Orkney ?souterrain; kelp kilns; fish-curing station Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 3, 88

Lowe, C E, Buteux, S & Hunter, J 2000 St Nicholas Chapel, Papa Stronsay (Stronsay parish), Iron Age activity; medieval chapel, *Discovery and Excavation in Scotland,* Council for Scottish Archaeology, New Series, Vol. 1, 67 – 8

Lowe, C E, Buteux, S & Hunter, J 2001 St Nicholas Chapel, Papa Stronsay (Stronsay parish), Iron Age structure *Discovery and Excavation in Scotland,* Council for Scottish Archaeology, New Series, Vol. 2, 72

Lucas, A T 1965 Washing and bathing in Ancient Ireland *Journal of the Royal Society of Antiquaries of Ireland* 95 (1/2), 65 – 114

Lukis, W C (ed) 1882 *The Family Memoirs of the Rev. William Stukeley and the Antiquarian and other Correspondence of William Stukeley, Roger & Samuel Gale etc* Edinburgh: William Blackwood & Sons, Vol I

Lukis, W C (ed) 1883 *The Family Memoirs of the Rev. William Stukeley and the Antiquarian and other Correspondence of William Stukeley, Roger & Samuel Gale etc Edinburgh*: William Blackwood & Sons, Vol II

Lukis, W C (ed) 1887 *The Family Memoirs of the Rev. William Stukeley and the Antiquarian and other Correspondence of William Stukeley, Roger & Samuel Gale etc* Edinburgh: William Blackwood & Sons, Vol III

Lynch, A 1983 The Seed Remains in Hedges, J W *Isbister A Chambered Tomb in Orkney* Oxford: British Archaeological Report British Series 115, 171 – 75

Lynn, D 2004 Is Howe of Howe an inconvenient aberration for broch excavations? *Papers and Pictures in Honour of Daphne Home Lorimer MBE* downloaded on 10/12/13 from http://www.orkneyjar.com/archaeology/dhl/papers/howe/index.html

Lynn, D 2012a Varme Dale, Gorn Field Visit *Discovery and Excavation in Scotland*, New Series Vol 13, Council for Scottish Archaeology, 131

Lynn, D 2012b Damsay Fieldwork *Discovery and Excavation in Scotland*, New Series Vol 13, Council for Scottish Archaeology, 131 – 3

Lynn, D & Bell, B 1985 Garson, Stromness parish, Settlement *Discovery and Excavation In Scotland*, Council for Scottish Archaeology, 65

Lynn, D & Bell, B 1986 Garson shore, Stromness parish, Settlement *Discovery and Excavation In Scotland* Council for Scottish Archaeology, 21

Lynn, D & Bell, B 1987 Bu of Cairston (Stromness parish), broch and settlement, pottery *Discovery and Excavation in Scotland* Council for Scottish Archaeology, 34 – 5

Lynn, D & Bell, B 1988a Bu of Cairston (Stromness parish), broch, settlement, later structures *Discovery and Excavation in Scotland* Council for Scottish Archaeology, 29

Lynn, D & Bell, B 1988b Garson shore, Stromness parish, Settlement, probably Neolithic *Discovery and Excavation in Scotland* Council for Scottish Archaeology, 29

Lynn, D & Bell, B 1990a Survey of Broch Sites on Westray: Queena Howe *Discovery and Excavation in Scotland* Council for Scottish Archaeology, 45

Lynn, D & Bell, B 1990b Garson shore, sherd, flint *Discovery and Excavation In Scotland* Council for Scottish Archaeology, 45

Lysaght, A M 1972 Note on a grave excavated by Joseph Banks and George Low at Skaill in 1772, *Proceedings of the Society of Antiquaries of Scotland* 104, 285 – 89.

Lysaght, A M 1974 Joseph Banks at Skara Brae and Stennis, Orkney, 1772 *Notes and Records of the Royal Society* 28(2), 221 – 34

Macaulay, G C (ed) 1913 *The Chronicles of Froissart translated by John Bourchier, Lord Berners* London: Macmillan & Co Ltd

Macaulay Institute 1981a *Soil Survey of Scotland*: *Orkney – Northern Isles*, *1:50,000* Southampton: Director General of the Ordnance Survey, for The Macaulay Institute for Soil Research, Soil Survey of Scotland, Aberdeen.

Macaulay Institute 1981b *Soil Survey of Scotland*: *Orkney – Mainland, 1:50,000* Southampton: Director General of the Ordnance Survey, for The Macaulay Institute for Soil Research, Soil Survey of Scotland, Aberdeen.

Macaulay Institute 1981c *Soil Survey of Scotland*: *Orkney – Hoy, 1:50,000* Southampton: Director General of the Ordnance Survey, for The Macaulay Institute for Soil Research, Soil Survey of Scotland, Aberdeen.

Macdonald, G 1936 Note on 'Jo Ben' and the Dwarfie Stane pp 217 – 36 *in* Calder, C S T The Dwarfie Stane of Hoy, Orkney: its Period and Purpose *Proceedings of the Society of Antiquaries of Scotland* 70, 217 – 236

MacGillivray, E 2003 Before the Orkney Heritage Society *New Orkney Antiquarian Journal* 3, 15 – 28

MacGregor, A 1974 The Broch of Burrian, North Ronaldsay, Orkney *Proceedings of the Society of Antiquaries of Scotland* 105, 63 – 118

MacGregor, A 2007 Forming an Identity: the Early Society and its Context, 1707 – 51 *in* Pearce, S (ed) *Visions of Antiquity The Society of Antiquaries of London 1707 – 2007 Being Volume 111 of Archaeologia* London: Society of Antiquaries, 45 – 73

MacGregor, G 2003 *Excavation of an Urned Cremation of the Bronze Age*, Glennan Argyll & Bute Scottish Archaeological Internet Report 8, www.sair.org.uk

MacGregor, G 2008 Elemental bodies: the nature of transformative practices during the late third and second millennium BC in Scotland *World Archaeology* 40 (2), 268 – 80

Mackenzie, M 1750 *Orcades: or, a Geographic and Hydrographic Survey of the Orkney and Lewis Islands, in Eight Maps, Exhibiting the Rocks, Shoals, Soundings, Quality of the Bottom, Diversities of the Coast, Flowings, Setting of the tides, and distant Views of the Land. Also the Manner of taking the Survey: the State of the Tides: and a Particular Description of the Rocks, Shoals, Channels, Harbours, Anchoring-Places; the Directions, Irregularities, and Velocities of the several Streams of Tide round each Island. Interspersed with Suitable Directions For Sailors.* London: Printed for the Author

Mackey, E C, Shewry, M C & Tudor, G J 1998 *Land Cover Change: Scotland from the 1940s to the 1980s* Edinburgh: The Stationery Office

MacKie, E W 1976 Iron Age pottery from the Stones of Stenness pp25 – 7 *in* Ritchie, J N G The Stones of Stenness, Orkney *Proceedings of the Society of Antiquaries of Scotland* 107, 1 – 60

MacKie, E W 1982 The Leckie broch, Stirlingshire: an interim report *Glasgow Archaeological Journal* 9, 60 – 72

MacKie, E W 1987 Impact on the Scottish Iron Age of the discoveries at the Leckie broch *Glasgow Archaeological Journal,* 14, 1 – 18

MacKie, E W 1994 Gurness and Midhowe Brochs in Orkney: some problems of misinterpretation *Archaeological Journal* 151, 98 – 157

MacKie, E W 2002 *The Roundhouses, Brochs and Wheelhouses of Atlantic Scotland c.700BC – AD500. Part 1: The Orkney and Shetland Isles* Oxford: Archaeopress, British Archaeological Report British Series 342

MacKie, E W 2005 Scottish Brochs at the Start of the New Millennium *in* Turner, V E, Nicholson, R A, Dockrill, S J & Bond, J M (eds) *Tall Stories? Two millennia of brochs* Lerwick: Shetland Amenity Trust, 11 – 31

MacKie, E W 2007 *The Roundhouses, Brochs and Wheelhouses of Atlantic Scotland c. 700 BC - AD 500 Architecture and material culture. Part 2: The Northern and Southern Mainland and the Western Islands* Oxford: Archaeopress, British Archaeological Report British Series 444, 2 volumes

MacLagan, C 1875 *The hill forts, stone circles and other structural remains of ancient Scotland: illustrated with plans and sketches* Edinburgh: Edmonston & Douglas

Maclean, A C & Rowley-Conwy, P A 1984 *Appendix 4: The Carbonised Material from Boghead, Fochabers in* Burl, H A W Report on the excavation of a Neolithic mound at Boghead, Speymouth Forest, Fochabers, Moray, 1972 and 1974 *Proceedings of the Society of Antiquaries of Scotland* 114, 35 – 73

MacSween, A 1999 Pottery pp218 – 25 *in* Moore, H & Wilson, G Food for thought: a survey of burnt mounds of Shetland and excavations at Tangwick *Proceedings of the Society of Antiquaries of Scotland* 129, 203 – 37

MacSween, A 2007 The Pottery *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 259 – 85

MacSween, A 2014 The Pottery pp74 – 6 *in* Moore, G & Wilson, H Section 2: Excavations at Cruester Burnt Mound, Bressay, Shetland *in* Moore G, & Wilson H *Ebbing Shores Survey and Excavation of Coastal Archaeology in Shetland 1995 – 2008* Historic Scotland Archaeology Report No. 8, 54 – 84

MacSween, A, Hunter, J, Sheridan, A, Bond, J, Bronk Ramsey, C, Reimer, P, Bayliss, A, Griffiths, S & Whittle, A 2015 Refining the Chronology of the Neolithic Settlement at Pool, Sanday, Orkney: Implications for the Emergence and Development of Grooved Ware *Proceedings of the Prehistoric Society* 81, 283 – 310

Magny, M 2004 Holocene climate variability as reflected by mid-European lake-level fluctuations and its probable impact on prehistoric human settlements *Quaternary International* 113, 65 – 79

Magny, M, Peyron, O, Gauthier, E, Rouèche, Y, Bordon, A, Billaud, Y, Chapron, E, Marguet, A, Pétrequin, P & Vannière, B, 2009 Quantitative reconstruction of climatic variations during the Bronze and early Iron ages based on pollen and lake-level data in the NW Alps, France *Quaternary International* 200, 102 – 110

Magny, M, Vannière, B, Zanchetta, G, Fouache, E, Touchais, G, Petrika, L, Coussot, C, Walter-Simonnet, A-V & Arnaud, F 2009 Possible complexity of the climatic event around 4300 – 3800 cal. BP in the central and western Mediterranean *The Holocene* 19 (6), 823 – 33

Magri, D & Parra, I 2002 Late Quaternary western Mediterranean pollen records and African winds *Earth and Planetary Science Letters* 200 401 – 8

Mahler, D L 2013 Stanydale Hall - a gathering site or just a large Neolithic house on Shetland? *in* Mahler, D L (ed) *The Border of Farming Shetland and Scandinavia Papers from the Symposium in Copenhagen September 19th –*

21st 2012 Copenhagen: The National Museum of Denmark Northern Worlds, 8 – 22

Mahr, A 1930 A Wooden Idol from Ireland *Antiquity* 4, 487 & plate IV

Mainland, I, Card, N, Saunders, M K, Webster, C, Isaksen, L, Downes, J & Littlewood, M 2014 'SmartFauna': a microscale GIS-based multi-dimensional approach to faunal deposition at the Ness of Brodgar, Orkney *Journal of Archaeological Science* 41, 868 – 78

Mainland, I & Moore, J 2010 Rinyo Geophysical Survey *Discovery and Excavation in Scotland*, New Series Vol 11, Council for Scottish Archaeology, 121

Major, A F 1907 Viking Notes: Yinstay, Tankerness *Saga Book of the Viking Club Society for Northern Research* 5, 180 – 1

Malcolm, J 1927 Parish of Firth and Stenness *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 174 – 87

Malcolm, W 1845 Parish of Firth and Stenness *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy, Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 67 – 9 of the Orkney section (volume not continuously numbered)

Malinowski, B 1922 *Argonauts of the Western Pacific* New York: George Routledge & Sons Ltd

Mallory, J P, Moore, D G & Canning, L J 1996 Excavations at Haughey's Fort 1991 and 1995 *Emania* 14, 5 – 20

Mamwell, C J 2006 *Dounby Quilco Archaeological Evaluation Report* Unpublished report, Orkney Archaeological Trust Projects Unit

Mamwell C J 2008 *Hatston Kirkwall Archaeological Evaluation* Unpublished report, Orkney Archaeological Trust Projects Unit

Mann, L M'L 1923 Bronze Age gold ornaments found in Arran and Wigtownshire, with suggestions as to their method of use *Proceedings of the Society of Antiquaries of Scotland* 57, 314 – 20

Mann, L M'L 1925 Recent discoveries in Arran *Proceedings of the Society of Antiquaries of Scotland* 59, 252 – 6

Manning, S W, Bronk Ramsey, C, Kutschera, W, Higham, T, Kromer, B, Steier, P & Wild, E M 2006 Chronology for the Aegean Late Bronze Age 1700–1400 BC *Science* 312, 565 – 9

Manning, S W, Kromer, B, Kuniholm, P I, Newton, M W 2001 Anatolian tree rings and a new chronology for the east Mediterranean Bronze–Iron ages *Science* 294, 2532 – 35

Manning, S, Kromer, B, Kuniholm, P, Newton, M 2003 Confirmation of near absolute dating of east Mediterranean Bronze–Iron dendrochronology *Antiquity* 77 (295), project gallery accessed on 25/11/10 at

http://antiquity.ac.uk.ezproxy.webfeat.lib.ed.ac.uk/projgall/manning/manning.html

Marean, C W 1986 Seasonality and seal exploitation in the southwestern Cape, South Africa *The African Archaeological Review* 4, 135 – 149

Marsden, B M & Nurse, B 2007 Opening the Tomb *in* Gaimster, D, McCarthy, S & Nurse, B (eds) *Making History Antiquaries in Britain 1707 – 2007* London: Royal Academy of Arts, 95 – 107

Marshall, P, Clarke, D, Sheridan, A, Shepherd, A, Sharples, N, Armour-Chelu, M, Hamlet, L, Bronk Ramsey, C, Dunbar, E, Reimer, P & Whittle, A 2016 *Links of Noltland, Westray, Orkney Radiocarbon Dating & Chronological Modelling* Historic England Research Report Series No. 39-2016 downloaded on 19/04/17 from http://research.historicengland.org.uk/

Marshall, P, Mulville, J, Parker Pearson, M & Gidlow, J 1998 Cladh Hallan (South Uist parish), late Bronze Age-early Iron Age settlement, *Discovery and Excavation in Scotland* Edinburgh: Council for Scottish Archaeology, 103

Marshall, P, Mulville, J, Parker Pearson, M, Smith, H & Ingram, C 1999 Cladh Hallan (South Uist parish), Late Bronze Age-Early Iron Age settlement, *Discovery and Excavation in Scotland* Edinburgh: Council for Scottish Archaeology, 91 – 3

Marstrander, S 1976 Building a hide boat. An archaeological experiment *International Journal of Nautical Archaeology and Underwater Exploration* 5(1), 13–22

Martin, K 2009a *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Philpotstown 1 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Martin, K 2009b *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Townparks 2 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Martin, K 2009c *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Williamstown or Bawn 2 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Martin M 1999 *A Description of the Western Islands of Scotland circa 1695* Edinburgh: Birlinn Ltd (reprint of 1703 edition)

Martínková, N, Barnett, R, Cucchi, T, Struchen, R, Pascal, M, Pascal, M, Fischer, M C, Higham, T, Brace, S, Ho, S Y W, Quéré, J P, O'Higgins, P, Excoffier, L, Heckel, G, Hoelzel, A R, Dobney, K M & Searle, J B 2013 Divergent evolutionary processes associated with colonization of offshore islands *Molecular Ecology* 22, 5205 – 20

Marwick, E 1975 *The Folklore of Orkney and Shetland* London: R Batsford Ltd

Marwick, E 1976 The Stone of Odin pp28 – 34 *in* Ritchie, J N G The Stones of Stenness, Orkney *Proceedings of the Society of Antiquaries of Scotland* 107, 1 – 60

Marwick, E 1991a An Odd Fish *in* Robertson, J D M *An Orkney Anthology The Selected Works of Ernest Walker Marwick Volume 1*, Edinburgh: Scottish Academic Press, 76 – 7

Marwick, E 1991b Creatures of Orkney Legend and their Norse Ancestry *in* Robertson, J D M *An Orkney Anthology The Selected Works of Ernest Walker Marwick Volume 1*, Edinburgh: Scottish Academic Press, 257 – 78

Marwick, H 1922 A rune-inscribed stone from Birsay, Orkney *Proceedings of the Society of Antiquaries of Scotland* 56, 67 – 71

Marwick, H 1923a Antiquarian Notes on Sanday *Proceedings of the Orkney Antiquarian Society* I, 21 – 9

Marwick, H 1923b The Place-Names of North Ronaldsay *Proceedings of the Orkney Antiquarian Society* I, 53 – 64

Marwick, H 1923c Celtic Place-Names in Orkney *Proceedings of the Society of Antiquaries of Scotland* 57, 251 – 65

Marwick, H 1924a Two sculptured stones found recently in Orkney *Proceedings of the Society of Antiquaries of Scotland* 58, 295 – 9

Marwick, H 1924b Antiquarian Notes on Rousay *Proceedings of the Orkney Antiquarian Society* II, 15 – 21

Marwick, H 1924c Burial Cist Discovered at Crantit, St. Ola, Orkney *Proceedings of the Orkney Antiquarian Society* II, 48

Marwick, H 1925a Antiquarian Notes on Papa Westray *Proceedings of the Orkney Antiquarian Society* III, 31 – 47

Marwick, H 1925b Note on Incised Stone found at Brodgar *Proceedings of the Orkney Antiquarian Society* III, 91

Marwick, H 1927a Underground Galleried Building at Rennibister, Orkney *Proceedings of the Society of Antiquaries of Scotland* 61, 296 – 301.

Marwick, H 1927b Antiquarian Notes on Stronsay *Proceedings of the Orkney Antiquarian Society* V, 61 – 83

Marwick, H 1927c Gallery Grave at Rennibister *Proceedings of the Orkney Antiquarian Society* V, 85 – 6

Marwick, H 1927d Underground Structure in Harray *Proceedings of the Orkney Antiquarian Society* V, 87 – 8

Marwick, H 1928a Cist Burials in Holm, Orkney *Proceedings of the Society of Antiquaries of Scotland* 62, 263 – 68

Marwick, H 1928b Two Unrecorded Stone-Circles in Rousay *Proceedings of the Orkney Antiquarian Society* VI, 17 – 18

Marwick, H 1929a Some Cist Burials in Orkney *Proceedings of the Society of Antiquaries of Scotland* 63, 377 – 83

Marwick, H 1929b Skerrabrae *Proceedings of the Orkney Antiquarian Society* VII, 17 – 26

Marwick, H 1929c Urn Burial in Deerness *Proceedings of the Orkney Antiquarian Society* VII, 75 – 6

Marwick, H 1929d *The Orkney Norn* Oxford: Oxford University Press

Marwick, H 1931a Modern Views of Ancient Orkney *Proceedings of the Orkney Antiquarian Society* IX, 9 – 16

Marwick, H 1931b Orkney Farm Name Studies *Proceedings of the Orkney Antiquarian Society* IX, 25 – 34

Marwick, H 1934 Two Orkney 18th Century Inventories *Proceedings of the Orkney Antiquarian Society* XII, 47 – 54

Marwick, H 1946 "Earth-House" at Naversdale, Orphir *Proceedings of the Society of Antiquaries of Scotland* 80, 143 – 4

Marwick, H 1949 Notes of archaeological remains found in Orkney *Proceedings of the Society of Antiquaries of Scotland* 83, 236 – 40 & plate XXXVII facing page 234

Marwick, H 1952 *Orkney Farm-Names* Kirkwall: W R Mackintosh

Marwick, J G 1926 Discovery of Stone Cists at Stenness, Orkney *Proceedings of the Society of Antiquaries of Scotland* 60, 34 – 6

Mass, C F & Portman, D A 1989 Major Volcanic Eruptions and Climate: A Critical Evaluation *Journal of Climate* Vol 2 (6), 566 – 93

Matthews, J A & Dresser, P Q 2008 Holocene glacier variation chronology of the Smørstabbtindan massif, Jotunheimen, southern Norway, and the recognition of century- to millennial-scale European Neoglacial Events *The Holocene* 18 (1) 181 – 201

Mauquoy, D, van Geel, B, Blaauw, M, Speranza, A and van der Plicht, J, 2004 Changes in solar activity and Holocene climate shifts derived from 14C wiggle-match dated peat deposits *The Holocene* 14, 45 – 52

Mauquoy, D, Yeloff, D, van Geel, B, Charman, D J and Blundell, A 2008 Two decadally resolved records from north-west European peat bogs show rapid climate changes associated with solar variability during the mid-late Holocene *Journal of Quaternary Science* 23 (8) 745 – 763

Mayewski, P A, Rohling, E E, Stager, J C, Karlén, W, Maasch, K A, Meeker, L D, Meyerson, E A, Gasse, F, van Kreveld, S, Holmgren, K, Lee-Thorp, J, Rosqvist, G, Rack, F, Staubwasser, M, Schneider, R R & Steig, E J 2004 Holocene climate variability *Quaternary Research* 62, 243 – 55

Maxwell, J 1874 The Brochs or "Pictish Towers" of Cinn-Trolla, Carn-Liath, and Craig-Carril, in Sutherland, with Notes on other Northern Brochs, (Plates XL – XVI) with Report upon the Crania found in and about them *Archaeologia Scotica Transactions of the Society of Antiquaries of Scotland* 5, part I, 95 – 130

McClellan, R 1970 *The Isle of Arran* Newton Abbot: David & Charles

McClintock, H F 1958 *Handbook on the Traditional Old Irish Dress with suggestions for designing an Irish uniform or National dress for Irish men on historic Lines* Dundalk: Dundalgan Press (W Tempest) Ltd

McColl, A 1794 Number XXIX Parish of Tiry Presbytery of Mull Synod and County of Argyll *The Statistical Account of Scotland Drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Volume Tenth,* Edinburgh: William Creech, 393 – 419

McCormick, F 1998 Calf slaughter as a response to marginality *in* Mills, C M & Coles, G (eds) *Life on the Edge Human Settlement and Marginality* Oxford: Oxbow Books, Oxbow Monograph 100, 49 – 51

McCormick, F 1999 The Animal Bones *in* Owen, O & Lowe, C *Kebister the four thousand year old story of one Shetland township* Edinburgh: Society of Antiquaries of Scotland, Monograph No. 14

McCormick, F & Buckland, P C 2003 Faunal Change The Vertebrate Fauna *in* Edwards, K J & Ralston, I B M (Eds) Scotland After the Ice Age Environment, Archaeology and History 8000 BC – AD 1000, Edinburgh: Edinburgh University Press, 83 – 108

McCormick, M P, Thomason, L W & Trepte, C R 1995 Atmospheric effects of the Mt. Pinatubo eruption *Nature* 373, 399 – 404

McCoy, M D 2008 Hawaiian Limpet Harvesting in Historical Perspective: A Review of Modern and Archaeological Data on *Cellana* spp. from the Kalaupapa Peninsula, Molokai'I Island Pacific *Science* 62 (1), 21 – 38

M'Crie, G 1881 Notice of the discovery of an urn of steatite in one of five tumuli excavated at Corquoy in the island of Rousay *Proceedings of the Society of Antiquaries of Scotland* 15, 71 – 3

McCullagh, R P J & Tipping, R (eds) 1998 *The Lairg Project 1988 – 1996 The Evolution of an Archaeological Landscape in Northern Scotland* Edinburgh: Scottish Trust for Archaeological Research

McDermott, F, Mattey, D P and Hawkesworth, C 2001 Centennial-scale Holocene climate variability revealed by a high-resolution speleothem δ18O record from SW Ireland *Science* 294, 1328 – 31

McGrail, S 1989 The Shipment of Traded Goods and of Ballast in Antiquity *Oxford Journal of Archaeology* 8 (3), 353 – 58

McGrail, S 1998 *Ancient Boats in North-West Europe The archaeology of water transport to AD 1500* London: Longman

McGrail, S 2001 *Boats of the World From the Stone Age to Medieval Times* Oxford: Oxford University Press

McGrail, S 2004 North-west European seagoing boats before AD 400 *in* Clark, P (ed) *The Dover Bronze Age Boat in Context Society and Water Transport in Prehistoric Europe* Oxford: Oxbow Books, 51 – 66

McGrail, S 2007 The Re-Assessment and Reconstruction of Excavated Boats *International Journal of Nautical Archaeology* 36(2), 254 – 64

McIntyre, A 1998 Survey and excavation at Kilearnan Hill, Sutherland, 1982 – 3 *Proceedings of the Society of Antiquaries of Scotland* 128, 167 – 201

McKenna, L E & Simpson, I A 2011 Thin section micromorphology of the anthrosols (Area 1) *in* Moore, G & Wilson, H *Shifting Sands Links of Noltland, Westray: Interim Report on Neolithic and Bronze Age Excavations, 2007 – 9* Historic Scotland Archaeology Report No. 4, 77 – 89

McLaren, D 2004 An Important Child's Burial from Doune, Perth and Kinross, Scotland *in* Gibson, A & Sheridan, A (eds) *From Sickles to Circles Britain and Ireland at the Time of Stonehenge* Stroud: Tempus, 289 – 303

McLaren, D & Hunter, F 2007 Worked Bone pp38 in Toolis, R Excavation of a burnt mound at Meur, Sanday, Orkney *Scottish Archaeological Journal* Vol 29 (1), 31 – 49

McLaren, D & Hunter, F 2014 The Pumice and Coarse Stone pp77 – 80 *in* Moore, G & Wilson, H Section 2: Excavations at Cruester Burnt Mound, Bressay, Shetland *in* Moore G, & Wilson H *Ebbing Shores Survey and Excavation of Coastal Archaeology in Shetland 1995 – 2008* Historic Scotland Archaeology Report No. 8, 54 – 84

McMillan, J A & Powell, J H 1999 BGS Rock *Classification Scheme Volume 4 Classification of artificial (man-made) ground and natural superficial deposits – applications to geological maps and data sets in the UK* British Geological Survey Report RR 99-04, http://www.bgs.ac.uk/downloads/browse.cfm?sec=1&cat=1, accessed 16/10/15

McNichol, D 2012 Spurness, Sanday Watching brief *Discovery and Excavation in Scotland* New Series Vol 13, Council for Scottish Archaeology, 130

McOmish, D 1996 East Chisenbury: ritual and rubbish at the British Bonze Age-Iron Age transition *Antiquity* 70, 68 – 76

McSweeney, K 2006 *Knowes of Trotty: Cremation Report* Unpublished report

Mead, M 1971 *Coming of Age in Samoa* Middlesex: Penguin Books Ltd (reprint of 1928 ed.)

Melton, N D 2008 West Voe: A Mesolithic-Neolithic transition site in Shetland *in* Noble, G, Poller, T, Raven, J & Verrill, L (eds) *Scottish Odysseys The Archaeology of Islands* Stroud: Tempus, 23 – 36

Melton, N D & Nicholson, R A 2004 The Mesolithic in the Northern Isles: the preliminary evaluation of an oyster midden at West Voe, Sumburgh, Shetland, UK *Antiquity* 78, No. 299, Project Gallery

Menounos, B, Clague, J J, Osborn, G, Luckman, B H, Lakeman, T R & Minkus, R 2008 Western Canadian glaciers advance in concert with climate change circa 4.2 ka *Geophysical Research Letters* 35, L07501, doi:10.1029/2008GL033172

Mercer, R 1999 The origins of Warfare in the British Isles *in* Carman, J & Harding, A (eds) 1999 *Ancient Warfare* Stroud: Sutton Publishing, 143 – 56

Mercer, R & Healy, F 2008 *Hambledon Hill, Dorset, England. Excavation and survey of a Neolithic monument complex and its surrounding landscape* Swindon: English Heritage, 2 vols.

M'Gillivray, W 1878 Notice of a Bronze Sword (exhibited by John L Stewart Esq. of Coll), and other antiquities, found in that island *Proceedings of the Society of Antiquaries of Scotland* 12, 686 – 8

Michel, R H & McGovern, P E 1993 The First Wine and Beer Chemical Detection of Ancient Fermented Beverages *Analytical Chemistry* 65, 8, 408 – 13

Mighall, T M, Lageard, J G A, Chambers, F M, Field M H & Mahi, P 2004 Mineral deficiency and the presence of Pinus sylvestris on mires during the mid- to late Holocene: palaeoecological data from Cadogan's Bog, Mizen Peninsula, Co. Cork, southwest Ireland *The Holocene* 14 (1) 95 – 109

Miguel, E 2005 Poverty and Witch Killing *Review of Economic Studies* 72, 1153 – 72

Miles, M 2008 Green Eday, Excavation *Discovery and Excavation in Scotland* New Series, Vol. 9, 128 – 9

Miles, M 2009 Green Eday, Excavation *Discovery and Excavation in Scotland* New Series, Vol. 10, 129

Miles, M 2010 Green Eday, Excavation *Discovery and Excavation in Scotland* New Series, Vol. 11, 119 – 20

Miles, M 2011 Green Eday, Excavation *Discovery and Excavation in Scotland* New Series, Vol. 12, 131 – 2

Miles, M 2012 Green Eday, Excavation *Discovery and Excavation in Scotland* New Series, Vol. 13, 130 – 1

Miles, M 2013 Green Eday, Excavation *Discovery and Excavation in Scotland* New Series, Vol. 14, 135 – 7

Miles, M J 2007 Green Eday, Trial excavation *Discovery and Excavation in Scotland* New Series, Vol. 8, 140

Milisauskas, S & Kruk, J 1991 Utilization of cattle for traction during the later Neolithic in southeastern Poland *Antiquity* 65, 562 – 6

Miller, J & Ramsay, S 2014 Kewing Cist: Botanical Results *in* Ballin Smith, B *Between tomb and cist: the funerary monuments of Crantit, Kewing and Nether Onston, Orkney* Kirkwall: The Orcadian (Kirkwall Press), 99 – 100

Miller, J, Ramsay, S, Alldritt, D & Bending, J 2016 Bay of Firth Environments from the 2nd to 4th Millennium BC: the evidence from Stonehall, Wideford Hill, Crossiecrown, Knowes of Trotty, Varme Dale and Brae of Smerquoy *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 495 – 519

Milligan, S F 1890 The Ancient Irish Hot-Air Bath *Journal of the Royal Historical and Archaeological Association of Ireland* (4th series) 9 (81), 268 – 70

Mitchell, A 1868 On some remarkable discoveries of rude stone implements in Shetland *Proceedings of the Society of Antiquaries of Scotland* 7, 118 – 34

Mitchell, A 1881 Notice of buildings designed for defence on an island in a loch at Hogsetter, in Whalsay, Shetland *Proceedings of the Society of Antiquaries of Scotland* 15, 303 – 15

Mitchell, A 1898 James Robertson's Tour through some of the Western Islands, etc., of Scotland in 1768 *Proceedings of the Society of Antiquaries of Scotland* 32, 11 – 19

Mitchell, A & Clark, J T (eds) 1908 *Geographical Collections Relating to Scotland made by Walter Macfarlane Vol III* Edinburgh: University Press (Publications of the Scottish History Society Vol LIII)

Mitchell, F J G 1990 The history and vegetation dynamics of a yew wood (Taxus baccata L.) in S. W. Ireland *New Phytologist* 115, 573 – 577

Moar, N T 1969 Two Pollen Diagrams from the Mainland, Orkney Islands *New Phytologist*, Vol. 68, No. 1, 201 – 8

Moll, H 1745 *Orkney Shire* London: Bowles and Bowles

Molloy, B P C 2007 What's the bloody point?: Bronze Age swordsmanship in Ireland and Britain *in* Molloy, B 2007 *The Cutting Edge: Studies in Ancient and Medieval Combat* Stroud: Tempus, 90 – 111

Molloy, K & O'Connell, M 1995 Palaeoecological investigations towards the reconstruction of environment and land-use changes during prehistory at Céide Fields, western Ireland *Probleme Der Küstenforschung Im Südlichen Nordseegebiet* 23, 187 – 225

Monipenny, J 1603 *Certain matters concerning the Realme of Scotland composed together as they were in Anno Domini 1597* London: John Flasket, dwelling at the Signe of the Blacke Beare, in Paules Church-yard *reprinted in* Scott, W (ed) 1810 *A Collection of Scarce and Valuable Tracts, on the Most Interesting and Entertaining Subjects, but chiefly such that relate to the history and Constitution of These Kingdoms selected from an Infinite Number in Print and Manuscript, in the Royal, Cotton, Sion, and other Public, as well as Private, Libraries; particularly that of the Late Lord Somers* London: T Cadell & W Davies, Strand, Volume Third (13 volumes published between 1809 & 1815), 344 – 402

Monk, M 2007 A greasy subject *Archaeology Ireland* 21 (1), 22 – 4

Monteith, R 1845 *Description of the Islands of Orkney and Zetland, by Robert Monteith of Egilsha and Gairsa 1633 Reprinted from the Edition of 1711, published under the superintendence of Sir Robert Sibbald, Knt, MD* Edinburgh: Thomas G Stevenson

Mooney, J 1923 *Eynhallow: The Holy Island of the Orkneys* Kirkwall: W R Mackintosh

Moore, H 2005 Berst Ness/Knowe of Skea, Westray pp176 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 6, Council for Scottish Archaeology, 165 – 81

Moore, H 2015a Links of Noltland discovery casts new light on Bronze Age Orkney *The Orcadian* 1/10/15, 12 – 13

Moore, H 2015b Northern Exposure *Historic Scotland Members Magazine* Winter 2015, 44 – 8

Moore, H & Wilson, G 1995 Two Orcadian cist burials: excavations at Midskaill, Egilsay and Linga Fiold, Sandwick, *Proceedings of the Society of Antiquaries of Scotland* 125, 237 – 51.

Moore, H & Wilson, G 1997a, *Report on a Coastal Zone Assessment of Orkney: Burray, Flotta, Graemsay, Hoy and South Ronaldsay*; Unpublished report for Historic Scotland

Moore, H & Wilson, G 1997b *An archaeological assessment at Moa Ness, (Westness), Rousay, Orkney*, EASE, Edinburgh, Unpublished report

Moore, H & Wilson, G 1998 *Report on a Coastal Zone Assessment of Orkney: Westray, Papa Westray and South Mainland*; Unpublished report for Historic Scotland

Moore, H & Wilson, G 1999a Report *on a Coastal Zone Assessment of Orkney: Sanday and North Ronaldsay*; Unpublished report for Historic Scotland

Moore, H & Wilson, G 1999b Food for thought: a survey of burnt mounds of Shetland and excavations at Tangwick *Proceedings of the Society of Antiquaries of Scotland* 129, 203 – 37

Moore, H & Wilson, G 2000a Knowe of Skea and Berst Ness, Westray *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 1, 68 – 9

Moore, H & Wilson, G 2000b Links of Noltland, Westray *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 1, 69

Moore, H & Wilson, G 2000c Cruester, Bressay, (Bressay parish), burnt mounds *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 1, 79

Moore, H & Wilson, G 2000d Point of Peterkirk, Westray, Orkney (Westray parish), polished stone axe; broch *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 1, 69

Moore, H & Wilson, G 2001a Verron Broch (Sandwick parish), Structures; metalworking deposits *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 2, 71 – 2

Moore, H & Wilson, G 2001b Links of Noltland, Westray Parish *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 2, 73

Moore, H & Wilson, G 2001c Berst Ness, Westray Parish Later prehistoric settlement and burials *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 2, 72 – 3

Moore, H & Wilson, G 2002 Knowe of Skea, Berst Ness, Westray *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 3, 88 – 9

Moore, H & Wilson, G 2003a Berst Ness, Knowe of Skea *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 4, 103

Moore, H & Wilson, G 2003b Langskaill, souterrain; Norse settlement *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 4, 103

Moore, H & Wilson, G 2004 *The Heritage of Westray Past, Present and Future* EASE Archaeological Consultants, unpublished report for the Westray Development Trust

Moore, H & Wilson, G 2005a Knowe of Skea *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 6, 101

Moore, H & Wilson, G 2005b Langskaill, Orkney, Iron Age settlement; Norse settlement *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 6, 101

Moore, H & Wilson, G 2006 Knowe of Skea *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 7, 127

Moore, H & Wilson, G 2007a Links of Noltland Rescue Excavation *Discovery and Excavation in Scotland*, New Series, Vol 8, Archaeology Scotland, 149

Moore, H & Wilson, G 2007b Links of Noltland Bronze Age Houses *Discovery and Excavation in Scotland*, New Series, Vol 8, Archaeology Scotland, 149

Moore, H & Wilson, G 2007c Berst Ness, Knowe of Skea *Discovery and Excavation in Scotland*, New Series, Vol 8, Archaeology Scotland, 148

Moore, H & Wilson, G 2008a Berst Ness, Knowe of Skea *Discovery and Excavation in Scotland*, New Series, Vol 9, Archaeology Scotland, 138

Moore, H & Wilson, G 2008b Links of Noltland *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 9, 138

Moore, H & Wilson, G 2008c Cruester burnt mound *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 9, 160

Moore, H & Wilson, G 2009a Berst Ness/Knowe of Skea Excavation *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 10, 142

Moore, H & Wilson, G 2009b Links of Noltland Excavation, Survey and trial trenching *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 10, 142 – 3

Moore, H & Wilson, G 2010a Links of Noltland Excavation *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 11, 134

Moore, H & Wilson, G 2010b The Links of Noltland *British Archaeology* July/August 2010, 12 – 17

Moore, H & Wilson, G 2011a *Shifting Sands Links of Noltland, Westray: Interim Report on Neolithic and Bronze Age Excavations, 2007 – 9* Historic Scotland Archaeology Report No. 4

Moore, H & Wilson, G 2011b Links of Noltland Excavation *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 12, 142

Moore, H & Wilson, G 2012 Links of Noltland Excavation *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 13, 141 – 2

Moore, H & Wilson, G 2013 Sands of Time Domestic Rituals at the Links of Noltland *Current Archaeology* 275, 12 – 19

Moore, H & Wilson, G 2014a Section 2: Excavations at Cruester Burnt Mound, Bressay, Shetland *in* Moore G, & Wilson H *Ebbing Shores Survey and Excavation of Coastal Archaeology in Shetland 1995 – 2008* Historic Scotland Archaeology Report No. 8, 54 – 84

Moore, H & Wilson, G 2014b Section 3: Excavations at Bayanne, Yell, Shetland *in* Moore, G & Wilson, H *Ebbing Shores Survey and Excavation of Coastal Archaeology in Shetland 1995 – 2008* Historic Scotland Archaeology Report No. 8, 86 – 238

Moore, H & Wilson, G 2014c Links of Noltland, Excavation *Discovery and Excavation in Scotland* New Series Vol 15, 154

Moore, H & Wilson, G 2014d Links of Noltland, Watching brief, Evaluation and Excavation *Discovery and Excavation in Scotland* New Series Vol 15, 154

Moore, H, Wilson, G & Barrett, J 2001 Berst Ness *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 2, 72 – 3

Moore, H, Wilson, G & Carruthers, M 2002 Langskaill, Westray, Orkney, souterrain; ?Norse period settlement *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, New Series, Vol 3, 89

Moore, J 2011 Yesnaby-Skaill Landscape Survey Walkover and geophysical survey *Discovery and Excavation in Scotland* New Series Vol 12, Council for Scottish Archaeology, 137

Moore, J 2013 *Landscape and Society in Orkney during the First Millennium BC* Unpublished PhD thesis, the Open University & the University of the Highlands and Islands

Moore, J & Carruthers, M 2006 Brae of Muckquoy, Firth, Pilot Study *Discovery and Excavation in Scotland* New Series, Vol. 7, 120

Morris, C D, 1989 *The Birsay Bay Project: coastal sites beside the Brough Road, Birsay, Orkney: excavations 1976-1982*, *Volume 1,* Durham: University of Durham, Dept of Archaeology, Monograph Series 1

Morris, C D, 1996 *The Birsay Bay Project: Sites in Birsay Village and on the Brough of Birsay, Orkney: excavations 1976-1982*, *Volume 2,* Durham: University of Durham, Dept of Archaeology, Monograph Series 2

Morris, C D & Emery N 1986 The Chapel and enclosure on the Brough of Deerness, Orkney: survey and excavations, 1975 – 1977 *Proceedings of the Society of Antiquaries of Scotland* 116, 301 – 74, fiche 2: A1 – 4: G7

Morris, C D, Emery, N, Owen, O A, Rains, M J & Watt, H M 1985 Skaill, Sandwick, Orkney: Preliminary Investigations of a Mound-site near Skara Brae *Glasgow Archaeological Journal* 12, 82 – 92

Morris, C D & Lamb, R G 1996 Christchurch, Birsay *in* Morris, C D, *The Birsay Bay Project: Sites in Birsay Village and on the Brough of Birsay, Orkney: excavations 1976-1982*, *Volume 2,* Durham: University of Durham, Dept of Archaeology, Monograph Series 2, 12

Mossop, M 2008 *M3 Clonee-North of Kells Contract 2 Dunshaughlin – Navan Report on the Archaeological Excavation of Clowanstown 2, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from:
http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Mossop, M, Ginn, V & Ruddle, E 2009 *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Ardbraccan 2 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from
http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Mossop, M & Mossop, E 2009 *M3 Clonee-North of Kells Contract 2 Dunshaughlin – Navan Report on the Archaeological Excavation of Clowanstown 1, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Mossop, M & Ruddle, E 2009 *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Ardbraccan 1 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Mowat, R J C 1996 *The Logboats Of Scotland* Oxford: Oxbow Books, Monograph 68

Mowbray, C L 1936 Excavation at the Ness of Burgi, Shetland *Proceedings of the Society of Antiquaries of Scotland* 70, 381 – 7

Moxon, M 2007 *Walking Land's End to John O' Groats with Mark Moxon* accessed online at www.landsendjohnogroats.info on 11/11/07

Muckleroy, K 1980 Two Bronze Age cargoes in British waters *Antiquity* 54, 100 – 12

Muckleroy, K 1981 Middle Bronze Age trade between Britain and Europe: a maritime perspective in *Proceedings of the Prehistoric Society* 47, 275 – 97

Mudge, W 1836 Description of an Ancient Structure dug out of Drumkelin Bog in the Parish of Inver County of Donegal communicated by Capt William Mudge RN *Archaeologia* Vol XXVI part II, 361 – 7

Muir, T 2005 *Orkney in the Sagas The Story of the Earldom of Orkney as told in the Icelandic Sagas* Kirkwall: The Orcadian Ltd

Mulcahy, D B 1891 An Ancient Irish Hot-Air Bath, or Sweat-House, on the Island of Rathlin *Journal of the Royal Society of Antiquaries of Ireland* 5th series, 1 (7), 589 – 90

Mullin, D 2012 *A Landscape of Borders: The Prehistory of the Anglo-Welsh Borderland* Oxford: Archaeopress, British Archaeological Report British Series 572

Mulville, J 2002 The Role of Cetacea in Prehistoric and Historic Atlantic Scotland *International Journal of Osteoarchaeology* 12, 34 – 48

Munro, R 1890 *The Lake-Dwellings of Europe being the Rhind Lectures in Archaeology for 1888* London, Paris & Melbourne: Cassell & Company Ltd

Murphy, E & McCormick, F 1996 The Faunal Remains from the Inner Ditch of Haughey's Fort, Third Report: 1991 Excavation *Emania* 14, 47 – 50

Murphy, K 2001 A Prehistoric Field System and Related Monuments on St. David's Head and Carn Llidi, Pembrokeshire *Proceedings of the Prehistoric Society* 67, 85 – 99

Murphy, K & Mytum H 2007 *Excavation of an Iron Age Inland Promontory Fort at Berry Hill, Pembrokeshire, 2007: Interim Report* Cambria Archaeology Project Report 2007/85 downloaded from www.cambria.org 27/12/11

Murray, D 2003 Results of the Excavation *in* Card, N, Downes, J, Murray, D & Sharman, P 2003 *Mine Howe and Round Howe Excavations 2002 Data Structure Report* Unpublished report, 17 – 28

Musson, C R, Britnell, W J & Smith, A G 1991 *The Breiddin Hillfort A later prehistoric settlement in the Welsh Marches* London: Council for British Archaeology, CBA Research Report 76

Mykura, W 1976 *British Regional Geology Orkney and Shetland* Edinburgh: Her Majesty's Stationery Office

Mytum, H 1985 Castell Henllys, Meline (SN 117 391), *Archaeology in Wales* 25, 25

Mytum, H 1986 Castell Henllys, Meline (SN 117 391), *Archaeology in Wales* 26, 40

Mytum, H 1989 Excavation at Castell Henllys, 1981-89: the Iron Age fort *Archaeology in Wales* 29, 6 – 10

Mytum, H 1991 Castell Henllys: Iron Age fort *Fortress, the Castles and Fortifications Quarterly* 9, 3 – 11

Mytum, H & Webster, C 2001 Survey and Excavation at Henllys Top Field and Cwm Gloyne Enclosures *Studia Celtica* 35, 89 – 108

Nakazawa, Y, Straus, L G, González-Morales, R, Cuenca Solana, D & Caro Saiz, J 2009 On stone-boiling technology in the Upper Paleolithic: behavioral implications from an Early Magdalenian hearth in El Mirón Cave, Cantabria, Spain *Journal of Archaeological Sciences* 36, 684 – 93

Nash-Williams, V E 1939 An Early Iron Age coastal camp at Sudbrook, near the Severn Tunnel, Monmouthshire, Archaeologia Cambrensis 94, 42-79

Nayling, N 1983 *Sub-peat Dykes on Eday, Orkney* Unpublished BA dissertation, University of Durham

Needham, S 1988 Selective deposition in the British Early Bronze Age *World Archaeology* 20 (2), 229 – 48

Needham, S 1996 Chronology and periodisation in the British Bronze Age *Acta Archaeologica* 67, 121 – 40

Needham, S 2000 The Development of Embossed Goldwork in Bronze Age Europe *Antiquaries Journal* 80, 27 – 65

Needham, S 2001 When Expediency Broaches Ritual Intention: The Flow of Metal between Systemic and Buried Domains *Journal of the Royal Anthropological Institute*, Vol. 7, No. 2, 275 – 98

Needham, S 2004 Migdale-Marnoch: sunburst of Scottish metallurgy *in* Shepherd, I A G & Barclay, G J (eds) *Scotland in Ancient Europe: The Neolithic and Early Bronze Age of Scotland in their European Context* Edinburgh: Society of Antiquaries of Scotland, 217 – 45

Needham, S 2005 Transforming Beaker Culture in North-West Europe; Processes of Fusion and Fission *Proceedings of the Prehistoric Society* 71, 171 – 217

Needham, S 2007 Isotopic Aliens: Beaker Movement and Cultural Transmissions *in* Larsson, M & Parker Pearson, M (eds) *From Stonehenge to the Baltic Living with*

cultural diversity in the third millennium BC Oxford: British Archaeological Report International Series 1692, 41 – 6

Needham, S 2008 Exchange, Object Biographies and the Shaping of Identities 10,000 – 1000 BC *in* Pollard, J (ed) *Prehistoric Britain* Oxford: Blackwell Studies in Global Archaeology, Blackwell Publishing 310 – 29

Needham, S 2009 Encompassing the Sea: 'Maritories' and Bronze Age maritime interactions *in* Clark, P (ed) *Bronze Age Connections Cultural Contact in Prehistoric Europe* Oxford: Oxbow Books, 12 – 37

Needham, S 2012 Case and Place for the British Chalcolithic *in* Allen, M J, Gardiner, J & Sheridan, A (eds) *Is there a British Chalcolithic? People, place and polity in the late 3rd millennium* Oxford: The Prehistoric Society/Oxbow Books (Prehistoric Society Research Paper no. 4), 1 – 26

Needham, S 2015 6.3 Discussion: Reappraising 'Wessex' Goldwork *in* Woodward, A & Hunter, J *Ritual in Early Bronze Age Grave Goods* Oxford & Philadelphia: Oxbow Books, 255 – 60

Needham, S & Ambers, J 1994 Redating Rams Hill and reconsidering Bronze Age enclosure *Proceedings of the Prehistoric Society* 60, 225 – 43

Needham, S & Bowman, S 2005 Flesh-hooks, technological complexity and the Atlantic Bronze Age feasting complex *European Journal of Archaeology* 8 (2), 93 – 136

Needham, S, Bray, P, O'Connor, S, Woodward, A & Hunter, J 2015 Items of Equipment I: Daggers, Pommels and Belt Fittings *in* Woodward, A & Hunter, J 2015 *Ritual in Early Bronze Age Grave Goods* Oxford: Oxbow Books, 23 – 68

Needham, S, Bronk Ramsey, C Coombs, D, Cartwright, C & Pettitt, P 1997 An Independent Chronology for British Bronze Age Metalwork: The Results of the Oxford Radiocarbon Accelerator Programme *Archaeological Journal* 154, 55 – 107

Needham, S, Lawson, A J & Woodward, A 2010 'A noble group of barrows': Bush Barrow and the Normanton Down Early Bronze Age cemetery two centuries on *The Antiquaries Journal* 90, 1 – 39

Needham, S, Parfitt, K & Varndell, G (eds) 2006 *The Ringlemere Cup and the Beginning of the Channel Bronze Age* London: British Museum Research Publication No. 163

Needham, S, Parham, D & Frieman, C J 2013 *Claimed by the Sea: Salcombe, Langdon Bay, and other marine finds of the Bronze Age* York: Council for British Archaeology CBA Research Report 173

Needham, S & Spence, T 1996 The nature and meaning of midden deposits in the early first millennium BC *in* Needham, S & Spence, T *Runnymede Bridge Research Excavations, Volume 2 Refuse and Disposal at Area 16 East, Runnymede* London: British Museum Press, 242 – 8

Needham, S & Spence, T 1997 Refuse and the formation of middens *Antiquity* 71, 77 – 90

Needham, S, Spence, T, Serjeantson, D & Stig Sørenson, M-L 1996 Formation and Late Bronze Age Activity in Area 16 East *in* Needham, S & Spence, T *Runnymede Bridge Research Excavations, Volume 2 Refuse and Disposal at Area 16 East, Runnymede* London: British Museum Press, 232 – 42

Needham, S & Woodward, A 2008 The Clandon Barrow Finery: a Synopsis of Success in an Early Bronze Age World *Proceedings of the Prehistoric Society* 74, 1 – 52

Needham, S, Woodward, A & Hunter J 2015 Chapter 6: Items of Personal Adornment II: Gold and the Regalia from the Bush Barrow *in* Woodward, A & Hunter, J *Ritual in Early Bronze Age Grave Goods* Oxford: Oxbow Books, 209 – 54

Neil, R J N, 1981 A Bronze Age Burial Mound at Holland, St. Ola, Orkney, *Glasgow Archaeological Journal* 8, 32 – 45.

Neill, A M 1806 *A Tour through some of the islands of Orkney and Shetland With a View Chiefly to Objects of Natural History* Edinburgh: Constable & Company

Neill, M 1996 Haughey's Fort Excavation 1991: Analysis of Wood Remains *Emania* 14, 29 – 46

Neumann, J & Parpola, S 1987 Climatic change and the eleventh-tenth century eclipse of Assyria and Babylonia *Journal of Near Eastern Studies* 46 (3) 161 – 82

Nevell, M 1998 Great Woolden Hall Farm A Model for the Material Culture of Iron Age and Romano-British Rural Settlement in North West England? *Archaeology North West* 3 (13), 48 – 63

Nichol, D 2012 Spurness, Sanday Watching Brief *Discovery and Excavation in Scotland*, New Series Vol 13, Council for Scottish Archaeology, 130

Nicholson, R A 1997 Fish Bones *in* Buteux, S *Settlements at Skaill, Deerness, Orkney: Excavations by the late Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981* Oxford: Archaeopress, British Archaeological Report British Series 260, 244 – 5

Nicholson, R A 2007a Fish Remains *in* Dockrill, S J, Bond, J M, Smith, A S & Nicholson, R A Investigations *in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 208 – 16

Nicholson, R A 2007b Marine molluscs *in* Dockrill, S J, Bond, J M, Smith, A S & Nicholson, R A Investigations *in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 227 – 8

Nicholson, R A 2007c The Fish Remains *in* Hunter, J, Bond, J M & Smith, A N *Investigations in Sanday, Orkney Vol 1: Excavations at Pool, Sanday A multi-period site from Neolithic to Late Norse times* Kirkwall, Orkney: The Orcadian Ltd, 262 – 79

Nicholson, R A & Davis, G 2007 Faunal remains: Mammal bones *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 169 – 195

NISMR The online database of the Northern Ireland Sites and Monuments Record at http://apps.ehsni.gov.uk/ambit/

NMS 1992 Glen Rosa, Arran 'Jet' Reused ?armlet fragment *Discovery and Excavation in Scotland* Council for Scottish Archaeology, 62

NMS 1993 Minch, off Shiant Islands, MBA gold torc *Discovery and Excavation in Scotland* Council for Scottish Archaeology, 109

Noble, G 2006 Harnessing the waves: Monuments and ceremonial complexes in Orkney and beyond *Journal of Maritime Archaeology* 1, 100 – 17

Noddle, B 1983 Appendix 4: Animal Bone from Knap of Howar pp92 – 100 *in* Ritchie, A Excavation of a Neolithic farmstead at Knap of Howar, Papa Westray, Orkney *Proceedings of the Society of Antiquaries of Scotland* 113, 40 – 121

Noddle, B 1986 Animal Bones *in* Whittle, A, Keith-Lucas, M, Milles, A, Noddle, B, Rees, S & Romans, J C C 1986 *Scord Of Brouster An Early Agricultural Settlement on Shetland Excavations 1977 – 1979* Oxford: Oxford University Committee for Archaeology, Monograph No. 9, 132

Noddle, B 1997 Animal Bone *in* Buteux, S *Settlements at Skaill, Deerness, Orkney: Excavations by the late Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981* Oxford: Archaeopress, British Archaeological Report British Series 260, 235 – 43

Noge, A 2009 Skärvstenshögar med människoben i norra Mälarområdet (Burnt mounds containing human bones in the region north of Lake Mälaren) *Fornvännen* 104, Stockholm, 241 – 52

Nordquist, G & Whittaker, H 2007 Comments on Kristian Kristiansen and Thomas B. Larsson (2005): The Rise of Bronze Age Society. Travels Transmissions and Transformations. Cambridge University Press, Cambridge *Norwegian Archaeological Review,* Vol 40, No. 1, 75 – 84

Normand, L & Roberts, G 2000 *Witchcraft in Early Modern Scotland James VI's Demonology and the North Berwick Witches* Exeter: University of Exeter Press

Nowakowski, J A & Quinnell H 2011 *Trevelgue Head, Cornwall: the importance of CK Croft Andrew's 1939 excavations for prehistoric and Roman Cornwall* Truro: Cornwall Council

Nur, A & Cline, E H 2000 Poseidon's Horses: Plate Tectonics and Earthquake Storms in the Late Bronze Age Aegean and Eastern Mediterranean *Journal of Archaeological Science* 27, 43 – 63

O'Brien, W 1994 *Mount Gabriel Bronze Age Mining in Ireland* Galway: Galway University Press

O'Brien, W 2004a (Con)Fusion of Tradition? The Circle Henge in Ireland *in* Gibson, A & Sheridan, A (eds) *From Sickles to Circles Britain and Ireland at the Time of Stonehenge* Stroud: Tempus, 323 – 38

O'Brien, W 2004b *Ross Island Mining, Metal and Society in Early Ireland* Galway: Department of Archaeology, National University of Ireland

O'Brien, W 2008 Cashell Hillfort, Clashanimud *in* Bennett, I (ed) *Excavations 2005: Summary Accounts of Archaeological Excavations in Ireland* Dublin: Wordwell Ltd

O'Brien, W 2012 The Chalcolithic in Ireland: a chronological and cultural framework *in* Allen, M J, Gardiner, J & Sheridan, A (eds) *Is there a British Chalcolithic? People, place and polity in the late 3rd millennium* Oxford: The Prehistoric Society/Oxbow Books (Prehistoric Society Research Paper no. 4), 211 – 25

O'Connor B 2004 The earliest Scottish metalwork since Coles *in* Shepherd, I A G & Barclay, G J *Scotland in Ancient Europe: The Neolithic and Early Bronze Age of Scotland in their European Context*, Edinburgh: Society of Antiquaries of Scotland 205 – 13

O'Connor, B & Cowie, T 1995 Middle Bronze Age dirks and rapiers from Scotland: some finds old and new *Proceedings of the Society of Antiquaries of Scotland* 125, 345 – 67

O'Connor, T 1984 The Beaker-Age Burial: The Skeleton pp13 – 17 *in* Evans, J G Stonehenge – the Environment in the Late Neolithic and Early Bronze Age *and* a Beaker-Age Burial *The Wiltshire Archaeological and Natural History Magazine,* 78, 7 – 30

O'Connor, T 1998 The South Nesting Palaeolandscape Project, Shetland: mires, mounds and margins *in* Mills, C M & Coles, G *Life on the Edge: Human Settlement and Marginality (Symposia of the Association of Environmental Archaeology No. 13)* Oxford: Oxbow Books, Monograph 100, 155 – 63

O'Connor, T & Bunting, M J 2009 Environmental Change in an Orkney Wetland: plant and molluscan evidence from Quoyloo Meadow *in* Allen, M J, Sharples, N & O'Connor, T (eds) *Land and People papers in memory of John G. Evans* Oxford: The Prehistoric Society & Oxbow Books, 161 – 8

Ó Cuív, B (ed) 1954 The Romance of Mis and Dubh Ruis, *Celtica* 2, 325 – 33

O'Curry, E 1861 *Lectures on the Manuscript Materials of Ancient Irish History* Dublin: James Duffy

O'Dell, A C 1939 Part 4 Orkney *in* Stamp, L D (ed) *The Land of Britain The Report of the Land Utilisation Survey of Britain* London: Geographical Publications Ltd, 191 – 263

Ó Drisceóil, D A 1988 Burnt mounds: cooking or bathing? *Antiquity* 62: 671 – 80

Ó Drisceóil, D A 1990 Fulachta Fiadh: the value of early Irish Literature *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 157 – 64

Ó Faoláin & Northover, J P 1998 The technology of Late Bronze Age sword production in Ireland *The Journal of Irish Archaeology* Vol 9, 69 – 88

O'Flaherty, R 2007a A weapon of choice – experiments with a replica Irish Early Bronze Age halberd *Antiquity* 81, 423 – 34

O'Flaherty, R 2007b The Irish Early Bronze Age halberd: practical experiment and combat possibilities *in* Molloy, B 2007 *The Cutting Edge: Studies in Ancient and Medieval Combat* Stroud: Tempus, 77 – 89

Ó Floinn, R 1995 Gazetteer of the Bog Bodies of the British Isles: Ireland *in* Turner, R C & Scaife, R G *Bog Bodies New Discoveries and New Perspectives* London: British Museum Press, 221 – 34

O'Kelly, M J 1954 Excavations and experiments in ancient Irish cooking places *Journal of the Royal Society of Antiquaries of Ireland* 84, 105 – 55

O'Mahony, J (trans) 1866 *The History of Ireland from the earliest period to the English Invasion, by the Reverend Geoffrey Keating, D.D. Translated from the*

original Gaelic and copiously annotated New York: James B Kirker (Facsimile print on demand: Michigan Historical Reprint Series).

O'Neil, H 1956 Court House Excavations, Kempsey, Worcestershire *Transactions of the Worcester Archaeological Society* 33, 33 – 44

Ó Néill, J 2009 *Burnt Mounds in Northern and Western Europe A study of prehistoric technology and society* Saarbrűcken: VDM Verlag Dr. Műller Aktiengesellschaft & Co.

Ó Néill, J 2004 *Lapidibus in igne calefactis coquebatur*: The Historical burnt mound 'tradition' *The Journal of Irish Archaeology* XII/XIII, 79 – 85

O Riordain, S P 1936 The Halberd in Bronze Age Europe *Archaeologia* 86, 195 – 321

Ó Ríordáin B & Waddell, J 1993 *The Funerary Bowls and Vases of the Irish Bronze Age* Galway: Galway University Press

O'Sullivan, T 1998 Mammals *in* Sharples, N *Scalloway A Broch, Late Iron Age Settlement and Medieval Cemetery in Shetland* Oxford: Oxbow Books, Monograph 82, 106 – 10

OIC 2008 *Orkney Economic Review No. 23* Kirkwall, Orkney: Department of Development Services, Orkney Islands Council

OIC 2009 Tidal Stream Atlas *in* Department of Harbours Orkney Islands Council *Tide Tables 2009*, Kirkwall, Orkney: Orkney Islands Council, 54 – 65

OCGU 2008 *Geophysical Survey Report 08/05 World Heritage Area Orkney – Inner Buffer Zone Phase XI* Unpublished Orkney College Geophysics Unit Report

OCGU 2009 *Interim Geophysical Survey Report 08/12 Ring of Brodgar, Stenness* Unpublished Orkney College Geophysics Unit Report

Olding, F 2016 *The Archaeology of Upland Gwent* Aberystwyth: Royal Commission on the Ancient and Historical Monuments of Wales

Oliver, P 1987 *Dwellings* Oxford: Phaidon

ONB 1880 *Object Name Books of the Ordnance Survey*: Orkney entries transcribed online in 26 volumes, under reference OS1/23 followed by volume & page number at: http://www.scotlandsplaces.gov.uk/digital-volumes/ordnance-survey-name-books/orkney-os-name-books-1879-1880

Oppenheimer, C 2003 Climate, environmental and human consequences of the largest known historic eruption: Tambora volcano (Indonesia) 1815, *Progress in Physical Geography* 27 230 – 59

Orwin, C S & Whetham, E H 1964 *History of British Agriculture 1846 – 1914* London: Longmans, Green & Co. Ltd

Osgood, R 2005 The dead of Tormarton – Middle Bronze Age combat victims? *in* Parker Pearson, M & Thorpe, I J N (eds) *Warfare, Violence and Slavery in Prehistory* Oxford: Archaeopress, British Archaeological Report International Series 1374, 139 – 144

Outram, A K 1998 *The Identification and Palaeoeconomic Context of Prehistoric Bone Marrow and Grease Exploitation* University of Durham PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Outram, A K 1999 A Comparison of Paleo-Eskimo and Medieval Norse Bone Fat Exploitation in Western Greenland *Arctic Anthropology*, 36 (1), 103 – 17

Outram, A K 2000 Hunting Meat and Scavenging Marrow: A seasonal explanation for Middle Stone Age subsistence strategies at Klasies River Mouth *in* Rowley-Conwy, P (ed) *Animal Bones and Human Societies* Oxford: Oxbow Books 20 – 7

Outram, A K 2001 A New Approach to Identifying Bone Marrow and Grease Exploitation: Why the 'Indeterminate' Fragments should not be Ignored *Journal of Archaeological Science* 28, 401 – 10

Outram, A K 2002 Bone Fracture and Within-Bone Nutrients: An Experimentally Based Method for Investigating Levels of Marrow Extraction *in* Miracle, P & Milner, N (eds.) *Consuming Passions and Patterns of Consumption* Cambridge: McDonald Institute for Archaeological Research, 51 – 64

Outram, A K 2003 Comparing levels of subsistence stress amongst Norse settlers in Iceland and Greenland using levels of bone fat exploitation as an indicator *Environmental Archaeology* 8(2), 119 – 28

Outram, A K 2004. Identifying dietary stress in marginal environments: bone fats, optimal foraging theory and the seasonal round *in* Mondini, M, Munoz, S & Wickler, S (eds) *Colonisation, Migration, and Marginal Areas A Zooarchaeological Approach* Oxford: Oxbow Books, 74 – 85

Outram, A K 2005 Distinguishing bone fat exploitation from other taphonomic processes: what caused the high level of bone fragmentation at the Middle Neolithic site of Ajvide, Gotland? *in* Mulville, J & Outram, A K (eds) *The Zooarchaeology of Fat, Oils, Milk and Dairying* Oxford: Oxbow Books, 32 – 43

Outram, Z 2007 Appendix 1 The recalibration of the radiocarbon dates *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 397 – 400

Ovenden, S 2006 St Peter's Bay Geophysical Survey *Discovery and Excavation in Scotland* New Series, Vol. 7, Council for Scottish Archaeology, 125

Ovenden, S 2007 *Nessbreck, Harray, Orkney Geophysical Survey* Unpublished Orkney College Geophysics Unit Report (Project 07/10)

Ovenden, S M, Gater, J & Saunders, M K 2009 Ten years on: Geophysical survey on the 'Heart of Neolithic Orkney' World Heritage Area *ArcheoSciences*, revue d' archeometrie, supplement 33, 125 – 7

Øvrevik, S 1985 The Second Millennium and After *in* Renfrew, A C (ed.) *The Prehistory of Orkne*y, Edinburgh: Edinburgh University Press, 131 – 49

Owen, O 1993 Tuquoy, Westray, Orkney: a challenge for the future? I*n* Batey C E, Jesch, J & Morris, C D (eds) *The Viking Age in Caithness, Orkney and the North Atlantic*, Edinburgh: Edinburgh University Press, 318 – 39

Owen, O (ed) 2005 *The World of the Orkneyinga Saga The Broadcloth Viking Trip* Kirkwall: The Orcadian Ltd

Owen, O & Dalland, M 1999 *Scar A Viking Boat Burial on Sanday, Orkney* East Linton: The Tuckwell Press

Owen, O & Lowe, C 1990 Kebister: burnt mounds and burnt mound material *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 84 – 6

Owen, O & Lowe, C 1999 *Kebister the four thousand year old story of one Shetland township* Edinburgh: Society of Antiquaries of Scotland, Monograph No. 14

Owen, O A 1992 Eildon Hill North *in* Rideout, J S, Owen, O A & Halpin, E *Hillforts of Southern Scotland* Edinburgh: AOC Scotland Ltd Monograph 1, 21 – 71

Owoc, M A 2001 The times they are a changin': experiencing continuity and development in the Early Bronze Age funerary rituals of southwestern Britain *in* Brück, J (ed) *Bronze Age Landscapes Tradition and Transformation* Oxford: Oxbow Books, 193 – 206

Pailler, Y & Sheridan, A 2009 Everything you always wanted to know about… la néolithisation de la Grande-Bretagne et de l'Irlande *Bulletin de la Société Préhistorique Française* 106, 25 – 56

Pantaléon, J, Errikarta-Imanol, Y, Pérez-Obiol, R & Roure, J M 2003 Palynological evidence for vegetational history in semi-arid areas of the western Mediterranean (Almería, Spain) *The Holocene* 13 109 – 19

Papathanasiou, A 2012 Evidence of Trauma in Neolithic Greece *in* Schulting, R & Fibiger, L (eds) *Sticks, Stones & Broken Bones: Neolithic Violence in a European Perspective* Oxford: Oxford University Press, 249 – 63

Pare, C 2000 Bronze and the Bronze Age *in* Pare, C F E (ed) *Metals Make the World Go Round The Supply and Circulation of Metals in Bronze Age Europe* Oxford: Oxbow Books, 1 – 38

Parker Pearson, M 2003 Cill Donnain (Kildonan) (South Uist parish), Earlier Bronze Age settlement with bronze working *Discovery and Excavation in Scotland*, New Series Vol 4, Council for Scottish Archaeology, 133

Parker Pearson, M 2005 Warfare, Violence and Slavery in later Prehistory: an introduction *in* Parker Pearson, M & Thorpe, I J N Warfare*, Violence and Slavery in Prehistory* Oxford: Archaeopress, British Archaeological Report International Series 1374, 19 – 34

Parker Pearson, M (ed) 2012 *From Machair to Mountains Archaeological Survey and Excavation in South Uist* Oxford & Oakville: Oxbow Books

Parker Pearson, M, Chamberlain, A, Craig, O, Marshall, P Mulville, J, Smith, H, Chenery, C, Collins, M, Cook, G, Craig, G, Evans, J, Hiller, J, Montgomery, J, Schwenninger, J-L, Taylor, G & Wess, T 2005 Evidence for mummification in Bronze Age Britain *Antiquity* 79, 529 – 46

Parker Pearson, M, Marshall, P, Mulville, J & Smith, H 2000 Cladh Hallan, South Uist, Western Isles (South Uist parish), late Bronze Age and Early Iron Age settlement', *Discovery and Excavation in Scotland* New Series Vol. 1, Council for Scottish Archaeology, 97 – 8

Parker Pearson, M, Marshall, P, Mulville, J & Smith, H 2001 Cladh Hallan, Western Isles (South Uist parish), late Bronze Age to early Iron Age roundhouse settlement', *Discovery and Excavation in Scotland* New Series Vol. 2, Council for Scottish Archaeology, 102 – 4

Parker Pearson, M, Mulville, J & Roper, T 1995 Cladh Hallan (South Uist parish), Late Bronze Age house and settlement, *Discovery and Excavation in Scotland* Edinburgh: Council for Scottish Archaeology, 109

Parker Pearson, M, Mulville, J & Smith, H 2002 Cladh Hallan, Western Isles (South Uist parish), later Bronze Age cremation cemetery and settlement; Beaker finds, *Discovery and Excavation in Scotland* New Series Vol. 3, Council for Scottish Archaeology, 121 – 2

Parker Pearson, M, Pollard, J, Richards, C, Thomas, J, Tilley, C, Welham, K & Albarella, U 2006 Materializing Stonehenge: The Stonehenge Riverside Project and New Discoveries *Journal of Material Culture* 11, 227 – 61

Parker Pearson, M, Pollard, J, Thomas, J & Welham, K 2010 Newhenge *British Archaeology* 110, January/February issue 2010, accessed online on 27/10/14 at: http://www.archaeologyuk.org/ba/ba110/feat1.shtml

Parker Pearson, M & Seddon, K 2004 Cill Donnain (Kildonan) (South Uist parish), Earlier Bronze Age Cordoned Urn settlement *Discovery and Excavation in Scotland*, New Series Vol 5, Council for Scottish Archaeology, 139

Parker Pearson M & Sharples, N M 1999 *Between Land and Sea Excavations at Dun Vulan, South Uist* Sheffield: Sheffield Academic Press

Parker Pearson, M, Sharples, N M & Mulville, J 1996 Brochs and Iron Age Society: a reappraisal *Antiquity* 70, 57 – 67

Parker Pearson, M, Sharples, N & Symonds, J 2004 *South Uist Archaeology and History on a Hebridean Island* Stroud: Tempus Publishing Ltd

Parker Pearson, M & Zvelebil, M 2014 *Excavations at Cill Donnain A Bronze Age Settlement and Iron Age Wheelhouse in South Uist* Oxford & Philadelphia: Oxbow Books

Paramānanda nd How to Make a Yoke *in* Anon, Cow Protection Book 1, ISKCON Ministry of Cow Protection and Agriculture, 104 – 112, downloaded from www.iscowp.org on 5/01/09

Parrington, M 1978 *The excavation of an Iron Age settlement, Bronze Age ring-ditches and Roman features at Ashville Trading Estate, Abingdon (Oxfordshire) 1974 – 76* London: Council for British Archaeology, Research Report 28, Oxfordshire Archaeological Unit Report 1

Parry, G 1977 Appendix VII Field Survey of some Quoyscottie-type barrow cemeteries in Orkney pp151 – 54 *in* Hedges, M E The excavation of the Knowes of Quoyscottie, Orkney: a cemetery of the early first millennium BC, *Proceedings of the Society of Antiquaries of Scotland* 108, 130 – 55

Parry, G 2007 Mists of Time *in* Gaimster, D, McCarthy, S & Nurse, B (eds) *Making History Antiquaries in Britain 1707 – 2007* London: Royal Academy of Arts, 17 – 35

Pastscape: the online search facility of English Heritage for the National Monuments Record in England at: www.pastscape.org.uk

Patchett, F M 1955 Appendix on the pottery from Maen Castle *Proceedings of the West Cornwall Field Club* 1 (3), 109 – 15

Paterson, J 1833 Manuscript Letter on Orkney Antiquities, in the library of the Society of Antiquaries of Scotland, quoted *in* Thomas, N W (ed) *County Folk-Lore Vol. III Examples of printed Folk-Lore concerning the Orkney and Shetland Islands collected by G F Black* London: Printed for the Folk-Lore Society by David Nutt, 1903

Pearce, J E 1919 Indian Mounds and other relics of Indian Life in Texas *American Anthropologist* New Series 21 (3), 223 – 34

Pearce, S 2007 Antiquaries and the Interpretation of Ancient Objects, 1770 – 1820 *in* Pearce, S (ed) *Visions of Antiquity The Society of Antiquaries of London 1707 – 2007 Being Volume 111 of Archaeologia* London: Society of Antiquaries, 147 – 71

Pearson, C, Manning, S W, Coleman, M & Jarvis, K 2005 Can tree-ring chemistry reveal absolute dates for past volcanic eruptions? *Journal of Archaeological Science* 32, 1265 – 74

Pearson, C L, Dale, D S, Brewer, P W, Kuniholm, P I, Lipton, J & Manning, S W 2009 Dendrochemical analysis of a tree-ring growth anomaly associated with the Late Bronze Age eruption of Thera *Journal of Archaeological Sciences* 36, 1206 – 14

Pennant, T 1784 *Arctic Zoology Vol I. Introduction. Class I. Quadrupeds* London: Henry Hughs

Perry, D R 2000 *Castle Park Dunbar Two Thousand years on a Fortified Headland* Edinburgh: Society of Antiquaries of Scotland, Monograph Series 16

Peterkin, A 1820 *Rentals of the Ancient Earldom and Bishoprick of Orkney; with some other explanatory and relative documents* Edinburgh: privately printed (not continuously numbered: each rental is numbered individually).

Peterkin, A 1822 *Notes on Orkney and Zetland: Illustrative of the History, Antiquities, Scenery and Customs of those Islands* Edinburgh: Macredie, Skelly, & Company, Princes St & London: T & G Underwood

Pétrequin, P, Errera, M, Pétrequin, A-M & Allard, P 2006 *The Neolithic quarries of Mont Viso* (Piedmont, Italy): initial radiocarbon dates *European Journal of Archaeology* 9 (1), 7 – 30

Petréquin, P, Sheridan, A, Cassen, S, Errera, M, Gauthier, E, Klassen, L, le Maux, N, Pailler, Y, Petréquin, A-M & Rossy, M 2011 Eclogite or jadeitite: The two colours involved in the transfer of alpine axeheads in western Europe *in* Davis, V & Edmonds, M (eds) *Stone Axe Studies III* Oxford & Oakville: Oxbow Books, 55 – 82

Petrie, G 1856 Description of antiquities in Orkney recently examined, with illustrative drawings, *Proceedings of the Society of Antiquaries of Scotland* 2, 56 – 62 & plates II & III

Petrie, G 1860 Notice of a barrow at Huntiscarth in Harray, Orkney recently opened, *Proceedings of the Society of Antiquaries of Scotland* 3, 195 & plate XXII, facing page 182

Petrie, G 1861 Notice of the opening a tumulus in the parish of Stenness, on the Mainland of Orkney *The Archaeological Journal* 18, 353 – 8

Petrie, G 1863 The Picts-Houses in the Orkneys *The Archaeological Journal* 20, 32 – 7

Petrie, G 1866a Notice of a Barrow containing Cists, on the farm of Newbigging, near Kirkwall; and at Isbister, in the parish of Rendall, Orkney *Proceedings of the Society of Antiquaries of Scotland* 6, 411 – 18

Petrie, G 1866b Fairies in Westrey (sic) Orkney (excerpt from Petries's notebook 9), quoted in *Viking Society for Northern Research: Old Lore Miscellany of Orkney Shetland Caithness and Sutherland*, 1909, 2, 22 – 3

Petrie, G 1866c Notice of the Brochs and the so-called Picts' Houses of Orkney *Memoirs read before the Anthropological Society of London* Vol II, 216 – 25

Petrie, G 1868a Notice of ruins of ancient dwellings at Skara, Bay of Skaill, in the parish of Sandwick, Orkney, recently excavated, *Proceedings of the Society of Antiquaries of Scotland* 7, 201 – 19 & plates XXXIX – XLII

Petrie, G 1868b Some Rude Stone Implements found in Orkney, *Proceedings of the Society of Antiquaries of Scotland* 7, 135 – 6

Petrie, G 1870 Notice of Excavations, and Discovery of Cists containing large Stone Urns in Stronsay, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 8, 347 – 51

Petrie, G 1874 Notice of the brochs or large round towers of Orkney, with plans, sections, drawings, and tables of measurements of Orkney and Shetland brochs, *Archaeologia Scotica Transactions of the Society of Antiquaries of Scotland* 5, part I, 71 – 94

Petrie, G 1927 Primeval Antiquities of Orkney, *Proceedings of the Orkney Antiquarian Society* V, 19 – 29 (paper written 1859)

Phillipe, M 2009 The Canche Estuary (Pas-de-Calais, France) from the early Bronze Age to the *emporium* of Quentovic: A traditional trading place between south east England and the continent *in* Clark, P (ed) *Bronze Age Connections Cultural Contact in Prehistoric Europe* Oxford: Oxbow Books, 68 – 79

Phillips, C W 1980 Archaeology and the Post-War Survey: Research and Recording – Field Reconnaissance and Survey *in* Seymour, W A (ed) *A History of the Ordnance Survey* Folkestone: Wm Dawson & Sons, 340 – 3

Phillips, J 1897 Exploration of earthworks on the coast of Pembrokeshire *Archaeologia Cambrensis*, 14 (5th Series), 41 – 4

Phillips, T 2003 Seascapes and Landscapes in Orkney and Northern Scotland *World Archaeology* 35, 371 – 84

Philp, B J 2005 *Excavation of the Roman fort at Reculver, Kent* Kent Monographs 10, Kent Archaeological Rescue Unit 2005

Photos-Jones, E 2007 The Technical Characterisation of Cramp *in* Sharman, P *Excavation of a Bronze Age funerary site at Loth Road, Sanday, Orkney* Scottish Archaeological Internet Report 25, www.sair.org.uk, 16 – 17

Photos-Jones, E 2014 Analysis of the West Cist: Cramp and calcite analysis *in* Ballin Smith, B *Between tomb and cist: the funerary monuments of Crantit, Kewing and Nether Onston, Orkney* Kirkwall: The Orcadian (Kirkwall Press), 75 – 89

Photos-Jones, E, Ballin Smith, B Hall, A J & Jones, R E 2007 On the intent to make cramp: an interpretation of vitreous seaweed cremation 'waste' from prehistoric burial sites in Orkney, Scotland *Oxford Journal of Archaeology* 26 (1), 1 – 23

Photos-Jones, E & Hall, A 2014 Kewing Cist Cramp: summary report *in* Ballin Smith, B *Between tomb and cist: the funerary monuments of Crantit, Kewing and Nether Onston, Orkney* Kirkwall: The Orcadian (Kirkwall Press), 101 – 8

Pidgeon, D 1892 The Evolution of Agricultural Implements II *Journal of the Royal Society of Agriculture of England* Third Series, Vol III, 238 – 57

Piggott, C M 1946 The Late Bronze Age Razors of the British Isles *Proceedings of the Prehistoric Society* New Series Vol. 12, 121 – 141

Piggott, C M 1947 A Late Bronze Age "Razor" from Orkney, *Proceedings of the Society of Antiquaries of Scotland* 81, 173 & plate XX

Piggott, S 1949 An Iron Age Prehistoric Yoke from Northern Ireland *Proceedings of the Prehistoric Society* 15, 192 – 3

Piggott, S 1954 *The Neolithic Cultures of the British Isles* Cambridge: Cambridge University Press

Piggott, S 1985 *William Stukeley–An Eighteenth-Century Antiquary* London: Thames and Hudson, revised and enlarged edition

Pilcher, J R, Hall, V A, & McCormac, F G 1995 Dates of Holocene Icelandic volcanic eruptions from tephra layers in Irish peats *The Holocene* 5 (1) 103 – 10

Pilcher, J R, Hall, V A & McCormac, F G 1996 An outline tephrochronology for the Holocene of the north of Ireland *Journal of Quaternary Science* 11 (6), 485 – 94

Pitcairn, D 1845 Parish of Evie and Rendall *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy*, *Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 196 – 203 of the Orkney section (volume not continuously numbered)

Pitt-Rivers, A H L F 1887 *Excavations in Cranborne Chase near Rushmore on the borders of Dorset and Wiltshire* Vol I Privately printed

Pitt-Rivers, A H L F 1888 *Excavations in Cranborne Chase Chase near Rushmore on the borders of Dorset and Wiltshire* Vol II Privately printed

Pitt-Rivers, A H L F 1892 *Excavations in Bokerley Dyke and Wansdyke Dorset and Wilts 1888-91 V*ol III Privately printed

Pitt-Rivers, A H Lane Fox 1898 *Excavations in Cranborne Chase Chase near Rushmore on the borders of Dorset and Wiltshire* Vol IV Privately printed

PKAS 1855 Proceedings and Transactions *Proceedings and transactions of the Kilkenny and South-East of Ireland Archaeological Society* 3, (1854 – 55), 337 – 45

Platt, M I 1934a Report on the Animal Bones pp348 – 50 *in* Callander, J G & Grant, W G A Long Stalled Chambered Cairn or Mausoleum (Rousay Type) near Midhowe, Rousay, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 68, 320 – 50

Platt, M I 1934b Report on Animal and Other Bones pp514 – 5 *in* Callander, J G & Grant, W G The Broch of Midhowe, Rousay, *Proceedings of the Society of Antiquaries of Scotland* 68, 444 – 516

Platt, M I 1935 Report on the Animal Bones pp341 – 3 *in* Callander, J G & Grant, W G 1935 The Knowe of Yarso, *Proceedings of the Society of Antiquaries of Scotland* 69, 325 – 51

Platt, M I 1936 Report on the Animal Bones found in the Chambered Cairn, Knowe of Ramsey, Rousay, Orkney pp415 – 19 *in* Callander, J G & Grant, W G A Stalled Chambered Cairn, the Knowe of Ramsay, at Hullion, Rousay, *Proceedings of the Society of Antiquaries of Scotland* 70, 407 – 19

Platt M I 1937a Report on the Animal Bones pp306 – 8 *in* Callander, J G & Grant, W G 1937 Long Stalled Cairn at Blackhammer, Rousay, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 71, 297 – 308

Platt, M I 1937b Report on the Animal Bones pp317 – 21 *in* Traill, W & Kirkness, W Hower, a Prehistoric Structure on Papa Westray, Orkney *Proceedings of the Society of Antiquaries of Scotland* 71, 309 – 21

Platt, M I 1956 Report on the Animal Bones *in* Hamilton, J R C *Excavations at Jarlshof, Shetland* Edinburgh: Her Majesty's Stationery Office, Ministry of Works Archaeological Reports No.1, 212 – 15

Plunkett, G, McDermott, C, Swindles, G T & Brown, D M 2013 Environmental indifference? A critique of environmentally deterministic theories of peatland archaeological site construction in Ireland *Quaternary Science Reviews* 61, 17 – 31

Plunkett, G M, Whitehouse, N J, Hall, V A, Brown, D M & Baillie, M G L 2004 A precisely-dated lake-level rise marked by diatomite formation in northeastern Ireland *Journal of Quaternary Science* 19, 3 – 7

Pollard, J 1999 'These places have their moments': thoughts on settlement practices in the British Neolithic *in* Brück, J & Goodman, M (eds) *Making places in the Prehistoric world: themes in settlement archaeology* London: University College London Press, 76 – 93

Pollard, T 1993 Kirkhill Farm, (Johnstone Parish) Mesolithic flint scatter with associated structures and burnt mound *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 15

Pope, A 1866 *Ancient History of Orkney, Caithness and the North by Thormodus Torfæus, Historiographer to the King of Denmark, translated with copious notes* Wick, Thurso & Kirkwall: Reid; Allen & Allen; Reid

Pope, R 2003 *Prehistoric Dwelling Circular Structures in North and Central Britain c.2500 BC – AD 500* University of Durham PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Pope, R 2007 Ritual and the roundhouse: a critique of recent ideas on the use of domestic space in later British prehistory *in* Haselgrove, C & Pope, R (eds*) The Earlier Iron Age in Britain And the Near Continent* Oxford & Oakville: Oxbow Books, 204 – 28

Pope, R 2015 Bronze Age Architectural Traditions: Dates and Landscapes *in* Hunter, F & Ralston, I (eds) *Scotland in Later Prehistoric Europe* Edinburgh: Society of Antiquaries of Scotland, 159 – 84

Popham, M 2001 The Collapse of Aegean Civilization at the End of the Late Bronze Age *in* Cunliffe, B (ed) *The Oxford Illustrated History of Prehistoric Europe* Oxford: Oxford University Press, 277 – 303

Porter, D 1997 Chapter 8 Small Finds *in* Buteux, S *Settlements at Skaill, Deerness, Orkney: Excavations by the late Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981* Oxford: Archaeopress, British Archaeological Report British Series 260, 96 – 132

Powell, T G E 1953 The Gold Ornament from Mold, Flintshire, Wales *Proceedings of the Prehistoric Society* New Series, Vol 19, Part 2, 161 – 79

Powlesland, D 2011 *Excavations at Boltby Scar Hillfort 2011 An Interim Report* downloaded from: www.landscaperesearchcentre.org on 07/01/12

Price, L 1952 Sweat House, Co. Wicklow *Journal of the Royal Society of Antiquaries of Ireland* 82 (2) 180 – 1

Pringle, R O 1874 On the Agriculture of the Islands of Orkney *Transactions of the Highland and Agricultural Society of Scotland* Fourth Series Vol VI, 1 – 68

Pryor, F 1996 Sheep, stockyards and field systems: Bronze Age livestock populations in the Fenlands of eastern England *Antiquity* 70, 313 – 24

Pryor, F 2001 *The Flag Fen Basin Archaeology and Environment of a Fenland Landscape* Swindon: English Heritage

Pyle, D M 1997 The global impact of the Minoan eruption of Santorini, Greece *Environmental Geology* 30 (1/2), 59 – 61

Quinlan, J 1886 The Cooking-Places of the Stone Age in Ireland *Journal of the Royal Historical and Archaeological Association of Ireland* (4th series) 7 (65), 390 – 2

Quinn, B & Moore, D 2007 *Ale, brewing and fulacht fiadh* article originally published in the autumn 2007 issue of *Archaeology Ireland*, text downloaded from the author's website at: http://mooregroup.wordpress.com/2007/10/08/the-archaeology-ireland-article/ on 22/02/08

Radford, C A R 1957 Excavations at Whithorn (Final report) *Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society* 34, 131 – 94

Rainbird, P 1999 Islands out of Time: Towards a Critique of Island Archaeology *Journal of Mediterranean Archaeology* 12 (2), 216 – 34

Rainbird, P 2007 *The Archaeology of Islands* Cambridge: Cambridge University Press

Raftery, B 1970 The Rathgall Hillfort, County Wicklow *Antiquity* 44 (173), 51 – 4

Raftery, B 1971 Rathgall, Co. Wicklow: 1970 excavations *Antiquity* 45 (180), 296 – 8

Raftery, B 1973 Rathgall: a Late Bronze Age Burial in Ireland *Antiquity* 47 (188) 293 – 5

Raftery, B 2004 Pit 119: Rathgall, Co. Wicklow *in* Roche, E, Grogan, E, Bradley, J, Coles, J & Raftery, B (eds) *From Megaliths to Metals Essays in Honour of George Eogan* Oxford: Oxford: Oxbow Books, 83 – 90

Raftery, J 1960 National Museum of Ireland: archaeological acquisitions in the year 1958 tabulated list. *Journal of the Royal Society of Antiquaries of Ireland* 90, 1 – 40

Ralston, I 1986 The Arbroath Antiquary Club's excavations at Castle Rock promontory fort, Auchmithie, Arbroath and Saint Vigeans, Angus District *Proceedings of the Society of Antiquaries of Scotland* 116, 101 – 15

Ramsay, Mrs 1886 Notice of a Leaf-shaped Bronze Sword, found at Leannan Buidhie (Yellow Hollow) Farm of Lower Coilabus, Oa, Islay *Proceedings of the Society of Antiquaries of Scotland* 20, 102 – 7

Ramseyer, D 1991 Bronze and Iron Age Cooking Ovens in Switzerland *in* Hodder, M A & Barfield, L H (eds) *Burnt Mounds and Hot Stone Technology: Papers from the Second International Burnt Mound Conference Sandwell, 12th – 14th October 1990* Sandwell, West Midlands: Sandwell Metropolitan Borough Council, 71 – 91

Rappaport, R A 1984 Pigs for the Ancestors Ritual in the Ecology of a New Guinea People A new, enlarged edition New Haven and London: Yale University Press

Randsborg, K & Christensen, K 2006 Bronze Age Oak-Coffin Graves: Archaeology and Dendro-dating *Acta Archaeologica* 77, 1 – 246

Rathbone, S 2008a *M3 Clonee-North of Kells Contract 2 Dunshaughlin – Navan Report on the Archaeological Excavation of Berrilstown 2, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Rathbone, S 2008b *M3 Clonee-North of Kells Contract 5 Kells – North of Kells Report on the Archaeological Excavation of Pottlebane 2 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Raven, A M, van Bergen, P F, Stott, A W, Dudd, S N & Evershed, R P 1997 Formation of long-chain ketones in archaeological pottery vessels by pyrolysis of acyl lipids *Journal of Analytical and Applied Pyrolysis* 40 – 41, 267 – 85

Razjigaeva, N G, Grebennikova, T A, Ganzey, L A, Mokhova, L M & Bazarova, V B 2004 The role of global and local factors in determining the middle to late Holocene environmental history of the South Kuril and Komandar Islands, northwestern Pacific *Palaeogeography, Palaeoclimatology, Palaeoecology* 209, 313 – 33

RCAHMS 1990 *North-East Perth an archaeological landscape* Edinburgh: Her Majesty's Stationery Office

RCAHMS 1993 *Strath of Kildonan an Archaeological Survey* Edinburgh: RCAHMS

RCAHMS 1994 *Glenesslin, Nithsdale an Archaeological Survey* Edinburgh: RCAHMS

RCAMS 1946 *The Royal Commission on the Ancient Monuments of Scotland. Twelfth report with an inventory of the ancient monuments of Orkney and Shetland* Edinburgh: His Majesty's Stationery Office (3 Volumes: Vol I Report and Introduction, Vol II Inventory of Orkney, Vol III Inventory of Shetland)

Rees, S 1978 Tools available for cultivation in prehistoric Britain *in* Limbrey, S & Evans, J G *The effect of man on the landscape: the Lowland zone* London: Council for British Archaeology Research Report 21, 103 – 14

Reilly, S & Ginn, V 2008 *M3 Clonee-North of Kells Contract 5 Kells – North of Kells Report on the Archaeological Excavation of Calliaghstown 2 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Rendall, J 2002 *A Jar of Seed-Corn Portrait of an Island Farm* Kirkwall, Orkney: The Orcadian Ltd

Rendall, R 1931 Notes on a Collection of Flints from Wideford Hill, *Proceedings of the Orkney Antiquarian Society* Volume IX, Kirkwall, 21 – 4

Rendall, R 1934a Further Notes on an Orkney Flintfield, *Proceedings of the Orkney Antiquarian Society* Volume XII, Kirkwall, 19 – 25

Rendall, R 1934b Notes on an Underground Chamber at South Keigar, Deerness, *Proceedings of the Orkney Antiquarian Society* Volume XII, Kirkwall, 26 – 8

Rendall, R 1937 The South Ettit Flint Industries, *Proceedings of the Orkney Antiquarian Society* Volume XIV, Kirkwall, 45 – 56

Renfrew, A C 1979 *Investigations in Orkney* London: Society of Antiquaries, Reports of the Research Committee of the Society of Antiquaries of London 38

Renfrew, A C (ed) 1985 *The Prehistory of Orkney*, Edinburgh: Edinburgh University Press

Renfrew, A C 1990 Climate and Holocene culture change: some practical problems *Philosophical Transactions of the Royal Society of London* Series A, Mathematical and Physical Sciences, vol 330, no. 1615, The Earth's Climate and Variability of the Sun Over Recent Millennia: Geophysical, Astronomical and Archaeological Aspect, 657 – 63

Renfrew, A C, Harkness, D, & Switsur, R 1976 Quanterness, radiocarbon and the Orkney cairns, *Antiquity* 50, 197 – 203

Renfrew, A C, Stenhouse, M J & Switsur, R 1983 The Radiocarbon Determinations *in* Hedges, J W *Isbister A Chambered Tomb in Orkney* Oxford: British Archaeological Report British Series 115, 61 – 71

Renfrew, C 1973 *Before Civilisation The Radiocarbon Revolution and Prehistoric Europe* London: Jonathan Cape Ltd

Renfrew, C 2000 The Auld Hoose Spaeks: Society and Life in Stone Age Orkney *in* Ritchie, A (ed) *Neolithic Orkney in its European Context* Cambridge: McDonald Institute Monographs, 1 – 20

Renfrew, C & Buteux, S 1985 Radiocarbon dates from Orkney in Renfrew, A C (ed.) *The Prehistory of Orkney*, Edinburgh: Edinburgh University Press, 263 – 74

Rennell, R 2009 *Exploring places and landscapes of everyday experience in the Outer Hebridean Iron Age: A study of theory, method and application in experiential landscape archaeology* University College London PhD Thesis available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Rennie, A F 2006 *The role of sediment supply and sea-level changes on a submerging coast, past changes and future management implications* University of Glasgow PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Reynaud-Farrera, I 1997 Late Holocene Vegetational Changes in South-West Cameroon *in* Dalfes, H N, Kukla, G & Weiss, H (eds.) *Third millennium BC climate change and old world collapse Proceedings of the NATO Advanced Research Workshop on Third Millennium BC Abrupt Climate Change and Old World Social Collapse, held at Kemer, Turkey, September 19-24, 1994* NATO ASI Series 1: Global Environmental Change vol 49, Springer, Berlin & New York, 641 – 52

Reynolds, D M 1984 J M Corrie, Archaeologist *Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society* Third Series, Vol LIX, 94 – 107

Reynolds, D M 1985 'How we found a tumulus' a story of the Orkney Islands – the Journal of Lady Burroughs, *Proceedings of the Society of Antiquaries of Scotland* 115, 115 – 125

Reynolds, D M & Ritchie, J N G 1985 Walter Gordon Grant: an archaeological appreciation *Proceedings of the Society of Antiquaries of Scotland* 115, 67 – 73

Richards, C 1986 Seatter Farm 1, Stromness parish, Flint scatters & Farm 2 *Discovery and Excavation in Scotland* Council for British Archaeology, Scotland 22

Richards, C 1990 The Late Neolithic House in Orkney *in* Sansom, R (ed) *The Social Archaeology of Houses* Edinburgh: Edinburgh University Press, 111 – 24

Richards, C 1991 Skara Brae: revisiting a Neolithic village in Orkney *in* Hanson, W S & Slater, E A (eds) *Scottish Archaeology New Perceptions* Aberdeen: Aberdeen University Press, 24 – 43

Richards, C 1993 *An Archaeological Study of Neolithic Orkney: Architecture, Order and Social Classification* University of Glasgow PhD thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Richards, C 1994 Skaill Bay, Sandwick Parish, late Neolithic Butchery Site *Discovery and Excavation in Scotland,* 50, Council for Scottish Archaeology, 92

Richards, C 1995 Vere Gordon Childe at Skara Brae and Rinyo: research and redemption *in* Gathercole, P, Irving, T H & Melleuish, G (eds) *Childe and Australia: Archaeology, Politics and Ideas* St. Lucia: Queensland University Press, 118 – 27

Richards, C 1996a Henges and Water Towards an Elemental Understanding of Monumentality and Landscape in Late Neolithic Britain *Journal of Material Culture* 1, 313 – 36

Richards, C 1996b Monuments as landscape: creating the centre of the world in late Neolithic Orkney *World Archaeology* 28 (2), 190 – 208

Richards, C 1998 Centralising Tendencies? A re-examination of Social Evolution in Neolithic Orkney *in* Edmonds, M & Richards, C *Understanding the Neolithic of North-Western Europe* Glasgow: Cruithne Press, 516 – 32

Richards, C 2003 *Excavation of the early Neolithic settlement at Wideford Hill, Mainland, Orkney: Data Structure Report* Unpublished report

Richards, C 2004 A choreography of construction: monuments, mobilization and social organization in Neolithic Orkney in Cherry, J, Scarre, C & Shennan, S (eds) Explaining social change: studies in honour of Colin Renfrew Cambridge: McDonald Institute Monograph, 103 – 13

Richards, C (ed) 2005a *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research

Richards, C 2005b The Neolithic settlement of Orkney *in* Richards, C (ed) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 7 – 22

Richards, C 2005c Period-based research and temporality *in* Downes, J, Foster, S M, Wickham-Jones, C R & Callister, J (eds) The *Heart of Neolithic Orkney World Heritage Site Research Agenda* Edinburgh: Historic Scotland, 37 – 9

Richards, C 2005d The Ceremonial House 2 *in* Richards, C (ed) *Dwelling among the monuments – the Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stenness, Orkney* Cambridge: McDonald Institute for Archaeological Research, 129 – 56

Richards, C 2009 Building the Great Stone Circles of Northern Britain: Questions of Materiality, Identity and Social Practices *in* O'Connor, B, Cooney, G & Chapman, J (eds) *Materialitas: Working stone, carving identities* Oxford: Oxbow Books, Prehistoric Society Research Papers, 54 – 63

Richards, C (ed) 2013 *Building the Great Stone Circles of the North* Oxford: Windgather Press

Richards, C, Brophy, K, Carruthers, M, Jones, A M, Jones, R & Jones, S 2016 Good neighbours: Stonehall Knoll, Stonehall Meadow and Stonehall Farm *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 91 – 127

Richards, C, Brown, J, Jones, S, Hall, A & Muir, T 2013 Monumental Risk: megalithic quarrying at Staneyhill and Vestra Fiold, Mainland, Orkney *in* Richards, C (ed) *Building the Great Stone Circles of the North* Oxford: Windgather Press, 119 – 48

Richards, C, Clarke, A, Ingrem, C, Mulville, J & Mainland, I 2015 Containment, closure and red deer: a Late Neolithic butchery site at Skaill Bay, Mainland, Orkney *Proceedings of the Society of Antiquaries of Scotland* 145, 91 – 124

Richards, C, Downes, J, Card, N, Carruthers, M, Challands, A, Jones, A, Jones, R & Jones, S 2000 *The Cuween-Wideford Landscape Project, Mainland, Orkney: Fieldwork 1999: Data Structure Report* Unpublished report

Richards, C, Downes, J, Card, N, Carruthers, M, Jones, S, Challands, A & Jones, R 2001 *The Cuween-Wideford Landscape Project, Mainland, Orkney: Fieldwork 2000: Data Structure Report* Unpublished report

Richards, C, Downes, J, Ixer, R, Hambleton, E, Peterson, R & Pollard, J 2013 Surface over Substance: the Vestra Fiold horned cairn, Mainland, Setter cairn, Eday, and a

reappraisal of later Neolithic funerary architecture *in* Richards, C (ed) *Building the Great Stone Circles of the North* Oxford: Windgather Press, 149 – 83

Richards, C, Downes, J, & Gee, C & Carter, S 2016 Materializing Neolithic house societies in Orkney, introducing Varme Dale & Muckquoy *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 224 – 53

Richards, C & Jones, R 1994 Stonehall Farm, Firth Parish *Discovery and Excavation in Scotland* Council for Scottish Archaeology, 91

Richards, C & Jones, R 1995a Stonehall, Firth Parish *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 103

Richards, C & Jones, R 1995b Crossiecrown, Kirkwall & St. Ola Parish *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 103

Richards, C & Jones, A M 2016 Houses of the dead: the transition from wood to stone architecture at Wideford Hill *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 16 – 40

Richards, C, Jones, A M, MacSween, A, Sheridan, A, Dunbar, E, Reimer, P, Bayliss, A, Griffiths, S & Whittle, A 2016 Settlement Duration and Materiality: Formal Chronological Models for the Development of Barnhouse, a Grooved Ware Settlement in Orkney *Proceedings of the Prehistoric Society* 82, 193 – 225

Richards C & Jones, R (eds) 2016 *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books

Richards C & Jones, R 2016 Images of Neolithic Orkney *in* Richards C & Jones, R (eds) *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 1 – 15

Richards, C, Jones, R, Challands, A, Jeffrey, S, Jones, A M, Jones, S & Muir, T 2016 At Stonehall Farm, Neolithic Life is Rubbish *in* Richards C & Jones, R (eds) 2016 *The Development of Neolithic House Societies in Orkney* Oxford: Windgather Press, Oxbow Books, 128 – 59

Richards, C & Robertson, J 2005 *Ramberry, St. Ola, Orkney Excavation 2005 Data Structure Report* Unpublished report

Richards, C & Stuart, E 1994 Moan Farm, Firth Parish, Bronze Age burial cist *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 91

Richards, M P, Fuller, B T, and Molleson, T I 2006 Stable isotope palaeodietary study of humans and fauna from the multi-period (Iron Age, Viking and Late Medieval) site of Newark Bay, Orkney *Journal of Archaeological Science* 33, 122 – 31

Richards, M P & Hedges, R E M 1999 A Neolithic Revolution? New evidence of Diet in the British Neolithic *Antiquity* 73, 891 – 97

Richards, M P, Schulting, R J & Hedges, R E M 2003 Sharp shift in diet at onset of Neolithic *Nature* 425, 366

Riehm, K 1961 Prehistoric Salt-Boiling *Antiquity* 35, 181 – 91

Rintoul, D 1845 Parish of Stronsay and Eday *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a*

Committee of the Society for the Benefit of the Sons and Daughters of the Clergy, *Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 156 – 68 of the Orkney section (volume not continuously numbered)

Ripper, S 2004 *Bodies, Burnt Mounds and Bridges: A Riverine Landscape at Watermead Country Park, Birstall, Leicestershire* University of Leicester Archaeology Services, ULAS Report No. 2004-048, Unpublished report, electronic copy supplied by ULAS

Ripper, S, Beamish, M, Bayliss, A, Bronk Ramsey, C, Brown, A, Collins, M, Cooper, N J, Cook, G, Cook, J, Gouldwell, A, Greig, J, Hatton, J, Marshall, P D, Meadows, J, Monckton, A, Van Der Plicht, H, Smith, D & Tetlow, E 2012 Bogs, Bodies and Burnt Mounds: Visits to the Soar Wetlands in the Neolithic and Bronze Age *Proceedings of the Prehistoric Society* 78, 173 - 206

Ritchie, A, 1977 Excavation of Pictish and Viking-age farmsteads at Buckquoy, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 108, 174 – 227

Ritchie, A 1983a Excavation of a Neolithic farmstead at Knap of Howar, Papa Westray, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 113, 40 – 121

Ritchie, A 1983b Birsay around AD 800 *in* Thomson, W P L (ed) *Orkney Heritage Volume 2 Birsay A Centre of Political and Ecclesiastical Power* Kirkwall: Orkney Heritage Society, 46 – 66

Ritchie, A 1985 *Exploring Scotland's Heritage: Orkney and Shetland* Edinburgh: RCAHMS

Ritchie, A 1995 *Prehistoric Orkney* London: Batsford/Historic Scotland

Ritchie, A 1996 *Exploring Scotland's Heritage: Orkney* Edinburgh: The Stationery Office

Ritchie A (ed) 2000 *Neolithic Orkney in its European Context,* Cambridge: MacDonald Institute for Archaeological Research

Ritchie, A 2009 *On the fringe of Neolithic Europe: excavation of a chambered cairn on the Holm of Papa Westray, Orkney* Edinburgh: Society of Antiquaries of Scotland

Ritchie, G 1845 Parish of Rousay and Eagleshay *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy*, *Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 83 – 4 of the Orkney section (volume not continuously numbered)

Ritchie, J N G 1976 The Stones of Stenness, Orkney *Proceedings of the Society of Antiquaries of Scotland* 107, 1 – 60

Ritchie, J N G 2002 Excavation archives: preservation and chance *in* Ballin Smith, B & Banks, I (eds) *In the Shadow of the Brochs The Iron Age in Scotland*, Stroud: Tempus, 205 – 16

Ritchie, J N G 2005 Brochs: A Long View *in* Turner, V E, Nicholson, R A, Dockrill, S J & Bond, J M (eds) *Tall Stories? Two millennia of brochs* Lerwick: Shetland Amenity Trust, 1 – 4

Ritchie, J N G & Ritchie, A, 1974 Excavation of a barrow at Queenafjold, Twatt, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 105, 33 – 40.

Ritchie, P R 1959 A Chambered Cairn at Isbister, South Ronaldshay, Orkney *Proceedings of the Society of Antiquaries of Scotland* 92, 25 – 32

Ritchie, P R 1968 The stone implement trade in third-millennium Scotland *in* Coles, J M & Simpson, D D A *Studies in Ancient Europe: Essays presented to Stuart Piggott* Leicester: Leicester University Press, 117 – 36

Ritchie, R 1992 Stone Axeheads and Cushion Maceheads from Orkney and Shetland: Some Similarities and Contrasts *in* Sharples, N & Sheridan, A (eds) *Vessels for the Ancestors Essays on the Neolithic of Britain and Ireland in honour of Audrey Henshall* Edinburgh: Edinburgh University Press, 213 – 20

Rivet, A L F & Smith, C 1981 *The Place-Names of Roman Britain* London: Book Club Associates

Roberts, B K 1996 *Landscapes of Settlement prehistory to the present* London: Routledge

Roberts, J & Lunt, D 2014 Analysis of the South Cist The Human Remains *in* Ballin Smith, B *Between tomb and cist: the funerary monuments of Crantit, Kewing and Nether Onston, Orkney* Kirkwall: The Orcadian (Kirkwall Press), 58 – 9

Roberts, O 2004a Round the headland or over the horizon? An examination of the evidence for British prehistoric efforts to construct a seaworthy boat *in* Clark, P (ed) *The Dover Bronze Age Boat in Context Society and Water Transport in Prehistoric Europe* Oxford: Oxbow Books, 35 – 50

Roberts, O 2004b Reconstruction and Performance *in* Clark, P (ed) *The Dover Bronze Age Boat* Swindon: English Heritage, 189 – 210

Roberts, O T P 2006 Interpretation of Prehistoric Boat Remains *International Journal of Nautical Archaeology* 35(1), 72 – 8

Robertson, D J 1924 Orkney Folklore, *Proceedings of the Orkney Antiquarian Society* Volume II, 37 – 46

Robertson, J. 2005 *The Bronze Age Dwelling at Wasbister, Orkney WHS: An Enhanced Landscape Interpretation* Orkney College, University of the Highlands and Islands, Unpublished Masters Dissertation

Robertson, J 2006 *Hoy and South Walls Landscape Investigations Pilot Study 2006* Report Unpublished report

Robertson, J 2007 Nessbreck, Corrigall, Rescue Excavation *Discovery and Excavation in Scotland* New Series, Volume 8, 138 – 9

Robertson, J & Downes, J 2000 *Stenchme Lop Ness: Rescue excavation of a cist at Lop Ness, Sanday, Orkney* Unpublished Data Structure report, Orkney Archaeological Trust

Robertson, J & Sharman, P 2006 The Bu Sands, Burray, Orkney (South Ronaldsay), evaluation *Discovery and Excavation in Scotland* New Series, Volume 7, 124 – 5

Robock, A 2002 Perspectives: Pintaubo eruption the climatic aftermath *Science* 295, 1242 – 4

Robock, A & Mao, J 1995 The volcanic signal in surface temperature observations *Journal of Climate* 8, 1086 – 1103

Roe, F 1968 Stone mace-heads and the latest neolithic cultures of the British Isles *in* Coles, J M & Simpson, D D A *Studies in Ancient Europe: Essays presented to Stuart Piggott* Leicester: Leicester University Press, 145 – 72

Roe, F E S 1966 The Battle-Axe series in Britain *Proceedings of the Prehistoric Society* 32, 199 – 245

Roe, F E S 1979 Typology of stone implements with shaftholes *in* Clough, T H McK & Cummins, W A *Stone axe studies Archaeological, petrological, experimental, and ethnographic* London: Council for British Archaeology Research Report 23, 23 – 48

Rohl, B & Needham, S 1998 *The Circulation of Metal in the British Bronze Age: the Application of Lead Isotope Analysis* London: British Museum, Occasional Paper No. 102

Romaniuk A A, Shepherd A N, Clarke D V, Sheridan A J, Fraser S, Bartosiewicz L & Herman J S 2016 Rodents: food or pests in Neolithic Orkney *Royal Society Open Science* 3: 160514 http://dx.doi.org/10.1098/rsos.160514

Romankiewicz, T 2009 Simple stones but complex constructions: analysis of architectural developments in the Scottish Iron Age *World Archaeology* 41 (3), 379 – 95

Romankiewicz, T 2011 *The Complex Roundhouses of the Scottish Iron Age. An architectural analysis of complex Atlantic roundhouses (brochs and galleried duns), with reference to wheelhouses and timber roundhouses*, *Volume I – Text and Illustrations, Volume II – Catalogue* Oxford: Archaeopress, British Archaeological Reports British Series 550

Rønne, P 1987 Flintægsværd fra bronzealderen *Aarbøger for Nordisk Oldkyndighed og Historie* 1985 – 87, 85 – 94

Rowley-Conwy, P 2004 The Three Age system in English: new translations of the founding documents *Bulletin of the history of archaeology* 14 (1), 4 -15

Russell-White, C J 1990 Excavation and Sampling of Burnt Mounds in Scotland *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Wordwell Ltd Academic Publications, Dublin, 69 – 76

Ryder, M L 2007 *Sheep and Man* London: Duckworth (reprint of 1983 edition).

Sadler, J P & Grattan, J P 1999 Volcanoes as agents of past environmental change *Global and Planetary Change* 21, 181 – 96

Salway, P 1981 *Roman Britain* Oxford: Clarendon Press, Oxford History of Britain

Salzer, M W & Hughes M K 2007 Bristlecone pine tree rings and volcanic eruptions over the last 5000 yr *Quaternary Research* 67, 57 – 68

Sands, R 1927 United Parishes of Hoy and Graemsay *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 220 – 4

Sanders, D 2007 The Dover Boat: Some Responses to Ole Crumlin-Pedersen and Seán McGrail Concerning its Propulsion, Hull-Form, and Assembly, and Some

Observations on the Reappraisal Process *International Journal of Nautical Archaeology* 36(1), 184 – 192

Sanmark, A 2012 *Althing and Lawthing in Orkney* http://www.uhi.ac.uk/en/research-enterprise/cultural/centre-for-nordic-studies/mimirs-well-articles/althing-and-lawthing-in-orkney accessed 29/09/15, originally published in *The Orcadian* on 1/3/12

Sanson, N 1665 *Les Isles Orcadney, ou Orkney; Schetland, ou Hetland; et de Fero, ou Farre, tirées de divers memoirs / par Sanson* Paris: Pierre Mariette

Saunders, J W, Mandel, R D, Sampson, C G, Allen, C M, Allen, E T, Bush, D A, Feathers, J K, Gremillion, K J, Hallmark, C T, Jackson, H E, Johnson, J K, Jones, R, Saucier, R T, Stringer, G L & Vidrine M F 2005 Watson Brake, a Middle Archaic Mound Complex in Northeast Louisiana *American Antiquity* 70 (4), 631 – 68

Saunders, M 2009 The Cairns, Windwick Bay Geophysical Survey Excavation *Discovery and Excavation in Scotland* New Series, Volume 10, Council for Scottish Archaeology, 138

Saville, A 2003 A Flint Core-tool from Wig Sands, Kirkcolm, near Stranraer, and a consideration of the absence of Core-tools in the Scottish Mesolithic *Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society*, Series III, Vol 77, 13 – 22

Savinetsky, A B, Kiseleva, N K & Khassanov, B F 2004 Dynamics of sea mammal and bird populations of the Bering Sea region over the last several millennia *Palaeogeography, Palaeoclimatology, Palaeoecology* 209, 335 – 52.

ScARF 2012a Downes, J (ed) *Chalcolithic and Bronze Age Panel Report*, Scottish Archaeological Research Framework: Society of Antiquaries of Scotland. Available online at http://tinyurl.com/clxgf5s

ScARF 2012b Lifeways and Lifestyles *in* Downes, J (ed) *Chalcolithic and Bronze Age Panel Report*, Scottish Archaeological Research Framework: Society of Antiquaries of Scotland, 35 – 72. Available online at http://tinyurl.com/clxgf5s

ScARF 2012c The Detailed Picture: issues of regional and chronological resolution *in* Brophy, K & Sheridan, A (eds) *Neolithic Panel Report*, Scottish Archaeological Research Framework: Society of Antiquaries of Scotland, 40 – 80. Available online at http://tinyurl.com/d73xkvn

ScARF 2012d Dalglish, C & Tarlow, S (eds) *Modern Scotland: Archaeology, the Modern past and the Modern present Modern Panel Report* Scottish Archaeological Research Framework: Society of Antiquaries of Scotland. Available online at http://tinyurl.com/cf3hm6m

Scarth, H M 1873 The Camps on the River Avon at Clifton, with remarks on the Structure of Ancient Ramparts *Archaeologia* 44, 428 – 34

Scarth, R 1845 United Parishes of Cross and Burness The Rev William Grant Minister *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy, Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 85 – 103 of the Orkney section (volume not continuously numbered; this is the Sanday section of Cross & Burness, for the North Ronaldsay section see White 1845)

Schaeffer, C F A 1948 *Stratigraphie Comparée et Chronologie de l'Asie Occidentale* London: Oxford University Press

Schaeffer, C F A 1968 Commentaires sur les lettres et documents trouvés dans les bibliothèques privées d'Ugarit. *Ugaritica V (Mission de Ras Shamra 16)* Geuthner, Paris, 607 – 768

Schlebecker, J T 1977 The Use of Objects in Historical Research *Agricultural History*, Vol. 51, No. 1, 200 – 8

Schmidt, P K & Burgess, C B 1981 *The Axes of Scotland and Northern England* Prähistorische Bronzefunde Abteilung IX, Band 7, München: C H Beck'sche Verlagsbuchandlung

Schulting, R & Fibiger, L 2012 Skeletal evidence for interpersonla violence in Neolithic Europe: an introduction *in* Schulting, R & Fibiger, L (eds) 2012 *Sticks, Stones & Broken Bones: Neolithic Violence in a European Perspective* Oxford: Oxford University Press, 1 – 15

Schulting, R, Sheridan, A, Crozier, R & Murphy, E 2010 Revisiting Quanterness: new AMS dates and stable isotope data from an Orcadian chamber tomb *Proceedings of the Society of Antiquaries of Scotland* 140, 1 – 50

Schulting, R, Snoeck, C & Sheridan, A 2014 Calcined animal bone fragments from Stanydale House (HU25SE 1), and House 1, Ness of Gruting (HU24NE 12), Shetland pp215 *in* Sheridan, A, Garrow, D, Mason, O, Schulting, R, Snoeck, C, Bradley, R, Waddington, C, Evershed, R, Whelton, H, Cook, G & Naysmith, P Radiocarbon dates associated with the Scottish History and Archaeology Department, National Museums Scotland, 2013/14 *Discovery and Excavation in Scotland* New Series Vol 15, 213 – 17

Schulting, R J 1998 *Slighting the Sea: The Mesolithic-Neolithic Transition in Northwest Europe* University of Reading PhD thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Schulting, R J 2004 An Irish sea change: some implications for the Mesolithic-Neolithic transition *in* Cummings, V & Fowler, C (eds.) *The Neolithic of the Irish Sea: Materiality and traditions of practice* Oxford: Oxbow Books, 22 – 8

Schulting, R J 2012 Skeletal evidence for interpersonal violence: beyond mortuary monuments in southern Britain *in* Schulting, R & Fibiger, L (eds) *Sticks, Stones & Broken Bones: Neolithic Violence in a European Perspective* Oxford: Oxford University Press, 223 – 48

Schulting, R J & Wysocki, M 2005 'In this Chambered Tumulus were Found Cleft Skulls …' an Assessment of the Evidence for Cranial Trauma in the British Neolithic *Proceedings of the Prehistoric Society* 71, 107 – 38

Schweitzer, H 2008a *M3 Clonee-North of Kells Contract 1 Klonee - Dunshaughlin Report on the Archaeological Excavation of Drumree 1, County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Schweitzer, H 2008b *M3 Clonee-North of Kells Contract 1 Klonee - Dunshaughlin Report on the Archaeological Excavation of Leshamstown 1, County Meath* Unpublished

report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from:
http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Scott, L 1951 The Colonisation of Scotland in the Second Millennium BC *Proceedings of the Prehistoric Society* New Series Vol 17, Part 1, 16 – 82

Scott, W 1822 *The Pirate* Edinburgh: Archibald Constable & Co, 3 volumes

Scott, W 1839a Vacation 1814: Voyage in the Lighthouse Yacht to Nova Zembla, and the Lord knows where *in* Lockhart, J G *Memoirs of the Life of Sir Walter Scott, Bart.* Edinburgh: Robert Cadell, 2nd edition in 10 volumes, Vol IV, 182 – 370

Scott, W 1839b Letter in verse to His Grace the Duke of Buccleuch, Lerwick Zetland 8th August 1814 & Postcriptum Kirkwall Orkney August 13th 1814 *in* Lockhart, J G *Memoirs of the Life of Sir Walter Scott, Bart.* Edinburgh: Robert Cadell, 2nd edition in 10 volumes, Vol IV, 373 – 7

Serjeantson, D 1990 The introduction of mammals to the Outer Hebrides and the role of boats in stock management *Anthropozoologica* 13, 7 – 18

Serjeantson, D 2007a The bird bones *in* Hunter, J, Bond, J M & Smith, A N 2007 *Investigations in Sanday, Orkney Vol 1: Excavations at Pool, Sanday A multi-period site from Neolithic to Late Norse times* Kirkwall, Orkney: The Orcadian Ltd, 279 – 85

Serjeantson, D 2007b Bird bones *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A 2007 *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 216 – 27

Serjeantson, D & Bond, J M 2007 Cattle and sheep husbandry: evidence for dairying from analysis of tooth eruption and wear *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A 2007 *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 202 – 206

Severin, T 1979 *The Brendan Voyage* London: Arrow Books

Seymour, J 1996 *The Complete Book of Self-Sufficiency* London: Dorling Kindersley Ltd

Sharman, P 2000 Steatite and other fine stone objects as chronological indicators *in* Downes, J & Lamb, R *Prehistoric Houses at Sumburgh in Shetland Excavations at Sumburgh Airport 1967 – 74* Oxford: Oxbow Books, 65 – 9

Sharman, P 2005 Bu Sand Quarry, Burray, Orkney (South Ronaldsay parish), human remains *Discovery and Excavation in Scotland* New Series, Volume 6, 100

Sharman, P 2007a *Excavation of a Bronze Age funerary site at Loth Road, Sanday, Orkney* Scottish Archaeological Internet Report 25, www.sair.org.uk

Sharman, P 2007b *Investigation and Restoration at the Muckle Hill of Linkataing Homestead, Eday, Orkney Data Structure Report* Orkney Archaeological Trust Projects Unit, Unpublished report for Historic Scotland

Sharman, P 2007c Hobbister Desk-based assessment, walkover survey and environmental impact assessment *Discovery and Excavation in Scotland* New Series, Vol 8, Archaeology Scotland, 143

Sharman, P 2009 Steatite Funerary Urns in the Early Prehistoric Northern Isles *in* Forster, A K & Turner, V E (eds) *Kleber: Shetland's Oldest Industry*, Lerwick: Shetland Amenity Trust, 39 – 47

Sharman P, & Hollinrake A 2007 *Proposed area of peat extraction at Hobbister, Orphir, Orkney: archaeological and cultural heritage impact assessment*. Unpublished report: Orkney Archaeological Trust Projects Unit

Sharman, P & Robertson, J 2007 Linkataing Topographical survey, minor excavation, restoration *Discovery and Excavation in Scotland* New Series, Vol 8, Archaeology Scotland, 140

Sharman, P M 1999 The Steatite *in* Owen, O & Lowe, C *Kebister the four thousand year old story of one Shetland township* Edinburgh: Society of Antiquaries of Scotland, Monograph No. 14, 168 – 78

Sharples, N 1998 *Scalloway A Broch, Late Iron Age Settlement and Medieval Cemetery in Shetland* Oxford: Oxbow Books, Monograph 82

Sharples, N 2000 Antlers and Orcadian Rituals: an Ambiguous Role for Red Deer in the Neolithic *in* Ritchie, A (ed) *Neolithic Orkney in its European Context* Cambridge: McDonald Institute Monographs, 107 – 116

Sharples, N 2005 Life Histories and the Buildings of the Atlantic Iron Age *in* Turner, V E, Nicholson, R A, Dockrill, S J & Bond, J M (eds) *Tall Stories? Two millennia of brochs* Lerwick: Shetland Amenity Trust, 106 – 19

Sharples, N 2009 Beaker Settlement in the Western Isles *in* Allen, M J, Sharples, N & O'Connor, T (eds) *Land and People papers in memory of John G. Evans* Oxford: The Prehistoric Society & Oxbow Books, 147 – 58

Sharples, N 2012 The Beaker-period and Early Bronze Age settlement at Sligeanach, Cill Donnain *in* Parker Pearson, M (ed) *From Machair to Mountains Archaeological Survey and Excavation in South Uist* Oxford & Oakville: Oxbow Books, 215 – 58

Sharples, N M 1984 Excavations at Pierowall Quarry, Westray *Proceedings of the Society of Antiquaries of Scotland* 114, 75 – 125

Sharples, N M 1985 Individual and Community: the changing role of megaliths in the Orcadian Neolithic *Proceedings of the Prehistoric Society* 51, 59 – 74

Sharples, N M 1991 *Maiden Castle: Excavations and Field Survey 1985–6* London: English Heritage Archaeological Report 19

Sharples, N M 1992 Aspects of Regionalisation in the Scottish Neolithic *in* Sharples, N & Sheridan, A (eds) *Vessels for the Ancestors Essays on the Neolithic of Britain and Ireland in honour of Audrey Henshall* Edinburgh: Edinburgh University Press, 322 – 31

Shaw, F J 1980 *The Northern and Western Isles of Scotland Their Economy and Society in the Seventeenth Century* Edinburgh: John Donald Publishers Ltd

Shaw, F J 2002 *The Northern and Western Isles of Scotland Their Economy and Society in the Seventeenth Century* Edinburgh: John Donald Publishers Ltd, (reprint of the 1980 1st edition)

Sheldon, J M 1979 Appendix A Analysis of Charcoal Fragments from Quanterness *in* Renfrew, A C *Investigations in Orkne*y, London: Society of Antiquaries Research Report 38, 29 – 30

Shennan, I & Horton, B 2002 Holocene land- and sea-level changes in Great Britain *Journal of Quaternary Science* 17, 511 – 26

Shepherd, A 1996 Skara Brae *in* Hall, A M (ed) *The Quaternary of Orkney Field Guide* London: Quaternary Research Association, 97 – 111

Shepherd, A N 2016 Skara Brae life studies: overlaying the embedded images *in* Hunter, F & Sheridan, J A (eds) *Ancient Lives: Object, People and Place in Early Scotland. Essays for David V Clarke on his 70th birthday* Leiden: Sidestone Press, 213 – 32

Shepherd, I 2012 Is there a Scottish Chalcolithic? *in* Allen, M J, Gardiner, J & Sheridan, A (eds) *Is there a British Chalcolithic? People, place and polity in the late 3rd millennium* Oxford: The Prehistoric Society/Oxbow Books (Prehistoric Society Research Paper no. 4), 164 – 71

Shepherd, I A G 1985 Jet and Amber *in* Clarke, D V, Cowie, T G & Foxon, A *Symbols of Power at the time of Stonehenge*, Edinburgh: Her Majesty's Stationery Office, 204 – 16

Shepherd, I A G 1986 *Powerful Pots: Beakers in north-east prehistory* Aberdeen: Anthropological Museum, University of Aberdeen

Sheridan, A 1999 Drinking, driving, death and display: Scottish Bronze Age Artefact studies since Coles *in* Harding, A F (ed) *Experiment and Design Archaeological Studies in honour of John Coles* Oxford: Oxbow Books, 49 – 59

Sheridan, A 2001 The National Museums of Scotland Radiocarbon Dating Programmes: Results obtained during 2001/2 *Discovery and Excavation in Scotland* New Series Vol 2, Council for Scottish Archaeology, 129 – 30

Sheridan, A 2002a The radiocarbon dating programmes of the National Museums of Scotland *Antiquity* 76, 794 – 6

Sheridan, A 2002b The National Museums of Scotland Radiocarbon Dating Programmes: Results obtained during 2001/2 *Discovery and Excavation in Scotland* New Series Vol 3, Council for Scottish Archaeology, 154 – 5

Sheridan, A 2003a The National Museums of Scotland Radiocarbon Dating Programmes: Results obtained during 2002/3 *Discovery and Excavation in Scotland* New Series Vol 4, Council for Scottish Archaeology, 167 – 9

Sheridan, A 2003b New Dates for Scottish Bronze Age Cinerary Urns: Results from the National Museums of Scotland Dating Cremated Bones Project *in* Gibson, A *Prehistoric Pottery: People Pattern and Purpose* Oxford: Archaeopress, British Archaeological Report International Series No.1156, 201 – 26

Sheridan, A 2003c French Connections I: spreading the *marmites* thinly *in* Armit, I, Murphy, E, Nelis, E & Simpson, D *Neolithic Settlement in Ireland and Western Britain* Oxford: Oxbow Books, 3 – 17

Sheridan, A 2004a Archaeological investigations 1773–2003 and beyond: an intriguing steatite urn from Orkney *Orkney Archaeological Trust Daphne Lorimer Tribute Website* accessed online on 18/10/07 at:

http://www.orkneyjar.com/archaeology/dhl/papers/as/index.html

Sheridan, A 2004b Scottish Food Vessel Chronology revisited *in* Gibson, A & Sheridan, A (eds) *From Sickles to Circles Britain and Ireland at the Time of Stonehenge* Stroud: Tempus, 243 – 69

Sheridan A 2004c The National Museums of Scotland Radiocarbon Dating Programmes: Results obtained during 2003/4 *Discovery and Excavation in Scotland* New Series Vol 5, Council for Scottish Archaeology, 174 – 6

Sheridan, A 2004d Neolithic connections along and across the Irish Sea *in* Cummings, V & Fowler, C (eds.) *The Neolithic of the Irish Sea: Materiality and traditions of practice* Oxford: Oxbow Books, 9 – 21

Sheridan, A 2004e Going round in circles? Understanding the Irish Grooved Ware 'complex' in its wider context *in* Roche, H, Grogan, Bradley, J, Coles, J & Raftery, B (eds) *From Megaliths to Metals Essays in Honour of George Eogan* Oxford: Oxbow books 26 – 37

Sheridan, A 2005a Cuween, Cuween-Wideford Project pp177 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 6, Council for Scottish Archaeology, 165 – 81

Sheridan, A 2005b The National Museums Scotland Radiocarbon Dating Programmes: Results obtained during 2004/5 *Discovery and Excavation in Scotland* New Series Vol 6, Council for Scottish Archaeology, 182 – 3

Sheridan, A 2006 The National Museums Scotland Radiocarbon Dating Programmes: Results obtained during 2005/6 *Discovery and Excavation in Scotland* New Series Vol 7, Council for Scottish Archaeology, 204 – 6

Sheridan, A 2007a Dating the Scottish Bronze Age: 'There is clearly much that the material can still tell us' *in* Burgess, C Topping, P & Lynch, F (eds) *Beyond Stonehenge Essays on the Bronze Age in Honour of Colin Burgess* Oxford: Oxbow Books, 162 – 185

Sheridan, A 2007b Scottish Beaker Dates: the good, the bad and the ugly *in* Larsson, M & Parker Pearson, M (eds) *From Stonehenge to the Baltic Living with cultural diversity in the third millennium BC* Oxford: Archaeopress, British Archaeological Report International Series 1692, 91 – 123

Sheridan, A 2007c Radiocarbon dates arranged through the National Museums Scotland during 2006/7 *Discovery and Excavation in Scotland* New Series Vol 8, Archaeology Scotland, 220 – 221

Sheridan, A 2007d Green Treasures from Magic Mountains *British Archaeology* 96, 22 – 7

Sheridan, A 2008 Towards a fuller, more nuanced narrative of Chalcolithic and Early Bronze Age Britain 2500 – 1500 BC *Bronze Age Review* Vol 1, Nov 2008, 57 – 78, accessed 01/12/08 at: www.britishmuseum.org/bronzeagereview/1

Sheridan, A 2010 The Neolithization of Britain and Ireland: the Big Picture *in* Finlayson, B & Warren, G (eds) *Landscapes in Transition* Oxbow, Oxford: 89 – 105

Sheridan, A 2012a A Rumsfeld Reality Check: what we know, what we don't know and what we don't know we don't know about the Chalcolithic in Britain and Ireland *in* Allen, M J, Gardiner, J & Sheridan, A (eds) *Is there a British Chalcolithic? People, place and polity in the late 3rd millennium* Oxford: The Prehistoric Society/Oxbow Books (Prehistoric Society Research Paper no. 4), 40 – 55

Sheridan, A 2012b Neolithic Shetland: a view from the 'mainland' *in* Mahler, D L (ed) *The Border of Farming and the Cultural Markers Short papers from the network meeting in Lerwick, Shetland September 5th – 9th 2011* Copenhagen: The National Museum of Denmark Northern Worlds, 6 – 36

Sheridan, A 2012c Review of Whittle et al 2011 Gathering Time *Antiquity* 86, 262 - 3

Sheridan, A 2013 Plus ca change…? Developments in Shetland, c 2500 – 1800 BC *in* Mahler, D L (ed) *The Border of Farming Shetland and Scandinavia Papers from the Symposium in Copenhagen September 19th – 21st 2012* Copenhagen: The National Museum of Denmark Northern Worlds, 47 – 72

Sheridan, A 2015 Review of Julian Thomas, The Birth of Neolithic Britain: An Interpretive Account *European Journal of Archaeology* 18 (4), 720 – 7

Sheridan, A, Clarke, D & Shepherd, A 2012 Radiocarbon dates for Skara Brae, Orkney *Discovery and Excavation in Scotland* New Series Vol 13, 204 – 5

Sheridan, A, Cowie, T & Hunter, F 2002 National Museums of Scotland Dating Programme: 1994 – 98, pp59 - 61 *in* Bronk Ramsey, C Higham, T F G, Owen, D C, Pike, A W G & Hedges, R E M Radiocarbon dates from the Oxford AMS system: Archaeometry Datelist 31, *Archaeometry* 44 (3), Supplement 1, 1 – 149

Sheridan, A & Davis, M 2002 Investigating jet and jet-like artefacts from prehistoric Scotland: the National Museums of Scotland project *Antiquity* 76, 812 – 25

Sheridan, A, Goldberg, M G, Blackwell, A, Mahler, D, Richards, M, Duffy, P, Gibson, A, Macniven, A & Caldwell, D 2012 Radiocarbon dates associated with the Scottish History and Archaeology Department, National Museums Scotland, 2011/12 *Discovery and Excavation in Scotland* New Series Vol 13, 200 – 02

Sheridan, A & Higham, T 2006 The Redating of some Scottish Specimens by the Oxford Radiocarbon Accelerator Unit (ORAU) *Discovery and Excavation in Scotland* New Series Vol 7, 202 – 4

Sheridan, A & Higham, T 2007 The Redating of some Scottish Specimens by the Oxford Radiocarbon Accelerator Unit (ORAU): Results received during 2007 *Discovery and Excavation in Scotland* New Series Vol 8, 225

Sheridan, A, Kochman, W & Araunaskas R 2003 The grave goods from the Knowes of Trotty, Orkney: reconsideration and replication *in* Downes, J & Ritchie, A (eds) *Sea Change: Orkney and Northern Europe in the later Iron Age AD 300–800,* Balgavies, Angus: The Pinkfoot Press, 176 – 88

Sheridan, A, Pailler, Y, Petréquin, P & Errera, M 2011 Old friends, new friends, a long-lost friend and false friends: Tales from Project JADE *in* Davis, V & Edmonds, M (eds) *Stone Axe Studies III* Oxford & Oakville: Oxbow Books, 411 – 26

Sheridan, A, Woodward, A & Hunter J 2015 Necklaces I: Disc Beads and Spacer Plate Necklaces *in* Woodward, A & Hunter, J *Ritual in Early Bronze Age Grave Goods* Oxford & Philadelphia: Oxbow Books, 261 – 388

Sheridan, J A 1986 Porcellanite Artifacts: A New Survey *Ulster Journal of Archaeology* 49, 19 – 32

Sheridan, J A, Cooney, G & Grogan, E 1992 Stone Axe Studies in Ireland *Proceedings of the Prehistoric Society* 58, 389 – 416

Sherratt, A 1995 Electric gold: re-opening the amber route *Antiquity* 69, 200 – 3

Sherratt, A 1996 Why Wessex? The Avon route and river transport in later British prehistory *Oxford Journal of Archaeology* 15 (2) 211 – 34

Sherratt, A 2001 The Emergence of Elites: Earlier Bronze Age Europe, 2500 – 1300 BC *in* Cunliffe, B (ed) *The Oxford Illustrated History of Prehistoric Europe* Oxford: Oxford University Press 244 – 276

Shirreff, J 1814 *General View of the Agriculture of the Orkney Islands with Observations on the Means of Their Improvement Drawn up for the Consideration of the Board of Agriculture* Edinburgh: Stevenson & Company for Archibald Constable & Co

Siedl, C 2011 Steinbier *in* Oliver, G (ed) *The Oxford Companion to Beer* New York: Oxford University Press, 764 – 5

Silva, A M, Boaventura, R, Ferreira, M T & Marques, R 2012 Skeletal evidence of interpersonal violence from Portuguese Late Neolithic collective burials: an overview *in* Schulting, R & Fibiger, L (eds) *Sticks, Stones & Broken Bones: Neolithic Violence in a European Perspective* Oxford: Oxford University Press, 317 – 40

Simek, R 1993 *Dictionary of Northern Mythology (Trans A. Hall)* Suffolk: D S Brewer

Simpson, D & Ransom, R 1992 Maceheads and the Orcadian Neolithic *in* Sharples, N & Sheridan, A (eds) *Vessels for the Ancestors Essays on the Neolithic of Britain and Ireland in honour of Audrey Henshall* Edinburgh: Edinburgh University Press, 221 – 43

Simpson, D D A 1976 The Later Neolithic and Beaker Settlement Site at Northton, Harris *in* Burgess C & Miket R (eds) *Settlement and Economy in the Third and Second millennium BC* Oxford: British Archaeological Report, British Series 33, 221 – 32

Simpson, D D A 1988 The Stone Maceheads of Ireland *Journal of the Royal Society of Antiquaries of Ireland* 118, 27 – 52

Simpson, D D A 1989 The Stone Maceheads of Ireland: Part II *Journal of the Royal Society of Antiquaries of Ireland* 119, 113 – 26

Simpson, D D A 1990 The Stone Battle Axes of Ireland *Journal of the Royal Society of Antiquaries of Ireland* 120, 5 – 40

Simpson, D D A, Murphy, E M, Gregory, R A & McCarthy, M 2007a Excavation of a double cist burial from Gyre Farm, Orphir, Orkney *Proceedings of the Society of Antiquaries of Scotland* 137, 59 – 68

Simpson, D D A, Murphy, E M, Gregory, R A & McCarthy, M 2007b Excavation at Orquil Souterrain, St. Ola, Orkney *Proceedings of the Society of Antiquaries of Scotland* 137, 169 – 78

Simpson, I A 1985 *Anthropogenic sedimentation in Orkney: The Formation of Deep Top Soils and Farm Mounds* University of Strathclyde PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Simpson, I A 1993 The chronology of anthropogenic soil formation in Orkney *Scottish Geographical Magazine* 109 (1), 4 – 11

Simpson, I A 1994 Spatial constraints on anthropogenic soil formation in Orkney *Scottish Geographical Magazine* 110 (2), 100 – 4

Simpson, I A 1997 Relict properties of anthropogenic deep top soils as indicators of infield management in Marwick, West Mainland, Orkney *Journal of Archaeological Science* 24, 365 – 80

Simpson, I A 1998 Early land management at Tofts Ness, Sanday, Orkney: the evidence of thin section micromorphology in Mills, C M & Coles, G (eds) *Life on the Edge Human Settlement and Marginality* Oxford: Oxbow Books, Oxbow Monograph 100, 91 – 8

Simpson, I A, Bol, R, Dockrill, S J, Pettzke, K-J & Evershed, R P 1997 Compound-specific $\delta^{15}N$ Amino Acid Signals in Palaeosols as indicators of early land use: a preliminary study *Archaeological Prospection* 4, 147 – 52

Simpson, I A, Bol, R, Bull, I D, Evershed, R P, Petzke, K-J & Dockrill, S J 1999 Interpreting Early Land Management Through Compound Specific Stable Isotope Analyses of Archaeological Soils *Rapid Communications in Mass Spectrometry* 13, 1315 – 19

Simpson, I A, Dockrill, S J, Bull, I D & Evershed, R P 1998 Early Anthropogenic Soil Formation at Tofts Ness, Sanday, Orkney *Journal of Archaeological Science* 25, 729 – 46

Simpson, I A, Dockrill, S J, Guttmann, E, Bull, I D & Evershed, R P 2007 Soils and the early cultural landscape *in* Dockrill, S J, Bond, J M, Smith, A N & Nicholson R A *Investigations in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* Kirkwall, Orkney: The Orcadian Ltd, 239 – 253

Simpson, I A, Dockrill, S J & Lancaster, S J 1998 Making Arable Soils: Anthropogenic soil formation in a multi-period landscape *in* Nicholson, R A & Dockrill, S J *Old Scatness Broch, Shetland: Retrospect and Prospect* Bradford: Department of Archaeological Sciences Research 5/North Atlantic Biocultural Organisation Monograph 2, 111 – 26

Simpson, I A, Guttmann, E B, Cluett, J & Shepherd, A 2006 Characterising Anthropic Sediments in North European Neolithic Settlements: An assessment from Skara Brae, Orkney *Geoarchaeology* 21, 221 – 35

Simpson, I A & Wilson, G 2011 [Extract from] Anthropic sediments and Anthrosols at Links of Noltland: the potential for integrated palaeo-landscape interpretations *in* Moore, H & Wilson, G *Shifting Sands Links of Noltland, Westray: Interim Report on Neolithic and Bronze Age Excavations, 2007 – 9* Historic Scotland Archaeology Report No. 4, 75 – 6

Simpson, F G & Richmond, I A 1934 Birdoswald (Report of the Cumberland Excavation Committee for 1933) *Transactions of the Cumberland and Westmorland Antiquarian & Archaeological Society* 34, 120 – 30

Simpson, W D 1954 The Broch of Clickhimin *in* Simpson, W D (ed) *The Viking Congress Lerwick, July 1950* Edinburgh & London: Oliver & Boyd for the University of Aberdeen, 19 – 45

Sinclair, J 1795 *General view of the agriculture of the northern counties and islands of Scotland; including the counties of Cromarty, Ross, Sutherland, and Caithness, and the islands of Orkney and Shetland. With observations on the means of their improvement* London: Colin MacRae

Slater, A, Brittain, M, Evans, C & Sharples, N 2012 *Excavations at Ham Hill, Somerset 2011* Cambridge: Cambridge Archaeological Unit University of Cambridge CAU Report No. 1101

Small, A 1969 Burghead *Scottish Archaeological Forum* 1, 61 – 8

Small, A 1972 Shetland Ness of Sound Burnt Mound *Discovery and Excavation in Scotland*, Scottish Regional Group, Council for British Archaeology, 38

Small, J (ed) 1883 *A Description of the Isles of Orkney by The Rev. James Wallace, Minister of Kirkwall reprinted from the Original Edition of 1693, with Illustrative Notes, from an interleaved copy in the Library of the University of Edinburgh, formerly the property of Malcolm Laing, the Scottish Historian, together with the additions made by the Author's Son, in the Edition of 1700* Edinburgh: William Brown

Smellie, G 1845 Parish of St. Andrews *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy*, *Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 169 – 90 of the Orkney section (volume not continuously numbered)

Smellie, W 1782 An Historical Account of the Society of Antiquaries of Scotland *Archaeologia Scotica: or Transactions of the Society of Antiquaries of Scotland* 1, iii - xiii

Smith, A 1845 Addition to the account of Holme and Paplay *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy, Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 218 – 27 of the Orkney section (volume not continuously numbered)

Smith, A N 1998 The worked bone and antler in Sharples, N *Scalloway A Broch, Late Iron Age Settlement and Medieval Cemetery in Shetland* Oxford: Oxbow Books, Oxbow Monograph 82, 110 – 11

Smith, A N 2007a The Artefacts: Introduction *in* Dockrill, S J, Bond, J M, Smith, A S & Nicholson, R A Investigations *in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* The Orcadian Ltd, Kirkwall, Orkney, 257 – 9

Smith, A N 2007b The Steatite *in* Dockrill, S J, Bond, J M, Smith, A S & Nicholson, R A Investigations *in Sanday, Orkney Vol 2: Tofts Ness, Sanday An island landscape through 3000 years of prehistory* The Orcadian Ltd, Kirkwall, Orkney, 285 – 88

Smith, A N & Forster, A 2007 Steatite *in* Hunter, J, Bond, J M & Smith, A N 2007 *Investigations in Sanday, Orkney Vol 1: Excavations at Pool, Sanday A multi-period site from Neolithic to Late Norse times* Kirkwall, Orkney: The Orcadian Ltd, 412 – 33

Smith, B 2001 The Picts and the Martyrs or Did Vikings Kill the Native Population of Orkney and Shetland? *Northern Studies* 36, 7 – 32

Smith, B, Budge, W & Budge, K 1988 North Links (S Ronaldsay Parish) Prehistoric settlement site *Discovery and Excavation in Scotland* Council for Scottish Archaeology, 29

Smith, C 1998 Dogs, cats and horses in the Scottish medieval town *Proceedings of the Society of Antiquaries of Scotland* 128, 859 – 85

Smith, C 2007 Animal Bone pp 38 – 9 *in* Toolis, R Excavation of a burnt mound at Meur, Sanday, Orkney *Scottish Archaeological Journal* Vol 29 (1), 31 – 49

Smith, C, Hodgson, G W I, Armitage, P, Clutton-Brock, J, Dickson, C, Holden, T & Ballin Smith, B 1994 Animal Bone Report *in* Ballin Smith, B (ed) *Howe: Four Millennia of Orkney Prehistory* Edinburgh: Society of Antiquaries of Scotland, Monograph Series 9, 139 – 53

Smith, C R (ed) 1856 *Inventorium Sepulchrale: An Account of Some Antiquities dug up at Gilton, Kingston, Sibertswold, Barfriston, Beaksbourne, Chartham, and Crundale, in the County of Kent from AD 1757 to AD 1773 by the Rev. Bryan Faussett of Heppington Edited from the Original Manuscripts in the Possession of Joseph Mayer, Esq, with Notes and Introduction* London: T Richards, Queen St.

Smith, D E, Shi, S, Cullingford, R A, Dawson, A G, Dawson, S, Firth, C R, Foster, I D L, Fretwell, P T, Haggarte, B A, Holloway, L K & Long, D 2004 The Holocene Storegga Slide tsunami in the United Kingdom *Quaternary Science Reviews* 23, 2291 – 2321

Smith, D N, Fletcher, M, Head, K, Smith, W & Howard, A J 2010 Environmental reconstruction of a later prehistoric palaeochannel record from Burrs Countryside Park, Bury, Greater Manchester *Environmental Archaeology* 15 (1), 16 – 31

Smith, G 1988 Excavation of the Iron Age Cliff Promontory Fort and of Mesolithic and Neolithic flint-working areas at Penhale Point, Holywell Bay, near Newquay, 1983 *Cornish Archaeology* 27, 171 – 99

Smith, H & Mulville, J 2004 Resource Management in the Outer Hebrides: an assessment of the faunal and floral evidence from archaeological investigations *in* Housley, R A & Coles, G (eds) *Atlantic Connections and Adaptations Economies, environments and subsistence in lands bordering the North Atlantic* Oxford: Oxbow Books, 48 – 64

Smith, H D 1984 *Shetland Life and Trade 1550 – 1914* Edinburgh: John Donald Publishers

Smith I F 1979 The chronology of British Stone Implements *in* Clough, T H McK & Cummins, W A *Stone axe studies Archaeological, petrological, experimental, and ethnographic* London: Council for British Archaeology Research Report 23, 13 – 22

Smith, J 1843 *Remarks on Drainage and Deep Ploughing Sixth Edition, with notes* Stirling: W Drummond & Sons

Smith, J A 1859 Notice of bronze relics & C. found in the Isle of Skye *Proceedings of the Society of Antiquaries of Scotland* 3, 101 – 6

Smith, J A 1872 Notice of a cinerary urn, containing a small-sized urn (in which were the bones of a child), discovered in Fifeshire; with notes of similar small and cup-like vessels, in the museum of the Society of Antiquaries of Scotland *Proceedings of the Society of Antiquaries of Scotland* 9 (1870 – 72), 189 – 207

Smith, J A 1883 Notes on some Stone Implements, & co, from Shetland, now presented to the Museum *Proceedings of the Society of Antiquaries of Scotland* 17 (1882 – 3), 291 – 9

Smith, K, Coppen, J, Wainwright, G J & Beckett, S 1981 The Shaugh Moor Project: Third Report – Settlement and Environmental Investigations *Proceedings of the Prehistoric Society* 47, 205 – 73

Smith, M, Brickley, M, & Leach, S 2007 Experimental evidence for lithic projectile injuries: Improving identification of an under-recognised phenomenon *Journal of Archaeological Science* 34, 540 – 53

Smith, M J, Brickley, M B & Leach, S 2011 A shot in the dark? Interpreting evidence for prehistoric conflict *in* Saville, A (ed), *Flint and Stone in the Neolithic Period* Oxbow Books: Oxford, 256 – 70

Smits, E 2012 Interpersonal violence in the Late Mesolithic and Middle Neolithic in the Netherlands *in* Schulting, R & Fibiger, L (eds) *Sticks, Stones & Broken Bones: Neolithic Violence in a European Perspective* Oxford: Oxford University Press, 191 – 206

Smits, E & Maat, G 1993 An Early/Middle Bronze Age common grave at Wassenaar, the Netherlands. The physical anthropological results *Analecta Praehistorica Leidensia* 26, 21 – 28

Snoeck, C, Brock, F & Schulting, R 2014 Carbon exchanges between bone apatite and fuels during cremation: impact on radiocarbon dates *Radiocarbon* 56, 2, 591 – 602

Sommerville, A A 2003 *Luminescence dating of wind blown sands from archaeological sites in Northern Scotland* University of Glasgow PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Sommerville, A A, Hansom, J D, Housley, R A & Sanderson D C W 2007 Optically stimulated luminescence (OSL) dating of coastal aeolian sand accumulation in Sanday, Orkney Islands, Scotland *The Holocene* 17 (5), 627 – 37

Sørheim, H 2004 Lead mortuary crosses found in Christian and heathen graves in Norway *Mediaeval Scandinavia* 14, 195 – 227

Spence, J 1915 The Kirk of Kirkgoe and the Picky Dykes of Birsa, Orkney *Viking Society for Northern Research: Old Lore Miscellany of Orkney Shetland Caithness and Sutherland* 8, 87 – 94

Spence, J 1925 Life and Work in Moorland Orcadia in Days of Old *Proceedings of the Orkney Antiquarian Society* Vol II, 77 – 82

Spence, M 1903 Report of the District Secretary for Deerness: Deerness Kirk; Mound-Diggings at St. Marys, Holm; Pict's House *Saga Book of the Viking Club Society for Northern Research* III, 312 – 8

Spence, P F 1981 An Eye-witness Account of the Division of the Birsay Commons *Orkney Heritage* 1, Kirkwall, Orkney Heritage Society

Speranza, A, van Geel, B and van der Plicht, J, 2002 Evidence for solar forcing of climate change at ca 850 cal BC from a Czech peat sequence *Global and Planetary Change* 35, 51 – 65

Speth, J D & Spielmann, K A 1983 Energy Source, Protein Metabolism and Hunter-Gatherer Subsistence Strategies *Journal of Anthropological Archaeology* 2, 1 – 31

Stafford, M 1998 In search of Hindsgavl: experiments in the production of Neolithic Danish flint daggers *Antiquity* 72, 338 – 49

Stafford, M 2003 The parallel-flaked flint daggers of late Neolithic Denmark: an experimental perspective *Journal of Archaeological Science* 30, 1537 – 50

Stanley, J-D, Krom, M D, Cliff, R A & Woodward, J C 2003 Short Contribution: Nile Flow Failure at the End of the Old Kingdom, Egypt: Strontium Isotopic and Petrologic Evidence *Geoarchaeology: An International Journal*, Vol. 18, No. 3, 395 – 402

Starkey, D 2007 Making History *in* Gaimster, D, McCarthy, S & Nurse, B (eds) *Making History Antiquaries in Britain 1707 – 2007* London: Royal Academy of Arts, 11 – 13

Staubwasser, M, Sirocko, F, Grootes, P M & Segl, M 2003 Climate change at the 4.2 ka BP termination of the Indus valley civilization and Holocene south Asian monsoon variability *Geophysical Research Letters* 30, 1425, doi:10.1029/2002GL016822

Stead, I M 1986 Excavation and Examination *in* Stead, I M, Bourke, J B & Brothwell, D 1986 *Lindow Man The Body in the Bog* British Museum Publications, London, 14 – 16

Stead, I M, Bourke, J B & Brothwell, D 1986 *Lindow Man The Body in the Bog* London: British Museum Publications

Steedman, K A 1986 The Archaeology of the Deerness Peninsula, fiche 2, A5 – C2 *in* Morris, C D & Emery N 1986 The Chapel and enclosure on the Brough of Deerness, Orkney: survey and excavations, 1975 – 1977 *Proceedings of the Society of Antiquaries of Scotland* 116, 301 – 74, fiche 2: A1 – 4: G7

Stevens C E 1951 Claudius and the Orcades *The Classical Review* New Series Vol 1 (1), 7 – 9

Stevens, C J & Fuller, D Q 2012 Did Neolithic farming fail? The case for a Bronze Age agricultural revolution in the British Isles *Antiquity* 86, 707 – 22

Stevens, T, Melikian, M & Grieve, S J 2005 Excavations at an early medieval cemetery at Stromness, Orkney *Proceedings of the Society of Antiquaries of Scotland* 135, 371 – 93

Stevenson, J B 1975 Survival and Discovery *in* Evans, J G, Limbrey, S & Cleere, H (eds) 1975 *The effect of man on the landscape: the Highland zone* London: Council for British Archaeology Research Report 11, 104 – 8

Stevenson, J B 1980 Tofts Ness Fieldwork 1980 *in* Lamb, R G 1980 *The archaeological sites and monuments of Sanday and North Ronaldsay, Orkney Islands Area*, The archaeological sites and monuments of Scotland series No. 11, Edinburgh: Royal Commission on the Ancient and Historical Monuments of Scotland, 33 & Sheet 3

Stevenson, R B K 1946 Jottings on Early Pottery *Proceedings of the Society of Antiquaries of Scotland* 80, 141 – 3

Stevenson, R B K 1958 A Wooden Sword of the Late Bronze Age *Proceedings of the Society of Antiquaries of Scotland* 91, 191 – 3

Stewart, W B & Dawkins, W B 1914 Note on a further excavation of ancient dwellings at Skara, in the parish of Sandwick, Orkney, made during August 1913, *Proceedings of the Society of Antiquaries of Scotland* 48, 344 – 55

Stokes, P R G 2000 The butcher, the cook and the archaeologist *in* Huntley, J P & Stallibrass, S *Taphonomy and Interpretation* Symposia of the Association for Environmental Archaeology No. 14, Oxford: Oxbow Books, 65 – 70

Stothers, R B 1999 Volcanic dry fogs, climate cooling, and plague pandemics in Europe and the Middle East *Climatic Change* 42, 713 – 23

Strachan, R, Ralston, I & Finlayson, B 1998 Neolithic and later prehistoric structures, and early medieval metal-working at Blairhill Burn, Amisfield, Dumfriesshire *Proceedings of the Society of Antiquaries of Scotland* 128, 55 – 94

Strickland, J 2014 *Kirkwall Health Campus - Scapa Road Site Kirkwall Orkney* Archaeological Evaluation Data Structure Report Unpublished report, ORCA, Project No: 492

Stuart, J 1866 Account of the Recent Examination of a Cairn, called 'Cairngreg,' on the Estate of Linlathen *Proceedings of the Society of Antiquaries of Scotland* 6, 98 – 103

Stukeley, W 1724 *Itinerarium Curiosum: Or, An account of the Antiquities, And remarkable Curiosities in Nature or art, Observed in travels through Great Britain* London: privately printed

Stukeley, W 1740 *Stonehenge A Temple Restor'd to the British Druids* London: Innys & Manby

Stukeley, W 1743 *Abury A Temple Restor'd to the British Druids* London: Innys & Manby

Stukeley, W 1776 *Itinerarium Curiosum: Or, An account of the Antiquities, And remarkable Curiosities in Nature or art, Observed in travels through Great Britain* London: Baker & Lee, 2 volumes, 2nd edition

Suddaby, I & Sheridan, J A 2006 A pit containing an undecorated Beaker and associated artefacts from Beechwood Park, Raigmore, Inverness *Proceedings of the Society of Antiquaries of Scotland* 136, 77 – 88

Sullivan, A P, Cook, R A, Purtill, M P & Uphus, P M 2001 Economic and Land-Use Implications of Prehistoric Fire-Cracked-Rock Piles, Northern Arizona *Journal of Field Archaeology* 28 (3/4), 367 – 82

Summers, M 1996 *Malleus Maleficarum The classic study of witchcraft Heinrich Kramer & James Sprenger translated with an introduction, bibliography & notes by Montague Summers* London: Bracken Books (reprint of 1928 edition)

Sumner, H 1917 *The Ancient Earthworks of the New Forest* London: Chiswick Press

Sutcliff, A E 1975 *North Coast of Scotland Pilot* Somerset: Hydrographer of the Navy

Suetonius *The Lives of the Twelve Caesars* An unexpurgated English Version edited with notes and an introduction by Joseph Gavorse, 1931, New York: The Modern Library

Sweet, R 2004 *Antiquaries The Discovery of the Past in Eighteenth-Century Britain* London & New York: Hambledon & London

Swindles, G T, Blundell, A, Roe, H M and Hall, V A 2010 A 4500-year proxyclimate record from peatlands in the North of Ireland: the identification of widespread summer 'drought phases'? *Quaternary Science Reviews* 29, 1577 – 89

Swindles, G T, Lawson, I T, Matthews, I P, Blaauw, M, Daley, T J, Charman, D J, Roland, T P, Plunkett, G, Schettler, G, Gearey, B R, Turner, T E, Rea, H A, Roe, H M, Amesbury, M J, Chambers, F M, Holmes, J, Mitchell, F J G, Blackford, J, Blundell, A, Branch, N, Holmes, J, Langdon, P, McCarroll, J, McDermott, F, Oksanen, P O, Pritchard, O, Stastney, P, Stefanini, B, Young, D, Wheeler, J, Becker, K & Armit, I 2013 Centennial-scale climate change in Ireland during the Holocene *Earth-Science Reviews* 126, 300 – 20

Swindles, G T, Plunkett, G and Roe, H M 2007a A multiproxy climate record from a raised bog in County Fermanagh, Northern Ireland: a critical examination of the link between bog surface wetness and solar variability *Journal of Quaternary Science* 22, (7), 667 – 79

Swindles, GT, Plunkett, G and Roe, H, 2007b A delayed climatic response to solar forcing at 2800 cal BP: multi-proxy evidence from three Irish peatlands *The Holocene* 17, 177 – 82

Symon, J A 1959 *Scottish Farming Past and Present* Edinburgh: Oliver and Boyd

Symonds, M 2016 Must Farm An extraordinary tale of everyday life *Current Archaeology* 319, 12 – 18

Tasker, C M K 1975 Appendix IV Environment – soils pp88 – 90 *in* Hedges, J W Excavation of two Orcadian burnt mounds at Liddle and Beaquoy, *Proceedings of the Society of Antiquaries of Scotland* 106, 39 – 99

Taylor, A B, 1938 *The Orkneyinga Saga. A new translation with introduction and notes*, Edinburgh & London: Oliver & Boyd

Taylor, J J 1980 *Bronze Age Goldwork of the British Isles* Cambridge: Cambridge University Press (Gulbenkian Archaeology Series)

Taylor, J J 1981 Maiden Castle, Bickerton Hill (hillfort excavation summary) *Cheshire Archaeological Bulletin* 7, 34 – 6

Taylor, J J 1983 An Unlocated Scottish Gold ore Source or an Experiment in Alloying? *in* O'Connor, A & Clarke, D V (eds) *From the Stone Age to the 'Forty-Five Studies presented to R B K Stevenson* Edinburgh: John Donald Publishers, 57 – 64

Taylor, M 1992 Flag Fen: the wood *Antiquity* 66, 476 – 98

Taylor, M 2001 The Wood *in* Pryor, F *The Flag Fen Basin Archaeology and Environment of a Fenland Landscape* Swindon: English Heritage, 167 – 228

Terrell, J E 2008 Islands and the Average Joe *Journal of Island and Coastal Archaeology* 3, 77 – 82

Terry, J 1995 Excavation at Lintshie Gutter Unenclosed Platform Settlement, Crawford, Lanarkshire, 1991 *Proceedings of the Society of Antiquaries of Scotland* 125, 369 – 427

Teschler-Nicola, M 2012 The Early Neolithic site Asparn/Schletz (Lower Austria): anthropological evidence of interpersonal violence *in* Schulting, R & Fibiger, L

(eds) *Sticks, Stones & Broken Bones: Neolithic Violence in a European Perspective Oxford*: Oxford University Press, 101 – 20

Thaw (neé Haynes), S, Jaarola, M, Searle, J B & Dobney, K M 2004 The Origins of the Orkney Vole *Microtus arvalis orcadensis*: a proxy for constructing human movements *in* Housley, R A & Coles, G (eds) *Atlantic Connections and Adaptations Economies, environments and subsistence in lands bordering the North Atlantic* Oxford: Oxbow Books, 114 – 19

Thelin, V H 2007 *Were burnt mounds derived from prehistoric copper production activities?* University of Durham MPhil Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Thomas, A 2007 The Braes of Ha'Breck, Wyre, Excavation *Discovery and Excavation in Scotland* New Series Vol 8, Council for Scottish Archaeology, 143 – 4

Thomas, A 2008 The Braes of Ha'Breck, Wyre, Orkney, Excavation *Discovery and Excavation in Scotland* New Series Vol 9, Council for Scottish Archaeology, 131 – 2

Thomas, A 2009 The Braes of Ha'Breck, Wyre, Excavation *Discovery and Excavation in Scotland* New Series Vol 10, Council for Scottish Archaeology, 134 – 5

Thomas, A 2010 The Braes of Ha'Breck, Wyre, Excavation *Discovery and Excavation in Scotland* New Series Vol 11, Council for Scottish Archaeology, 121 – 3 & illus. top left back cover

Thomas, A 2011 The Braes of Ha'Breck, Wyre, Excavation *Discovery and Excavation in Scotland* New Series Vol 12, Council for Scottish Archaeology, 134 – 6

Thomas, A 2016 *Art and Architecture in Neolithic Orkney Process, Temporaility and Context* Oxford: Archaeopress

Thomas, F W L 1852 An account of some of the Celtic Antiquities of Orkney, including the Stones of Stenness, Tumuli, Picts-Houses, & co. with plans *Archaeologia* 34, 88 – 136

Thomas, F W L 1866 Notice of two bronze swords, recently found under moss at South Uist *Proceedings of the Society of Antiquaries of Scotland* 6, 252 – 3

Thomas, F W L 1868 On the Primitive Dwellings and Hypogea of the Outer Hebrides *Proceedings of the Society of Antiquaries of Scotland* 7, 153 – 95

Thomas, F W L 1882 What is a Pennyland? Or Ancient Valuation of Land in the Scottish Isles *Proceedings of the Society of Antiquaries of Scotland* 18, 253 – 85

Thomas, F W L 1890 On the Duns of the Outer Hebrides *Archaeologia Scotica Transactions of the Society of Antiquaries of Scotland* 5, part III, 365 – 415 & plates XLVII – LIII

Thomas, J 1991 *Rethinking the Neolithic* Cambridge: Cambridge University Press

Thomas, J 1996 Neolithic houses in mainland Britain and Ireland—a sceptical view *in* Darvill, T & Thomas, J(eds) *Neolithic houses in northwest Europe and beyond* Oxford: Oxbow books, 1 – 12

Thomas, J 1999 *Understanding the Neolithic* London and New York: Routledge

Thomas, J 2004 Current debates on the Mesolithic-Neolithic Transition in Britain and Ireland *Documenta Praehistorica* 31, 113 – 30

Thomas, P A & Polwart, A 2003 Biological Flora of the British Isles List Br. Vasc. Pl. (1958) no. 35, 1 *Taxus baccata* L. *Journal of Ecology* 91, 489 – 524

Thompson, L G, Mosley-Thompson, E, Davis, M E, Henderson, K A, Brecher, H H, Zagorodnov, V S, Mashiotta, T A, Lin, P-N, Mikhalenko, V N, Hardy, D R & Beer, J 2002 Kilimanjaro Ice Core Records: Evidence of Holocene Climate Change in Tropical Africa *Science* 298, 589 – 93

Thompson, S 1955 – 58 *Motif-Index of Folk-Literature Revised & Enlarged Edition* Copenhagen: Rosenkilde & Bagger, Six volumes published between 1955 & 1958

Thoms, A V 2008 The fire-stones carry: ethnographic records and archaeological expectations for hot-rock cookery in western North America *Journal of Anthropological Archaeology* 27, 443 – 60

Thoms, A V 2009 Rocks of ages: propagation of hot-rock cookery in western North America *Journal of Archaeological Sciences* 36 573 – 91

Thomson, W P L 1981a Common Land in Orkney *in* Thomson, W P L (ed) *Orkney Heritage* 1, Kirkwall, Orkney: Orkney Heritage Society, 73 – 91

Thomson, W P L 1981b *The Little General and the Rousay Crofters Crisis and Conflict on an Orkney Estate* Edinburgh: John Donald

Thomson, W P L 1983 *Kelp-making in Orkney* Kirkwall, Orkney: The Orkney Press

Thomson, W P L 1995 The landscape of Medieval Birsay *in* Crawford, B E (ed) *Northern Isles Connections Essays from Orkney & Shetland presented to Per Sveas Andersen* Kirkwall, Orkney: The Orkney Press, Kirkwall, 47 – 75

Thomson, W P L 1996 *Lord Henry Sinclair's 1492 Rental of Orkney* Kirkwall, Orkney: The Orkney Press

Thomson, W P L 2001 *The New History of Orkney* Edinburgh: Mercat Press

Thomson, W P L 2013 *Orkney Crofters in Crisis* Kirkwall: The Orcadian (Kirkwall Press)

Thurnam, J 1869 On Ancient British Barrows, especially those of Wiltshire and the adjoining counties (Part I Long Barrows) *Archaeologia* 42, 161 – 224

Thurnam, J 1871 On Ancient British Barrows, especially those of Wiltshire and the adjoining counties (Part II Round Barrows) *Archaeologia* 43, 285 – 552

Tilley, C 2004b Round barrows and dykes as landscape metaphors *Cambridge Archaeological Journal* 14 (2), 185 – 203

Timberlake, S 2003 Early Mining Research in Britain: The Developments of the Last Ten Years *in* Craddock, P & Lang, S (eds) *Mining and Metal Production Through The Ages* London: The British Museum Press, 21 – 42

Timperley, L 1980 The Pattern of Landholding in Eighteenth Century Scotland *in* Parry, M L & Slater, T R (ed) *The Making of the Scottish Countryside* London: Croom Helm

Tipping, R 1994 The form and fate of Scotland's woodlands *Proceedings of the Society of Antiquaries of Scotland* 124, 1 – 54

Tipping, R 1995 Holocene evolution of a lowland Scottish landscape: Kirkpatrick Fleming. Part 1, peat and pollen-stratigraphic evidence for raised moss development and climate change *The Holocene* 5 (1), 69 – 81

Tipping, R 1998 Fine-Resolution Pollen Analyses across the Soil/Peat Boundary within House 3 *in* McCullagh, R P J & Tipping, R (eds) *The Lairg Project 1988 – 1996 The Evolution of an Archaeological Landscape in Northern Scotland* Edinburgh: Scottish Trust for Archaeological Research, 161 – 5

Tipping, R 2002 Climatic Variability and 'Marginal' Settlement in Upland British landscapes: A Re-Evaluation *Landscapes* 3 (2) 10 – 28

Tipping, R 2008 Blanket peat in the Scottish Highlands: timing, cause, spread and the myth of environmental determinism *Biodiversity & Conservation* 17, 2097 – 2113

Tipping, R 2010 *Bowmont An Environmental History of the Bowmont Valley and Northern Cheviot Hills 10000 BC – AD 2000* Edinburgh: Society of Antiquaries of Scotland

Tipping R, Ashmore P, Davies A, Haggart A, Moir A, Newton A, Sands R, Skinner T, Tisdall E 2007 Peat, pine stumps & people: interactions behind climate, vegetation change and human activity in wetland archaeology at Loch Farlary, northern Scotland *in* Barber J, Clark, C, Cressey, M, Crone, A, Hale, A, Henderson, J, Housley, R, Sands, R & Sheridan, A (eds) *Archaeology from the wetlands:recent perspectives Proceedings of the 11th WARP Conference, Edinburgh 2005 (WARP Occasional Paper 18)* Edinburgh: Society of Antiquaries of Scotland, 157 – 64

Tipping, R, Ashmore, P, Davies, A L, Haggart, B A, Moir, A, Newton, A, Sands, R, Skinner, T & Tisdall, E 2008 Prehistoric Pinus woodland dynamics in an upland landscape in northern Scotland: the roles of climate change and human impact *Vegetation History and Archaeobotany* 17, 251 – 67

Tipping, R, Bradley, R, Sanders, J, McCulloch, R & Wilson, R 2012 Moments of Crisis: climate change in Scottish prehistory *Proceedings of the Society of Antiquaries of Scotland* 142, 9 – 25

Tipping, R, Davies, A, McCulloch, R and Tisdall, E 2008 Response to late Bronze Age climate change of farming communities in north east Scotland *Journal of Archaeological Science* 35, 2379 – 86

Tipping R, Davies A, Tisdall E 2006 Long-term woodland dynamics in West Glen Affric, northern Scotland *Forestry* 79, 351 – 59

Tipping, R & McCullagh, R 1998 Chapter 7: A Dynamic Landscape *in* McCullagh, R P J & Tipping, R (eds) *The Lairg Project 1988 – 1996 The Evolution of an Archaeological Landscape in Northern Scotland* Edinburgh: Scottish Trust for Archaeological Research, 202 – 14

Tipping, R, Tisdall, E, Davies, A, Wilson, C & Yendell, S 2007 Living with peat in the flow country: prehistoric farming communities and blanket peat spread at Oliclett, Caithness, northern Scotland *in* Barber J, Clark, C, Cressey, M, Crone, A, Hale, A, Henderson, J, Housley, R, Sands, R & Sheridan, A (eds) *Archaeology from the wetlands: recent perspectives Proceedings of the 11th WARP Conference, Edinburgh 2005 (WARP Occasional Paper 18)* Edinburgh: Society of Antiquaries of Scotland, 165 – 73

Tisdall, E W, McCulloch, R D, Sanderson, D C W, Simpson, I A & Woodward, N L 2013 Living with sand: A record of landscape change and storminess during the Bronze and Iron Ages Orkney, Scotland *Quaternary International* 308 – 9, 205 – 15

Todd, T N The aerodynamics of carved stone balls *Proceedings of the Society of Antiquaries of Scotland* 136, 61 – 74

Toolis, R 2004 Geroin, Harray, Birsay and Harray Parish, Cist burial *Discovery and Excavation in Scotland* New Series Vol 5, Council for Scottish Archaeology, 95

Toolis, R 2005a *Historic Scotland Call-Off Contract Excavation at Meur, Sanday, Orkney Data Structure Report* Unpublished report for Historic Scotland

Toolis, R 2005b Geroin, Harray pp177 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, New Series Vol 6, Council for Scottish Archaeology, 165 – 81

Toolis, R 2007a Excavation of a burnt mound at Meur, Sanday, Orkney *Scottish Archaeological Journal* Vol 29 (1), 31 – 49

Toolis, R 2007b Intermittent occupation and forced abandonment: excavation of an Iron Age promontory fort at Carghidown, Dumfries and Galloway *Proceedings of the Society of Antiquaries of Scotland* 137, 265 – 317

Toolis, R 2008 Excavation of medieval graves at St. Thomas' Kirk, Hall of Rendall, Orkney *Proceedings of the Society of Antiquaries of Scotland* 138, 239 – 66

Torfaeus, T 1697 *Orcades Seu Rerum Orcadensium Historiae* Copenhagen: University Press (Havniae: Literis Justini Hög, Universit. Typogr.)

Towers, J, Montgomery, J, Evans, J, Jay, M & Parker Pearson, M 2010 An investigation of the origins of cattle and aurochs deposited in the Early Bronze Age barrows at Gayhurst and Irthlingborough *Journal of Archaeological Science* 37, 508 – 15

Towers, R 2010 *Orcadian Pottery of the Iron Age: Technology, Function and Change* Unpublished MPhil thesis, University of Aberdeen

Towers, R, Card, N & Edmonds, M 2015 *The Ness of Brodgar* Kirkwall: The Ness of Brodgar Trust

Towers, R, Card, N & Edmonds, M 2017 *The Ness of Brodgar Digging Deeper* Kirkwall: The Ness of Brodgar Trust

Towrie, S 2013 *Prehistoric walled complex revealed on Firth farmland* downloaded 28/11/14 at http://www.orkneyjar.com/archaeology/2013/04/25/prehistoric-walled-complex-revealed-on-firth-farmland/

Towrie, S 2015 *Scale of Sanday Bronze Age Discovery unparalleled in Orkney* downloaded 12/12/15 at: http://www.orkneyjar.com/archaeology/2015/12/10/scale-of-sanday-bronze-age-discovery-unparalleled-in-orkney/

Towsey, K (ed) 2002 *Orkney and the Sea: an oral history* Kirkwall, Orkney: Orkney Heritage

Toynbee, P 1904 (ed) *The Letters of Horace Walpole Fourth Earl of Orford* Vol XII, 1781 – 1783, Oxford: The Clarendon Press

Traill, W 1845 Parish of Lady *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy*, *Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 133 – 48 of the Orkney section (volume not continuously numbered)

Traill, W 1868 General remarks on the dwellings of the pre-historic races in Orkney; with a special notice of the Pict's House of Skerrabrae, in the parish of Sandwick, showing the present state of the excavations lately made there, *Proceedings of the Society of Antiquaries of Scotland* 7, 426 – 39

Traill, W 1876 Notice of Two Cists on The Farm of Antabreck, North Ronaldsay, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 11, 309 – 10

Traill, W, 1880 Results of Excavations at the Broch of Burrian, N Ronaldsay, Orkney, during the summers of 1870 and 1871, *Archaeologia Scotica Transactions of the Society of Antiquaries of Scotland* 5, part II, 341 – 64

Traill, W 1885 Notice of Excavations at Stenabreck and Howmae in N. Ronaldsay, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 19, 14 – 33

Traill, W & Kirkness, W 1937 Hower, a Prehistoric Structure on Papa Westray, Orkney *Proceedings of the Society of Antiquaries of Scotland* 71, 309 – 321

Tresset, A 2002 De la mer au bétail en domaine atlantique: unité et diversité des processus l'apparition de l'élevage à la marge nord-ouest de l'Europe *Anthropozoologica* 36, 13 – 35

Tresset, A 2003 French Connections II: of cows and men *in* Armit, I, Murphy, E, Nelis, E & Simpson, D *Neolithic Settlement in Ireland and Western Britain* Oxford: Oxbow Books, 18 – 30

Trigger, B 1980 *Gordon Childe Revolutions in Archaeology* New York: Columbia University Press

Tucker, F C 2010 *Woven Into the Stuff of Other Men's Lives: The Treatment of the Dead in Iron Age Atlantic Scotland* University of Bradford PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Tudor, J R 1883 *The Orkneys and Shetland; Their Past and Present State* London: Edward Stanford

Tulloch, P A 1974 *A Window on North Ronaldsay* Kirkwall: The Kirkwall Press

Turner, E T, Swindles, G T, Charman, D J & Blundell, A 2013 Comparing regional and supra-regional transfer functions for palaeohydrological reconstruction from Holocene peatlands *Palaeogeography, Palaeoclimatology, Palaeoecology* 369 395 – 408

Turner, R C 1995a Recent Research into British Bog Bodies *in* Turner, R C & Scaife, R G (eds) *Bog Bodies New Discoveries and New Perspectives* London: British Museum Press, 108 – 22

Turner, R C 1995b Gazetteer of Bog Bodies in the British Isles: Britain *in* Turner, R C & Scaife, R G (eds) *Bog Bodies New Discoveries and New Perspectives* London: British Museum Press, 205 – 20

Turner, R C & Briggs, C S 1986 The Bog Burials of Britain and Ireland in Stead, I M, Bourke, J B & Brothwell, D (eds) *Lindow Man The Body in the Bog* London: British Museum Publications, 144 – 61

Turner, R C & Scaife, R G (eds) 1995 *Bog Bodies New Discoveries and New Perspectives* London: British Museum Press

Turner, V E 2012 *Location, Form and Function in Shetland's Prehistoric Field Systems* University of Stirling PhD thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Turner, V E, Chrystall, F, Simpson, I A & Guttmann, E 2004 Form and Function in Shetland Prehistoric Field Systems *in* Housley, R A & Coles, G (eds) *Atlantic Connections and Adaptations Economies, environments and subsistence in lands bordering the North Atlantic* Oxford: Oxbow Books, 120 – 7

Turner, V E, Guttmann-Bond, E B A, Burbidge, C I & Simpson, I A 2015 Section 6.9 Old Scatness: the Iron Age anthrosols *in* Dockrill, S J, Bond, J M, Turner, V E, Brown, L D, Bashford, D J, Cussans, J E M & Nicholson R A *Excavations at Old Scatness, Shetland Volume 2: The Broch and Iron Age Village* Lerwick: Shetland Heritage Publications, 292 – 301

Turner, V E, Nicholson, R A, Dockrill, S J & Bond, J M (eds) 2005 *Tall Stories? Two millennia of brochs* Lerwick: Shetland Amenity Trust

Turner, W 1903 An Account of a Chambered Cairn and Cremation Cists at Taversoe Tuick, near Trumland House, in the Island of Rousay, Orkney, excavated by Lieutenant-General Traill Burroughs, C. B. of Rousay, in 1898, *Proceedings of the Society of Antiquaries of Scotland* 37, 73 – 82

Turney, C S M, Baillie, M, Palmer, J and Brown, D 2006 Holocene climate change and past Irish societal response *Journal of Archaeological Science* 33, 34 – 8

Turville-Petre, E O G 1964 *Myth and Religion of the North The Religion of Ancient Scandinavia* London: Wiedenfeld & Nicholson

Ucko, P J 1969 Ethnography and Archaeological Interpretation of Funerary Remains *World Archaeology* 1 (2), 262 – 80

UHIAI 2009 *The Bere Plant* accessed on 14/02/09 at: http://www.agronomy.uhi.ac.uk/html/Bere_research.htm

UNESCO 1999 *Decision of the World Heritage Committee: Excerpt from the Report of the 23rd Session of the World Heritage Committee* downloaded on 24/11/14 from http://whc.unesco.org/en/list/514/documents/

USMC 2008 *Lesson Plan: Range Estimation CMC-30, Combat Marksmanship Coaches Course* United States Marine Corps Weapons Training Battalion Downloaded from http://www.lejeune.marines.mil/ on 21/6/17

Van Geel, B, Buurman, J & Waterbolk, H T 1996 Archaeological and palaeoecological indications of an abrupt climate change in The Netherlands, and evidence for climatological teleconnections around 2650 BP *Journal of Quaternary Science* 11 (6) 451 – 60

Van Geel, B, Heusser, C J, Renssen, H & Schuurmans, C J E 2000 Climatic change in Chile at around 2700 BP and global evidence for solar forcing: a hypothesis *The Holocene* 10, 659 – 64

Van Geel, B, Raspopov, O M, Renssen, H, van der Plicht, J, Dergachev, V A & Meijer, H A J 1999 The Role of Solar Forcing on Climate Change *Quaternary Science Reviews* 18, 331 – 8

Van Geel, B, Van Der Plicht, J, Kilian, M R, Klaver, E R, Kouwenberg, J H M, Renssen, H, Reynaud-Farrera, I & Waterbolk, H T 1998 The sharp rise of δ^{14} C ca. 800 cal BC: possible causes, related climatic teleconnections and the impact on human environments *Radiocarbon* Vol 40, (1), 535 – 50

Van De Noort, R 2006 Argonauts of the North Sea – a Social Maritime Archaeology for the 2nd Millennium BC *Proc Prehist Soc* 72, 267 – 87

Van de Noort, R 2009 Exploring the ritual of travel in prehistoric Europe: the Bronze Age sewn plank boats in context *in* Clark, P (ed) *Bronze Age Connections Cultural Contact in Prehistoric Europe* Oxford: Oxbow Books, 159 – 75

Van de Noort, R 2011 *North Sea Archaeologies A Maritime Biography, 10,000 BC – AD 1500* Oxford: Oxford University Press

Van de Noort, R, Cumby, B, Blue, L, Harding, A, Hurcombe, L, Monrad Hansen, T, Wetherelt, A, Wittamore, J & Wyke, A 2014 Morgawr: an experimental Bronze Age-type sewn-plank craft based on the Ferriby boats *The International Journal of Nautical Archaeology* 43 (2), 292 – 313

Van der Sanden, W A B 1995 Bog Bodies on the Continent: the Developments since 1965, with special reference to the Netherlands *in* Turner, R C & Scaife, R G (eds) *Bog Bodies New Discoveries and New Perspectives* London: British Museum Press, 146 – 65

Van der Sanden, W A B 1996 *Through Nature to Eternity: The Bog Bodies of North West Europe* Amsterdam: Batavian Lion International

Van der Sanden, W A B & Eisenbeiss, S 2006 Imaginary people - Alfred Dieck and the bog bodies of northwest Europe *Archaologisches Korrespondenzblatt* 36, Heft 1, 111 – 22

Vans Agnew, R 1882 Note of the discovery of a large stone hammer of peculiar form, now presented to the museum *Proceedings of the Society of Antiquaries of Scotland* 16, 56 – 61

Varley, W J 1935 Maiden Castle, Bickerton: Preliminary Excavations, 1934 *University of Liverpool Annals of Archaeology and Anthropology* 22, 97 – 110

Varley, W J 1936 Further Excavations at Maiden Castle, Bickerton, 1935 *University of Liverpool Annals of Archaeology and Anthropology* 23, 101 – 12

Vetterlein, J 2015 The wettest May in over four decades *The Orcadian* Thursday 4th June 2015, 11

Voget, F W 2001 Crow *in* DeMallie R J (ed) *Handbook of North American Indians* Washington: Smithsonian Institute, 695 – 717

Vooght, C J 1695 *Nieuwe paskaart van de Orcades Eylanden / door Vooght geometra* Amsterdam: Iohannes van Keulen

Vyner, B E 1988 The Hill-fort at Eston Nab, Cleveland *The Archaeological Journal* 145, 60 – 98

Vyner, B 2004 Clegyr Boia: a potential Neolithic enclosure and associated monuments on the St. David's peninsular, southwest Wales *in* Darvill, T & Thomas, J (eds) 2001 *Neolithic Enclosures in Atlantic Northwest Europe* Neolithic Studies Group Seminar Papers 6, Oxford: Oxbow Books, 78 – 90

Waddell, J 1984 Bronzes and Bones *Journal of Irish Archaeology* 2, 71 – 2

Waddell, J 1990 *The Bronze Age Burials of Ireland* Galway: Galway University Press

Waddell, J 2010 *The Prehistoric Archaeology of Ireland Revised Edition* Dublin: Wordwell Ltd

Waddington, C 1999 *A Landscape Archaeological Study of the Mesolithic-Neolithic in the Milfield Basin, Northumberland* Oxford: Archaeopress, British Archaeological Report British Series 291

Waddington, K 2009 *Reassembling the Bronze Age Exploring the Southern British Midden Sites* University of Cardiff PhD Thesis, available via British Library Electronic Theses Online Service http://ethos.bl.uk/

Wahl, J & Trautmann, I 2012 The Neolithic massacre at Talheim: a pivotal find in conflict archaeology *in* Schulting, R & Fibiger, L (eds) *Sticks, Stones & Broken Bones: Neolithic Violence in a European Perspective* Oxford: Oxford University Press, 77 – 100

Wainwright G J 1971 Excavations at Tower Point, St Brides, Pembrokeshire, *Archaeologia Cambrensis* 120, 84 – 90

Wakeham, W F 1885 Inis Muiredaich, now Inismurray, and its Antiquities *Journal of the Royal Historical and Archaeological Association of Ireland* 4th Series, 7 (64), 175 – 332

Wakeham, W F 1890 The Hot-Air Bath *Journal of the Royal Society of Antiquaries of Ireland* 5th series, 1 (2), 165

Walker, E A 2000 Burry Holms (SS40019247) *Archaeology in Wales* 40, 88 – 9

Walker, E A 2001 Burry Holms (SS40019247) *Archaeology in Wales* 41, 126

Wallace, J 1693 *A Description of the Islands of Orkney*, Edinburgh: John Reid

Wallace, J 1700 *An Account of the Islands of Orkney* London: Jacob Tonson

Wandsnider, L 1997 The Roasted and the Boiled: Food Composition and Heat Treatment with Special Emphasis on Pit-Hearth Cooking *Journal of Anthropological Archaeology* 16 (1), 1 – 48

Ward, T 1995 Daer Reservoir, Crawford Parish, Cairns, find-spots, Mesolithic flint knapping site *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 87

Ward, T 1997 Daer Reservoir, Crawford Parish, Mesolithic sites; burnt mounds; cairns *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 75

Ward, T 1998 Daer Reservoir, Crawford pp128 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 125 – 8

Ward, T 1999a Manor Valley, Manor Parish, Survey *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 77

Ward, T 1999b Manor Valley pp114 *in* Ashmore, P J A List of Archaeological Radiocarbon Dates *Discovery and Excavation in Scotland*, Council for Scottish Archaeology, 110 – 15

Wastegård, S Björck, Grauert, M & Hannon, G E 2001 The Mjáuvøtn tephra and other Holocene tephra horizons from the Faroe Islands: a link between the Icelandic source region, the Nordic Seas, and the European continent *The Holocene* 11 (1), 101 – 9

Waterson, R 1990 *The Living House* Oxford: Oxford University Press

Watkins, T 1980 Excavation of a settlement and souterrain at Newmill, near Bankfoot, Perthshire *Proceedings of the Society of Antiquaries of Scotland* 110, 165 – 208

Watkins, T 1982 The excavation of an Early Bronze Age cemetery at Barns farm, Dalgety, Fife *Proceedings of the Society of Antiquaries of Scotland* 112, 48 – 141

Watson, D M S 1931 The Animal Bones from Skara Brae *in* Childe, V G 1931 *Skara Brae: A Pictish Village in Orkne*y London: Kegan Paul, Trench, Truber & Co. Ltd, 198 – 204

Watson, J 1927 United Parishes of South Ronaldsay and Burray *in* Clouston, J S (ed) *The Orkney Parishes, containing the Statistical Account of Orkney, 1795 – 1798, drawn up from the communications of the Ministers of the Different Parishes by Sir John Sinclair, Bart. Together with a General Introduction and Notice of Each Parish* Kirkwall, Orkney: W R Mackintosh, The Orcadian Office, 204 – 16

Watt, W G T 1878 Notice of the discovery of a cist, with three skeletons at Innertown, near Stromness *Proceedings of the Society of Antiquaries of Scotland* 12, 301 – 2

Watt, W G T 1882 Notice of the Broch known as Burwick or Borwick, Yescanbee, Sandwick, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 16, 442 – 50.

Watt, W G T 1885 Notice of the discovery of two cists with Urns of Steatite in the Parish of Sandwick, Orkney*, Proceedings of the Society of Antiquaries of Scotland* 19, 160 – 1.

Watt, W G T 1888 Notice of the discovery of a stone cist, with an Iron Age interment at Skaill Bay, *Proceedings of the Society of Antiquaries of Scotland* 22, 283 – 5.

Watters, M, Cormack, B & Cormack, S 1995 *Notes on George Petrie 1818 – 1875 Antiquary and Sheriff Clerk* Privately printed

Waugh, D 2003 Orkney Place-names *in* Omand, D (ed) *The Orkney Book* Edinburgh: Birlinn, 115 – 26

Weir, W 1845 Parish of Walls and Flotta *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy*, *Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 70 – 9 of the Orkney section (volume not continuously numbered)

Weiss, B 1982 The decline of Late Bronze Age civilization as a possible response to climatic change *Climatic Change* 4, 173 – 98

Weiss, H 1997 Late Third Millennium Abrupt Climate Change and Social Collapse in West Africa and Egypt *in* Dalfes, H N, Kukla, G & Weiss, H (eds.) *Third millennium BC climate change and old world collapse Proceedings of the NATO Advanced Research Workshop on Third Millennium BC Abrupt Climate Change and Old World Social Collapse, held at Kemer, Turkey, September 19-24, 1994* NATO ASI Series 1: Global Environmental Change vol 49, Springer, Berlin & New York, 711 – 23

Weiss, H, Courty, M-A, Wetterstrom, W, Guichard, F, Senior, L, Meadow, R & Curnow, A 1993 The Genesis and Collapse of Third Millennium North Mesopotamian Civilization *Science* 261, 995 – 1004

Weld, C R 1860 *Two Months in the Highlands, Orcadia and Skye* London: Longman, Green, Longman, & Roberts

Weller, J 1982 *History of the Farmstead* London: Faber and Faber

Wenham, S 2003 The South Isles *in* Omand, D (ed) *The Orkney Book* Edinburgh: Birlinn, 206 – 13

Wenxiang, W & Tungsheng, L 2004 Possible role of the "Holocene Event 3" on the collapse of Neolithic Cultures around the Central Plain of China *Quaternary International* 117, 153 – 66

West, J F (ed) 1970 *The Journals of the Stanley Expedition to the Faroe Islands and Iceland in 1789 Volume I: Introduction and the diary of James Wright* Tórshavn: Føroya Fróðskaparfelag

West, J F (ed) 1975 *The Journals of the Stanley Expedition to the Faroe Islands and Iceland in 1789 Volume II: Diary of Isaac S Benners* Tórshavn: Føroya Fróðskaparfelag

West, J F (ed) 1976 *The Journals of the Stanley Expedition to the Faroe Islands and Iceland in 1789 Volume III: Diary of John Baine* Tórshavn: Føroya Fróðskaparsetur

Wheeler, A 1983 Appendix 6: Fish Remains from the Knap of Howar, Orkney pp103 – 5 *in* Ritchie, A The Excavation of a Neolithic Farmstead at Knap of Howar, Papa Westray, Orkney *Proc Soc Antiq Scot* 113, 40 – 121

Wheeler, R E M 1943 *Reports of the Research Committee of the Society of Antiquaries of London No. XII Maiden Castle, Dorset* Oxford University Press: The Society of Antiquaries

Wheeler, R E M & Wheeler T V 1932 *Report on the excavation of the prehistoric, Roman, and post-Roman site in Lydney Park, Gloucestershire* Oxford: Oxford University Press, Reports of the Research Committee of the Society of Antiquaries of London No.1

White, A 1845 North Ronaldsha United Parishes of Cross and Burness *The New Statistical Account of Scotland by the Ministers of the Respective Parishes under the Superintendence of a Committee of the Society for the Benefit of the Sons and Daughters of the Clergy, Vol 15, Sutherland – Caithness – Orkney – Shetland* Edinburgh and London: William Blackwood & Sons, 103 – 13 of the Orkney section (volume not continuously numbered)

White, R B 1977 Rhosgoch to Stanlow Shell Oil Pipeline. Archaeological work carried out on Behalf of the Department of the Environment on the Anglesey Section of the Pipeline in the Summers of 1973 and 1974 *Bulletin of the Board of Celtic Studies* 27 (3) 463 – 93

Whitefield, A 2017 Neolithic 'Celtic' Fields? A Reinterpretation of the Chronological Evidence from Céide Fields in Northwestern Ireland *European Journal of Archaeology* doi:10.1017/eaa.2016.5

Whittington G 1978 A sub-peat dyke on Shurton Hill, Mainland, Shetland *Proceedings of the Society of Antiquaries of Scotland* 109, 30 – 5

Whittington G 1983 Appendix 10: Palynological Studies from Knap of Howar, Papa Westray, Orkney, 1975, pp116 – 7 *in* Ritchie, A Excavation of a Neolithic farmstead at Knap of Howar, Papa Westray, Orkney, *Proceedings of the Society of Antiquaries of Scotland* 113, 40 – 121

Whittle, A 1996 Moving on and moving around: Neolithic settlement mobility *in* Topping, P (ed) *Neolithic Landscapes* Oxford: Oxbow books, 1 – 14

Whittle, A, Healy, F & Bayliss, A 2011 *Gathering Time Dating the Early Neolithic Enclosures of Southern Britain and Ireland* Oxford: Oxbow Books, 2 volumes

Whittle, A, Keith-Lucas, M, Milles, A, Noddle, B, Rees, S & Romans, J C C 1986 *Scord Of Brouster An Early Agricultural Settlement on Shetland Excavations 1977 – 1979* Oxford: Oxford University Committee for Archaeology, Monograph No. 9

Wickham-Jones, C 2003 The tale of the limpet *British Archaeology* 71, July 2003, accessed online at www.britarch.ac.uk on 28/02/09

Wickham-Jones, C 2006 *Between the Wind and the Water World Heritage Orkney* Cheshire: Windgather Press Ltd

Wickham-Jones, C 2015 *Between the Wind and the Water World Heritage Orkney* Oxford: Oxbowbooks, 2nd edition

Wickham-Jones, C, Bates, R, Dawson, S, Dawson, A & Bates, M forthcoming The Changing Landscape of Prehistoric Orkney *in* Persson, P (ed) *The Ecology of Early Settlement in Northern Europe - Conditions for Subsistence and Survival Volume 1* Sheffield: Equinox Publishing (Prepublication copy kindly supplied by the first named author)

Wickham-Jones, C R & Collins, G H 1978 The sources of flint and chert in northern Britain *Proceedings of the Society of Antiquaries of Scotland* 109, 7 – 29

Wickham-Jones, C R, Dawson, S & Bates, R 2010 *Drowned Stone Age settlement of the Bay of Firth, Orkney, Scotland* downloaded on 20/09/12 from http://www.abdn.ac.uk/archaeology/profiles/c.wickham-jones/

Wickham-Jones C R, Dawson S, Bates R, Bates M, & Huws D 2011 Rising Tide Landscape Survey *Discovery and Excavation in Scotland* New Series Vol 12, Council for Scottish Archaeology, 132 – 3

Wickham-Jones C R, Dawson S, Bates R, Bates M, & Huws D 2012 Rising Tide Landscape survey including subsea *Discovery and Excavation in Scotland* New Series Vol 13, Council for Scottish Archaeology, 133 – 4

Wickham-Jones C R, Dawson S, Bates R, Bates M, Huws, D & Nayling, N 2013 Rising Tide Landscape survey including subsea *Discovery and Excavation in Scotland* New Series Vol 14, Council for Scottish Archaeology,139

Wickham-Jones, C R, Dawson, S & Bates, R, Bates, M, Huws, D, Gal, E & Killingbeck, J 2014 Rising Tide Landscape survey including subsea *Discovery and Excavation in Scotland* New Series Vol 15, Council for Scottish Archaeology, 144 – 5

Wickham-Jones, C R, Dawson, S, & Dawson, A 2008 Rising Tide, sea-level survey *Discovery and Excavation in Scotland* New Series Vol 9, Council for Scottish Archaeology, 133 – 4

Wickham-Jones, C R & Downes, J 2007 Long Howe Excavation *Discovery and Excavation in Scotland* New Series Vol 8, Council for Scottish Archaeology, 147

Wiggins, K 2009 *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Williamstown or Bawn 1 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Wiggins, K, Ginn, V & Martin, K 2009 *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Kennastown 1 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Wiggins, K, Ginn, V & O'Hara, R 2008 *M3 Clonee-North of Kells Contract 3 Navan Bypass Report on the Archaeological Excavation of Kennastown 3 County Meath* Unpublished report by Archaeology Consultant Services Ltd, downloaded on 25/10/09 from: http://www.m3motorway.ie/M3Background/ArchaeologicalInvestigation/Excavation/

Wigley, T M L & Kelly, P M 1990 Holocene climatic change, ^{14}C wiggles and variations in solar irradiance *Philosophical Transactions of the Royal Society of London* Series A, Mathematical and Physical Sciences, vol 330, no. 1615, The Earth's Climate and Variability of the Sun Over Recent Millennia: Geophysical, Astronomical and Archaeological Aspect, 547 – 60

Wilde, W R 1857 *A Descriptive Catalogue of the Antiquities of Stone, Earthen, and Vegetable Materials in the Museum of the Royal Irish Academy* Dublin: M H Gill

Wilde, W R 1861 *A Descriptive Catalogue of the Antiquities of Animal Materials and Bronze in the Museum of the Royal Irish Academy* Dublin: Hodges, Smith & Co

Williams, A 1939 Excavations at The Knave Promontory Fort, Rhossili, Glamorgan *Archaeologia Cambrensis* 94, 210 – 19

Williams, G 1990 Burnt mounds in south-west Wales *in* Buckley, V (ed) *Burnt Offerings International Contributions to Burnt Mound Archaeology* Dublin: Wordwell Ltd Academic Publications, 129 – 40

Williams, G H, Taylor, J A, Hunt, C, Heyworth, A & Benson D G 1987 A Burnt Mound at Felin Fulbrook, Tregaron, Ceredigion, *Bulletin of the Board of Celtic Studies* 34, 228 – 43

Wilson, D 1851 *The Archaeology and Prehistoric Annals of Scotland* Edinburgh: Sutherland & Knox

Wilson, D 1854 Anniversary Address *Proceedings of the Society of Antiquaries of Scotland* 1, 2 – 7

Wilson, D 1863 *Prehistoric Annals of Scotland* London & Cambridge: Macmillan & Co, 2 volumes

Wilson, E M 1980 Excavations at West Mains of Ethie, Angus *Proceedings of the Society of Antiquaries of Scotland,* 110, 114 – 21

Wilson, G & Moore, H 1996 Coastal Erosion Survey (Stronsay, Eday parishes) *Discovery and Excavation in Scotland,* Council for Scottish Archaeology, 80 – 1

Wilson, P, McGourty, J & Bateman, M D 2004 Mid- to late-Holocene coastal dune event stratigraphy for the north coast of Ireland *The Holocene* 14, 406 – 16

Withers, C W J 1996 Geography, science and national identity in early modern Britain: The case of Scotland and the work of Sir Robert Sibbald (1641–1722) *Annals of Science* 53:1, 29 – 73

Withers, C W J 1999 Introduction *in* Martin M *A Description of the Western Islands of Scotland circa 1695* Edinburgh: Birlinn Ltd (reprint of 1703 edition), 1 – 11

Withrington, D J & Grant, I R (eds) 1983 *The Statistical Account of Scotland 1791 – 1799 edited by Sir John Sinclair Volume I General* Wakefield: E P Publishing

Wood, A 1927 Supplementary Notes on Firth Parish, *Proceedings of the Orkney Antiquarian Society* Volume V, Kirkwall, 57

Wood, W 1826 Description of the contents of a Tumulus in the parish of Burness, Island of Sanday *Edinburgh New Philosophical Journal* Volume 1, 216 - 19 & plate III

Wood, J 2000 Food and Drink in European Prehistory *European Journal of Archaeology*, 3 (1), 89 – 111

Woolf, D 2007 Images of the Antiquary in Seventeenth Century England *in* Pearce, S (ed) *Visions of Antiquity The Society of Antiquaries of London 1707 – 2007 Being Volume 111 of Archaeologia* London: Society of Antiquaries, 11 – 43

Wood-Martin, W G 1886 *The Lake Dwellings of Ireland or Ancient Lacustrine Habitations of Erin Commonly Called Crannogs* Dublin & London: Hodges, Figgis & Co, Longmans, Green & Co

Woodman, P & McCarthy, M 2003 Contemplating some awful(ly interesting) vistas: importing cattle and red deer into Prehistoric Ireland *in* Armit, I, Murphy, E, Nelis, E & Simpson, D *Neolithic Settlement in Ireland and Western Britain* Oxford: Oxbow Books, 31 – 9

Woodman, P E 2000 Beyond significant patterning, towards past intentions: the locations of Orcadian chambered tombs *in* Buck, C (ed) *Proceedings of the UK Chapter of Computer Applications and Quantitative Methods in Archaeology 1999* Oxford: British Archaeological Reports International Series 844, 91 – 105

Woodward, A 2000 *British Barrows A Matter of Life and Death* Stroud: Tempus

Woodward, A 2002 Beads and beakers: heirlooms and relics in the British Early Bronze Age *Antiquity* 76, 1040 – 7

Woodward, A & Hunter, J 2011 *An examination of Prehistoric Stone bracers from Britain* Oxford: Oxbow Books

Woodward, A & Hunter, J 2015 *Ritual in Early Bronze Age Grave Goods* Oxford: Oxbow Books

Worsaae, J J A 1849 *The Primeval Antiquities of Denmark: Translated, and applied to the illustration of similar remains in England by William J Thoms* London: John Henry Parker

Wright, A G 1923 The Dagenham idol *Transactions* of *the Essex Archaeological Society* 16, 288 – 93

Wright, E 1990 *The Ferriby Boats Seacraft of the Bronze Age* London: Routledge

Wright, R P 1953 Roman Britain in 1952: I. Sites Explored: II. Inscriptions *The Journal of Roman Studies* 43, 104 – 32

Wright, E V, Hedges, R E M, Bayliss, A & Van De Noort, R 2001 New AMS radiocarbon dates for the North Ferriby boats – a contribution to dating prehistoric seafaring in northwestern Europe *Antiquity* 75, 726 – 34

Yates, D 1999 Bronze Age Field Systems in the Thames Valley *Oxford Journal of Archaeology* 18 (2), 157 – 70

Yates, D 2001 Bronze Age Agricultural Intensification in the Thames Valley and Estuary *in* Brück, J (ed) *Bronze Age Landscapes Tradition and Transformation* Oxford: Oxbow Books, 65 – 82

Yates, D 2007 *Land, Power and Prestige: Bronze Age Field Systems in Southern England* Oxford: Oxbow Books

Young, H W 1891 Notes on the ramparts of Burghead, as revealed by recent excavations *Proceedings of the Society of Antiquaries of Scotland* 25, 435 – 47

Young, H W 1893 Notes on further excavations at Burghead, *Proceedings of the Society of Antiquaries of Scotland*, 27, (1892 – 3), 86 – 91

Zazzo, A, Saliège, J-F, Lebon, M, Lepetz, S & Moreau, C 2012 Radiocarbon dating of calcined bones: insights from combustion experiments under natural conditions *Radiocarbon* 54, 3 – 4, 855 – 66

Zolitschka, B & Negendank, J F W 1997 Climate Change at the End of the Third Millennium BC – evidence from Varved Lacustrine sediments *in* Dalfes, H N, Kukla, G & Weiss, H (eds.) *Third millennium BC climate change and old world collapse Proceedings of the NATO Advanced Research Workshop on Third Millennium BC Abrupt Climate Change and Old World Social Collapse, held at Kemer, Turkey, September 19-24, 1994* NATO ASI Series 1: Global Environmental Change vol 49, Springer, Berlin & New York, 679 – 90