University of Southampton

FACULTY OF ARTS AND HUMANITIES

DEPARTMENT OF ARCHAEOLOGY

TRANSIENT TRAJECTORIES:

MODELLING MOVEMENT AND CONNECTIVITY IN THE NEOLITHIC OF THE OUTER HEBRIDES

by

Stephanie L. Blankshein

Thesis for the degree of *Doctor of Philosophy*

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Abstract

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Islands and archipelagos have long fascinated humankind. Often viewed as bounded and isolated, given the right conditions and technology, their true nature may be far more complex. Such is case with the Outer Hebrides of Scotland, where a robust Neolithic archaeological record evidences varying degrees of movement that would have transcended not only a range of temporal and spatial scales but also environments. As movement itself leaves little archaeological trace, exploring the connectivity of these complex island communities requires innovative methodologies that can cope with the transience of movement as well as its different milieus. Using a least-cost approach, established for terrestrial movement and adapted to seafaring, a more holistic digital analysis was developed that allowed for movement to be modelled through both milieus and connected within the maritime landscape. Whilst the modelled pathways highlight the varying trajectories of Neolithic movement that would have occurred in response to a geographically and temporally constrained environment, they conversely reveal a strong continuity of practice and significance of place that together would have engendered complex patterns of mobility and social connectivity within the Outer Hebrides and beyond.

Thesis for the degree of *Doctor of Philosophy*

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ACADEMIC THESIS: DECLARATION OF AUTHORSHIP

Stephanie L. Blankshein

Transient Trajectories: Modelling Movement and Connectivity in the Neolithic of the Outer Hebrides

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. None of this work has been published before submission

Signed: Date: August 1, 2019

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Chapter 1. INTRODUCTION

Islands are pluralistic places, often evoking connotations of isolation and boundedness, and yet given the right conditions, they can also be highly connected places. In instances where strong environmental affordances and established maritime practices exist, the sea can become a highway, enabling movement and connectivity across the geographic divide and connecting the bounded with the beyond. Such is the case with the Outer Hebrides of Scotland, an archipelago positioned on the extreme northwest edge of Europe and long deemed peripheral to the mainstream activities of contemporary populations. However, its remarkable archaeological record has revealed a place not of marginality but of centrality. In his highly influential work *Facing the Ocean*, Barry Cunliffe (2001) explored the cultural cohesion engendered through living along the Atlantic façade of Europe, an identity propagated through and reinforced by the ocean. Whilst the Outer Hebrides may reside at the terminus of this long Atlantic highway, its Neolithic inhabitants would have nonetheless been connected to this broader Atlantic identity (Figure 1).

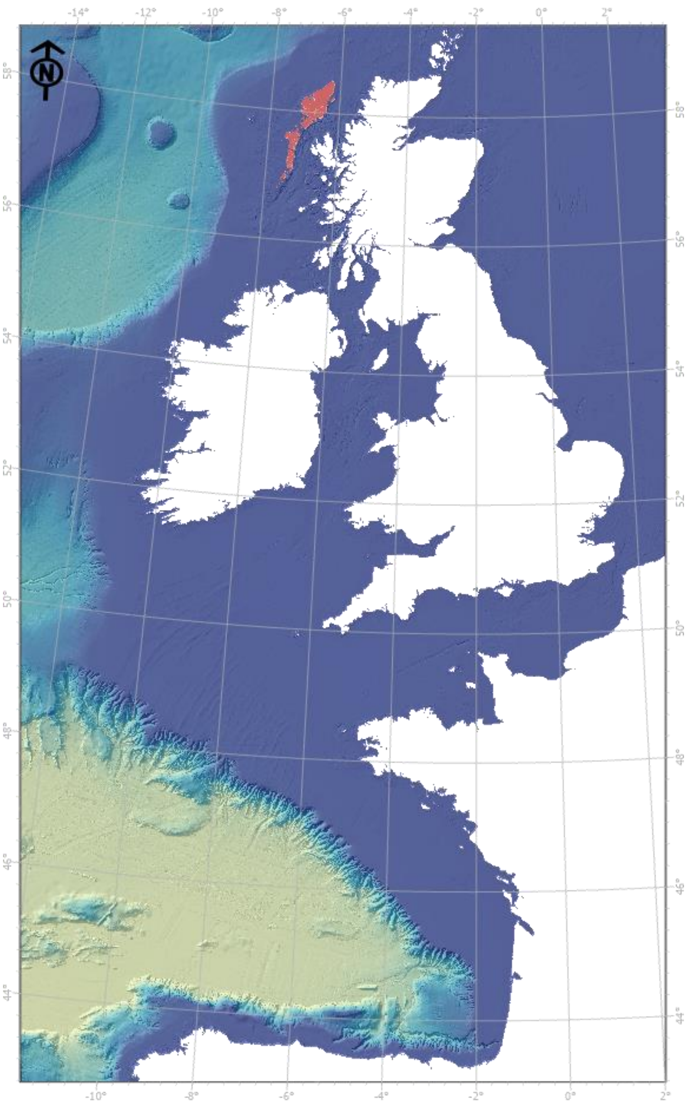


Figure 1. Map of the Atlantic facade of Europe and position of the Outer Hebrides (in coral) along this Atlantic corridor.

Evolving from tenuous Mesolithic origins, the robust and varied activities of Neolithic Hebrideans still leave their imprint on the landscape, evidencing highly sophisticated Hebridean communities that would have been well-connected through the seaways. Through time, these overlapping degrees of movement have created a rather incoherent picture of what is often considered to be waxing and waning levels of maritime connectivity occurring throughout the Neolithic. Although the Outer Hebrides have long been encompassed within these broader narratives of movement and connectivity along the Atlantic façade, its Neolithic record reveals a unique suite of Hebridean traditions encompassed within an otherwise 'Atlantic Neolithic'. This pluralistic identity demonstrates the engagement of Neolithic Hebrideans in a range of mobilities, both regionally and abroad, and it is this movement, and the subsequent Hebridean identity that it engendered, that this thesis aims to address.

1.1 The 'Atlantic Neolithic'

The transition to farming represents one of the most significant changes in the timeline of human evolution, and its implications for the development of increasingly complex and sophisticated societies are axiomatic. However, the nature of this transition is not so forthright. Whilst the shift in subsistence practices from hunting and gathering to agriculture and animal husbandry has long formed the signifier of the transition to the Neolithic, this process would have involved a number of other elements, including new material culture, funerary and ritual practices, social structures and ideologies (Thomas 1999, p. 7). The complex relationship between the various elements of the 'Neolithic package' has made it increasingly clear that the emergence of one element does not imply the adoption of all others (Zvelebil 1998, p. 2), and instead, there is growing evidence for a diverse Neolithic, one in which Neolithic communities would have been highly variable, incorporating some or all aspects of the Neolithic package based on their unique environment (Sharples 1992, p. 330).

1.1.1 The Western Seaways of the British Isles

> The sea has always been the natural highway linking island to island and peninsula to peninsula along the Western Fringes of Europe (Bowen 1972, p. 8).

In the British Isles, the many complexities of this transition become even more enigmatic due to the millennium-long delay in the arrival of the Neolithic after its establishment on the adjacent northwest continent (Whittle et al. 2011; Brace et al. 2018). This period of apparent stasis highlights the need to refine not only the timing and tempo of the transition but also its method of transmission. Whittle et al.'s (2011) *Gathering Time* sought to address these questions through large-scale dating of causewayed enclosures across England, Wales and Scotland—the latter two contributing few dates. Their Bayesian analysis suggested the emergence of the Neolithic in southeast England at *c*. 4100-4000 cal BC and its spread to Wales, Scotland and Ireland within three centuries (Whittle et al. 2011, p. 868) (Figure 2, *left*). Whilst Thomas (2013, p. 221) has surmised that these models may provide ‘the framework for our understanding of the earlier Neolithic for some time to come’, he also acknowledged that these models should be viewed ‘critically and cautiously’. Whittle et al. (2011, p. 822, 846) themselves have acknowledged the omission of dates from ‘key areas’, including the Northern and Western Isles of Scotland, which along with the growing aDNA evidence for large-scale maritime migrations by Atlantic Neolithic populations (Cassidy et al. 2016; Brace et al. 2018, 2019) strongly suggests the need to consider different trajectories for the Neolithisation of Britain.

Along the Atlantic façade, the evidence points to a different, rather challenging picture to that proposed by Whittle et al. For instance, foreign cattle bones found at a Mesolithic occupation site at Ferriter’s Cove on the southwest coast of Ireland have been dated to *c*. 4495-4195 BC (Woodman and McCarthy 2003, p. 33). Although Thomas (2008, p. 64) has argued for the indigenous adoption of domesticates by Mesolithic seafarers, it is also possible that Mesolithic and Neolithic populations cohabitated, as suggested by Tresset (2003) and now further evidenced through aDNA and isotopic studies (Schulting and Richards 2002; Chandler et al 2005; Charlton et al. 2016; Brace et al. 2018, 2019). Further, the Achnacreebeag pot found in a megalithic tomb on the west coast of Scotland has been argued by Sheridan (2003) as demonstrating stylistic similarities with the Castellic tradition from Brittany, thus suggesting early contact between the two regions around the fourth millennium BC. Whilst this vessel once again provides contentious

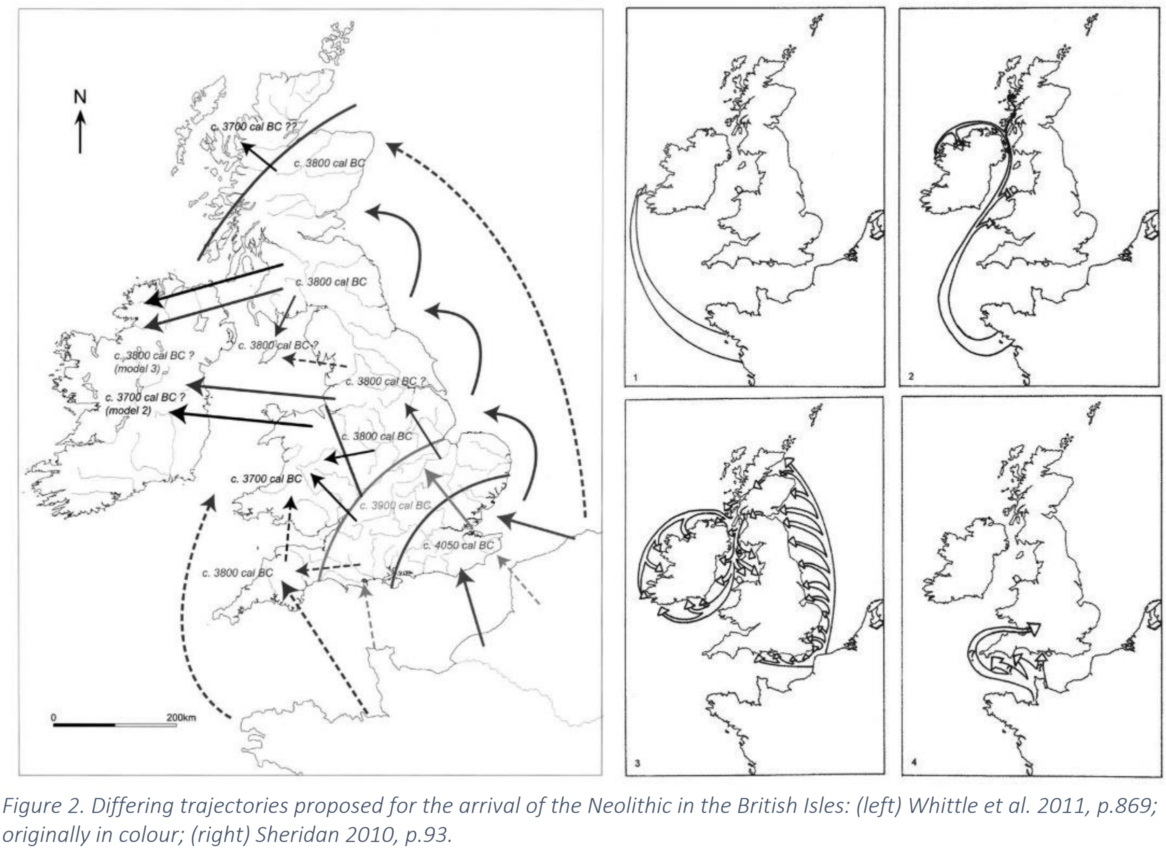


Figure 2. Differing trajectories proposed for the arrival of the Neolithic in the British Isles: (left) Whittle et al. 2011, p.869; originally in colour; (right) Sheridan 2010, p.93.

evidence regarding the nature of the transition (i.e. Neolithic colonisation versus indigenous adoption), together, these materials highlight a different medium of potential transmission.

Sheridan (2010) has thus proposed four different strands of 'Neolithisation', distinguishing between the Channel, the North Sea and the western approaches (Figure 2, *right*). Whilst the dynamic nature of the early Holocene North Sea and Channel environments have been increasingly highlighted (e.g. Shennan and Horton 2002; Gaffney et al. 2007; Ward et al. 2012; Gupta et al. 2017), the western seaways would have presented a relatively stable and predictable environment by around 6000 BC, 'a route that had been open and in existence for over 5000 years' (Garrow et al. 2011, p. 63; see also Sturt et al. 2013). The potential for the western seaways to have been an important corridor of movement during prehistory has long been recognised and has led to its emergence at the forefront for early cultural-historical debates regarding the transition. Used initially by O. G. S. Crawford (1936) to support his Neolithic diffusionist theories, the significance of the western approaches was subsequently underscored by V. Gordon Childe (1946, p. 36) in his now infamous statement that 'the grey waters of the Irish Sea were as bright with Neolithic argonauts as the Western Pacific is today'. Childe saw the western corridors as being of primary importance for the cultural development of Europe, a notion later advocated by Bowen (1972, p. 25) who envisioned the Neolithic as 'the first Golden Age of the western seaways'. The continued emphasis on the significance of the western approaches for understanding the transition to and subsequent development of the Neolithic in the British Isles is no less apparent in recent research (e.g. Sheridan 2010; Garrow and Sturt 2011, 2017; Robinson 2013; Anderson-Whymark and Garrow 2015; Garrow et al. 2017a). Thus, regardless of the nature and timing of the transition, it is evident that the western seaways would have served as a facilitator for many of the social and ideological changes that occurred throughout the Neolithic, perhaps most apparent in the megalithic funerary structures that flourished along the Atlantic façade.

1.1.2 Continental Preludes: A Megalithic Mentality

> All routes from the South… converge on Britain. It is the northern terminus of the "megalithic" seaway along the Atlantic coasts from Portugal (Childe 1925, p. 322).

As the Neolithic way of life spread across Europe, upon reaching its Atlantic terminus a characteristically different 'Western Neolithic' appears to have developed. First distinguished by Childe (1925, p. 304) on the basis of a unique relationship to monumentality, Cunliffe (2001, pp. 154-155) has suggested that this Atlantic identity would have developed in the preceding Mesolithic as hunter-fisher-gatherer societies took advantage of the rich and varied resources of the coastal fringe of Europe. Further, parallels have been drawn between Mesolithic shell middens and Neolithic monuments, suggesting the Mesolithic precedence of this emerging mentality (Renfrew 1983, p. 162; Pollard 1996, pp. 204–205). Whilst aDNA studies are contributing to the timing and nature of interaction between the two populations (Chandler et al. 2005; Sánchez-Quinto et al. 2019), what is clear is that by 4500 BC a megalithic mentality had emerged in France in the form of large funerary structures that were eventually transmitted along the Atlantic façade of the British Isles (Sánchez-Quinto et al. 2019). From Iberia to Orkney there emerged 'a highly distinctive character and a degree of cultural coherence which served to distinguish it from the rest of Europe' (Cunliffe 2001, p. 159). Thus, a broadly Neolithic way of life was merged with a strong maritime tradition, forming an Atlantic Neolithic culture of 'maritime farmers', who may have been presaged by Mediterranean progenitors (Brace et al. 2018, 2019). What served to distinguish and subsequently unify this Atlantic Neolithic culture was the construction of large ancestral monuments in stone, 'an Atlantic phenomenon without contemporary parallel' (Cunliffe 2001, p. 159).

Extensive research into these monuments has repeatedly demonstrated their deliberate placement in positions of directed prominence and visibility, often in reference to certain landscape and seascape features (e.g. Richards 1996a; Woodman 2000; Cummings 2002a; Phillips 2002, 2003; Scarre 2002; Cummings et al. 2005; Robinson 2007, 2013; Cummings and Fowler 2015; Rodriguez-Rellan and Rodriguez Casal 2019). For instance, Woodman's (2000) visibility analysis of chambered tombs in Orkney demonstrated that these monuments were not particularly visible within the local landscape but contained wider views of the surrounding region. Building on from Woodman's analysis, Cummings and Pannett (2005) looked more specifically at what landscape features were visible from these monuments and found many to be located in peripheral locations, often on the side of a slope or prominent knoll, which restricted visibility uphill whilst directing it towards specific regions within the immediate landscape. Given that the visible landscape was often comprised of lowlands, it has thus been suggested that these monuments would have overlooked occupation areas (*ibid*, see also Phillips 2002, 2003). However, in some instances, tombs appear to have also been placed with reference to specific mountains (Scarre 2002; Cummings et al. 2005) or other prominent landscape or seascape features (Robinson 2007, 2013). In addition to landscape connections, it also appears that proximity to the sea and visibility of or from it was important in the siting of tombs. Whilst having clear views of the sea may relate to the symbolic importance of water (Richards 1996b) or the coast (Scarre 2002), Robinson (2007), has emphasised that the sea would not simply have been a backdrop to Neolithic activities but would have been integral to these communities for both economic subsistence and social connectivity.

As a whole, these analyses suggest the strong associations between megalithic funerary structures and patterns of movement. It has been noted that the topographic position of these monuments would have facilitated a visually and directionally structured journey to or around them, perhaps in order to control the experience of approach through visual perception (Phillips 2003; Cummings et al. 2005). Whilst this theory has been more fully developed within the landscape, the placement of these monuments as seafaring markers along navigable sea routes has also been suggested (Phillips 2003; Cummings 2004, Cummings and Richards 2013), and thus it appears that these structures would have been used as reference points for movement through both the landscape and the surrounding seaways. Consequently, although these monuments more broadly serve to highlight the transmission of Neolithic practices and ideologies along the Atlantic facade, they also provide strong indications of more localised patterns of mobility.

1.1.3 Neolithic Mobility and the Need for Regional Narratives

> [Neolithic] life was neither static and fixed, nor highly mobile, but composed of complex mobilities (Leary and Kador 2016, p. 1).

Prehistoric people, whether hunter-gatherers or farmers, appear to have been continually on the move and keen to maintain social contact networks (Kador 2007, p. 42), and it is this mobility that according to Leary and Kador (2016, p. 1), ‘lies at the very heart of Neolithic studies’. The strong role of movement in the emergence of the British Neolithic is clear, and yet, in contrast to the apparent fixity which an agricultural way of life enables, this emphasis on movement appears to have intensified throughout the Neolithic. Around the third millennium BC, a new megalithic mentality emerged in the form of standing stones, stone circles and eventually ceremonial complexes, typified by those at Avebury, Boyne Valley and Orkney. Whilst this new tradition would eventually replace the ancestral monument tradition, it appears to have retained and perhaps even intensified this relationship to movement (Noble 2006, p. 139).

Richards (1996b) has proposed that Late Neolithic monuments were sited to intentionally reference older monuments and significant places, a notion later built upon by Thomas (2004, p. 174), who suggested that ‘quite astonishing effort [was] expended in re-establishing spatial configurations that may in some cases have already been quite ancient.’ For example, the Great Cursus in Wessex is situated on a more visible position within the local topography, commanding extensive views of the surrounding landscape, and yet, just as with earlier monuments, this visibility appears to have been directed towards specific places within the immediate landscape (Batchelor 1997, pp. 70–71; Thomas 1999, pp. 170–171). Further analysis of the surrounding environ has demonstrated the position of the cursus along a less prominent pathway running through the landscape, leading to the suggestion that the monument ‘formalised a pre-existing routeway’ (Thomas 1999, p. 171). Noble (2006, p. 183) has also highlighted the association between ceremonial complexes and natural routes through the landscape, believing topographic affordances to movement to have undoubtedly contributed to their increased significance. As these patterns of movement evolved throughout the Neolithic, so too did the structuration of the landscapes through which this movement took place, and thus ceremonial complexes may provide the most archaeologically visible evidence for the mobility of Neolithic people through the landscape (see Pollard 1992; Barrett 1994).

There would have been many different motivations for and influences on movement. For instance, based on his analysis of regional sequences around Avebury, Thomas (1999, p. 228) has suggested 'that from the start of the Neolithic people found themselves involved in a series of cycles of circulation', including seasonal movement to procure resources or livestock as well as social and ritual movement in order to exchange or even deposit objects, such as ceramics and stone axes. Focusing on more localised scales of movement, Whittle (1997) has suggested the existence of a range of Neolithic mobilities based on various environmental, social and cultural factors that would have varied both spatially and temporally. The most fixed form of movement is referred to as logistical or radiating mobility in which settlements were occupied on a seasonal basis, with broader mobility by select groups to additional outlying camps in order to carry out specific activities (e.g. herding, hunting, cultivation or lithic procurement) (*ibid*, p. 21). In contrast, tethered or embedded mobility would have involved structured patterns of repeated movement, perhaps by the entire population, over varying annual or generational time scales through familiar landscapes, 'with both monuments and built dwellings providing repeatedly used anchors in the system' (*ibid*).

As regards the Scottish Neolithic, Brophy (2006) has stated that 'within the cycle of life for early farming communities, places were permanently important, but temporarily inhabited.' These varying temporalities of inhabitation and their strong connection to the monument record thus demonstrate the significance of movement not only for broader connectivity and the transmission of change but also for daily activities occurring within the local environment. Hence, any understanding of British prehistory can only be furthered through a focus on the interactions that would have taken place within and between various regions at a range of scales (Barclay 2001, p. 1). As such, it is evident that understanding this movement in all its spatial and temporal extents is crucial to unravelling the complexities of this dynamic period as well as the many social and ideological changes that occurred throughout it.

1.2 Aims and Objectives

With a focus on these potentialities for movement, this thesis aims to generate a more refined regional understanding of the Neolithic of the Outer Hebrides. Underlying this broad aim is the more specific question: What can the extant archaeological and environmental records indicate about the varying degrees of movement and connectivity of Neolithic Hebrideans? To address this aim, the first objective was to gather all extant information regarding the Hebridean Neolithic, including both the archaeological and environmental records, in order to perform an initial comprehensive analysis of existing knowledge. Through this archaeological review, a number of more specific questions were highlighted regarding movement and social connectivity that are crucial to the stated thesis and thus shaped the subsequent objectives. These questions include:

1. What was the nature of settlement practices—i.e. were communities relatively fixed or were they engaged in some form of repeated mobility?
2. How were more 'traditional' settlements connected to a broader settlement record comprised of more ephemeral occupation areas and more enigmatic islet sites?
3. How does this broader settlement record relate to the monument record, which includes both early Neolithic chambered tombs and later Neolithic stone settings?
4. What was the nature of regional connectivity around the archipelago, and why were these social contacts important?
5. How was this regional identity connected to broader patterns of movement and connectivity along the western seaways?

These questions involve a range of temporal and spatial scales, and thus, in order to fully address each, the main objective was to establish a methodology that could cope with the fluidity of movement, which would have not only transcended a range of scales but also milieus.

1.3 Methodology

In accordance with the above aims and objectives, the methodology can generally be grouped into two main categories of fundamentally different but not temporally exclusive approaches: quantitatively and spatially analysing the extant archaeological record and modelling and statistically analysing potential routes of movement and the connectivity they would have enabled. The former required the consultation of a variety of sources including the Historic Monuments Record (HER), the Sites and Monuments Record (SMR), the *Canmore* database, excavation reports, unpublished PhD theses and any other publications or reports containing information regarding Neolithic sites or materials recovered. Through this means, a Hebridean Neolithic database was assembled, comprised of settlements, chambered tombs, standing stones, lithics and ceramics. This record was subsequently analysed both quantitatively and spatially in Microsoft Excel and ArcGIS Pro.

The second and principal method was focused on the analysis of movement and thus required the establishment of a methodology suited to not only the identified thesis questions but also the unique Hebridean environment in which this movement took place. Movement is essentially intangible, and whilst its existence may be inferred from the archaeological record, it is through the environment that movement must necessarily be modelled. This dynamic environment has undergone many changes since the Neolithic, and thus, any understanding of movement through the Outer Hebrides must necessarily begin with an understanding of the palaeoenvironment and subsequently a palaeogeographic reconstruction. Further, given the strong maritime nature of the analysis, a blended methodology needed to be devised that could model movement through both the landscape and the seaways. Utilising a least-cost approach to model terrestrial movement, the method was subsequently adapted to the seaways before the results of each were statistically analysed before being combined and compared.

These results were then used as a heuristic device to explore the potentialities of movement alongside the extant archaeological and environmental records. Through the incorporation of a variety of additional sources regarding movement through the Hebrides, including modern and historical narratives, modern pilot guides and toponyms, a more subjectively-situated perspective was assumed in the final discussion of the resulting pathways. Ultimately, through an analysis of these modelled pathways, a more thorough discussion of movement and connectivity throughout the archipelago and beyond was generated, enabling a more refined understanding of the Neolithic of the Outer Hebrides and its place within the broader Atlantic Neolithic.

1.4 Scope

This study covers the entirety of the Hebridean Neolithic, beginning with its earliest dates at *c*. 3700 cal BC and concluding with the arrival of Beaker elements at *c*. 2450 BC (Garrow and Sturt 2017, p. 153; Garrow et al. 2017a). This broad temporal extent encompasses a complex and diverse archaeological record, representing multiple aspects of Neolithic life and various cultural practices. However, limited modern excavations have been conducted, resulting in few absolute dates, and thus only a broad chronology of the Neolithic record can currently be established. Accordingly, for this thesis, the Hebridean Neolithic will be divided into two main phases separated by the emergence of the standing stone tradition around the start of the third millennium BC. The Early Neolithic will thus encompass the earliest record of activity, including the erection and use of funerary structures, and the Late Neolithic will include the new monolith tradition and its associated materials. Whilst the settlement and material record may, in many cases, transcend this established chronological divide, it does serve to differentiate between the long-continuity of traditions that characterise the Early Neolithic and the broad-scale changes witnessed in the Late Neolithic. Further, this division can be broadly matched to the temporal windows of the palaeogeographic reconstruction, consequently allowing the archaeological record to be more adequately matched to the palaeoenvironmental record. On a final note, all radiocarbon dates will be presented as cal BC whilst all environmental dates will be presented in BP.

1.5 Structure

Given the great significance of the landscape and environment, the ensuing chapter will begin with the Hebridean archipelago, its modern geography and climate, its unique geology and landscape types and its dynamic geomorphological and palaeoenvironmental changes. From there, Chapter 3 will introduce the broader settlement record, as evidenced primarily through excavations, as well as the vast quantities of ceramics and lithics that have been recovered from these relatively few sites. This chapter will ultimately highlight the many challenges currently faced in Hebridean archaeology, most notably the need for a more comprehensive approach to the entirety of the Hebridean Neolithic record. The monument record will be covered separately in Chapter 4, which includes an introduction to the primary types of monuments and a discussion of the few that have been excavated. This chapter also includes the basis for narratives of movement and connectivity and demonstrates why a refined regional understanding is necessary before the archipelago can be incorporated into broader discussions of Neolithic connectivity along the western seaways. The establishment of the methodology aimed at addressing this regional narrative is discussed in Chapter 5, which includes a review of recent approaches to movement, both terrestrial and maritime, as well as a discussion of the importance of more blended approaches to both environments. This chapter ends with a discussion of current limitations to the use of GIS as a methodology and how the established method will seek to mitigate these challenges. Chapter 6 subsequently details this method, beginning with the collation and subsequent analysis of the Neolithic record before moving on to the GIS-based methodology. The GIS analysis includes the creation of a palaeogeographic reconstruction as well as the terrestrial and maritime least-cost analyses. Following each method, the results will be discussed before they are combined and statistically analysed, which forms the final section of this chapter. In Chapter 7, the results are discussed in detail, incorporating the archaeological and environmental records as well as additional sources of information regarding movement. This discussion takes the form of two different scales of movement, focusing firstly on micro-scales of movement occurring around individual sites and secondly on meso-scale movement that may have connected them. At the end of this chapter, the significance of local environmental conditions will be highlighted and a number of divergences within the record addressed. This leads into Chapter 8, which discusses the unique Hebridean environment and its strong influence on a regional identity, before concluding with a discussion of the potentialities for broader movement and connectivity along the western seaways.

Chapter 2. TO THE HEBRIDES

> Of these Islands it must be confessed, that they have not many allurements, but to the mere lover of naked nature (Dr Samuel Johnson in Black 2007, p. 400).

So wrote Dr Samuel Johnson of his infamous *Journey to the Western Islands of Scotland* in 1773 that, incidentally, did not include the Outer Hebrides; however, just as this statement can be extended to include the Outer Hebrides as well, so too can evocative history be added to this lone list of Hebridean allurements. Indeed, the human history of the Outer Hebrides is inextricably linked to its natural history; from the broad-scale geomorphological events that formed the archipelago millions of years ago and the repeated glacial incursions that subsequently shaped it, to the dramatic environmental changes that have occurred throughout the Holocene, each has provided its unique contribution to the human history of the archipelago. As emphasised by Gilbertson et al. (1996, p. 1), 'the present-day landscapes of the Outer Hebrides can only be fully appreciated by thoroughly understanding the depth and variety of both their natural and human history.' Thus, any understanding of the archaeological record must necessarily begin with the environment, including its modern geography and climate, its unique geology and landscape types as well as its palaeoenvironmental record.

2.1 GEOGRAPHY AND CLIMATE

The Outer Hebridean archipelago consists of 15 inhabited and more than 50 uninhabited islands, stretching roughly 210 km and covering an area of *c*. 2900 km² (Figure 3). The archipelago is separated from the mainland by the Minch, which is constricted by the wing-like extensions of the Isle of Skye that reach to within 23 km of the archipelago. Whilst the inner seaways have been highly significant for Hebrideans throughout the archipelago's history, it is instead the influence of the Atlantic that is most palpable. Residing on the Atlantic margin, the Outer Hebrides are subject to the many temperaments of the North Atlantic, creating a challenging yet fairly moderate climate in comparison to areas of similar latitudes due to the Gulf Stream (Armit 1996, p. 19). High winds are common year-round, amplified by the lack of trees and general openness of the landscape, but are particularly high in the winter (Bennett et al. 1990, p. 283). The frequency of severe gales has been identified as 'one of the chief difficulties' of living in the Outer Hebrides (Henshall 1972, p. 114). Rain is also common throughout the year, at around 120 cm per annum, with drier months (April to June) receiving as little as 60 cm of rain and wetter months (October to January) receiving as much as 140 cm (Angus 2018, pp. 335–336). In addition to an overall wet and windy climate, the Hebrides are notorious for unpredictable and at times severe storms, such as the great storm of 1756 which separated Baleshare from the southwest coast of North Uist, creating tidal islands and burying houses up to their roofs in sand (Gilbertson et al. 1999, p. 443).

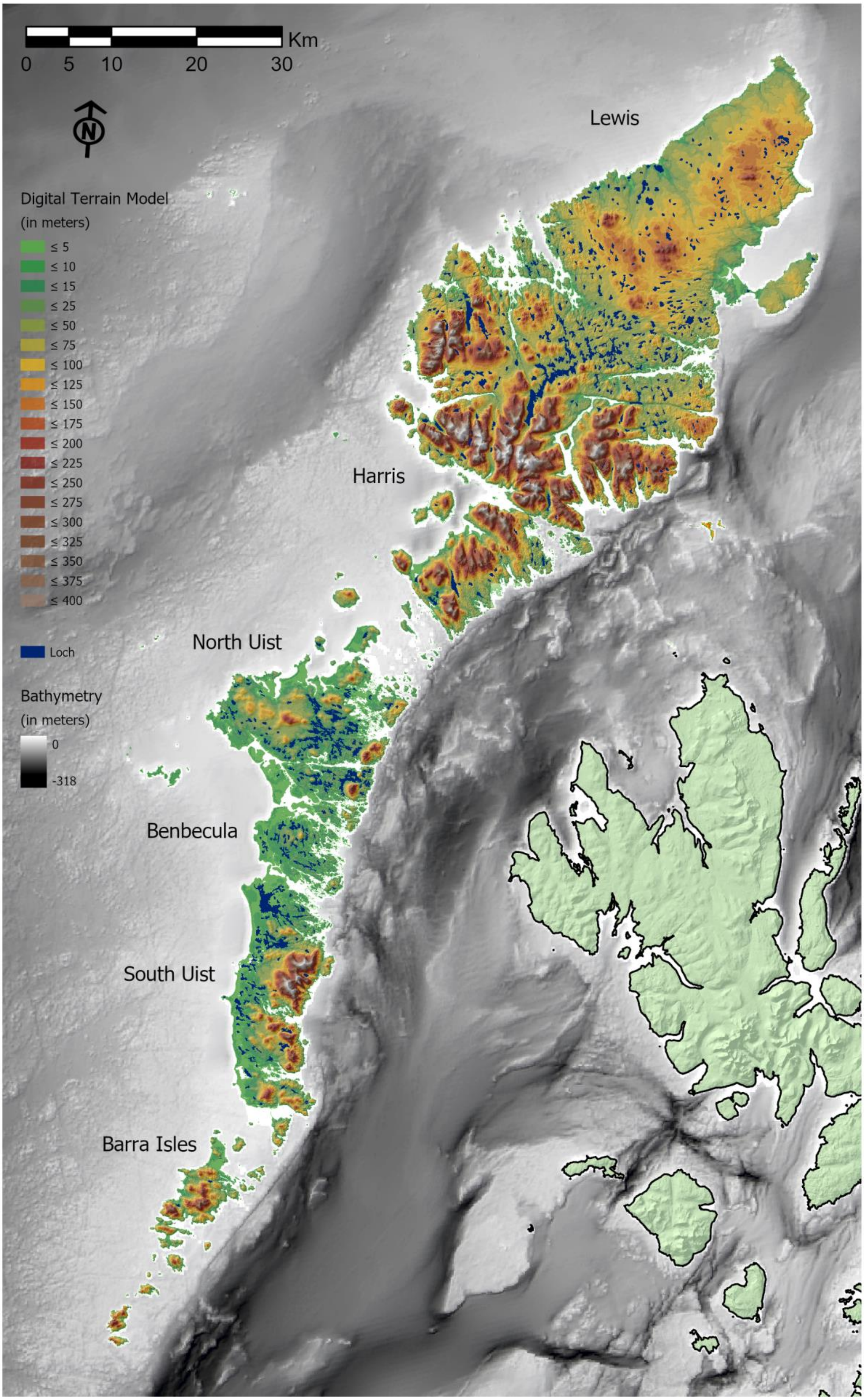


Figure 3. Topographic and bathymetric data of the Outer Hebrides and its surrounding seaways, with Skye to the east and the Small Isles to the southeast.

This exposure to the Atlantic not only affects the climate of the Hebrides but also the character of its surrounding seaways. The exposed west coast is bombarded with strong waves from the North Atlantic, with an analysis of annual wave power showing the west coast of the Outer Hebrides to be 'one of the most energetic wave resources in the world' (Neill et al. 2017, p. 10). In addition, Scotland's tides are dictated by the North Atlantic tidal wave, which propagates northwards along the western edge of the continental shelf, reaching the Outer Hebrides first before turning eastwards across the north of Scotland and into the North Sea. These tides are strongly semi-diurnal, with a typical spring tidal range of three to four meters (*ibid*). However, whilst tidal levels vary gradually with distance, tidal currents are far more complex (Ramsay and Brampton 2000, p. 9). Given the large number of islands and their highly indented coastlines, the Inner and Outer Hebrides 'create a network of channels, sounds and headlands, leading to enhanced currents and turbulence, eddy generation, and flow separation in the region' (Neill et al. 2017, p. 6). Although these sea conditions would have varied in the past, it will become clear throughout this analysis that the tidally driven Minch and its contrast to the dynamic and often unpredictable nature of the North Atlantic would have been just as significant for Neolithic Hebrideans as it is for modern inhabitants.

2.2 Geology and Landscape

Formed by fire and shaped by ice, the Outer Hebrides contain a diverse landscape comprised of dramatic landforms and unique vegetation. The bedrock geology is comprised almost entirely of Lewisian gneiss, one of the oldest known rock types in Europe, formed around 2900 million years ago (Ma) (Hall 1996, p. 5). These rocks have undergone repeated periods of deformation and metamorphism, in turn obscuring their geochronology; however, the Lewisian Complex can broadly be divided into two tectonothermal events; the older *Scourian* event that spanned from 2900-2500 Ma and led to the initial formation of the Lewisian complex, and the ensuing *Laxfordian* event, which lasted until 1400 Ma and involved the large-scale tectonic movements that formed much of the major land formations seen throughout the present-day archipelago (Fettes et al. 1992). The *Laxfordian* terminated in a major thrust event that produced the *Outer Hebrides Thrust Zone*, a major geological feature of the Outer Hebrides that runs the whole length of the archipelago and is marked by a spine of mountains along its east coast (Stoker et al. 1993). Secondary fault lines running transversely to the main thrust zone created strong northwest to southeast geological lineations, such as the numerous inlets and sea lochs that punctuate the coast (Ritchie et al. 2001). This has resulted in an intricate coastline equalling many thousands of kilometres in length (Fettes et al. 1992). Whilst heat and pressure formed the landscape, it was through successive periods of glacial expansion and retreat that the landscape was carved into its current form, resulting in the characteristic Hebridean landscape of undulating hills, rocky outcrops, and numerous loch-filled scours (Goodenough and Merritt 2010).

Overlying this glacially stripped bedrock is a thin, acidic soil that is of limited agricultural value, and moreover, due to its poor drainage qualities, is conducive to peat growth (Armit 1996, p. 22). The most notable exception is the region of Stornoway, which is underlain by conglomerates of Torridonian Sandstone (Chesher et al. 1983, p. 8). Being the largest town in the Outer Hebrides and the second largest town in the Scottish Isles, this geology has undoubtedly contributed to its long and intensive history of human occupation (Armit 1996, p. 22). Whilst the underlying bedrock and soils are relatively homogenous throughout the archipelago, the diverse landforms and unique Atlantic environment have produced a superimposed landscape of remarkable diversity.

The most significant landscape type for inhabitants throughout the archipelago's history is the machair sands that fringe the Atlantic coast (Figure 4 and Figure 5). These fertile sands have been touted as 'one of the most distinctive landscapes in Europe' (Whittington and Edwards 1997) and have a long history of anthropogenic use, likely dating to the Mesolithic (Whittington and Edwards 1997; Edwards et al. 2005). Machair plains are often separated from the beach by sand dunes, reaching 10 to 15 meters in height, that are continually eroding and accreting (Gilbertson et al. 1999, p. 442). Dune erosion has also revealed numerous archaeological deposits, including Neolithic settlements, Iron Age wheelhouses and medieval middens and structures (Armit 1996, p. 28; Gilbertson et al. 1999, p. 442), demonstrating both its temporally expansive history of use as well as its erosive nature.

Figure 4. View from knock and lochan landscape overlooking eroding machair plains and Traigh Na Beirigh, 'Reef Beach', at Uig, Lewis (Photograph by author, 2015).

Despite its geological and archaeological significance, machair only comprises a small portion of the total Hebridean landscape and only one of 11 types identified as part of a detailed landscape character assessment (Richards 1998). These landscapes can be broadly grouped into five main types based on geology, vegetation and agricultural suitability, which includes machair, croft, moorland, knock and lochan and mountain massif landscapes. Machair is predominate along the Atlantic coast and its interminable migration inland leads to the mixing of these coastal sands with the less fertile acidic soils, forming croft land that is characterised by its mixed agricultural and grazing use (Parker Pearson et al. 2004). In contrast, much of the interior of the Outer Hebrides is comprised of boggy moorland, a barren and inhospitable landscape that forms perhaps the most iconic image of the Hebrides, with its gently undulating peatland strewn with boulders and filled with lochs (Figure 6). Where this moorland meets the coast, it often forms sea cliffs with deeply eroded gullies (Richards 1998, p. 81). Small regions of the coast are fringed with dramatic knock and lochan landforms (see Figure 4 and Figure 5). These landscapes are highly variable and characterised by steep knocks of large boulder-filled bedrock surrounded by small loch-filled depressions. The most impressive landscapes, however, are the mountain massif landforms that run along the east coast and cover much of north Harris and south Lewis (see Figure 6). These landforms are comprised of peaks and broad summits that rise steadily from the surrounding landscape, and where they meet the Minch, they form rocky headlands and high sea cliffs. Although this landscape characterisation forms a brief overview of the primary landscape types of the archipelago, further geographical and geological semblances and variations allow for a more in-depth discussion of the landscape to be broadly partitioned into the southern and northern islands.

Figure 5. View from machair plains overlooking Traigh Na Beirigh (left) and knock and lochan landforms (background) (Photograph by author, 2015).

2.2.1 The Southern Islands

The southern islands consist of North Uist, Benbecula and South Uist (collectively known as the Uists) as well as a chain of islands to the south, known as the Barra Isles (Figure 7). The Uists are best characterised by a strong east-west landscape delineation, with the machair sands and croft land on the west coast giving way to a peat and loch-filled interior that abuts the mountain massif landforms of the east coast. In contrast to the low-lying west coast, the east coast is far more topographically complex, comprised of elevated coastlines punctuated by deep sea lochs that stretch more than halfway through the islands in some places. In North Uist, much of the north coast is also formed of machair landscapes, the erosion of which has created a coastline encompassed by large expanses of intertidal sands and numerous tidal islands (Figure 7, *inset Vallay Strand* and *Baleshare*). In addition, the greater east-west breadth of the island has contributed to a more diverse interior topography compared to Benbecula and South Uist, including a series of hills running northwest to southeast through the island. The interior of North Uist is also filled with a substantial number of lochs and smaller lochans (Figure 7, *inset North Uist*). Separated by the North and South Fords, the low-lying landscape of Benbecula presents a scaled version of North Uist, filled with lochs and surrounded by inter-tidal sands that stretch to the east coast.

Figure 6. View southeast over moorland and loch-filled interior of North Uist with Eaval in the background (Photograph by Tomkins).

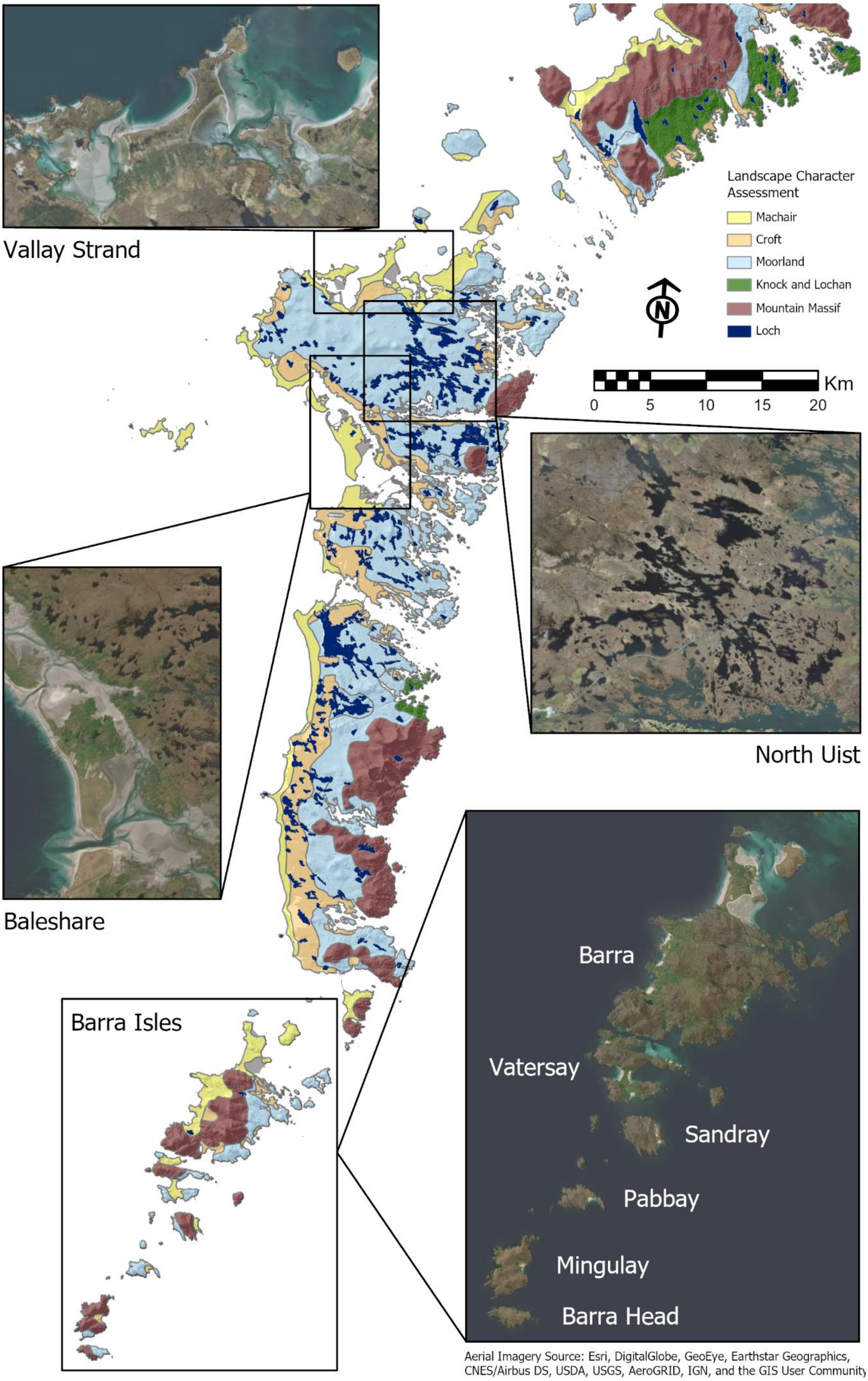


Figure 7. Landscape characterisation of the southern Islands showing strong east-west landscape delineations.

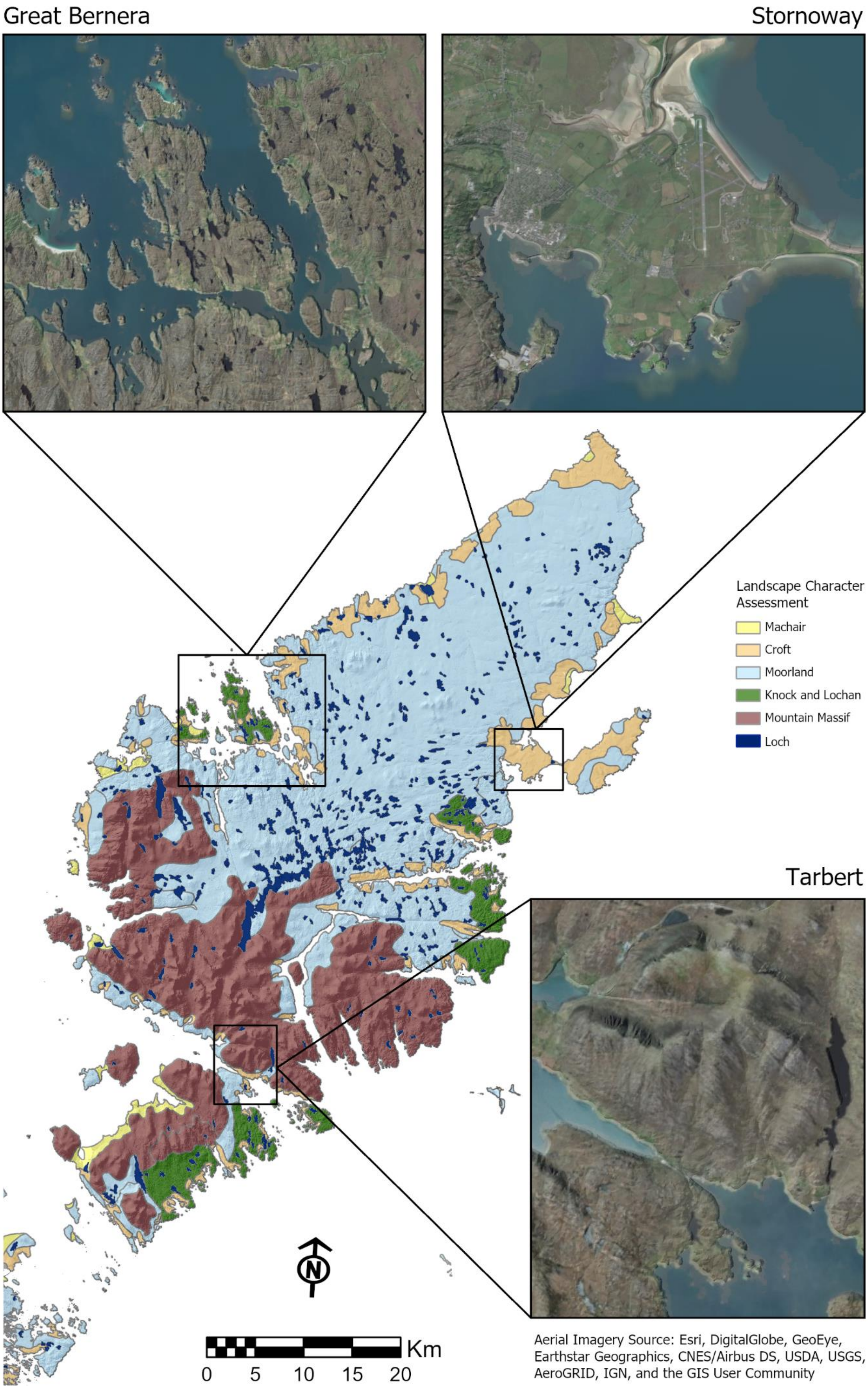


Figure 8. Landscape characterisation of the northern islands showing clear north-south landscape delineations, including a strong geographic and topographic divide between south Harris and north Lewis.

In contrast, the long and narrow island of South Uist demonstrates the clearest east-west landscape delineations, with each landscape type running in distinctive north-south bands through the island. In addition, the east coast of South Uist is dominated by mountain massif landforms, the tallest being Beinn Mhor, which reaches its highest point at 608 meters. The result of the aforementioned *Outer Hebrides Thrust Zon*e, this massif spine continues into Barra, which sits roughly 9 km to the south. Whilst this rugged island is comprised primarily of massif landforms, its north and west coasts are characterised by sweeping sandy beaches and substantial machair plains. Separated by a narrow sound, the island of Vatersay currently forms the southernmost inhabited island. Vatersay is also primarily formed of a massif interior, although the island is also fringed with machair, most notably forming a sandy isthmus, or tombolo, that connects the northern and southern regions of the island (Figure 7, *inset Barra Isles*). To the south of Vatersay, the largest of the remaining Barra Isles include Sandray, Pabbay, Mingulay and Barra Head. Although no longer inhabited, each of these islands contains a record of activity dating to prehistory, demonstrating a long and varied use of even the most remote of the Outer Hebridean islands.

2.2.2 The Northern Islands

Separated from the southern islands by the Sound of Harris, the northern islands are comprised of Harris, Lewis and Great Bernera (Figure 8). Whilst Harris and Lewis are in fact one landmass, they are commonly referred to as two separate islands due to their extreme topographical divide. In contrast to the southern islands, the northern islands display a strong north-south delineation in landforms, even dividing the so-called islands into distinct northern and southern regions. Harris is primarily comprised of mountain massif landforms, resulting in what has been likened to a 'lunar landscape' due to the prevalence of anorthosite, a rock that forms part of the moon's surface (Goodenough and Merritt 2010, p. 7). However, the west coast of south Harris contains substantial machair plains, which sharply contrast the general ruggedness of the island. South Harris itself is nearly an island, separated from north Harris by the Tarbert isthmus, an approximately 1 km wide strip of land at the foothills of north Harris and home to the main community of Harris (Figure 8, *inset Tarbert*).

To the north of Tarbert, north Harris and south Lewis contain the most dramatic and inhospitable region of the archipelago, filled with large massif landforms, the tallest of which is Clisham standing at 799 meters high. During the last glaciation, an ice sheet was centred over these mountains, creating a radial ice flow and resulting in many of the dramatic landforms of the region (Hall 1996, p. 6), including long and deep lochs and a coastline punctuated by numerous sea lochs. These landforms eventually fall away to central Lewis and the north Lewis plateau, comprised primarily of moorland interspersed with lochs. To the west, an extensive sea loch, known as Loch Roag, separates the small island of Great Bernera from Lewis and provides sheltered waters, a rare feature along the Atlantic coast (Figure 8, *inset Great Bernera*). To the east, the sandstone region of Stornoway connects to the Eye Peninsula, a primarily croft-filled landmass that extends into the North Minch (Figure 8, *inset Stornoway*). The plateau of north Lewis is characterised by a gently undulating moorland filled with lochs. Although croft land fringes the coast along with the occasional sandy beach, most notably around the Butt of Lewis at the extreme northern tip of the island, the elevated coastline is primarily comprised of dramatic rocky cliffs and sea stacks.

2.3 Palaeoenvironment

Although much of this chapter has focused on the modern landscape and environment, it is clear that the Outer Hebrides have undergone dramatic environmental changes since the Neolithic. Thus, as highlighted by Harding (2000), 'it is axiomatic in Hebridean archaeology that palaeo-environmental studies are integral to archaeological research.' In recent decades, palaeoenvironmental work conducted throughout the archipelago has provided a glimpse into this changing environment (e.g. Bennett et al. 1990; Fossitt 1996; Whittington and Edwards 1997; Ashmore 1999; Ritchie et al. 2001; Edwards et al. 2005). Although these studies have demonstrated the great temporal and spatial variability of environmental change, they have also revealed a disparate Neolithic environment. The most evident changes have occurred along the coast, with sea-level rise leading to the inundation of several megalithic tombs and coastal erosion enabling the identification of many Neolithic settlements. However, great changes have occurred within the landscape as well, consisting primarily of machair formation and movement, woodland decline and blanket peat expansion.

2.3.1 Coastal Change

The dynamic relationship between land and sea in the Outer Hebrides has played an integral role in human inhabitation since the earliest occupation of the islands (Armit 1996, p. 27). It has been estimated that sea levels have risen roughly four to five meters around the Outer Hebrides since *c*. 3100 BC (Armit, 1992, p. 10; 1996, p. 28). As emphasised by Lambeck et al. (2010, p. 66), 'it is important, however, to recognize that there are a number of global, regional, and local factors… that influence the record of relative sea-level change observed at any point on the globe.' Thus, understanding relative sea-level change requires the consideration of a complex interweaving of factors beyond eustatic sea-level rise—i.e. the change in ocean volume divided by ocean surface area. These include radial displacement of land by changing loads, changes in the shape of ocean basins, the redistribution of water within these basins and changes in gravitational potential as a result of these deformations, which are referred to collectively as glacial isostatic adjustment (GIA) (*ibid*, p. 65).

GIA models have a long history of use in the creation of palaeogeographic reconstructions, and recent models have demonstrated the great variability of relative sea-level change around Northwest Europe (Lambeck 1995; Shennan et al. 2000; Brooks et al. 2011; Sturt et al. 2013). Lambeck's (1995) early models suggested the first deceleration of sea-level rise to have occurred around 7000 BP, a trend which is also apparent in subsequent eustatic sea-level curves used in more recent GIA models (Figure 9). This process is, however, iterative, and thus each refined model represents a closer approximation of past sea-levels (Sturt et al. 2013). Further, the scale of analysis and hence the spatial resolution of the underlying digital elevation models will affect the resolution of the results. As stated by Brooks et al. (2011, p. 574), 'a detailed appreciation of spatial and temporal changes in RSL [relative sea-levels] is clearly of critical importance to the successful mapping of palaeogeographies.' Thus, it is clear that in order to move beyond broad generalisations regarding the nature of sea-level rise around the Outer Hebrides, a more refined understanding of the Neolithic palaeogeography is necessary.

This is best illustrated by the North and South Fords, the shallow channels that separate Benbecula from North and South Uist. These channels are of considerable importance as their opening in the mid-Holocene would have provided connections between the Atlantic and the Minch through the archipelago, profoundly altering the geography of the Outer Hebrides and transforming coastal sediment dynamics and tidal exchanges (Ritchie et al. 2001, p. 121)—changes which would have also had considerable effect on maritime activity around the archipelago. This would have been a time when 'the sea reached a critical level and breached the dune and machair barrier of the Atlantic seaboard to open up the North Ford', perhaps compounded by a coinciding increase in

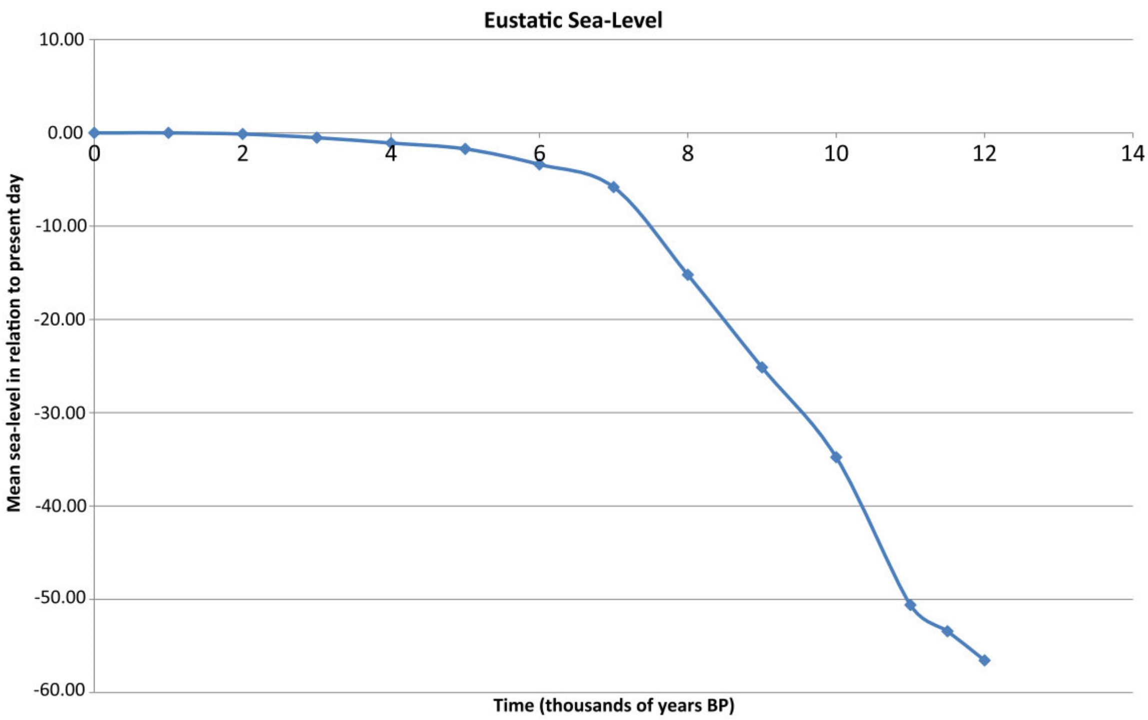


Figure 9. Eustatic sea level curve utilised in GIA models by Sturt et al. (2013, Fig. 2) showing first stage of sea-level rise deceleration at c. 7000 BP and its near cessation at c. 2000 BP.

storminess (*ibid*, p. 134). Whilst Ritchie et al.'s (2001) analysis of sub-tidal organic deposits has suggested the submergence of the North Ford at around 4500 BP, a subsequent analysis of machair deposits by Edwards et al. (2005) led them to suggest an earlier opening at around 5170 cal BP. Thus, whilst these variations in the date of submergence could be considered a minor discrepancy on a geological time scale, these dates have profound implications for the ability to match the submergence of the North Ford with its contemporaneous archaeological record.

Further, the North Ford also demonstrates the compounding effect of coastal erosion, which would have been most predominant along the low-lying and exposed Atlantic coast of the southern islands. The dynamic interface between land and sea has resulted in the formation of complex and unstable sand dunes backed by more stable machair plains (Armit 1996, p. 28). This results in a shoreline that is constantly in a state of flux, making the palaeocoastline difficult to retroactively predict. Without knowing the totality of erosion, what is known is that the western coastline has experienced considerable erosion since the Neolithic, the evidence for which can be seen in the numerous Neolithic sites that are either eroding or at-risk. However, coastal erosion may not have been a steady process. If eustatic sea-level rise began to slow between 7000 and 5000 BP, then as suggested by Ritchie et al. (2001, p. 131), coastal processes may have reversed for a time, allowing vast sediment banks from the continental shelf to create prograding coastlines along the Atlantic coast and effectively reversing the process of shoreline retreat. Whilst similar deposition events may have occurred around the archipelago, the clear long-term trend has been a receding coastline, the product of not only rising sea levels and coastal erosion but also changes occurring within the landscape (*ibid*, p. 130), a relationship of reciprocal influence that requires an understanding of both environments.

2.3.2 Vegetation

Throughout most of the archipelago, the absence of tree cover provides a stark contrast to the barren peat and loch-filled landscape interspersed with rocky outcrops; however, palaeoenvironmental evidence has indicated that the Outer Hebrides were not always so barren. Scattered exposures of inter-tidal organic deposits along the Atlantic coasts of Benbecula (Whittington and Edwards 1997) and several sites on the Uists (Ritchie et al. 2001, p. 125) have made it possible to establish the nature of the earliest vegetation of the present coastal zone. These studies have highlighted the primary changes within the palaeoenvironmental record, which include machair movement, woodland decline and peat expansion, as well as the intricate relationship between them.

Machair Formation and Movement

The unique significance of machair is such that it has been extensively studied through both palaeoecological and archaeological investigations (e.g. Crawford and Switsur 1977; Branigan and

Foster 1995a; Whittington and Edwards 1997; Gilbertson et al. 1999). 'Machair consists mainly of the crushed fragments of marine mollusca and crustacea as well as quartz sand and other products derived from reworked glaciofluvial deposits' (Edwards et al. 2005, p. 435). Holocene sea-level rise mobilised and mixed this offshore debris, reworking the material into coastal ridges that moved onshore, overriding pre-existing lacustrine and organic deposits (*ibid*) (Figure 10). Although the formation of machair likely began around 9000-8000 BP (Gilbertson et al. 1999), Ritchie et al. (2001, p. 134) have revealed that many of the present machair deposits were formed between 5800-4200 BP, a period of strong sand drift on the coasts of Northwest Europe. Whilst these studies provide a broad chronology of machair development, spatial and temporal variations must also be acknowledged.

Investigations of inter-tidal deposits in North Uist by Whittington and Edwards (1997) led them to suggest that the evolution of machair would have been slow and variable, diverging even in adjacent areas, possibly as a result of differing topographies. Thus, as emphasised by Dawson et al. (2004, p. 284), 'it is important to recognise that the pre-sand encroachment surface will be variable across the island chain and also to acknowledge that local coastal configuration will play a part in determining the subsequent pattern of sand encroachment.' Whilst machair is often described as a dynamic and unstable landscape, exposures in the dunes have revealed soil and peat horizons which reflect periods of stability, implying a complex evolution (*ibid*). Ritchie and Whittington

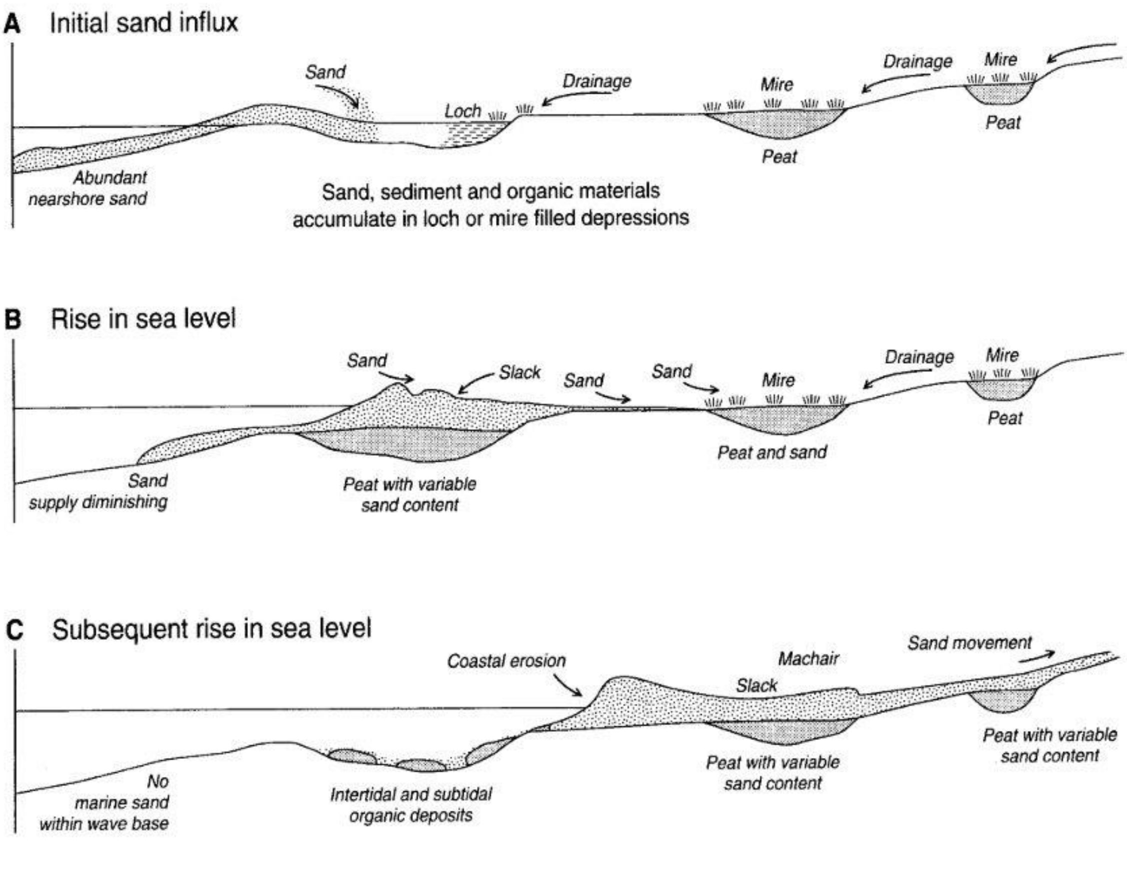


Figure 10. A refined model of machair plain development and migration demonstrating its dynamic relationship with both sea-level rise and inland geology and vegetation (Ritchie et al. 2001).

(1994) have identified rising sea levels, coastal erosion and climate change as the predominant factors for its cyclical migration; however, a combination of palaeoecological and archaeological investigations have suggested that intermittent periods of stability and drift 'may be related, in an unclear manner, to the long and complex history of human settlement and subsistence along these shorelines' (Gilbertson et al. 1999). Regardless of the forces behind its movement, machair incursions would have not only altered the configuration of coastlines but also impacted the existing vegetation (Ritchie et al. 2001, p. 131).

Woodland Decline

Whilst small pockets of woodland currently exist throughout the archipelago, primarily in sheltered valleys or littoral zones (Figure 11), palynological evidence is revealing greater expanses of woodland in the past. Ritchie et al.'s (2001) analysis of inter-tidal deposits from the Uists has revealed that at *c*. 8700 BP, *Betula* (birch) and *Corylus avellane* (hazel) would have existed more broadly along the west coast along with other flora species, such as *Ophioglossum* (adder's tongue) and *Sphagnum* (bog moss), leading to their conclusion that Holocene woodland would have existed in patches along the western littoral zone interspersed with open grasslands until machair incursion led to its decline. This was also evidenced by Edwards et al. (2005) who reported the presence of *Salix* (willow) and *Calluna* (heather) prior to the development of machair along the coasts of North Uist and Benbecula. Although this suggests the high probability of its existence elsewhere along the coast (Ritchie et al. 2001, p. 134), just as with other environmental changes, Holocene woodland and its decline would have been highly variable.

Figure 11. Existing pockets of woodland identified during landscape characterisation assessment, including coniferous woodland planted around crofts (top) and small copses of coniferous woodland in moorland (bottom) (Richards 1998, pp.77-78).

Palynological evidence from core samples taken from Loch Lang, a small loch to the south of Beinn Mhor in South Uist, has also demonstrated more substantial woodland cover than presently exists, leading Bennett et al. (1990) to suggest that the landscape would have contained more forest than at present but would not have been completely wooded. Birch and hazel along with *Quercus* (beech-oak)*, Ulmus* (elm)*, Alnus glutinosa* (alder) *and Fraxitius excelsior* (ash) all existed from *c*. 9000-4000 BP with birch and hazel trees dominating the vegetation between 9360-7095 BP. However, the sequence also demonstrates expansions and contractions in woodland cover, with the pollen spectra dominated by tree and shrub pollen at around 7700 BP and again at 4500 BP, whilst from *c*. 4300 BP this pollen began to decline from 60% of total land pollen and spore (TLPS) to the 10% that occurs in modern TLPS (Bennett et al. 1990, p. 294). A subsequent palaeoecological investigation of Loch a'Phuinnd, located near the northeast coast of South Uist, revealed a rapid expansion of hazel trees at around 8500 BP that led to the development of open birch-hazel woodland, although once again occurring in patches of tree cover interspersed with grasslands (Fossitt 1996, p. 188). Woodland types continued to diversify until the first major decline began shortly before 4000 BP, gradual at first but increasing after 3400 BP (*ibid*).

A similar sequence to that evidenced at Loch Lang was revealed at Callanish in Lewis, with pollen from peat columns demonstrating birch to have reached its maximum extent at *c*. 8400 BP, sharply declining at around 7900 BP before returning again, although to a lesser extent, between 7650 and 5320 BP (Bohncke 1988). Pollen sequences from Loch Buailaval Beag, 8 km to the north of Callanish also demonstrated the maximum extent of woodland to have occurred between 9300-7900 BP, with tree cover again existing in patches separated by open grasslands (Fossitt 1996, p. 187). After 7900 BP, this woodland saw a major decline at approximately the same time as woodland decline occurring at Callanish. These phases of woodland expansion and decline were also reflected in radiocarbon dates from 13 samples of subfossil wood from sites around the Outer Hebrides, which revealed two distinct phases of maximum woodland cover at 9200-7800 BP and 5200-3800 BP (*ibid*, p. 176).

However, in contrast to these overall trends, pollen sequences from Little Loch Roag, around 10 km to the southeast of Callanish, demonstrated maximum woodland cover during the period of major decline elsewhere, with birch and hazel reaching their highest frequency between 7700 and 6400 BP (Birks and Madsen 1979, pp. 835–836). However, arboreal pollen comprised at most 18% of TLPS, compared to, for instance, the 9% that tree pollen comprises within a virtually treeless landscape (*ibid*) or the 10% demonstrated in modern TLPS in South Uist. Thus, Bohncke (1988, pp. 459–460) has warned against any assumed correlation between adjacent regions and has instead emphasised the influence of topography and climate on woodland cover, suggesting that pockets of woodland would have existed in Lewis, predominately in sheltered valleys, within an overall barren landscape. Whilst Holocene woodland expansion and decline would have thus varied, both spatially and temporally, the second period of major decline at *c*. 5200-4000 BP, although also variable, would have occurred throughout the archipelago, eventually leading to the near total replacement of woodland by blanket peat (Fossit 1996, p. 190).

Blanket Peat Expansion

Just as with woodland and machair, blanket peat expansion would have also varied throughout the archipelago based on a variety of factors, obscuring its relationship with woodland decline. For instance, whilst radiocarbon dates from regions of the Uists and Lewis suggest blanket peat was accumulating before 8500 BP, coinciding with the first episode of woodland decline in these regions (Fossitt 1996, p. 190), dates from Bharpa Carinish in North Uist revealed the earliest date for the onset of blanket peat expansion to be around 3100 BP (Crone 1993, p. 377). This later expansion of peat in North Uist is also reinforced by excavations of two Neolithic tombs, which showed no evidence of underlying peat prior to their construction (Henshall 1972, p. 115). In contrast, Bennett et al.'s (1990, p. 294) work in South Uist suggested that the major spread of blanket peat as it stands today would have occurred around 5500 BP, nearly 1000 years earlier than the final decline of woodland in South Uist. For blanket peat to dominate the landscape and prevent woodland regeneration, adverse pressure on tree populations had to be maintained or intensified following its decline, which may have been the result of increased precipitation and oceanicity in western Scotland around 4300 BP (Bohncke 1988; Birks 1991; Fossitt 1996, p. 191). Thus, once again the inextricable relationship between various aspects of this changing environment is highlighted.

2.4 Conclusion

This tour through the Hebrides and introduction to its palaeoenvironment highlights two important points. Firstly, the great diversity of landforms, landscapes and seascape is clear, as is the strong influence of this diverse environment on settlement and land-use practices throughout the archipelago's history of inhabitation. In other words, the unique geography of fragmented islands, complex topographical features and variable landscapes has resulted in a correspondingly diverse archaeological record. Thus, the archipelago's great diversity simultaneously demonstrates the inefficacy of applying broad generalisations to either the environmental or archaeological records. Secondly, the timing of palaeoenvironmental changes demonstrates that although the environment would have been milder, more abundant and altogether more conducive to Neolithic activity, it would have also been undergoing substantial changes throughout this period. Whilst some environmental changes would have been the result of, or at least related to, anthropogenic activity, underlying this human factor would have been a gradually and irreversibly deteriorating environment. These changes would have impacted the suitability of the landscape and overall conduciveness of the environment during the Neolithic and in all likelihood would have been well observed and noted through the generations. Nevertheless, whilst understanding this changing Hebridean environment is clearly crucial to understanding the Hebridean Neolithic, the great temporal and spatial variability of these changes make it difficult to match this piecemeal yet well-dated environmental record to an extensive record of Neolithic activity with an overall absence of absolute dates. Whilst these issues are not easily resolved without further excavations and dated materials, the incorporation of and consideration for various aspects of the environmental record, within both the analysis of movement and subsequent discussions of it, will aid in mitigating some of these limitations.

Chapter 3. THE HEBRIDEAN ARCHAEOLOGICAL RECORD

> Any attempt to tell the story of an area through its archaeology relies heavily on the actions and ideas of previous generations of archaeologists and antiquarians (Armit 1996, p. 6).

The substantial archaeological record of the Outer Hebrides has led to a long and varied history of research—the prominent and well-preserved monumental record attracting inquisitive antiquarians and later archaeologists alike. In the 17th century, Martin Martin (1703) recorded the Callanish stone circle to include in his work, *A Description of the Western Isles of Scotland*, and later visitors to the archipelago illuminated its rich and enigmatic archaeological record through narratives and illustrations, 'providing fascinating insights into the emerging awareness of the broad outlines of Scotland's distant past' (Armit 1996, p. 7). The growing awareness of this remarkable Neolithic record led to a series of archaeological campaigns in the early 20th century that provided the main fount of archaeological knowledge of the Hebridean Neolithic until the 1980s (*ibid*, p. 6). The first of these was conducted by Erskine Beveridge (1911), a relocatee to the archipelago, who focused his efforts around Vallay Strand on the northwest coast of North Uist, exposing a multitude of prehistoric and medieval sites. Whilst Beveridge was less concerned with interpreting these sites, and indeed often incorrectly assigned them, his investigations still provide the basis of understanding for many sites that have not been investigated since.

Following Beveridge's work, there was an understandable hiatus in archaeological excavations, during which time the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) began compiling an inventory of monuments resulting in the publication, *Outer Hebrides, Skye and the Small Isles* in (1928), still an invaluable database of all archaeological sites in the Hebrides. Excavations recommenced in the 1930s by Sir Lindsay Scott (1935, 1948, 1951a), whose excavations focused primarily on Iron Age dwellings but also included three significant Neolithic sites in North Uist. Although much of his interpretive work has subsequently been dismissed, his excavations, much like Beveridge's, still form the primary understanding of these Neolithic sites and, more significantly, are the only substantial excavations of chambered tombs to date. The development of Hebridean archaeology throughout the 20th century, and more pertinently the understanding of the Neolithic, thus evolved from the work of these few keen antiquarians.

Whilst the 1960s and 1970s were dominated by Iron Age research, notable Neolithic work included excavations of eroding coastal settlements at Northton, Harris (Simpson et al. 2006) and the Udal, North Uist (Crawford and Switsur 1977), two significant sites that were not comprehensively published until nearly a half-century later. Accordingly, in the past three decades, the majority of

Neolithic work has involved rescue archaeology as well as more extensive multi-period survey campaigns in South Uist (Gilbertson et al. 1996; Parker Pearson 2012a) and the Barra Isles (Branigan and Foster 1997; Branigan and Grattan 1998). Whilst the majority of rescue work has involved small-scale, and often unpublished, excavations, four substantial excavations of Neolithic sites have also conducted, three of which were identified as settlements and the fourth being the extensively studied Callanish complex. Hence, all definitive Neolithic settlements have been discovered through rescue operations within the past several decades, whilst early antiquarian research still forms much of the current understanding of the monument record. This has created a strong discrepancy in knowledge between domestic and ritual contexts, leaving little understanding of the relationship between the two. In addition, the paucity of modern excavations and radiocarbon dates has predisposed the current understanding of the Neolithic towards the few extensively investigated sites—themselves often the result of happenstance discovery due to erosion—further fragmenting an already biased record of Neolithic activity. This is compounded by a wealth of materials that have been recovered from these few sites, predominately ceramics and lithics, which have also suffered from research biases towards the pottery assemblage, further contributing to an altogether partial and piecemeal picture of the Hebridean Neolithic.

3.1 The Broader Settlement Record

Whilst the Early Neolithic settlement record of the Outer Hebrides 'rivals anything known in Britain as a whole in terms of surviving architecture' (Garrow and Sturt 2017, p. 205), the rather ambiguous and often ephemeral nature of the record raises questions as to the size and permanence of these settlements (Parker Pearson et al. 2004, p. 38). Indeed, differences in setting, structural remains, duration of activity and material assemblages suggest that some sites may differ from the traditional conception of a settlement. This broader settlement record thus includes four more-substantial Neolithic settlements, numerous occupation areas and several enigmatic islet sites. Whilst the more definitive settlements revealed a number of similarities, most notably their coastal settings and temporally expansive multi-period phases of use, the more ephemeral occupation areas vary in setting, duration of use and material remains, leading to a range of interpretations, from resource-based areas to ritual or otherwise communally significant places. Figure 12 provides the location of all discussed settlements.

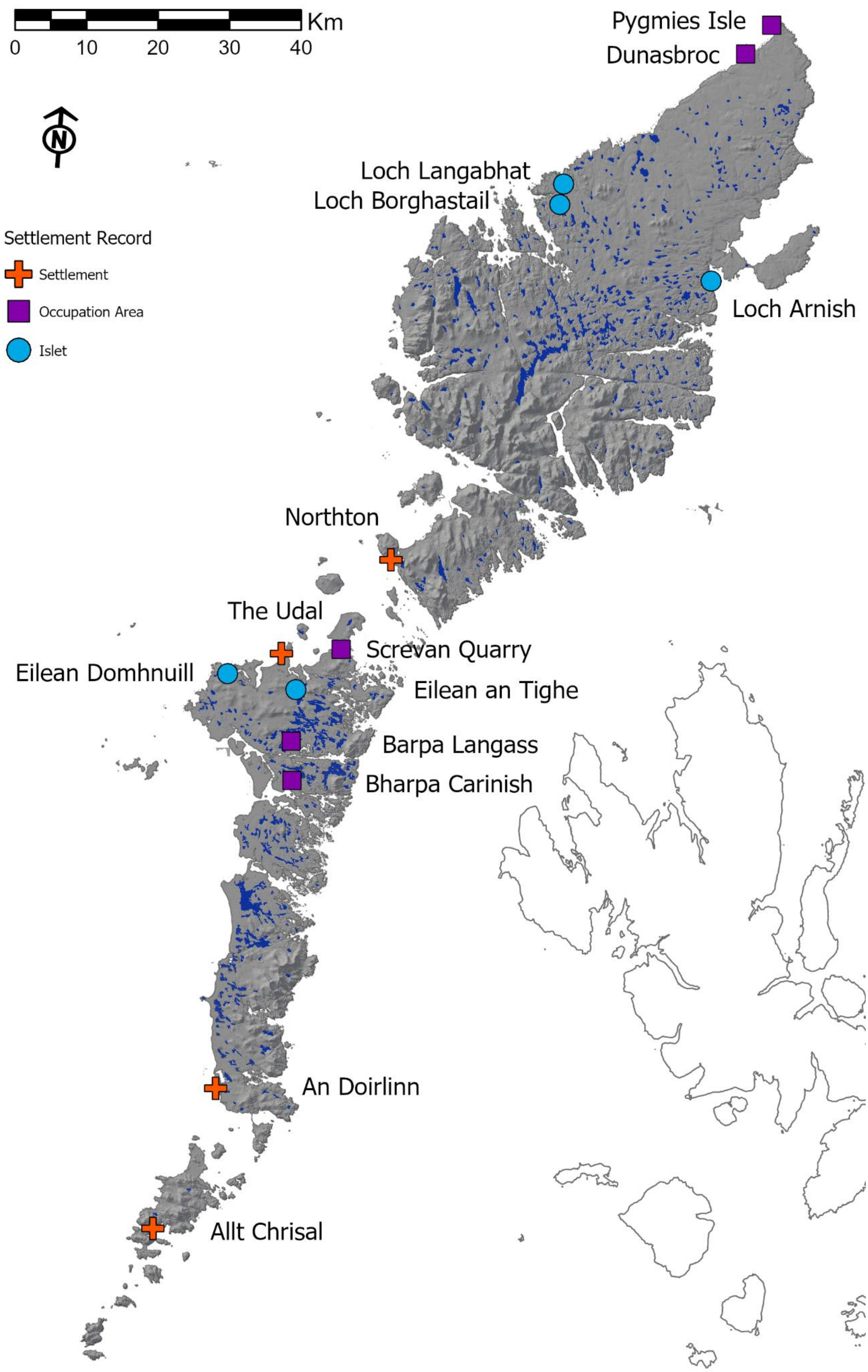


Figure 12. Analysed sites within the broader settlement record by category.

3.1.1 Excavated Settlements

Northton

Currently located on the machair coast south of Toe Head, a prominent headland at the extreme southwest of south Harris, archaeological remains at the site of Northton were initially discovered due to erosion, leading to subsequent rescue excavations in 1965 and 1966 (Simpson et al. 2006). Whilst the site provided evidence for Neolithic, Bronze Age and Iron Age activity, charred hazelnut shells from a midden revealed two possible phases of earlier activity dating to 7060-6650 cal BC and 6510-6090 cal BC (Gregory et al. 2005, p. 945). Although the context of the hazelnut shells is uncertain, as is whether their charring is the result of anthropogenic activity, the reliability of these dates has been confirmed through the dating of an adjacent shell midden to the Late Mesolithic (Piper and Church 2012; Bishop et al. 2013). Thus, the enduring significance of this site is clear.

Excavations of the Neolithic phases revealed 'drystone walling, stones and boulders intermixed with deposits of peat ash and clay as well as a large pit' (Simpson et al. 2006, p. 40). A midden deposit produced a single radiocarbon date, indicating activity at the site at 3350-2890 cal BC (*ibid*, p. 44). This deposit revealed a large and varied faunal assemblage, demonstrating a dependence on both animal husbandry, primarily sheep but also cattle, as well as on wild resources, including red deer, wild boar and fowl and marine mammals and fish. Along with these remains, a single degraded grain of barley was recovered, suggesting its cultivation (*ibid*, p. 40). In addition, a large quantity of bone and antler tools were recorded, which contrasted an overall impoverished lithic assemblage. The apparent scarcity of local lithic resources led to the suggestion that these faunal remains would have provided the raw materials necessary for the success of the site, although foreign lithics were also recovered, evidencing their supplementary use (Nelis 2006).

In comparison, large quantities of ceramics were recovered, with over 2700 Neolithic sherds of a diverse range of forms and styles; however, a lack of contextual information for the Neolithic phases prevented the establishment of more refined chronologies of both site and material use (Johnson 2006). Overall, the large quantity of recovered materials along with structural similarities to other Hebridean settlements suggested 'a certain degree of permanency' and thus led to the site's interpretation as a coastal settlement that acted as 'the focus for a range of activities connected to various aspects of Neolithic life' (Gregory and Simpson 2006, p. 83). However, it was also acknowledged that certain aspects of the site remained unclear, such as whether it was permanently occupied or used by mobile communities (Gregory and Simpson 2006).

The Udal

Located on the extreme edge of a peninsula that juts into the Atlantic from the north coast of North Uist, the Udal is another machair site that has suffered from considerable erosion. Excavations in the 1960s and 1970s revealed a sequence of occupation from the Neolithic up to the early 20th century, and it was deemed likely that earlier Neolithic, and perhaps even Mesolithic, deposits had been lost due to erosion (Crawford and Switsur 1977). Given the temporally expansive use of the site, the Udal has since been touted as one of the most unique archaeological sites in the world (DSCS 2010). Whilst the many Neolithic levels uncovered were of an ephemeral and inconsistent nature, exacerbated by the detrimental effects of erosion, materials were recovered from all Neolithic phases (Squair 1998, pp. 423–427; DSCS 2010), including a polished axe-head that had been inserted into the drystone walling of a Neolithic structure (Crawford 1980, p. 4, 1986, p. 7; Ballin Smith 2018, pp. 176–177).

Bayesian modelling of six radiocarbon dates obtained from animal bones and carbonised food residue revealed Neolithic activity at the site between 2700-2470 cal BC and 2465-2165 cal BC (Ballin Smith 2018, pp. 65–66). Given that the dates obtained from the food residue were earlier than the associated bones at 2888-2640 cal BC and 2618-2467 cal BC, a marine reservoir correction was applied to them, leading to a good agreement between the radiocarbon dates and thus suggesting that the residue of at least the earlier date may have been from a marine resource (*ibid*, pp. 65-67). In addition, the faunal remains revealed a reliance on domestic and wild resources, similar to those in use at Northton, including sheep and/or goat, cattle, deer, birds and fish. Other organic remains included large quantities of uncarbonised wood fragments, predominately pine but also birch, hazel and oak, reflecting the more extensive woodland cover suggested by palaeoenvironmental work in the region.

As a result of limited funding for the project, recovered artefacts have suffered in preservation and diminished in quantity due to a long history of relocation for assessment and analysis by a great many specialists over the past two decades (see Ballin Smith 2018). This, in combination with minimal reporting, has limited a more thorough understanding of this significant settlement and its material assemblage, and a post-excavation assessment of a portion of the site was only recently produced by Ballin Smith (*ibid*). Finds included nearly 2000 Neolithic sherds, most of which were highly abraded (Squair 1998, Ch. 8; Squair and Ballin Smith 2018), and over 5000 lithic pieces, comprised primarily of quartz (Wickham-Jones 2018, pp. 123–124). Of the lithic assemblage, Wickham-Jones (*ibid*, pp. 128, 132) noted that ‘although the material derives from five different phases which differ in terms of date and activities, there is remarkably little variation between the sub-assemblages from the different phases.’ Altogether, the evidence suggests a significant and abundant site with a strong continuity of practices and use throughout the Neolithic.

Allt Chrisal

Located on a massif hillside overlooking the southern coast of Barra, Allt Chrisal is the only extant settlement not currently located in machair; however, much like the other settlements, it also demonstrated a longevity of use for a range of activities from the Neolithic to the modern era

(Branigan and Foster 1995a). Excavations from 1989-1994 revealed two main areas of activity, an artificially levelled platform of Neolithic origin and a possible Neolithic roundhouse. The platform was severely truncated by an 18th century blackhouse, although excavations revealed a series of complex prehistoric features, including hearths, pits, post-holes, stone revetments and occupational debris (Foster 1995, p. 72). Additional work on the foreshore exposed a potential flint-knapping site associated with a few sherds of Neolithic pottery.

Charcoal deposits revealed a variety of tree and shrub species, including alder, birch, hazel and pine, and charred macrofossils demonstrated a reliance on fishing and pastoralism along with the small-scale cultivation of barley (Boardman 1995). Radiocarbon dating of birch wood exposed on the artificial platform demonstrated activity at 3711-3379 cal BC and 3360-2938 cal BC, although these dates are controversial. Most notably, the presence of Beaker sherds throughout almost all sequences suggested high levels of redeposition and raised doubts as to the stratigraphic integrity of the dated phases (Gibson 1995, p. 108). The Neolithic ceramic assemblage was considerable, including over 6800 sherds of a range of forms and styles. Stylistically, the pottery suggests a wide range of dates from the Early to the Late Neolithic (Foster 1995, p. 57), whilst contextually, pumice and other lithic deposits suggest a date of *c*. 3000 BC (Clarke 1995, p. 145). In addition, a substantial lithic assemblage of over 3700 pieces was recovered, primarily comprised of local pebbles and flint along with pumice and a few pieces of polished foreign stone (Sheridan and Addison 1995; Wickham-Jones 1995). On the basis of this evidence, the settlement was interpreted as a small area of intense and varied activities with a longevity of use that produced 'a wealth of disturbed features and large quantities of what can only be described as residual material' (Foster 1995, p. 73).

An Doirlinn

Located on a small isthmus connecting the tidal island of Orosay to the mainland of South Uist, An Doirlinn presents, as with all other settlements, a multi-period site spanning from the earlier Neolithic to the Bronze Age, and like all other coastal settlements, the site was identified due to erosion (Garrow and Sturt 2017). Despite much of the site having been lost to erosion, excavations in 2012 revealed a deeply stratified sequence of deposits, representing perhaps 1000 years of continual use (*ibid*, p. 202). Neolithic structural remains included 'stone-built walls, hearths, post-holes, pits and midden-like occupation deposits', with hearths and other structures appearing to have been rebuilt and reused over several hundred years (*ibid*, p. 134). 12 radiocarbon samples were obtained, and subsequent Bayesian modelling suggested the presence of an earlier Neolithic settlement between 3530-3100 cal *BC* and 2840-2640 cal *BC* and a later phase of occupation beginning at 2830-2600 cal *BC* and ending at 2480-2330 cal *BC* (Garrow et al. 2017a, pp. 200–202).

These dates were primarily obtained from wood charcoal, which demonstrated the great diversity of trees surrounding the site, including pine, birch, hazel, alder, willow, oak and ash (Kabukcu 2017). Although the later phase of occupation coincides with the initial period of woodland decline in the region, the evidence suggests no significant changes in the woodland resources surrounding the settlement (*ibid*). Whilst these remains provided substantial evidence for the types of wood being used for fuel, evidence for the materials being cooked was less forthcoming. Faunal remains were limited to very small fragments, preventing any identification of species but confirming a reliance on mammals, perhaps domestic and wild (Garrow and Weinstock 2017, pp. 191–192). Further, no cereals were recovered from the site, although whether this reflects subsistence practices or different taphonomies due to soil conditions remains unclear (Garrow and Sturt 2017, p. 205). The material record was far more revealing, with nearly 4800 sherds of Neolithic pottery recovered, representing both Early and Late Neolithic forms. In addition, 7000 lithic pieces were recorded, primarily chipped flint and quartz but also including two polished stone axe-heads, one of possible foreign origin. Similar to Northton, the lithic assemblage was noted to reveal a constancy of technology and tool forms throughout the Neolithic phases (Pirie 2017, p. 183), which reinforces a continuity of site use as well as associated practices throughout the Neolithic.

3.1.2 Occupation Areas

Bharpa Carinish

Bharpa Carinish on North Uist was excavated in 1988 and 1989 following the exposure of stone structures during peat cuttings around the chambered cairn Caravat Barp. Excavations revealed three hearth complexes, although the additional evidence of boulder alignments and occasional stake holes left an incoherent settlement picture (Crone 1993, p. 361). Radiocarbon dates obtained from the hearths revealed all to be broadly contemporary and used within a short period of time between 3300-2900 cal *BC* (*ibid*, p. 370). Over 400 sherds of pottery were recovered of a range of highly decorated styles and forms, which contrasted the handful of recorded lithics, comprised primarily of locally sourced flint and quartz. Deposits of charcoal and ash were discovered across the site, demonstrating a range of plants, including wild and domesticated species. This is typical of many Neolithic assemblages in southwest Scotland and Ireland and was taken to suggest a mixed subsistence economy with a continued reliance on foraging (*ibid*, p. 376). The domestic nature of the artefact and macroplant assemblages as well as comparisons with other excavated settlements led to its interpretation as a settlement rather than temporary encampments by tomb builders or visitors (*ibid*, pp. 371, 380), although the comparatively small size of the material assemblage and short period of use—not to mention its inland location and strong association with an adjacent chambered tomb—highlight the strong differences between this site and the coastal settlements.

Barpa Langass

Barpa Langass is another occupation area associated with a chambered tomb, from which its name is derived. Located at the base of a hill on which the chambered cairn resides, the site was excavated in advance of road improvements in 2005, revealing semi-circular and sub-rectangular structures, kerbstones, post-settings and a hearth (Badcock 2007). In addition, 186 lithic artefacts were recovered, mainly of quartz but also containing flint and pitchstone (Ballin 2008). Given its structural remains, the site has been interpreted as a small Neolithic settlement, perhaps associated with the adjacent cairn, whilst quartz debitage suggested the processing of quartz at the site (*ibid*). However, in contrast to the lithic assemblage, sherds from only a single vessel were recovered that may, along with the ephemeral structural remains, suggest its more impermanent nature (Copper 2015, pp. 369–370).

Screvan Quarry

Following a watching brief undertaken during the development of the Screvan Quarry site and Berneray causeway linking North Uist to the small island of Berneray, excavations were conducted on a findspot that had produced Neolithic pottery. Excavations revealed an arc of large boulders and stones along with a wide, shallow pit (Downes and Badcock 1998). The pit contained the remains of over 150 Neolithic vessels of a limited range of styles and decorations along with over 250 lithic pieces, primarily flint and quartz tools as well as part of a mace-head (*ibid*, p. 101; Copper 2015, pp. 332-333). Two radiocarbon samples produced dates of 3515-2873 cal BC and 3314-2491 cal BC, suggesting contemporaneous use with other settlements, although based on the rather ephemeral nature of the structural record and the lack of evidence for the working of stone on site, Screvan Quarry was interpreted as a resource-specific site (Downes and Badcock 1998, p. 48).

Dunasbroc

In contrast to all previously discussed sites, Dunasbroc and nearby Pygmies Isle, are located in the most anomalous setting, being the only extant occupation areas in Lewis and further residing on sea cliffs on the west coast of the north Lewis plateau. Much like other coastal sites, they have suffered from considerable erosion, which has limited more thorough investigations. Dunasbroc now resides on a sea stack precariously positioned over the Atlantic, although the site may have been situated on a well-defined coastal hillock during the Neolithic (McHardy et al. 2009, p. 97). Continued erosion of the site is progressively restricting access to it, and thus, a small excavation was carried out in 2003-2005 (McHardy et al. 2009). Whilst later Iron Age activity has limited the ability to identify and interpret Neolithic structural remains and deposits, a number of definitive Neolithic finds were recovered, including around 480 sherds of pottery of elaborate styles and decoration as well as roughly 100 lithic pieces. Of particular interest was a distinctive leaf-shaped arrowhead of imported flint that parallels styles found throughout Scotland, often in early Neolithic funerary or ritual contexts (*ibid*, p. 134). This early date for site use is reinforced by two radiocarbon dates that revealed activity at 3660-3520 cal BC and 3500-3100 cal BC (*ibid*, p. 90). Based on the lack of debitage, it was suggested that the finds did not signify a 'conventional domestic assemblage', and further, there was evidence for collective burning using a variety of wood types, predominately willow, that was reflected in the presence of burnt bone and heat-affected lithics (*ibid*, p. 100). Taken together, the evidence led to the suggestion that the site would have represented a significant place within the landscape rather than a settlement, used for ritual or ceremonial practices that may have included some form of collective burning, perhaps as a type of votive deposit or offering (*ibid*, pp. 97-99).

Pygmies Isle

Highly reminiscent of Dunasbroc, the site of Pygmies Isle has suffered from substantial erosion and is now precariously located on a sea stack. This coastal location at the Butt of Lewis was later home to an early Christian chapel, and it was during early antiquarian work on the foundations of this church that an unspecified, and now largely lost, number of pottery sherds and associated animal bones were recovered (Lenfert 2012, p. 218). A single illustrated sherd was identified by subsequent researchers as Neolithic and has now formed the basis for its Neolithic origins (see Armit 1996, p. 52). As the site can now only be accessed with climbing equipment, a more thorough understanding of it may never be forthcoming, and thus antiquarian investigations necessarily form the basis of its understanding. The faunal remains revealed seven different species of mammal, including oxen and sheep, and a further seven species of seabird (Lenfert 2012, p. 218). Given the great effort required to bring these animals to the site, even if slaughtered elsewhere, as well as the exposed nature of the location, the site does not appear to have been of a domestic nature (*ibid*, pp. 218-219). When combined with its later monastic use and its strong similarities to Dunasbroc, Pygmies Isle may have also represented a significant place within the landscape, perhaps used for some form of communal gathering or ceremonial practices during the Neolithic.

3.1.3 Islet Sites

Eilean an Tighe

Located in Loch nan Geireann, a now brackish loch on the north coast of North Uist, Eilean an Tighe was initially investigated by Beveridge (1911, p. 222), who noticed numerous fragments of pottery around the site, and later excavated by Scott in the 1950s. The earliest identified Neolithic phase revealed the presence of two adjacent rectangular structures, although later structures were of a more ephemeral nature (Scott 1951a). Despite being only partially excavated, the islet produced a wealth of materials, including over 4500 sherds of pottery of a broad range of forms and styles, many highly decorated. The lithic assemblage included over 100 pieces of worked stone tools, comprised primarily of flint and pumice, with some foreign examples. In addition, the islet revealed 'very numerous flakes of quartz', of which some were certainly worked; however, its prevalence along with an overall anthropogenic ambiguity resulted in the omission of quartz from the recovered material assemblage (*ibid*, p. 35).

Based on the large quantities of pottery as well as the more ephemeral structural record, Scott suggested the use of the site as a pottery workshop, although this interpretation has subsequently been challenged (see Simpson 1976; Armit 1996, pp. 50–54; Squair 1998, Ch. 6). Armit (1996) instead suggested the site to be a settlement based on his excavations of the more substantial islet site, Eilean Domhnuill. Similarities in setting, ceramics and even structural remains suggested a close relationship between the two islet sites (*ibid*, pp. 50–51), and radiocarbon dates from Eilean an Tighe at 3620-3370 cal BC and 3510-3340 cal BC (Garrow et al. 2017, p. 33) indicate contemporaneous activity. However, interpretations of the site have been problematic due to the construction of later structures, which disturbed much of the Neolithic layers, as well as the damming of the loch in the late 18th century, which makes both loch levels and the size of the islet during the Neolithic difficult to determine (Armit 1996, p.50). Further, doubts remain as to whether the site was even an islet during the Neolithic (Lenfert 2012, p. 220; Garrow and Sturt 2019, p. 667), a question initially raised by Scott (1951a, p. 2) who noted the shallow soundings between Eilean an Tighe and Ard Reamhar, an adjacent promontory. Whilst the heavy concentration of activity at this site is clear, any further understanding of it is hindered by a lack of modern excavation and an absence of any investigation of its underwater deposits.

Eilean Domhnuill

Less than 10 km to the west of Eilean an Tighe, Eilean Domhnuill is located in Loch Olabhat, a small loch at the extreme northwest of North Uist. Eilean Domhnuill was first investigated by Erskine Beveridge (1911, pp. 197-198) who believed it to be an Iron Age island-fort, and only after an initial trial excavation in 1986 were its Neolithic origins revealed. Extensive excavations in the following years produced a wealth of information, including at least 11 different phases of Neolithic activity, spanning nearly 1000 years (Armit 1992, 1996). Several radiocarbon samples revealed an earliest date at 3792-3537 cal BC and a latest date at 2836-2356 cal BC, although no radiocarbon dates were obtained from the latest Neolithic phases (Copper 2015, pp. 290-291). Further, this long duration of use was set amidst evidence for periodic flooding and reoccupation, with early phases extending several metres into the loch (Armit 1996, pp. 45-50).

Within these numerous phases, a vast quantity of materials was recovered, including over 22,000 sherds of pottery, two 'phallic' clay objects and numerous stone objects, including several carved stone balls, a miniature stone axe-head and numerous worked stone objects (Armit 1986, 1987, 1988, 1996, 1997). The pottery assemblage revealed a vast range of forms and styles, many containing elaborate decorations (Copper 2015; Copper and Armit 2018). Based on the large material assemblage as well as the evidence for numerous phases of structure building, Armit's initial interpretation was that of a settlement; however, he also acknowledged that even if the islet were bigger during the Neolithic, its size would have still constrained the number of dwellings and hence occupants (Armit 1996, p. 46). In addition, despite strong evidence for domestic occupation, such as pottery, querns and pumice, no evidence was recovered for the everyday activities associated with a dwelling, such as stone knapping, woodworking and subsistence activities (Armit 1992, pp. 315–316). More refined interpretations subsequently suggested that Eilean Domhnuill and Eilean an Tighe would have existed as a type of specialised site within a broader domestic network that would have encompassed a range of landscapes and resource-based areas (Armit 2003a; Sheridan 2003, p. 98). More recently, Copper and Armit (2018) have acknowledged that its significance would have 'went beyond that of simple dwelling places' and based on the large quantities of elaborately decorated pottery and substantial deposits of ash, have suggested its use as a gathering place for communities to interact through ritualised commensality.

Lewis Islets

More recent work on a number of newly discovered Neolithic islet sites in Lewis has further challenged earlier domestic interpretations (Garrow and Sturt 2019). To date, five sites have produced definitive Neolithic pottery, three of which have been extensively surveyed, including Loch Arnish near Stornoway and Loch Borghastail and Loch Langabhat to the north of Callanish (Garrow et al. 2017b; Garrow and Sturt 2019). More concentrated investigations of the latter two sites revealed the substantial construction efforts required to create and maintain these artificial and substantially reinforced islets along with large quantities of what appears to have been deliberately deposited pottery on the loch bed (Garrow and Sturt 2019). Although these islet sites have revealed a number of dissimilarities to Eilean Domhnuill and Eilean an Tighe, including their predominately artificial nature, smaller size and, as of yet, absence of Neolithic structures, radiocarbon dates obtained from four islet sites in Lewis have demonstrated their contemporaneity with the islets in North Uist, although their use appears to have been of a much shorter duration, falling within 3640-3360 cal BC (Garrow et al. 2017a; Garrow and Sturt 2019, p. 678). Perhaps most significantly, these sites demonstrate that islet construction and use was a widespread practice during the Hebridean Neolithic, a littoral setting that was clearly imbued with great significance (Garrow and Sturt 2019, p. 680). Thus, whilst interpretations of Eilean Domhnuill and Eilean an Tighe are slowly moving away from the domestic, these Lewis sites have provided near immediate evidence for the greater conceptual significance of islets beyond the domestic.

3.2 Material Assemblages

It is clear from this review of the broader settlement record that these relatively few excavations have produced a wealth of materials, primarily ceramics, and thus, whilst Neolithic pottery is relatively scarce on the Scottish mainland, it appears that in the Hebrides 'it was made and used in huge quantities' (Parker Pearson et al. 2004, p. 41). Given the great diversity of forms and styles that were being used in a range of contexts throughout the Neolithic, the creation of Hebridean pottery sequences has been demonstrated to be both challenging and necessary. Scott (1935, 1948, 1951b) first attempted to build a chronological sequence based on deposits from his excavations, identifying a broad sequence that, despite the later addition of large quantities of pottery to the known assemblage, has been broadly maintained through subsequent ceramic analyses. The two most comprehensive studies of the Hebridean ceramic assemblage to date have been conducted through PhD research. Copper's (2015) analysis of the assemblage from Eilean Domhnuill and its comparisons to other assemblages aimed to build a regional sequence of pottery development and use, whilst Squair's (1998) earlier analysis sought to 'revivify artefact studies' by using the ceramic assemblage to situate the Hebridean Neolithic within its wider context. In many ways, these studies reflect broader research trends, which have been progressively emphasising the need for more refined regional analyses of the Neolithic (see Ashmore 1996, Chapter 3-4; Barclay 2001; Noble 2006).

In contrast to ceramic analyses, the lithic assemblage as a whole has been little discussed. With the majority of recovered lithics comprised of local materials, only more exceptional prestige objects and/or those of foreign provenance have been discussed and often as part of broader analyses of lithic movement throughout the British Isles (Ritchie 1968; Marshall 1976; McK Clough and Cummins 1979, 1988a; Roe 1979; McK Clough and Woolley 1985)—many of which are clearly dated. The exception is formed by Ballin's (2004, 2018) work on specific types of local lithics recurring in prehistoric Hebridean assemblages as well as their potential sources. This bias has clearly resulted in an emphasis on the more exotic lithic objects and perhaps an exaggeration of their quantities and significance, which when combined with a heavier emphasis on ceramics, has further contributed to the fragmented and partial record of Neolithic activity.

3.2.1 Pottery Styles and Sequences

Hebridean Ware

The most prevalent form of pottery within the Hebridean assemblage is a distinctive regional form known as Hebridean Ware. Characterised by a baggy-bottom and round frame, this tradition includes highly decorative large jars, collared bowls and flanged dishes and is generally made of a dark gritty ware (Henshall 1972, p. 153) (Figure 13). This style appears to have been in use in the Outer Hebrides throughout the fourth-millennium BC, essentially forming 'a distinctive polythetic group' within Scottish Neolithic pottery (Copper 2015, p. 396). Through a comparison of pottery recovered from two chambered tombs with the Beacharra tradition from Argyll—a distinctive bipartite bowl associated with the Clyde-Carlingford tradition of cairns—J.G. Scott (1964) concluded that Hebridean Ware developed independently from an earlier phase of the Beacharra tradition, a notion later supported by Henshall's (1972, pp. 152-154) analysis of ceramic assemblages from Scottish chambered tombs. Whilst comparisons between Hebridean and mainland assemblages do suggest an association between the styles and thus regions, the potential inefficacy of creating narratives of origin based on stylistic similarities has also been highlighted. One of the greatest challenges resides with the multiple directions of possible influence. For instance, whilst Squair (1998) recognised an apparently early stylistic influence from the southwest mainland, he also acknowledged a range of other possible influences, subsequently admonishing that 'a typological treatment of pottery, attempting to identify the cultural origins and relations of an assemblage, is almost certainly misconceived.'

From his analysis of the Hebridean assemblage, Copper (2015) identified two forms of Hebridean Ware, a 'basic' and an 'elaborate' assemblage. Whilst more elaborate Hebridean Ware has served as the archetype for the tradition, less decorative styles were also in use at a number of sites, often reflected by an overall lack of decoration within the assemblage as well as the presence of undecorated or plain ceramics. For example, the estimated 154 vessels recovered from Screvan Quarry included a less decorative form of Hebridean Ware along with a considerable number of undecorated vessels, leading Copper (2015, p. 333) to draw parallels between assemblages from this site and those from An Doirlinn and Allt Chrisal. Although the assemblages from these sites

Figure 13. Hebridean Ware vessels recovered from Eilean an Tighe (left) (Scott 1951a, Plate II, 2); and Unival (right) (Scott 1948, Plate IV, 1).

were far more substantial, they also contained a high proportion of undecorated vessels (Copper 2015). These less elaborate assemblages are contrasted by those containing highly decorative Hebridean Ware. Large proportions of elaborately decorated pottery of comparable forms and styles were evidenced within the large ceramic assemblages from Eilean an Tighe and Eilean Domhnuill and were also evidenced at Northton, Bharpa Carinish and Dunasbroc (*ibid*). In addition to elaborate Hebridean Ware, these assemblages as a whole contain more decorative styles on a range of forms. For instance, of the 2756 sherds from Northton, 69% were decorated (Johnson 2006, p. 62), and of the 422 sherds recovered from Barpa Carinish, most were highly decorative (Copper 2015, p. 327). In addition, despite its anomalous setting, the majority of Neolithic sherds recovered from Dunasbroc revealed 'the prevalence of a decorated Hebridean Ware characteristic of many Hebridean Neolithic sites' (MacSween 2009, p. 122).

Nevertheless, despite this potential demarcation in decoration, the overlapping use of certain decorative motifs, fabrics and manufacturing techniques demonstrates a familial resemblance between all Hebridean site assemblages, suggesting that these sites were still 'drawing on a common pool of ideas' (Copper 2015, pp. 332, 396). Thus, whilst the origins and sequences of Hebridean Ware can only be speculated upon, these assemblages do demonstrate the development and perpetuation of a regionally distinct material culture throughout the archipelago, beginning in the Early Neolithic and lasting throughout the fourth-millennium BC (Sheridan 2000, p. 9) and even into the early third-millennium BC at some sites (see Garrow and Sturt 2017). In contrast to its clear regional significance, the absence of the Hebridean Ware tradition outwith the archipelago has been seen as evidence for an increasing level of insularity, leading to the suggestion that the contacts which first incited its inception would have dissipated throughout the fourth-millennium BC (Scott 1964, pp. 155-156; Henley 2003; Gannon 2017). However, this theory is challenged by evidence for the concurrent use of an inter-regional style known as Unstan Ware.

Unstan Ware

This distinctive vessel has been described by Henshall (1972, pp. 177-178) as:

> A wide shallow round-based vessel, the external diameter at the carination being more than double the total depth of the pot, having a vertical or nearly vertical collar defined outside… which is generally decorated.

Named after its site-type in Orkney, this form of pottery is prevalent in Orkney and the northern mainland, and yet equivalent Unstan-type bowls have been found in the Outer Hebrides and southwest mainland (Figure 14). Whilst petrological analyses of Unstan sherds from Eilean an Tighe and Northton has demonstrated their local manufacture (Henshall 1972, pp.177-178; Simpson et al. 2006, p.59), the stylistic similarities between the Orcadian and Hebridean Unstan-type assemblages have been cited as evidence for a clear link between the two regions (Brophy and Sheridan 2012, p. 28). However, the nature of its origins and subsequent transmission is less clear.

Figure 14. Unstan bowl from Eilean an Tighe (Scott 1951a, Plate III, 2).

There is growing evidence for its emergence in northeast Scotland (Sheridan 2016 p. 589), and Bayesian modelling of radiocarbon dates obtained from the Knap of Howar settlement in Orkney indicate its spread to the archipelago around 3600 BC (Schulting et al. 2010, p. 33). Sheridan (2016, p. 589) has thus suggested that Unstan-type vessels were adopted in the Outer Hebrides from contacts with Orkney around the mid-fourth millennium BC. However, as noted by Copper and Armit (2018, p. 264), the similarity in earliest dates between the two archipelagos, for both the emergence of the Neolithic and the use of Unstan-type vessels, presents 'no good reason to assume that Unstan bowls necessarily represent an introduction of a new style of pot *from* Orkney.'

Further, these assemblages present a number of variations. Firstly, Unstan-type vessels recovered from the Hebrides display a limited range of decoration compared to examples from Orkney, reflecting instead decorative motifs and techniques common throughout Hebridean ceramic assemblages (Copper 2015; Copper and Armit 2018). In addition, the two assemblages reside within different contexts—the large proportion of Unstan bowls from Orcadian tombs contrasting their absence from Hebridean tombs (Henshall 1972, p. 177; Simpson et al. 2006, p. 69). Instead, substantial proportions of Unstan Ware have been recovered from occupation areas including Allt Chrisal, Bharpa Carinish, Northton and Eilean Domhnuill as well as at several of the Lewis loch sites. Within the large number of ceramics recovered from Eilean Domhnuill, Copper (2015, p. 117) has suggested that over half of the identifiable vessels are Unstan-type bowls, and at Northton, the unusually high proportion of Unstan Ware was noted (Simpson et al. 2006, p. 69). Indeed, despite its long association with Orcadian chambered tombs, as emphasised by Copper (2015, pp. 413-414), the vast majority of known examples are neither from Orkney nor from chambered cairns. Instead, it appears that it is within the Outer Hebrides that this style is most strongly represented (*ibid*).

Thus, despite attempts to establish theories of origin and inter-regional connectivity, the Unstan tradition in the Outer Hebrides more readily testifies to a highly connected archipelago. Its concurrence with Hebridean Ware was apparent at several sites, and its presence within the earliest phases excavated at Eilean Domhnuill indicates its use at the start of or shortly after the start of the Hebridean Neolithic (Copper and Armit 2018, p. 265), with both styles remaining in use throughout the fourth millennium BC (Crone 1993; Gibson 1995, p.115; Copper 2015, p. 175). Consequently, the diffusion of the Unstan tradition throughout the archipelago and its occurrence alongside a distinct regional style demonstrates not only a high level of regional connectivity but also the pervasiveness of unified Hebridean traditions. Further, these two styles appear to have undergone little to no significant alteration until the appearance of Grooved Ware in the early-third millennium BC (Copper and Armit 2018).

Grooved Ware

'One of the most frequently recurring and distinctive finds on Later Neolithic monumental sites' (Noble 2006, p. 19), Grooved Ware was originally identified by its flat-based bucket-shaped form, upright rims, and profuse decoration (Warren et al. 1936, p. 191) (Figure 15). Emerging at the end of the fourth millennium BC, its prevalence amongst later Neolithic artefact assemblages and seeming lack of precedence in southern England in terms of form, decoration and composition has led researchers to suggest 'a profound break in the ceramic sequence of southern Britain' (Thomas 1999, p. 113). Evidence from Stenness, Orkney, Balfarg, Fife and Machrie Moor, Arran indicates a pattern of association between Grooved Ware and stone circles (Sheridan et al. 2016, p. 594), leading to the suggestion that Grooved Ware formed part of a 'ritual package' associated with a new belief system spreading throughout the British Isles in the early-third millennium BC (Cunliffe 2001, p. 190). Some of the earliest radiocarbon dates for Grooved Ware come from Scotland (Ashmore 1999), and given the stylistic and technological similarities between Unstan Ware and Grooved Ware, some researchers have suggested its inception in Orkney (Renfrew 1979, pp. 205–

Figure 15. Grooved Ware vessel from Unival (Scott 1948, Plate VII).

208; MacSween 1992; Cunliffe 2001, p. 190). In contrast, others have proposed that the decorative motifs demonstrate a greater resemblance to Irish passage tomb art (Richards and Thomas 1984, pp. 192–193; Bradley and Chapman 1986), with interaction between Boyne Valley communities and those living along the western seaways acting as a conduit for the transmission of the 'Grooved Ware complex' (Sheridan 1999, p. 30). Regardless of the origin and direction of transmission, it is clear that Grooved Ware was a highly significant and influential pottery style, and its diffusion and profusion throughout the British Isles suggests increasing or fortified contact networks, especially along the western seaways.

However, evidence for the use of Grooved Ware in the Outer Hebrides has remained scant, with only three near-complete examples having been recovered from An Doirlinn, the chambered tomb of Unival and Callanish stone circle. In addition, Grooved Ware sherds were recently identified in the assemblage from the Udal, although the small size of the sherds, their heavy abrasion and the low percentage of diagnostic pieces made it difficult to determine styles and forms and as such only broad generalisations about its use can be made (Squair and Ballin Smith 2018, pp. 191–192). Whilst Orcadian sequences date its emergence to before *c*. 3100 BC (Schulting et al. 2010, p. 38) and prevalence to around 3000-2900 BC (Ballin Smith 2018, p. 196), the few Hebridean examples demonstrate a later use. Radiocarbon dates from associated materials recovered from the Udal date Grooved Ware usage at the site to 2618-2464 cal BC (*ibid*, pp. 65, 196), which would have been contemporaneous with Grooved Ware use at An Doirlinn, which was dated at 2780-2480 cal *BC* and 2480-2330 cal BC (Garrow and Sturt 2017, p. 172).

Whilst the emergence and spread of later Neolithic traditions has been suggested as evidence of renewed or increased connectivity during this time, the limited examples in the Outer Hebrides and the apparent later date of its adoption have been suggested by MacSween (2009, p. 122) to demonstrate diminishing contact between the Hebrides and Orkney throughout the Neolithic. Furthermore, just as with Unstan Ware, Grooved Ware in the Hebrides also resides within a different context. Whilst Grooved Ware has been recovered from both Callanish and the chambered tomb of Unival (representing a later phase of the tomb's use), its presence at An Doirlinn and the Udal demonstrates that its use within the Outer Hebrides was not confined to ceremonial contexts (Garrow and Sturt 2017, p. 172).

Regardless of the broader implications of this ceramic tradition, the emergence of this style in the Outer Hebrides clearly represents a significant break from a long-held and well-unified tradition of pottery manufacture and use. Radiocarbon dates from An Doirlinn indicate the end of Hebridean Ware usage at 2840-2640 cal BC with no overlap in Grooved Ware indicated (Garrow and Griffiths 2017, p. 202). These drastic changes prognosticate the impending arrival of Beaker Ware (*c*. 2450), which sees even greater breaks in previous traditions, most notably a shift in settlement practices

(Sharples 2009). It is thus possible that significant changes had already occurred in the Outer Hebrides prior to the arrival of Grooved Ware (Garrow and Sturt 2017, p. 205), which may explain both its late adoption and limited examples as well as its ready acceptance as a new ceramic tradition.

3.2.2 Hebridean Lithics

Foreign Representatives

Although the majority of recovered lithics in the Outer Hebrides are of local origin, almost all excavated sites have produced foreign lithics, the most common being Rum bloodstone, Arran pitchstone and Irish porcellanite. Rum bloodstone is derived from Bloodstone Hill on the island of Rum (Ritchie 1968, p. 118) and has been described as being a distinctive deep green in colour with blood-red intrusions. It was first mentioned in a report on Rubh' an Dunain, a Mesolithic occupation site on Skye, evidencing its early exploitation and movement via the seaways (Scott 1934b, 1951b, p. 43). Whilst the exact starting date for the exploitation of bloodstone is uncertain, its use continued into the early-second millennium BC (Ritchie 1968, pp. 117–118). Like bloodstone, the initial exploitation of Arran pitchstone is not definitive, although Ballin (2015) has suggested it to be an early Neolithic phenomenon, with its use also continuing into the early-second millennium BC or later (Ritchie 1968, p. 117-118). The use of pitchstone and its deposition has been suggested to be due to the 'symbolic values associated with the material's distinctive colour' (Ballin 2009, p. 5). Another distinctive stone is porcellanite from Rathlin Island and Tievebulliagh in Co. Antrim, Ireland. This stone is most commonly associated with polished axe-heads belonging to the Group IX stone objects, a petrological group of late Neolithic stone implements developed by Mck Clough and Cummins (1979, 1988b). Group IX objects have been found in considerable numbers throughout Britain with even greater concentrations in Scotland (Ritchie 1968, p. 124; Edmonds 1995; Sheridan 2004b, p. 14).

Prestige Objects

Although foreign lithics may have been moved as raw materials, the more archaeologically visible objects being exchanged were stone axe-heads and mace-heads. Emphasising the importance of stone axes, Kinnes (1985, p. 125) has commentated that:

> Stone axes are the most visible and resilient part of the archaeological record… relative quantities are an index of settlement density and their sources an indication of broader cultural and economic contracts.

The results of an analysis of stone implements in the British Isles by Ritchie and Scott (1988) identified 494 unperforated axes recovered from Scotland. Of these, there was a remarkable concentration of porcellanite axes found to the west and north of Britain (Ritchie 1968, p. 124). In contrast to axe-heads, mace-heads are 'distinguished by the absence of a blade of any kind, being instead convex in shape at either end' (Roe 1979, p. 146). In addition, the hole, which is often cylindrical or near-cylindrical in shape, is characteristically placed nearer to the narrower end (*ibid*). Mace-heads have been further divided into type, with certain types being more prevalent in certain regions. Although enigmatic, the symbolic reference of these objects to tools is apparent. Less clear, however, are the carved stone balls prevalent in the Northern Isles and mainland of Scotland. These objects are often described in terms of the number of 'knobs' they contain as well as their decorative motif (see Marshall 1976). Whilst often carved from local materials, the distinctive form of this object and its ambiguous purpose demonstrates its significance within late Neolithic contexts.

Prestige objects in the Outer Hebrides are often found through peat cuttings or other land-use practices, thereby limiting any associated contexts but suggesting a practice of ritual deposition (Armit 1996, p. 61). The most notable find is the Shulishader axe recovered during peat cutting near Stornoway (Figure 16). This porcellanite axe was found with a substantially intact hawthorn haft, allowing it to be dated at 3389-2914 cal BC (Sheridan 1992, pp. 198–201; Garrow et al. 2017a, p. 22). This date thus suggests the emergence of prestige stone objects in the Hebrides along with the standing stone tradition, perhaps as a result of some form of strengthened or renewed contact along the western seaways at this time. However, this suggested increase in inter-regional movement throughout the Neolithic appears to conflict with the later arrival of Grooved Ware in

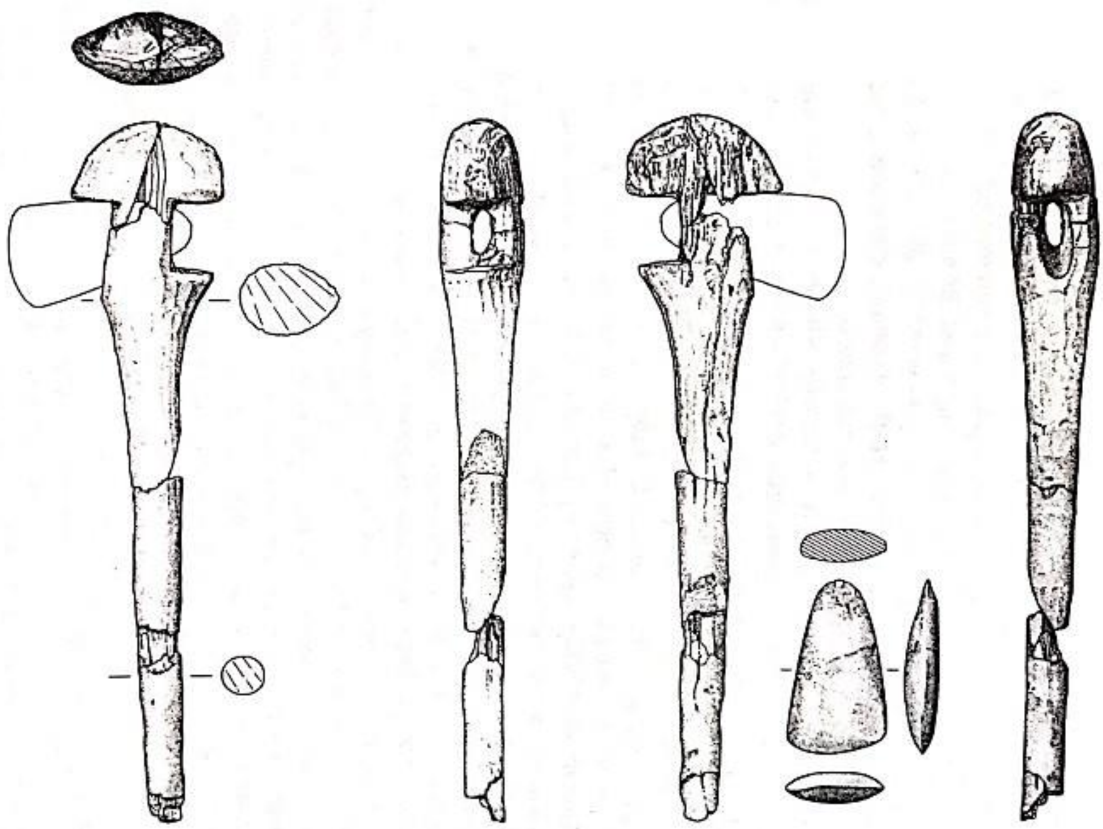


Figure 16. Shulishader porcellanite stone axe found near Stornoway, Lewis (Sheridan 1992, p.199).

the Outer Hebrides, which has highlighted questions regarding the nature of inter-regional connectivity, especially with Orkney, around the third millennium BC and subsequently Grooved Ware's association with the emerging standing stone tradition and movement of prestige objects. One possible explanation, as suggested by Cooney (2000, p.211), is 'that ideas about the design and form of pottery were moving in a different sphere of exchange' than lithic assemblages. However, the ability to address such theories in the Hebrides is only possible through a more comprehensive comparison of the two assemblages.

Local Lithics

The combination of local stone exploitation and the use of imported materials is a trend noted at other Neolithic sites in Scotland and Ireland (Sheridan and Addison 1995, p. 137). Whilst local materials have been largely overlooked, there is clearly still much to be learned from them. For instance, the richer lithic assemblages of Allt Chrisal and An Doirlinn contrast the scant and poorer quality assemblages to the north. This contrast between site assemblages suggests that local materials of better quality were not being moved between Hebridean communities, which again contradicts the indications of a highly connected archipelago as revealed through the ceramic assemblage. However, the assemblages from An Doirlinn and the Udal show little variation in technology and/or tool form across the phases of use, suggesting a strong continuity in lithic traditions that reflects the continuity of forms and styles apparent in ceramic traditions. Thus, whilst foreign lithics may foremost be used to construct narratives of broader contacts, local lithics and their comparison to ceramics may also provide insight into the nature of regional connectivity. Although foreign examples of prestige objects are more readily cited, there are also examples of stone axes of apparently local origin. Combined with the recovery of several carved stone balls, also of local materials, this suggests not only the emergence of this broader material tradition but also the emulation of it. In essence, the lithic assemblage, much like the ceramic assemblage, demonstrates a strong regional narrative punctuated by more ambiguous inter-regional contacts.

3.3 Conclusion

As emphasised by the quote from Armit (1996, p. 6) at the beginning of this chapter and evidenced throughout the ensuing archaeological review, any attempt to narrate the Hebridean Neolithic relies heavily on the work and theories of previous generations of antiquarians and archaeologists, with the early historiography of archaeological research having a strong influence on modern practices and interpretations and, in turn, the current understanding of the Neolithic. For instance, the early emphasis on more visible and extraordinary monuments, such as Callanish, has resulted in a biased understanding of these sites within the broader record of activity, assigning them a significance that may only be the result of visibility, preservation and/or concentrated research. This myopic approach to research foci in the past, focussing on certain regions or classes of sites, is also apparent in modern research practices, with a strong emphasis on North Uist, ceramics and foreign objects. Whilst modern excavations of Neolithic settlements have provided crucial information regarding the domestic aspects of Neolithic life, they have been no less biased, this time on eroding or at-risk sites. This has built a picture of settlement and activity that is heavily concentrated towards the exposed west coast, a bias which has been further compounded by the substantial quantity of materials recovered and their juxtaposition to the limited materials recovered through the less-thorough excavation practices of the early-20th century. This concentrated focus is apparent in published work as well. Few comprehensive narratives of the Hebridean Neolithic have been published, with the notable exception of Armit's (1996) *The Archaeology of Skye and the Western Isles,* although numerous new sites have been discovered since the more than two decades that have elapsed since its publication. The majority of published excavation reports have addressed the significance of the site and its materials within its local context and compared this evidence to other excavated sites, when and where comparable. This has led to the gradual development of a regional narrative, although stitched together in a chronologically piecemeal way.

More comprehensive analyses have taken the form of PhD research, perhaps necessarily so, allowing for a refined approach, although again focussed on certain classes of materials (Squair 1998; Copper 2015) or sites (Muller 1988; Henley 2003; Lenfert 2012) within the broader Neolithic record. Whilst these syntheses have provided invaluable contributions to the current understanding of the Neolithic, they have nonetheless also contributed to the bias in extant knowledge. The first attempt at a comprehensive approach to the archaeological record was made by the RCAHMS in the 1910s and 1920s, and much of this work still forms the current HER and SMR databases. However, the vast scope of the survey, covering the entire extant archaeological record, combined with the challenging years in which the survey took place, limited a more thorough analysis and resulted in the questionable identification of many sites.

For instance, of the numerous listed islet sites identified as Iron Age duns or brochs, the majority were only identified from the shore (Armit 1996, pp. 10-11), leading to their predominate interpretation as Iron Age dwellings, an age that was only questioned in the 1980s with excavations at Eilean Domhnuill. This again demonstrates the influence of early work on modern interpretations, and yet, this attempt to comprehensively catalogue and quantify the vast and growing Neolithic record in the Outer Hebrides is no less applicable today. Despite the limited number of excavations that have been conducted in the Outer Hebrides, a wealth of Neolithic materials has been recovered, evidencing the development of a unique Hebridean culture alongside the influence of foreign Scottish Atlantic styles. When combined with the vast and prominent monument record, comprised of a variety of forms, sizes and settings, the importance of a comprehensive approach to the extant archaeological record and the need for a more refined regional narrative will become clear.

Chapter 4. The Hebridean Monument Record

> There was much cultural diversity, but there was also a remarkable thread of cultural similarity running throughout the whole of the Atlantic zone, expressed most clearly in the ritual monuments (Cunliffe 2001, p. 211).

From the settlement and material record, the presence of a regionally distinct and culturally unified Hebridean Neolithic punctuated by foreign contacts has been highlighted, and this trend is further supported by the monument record. These monuments, scattered across the many islands of the archipelago, include earlier megaliths and later monoliths. Whilst megalithic funerary structures have provided evidence for the diffusion of the Atlantic Neolithic along the western seaways, the long and extensive period of chambered tomb construction and use in the Hebrides also demonstrates the development and maintenance of a regional identity within these foreign traditions. Further, the emergence of the standing stone tradition and its associated materials at the start of the third millennium BC suggests a period of intensified or renewed foreign contacts; however, regional variations in form and a strong continuity of setting also demonstrate a unique Hebridean signature within this broadly homogenous Neolithic trend. Thus, although these monuments have long been used to construct narratives of a culturally unified Atlantic façade, just as with the settlement and material records, they also provide strong evidence for the development and maintenance of a Hebridean identity alongside foreign contacts. Additionally, the association between these monuments and movement may provide the greatest evidence for local patterns of mobility and regional patterns of connectivity throughout the archipelago. Figure 17 lists all monuments discussed in this chapter.

4.1 Chambered Cairns

Despite over a century of research and debate, the most substantial and well-researched class of Neolithic structures in the Outer Hebrides remain enigmatic. Of the estimated 38 to 42 Hebridean tombs (Muller 1988; Cummings and Richards 2013, p. 189), only four have been excavated, the two most substantial of which having been conducted during the first half of the 20th century. Further, these few excavations have demonstrated the many challenges in attempting to refine cairn sequences; the continual clearance of chambers and their long period of use and reuse obscure stratigraphic sequences (Scott 1942, p. 305), and an absence of radiocarbon dates further limits any chronological refinement of these temporally expansive sites. In lieu of excavations, researchers have instead concentrated on architectural form, ceramic assemblages and more recently landscape setting in order to build a chronology of origin and use.

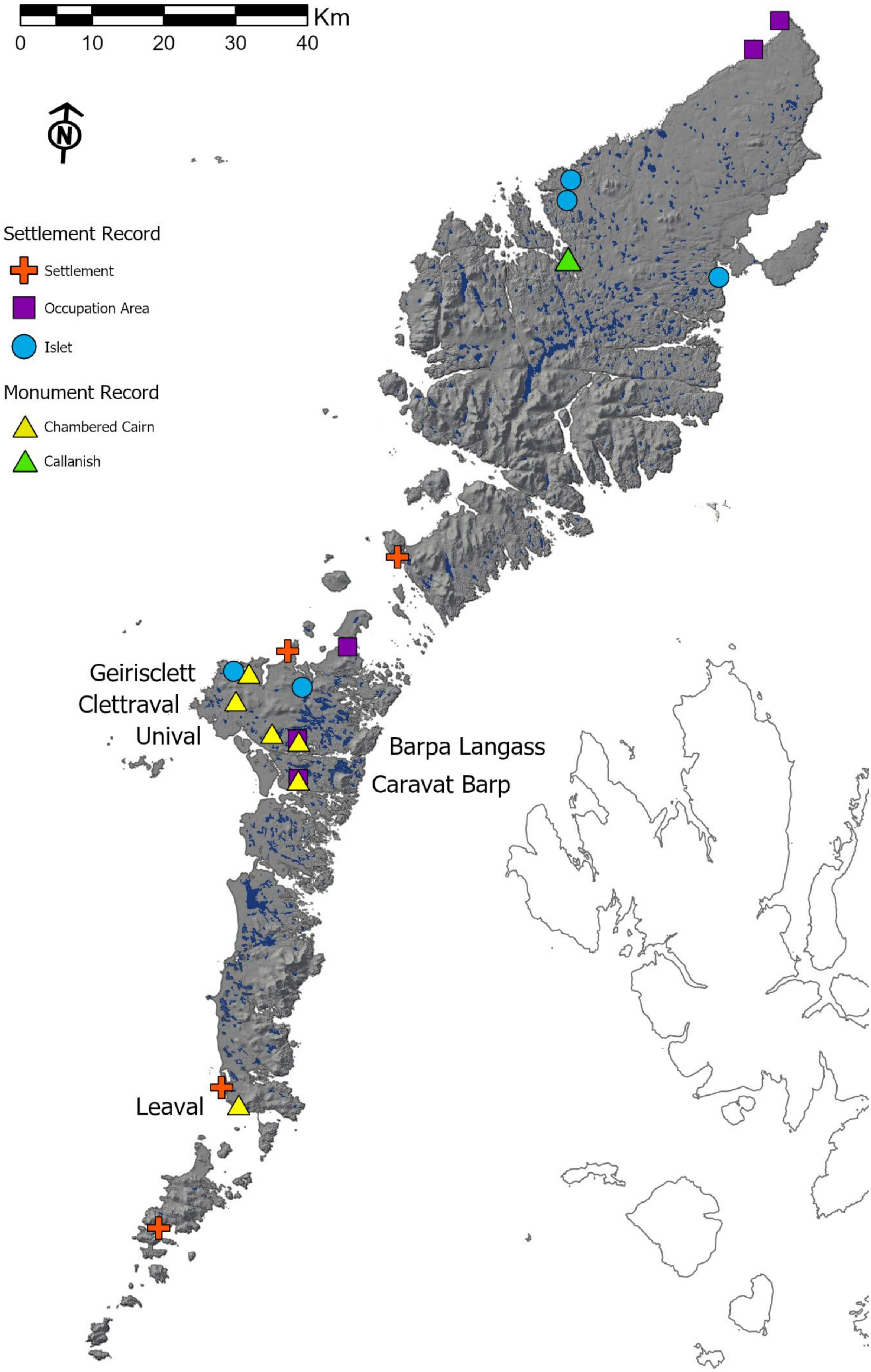
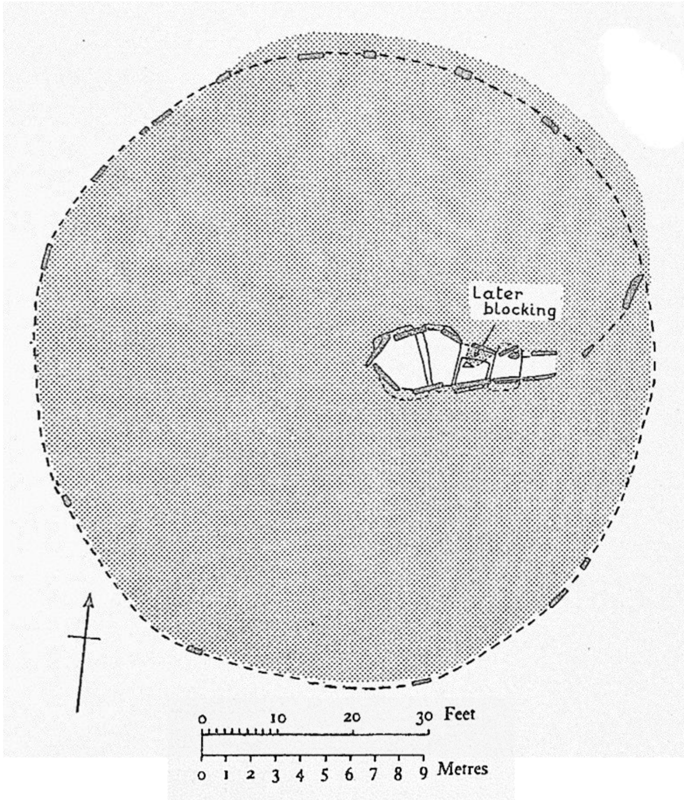


Figure 17. All excavated monuments discussed in the chapter along with broader settlement record.



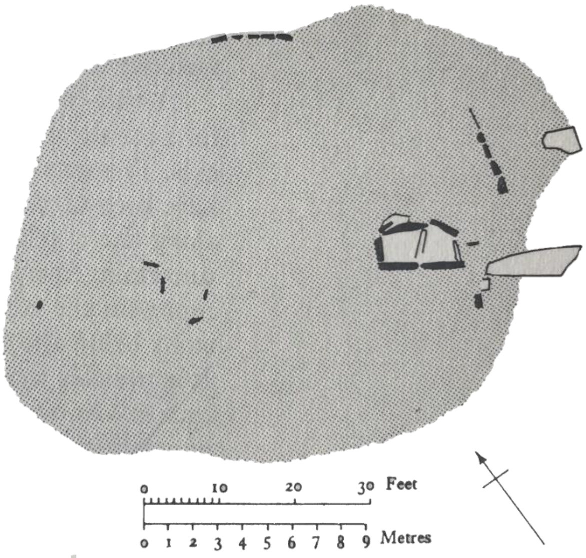


Figure 18. Barpa Langass Hebridean Passage Tomb (top) (after Henshall 1972, p.501); and Geirisclett Clyde-type Tomb (bottom) (Henshall 1972, p.515).

In the early nineteenth century, Beveridge's (1911) investigation of several tombs in North Uist led him to distinguish a distinct group of Hebridean-type chambered tombs, later elaborated on by Henshall (1972) during her systematic study of Scottish tombs—still the most comprehensive assessment of Scottish chambered tombs to date. Henshall identified these Hebridean types as being of a circular form defined by a peristalith of kerbstones that surround a central undifferentiated chamber (Figure 18, *top*). The chamber is reached by a short passage that is preceded at times by a recessed funnel-shaped forecourt (*ibid*, p. 124). Whilst the Hebridean passage tomb is prevalent throughout the Outer Hebrides, a second type of tomb was also recognised, primarily from differences in chamber form (Figure 18, *bottom*). Drawing on Bryce's (1910) initial description, this rarer form was described by Henshall (1972, pp. 15-16) as a large rectangular cairn defined by flagstones. Unlike Hebridean tombs, there is no passage of entrance, and instead, the chamber, which is partitioned into sections, is reached through a portal. The more anomalous nature of these monuments as well as their structural similarities to the Clyde tradition of tombs from southwest Scotland, led to their distinction as a separate class of chambered tomb in the Outer Hebrides, perhaps evidencing early contact with this region (Henshall 1972, p. 279-280, Henley 2003, p. 162). However, whilst these structural analyses have enabled discussions of the chronology of tombs and the potential existence of foreign contacts, in many cases chambered tombs reveal further distinctions and amalgamations that do not fit neatly into established typologies.

4.1.1 Excavated Tombs

Barpa Langass

Barpa Langass is a well-preserved Hebridean passage tomb prominently situated on the northwest slope of Beinn Langass, overlooking the now moorland interior of North Uist. The monument was investigated by Beveridge (1911, pp.246-248) who noted that the original deposits appeared to have been substantially pillaged prior to his investigation. However, pottery sherds, likely Beaker, charcoal and cremated human bones were found along with a small barbed-and-tanged arrowhead, five flint flakes and a mica disc (*ibid*; Henshall 1972, p.156). Whilst little can be said of the materials due to the lack of associated Neolithic contexts, more information about Neolithic activity around the site was revealed through excavations of the adjacent occupation area, which suggested the processing of quartz at the site, perhaps in association with the chambered tomb (Ballin 2008).

Unival

Unival, a square cairn with a Hebridean passage and chamber, is positioned on the southwest slope of Unival, the southernmost hill in a series that stretches through the interior of North Uist. The monument was excavated by Scott between 1931 and 1939. Although the northeast corner of the cairn was disturbed due to the insertion of an Iron Age dwelling, excavations produced a number of Neolithic sherds (estimated by Scott to comprise 14 vessels) along with a pumice pendant (Scott 1948). The vessels have subsequently been suggested to represent 'the same eclectic mixture of vessel forms and decorative schemes as at other Hebridean sites' that, along with the presence of both Hebridean Ware and Grooved Ware, demonstrates its continued use throughout the Neolithic (Copper 2015, p. 363).

Clettraval

Scott also excavated Clettraval in 1935, which is located 7 km to the west of Unival, on the southern slope of South Clettraval. Although again much of the cairn was disturbed due to the construction of an Iron Age roundhouse into its western half, excavations revealed an unusual form and chamber. Although classified by Henshall (1972, pp. 506-508) as a Clyde cairn due to its rectangular form and multi-compartmental chamber, the presence of a passage led Scott to consider it an unusual type of Hebridean passage tomb (Scott 1935, p. 535). Finds included pottery sherds of an estimated 18 vessels, fragments of human and animal bones, charcoal and a pumice object (Scott 1935). Three stratigraphic levels were identified with the lowest layer containing only Neolithic ceramics and the middle layer containing both Neolithic and Beaker sherds (Copper 2015, p. 354). However, the deposits had clearly been thoroughly mixed, leading Henshall (1972, p. 164) to theorise that the chamber would have been cleared out at regular intervals. This means that few materials from its early phases of use would have survived, and even if they did, their fragmentary nature would be difficult to distinguish from later deposits (*ibid*, p. 165).

Geirisclett

Geirisclett is located on the high-water mark overlooking the inter-tidal sands of Vallay Strand around 2 km to the east of Eilean Domhnuill. Although identified by Henshall (1972, p. 515) as a Clyde cairn, just as with Clettraval, the structural characteristics of Geirisclett present features common to both traditions. This has led to the suggestion that the monument represents a localised hybrid form, although the possibility of multiple phases of construction has also been acknowledged (Dunwell et al. 2003, pp. 24–25). The tomb was initially investigated by Beveridge (1911, pp. 255-256), and although he provided only a brief account of his work, some of the pottery within the recovered materials was later identified by Henshall (1972, pp. 516-517) and reconfirmed by Dunwell et al. (2003, p. 18) as comprising a Neolithic carinated vessel. Nearly a century later, an excavation was carried out to recover extant deposits within the cairn that were at risk of erosion (Dunwell et al. 2003). This subsequent work revealed over 300 sherds of Neolithic and Beaker pottery, with 11 Neolithic vessels being identified from diagnostic pieces, along with considerable quantities of quartz, at around 1030 pieces, and only eight pieces of struck flint. Much like at Barpa Langass, the quartz remains were suggested to represent in situ knapping (*ibid*, pp. 19, 28). In addition, the cairn showed evidence for later disturbance as attested to by the partial and abraded nature of the recovered ceramics as well as the presence of sherds from the same vessel in two separate compartments (*ibid*, p. 19).

Leaval

The only excavated chambered tomb not in North Uist is Leaval, located on the northern slope of its eponym in the southern region of South Uist. An unclassified cairn according to Henshall's

(1972, p. 520) established typologies, the monument was further investigated as part of a broader campaign undertaken to examine the landscape settings of Hebridean cairns in South Uist and, where possible, to update Henshall's original survey (Cummings and Sharples 2005). A small-scale excavation in 1999 thus revealed a highly unusual form. The rectangular chamber and absence of a passage was clearly not of the Hebridean-type but was also dissimilar to the Clyde cairn forms with open chambers containing multiple compartments. It was thus suggested that the monument may have been an 'early form of burial monument preceding the development of the Hebridean type of tomb' (*ibid*, p. 66). The finds recovered were less revealing, although the excavation only involved the removal of turf and peat and the cleaning of underlying stones around the chamber. The impoverished assemblage, absent of any pottery, included large quantities of flint and quartz that were suggested to be of Bronze Age origin based on both the absence of Hebridean pottery as well as the apparent robbing of the monument during the Bronze Age for the construction of a nearby settlement enclosure (*ibid*, pp. 66-67). However, as the chamber itself was not investigated, it is possible that its interior still contains intact primary deposits (*ibid*).

4.1.2 Building a Chronology of Chambered Tombs

Based on her investigations, Henshall (1972) developed a sequence for Scottish chambered tombs, suggesting that the earliest monuments would have been the Clyde cairns of southwest Scotland (see Henley 2003, Table 5.1 for summary). Thus, the more anomalous Clyde forms, such as Clettraval, would represent early contact with the southwest mainland before the subsequent development of Hebridean passage tombs by the mid-fourth millennium BC (Henshall 1972, p. 280). This sequence was first proposed by Scott (1935, 1942, 1948) who suggested that the ceramics from Clettraval and their resemblance to forms from southwest Scotland would have represented an earlier date of construction and use, in contrast to the later Grooved Ware recovered from Unival. Further, Henshall believed long cairns, another anomalous form in the Hebrides, to represent later extensions to pre-existing round cairns, also making them some of the earliest in the archipelago (Henshall 1972, p. 296). From these typologies Henshall (*ibid*) thus developed a chronological sequence for chambered tombs in the Outer Hebrides, beginning with Clyde forms and followed shortly by circular passage tombs, with each style being further developed until reaching their most substantial forms around the mid-fourth millennium BC.

However, whilst the use of these typological distinctions serves to develop a general chronological sequence within the Hebrides, these distinctions become less clear when individual cairns and their recovered materials are analysed (Armit 1996, p. 70). To date, only Geirisclett and Clettraval have been definitely confirmed as Clyde cairns (Dunwell et al. 2003, p. 24), and there are clearly many tombs that do not fit neatly into established typologies, yet exhibit a number of other similarities. For instance, despite the structural, and perhaps chronological, differences between Unival and Clettraval, Scott (1942, p. 305) believed them to have been closely associated due to similarities in pottery assemblages and landscape setting. Indeed, Henshall (1972, p. 113) also noted that despite their differences in architectural form, the two tombs demonstrate strong commonalities in landscape setting, suggesting that they may have been contemporaneous. Further, it is obvious that this chronology hinges upon levels of preservation and is highly influenced by the few excavations that have been conducted.

Whilst the establishment of tomb chronologies based on architecture or recovered materials is fraught with challenges, these typologies do allow for broader comparisons to be made between various regions of Scotland (Ashmore 1999, p. 56). Henshall (1972, p. 280) believed these architectural typologies to be indicative of the centrality of the Outer Hebrides to maritime contacts taking place between Ireland and the Northern Isles of Scotland, with styles exclusive to each converging within this 'waypoint of connectivity'. Hebridean-type tombs have also been identified in Skye and the western mainland (Cummings and Richards 2013, p. 190) and have been linked to the Orkney-Cromarty sequences, with some Orcadian examples having been suggested to be an elaboration of the basic Hebridean design (Armit 1996, p.70). Muller's (1988) analysis of the distribution and size of cairns and chambers in the Hebrides supported Henshall's (1972, p. 280) theory of a shift in influence from the southwest to the north throughout the fourth millennium BC, a theory later advocated by Henley (2003). However, the prevalence of a distinctive form of cellular chambered tomb in Orkney unlike anything found in the Hebrides also suggests increased regionalisation throughout the earlier Neolithic (Ashmore 1999, pp. 56-57; Parker Pearson et al. 2004, p. 33).

These theories demonstrate not only the many questions that remain regarding the chronology of Hebridean tombs and their origin or direction of influence but also the difficulties in relying on typologies and limited excavations alone to answer such questions. In critique of the heavy emphasis on architectural typologies, Squair (1998, pp. 501-502) has instead suggested the need to focus on how the architectural design of chambered cairns would have facilitated the rituals being carried out. Indeed, Armit (1996, p. 72) has suggested that despite the construction of different architectural forms, Hebridean communities were still subscribing to a broader, more uniform tradition of ritual organisation, and further, Cummings et al. (2005, p. 37) have suggested that the structural features of the Hebridean tradition should foremost be considered to represent 'an indigenous variation of a common idea'. Thus, without further excavations and materials, it may be through a focus on the use of these monuments that a more refined understanding of them can be achieved. This includes their broader homologies in setting and use with the megalithic mentality of the Atlantic Neolithic as well as their localised adaptions and subsequent role within the lives of mobile Neolithic populations.

4.1.3 Chambered Tombs and Movement

More recent work on Hebridean chambered tombs has therefore focused on their landscape setting (Henley 2003; Cummings et al. 2005; Cummings and Richards 2013), revealing many of the same trends as other regions along the Atlantic façade (see Section 1.2). The greatest concentration of chambered tombs occurs in North Uist, also reflecting the density and distribution of the known occupation record. As with other regions, cairns in the southern islands of the archipelago tend to be located in prominent positions on the slopes of hills, which restricts visibility uphill whilst providing expansive views downhill (Cummings et al. 2005). Armit (1996, p. 77) has noted that these positions do not necessarily achieve maximum visual impact but instead appear to relate to specific areas of land, perhaps used as territorial markers. Further, reflecting Scarre's (2002) interpretation of cairns in Wales, visibility also appears to have been focused towards certain features in the landscape, such as distant mountain peaks or unique horizons (Parker Pearson et al. 2004, pp. 35-36; Cummings et al. 2005, p. 47).

These static landscape analyses have been supplemented by theoretical discussions of movement to or around these sites. Armit and Finlayson (1992, p. 671) have noted that chambered tombs may have been used as fulcrum points for logistic economies, 'acting as symbols of permanence around which a transient, mobile settlement system might operate.' This would reflect Whittle's (1993) discussion of varying Neolithic mobilities, suggesting the presence of logistical mobility patterns embedded within a broader tethered system of mobility, with chambered tombs providing the anchors for these structured patterns of recurrent movement. More recent research has supported this theory, with tombs having been suggested to reside along pathways through the landscape and seascape (Henley 2003; Cummings & Richards 2013), and further, Cummings et al. (2005, p. 47) have proposed that inland pathways, particularly through valleys, may have originated from Mesolithic hunting trackways, themselves having evolved in function and significance over time. Parker Pearson et al. (2004, p. 35) have also noted that tombs in North Uist appear to mark out east-west pathways across the island. Consequently, the position of tombs within the landscape may have been related to earlier economic patterns of movement, which subsequently implies that their locations should reflect the affordability of both topography and landscape.

Beyond these economic and territorial implications, these monuments have also been viewed through more symbolic and ritual connotations. Cummings et al. (2005, p. 46) have also suggested that Hebridean tombs may have also formed part of a series of ritual activities that would have involved structured patterns of movement around the site. The journey to these monuments would have been emphasised, with most sites being skylined on approach but requiring a more substantial walk uphill to reach them (*ibid*, p. 45). Thus, whilst the visibility of these structures from specific places within the surrounding landscape may have been significant, accessibility to them would have been restricted. This has been interpreted as a means of controlling the site by allowing it to be opened or closed at specific times or for specific people depending upon the direction of approach (Cummings et al. 2005). Further, Henley's (2003, Ch.7) analysis of chambered tomb orientations found them to be predominately east to southeast facing, suggesting that they would have been approached from the opposite side of the chamber and leading him to propose the use of monument orientation as an additional means of controlling or restricting access. In addition to being potential markers for terrestrial movement, Cummings and Richards (2013, pp. 193–195) have suggested their use as navigational markers along potential maritime routes, a notion that would be highly significant for understanding regional and inter-regional movement. Thus, based on the current evidence it appears that the location of these monuments would have been carefully chosen in order to direct visibility towards specific places or features within the surrounding landscape and/or seascape whilst remaining prominent or visible to occupation areas, well-traversed pathways or seafaring routes. Further, their strong associations with patterns of movement have the ability to inform on not only more economic patterns of domestic mobility but also more ritualised patterns of movement developing from the ancestral use of these monuments.

4.2 Standing Stones and Stones Circles

After nearly one thousand years of focussed cairn construction in the southern islands, 'a dramatic shift takes place in the form, use and geographical focus of megalithic monuments in the Outer Hebrides' (Henley 2005, p. 95). Around 3000 BC, the construction of cairns ceases and is replaced by standing stones and stone circles, most heavily concentrated around the region of Callanish in Lewis. This transition from the use of ancestral monuments to stone settings is a sequence also observed for other regions, such as Orkney (see Sharples 1985, p. 69), suggesting broader changes in Neolithic ideologies and social practices around the start of the third millennium BC (Richards 1996a, p. 193) and subsequently new or increased social connectivity along the western seaways. However, whilst the emergence of standing stones and stone circles has more frequently been discussed in terms of these profound changes in Neolithic ideologies, social practices and connectivity, there still appears to have been a continuity of, or at least reference to, earlier traditions. Bradley (1998b, p. 114) has proposed this transition to be the result of a shift in the perception of space from closed to open monuments whilst retaining an emphasis on the circular form. The emphasis on circular forms in the Outer Hebrides is apparent in both Hebridean passage tombs and islet sites, suggesting these allusions to circularity to have been a lasting theme throughout the Hebridean Neolithic, despite changing social practices (Henley 2003; Cummings and Richards 2013).

However, there are also variations in the form of stone circles. Barnatt (1989), in his investigation of stone settings in Britain, identified three classes of stone circles in the Outer Hebrides: irregular circles, larger open circles and occasional small circles. Just as with cairns, the role of these various forms within the broader monolith tradition is enigmatic, yet they appear to have been influenced by the Hebridean landscape as well as earlier traditions. Burl (1976, pp. 147–148) first recognised this reference to earlier monuments in his observation of the proximity of stone circles to chambered tombs, especially in North Uist. Drawing on Burl's work, Henley (2003, p. 96) has noted that whilst there does not appear to be as uniform a trend in the setting of stone circles, those in close proximity to a tomb appear to reflect its topographic setting. Thus, the stone circles of North Uist might also be interpreted as localised in terms of form and location yet still part of 'a broader system of associations that would have been recognisable to others' (*ibid*), much like their chambered tomb predecessors. However, despite their prevalence throughout the archipelago, few investigations of stone settings outside of Lewis have been carried out and little discussion of them even exists, with the obvious exceptions of Burl (1976), Barnatt (1989) and Henley (2003).

4.2.1 Callanish

In contrast, the remarkable site of Tursachan, more commonly referred to as Callanish, has been extensively investigated. This site has been touted as one of the greatest stone circles in Britain, second only to Stonehenge (Munro 1915; Burl 1976, p. 148), and the most spectacular stone circle in Scotland (Richards et al. 2013, p. 224). However, the term 'circle' may be misleading (see Henley 2003, pp. 271-275 for reinterpretation) as in addition to a central ring around 12 meters in diameter and comprised of 13 standing stones, there is also a large central monolith, around 5 meters tall, and an additional 35 stones laid out in a cruciform plan (Figure 19). The unusually complex form of Callanish has been emphasised by Burl (1993) who noted that the stones forming the avenue were graded in height from lowest in the centre to highest at either end. Given the remarkable and enduring nature of the setting, Callanish has a long history of research dating to the late 17th century when early antiquarians sought to record and interpret the site (see Ashmore 2016, Ch. 1 for historiography). More recently, Callanish was excavated by Ashmore (2016) between 1979 and 1988, revealing numerous phases of activity at the site, beginning in the Mesolithic and lasting well into the Bronze Age. In total, Callanish is believed to have contained around 80 stones, compared to the 49 extant monoliths, with the central monolith and rings erected sometime between 2900 and 2600 BC (*ibid*, p. 64). Whilst Callanish remains the most enduring and renowned stone setting in the region, it would have formed only part of the broader 'Callanish complex', comprised of at least twenty other stone circles and numerous monoliths scattered throughout the region (Ponting and Ponting 1984), a thorough synthesis of which was only recently conducted by Richards (2013b).

Figure 19. Aerial view of Callanish stone circle showing central monolith and stone rows forming a cruciform plan (RCAHMS 2004).

4.2.2 Movement and Connectivity in the Late Neolithic

Despite its many investigations, the purpose of the Callanish complex has remained obscure, although numerous interpretations exist, including its use as an astronomical calendar (Thom 1967, Ch. 11; Curtis and Curtis 2011; Curtis 2016, pp. 184–185) or a stop-over for travellers along the western seaways (Burl 2000, pp. 39-40; Henley 2003 p. 104). The presence of a Grooved Ware vessel further supports the theory of a highly connected site (Wilkin and Vander Linden 2015, p. 100), and given the extensive nature of the complex, Richards (2013a, p. 271) has suggested that upon entering the Callanish region, the entire complex would have been arranged in order to 'structure a journey from the outside world' to the largest and most complex stone circle of Tursachan. According to Burl (2000, p. 202), this journey would have started in the sheltered harbour of Loch Roag, which has been noted as a 'rare and magnificent bay' protected from Atlantic gales by the island of Great Bernera and providing a safe landing place for seafarers voyaging northwards. In fact, the name Callanish derives from Old Norse *kalladarnes* meaning 'the headland from which a ferry can be hailed' (*ibid*), emphasising the importance of Loch Roag throughout the maritime history of the Outer Hebrides. These sheltered waters may thus have promoted the significance of the region long before the erection of the many monoliths that still dominate it. The earliest evidence for activity at Callanish comes from pollen and charcoal samples that show evidence of woodland clearance and foraging between 6600-6200 BC (Ashmore 2016, p. 1191). In addition, recent dating of materials from excavations at nearby Aird Calanais has confirmed Mesolithic activity in the region between the early-sixth and mid-fifth millennium BC

(Bishop et al. 2013). Despite the absence of dates for early Neolithic activity at Callanish, Cummings (2002b) has suggested that the persistent and increasing use of sites of such strong suitability would have led to their development into late Neolithic complexes.

As elucidated by Ashmore (2016, p. 1), 'Callanish was of more than local significance', and its material assemblage indicates far-reaching contacts with other regions of Britain throughout its use. This sentiment echoes Burl (2000, pp. 39-40) who envisioned a highly connected Outer Hebrides with Callanish acting as a staging post along the long and busy seaway between the Boyne Valley and Orkney. Burl has thus developed a chronological sequence at Callanish that reflects his theory of foreigner travellers. He has suggested that construction at Callanish began with the central monolith, which may have originally stood as a landmark for seafarers—similar to the 5.8 meter tall Clach an Trushal located on the west coast of the north Lewis plateau as well as the prominent coastal stones of Clach Mhic Leoid and Borve on the west coast of south Harris (*ibid*, p. 203). Following on from the monolith, the initial stone circles of the Callanish complex (known as Circles I-IV), which are dissimilar to one another, 'may have resulted from the arrival of crews from southern Scotland, Ireland and England taking shelter on the long voyage to the Orkneys' (*ibid*), a theory which could also explain the many variations in stone circle forms found throughout the archipelago. The distribution of standing stones in the region would thus have served as markers announcing maritime havens and landing places, whilst the central monolith at Callanish would have provided a navigational marker or 'sailors' stone', with its broader face looking out to sea (*ibid*, pp. 202-203).

As emphasised by Henley (2005, p.95) in his analysis of the 'choreographed monumentality' of Callanish:

> We must appreciate the extensive ranges of interaction taking place during the late Neolithic, particularly the connections between Callanish, Ireland and Orkney, and the ultimate influence this had upon the form and function of the Callanish monument.

Regardless of whether or not the Outer Hebrides existed as a waypoint along a broader route of maritime connectivity between Orkney and Ireland, it is clear that some form of movement was converging at Callanish during the Late Neolithic. Whilst the monument trend itself suggests increased long-distance connectivity, the many variations in form and apparent continuity of certain trends in setting also indicate the influence of the local environment and the importance of the unique Hebridean identity. In regards to the role of Scotland within the European Neolithic, Brophy (2006, p. 39) has emphasised that communities should be viewed as 'active participants in wider networks of movement and exchange, not the last, passive recipients', and this statement is just as applicable to the role of the Outer Hebrides within the Scottish Neolithic. Thus, by shifting the focus of movement around Callanish from narratives of arriving foreigners to narratives of well-connected Hebrideans, the role of local communities within this broader tradition and the significance of the Hebridean identity can also be acknowledged.

4.3 Towards a Regional Narrative through a Comprehensive Approach

This review of previous research has highlighted a number of significant questions regarding the Neolithic of the Outer Hebrides and has exposed a number of challenges to and limitations of previous research. Whilst typological studies of ceramics and chambered tombs have provided the most tangible evidence for the existence of a strong regional identity juxtaposed against a recurrent yet transient influence of broader social contacts, these analyses have also demonstrated the conflicting arguments that arise from the use of typological studies alone as well as the many limitations of relying too heavily on one class of evidence. Consequently, in order to avoid some of the pitfalls of more typological or site-based narratives, each component of the record must be considered significant in its own right and as a contributor to a more refined understanding of the Hebridean Neolithic. Unravelling this complex picture of Neolithic activity thus requires a comprehensive yet thorough understanding of the full suite of archaeological evidence, comprised of settlements, resource areas, islets, ritual sites, chambered tombs and standing stones, all of which have contributed to tens of thousands of recorded artefacts. Although caution should be assumed in attributing too much significance to the currently biased and fragmented picture presented, through this review of archaeological work and the material record, a number of questions have been highlighted regarding the nature of settlement practices, movement and connectivity that can only be addressed through such a comprehensive approach.

The patchy and rather elusive nature of the settlement record raises some important questions regarding Hebridean settlement practices and mobility patterns. Whilst all of these sites have been suggested to have retained some domestic functions, almost all present evidence to suggest that they were not continuously occupied or at least would have been dependent upon resources obtained during broader mobility through the landscape. As suggested by Gannon (2016, p. 150), the Hebridean environment would have 'demanded local mobility' for resource exploitation. For instance, floral remains at Bharpa Carinish and Northton demonstrate a reliance on both wild and domestic resources, suggesting a logistical economy in which at least some of the community moved through the landscape for resource procurement. In addition, the identification of a number of resource-based areas has revealed concentrations of activity around specific resources within the landscape, demonstrating more transitory occupation areas within the wider landscape and further contributing to the theory of logistical or tethered mobilities.

This evidence raises the first two questions highlighted in Chapter 1 regarding the nature of settlement and mobility patterns within the wider landscape as well as the relationship between all sites within the broader settlement record. In contrast to the more traditional and enduring coastal settlements, the unique setting of islet sites as well as the more anomalous location of ritual sites in north Lewis suggest that they retained different contexts and associations. However, whilst these various sites within the settlement record show strong differences in setting and temporality of use, they are also united through the material record, suggesting a shared Hebridean identity maintained through social contacts. It is this identity that provides the strongest evidence for movement within the archipelago. Thus, whilst the nature of local mobility practices requires further refinement, the settlement record also highlights questions regarding regional patterns of mobility and connectivity leading to the transmission and maintenance of a unified material culture. Although the greatest indications for movement are derived from the excavation record, each of the mobility patterns discussed by Whittle (2003) would have been strongly rooted in the landscape and at times manifested through monument building. Accordingly, although it is the settlement and material records that suggest continual local and regional movement, it is the monument record that may provide the most tangible evidence for actual routes taken.

Comprised of a variety of forms, sizes and settings, the monument record attests to the strong influence of the environment on local and regional practices; however, scant associated materials and radiocarbon dates have limited the ability to fit these structures into the broader record of activity. Thus, whilst the connection between domestic and ritual activity is apparent in the material record, the nature of that connection is not, raising the third question of this thesis regarding the relationship between settlements and monuments. Within the chambered tomb tradition, typological similarities in structural and ceramic forms have been used to develop broad chronologies of tomb development and use, establishing the contemporaneity of at least some tombs and settlements. Although the association of some sites is clear, such as the close proximity of occupation areas to Caravat Barp and Barpa Langass, more indirect associations have been posited through the landscape setting and spatial distribution of these sites that upon further development may prove to be highly informative. Analyses of landscape setting and orientation have provided the basis for discussions of both the practical and symbolic use of these monuments for movement. Expounding on these theories, the position of tombs may provide an opportunity to further explore movement through the landscape, thereby addressing the role of these monuments within an already dynamic record of activity.

Further, the later monolith tradition may offer similar insight into Late Neolithic activities. Although its emergence has been most often associated with increasing levels of inter-regional connectivity, the more ambiguous adoption of the ‘Grooved Ware complex’ in the Outer Hebrides raises questions as to the nature of these contacts. When combined with the development of unusual forms of stone circles and the locational reference to earlier tombs, the strength of the archipelago, its environment and the traditions of communities living within it is once again highlighted. Thus, whilst discussions of the standing stone tradition have been dominated by a foreign perspective, a more regional focus exposes, just as with their tomb predecessors, questions regarding the role of these monuments in more localised and regionalised patterns of movement and connectivity. For instance, discussions of Callanish have long sought to emphasise the connectivity of Neolithic populations and the role of the Hebrides within this broader network of movement, an important focus in its own right; however, such discussions have overshadowed the local and the particular by taking an outside-in approach, forming narratives of the arrival and subsequent activities of foreign seafarers with a noticeable absence of Hebrideans themselves. Accordingly, in order to more fully address questions regarding the role of monuments within the mobile lives of Neolithic Hebrideans, these sites must be considered from a local perspective, not just terrestrially but also maritimely. Although theories have suggested a relationship between Hebridean monuments and seafaring routes, such suppositions have not been advanced through consideration for either the surrounding seaways themselves or the relationship of Hebrideans to them. Through such a perspective, the more unified cultural practices evident in the archaeological record can be more fully explored by focusing on the role of the seaways in the propagation of this unique Hebridean identity.

Although the aim of this thesis is to refine this regional narrative, the persistent influence of broader contacts cannot be dismissed. Typological similarities in monument and material forms, as well as the movement of foreign materials, have revealed a complex and at times contradictory history of inter-regional connectivity, raising numerous questions as to the nature of these contacts. As stated by Callaghan and Scarre (2009, p. 359), 'the issue, then, is not the existence of these maritime connections, but the character and intensity of contact.' For instance, the monument record suggests connectivity with the southwest mainland around the mid-fourth millennium BC and strengthened or renewed contact with Orkney, and perhaps Ireland, at the start of the third millennium BC. This is reflected in the movement of lithics within the Inner and Outer Hebrides, which may have evolved from early intermittent movement into more substantial exchange networks along the western seaways. Conversely, whilst the ceramic assemblage does support these theories of early Neolithic contact with the southwest, it also suggests connections with the Northern Isles and/or mainland at around the same time, connections that appear to have dissipated and only re-emerge with the adoption of Grooved Ware several centuries after the monolith and lithic traditions were already established in the Hebrides. Given these discrepancies, the possibility that materials and/or ideologies were being transmitted through different spheres of contact must be acknowledged, a theory which requires a more thorough comparative analysis of both classes of materials, including their quantities and spatial distribution. Thus, it is clear that any refined understanding of the nature of inter-regional connectivity is heavily dependent upon not only additional excavations and recovered materials—of both secure dates and provenance across all relevant regions—but also more refined regional narratives, requiring the full suite of archaeological evidence to be brought together in a temporally and spatially cohesive way before the nature of broader inter-regional contacts can be addressed. Ultimately, it is through a comprehensive approach to the archaeological record and a refined approach to movement that such a refined understanding of the Neolithic of the Outer Hebrides can be constructed.

Chapter 5. Establishing a Method of Movement

> In movement, issues of temporality, spatiality and practices are dialectically woven together and inseparable (Mlekuž 2014, p. 14).

Having identified a number of questions regarding the nature of settlement, movement and connectivity, the best way to address these questions must now be established. Previous research has highlighted not only the numerous indications of movement in the archaeological and environmental records but also the need for a more comprehensive approach to the entirety of the record. Thus, the full record must first be collated, gathering all available information in order to reach a more holistic quantitative, spatial and temporal understanding of this complex record. This refined database can then be used to address questions regarding movement and connectivity.

The significance of movement for understanding past societies is evident in various movement- and journey-themed volumes (e.g. Cummings and Johnston 2007; Leary 2014; Leary and Kador 2016), with contributions to the study of prehistoric movement in the past few decades ranging from more phenomenologically and perceptually grounded discussions (e.g. Tilley 1994; Bender 2002; Ingold 2004, 2011), to more quantitative computational approaches (e.g. Llobera 2000; Murrieta-Flores 2012; Mlekuž 2014; Wernke et al. 2017). Whittle's (1997) discussion of the different forms of mobility in Neolithic Britain has highlighted the varying temporal and spatial extents of movement as well as the motivations for it, and as such, multi-scalar approaches are required that can tack between spatial extents as well as environments. Not only do more general scales of analysis limit the ability 'to recognise and appreciate the very subtle, fine-grained and highly varied nature of people's movements' (Kador 2007, p. 42), they may also overlook the complexities of motivating factors as well as the difficulty in detecting them archaeologically (Cummings 2007, p. 54).

Whilst discussions of maritime movement in the Outer Hebrides have been constrained to more general theoretical narratives, through the use of computational approaches, potential pathways or corridors of movement can be identified and discussions of Hebridean mobility furthered. This approach allows for a more dynamic discussion of movement by focussing on the journey itself rather than the points at either end. Throughout this journey, the environment would have had a strong influence on specific routes taken, and thus, computational approaches to movement are thoroughly grounded in milieu. Although methodologies for modelling terrestrial movement have been refined over the past two decades, the additional complexities affecting the nature of the seaways have constrained maritime approaches to movement (with some notable exceptions as will be subsequently discussed). Such methodological discrepancies have, in turn, had a profound impact on the ability to blend maritime and terrestrial patterns of movement and consider where the two may have converged within the maritime landscape—a significant transitional space that is dynamic and often elusive. Ultimately, through the adoption of a more fluid approach to the study of movement, a more refined understanding of local and regional mobility patterns can be generated and the nature of varying scales of connectivity deduced.

5.1 Connecting the Dots through a Least-Cost Approach

5.1.1 Least-Cost Analysis: The Concept

Essentially, 'mobility lacks a presence' (Leary 2014), and by focusing only on either end of the spectrum of movement, researchers inadvertently assume a static view of mobility, never capturing 'the mobile and flexible nature of the subject' by actually connecting the dots through the journey itself (Kador 2007, p. 33). This is not to say that these 'dots' should be dismissed entirely, as the archaeological record provides the only tangible indications of movement, but rather that it should be used as the starting and ending points for discussions of movement whilst recognising the fluidity of the process that would have connected them. Currently, the most relied upon methodology for modelling past movement is a least-cost analysis (LCA) (Mlekuž 2012a). Verhagen et al. (2019) recently presented an overview of current least-cost approaches to the computational modelling of movement in archaeology, demonstrating 'its considerable potential for understanding ancient movement.' Underlying this method is the assumption that movement will be optimised whenever possible, which when combined with quantified representations of friction to movement, allows for the creation of least-cost pathways (LCPs). Whilst there are a number of social and cultural factors that would have also influenced movement, the concept of the least-cost approach is grounded in the notion of environmental affordances, derived from the work of psychologist James Gibson (1979). In this respect, affordance refers to 'the potential offered by the environment in relation to an individual's properties and abilities to act in that environment' (Verhagen et al. 2019, p. 218). Thus, in terms of movement, affordances can only be explored by considering both the environment and the movement capabilities of individuals (*ibid*, p. 219). Whilst general assumptions and estimations must necessarily be made regarding the nature of prehistoric movement (i.e. method and speed), it is thus the environment itself that would have permitted or constrained movement.

Closely related to movement potential is the concept of accessibility. Whilst movement potential addresses the ability to move *away* from a specific location, accessibility considers the ability to move *towards* it. In regards to site location, human geographer Anders Karlqvist (1975, pp. 71–72) believed the role of accessibility to be a fundamental question and 'a key concept for characterising a fundamental principle of organisation of human activity'. Essentially what measures of accessibility demonstrate are degrees of connectivity. Hence, locations of higher accessibility allow for both an ease of access to resources and higher degrees of overall connectivity with other areas. Relying on Hagerstrand's (1975) influential concept of time-geography—an ontological framework in which a series of constraints leads to a trade-off in the allocation of time amongst practices in space—Mlekuž (2012, 2014) has devised a least-cost method that provides a new way of looking at the landscape in terms of its connection to other places. This more qualitative approach to movement has been termed a *topography of connectivity*, which allows for the identification of areas within the landscape that are better connected based on topographic affordances to movement (Mlekuž 2012, p. 2). Conversely, this approach also allows for the exploration of the role of inaccessibility in movement or the structuring of the landscape (see Mlekuž 2014, p. 12), a notion that may have been important for the siting of chambered tombs and the subsequent generation of notions of exclusivity.

5.1.2 Least-Cost Analysis: The Method

Numerous least-cost methods have been employed using a range of GIS software on a variety of archaeological sites in order to address questions related to movement and connectivity (e.g. White and Surface-Evans 2012). Whilst these various methodologies have been the subject of much debate and revision, leading to refined yet inconsistent methods, the fundaments of the least-cost concept promote a generically uniform process. This begins with the creation of a cost surface that represents movement capabilities, typically measured through movement speed or energy expenditure (Kantner 2012, p. 226). In focussing solely on the movement capabilities of individuals without consideration for environmental affordances, pathways will be modelled through simple Euclidean representations of space. Thus, for more accurate models of movement, cost calculations must also consider energy expenditure (i.e. the speed of travel as a result of topography). Within more topographically complex landscapes, such as the Outer Hebrides, the most perceptible cost to movement is the slope of the landscape.

Land slope has the longest history of use in least-cost approaches as it is believed to be a good predictor of the physiological cost of human movement (Kantner 2012, p. 226). As stated by Pingel (2013, p. 146), ‘although humans choose routes based on more than just slope or time, changes in elevation do exert a powerful influence on route selection in hilly and variable topographies.’ The effects of slope on movement will, of course, be dependent upon the direction of travel, with directionality being all the more critical in complex landscapes (Kantner 2012, p. 226). Accordingly, through the use of a ‘hiking function’, slope can be converted into units of time and directionality incorporated to create anisotropic models. The most popular formula used in archaeological studies of movement has been Tobler’s (1993) hiking function (Verhagen 2019, p. 227), which applies a weighted factor to slope degree in order to model the inverse relationship between slope and walking speed (Table 1).

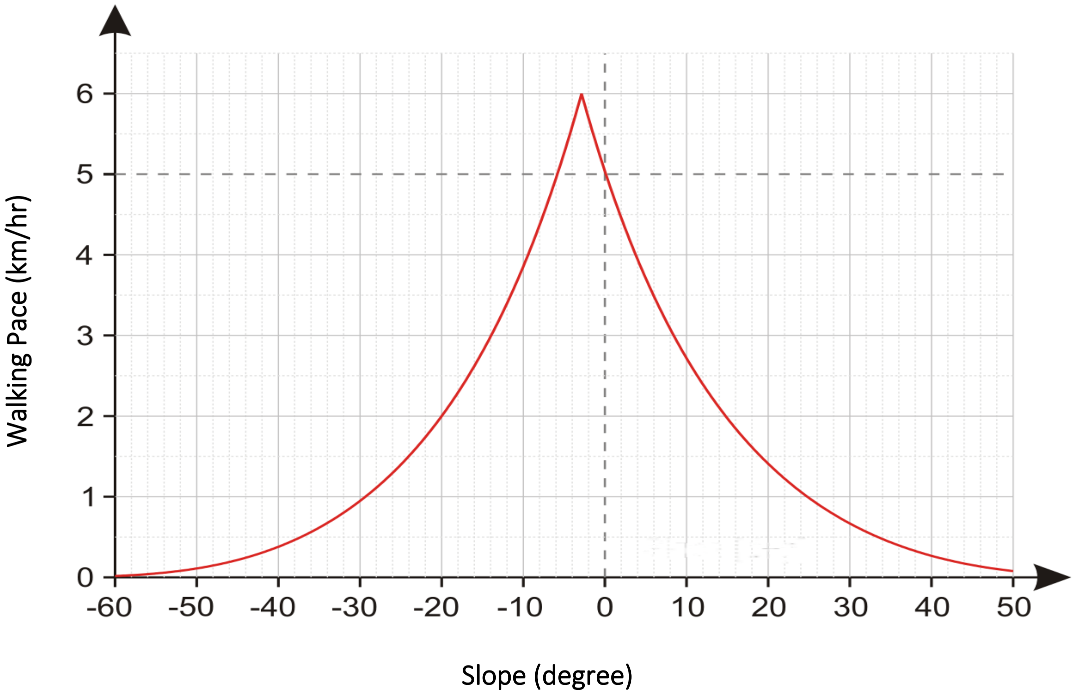


Table 1. Tobler's hiking function showing the parabolic relationship between slope and walking pace.

In addition to slope, a number of other environmental factors can influence movement capability, such as boggy terrain or bodies of water, both highly relevant in the Outer Hebrides. Such factors, whilst important to consider, are also highly challenging to incorporate into measures of cost. Not only are certain palaeoenvironmental factors difficult to represent spatially (see Section 2.3) but also their effects on movement, or cost value, are difficult to estimate (Verhagen 2019, p. 228). However, the impact of inland bodies of water may be easier to quantify, although in some instances still challenging to model. These bodies of water would have represented either barriers to or facilitators of movement, depending on the level of maritime knowledge. Whilst the potential for travel along rivers has been discussed in least-cost studies (e.g. Nolan and Cook 2012, p. 81; Phillips and Leckman 2012), few attempts have been made to incorporate river travel into least-cost pathways (see Livingood 2012; Surface-Evans 2012 for exceptions). The chief difficulty resides in not only the need to model a different set of environmental affordances and human capabilities but also the ability to subsequently combine the costs of water-borne movement with terrestrial costs. These challenges become even more complex when considering movement through the seas, which add additional cost considerations such as tides and currents. Consequently, although there has been a heavy emphasis on the exploration of terrestrial movement through least-cost methodologies, given the strong influence of the environment as well as the many complex factors affecting water-based transport, 'relatively little research has been done on the quantification of ancient movement over water' (Verhagen 2019, p. 221).

5.2 Building a Method to Model Prehistoric Seafaring

5.2.1 The Nature of Prehistoric Seafaring along the Atlantic Façade

The nature of the seas and the complexity of movement through them offers a unique set of challenges in comparison to terrestrial movement. As elucidated by Parker (2001, p. 22):

> The very basis of sea travel, the surface of the ocean, is changeable and mobile, unlike the firm land, which can preserve, in its surface features, the record of past activities and be read like a palimpsest by the landscape historian or archaeologist.

Thus, any discussion of movement through the seaways requires the consideration of a variety of factors not applicable on land; not only are movement capabilities, or the method of travel, different but also the affordances offered by littoral environments. This environment is formed of a series of intricately related factors that vary significantly and can be both predictable (e.g. tides, currents, sea hazards) and unpredictable (e.g. storminess, oceanicity). Combined, these factors would have influenced both the temporality and spatiality of seafaring, constraining the best times of year to travel by sea as well as the achievable length and duration of the voyage. As such, whilst in theory all factors are important, 'in practice it is very challenging to model all aspects influencing movement capability on water' (Verhagen 2019, p. 228). Thus, there has been little application of least-cost approaches to seafaring, and despite the long-acknowledged significance of the western seaways, discussions of prehistoric movement through them have been largely constrained to more theoretical discussions.

The importance, as well as the many challenges, of understanding and incorporating past sea conditions into discussions of prehistoric seafaring along the western seaways has been highlighted by Garrow and Sturt (2011). These environmental factors would have had a strong effect on the temporality of seafaring, constraining the best time of day, month and year to travel. For instance, it is likely that travel along the Atlantic façade would have taken place between May and September as increased winds and storminess would have restricted seafaring in the winter months (McGrail 2001, p. 171). In the absence of specific information on ancient sea conditions, McGrail (*ibid*, p. 168) has suggested that 20th century data can be seen as analogous (see also Murray 1987, 1995). Whilst this may be appropriate or even necessary for more dynamic and unpredictable factors, such as wind, oceanicity and storminess, tides and currents behave more predictably and through smaller temporal cycles. In addition, although all factors would have been affected by palaeoenvironmental changes, recent palaeotidal models for Northwest Europe created by Ward et al. (2016) have demonstrated the highly sensitive nature of tidal dynamics in relation to relative sea levels. Thus, these models highlight both the complexity of sea conditions and the potential inefficacy of using modern data or large-scale generalities to understand them.

In addition, sea conditions would have influenced the method of movement, including the type of boat, method of propulsion and form of navigation, in turn influencing specific routes taken as well as launching and landing points. Whilst evidence for Neolithic watercraft in the British Isles is scant, prehistoric logboats have been found in regions throughout the Atlantic façade (McGrail 2001, p. 172). However, as stated by Muckelroy (1978, p. 128), 'being essentially vessels for use on inland waterways, they should perhaps be considered primarily in the context of river craft' and may thus have not been deemed suitable for the turbulent and unpredictable North Atlantic seaways. From an analysis of fish bones from Orkney middens, Sturt (2005, p. 75) has suggested the engagement of Neolithic people in deep-sea fishing practices that would have required a 'seaworthy craft capable of dealing with Orkney's frequent rough seas and strong currents.' This may have been a skin or hide boat that given its light frame, provides enough freeboard, even when loaded, to maintain seaworthiness whilst also allowing it to be easily pulled ashore (McGrail 2001, p. 183). Although there is no direct evidence for the use of hide boats during the Neolithic, its use by Mesolithic and Neolithic seafarers along the western seaways has been suggested based on iconographic and ethnographic evidence as well as modern parallels in the form of Welsh coracles and Irish currachs (Muckelroy 1978, p. 128; McGrail 2001, pp. 182-183). These boats, propelled with a paddle, would have been incredibly seaworthy and would have allowed for the movement of not only people but also material goods and domesticates.

In addition to the type of boat and method of propulsion, the form of navigation is also important for understanding seafaring routes. In seafaring, just as in terrestrial movement, linear point to point travel can rarely be assumed. Along the western seaways, with its indented coastline and tidal waters, the potential for pilotage and coastal hopping should be considered likely (Callaghan and Scarre 2009, p. 367; Garrow and Sturt 2011). As admonished by Knappett et al. (2008), previous approaches to maritime movement 'while dynamic in measuring contacts, have favored fixed linear distances that bear little relationship to human experience at sea' (Knappett et al. 2008). Instead, it must be acknowledged that 'we can never be sure of the directness of the route taken or the desire to complete it as fast as possible' (Garrow and Sturt 2011, p. 62). Altogether, these various factors would have contributed to the perceived 'cost of seafaring', both a deterministic and subjective assessment of cost that may have led to a conciliation between constraining factors and affordances, in turn complicating the modelling of past seafaring.

5.2.2 Simulating the Western Seaways

The most detailed study to date of the nature of Neolithic seafaring in the western seaways is Callaghan and Scarre's (2009) computer simulations of various potential sea routes between Brittany and Ireland, Wales and the western mainland of Scotland and Orkney. Incorporating a range of factors, such as the type of craft, method of propulsion, time of year and sea conditions, the authors were able to demonstrate varying constraints on seafaring as well as possible durations of voyages. Considerations were made for both paddling and sailing—although it is generally believed that Neolithic watercraft would not have been equipped with sails—allowing for comparisons between the two methods of propulsion (*ibid*, p. 360). Whilst paddled journeys were less affected by winds and thus provided broader temporal windows for seafaring throughout the year compared to sailing, the journeys were considerably longer (although the questionable nature of the importance of time to prehistoric seafarers has already been discussed). Further, they acknowledged the importance of the tides, especially around the Inner Hebrides, yet suggested that given the semi-diurnal nature of the tides, 'they could only effectively be used for shorter distances' (*ibid*, p. 367). This highlights the most significant limitation of the utilised methodology, the creation of point-to-point voyages—a limitation acknowledged by the authors themselves who stated that given the proximity of landfalls, 'it is perhaps plausible to envisage frequent stopovers, especially in the case of paddled boats where crews may have needed to rest and reprovision' (*ibid*). It must also be noted that no consideration was made for the Outer Hebrides in these simulations, an avoidance that in essence serves to accentuate the centrality of the archipelago—the circuitous route required to circumnavigate this landmass in turn tracing its interstitial position (Figure 20). Ultimately, these simulations add an invaluable temporal understanding to prehistoric

Figure 20. Callaghan and Scarre's (2009, Fig. 2) map showing routes of contact analysed through their simulations.

seafaring along the western seaways whilst also emphasising the need for more flexible approaches.

In contrast to Callaghan and Scarre's computational approach, Burl's (2000, pp. 93-94) theoretical discussion of sea voyages from the Irish Sea to Orkney focused on the character of the seaways and the importance of coastal topography along maritime routes. Based on the presence of numerous sea hazards from the Irish Sea to Skye as well as the challenging conditions within the Little Minch between Skye and the Hebrides, which exhibit strong tidal races and currents, he suggested that the Atlantic coast would have been preferable to the more protected Minch. Thus, Burl envisioned a route that after initially piloting along the islands of the Inner Hebrides, passed through the Sound of Barra to move northwards along the west coast of the Outer Hebrides (*ibid*). In further support for this theory, he cited the strong concentration of sites along the west coast, suggesting their location to have been determined by the demands of the sea routes (*ibid*). Whilst there are numerous limitations to such speculative theoretical narratives, Burl's discussion does emphasise the need for more blended approaches, incorporating the landscape and the record found within it into suggested seafaring routes. This is where least-cost approaches become advantageous.

5.2.3 Least-Cost Approaches to Modelling Past Seafaring (or the lack thereof)

The few examples of the use of least-cost methods to address seafaring questions come from the Baltic (Indruszewski and Barton 2008) and the Pacific (Gustas and Supernant 2017; Kealy et al. 2018). Whilst the cost values applied in the Pacific examples were derived from a number of factors relevant to the research question, the conditions of the sea itself were omitted. For instance, Gustas and Supernant's (2017) analysis of Late Pleistocene and Holocene migration along the Northwest Pacific coast focused on three factors of cost: physiological (travel distance), cultural (visibility and proximity to coast) and environmental (beach slope and aspect and proximity to freshwater). Although their analysis allowed for the incorporation of the landscape into models of movement, the seaways themselves were overshadowed by an emphasis on factors relating to land. Essentially, without consideration for the character of the seas, this littoral environment is represented as a blank space devoid of complexity and meaning, and it is this complexity of maritime space that makes its incorporation into seafaring models both pivotal and problematic.

These challenges were well elucidated by Indruszewski and Barton (2008) in their models of Viking Age seafaring in the Baltic Sea using modern wind data. Whilst their method benefitted greatly from the ability to compare the results to historical accounts from a well-known 11th century voyage as well as real-time sailing data from an experimental reconstruction of that voyage, it also demonstrated the challenges of modelling this environmental cost. The chief difficulty resides with the creation of a single cost surface (necessary in standard GIS applications) to represent both the intensity and direction of winds (*ibid*, p. 62)—to which tides and currents could also be included.

Their solution was the use of an, at the time, untested intermediary software, the efficacy of which could be verified against an alternative digital method as well as historical and experimental sources, both of which appeared to support the results (*ibid*, pp. 62-63). However, in the absence of such comparative data, especially as regards prehistoric seafaring, new approaches need to be devised.

These few studies highlight the need for and benefit of a method that incorporates multiple cost criteria. Despite its terrestrial usage, Howey's (2007) creation of a multi-criteria cost surface to model movement during the Late Prehistoric period in Michigan, USA demonstrated the many advantages of such an approach, allowing for more realistic and effective models to be created based on the specificities and complexities of the research question and study area, including its use for larger spatial scales of analysis. However, this method relies on relative and even subjective measures of cost, forcing the researcher to not only select the most relevant cost factors but to also weight the importance of these factors in a meaningful way in order to combine them into a single cost surface. Given the highly nuanced and subjective nature of least-cost methodologies juxtaposed with the complex and often unpredictable nature of seafaring, the paucity of least-coast approaches to model past seafaring is thus comprehensible; and yet, these factors also demonstrate why more refined methods for modelling maritime movement are imperative—not the least of which being the ability to connect these maritime routes to terrestrial pathways.

5.3 Crossing the Divide: Connecting Movement in the Maritime Landscape

As discussed in the introduction to this thesis, islands have long been at the centre of debates regarding isolation and connectivity. Whilst early biological and anthropological studies viewed islands as isolated pieces of land through which native populations and their evolution could be studied, archaeologists have come to challenge this notion of 'boundedness' (Broodbank 2000; Boomert and Bright 2007; Rainbird 2007). Although islands in the Hebrides have provided researchers with 'nice sharp edges' through which to define an area of study (Parker Pearson et al. 2004, p. 11), it is clear that such boundaries are only applicable in the absence of strong maritime communities. Indeed, as emphasised by Broodbank (2000, p. 363), island archaeology must 'abandon the expectation that discrete islands are necessarily useful analytical units.' Further, living an island does not necessarily lead to a homogenous sense of 'islandness' (Boomert and Bright 2007). In some instances, inland topography may present a greater geographical barrier to movement than surrounding waters, leading to the development of disparate cultures on the same island, and in some cases, closer connections to communities living on other islands (Broodbank 2000). This is evident on the northern islands of the Outer Hebrides where great topographical barriers have resulted in the cultural divide of a single landmass into the Isles of Harris and Lewis. In fact, topography and distance present such a strong divide that Harris has greater historical and cultural connections with North Uist despite being separated by the Sound of Harris (Rennell 2010, p. 48).

Islands thus present a paradox, both conceptually and methodologically. Consequently, there may be no single standardised archaeological approach to islands, and instead, the nature of each when addressed through the lens of individual research, will dictate the appropriate 'islandology'. In some instances, especially as regards this study, what lies beyond the concept of 'islandness' is a regional archipelagic identity. According to Boomert and Bright (2007, p. 14), participation in regional archipelagic spheres of interaction would have been essential to the sustainability of island communities. Therefore, any understanding of an archipelagic identity thus requires a more blended approach to land and sea; in other words, a methodological complement to Broodbank's (2000, pp. 21–22) conceptual 'islandscape'. This concept, which encompasses both island landscapes as well as their surrounding seascapes, allows for researchers to not only work within more suitable scales of analysis but also transcend perceived dichotomies between land and sea. As stated by Ilves (2004, p. 174), when addressing research questions regarding maritime communities, it is important to remember that 'the context of coast and islands is both maritime and terrestrial; cultural remains in these places, with practical and/or symbolic meaning… belong to both spheres.'

This need for blended maritime and terrestrial approaches was first espoused by Westerdahl (1992, p. 5) when, during a maritime archaeological survey on the Swedish coast, 'the need arose for a scientific term for the unity of remnants of maritime culture on land as well as underwater.' Thus, arose the maritime cultural landscape—a highly influential term that through its conceptual assimilation of the material and intangible traces of human activity occurring within both milieus, simultaneously exposes the limitations of diametric archaeological approaches to land and sea. It is within this maritime landscape that seafaring routes would have converged with inland transport, places identified by Westerdahl (1992, pp. 6–7) as transit points. These places would have been significant points along maritime routes, requiring a change in transportation methods but also serving as a liminal space for the exchange of goods and ideologies.

Bradley et al. (2016) have elaborated on these transit, or transition points, distinguishing between two types, maritime havens and landing places. The former refers to a sheltered bay where boats could have moored, a site that could have been in use for an extended period of time, and the latter refers to a more ephemeral place that may have changed in relation to the type of watercraft being used as well as existing seafaring routes (*ibid*, p. 126). Whilst maritime havens may be more readily identified through an analysis of the coastal topography, the recognition of more transient landing places requires consideration for both the topography and geology of the maritime landscape as well as the nature of seafaring. Thus, although an analysis of topographic features may aid in the identification of these transitional places, their development would have been dependent not only on conducive geographies but also existing cultural factors and maritime traditions (Westerdahl 1992, pp. 6-9), a challenge further complicated by the dynamic nature of the coastal environment in which they would have existed. Despite these challenges to archaeological detection, transition points would have served as a crucial link, physically, culturally and conceptually, connecting sea routes to terrestrial pathways and thereby enabling the exchange or maintenance of cultural practices and ideologies within this liminal space. To this list of connections could also be added the crucial link these transition places create between maritime and terrestrial archaeology. With a paucity of direct evidence for Neolithic seafaring, it is thus through a blended approach to movement through both land and sea that the nature of maritime movement can ultimately be assessed and a greater understanding of the use of this medium for the propagation and maintenance of the Hebridean archipelagic identity achieved.

5.4 Challenges to a GIS-based Approach

Before proceeding to the methodology chapter, it is necessary to first address a number of limitations and criticisms of the use of Geographic Information Systems in order to subsequently demonstrate how these issues will best be mitigated through the established methodology. Whilst the advantages of using GIS to explore past socio-natural processes are now widely recognised by archaeologists (see Brouwer Burg 2017), criticisms of its use still abound. These critiques have been thoroughly discussed elsewhere (e.g. Llobera 1996; Wheatley and Gillings 2000; Conolly and Lake 2006; Gillings 2017), and thus only criticisms most relevant to this analysis will be highlighted. These pertinant critiques can be broadly divided into two issues: the limitations within the use of GIS itself—i.e. 'the toolbox problem' as branded by Gillings (2012)—and an overreliance on GIS as a method. Although some of these issues may be more difficult to address, others can be mitigated through a more comprehensive and informed approach to the use of GIS.

As already demonstrated in this chapter, GIS methods can be highly subjective, requiring a number of assumptions to be made in order to predict past behaviour. For instance, many toolboxes within GIS are dependent upon the selection of a number of subjective parameters before the analysis can be conducted. As stated by Whitley (2017, p. 113), 'we may put a great deal of effort into developing parameters and details that go into a model but our choice of those things are biased.' However, it is not the inherent subjectivity of the process that presents a limitation but rather an uninformed selection of parameters and an altogether lack of acknowledgement of both the existence of this subjectivity as well as its importance. As stated by Chadwick (2004, p. 9), 'archaeologists create histories in the present.' Thus, computational modelling is not independently objective nor should it be treated as such (Whitley 2017, p. 113). This is not, however, to suggest that 'anything goes' in GIS but rather that researchers must first acknowledge these subjective limitations and do their best to mitigate them *before* the analysis is conducted. This requires firstly a clear elucidation of the archaeological question being addressed and only secondly an informed consideration for the GIS analyses that can be used to address it—in other words, not viewing GIS as 'a set of methods looking for a problem' (Gillings 2012, p. 603). Thus, as stated by Verhagen et al. (2019, p. 239), by 'providing a clear argumentation for the choice of parameters, equations, and/or algorithms used' the dangers of applying 'push-button' approaches without understanding their implications can be avoided.

Whilst this may enable a more informed and informative use of GIS, researchers must regardless 'remain aware that all models are inherently flawed' (*ibid*), and it is a dismissal of this fundamental limitation that leads to the second, and perhaps greatest, challenge to the archaeological usage of GIS. What could be likened to a 'GIS hubris', the strong computational and analytical nature of GIS can lull users into a false sense of the definitiveness of the results, an issue easily mitigated through the use of GIS as a heuristic device that produces inductive rather than conclusive results (see Llobera 1996). Related to this critique is an overreliance on GIS alone, an inherently quantitative method, without the inclusion of more qualitative practical or theoretical work. As emphasised by Llobera (2003), ultimately new GIS methods will need to be employed 'if cognitive and perceptual factors are to be linked with spatial information.' Thus, just as with all archaeological methods, GIS should be viewed 'as a form of practice that must be situated within archaeological theory' (Richards-Rissetto 2017, p. 11).

Consequently, whilst the GIS analysis must necessarily begin with the environment in which this movement would have taken place, invariably removing the behavioural elements of people, it must eventually move away from the 'peopleless landscapes of spatial science' to the 'peopled landscapes of humanistic geography' (Cloke et al. 1991, p. 67) in order to consider the many social and cultural factors that would have also influenced movement. It thus follows that although focusing on the more tangible indications of environmental affordability to movement allows for an initial understanding of potential routeways, it is only through a more perceptual or experiential approach to the results that a more refined and informed understanding of movement can truly be achieved. Following the sentiments of Whitley (2017, p. 108) in his geospatial experimentation with cost-distance analysis, the aim is not simply to ask questions about where archaeological sites or landscapes exist but rather to understand *how* and more importantly *why* people moved through the landscape. Accordingly, it will thus be through a comprehensive and conversant approach to the archaeological record, a fine-grained and inclusive approach to movement and an informed and inductive approach to the use of GIS and the analysis of its results that a refined regional narrative of movement and connectivity during the Hebridean Neolithic will be constructed.

Chapter 6. METHODOLOGY AND RESULTS

It is now clear from both the Hebridean archaeological and environmental records as well as previous discussions of and approaches to prehistoric movement that any method of its study requires a multi-scalar approach. However, rather than taking an outside-in approach, as has been admonished in the archaeological review, it is the aim of this thesis to work from the inside-out. By beginning with the settlement record, micro-scale or localised patterns of movement within the surrounding landscape can first be addressed, building overlapping narratives of movement and connectivity and expanding outwards towards a regional narrative. As this movement is predicated on the archaeological record, the first objective of this thesis was to create a comprehensive, quantitative database of the Neolithic archaeological record that could be incorporated into the GIS analysis and results. Within each scale of mobility, there would have existed a range of environmental factors affecting movement, thus whilst a comprehensive quantitative approach to the archaeological record serves as the basis for notions of movement, it is through a more detailed environmental approach that this movement can be studied.

This environment ranges from low-lying coastal plains to loch and rock-strewn landscapes to substantial massif features, all of which would have been surrounded by deep sea lochs and the dynamic sounds and seas surrounding the Hebrides. The inexorable relationship between land and sea within the Hebridean maritime landscape has been well emphasised as well as its significance for understanding the nature of maritime practices, and hence, before any analysis of potential pathways could be conducted, the Neolithic palaeogeography had to first be modelled. Using this palaeogeographic reconstruction, the least-cost analysis began with terrestrial movement. Given the emphasis on a blended approach to movement through these different milieus, a standard least-cost approach was used to model terrestrial movement before more empirical approaches were used to model seafaring. The use of a single method for both environments allowed for not only a comparison of the two but also the identification of where these patterns of movement may have converged within the maritime landscape. Whilst the resulting pathways are most advantageous for the discussion of individual sites, it was through further computational processing and statistical analysis of all pathways that comparative measures of connectivity and accessibility could be generated for all sites and a more suitable and informative discussion generated.

6.1 THE EXTANT ARCHAEOLOGICAL RECORD

The first objective of this thesis was to bring the full Neolithic record together into one inclusive dataset in order to generate comparisons within the record, both spatially and quantitatively, that could subsequently be combined with the results of the least-cost analysis in the final discussion. This initial comprehensive analysis was necessary in order to address a substantial gap in the current understanding of the Hebridean Neolithic—that of a piecemeal and biased record that has yet to be combined into a single comprehensive database, much less analysed in detail. As repeatedly demonstrated, it is through a comparison of material assemblages between sites that indications of a unified Hebridean identity have been revealed, and thus, the extant archaeological record provides a necessary tangibility to the study of movement. Further, although the mobility models were derived primarily from the environment, the archaeological record provides a necessary ambit to this analysis, dictating both the origin points for modelled pathways and their ultimate suitability and enabling a richer discussion of movement and connectivity in the Outer Hebrides and beyond.

6.1.1 Method

Given the long history of research as well as the tendency for finds to be recovered through modern land-use, collating the complete Neolithic record required the consultation of a variety of sources. The Historic Monuments Record and the Sites and Monuments Record provide the most comprehensive digital records of Hebridean archaeology along with *Canmore*, an online database of archaeological sites and materials maintained by Historic Environment Scotland. In collating the material record, published excavation and survey reports as well as previous PhD work provided the most detailed information regarding recovered artefacts. Additional small-scale, often rescue, excavations could be found in *Discovery and Excavation in Scotland*, which provides a current record of archaeological work undertaken across Scotland from 1947 to present. Further, the numerous chance finds that have been recovered are listed across a variety of sources. Broader syntheses of prestige objects and lithic exchange provided basic information regarding the existence of objects recovered primarily in the first half of the 20th century, and the 'Donations to and purchases for the Museum' section of the *Proceedings of the Society of Antiquaries of Scotland* lists all known information regarding finds donated from private collections. Ultimately, by compiling and cross-referencing all sources of information, a thorough database of the Hebridean Neolithic was thus assimilated but not without first overcoming a number of challenges.

The difficulties encountered in the collation of the Hebridean Neolithic record are primarily the result of a long and varied history of research. Differing research objectives and archaeological practices throughout the archipelago's historiography have led to various methods of recording and even different levels of appreciation for the importance of reporting—indeed some excavations still await publication. Further, whilst more recent excavations have followed thorough practices of recovery, analysis and cataloguing of finds, excavations in the first half of the 20th century were hindered by an absence of standardised practices, limiting both the understanding of these sites and the ability to generate comparisons. For instance, the use of wet sieving or flotation sampling at some sites resulted in the recovery of charcoal and macrofossil assemblages, thereby promoting their domesticity over sites that, in the absence of such practices, demonstrate an inherent absence of these micro-organics. In addition, the way finds have been reported varies significantly, with more recent excavations providing detailed catalogues of finds in contrast to reports from earlier excavations, which tended to provide only basic information regarding recovered materials—in some cases even omitting specific quantities and instead listing finds as 'numerous' or 'a few', if reported at all. Moreover, discrepancies between quantity units (e.g. sherds versus estimated vessels or lithic pieces versus weights) not only affected the comparability of assemblages between sites but also the ability to make broader comparisons between lithic and ceramic usage. Rectifying these inconsistencies was a necessary yet subjective process. For generic quantities, a standard value was applied (e.g. 'few' was assigned a quantity of two, 'several' a quantity of five, etc.), and in instances where no quantifier was given, the material or object was assigned a single value to denote its presence or was omitted entirely due to the impossibility of estimation (e.g. quartz artefacts from Eilean Domhnuill and Eilean an Tighe). In all instances, such estimations or omissions were noted in the database. Further, vessel quantities were deemed more indicative of ceramic usage due to the great variations reported in the size of sherds (e.g. the large fragments recovered from the Lewis islet sites versus the small, abraded pieces recovered from the Udal and Eilean Domhnuill), and in most cases, the previous ceramic analyses of Squair (1998) and Copper (2015) provided such estimates. A further challenge to the collation and quantification of the material record was the numerous chance finds recovered. Whilst many finds have been donated to museums over the past century, there is little way of knowing how many other extant materials are still held privately. Further, the finds that have been donated have little contextual information beyond generic coordinate locations, which also limits the ability to spatially analyse these findspots.

Finally, just as with more ambiguous material quantities, the collation of the monument record also necessitated subjective decisions regarding the inclusion of sites. With much of the known monument record being derived from HER and SMR databases—which are themselves dependent upon the thoroughness of field surveys and levels of preservation—some listed sites contain a degree of uncertainty in period, location and, at times, even existence. The monument record thus needed to be compared against the *Canmore* database and other relevant sources of information in order to include only those monuments that were ranked highest in degrees of certainty. Given these numerous challenges in collating and quantifying the full Neolithic record, its potential incompleteness and partiality must be acknowledged; however, it still provides a thorough and comprehensive database of the Hebridean Neolithic and the most complete record to date.

6.1.2 Results

The Neolithic database was divided into five main categories based on record class and type, which includes settlements, cairns, standing stones, lithics and ceramics, with as much information as possible gathered for each (see Appendix B for full record). Sites identified within the broader settlement record include the 14 sites discussed in Chapter 3, which also provided the origin points for the least-cost analysis. For the monument record, 49 chambered tombs were identified with another 24 sites of less certainty, whilst 119 monoliths and stone circles were identified with another 23 sites of less certain origin (Figure 21). Although the compilation of chambered tombs and standing stones was challenged by levels of preservation and minimal investigations, the totals reached within this database reflect other listed quantities—e.g. 38 tombs (Muller 1988) or 42 tombs (Cummings and Richards 2013).

In addition, 63 sites were identified with reported finds of either pottery or lithics. This includes excavated sites and finds recovered during field surveys—the most extensive having been conducted on the Barra Isles (Branigan and Foster 1997; Branigan and Grattan 1998) and South Uist (Gilbertson et al. 1996; Parker Pearson 2012a)—as well as reported findspots (Figure 22). The total quantity of materials recovered through each method is shown in Table 2. Perhaps most evident from this analysis of materials by recovery method is the clear bias towards the southern islands, which have produced over 90% of the total artefact record. Given that materials derived from excavation account for over 98% of all known materials and over half of all excavations have been conducted in North Uist, it is apparent that the density of recorded materials and structures on this island is, at least in part, the result of concentrated research.

In contrast, the distribution of artefacts recovered during survey and chance finds are more heavily weighted towards the northern islands, with Lewis alone accounting for nearly 68% and 87% of total finds within each category respectively. However, given that in total these finds still account for such a small proportion of the total material record, it is clear that there is a significant gap in knowledge regarding the Neolithic of the northern islands. Hence, upon initial assessment, the heavy influence of excavated sites on the extant material record as well as the current understanding of the Neolithic is clear. Given the relatively few excavations that have been conducted and the even fewer that are modern and of a comprehensive nature, this bias in understanding towards excavations suggests the potential inefficacy of assigning too much significance to the current density and distribution of the record, especially settlements. Nevertheless, bearing this caveat in mind, an analysis of the full material record reveals some interesting trends.

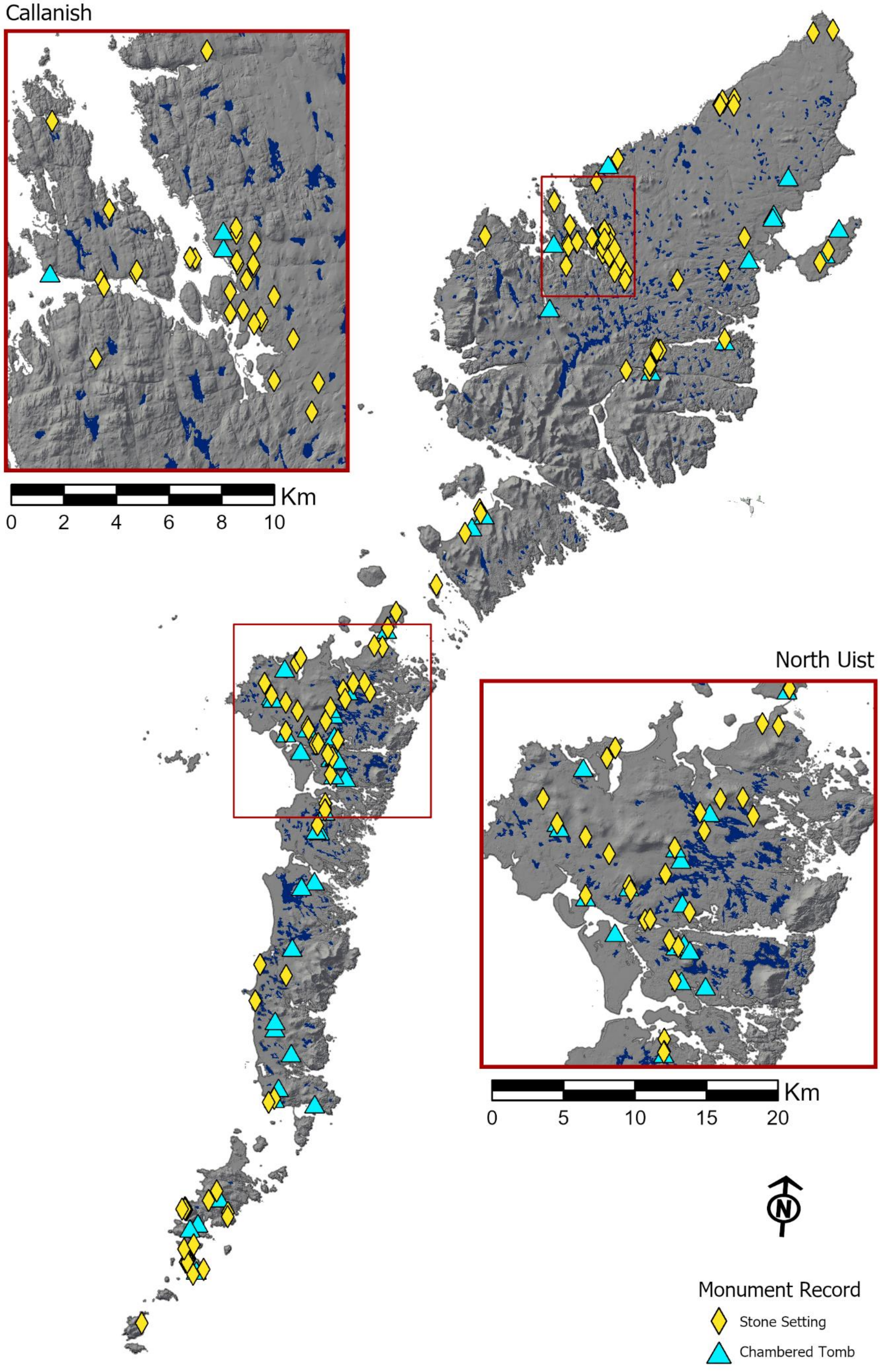


Figure 21. All Neolithic monuments identified during the collation of the Hebridean Neolithic record.

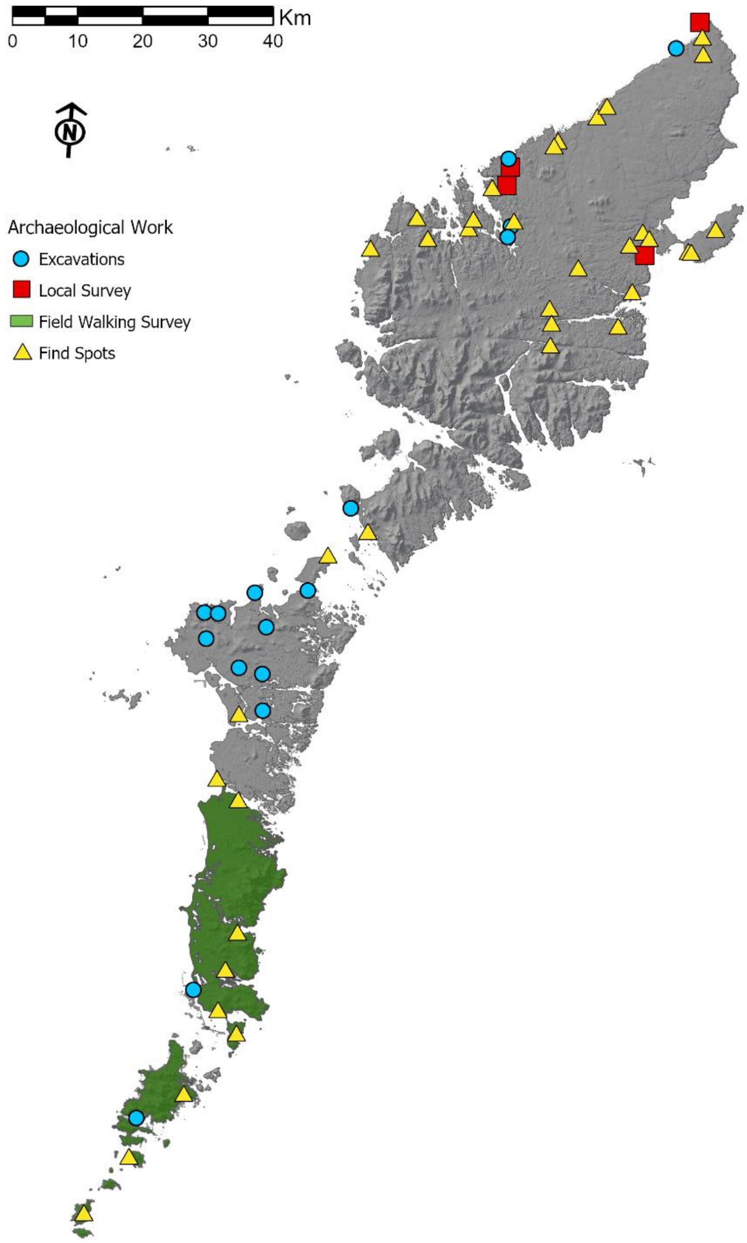


Figure 22. All reported work contributing to the Hebridean material record by recovery method.

Hebridean Neolithic Materials by Recovery Method

	Vessels	Lithics	Total	
Total from Excavations	5411	18447	**23858**	(98.39%)
Southern Islands	4001	17995	21996	
Northern Islands	1410	452	1862	
Total from Survey	211	95	**306**	(1.26%)
Southern Islands	11	95	106	
Northern Islands	200	0	200	
Total from Find Spots	31	53	**84**	(0.35%)
Southern Islands	2	8	10	
Northern Islands	29	45	74	
Totals	**5653**	**18595**	**24248**	
Southern Islands	4014	18098	**22112**	(91.19%)
Northern Islands	1639	497	**2136**	(8.81%)

Table 2. Neolithic Hebridean materials by recovery method demonstrating strong bias in understanding towards excavations in the southern islands.

The Hebridean Lithic Assemblage: Local Materials

Of the 18,595 lithics recovered, over half were flint objects, followed by quartz at nearly 42% and, more distantly, pumice at 3.5%. Of the total assemblage, 97% of lithics were recovered from the southern islands, a total that is derived primarily from three excavations. An Doirlinn produced by far the largest number of lithics, equalling 39% of the total Hebridean record, followed by the Udal at 29% and Allt Chrisal at 20%. However, the stone types within these assemblages vary, showing a clear decrease in flint quantities north of An Doirlinn and an increase in the use of quartz (Figure 23). Lithic assemblages from Allt Chrisal and An Doirlinn were comprised primarily of flint at 3,433 (92% of the total site assemblage) and 6,025 (83%) pieces respectively, whilst at the Udal, 112 (0.02%) pieces were recovered. Instead, the Udal's assemblage was comprised primarily of quartz, totalling 4,975 pieces (93%) and contrasting the 1,045 (14%) quartz pieces recovered from An Doirlinn and the minimal 138 (0.04%) pieces recovered from Allt Chrisal.

In addition to apparent reductions in flint quantities to the north, there also appears to have been a decline in the quality of flint, with sites such as Northton evidencing the use of 'diminutive beach pebble flint' (Nelis 2006, p. 25). In contrast, and perhaps in response to these diminished flint resources, there is a clear increase in the use of quartz in North Uist (Figure 23, *middle*), with small-scale work at Barpa Langass and Screvan Quarry producing 173 (93%) and 217 (85%) quartz pieces respectively. Excavations at the chambered tomb of Geirisclett also produced large quantities of quartz; of the 1,038 lithic pieces recovered, 1,030 pieces were quartz and the remainder were flint. However, a more comprehensive understanding of the use of quartz in North Uist as well as how its usage compares to flint is not possible due to its prevalence, and thus omission, from recorded

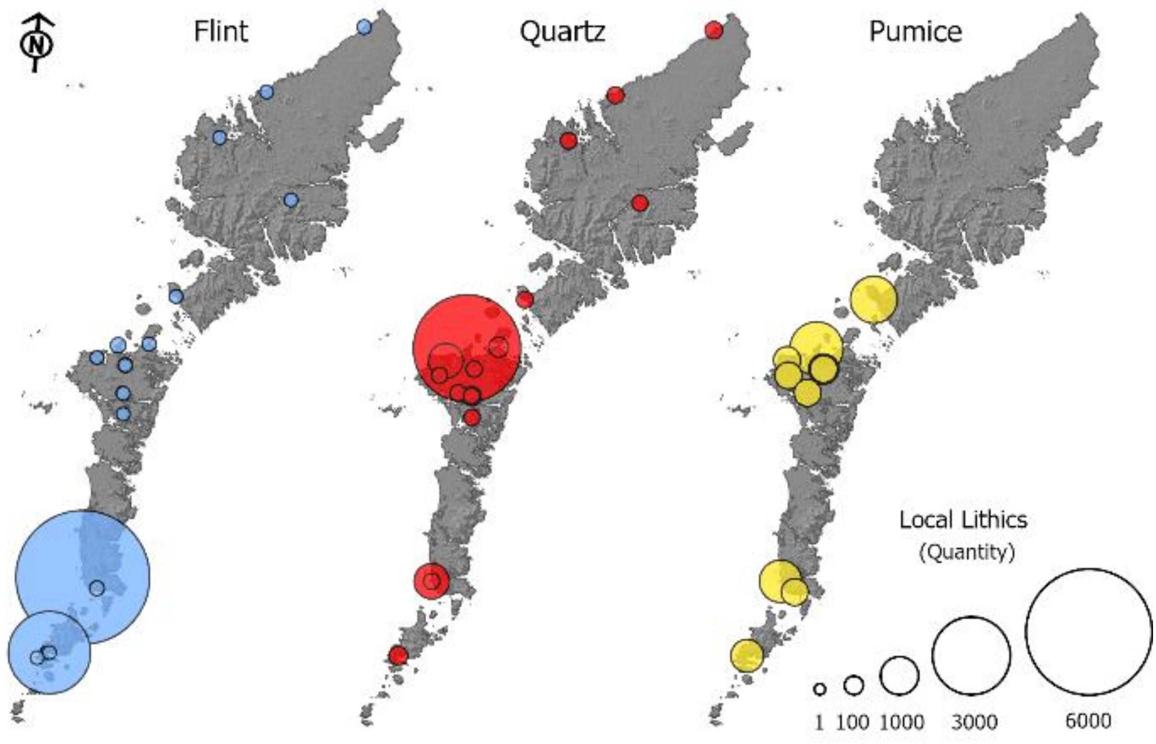


Figure 23. Local Hebridean lithic record showing differences in density and distribution by lithic type.

materials at some sites, most especially the islet sites in North Uist (see Scott 1951a; Armit 1987, 1988). As such, total quartz quantities, especially in North Uist, can generally be assumed to be greater than reported values, and thus, any comparison between flint and quartz use is clearly restricted. Further, given that the overall density and distribution of local lithics is in large part the result of recovery and reporting practices, a greater understanding of regional densities and distributions is also limited.

Moving into Harris and Lewis, total lithic quantities become even sparser. At Northton, lithic totals were severely diminished at only 226 pieces, of which local lithics included 180 pieces of pumice, 28 pieces of quartz and 14 pieces of flint. These volcanic sedimentary rocks are the next greatest lithic type in use in the Hebrides, although still only equalling 3.5% of total lithics (Figure 23, *right*). Geochemical analyses of five pumice pieces recovered from the Udal revealed its correlation to other pumice deposits found in Scotland, the source of which has been attributed to the Katla Volcanic System in Iceland that, given its light and porous composition, would have subsequently arrived as drift (Ballin Smith 2018, p. 165-168). Aside from Northton, no pumice has been recovered from the northern islands, and of the 203 lithic pieces recovered from four excavations and surveys (excluding Northton), 145 pieces were quartz and 58 pieces were flint.

Consequently, whilst Northton may reveal a diminishing flint resource, the overall absence of local lithics from the northern islands is clearly influenced by a lack of substantial excavation work as well as an absence of more traditional settlements. In addition to these three primary types of local lithics, it is possible that rarer or more distinctive local lithics were also being moved around the archipelago. For instance, several mudstone and sandstone pieces were recovered from Northton and Allt Chrisal, the only local deposits coming from Stornoway and the Shiant Isles, a group of three small islands located approximately 7 km east of south Lewis. These sedimentary deposits continue into Skye and Raasay, making their exact origin difficult to pinpoint but nonetheless suggesting the regional movement of more exceptional local lithics.

The Hebridean Lithic Assemblage: Foreign and Prestige Objects

In contrast to the density and distribution of local lithics, sites producing foreign lithics are fairly evenly distributed between the northern and southern islands, with Lewis producing the greatest quantity by island (Figure 24, *left*). However, lithics of certain foreign provenance in the Hebrides are minimal, equalling only 23 pieces, or 0.13% of the total lithic record. The provenances of most of these definitive pieces have been identified, although several pieces remain unattributed. Thus, this low quantity may reflect not only the paucity of excavation work but also the less thorough analyses of some lithic assemblages and, in some instances, the inability to source samples through thin sectioning. Accordingly, there are another 13 pieces of possible foreign origin and 88

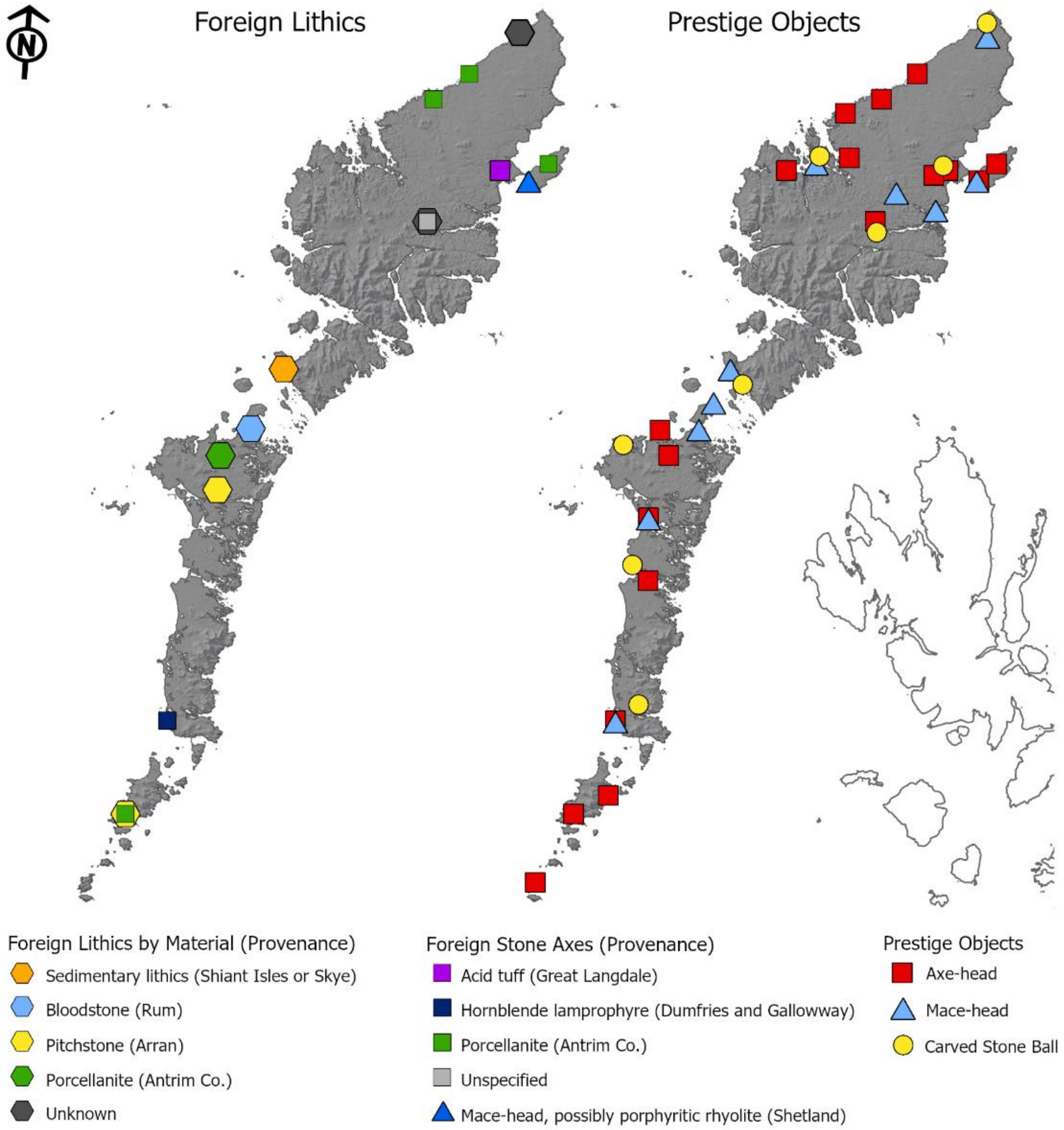


Figure 24. Distribution of recovered foreign lithics, including foreign stone axes (left) and all recovered prestige objects by object type (left).

Hebridean Neolithic Foreign Lithic Assemblage		
Lithic Type	Provenance	Quantity
porcellanite	Antrim Co. Ireland	7
pitchstone	Arran	2
pitchstone	Eigg (possible)	1
hornblende lamprophyre	Dumfries and Galloway (possible)	1
acid tuff	Great Langdale	1
bloodstone	Rum	4
porphyritic rhyolite with riebeckite felsite	Shetland (possible)	1
mudstone, indurated/banded	Shiant Isles, Skye or Raasay	1
fine-grained igneous rock, 'basalt'	Skye (possible)	1
hornfels	Skye (possible)	1
orange agate	unknown	1
unspecified	unknown axe-factory	2

Table 3. Quantity of certain foreign lithics by type and provenance.

unattributed or unspecified pieces. Table 3 provides the sources of foreign lithics, with the greatest proportion coming from Antrim Co. Ireland, followed by Skye and the Inner Hebrides.

All foreign examples of prestige objects are axe-heads, with the exception of a more controversial cushion mace-head found near Stornoway, which was originally suggested to be of porphyritic rhyolite with riebeckite felsite (Gibson 1933, p. 432, 1944, p. 20). Although no thin sectioning was undertaken, the only comparable example comes from Northmavine, Shetland, an origin which has subsequently been called into question (see Ritchie 1968, p. 132). These foreign axes have been attributed to various petrological groups, including an axe-head found near Stornoway that was demonstrated through petrological analysis to belong to the Group VI stone implements from Great Langdale, an axe type widely distributed throughout Britain (Mck Clough and Cummings 1988; Edmonds 1995). A less certain hornblende lamprophyre axe was suggested to belong to the Group XXX stone axes (Pirie 2017) derived from extensive deposits within Caledonian dykes on the western mainland of Scotland (Mck Klough and Cummins 1988, pp. 102, 105-106). The remaining five foreign examples are of Irish porcellanite, belonging to the Group IX implements from Rathlin Island and Tievebulliagh in Co. Antrim Ireland (see Section 3.2.2).

In contrast to the limited examples of foreign lithics, 56 prestige objects have been found including 28 axe-heads, 13 mace-heads and 15 carved stone balls, the majority of which are made of local materials (Figure 24, *right*). Most of these objects (64%) have been recovered through chance finds, which contrasts foreign lithic pieces, all of which have been recovered through excavations (with the exception of foreign stone axes, which fall into both categories). Given this trend, the distribution of recovered prestige objects is not affected by excavation biases but rather land-use practices, further suggesting the great potential for additional objects to await discovery. The distribution of prestige objects reflects that of the monolith record, with over half having been recovered from the northern islands and 24 objects from Lewis alone. Of these examples from Lewis, 23 are derived from chance finds, compared to the two out of the 15 prestige objects recovered by chance in North Uist. Additionally, it must be noted that seven of these North Uist examples are carved stone balls recovered from Eilean Domhnuill, the majority of which represent a diminutive form of the more elaborate tradition evidenced in northeast Scotland (see Section 3.2.2), thereby raising some uncertainty as to the appropriateness of their inclusion within this classification.

Given that the majority of prestige objects are derived from find spots, with around one-third being recovered from uncertain or unknown locations, these objects contain little contextual information. The one exception is the previously discussed Shulishader axe of polished porcellanite found with an intact hawthorn haft, which allowed it to be dated to *c*. 3300 to 2900 BC (Garrow et al. 2017, p. 22). Consequently, the association of prestige objects with Late Neolithic activity further suggests that current divergences in understanding between the southern and northern islands also encompasses Early and Late Neolithic activity as well as domestic and ritual contexts—the significance of which will become clear throughout the subsequent analysis and discussion.

Material Assemblage Comparisons

Given the in-depth analyses of Hebridean pottery that have already been conducted by previous researchers (see Section 3.2.1), the main aim of the pottery collation was to determine total quantities and distributions in order to generate comparisons with the lithic assemblage. In addition, the longevity of both ceramic traditions and site use, along with the lack of clear stratigraphy at many sites, limits the ability to further reduce and categorise the ceramic assemblage, either temporally or by style, and thus discussions of both are limited. This is especially true for larger ceramic assemblages and those derived from early excavations. For instance, the large quantities of pottery recovered from Eilean Domhnuill were derived from 11 different phases of Neolithic occupation, many exhibiting re-deposition that, when combined with the range of forms and styles, has led to the suggestion that all identified vessel forms would have been in use throughout the entire occupation of the site (Copper 2015, pp. 181-183). Thus, it would be neither appropriate nor feasible to further divide this assemblage chronologically. Indeed, Sheridan et al. (2016, p. 591) have argued that such divisions are moot until more materials and absolute dates can enable the establishment of more refined chronologies.

Total quantities of materials and their density distribution can be seen in Figure 25 and Table 4. Few sites that produced both lithics and ceramics, typically excavated or surveyed sites, produced more lithics than either sherds or vessel estimates. Those that did, include all sites previously discussed in the analysis of local lithics, including the settlements of Allt Chrisal, An Doirlinn and the Udal, the occupation areas of Barpa Langass and Screvan Quarry and the chambered tomb of Geirisclett. Removing quartz and pumice from the totals, only the two southernmost settlements retain higher quantities of lithics. Thus, the strong distribution of lithics, and moreover flint, towards the south is once again apparent. Conversely, removing all recovered quartz from the lithics database has little effect on relative quantity comparisons between sites, with the exception of the Udal and Geirisclett, the two sites producing the largest quantities of quartz.

What is more notable, however, is that without the inclusion of quartz, North Uist no longer produces the largest quantity of materials, and instead, South Uist becomes the greatest contributor to the material record. Given that 99% of total materials from South Uist are derived from the excavation at An Doirlinn, this one site offsets not only the much greater concentration of work in North Uist but also the substantial amounts of pottery that have been recovered from it. Further, with An Doirlinn’s assemblage comprised of 7,226 lithics or 62% of the total combined lithic and sherd quantities in South Uist, the counterbalance to what has been deemed an

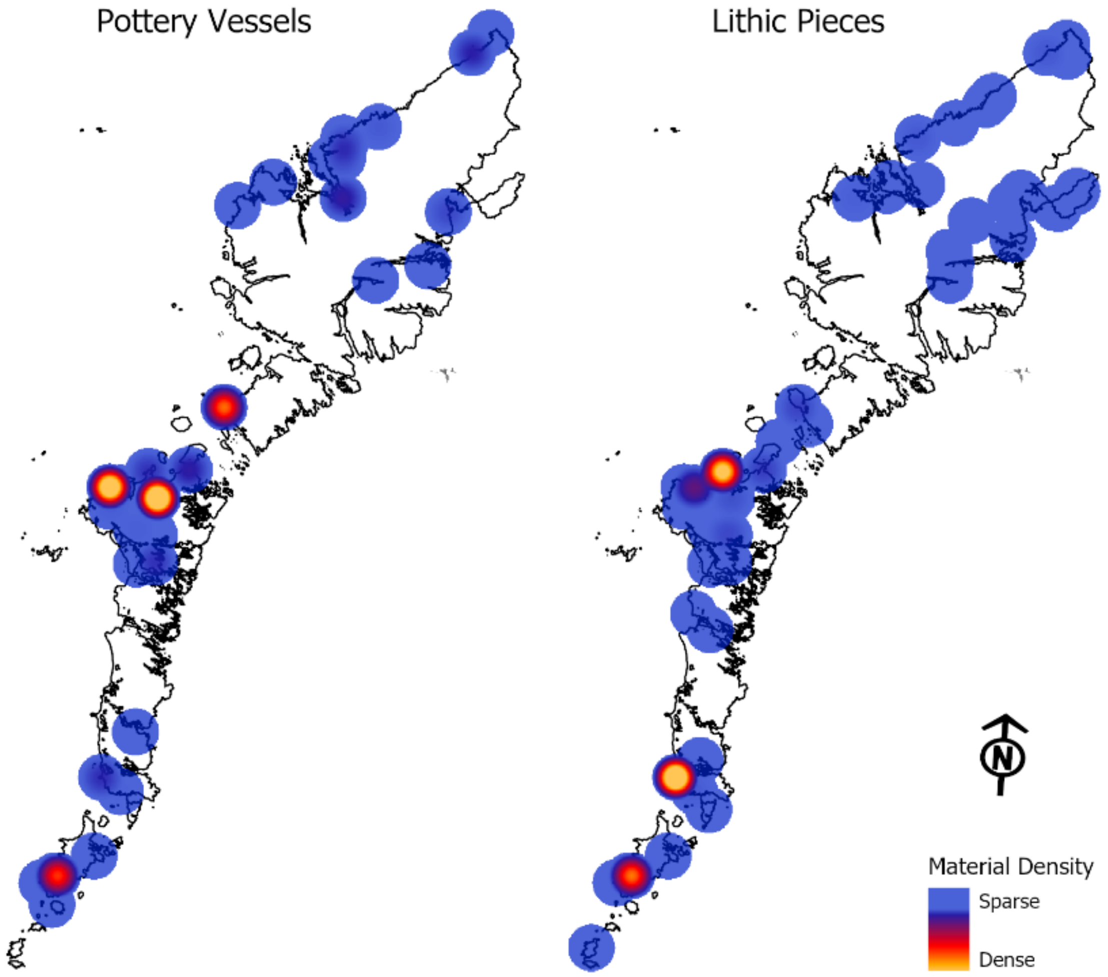


Figure 25. Density map of pottery vessels (left) versus lithic pieces (right).

Hebridean Neolithic Material Record					
Island	Sherds	Vessels	Lithics	Sherds + Lithics	Vessels + Lithics
Vatersay	6	3	17	23	20
Sandray	*2	1	0	*2	1
Eriskay	0	0	1	1	1
Mingulay	0	0	1	1	1
Barra	6800	954	3737	10537	4691
South Uist	4920	120	7296	12216	7416
Benbecula	0	0	1	1	1
North Uist	30937	2937	*7045	**37982	**9982
Berneray	0	0	1	1	1
Harris	2756	1097	227	2983	1324
Lewis	1765	541	267	2032	808
Great Bernera	0	0	2	2	2
Southern Islands	42665	4015	18099	60764	22114
Northern Islands	4521	1638	496	5017	2134
Totals	47186	5653	18595	65781	24248

* includes estimated quantities

**quartz not included

Table 4. Total Hebridean lithic assemblage by island and material type.

extraordinarily profuse Hebridean ceramic assemblage is an equally strong yet clearly underrated record of local lithics. This is also apparent in Figure 25, which aside from differences in density, reveals a more even distribution between ceramic and lithic finds as well as between the northern and southern islands. Thus, although strong biases towards the excavation record are clear, it is also apparent that these biases only affect certain classes of sites, mainly settlements and ceramics, whilst others, primarily prestige objects, may reflect a more apposite distribution.

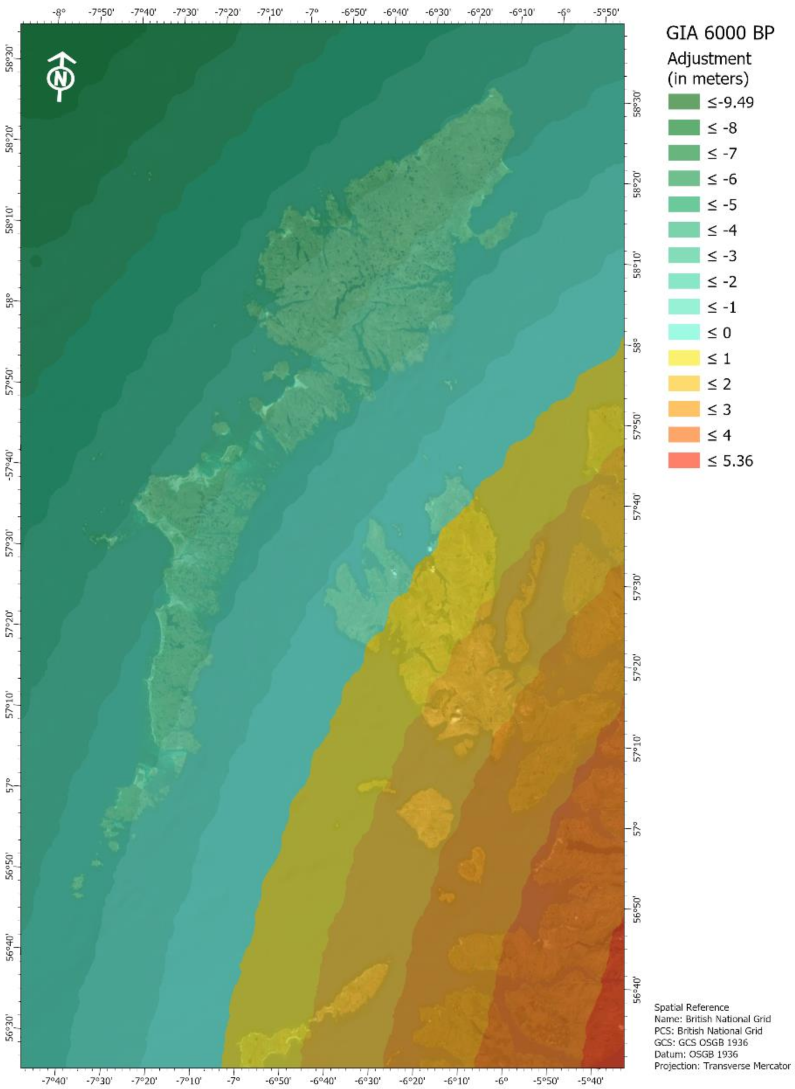
6.2 GIS ANALYSIS

The GIS-based analysis began with the creation of a palaeogeographic reconstruction of the Outer Hebrides in ArcGIS Pro, using modern topographic and bathymetric data along with glacial isostatic adjustment models derived from Sturt et al. (2013). Using this reconstruction, along with a modern landscape characterisation, the terrestrial cost rasters were created. For the seafaring models, the cost raster was based on palaeotidal data derived from Ward et al. (2016), along with the palaeogeographic model and modern topographic data for Skye. All data sources used are listed in Appendix A.

6.2.1 Palaeogeographic Reconstruction

Method

The creation of the palaeogeographic reconstruction began with a 5 meter resolution digital terrain model (DTM) of the Outer Hebrides, to which was merged bathymetric data (resampled from 25 meters) of the surrounding seaways, resulting in a high resolution topographic and bathymetric digital elevation model (DEM). With this DEM, elevation values could then be adjusted using the latest GIA models from Sturt et al. (2013), which have subsequently been refined through new mantle viscosity calculations (Sturt 2016, pers. comm.). The GIA data was presented as a point grid with each point representing the adjustment value necessary to convert current elevation into past elevation. These points thus had to be interpolated using inverse distance weighting, before being subtracted from the modern DEM (Figure 26). The diminishing effects of isostatic rebound along the west coast of Scotland are evident from this interpolated surface, which demonstrates that although much of the western mainland and Skye have experienced rebound, the Outer Hebrides have subsided, becoming more prominent towards the low-lying west coast. As the GIA models were presented in 1000 year intervals, three models were created representing 6000 BP, 5000 BP and 4000 BP. Although only the 6000 BP palaeogeographic reconstruction was used for the subsequent analyses, the creation of Late Neolithic and Bronze Age models introduces an additional temporal refinement to this submergence.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 26. Inverse distance weighting of GIA adjustment points used for the palaeogeographic reconstruction showing decreasing effect of isostatic rebound beyond the west coast of Scotland.

Results

The 6000 BP palaeogeographic reconstruction is presented in Figure 27. What is most immediately evident from the model is the major submergence that has occurred around the southern islands and more specifically along the western and northern coasts, resulting in a single island chain. A comparison to the 5000 BP model suggests that the submergence of the North and South Fords between Benbecula and the Uists began around this time, with complete submergence by 4000 BP. This is supported by palaeoenvironmental work carried out in the North Ford, which dated submergence of this region to sometime between 5200 and 4500 BP (see Section 2.3.1). Whilst the opening of these channels would have had a profound impact on coastal and tidal dynamics (Ritchie et al. 2001, p. 121) as well as maritime practices, it is also important to consider how the potential connection of these islands during the Early Neolithic would have affected land-use, terrestrial movement and ultimately social connections. Thus, the reconstruction provides an opportunity to re-evaluate not only the density and distribution of the structural record in relation to the coastline but also the nature of movement between sites throughout this region. For

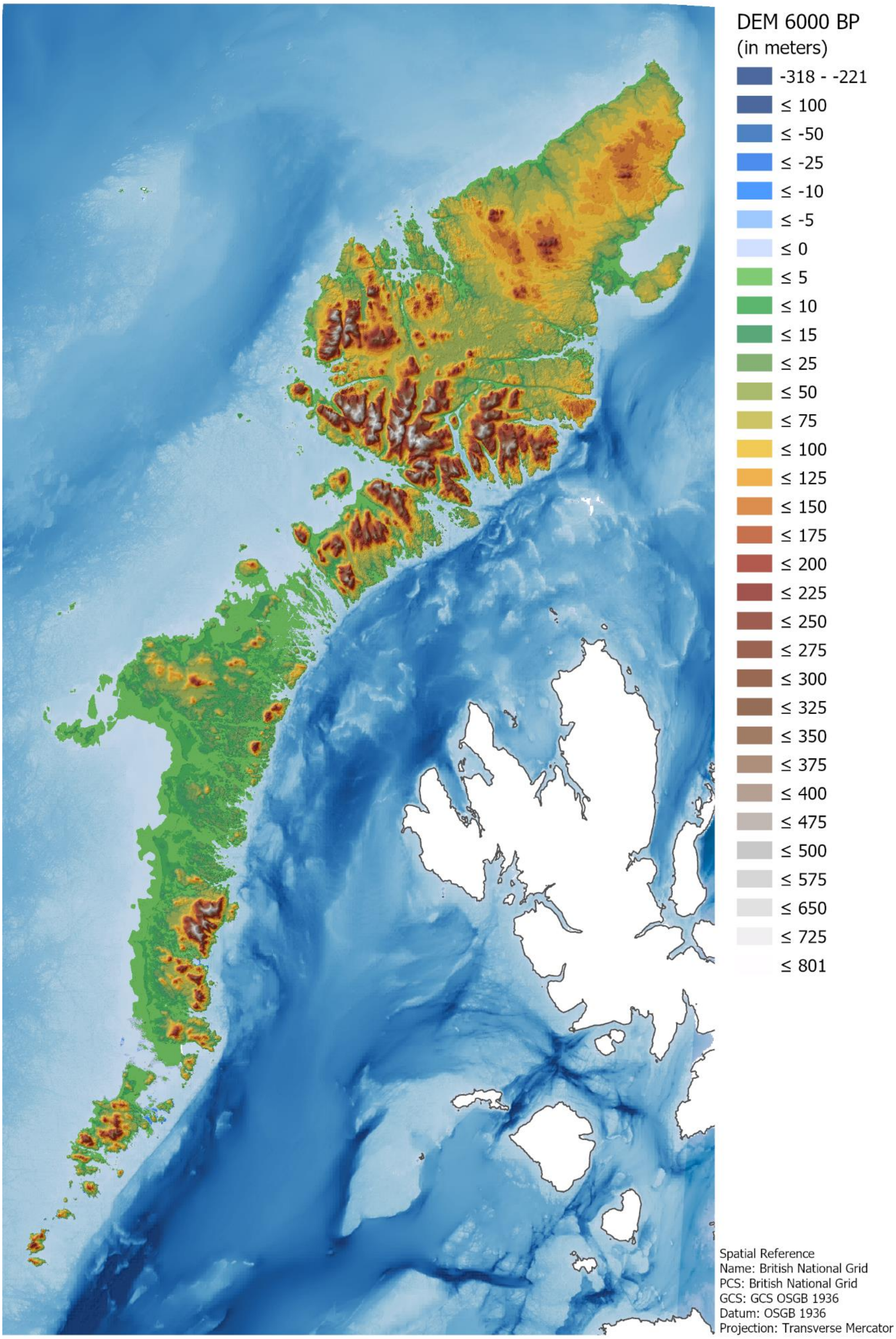


Figure 27. Digital elevation model of 6000 BP palaeogeography.

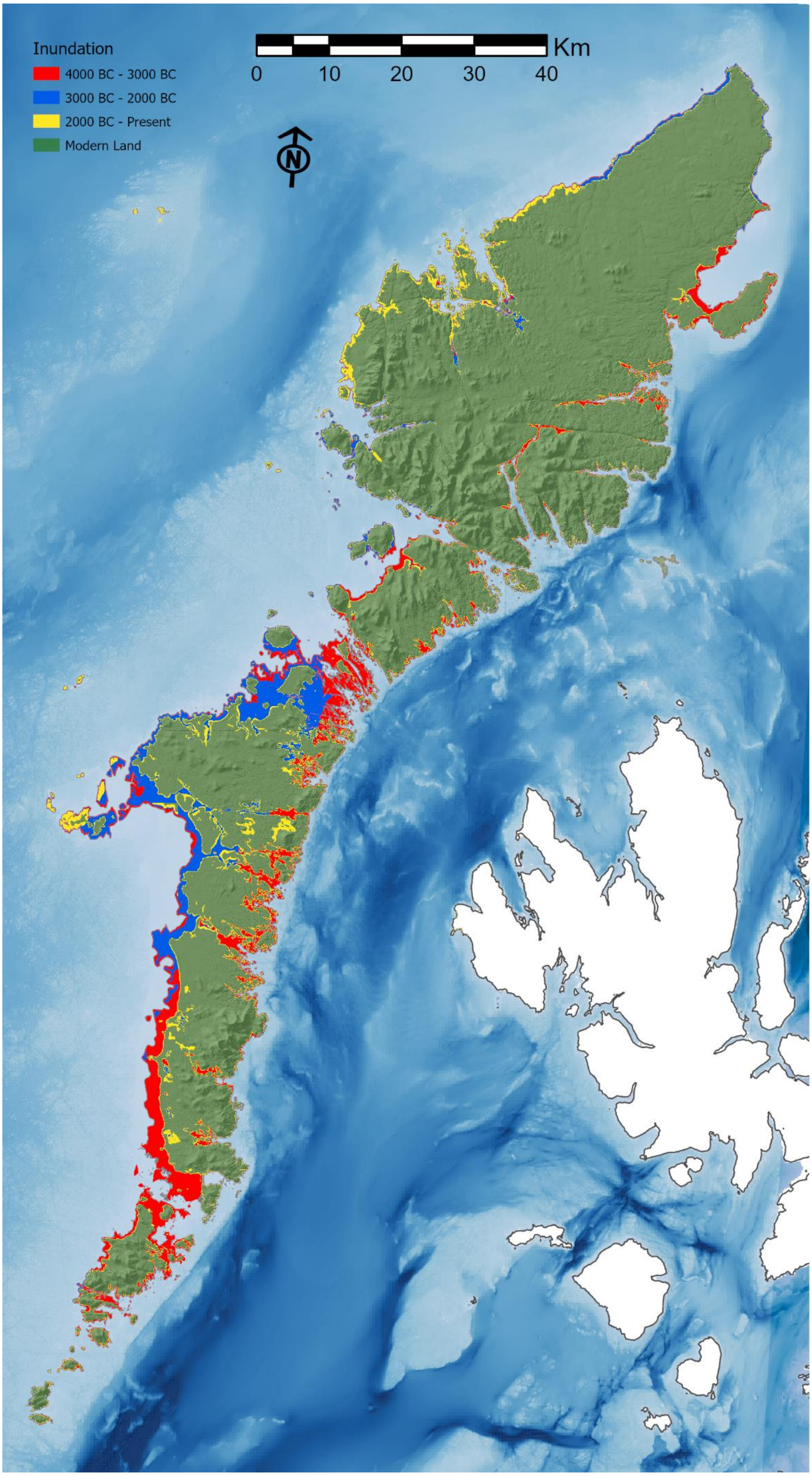


Figure 28. Inundation by 1000 year intervals showing spatial distribution and extent of inundation throughout the Neolithic.

instance, previous discussions of settlement territories and chambered tomb distributions in the Uists have used island-based divisions (see Muller 1988, Fig. 16), and whilst the inefficacy of such a bounded approach has already been discussed, these models further demonstrate that such divisions may be not only conceptually ineffectual but also geographically inappropriate.

With a greater understanding of the potential Early Neolithic coastline, what is less clear is the rate of submergence throughout the Neolithic. The creation of two additional palaeogeographic reconstructions thus added a refined level of temporal understanding to this submergence (Figure 28). The inundation map for 6000 BP projects the total land lost since the start of the Neolithic to be upwards of 500 km², and based on the additional models, this submergence can further be divided into *c*. 280 km² of submergence from 6000 BP to 5000 BP and *c*. 200 km² of submergence between 5000 BP and 4000 BP. This sharply contrasts projected inundation from 4000 BP to the present, which may have only equalled around 80 km² of submergence. Whilst a further understanding of the rate of inundation within these 1000 year periods can only be speculated upon, what can be more broadly said from these models is that sea-level rise would have been more substantial in the Early Neolithic and would have slowed, although certainly not ceased, by the Late Neolithic.

However, what is more apparent from the inundation model is the clear spatiality of inundation, with Early Neolithic submergence occurring most prominently along the western coast of South Uist and the east coasts of Benbecula and North Uist and Late Neolithic submergence concentrated most heavily around North Uist and the west coast of Benbecula. Although sea-level rise around the northern islands during the Neolithic would have been negligible by comparison, Early Neolithic inundation would have been more prominent around low-lying regions, especially Stornoway and the Eye Peninsula, whilst Late Neolithic submergence may have been concentrated along the west coast of north Lewis and around East Loch Roag. However, it must be noted that the resulting DEMs are heavily based on the resolution of the underlying bathymetric dataset, especially along the inshore regions, which has resulted in an adjusted coastline of correspondingly poor resolution in comparison to the 5 meter DTM. Further, this model does not include other significant coastal morphology factors, such as erosion and deposition that, as demonstrated in Chapter 2, would have also had considerable impact, especially along the Atlantic coast. Regardless of these limitations, the reconstructions do provide new insight into the temporality and spatiality of changing sea levels around the archipelago and allow for an exploration of the potential relationship between these coastal changes and the archaeological record. In addition, the use of this 6000 BP reconstruction enabled the ensuing least-cost analysis to be based on a model that more accurately reflects the Neolithic environment than modern topographic data.

6.2.2 Terrestrial Least-Cost Analysis

Method

The least-cost analysis began with the creation of a cost raster using slope as a proxy for the physiological expense of moving through the landscape. As the cost surface provides the unit value for all subsequent outputs, slope values were converted into walking pace using Tobler's hiking function (Figure 29). This provides an indication of the speed at which a person can walk through the landscape based on the topography. Preliminary least-cost pathways (LCPs) derived from this raster showed the influence of near 0° slope—most predominate along the elevated coastlines of the palaeogeographic reconstruction—with pathways taking illogically long and circuitous routes in order to follow the lowest slope possible. To more evenly balance the cost weighting between slope and distance, the cost surface was reclassified into intervals of 500 meters (Table 5). Connolly and Lake (2006, p. 255) have warned against the use of relative costs in modelling LCPs as cost will be measured on an interval rather than a ratio scale, thereby altering the cost relationship between cells; however, this altered relationship offsets the strong influence of slope around the coastline by assigning the same cost to 0° slopes as those of 1° to 2°. In turn, the use of 500 m/hr increments appeared to more evenly balance the cost relationship between slope and distance, resulting in more seemingly logical pathways, rather than routes that followed the lowest slope regardless of distance. Further, having represented cost as time rather than slope degree, the use of this interval scale was necessary as the relationship between walking pace and cost is an inverse one.

Although not without its share of challenges (see Table 6 for process needed to reconvert LCP results into units of time), the use of cost intervals also allowed for the inclusion of other cost factors. Although slope may have presented the most influential constraint to movement, the influence of other environmental factors also needed to be considered. The most obvious barriers to walking are the numerous lochs scattered throughout the landscape. Without the inclusion of lochs, the pathways tended to take advantage of the often 0° slope of these surfaces within the DEM, and whilst this may generically imitate the potential use of these waterways (although assuming walking speed rather than paddle speed), the circumnavigation of them also needed to be considered within pathway models. Thus, a second cost surface was created by combining the reclassified slope raster with digitised lochs, assigning an arbitrarily high cost value to lochs in order to influence the modelled pathways to avoid these areas (Figure 29, *top inset*). It must, however, be noted that the digitised lochs represent modern data, and many lochs would have differed in size during and even throughout the Neolithic. However, given the complexity of factors affecting individual loch levels—e.g. the fluctuating Neolithic levels evidenced at Eilean Domhnuill versus the near present-day levels demonstrated at the Lewis islet sites—such changes can neither be known

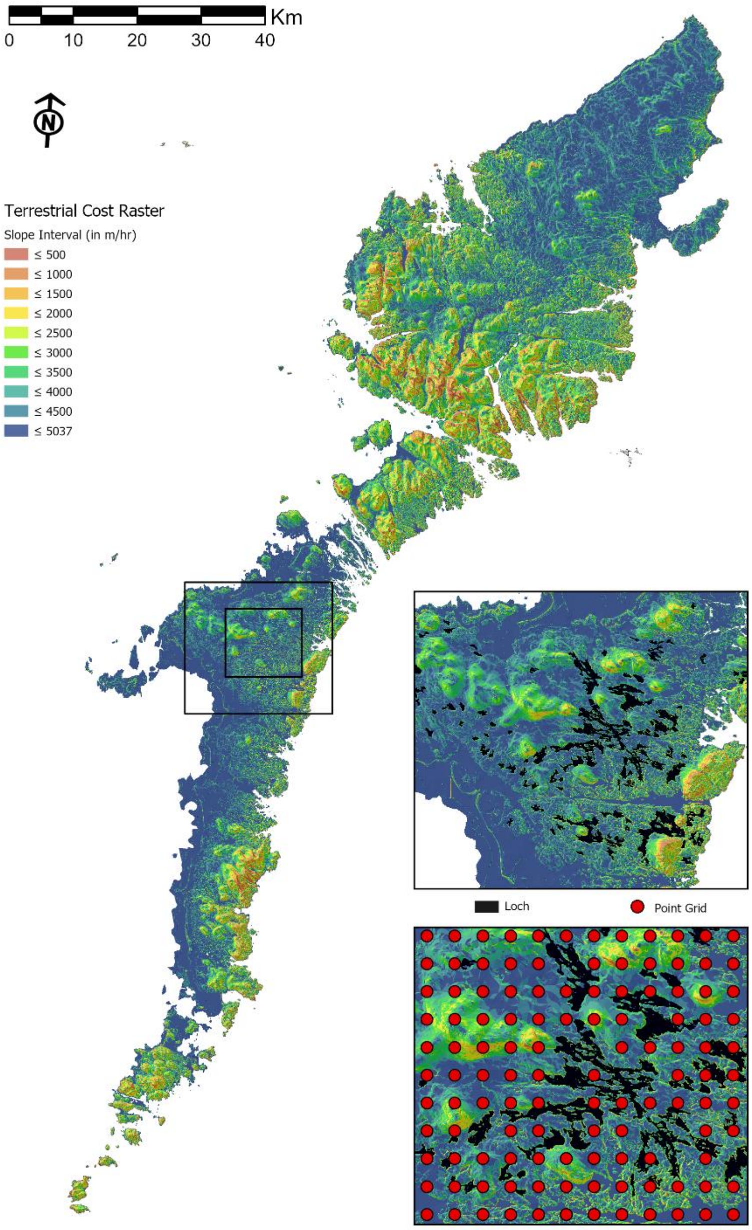


Figure 29. Terrestrial cost raster classified by walking pace, with second raster including lochs (top inset) and 1 km grid used for destination points (bottom inset).

Terrestrial Cost Raster Intervals	
Cost	Walking Speed (m/hr)
1	5037 – 4500
2	4500 – 4000
3	4000 – 3500
4	3500 – 3000
5	3000 – 2500
6	2500 – 2000
7	2000 – 1500
8	1500 – 1000
9	1000 – 500
10	500 – 0

Table 5. Landscape intervals used for terrestrial cost raster.

nor modelled without a substantial campaign of palaeoenvironmental work. As such, it was only possible to use the available modern data. The challenges presented to modelling movement through this dynamic landscape are also demonstrated by other environmental factors, such as peat bogs and woodland. However, given the great temporal and spatial variability of changing vegetation (as evidenced in Section 2.3.2) as well as the great difficulty in quantifying their constraint on movement, it was decided not to include these environmental factors within the cost raster.

Using these two cost surfaces, two LCAs were conducted for each of the 14 sites identified within the broader settlement record. This analysis had to be conducted in two parts. First, the *Path Distance* tool was used to create an accumulated cost raster, or the growing cost of moving away from the origin point, along with a backlink raster, which tracks the direction of least-cost movement for every cell in the cost raster. In addition to assigning the origin point and cost surface, a vertical factor was applied, again using Tobler's hiking function, in order to account for the directional influence of slope. This was necessary due to the nature of the initial slope analysis, which calculates the maximum rate of change in elevation (from 0° to 90°) from a single cell to its immediate neighbours. By applying a vertical factor, the positive (uphill) or negative (downhill) aspects of slope could be determined based on the direction of movement, in this case outward from each site. Given the parabolic effect of slope on movement, the vertical factor thus adjusts the cost values in order to incorporate negative slope (see Table 1), thereby allowing for anisotropic models of movement. The resulting accumulated cost and backlink rasters for each site were then used as the cost inputs for the *Cost Path* tool along with the assigned destination.

Whilst the standard least-cost approach is to calculate specific site-to-site(s) pathways, this 'conceptually simple' model can be problematic, introducing a number of assumptions, such as the existence of connections between sites as well as the direct nature of movement between them (see Verhagen 2009, p. 234). Rather than assuming connections, the main objective was to explore potential connections, not just between sites but also with the surrounding landscape. Thus, in broadly keeping with Mlekuž's (2012b, 2014; see also Kohut 2018) conceptual model for developing a *topography of connectivity*, it was decided to instead use an randomly generated 1 km point grid as the destination (Figure 29, *bottom inset*). This allowed for the creation of a less deterministic model of movement for each site without the influence of prior assumptions regarding connections. Further, whilst enabling a greater understanding of each site's connectivity to the landscape, this method still allowed for site-to-site(s) connections to be analysed, if deemed suitable, by extracting the nearest pathways leading from the analysed site to the other site(s) in question. Moreover, following a similar process, accessibility measures could also be generated for each settlement based on all other modelled pathways, as will be discussed in the statistical analysis.

The resulting pathways provide a cost value and shape length for each path generated; however, given the use of an inverse classification of 500 m/hr intervals, the resulting cost values needed to be reconverted into units of time. Table 6 lists the steps required: first removing the cell size from the path cost (PC) before applying a formula to remove the applied intervals and reconvert average cost (AC) into average speed of movement (S) in meters per hour. In addition, by using this assigned walking speed along with respective path lengths (PL), the pathways could be converted into travel time in hours (H). A subsequent comparison of estimated LCP hours to hiking trails of comparable distances within various regions of the Outer Hebrides (Outer Hebrides 2019) demonstrated the appropriateness of modelled time values.

Reconversion from Intervals to Time	
1.	PC / 5 = AC
2.	5037 – (500 / (1 / |-1 + AC|)) = S
3.	PL / S = H

Table 6. Steps required to reconvert resulting path cost values into time.

Results

An example of the resulting terrestrial LCPs avoiding lochs for various sites is shown in Figure 30. Given the nature of the palaeogeography, the terrestrial LCPs fall within three bounded regions: Barra (including Vatersay), the southern island (the Uists) and the northern island (the extant landmass of Harris and Lewis connected to Great Bernera). By combining the LCPs within each of these three regions, comparisons of the average cost of travel within each could be made. Table 7 (*left*) shows the mean LCP values for each region, with the northern island (NI) demonstrating the greatest cost to movement (or slowest walking pace) followed by the southern island (SI) and Barra. Whilst the more rugged terrain of north Harris and south Lewis clearly had an impact on the cost of movement, the greater potential pace of movement around Barra, a region comprised primarily of mountain massif landforms, highlights the effect of geographic area on the results, with costs in the northern island being measured over a much greater path length (48-50 km on average) compared to Barra (< 13 km on average). In order to reach a more normalised comparison, the maximum number of hours needed to move from Allt Chrisal to the furthest extent of Barra (*c*. 5 hours) was used as a constraint for the other two regions, extracting all LCPs that fall within this time limit (Table 7, *right*). The results show that the average cost of movement within this 5 hour window is far more uniform than total averages would suggest, essentially removing pathways that cross the most topographically complex terrains.

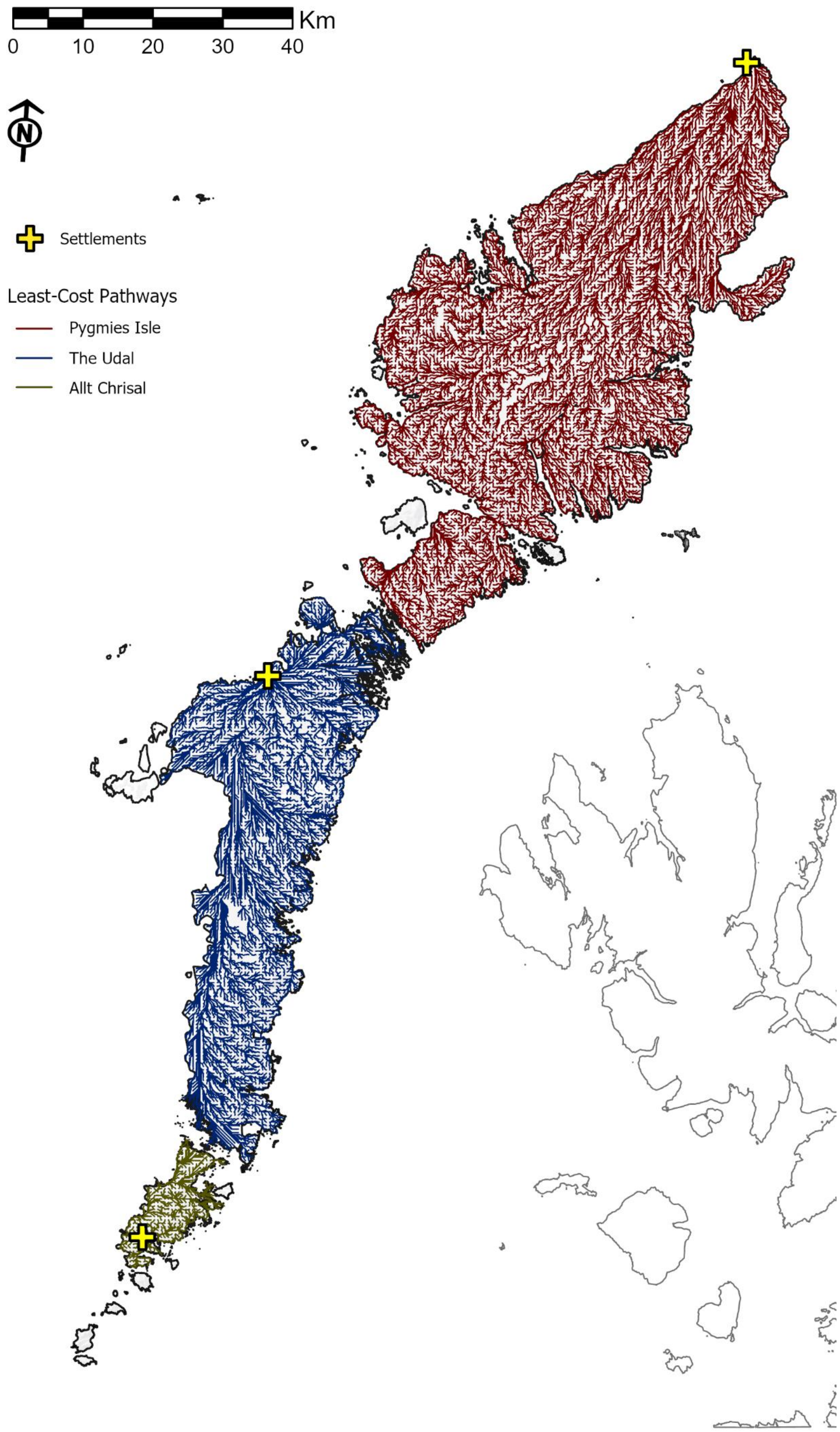


Figure 30. Resulting least-cost pathways (avoiding lochs) for Pygmies Isle, The Udal and Allt Chrisal.

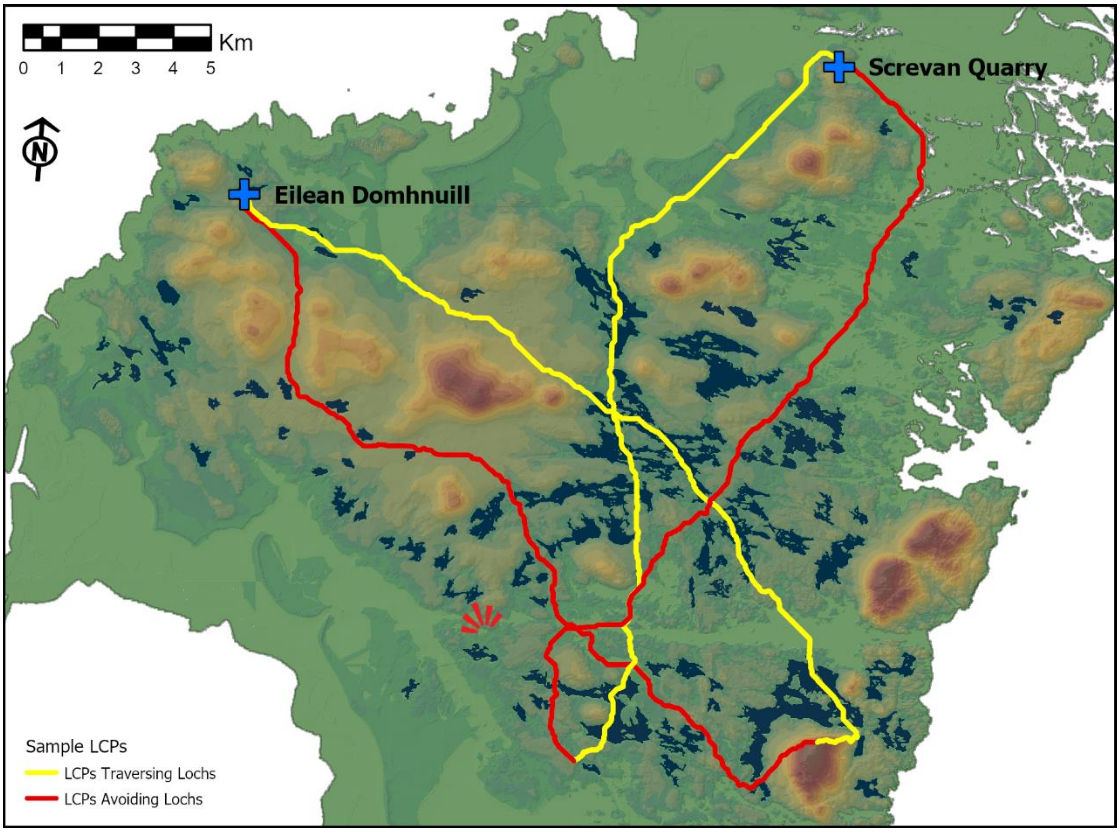
Mean LCP Values			
	Traversing Lochs	**Avoiding Lochs**	**Cost of Lochs**
Barra			
Path Length (m)	12717	12690	-27
Hours	2.57	2.56	-0.01
Pace (km/hr)	4.90	4.90	0.00
SI			
Path Length (m)	30690	31676	986
Hours	6.85	7.11	0.26
Pace (km/hr)	4.67	4.66	0.01
NI			
Path Length (m)	47765	49707	1942
Hours	12.93	14.47	1.54
Pace (km/hr)	4.20	4.08	0.12

Normalised Mean LCP Values (5 hours max.)			
	Traversing Lochs	**Avoiding Lochs**	**Cost of Lochs**
Barra			
Path Length (m)	12717	12690	-27
Hours	2.57	2.56	-0.01
Pace (km/hr)	4.90	4.90	0.00
SI			
Path Length (m)	13690	13765	75
Hours	2.80	2.81	0.01
Pace (km/hr)	4.84	4.86	-0.02
NI			
Path Length (m)	15593	15521	-72
Hours	3.16	3.15	-0.01
Pace (km/hr)	4.90	4.90	0.00

Table 7. Mean LCP values by landmass showing differences in cost between traversing and avoiding lochs (left) compared to normalised mean LCP values by landmass, which are based on the geographic size and maximum travel time around Barra (right).

Further, Table 7 provides a comparison of paths traversing and avoiding lochs, demonstrating the varying influence of lochs on movement. For instance, given the fewer lochs that exist within Barra, their avoidance had little effect on routes and travel cost; in fact, the routes taken to avoid the few lochs that exist were shorter, resulting in a negative cost of lochs for these two measures, which although following a slightly more challenging route, had little effect on walking pace at a kilometre scale. In contrast, LCPs from the other two islands were more greatly affected by lochs, influenced most especially by the vast concentrations of inland lochs and lochans in North Uist, Benbecula and Lewis. On average, circumnavigating lochs in the southern island increased the mean path length and travel time by around 4%, yet maintained the mean walking pace, suggesting the ability to find alternatives routes of similar affordability.

Avoiding lochs in the northern island also added around 4% to the mean path length but around 10% to mean travel time, thus suggesting the need to cross more difficult terrain in order to avoid them, as evidenced by the slower walking pace. However, the cost effect of circumnavigating lochs is clearly compounded with distance, as the removal of all LCPs requiring more than 5 hours of travel time demonstrates. At this normalised scale, the effect of avoiding lochs was negligible for all regions, highlighting the true impact of lochs on movement, which is on individual routes taken. Comparisons of individual pathways between the northern and southern islands showed that, despite the more topographically challenging routes required to avoid lochs in Lewis, their less dense distribution required little alteration to the overall route, whilst the heavier concentration of lochs in North Uist, especially in the eastern interior, necessitated much greater route variations despite relative similarities in walking pace.



	Eilean Domhnuill			Screvan Quarry		
	Path Length (m)	Hours	Pace (km/hr)	Path Length (m)	Hours	Pace (km/hr)
Traversing Lochs	26102	5.56	4.69	24884	5.02	4.96
Avoiding Lochs	28033	6.18	4.54	26269	5.37	4.89
Cost of Lochs	1931	0.62	0.15	1385	0.35	0.07

Figure 31. Sample least-cost paths from Eilean Domhnuill and Screvan Quarry demonstrating diverging routes (map) and costs (table) between LCPs traversing and avoiding lochs through the interior of North Uist. The location of Loch nan Struban (Figure 32) is indicated by the red viewpoint symbol.

This is well demonstrated by two sample routes travelling southeast from Eilean Domhnuill to the foothills of Eaval and southwest from Screvan Quarry towards Barpa Carinish (Figure 31). The table associated with these routes demonstrates that their avoidance added from 1.4 to 1.9 km or 21 to 37 minutes to the journey. However, perhaps more important than time or distance is the great variations between routes. In these two examples, the pathways did not simply circumnavigate the loch but instead greatly diverged in direction at the start of the journey, even if the influencing lochs were at a great distance, in some instances up to 10 km distant, from the initial divergence. Although this may seem exaggerative, personal experience of walking through this island has demonstrated to the author that moving around the perimeter of lochs is often neither easy nor straightforward, the complexity of the loch shoreline and surrounding topography in many cases requiring considerable backtracking before a suitable route in the desired direction can be found (Figure 32). Thus, it follows that whilst the avoidance of lochs may have had little effect on the overall cost of movement, lochs would have had a considerable effect on specific routes taken, especially through the interior of North Uist, in some cases requiring considerable divergences and resulting in seemingly illogical routes.

Combining all LCPs for each region, the density of pathways was calculated, resulting in a heat map of optimum travel corridors (Figure 33). Given the great number of pathways, LCPs for each site were first reduced using the *Intersect* tool to remove any secondary paths (i.e. paths that were only travelled once). From the density map, several key trends become immediately apparent. Firstly, the isolation of An Doirlinn and Northton from denser concentrations of activity within their respective regions is clear. Whilst lower sea levels would have allowed for terrestrial movement through the Uists, at least in the Early Neolithic, movement between sites in North Uist and An Doirlinn would have taken from 10.5 to 19 hours in order to traverse the 4.8 to 7.5 km distance. The even greater isolation of Northton is apparent, with travel between Harris and central and north Lewis requiring a 17 to 35 hour journey across 86 to 126 km of some of the most challenging terrain in the archipelago.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 32. Panorama from Loch nan Struban, North Uist showing varying surrounding topography (top) (Photograph by author 2015); and aerial image of same loch showing its complex shoreline (bottom), with the location of the panorama indicated in red.

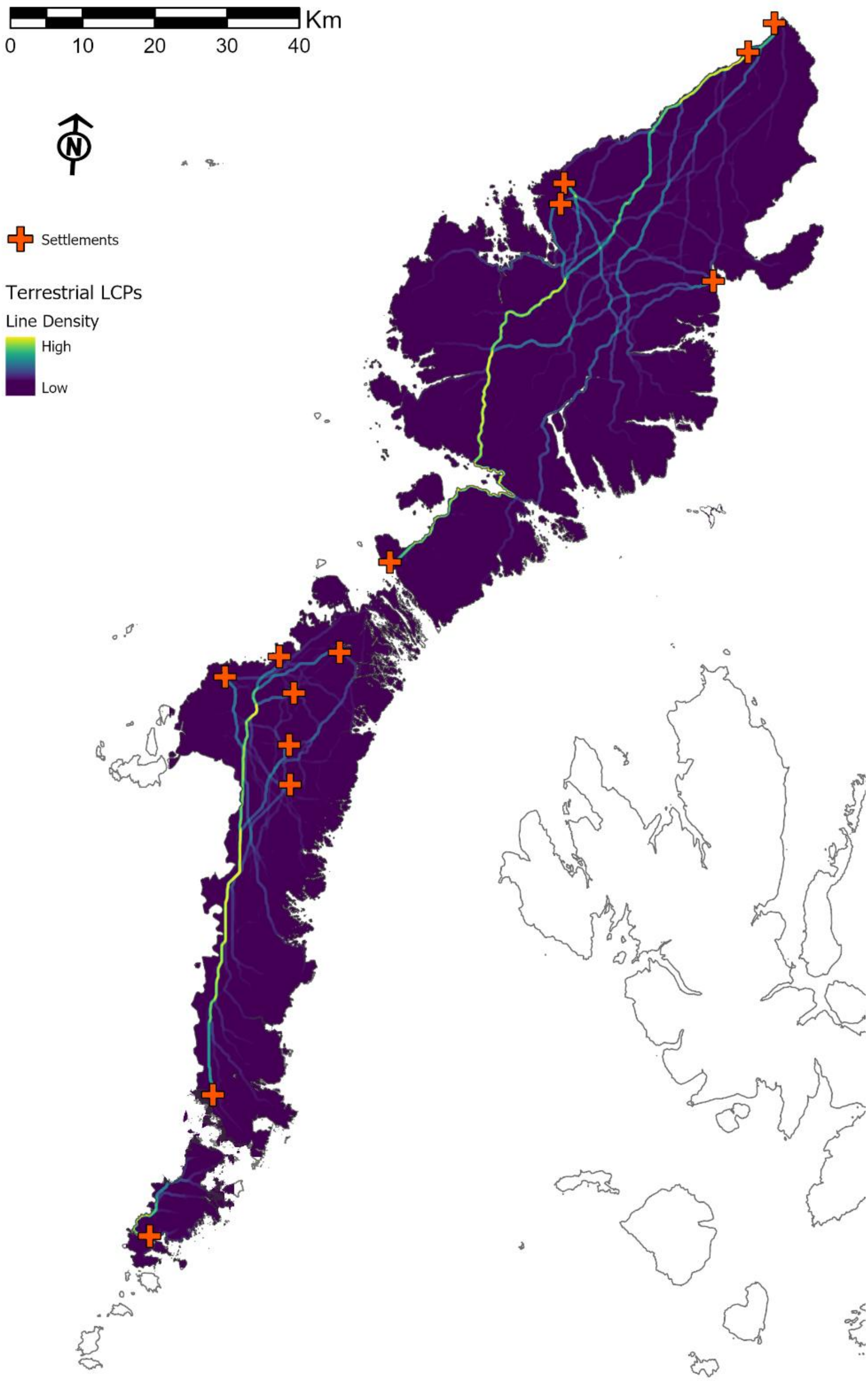


Figure 33. Line density of all least-cost pathways by landmass showing constrained corridors of movement between north and south in the southern and northern islands.

Given the extreme mountain massif landforms and small isthmus that separate Northton from Lewis, movement between the two was restricted to a single route along the west coast, a feature also seen in the Uists, with movement through Benbecula and South Uist constrained to the low-lying west coast. The isolation of these two sites and the constrained movement required to reach them thus had a clear influence on density values, increasing line densities across regions that may actually have been little traversed but concurrently demonstrating higher-cost areas that restrict terrestrial movement. Further, the differences between Barra and the other two landmasses became even more apparent through the density analysis, this time due to the presence of only one known settlement on the island. Whilst line densities for the northern and southern islands highlight the confluence of movement between sites, line densities for Barra are based solely on Allt Chrisal, and although these density corridors are still valuable for the micro-scale analysis of movement from this site, they are, in turn, of limited comparability to the rest of the archipelago. Thus, although LCPs were generated to the furthest possible terrestrial extent for each site, thereby allowing for regional comparisons to be made, it is clear that any micro-scale of analysis of movement and connectivity from individual sites must focus on more suitable spatial scales.

This was done by identifying catchment areas for each site based on their LCPs. Whilst site catchments are often derived from a speculative maximum travel distance or time (both typically based on Euclidean measures), through the use of least-cost pathways, catchment areas could be identified through travel costs, resulting in what has been termed by Surface-Evans (2012) as 'cost catchments'. Although walking pace provides a comparable measure of cost, the quickest walking pace within each site's individual pathways does not necessarily occur within suitable catchment distances, and thus a different measure of cost needed to be sought. Several measures were tested with the aim of both extracting suitable catchment areas and identifying them through a uniform measure that could be applied to all sites. For instance, the use of a maximum distance was not deemed suitable due to the great topographic variability of site locations, which results in a broad range of travel times in order to reach a standard distance. Conversely, whilst the use of a maximum travel time provides a comparable measure between sites, it also introduces assumptions regarding what was deemed a suitable or feasible maximum daily travel time, a subjective measure which may itself have varied depending on a variety of factors, such as season or the motivation for movement (see Surface-Evans 2012). Instead, it was decided to return to the cost values assigned to the initial results, as this value is based on optimum walking pace offset by distance. Thus, by extracting all pathways with an average cost value of one or less (broadly comparable to the lowest cost interval of 5037-4500 m/hr), the most optimum LCPs, which are consequently those expanding outwards from the origin points, could be extracted and representative catchments identified through an equitable process (Figure 34).

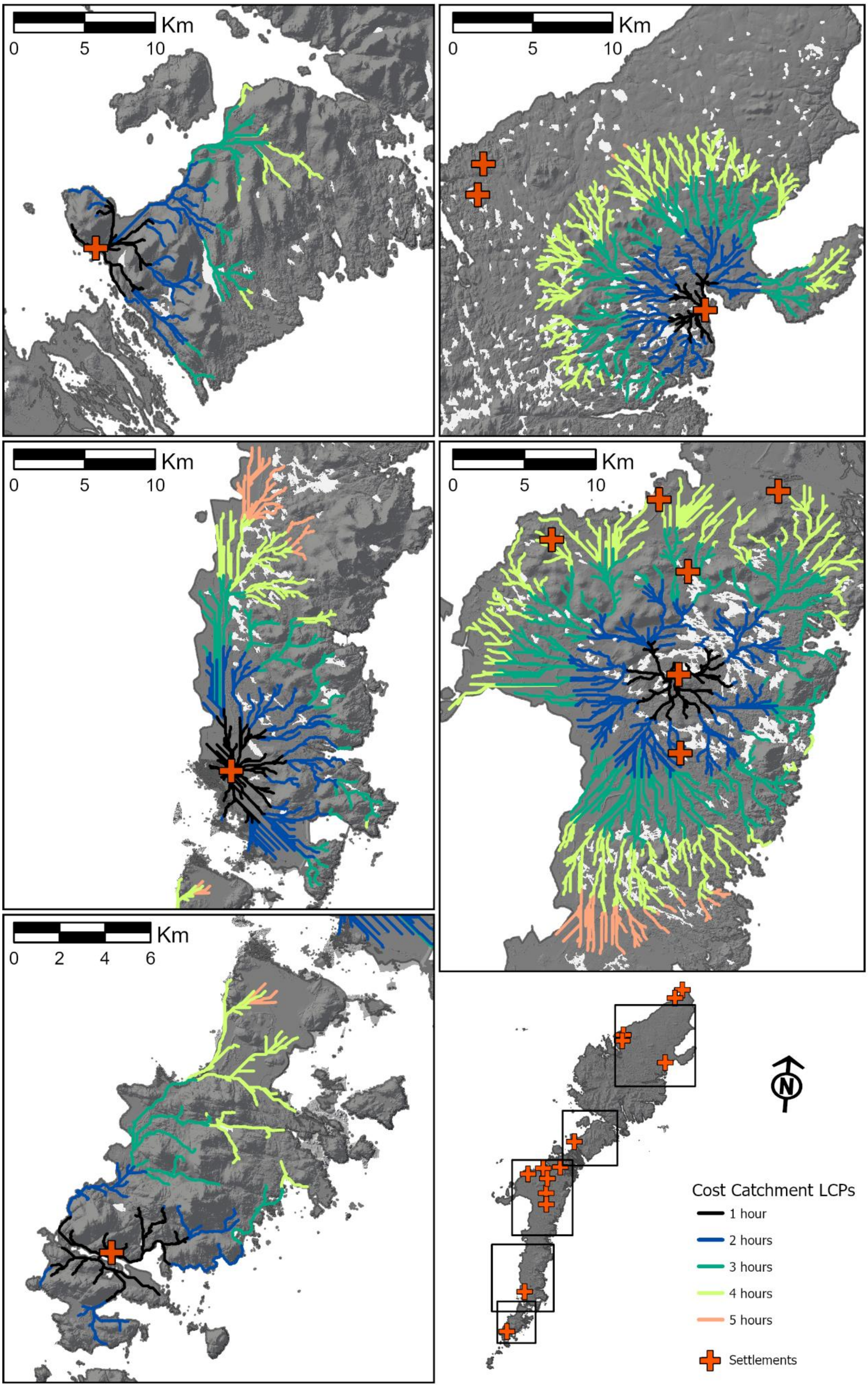


Figure 34. Cost catchment LCPs for Barra (bottom left), An Doirlinn (middle left), Barpa Langass (middle right), Northton (top left) and Loch Arnish (top right), demonstrating the great differences in catchment distances and travel time between various sites.

6.2.3 Maritime Least-Cost Analysis

Method

Having created the terrestrial LCPs, the analysis then turned towards the sea in order to model potential seafaring routes around the archipelago. As discussed in Section 5.2, moving from land to sea requires the consideration of a number of different variables, or costs to maritime movement, including the nature of seafaring and sea conditions. Firstly, assumptions needed to be made regarding the method of movement and propulsion. Based on previous literature regarding prehistoric seafaring in Northwest Europe, this was assumed to be the paddling of skin boats. Next, the most suitable factor for modelling sea conditions needed to be determined, and as previously discussed, any factors used must be combined into a single cost raster. Whilst winds, waves and currents would have had a considerable effect on seafaring routes, especially through the Atlantic, Callaghan and Scarre's (2009) analysis has demonstrated the minimal effect of these factors on paddled journeys. Furthermore, their models, along with discussions by Burl (2000), have highlighted the great affordances and challenges presented by tidal streams within the western seaways. These tides are highly localised based on the topography and orientation of the coastline (Ramsay and Brampton 2000), and thus, their incorporation into the cost raster allowed for a greater understanding of localised variations within the seaways as well as how they may have affected seafaring routes—a significant consideration based on the strive towards more refined scales of analysis. Finally, the suitability of incorporating modern data into models of past seafaring has already been addressed, and given the use of a palaeogeographic reconstruction and the overall emphasis on the palaeoenvironment, it was deemed requisite to also use past sea data. Thus, in using recent palaeotidal models generated by Ward et al. (2016), other sea conditions were omitted in favour of the tides.

Much like the terrestrial LCA, this analysis began with the creation of a cost raster. The palaeotidal data present tidal magnitude in 1 hour increments for 30 days within the year 6000 BP. For each time slice, this tidal magnitude is represented by two models, with *u*-direction representing eastward velocities and *v*-direction representing northward velocities (with velocity represented in psi). The ultimate aim was to average all 720 tidal models (1440 rasters in total) into three cost rasters, representing low and high tides as well as a mean comparator. Given the great variations in tidal velocities that occur throughout the month, culminating in spring and neap tides, monthly averages were sought rather than daily values. The semi-diurnal nature of tides around the UK means that tides can generally be measured in 6 hour windows, with a 15 minute window of slack water before the tide reverses direction; however, within these tidal windows, tidal streams will vary. The Rule of Thirds used to estimate tidal flow describes the flow at slack water to be 0/3, increasing by 1/3 its maximum rate each hour until reaching the full rate of flow at hour three, before decreasing by 1/3 proportional increments until again reaching slack water after 6 hours (Brown 2006, p. 168).

By averaging all tidal models within the respective directions, first into day then into month, mean tidal velocities for both *u*- and *v*-directions were calculated. For east-west tidal movement, this value was between 0.23 and -0.21 m/s and for north-south movement it was between 0.43 and -2.63 m/s, the greater velocity range of the latter reflecting the general north-south direction of tidal streams. Thus, using the *v*-velocity range, 2/3 the rate of maximum flow, or 1.32 m/s, was identified as a proxy for the rate of flow at half tide, and all time slices with values above and below this range were selected from the *v*-direction models, representing high and low tides respectively. For each model selected, the matching *u*-direction time slices were also extracted, and both directions were then averaged into daily then monthly means. By then combining the appropriate directional velocities, mean low and mean high tide models could be created. This was done by likening the respective tidal rasters to *x* and *y* coordinates, using Pythagorean theorem to determine their combined magnitude (converted from psi to m/s) and inverse tangent to convert their direction into degrees (later converted from arithmetic rotation to polar degrees). This was done for all tidal ranges, resulting in three tidal models representing mean-low, mean-high and mean-half tide, with each tidal range signified by two rasters, one for tidal stream magnitude and the other for tidal stream direction (Figure 35).

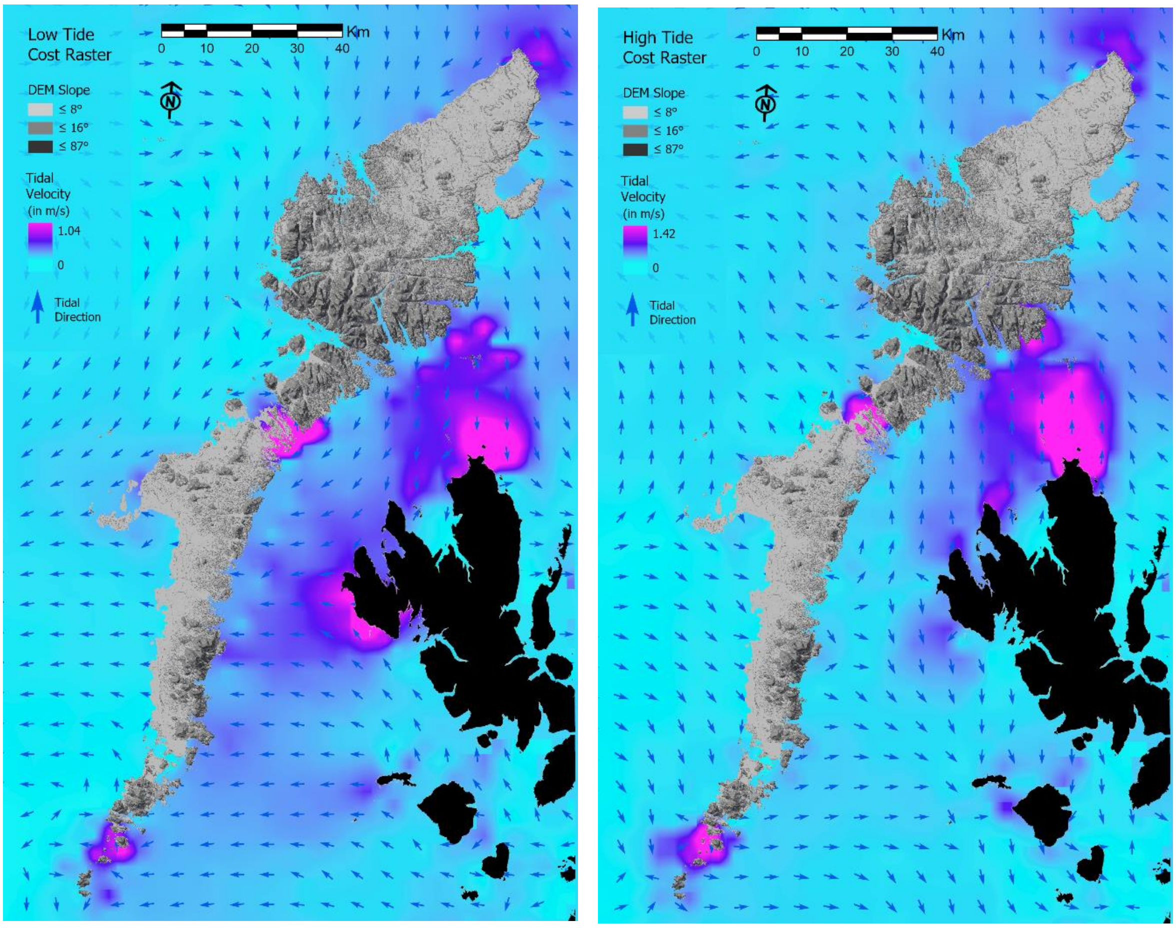


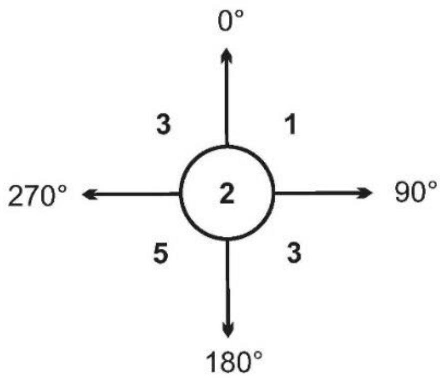
Figure 35. Resulting mean tidal models used for maritime LCPs, with mean low tide (left) and mean high tide (right).

Despite the time consuming and rather subjective process of arriving at three mean palaeotidal models, it was instead the presence of these two variables within one factor of cost that presented the greatest challenge to modelling seafaring routes through a least-cost method, as highlighted in Section 5.2.3. Whilst in terrestrial models the cost relationship between the direction of movement and slope is parabolic, with slope cost generally being equal for positive or negative slope values, within the seaways the cost relationship between tidal velocity, tidal direction and the direction of seafaring movement is linear and thus can range from direct to inverse. Consequently, velocity values cannot simply be inversely equated with seafaring cost as slope can with walking cost. Whilst Indruszewski and Barton (2008) used an intermediary software to rectify this challenge that when compared to other digital and experimental methods, appeared to produce suitable results, in the absence of such comparative markers and given the ideal geographical orientation of the archipelago, it was decided to incorporate direction of travel into the tidal velocity and ultimately the cost raster.

This was done by specifying the direction of travel based on windows of movement. The geographic curvature of the archipelago around the Minch fault line is conducive to such an approach in that travel from Barra northward falls within a roughly 0° to 45° direction of movement and travel from Pygmies Isle southward falls within a 180° to 225° window. Whilst these smaller ranges of movement could have been used, broader 90° segments were deemed more suitable and efficient. From the previous trigonometric process, the directional rasters were already divided into four 90° segments and thus could simply be used to extract the respective velocities for each segment before assigning a cost value. For each window, a paddle speed of 3 knots or 1.54 m/s—derived from McGrail's (1987, p. 184) estimation for the average paddle speed of skin boats—was applied based on the direction of travel. Beginning with 0° to 90° as the optimum travel direction, representing movement northward from any site, paddle speed was added to velocity in order to determine a combined rate of travel. For 90° to 180° and 270° to 360°, representing perpendicular movement to the desired direction, Pythagorean theorem was once again applied, this time using current velocity and paddle speed as the *x* and *y* values in order to determine the adjusted velocity. For 180° to 270°, representing movement in the opposite direction to that desired, tidal velocity was subtracted from paddle speed in order to determine the minimised rate of travel. This process was then repeated for movement from southward, switching the calculations for 0° to 90° and 180° to 270° and leaving the two perpendicular values the same. Although the incorporation of paddle speed into tidal velocities was not strictly necessary, it did allow for the estimations to generated from the results for paddle speeds and hours, although generically, as will soon be discussed.

This process resulted in two directional rasters for each tidal range that then needed to be converted into interval cost values, at this stage also incorporating the landscape into the cost surface. It was initially desired to divide each 90° segment into two cost values based on velocity, resulting in eight intervals in total. However, variations in velocity ranges within each segment and between tidal models would have resulted in unequal cost divisions. Thus, the initial method was relinquished in favour of assigning a single cost value to each segment, and in conciliation, by incorporating an additional interval for all velocities equalling 1.54 m/s, or zero tidal velocity, as no tidal stream offers a flexible range of movement in any direction. Further, after an empirical approach to various cost value intervals, it was decided to assign a slightly higher value to velocities moving in the opposite direction of travel in order to more effectively prevent any backward movement. This separation was also necessary as it was at this highest interval value that the landscape was incorporated into the cost raster, thus allowing the models the equal option of moving onto land if travel forward was halted but preventing them from crossing the land too often. Table 8 provides the intervals used for movement north, which were reversed for movement south.

In order to ensure that these models chose crossing points that were conducive to landing (i.e. sandy shallow-shelving beaches), the landscape was classified into three costs, again based on slope, although this time slope was used as an indicator of beach sediments. As most beaches with fine- to medium-grained sands range in gradient between 1° and 8° (Short 2012), this was the



Maritime Cost Raster Intervals (north)				
	Tidal Stream			Land
Cost Value	Degree Range (geographic)		Magnitude Range (m/s)	Slope (degree)
1	0 - 90°	=	Max. Vel. + 1.54	
2	0 - 360°	=	0 + 1.54	
3	90 - 180°	=	$\sqrt{((\text{Max. Vel.})^2 + (1.54)^2)}$	
3	180 - 270°	=	$\sqrt{((\text{Max. Vel.})^2 + (1.54)^2)}$	
5	270 - 360°	=	1.54 - Max. Vel.	0 - 8°
10				8 - 16°
15				16 - 89°
255				Skye

Table 8. Intervals used for the maritime cost raster, including degree range (top image), calculations used for magnitude values and the incorporated land slope.

selected slope range for identifying potential transition points (see also Figure 35). This range was thus assigned a cost value of five, whilst intermediate slopes (ranging from 8° to 16°) were assigned a greater cost of ten and slopes above 16° a value of 15. These staggered intervals thus induced the models to only move across the landscape when necessary, either for launching and landing or when encountering adverse tidal streams, whilst also encouraging them to choose the most suitable transition points in so doing. Whilst the incorporation of the landscape was essential to a more blended approach to movement and connectivity, it also presented a quid pro quo in that the results could not be reconverted into units of time due to the overlapping of different cost unit values between land and sea. Instead, the resulting pathways were used to extract paddle speeds from the cost rasters, resulting in estimations of speed and time, which due to their great generality, were only used for the final discussion.

Following this long and exploratory approach to the creation of the maritime cost rasters, the maritime LCA was conducted broadly following the process outlined for the terrestrial analysis, including the creation of accumulated cost and backlink rasters for all 14 sites with the *Path Distance* tool. However, this process had to be repeated six times for each site in order to model each tidal range and direction of movement (with the exception of movement south from Allt Chrisal and movement north from Dunsabroc and Pygmies Isle). For the generation of pathways, given the large area of the analysis as well as the desire to connect these maritime models with the landscape, a site-to-sites analysis was conducted rather than a site-to-grid analysis. The sites included in the destination were thus set based on their location with respect to the origin point and direction of movement being modelled. Ultimately, movement to all other sites was modelled through the two directional rasters, although sites within close terrestrial proximity to the site of origin (i.e. sites in North Uist and Lewis) were omitted from the destination. This bidirectional process was repeated for each site on each tidal model, resulting in 144 LCPs for each tidal range or 432 pathways in total.

Results

Given the high number of maritime LCPs and the great variations in pathways, the results were combined by tidal range and direction before the initial assessment and subsequent statistical analysis were conducted. For each group of models, pathways crossing the land were removed before line densities were calculated, resulting in a heat map of seafaring corridors (Figure 36 and Figure 37). By using the half tide models as a comparator, a number of initial observations could be made that correspond with modern and past tidal streams. Given the great variations between individual pathways, density values in the maritime LCPs essentially indicate where maritime movement becomes constrained. These dense corridors stand in contrast to regions with greater deviations in path routes and thus lower density values, which suggests a greater freedom of movement through these regions.

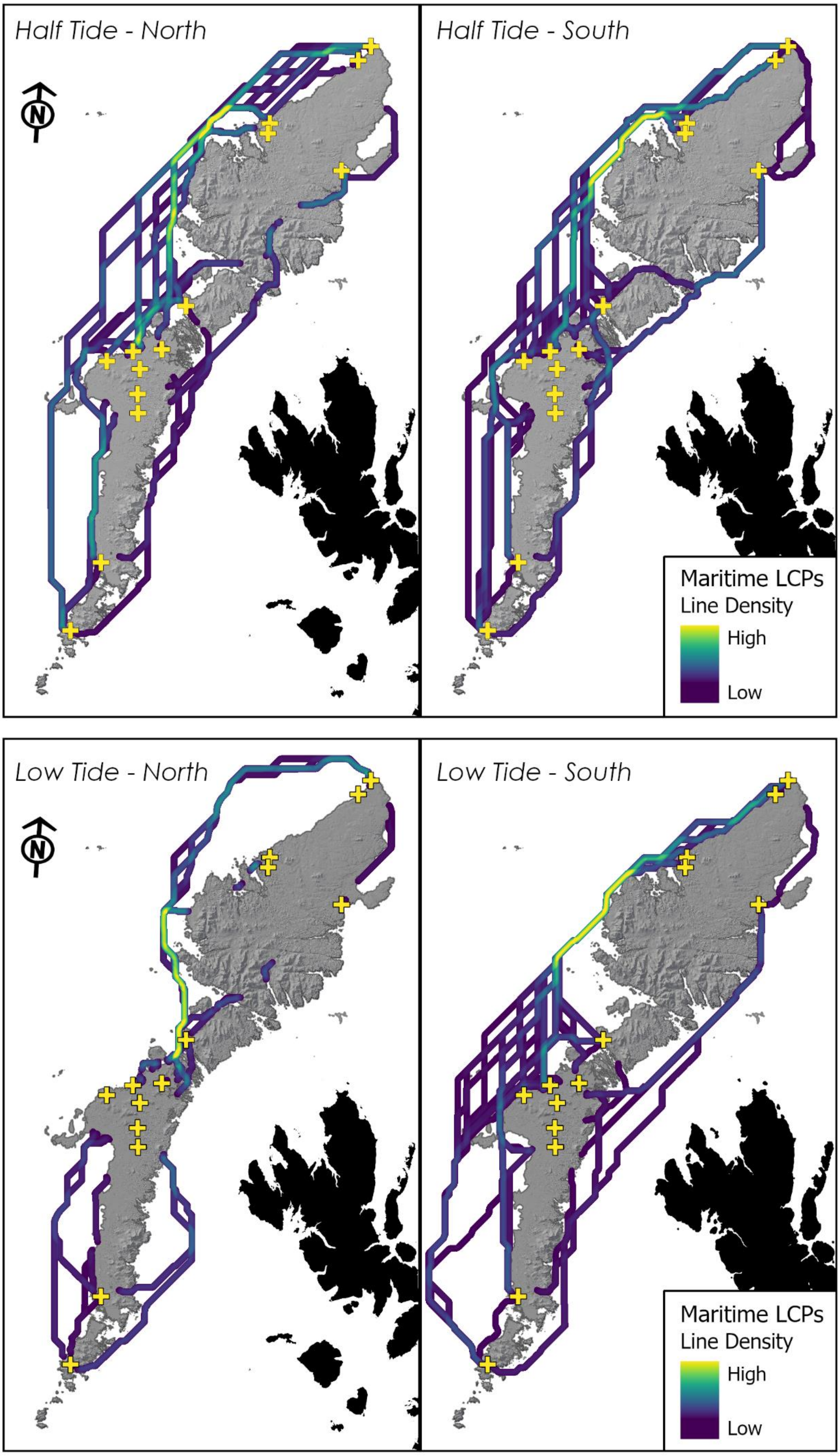


Figure 36. Line density of maritime LCPs at low tide (bottom) showing routes moving north (left) and south (right), with half tide as a comparator (top).

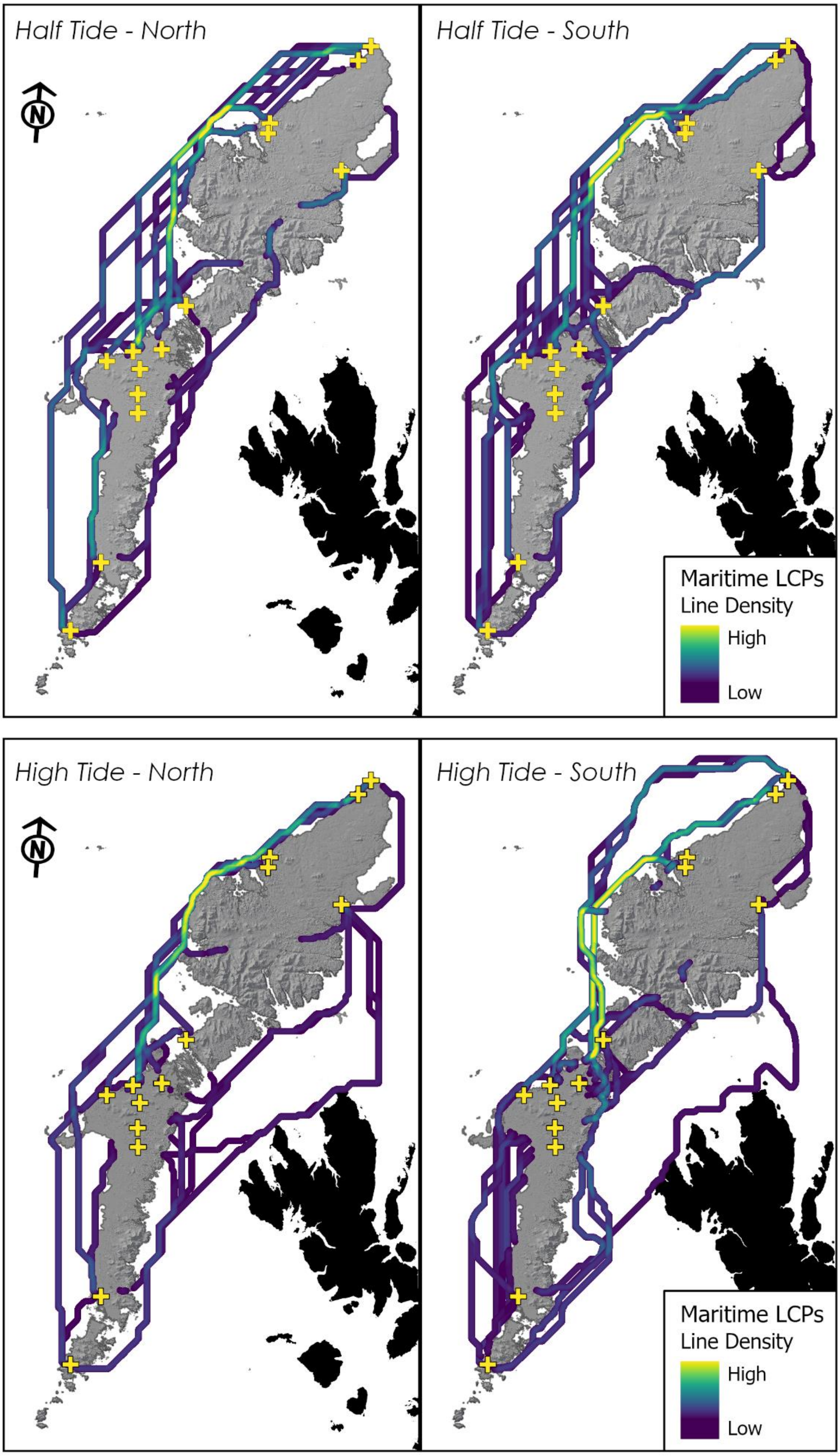


Figure 37. Line density of maritime LCPs at high tide (bottom) showing routes moving north (left) and south (right), with half tide as a comparator (top).

Further, given the trade-off between cost and distance, a greater distance of pathways from the coast combined with more sinuous routes may also serve as an indicator of more costly areas versus regions where more linear or direct pathways were modelled. This is most evident in both half tide models, which produced both a greater variety of individual routes and more linear pathways, indicating a greater freedom of movement—as would be expected at half tide—especially through the Atlantic, which is less impacted by the tides (see Ramsay and Brampton 2000). Thus, through an initial assessment and comparison of these models, along with the subsequent statistical analysis, the suitability of each model could first be surmised before they were used to generate discussions of maritime movement.

Although the half tide models are broadly similar regardless of the direction of travel, there a few notable differences. For movement north to Loch Arnish, the LCPs avoided the southeast coast of Lewis, diverting instead into Loch Seaforth, a journey which would require crossing around 10 km of land before entering Loch Erisort and exiting into the North Minch (Figure 36/37, *top left*). In contrast, pathways moving south from Loch Arnish travelled through the North Minch, reaching the Isle of Scalpay on the eastern extreme of north Harris, where some routes crossed over to the Atlantic via Tarbert (Figure 36/37, *top right*). The use of Tarbert for such crossings is evident in its toponym, which is derived from Gaelic *tairbeart* translating to 'over-bringing' or 'isthmus' (Watson 1973, p. 505). The absence of southward routes through the sea lochs of Harris and Lewis is evidenced by all tidal models moving from Loch Arnish, even high tide, which would have required movement against the predominate northward-flowing flood tide. In comparison to half and low tide models, high tide pathways moving south from Loch Arnish remained at a greater distance from the east coast of Lewis and Harris (up to 6 km) and instead travelled to within 600 meters of the Shiant Isles before diverting sharply west towards Tarbert (Figure 37, *bottom right*). Both high tide LCPs highlight the position of the Shiant Isles, passing within 300 to 600 meters of these islands, and although this may suggest the importance of the Shiant Isles for maritime routes through the region, their omission from the cost raster (an admitted oversight by the author) limits any greater understanding of their potential use. In contrast, the strong linearity of low tide pathways and their close alignment to the coast highlights the greater affordability to movement through the Minch with the ebbing tide.

Presenting the greatest contrast to all models are LCPs moving north at low tide (Figure 36, *bottom left*). Overall, pathways were constrained to the same general routes, which travelled at great distances from the coast (up to 10 km from the southern island and 23 km from the northern island), resulting in a greater average length of pathways compared to all other models (see Table 9). This high cost of moving against ebb is also apparent in the unsuitable transition places chosen, especially in Harris and Lewis, where pathways entered the landscape at great distances from the desired destination before taking topographically indifferent routes through it (Figure 38).

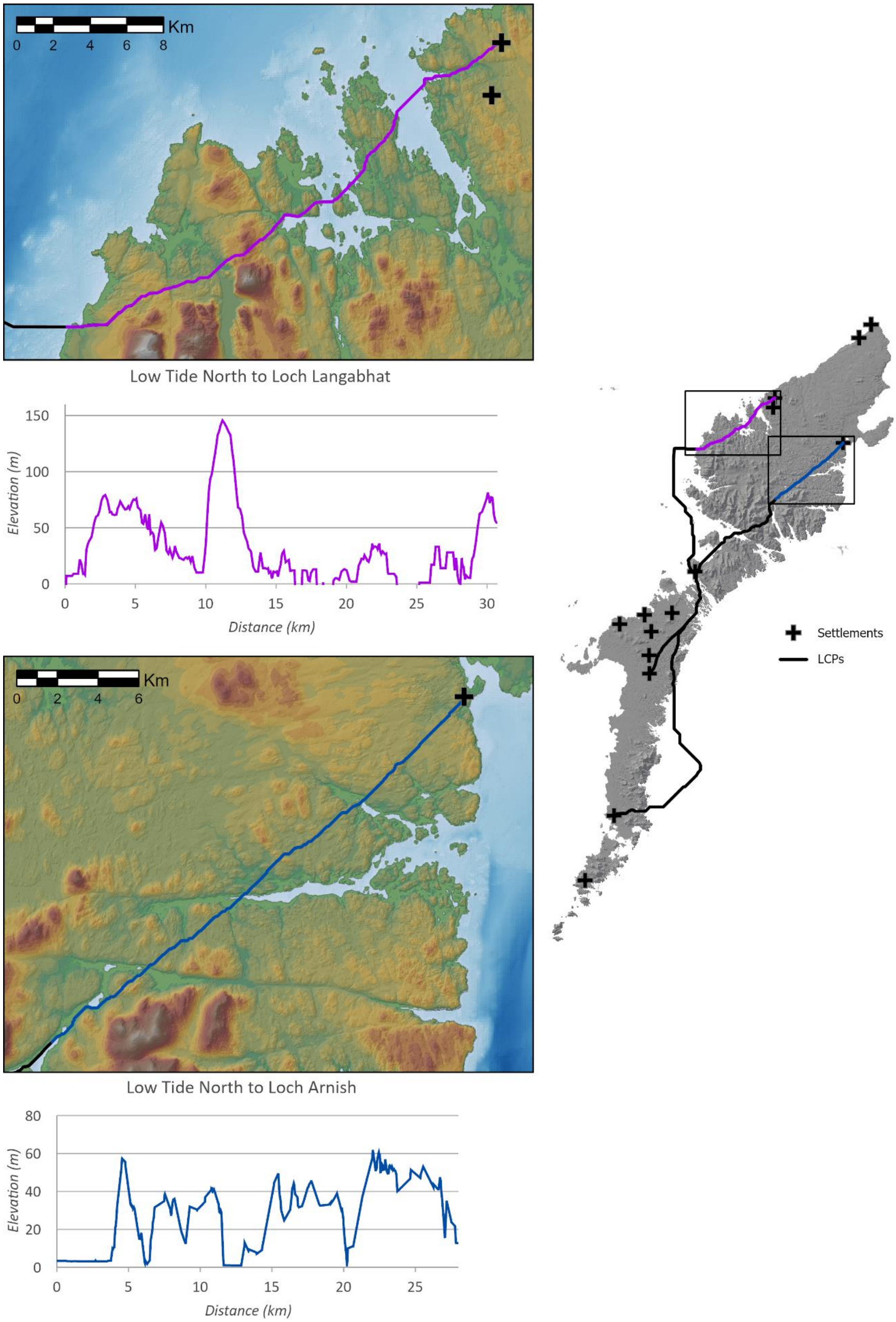


Figure 38. Routes and profiles of LCPs moving north at low tide showing the use of unsuitable transition places as well as the topographic complexity of routes through the landscape.

LCPs travelling to Loch Borghastail and Loch Langabhat landed on the west coast to the south of Uig, a challenging transition point that nonetheless suggests the difficulty of landing at either the nearby machair sand beaches around Uig or the sheltered waters of Loch Roag at low tide. This is further supported by the challenging terrestrial route taken, which traversed elevations of up to 150 meters and crossed West Loch Roag, Great Bernera and East Loch Roag before entering Lewis via Loch Carloway (Figure 38, *top*). For movement to Loch Arnish, the LCPs avoided the Minch entirely and instead travelled closely along the west coast of south Harris before entering north Harris via West Loch Tarbert. The pathways made limited use of Loch Seaforth before moving straight across the landscape to Loch Arnish, also a topographically unsuitable route (Figure 38, *bottom*). These illogical routes effectively demonstrate the high cost of travelling against the ebbing tide, especially to the northern islands, a cost which is such that the LCPs chose to move through rugged and challenging terrain rather than moving through the seaways. The unsuitability of this model is further demonstrated by the total distance of terrestrial pathways within these LCPs, which equalled around 2189 km of terrestrial movement in comparison to the approximately 468 km of terrestrial movement required when moving south with the ebbing tide.

Another notable contrast to the majority of models is the greater variations in the use of the Minch at high tide, suggesting a temporally and spatially constrained affordability to movement through this seaway. What is most evident from these models are the divergences towards Skye for movement between Loch Arnish and the southernmost sites. As this region was not included in the initial cost rasters, preliminary LCPs indiscriminately crossed Skye before entering the Sound of Raasay to the east of the island and continuing northwards through the Minch. In order to prevent this, an arbitrarily high cost was assigned to Skye, as was done with lochs in the terrestrial LCPs (see Table 8). Whilst this influenced some pathways to instead move along the east coast of the Hebrides, other pathways persisted in moving towards Skye—the high cost of this landmass resulting in the irregular patterns of LCPs generated, especially for movement south. Further, these high tide models moving south also travelled at greater distances from the west coast of Lewis, again suggesting the unsuitability of moving against the predominate tidal stream, especially around the northern island.

Whilst models moving with the predominate tidal flow can thus be considered to be the most suitable maritime LCPs, both of these models contrast all others in their avoidance of the Sound of Harris as well as East and West Loch Tarbert. Whilst this resulted in direct routes through solely the Atlantic or the Minch with the ebbing tide, in order to cross from west to east at high tide, pathways entered the landscape via Loch Resort on the west coast of north Harris, crossing a 17 km distance through the interior of the island and exiting into the Minch through Loch Erisort (Figure 37, *bottom left*). Such a divergence, which includes movement across the more challenging terrain of north Harris and south Lewis, emphasises the high cost of moving through the Sound of

Mean Maritime LCP Values			
Tidal Model	Direction	Path Length (m)	Cost
Half	North	104,205.70	2.32
Half	South	104,036.55	2.03
Half	**Both**	**104,121.13**	**2.17**
Low	North	111,480.13	2.91
Low	South	105,896.61	1.36
Low	**Both**	**108,688.37**	**2.13**
High	North	104,691.29	2.22
High	South	106,027.19	1.85
High	**Both**	**105,359.24**	**2.03**
All	**North**	**106,792.37**	**2.48**
All	**South**	**105,320.12**	**1.74**

Table 9. Mean maritime LCP values showing mean path length and mean cost by tidal window and direction, demonstrating the extremes in cost presented at low tide as well as the greatest combined cost advantage presented at high tide.

Harris at the tidal extremes, thereby suggesting not only the need to use these waters between slack and half tide but also the spatial and temporal constraints to routes moving between the Atlantic and the Minch.

In order to more fully determine the costs of the maritime LCPs, mean values were calculated for all models, allowing for comparisons to be made between the various tidal ranges and directions of movement (Table 9). Of note are the two extremes demonstrated by low tide LCPs, with movement with the ebbing tide offering the greatest cost advantage and movement against ebb presenting the highest cost. In contrast to logic, movement with the flood tide produced a higher cost than movement against it, with a shorter mean path length but a higher mean path cost. However, after movement against ebb, LCPs moving with the flood stream produced the greatest length of terrestrial pathways, equalling nearly 664 km, or 100 km more than movement against it. This is predominately the result of the aforementioned 17 km challenging route from Loch Resort through the interior of Harris and Lewis to Loch Erisort. Hence, it appears that this higher cost of moving with the flood tide is the result of crossing from the Atlantic to the Minch, a cost which could have been mitigated by using the Sound of Harris or Tarbert between slack water and half tide. Nevertheless, despite this higher cost, movement at high tide offers the greatest combined cost advantage of all tidal ranges, emphasising the greater flexibility of movement in either direction at high tide in comparison to the directionally dependent movement at low tide. Altogether, this results in what appears to be an overall greater challenge to movement north.

However, whilst the results clearly suggest the greater affordances offered by moving with predominant tidal streams as well as the greater challenge to movement north, strong variations in routes and costs suggest the need to acknowledge differences between the Atlantic and the

Mean LCP Cost Values by Seaway			
Tide	Direction	Atlantic	Minch
Half	North	**1.99**	2.68
Half	South	2.25	**2.08**
Half	**Both**	**2.12**	2.38
Low	North	**2.87**	3.31
Low	South	**1.32**	1.50
Low	**Both**	**2.10**	2.40
High	North	2.24	**2.14**
High	South	**1.85**	1.95
High	**Both**	**2.04**	**2.04**

Table 10. Mean LCP cost values by seaway showing the greater affordability of movement through the Atlantic for all tides and directions which is contrasted by the lower cost presented for movement north at high tide.

Minch. Thus, in order to more fully explore these differences, respective pathways through each seaway were extracted and averaged (Table 10). Although more accurate comparisons cannot be made due to the movement of some LCPs through both seaways, general estimations demonstrate that for all models movement through the Minch is more costly except when moving north with the flood tide. This lone deviation is such that the combined cost of moving in either direction through the Minch at high tide is equal to that of moving through the Atlantic, despite the lowest cost being presented by movement with the ebbing tide. Given that these measures do not include other sea conditions that would have presented a stronger challenge to movement through the Atlantic, it is clear that by taking advantage of the flood tide, the Minch becomes the most affordable and predictable seaway for movement north, thereby overcoming the greater overall cost of maritime movement north exhibited in the mean maritime LCP values.

Finally, in order to more fully understand where maritime LCPs crossed into the landscape, a 150 meter coastal buffer was used to extract all initial LCPs crossing the coast. An analysis of these intersects against modern aerial imagery revealed that these transition points are located within 500 meters of the following modern maritime infrastructures: Lochboisdale Ferry Terminal, Lochmaddy Ferry Terminal, Berneray Ferry Terminal, Leverburgh Harris Ferry Terminal, Tarbert Ferry Terminal and Stornoway Harbour, as well as at least seven lighthouses (Figure 39). By removing intermediary crossing points, just potential launching and landing places were identified, eliminating spatial connection to lighthouses yet leaving all ferry terminals, with the exception of Berneray, which is located further inland based on the palaeogeography. The close proximity of these maritime sites is remarkable considering both the use of a palaeogeographic reconstruction as well as the sole use of tides to model cost. Given that all these connections to modern infrastructure occur along the east coast, these preliminary results suggest a continuity of use of the maritime landscape along the Minch despite the many environmental and technological changes that have occurred since the Neolithic.

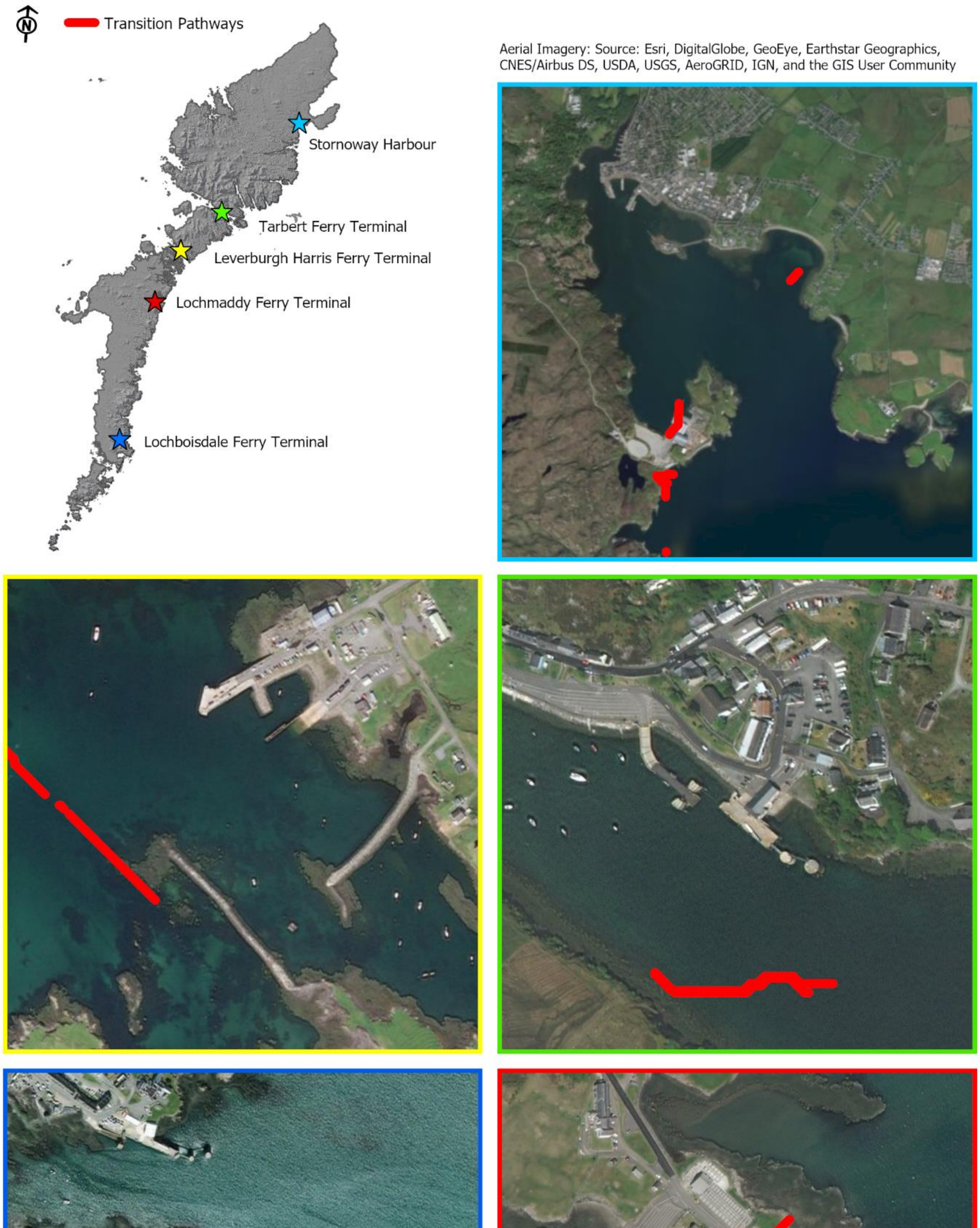


Figure 39. Transition pathways identified through 150 meter coastal buffer showing proximity to modern maritime infrastructure along the east coast.

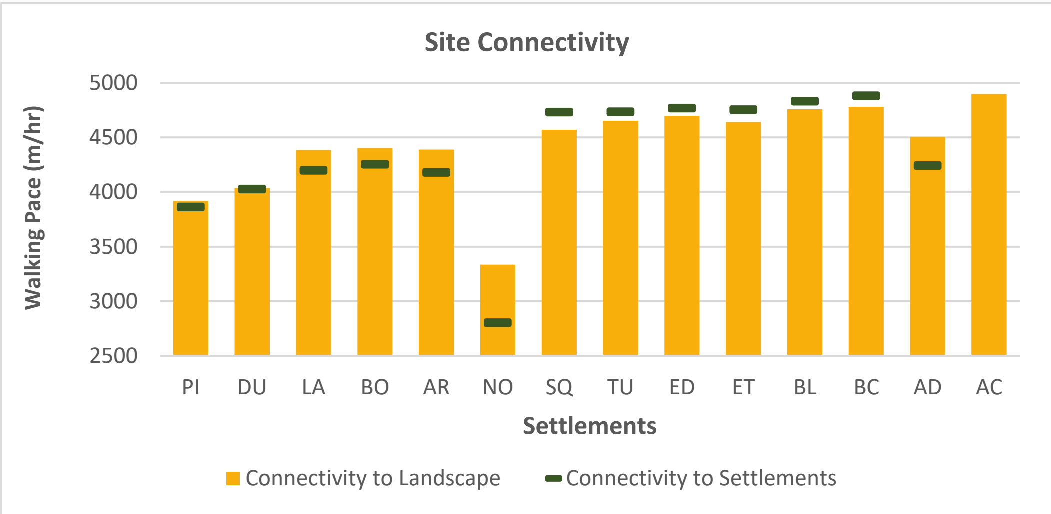
6.3 Statistical Analysis

6.3.1 Terrestrial Connections

The first step of the statistical analysis was to generate two measures of connectivity, representing each site's connection to the landscape as well as to the other analysed sites. Given the minimal mean cost of lochs and their stronger influence on individual routes, only the LCPs avoiding lochs were used for this comparison. For connectivity to the landscape, a mean walking pace was calculated from each site's LCPs, and for connectivity to other settlements, a 500 meter buffer around all other sites allowed for any pathways crossing this buffer to be extracted before mean costs for these connecting pathways were also determined. Table 11 (*top*) shows the results of these calculations. From these measures, the isolation of An Doirlinn and Northton is again clear; however, it also becomes evident that both sites reside in locations that offer less connectivity to the overall landscape when compared to other sites in the region. Also apparent is the higher connectivity of sites in North Uist, their proximity along with a less challenging topography enabling greater connectivity (i.e. walking paces of 4.7 km/hr or faster) between them compared to the broader landscape. This contrasts the islet sites in central Lewis, which demonstrate less connectivity to other sites than they do the broader landscape despite being positioned more centrally between Northton to the south and Dunasbroc and Pygmies Isle to the north. Whilst Allt Chrisal is also included in this comparison, as previously mentioned, with no other settlements on the island, no site connections could be determined. Further, its higher connectivity to the landscape relative to all other sites may be in part the result of its small geographical area, as previously demonstrated in the normalised LCP values (see Table 7).

These results were then compared to the accessibility of each site. Given the modelling of outward movement only, accessibility from the broader landscape could not be determined, and thus, only accessibility from other sites was calculated. This was done by following a process similar to that used to determine site connectivity, this time using individual buffer areas around each site along with all other LCPs in the region to extract any pathways coming within 500 meters of the site before determining mean sites-to-site accessibility values (Table 11, *bottom*). Comparisons to connectivity show that all sites within the southern island, including An Doirlinn, are generally as accessible as they are connected. In comparison, all sites in Lewis are easier to reach than they are connected, which may indicate topographically lower-lying, and thus more accessible, positions within the landscape. Again, Northton presents the greatest contrast, being the only site that is more connected than it is accessible, although both values are negligible by comparison. With a mean accessibility that is 40% lower than the regional average, these measures further highlight the limited affordances to movement between south Harris and Lewis and suggest that it would have been relatively easier to travel north through the northern island than south. Again, no measures could be generated for Allt Chrisal, underscoring the already obvious fact that the only way this site could have been connected to the extant settlement record was through maritime movement. However, from these measures, it is also clear that terrestrial affordances (i.e. connected landmasses) do not necessarily equate to affordances in social connections, thereby reemphasising the variety of environmental factors that would have influenced movement and social contacts, including geographic size and proximity as well as topography and landscape. Hence, whilst these measures allow for regional comparisons to be made, they also highlight strong variations between sites based on the environment and thus reinforce the need to focus on more refined spatial scales (i.e. cost catchment areas) in order to address movement around individual sites.

Consequently, the identified cost catchment LCPs were used to determine potential relationships between patterns of movement from settlements and the broader archaeological record. This was done by creating a 500 meter buffer around each site's catchment pathways in order to extract any archaeological sites residing within 250 meters of these pathways. Of the 214 sites that it would



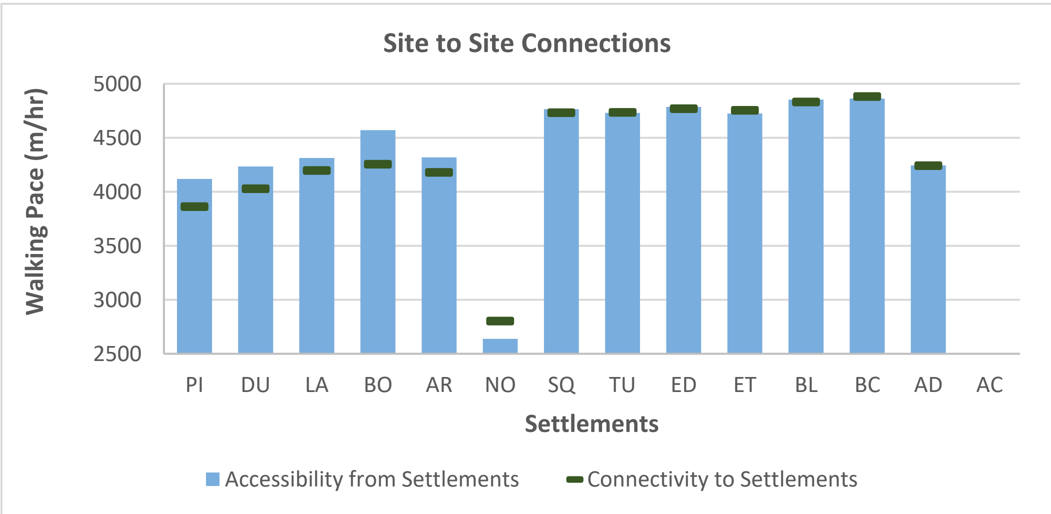


Table 11. Connection measures generated through LCPs, with site connectivity comparing connections to the landscape with connections to other settlements (top); and site to site connections comparing connectivity to and accessibility from other settlements (bottom), both of which demonstrate the extreme isolation of Northton and Allt Chrisal.

have been possible to reach via terrestrial pathways (excluding the 14 settlements as well as the isolated monuments on the islands south of Barra), cost catchment LCPs are proximal to 120 (56%) of them. Table 12 shows the number of archaeological sites by category that exist within this buffer zone compared to the total number of archaeological sites existing within each catchment area (%). Whilst the individual sites connected to each settlement's catchment LCPs will be elaborated on in the following chapters, a regional comparison exposes some noteworthy trends as well as divergences in the types and quantities of surrounding and connected archaeology within and between sites. For example, only four chambered tombs exist within the catchment areas of the islet sites on the west coast of Lewis, of which, only one is connected to Loch Borghastail. Further, neither chambered tomb nor Neolithic pottery finds have been recorded within the catchments of Dunasbroc and Pygmies Isle. In contrast, Loch Arnish's catchment area contains the highest number of lithic findspots, of which seven out of eight sites are connected to its pathways. Although the uncertain location of recovery for many of these chance finds limits a more thorough understanding of their connections to movement around settlements, most especially in North Uist, many of the more exceptional prestige objects recovered from Lewis have been more precisely recorded and thus securely located, suggesting the greater certainty of this correlation. Also notable is the large number of sites existing within Barpa Langass' and Bharpa Carinish's catchments, at 49 for both, with over half of these sites being connected to their pathways. Given

Number of Sites (%) within 250 m of Catchment Pathways					
Sites	Chambered Tombs	Standing Stones	Pottery Findspots	Lithic Findspots	Total
PI	-	7 (88%)	-	0	**7 (64%)**
DU	-	7 (64%)	-	2 (40%)	**9 (56%)**
LA	0	12 (50%)	2 (50%)	1 (25%)	**15 (42%)**
BO	1 (25%)	13 (46%)	2 (50%)	1 (33%)	**17 (44%)**
AR	3 (50%)	3 (60%)	-	7 (88%)	**13 (68%)**
NO	2 (100%)	2 (67%)	-	1 (100%)	**5 (83%)**
SQ	4 (57%)	7 (39%)	-	0	**11 (42%)**
TU	4 (36%)	8 (31%)	1 (100%)	3 (100%)	**16 (39%)**
ED	4 (29%)	8 (31%)	0	0	**12 (28%)**
ET	4 (31%)	8 (31%)	0	0	**12 (28%)**
BL	10 (56%)	12 (44%)	1 (100%)	3 (100%)	**26 (53%)**
BC	12 (60%)	11 (44%)	1 (100%)	2 (67%)	**26 (53%)**
AD	5 (71%)	3 (50%)	1 (50%)	1 (33%)	**10 (56%)**
AC	5 (100%)	4 (31%)	5 (100%)	4 (100%)	**18 (67%)**

Table 12. The number of archaeological sites by category falling within 250 meters of each settlement's catchment LCPs compared to total surrounding sites (%) within the catchment area.

that these two sites exhibit extensive catchments areas, their overall greater connectivity, and accordingly that of their adjacent chambered tombs, is apparent.

Finally, in order to test the statistical significance of this relationship between catchment pathways and archaeological sites, a Chi-square evaluation was used. Expected counts were determined through the generation of random points, representing the total number of sites by category that exist within each island. Buffers from the cost catchment LCPs were once again used to extract the random points, leading to expected values for each settlement by site type. At an individual scale, the frequency values were often too low (< 5) for an effective Chi-square analysis, and thus all values were combined, duplicates removed and the significance determined for the whole of the archipelago (Table 13). With a P-value of < 0.000045, this evaluation indicates a significant relationship between the broader archaeological record and modelled catchment pathways.

Relationship between Cost Catchment LCPs and Sites			
	Observed	Expected	Total Possible
Chambered Tombs	30	17	48
Standing Stones	59	47	108
Pottery Findspots	8	4	19
Lithic Findspots	23	14	39
Totals	**120**	**82**	**214**

Chi-square:	22.7907
P-value:	0.000045

Table 13. Chi-square evaluation of all connected sites compared to a random distribution, demonstrating a significant relationship between modelled pathways and the broader archaeological record.

6.3.2 Maritime Connections

Similar to the terrestrial analysis, the maritime LCPs were used to determine each site's connectivity and accessibility via the seaways. The process of determination was the same, with connectivity calculated from the mean cost of each site's combined LCPs and accessibility determined through the extraction of all other pathways moving to each site. However, the inability to more accurately reconvert the results into travel speed and time required the use of initial path cost values to determine connections, resulting in an inverse relationship between cost and connection measures rather than the direct relationship between walking pace and connections exhibited in the terrestrial analysis. As would be expected based on the initial assessment of the results, half tide demonstrated comparatively minimal variations in connection measures, between accessibility and connectivity by site as well as mean connection values between sites (Table 14). Of note are three sites that demonstrated the highest mean cost values at half tide, Bharpa Carinish and Barpa Langass (the two most inland sites based on the palaeogeography) and Loch Arnish (the only site on the east coast of Lewis). Whilst the lower standard deviations of the former two sites suggest overall limited maritime connections, Loch

Half Tide Connections (Mean LCP Costs)				
Site	Accessibility	Connectivity	Mean	SD
Pygmies Isle	2.16	2.11	2.13	0.04
Dunasbroc	2.24	**1.82**	**2.03**	0.30
Loch Arnish	2.58	2.12	**2.35**	0.33
Loch Langabhat	2.19	2.19	2.19	0.00
Loch Borghastail	2.34	2.01	2.17	0.23
Northton	2.20	2.31	2.26	0.08
Screvan Quarry	2.11	2.26	2.19	0.11
The Udal	**1.95**	2.13	**2.04**	0.13
Eilean Domhnuill	2.03	2.18	2.10	0.11
Eilean an Tighe	2.21	2.34	2.28	0.09
Barpa Langass	2.29	2.46	**2.37**	0.12
Bharpa Carinish	2.26	2.52	**2.39**	0.18
An Doirlinn	2.04	2.27	2.15	0.16
Allt Chrisal	**1.93**	2.16	**2.04**	0.17
Mean	**2.18**	**2.19**		
SD	**0.17**	**0.19**		

Table 14. Half tide maritime connections demonstrating the cost of connectivity and accessibility for each site, with the highest and lowest costs indicated in bold font.

Arnish also presents the highest standard deviation. Thus, whilst Loch Arnish is the least accessible site via the seaways, reflecting the overall higher cost of moving north as demonstrated in the initial assessment of the results, it still exhibits higher levels of connectivity than most other sites. In contrast, Dunasbroc, the Udal and Allt Chrisal all present the lowest mean costs to maritime movement. The former demonstrates the greatest maritime connectivity at half tide, which although also exhibiting the greatest standard deviation after Loch Arnish, leads to this site being the most connected via the seaways. Dunasbroc's higher mean connection is closely followed by the Udal and Allt Chrisal, which are the two most maritimely accessible sites and furthermore exhibit far lower standard deviations than Dunasbroc, suggesting their greater overall maritime connections.

Using half tide as a benchmark for maritime connections, comparisons between the two tidal extremes were made, highlighting the variations in site connection measures facilitated by each tidal window (Table 15). Immediately evident from the results is the great difference in connection measures between sites in Lewis and those to the south. All sites in Lewis are far more connected than they are accessible, with low tide once again offering the most significant affordances and constraints. In addition, accessibility at high tide more closely reflects half tide values, once again suggesting that high tide is the optimal tide for movement north to Lewis. In contrast, sites south

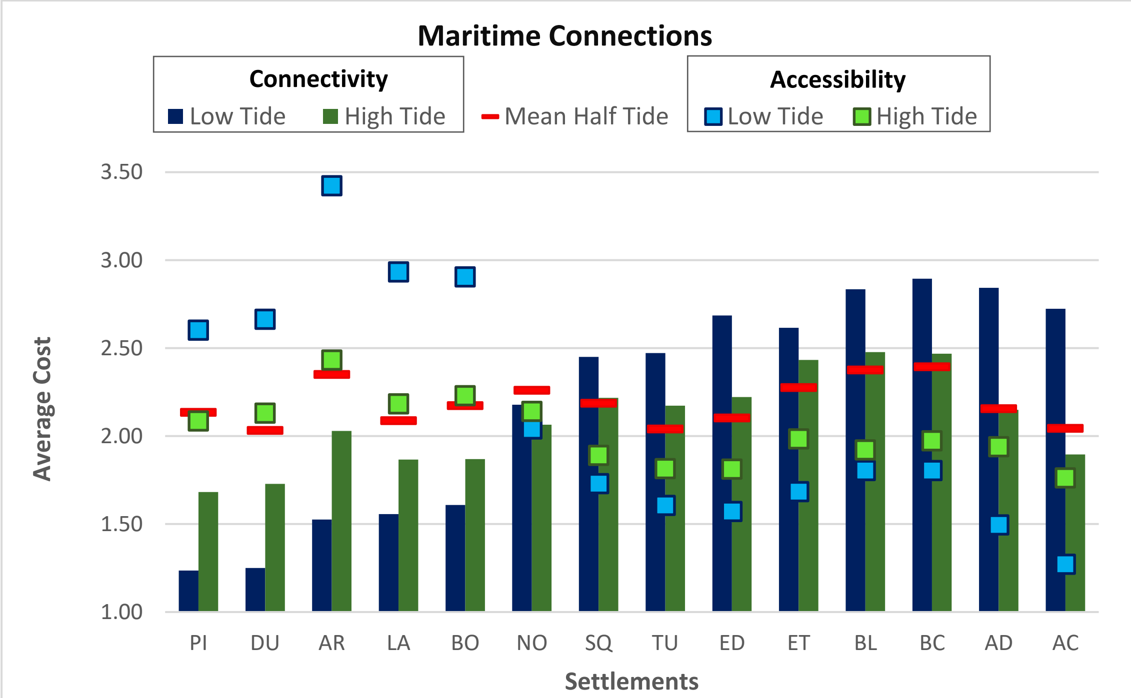


Table 15. Maritime connections by site, with the bar graph representing connectivity by tide and the scatter plot representing accessibility by tide. Mean half tide values are indicated in red for comparison.

of Northton demonstrate an inverted trend, with all being more accessible than they are connected. In addition, the smaller variations in accessibility between low and high tides for sites in North Uist suggests an overall greater accessibility regardless of tide. Further, half tide values more closely reflect connectivity at high tide, suggesting high tide to be the optimal tide for movement from these sites, which would coincide with the optimal tide for movement to Lewis. Poised between these northern and southern distinctions, Northton demonstrates the smallest variance between all measures. With a combined standard deviation of 0.10, the site appears to be generally as accessible as it is connected, regardless of tide. In addition, Northton is the only site to exhibit its highest cost to movement at half tide, further suggesting the affordability of either tidal stream.

6.3.3 Maritime and Terrestrial Comparisons

Although the maritime and terrestrial LCPs represent different cost units, a comparison of the two was performed by establishing a relative ranking of each site's connection values, with a value of 1 assigned to the site with the lowest cost, representing the greatest connections, and 14 assigned to the site with the highest cost (or 13 for terrestrial measures, which necessarily needed to omit Allt Chrisal) (Table 16). One notable trend is the broadly inverse relationship between terrestrial and maritime connectivity. For instance, Pygmies Isle ranked as the least connected site through the landscape after Northton yet the most connected site through the seaways. Conversely, Bharpa Carinish and Barpa Langass demonstrate the greatest terrestrial connectivity but also rank as the least maritimely connected sites. In contrast, terrestrial and maritime accessibility rankings appear more evenly balanced between sites, most evident in a mean standard deviation for all sites of 2.8 compared to 4.6 for connectivity.

Further variations exist between the two mediums as seen in the mean connection values, with terrestrial connectivity and accessibility rankings being are far more equitable, as was evident in the terrestrial connections statistics (see Table 11), resulting in a combined standard deviation of 0.4. This is sharply contrasted by maritime connection rankings which reflect the greater directionality of the seaways, resulting in a broadly inverse relationship between maritime connectivity and maritime accessibility by site and hence a combined standard deviation of 4.5. In other words, sites to the north are generally more connected through the seaways, whilst sites to the south are generally more accessible. What in turn becomes notable are sites that vary from this trend. For instance, Dunasbroc ranks low in all connection measures regardless of its northern position and despite its close proximity to Pygmies Isle, which ranks third highest in maritime connections. A similar trend is demonstrated by the two Barpa sites, which along with Dunasbroc exhibit the lowest mean maritime connections. Whilst their ranking lowest in maritime connectivity reflects general directional trends, their lower maritime accessibility, in contrast to other sites on the island as well as their more southerly position, further reinforces their limited maritime connections.

Terrestrial and Maritime Connections (1 = high; 14 = low)

Sites	Connectivity				Accessibility				Mean Connections			
	T	M	$\bar{x}$	σ	T	M	$\bar{x}$	σ	T	σ	M	σ
PI	12	1	6.5	7.8	12	10	11	1.4	**12.0**	0.0	**5.5**	6.4
DU	11	9	10	1.4	11	11	11	0.0	**11.0**	0.0	**10.0**	1.4
LA	9	3	6	4.2	9	12	10.5	2.1	**9.0**	0.0	**7.5**	6.4
BO	7	2	4.5	3.5	7	13	10	4.2	**7.0**	0.0	**7.5**	7.8
AR	10	4	7	4.2	8	14	11	4.2	**9.0**	1.4	**9.0**	7.1
NO	13	5	9	5.7	13	9	11	2.8	**13.0**	0.0	**7.0**	2.8
SC	6	8	6.5	0.7	4	5	4.5	0.7	**5.0**	1.4	**6.5**	2.1
TU	5	6	5.5	0.7	5	2	3.5	2.1	**5.0**	0.0	**4.0**	2.8
ED	3	10	6.5	4.9	3	3	3	0.0	**3.0**	0.0	**6.5**	4.9
ET	4	12	8	5.7	6	6	6	0.0	**5.0**	1.4	**9.0**	4.2
BL	2	13	7.5	7.8	2	7	4.5	3.5	**2.0**	0.0	**10.0**	4.2
BC	1	14	7.5	9.2	1	8	4.5	4.9	**1.0**	0.0	**11.0**	4.2
AD	8	11	9.5	2.1	10	4	7	4.2	**9.0**	1.4	**7.5**	4.9
AC	-	7	-	-	-	1	-	-	**-**	-	**4.0**	4.2
$\bar{\sigma}$				**4.6**				**2.8**		**0.4**		**4.5**

Table 16. Comparisons of terrestrial (T) and maritime (M) connections by site, including means and standard deviations for connectivity and accessibility as well as for terrestrial and maritime connections.

6.4 CONCLUSION

Throughout the analysis, a number of similarities and divergences between sites and within the broader archaeological record have become clear. The fragmented state of existing knowledge, as well as the strong influence of the environment, means that whilst a comprehensive approach to the Hebridean Neolithic record is desirable, it is not always possible nor indeed appropriate. What became most evident throughout the terrestrial analysis was the strong isolation of some settlements in comparison to the broader record. Whilst this may, in part, reflect the limited number of extant sites as well as archaeological work in these regions, the results do suggest the limited geographic and topographic affordability to movement between these isolated sites and denser concentrations of activity. In addition, the analysis of Allt Chrisal presented all the limitations of a bounded-island approach, suggesting at face value that the site would have been largely isolated from the archipelago. However, its archaeological record tells a different story, and thus Allt Chrisal, more than any other site, highlights the need to move beyond the landscape in order to understand how the seaways may have enabled or hindered movement.

From the maritime analysis, Allt Chrisal instead emerged as the most maritimely accessible site in the archipelago. Extending upon human geography concepts regarding the importance of accessible landscapes (see Section 5.1.1), it may be plausible to suggest that the overall maritime affordability of movement south may have subsequently enabled more reliable and thus frequent movement to Barra, thus enabling an overall higher level of social connections with this site. Hence, it is evident that through a more blended approach to land and sea, any terrestrial limitations to a comprehensive analysis of movement can be attenuated through the incorporation of maritime models of movement. In addition to transcending the spatial constraints of a purely terrestrial analysis, the maritime models added their own spatial and temporal refinements, suggesting the influence not only of the tides on social connectivity but also the geographic position of sites within the archipelago as well as their proximity to either the Atlantic or the Minch. Strong differences between the cost of moving north and south also reflect strong distinctions between these two regions that were noted during the analysis of the material record, which included clear divisions in the concentrations of local lithics and prestige objects, Early and Late Neolithic records as well as domestic and ritual contexts. Whilst these divergences are no doubt influenced by biases in archaeological work and extant knowledge, the results of the least-cost analysis suggest that such distinctions may more aptly reflect the constrained affordances to movement between them.

Consequently, this ability to transcend disparate mediums of movement and combine them through comparative analyses provides the greatest advantage of the established methodology, further allowing for the creation of different yet comparable measures of each site's connectivity and accessibility via both mediums, which will subsequently be used to develop micro- and meso-narratives. Whilst the use of a least-cost approach to model seafaring offered numerous challenges, requiring much experimentation before a suitable method could be established, the benefits of its use far outweighed its many contestations. Perhaps the greatest limitation to the methodology was the use of tides alone to represent the cost of seafaring, and yet the maritime LCPs were able to identify numerous suitable landing places that are supported by modern maritime activities, demonstrating the strong applicability of tides to models of seafaring in this region, at least along the inner seaways.

Ultimately, the established least-cost methodology demonstrates the highly sensitive nature of the process as well as the strong influence of the generated cost raster on the resulting models. This reactivity highlights the strong influence of various established parameters and consequently the various outputs possible. In other words, these models represent only one of numerous possibilities, and thus, whilst the resulting pathways can be highly informative, they should never be viewed as more than a heuristic model through which to analyse the archaeological record. As stated by Richards-Rissetto (2017, p. 11):

> As archaeologists we cannot simply use GIS as a deductive tool but rather we must also use GIS as part of an inductive PROCESS, where we tack back and forth between various data and methods to formulate new hypotheses and as a consequence provide fertile ground to drive theoretical growth.

By subsequently incorporating all available information, including modern and palaeoenvironmental data, modern and historical narratives of movement, pilot books and toponyms it is hoped that the established methodology and the ensuing discussion that it facilitates will do just that—not only enabling a greater understanding of movement and connectivity during the Hebridean Neolithic but also encouraging new approaches, methodological and conceptual, to both an evocative record of human history and the archaeological study of islands and archipelagos more broadly.

Chapter 7. TOWARDS A REGIONAL NARRATIVE

Throughout the previous chapters, the importance of scale has been emphasised, and thus the following discussion of movement and connectivity around the Hebridean archipelago will begin with micro-scale movement and work outwards towards a regional narrative. By using each site's catchment area, the affordability of the environment for both movement and resource procurement will be analysed, thereby addressing the first question identified in Chapter 1: What was the nature of settlement practices? In other words, was it necessary or even feasible for Neolithic populations to move around the landscape? Further, by analysing each site's individual environmental affordances against the broader archaeological record, additional insight can be gained into not only the suitability or likelihood of certain pathways or corridors but also the potential connectivity of each settlement to this broader record, thereby addressing the third question of this thesis: What is the relationship between settlements and the broader monument record?

Although this bypasses the second identified question regarding the relationship between sites within the broader settlement record, this is necessary due to the isolation exhibited by some settlements, meaning that for these sites, this relationship cannot be addressed through a local analysis. Thus, it is only after focusing on localised movement that the scale can be expanded and comparisons made between sites within the broader settlement record, allowing potential connections to be identified. Throughout the previous analysis, the same five distinct regions repeatedly emerged: Barra, southern South Uist, North Uist, south Harris and central/north Lewis. Whilst these regions were primarily identified through geographic and topographic affordances and constraints, they must now be connected through the seaways in order to determine whether movement between them was even feasible, much less desirable.

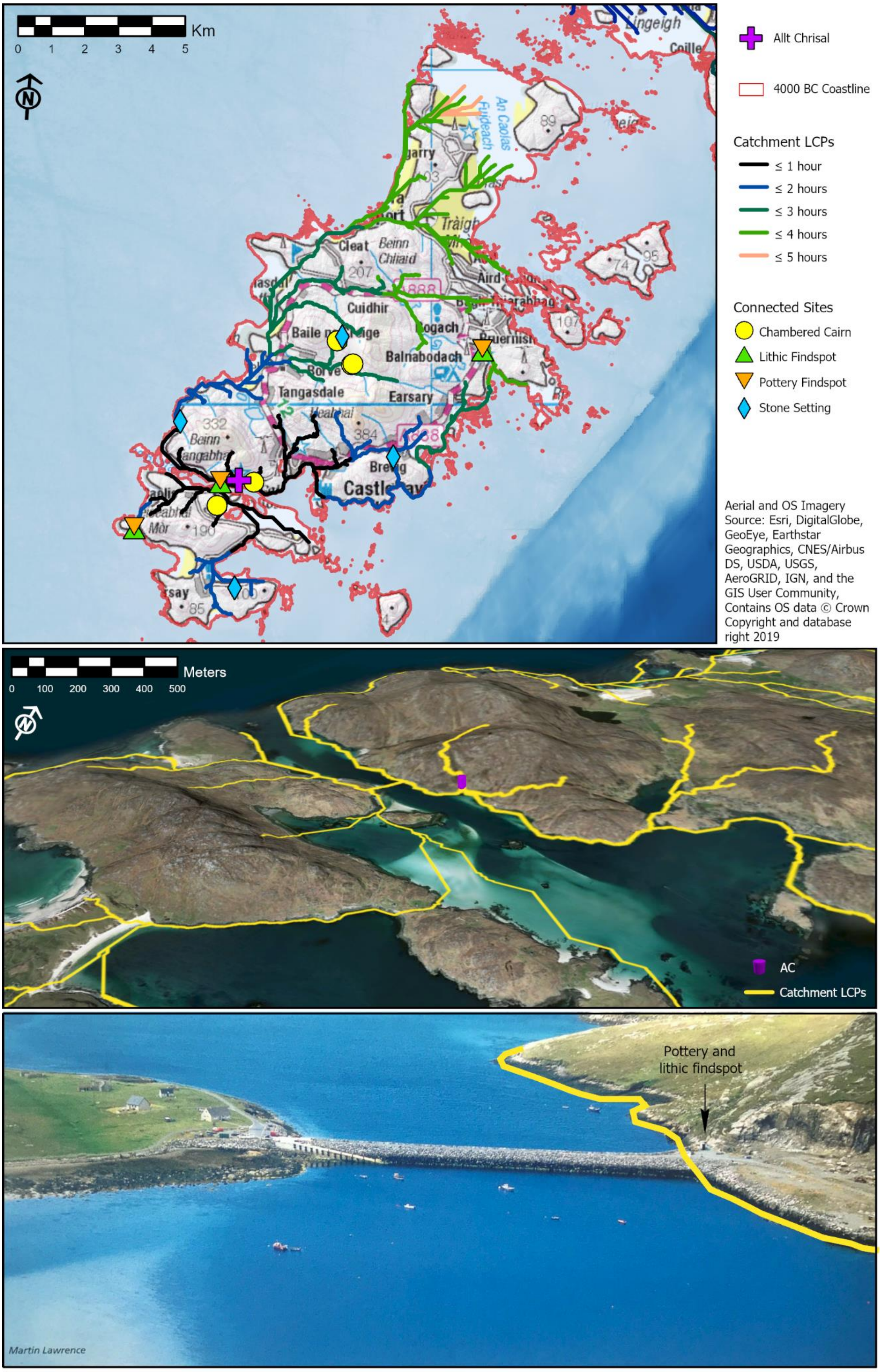
Thus, in moving towards a regional narrative, the influence of the seaways, and subsequently the directionality of maritime connectivity, is evident. Whilst terrestrial connectivity and accessibility measures revealed little distinction between most sites, the influence of tides on maritime movement is pervasive. As recognised by Callaghan and Scarre (2009, pp. 366-367), given the semi-diurnal nature of tides around the British Isles, they could have only been effectively used over short distances. Thus, in keeping with the tides, as it were, longer-distance voyages, although certainly a possibility, will be omitted in favour of coastal hopping or otherwise shorter legs of movement, much like that discussed for other connected archipelagos (see Broodbank 2000; Mackie 2001; Knappett et al. 2008) as well as Neolithic movement within the western seaways (Garrow and Sturt 2011). By working within this roughly 6 hour temporal constraint, discussions of Hebridean seafaring and connectivity can move beyond, or more accurately within, narratives of long-distance movement by foreigners to instead focus on the quotidian aspects of maritime practices, thereby placing the emphasis on local perspectives. Thus, it is through this localised maritime perspective that the fourth, more ambiguous, question can be addressed in the final chapter: What was the nature of regional connectivity around the archipelago, and more elusively, why were these connections important?

7.1 Localised Movement: Cost Catchments

7.1.1 Allt Chrisal

Throughout the previous analysis, the isolation of Allt Chrisal from the broader record has been clear, a geographic isolation that further served to segregate the site through an inability to generate cumulative statistics and thus formulate regional comparisons. Whilst Barra represents a bounded and isolated geographic space, the small size of the island lends itself to a greater overall connectivity despite its rugged terrain. Allt Chrisal's catchment area covers nearly the whole of Barra and Vatersay, all of which could have been reached within 5 hours (Figure 40, *top*), and whilst no comparative measures of Allt Chrisal's connection to other settlements could be generated, the pathways moving from this site revealed a strong connection to the archaeological record. In fact, of the 27 sites identified on Barra and Vatersay, pathways generated from Allt Chrisal were proximal to 67%, with standing stones forming the lone exclusion.

Given the rugged mountain massif interior, Neolithic movement around the island would have been primarily constrained to the coast, a constraint realised even in modern movement, as evidenced by the A888, which forms a ring around the island. However, with lower sea levels, especially along the western and northern coasts, much of this movement may have occurred within the current intertidal zone—the models no doubt being influenced by the elevated coastline of the reconstructed DEM. The most notable divergence from modern movement, and most relevant as regards Allt Chrisal, is a heavily utilised corridor around the southwest foothills of Beinn Tangabhal in order to reach the west coast—the same route followed by the seafaring models in order to reach the Atlantic. Today movement around Beinn Tangabhal terminates at the Vatersay Causeway, and instead, the A888 passes to the northeast of this mountain, following a passage that separates it from the rugged hills of Heaval to the northeast (Figure 40, *middle and bottom*). However, the more challenging topography along this route influenced the models to instead move along the coast, doubling the travel distance and time yet maintaining a less topographically challenging route to the west coast. Moreover, Neolithic activity along this passage has been evidenced by lithic and pottery finds to the northwest of the causeway and within 20 meters of this primary corridor.



Vatersay Causeway from the east with pathway indicated in yellow (Photograph from Mason 2017, p.24).

Figure 40. Allt Chrisal's catchment pathways compared to modern movement (top) and the southwest corridor highlighted around Beinn Tangabhal (middle and bottom).

The greater affordability of the west coast for both movement and sustainability is clear, with pathway densities along the coast also highlighting the existing distribution of machair sands on the island, which stretch from the Eoligarry peninsula in the north down to Vatersay (Figure 41). With a potential coastline up to 800 meters from the current shore, these extensive coastal plains may have provided the fertile land for the small-scale cultivation of Barley, as evidenced at Allt Chrisal. From this settlement, the southernmost machair deposits on Barra could have been reached within 1.6 hours by moving along the southwest corridor or in less than an hour by taking the 3 km shorter yet more challenging passage to the north. This corridor along the west coast would have been significant for broader patterns of movement to the majority of Barra, with pathways following this western route to reach much of the island. The northernmost extent of this corridor covers much of the now submerged coast around Eoligarry, whilst directly south of it another east-west corridor broadly follows the northern stretch of the A888. Given the limited number of lochs on the island, their avoidance has limited effect on movement, with the exception of Loch an Duin, which resides along this northern corridor. Although the circumnavigation of this loch adds little time (roughly three minutes) to the journey, its avoidance does have a greater impact on overall patterns of movement to the northeast. Whilst these northernmost corridors may have provided the optimum routes from Allt Chrisal to the northeast, the need to avoid Loch an Duin would have

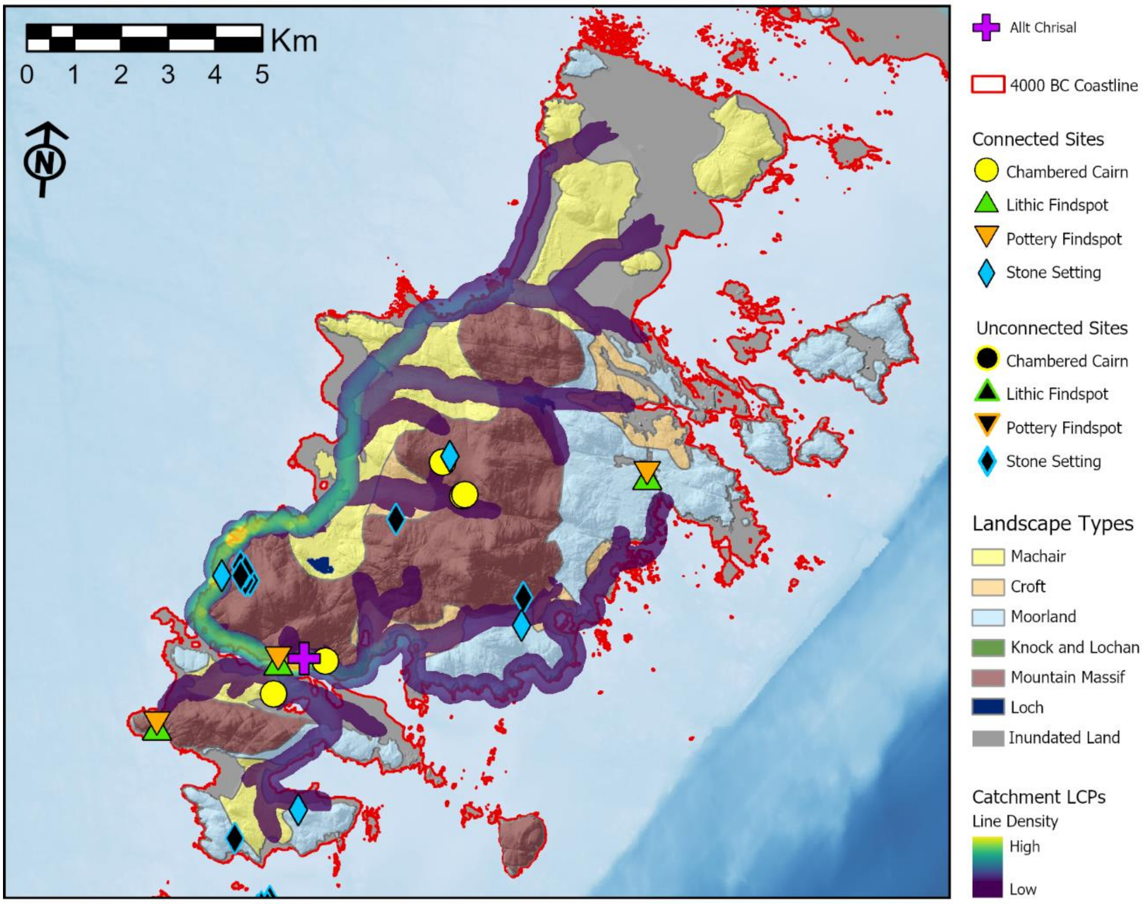


Figure 41. Line density of Allt Chrisal's catchment pathways demonstrating the alignment of western corridors with the distribution of machair landscapes as well as archaeological sites.

made shorter routes along the more challenging east coast an equally affordable option—thus the reason for reduced mean path length and travel hours in comparative measures (see Table 7). Whilst no Neolithic sites have been recorded in this region, a small number of sherds and an associated axe-head found near Buaile nam Bodach were proximal to the adjusted pathways along the east coast.

To the south of these northern routes, a third east-west corridor extends into the interior of the island via Borve Valley, a route surrounded by mountains on all sides except to the west. The significance of this region during the Neolithic is evident from a group of monuments situated on higher ground around the valley, four of which are connected to Allt Chrisal's pathways (Figure 42, *top*). The most notable is Dun Bharpa, a large, well-preserved Hebridean-type passage tomb that is situated between the large hills of Mhartainn to the west and Grianan to the east at an elevation of 130 meters above sea level or around 80 meters above the valley. The clearly challenging approach to this monument would have skylined its southern façade, and the pathways indicate its approach from the southwest, passing within 20 meters of its northwest façade. Whilst these landforms would have largely restricted visibility in most directions, the view south would have provided not only expansive views of the valley but also a distinctive horizon formed by the surrounding mountains (Figure 42, *middle*). Further, these landforms would have provided a unique backdrop to activities taking place within the east-facing forecourt. In the opposite direction, restricted views of the Atlantic would have been possible behind Mhartainn, a view perhaps significant for the return journey down to the valley (Figure 42, *bottom*). More than any other chambered tomb on Barra and Vatersay, this monument exhibits the predominant characteristics in setting noted by previous researchers, including prominence over a sheltered valley and restricted visibility directed towards the valley, prominent landforms and the sea. In addition, movement towards the site would have been highly structured with only one suitable route of approach from the south.

Whilst no evidence for Neolithic domestic activity has been recorded within the valley, two other monuments mark its easternmost extent, both of which are also connected to Allt Chrisal's pathways. Roughly 830 meters southeast of Dun Bharpa, these two less definitive chambered tombs include Grianan, whose existence is only indicated by HER data, and Borve, a cairn surrounded by conflicting interpretations. Henshall (1972, p. 498) believed Borve to have been a long cairn with a wider and taller south end containing the chamber and tapering in size and elevation to the north. However, Scott believed it to be more reminiscent of an Iron Age roundhouse, an interpretation perhaps influenced by the later construction of hut circles and domestic structures within the monument (Canmore 2019, Harris Borve). Regardless, these structures have experienced substantial multi-period reuse, indicating an enduring suitability or significance of this location. From Allt Chrisal, all three of these monuments could have been reached in under 3 hours by following the southwestern and western corridors indicated by pathway densities. Although there are two chambered tombs within much closer proximity to Allt Chrisal, the closest, which could have been reached in under 10 minutes, is severely robbed and provides no indication of a chamber (Branigan and Foster 1995b, p. 37). The second tomb, known as Cornaig Bay, is located on Vatersay.

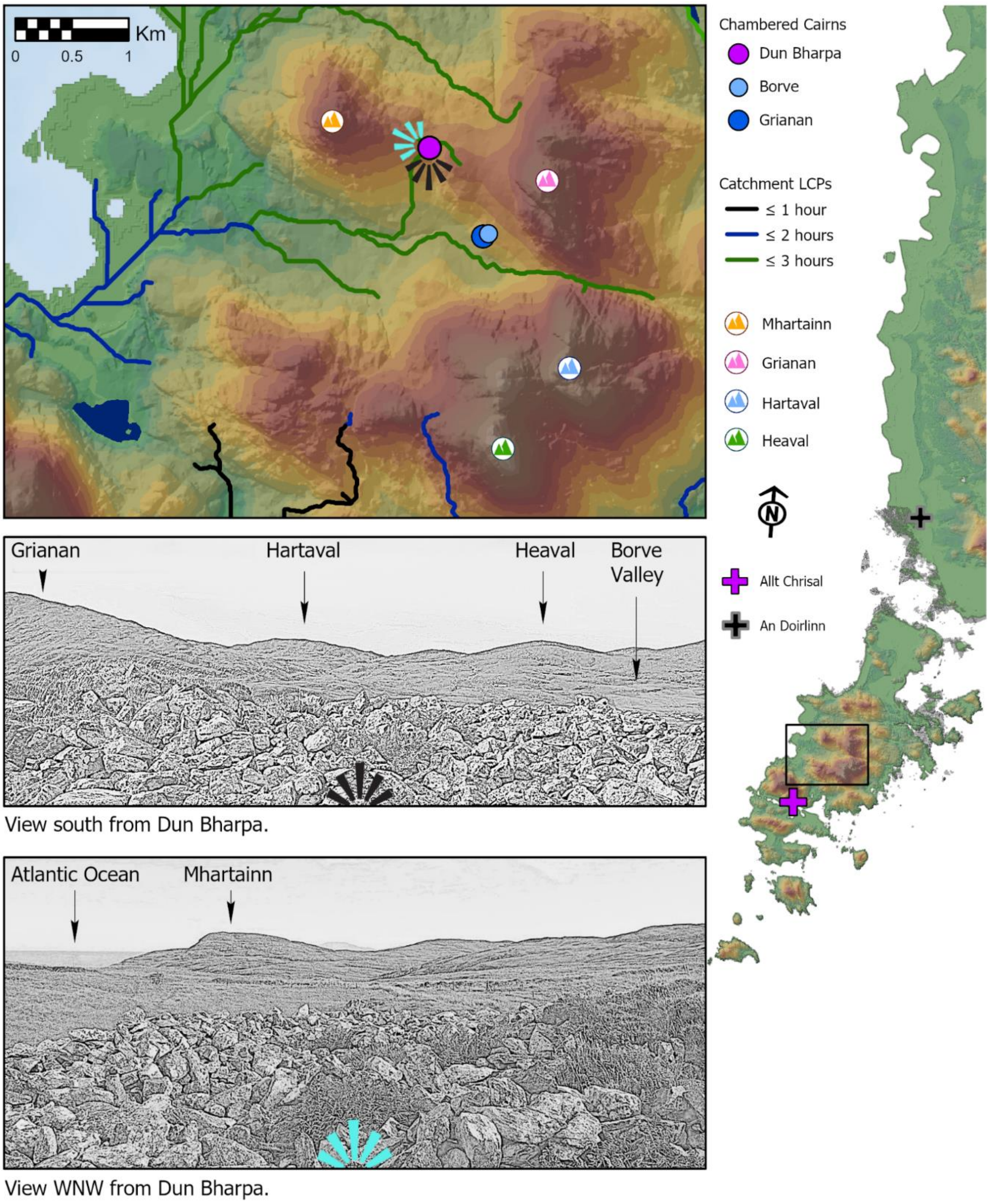


Figure 42. Chambered tombs centred around Borve Valley corridor (top) and the view of surrounding landforms from Dun Barpa (middle and bottom).

Although the models suggest that the Cornaig Bay monument could have been reached within 30 minutes, the pathways follow the modern Vatersay Causeway (Figure 43). With the causeway spanning a minimum depth of 11 meters (WIC 2019, Vatersay Causeway), terrestrial movement across this region may not have been possible even during the Early Neolithic; however, the palaeogeography does indicate the connection of the two islands along the western passage of the Sound of Vatersay, creating a barrier to the Atlantic that would have significantly altered the nature of this littoral environment. Although the sound currently reaches depths of up to 17 meters along its eastern channel, the GIA models project its depth to have been up to 6 meters during the Early Neolithic. To the south, the sound opens to Cornaig Bay, which currently reaches depths of up to 5 meters and is enclosed by shoals to the east, much of which is projected to have been dry land during the Early Neolithic, forming perhaps a freshwater or brackish loch within the current bay. This would have resulted in a substantial coastal plain, extending over 800 meters from the current northeast coastline of Vatersay. As a result, the Sound of Vatersay would have been substantially narrower, with a maximum distance of around 300 meters between the two islands, resulting in a much greater land area to the northeast of Vatersay as well as a greater freedom of movement around Allt Chrisal, most notably the southwest corridor around Beinn Tangabhal.

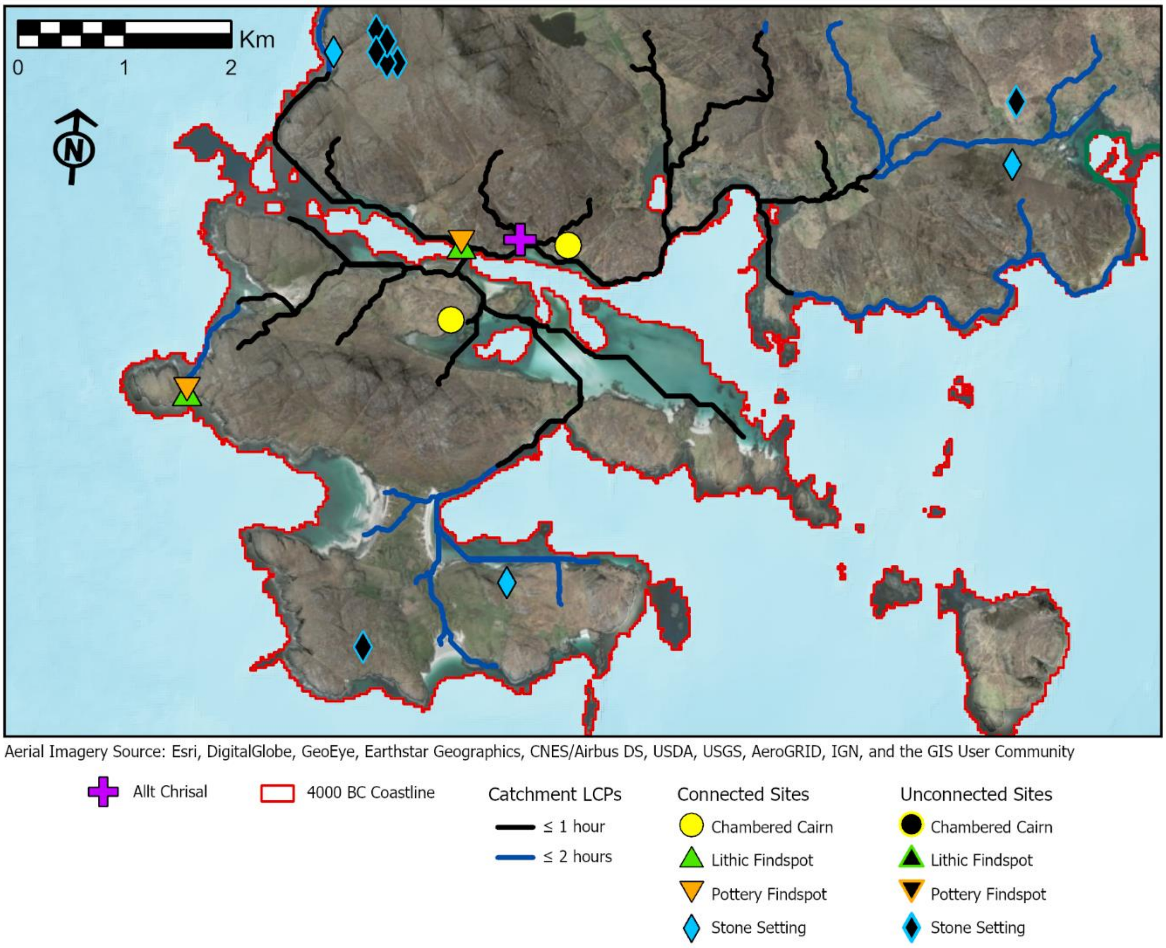


Figure 43. The palaeogeography of Vatersay showing potential coastal plains projecting from the northeast coast as well as the potential connection of the two islands along the west coast of the current Sound of Vatersay.

What remains uncertain, however, is the timing and extent of inundation. Whilst the GIA models project this submergence to have occurred during the Early Neolithic, reaching near present-day levels by the start of the Late Neolithic, it is unclear whether this inundation was gradual, as a result of periodic tidal scour along the west coast, or rapid, due to a single breaching event. It is worth noting that the construction of the Vatersay Causeway in the early 1990s was challenged by very strong tidal races, which were created as the causeway extended into the sound (WIC 2019, Vatersay Causeway). Regardless of its temporality, this suggests that when the connection to Vatersay was severed, the inundating Atlantic would have significantly altered the littoral environment around Allt Chrisal, perhaps resulting in challenging tidal waters through the narrowed sound and certainly contributing to the scour of it. Whether this inundation occurred at the time of Allt Chrisal's inhabitation is indeterminate from the current data; however, even the gradual submergence of large swaths of coastal land around Vatersay would have been noticed through the generations of occupation at Allt Chrisal.

Thus, lower sea-levels along the western Sound of Vatersay would have profoundly impacted not only the littoral setting of Allt Chrisal and movement from it but also its connection to Vatersay. Vatersay's unique geography is comprised of a rugged massif interior that separates machair deposits to the north and south. The south is characterised by a machair tombolo, projected to be around 1 km across in the Early Neolithic and further dividing the island into north and south. To the east of this tombolo, Vatersay Bay provides a sheltered harbour well-protected from the predominate elements (Mason 2017, p. 20-21), which would have been separated from the Sound of Vatersay by a headland and perhaps the extended coastal plains around Cornaig Bay. Of the five known archaeological sites on Vatersay, four of them are connected to primary pathways from Allt Chrisal, including the previously mentioned Cornaig Bay monument, a Hebridean-type tomb that overlooks the current bay and what may have been a loch and coastal plains during the Neolithic. Thus, whilst the hillside position of Allt Chrisal has been highlighted as being rather anomalous in comparison to other coastal settlements, it may have been this connection to Vatersay that motivated its location—allowing the site to overlook the sheltered waters of the sound and providing quick and easy access to the coastal plains of Vatersay by watercraft whilst still allowing access to the west coast of Barra, its more extensive machair plains and its significant interior valley.

Although comparatively few Neolithic sites have been recorded on Barra and Vatersay, all chambered tombs and find spots on the two islands fall within 250 meters of Allt Chrisal's pathways, demonstrating a strong connection between modelled pathways and the Early Neolithic record of both islands. In contrast, the connection between Allt Chrisal and stone settings is less forthcoming, with only 4 out of 13 monoliths connected to primary pathways. This may possibly be due to the end of Allt Chrisal's use prior to the emergence of the standing stone tradition (with a *terminus post quem* for Neolithic activity at around 2900 BC); however, this is clearly also the result of the location of many of these monoliths, a large concentration of which are positioned on the northeast face of Beinn Tangabhal (see Figure 41 and Figure 43). Whilst these monuments may have overlooked terrestrial movement along the west coast, their reference to the Atlantic is clear, an association that may be explained through the seafaring models, as will be discussed in Section 7.2.

7.1.2 An Doirlinn

Although it is likely that South Uist would have been connected to Benbecula and North Uist during at least the Early Neolithic, An Doirlinn is a site that appears to be largely isolated from major concentrations of activity. Much like the majority of known settlements, the site resides in an exposed coastal setting that has suffered from considerable erosion, suggesting the excavated site to be only a small portion of the original Neolithic settlement (Garrow and Sturt 2017, p. 143). Whilst the palaeogeography suggests the Early Neolithic coastline to have extended up to 2.5 km to the west and over 4 km to the south, it also indicates its total submergence to have occurred before the start of the Late Neolithic. However, this does not include consideration for the many complexities of coastal morphology along the west coast, including machair formation and movement, which would have subsequently altered erosional and depositional patterns along the coast. As such, it was deemed probable by the excavators that these more extensive coastal plains would have been inundated at a later date (Garrow and Sturt 2017, p. 139).

Further challenges to understanding the nature of the coastal landscape and its use during the Neolithic are demonstrated by the toponym of the site. The Gaelic name *Dòirlinn* refers to an isthmus covered at high tide and connected to a dry island at low tide, in this case, the island of Orosay—a name derived from Old Norse *Örfirisey* meaning 'island of the ebb tide' (Watson 1973, p. 505). This would suggest that by the Norse period (*c*. 9th century AD), the site would have been habitually inundated at high tide, a feature which contrasts its current position above the high-water mark—the result of modern reinforcement of the isthmus (Sturt 2019, pers. comm.). Thus, this site demonstrates the complex nature of coastal sediment dynamics which, in conjunction with anthropogenic activity, prevents a more refined understanding of the nature of the coastal landscape during the Neolithic without further environmental work.

Regardless of the timing and tempo of inundation, An Doirlinn presents the most substantial structural record compared to all other settlements; its numerous phases of structure building demonstrate a steadfastness against an encroaching sea. However, the strong exposure of the site to the Atlantic—although sheltered to some extent by Orosay—along with the large quantity and variety of tree species being used for fuel as well as the lack of evidence for cultivation suggests the need to look within the broader landscape for other occupation areas or resource-specific sites.

Whilst the palaeoenvironmental record of South Uist has suggested more substantial areas of woodland during the Neolithic, especially around lochs and in sheltered regions, just as with the coastal dynamics, their existence and decline would have been spatially and temporally variable, reinforcing the potential inefficacy of interpreting Neolithic activity based on the modern landscape. However, given the current east-west distribution of disparate landscape types, it has been suggested for later prehistoric periods with denser populations, such as the Iron Age, that catchments would have likewise been divided into vertical east-west strips of land covering each of the landscape types (Armit 2003b, Ch. 4; Parker Pearson 2012b, pp. 33–34), and the same may have been true for Neolithic populations.

Whilst An Doirlinn's cost catchment stretches to Grogarry around 24 km to the north, a distance that could have been reached within 5 hours, the banks of Loch Boisdale could have been reached within 1.5 hours (Figure 44). The banks of this sea loch contain some of the nearest extant remnants of woodland, evidencing the enduring fertility of the region, which may have been even more expansive due to lower sea levels around the inner reaches of the loch. In addition, this stretch of land from An Doirlinn to Loch Boisdale is the only region in South Uist where croft land currently reaches to the east coast. Although this may be the result of post-Neolithic machair sand incursion, overall, the modern and palaeoenvironmental records suggest a rich and fertile landscape wedged between two disparate littoral zones. Given the apparent affordability of the surrounding landscape as well as the limited terrestrial connections evidenced to the north, the preliminary results of this analysis suggest that occupants of An Doirlinn did not have to travel far through the landscape in order to obtain resources.

This is supported by the archaeological record, with all sites connected to An Doirlinn's pathways existing within 10 km of the settlement. The closest sites to An Doirlinn are two chambered tombs, both of which reside to the west of Easaval, a prominent hill south of Loch Boisdale, and could have been reached within around an hour. The nearer tomb, Dun Trossary, is a severely mutilated long cairn with little indication of a passage, although its larger south end and diminishing height and width to the north reflect the orientation and form of Borve in Barra, as does its substantial reuse. Its unusual form was suggested by Cummings et al. (2005, p. 44) to represent a broader range of activities taking place at the monument, possibly for a wider group of communities. Pathways from An Doirlinn pass within 50 meters of the monument, approaching it from the northwest with Easaval serving as a backdrop. The southern monument is Leaval, a badly damaged cairn of an unusual form (see Section 4.1.1), which is located on the northern slope of a small but prominent knoll of the same name. From An Doirlinn, the pathways indicate the approach to Leaval from the northwest, arriving at the monument on the opposite side of its southeast facing chamber, a route that was also suggested by Cummings et al. (2005) during their work on the chambered tombs of South Uist. From this direction, Ben Scrien on Eriskay would have provided a backdrop during the

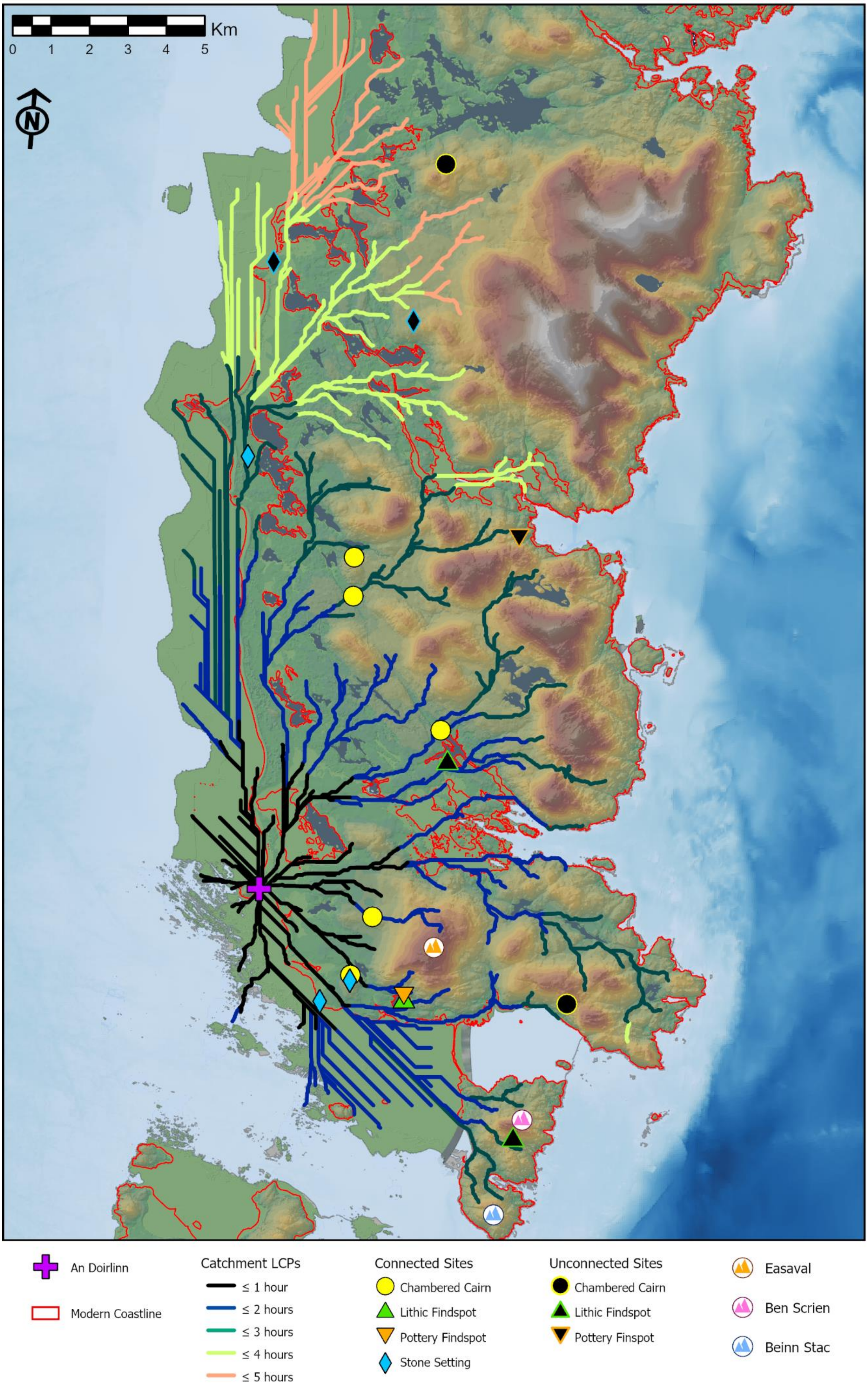


Figure 44. An Doirlinn's potential position within the Neolithic landscape as well as its catchment pathways and connected archaeology.

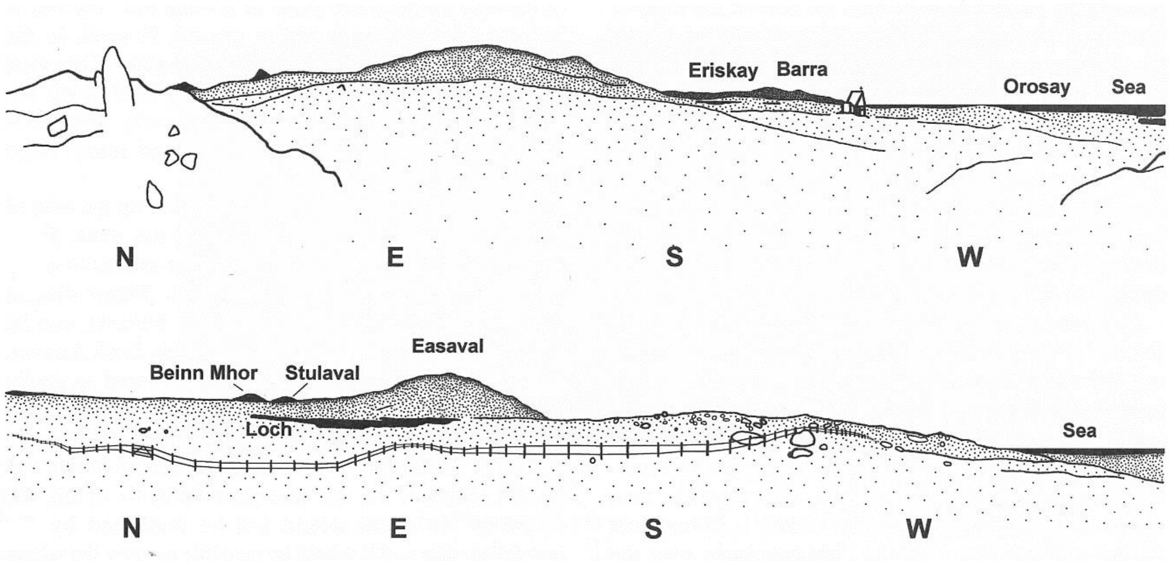
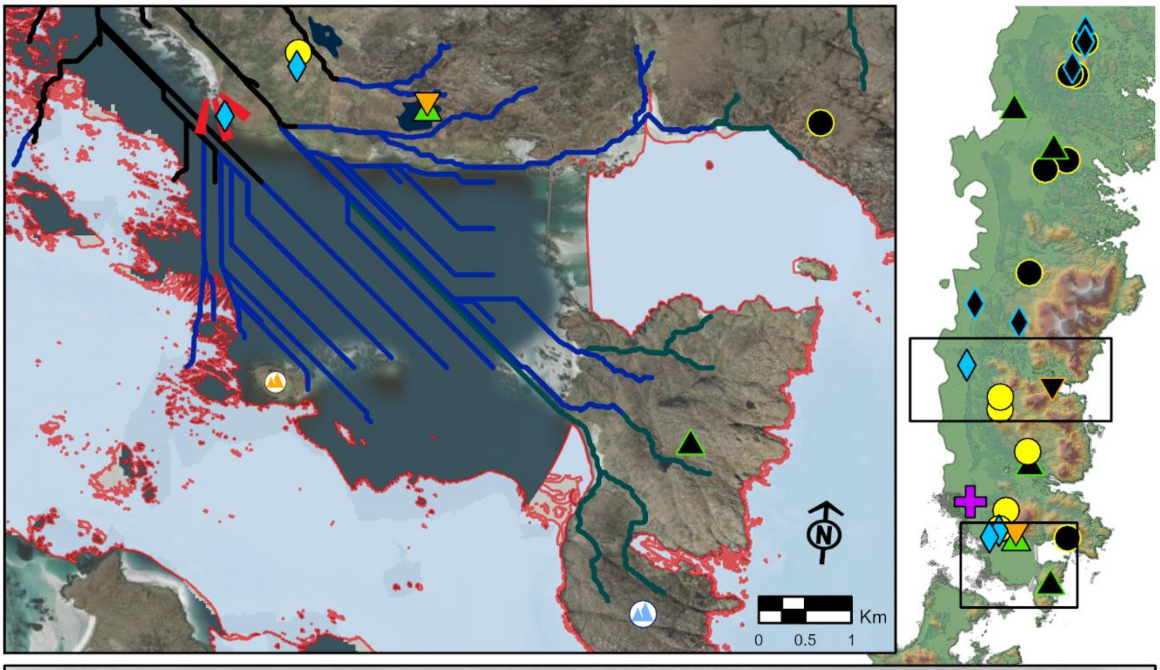


Figure 45. 360 degree views from Dun Trossary (top) and Leaval (bottom), showing eastern orientation towards prominent landforms and western orientation towards the sea (Cummings 2005, p.43).

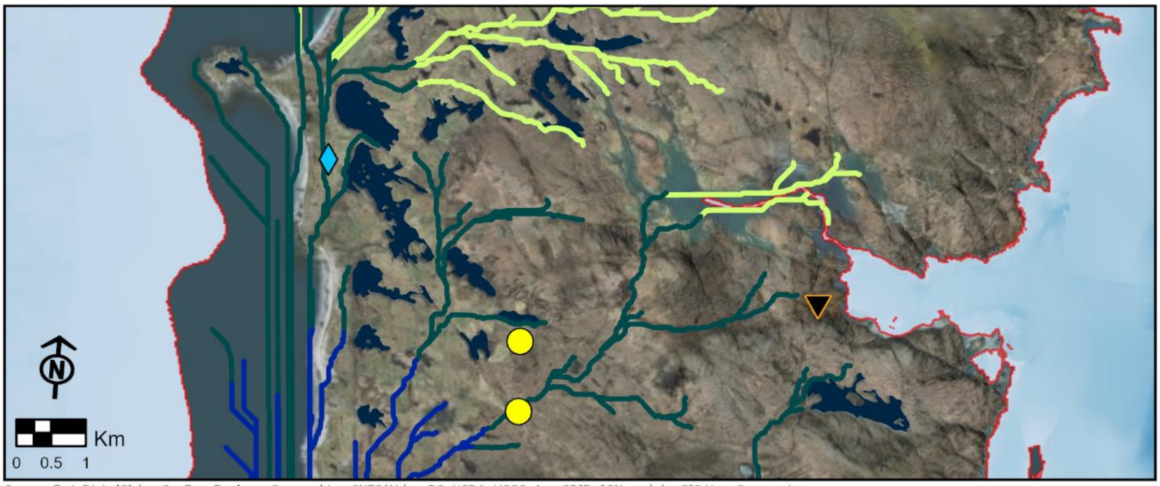
approach to the monument as well as activities taking place outside of the chamber. Further work by Cummings et al. (2005) on the landscape setting of tombs in South Uist and their potential orientation to significant landscape features has resulted in detailed panoramas for these monuments that highlight the visibility of these distant landforms (Figure 45). What is most notable from their work is the general eastern alignment towards prominent landforms and western alignment towards the sea. Whilst Easaval restricts views to the east and southeast, their more prominent positions offer extensive views over the low-lying coastal plains to the west, including the prominent tidal island of Orosay (*ibid*).

The route to Leaval moves around the northeast side of the monument before reaching the north bank of Loch a'Choire at the southern foothills of Easaval (Figure 46, *top*). Survey and a small-scale excavation around the loch produced 68 flint flakes and 7 elaborately decorated Hebridean Ware sherds (Henley 2012). Whilst this loch is currently wedged between Easaval and the southern coast, the extended Neolithic coastline may have positioned it around 3 km from the sea. This greater extent of land may have also connected South Uist to the island of Eriskay; the current Sound of Eriskay between the two is a shallow, sandy expanse bridged by a *c*. 1.5 km causeway. With neither topographic nor bathymetric data for the sound, any understanding of its nature during the Neolithic is limited; however, it is this inability to collect geophysical data which serves to illustrate the likelihood of its existence as dry land.

From An Doirlinn, Eriskay could have been reached in under 3 hours by foot, following a southeast route that would have passed between monuments on Leaval and a standing stone on the southwest littoral extreme of the island (Figure 46, *top*). Approximately 150 meters south of the chambered tomb, a stone setting resides on the top of Leaval, comprised of a disjointed pair of now prostrate monoliths. The other monolith is Pollachar, which currently stands at 1.75 meters



View SSE from Pollachar (Photograph from RCAHMS 1915).



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

An Doirlinn
4000 BC Coastline
Catchment LCPs: ≤ 1 hour, ≤ 2 hours, ≤ 3 hours, ≤ 4 hours
Connected Sites: Chambered Cairns, Lithics, Pottery, Standing Stones
Unconnected Sites: Chambered Cairns, Lithics, Pottery, Standing Stones
Beinn Stac
Lingay

Figure 46. An Doirlinn's connection to archaeological sites to the south (top), including the standing stone Pollachar (middle); and An Doirlinn's furthest extent of connected archaeology to the north (bottom).

tall, overlooking the Sound of Barra (Figure 46, *middle*). Whilst both stone settings are proximal to An Doirlinn's pathways, Pollachar's proximity is due to movement along the extended Early Neolithic coastline, suggesting the need for a more refined understanding of the timing and tempo of inundation before any associations can be made between this monument and terrestrial pathways. Conversely, although the coastline can generally be suggested to have extended further into the Atlantic during the occupation of An Doirlinn, much like standing stones in Allt Chrisal, the location of Pollachar may relate more strongly to maritime routes or perhaps a combination of both mediums of movement.

Having focused on An Doirlinn's connections to the east and south, the potential connectivity to sites to the north must also be noted. In total, nine chambered tombs from South Uist were included in the Hebridean database based on Henshall's (1972) work, and of these nine sites, six were identified along catchment pathways; five were connected An Doirlinn and one, located to the extreme north of South Uist, was connected to Bharpa Carinish. It is thus interesting to note that these six monuments have been identified by Cummings et al. (2005) as definitive Neolithic chambered tombs, whilst two of the three monuments not connected to pathways were suggested by the authors to be of later origin and hence could conceivably be discarded from the analysis. The end of An Doirlinn's archaeological connections is a standing stone, possibly one of three, which stands just over 2 meters tall at a point where lochs, mountains and sea combine to constrain movement to the west coast (Figure 46, *bottom*). Beyond this monolith, the presence of a second demi-island along the west coast, with known occupation dating to the Iron Age (Parker Pearson et al. 1996), as well as Loch Aineort, an adjacent sea loch stretching inland from the east coast, demonstrate strong similarities to the catchment setting of An Doirlinn. This suggests that the furthest sites connected to An Doirlinn may also represent the furthest extent of its catchment area, perhaps overlapping with another suitable catchment area in this region.

7.1.3 North Uist

The Barpa Sites

Barpa Langass and Bharpa Carinish are the two southernmost sites in North Uist, both of which are located adjacent to chambered tombs and exhibit a number of strong correlations in movement and connected sites, leading to their discussion together. Based on evidence for structural features, as well as a macroplant assemblage at Bharpa Carinish, both sites were interpreted as substantial occupation areas, although their comparatively minimal material assemblages suggest a certain level of temporality in contrast to the longevity of use evidenced at the more traditional coastal settlements. The primary difference between these two sites is their material assemblages, with Carinish revealing a large number of ceramic sherds in contrast to a minimal lithic assemblage and Langass revealing a large number of lithics (primarily quartz debitage) in contrast to a handful of sherds. Whilst no datable material was recovered from Langass, an Early Neolithic date was proposed by Ballin (2008, p. 8) based on the aphyric composition of a recovered pitchstone artefact as well as on lithic and ceramic typologies. With Carinish dated to 3300-2900 cal BC (Crone 1993, p. 370), this would thus indicate an overlap of activity at the two sites towards the end of the Early Neolithic.

The occupation area of Barpa Carinish is currently located towards the southwest of the island less than a kilometre from the intertidal sands of the North Ford, which dramatically alter the region from water-bound at high tide to sweeping sands at low tide (Figure 47, *top*). The settlement curves around the base of the small hillock on which the monument Caravat Barp sits roughly 15 meters to the south. Whilst Carinish is currently located in boggy moorland at the edge of croft land, radiocarbon dates demonstrate the earliest date for blanket peat expansion at the site to be during the Bronze Age (Crone 1993). In addition, the macroplant assemblage suggests the surrounding region would have been suitable for mixed subsistence practices, including cultivation and foraging (*ibid*, p. 376). However, substantial inundation in the region limits a more thorough understanding of the nature of the surrounding landscape as well as the site's connection to it.

The impact of the encroaching *Oitir Mhor* or 'Great Sandbar' is most evident in the North Ford causeway, the longest causeway in the archipelago at over 8 km long, stretching from Carinish to Benbecula and including three bridges (WIC 2019, North Ford Causeway) (Figure 47, *top inset*). Before this causeway was completed in 1960, movement between North Uist and Benbecula required either the use of a boat that moved at high tide between Carinish and Gramisdale, the end of the modern causeway in Benbecula, or by walking across the sands at low tide (*ibid*). Foot passage was limited to one hour on either side of low tide and further restricted by spring tides and severe weather, with the shifting of sandbanks during winter storms often requiring a local expert to trace new routes in the spring (*ibid*). The dangers of straying from the path have been repeatedly enumerated in historical accounts, which state that deviating a meter or two from the path could cause a person to fall into the quicksands and any delay meant submergence by the incoming tides (*ibid*). This route was thus marked by a series of cairns, allowing a safe and predictable passage across the roughly 6.5 km stretch of intertidal sands. Although the GIA models suggest that much of this submergence would have occurred between the Late Neolithic and Bronze Age, the encroaching sands would have no doubt significantly altered movement through the region throughout the Neolithic, eventually leading to the separation of the two islands as early as 3200 BC. Regardless of the temporality of submergence, such narratives of past movement serve to demonstrate the great impact the tides can have on not only seafaring routes but also terrestrial movement.

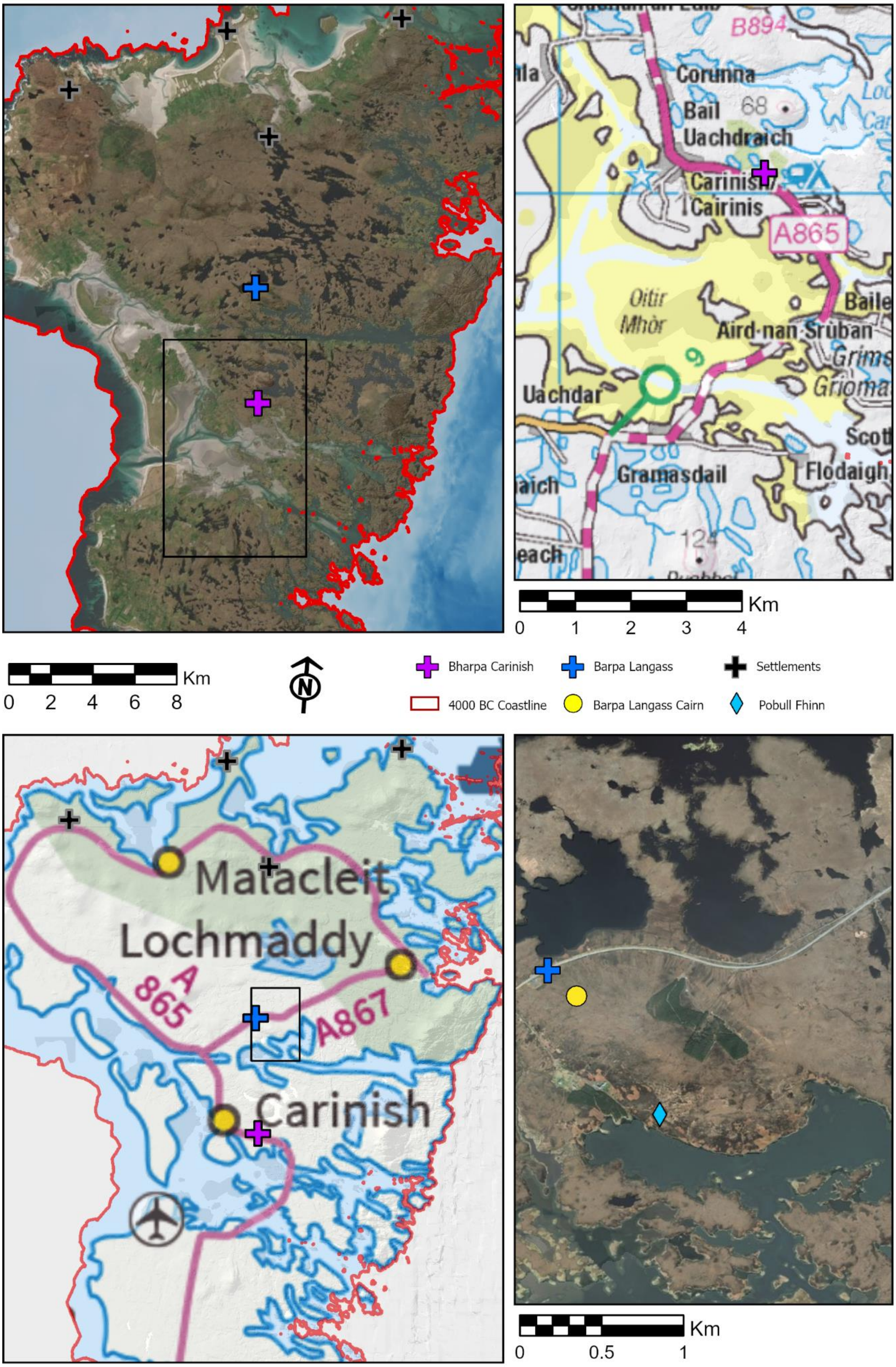


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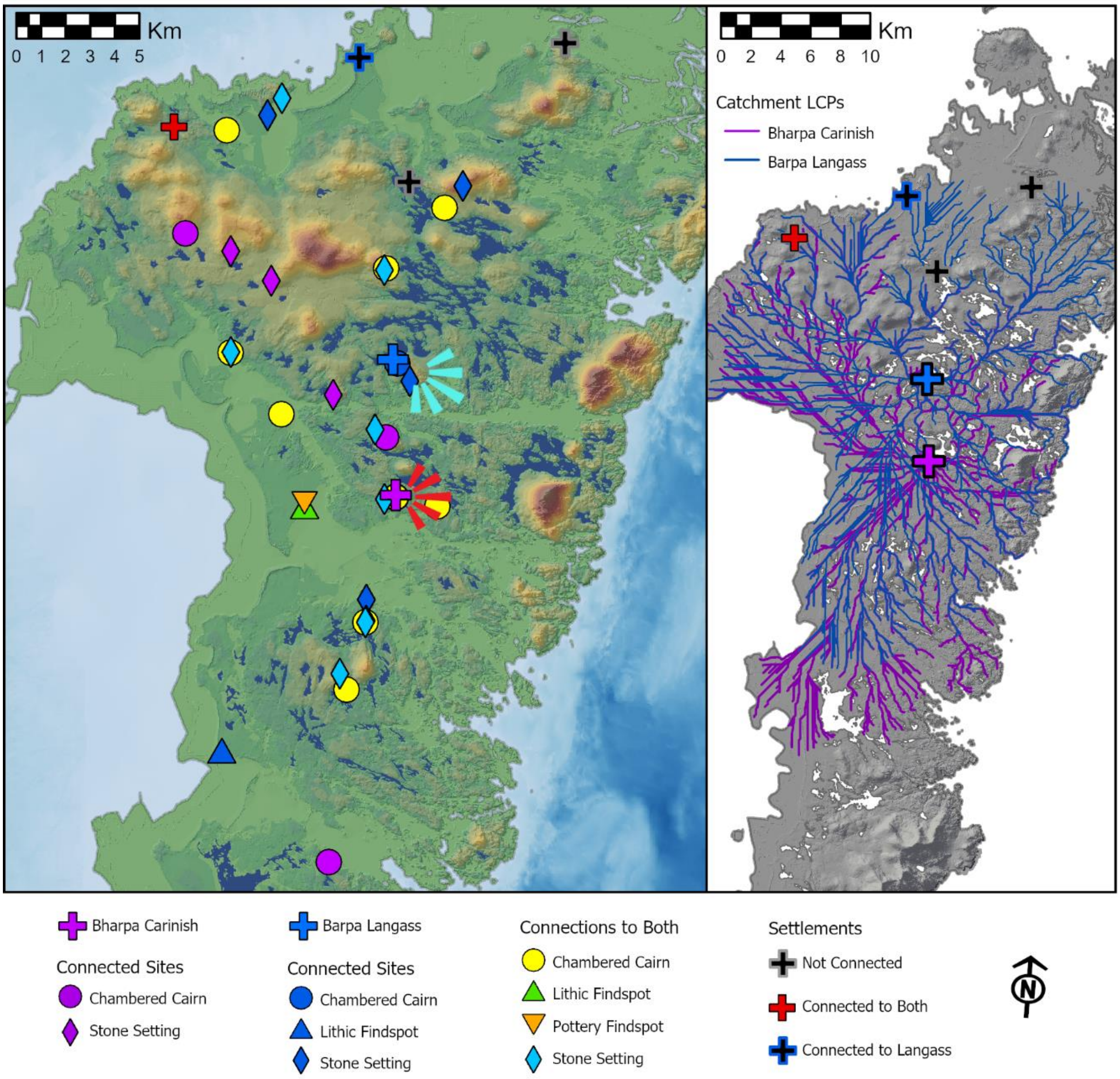
Figure 47. The location of Bharpa Carinish near encroaching machair sands (top) and Barpa Langass at the northwest base of Beinn Langais (bottom).

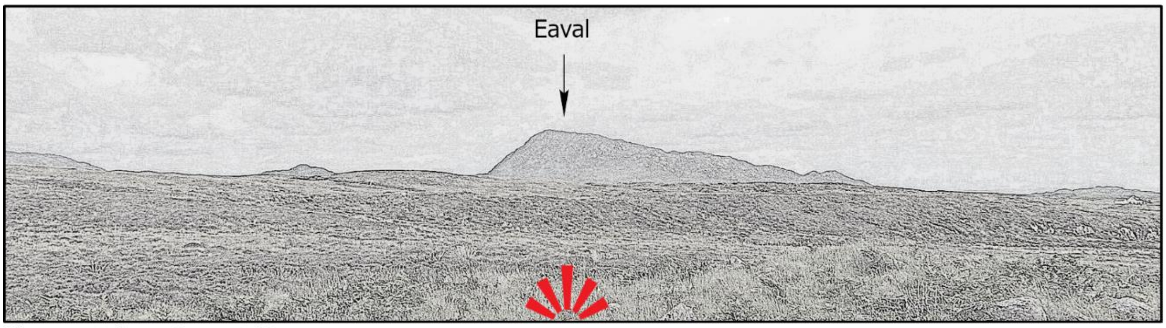
Located approximately 5.5 km to the north of Carinish, Barpa Langass resides at the northwest base of Beinn Langais, a prominent hill in the region, and approximately 235 meters from its eponym, which is located on its northwest slope (Figure 47, *bottom inset*). Whilst Beinn Langais largely restricts views from east to south, to the north the site overlooks the loch-filled interior of the island with the interior hills of North Uist dominating the skyline from west to northeast. Although the site is currently positioned deep within moorland, the Bronze Age dates for peat development at Carinish as well as its absence from under several chambered tombs in North Uist suggest that this later date for peat expansion may be applicable to Langass' period of occupation as well. Further, patches of woodland currently exist on the eastern and southwestern slopes of Beinn Langais, suggesting more extensive woodland surrounding the site during the Neolithic. Near the southwest patch of tree cover is a quartz vein that has been suggested to be the source of quartz recovered from Langass (Ballin 2008). The enduring significance of this quartz outcrop is evident in the later erection of Pobull Fhinn, a large irregularly shaped stone circle that overlooks Loch Langass to the south (see Figure 6). Although Langass produced no evidence for subsistence resources, the overall suitability of the surrounding landscape for resource procurement is thus evident.

The interpretation of these sites as substantial occupation areas, although of temporal confinement, is supported by their high terrestrial connections, ranking highest in the archipelago, as well as their strong associations with modern patterns of movement. Carinish is located 300 meters from the A865, which connects to the Berneray Causeway a kilometre further to the south, whilst Langass sits on the A867, the southern stretch of the main circular route around the island—its discovery in fact due to improvements of this road (Figure 47, *bottom*). Further, their respective catchment areas cover the largest extents of land in North Uist, with Carinish's catchment stretching from the islet sites in the north down to the northern tip of South Uist, covering a distance of approximately 32 km, and Langass' catchment stretching from the Udal and Screvan Quarry over 31 km to the south of Benbecula (Figure 48, *top right*).

This large area of accessible land may partially explain why these two settlements contain the greatest number of surrounding archaeological sites, at 49 sites for both, of which over half are connected to their pathways (Figure 48, *top left*). With 20 cairns residing within Carinish's catchment area, essentially 71% of all chambered tombs in the southern island could have been reached from this site in less than 5 hours. Further, all 10 of the cairns that are proximal to Langass' pathways are also connected to Carinish, with the exception of Barpa Langass' cairn itself. Thus, whilst strong connections between the two could be postulated based on their large number of similarities, an equally likely option is that these strong associations reflect similarities in context and use of these sites by different communities, which would have included their use for a variety of resource-based activities taking place around the chambered tombs as well as for broader



View southeast from Beinn Langass.



View east from Caravat Barp.

Figure 48. Barpa Langass' and Bharpa Carinish's connected archaeology (top left) and catchment pathways (top right), demonstrating high levels of overall connectivity; and views from their adjacent cairns (middle and bottom).

patterns of movement through the landscape. These strong associations in context are further evidenced by their positions within the wider landscape, both of which are located directly east of the two most prominent landforms on the island, with the top of Beinn Langass providing expansive views of the North and South Lees as well as Eaval to the southeast and the position of Caravat Barp providing a distinctive view of Eaval (Figure 48, *middle and bottom*).

Eilean Domhnuill

Eilean Domhnuill is located in Loch Olabhat towards the extreme northwest of North Uist. The loch is currently positioned between boggy moorland and machair sands, which are encroaching along its northern bank, and is furthermore located less than 200 meters from the A865, which forms the northern corridor of modern movement around the island (Figure 49, *bottom*). With the Neolithic coastline projected to have extended up to 800 meters from the current northwest coast and machair formation along the north coast suggested to have begun in the Mesolithic, Eilean Domhnuill's position may have enabled access to these fertile coastal plains within 20 minutes. Approximately a kilometre west of the site is the intertidal expanse of Vallay Strand, which separates the island of Vallay from North Uist at high tide. The fertility of this region is most evident in the current patches of woodland that exist along the shoreline as well as the rare Uist forest just inland of Vallay Strand, which could have been reached in under 40 minutes from Eilean Domhnuill. This reflects palaeoenvironmental work along the north coast, which has suggested the presence of more extensive woodland within the littoral zone of North Uist during the Neolithic. Further, with the palaeogeography suggesting the majority of submergence in this region to have occurred between the Late Neolithic and Bronze Age, extensive woodland cover and an overall fertile landscape around Vallay Strand, and thus Eilean Domhnuill, is likely.

Despite its marginal location, Eilean Domhnuill is the most connected site to the broader landscape after the Barpa sites. Its catchment area stretches southeast across North Uist stopping just short of the more rugged east coast, all of which could have been accessed within 4.5 hours, making it the most connected site to its catchment area in North Uist (Figure 49, *top*). This connection to the broader landscape is contrasted by its connectivity to the broader record. With only 35% of Eilean Domhnuill's catchment archaeology being connected to its pathways, this site is the second-least connected to its surrounding archaeology in the archipelago, after Eilean an Tighe. In addition, 12 out of 15 of these sites are located at a distance of 10 km or greater, the remaining three being located along pathways within an hour's walk from the islet. These sites include two standing stones, one located on the southeast coast of Vallay and the other residing at the southern foothills of the series of hills stretching northwest to southeast through the island, as well as the chambered tomb of Geirisclett (see Figure 49, *bottom*). As Eilean Domhnuill's use appears to have ended around the third millennium BC (Copper and Armit 2018), the site's connection to standing stones is more speculative; however, its connection to Geirisclett, a Clyde-type cairn now located at the high-water mark on the western extent of Vallay Strand, is more certain. This monument could have been reached within a half-hour and would have been approached from the west on the opposite side of its southeast-facing chamber, although a more refined understanding of movement to this monument is limited due to substantial inundation.

Three other chambered tombs are connected to Eilean Domhnuill's pathways, although at much greater distances. Two are severely disturbed, being again located at the high-water mark, this time along the southwest coast near the tidal islands of Kirkibost and Baleshare, and the third is Barpa nam Feannag, a long cairn located in the interior of North Uist. This monument is approximately 55 meters long and is oriented ESE to WSW. Whilst there is little evidence of a chamber, Henshall (1972, p. 503) has suggested it to be located towards the east at the widest and

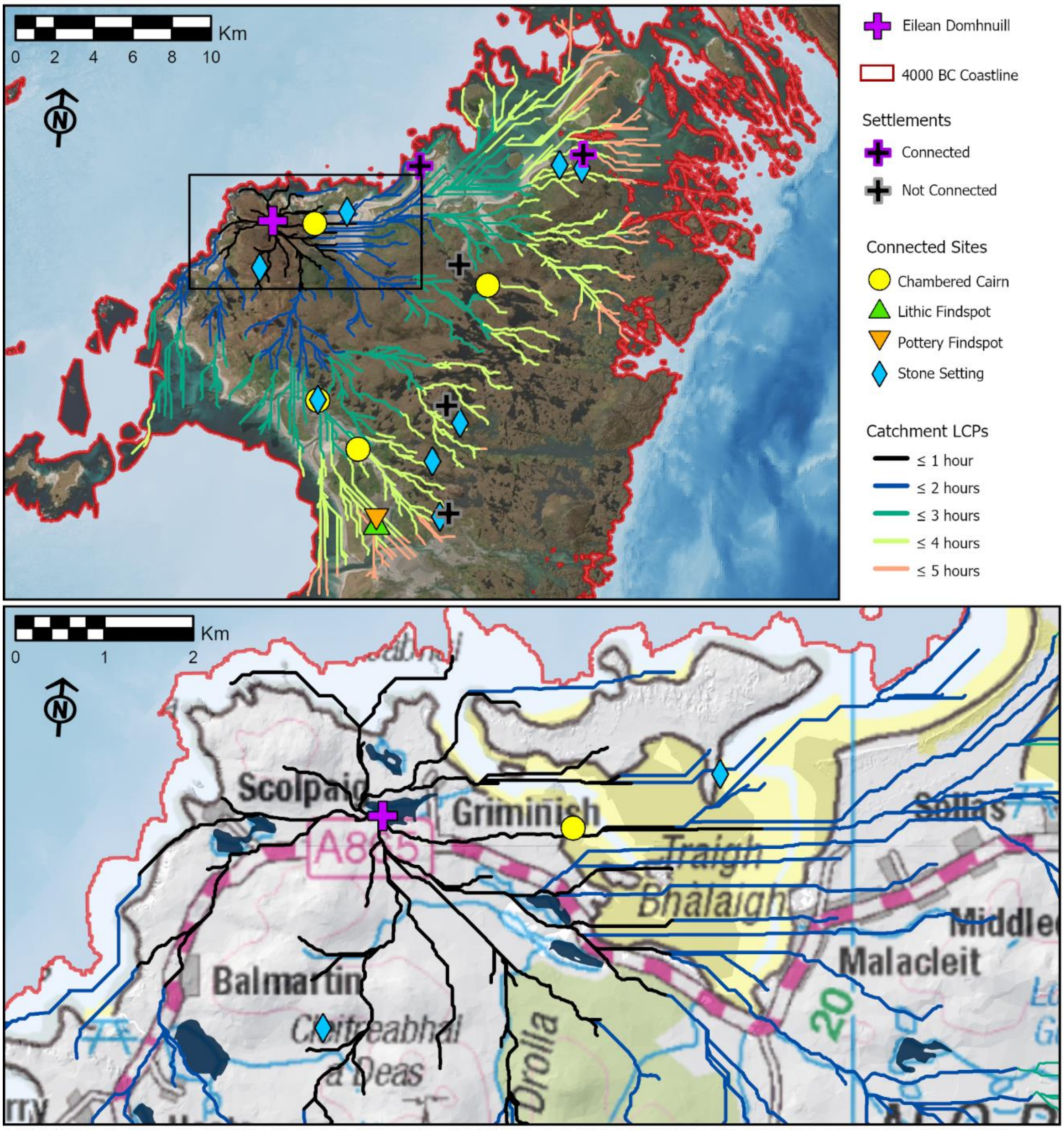


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Figure 49. Eilean Domhnuill's catchment pathways and connected archaeology (top) and current proximity to the encroaching intertidal sands of Vallay Strand as well as three connected monuments (bottom).

tallest end. The tomb is positioned at the southwest base of a large hill, which would have restricted visibility from the site to the northeast. However, expansive views from southeast to northwest include visibility of the Lees and Eaval as well as Marrogh, the easternmost hill in the series stretching across the interior of North Uist. Pathways from Eilean Domhnuill approach the site from the southwest, although a pathway also extends to within a kilometre from the northwest. Either way, both routes would have required the circumnavigation of Loch nan Geireann, the loch containing Eilean an Tighe.

Eilean an Tighe

Loch nan Geireann is, much like Loch Olabhat, primarily surrounded by boggy moorland with machair sands encroaching from the north and furthermore is located less than 200 meters from A865 (Figure 50, *top inset)*. Whilst the encroaching intertidal sands having breached its northern bank, subsequently turning it into a tidal loch (Murray and Pullar 1910, p. 190) and positioning the modern coast within 200 meters of the site, substantial inundation in the region may have resulted in an Early Neolithic coastline over 5 km distant. In contrast to Loch Olabhat, Loch nan Geireann is far more extensive; at over 12 times its size, the loch contains numerous other islets and has a far more complex shoreline. With excavations dating to the 1950s and a long history of conflicting interpretations, the current understanding of this site leaves much to be desired. This ambiguity is reflected in the terrestrial analysis and the site's connection to the surrounding landscape and broader record. Given the islet's greater distance from the shore compared to Eilean Domhnuill as well as the high cost value assigned to lochs, the pathways first needed to move to the loch bank, choosing, in almost all instances, the nearest bank directly north of the site. Whilst this is conducive for movement northward, it created much longer, often circuitous, routes to the south. If, however, a watercraft was necessary to reach the banks (as no causeway was apparent during excavations), then any number of places along the shore could have been used to start the journey. Alternatively, if loch levels were substantially lower during the use of the site, as suggested by the damming of the loch as well as inundation, then, as suggested by Scott (1951, p. 2), the islet could have been connected to the promontory Ard Reamhar via a causeway, which would thus connect the site to the north bank as suggested by the models.

Regardless of its potential connection to the shore, it is clear that the use of watercraft through this loch would have considerably benefited movement around the site. Comparisons between Eilean an Tighe's LCPs traversing and avoiding lochs allowed for a greater understanding of the potential benefits of using watercraft within this loch, which would have allowed for substantial movement through the loch, up to 2.5 km, thereby significantly reducing the overall length of routes. In addition, the current southern extent of the loch sits less than 300 meters from the northern extent of Loch Scadavay, the largest loch by area on North Uist (Figure 50, *bottom left*).

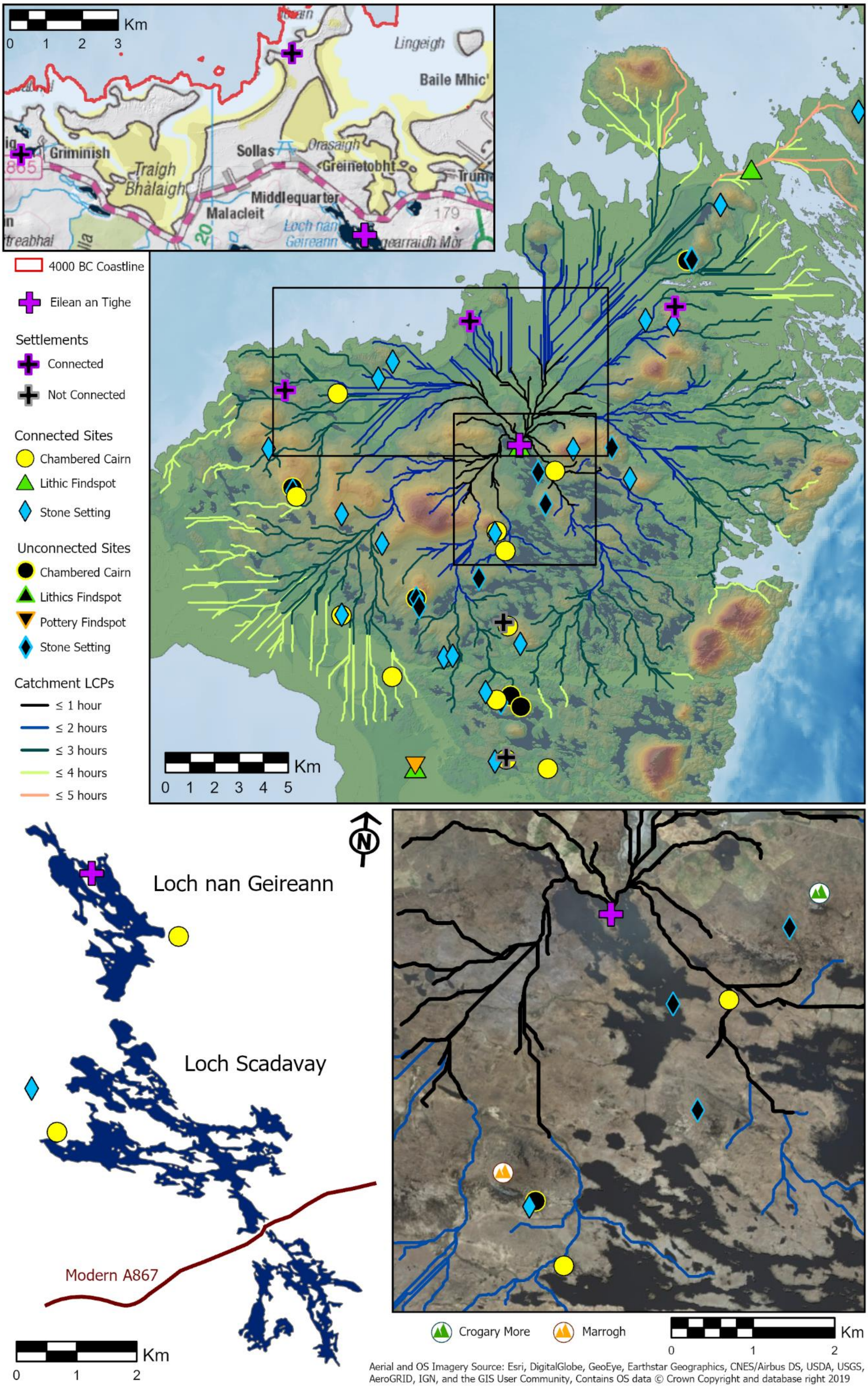


Figure 50. Eilean an Tighe's catchment pathways, connected and unconnected archaeology (top) and its position within the Neolithic landscape (top inset); as well as within a constrained topographic and littoral setting (bottom).

According to Murray and Pullar (1910, p. 188) in their chapter on the lochs of North Uist, written as part of the first comprehensive bathymetric survey of Scottish lochs, 'there is probably no other loch in Britain which approaches Loch Scadavay in irregularity and complexity of outline.' The loch stretches over 7 km in length, occupies an area of *c*. 4.6 km^2 and contains a total shoreline of 80.5 km, producing 'an extraordinary labyrinth of narrow channels, bays, promontories and islands' (*ibid*). As it is this loch that presents the greatest challenge to terrestrial movement through North Uist, the use of watercraft through it would have offered significant advantages. Also of note is a narrow channel roughly 25 meters wide that divides the loch into north and south. This channel serves as the crossing point for the A867, providing access between Lochmaddy and the southwest of the island, and was also used as the crossing point for all modelled pathways from Barpa Langass to the northeast. Hence, the use of this inland waterway would have enabled much greater connectivity through the interior of the island; however, as the modelled pathways either included movement through all lochs or none, the potential cost benefits of using these two lochs alone for movement cannot be further dissected and explored.

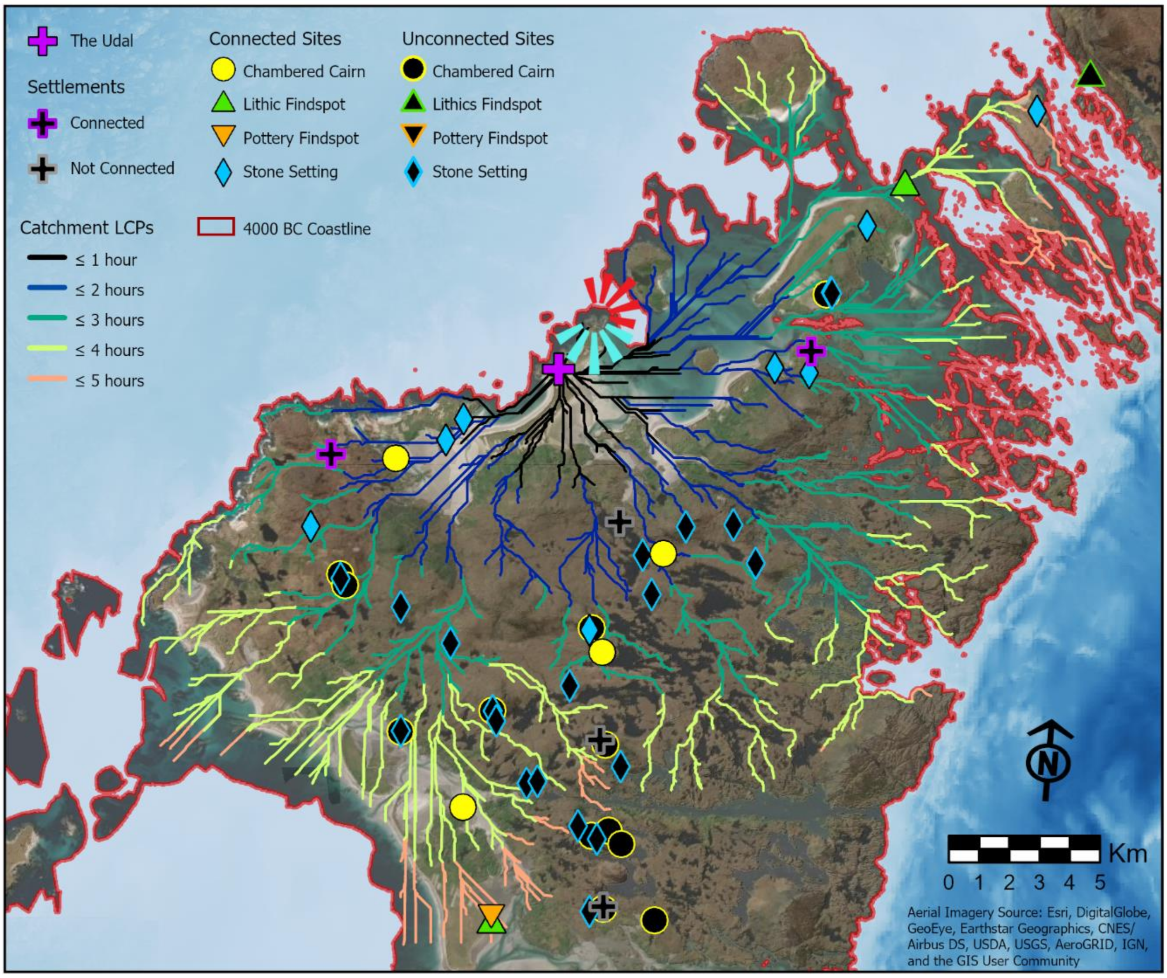
Returning to the routes avoiding lochs, the catchment area for Eilean an Tighe covers the northern extent of North Uist down to Baleshare to the west and Loch Eport to the east (Figure 50, *top*). Of the 43 sites that exist within its catchment area, only 30% of these are connected to its pathways, the lowest percentage of any Hebridean site. However, the distribution of connected archaeology highlights a *y*-shaped pattern of connected sites, with the long arm connecting to stone settings, a lithic findspot (the purported location of an ovoid mace-head found in the Sound of Harris) and Screvan Quarry in the northeast and extending down to Carnan nan Long on Baleshare in the southwest (one of the intertidal cairns connected to Eilean Domhnuill's pathways). The short arm stretches northwest from Eilean an Tighe towards Eilean Domhnuill and includes Geirisclett and the two standing stones connected to this site. Eilean an Tighe also connects to the Udal to the north, which could have been reached in under 2 hours. With only Early Neolithic dates recorded at the site and the end of its use indicated to be several centuries before the start of the Late Neolithic, again any connections to the Late Neolithic record are conjectural.

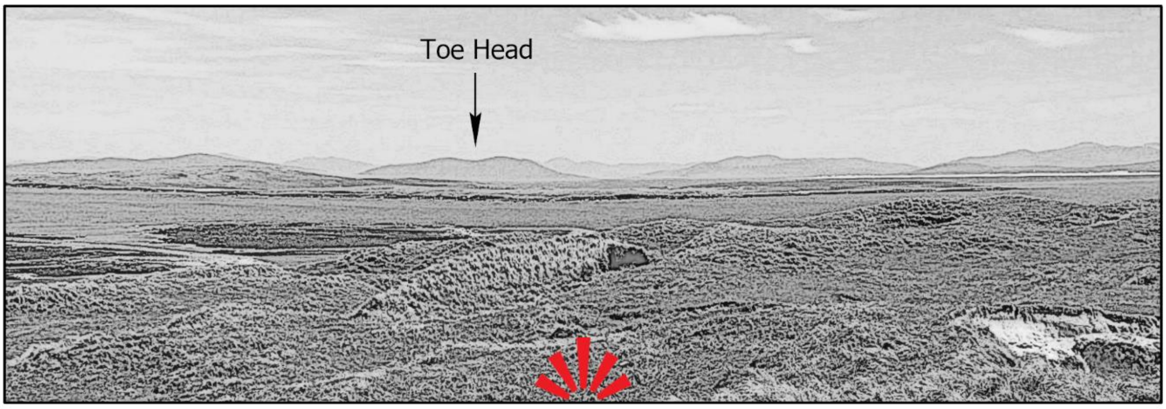
In addition to the two intertidal tombs, Eilean an Tighe is also connected to two inland chambered tombs. The previously mentioned long cairn of Barpa nam Feannag could have been reached by a half hour's walk or via a 1.6 km journey through Loch nan Geireann to its easternmost shore and a short 215 meter walk due east from there, in both scenarios approaching the monument from the west or northwest, much like movement from Eilean Domhnuill (Figure 50, *bottom*). The other connected cairn is Airidh Nan Seilicheag, a highly disturbed and stone robbed cairn located approximately 3.5 km south of Eilean an Tighe between Marrogh and a western branch of Loch Scadavay (see Figure 50, *bottom*). This cairn was initially suggested by Henshall (1972, p. 496) to be a long cairn aligned WNW to ESE with a suspected chamber on the west side; however, its form was later revised through field survey to be circular in shape, although the unusual west-facing chamber appears to be valid (Canmore 2019, Airidh Nan Seilicheag). From Eilean an Tighe, this monument could have been reached in less than 1.5 hours walk, approaching it from the north or northwest. However, the route to it would have not only been challenging but also made the monument invisible on approach, an unusual phenomenon for connected tombs thus far analysed. Alternatively, if the monument was approached via Loch Scadavay, it would have been prominent on approach from the south or southeast. Thus, despite Eilean an Tighe's limited connections, the position of the site highlights the potential use of inland waterways for movement, an additional method of movement that could have subsequently enabled the site's greater connectivity.

The Udal

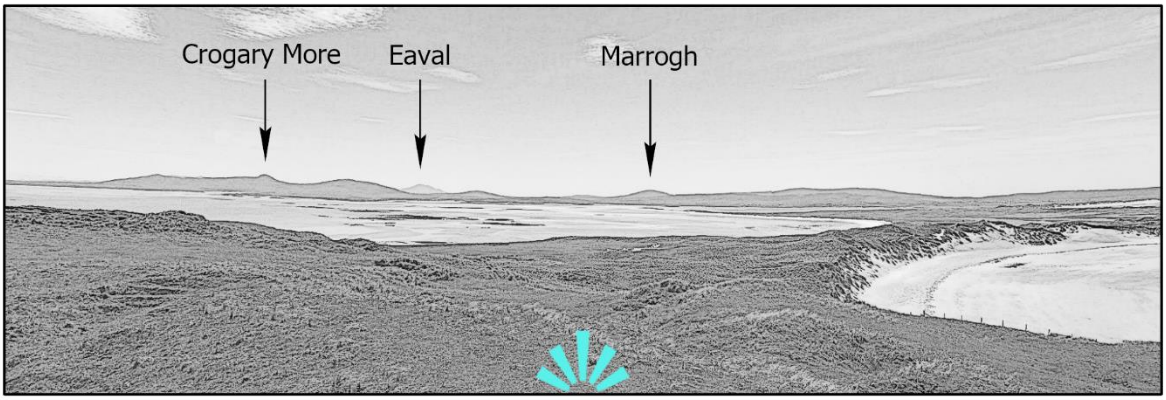
Despite the heavy concentration of Neolithic sites in North Uist, the Udal is the only known coastal settlement on the island; its long duration of use and extensive material record reflects that of other coastal settlements. Moreover, the site has also experienced considerable erosion, leaving it positioned on a narrow peninsula jutting into the Atlantic (see Figure 50, *top inset*). To the southwest sits the intertidal sands of Vallay Strand and to the southeast the encroaching sands near Loch nan Geireann. With the entire northern coast projected to have suffered from considerable inundation throughout the Neolithic, along with evidence for broad scale machair deposition during the Mesolithic, much of the region surrounding the Udal, both intertidal and inshore, may have existed as fertile coastal plains during the Early Neolithic. This is supported by the settlement's location on pre-machair deposits (Ballin 2018), and thus the site may have been situated inland of machair sands even during the Late Neolithic. Floral and faunal remains from the site revealed a mixed reliance on marine and domesticated resources, and whilst the fertility of the region surrounding Vallay Strand has already been discussed, animal husbandry would have required the use of the broader landscape for grazing and perhaps overwintering.

This connection to the broader landscape is evident, firstly, in the visibility from the site. The low-lying Udal peninsula provides expansive views in all directions, including Toe Head and the mountains of Harris to the north as well as the more distant landforms of North Uist, most notably the conical knoll that forms the summit of Crogary More, one of the series of hills backing Barpa nam Feannag, and more distantly, Eaval (Figure 51, *middle* and *bottom*). This connectivity to the broader landscape is also evident in the Udal's catchment area, which covers the full northern extent of the island and stretches to Baleshare in the southwest and the northern banks of Loch Eport to the southeast (Figure 51). However, whilst this area includes the majority of sites in North Uist, pathways from the Udal are only connected to 39% of these sites, the third lowest in the archipelago after the two islet sites.





View northeast from the Udal Peninsula.



View south from the Udal Peninsula.

Figure 51. The Udal's catchment pathways, connected and unconnected archaeology (top); with sweeping views from the Udal peninsula to the north (middle) and south (bottom) demonstrating its greater visual connectivity to the north of North Uist.

Connected sites include much of the record to the north and, most notably, all but two of the sites connected to Eilean an Tighe, highlighting the same northeast to southwest distribution of connected sites as well as the same group of monuments around Eilean Domhnuill. Although the Udal is only connected to Eilean Domhnuill, strong similarities in connected sites likewise suggest strong associations in patterns of movement between this settlement and both of the islet sites. However, the severe erosion that has occurred at the site not only limits a greater understanding of its landscape setting but has also impacted both the materials recovered and the ability of excavators to analyse and date them. As such, whilst the existence of earlier Neolithic, and even Mesolithic, phases has been suggested, only dates from the Late Neolithic have been recorded. These later dates thus make it difficult to assign too much significance to its relationship with Early Neolithic sites. In contrast, however, its connection to the Late Neolithic record does not appear to be any stronger than its connection to Early Neolithic sites, and further, the settlement is connected to the same number of both chambered tombs and standing stones as the two islet sites. Thus, this analysis of movement further supports the use of this site in the Early Neolithic as well as its connection to the islet sites.

Screvan Quarry

Screvan Quarry is the located to the extreme northeast of the island. Much like the Udal, it is a site surrounded by substantial inundation, which is projected to have occurred predominately between the Late Neolithic and Bronze Age. Located on the east coast of Rubh'a'Charnain Mhoir peninsula, which connects North Uist to Berneray via the Berneray Causeway, the site is currently positioned around 50 meters from the coast. However, its location within the Neolithic landscape is projected to have been up to 3 km from the sea (Figure 52, *top*). Whilst its structural remains, large material assemblage and radiocarbon dates have led to its interpretation as an occupation area, the site appears rather anomalous within the broader settlement record of North Uist. Its setting and suggested single phase of occupation most readily contrasts other coastal settlements with their long history of occupation of reuse and its surrounding topography restricts both visibility and movement considerably; although the distant mountains of Harris are visible to the north, its position to the north of the prominent Beinn a' Chaolais, restricts views south to North Uist.

Its anomalous nature is further supported by its apparent isolation from both the surrounding landscape as well as the broader record of activity. Its catchment area covers the smallest extent of land of any site in North Uist, stretching from the northeast coast down to the banks of Loch Eport in the southeast but falling short of much of the west and southwest coasts (Figure 52, *bottom*). The site is also the least connected by any measure in North Uist. The total number of sites existing within its catchment area is nearly half that of the Barpa sites, and its proximal sites are less than half of that, resulting in a total of 11 connected sites out of 26 surrounding, or one more than An Doirlinn, which only contained 18 sites within its catchment area. Also of note is Screvan Quarry's

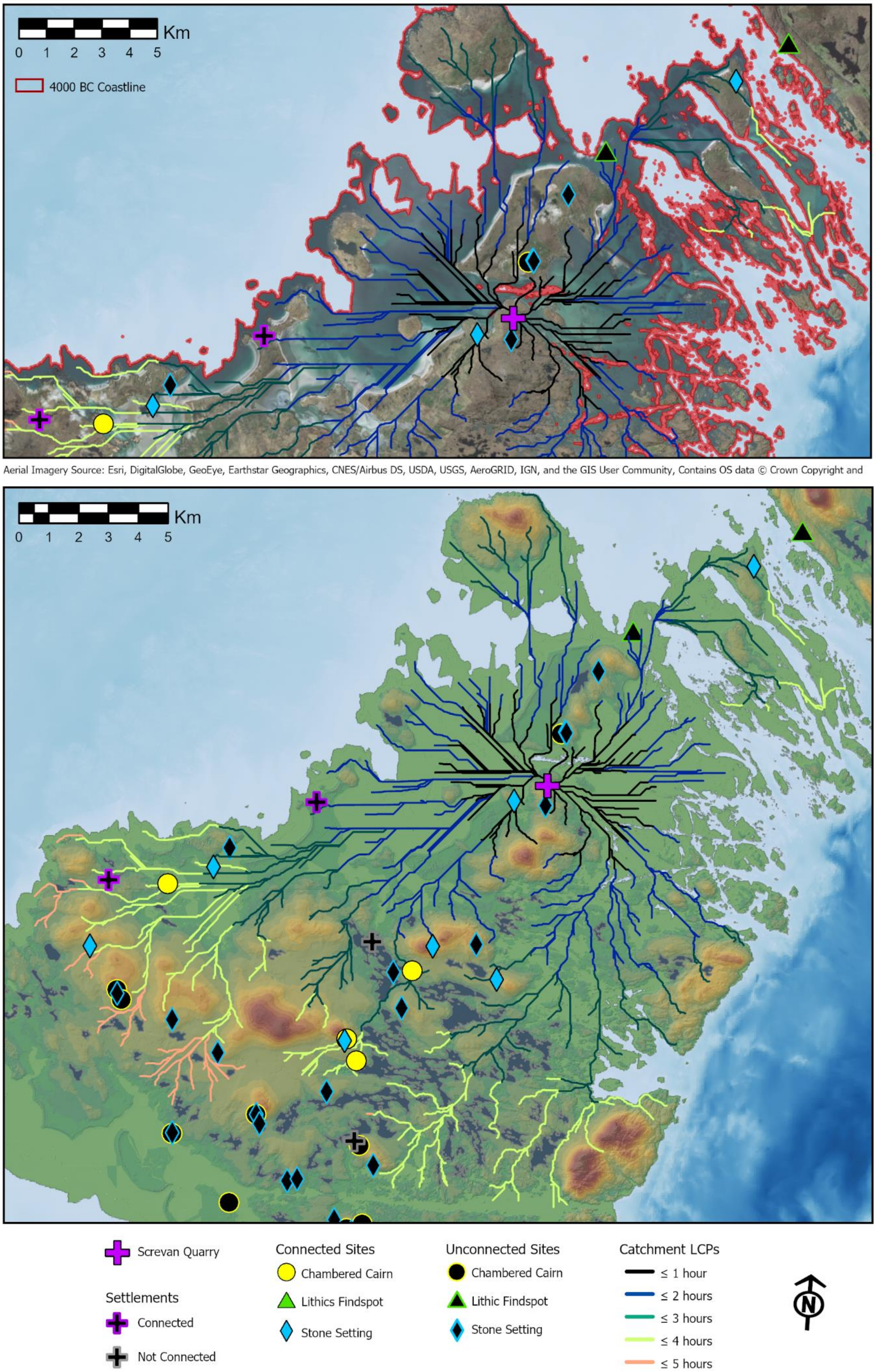


Figure 52. Screvan Quarry's central position within a substantially inundated landscape (top); and its catchment pathways and connected archaeology demonstrating the strong topographic barriers to visibility and movement (bottom).

limited connection to sites within the more immediate landscape. Four standing stones and one chambered tomb exist within a radius of 2 km from Screvan Quarry, and yet only one monolith is connected to its pathways. However, it must be emphasised that similar to the Udal, a more refined understanding of movement through the surrounding landscape is limited due to substantial submergence. Nevertheless, Screvan Quarry is connected to the same *y*-distribution of sites, including Barpa nam Feannag near Eilean an Tighe and Airidh Nan Seilicheag on the banks of Loch Scadavay, as well as the same group of monuments around Eilean Domhnuill. Thus, whilst the context and use of this site are unclear, its position does highlight the same patterns of movement evidenced within the broader settlement record, suggesting a connection to these northern sites, at least through patterns of movement.

7.1.4 Northton

Northton, much like An Doirlinn, is a site largely isolated from denser concentrations of activity; its connection to the rest of the northern island is restricted by distance and topography. As typical for coastal settlements, the site is currently positioned in machair, and although the site has clearly suffered from erosion, unlike other coastal sites, limited inundation is projected to have occurred around it, with an Early Neolithic coastline ranging in extent from *c*. 300 to 900 meters from the present coast. However, the potential loss of earlier Neolithic phases has been suggested along with the reuse of an earlier Mesolithic site (Simpson et al. 2006), and thus, like the Udal, this settlement is one of great importance, with potential for revealing not only the earliest activity in the archipelago but also the relationship between Mesolithic inhabitants and the emerging Neolithic. Much like Screvan Quarry, its location would have provided expansive views south over the Sound of Harris and the more prominent landforms of North Uist, yet Toe Head, the prominent headland north of the site, would have restricted visibility to the north, leaving only the southern coast of south Harris and its prominent mountains visible. Despite this estrangement from the broader landscape, the settlement's large and varied faunal assemblage reveals a landscape of great suitability, with a heavy reliance on both wild and domestic resources suggesting a mixed strategy of hunting, fishing, gathering and possibly barley cultivation (Gregory and Simpson 2006).

Whilst Northton's connectivity to its catchment area is as high as most sites, the overall accessible landscape is much smaller. Its catchment stretches around 18 km or 4 hours walk to the north, essentially covering the whole of the west coast of south Harris, ending at Luskentyre Bay at the southern foothills of Beinn Dhubh, a large intertidal bay that is projected to have suffered from considerable inundation by the Late Neolithic (Figure 53). Around Luskentyre Bay and within sheltered valleys along the west coast, pockets of woodland still exist, demonstrating along with substantial machair plains, the greater fertility of the west coast. To the east, Northton's catchment area covers the whole length of the southern coastline, just short of Rodel on the southeast coast. Much like Barra, the rugged massif interior has constrained modelled pathways to the coast, with inland routes following various valleys from the west coast. In addition, the area highlighted by Northton's cost catchment strongly reflects modern movement, with the main road around the island running from Rodel to Northton along the south coast and Northton up to Luskentyre Bay along the west coast before moving inland then north to Tarbert (Figure 53, *OS map*).

This pattern of movement also reflects the archaeological record with all but one extant site in south Harris being located along the west coast. However, the total number of sites within Northton's catchment area is minimal compared to all other analysed sites, at only six, of which five are connected to Northton's pathways. This includes the findspot of a carved stone ball along

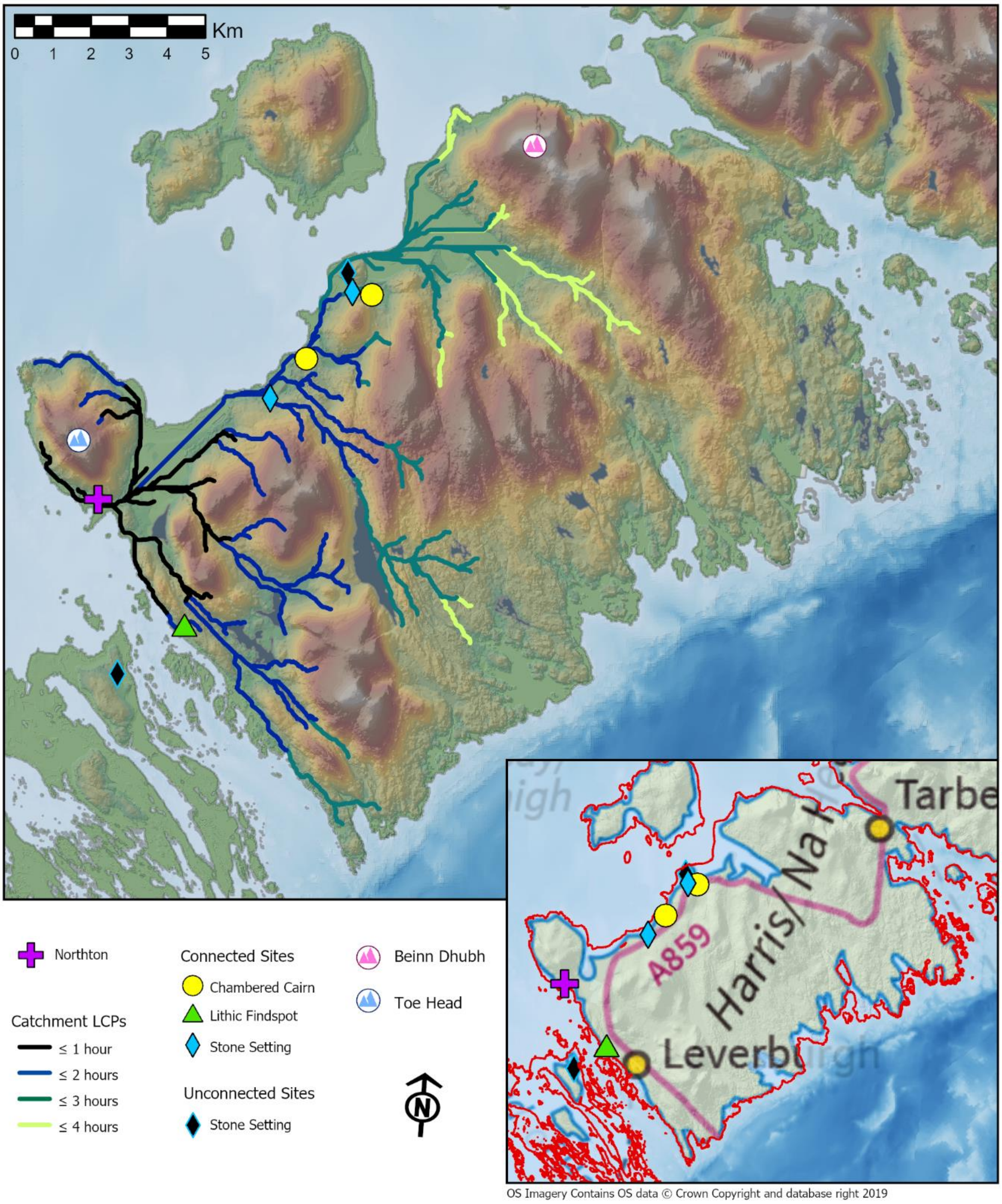
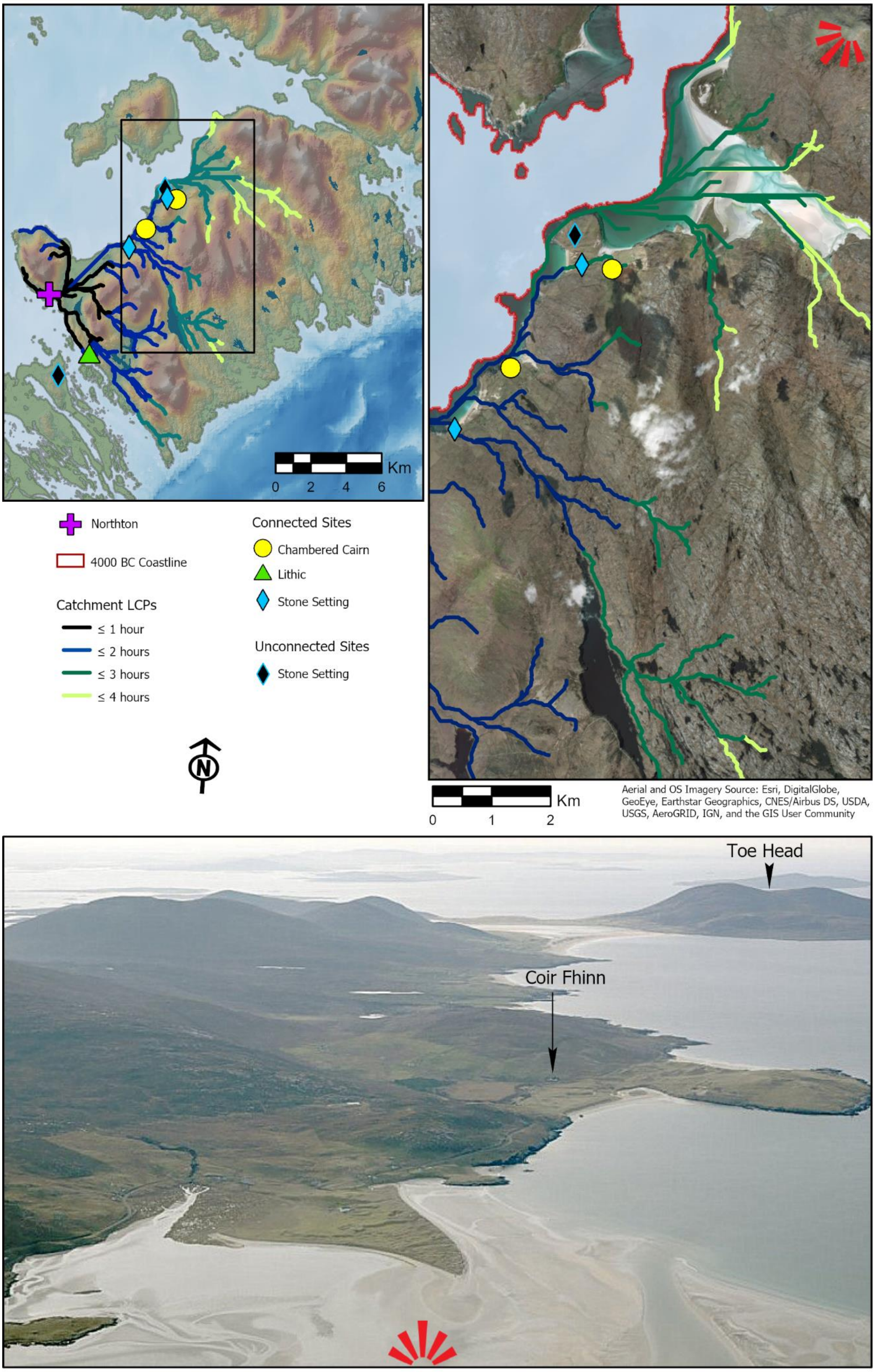


Figure 54. Northton's catchment pathways and connected archaeology (top) compared to modern movement through south Harris (bottom).

the south coast near Leverburgh as well as two chambered tombs and two stone settings on the west coast. Whilst the two cairns are severely overgrown and disturbed, they present unusual characteristics. The nearest is Borve, located in machair just over 30 meters from the coast or perhaps 275 meters from the Early Neolithic coast (Figure 55, *inset*). An RCAHMS field visit in 2010 identified the possible remains of an east-facing chamber, although a number of oddities not typical of a Hebridean passage tomb were also noted (Canmore 2019, Harris Borve). The journey to this monument would have taken 1.5 hours, following along the coast and approaching the cairn from the west, although its current position in eroding machair sands limits a more refined understanding of movement to the site.

The second chambered tomb is Coir Fhinn, located on the northeast base of Cleit Niosaboist, a hill which connects to Aird Niosaboist, a prominent headland on which the lone unconnected standing stone of Clach Mhic Leoid is located (see Figure 55, *inset*). The site is roughly 250 meters from the current coastline but may have been as much as a kilometre from the Neolithic coast. The monument has been severely disturbed, and little remains of the chamber or deposits within it as the site was cleared by locals in the late-19th century and furthermore is now positioned in the garden of a Bed and Breakfast within 5 meters of the A859 (Henshall 1972, p. 430; Canmore, Coir Fhinn). From Northton, this tomb could have been reached in under 2.5 hours, with pathways moving along the west coast and passing between hill and headland, and simultaneously two standing stones, to approach the site from the northwest. However, along this route, the monument would have remained obscured by Cleit Niosaboist until within a few hundred meters. Alternatively, if the monument was approached from the now submerged region of Luskentyre Bay, it would have been visible, if not prominent, along this route and furthermore would have marked the entrance to Horgabost Valley, one of the sheltered valleys containing extant woodland (Figure 55, *bottom*). Indeed, the position of the two chambered tombs to the north and south of Cleit Niosaboist hints at their respective associations with Luskentyre and Northton, with the headland and its unconnected standing stone serving as the transition point between the two.

The second connected standing stone may have been part of a stone circle and is located 4 meters from a pathway that would have provided access to Loch Langabhat. Literally translating from Old Norse to 'long water', this long slender loch sits at an elevation of 48 meters and stretches over 4 km from north to south through the rugged interior. The position of this stone circle may have thus been related to this route through the interior of the island, marking the turning point for movement from the coast. Whilst Loch Langabhat may have been significant for its resources during the Neolithic, in modern history, local folklore has highlighted the strong esoteric associations of this loch and a small, partially artificial, island within it, known as Eilean na Caillich (McIntosh 2016, p. 61). Translating to the 'island of the holy old woman', the name of this islet



View southwest from Beinn Dhubh overlooking the west coast of south Harris (Image from RCAHMS 2011).

Figure 55. Connected chambered tombs and stone settings along the west coast and their potential associations with Loch Langabhat (inset) and Luskentyre Bay (bottom).

and the mystical associations attributed to it may be derived from earlier associations between this site and a medieval church established at Rodel (*ibid*). Thus, whilst no Neolithic islet sites have been recorded in Harris, the enduring significance of loch islands throughout the archipelago suggests the possibility of Neolithic islet sites within south Harris as well (see also Lenfert 2012, p. 57). Regardless of the potential use of upland lochs, the modelled pathways, their connected sites and the overall abundance of resources recovered from the settlement suggest the use of the entire west coast of south Harris by occupants of Northton and further highlight the potential use of Luskentyre Bay, perhaps by the same community or another strongly connected one.

7.1.5 Lewis Islets

Whilst research into the Lewis islet sites is still in its early phases, terrestrial and underwater survey work has already produced large quantities of pottery as well as radiocarbon dates. Due to their strong assemblages and an overall absence of more definitive occupation areas in Lewis, these islet sites were included in the analysis, with Loch Arnish further allowing for an analysis of movement to the east coast of Lewis. Due to their proximity, the two western sites demonstrate a strong number of similarities that further serve to distinguish them from the differing context of Loch Arnish. The two western sites are located to the northeast and southeast of Loch Carloway. Whilst they are currently located within moorland, they are within a few hundred meters of croft land, which is interspersed around the coast of Lewis. Although the variety of complex factors affecting loch levels have already been demonstrated at the North Uist sites, evidence from these two sites suggests that loch levels would have been much the same at the time of their construction (Garrow and Sturt 2019, p. 671). Further, these sites revealed a number of contrasts to Eilean Domhnuill, being artificial with no immediate evidence for Neolithic structures and producing large quantities and fragments of deposited pottery from the loch bed (*ibid*). Given the many distinctions already noted between the northern and southern islands, such differences between islet sites could also be added to the list, although their consistent context and overlapping radiocarbon dates suggest an overall uniformity of the islet conception.

Due to their less than 3 km distance from each other, the catchment areas of the two western sites largely overlapped, covering a radius of around 16 km which includes much of the southwest region of the north Lewis plateau, all of which could have been reached within 4 hours (Figure 56, *top*). To the north, Loch Langabhat's catchment area overlaps with catchment pathways from Dunasbroc near Barvas, and inland, the catchment areas of both sites overlap by as much as 5 km with that of Loch Arnish. All three sites thus demonstrate the highest levels of connectivity in the north, with Loch Borghastail repeatedly exhibiting the highest measures. The overall accessible land area, which is comparable to that of the Barpa sites, thus suggests a greater connection to the wider landscape that is contrasted by their lower connections to the broader settlement record.

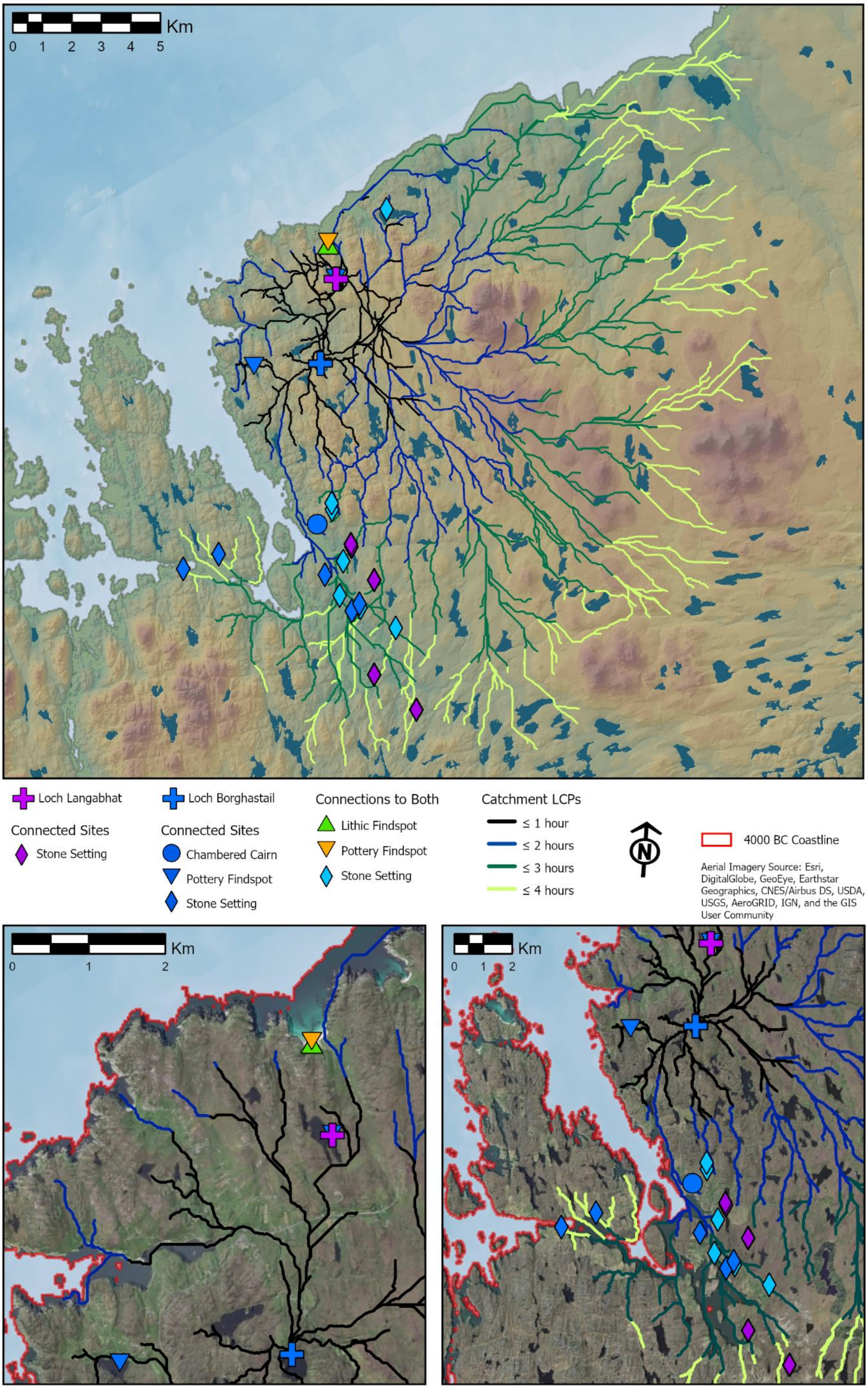


Figure 56. Loch Langabhat's and Loch Borghastail's catchment pathways and connected archeology (top) and potential assocations with Dalmore Beach (bottom left) and Callanish (bottom right).

Further, with the region being dominated by Late Neolithic sites and only Early Neolithic dates indicated at the islet sites, it is unclear how these islets relate to the broader archaeological record; the 13 out of 28 standing stones connected to Loch Borghastail's pathways contrast the 1 out of 3 connected chambered tombs. Little is known about these monuments due to limited levels of preservation and minimal investigations of them; however, the single connected cairn of Breasclete is also the only chambered tomb to have been definitively identified (Henshall 1972, p. 460). In contrast, Loch Langabhat's pathways are only connected to standing stones, along with lithic and pottery finds from Dalmore Beach (also connected to Loch Borghastail), less than 2 km to the northwest (Figure 56, *bottom left*). This site could have been reached within a half-hour from Loch Langabhat and in just over an hour from Loch Borghastail, and although Dalmore has only revealed evidence for Bronze Age occupation (Armit 1996), the use of this rare sandy beach on the west coast of Lewis for both terrestrial and maritime movement suggests a strong connection between the western islet sites and Dalmore. However, the most apparent connection to archaeological sites occurs around Callanish (Figure 56, *bottom right*). Despite its Late Neolithic ceremonial context, Callanish is another site with earlier Mesolithic origins (Bohncke 1988; Bishop et al. 2013; Ashmore 2016), and radiocarbon dates indicate its potential contemporaneity with the islet sites during the Early Neolithic (Ashmore 2016), although they appear to have gone out of use before the more extensive monolith building phase of the Late Neolithic.

In contrast to the western sites, Loch Arnish reveals a much different context as well as associated archaeology. The loch is located inland of Arnish Point, a headland forming the sheltered waters of Stornoway Harbour, and is less than 150 meters from the modern coastline, or 200 meters from the Early Neolithic coast. The importance of the site is indicated by its multi-period use which creates a complex picture of activity and limits any greater understanding of its Neolithic phases without more intensive investigations (Garrow et al. 2017b). Although the loch is currently situated in moorland, its proximity to the rare sedimentary deposits around Stornoway and the Eye Peninsula would have placed it within an hour's reach of this more fertile landscape.

More than any other site in the northern islands, Loch Arnish appears to be highly connected to patterns of movement. Its catchment area stretches around 17 km to the north and northwest and over 15 km inland, covering the whole of Stornoway and most of the Eye Peninsula to the east and just reaching the northwest banks of Loch Seaforth (Figure 57, *top*). Despite this large extent of accessible land, the majority of its catchment area could have been reached within 5 hours, making Loch Arnish is the most connected site to its catchment area of any in the archipelago, after Allt Chrisal, and the most connected to the broader settlement record of Lewis. With 68% of the 19 surrounding sites connected to its pathways, Loch Arnish is also one of the most connected sites to its surrounding archaeology. In contrast to the other two islet sites, this archaeology includes six chambered tombs, of which three are connected to its pathways, and only five standing stones.

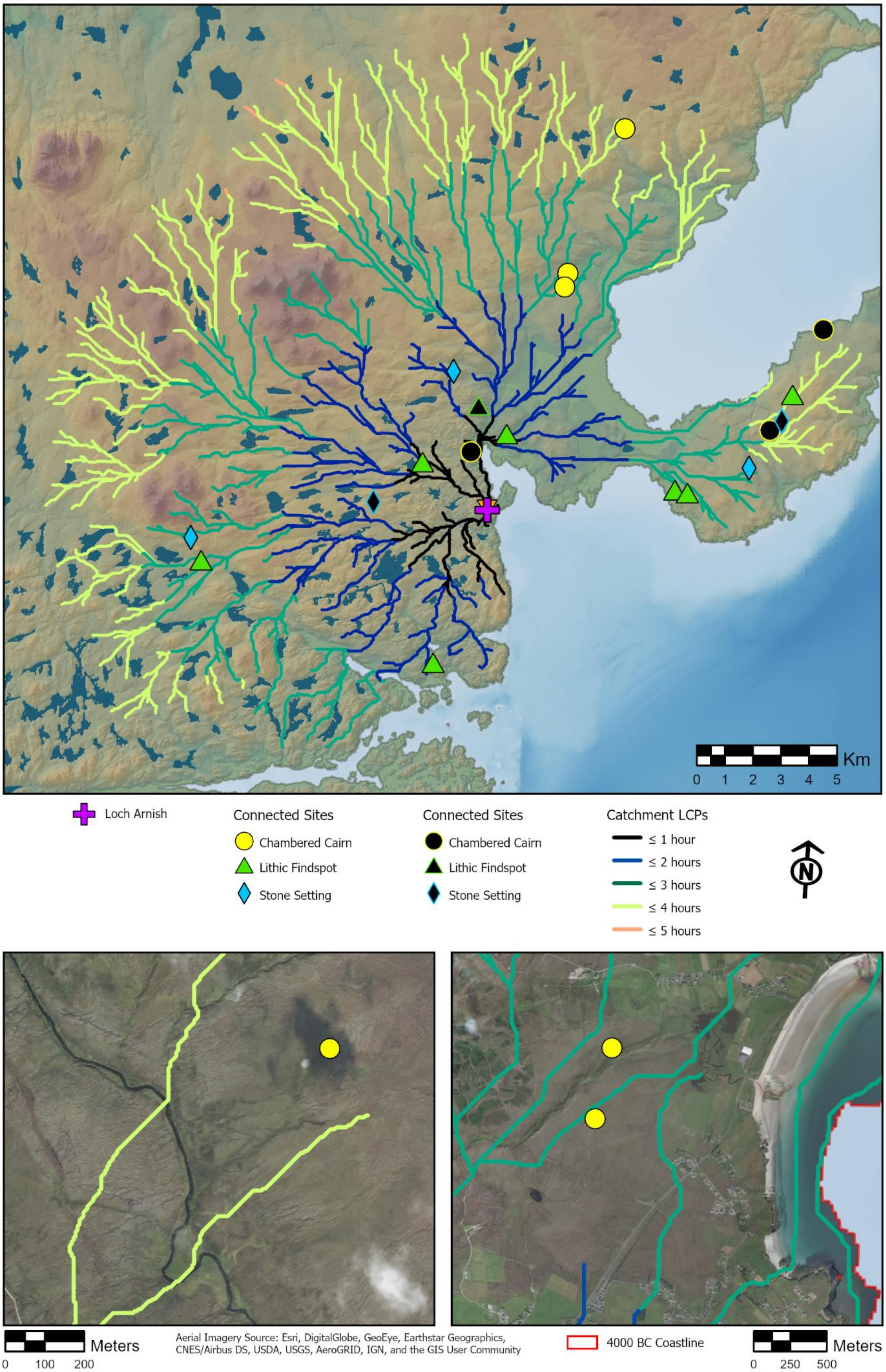


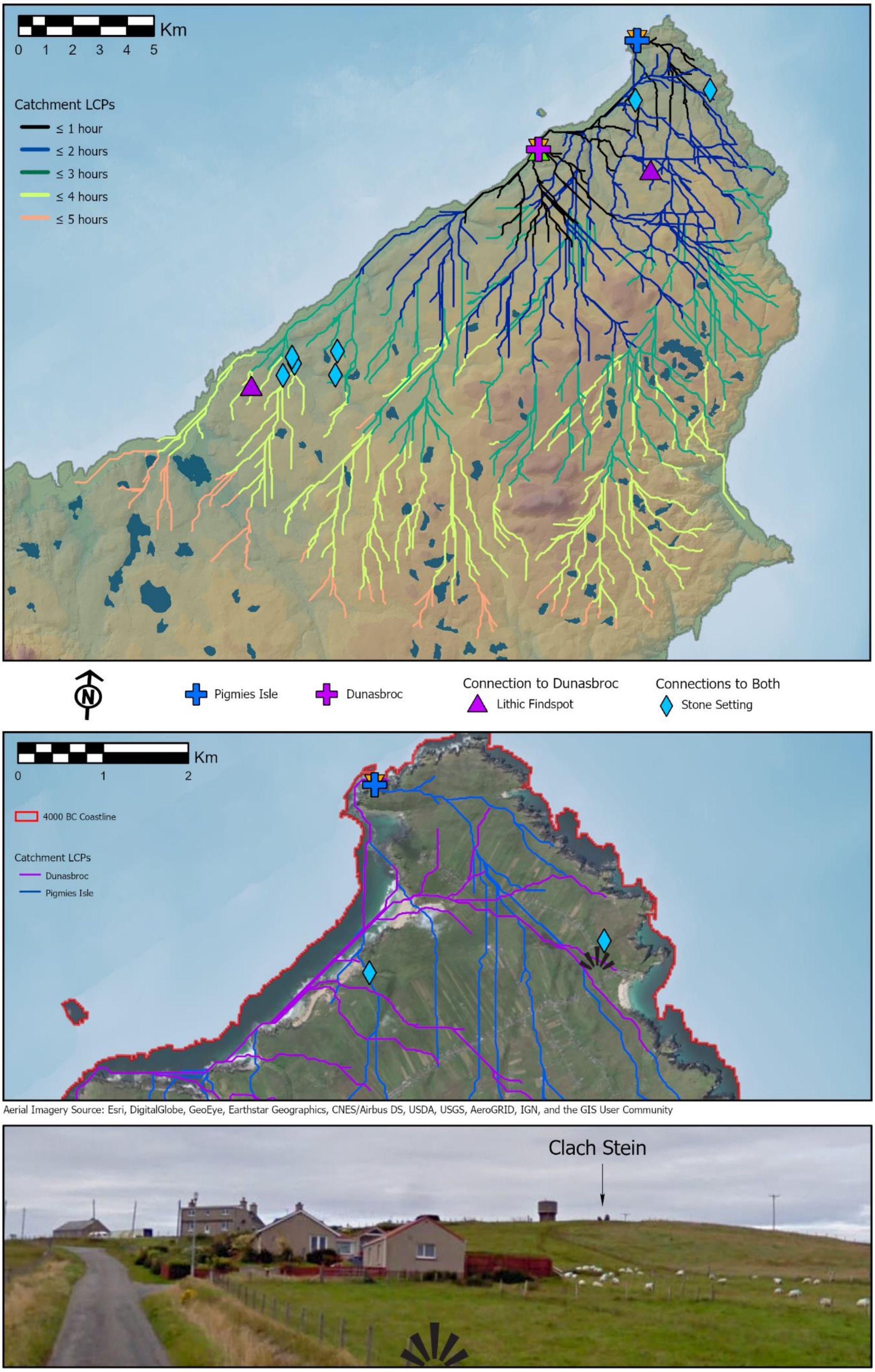
Figure 57. Loch Arnish's catchment pathways and connected archaeology demonstrating strong connections to lithic find spots (top); as well as connections to chambered tombs (bottom).

Despite its proximity to Stornoway and the Eye, none of the tombs from this region are connected to Loch Arnish, and instead, the islet is connected to chambered tombs much further to the north. This includes a pair of cairns located near Upper Coll between Coll beach and a patch of woodland to the west (Figure 57, *bottom right*). One is a less definitive and largely grass-covered structure, the other is Dunan, a Hebridean-type passage tomb with an east or ESE facing chamber that may be much intact but is heavily overgrown by peat (Canmore, Dunan). Both of these sites could have been reached in just over 2 hours with routes approaching from the southwest, although neither would have been particularly prominent on approach. The third connected tomb is located further north on a gently sloping hillside northeast of the Gress River (Figure 57, *bottom left*). Much like the other two cairns, the site is largely overgrown by peat, but evidence of a chamber suggests a southeast passage (Henshall 1972, pp.462-463). This cairn would have taken nearly 3.5 hours to reach from Loch Arnish, with routes approaching the monument from the southwest on the opposite side of the river. Overall, the great expansion of peat that has occurred around most chambered tombs in Lewis limits any further understanding of both their Neolithic setting and movement around them, although the clear concentration of tombs towards the east coast is notable.

Presenting the most noteworthy trend, however, and the greatest contrast to all other sites is the high number of surrounding lithic findspots, which account for more than 50% of Loch Arnish's total connected archaeology. Of the eight findspots existing within the site's catchment area, seven are connected to Loch Arnish's pathways, including four axe-heads, one of which is the Shulishader axe, and three mace-heads. As the majority of these finds have been recovered during peat cuttings, their context is limited; however, in contrast to prestige objects recovered between Harris and Benbecula, the location of many of these finds are more definitive, allowing for a greater significance to be attributed to their connection to pathways. Although Loch Arnish has been solely dated to the Early Neolithic, the multi-period use of the site demonstrates not only the enduring significance of this loch and islet but also the potential for its use to have continued into the Late Neolithic, thereby strengthening the site's connection to these prestige objects.

7.1.6 Pygmies Isle and Dunasbroc

Much like the other pairs of sites discussed, Dunasbroc and Pygmies Isle present a great number of similarities, and their pathways, both maritime and terrestrial, were so closely intertwined as to make them, at times, indistinguishable. Whilst these two rather ambiguous cliffside locations appear anomalous within the record as a whole, their proximity and strong associations suggest a different use of the northern tip of Lewis, perhaps for ritual offerings or communal gatherings but certainly retaining a strong emphasis on the sea. Although the Early Neolithic coast is projected to have extended between 150 to 200 meters from the present shoreline, the precarious location of both sites on sea stacks demonstrates the considerable erosion that has occurred since the



Google Street View from B8014 showing Clach Stein on the horizon.

Figure 58. Dunasbroc's and Pygmies Isle's catchment pathways and connected archaeology (top) and their connection to standing stones near sandy beaches (middle), including Clach Stein (bottom).

Neolithic. Yet regardless of their distance from the coast, they would have nonetheless offered expansive views over the Atlantic. Despite their extreme northern location, the faunal assemblage from Dunasbroc evidences the use of a variety of resources at the site. Further, the northern tip of Lewis, from Dunasbroc northward, is comprised entirely of croft land and machair, demonstrating the enduring fertility yet erosiveness of the region. Whilst little may ever be known about the Neolithic use of Pygmies Isle, the lasting significance of this littoral site is most evident in its reuse for the erection of an early Christian monastery.

The catchment areas of these sites stretch around 20 km to the south, reaching Barvas on the west coast and North Tolsta on the east coast, all of which could have been reached within 5 hours (Figure 58, *top*). However, their extreme northwest position limits their overall connectivity to the landscape, leading to the lowest catchment connectivity after Northton. This isolation is further supported by the archaeological record. After Northton, these two sites have the fewest number of archaeological sites existing within their catchments, which are comprised entirely of standing stones and lithic finds. Both sites are connected to the same seven standing stones, and Dunasbroc is connected to a further two lithic findspots, an axe-head and a cushion mace-head. Much like all other sites in Lewis, with only Early Neolithic dates for Dunasbroc, and no dates for Pygmies Isle, the association between these sites and Late Neolithic activity is unclear. However, like Loch Arnish, their multi-period use suggests their enduring significance and the potential continuation of their use beyond the Early Neolithic.

Of the two nearest connected stone settings, one is a less definitively Neolithic monolith located on the west coast between Pygmies Isle and Dunasbroc and the other is Clach Stein, a stone setting on the west coast (Figure 58, *middle*). Clach Stein is located roughly 400 meters northwest of Port Ness on the east coast and around 80 meters from the B8014, which runs between Port Ness and Eoropie Beach to the south of Pygmies Isle. Reputed to have been a rectangular stone setting formed of four standing stones, the two extant monoliths currently stand at 1 to 1.5 meters tall, and although overshadowed by modern structures, their position on a prominent hill still makes them visible along this route (Figure 58, *bottom*). The remaining five proximal standing stones are grouped around Shader to the north of Barvas. Despite varying levels of certainty, all of these sites are believed to have been stone circles; however, more notable than the connection to these stone settings is the single monolith in the area that is not connected to either site's pathways.

Clach an Trushal is a substantial monolith, its broken form still stands at 5.8 meters tall, with a width of 2 meters and a thickness of over a meter (Figure 59). This monolith is reputed by locals to have been central to a surrounding stone circle, much like Callanish (Canmore 2019, Clach an Trushal), and if such is the case, this concentration of stone circles may have formed a complex sited to structure movement through the region, as has been suggested of the broader Callanish complex. Further, the absence of Clach an Trushal from connected pathways becomes more notable as this monolith was suggested by Burl (2000) as having been a marker for Neolithic seafarers, a suggestion also postulated for the central monolith at Callanish (see Section 4.2.2). Such a use would thus strengthen the already strong associations between the two northern sites and the sea, and when combined with potential connections to Port Ness as evidenced by Clach Stein, it is possible to suggest the strong connection of these sites to maritime landscapes that may have subsequently been connected to broader patterns of maritime movement.

Figure 59. The 5.8 meter broken standing stone of Clach an Trushal near Shader and its clear visibility to and from the Atlantic.

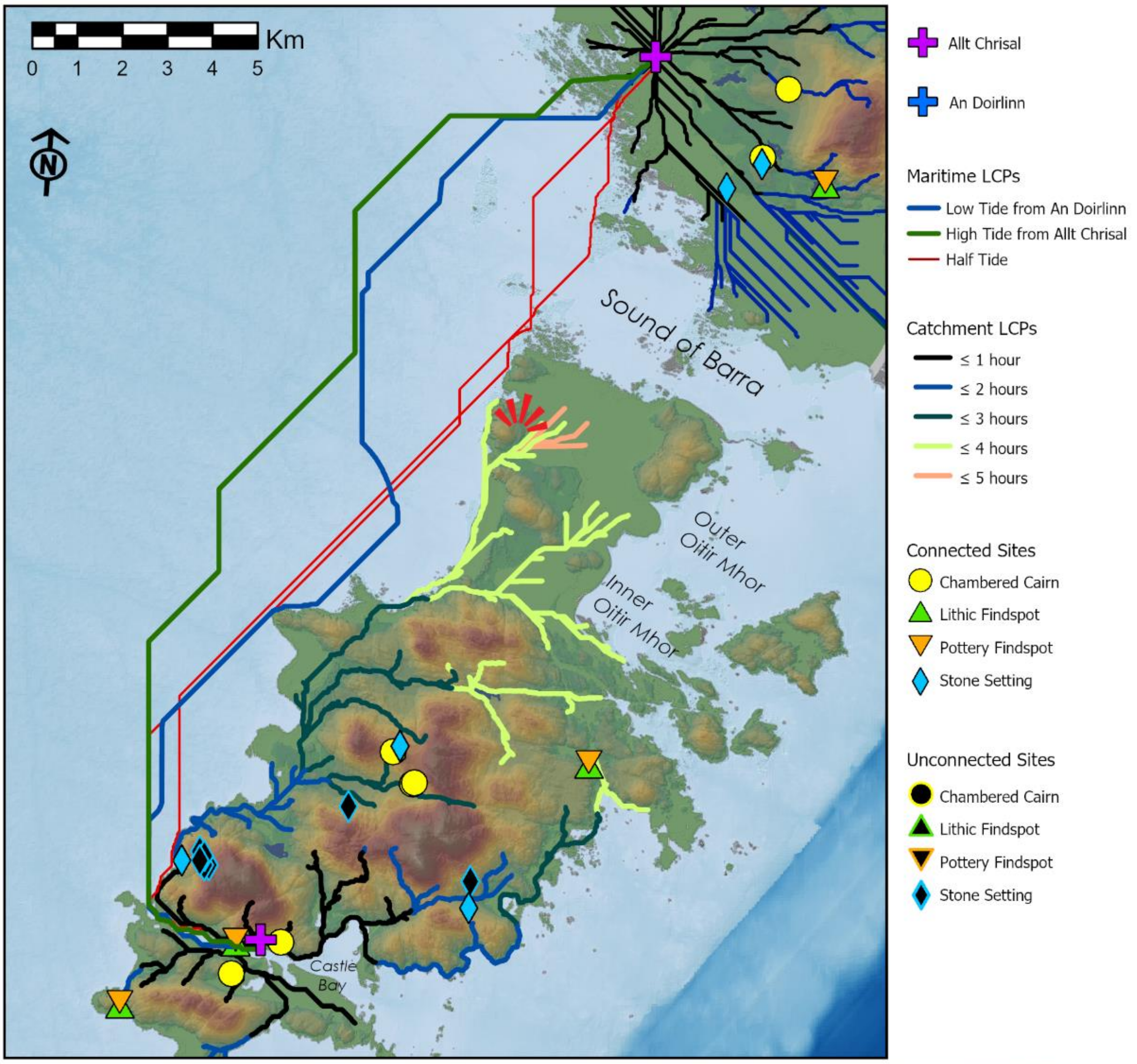
7.2 MESO-CONNECTIONS

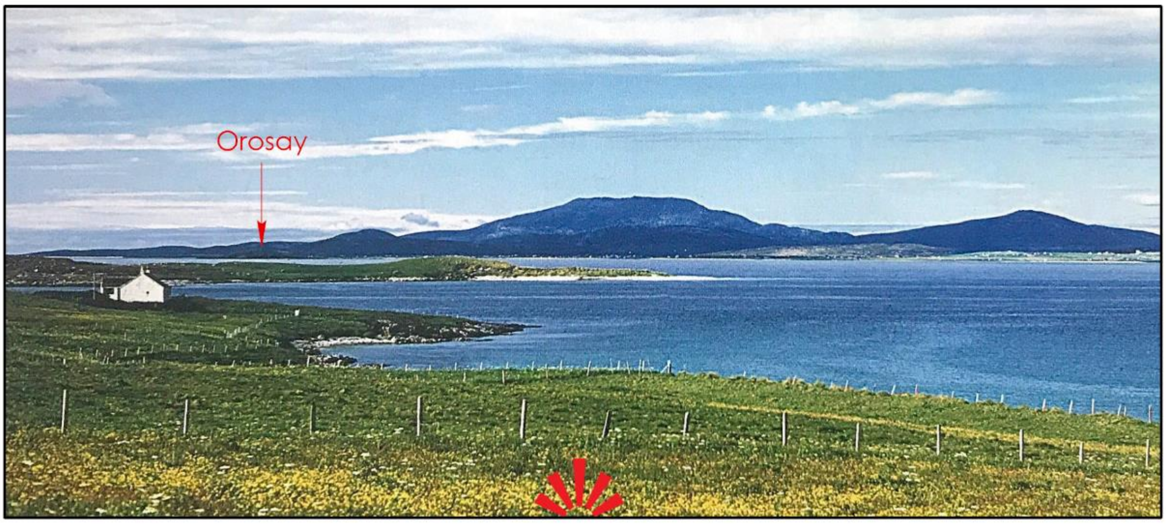
7.2.1 The South

Spatial Connections through Palaeogeography

Allt Chrisal is a site of contradictions. From a geographic perspective, the settlement is isolated from the rest of the archipelago, separated not just by water but also by distance; yet, from an archaeological perspective, it appears to be well-connected, both within the archipelago and beyond. As previously highlighted, the settlement is the most accessible site via the seaways—an ease of accessibility due to the general trend noted throughout the analysis of the results that movement south is easier than movement north, most especially through the Atlantic with the ebbing tide. Thus, despite its greater distance from denser concentrations of activity, Allt Chrisal is overall the least costly site to reach via the seaways, which may, in part, explain the strong similarities in its material assemblage to other sites, especially in North Uist, despite its geographical distance. Further, whilst its southern position may, in turn, suggest a low maritime connectivity, Allt Chrisal instead ranks average amongst Hebridean sites, thus resulting in the settlement being the most connected in the archipelago via the seaways (along with the Udal). Given that movement against the ebbing tide presents the greatest challenge to maritime movement around the archipelago, it is likely that any journey from Allt Chrisal to the north would have avoided ebb and instead taken advantage of northward moving tidal streams with the flooding tide. With an approximately 6 hour window in which to move north before the tides turn, the only known settlement that could have been reached within a single tidal window is An Doirlinn.

Modern maritime routes between the two islands generally use the Sea of the Hebrides—with Castle Bay, at the eastern entrance to the Sound of Vatersay, and the deeply penetrating Loch Boisdale in South Uist providing stable and sheltered maritime environments conducive to harbouring. However, all modelled routes between Allt Chrisal and An Doirlinn occurred through the Atlantic (Figure 60, *top*). Whilst the use of the Atlantic may have, in part, been prompted by the absence of winds, waves and currents from the maritime cost raster, this route was also strongly influenced by the low-lying extended coastline between the two islands, a geographic affordability that allowed for stops along the coast as well as much shorter travel distances. With an average route length of 27.6 km between the two and a travel rate of 1.57 m/s (the mean value of high and half tide velocities along this route being 0.03 m/s, plus a 3 knot paddle speed), this journey would have taken just under 5 hours. Movement south from An Doirlinn at low to half tide would have taken only six minutes longer, but the route differs from the journey north by making landfall at Aird Ghrein—a rocky headland on the west coast of Barra that today would be unsuitable for landing. However, with lower sea-levels and at low tide this headland may have provided a suitable





View NNE from Eoligarry across the Sound of Barra towards South Uist (Photograph from Mason 2017, p.33).

Figure 60. Maritime routes between Allt Chrisal and An Doirlinn (top); and view from Eoligarry Peninsula over the Sound of Barra, showing the tidal island of Orosay in left background (bottom).

landing place, perhaps to wait for optimum tides or weather before continuing south. At half tide, movement both north and south is able to follow the coastline more closely, essentially forming a three-legged maritime journey by taking advantage of both Aird Ghrein and the northwest coast of Eoligarry (Figure 60, *bottom*). This half tide route thus highlights the most significant passage along the maritime route between the two islands, the Sound of Barra.

The present-day sound is shallow and filled with isolated rocks, requiring great care to be taken when passing through it without local knowledge or experience (Mason 2017, p. 35). Whilst this highlights the great potential for larger extents of land at Neolithic sea levels, it also demonstrates the potential challenges to movement through it. Modern tidal streams through the sound enter simultaneously from both east and west with the flood tide and likewise exit from both directions at ebb, with tidal streams converging and separating in the Outer Oitir Mhor (*ibid*). Whilst modern tidal velocities through the sound are minimal, with the two coastlines projected to have extended to within 2.5 km of each other, the narrower Sound of Barra may have been subject to much stronger tidal velocities—reminiscent of the strong tidal races created when the Sound of Vatersay was narrowed during causeway construction. This would have constrained movement through the sound to between half and slack water or perhaps even neap tides; however, by taking advantage of the narrowest point between the two islands, at a 3 knot paddle speed, the sound could have easily been crossed within the 15 minute window of slack water. Although all modelled routes passed to the west of the sound, this region may have been equally susceptible to tidal streams moving between the Atlantic and the Minch, and thus, the now inundated coastal plains of Eoligarry and the southern coast of South Uist may have been crucial to movement between the two sites, allowing for landing or sheltering in order to wait for the optimum tidal window to cross the sound.

Whilst An Doirlinn's connectivity to the southern extent of the island and its archaeological record has already been noted, a region which could have been reached within 2 hours, the lack of any extant Neolithic archaeology along the northern coast of Barra makes any theories of its use for maritime routes purely conjectural. However, the extensive machair plains of Eoligarry would have been highly suitable for arable practices, and further, the greater fertility of the northeast coast is evident in the extant patches of trees and shrubs that exist along the northern corridor of the modern A888—the same corridor to the northeast highlighted by the pathway densities. Thus, despite an absence of archaeological evidence, the overall affordances of the north coast of Barra, for both resource procurement and maritime movement, suggest the need to consider its use, if not by inhabitants of Allt Chrisal then by those of An Doirlinn.

Archaeological Contradictions

Whilst movement between Allt Chrisal and An Doirlinn can be suggested based on the geographic and environmental affordances between them, the archaeological record presents a number of contradictions to their potential connectivity. Similarities in material assemblages and occupation deposits between the two settlements were noted by the excavators of An Doirlinn (Garrow and Sturt 2017), with radiocarbon dates suggesting an overlap in occupation during the second half of the fourth millennium BC. Comparisons have also been made between ceramic assemblages, with both sites producing large and varied assemblages, including a range of less decorative forms and styles (Copper 2015). However, the absence of Unstan Ware at An Doirlinn contrasts the large quantities recovered from Allt Chrisal, a discrepancy which further distinguishes An Doirlinn from the broader settlement record of the archipelago. Further, as noted in the material analysis (see Section 6.1.2) both sites produced by far the largest lithic assemblages, most especially large quantities of worked flint, along with evidence for knapping on the coast. Whilst this may represent similar lithic technologies and usage, this could equally be the result of environmental affordances rather than any uniform practices between the two. Thus, despite the numerous potentialities presented, any theories of a strong connection between Allt Chrisal and An Doirlinn are dependent primarily upon the geographic proximity of the two and the environmental affordances to movement between them.

Whilst lower sea levels would have certainly enabled greater connections between the two sites, the temporality of submergence is unclear. The major inundation around the Sound of Barra is projected to have occurred throughout the Early Neolithic, although the complexity of coastal dynamics and the potential later date of inundation around An Doirlinn has already been noted. Despite this potential variability, this inundation may have occurred alongside the major changes taking place around the Sound of Vatersay, and in fact, it is this southern region of the archipelago which is projected to have been most heavily impacted by Early Neolithic sea-level rise. It is thus interesting to note the coincidence of the apparent end of Allt Chrisal's Neolithic use with the potential end of a period of major submergence. Whilst the reason for its abandonment is unclear, any potential connections between the two would have certainly been strained by the submerging coastlines between them, which along with the inundation of the southwest corridor around Beinn Tangabhal and the coastal plains of Cornaig Bay, may have influenced the need or decision to abandon Allt Chrisal by the start of the Late Neolithic. Conversely, however, the concentration of standing stones on Beinn Tangabhal and their strong correlation to modelled maritime routes leading into the Sound of Vatersay, as well as the presence of Pollachar on the southwest coast of South Uist (see Figure 46, *middle*), suggest continued connections between the two sites into the Late Neolithic, which may have ended before the adoption of Grooved Ware at An Doirlinn, a form noticeably absent from Allt Chrisal's more varied ceramic assemblage.

Moving North

From An Doirlinn, movement north could have occurred through either the landscape or the seaways; however, despite the probable connection of the Uists during the Early Neolithic, An Doirlinn's terrestrial measures repeatedly demonstrated a site greatly isolated from the main concentration of activity in North Uist. Although Neolithic sites have been recorded throughout the southern island, with no known settlements between An Doirlinn and Bharpa Carinish, the use of this region and any potential connections to it cannot be explored through the current methodology. Despite its location near the Neolithic coast as well as its proximity to Loch Boisdale, the site ranks average in the archipelago in terms of its maritime connections, with great variations between accessibility and connectivity measures. Following general trends noted throughout the maritime analysis, An Doirlinn is one of the least connected sites in the archipelago yet one of the most accessible, although its accessibility still ranks lower than sites along the northwest coast of North Uist. Given An Doirlinn's overall limited terrestrial connections, it appears that the seaways would have been more conducive for movement between the two regions, although, much as with Barra, it would have been easier for inhabitants from the north to reach An Doirlinn than vice versa.

In terms of social connectivity, this thereby reinforces the site's connection with Allt Chrisal, which would have been the easiest extant settlement for occupants of An Doirlinn to reach. In contrast to the approximate 5 hour journey to Allt Chrisal, the shortest route to settlements to the north would have been to Bharpa Carinish, making landfall to south of Baleshare on the southwest coast of North Uist (Figure 61, *top*). This journey would have spanned 45 km and, with minimal advantage achieved by moving with the flood tide through the Atlantic, would have travelled at an average speed of 1.55 m/s, taking just over 8 hours to reach North Uist. Although all pathways from An Doirlinn to North Uist travel along the Atlantic, with the exception of movement to Screvan Quarry, much like routes between South Uist and Barra, these models were influenced by the low-lying palaeogeography of the west coast, which allowed pathways to closely follow the coastline.

Today such a route is not possible due to the numerous rocks, reefs and shoals that exist within 5 km of the coast (Mason 2017, p. 130), which not only demonstrate the greater extents of land along the west coast at Neolithic sea levels but also suggest a similar Neolithic inshore environment. Further, there is currently no secure shelter between Barra and the Sound of Harris if adverse conditions are encountered (*ibid*), and hence it follows that the affordability of such a route would have not only been temporally variable but also spatially constrained to shorter legs of movement. Given optimum conditions, maritime routes from An Doirlinn would thus have only been able to reach the southern coast of Benbecula before the tides the turned, a region marked by a findspot of a carved stone ball (although its position is based on generic coordinates)

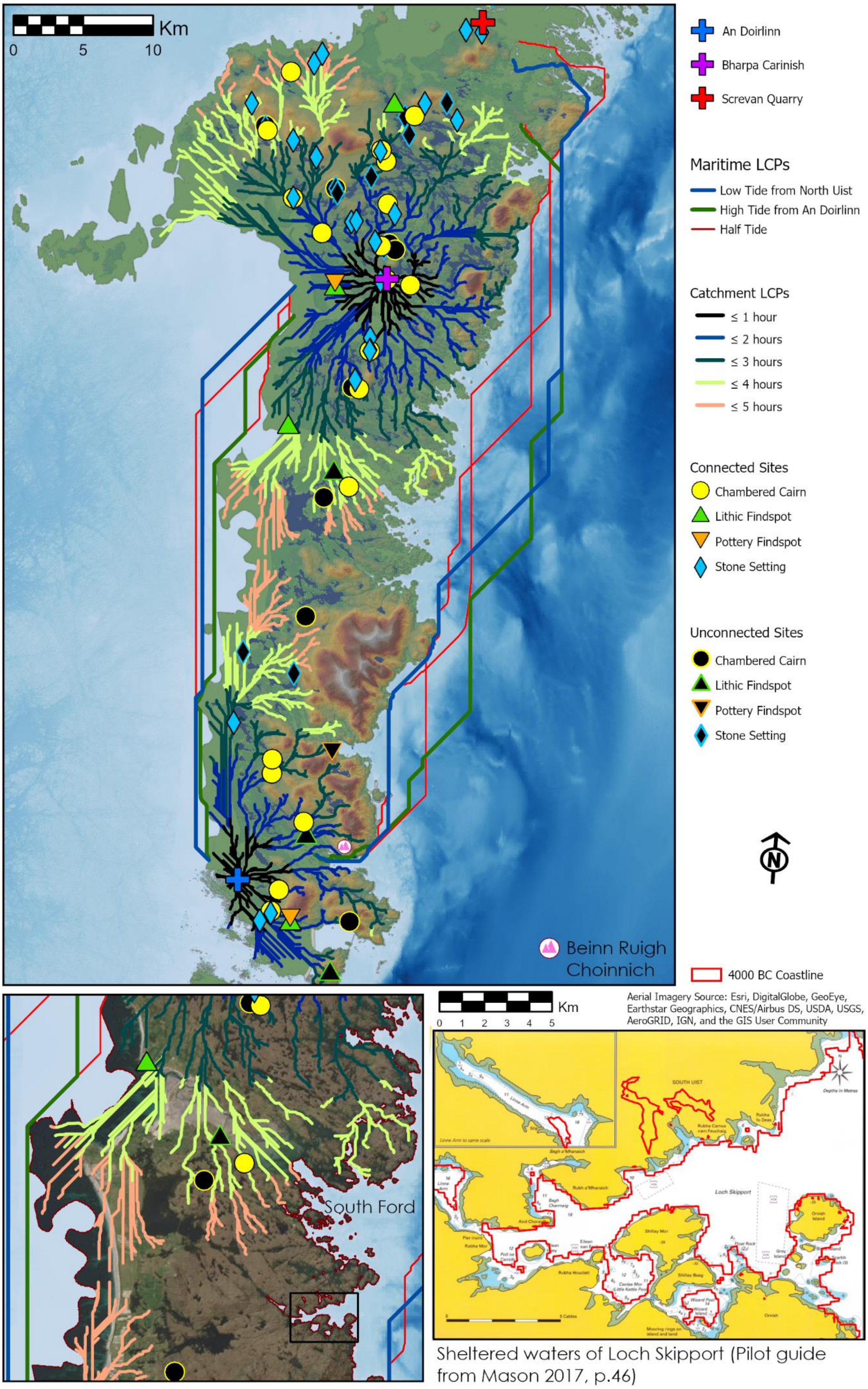
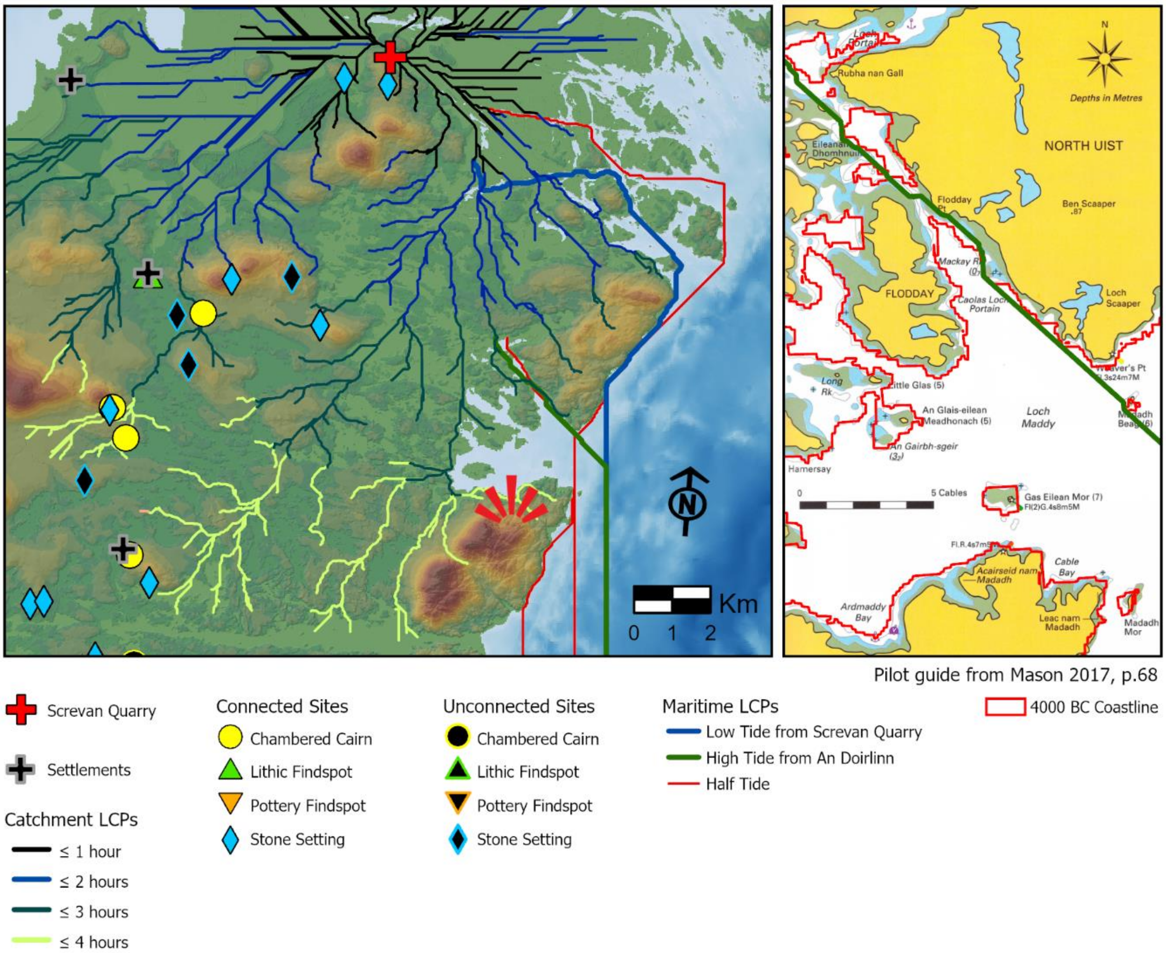
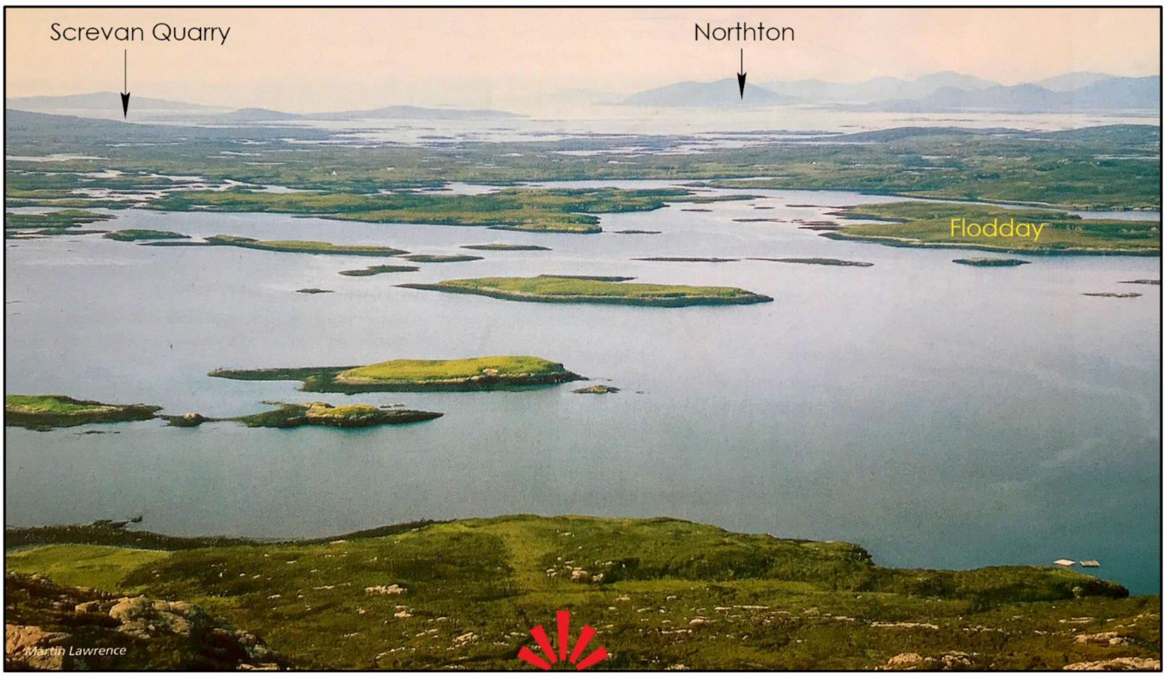


Figure 61. Maritime routes between An Doirlinn and North Uist, showing the heavy use of the Atlantic (top), with more feasible landing places identified between South Uist and Benbecula (bottom).





View north from North Lee overlooking Loch Maddy (Photograph from Mason 2017, p.69).

Figure 62. The use of Loch Maddy as indicated by modelled routes from An Doirlinn to Screvan Quarry (top) as well as the location of this sea loch in reference to other settlements.

(Figure 61, *bottom left*). Further, although the palaeogeography suggests a sheltered beach around the current South Ford, the complex factors affecting the actual nature of the machair coast have already been addressed, and thus little more can be said regarding the nature of the Neolithic coastline beyond its potential furthest extent.

In contrast to the use of the Atlantic, the only route moving through the Minch is to Screvan Quarry, which launches at Loch Boisdale and lands on the northwest coast of Loch Maddy between Weaver's Point and the present-day island of Flodday (Figure 62). Whilst high tide would have been the optimum tide for travel through the Minch, the inflowing tidal stream in Loch Boisdale would have made movement out of the loch difficult. This is reflected in the high tide route which avoids Loch Boisdale and instead travels across its northern bank to the south of Beinn Ruigh Choinnich, crossing elevations of up to 120 meters and entering the Minch off of a rocky coastline, an unsuitable terrestrial route and launching point (see Figure 61, *top*). Thus, departure would have ideally occurred at slack water or towards the end of ebb, taking advantage of the outward flowing tidal stream to move out of the loch, a route that would have taken around 30 minutes to reach the Minch. From there, movement north could have used the flooding tide, although the journey would have taken over 11.5 hours, only reaching the northern tip of South Uist before the tides reversed.

However, in contrast to the Atlantic coast, movement through the inner seaways would have offered numerous havens for sheltering in poor weather or to wait for optimum tidal conditions, a practice still common along the east coast today (Mason 2017). Thus, Loch Skipport in South Uist or the South Ford between South Uist and Benbecula may have provided a safe haven or landing place (see Figure 61, *bottom*). Loch Skipport is currently a well-protected and easily accessible sea loch and its coastline is projected to have remained largely unchanged since the Neolithic. In contrast, the South Ford has experienced substantial submergence due to the breaching of the east coast by the Atlantic. With the opening of the North Ford projected to have occurred as early as 3200 BC, this region could likewise be considered to have been dynamic and unstable during the Neolithic. Regardless, with a local knowledge of the maritime landscape as well as the tides, it is clear that the inner seaways would have offered a safer and more predictable route through coastal hopping and/or sheltering.

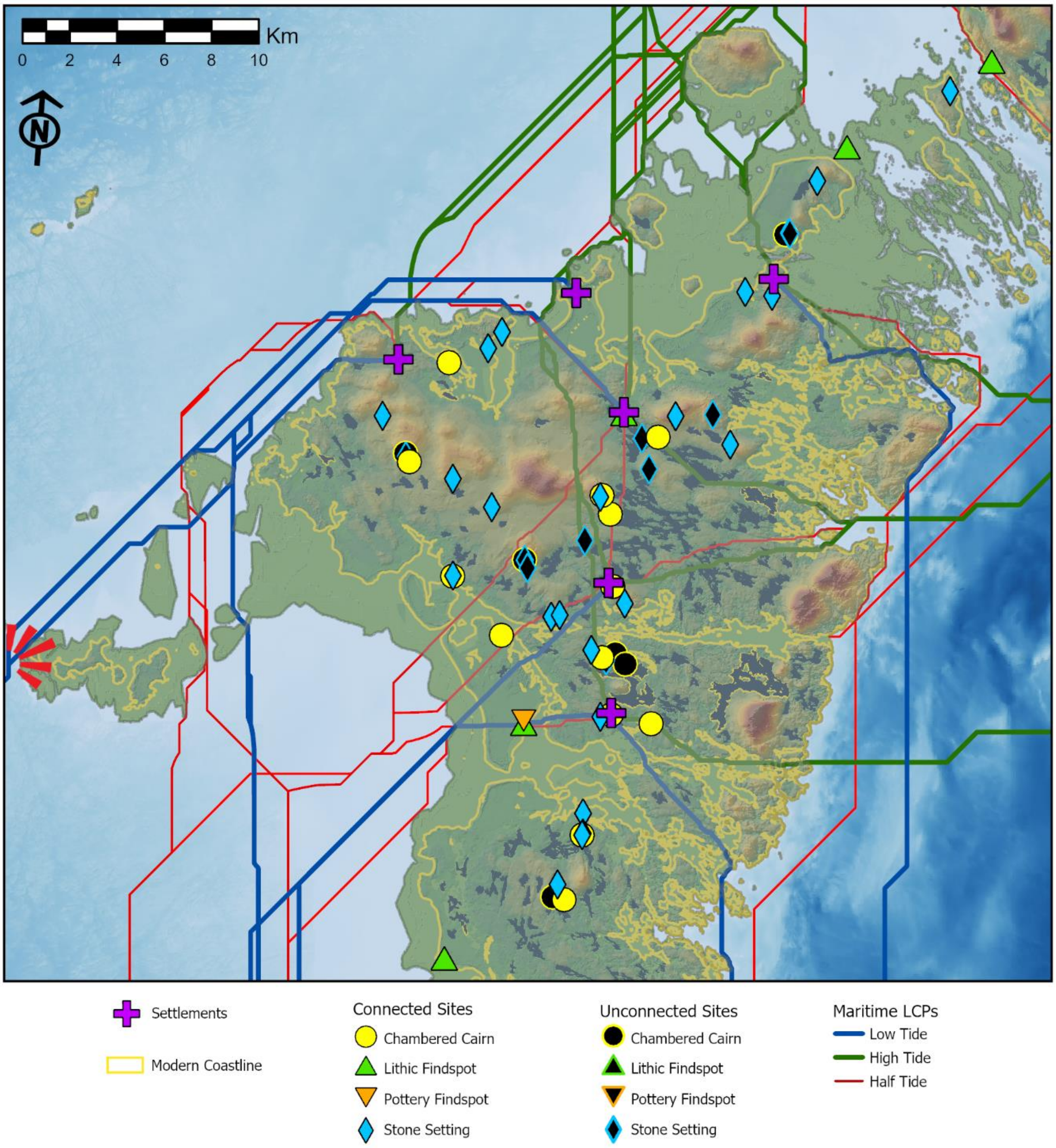
7.2.2 The Midway Isles

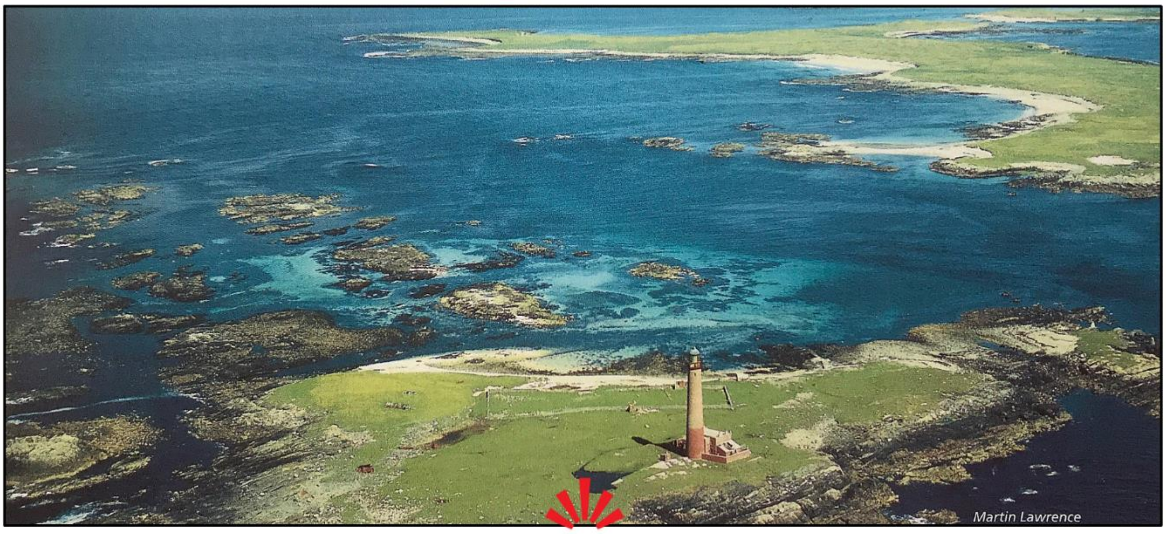
Diverging Maritime Connections

The centrality of North Uist within the historiography of the Hebridean Neolithic is evident from both the archaeological review and the material analysis, and whilst its dense archaeological record may reflect this partiality in research foci, its maritime connection measures, which are themselves relatively impervious to such research biases, demonstrate a similar proclivity towards this midway islandscape. Thus, whilst the long duration and heavy concentration of research in North Uist predisposes theories regarding its significance, it is this density of extant archaeological sites that lends further credence to the island's overall strong connectivity. Through both the comprehensive statistical analysis as well as the discussion of individual sites, this dense jumble of activity was further compounded by overlapping catchment areas and connected sites, and although it is not the intention of this thesis to further facilitate any biases towards North Uist, it is unavoidably this midway island that offers the greatest ability to understand the relationship between sites within the broader settlement record as well as how the more domestic record of activity relates to the profuse monument record.

All dated sites within the North Uist settlement record have produced Early Neolithic dates, with the exception of the Udal, whose potential earlier origins have already been discussed. When combined with relative dates, similarities in materials assemblages and the overall affordability of the environment for movement, there is substantial evidence to support the existence of strong connections between many of these sites throughout the Early Neolithic. Whilst all sites in North Uist demonstrate the highest terrestrial connection rankings in the archipelago, it is the strong divergences in maritime connections that provide further insight into site use. The greatest contrast between maritime and terrestrial connections is demonstrated by the Barpa occupation areas; although both sites exhibited the highest terrestrial connection rankings in the archipelago, they also exhibited the lowest maritime connections. This is rather contradictory to the modern landscape, with both sites currently being located near littoral bodies, either intertidal or sea loch. However, with lower sea levels, the nearest launching points were identified as the southwest coast near Baleshare and the northwest coast near the Udal (Figure 63).

The southwest coast was already highlighted by routes moving from An Doirlinn and is further the primary launching point for movement south from North Uist. From Bharpa Carinish, this region could have been reached in less than 1.5 hours, and from Barpa Langass, the journey would have taken around 2 hours. Activity in this region is evidenced by two chambered tombs, one on Baleshare and the other on the mainland coast facing the island of Kirkibost, as well as a findspot, which produced a mace-head, an axe-head and pottery sherds (although their location is purported). Further, the connectivity of settlements to this region is demonstrated by the connection of most sites to these two intertidal monuments. Whilst today this coastline is characterised by these tidal islands and their surrounding intertidal sands, the Early Neolithic coastline may have extended at least a kilometre further into the Atlantic, indeed, the final separation of the island of Baleshare is only reported to have occurred in 1756 during a severe storm (Gilbertson et al. 1999, p. 443). Further north, the palaeogeography suggests an extended coastline of up to 4.5 km, connecting the region of Balemore to the Monach Islands, a group of five low-lying islands approximately 8 km to the southwest (Figure 63, *bottom*). Again, their connection





View northeast over Monach Isles and surrounding rocks, skerries and shoals (Photograph from Mason 2017, p.133).

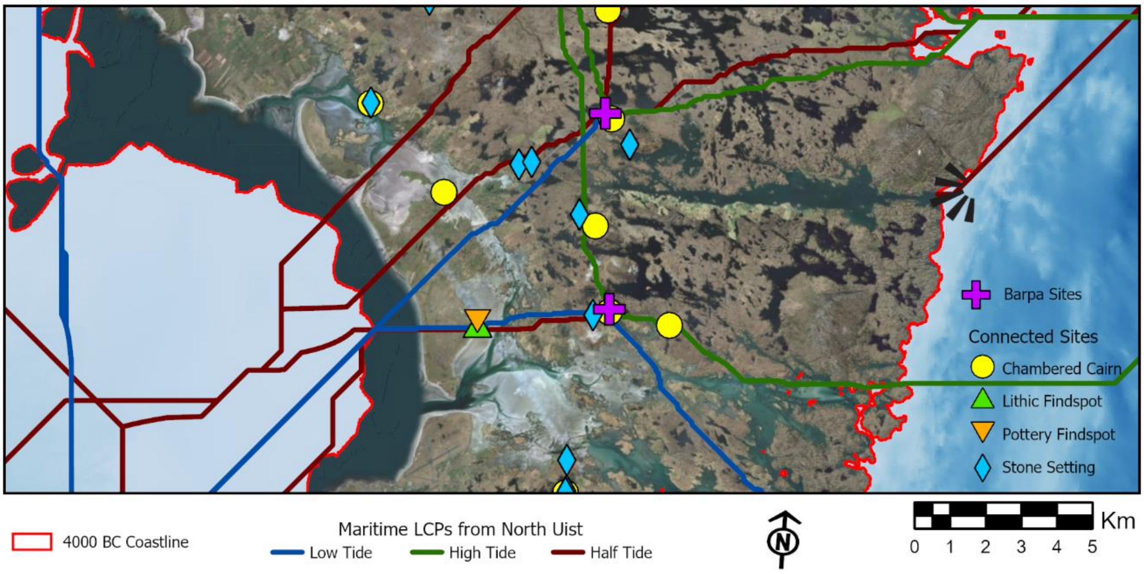
Figure 63. Modelled maritime routes departing from North Uist showing the heavy use of the northwest and southwest coasts for landing and launching (top) as well as the potential bay formed by a connection to the Monach Islands (bottom).

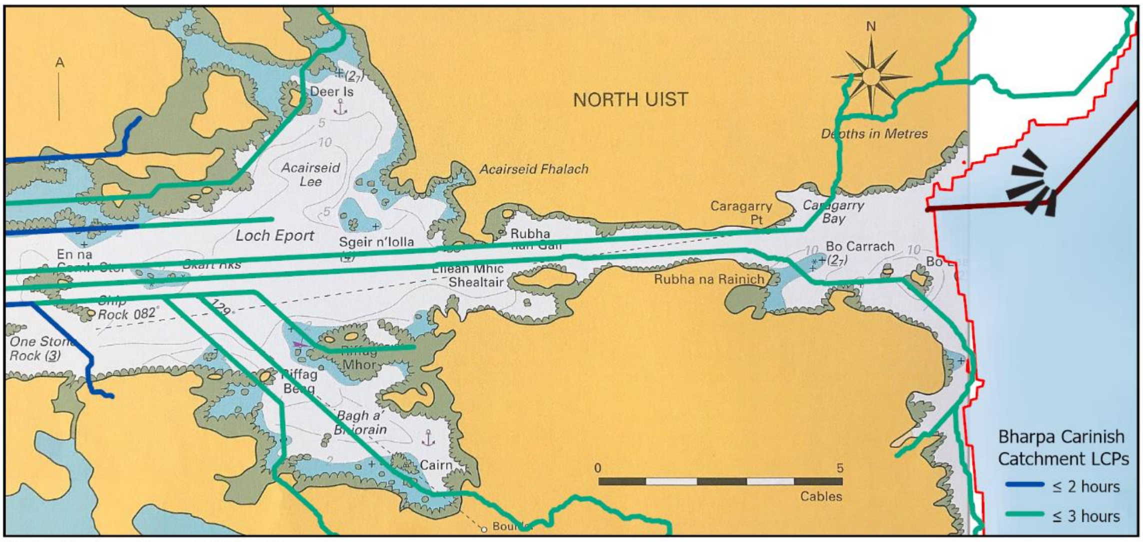
during the Neolithic is supported by historical accounts, which state that the islands were accessible at low tide until a severe storm in the 17th century led to their ultimate separation (Haswell-Smith 2015). Together, these tidal islands evidence not only the great change that has occurred in this region since the Neolithic but also how quickly such drastic changes can occur along the exposed Atlantic coast.

The dynamic nature of the Hebrides' western-facing beaches compared to the more geologically stable east coast was highlighted in a coastal zone assessment, which also identified the orientation and plan-shapes of these beaches as being the result of swell waves and geology (Ramsay and Brampton 2000, p. 50). If the Neolithic coastline thus extended to the Monach Islands, the southwest coast of North Uist would have been characterised by a wide bay; however, its orientation to the southwest not only demonstrates the predominate wave patterns but also its exposure to the Atlantic elements, leading to its substantial erosion. Regardless of the nature of the maritime landscape, the connection of these islands to North Uist would have impacted maritime movement through the region, with some routes travelling much greater distances in order to circumnavigate this land. Others, however, passed through the current Sound of Monach to the east of the islands, suggesting its use as an isthmus road along these sea-lanes.

In contrast, most pathways north from these sites launch from the coastline around the Udal, which was connected to both of their catchment pathways, at a distance of around 3.5 hours from Barpa Langass and just under 5 hours from Bharpa Carinish. This not only highlights the potential connection of these occupation areas to the Udal, but also the greater maritime connections demonstrated by this coastal settlement, which ranks highest in the archipelago alongside Allt Chrisal. This is due in large part to the high maritime accessibility of the northwest coast as evidenced by both the Udal and Eilean Domhnuill, both of which rank, again, just after Allt Chrisal in terms of maritime accessibility. With northern maritime routes from inland sites, including Eilean an Tighe, also launching from here, this northwest coast may have provided the greatest point of connection between North Uist and the west coast of Lewis. The significance of this region is further supported by its dense multi-period archaeological record; however, the great inundation and machair erosion that has occurred along the north coast once again confounds any greater understanding of both the use and connectivity of this region.

Whilst the LCPs thus highlight the northwest and southwest coasts for maritime movement, the dynamic, unstable and unpredictable nature of these coasts compared to the more immutable east coast highlight the need to also consider the use of eastern sea lochs. The use of Loch Maddy for landing was highlighted by routes from An Doirlinn to Screvan Quarry, and routes from Barpa Langass to Loch Arnish also used this sea loch for launching (Figure 64, *top*). Further, movement from Bharpa Carinish to Loch Arnish followed Loch Eport in order to enter the Minch. With the GIA





Pilot guide from Mason 2017, p.64.

View of entrance to Loch Eport from the east (Photograph from Mason 2017, p.66).

Figure 64. Modelled pathways through the eastern sea lochs of North Uist (top) and the potential use of Loch Eport for movement (middle and bottom).

models projecting this loch to have been dry land (or perhaps a freshwater loch), the nature of its use for movement is unclear. However, despite its limited use for maritime movement, Loch Eport was extensively utilised for terrestrial movement through the region, given its near-zero degree slope (Figure 64, *middle* and *bottom*), suggesting that regardless of the nature of the boundary between terrestrial and littoral, this region would have been highly significant for movement.

Terrestrial and Littoral Corridors

Whilst the significance of the eastern sea lochs for movement can be strongly proposed, the use of the inland waterways of North Uist should also be considered likely. Given the series of inland hills running through the western half of the island, which are backed by lochs throughout the eastern half, movement between north and south would have been constrained. This is most evident in the combined catchment pathway densities for all sites which highlight a series of north-south corridors through the island (Figure 65). The two more definitive corridors of movement occur to the east and west of the Uist forest to the south of Valley Strand; the westernmost of these follows

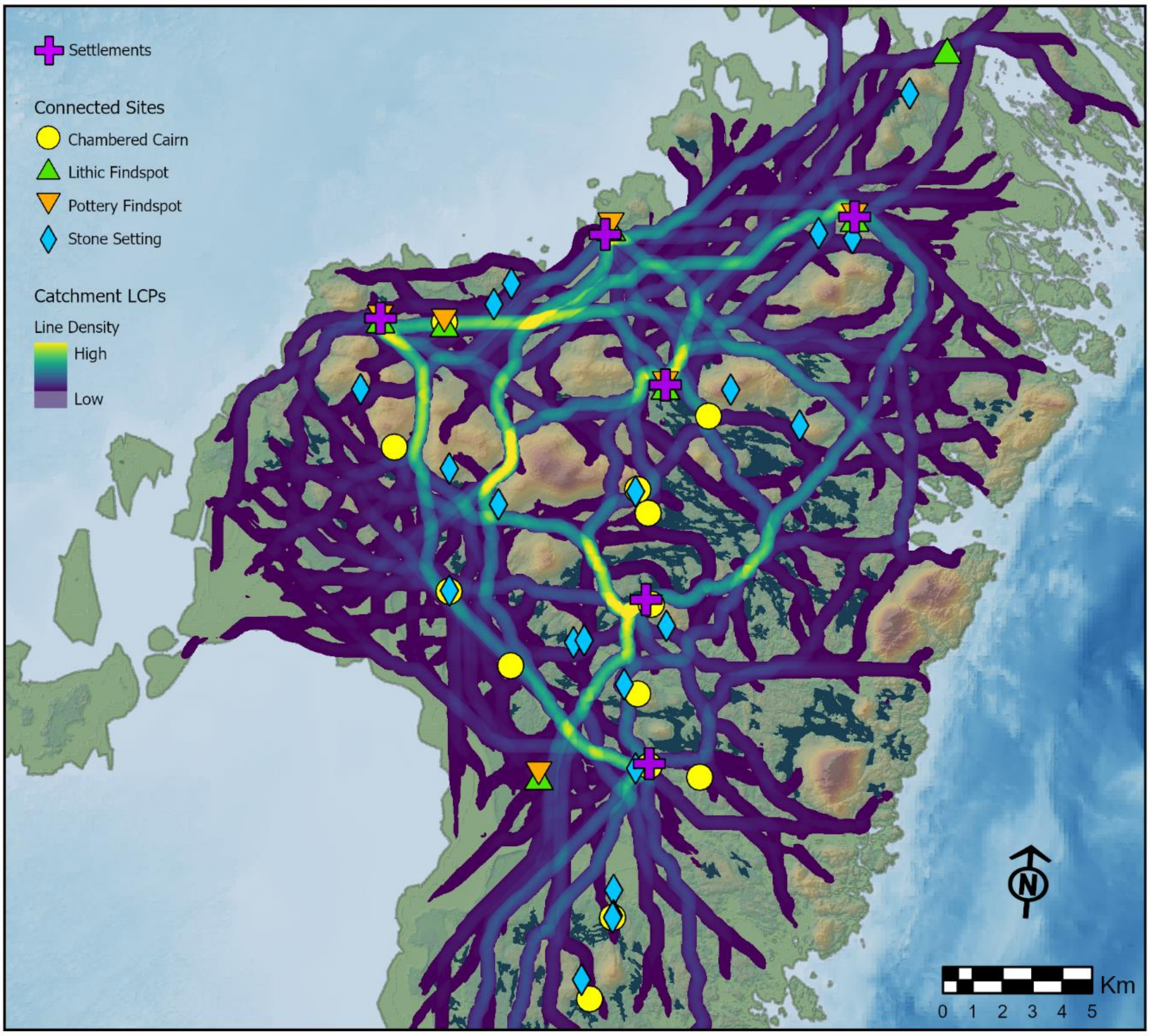


Figure 65. Line densities of all terrestrial pathways in North Uist, showing clear topographic and littoral barriers to movement, resulting in two distinct north-south corridors to the west of the island and one, less definitive, corridor to the east.

the Drolla Valley to the east of Eilean Domhnuill and the easternmost follows a relatively flat stretch of land currently used by the Committee Road, the only modern road providing passage through the interior of the island. However, less distinct is the primary route used for movement through the eastern half of the island.

Throughout the discussion of individual sites, a distinctive *y*-distribution of connected sites was noted between Screvan Quarry and Baleshare and Eilean an Tighe and Eilean Domhnuill. At the centre of this distribution is thus Eilean an Tighe, suggesting its greater overall connection to patterns of movement through the region. However, the site ranked average in terms of its connectivity, and further demonstrated, along with Screvan Quarry, the greatest variance between terrestrial connection measures, being more connected than it is accessible. This lower accessibility is contrary to the predominate lower-lying position of loch islets within the landscape, with all other islet sites being more accessible than they are connected. If, however, the inland lochs were being used for movement—and given the heavily maritime nature of the analysis combined with high levels of activity at islet sites, the use of these inland waterways for movement should be deemed highly likely—then Eilean an Tighe and the northeast coast may have been far more accessible.

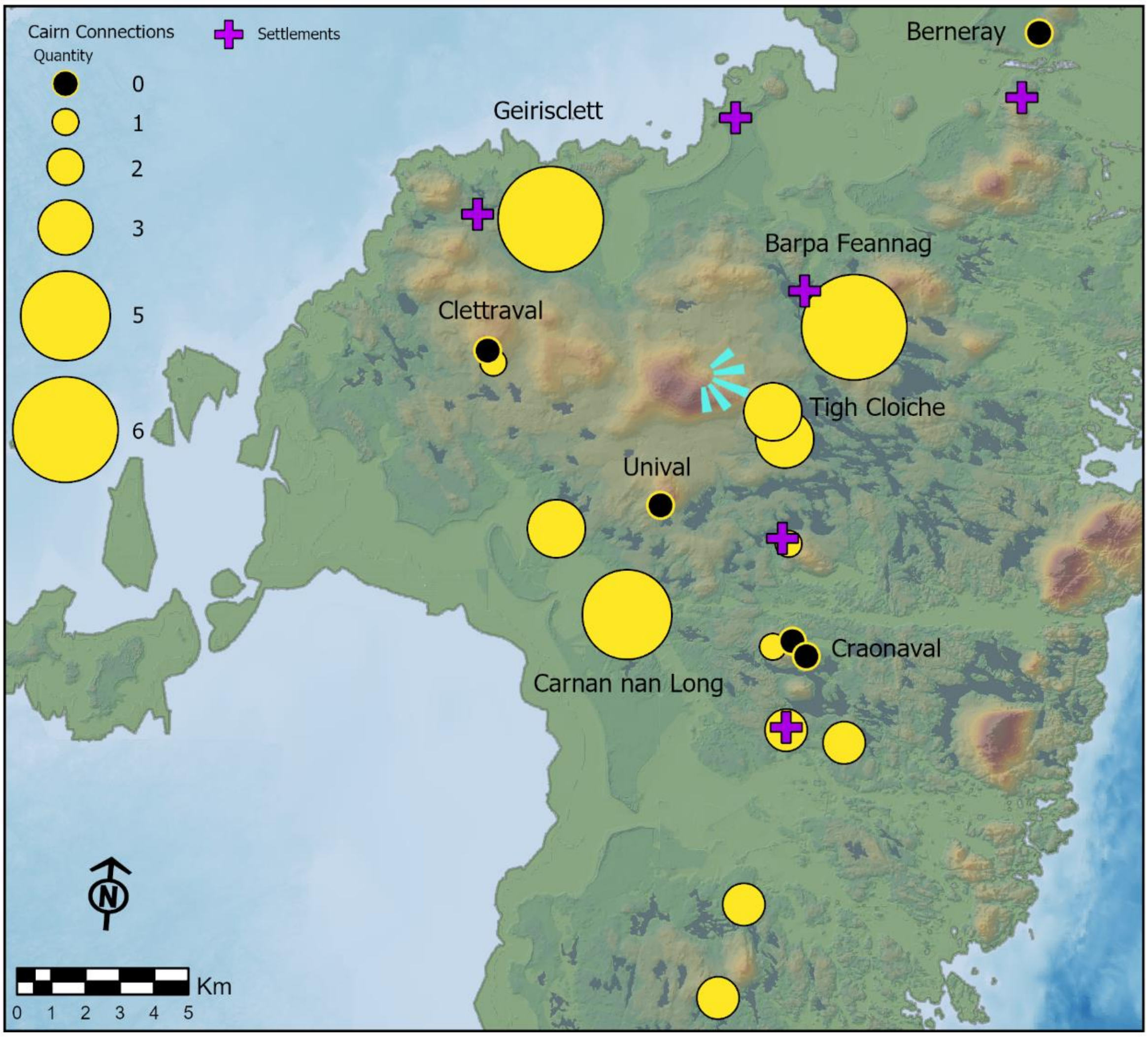
The biggest impediment to terrestrial movement, and thus the most practical place for the use of inland watercraft, is Loch Scadavay, which through its many branches would have provided access to large areas of shoreline. In addition, the ability to move boats between many of these North Uist lochs, even in modern moorland, was noted by Murray and Pullar (1910, p. 184) during their bathymetric survey, a capability which would have provided further access to numerous other lochs, thereby engendering greater inland connectivity throughout the island. Whilst Loch Scadavay would have provided access to much of the southeast, Loch nan Geireann would have offered ideal passage to the north of the island, a corridor constrained between hills to the east and west. Thus, by assuming the use of watercraft within these lochs, this rather indistinct terrestrial corridor of movement between the northeast and southeast becomes a more distinct littoral corridor of movement. Moreover, these inland waterways would have provided greater inland connections for any broader patterns of maritime movement occurring along the east coast, primarily from Loch Maddy and Loch Eport, thereby enabling greater connections not only between sites within North Uist but also between these sites and the broader archipelago.

Chambered Cairn Connections and Misconnections

Whilst the discussion of individual catchment areas has allowed for a greater understanding of each site's connection to the landscape, other settlements and the broader archaeological record, it has simultaneously enabled a greater understanding of the overall accessibility of chambered tombs. Several monuments revealed strong connections to the broader settlement record, two being connected to pathways from all six sites (Figure 66, *top*). These include Geirisclett, the Clyde cairn to the east of Eilean Domhnuill, and Barpa Feannag, the long cairn to the southeast of Eilean an Tighe. This association between strongly connected cairns and islet sites is notable as it suggests the proximity of both islet sites to highly accessible locations, despite Eilean an Tighe not demonstrating particularly high accessibility based on terrestrial pathways. In addition, Carnan nan Long, the intertidal cairn on the northeast corner of Baleshare, is connected to all sites except Screvan Quarry, and another three cairns are connected to three sites, in all forming a triangle pattern of connections oriented around the inland series of hills, with Geirisclett and Eilean Domhnuill residing towards the apex and the inland lochs, and more distantly, the prominent landforms of the east coast forming the base. The base of this formation once again highlights the strong northeast to southwest distribution of connected sites through the interior of the island and further reinforces the strong topographic influences affecting both movement and monument placement.

Of these six most connected monuments, five are either long cairns or Clyde cairns; the lone exception is Tigh Cloiche, a largely intact Hebridean-type passage tomb, residing on the southeast slope of Marrogh, at the place where inland hills and waterways converge. The monument thus provides expansive views of the loch filled interior of North Uist, with its southeast facing chamber overlooking Loch Scadavay and the Lees (Figure 66, *bottom*). Whilst its greater connection to settlements is derived from the constrained terrestrial movement occurring through the region (the same route from Eilean an Tighe and Screvan Quarry that connected to the less prominent side of Airidh nan Seilicheag long cairn), on the assumption of the use of these inland waterways for movement, it is likely that Tigh Cloiche would have been less connected to terrestrial patterns of movement than the models indicate. Furthermore, the monument would have provided extensive views over this proposed littoral corridor.

Just as informative as highly connected chambered tombs are those that exhibit a lack of connections. Whilst almost all tombs in North Uist have been discussed through movement to some degree, there remain five sites that are not proximal to any settlement's pathways. Two of these are severely disturbed monuments near Craonaval, midway between Barpa Langass and Bharpa Carinish, and a third is a suspected chambered tomb on Berneray (all of which currently appear to have stronger associations with littoral environments). However, most notable amongst these unconnected monuments are Clettraval and Unival, the two cairns excavated by Scott that have, along with their recovered ceramics, been highly influential in the construction of chambered tomb chronologies and interpretations of foreign contacts (see Section 4.1). Clettraval is located on the southern slopes of South Clettraval, one of the hills constraining movement from north to south. Its position thus marks the southern entrance to the westernmost corridor through Drolla Valley, suggesting the monument's prominence over this corridor of movement between the



View ESE overlooking Tighe Cloiche with Loch Scadavay in the left background and the Lees on the horizon (RCAHMS 1915).

Figure 66. Accessibility of chambered tombs from the broader settlement record revealing a triangle orientation of connections around the inland series of hills (top), with Tigh Cloiche at the centre of the base of the triangle, poised between hills and lochs (bottom).

northwest and southwest coasts, although it would have only been visible from the south (see Figure 65). Located just under 7 km to the southeast, Unival is positioned on the southwest slope of its eponym, placing the monument to the southeast of the second terrestrial corridor highlighted in the previous section, although again, the site would have only been prominent from the south. Although the position of these two monuments on the slopes of prominent hills doubtless leaves them unconnected to pathways based on proximity, they would have certainly been connected through visibility. Further, given that this visibility would have only been achieved during movement from the south, it may be plausible to suggest the connection of these monuments to occupation areas on the southwest coast now lost to erosion. This is further supported by the notable alignment of these two sites and the two unconnected cairns near Craonaval from northwest to southeast along the southwest coast. Whilst a greater understanding of these monuments is limited due to their long duration of use and multi-period reuse, their unusual square-shaped forms along with their undecorated ceramics were cited as evidence for not only the early dates of these monuments but also early contacts with the southwest mainland (Henshall 1972, pp.174-175; see also Henley 2004). If such is the case, then these monuments, along with their associations to the southwest, would further suggest a concentration of activity around the now heavily eroded southwest coast by the earliest Neolithic inhabitants of the island.

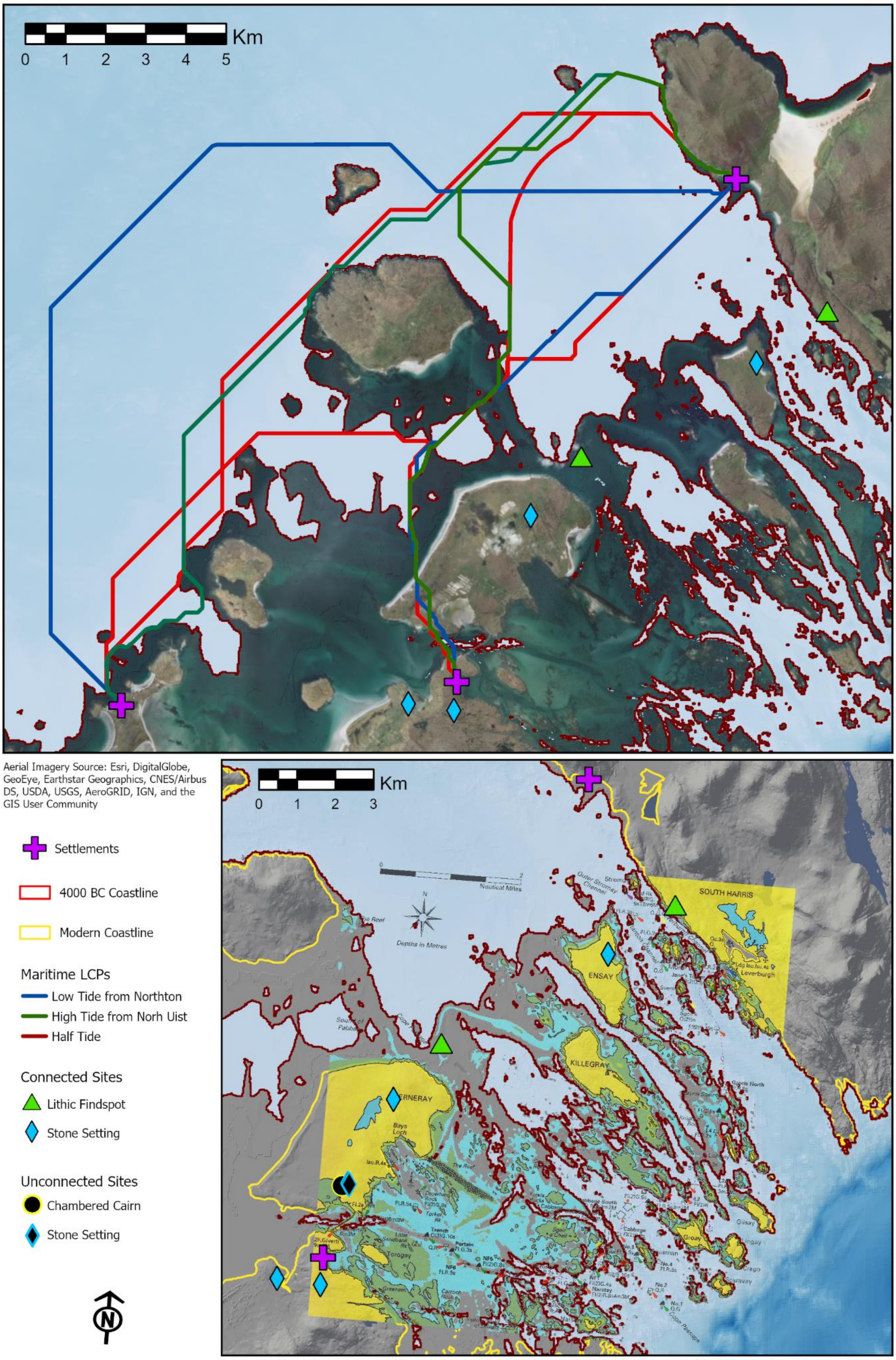
In addition to these unconnected monuments, the Hebridean-type passage tombs of Caravat Barp and Barpa Langass were also little connected to the broader settlement record despite the overall connectivity of their positions, as seen through their adjacent occupation areas. In fact, the only sites connected to these monuments are their adjacent occupation areas, with the addition that Caravat Barp is connected to pathways from Barpa Langass. To this list of unconnected tombs could also be added Tigh Cloiche, if the inland waterways were being used for movement. These inland monuments would thus form a north-south alignment through the centre of the island, which could perhaps suggest a chronological shift away from the volatile southwest coast or an overall expansion of activity to the north and south. In addition, the alignment and orientation of these monuments to the dominate landforms along the east coast is clear, further suggesting a shift in focus from west to east or, at least, an increased emphasis on the liminal position between the two.

Altogether these unconnected sites in North Uist reflect the most characteristic settings of chambered tombs, being highly connected to patterns of movement through prominent and visible positions yet in various ways remaining distanced from the broader settlement record. With the occupation areas adjacent to Caravat Barp and Barpa Langass offering a glimpse into the use and connectivity of the surrounding landscape, it appears that both monuments were placed within landscapes of great affordances, for both resource procurement and movement, yet were specifically sited to maintain maximum visibility of certain places or features within the landscape, often lochs or mountains, whilst retaining a strong perception of inaccessibility.

Looking North

The primary outlier to this discussion has been Screvan Quarry. The anomalies already noted for its setting and terrestrial and archaeological connectivity are further reinforced by its maritime connections, ranking average in the archipelago, with a slightly greater accessibility. Whilst this may be, in part, due to its further distance from the coast during the Neolithic, as evidenced by the two Barpa occupation areas, conversely, the flat slope of the surrounding topography should have mitigated the higher costs associated with movement through the landscape. Whilst the dramatic changes that have occurred around Screvan Quarry limit any greater understanding of both mediums of movement around it as well as its connection to the broader record, this site does represent the nearest occupation area to Northton. Given the substantial inundation that has occurred in the Sound of Harris, much of the modern sound is filled with skerries, reefs, shoals and drying rocks which constrain modern maritime movement here perhaps more than anywhere else in the archipelago (Figure 67, *bottom*). Modern movement through the sound is thus restricted to narrow passages, demonstrating a tense negotiation between tide and rock—e.g. the restricted access to Berneray along the Ferry Route, which is itself inaccessible until water levels are above half tide (Mason 2017, pp.78-79). Thus, with large portions of the sound projected to have been dry land, or at least tidal islands, Neolithic movement through the sound may have likewise been constrained to specific routes and tides, a restriction that becomes more interesting as it relates to the position of Northton.

Whilst Northton, much like An Doirlinn, was repeatedly demonstrated to be a site greatly isolated from concentrations of activity to the north, unlike An Doirlinn, the settlement demonstrated much stronger maritime connections. Although the settlement ranks around average in the archipelago, comparisons of connection measures between the tidal ranges demonstrated the site to be nearly as accessible as it is connected, regardless of the tides (see Table 15). Moreover, Northton was the only site to be the least connected at half tide, not only suggesting the greater affordances to maritime movement offered by both tides but also the overall maritime affordability of its central position within the archipelago, rendering the site immune to the overall directionality of the seaways that has been repeatedly highlighted. These maritime connection measures and their strong contrast to the site's terrestrial measures suggest that, much like Allt Chrisal, any social contacts would have been borne through the seaways. From this maritime perspective and given the overall proximity of south Harris to North Uist, which is apparent in the visibility between the two (see images in Figure 51 and Figure 62) as well as their stronger cultural affinities, it is plausible to suggest much stronger connections between the two islands then bounded island-based perspectives may allow for.



Sound of Harris paleogeography and modern pilot guide, showing numerous skerries, reefs and shoals that fill the modern sound (Pilot guide after Mason 2017, p.81)

Figure 67. Maritime routes between North Uist and Northton (top); and Sound of Harris palaeogeography and modern pilot guide demonstrating the numerous sea hazards and constricted modern routes which may have also affected maritime movement during the Neolithic (bottom).

Departing to the north of Berneray, near the now island of Pabbay, it would have been possible to reach Northton in less than 2.5 hours by moving along the Atlantic coast between half and high tide (Figure 67, *top*). From the Udal and following much the same route, this journey would have taken around 4.5 hours. Conversely, movement from Northton to these sites between low and half tide would have taken at least 30 minutes less, reflecting the greater affordability of movement south. In contrast to half tide exhibiting the highest overall maritime cost for Northton, movement at half tide between Northton and North Uist allowed for shorter routes and quicker paddle speeds. Much like the Sound of Barra, tidal streams through the Sound of Harris run parallel to the coastline, incoming at flow and outgoing at ebb, which when combined with the narrowed sound and numerous sea hazards, may have made its crossing hazardous at the tidal extremes. This was well demonstrated by the avoidance of the sound by tidal models moving with the predominant tidal stream, as highlighted in the initial analysis of the maritime LCPs.

Thus, whilst the position of the site may have offered great affordances to maritime connections, these connections would have also been intimately connected to the temporality of the tides. This becomes even more significant when considering the position of Northton within the wider Neolithic archipelago. With the likely connections of the Uists, the only access between the Atlantic and the Minch would have occurred through the Sound of Barra, a route which was not used by maritime models, through the Sound of Harris or across the Tarbert isthmus. This crucial position along broader maritime routes as well as the overall affordability of the site itself for maritime movement may thus explain the enduring significance of Northton, beginning in the Mesolithic and including a highly abundant and potentially well-connected Neolithic settlement, as demonstrated by its material assemblage.

Whilst looking out from Northton reveals the greater affordances to southern connections, the site is also the nearest extant settlement to Lewis and may thus have provided the point of connection for movement north. Although terrestrial movement between Northton and Lewis is possible, the strong isolation of south Harris as evidenced in the terrestrial LCPs, which extends even into modern geographical and cultural constructs, emphasises the strong topographic challenges formed by the Harris Hills between the two. Terrestrial movement would have thus been slow, with pathways traversing the approximately 86 to 126 km distance in 17 to 35 hours. In comparison, McIntosh (2016) recounts his experience of walking from Rodel on the southeast coast of south Harris to the Butt of Lewis in a ‘generous’ 12 days. However, in contrast to leisurely paces and meandering scenic journeys, more direct and purposeful movement between the two would not have offered any great affordances to social connectivity. For instance, in *Sketches of the Coast and Islands of Scotland*, Lord Teignmouth describes the ‘exhausting’ walk undertaken in 1828 in order to reach the southwest coast of Lewis from Stornoway. Consequently, the seaways present not only a quicker but also an overall less physiologically arduous form of movement between the two, given optimal conditions and adequate local knowledge.

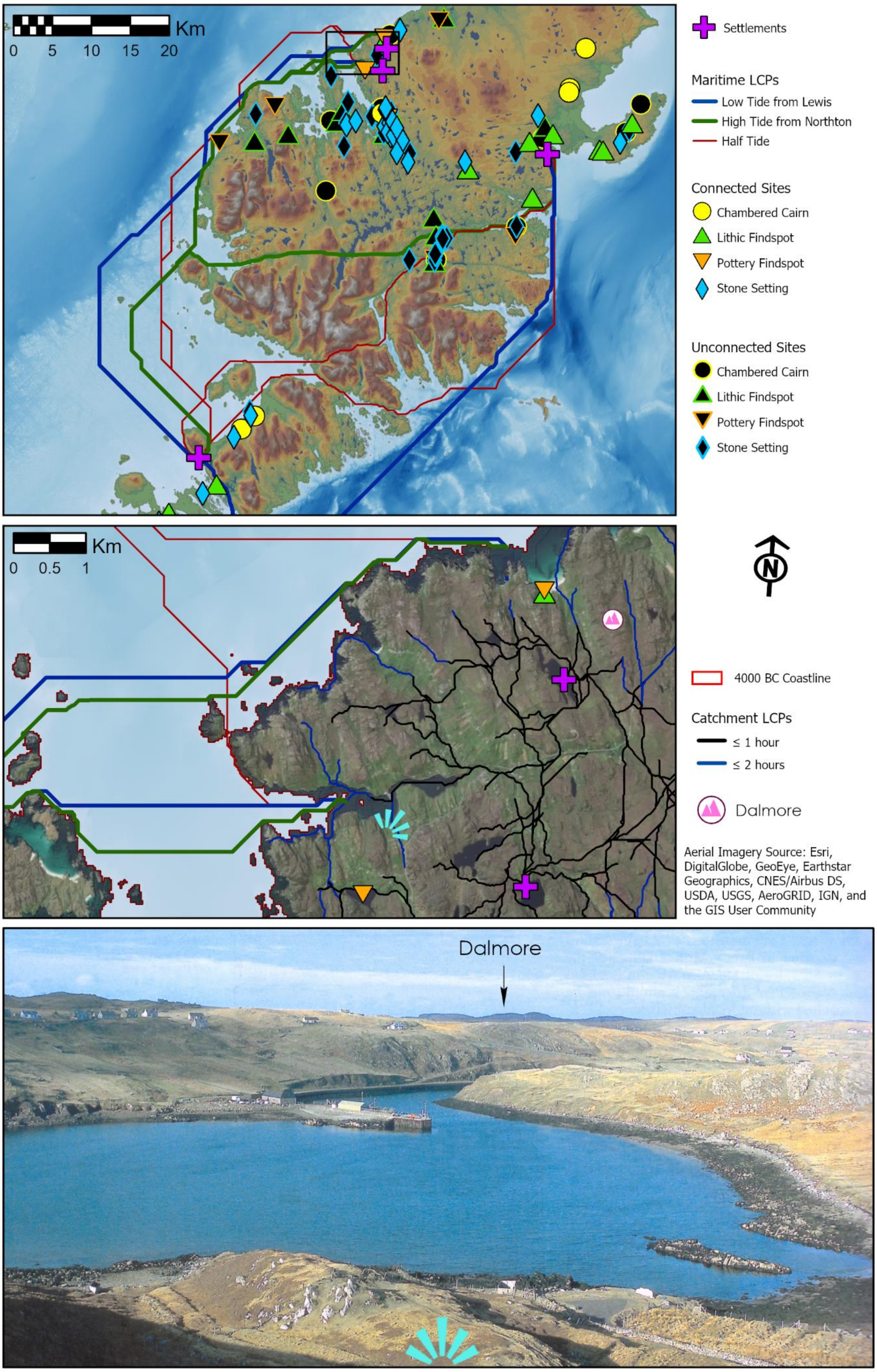
7.2.3 The North

Challenging Connections

Based on the overall affordances to social connectivity demonstrated by Northton as well as the strong distinctions between north and south that have been repeatedly demonstrated throughout the analysis and discussion, rather than viewing Northton as a site greatly isolated from activity in Lewis, as has been repeatedly stated, it is perhaps more apt to consider sites in Lewis as being largely isolated from the rest of the archipelago. Like all other regions, Lewis can be reached from either the Atlantic or the Minch, and whilst both routes would have provided their own unique affordances, they may also have presented the greatest maritime hazards in the archipelago. This is especially prominent in the seas around north Harris and south Lewis, simultaneously its widest and most topographically complex area, where modelled pathways became far more constrained and, in some cases, even abandoned the seas entirely (Figure 68, *top*). Thus, these five sites in Lewis were demonstrated to be the least accessible in the archipelago via the seaways, with, contrary to distance, the islet sites in central Lewis ranking lower than the two northernmost sites at the Butt of Lewis.

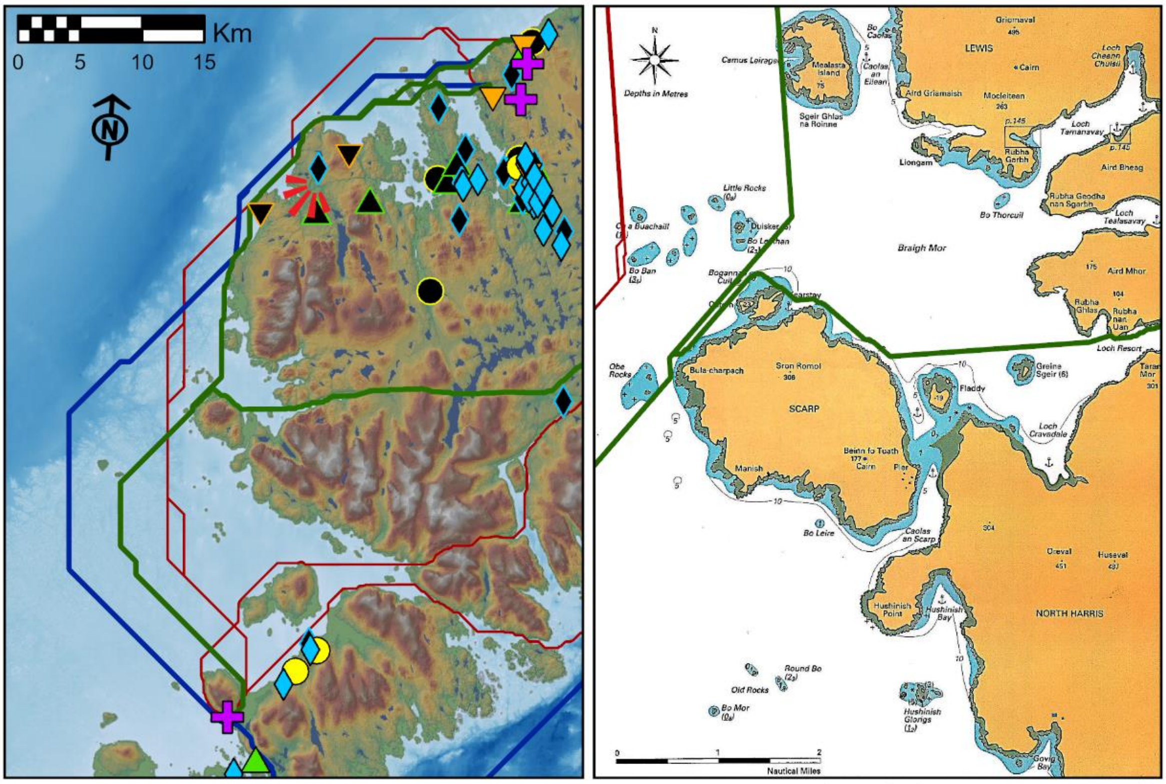
The primary difficulty of travelling along the west coast of Lewis is the greater distances that must be traversed, which when combined with its overall susceptibility to severe weather and gales, would have created a journey of sporadic conduciveness. However, these seaways exhibit minimal tidal velocities, and thus, in optimal conditions and by making use of the few sheltered harbours along its coastline (see Ramsay and Brampton 2000; Mason 2017, p. 136), such routes would have been possible. From Northton to the western islet sites, a journey of around 72 km at an average paddle speed of 1.62 m/s would have taken 12.5 hours to reach East Loch Roag. From there, routes to Loch Borghastail entered Loch Carloway on the north bank of East Loch Roag, and routes to Loch Langabhat continued north to land near Dalmore Beach (Figure 68, *middle* and *bottom*). Whilst all modelled pathways between Northton and the two western islet sites followed the same general route, regardless of the tide, it is instead movement to Loch Arnish that highlights another potential waypoint between the two.

This route from Northton to the east coast moves, rather contradictorily, through the Atlantic before entering Braigh Mor, a large sheltered sound on the west coast of north Harris, and continuing through the interior of south Lewis in order to reach Loch Resort on the east coast and ultimately the Minch (Figure 69, *top*). Given the roughly 17 km journey required through the rugged interior of north Harris and south Lewis, not to mention the need to cross the epitome of the Hebrides' Langabhats, this route may not have been ideal for movement to the east coast.



View northeast over Loch Carloway (Photograph from Mason 2017, p.148).

Figure 68. Maritime routes between Northton and the western islet sites (top) showing the use of Loch Carloway and Dalmore Beach to enter Lewis (middle) as well as the proximity between them (bottom).



Pilot guide from Mason 2017, p.142).

View southeast over Traigh Uig, a rare sandy beach on the west coast of Lewis (Photograph by author, 2015).

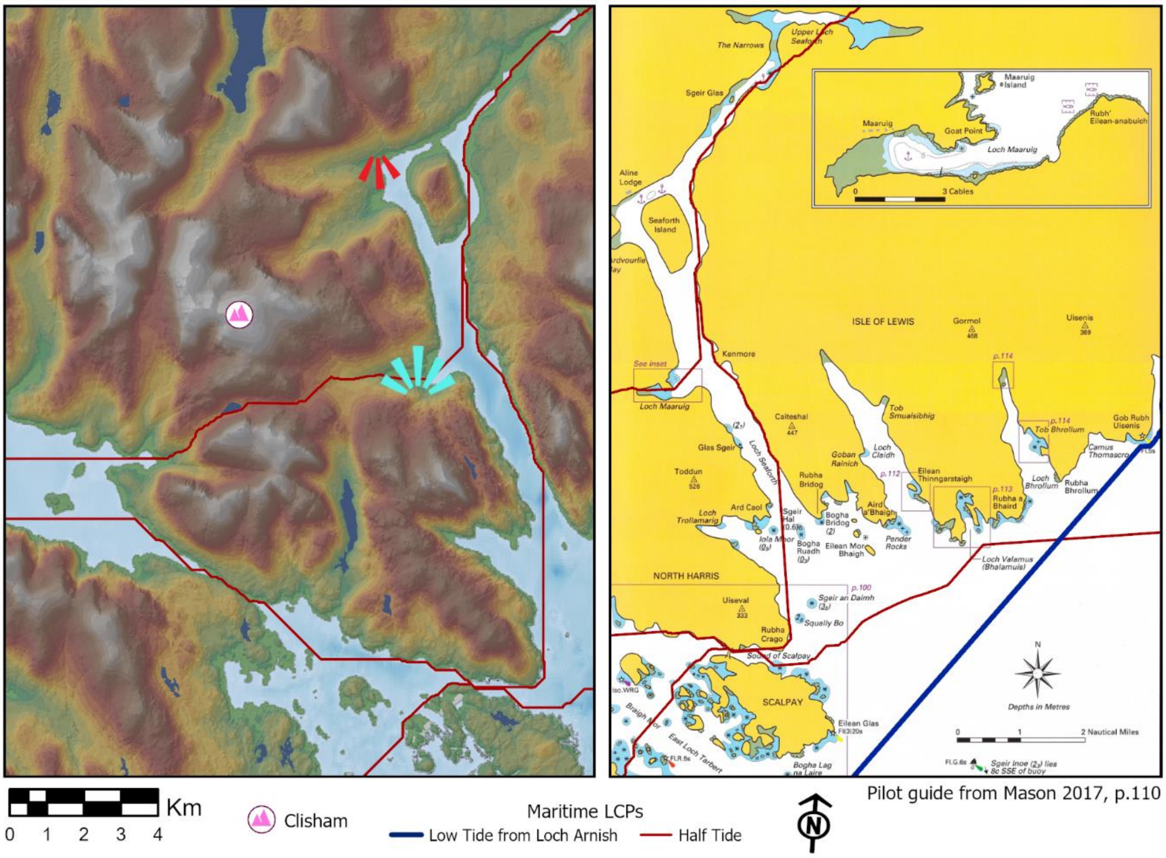
Figure 69. Maritime routes along the Atlantic coast of Lewis showing the use of Traigh Mor in order to reach the east coast (top right); and the potential use of these sheltered waters as well as sandy beaches around Uig (bottom) to move to the western islet sites.

Although the tides would have been less significant along this journey, given that Braigh Mor could have been reached within 5.5 hours, these sheltered waters may have provided an ideal stop-over or necessary haven in order to wait for favourable conditions. From there, Loch Roag could have been reached in 5 hours; however, given that the entrance to the sea loch is subject to strong overfalls at ebb tide (Ramsay and Brampton 2000), the last leg of this journey would have once again required consideration for the tides, entering and exiting between slack water and half flow.

Accordingly, by dividing the route into shorter legs of movement, the journey could have been timed with the tides and structured around the weather. Although no Neolithic sites have been recorded in the region around Braigh Mor, a large number of sites, primarily findspots, exist around the region of Uig. This headland is fringed with one of the rare machair deposits in Lewis and has consequently demonstrated an extensive record of use throughout prehistory, beginning with the Mesolithic (Church et al. 2011, 2012; Snape-Kennedy et al. 2013) (Figure 69, *bottom*). Thus, despite the limited maritime accessibility of the two western islet sites, by taking advantage of the few sheltered waters and sandy beaches along the west coast, the overall accessibility of these sites may have been greater than indicated by the modelled routes, although this accessibility would have been constrained to optimal weather and sea conditions.

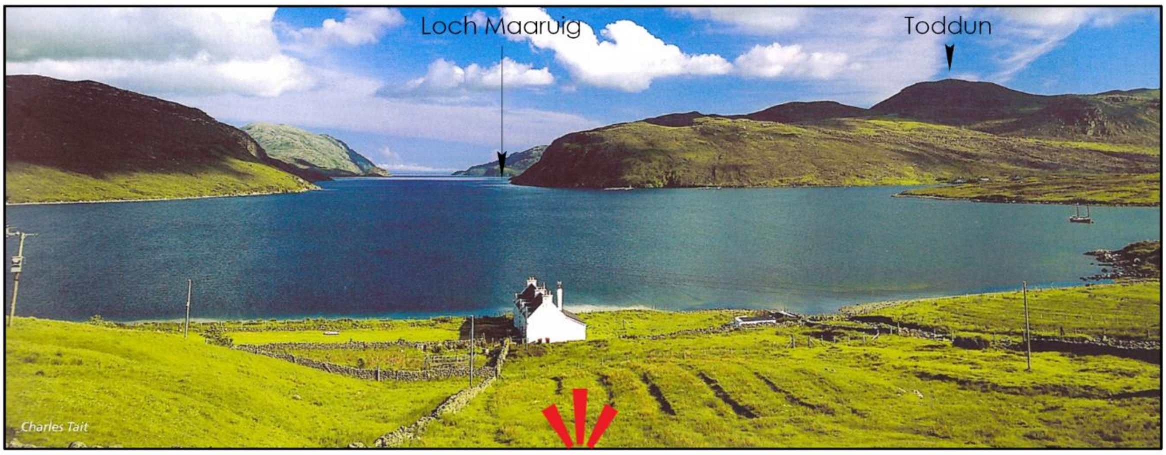
Access to the east coast would have been even more challenging, as Loch Arnish was demonstrated to be, by far, the most inaccessible site via the seaways. However, as highlighted in the division of costs between the Atlantic and the Minch (see Table 10), the Minch is clearly the more suitable option for movement north yet also the most dependent upon the tides. In contrast to high tide models, which followed the aforementioned route inland from the Atlantic, half tide pathways from Northton travelled through Loch Seaforth and Loch Resort in order to reach the east coast (Figure 70, *top*). These routes entered West Loch Tarbert and landed at Loch Bun Abhainn-eader on its northern bank in order to enter south Harris, a journey which would have taken just under 5 hours from Northton or considerably less if launching from the northwest coast near Luskentyre Bay. From there, modelled pathways broadly followed the route of the A859 which meanders through a narrow pass between Clisham, the island's highest mountain, and a series of hills and mountains on the eastern flank of north Harris, a challenging terrestrial route that could have been accomplished in under 2.5 hours before entering Loch Seaforth via Loch Maaruig on its western bank (Figure 70, *middle*).

Alternatively, pathways moving from sites south of Northton entered East Loch Tarbert to move through the Sound of Scalpay and enter Loch Seaforth (Figure 70, *top right*), an entrance that is subject to tidal rushes and overfalls, which create dangerous seas during the ebbing tide (Nicolson 2001, p. 29; Mason 2017, p. 110). This narrow entrance to Loch Seaforth is overlooked by two mountains which stand on either bank, creating a dramatic entrance further guarded by steep cliffs



Pilot guide from Mason 2017, p.110

View north from south bank of Loch Maaruig with Loch Seaforth in the background.



View SSE down the narrow entrance of Loch Seaforth (Photographs from Mason 2017, p.109).

Figure 70. Maritime routes to Loch Arnish at half tide (top), showing use of Loch Maaruig (middle) and Loch Seaforth (bottom).

before the topography flattens out from Loch Maaruig up to Seaforth Island (Figure 70, *bottom*). The journey through Loch Seaforth would have taken just under 2.5 hours at half tide (or 2 hours if entering at Loch Maaruig), circumventing the mounded Seaforth Island, which stands at an elevation of 217 meters, before continuing to Upper Loch Seaforth. Along this route, the west banks of Loch Seaforth currently contain large patches of woodland, most predominately the Aline Community Woodland (2019), which covers an area of 636 hectares.

Today Upper Loch Seaforth and the Narrows leading to it are filled with drying rocks, which create tidal rapids with streams up to 7 knots and only 5 minutes of slack water (Mason 2017, p. 111). However, it is apparent from both the palaeogeography as well as the archaeological record that this upper loch would likely have been either dry land or a freshwater loch during the Neolithic (Figure 71). Along the eastern branch of Upper Loch Seaforth, at the nearest point to Loch Erisort,

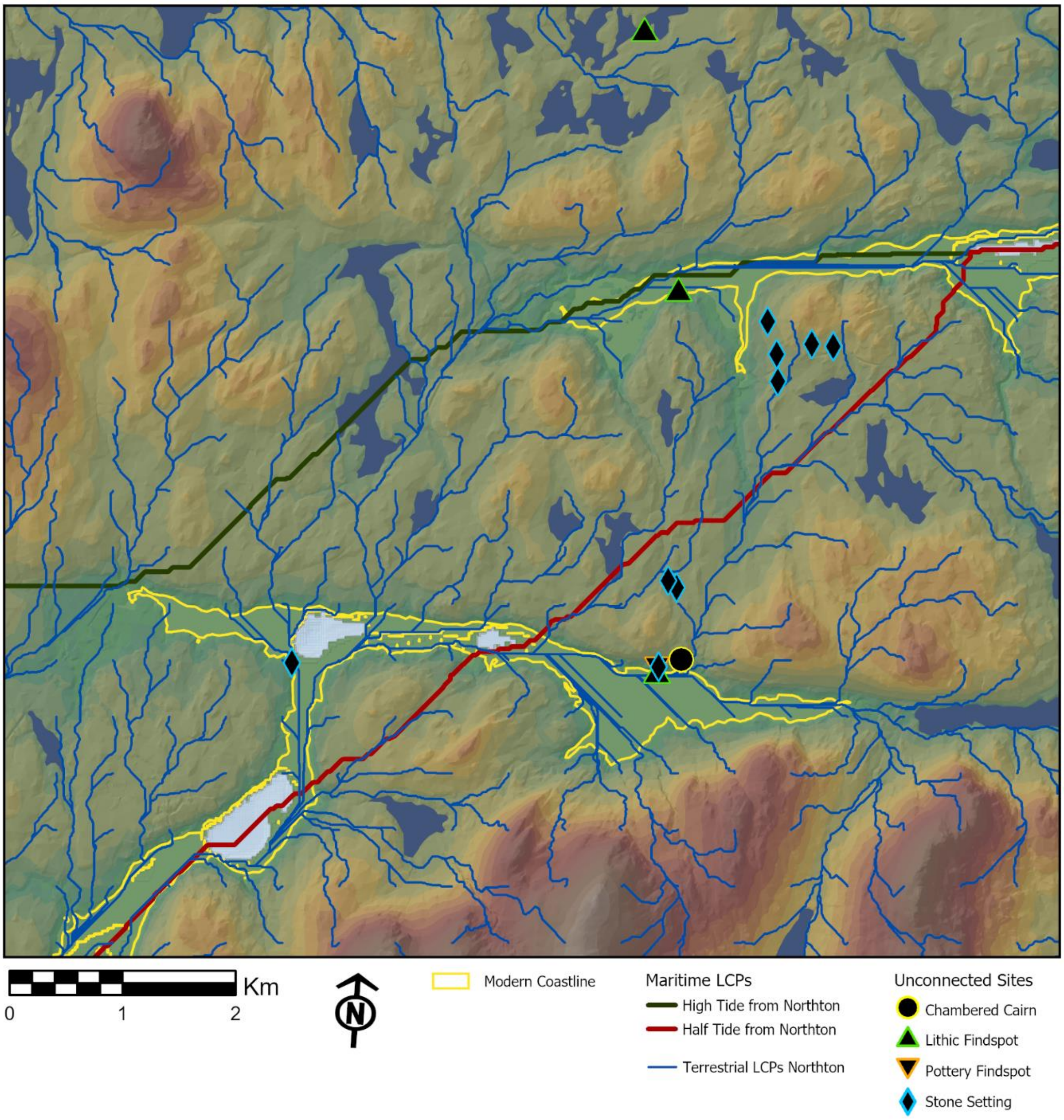


Figure 71. Maritime and terrestrial routes between Upper Loch Seaforth and Loch Resort showing concentration of Late Neolithic sites along a potential combined maritime and terrestrial pattern of movement.

there are two stone settings. The first is a large stone circle that resides around 20 meters from the current shoreline and has produced pottery and worked lithics, and the second less definitive setting sits below the high-water mark, testifying to lower loch levels in the Late Neolithic. Just beyond these stone settings sits a possible chambered tomb and upon moving north to Loch Erisort two more standing stones are found before crossing the 3.5 km distance to its southern banks, the approach to which is overlooked by a stone circle and four standing stones. Upon entering Loch Erisort, the journey to Loch Arnish would have taken around 2.5 hours, a route again dictated by optimum tides. Much like at Loch Boisdale, by timing movement at the end of ebb, advantage could have been taken of outward flowing tidal streams, reaching the Minch at slack water to half flow to avoid potential overfalls and continuing north to Loch Arnish with the flood tide.

Further North?

Modelling seafaring routes to Loch Arnish concurrently allows for a greater understanding of potential routes of movement to Stornoway, today the most densely populated town in the Outer Hebrides and the second most populous amongst the Scottish islands, after Kirkwall in Orkney. The rare sedimentary deposits of this region would have certainly promoted its early use and long history of occupation, an attractiveness furthered by its 'two-for-the-price-of-one inner and outer harbours' (McIntosh 2016, p. 31) (Figure 72, *bottom*). Protected by Arnish Point, this large harbour is well sheltered and has the additional benefit of allowing entry at all states of the tide (Mason 2013, p. 128). It is thus worth mentioning that Loch Arnish is situated 400 meters (500 meters at Early Neolithic sea levels) from Glumain Harbour, currently the best anchorage in Stornoway Harbour, and although no pathways were modelled through these harbours, it is plausible to assume the greater affordability of a 1.2 km journey across these protected waters than the over 4.2 km terrestrial journey required to reach the same point.

Maritime routes north from Loch Arnish instead travelled across the isthmus connecting Stornoway to the Eye Peninsula at half tide or around the peninsula at high tide, an alternative route that would have added considerable distance to the journey (Figure 72). Beyond Stornoway, the waters become more challenging, influenced by both tides, most predominately the ebbing tide flowing off of Cape Wrath (Nicolson 2001), the northwest headland of mainland Scotland, and the conditions of the Atlantic. At the Butt of Lewis, the Atlantic and Minch converge, resulting in strong tides and heavy seas (Ramsay and Brampton 2000). These challenging waters along with the general unsuitability of modelled transition points leaves much uncertainty as to the modelled pathways moving north. Further, it must be noted that movement from Loch Arnish to the northwest coast of Lewis is the one route that does not fall within the 0° to 90° window of optimum movement originally used to include direction within the cost raster, thus introducing an additional degree of doubt as to their suitability.

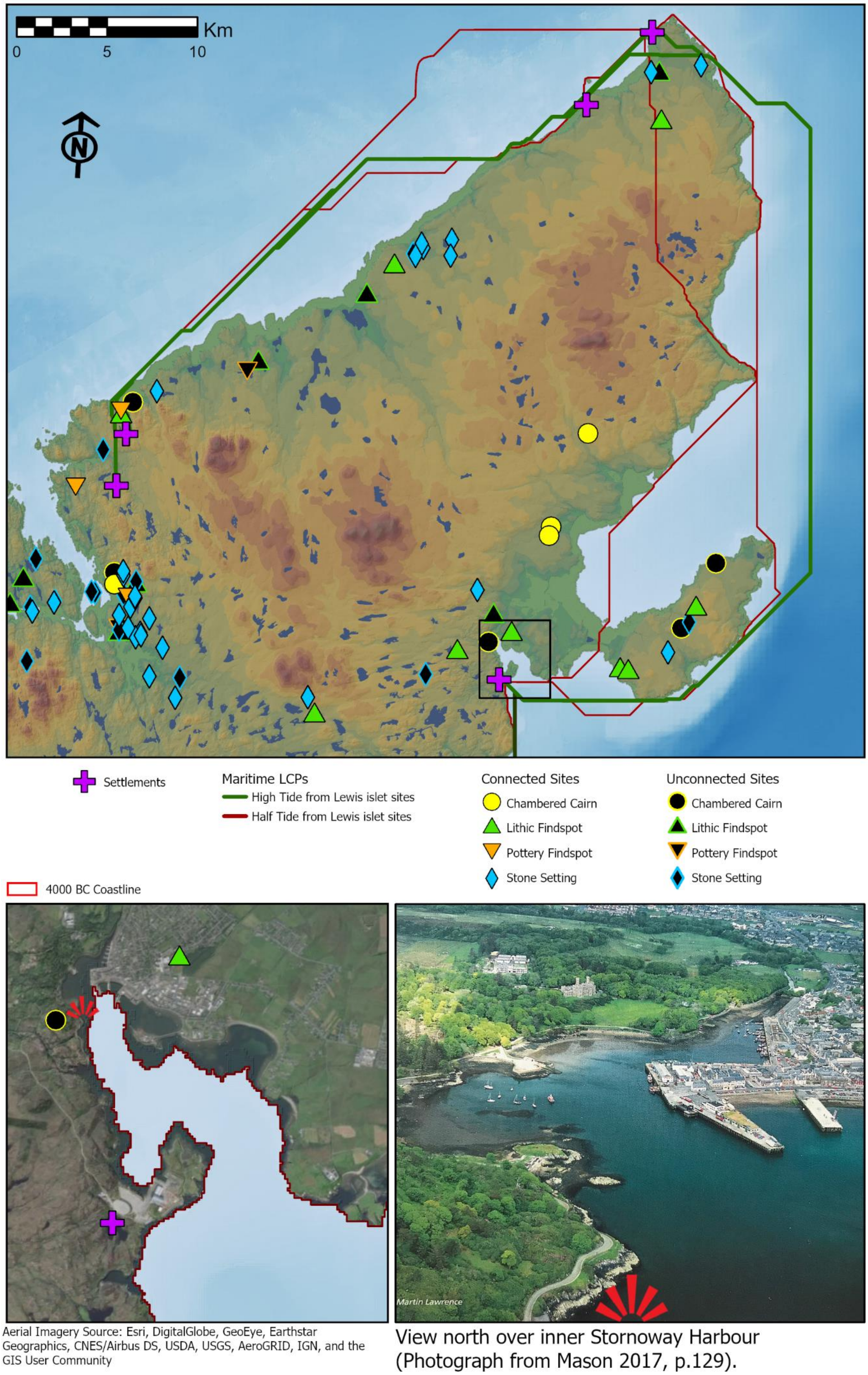
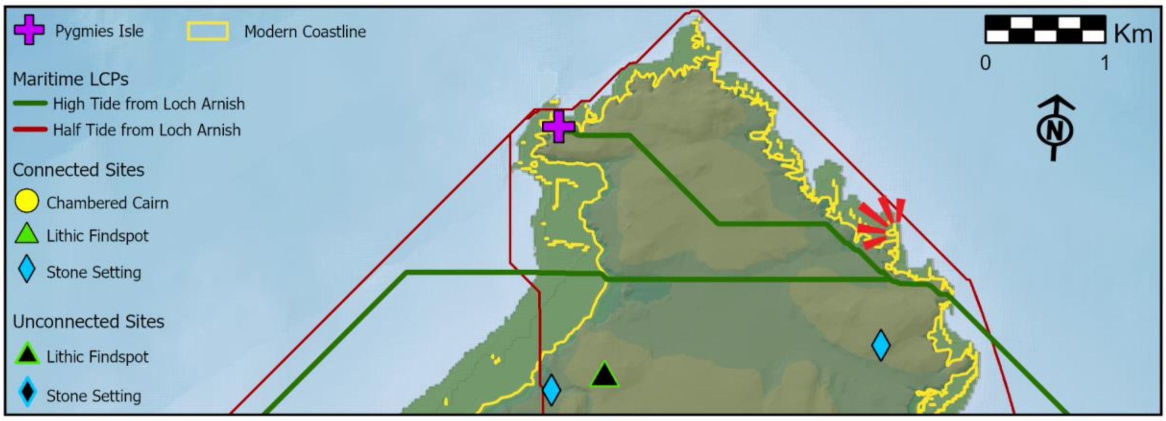
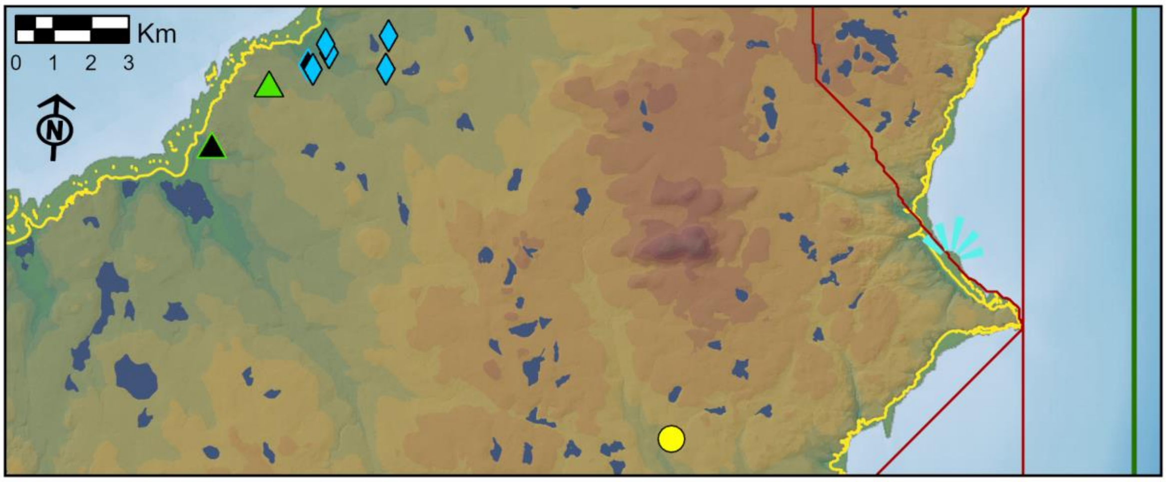


Figure 72. Maritime routes from the western islet sites to Dunasbroc and Pygmies Isle (top) and Stornoway Harbour near Loch Arnish (bottom).

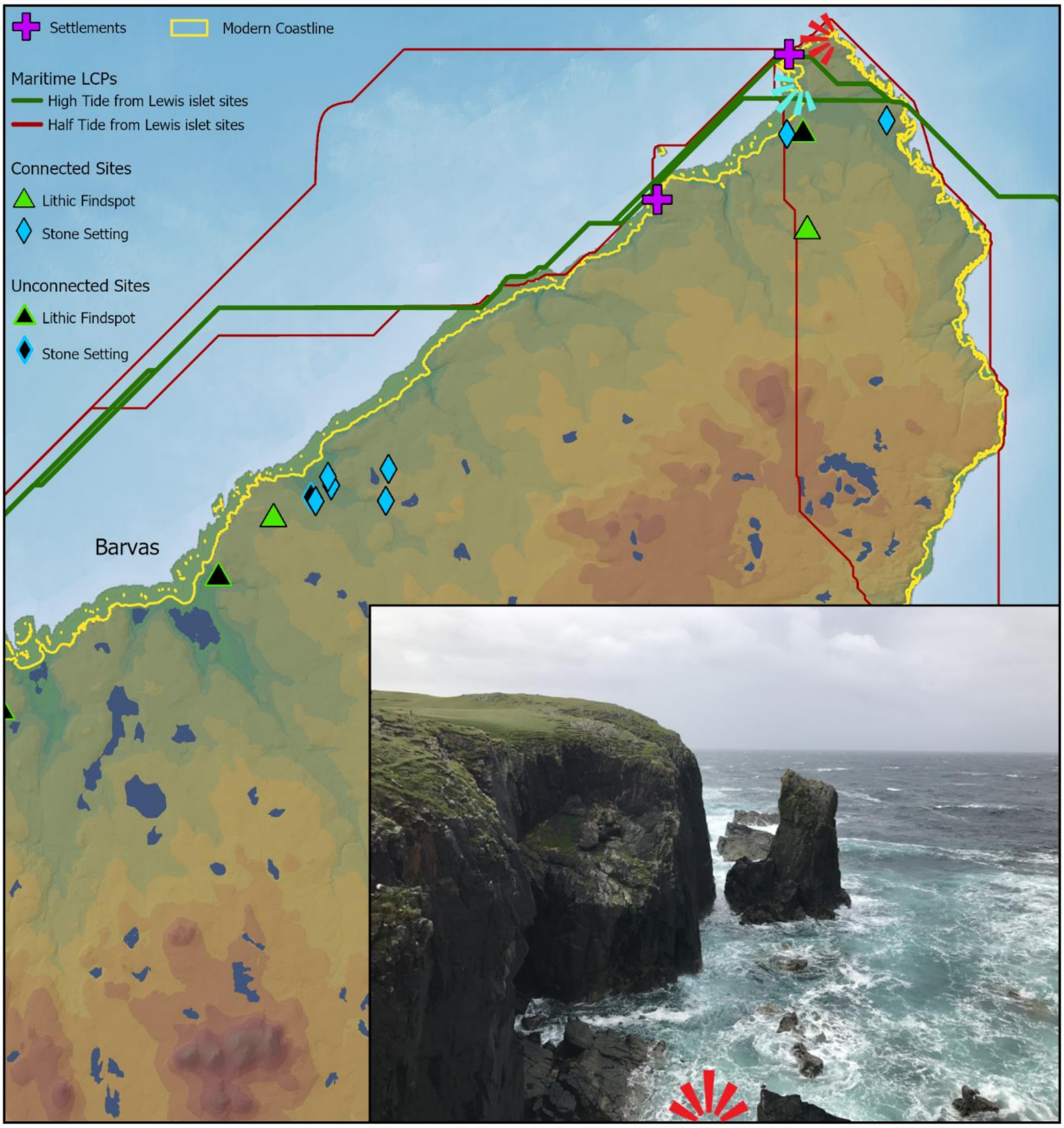


View NW from Dun Eistean with Butt of Lewis Lighthouse on the horizon (Photograph by A., 2017).



View NNE from Traigh Mhor (Photograph by Oz, 2017).

Figure 73. Maritime routes from Loch Arnish to the northern tip of Lewis showing both unsuitable landing places (top) and the more suitable use of Traigh Mhor (bottom).



View west from Butt of Lewis (Photograph by author, 2017).

View southwest across Eoropie Beach (Photograph by author, 2015).

Figure 74. Maritime routes from western islet sites to Dunasbroc and Pygmies Isle, showing unsuitability of landing places around Butt of Lewis (middle) and potentially more suitable Eoropie Beach (bottom).

One exception to the rather unsound and generally unsafe transition places modelled is Traigh Mhor, a rare sandy beach on the east coast, just north of Tolsta Head. From Loch Arnish, Tolsta head could have been reached within 3.5 hours, and from there, movement across the landscape to Dunasbroc and Pygmies Isle would have taken between 3.5 to 4 hours (Figure 73, *bottom*). To this speculative list of landing places could also be added Ness Beach, which was first identified through connections between the two northern sites and Clach Stein, the standing stone that would have stood prominently on the 1 to 2 hour journey from this sandy beach to the west coast. The fact that half tide pathways chose instead to cross at sea cliffs near Dun Eistean around 1 km to the north may suggest a constrained temporality of access (perhaps only at slack water) or the difficulty of accessing this beach from the south, but regardless, this unsuitable landing place demonstrates the much greater challenge to landing along the northern tip of Lewis (Figure 73, *top*).

Whilst these routes from Loch Arnish may have been influenced by the methodology, routes from the western islet sites likewise chose unsuitable landing places, despite the presence of two, more suitable sandy beaches along the west coast between the two (Figure 74). The previously discussed Barvas and Eoropie Beach are the sole machair deposits on the north Lewis plateau and both are highly erosive, having been identified as Potentially Vulnerable Areas as part of a National Flood Risk Assessment. Whilst Dunasbroc's and Pygmies Isle's pathways demonstrated connections to sites around these beaches, subsequently suggesting their connection to broader maritime routes, the absence of their use in maritime routes as well as the clear erosion that they have suffered from limits any further understanding of their potential maritime use during the Neolithic. Thus, it is apparent that the challenging waters around the northern tip of Lewis would have constrained access to suitable landing places, which when combined with the overall higher cost of moving north through the seaways, would have made movement to these two sites highly challenging. Thus, despite their ranking higher in maritime accessibility than the islet sites in central Lewis, it is more likely that these two sites represent the least accessible sites in the archipelago, in contrast to their greater connectivity.

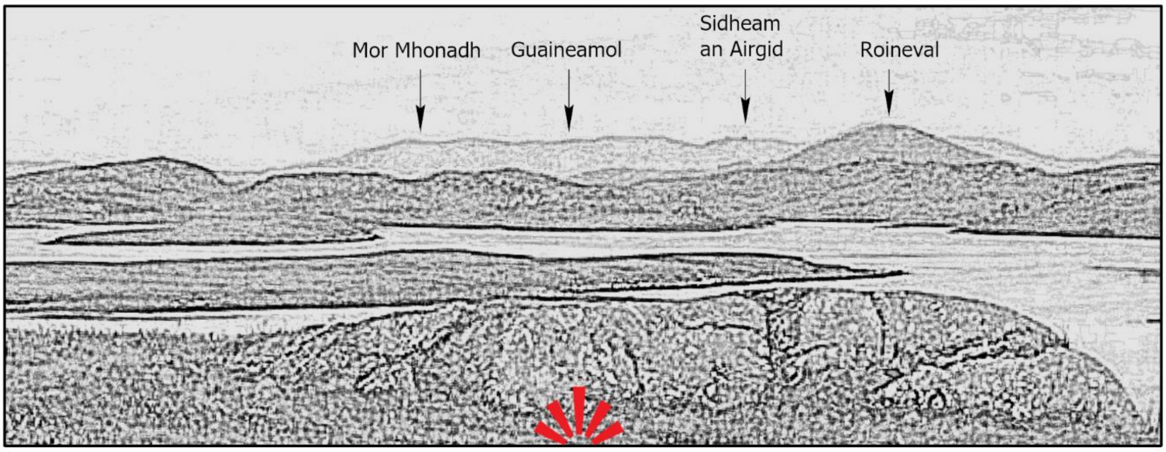
Movement, Archaeology and Environment

As a whole the archaeological record of Lewis leaves much to be desired. There is an overall lack of evidence for domestic activity, with the potential exception of Callanish and Uig, which have revealed earlier Mesolithic activity. With pollen sequences from Little Loch Roag demonstrating woodland to have started its final decline at 4400 BC, the region would have contained a sporadic yet still much denser woodland, primarily within sheltered valleys and around Loch Roag. In contrast, the region around Stornoway, whose fertile landscape has been repeatedly discussed, has produced no evidence for Neolithic occupation. However, despite a lack of domestic evidence, the region still demonstrates activity throughout the Neolithic. Most notably, it is along the banks of

Broad Bay, the large northern bay formed by the connection between Stornoway and the Eye Peninsula, that the major concentration of chambered tombs is found, which along with dates from Loch Arnish, evidence Early Neolithic activity in the region. Although only general assumptions can be made about domestic activity around Stornoway, the region's overall suitability is demonstrated by its long history of continuous occupation, which when combined with substantial peat growth, has no doubt obscured earlier phases of occupation. Although the region contains far fewer standing stones compared to Callanish, it has instead produced a high proportion of Late Neolithic prestige objects that appear to be strongly associated with patterns of movement. The recovery of many of these objects from great depths within blanket peat highlights both the drastic changes that have occurred within the Lewis landscape since the Neolithic as well as the great potential for further sites and materials to await discovery.

These two regions thus present the greatest potential for domestic activity, and yet they also present a number of strong dissimilarities. This is most evident in the variations presented between the western islet sites and Loch Arnish. The minimal number of chambered tombs along the west coast resulted in much stronger connections to the Late Neolithic record that is not supported by radiocarbon dates from either site. In contrast, Loch Arnish's multi-period use could suggest its continued use into the Late Neolithic, thereby supporting its strong connections to deposited prestige objects in the region. However, despite their differences in archaeology and littoral environments, the two regions may have still been connected through broader patterns of movement. Whilst it is the stone circles around Callanish that are the most archaeologically visible and thus most heavily researched, leading to theories of structured journeys through the region in order to reach the penultimate Tursachan, it is along the east coast that the majority of prestige objects have been recovered, many of which have demonstrated strong associations with Late Neolithic patterns of movement. Further, just beyond the reach of Loch Arnish's catchment area, the archaeological record between Loch Erisort and Upper Loch Seaforth demonstrates not only the strong likelihood of patterns of movement through and between these sea lochs but also their potential connection to Callanish.

The stone circles found along the banks of Upper Loch Seaforth have been considered to be part of the broader Callanish complex (Curtis and Curtis 2006), suggesting their role in structured patterns of movement to this site. In addition to the monument record, a number of prestige objects have been found in the region, including a carved stone ball that was recovered from the inner reaches of Loch Erisort (Marshall 1976, p. 68) and around 2.3 km to the north a hoard of five stone axe-heads, two of which have been suggested to be from axe-factories (DES 1981, p. 50) (Figure 75, *top*). Surrounding these sites and enclosing the inner reaches of the two sea lochs are a series of hills and mountains that from the north form a distinctive silhouette known as the Sleeping Beauty Hills or in Gaelic *Cailleach na Mointeach*, translating to the less romanticised 'Old Woman of the



View SE from Cnoc an Tursa hillock of Sleeping Beauty hills.

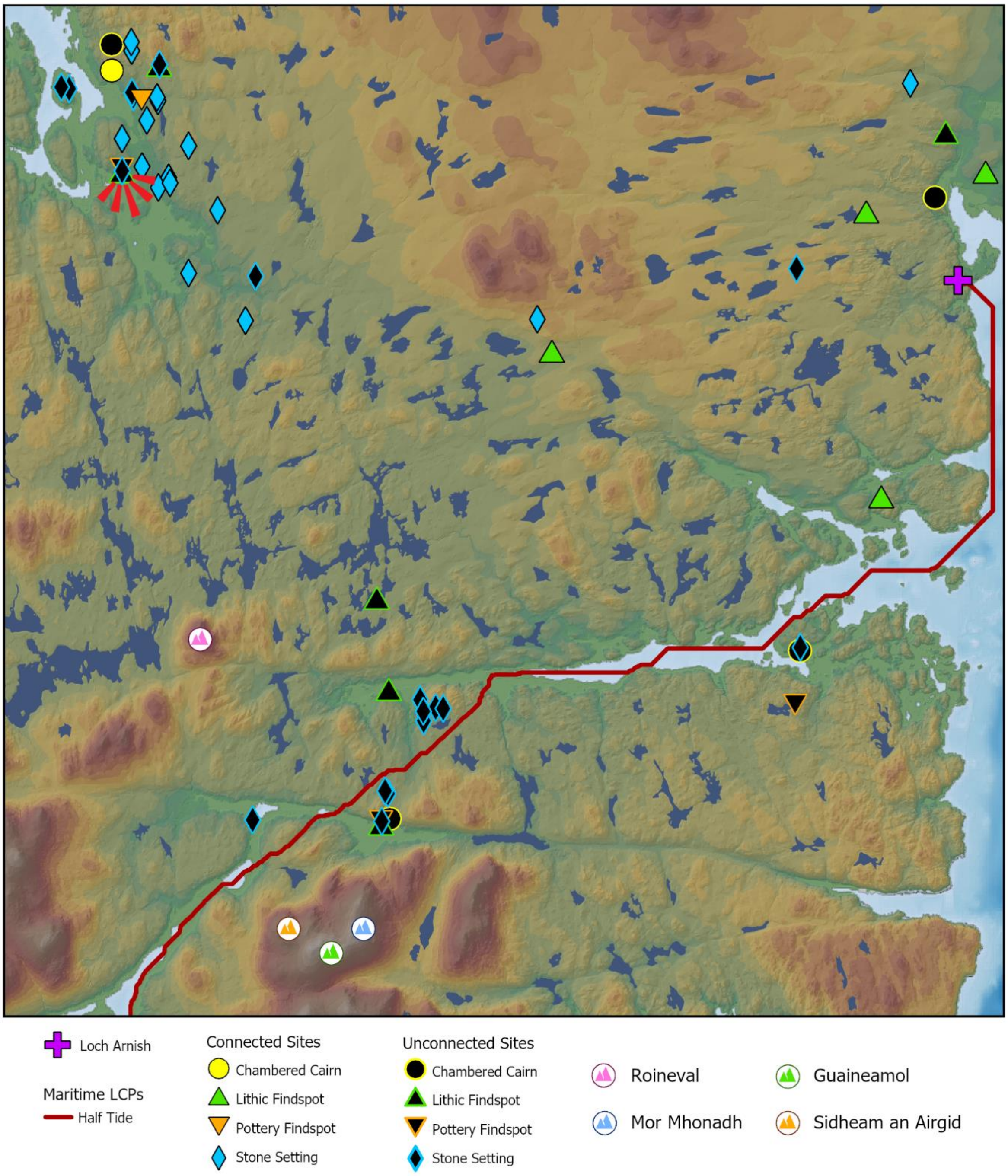


Figure 75. Associations between Callanish and modelled pathway through Loch Seaforth and Loch Resort.

Moors'. Consequently, the extant archaeology along the banks of Upper Loch Seaforth would have been overlooked by the hills and mountains that form this silhouette. Further, it has been observed by researchers that every 18.61 years the major lunar standstill can be observed at Callanish, at which time the moon rises from the head of the sleeping figure formed by Sidhean an Airig and sets behind the rocky hillock to which Callanish is oriented (Ponting and Ponting 1984; Curtis and Curtis 2011) (Figure 75, *top*). Regardless of the potential cosmological connections, the orientation of Callanish to these prominent landforms not only reveals the continuity of a tradition apparent in the Early Neolithic monument record but also suggests strong associations between this ceremonial complex and patterns of movement occurring along the east coast. Thus, the coalescence of modelled pathways, archaeology and environment in Lewis provide both a temporal and a spatial cohesion to a fragmented and incongruous record of Neolithic activity through movement.

And Back Again

How Dunasbroc and Pygmies Isle fit into the broader picture of activity remains unclear. Their evidence suggests ritual burning or feasting, and yet, an overall absence of extant archaeology in the region provides little understanding of where these resources were coming from. However, both sites appear to have been significant within the landscape; Pygmies Isle's long history of use culminated in an early Christian monastery, and Dunsbroc's faunal assemblage and elaborately decorated pottery reveal a heavy concentration of activity that would re-emerge in the Iron Age. Perhaps most importantly, their connection to the sea is clear. Today the seas around the Butt of Lewis are a turbulent and unpredictable place, where the wind and wave-driven Atlantic meets the tidal Minch, and beyond this point, the North Atlantic stretches into the horizon. And yet, whilst Dunasbroc and Pygmies Isle may have represented the most isolated and difficult sites to reach in the archipelago, they may have simultaneously provided the greatest access to the south—the great difficulties in reaching the northern tip of Lewis overcome by the greater affordances presented in moving south with the ebbing tide. Thus, there is a sense that despite the many challenges to reach the northern tip of Lewis, certain tidal windows would have opened the seaways, with the inner seaways most especially providing a more cyclically conducive route for movement south.

Whilst modelled pathways moving south through the Atlantic generally followed the same routes, pathways through the Minch varied greatly, most predominately at high tide (see Figure 68, *top*). This is most evident in Loch Arnish's great variance between maritime accessibility and connectivity as well as between the cost of movement during low and high tides. Rather than moving through the sea lochs, all pathways south remained within the Minch, following the coastline closely and reaching the sheltered waters of East Loch Tarbert within 6 hours. In contrast, high tide models moving against the flood tide, certainly an unsuitable time to move through Minch, highlighted the role that both the Shiant Isles and Skye can serve along a challenging journey. From East Loch Tarbert, pathways either crossed over to the Atlantic via the Tarbert isthmus or continued south along the eastern coastline. From Scalpay, Loch Maddy could have been reached within 10 hours, suggesting the need to consider additional waypoints. Further, given the tidal extremes and variations as well as the probable existence of numerous sea hazards within the Sound of Harris, movement across it would have likely been constrained to slack or half water, requiring any journey to wait for optimum tides. However, in contrast to the machair west coast of south Harris, the indented east coast provides numerous sheltered waters before reaching the sound.

The models moving south also indicate greater use of the eastern sea lochs along the coast of North Uist as well as Loch Boisdale and Castle Bay. Whilst the dynamic nature of the western coastline during the Neolithic is supported by palaeoenvironmental work as well as the numerous intertidal monuments and eroding settlements, the nature of sea lochs on the east coast throughout the Neolithic is unclear. The GIA models suggest their inundation throughout the Neolithic, making it difficult to match their extent with Neolithic activity. Whilst the ambiguity of their nature thus limits any further understanding of their maritime use, the coincidence of incoming maritime routes and modern maritime infrastructure suggests the overall stability of the east coast, or at the very least maritime practices, along the inner seaways despite changing sea levels. Further, whilst their littoral nature would have been greatly affected by sea-levels and isostasy, the deep glacial scouring that ultimately enabled their development would have been conducive to movement, be it maritime or terrestrial. Ultimately, it may have been the use of these sea lochs for incoming movement that enabled the Barpa sites to be more accessible via the seaways than they are connected (with most departures occurring from the west coast), a possible factor affecting An Doirlinn's maritime connection measures as well. Thus, models moving south further suggest the more predominant use of both the inner seaways as well as the many sea lochs residing within the eastern maritime landscape for maritime movement during the Neolithic.

7.3 The Inner Seaways

The environmental influence of the Atlantic is pervasive throughout the archipelago. However, whilst the Atlantic would have been ruled by climate, season and weather, presenting a dynamic and at times volatile environment, the ocean would have, much like the contiguous coast, presented a relatively homogenous maritime space in contrast to the topographically constrained and tidally dominated inner seaways. Throughout the analysis and discussion, it has thus become clear that the inner seaways cannot be represented as a single maritime space. Each of the discussed islandscapes (i.e. the South, Midway and North) would have been fronted with a unique maritime landscape along its inner approaches that would have influenced local settlement practices and terrestrial mobility patterns, and beyond the local, broader patterns of movement and social connectivity would have been influenced by the character of the surrounding seaways. Whilst the inner seaways are strongly governed by the tides, their character is derived from a combination of tides and topography, both terrestrial and underwater, which have divided the seas into distinct maritime spaces. Each sea would have enabled or constrained maritime movement in its own unique way, requiring local knowledge and experience in order to take full advantage of them, and as such, the complexities of these inner seaways must be acknowledged (Figure 76).

7.3.1 The North Minch

The North Minch is characterised by the long stretch of sea between the east coast of Lewis and the northwest mainland, which is over 50 km distant. Although this region of the inner seaways is less influenced by the tides, the seas are exposed to wind and weather, especially from the north (Mason 2017, p. 120). Today the Caledonian ferry connects Stornoway to Ullapool, a small village located on the north bank of Loch Broom, a deep sea loch on the western mainland. This small, unimposing village is not only an important port but also the largest settlement on the northwest mainland. Overall the western coast of mainland Scotland demonstrates a 'near-absence of evidence' for Neolithic activity (Brophy and Sheridan 2012, p. 77), and although this may be influenced by research bias, there is little evidence to suggest any connection between Lewis and the mainland during the Neolithic. Instead, seafaring models through the North Minch followed the coastline closely, most especially routes south from Loch Arnish down to the Little Minch, some of the most turbulent waters of the inner seaways.

7.3.2 The Little Minch

The nature of the Little Minch and its tidal streams are strongly governed by topography. It is here that the wing-like extensions of Skye stretch towards the Midway islandscape of North Uist and south Harris, constricting the Minch at the waist and channelling tidal streams over an uneven seafloor. When the tidal extremes combine with high winds and severe weather, the Little Minch can become a dangerous stretch of seaway filled with steep waves (Mason 2017, 106). Within the Little Minch, these factors are maximised in a triangle of sea formed between Loch Shell on the west coast of Lewis, the Shiant Isles 11 km to the south and Loch Bhrollum on the southwest coast of Lewis (Figure 76, *inset*).

Known as the Sound of Shiant or in Gaelic as *Sruth na Fear Gor*, the 'Stream of the Blue Men', the dangers of this sound are well-noted within both modern navigation charts and maritime folklore. Between the Shiant Isles and Lewis, a shallower seafloor extends from the Shiant Isles to further constrict the seas, resulting in strong tidal streams and overfalls (Ramsay 2013, p. 108), especially at ebb tide when the surrounding sea lochs empty their contents quicker than the whole of the Minch can (Nicolson 2001, p. 51). Further, the bathymetry of the Little Minch is complex due to the

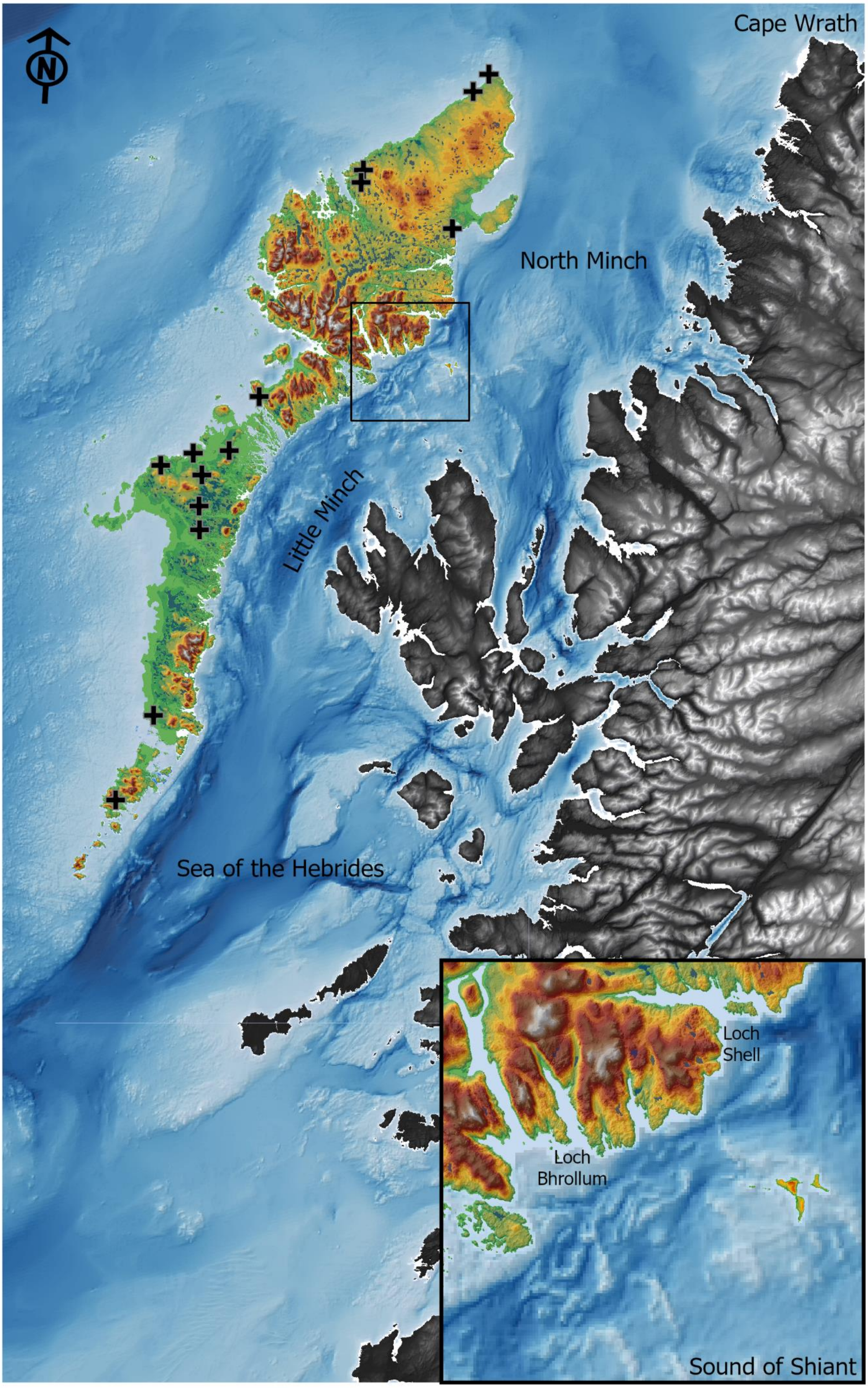


Figure 76. The complex topography and bathymetry of the inner seaways and its maritime landscape, which is compounded in Sound of Shiant (inset).

intrusion of Tertiary sills within Mesozoic deposits, resulting in 'numerous banks, knolls and arcuate scarp[s] and dip ridges' (Chesher et al. 1983, pp. 3–5). Adam Nicolson (2001, p. 29), former owner and periodic occupant of the Shiant Isles, described the effects of a spring tide against a high wind which can result in 'a chaos in which there are not only steep-faced seas coming at you from all directions, but terrifyingly, holes, pits in the surface of the sea, into which the boat can plunge nose-first and find it difficult to return.' Thus, the geomorphology of the archipelago and its influence on movement, which is so prominent in the dominate landforms and sea lochs, also extends to encompass the seaways as well, influencing maritime practices even in modern history. The dangers of these waters are well-cited amongst mariners both today and in the past with countless lives lost due to the *Fear Gor* or 'Blue Men' (Nicolson 2001; Macfarlane 2012, pp. 97–98; McIntosh 2016). *Gor* in Irish Gaelic describes the blue-green colour of deep seawater at the foot of a cliff (Nicolson 2001, p. 30), a colour reflecting the turbulence of a deluging sea that has been anthropomorphised into men. The Blue Men that own these waters are said to pull themselves into boats and sing a verse to seafarers that must be returned by rhyme or else all are drowned (*ibid*; Macfarlane 2012, p. 104).

It is thus unsurprising that it is within this stretch of seas that the greatest variations in modelled maritime routes occurred. Ultimately, it is the Little Minch that leads to Loch Arnish ranking as the least maritimely accessible site in the archipelago but the fourth most connected. Its avoidance for movement north resulted in the use of the inland sea lochs as well as longer terrestrial movement along these maritime routes. Whilst only routes south at half tide and low tide move through the Little Minch, although half to slack water would have been most optimal given the overfalls creating out the mouth of the adjacent sea lochs. From Loch Arnish, the waters just past the Sound of Shiant could have been reached in 6 hours, and thus by timing the departure at slack water and moving through the North Minch with the ebbing tide, the sound could have been crossed at slack water or half tide, other optimal conditions providing. Otherwise, shelter could have been sought in Loch Shell, currently 'one of the best and most convenient anchorages on the east coast of Lewis' and an optimal haven for waiting for the tides to turn before crossing to the Shiant Isles (Mason 2017, p. 118).

Thus, despite its many dangers, by taking advantage of optimum conditions and a keen local knowledge, movement through the Little Minch, and more specifically the Sound of Shiant, would have been possible, although its use would have been a more temporally constrained and conditional route than inland movement through the sea lochs. Further, the concentration of sites between Loch Seaforth and Loch Resort suggests a greater frequency of their use and an overall significance of this inland journey through the sea lochs, especially during the Late Neolithic. Thus, this combined maritime and terrestrial journey would have provided not only a more stable route conducive to more frequent movement but also the safest route for maritime movement in the absence of the distinct local knowledge required to move through the Little Minch.

7.3.3 The Sea of the Hebrides

Beyond the Little Minch, the seaways open to the Sea of the Hebrides, a large stretch of water separating South Uist and Barra from the Inner Hebrides. Much like the Little Minch, steep seas can be encountered, once again the result of an uneven seafloor (Mason 2017, pp. 16-17), and further, the seas are subject to strong winds that can generate local waves (Ramsay 2000, p. 26). In addition, whilst tidal streams in the region are minimal, the palaeotidal models showed differences in tidal stream directions from overall north-south trends, with minimal tidal streams moving east at high tide and stronger streams moving west at low tide. Although much like the North Minch, modelled routes through this seaway hug the coastline, unlike the North Minch, across the Sea of the Hebrides, a profusion of Neolithic sites have been recorded in the Inner Hebrides. Thus, the broader use of this seaway must be considered, especially in regard to well-acknowledged connections with the Inner Hebrides, southwest Scottish mainland and Antrim Co. Ireland.

7.4 Diverging Trajectories

Throughout this thesis, the strong influence of the environment on Neolithic practices has been palpable. Within the landscape, daily activities and patterns of mobility as well as the placement and associations of monuments would have been driven by the local environment and topography; however, any movement between these islandscapes would have been dictated by dual seaways—one temporal, the other tempestuous. Although the Atlantic features heavily in modelled maritime routes, the omission of other sea factors and the overall limited understanding of climate and oceanicity during the Neolithic shrouds the ocean in a level of unpredictability that may indeed reflect its nature throughout the Holocene. Whilst there is much to speculate on regarding the nature of the Atlantic, both its sea conditions and its coastlines, based on the results of this analysis, it is possible to presume a more stable maritime landscape along the east coast and an altogether more conducive environment for maritime practices. However, whilst ruled by the more predictable tides, the complexity of the inner seaways and their localised and unique conditions would have constrained movement in various ways, requiring local knowledge of and an intimacy with these seas in order to unlock their affordances.

Consequently, throughout this analysis, several geographic distinctions were repeatedly noted, most especially between the northern and southern islands but also between the east and west coasts. Whilst such distinctions may be affected by the partiality of the underlying dataset, the strong influence of the environment is also apparent. These varying environmental factors would have influenced the use of the landscape and seascape, in turn impacting social connectivity and the reinforcement of distinctly Hebridean traditions and culture. Thus, despite the clear existence of a Hebridean identity, the local environment and its strong spatial and temporal constraints appear to have contributed to a number of divergences in an otherwise homogeneous record. Accordingly, before moving to the final discussion of the nature of this Hebridean identity and the movement and connectivity facilitating it, these clear spatial and temporal distinctions must first be acknowledged.

7.4.1 North versus South

Perhaps the strongest distinction throughout the analysis was between the northern and the southern islands. The strong topographic and geographic divide between Harris and Lewis combined with the overall higher cost of travelling north through the seaways may have contributed to the isolation of Lewis and its overall divergent record. These distinctions are most apparent in the lithic assemblage and the monument record. The first apparent distinction between flint and quartz use appears to be due primarily to the greater abundance of flint deposits in the south. Whilst there has been no quantitative work conducted regarding the availability of flint on beaches around most of the archipelago, research on Barra and the Inner Hebrides has indicated that flint may have been relatively abundant in these regions (Sinclair and Finlayson 1989; Dickens 1990). The main flint sources along the western seaways are found along the Antrim coast, reaching into the southern parts of the Inner and Outer Hebrides (Wickham-Jones and Collins 1978) and possibly declining in both quantity and quality towards the north (Ballin Smith 2018, p. 123). Whilst this theory is supported by the Hebridean lithic assemblage (see Garrow and Sturt 2017, p. 205), the impoverished flint assemblages to the north, especially at the Midway settlements of the Udal and Northton, suggest that its exploitation and use in the south was not being transmitted to the north. This contradicts indications of an overall connected archipelago and raises the question as to why higher quality local lithics were not being exchanged through apparent social connections. Whilst Simpson et al. (2006) have suggested the opportunistic use of foreign materials, again, the maritime connectivity implied in this theory does not explain why local materials were not being exchanged throughout the archipelago.

Alternatively, what could be suggested are differences in lithic use. For instance, at Northton, the large quantities of pumice that were recovered in contrast to an impoverished flint and quartz assemblage were suggested to indicate the finishing of products, such as the polishing and sharpening of objects or the rubbing of hides and skins (Simpson et al. 2006, p. 83)—i.e. activities whose understanding relies on organic materials long since lost. Whilst these materials may have served more practical resource-based functions, given the assumption of the use of skin boats as well as the overall centrality of Northton's position along maritime routes through the archipelago, the use of these lithics for practices associated with the making or repairing of watercraft should also be considered.

In addition, the large quantities of quartz debitage recovered from the Udal and the occupation area at Barpa Langass suggest the working and use of quartz in a domestic capacity; however, its strong ritual contexts are also evident. High quantities of quartz were recovered during excavations at Geirisclett, and at Clettraval, quartz appears to have been intentionally placed around the cairn (Scott 1935, p. 498). In addition, Henley (2003, p. 238) has noted the east alignment of Clettraval to a natural quartz outcrop, to which could be added the associations between Barpa Langass and its occupation area to a quartz vein on the southern slopes of Beinn Langass. Despite the implied social and ideological changes that emerged with the standing stone tradition, this emphasis on quartz does not appear to have abated. Instead, stone circles are also aligned towards rock outcrops or quartz veins, such as the orientation of Callanish to Cnoc an Tursa, a hillock with distinctive rock outcrops, as well as the erection of Pobull Fhinn stone circle adjacent to the quartz vein south of Beinn Langass (Henley 2003, p. 238). The use of quartz at prehistoric ritual sites has been long noted, and Bradley (2000, p. 12) has suggested its symbolic reference to associations between the living and the dead, a theory which subsequently transcends traditional dichotomies between domestic and ritual activities and further suggests strong association between these quartz producing settlements and chambered tombs. The significance of quartz and its coalescent context may thus have reduced the need or desire for the use of flint.

However, the degree to which these lithic assemblages reflect either the opportunistic use of materials or differing practices will remain unclear without a more refined analysis of the Hebridean lithic assemblage. For instance, Barra contains deposits of pseudo-tachylite, a dark flinty-crush that has been likened to porcellanite and may have provided or be linked to similar materials recovered from the Udal (Ballin 2018). In this case, the overall heavier density of what has been attributed to Irish porcellanite could, through thin sectioning, prove to be a product of the regional movement of pseudo-tachylite from Barra. Further, the 88 unknown or unattributed lithic pieces, as well as the several sedimentary objects suggested to be from Stornoway, the Shiant Isles or Skye, have the potential to inform on both regional and inter-regional movement of lithics. When combined with the minimal thorough assessment that has been conducted of local lithics and their sources, caution should be assumed before assigning too much significance to the current picture of limited local lithic exchange presented by the extant record.

The other great distinction between the archaeological records of the northern and southern islands is the concentration of Early and Late Neolithic monuments—e.g. the 12 chambered tombs and 51 stone settings in Lewis versus the 15 chambered tombs and 24 stone settings in North Uist. Whilst the shift in geographic focus between Early and Late Neolithic activity is apparent in the monument record, the concentration of prestige objects in Lewis, especially along the maritime routes leading to Stornoway, further supports this geographic transition. Ultimately, the shift in activity from south to north has been seen as evidence for a broader transition in inter-regional contacts, or at least their influence, from the southwest to the northeast (see Chapter 3), yet regardless of the nature and direction of influence, these profound social and ideological changes were clearly linked to increased movement and connectivity.

Whilst the long history of chambered cairn research has enabled more thorough discussions of potential inter-regional contacts, investigations of standing stones have been minimal, limiting any greater understanding of the development of this tradition, which is further hindered by biases towards the more substantial stone settings in Lewis. Further, whilst the associations between chambered tombs and settlements as well as broader patterns of movement around them is clear, potential associations between Late Neolithic monuments and settlements are less clear. The locational reference of stone settings to chambered tombs has been highlighted by previous researchers (see Burl 1976; Henley 2003), and yet these sites do not reflect their predecessor's relationship to broader patterns of movement. For instance, although the overall distribution of stone settings in North Uist reflects the same corridors of movement that were highlighted by connected sites (see Figure 65), only 38% of standing stones were connected to the settlement record versus the 59% of chambered tombs. Given the minimal Late Neolithic dates in North Uist, this limited association is perhaps unsurprising but nonetheless highlights addition questions regarding the emergence and use of these Late Neolithic monuments.

This picture may further be confounded by the substantial changes in sea level and complex coastal dynamics that have occurred both since the Neolithic and throughout the century between the 4000 BC palaeogeographic models and the emergence of the standing stone tradition. In many instances, standing stones not directly associated with a chambered tomb appear to correspond more fittingly to the modern littoral environment, which when combined with Henley's (2003, p. 260) suggestion that they were placed in reference to sea inlets, highlights their potential to relate more strongly to maritime patterns of movement. For instance, the group of standing stones on the northwest slope of Beinn Tangabhal, appear to mark the entry into the Sound of Vatersay for maritime routes moving from An Doirlinn, whilst Pollachar on the southwest littoral extreme of South Uist may mark a landing place for routes moving to An Doirlinn. Further, the lone unconnected monoliths on the west coast of south Harris and at Barvas in Lewis—both of which have been suggested by Burl (2000) to have been important markers for seafarers—may also suggest stronger associations between monoliths and transition places along maritime routes. However, beyond such speculations, the overall ambiguity of stone settings, the limited investigation of them and the great difficulty in definitively dating them leaves many questions as to not only their purpose and relationship to broader activity but also what they can indicate about social changes occurring at this time.

7.4.2 East versus West

Along with these clear distinctions between the archaeological records of the north and south, strong environmental and geographic distinctions were noted between east and west. Whilst the significance of the fertile and low-lying west coast for inhabitants of the archipelago has long been noted, from a seafaring perspective the west coast offers few affordances and an overall more dynamic and unpredictable environment compared to the east coast. The low-lying and homogeneous nature of the western maritime landscape of the southern islands would have offered limited ability to travel near to the coast nor would it have provided sheltered waters in case of unfavourable conditions. In contrast, the east coast would have provided a more conducive environment for maritime practices due to its strongly indented coastline, which would have provided numerous havens and more enduring landing places. In addition to its more protected waters, the east coast would have also provided a more immutable maritime environment. This stability is reflected in the endurance of maritime practices along the east coast as evidenced between the seafaring models and modern maritime practices.

Furthermore, the stronger influence of the tides on the east coast would have provided an altogether more predictable maritime environment that could have been mastered through local knowledge and experience. In contrast, the west coast would have been subject to the unpredictable influences of the Atlantic, alongside longer-term temporal influences, ranging from seasonal changes in weather to more gradual sea-level rise and an overall deteriorating climate. Altogether, these Atlantic influences would have created a more transient maritime landscape and a more sporadically conducive seaway. Whilst these distinctions between east and west would have had strong implications for overall patterns of activity, their influence on maritime practices may be most strongly noted in Bradley et al.'s (2016) distinction between landing places and maritime havens—the west coast representing the more ephemeral potentialities of the former and the east coast demonstrating the stability and durability of the latter.

It is thus interesting to note that despite the long-noted affordability of the west coast and its heavier concentration of activity, many monuments reference the dominant landforms of the east coast. Accordingly, whilst the concentration of sites, predominately settlements, on the west coast resulted in a greater concentration of pathways through the Atlantic, by incorporating a more localised maritime perspective, the east coast becomes an overall more predictable and affordable environment for maritime practices. This is apparent even in the modelled pathways as even with the omission of elements more relevant to the Atlantic from the cost surfaces, the least costly route north was demonstrated to be through the Minch. Thus, the inner seaways would have offered unique and cyclical affordances that when combined with the Atlantic, would have created a layer of littoral temporalities and temperamentalities, the encapsulating presence of these two disparate seaways not only influencing local practices and patterns of movement but also serving to reinforce a uniquely Hebridean identity.

7.5 CONCLUSION

Given the overall centrality of the Midway Isles, evidenced in both the density of archaeological sites as well as connection measures, it may be plausible to assume the diffusion of social contacts from this interstitial location. From here, patterns of movement would have spread across land or sea, likely a combination of both, forming a network of connectivity of varying trajectories, heavily influenced by the surrounding topography and seaways. Similar to Watts' (2004) S*mall Worlds* theory, a large number of shorter-distance connections would have enabled a high degree of regional connectivity without requiring sites at either end of the archipelago to have been directly connected, or at least not at the same frequency as more proximal sites.

In this way, only one site within each islandscape would have needed to have been connected to the broader region, serving as the transmitter or reinforcer of the Hebridean identity to the rest of the islandscape. For instance, despite An Doirlinn being located in closer proximity to North Uist than Allt Chrisal, the settlement's low overall connection measures suggest a site largely isolated from the broader archipelago. In contrast, Allt Chrisal's high maritime connections (ranking highest in the archipelago) suggest that this settlement would have been highly connected to the broader archipelago, despite its greater distance. This is reinforced by the material record, with the notable absence of Unstan-type vessels in use at An Doirlinn contrasting the large a varied assemblage at Allt Chrisal. Thus, it may have been through regular, or perhaps more intermittent, contacts with Allt Chrisal that An Doirlinn remained connected to the broader Hebridean identity whilst still remaining largely isolated from it. Consequently, the environment and its resources, as well as established social practices, all would have dictated whether broader contacts were necessary, desirable or even possible.

Chapter 8. THE HEBRIDEAN NEOLITHIC: A LIFE OF CONTINUITY AMIDST THE FLOW

Despite geographic and littoral distinctions, or perhaps because of them, there is an underlying thread of cultural unity that binds social, funerary and ritual practices throughout the archipelago. Whilst, much like the overall record, each region has its own variants of the ‘Hebridean style’, their overall familial resemblances provide the greatest evidence for an archipelago connected through the intangible thread of movement. Having looked at the unique environmental affordances of each site and the potentialities for connectivity, both environmental and archaeological, it is clear that with local knowledge and optimal conditions, shorter and more frequent connections between islandscapes would have been entirely possible.

However, the strong affordability of each islandscape demonstrates little need for movement between them, at least in the Early Neolithic, and thus the question remains as to why these social contacts were important. Although this question will not be easily answered through this or even subsequent research, by focusing on the unique Hebridean environment and material culture, a more refined understanding of this identity, its genesis and propagation can be sought. And yet, despite this refined regional focus, it is also clear that Neolithic Hebrideans cannot be considered apart from their wider context, including patterns of movement and connectivity outwith the archipelago. Indeed, even throughout the analysis, the line between regional and foreign along the inner seaways was indistinct. Thus, it is only through a final focus on the macro-scale, and simultaneously the *longue durée* of an overall deteriorating climate, that the true nature and significance of this Hebridean identity can ultimately be revealed.

8.1 THE TEMPORALITY OF THE ENVIRONMENT

The strong influence of the environment apparent throughout this thesis would have enveloped the archipelago in overlapping cycles of time formed through the strong influence of the North Atlantic and the tidal inner seaways. As stated by Cooney (2000, p. 6):

> For people whose lives are likely to have been closely attuned to environmental variables such as the seasonality of resources, in coastal areas the daily cycle of the ebb and flow of tides, and the patterns of the movement of celestial bodies, such as the lunar cycle, it could be expected that the landscape would be the reference point by which people set their lives.

These temporal reference points would have governed daily activities, broader patterns of movement through the landscape and even broader regional connections, each intricately woven into the next and ultimately forming the three levels within Gosden’s (1994) human perspective on time. These levels of time encompass the most elusive individual lifetime, which through shorter economic, environmental or social cycles, would have been incorporated into broader public time, usually cyclical and marked by important events or ritual practices. This meso-scale of time would have ultimately formed the basis for the *longue durée*, or long-term temporalities, embedded in a continuity of practices that linked the past with the present. The encompassment of Neolithic Hebrideans within these overlapping cycles of social time was highlighted by Henley (2003) in his island history of the Hebridean Neolithic, which included a focus on the micro-scale daily practices carried out at settlements, the broader social cycles evidenced in the monument tradition, and the macro-scale of environmental change. Whilst Henley's three histories focused on the material evidence for these cycles of time, through a focus on the environment that engendered these temporal cycles as well as the patterns of movement through which they were marked, such narratives can be furthered by matching the tangible archaeological evidence for these encompassing temporalities with their ultimate genitor.

8.1.1 Tides

In an archipelago so heavily dominated by its littoral environment, the character of the surrounding seaways is pervasive. Whilst the Atlantic has long been seen as the ultimate impelling force for human activity in the archipelago, throughout this thesis, the strong influence of the tidally dominated inner seaways on movement, both terrestrial and maritime, has become evident. Consequently, the tides are paramount to any understanding of Hebridean inhabitants, from prehistory to the present. In a 18th century account of a visit to Erskine Beveridge's Traigh Mor or 'Big House' on the island of Vallay, 'the visitor was tickled that his worldly cousins should ignore British Summer Time – then a recent innovation – in favour of solar time that governed the all-important tide' (Macdonald 2013, p. 7). The significance of tidally driven time would have been no less and perhaps even more relevant to Neolithic communities and thus offers the greatest ability to move towards the most elusive micro-scale temporality of daily existence.

As emphasised by Sturt (2006, p. 120), 'maritime archaeology's point of engagement with the environment forces a more sensitised approach to space, temporality and change than occurs in terrestrial archaeology', a fine-tuned approach that is necessary in order to capture the impact that environmental nuances such as tidal variations would have had on prehistoric maritime communities. Pollard (1996) has also emphasised the importance of tidal time in the structuring of practices amongst early prehistoric communities living along the west coast of Scotland, thereby emphasising its significance for not only Outer and Inner Hebrideans but also Mesolithic and Neolithic populations. Thus, although the tides may have had less effect along the Atlantic seaboard, the use of the eastern maritime landscape for resource procurement and other quotidian maritime practices would have been intricately entwined with the tidal cycles.

Further, beyond the local, these cycles would have governed meso-connections, thereby also forming part of the broader meso-cycle of socially constructed time. Local tidal variations would have required an intimacy with the surrounding seaways, with the flood tide opening havens and landing places and half to slack water allowing the crossing of sounds and channels that may have otherwise been too dangerous. At present, in most places throughout the Hebrides, 'sufficient information to predict tides with reasonable accuracy can be gathered in as little as four weeks (a Spring-Neap tidal cycle)' (Ramsay and Brampton 2000, p. 8). Thus, beyond the daily tidal cycles, it may have been spring and neap tides, corresponding to half periods of the monthly lunar cycle, that would have offered the greatest affordances (and challenges) to maritime movement, in turn governing broader patterns of movement and thus social connections. Hence, the maritime affordability of these inner seaways would have expanded and contracted with tides, offering diurnal pulsations of localised maritime affordability within 6 hour windows and more substantial fortnightly oscillations in the affordability of broader movement and connectivity. Further, beyond these daily and bi-weekly cycles, the tides would have also been encompassed within the cycle of the seasons, culminating in equinoctial tides in September and March.

8.1.2 Seasons

Sailing during the winter months between the equinoxes has been referred to as 'crossing the equinoctial Minch' and is known to be a dangerous time to travel through these seaways (Nicolson 2001, p. 91). Thus, the seasons would have further constrained maritime movement, with the equinoctial tides perhaps marking the start and end of the maritime season. In addition, these seasonal cycles would have provided the greatest stimulus for cyclical patterns of mobility through the landscape. As suggested by Gannon (2016), variations in climate and access to resources throughout the year would have necessitated movement through the landscape for sustainability. Thus, it is these cycles of seasonal movement that would have been interwoven into broader socially-constructed time marked through monuments and connecting an ephemeral and disparate settlement record. This seasonality to mobility would have not only dictated the temporality of movement but also its extent. Much like the seaways, the landscape would have opened and closed at certain times of year; longer daylight hours in the summer (up to 18 hours by the summer solstice) would have allowed communities to move further and wider, making greater use of the abundance of resources within the landscape and seascape and perhaps conserving those resources for the contraction of daylight and landscape use that occurs during the winter.

Whilst the seascape would have provided fertile coastal plains for the cultivation of barley and oats, the inland knock and lochan and massif landscapes would have provided rough grazing for livestock (Cummings et al. 2005). Thus, the coast may have provided the foci for summer-based logistical economies in what could be considered the more traditional coastal settlements, whilst portions of the community moved upland to graze livestock and inland for the procurement of wild resources. If such is the case, then various sites may have served specific functions based on the season. This is most evident in the traditional shieling practice of moving livestock upland during the summer months to graze, a tradition that has been well-documented in the islands of Scotland for over 2000 years (see also Gannon 2016; The Shieling Project 2019) and has culminated in an upland landscape filled with stone shieling structures used for temporary summer encampment. The shieling tradition also highlights the ability for economic practices to engender socially constructed time, as in addition to grazing livestock and making dairy products, it was also an important time for the younger members of the community to take on new responsibilities and learn about their environment (The Shieling Project 2019). However, the extent of this movement would have also been dictated by the local environment, with some catchment areas, such as those around An Doirlinn and Northton, suggesting little need to engage in more extensive patterns of movement for resource procurement.

Regardless of extent, any expansion of economic and social activities in the summer must necessarily constrict in the winter. Shorter daylight hours (reducing to 6.5 hours at the winter solstice), a harsher climate and fewer resources would have reduced the overall suitability of the landscape and constricted the extent of movement, perhaps requiring the community or communities to gather together, collecting and sharing their resources through the winter. Whilst the west coast would have been fertile and highly suitable for cultivation and animal husbandry, it has also repeatedly been shown to be highly exposed, vulnerable and erosive. Throughout modern history, considerable shifts in sands and coastlines during winter storms have been recounted, as each spring a new barrier with the Atlantic was established. In contrast to the dynamic and topographically featureless west coast, the immutability of the east coast and its greater topographic features may have provided a drier and more sheltered environment within the landscape for overwintering. In the present peat-filled landscape, boggy conditions are worsened in the winter due to an overall wetter and harsher modern climate; however, such places are more easily imaginable in a drier, peat-less and more-densely wooded Neolithic landscape, as highlighted by the occupation areas of Barpa Langass and Bharpa Carinish. These more anomalous yet highly connected occupation areas along with their associated chambered tombs may thus provide the greatest indications of the use of more sheltered inland locations for seasonal settlement practices.

Following the winter, the landscape would have once again opened, the proliferation of resources beckoning after a long winter, and from these occupation areas, the broader landscape would have been readily accessible. The opening of the spring landscape may have also coincided with the opening of the seaways, perhaps allowing for social connectivity after a long winter but also resource procurement. The present-day spring seas proliferate with plankton and thus fish, pelagic birds and sea mammals (Nicolson 2001, p. 23), resources evidenced at many coastal settlements, which may have become more enticing and even necessary due to worsening environmental conditions.

8.1.3 Climate

These seasonal cycles which would have formed the bedrock of both economic and social practices would have thus been encompassed within a third cycle of time, the *longue durée* of environmental change. Although the current understanding of the temporality and spatiality of these environmental changes is constrained to localised investigations strung together into broad generalisations, these changes would have had the most dramatic effect on what is apparent in the archaeological record as a long-term continuity of traditions and culture. A gradually deteriorating environment would have brought increased precipitation and oceanicity, rising sea levels, the erosion of coastal plains, loss of woodland and expansion of peat, all gradual yet dramatic changes that may have led to the impossibility of agriculture in many regions of the archipelago by 2000 BC (Parker Pearson and Smith 2012, p. 4; Ashmore 2016). And yet, alongside these changes, there appears to have been a continuity of practice and place that would have served to unite Neolithic Hebrideans and simultaneously provides the greatest archaeological evidence for a unified Hebridean identity. Perhaps the greatest evidence for the overlapping forces of environmental change and human resilience is at the temporally enduring settlement on the Udal peninsula. Whilst the Neolithic phases demonstrate a site of great fertility and resourcefulness, perhaps building off of earlier Mesolithic use, by the Bronze Age it appears that occupants would have been suffering the effects of worsening environmental conditions, including periodic famine, and yet despite this its use endured into the Norse period (Ballin 2018). Thus, in spite of or perhaps because of this deteriorating climate Hebridean traditions would have endured through the generations.

The influence of the environment on economic and socially constructed time is thus indubitable, and it is through this strong relationship with the unique Hebridean landscape and seascape, that Neolithic Hebrideans would have ultimately been connected. Thus, the identity of the archipelago would have been generated through these varying cycles of time, with tides and seasons dictating patterns of localised movement, marked through monuments and temporary encampments, which would have been incorporated into broader meso-constructs of time and connectivity. When set against the gradual yet significant effects of environmental change, these social cycles would have ultimately engendered a continuity and homogeneity of traditions witnessed through the *longue durée* as a unique Hebridean identity.

8.2 UNIFYING HEBRIDEAN TRADITIONS

It is these overlapping cycles of time that would have not only provided motivation for movement around the archipelago but also the driving forces behind social connectivity. Whilst the variations between seaways in the inner approaches would have presented each islandscape with a unique seascape and individualised set of maritime affordances, the very nature of this complex environment, its temporally predictable seaways and the localised knowledge required of them, would have not only provided a medium for connectivity but also enabled a unifying identity formed and reinforced by this intimacy with the enveloping seaways. Although each site or islandscape would have had its own variations of the Hebridean tradition, overall semblances provide the greatest evidence for a connected archipelago, and thus, any refined discussion of the Hebridean Neolithic must ultimately address this cultural thread of uniquely Hebridean traditions.

8.2.1 Hebridean Passage Tombs

The numerous variations in the setting and form of chambered tombs were apparent throughout this analysis as well as through previous research; however, these variations appear to coincide with variations evidenced in the degrees of accessibility from settlements. Most apparent is the stronger connection of pathways to long cairns or otherwise more anomalous forms, and where stronger connections to more characteristic Hebridean forms exist, this relationship also typically includes a connection to an adjacent long cairn, for example, Dun Bharpa and Borve in Barra, Tigh Cloiche and Airidh nan Seilicheag in North Uist and possibly Leaval and Dun Trossary in South Uist. In North Uist, the majority of strongly connected tombs are Clyde and long cairns, including most of the intertidal monuments. Thus, whilst form has long been used to establish chronologies of both origin and use, these variations may instead serve to indicate variations in use. In a critique of the use of architectural typologies to establish chronologies, Squair (1998, pp.501-502) has instead suggested that the architectural design of chambered cairns would have served as a 'framing device' for certain rituals being performed there, facilitating and coordinating movement and ritual performance, much like a theatre stage. Therefore, although architectural forms and associated ceramics are essential to understanding the use of these monuments, they cannot be considered apart from the landscape setting of these structures as well as the movement that they would have facilitated.

For instance, the unusual forms of Unival and Clettraval and their plainer ceramics have been cited as evidence for their early dates, with the latter suggested to have been one of the earliest monuments on the island. If such is the case, then it would follow that Clyde cairns and other more anomalous long cairns would be the earliest monuments on the island, erected before the development of more characteristic Hebridean passage tombs, such as Bharpa Carinish and Barpa Langass (see Henley 2004). In further support of this theory is the fact that all monuments at risk of erosion in North and South Uist are either Clyde or long cairns. This would thus suggest that many of the cairns associated with movement around occupation areas, especially nearer to the coast, are earlier examples of the funerary tradition, perhaps located along early pathways that evolved in use and significance through time.

However, the two monuments that have contributed to this chronological theory appear to have been little connected to optimum routes, a trend also noted for the more characteristic Hebridean passage tombs in North Uist. Whilst their limited connectivity to pathways may, in large part, be due to their more prominent hillside locations, at the very least, the large number of chambered tombs that are strongly connected to pathways serves to highlight the strong differences in setting between connected and unconnected cairns. For instance, Henley's (2003, p. 201) classification of cairn settings revealed that all long cairns are located in open or low-lying settings. Whilst this could explain the stronger connection of long cairns to pathways, it also exposes fundamental differences that could be explained through differences in use.

Squair (1998, p. 501) has suggested that not all cairns were directly employed in funerary practices and may have instead served other ritual functions. If such is the case, then pathway connections to these monuments, especially those of more anomalous forms and settings, could be indicative of the role of these monuments within cyclical patterns of movement. In some instances, these monuments may have provided markers or waypoints for movement, such as Barpa nam Feannag, the long cairn near Eilean an Tighe which is located along the easternmost littoral corridor between north and south and is thus connected to every settlement in North Uist—a connectivity that may have been even greater given the use of watercraft through these inland waterways. In other instances, these monuments may have provided points of convergence for a wider group of communities and a broader range of activities, as has been suggested by Cummings et al. (2005) for Dun Trossary in South Uist. Thus, these communal monuments may more strongly reflect communal or seasonal gathering places rather than funerary monuments.

In contrast, the unconnected and more archetypical Hebridean passage tombs, many of which retain high levels of preservation, may have been the true ancestral monuments and anchors for mobile communities. From these more characteristic monuments, a number of trends in setting and orientation have been well-noted (Muller 1998; Henley 2003, Ch.5; Cummings et al. 2005). These include hillside locations with directed prominence and visibility, typically towards coastal plains or valleys, with east to southeast aligning passages, and, perhaps most evident, a strong marginality, with chambered tombs often positioned between disparate landscapes or landforms. In the Uists and Benbecula, the central distribution of monuments between east and west is evident, which would have positioned them between upland and lowland or pastureland and arable land. Thus, their marginal positions would have marked the transition between the two, physically and perhaps also symbolically. However, their positions are often such that whilst they would have been dominant over one region, typically coastal plains or valleys, they would have been nearly invisible from the opposite direction.

This would have allowed the monument to be opened or closed depending on the direction of approach, a dual concept that would have itself been engendered through form and setting—its prominent position exposing it to the wider landscape yet its enclosed chamber concealing its inner workings. This concept may apply to the landscape as well, and Cummings et al. (2005, p. 46) have noted that depending on the direction of approach to monuments in South Uist, the surrounding landscape could either be opened up or closed down. Such a concept strongly reflects the opening and closing of the landscape and seascape through the seasons, suggesting the incorporation of these environmental temporalities and spatialities into this monument tradition.

Bradley (1998a, pp. 51–54) has argued that these monuments encapsulate a different conception of time that arises from the adoption of agriculture. In this way, chambered tombs would have been incorporated into the seasonality of movement. Furthering Bradley's theory, Henley (2003, p. 230) has suggested that the dead would have provided static reference points in time and space. Whilst these monuments clearly provide fixed reference points in an otherwise transient landscape, such associations may have been solidified through their associations with the east coast, its dominate landforms providing the most immutable references possible. As stated by Braudel (1972, p. 29) in his historical perspective on the three scales of socially-constructed time:

> To tell the truth, the historian is not unlike the traveller. He tends to linger over the plain, which is the setting for the leading actors of the day, and does not seem eager to approach the high mountains nearby… and yet how can one ignore these conspicuous actors.

Thus, whilst there has long been a focus on the significance of the west coast, these 'conspicuous actors' along the east coast and their durable, prominent yet inaccessible forms may have been just as significant for Neolithic communities, their connotations not only mimicked by the chambered tomb tradition but also serving as a distinct antithesis to the low-lying fertile and easily accessible coastal plains. Thus, chambered tombs may have served as fulcrum points for movement as suggested by Armit and Finlayson (1992, p. 671); however, this anchor would not only have been between the disparate landscapes and seascapes of the west and east but also between concepts of ephemerality and immutability, life and death.

8.2.2 Hebridean Crannogs

The concept of a Neolithic crannog is still new and, given the term's traditional association with the artificial timber-built and palisaded loch dwellings of the Iron Age, has as yet been omitted from this thesis. However, new and burgeoning evidence from these islet sites suggests the need to re-evaluate the concept of a crannog in order to consider its Neolithic origins (Garrow and Sturt 2019). Currently, these Hebridean islet sites are the only islets to have been definitively dated to the Neolithic, and it may thus be plausible to suggest the inception of this tradition in the Outer Hebrides. However, the over 570 crannogs and island duns recorded in Scotland (Lenfert 2013, pp. 125-127) and the estimated 2000 in Ireland (Garrow and Sturt 2019, p. 666) should promote caution in assigning too much significance to its apparent Hebridean precedence. Further, the more than 170 islet sites that have been identified in the Outer Hebrides (Lenfert 2012) not only suggest the great potential for further Neolithic crannogs to be discovered but also the overall limited understanding of these sites that currently exists.

The most substantial of these islet sites and the most thoroughly excavated are the two examples in North Uist. Whilst Eilean Domhnuill has served as the archetypal Neolithic islet site, Eilean an Tighe presents a number of discrepancies—including fundamental questions as to its existence as an islet during the Neolithic—which promotes its exclusion from this class of sites (see Lenfert 2012, p. 219; Garrow and Sturt 2019). Further, whilst all extant Neolithic examples are located along the east or west coast (see Garrow and Sturt, Fig. 4), Eilean an Tighe would have been located much further inland during the Neolithic, as its limited maritime connections can attest to. Thus, whilst Scott's (1951) theory of its use as a pottery workshop has largely been discredited, it may instead be that this 'House Island', as its name translates, served a more domestic role, perhaps associated with the Udal but certainly placed along a crucial corridor between north and south. Consequently, whilst new evidence and continued analysis of these islet sites, is leading interpretations away from the domestic, Eilean an Tighe has remained conspicuously absent from such theories and may instead be truer to its original interpretation than previously believed—although any further understanding of this site hinges upon further investigation, especially of its underwater deposits.

In contrast, a re-examination of the ceramic assemblage from Eilean Domhnuill as well as ongoing research into the crannogs of Lewis is revealing more ritualistic functions. Researchers have long noted the similarities between Eilean Domhnuill and passage tombs (Armit 2003, p. 98; Henley 2003, p. 137; Cummings and Richards 2013, pp. 199-200; Copper and Armit 2018), a comparison that has now been extended to include the Lewis islet sites (Garrow and Sturt 2019). Circularity, boundedness and liminality are recurring themes for both types of sites, as is the restricted access granted by either passage or causeway, which was suggested by Cummings and Richards (2013, pp. 199-200) as a way of providing 'a necessary dislocation and removal from an exterior world.' Whilst the activities occurring within this bounded space remain enigmatic, both types of structures were strongly associated with ceramics. Although the long periods of use and reuse of both chambered tombs and Eilean Domhnuill obscure pottery sequences at these sites, the large fragments recovered from the loch bed surrounding the Lewis crannogs suggest their deliberate deposition into the water (Garrow and Sturt 2019, p. 677).

The clear significance of these littoral settings, the substantial efforts required to construct and maintain them as well as their many homologies with chambered tombs suggest a communal significance beyond the domestic (Garrow and Sturt 2019), which along with the substantial quantities of ash and pottery recovered from Eilean Domhnuill, led Copper and Armit (2018) to suggest that this islet would have served as a communal gathering point for the preparation and consumption of food. The strong terrestrial connections of Eilean Domhnuill, ranking third in the archipelago, lends support to this theory, as the site itself would have been one of the most connected in the landscape despite its apparent marginality. The fact that its terrestrial connectivity is third only to the two Barpa occupation areas further highlights the associations between chambered tombs and islet sites, suggesting the placement of communal structures in well-connected locations. In addition, their disparate locations to the east and west may further lend support to their homology. Eilean Domhnuill's unimposing location to the far northwest of the island and its proximity to the undoubtedly fertile yet now submerged region of Vallay Strand conjures both the fertility and ephemerality of the west coast compared to the prominent, stone-built monuments, which reference the more dominant and stable landforms on the east coast.

In this way, cairn and islet may have served as opposing communal fixtures within the cyclical patterns of movement occurring throughout the year. If such is the case, then perhaps the islet sites could be likened to the chambered tombs of the summer, providing a focus for local activities that may have culminated in a large communal feast, perhaps at the end of the harvest when resources were being gathered and livestock culled in preparation for winter—a practice that was suggested at Northton (Simpson et al. 2006, p. 84). The ceramic remains deposited around the site and within the loch would thus represent the symbolic closing, and perhaps literal clearing, of the site before the long physical and metaphorical journey through winter. With many chambered tombs overlooking the west coast, they would have served not only as a reference point for this cyclical journey but also as a constant reminder that even in the fertile summer landscapes, winter and decay are always waiting. As the affordances of the landscape and seaways began to constrict and movement away from the settlements and islets on the exposed west coast occurred, the closing of the islet site may have been followed by a symbolic transitional journey in which physical movement away from the west coast resulted in a metaphorical closing of the summer landscapes to perception. Upon reaching these monuments, both coastal settlements and prominent landforms would have been visible, a symbolic visual marking of the final transition between the two, and once beyond the chambered tomb, it too would have become invisible, a reminder of the dead no longer needed once behind its walls of prominence, winter itself reminder enough.

Although North Uist lends itself well to such theories, the differences between islet sites in North Uist and Lewis already discussed in Section 3.1.3 must once again be addressed, with Eilean Domhnuill presenting a more extensive and temporally expansive site in comparison to the smaller artificial islets of Lewis. Thus, the strong variations between north and south once again become apparent. However, whilst Eilean Domhnuill has long represented the archetypal Neolithic islet setting, the growing number of more definitive and diminutive Neolithic crannogs suggests that this islet site may instead represent the exception rather than the rule; its substantiality and longevity the result of its location within the densest and most connected islandscape in the archipelago. In this way, Eilean Domhnuill may have been a site of regional significance and perhaps the influence behind the construction of more locally significant crannogs in Lewis.

However, this is not to imply differences in context, as similar transitional theories could also be posited for the western crannogs, which demonstrated strong connections to Dalmore Beach to the west and Callanish to the east. The site of Dalmore has produced Neolithic pottery and further reflects the context of other coastal settlements, representing a site of substantial multi-period use that was discovered due to coastal erosion during a severe equinoctial storm (Sharples 1983, pp. 38–39). Further, this site has been suggested to have been seasonally occupied, most notably only during the summer, as the surrounding topography would have left the site in shadow throughout the winter (Armit 1996, p. 92) (Figure 77). Thus, in transitioning from this summer landscape and moving inland towards Callanish, the only region on the west coast to contain a definitive chambered tomb, much the same metaphorical journey may have been enacted until reaching the region of Callanish, which itself would have afforded views towards the prominent landforms to the southeast. Furthermore, strong associations between Dalmore and Callanish were noted by Ashmore (2016), although based on Bronze Age structural evidence, with movement between the two necessarily passing by these western islet sites. Thus, although different in structure and

Figure 77. Dalmore Beach and its surrounding topography (Photograph by author, 2017).

temporal extent, these Lewis crannogs may have still retained the same social functions and ideological associations with the temporality of movement as the more substantial prototype in North Uist. Consequently, despite the many divergences noted between north and south, these islet structures along with their associated ceramics also demonstrate the ability of both the Atlantic and the Minch to unite Hebridean communities and transmit these unifying Hebridean traditions.

8.3 An Atlantic Hebridean Identity

Although the primary focus has been on developing a regional narrative, it is clear that this narrative is just as much dependent upon broader patterns of movement and connectivity taking place through the western seaways and along the broader Atlantic facade. Even in focusing on a comprehensive regional narrative, the next appropriate spatial scale of analysis was unclear, with potential maritime connections to the Shiant Isles and Skye becoming apparent through the seafaring models, suggesting the need to consider these islands within regional Hebridean narratives (Figure 78). Further, the strong relationship to the south, repeatedly discussed through material typologies and lithic sources, suggests strong and enduring connections throughout the Neolithic, in contrast to the rather tenuous evidence for connections with Orkney, which leaves many questions as to the nature of this relationship that is so often presumed. Ultimately, whilst the focus of this thesis has been on building a regional narrative, it is clear that this Hebridean identity would have been subsumed within a broader Atlantic Neolithic culture, an overlapping of identities engendered through disparate seaways and ultimately leading to the true uniqueness of the Hebridean Neolithic.

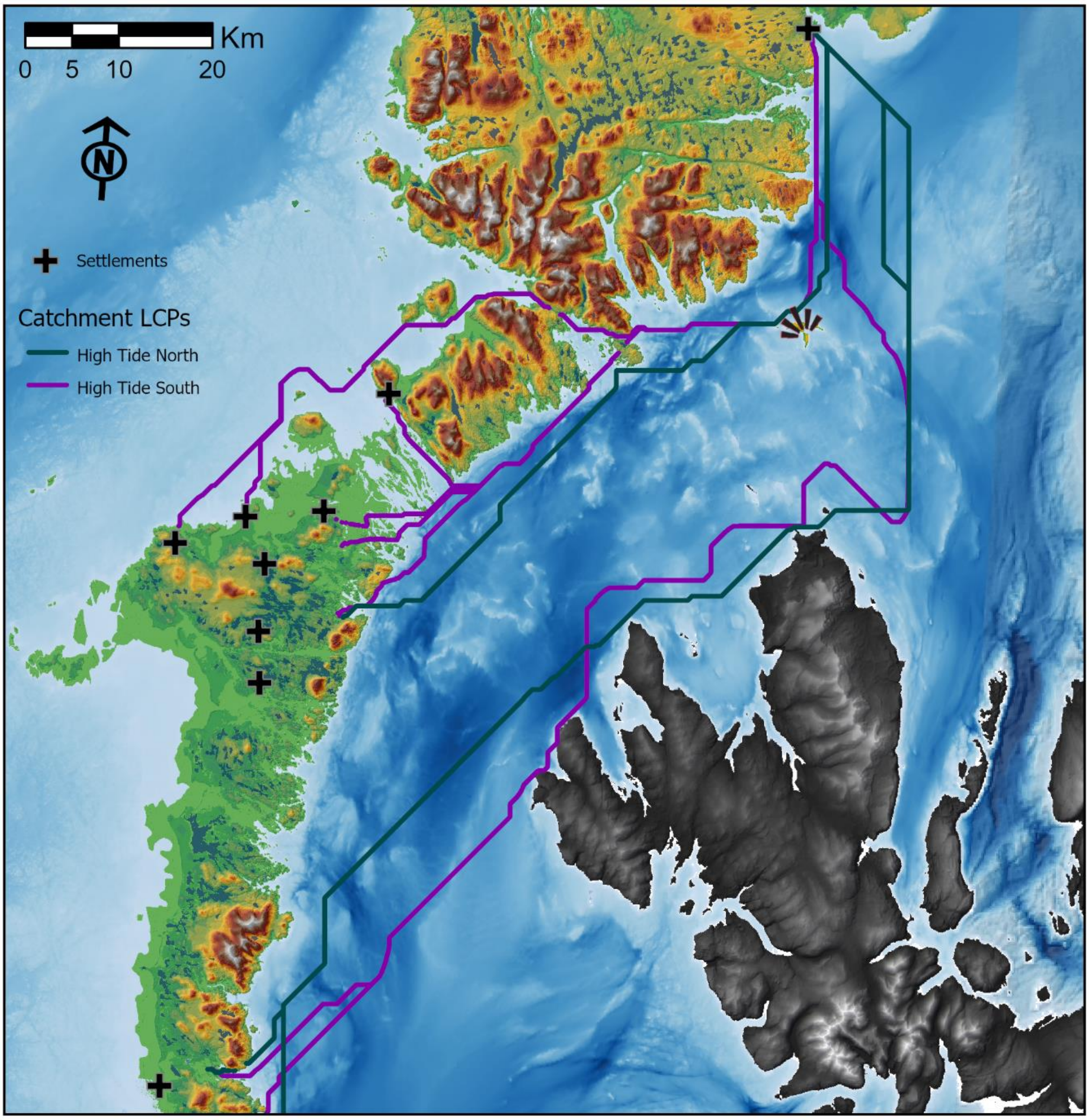
8.3.1 The Isle of Skye

The potential cultural links between Skye and the Outer Hebrides has long been acknowledged (see Armit 1996), most notably through the several possible Hebridean-type passage tombs identified on the island (Henshall 1972). The potential for Skye to be included in the regional analysis was further highlighted by sedimentary lithics as well as the maritime models. Although the provenance of these lithics is less certain, the geographic proximity of Skye is such that the landmass featured heavily in maritime routes through the Minch. Although a more refined understanding of the use of Skye for maritime movement is limited due to its exclusion from the analysis, the models crossed the northern tip of several of the island’s wing-like peninsulas, including Rubha Hunish, the northernmost headland of Skye, and Dunvegan Head, the closest point to the Hebrides at around 23 km from the east coast of south Harris (Figure 78). Whilst these headlands may not have been suitable waypoints, their positions do highlight potential routes and points of connection between the two.

The most judicious point of contact would have been between the Midway Isles and Skye. However, although this is the point where Skye reaches its closest extent, this topographic convergence simultaneously creates some of the most challenging seas of the Minch. Today the route from Skye to Harris is subject to not only strong tidal rushes and overfalls but also the effects of wind and poor weather along with the previously noted complexity of the seafloor, which together can result in steep waves (Mason 2017, p. 106). However, Skye's proximity to the most connected region in the Hebrides is perhaps less fortuitous than it is informative, thus making the Midway Isles the centre for both regional and broader contacts.

Although all maritime routes that connect to Skye are derived from movement to or from Loch Arnish, movement from the north of Skye to Stornoway would have required much longer distances, over 66 km, of sea travel. However, along this route, the Shiant Isles would have offered shelter in poor weather and also provided protection from the dangerous Sound of Shiant by passing to the east of the islands (Mason 2017, p. 107). In contrast, movement to the Midway Isles would have been guided by the prominent hills and mountains of the east coast. From the north of Skye towards Tarbert, the distinctive conical hill of Toddun on Harris provides a bearing to avoid overfalls and hazards (Mason 2017, pp.106-107) (Figure 79, *top*; see also Figure 78, *bottom*). Toddun also marks the entry to Loch Seaforth as seen in Figure 70, and thus this landform would have provided a bearing for movement to both the Midway Isles and the sea loch route through the interior of Lewis. However, a less hazardous journey may have been between Dunvegan on the Duirinish peninsula and North Uist. Although strong tidal races and overfalls exist along the west coast of the Duirinish peninsula and along the journey to the north, the route from Dunvegan to the Midway Isles contains fewer sea hazards (Mason 2017, p. 106) (Figure 79, *bottom*). On this approach, Eaval and the Lees would have provided distinctive bearings in their relative topographic isolation, also marking the entrance to Loch Maddy and Loch Eport. Thus, the same dominant landforms that would have been significant in the lives and cosmologies of local Hebrideans may have simultaneously provided a crucial link between these regional associations and broader connectivity.

Between routes to Tarbert or North Uist, the Sound of Harris would have provided, or guarded, access to the Atlantic. From this perspective, the position of Northton is once again highlighted by maritime movement. Its location at the end of the narrow Leverburgh Channel would have overlooked any movement between the Atlantic and the inner seaways, a dominance that would not have been felt had the settlement been located elsewhere around Toe Head or along the west coast (see Figure 67). Whilst Northton's strong maritime connections to the north and south have already been noted, potential connections to Skye would have further positioned this settlement between the inner and outer approaches. It is thus interesting to note that despite its impoverished lithic assemblage, Northton produced the largest quantity of lithics with potential



View NNW from Shiant Isles across the Sound of Shiant with south Harris and Lewis on the horizon (Photograph from Mason 2017, p.117)

Figure 78. High tide maritime routes highlighting the Shiant Isles (bottom) and Skye.

connections to Skye. This includes an igneous knife borer, thought to be imported as a finished product, and a hornfels flake, both potentially from Skye, as well as a mudstone blade fragment from either Skye, the Shiant Isles or the Inner Hebrides (Murphy and Simpson 2003, p. 107; Simpson et al. 2006). Thus, this Midway Isles become a region of converging meso-connections ingrained within broader macro-connections between the Inner and Outer Hebrides.

Further evidence for cultural connections between the two is found in Skye, where numerous chambered tombs have been noted to be of Hebridean forms (Henshall 1972), most notably Rudh' an Dunain, which was excavated by Scott (1932, 1934a) within the same period as his excavations of Unival and Clettraval. Although the cairn revealed remarkable similarities to other Hebridean tombs, most especially Barpa Langass (Armit 1996, pp.72-73), its setting is rather unusual compared to other Hebridean examples. Located at the end of a low-lying peninsula to the southwest of the island, the monument would have only been prominent from the immediate landscape (Figure 80, *bottom*). However, with the peninsula backed by the Cuillin Hills to the east, the site would have been difficult to access, by either land or sea, with only one suitable route of approach via Glen Brittle, roughly 4 km to the northeast, at the head of Loch Brittle (Scott 1932, pp.183-184). Thus, movement to the site would have been highly structured. Further, Scott also noted that the cairn and its adjacent brackish lochan form the apex of a triangle, the base of which is formed by the Cuillin Hills. This is reminiscent of the pattern of connected cairns noted in North Uist, with Eilean Domhnuill forming the apex and the landforms along the east coast of North Uist forming the base.

These mountains would have provided a dramatic backdrop to activities taking place within the southeast facing forecourt, which was revealed to be a focus of activity (Scott 1932), along with the surrounding seas, the adjacent island of Soay to the southeast and the more distant Small Isles to the south. The largest of the Small Isles is Rum, which sits roughly 12 km directly south of Rudh' an Dunain, and on a clear day, the Rum Cuillins—not to be confused with those on Skye—loom large on the southern horizon. Connections between the two islands are evident in not only their proximity but also the Rum bloodstone pieces found at the site (Scott 1934b; Ritchie 1968). Around 3 km to the northwest of Rum sits Canna which today provides a staging post for movement to the Outer Hebrides (Mason 2017, p. 17).

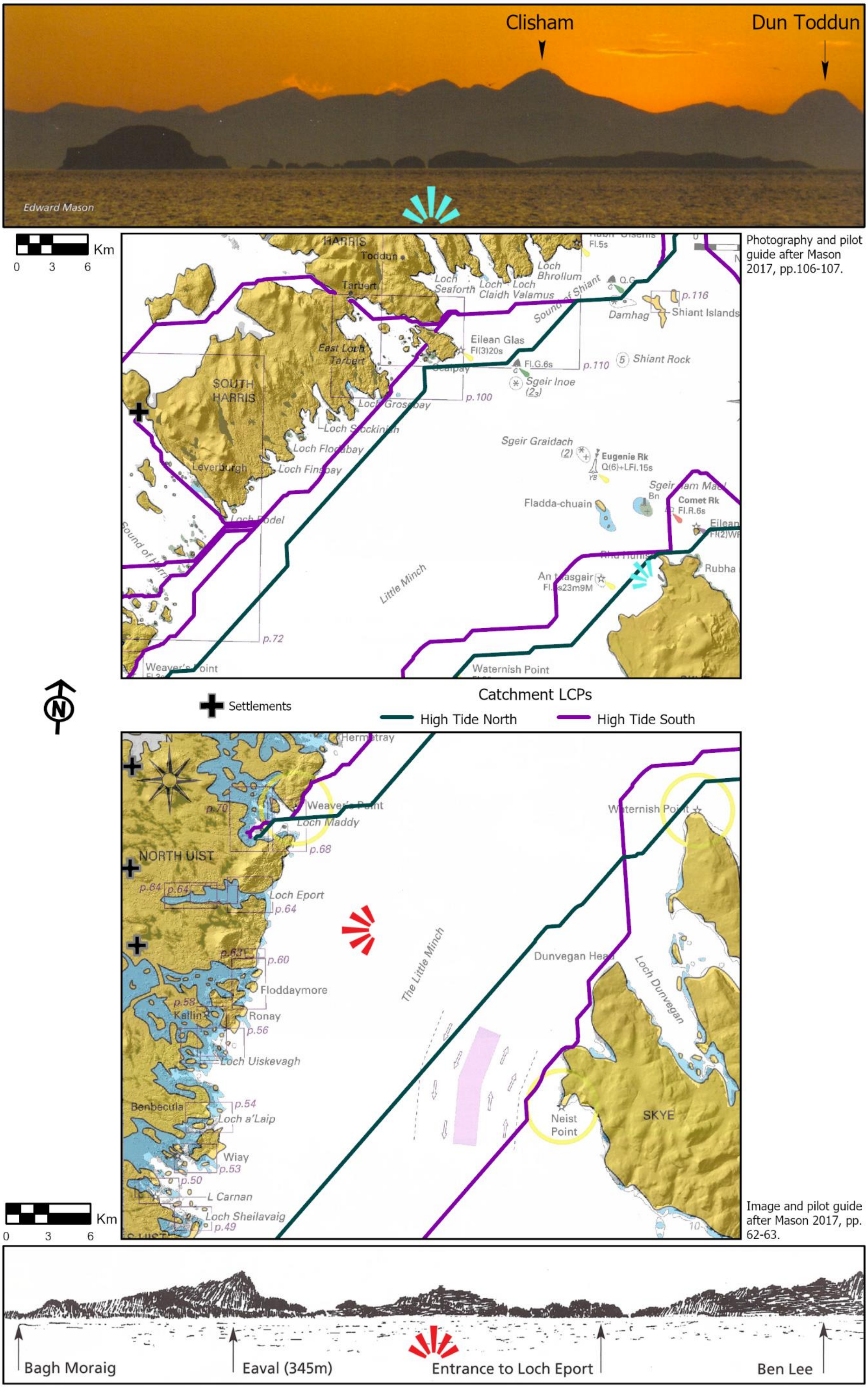
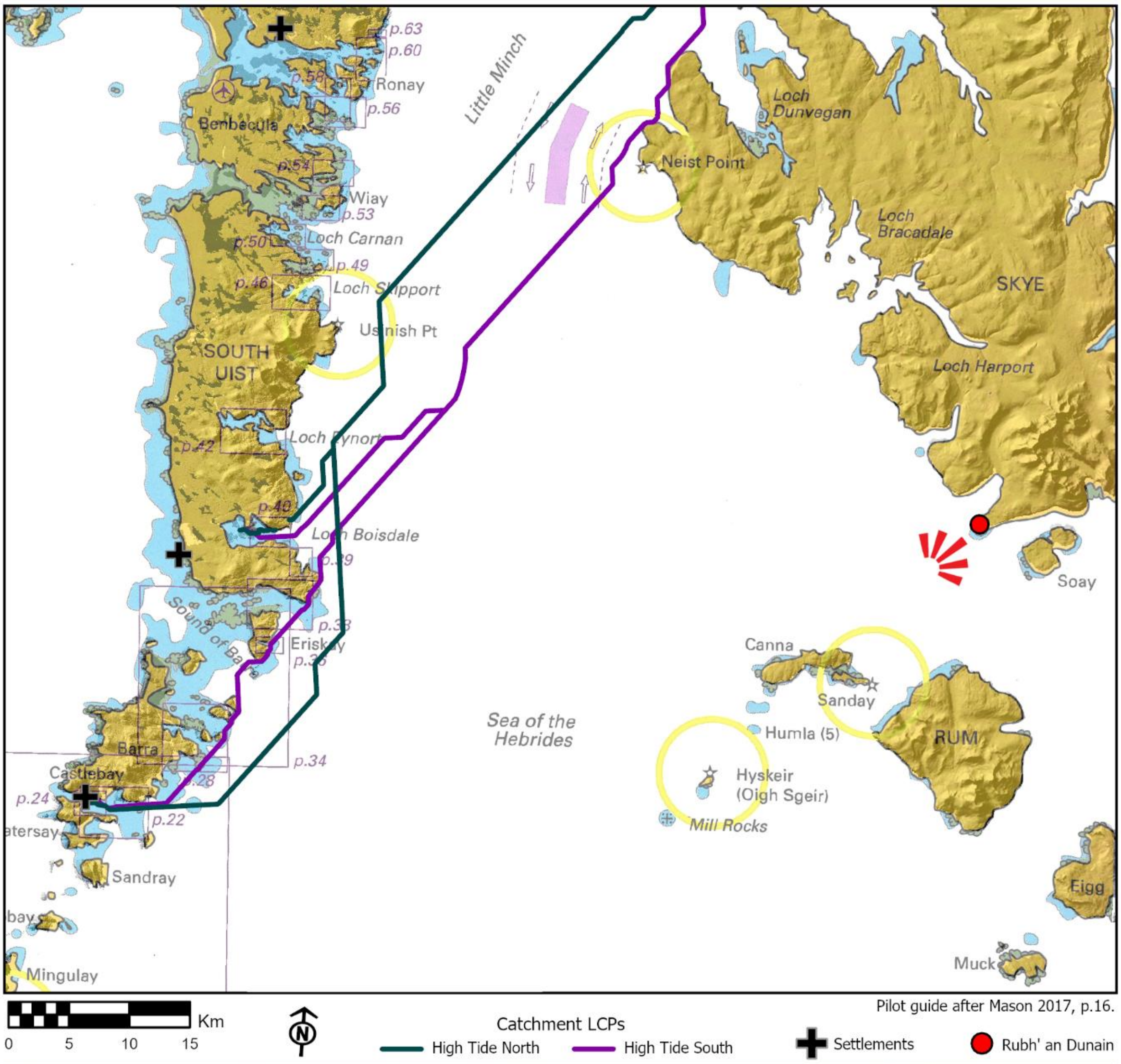


Figure 79. Maritime routes between Skye and the Outer Hebrides compared to modern pilot guide with images showing landmark bearings along the east coast of the Hebrides.

8.3.2 Southern Connections: A Sea of Islands

From the south, Canna is optimally position for movement to the Outer Hebrides; its harbour provides anchorage whilst waiting for optimal weather, and its position is such that winds of almost any direction can be taken advantage of, if any destination between Barra and North Uist is acceptable (Mason 2017, pp. 16-17) (Figure 80, *top*). Although steep seas may be encountered further south, once again the result of an uneven seafloor, from Canna the crossing may have been relatively straightforward, involving few sea hazards and perhaps taking advantage of the east-west moving palaeotidal streams. The greatest challenge is thus the 70 km distance. Nevertheless, despite this distance, the strong connections between the Inner and Outer Hebrides suggest the use of this seaway for movement between the two. Parallels have been drawn between Neolithic structures on Canna and those evidenced at Eilean Domhnuill, Northton and Barpa Carinish (Gannon 2016, pp.144-146). Further, Allt Chrisal produced the greatest quantity of foreign lithics, all derived from the south, including flaked bloodstone tools from Rum, pitchstone flakes from Eigg and/or Arran and a porcellanite core fragment and axe-head spall from Co. Antrim. This connection with the south is a prevalent theme throughout the Neolithic, with early connections with the southwest suggested by chambered tomb and ceramic typologies and later connections evident in the larger quantity of porcellanite axe-heads that have been recovered. Further, a pottery find of 'distinctive Hebridean character' on the north Antrim coast was noted by Sheridan (2004a, p. 14), leading to the suggestion of direct connections between the two. Thus, from the south, Barra would have provided the nearest point of contact with the Outer Hebrides and may have thus been the site through which people, goods and ideologies were transmitted between the two regions.

These stronger connections to the south may have been presaged by Mesolithic activity in the Inner Hebrides and provoked by the nature of the transition to the Neolithic. This region provides some of the greatest evidence for Mesolithic settlement practices along the western seaways, with the Hebrides providing 'access to a variety of environmental zones and a wide range of resources' that would have been significant to Mesolithic communities (Armit 1996, p. 33). Kinloch on Rum provides the earliest dates for Mesolithic activity, which would have occurred within a century either side of 7500 cal BC (Ashmore 2004, p. 92; Gregory et al. 2005, p. 947). Further, Mesolithic dates from sites on Skye, Rum and Colonsay are contemporaneous with Mesolithic dates from Northton (see Ashmore 2004; Gregory et al. 2005, p. 946; Simpson et al. 2006, pp. 19-23). When combined with the strong potential for Mesolithic activity in the Outer Hebrides, the evidence suggests the existence of highly mobile Mesolithic communities within the Inner and Outer Hebrides who would have had strong and active maritime cultures. This is significant as it may have been through these existing contexts that the Neolithic of the Outer Hebrides would have emerged.



View ENE of Rubh' an Dunain with the Cuillin Hills in the background (Photograph from RCAHMS 2011).

Figure 80. Maritime routes through the Sea of the Hebrides compared to modern pilot guide demonstrating potential connections between the Inner and Outer Hebrides (top) along with Rubh' an Dunain, a Hebridean-type tomb (bottom).

Thomas (2013, p. 128) has argued that long-distance networks of contact established in the Mesolithic would have presaged the transition to the Neolithic, 'so that transformation often took place in the context of established relationships.' For instance, associations between Mesolithic shell middens and Neolithic chambered tombs have been noted along the Atlantic façade (Renfrew 1983, p. 162), which is supported by the reuse of several middens for chambered cairn construction in western Scotland, leading Pollard (1996, pp. 204-205) to suggest that Mesolithic shell middens should be considered monumental in their own right. This theory is also supported by the exploitation and movement of Rum bloodstone, which has been found at 22 sites on neighbouring islands and the coastal mainland, the majority of which are Mesolithic (Wickham-Jones 1990, p. 154). Whilst the exact nature of the Mesolithic-Neolithic transition is still unclear, aDNA and isotopic evidence are suggesting that the two populations may have coexisted for several centuries (Schulting and Richards 2002; Chandler et al 2005; Charlton et al. 2016; Brace et al. 2018, 2019). In the Outer Hebrides, the potential reuse of a Mesolithic shell midden was noted at Northton (Simpson et al. 2006), which along with other Mesolithic middens discovered in the vicinity (Piper and Church 2012; Bishop et al. 2013) as well as the Mesolithic cave near the chambered tomb of Rudh' an Dunain (Scott 1934b), further emphasises connections not only between earlier Mesolithic and Neolithic practices but also between the Inner and Outer Hebrides—connections that have already been highlighted and may have further been engendered by an intimacy with the tides through the inner seaways.

8.3.3 Northern Connections: The Turning Point

Whilst ongoing or at least repeated contacts with the south can be strongly suggested based on a broad range of associations, including earlier Mesolithic activity, ceramic and chambered tomb typologies, the movement of lithics and the overall geographic and maritime affordances to movement between them, aside from Unstan-type bowls there is little evidence to suggest a connection with Orkney until the emergence of the standing stone tradition. As argued by Copper (2015; see also Copper and Armit 2018), despite its long association with Orkney chambered tombs, the limited examples of Unstan Ware and divergences in its context suggest that the origins of its development and transmission to the Hebrides did not necessarily reside with Orkney. Further, the earliest dates for Orkney at 3766-3536 cal BC and 3767-3635 cal BC (Griffiths 2016, pp. 296–297) are broadly contemporary with the earliest dates from the Outer Hebrides (see Garrow et al. 2017a). Given that Unstan-type vessels were recovered from the earliest phases of Eilean Domhnuill's excavated layers along with its apparent spread to Orkney around 3600 BC (Schulting et al. 2010, p. 33), Copper and Armit (2018) have further suggested the adoption of the Unstan form in both archipelagos at broadly the same time. With its likely origins in northwest Scotland (Sheridan 2016 p. 589), what could instead be suggested is the diffusion of this tradition south through the Great Glen before being transmitted to the Outer Hebrides through contacts with the southwest mainland or Inner Hebrides. If such is the case, then there is little evidence left to suggest Hebridean associations with Orkney during the Early Neolithic.

Further, the two archipelagos do not demonstrate the same geographic and maritime affordances to connectivity. Despite utilising different methodologies to model maritime movement, the overall trends noted in this analysis regarding maritime affordances to movement around the Outer Hebrides reflect those noted by Callaghan and Scarre's (2009) maritime models around the British Isles. Although assuming direct voyages, their simulations revealed the strong differences in affordability between both the western and eastern approaches as well as movement north and south. Whilst simulated paddled voyages along the east coast of England to Orkney were unable to complete the journey, movement south could be completed in 16 days, the nature of the coastline allowing maritime routes to hug the coast when moving south (*ibid*, p. 364). In contrast, the western approaches would have allowed for journeys both north and south, which could have been completed in broadly the same amount of time. This suggests two things; firstly, the western approaches would have served as the most suitability route to Orkney—a suitability that when combined with the conduciveness of the indented coastline to maritime practices of pilotage and coastal-hopping could be assumed to have been even greater—and secondly, even this route would have been constrained, as demonstrated in this analysis by the overall higher cost of moving north through the seas around the Outer Hebrides. Consequently, this would indicate that Orkney was more connected than it was accessible and further, that it would have been easier for Orcadians to travel to the Hebrides than for Hebrideans to travel to Orkney.

This is further suggested by the nature of the geography and topography between the two. The northwest headland of Scotland, known rather ominously as Cape Wrath, is, in fact, a name derived from Old Norse *hvarf* meaning 'turning point'. This toponym demonstrates the importance of this headland for movement from the east, marking the turning point at which maritime movement could continue through the inner seaways. From the Outer Hebrides, however, Cape Wrath may have represented a place truer to its English homograph. Its near 75 km distance from the Butt of Lewis, separated by the defiantly converging waters of the Atlantic and the Minch, would not have been easily crossed. Instead, movement beyond the cape would have likely required pilotage along the west coast of the mainland, a route that, given the great expanse of the North Minch, would have judiciously required first crossing to Skye before travelling north along the coast. And yet, the paucity of evidence for Neolithic activity on the northwest mainland, which is doubtless influenced by research bias (Brophy and Sheridan 2012, p. 77), could regardless suggest that little activity was occurring along the coastline, at least not to any tangible extent compared to the heavy concentrations of activity evidenced from Skye south through the western seaways (although such theories can only be addressed through increased archaeological investigation in this region).

Whilst the ebb and flow of Hebridean connectivity throughout the Neolithic has long been a subject of debate, the strong juxtaposition between the, at best, tenuous evidence for connections with Orkney during the Early Neolithic and the immediate and persistent signs of its influence in the Later Neolithic may be most informative. The cited change in influence or cultural affiliations from south to north, which is most evident in the monolith tradition and its associated materials, also coincides with a refocus of activity to the north of the archipelago as well as a clear increase in movement through it, as evidenced by the high quantities of prestige objects as well as their apparent association with maritime routes through the inner sea lochs. However, this need not assume that connections to the south abated, as the high quantity of foreign stone axes from the south can attest to. Instead, there appears to have been an overall increase in movement throughout the region and accordingly, increased Hebridean connectivity with both the Northern Isles and regions to the south, with the Hebrides placed at a crucial position for any movement between the two. This position, rather than rendering Hebrideans at the mercy of new traditions and ideologies, may have instead engendered the archipelago with a great level of significance, both functional and metaphorical, and thus, rather than being mere passive recipients of change, Neolithic Hebrideans may have been strong mediators of these changes, perhaps even infusing emerging traditions with their own unique Hebridean identity.

8.3.4 The Atlantic Cultural and Environmental Influence

In this way, rather than viewing Neolithic connectivity along the western seaways as a waxing and waning network of which Hebrideans played little part, it could instead be seen to have taken the form of a gradually increasing network of connections that by the third millennium BC would have included Orkney, subsequently evolving into a substantial network of lithic exchange and cultural transmission. Suggestions for the motivation behind this increased movement have cited environmental degradation, population collapse and subsequent economic pressure (Stevens and Fuller 2012; Shennan et al. 2013; Bevan et al. 2017), which would once again highlight the *longue durée* of environmental change. Regardless of its influence on movement and connectivity, this deteriorating environment would have been keenly felt through the generations and strongly linked to the Atlantic, and it is this Atlantic influence that would have served as the final unifying factor for Neolithic Hebrideans.

Whilst the inner seaways were the source of the familiar, and likely the medium for much of the social contacts throughout the archipelago as well as with the Inner Hebrides, the Atlantic would have been the source of the unfamiliar and unpredictable—i.e. the source of change—and it is this juxtaposition between seaways that has played an integral role in the history of this archipelago. Although clearly a land of continuity of practice and place, its timeline is ultimately one sharply punctuated by foreign contacts. From the Neolithic transition to the arrival of the continental Beaker culture and even the later Vikings, all would have brought new traditions and ideologies and all would have been borne, in some way, through the Atlantic. This shared experience of facing either ocean or inner sea and its strong influence on the temporality and spatiality of the environment would have united Hebrideans in spirit, if not in social interaction. This strength of community and place, as well as a strong respect for established traditions, is evidenced throughout Hebridean history, with the endurance of sites and the reuse of previous monuments and structures occurring even several centuries later, such as the commandeering of the Neolithic islet practice for Iron Age dwellings. Thus, in spite of the strong and overlapping temporal and social layers enforced and enabled by the dynamic environment and surrounding seaways, Neolithic Hebrideans would have been united through an endurance of practice and place, enabling a life of continuity amidst the flow.

8.4 Final Remarks

On his writing of *The Archaeology of Islands*, Rainbird (2007, p. 3) commented that it soon became clear that 'islands form only a part of a much more complex story, the story of maritime communities', a statement that is acutely applicable to the writing of this thesis as well. As clearly evident throughout this research, the study of prehistoric maritime communities is neither simple nor straightforward; with the sea serving as a complex, and at times temporally constrained, highway, the various affordances and constraints to seafaring would have enabled diverse trajectories of movement based on a variety of not only environmental factors but also cultural ones. Furthermore, in many instances, these transient trajectories of movement are confounded by the presence of terrestrial mobility patterns, and thus, any holistic study of prehistoric maritime communities must also consider the significance of the landscape and land-based practices. Whilst discussions of Neolithic seafaring along the western seaways have long been enchanted by the more exceptional narratives of inter-regional connectivity and exchange—focused primarily on the transition to the Neolithic and the emergence of more mobilised practices around the start of the third millennium BC—refining these discussions requires a focus not only on these broad chronological snapshots but also on the time lived between time, recognising the importance of both foreign and local, unique and homogeneous. Thus, through the use of digital approaches, a method was devised that could tack between temporal and spatial scales as well as terrestrial and maritime milieus, enabling a refined understanding of the Neolithic of the Outer Hebrides within the broader chronological limitations of current research.

Whilst numerous spatial and quantitative trends were noted throughout the initial analysis of the Hebridean record—e.g. the clear fall-off in the use of flint beyond South Uist and the prevalence of prestige objects in Lewis—perhaps more informative than what could be inferred from the extant record is what could not. The limited understanding of the local lithic assemblage, including types of materials and their sources, prevents more refined narratives regarding their sourcing and use as well as their potential movement throughout the archipelago. This issue encompasses the entirety of the Hebridean lithic assemblage as well, making it difficult for the nature of both regional and inter-regional movement and connectivity to be refined without a more thorough analysis of the extant lithic assemblage.

Further, the clear biases in research have also had a profound influence on the current state of knowledge. Although chambered tombs have the longest history of research, it is evident that a paucity of modern research has hindered any further understanding of these still enigmatic sites. This is a challenge that can only truly be resolved through further investigations of tombs, especially those likely to be the earliest examples on the island—both Clyde and inter-tidal cairns—as well as those that may have developed at the height of tradition around the mid-fourth millennium BC—i.e. Hebridean passage tombs demonstrating more substantial architectural forms, characteristic landscape settings and locations of lower accessibility. In addition, discrepancies in existing knowledge were highlighted between monuments in the northern and southern islands. The heavy focus on chambered tombs in the Uists sharply contrasts the minimal investigation of them that has been conducted in Lewis, and the same can be said of stones settings, although in the reverse, with little understanding of the date or context of standing stones beyond the Callanish complex, itself still an enigmatic site. Whilst movement was clearly converging within the region around the start of the third-millennium BC, the actual routes of movement that these stone circles may have been facilitating, much like the tomb tradition, remains questionable. However, whilst the numerous chambered tombs that were highlighted throughout this analysis were based on terrestrial movement, the few stone settings that were highlighted, primarily through their lack of connectivity to terrestrial pathways, appeared to correlate more closely to the sea, often proximally and visually. Thus, whilst a refined understanding of the two monument traditions is heavily dependent upon further investigation of sites, the discrepancies in connectivity between them also highlights the need for a more refined understanding of the palaeogeography and palaeoenvironment.

As regards this study, the additional use of 5000 BP palaeogeographic and palaeotidal models within the least-cost analysis would allow for a greater understanding of Late Neolithic patterns of movement and their potential connections to stone settings; however, further collaboration between the archaeological and environmental sciences is also crucial. By allowing archaeological research questions to dictate palaeoenvironmental work, a refined understanding of the *longue durée* of environmental change can be achieved, addressing not only sea levels but also loch levels (especially lochs that may have been important for inland movement such as Loch Scadavay and Loch Seaforth) as well as the nature of changing vegetation, most especially peat expansion and its potential effects on movement. Having highlighted a number of areas that may prove most informative for collaborative archaeological and environmental research, this thesis also illuminated the overall influence of the environment and its many temporalities on the lives of Neolithic Hebrideans and consequently the importance of a refined temporal understanding of environmental change. With the analysis of the modelled pathways exposing a number of potentially significant places within the landscape and along maritime routes, focusing on these smaller areas of interest would enable more detailed analyses of movement to be generated, which could be further refined through any combination of higher-resolution remotely sensed data, targeted palaeoenvironmental research and additional archaeological fieldwork. Thus, through further archaeological and environmental exploration of the many regions of interest exposed through this thesis, a greater overall understanding of how this changing environment may have influenced the practices and identities of Neolithic Hebrideans can be achieved and theories of movement and connectivity based on environmental factors, such as tides and seasons, can be furthered.

Despite the limitations to existing knowledge that is intrinsic to a fragmented record and paucity of absolute dates, the established methodology has not only highlighted sites and regions within the Outer Hebrides that may be significant for future fieldwork but also provided a template for future digital research that can be both refined and expanded upon through an iterative and reflexive process. Whilst focusing primarily on a regional narrative, the results of this thesis raised questions regarding the appropriate spatial resolution of the analysis, most predominately highlighting the potential for strong connections with Skye as well as a number of small islands around the archipelago. Exploring such connections is thus a crucial next step to both refining the current understanding of the Hebridean Neolithic and revealing its place within the broader Neolithic. This could be achieved simply enough by including these landmasses within existing maritime cost rasters and generating maritime LCPs between suitable maritime places highlighted along the east coast of the Outer Hebrides and sites on Skye demonstrating potential cultural affinities.

Although the ability to generate broader discussions of movement along the western seaways was hindered by a paucity of extant direct evidence for such movement, namely 23 foreign lithic pieces with limited chronological resolution, this thesis regardless highlighted inter-regional connections that also deserve further exploration, most especially with the Inner Hebrides, southwest Scotland and Antrim Co. Ireland. Whilst the exploration of these connections and ultimately the ability to address the nature of Neolithic connectivity along the western seaways has been broadly limited to theoretical discussions and computational approaches, through the combination of the two, as utilised in this thesis, theories can be furthered and new avenues and areas of interest highlighted until such time as further materials are recovered and absolute dates recorded. Thus, the expansion of the established methodology would allow for a refinement of Callaghan and Scarre's (2009) models through the western seaways by allowing for the potential significance and use of the landscape for maritime movement to be considered as well. Comparisons between the results of this thesis and those of Callaghan and Scarre's simulations highlighted a number of uniform trends, including the greater ease of movement along the western seaways than the North Sea and the overall greater conduciveness of the maritime landscape for movement south around the British Isles. Focusing thus on the whole of the British Isles, this analysis offers further insight into maritime aspects of the British Neolithic more broadly as well as the role of the western seaways in the transition to the Neolithic more specifically. With burgeoning aDNA studies and isotopic analyses contributing to the nature of the Mesolithic-Neolithic transition along the Atlantic facade, the expansion of the current analysis could thus be used to examine prevailing maritime migration models, offering additional insight into the nature of the transition through a focus on the method of its transmission. Accordingly, by refining and expanding upon the established methodology and incorporating new data through an iterative and inductive process, a refined understanding of these complex maritime communities can be gradually obtained through a focus on the role of these transient trajectories of movement.

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Appendix A

Data Sources Used

Data Source	Data Type	Resolution	Description	Year
OS Digimap	OS Terrain 5 DTM	5 m	Topographic data for Outer Hebrides	2016
OS Digimap	OS Terrain 50 DTM	50 m	Topographic data for Scotland	2018
EMODnet	Raster	25 m	Bathymetric data	2016
Historic Environment Scotland (HES)	Vector data	n/a	Sites and Monuments Record (SMR); Historic Monuments Record (HER)	2016
Scottish Natural Heritage (SNH)	Vector data	n/a	Landscape characterisation	2015
Sturt et al. 2013	Vector data	5 km	Glacial Isostatic Adjustment data	2013
Ward et al. 2016	Multidimensional raster	1 km	Palaeotidal data	2016

APPENDIX B

Hebridean Neolithic Database

Legend

GW	Grooved Ware
Neo	Neolithic
BA	Bronze Age
IW	Impressed Ware
HW	Hebridean Ware
UW	Unstan Ware
UV	Undecorated Vessel
DV	Decorated Vessel
PB	Plain Bowl
C	Carinated Bowl
CW	Cordoned Ware

QS	Quantity in sherds, number of vessels deduced
QV	Quantity in vessels, number of sherds not exact
AVG	Mean from range of vessel numbers given
ME	Minimun estimate of possible vessels (i.e. 1 sherd = 1 vessel)
NQ	Not quantified

#	Not given
+	Number likely to be greater
-	Number likely to be overestimate
*	See note (e.g. # not included)
TD	Typologically dated
SD	Stratigraphically dated
RC	Associated radiocarbon date
AC	Neolithic associated context
AU	Date uncertain
US	Unstratified Deposit

E	Excavation
S	Survey
FS	Findspot/no context
DM	Donated to Museum/no context
NL	No location/Generic coordinates

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Allt Chrisal	Barra	6800	953		Over 6800 sherds or 600 vessels inc. Beaker (from diagnostic, 565 Neo. vessels) (from undecorated/featureless, 416 vessels inc. Beaker). Equals 981 vessels. Compared to Copper's est. of 953.	HW, UW, UV (predominate), IW (predominate), undiagnostic. Found throughout all sequences.	T19 (Neo roundhouse) = 19 HW (inc. 11 UV, 4 incised, 4 IW); T26a (activity area) = 546 vessels (inc. 256 UV, 207 incides, 65 IW , 18 UW); further 388 undiagnostic vessels from both areas		64250	797730	Gibson 1995, 100; Copper 2015, p.338; https://canmore.org.uk/site/69639/barra-allt-chrisal
An Doirlinn	South Uist	#	1	QS ME	sherds (few)	C	large carinated rim sherd with diagonal line decoration indicating Neo. date		73038	817357	DES 2005, p.147; https://canmore.org.uk/site/9797/south-uist-an-doirlinn

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
An Doirlinn	South Uist	4799	111		4831 sherds (75kg) (inc. Beaker) or 135 vessels (inc. Beaker) (Copper 2015); 4799 Neo. sherds, 111 vessels (Copper 2017)	Phase 1 = HW (85 vessels), phase 2 = GW (26 vessels), no Unstan bowls or ridged baggy jars	Earlier Neolithic phase 1a: 17 sherds + 1 vessel. Phase 1a: 2090 sherds (39kg, 25 vessels) + 5 smashed. Phase 1b Later Neolithic (c.2900-2800): 324 sherds. Phase 1b: 559 sherds. Phase 1c (c.2840-2640) 595 sherds. Phase 2a (c.2780-2480): 64 sherds. Phase 2b (c.2480-2330): 282 sherds. According to Copper Phase 1=4326, Phase 2=473	Almost all pottery consistent with derivation from a local source'. Grooved ware showed different consistency in fabrics althouth still 'no reason to belive that the clay for thisfabric is not from a local source' Garrow and Sturt 2017, p.160	73038	817357	Garrow and Sturt 2017, p.143-156, 164, 167; Copper 2017, p.157-164, 2015, p.329; https://canmore.org.uk/site/9797/south-uist-an-doirlinn
Barpa Carinish	North Uist	422	100	-	sherds	HW, IW, UW, but no plain bowls, no collared rims, only round-bottomed, 150 highly decorated	Over 100 vessels (est. by Crone et al. 1993, p.370-375); Perhaps overestimation according to Copper (2015; Spread B (RC) Hearth 1 earliest (38 sherds), Dep. E Hearth 2 (97 sherds), Spread D Hearth 3 (125 sherds)	Mainly sandy clay or course sandy clay, probably local	83697	860308	Crone 1993, p.370; Copper 2015, p.326; Gibson 1995, p.115; https://canmore.org.uk/site/10288/north-uist-bharpa-carinish
Barpa Langass (area)	North Uist	4	1	QS ME	sherds, conjoining = 1 vessel, QS	HW, round based	RC dates relating to this form of pottery suggest Early Neo. date		83590	865890	Ballin 2008, p.8-9; Sheridan 2007

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Birusaslum	Vatersay	5	2	QS	sherds, based on styles must be at least two vessel types, QS	DV bowl rim, UV sherd	Midden deposit, decorated bowl rim, undecorated sherd, undecorated cordon/lug, 2 small sherds		61125	796320	Branigan and Foster 2000, p.49; https://canmore.org.uk/site/335599/biruaslum
Buaile nam Bodach	Barra	#	1	QS ME	sherds (small quantity), QS				71538	801643	Copper 2015, p.376; Brannigan, K. (2000) The Buaile nam Bodach Project; https://canmore.org.uk/site/335600/buaile-nam-bodach-neolithic-site
Callanish	Lewis	1100	169	+	1100 sherds (inc. Neo and BA); Hensall identified 33 Neo vessels although total may be significantly higher	HW, UW, 1 GW pot	Dates based on typologies, no RC dates	The recurrence of the same kinds of lithic inclusion in pottery of different dates suggests it was made locally (Sheridan 2016, p.577)	121296	933013	Copper 2015, p.346-347, 355; sheridan 2016 in Ashmore 2016

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Clettraval	North Uist	#	18	+	vessels plus sherds, at least 15, perhaps as many as 36 Neo. vessels (Copper 2015)	HW (less decorative) and later (cordoned ware) (no unstan)	18 definitive Neo. + 21 indeterminate (neo or beaker), 1 Beacharra/Hebridean, 2 unstan type, 2 inturned collar (3rd possible), 4 deep collar, 1 open bowl, numerous sherds (possible 1 or 2 vessels),	All vessels likely to have been manufactured locally (Henshall 1972, pp.508-511)	74998	871369	Scott 1935, 496; Henshall 1972, p.153, 308-309; Copper 2015, p.355; https://canmore.org.uk/site/10106/north-uist-south-clettraval
Dalmore	Lewis	#	1	QS ME	sherds (few)	unspecified	4000 sherds of pottery found, a few Neo.		121410	945030	DES 1983, p.38-39; https://canmore.org.uk/site/4206/lewis-dalmore
Dunasbroc	Lewis	477	140 #	QS	sherds, mostly Neo but a few IA (vessel number estimated from MacSween 2009, p.118 catalogue of sherds)	unspecified	size and preservation limit construction of profiles		147137	962004	DES 2005, p.148; https://canmore.org.uk/site/69532/lewis-dunasbroc

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Eilean an Tighe	North Uist	4500	2162	AVG	4000 sherds, 365 vessels (Scott 1935, p.34), 4500 sherds, between 632-3691 vessels (Squair 1998, p.335 in Copper 2015 p.316)	UV moving towards more highly decorated, ridged jar and 1 UW bowl (no flat bottomed vessels)	270 vessels show signs of use related abrasion (squair 1992, p.343); Based on pottery form and decoration Scott suggested 3 phases: 1st phase kiln 3, 2nd phase kiln 1, 3rd and final phase, kiln 2	The composition was examined by Phemister (PSAS Vol. 76, p.131) with grit derived from native rocks (probably obtained from loch beach) and clay (not known) was presumed to be from shores as well	84240	873100	Scott 1951, p.5; Henshall 1972b, 167; Squair 1998, p.335; Copper 2015, p.316; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe DM	North Uist	#	9	QV	Restored vessels (1950), Neo. pottery and other objects (1952), various sherds (1975)	Style consistent with Late Neo. Date	decorated pottery found by Beveridge		84240	873100	Beveridge 1911, p.222; DtPfM 1950 p.183, 1952 p.201, 1975 p.333; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Eilean Domhnuill	North Uist	22181	1900		sherds and vessels	HW, UW (224 vessels), PB, 1 lugged vessel (rare, only other found at Clettraval although form and decoration are different) assoc. with HW and UW	28 sherds from Level 11 (submerged deposit, RC date), 10 rim sherds (11 vessels) from Level 9 (RC date), 3 rim sherds (11 sherds total) from Level 8, 300 rim sherds from Level 7, 371 rim sherds Level 6, 660 rim sherds from Level 5 (RC dates), 25 rim sherds Level 1, UW distributed throughout all levels, all pottery styles in use during Levels 7,6,5 (late 4th millennium - early 3rd millennium BC)	Local fabric composition	74696	875332	Copper 2015, p.112-118, 173; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill,
Eilean Domhnuill	North Uist	#	1	QS	Sherds		Found by Beveridge (1911) 12-17 inches beneath surface, patterned pottery along with saddle quern and stone pounder		74696	875332	Beveridge 1911, p.198; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Geirisclett	North Uist	317	12	QS +	Sherds inc. Beaker (plus 16 sherds from Beveridge excav.), (134 sherds undiagnostic), Neo. vessels based on diagnostic sherds alone (plus 1 vessel from Beveridge)	HW, 1 C	Some sherds recovered by Beveridge and analysed by Henshall (1972, p.516) inc. 1 carinated Neo vessel, confirmed by Dunwell et al. (2003, p.18), Phases: disturbed subsoil, basal floor, intact lower fills, disturbed upper fills (majority of finds from this phase), paving and hearths	Smooth surface, almost burnished, inc. quartz, geniss, mica 'all of which would have been locally available'	76840	875200	Dunwell et al. 2003, pp.12-13, 18; https://canmore.org.uk/site/10033/north-uist-geirisclett
Kirkidale, Daliburgh	South Uist	#	1	QS ME	sherds	unspecified	Course handmade pottery falls into two groups, one of which is probably Neo., although no Neo. context (medieval building)	Course-grained	79790	826440	HER; DES 19992, p.88; https://canmore.org.uk/site/9820/south-uist-kirkidale; http://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-753-1/dissemination/pdf/1990/1992.pdf p.88

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Loch a' Choire	South Uist	121	7	QS	sherds (541.5g)	HW, C	Redeposited material, no Neo. context but forms parallel those from other sites inc. 2 body sherds, 2 carinated sherds and a lug. Number of vessels estimated from context (3 sites), form (lugs, carination) and decoration (incisions)		76788	814522	DES 2000, p.99; Henley 2012, p.192-194; https://canmore.org.uk/site/187059/south-uist-loch-a-choire
Loch an Duin, Carloway	Lewis	1	1	QS ME	sherds (early discoveries), total vessels since 2014	HW	At least one of two sherds recovered is Neo		118901	940829	Garrow and sturt forthcoming; Copper 2015, p.381;
Loch an Duna, Ranish	Lewis	8	23	QV	sherds (early discoveries), total vessels since 2015	HW	One RC date from charred residue 3519-3365 cal BC		128394	947230	Garrow and sturt forthcoming; Copper 2015, p.382;
Loch Arnish	Lewis	36	58	QV	sherds (early discoveries), total vessels since 2012	HW, UW	One RC date from charred residue 3512-3348 cal BC		142311	930238	Garrow and sturt forthcoming; Copper 2015, p.379;
Loch Beag an Tanga, Toristay	Lewis	2	1	QS ME NL	sherds (2 shown in illus. from PSAS 1949), 1 vessel at most, QS	DV	'Probably Neo', decorated with est. rim diameter of 11.5", found by Kenneth MacKinnon, exact location unknown		138220	919540	PSAS 1949; HER; https://canmore.org.uk/site/4220/lewis-toristay-loch-beag-an-tanga

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Loch Borghastail	Lewis	55	59	QV	sherds (early discoveries, 21, plus interim report, 34), total vessels since 2011	HW, UW	RC dates from 3640-3360 cal BC		121150	940953	Garrow and sturt forthcoming; Copper 2015, p.380;
Loch Langabhat	Lewis	76	83	QV	sherds (early discoveries, 16, plus interim report, 60), total vessels since 2013	HW	One Neo RC date 3630-3380		121680	943816	Garrow and sturt forthcoming; Copper 2015, p.379;
Loch Mor	Lewis		1	QV	vessel	UW	almost complete unstan type bowl		107336	936232	Copper 2015, p.383;
Luchruban, Pigmie's Isle	Lewis	4	1	QS ME	sherds, may have all derived from same vessel	unspecified	Excavated by Mackenzie (1905), sherds identified by Stevenson (1948) as Neo. Inc. 1 sherd 'channelled' Neo bowl, 3 sherds thinner and burnished but also 'channelled', no context	dark micaceous clay consistent with local manufacture	150781	966020	Copper 2015, p.374; Stevenson 1948; https://canmore.org.uk/site/4420/lewis-pigmies-isle-luchruban

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Northton	Harris	2756	1097	-	sherds, vessel est. by Johnson, likely overestimation - weight 22.455kg	UW comprising over half the recognisable assemblage (Copper in Garrow and Strut 2017, p.170) and HW DV	Johnson's (2006, p.44) estimation of 1097 vessels is possible overestimation (copper 2015, p.320), complete lack of contextual info. and 60% featureless body sherds.	Thin sectioning on a selection of sherds shows that clay used to be derived from same or similar sources (most likely local machair sands) and the inclusions reflect the local geology (Simpson 2006, p.59)	97536	891259	Simpson 1976, 221-222; Armit 1996, 56; Burleigh, Evans and Simpson 1973, 61; Copper 2015, p.320; Johnson 2006, p.44; https://canmore.org.uk/site/10502/harris-northton
Olcote	Lewis	2	2	+	sherds, vessels +	HW	12 sherds represent 11 vessels of redeposited Neo/Beaker age, only 2 sherds definitively Neo. although similarities in motif mean more incised sherds may be Neo.		121796	934735	Neighbour 2005, p.29-30; Copper 2015, p.377; https://canmore.org.uk/site/110238/lewis-callanish-olcote-breasclete-park

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Rubh' a' Charnain Mhoir / Screvan Quarry	North Uist	1713	154		vessels (150 from DES), 154 from Copper	HW, UV	Most finds recovered and within vicinity appear to be of Neo. origin, 2 RC dates (from Copper 2015, p.333)	Fabrics contain inclusions deriving from locally available rocks (Squair in Downes and Badcock 1998)	90577	878737	Henley 2003, p.82; Copper 2015, p.332; Des 2000, p101; https://canmore.org.uk/site/140108/berneray-causeway
Rubh' a' Charnain Mhoir / Screvan Quarry	North Uist	60	#	QS *	sherds QS		Found during fieldwalking appr. 20m nw of pit	Fabrics contain inclusions deriving from locally available rocks (squair in Downes and Badcock 1998)	90577	878737	Henley 2003, p.82; Copper 2015, p.332; Des 2000, p101; https://canmore.org.uk/site/140108/berneray-causeway
Sheader	Sandray	#	1	QS ME	sherds QS	unspecified	Several phases of occupation, earliest phases may be associated with Neo. pottery from site		63120	792000	DES 1991, p.75; https://canmore.org.uk/site/78851/sandray-sheader
Sideval	Lewis	3	1	QS ME	sherd, 1 possible vessel, QS	unspecified	Found due to rabbit activity on shore of Loch Seaforth, no contex but found near Neo. standing stone		127810	916620	DES 2006, p.180; https://canmore.org.uk/site/4135/lewis-loch-seaforth

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Stac Domhnuill Chaim	Lewis	1	1	QS ME	sherd	HW	One sherd of hebridean incised ware found during excavation/investigation of stac		100220	931520	Copper 2015, p.374; MacLeod et al. 2009, p.124; https://canmore.org.uk/site/4420/lewis-pigmies-isle-luchruban
The Udal	North Uist	1798	104	+	sherds and vessels (or 92?)	One GW vessel identified (Building 2, DH) with two assoc. C pots	Much of the assemblage comprises either indeterminate fragments or sherds for which only a provisional identification is possible'. Only 22 Neo. pots have identifiable form. Dates contemporaneous with GW from An Doirlinn (2780-2480 and 2480-2330 BC). c. 1100 sherds from Later Neo Building 2 (DH), sherds from Phase E (earliest Neo) most likely intrusive sherds from Phase D	The raw materials of the pottery 'were all available in the immediate locality'	82420	878430	Ballin Smith 2018, p.189, 192-193, 195; Squair 1998, p.438-439, 441, 442; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail

Findspot	Island	Sherds	Vessels	Quantity description	Original Find Quantifier	Style description	Note	Composition	Easting	Northing	Source
Unival	North Uist	#	14		vessels	PB, HW, GW	1 plain bowl (early), 4 Beacharra/Hebridean types (earlier), 2 inturned collars (later), 3 large collared jars (later), 5 bowls (incl. 1 grooved ware bowl) (latest) and numerous sherds		80033	866859	Copper 2015, p.363; Armit 1996, 75; Henshall 1972, p.153-154, 309; https://canmore.org.uk/site/10234/north-uist-unival-leacach-an-tigh-chloiche
unlocated	North Uist	2	1	QS ME	sherds	unspecified	No context, two sherds of Neo. pottery donated to NMAS from Mackenzie collection		80000	860000	https://canmore.org.uk/site/10230/north-uist; DtPfM 1977, p.381
Vatersay	Vatersay	1	1	QS ME	sherd	unspecified	Found in temporary Neo rock shelter along with flint		63700	797700	Branigan and Foster 2000, p.322, 1995, p.165; https://canmore.org.uk/site/335600/buaile-nam-bodach-neolithic-site;

Total		46186	5653

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Achmore	FS	Lewis	1		not specified		macehead	Part of a broken polished perforated stone macehead or battle axe, 63cm long, 48cm wide and 35cm thick. Found 850m SSE of Achmore stone circle		132100	928500	HER; DES 1994, p.95; https://canmore.org.uk/site/91807/lewis-achmore
Allt Chrisal	E	Barra	2		bloodstone (Rum)	oxide, minerals	flaked stone tools	Large retouched flake, possible knife, and smaller flake	Rum	64250	797730	Sheridan and Addison 1995, p.138; Wickham-Jones 1995, p.120; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		pitchstone	igenous, very fine grained	flake	microscopically does not resemble arran pitchstone, Eigg is next closest pitchstone source. 30.2mm x 19.4mm x 10.9mm. Dark greyish-green with pale phenocrysts.	Eigg? Further geological investigation needed to verify whether Eigg is the source	64250	797730	Sheridan and Addison 1995, 137-139; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		pitchstone (Arran)	igenous, very fine grained	flake	narrow and blade-like (of particular interest due to similar shapes in other Neolithic contexts e.g. Auchategan: Marshall 1978 (Sheridan and Addison 1995, p.137)	Arran	64250	797730	Sheridan and Addison 1995, 137-139; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		porcellanite (Antrim)	sedimentary, fine grained	axehead spall		Tievebulliagh or Rathlin Island	64250	797730	Sheridan and Addison 1995, 137-139; https://canmore.org.uk/site/69639/barra-allt-chrisal

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Allt Chrisal	E	Barra	1		acid tuff (volcanic stone)	igneous, acid (rhyolitic) tuffs	core	core on water-worn pebble, Whitish volcanic stone, probably acid tuff		64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		acid tuff (volcanic stone)	igneous, acid (rhyolitic) tuffs	pebble flake	flaked and battered water-worn pebble, acid tuff		64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		baked mudstone/chloritic schist (a calcic metamorphic stone, probably Torridonian)	metasedimentary, torridian sandstone, mica schist/muscovite schist (medium grade regional metamorphism of often mud or clay based rocks)/greenschist	axehead	polished, pale greenish-grey on surface, band of dark red-brown iron staring below and darker grey at centre. Pebble of similar material to baked mudstone axehead (C526).	'probably local' or Skye or Shiant. At Tighe listed as possible drift	64250	797730	Sheridan and Addison 1995, 137-139; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		baked mudstone/chloritic schist (a calcic metamorphic stone, probably Torridonian)	metasedimentary, torridian sandstone, mica schist/muscovite schist (medium grade regional metamorphism of often mud or clay based rocks)/greenschist	axehead	small, polished, dark grey-brown, of similar material to C526	'probably local' or Skye or Shiant. At Tighe listed as possible drift	64250	797730	Sheridan and Addison 1995, 137-139; https://canmore.org.uk/site/69639/barra-allt-chrisal

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Allt Chrisal	E	Barra	1		baked mudstone/chloritic schist (a calcic metamorphic stone, probably Torridonian)	metasedimentary, torridian sandstone, mica schist/muscovite schist (medium grade regional metamorphism of often mud or clay based rocks)/greenschist	retouched flake	possibly from pebble axehead, pale greenish-grey, same material as C526	'probably local' or Skye or Shiant. At Tighe listed as possible drift	64250	797730	Sheridan and Addison 1995, 137-139; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		calcic metamorphic stone (pebble)	metamorphic, calc-alkaline	pebble flake	possible polished pebble tool	Most pebbles assumed with some degree of confidence to have been collected from a nearby shore (Sheridan and Addison 1995, 137). According to Dickens 1990 study of available flint resources on Barra… (Wickham-Jones 1995, p.120)	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Allt Chrisal	E	Barra	1		calcic metamorphic stone (pebble)	metamorphic, calc-alkaline	pebble flake	large flake from water worn pebble	Most pebbles assumed with some degree of confidence to have been collected from a nearby shore (Sheridan and Addison 1995, 137). According to Dickens 1990 study of available flint resources on Barra… (Wickham-Jones 1995, p.120)	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		calcic metamorphic stone (pebble)	metamorphic, calc-alkaline	pebble flake	flake	Most pebbles assumed with some degree of confidence to have been collected from a nearby shore (Sheridan and Addison 1995, 137). According to Dickens 1990 study of available flint resources on Barra… (Wickham-Jones 1995, p.120)	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Allt Chrisal	E	Barra	1		calcic metamorphic stone (pebble)	metamorphic, calc-alkaline	pebble fragment	possible polished pebble tool	Most pebbles assumed with some degree of confidence to have been collected from a nearby shore (Sheridan and Addison 1995, 137). According to Dickens 1990 study of available flint resources on Barra (Wickham-Jones 1995, p.120)	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		calcic metamorphic stone (probable)	metamorphic, calc-alkaline	chunk (core fragment)		Most pebbles assumed with some degree of confidence to have been collected from a nearby shore (Sheridan and Addison 1995, 137). According to Dickens 1990 study of available flint resources on Barra (Wickham-Jones 1995, p.120)	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	27		chert	sedimentary	flaked stone tools		local?	64250	797730	Wickham-Jones 1995, p.120; https://canmore.org.uk/site/69639/barra-allt-chrisal

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Allt Chrisal	E	Barra	1		flint	sedimentary	polished flint artefact, possible adze or knife	motled, creamy coloured flint, impossible to tell wether of primary and secondary source flint	local	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	3432		flint	sedimentary	flaked stone tools		local?	64250	797730	Wickham-Jones 1995, p.120; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	55		pumice	igneous	brown dacitic material	all brown in colour (small vesicles and appears non-glassy) (rare as most sites contain both brown and black pumice, such as Baleshare, NU)	Arrival of pumice in OH by tidal drift across the north Atlantic'. 'Would have been found on contemporary or raised beach.' 'Geochemically correlated to the dacitic pumice found elsewhere in Scotland, Norway and Iceland'	64250	797730	Clarke 1995, p.144-148
Allt Chrisal	E	Barra	138		quartz	oxide	flaked stone tools		Commonly available throughout the Hebrides as pebbles on beaches, in gravels, and in veins in dykes' (Wickham-Jones 1995, p.120). 'quartz is abundantly available on and around the site at Allt Chrisal' (Dickens op cit. 43).	64250	797730	Wickham-Jones 1995, p.120, 137-139; https://canmore.org.uk/site/69639/barra-allt-chrisal

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Allt Chrisal	E	Barra	1		siliceous stone	chert, chalcedony, agate, jasper, porcellanite, granite, quartzite	polished flint artefact, possible adze or knife	fine grained buff and pale grey banded siliceous stone		64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		volcanic stone	igenous, fine-grained, description sounds like rhyolitic tuff	chunk	fine-grained, pale greenish-grey volcanic stone with white inclusion		64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		chalcedony or bloodstone	oxide, minerals	flaked stone tools	1 flake: pale green translucent with darker green inclusion, chalcedony OR bloodstone	local OR Rum	64250	797730	(Wickham-Jones 1995, p.120); https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		fine to medium-grained pale grey stone		flake	soft, weathered fine to medium-grained pale grey stone	'Further geological consultation needed to confirm whether local sources exist'	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		fine-grained dark grey-brown stone		flake	proximal flake segment	'Further geological consultation needed to confirm whether local sources exist'	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		fine-grained grey stone	igenous, maybe rhyolite, dacite, andesite (if not langdale tuff still tuff)	arrowhead	Fine-grained grey stone. Pale grey darker grey at butt.	NOT Group IV tuff from Lake District. 'Further geological consultation needed to confirm whether local sources exist.'	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Allt Chrisal	E	Barra	1		fine-grained grey stone	igenous, maybe rhyolite, dacite, andesite (if not langdale tuff still tuff)	knife-like artefact	large retouched flake, not from axehead. Fine-grained grey stone NOT Group IV tuff from Lake District	tuff similar to that of Lake District? 'Further geological consultation needed to confirm whether local sources exist'	64250	797730	Sheridan and Addison 1995, 137-138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		fine-grained grey-brown stone	igneous/metamorphic, trachyte, phyllite, mylonite	flake	proximal flake segment	'Further geological consultation needed to confirm whether local sources exist'	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		fine-grained medium grey stone	igneous/metamorphic, phyllite, mylonite	fragment	fine-grained medium grey stone, shiny surfaces	'Further geological consultation needed to confirm whether local sources exist'	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	1		medium to fine-grained buff-grey stone	igneous/metamorphic, phyllite, mylonite	flake	proximal flake segment	'Further geological consultation needed to confirm whether local sources exist'	64250	797730	Sheridan and Addison 1995, 138; https://canmore.org.uk/site/69639/barra-allt-chrisal
Allt Chrisal	E	Barra	52		unspecified course stone		cobble tools	all cobble tools except one sharpening stone, most of the 45 grinders and hammer-stones belong to later Neo phases (Branigan 2000, p.321)	Raw materials have not been identified but grain size given in some instances… Perhaps local?	64250	797730	Clarke 1995, p.141
Allt Chrisal	E	Barra	5		chalcedony	oxide, minerals	flaked stone tools	1 flake fragment: milky green siliceous stone, probably chalcedony	'Further geological consultation needed to confirm whether local sources exist'	64250	797730	(Wickham-Jones 1995, p.120); https://canmore.org.uk/site/69639/barra-allt-chrisal

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Allt Chrisal	E	Barra	1		porcellanite (possible)	sedimentary, pseudotachylite?	chunk (core fragment)	fine-grained pale grey stone, possibly porcellanite (but not like Antrim). A good parallel with its artefactual use comes from a mesolithic midden deposit at An Corran rock shelter, Skye (Sheridan and Addison 1995, p.137)	further geological consultation needed to confirm whether local sources exist. Similar finds are known from a number of sources in the WI and West Scott mainland, associated with volcanic activity	64250	797730	Sheridan and Addison 1995, 137-139; https://canmore.org.uk/site/69639/barra-allt-chrisal
An Doirlinn	E	South Uist	1		hornblend lamprophyre, possibly Group XXX	igneous, medium-grained acid to basic, forms in sills and dykes, assoc. with granites and diorites	axe head	1 polished axe head (weathered to light olive grey) and 1 waisted axe head-like implement (found in Phase 3, Beaker layer) (weathered to pale yellow-brown), macroscopically identified	possibly group XXX, originating from western mainland of Scotland	73038	817357	Garrow and Sturt 2017, p.143-164, 185, 190; https://canmore.org.uk/site/9797/south-uist-an-doirlinn
An Doirlinn	E	South Uist	6025		flint	sedimentary	flakes, blades, scrapers, knives	Mainly greyish brown, with some dark grey/black and one pale grey.	cortex present suggests that raw materials were derived from beach pebbles'	73038	817357	Garrow and Sturt 2017, p.143-164; ADS Archive; https://canmore.org.uk/site/9797/south-uist-an-doirlinn

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
An Doirlinn	E	South Uist	9		igneous and metamorphic	igneous and metamorphic	worked stone: flake, anvil/hammerstone, rubber/smoother, quernstone	water-worn pebbles and cobbles: 1 flake (phase 1c) from hammer or mace-head, 4 facially pecked cobble anvil/hammerstone (Phase 1b, 1c, 2a, 2c), 2 quernstones (both 1a), and 2 rubber/smoothers (1c, 2a)	no detailed geological identification undertaken as stones were 'probably obtained from local beach deposits'	73038	817357	Garrow and Sturt 2017, p.143-164, 185, 190-191; https://canmore.org.uk/site/9797/south-uist-an-doirlinn
An Doirlinn	E	South Uist	1		metamorphosed (highly) black rock	metamorphic, amphibolite or hornfels?	ovoid hammer-stone or mace-head	pebble, heavily flecked with quartz	no detailed geological identification undertaken as stones were 'probably obtained from local beach deposits'	73038	817357	Garrow and Sturt 2017, p.143-164, 185, 189; https://canmore.org.uk/site/9797/south-uist-an-doirlinn
An Doirlinn	E	South Uist	137		pumice	igneous	pieces	some modified and worked	most likely drift pumice from Iceland	73038	817357	Garrow and Sturt 2017, p.191; https://canmore.org.uk/site/9797/south-uist-an-doirlinn
An Doirlinn	E	South Uist	1045		quartz	oxide	chipped stone artefacts		local	73038	817357	Garrow and Sturt 2017, p.143-164; https://canmore.org.uk/site/9797/south-uist-an-doirlinn

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
An Doirlinn	E	South Uist	2	(very few)	quartzite	oxide	chipped stone artefacts		local	73038	817357	Garrow and Sturt 2017, p.143-164, 174; https://canmore.org.uk/site/9797/south-uist-an-doirlinn
An Doirlinn	E	South Uist	1	(very few)	chalcedony	oxide, minerals	chipped stone artefacts			73038	817357	Garrow and Sturt 2017, p.143-164, 174; https://canmore.org.uk/site/9797/south-uist-an-doirlinn
An Doirlinn	E	South Uist	3	(very few)	jasper	an opaque form of chalcedony	chipped stone artefacts			73038	817357	Garrow and Sturt 2017, p.143-164, 174; https://canmore.org.uk/site/9797/south-uist-an-doirlinn
An Doirlinn	E	South Uist	2	(very few)	mudstone (possible)	sedimentary	chipped stone artefacts		drift or Stornoway or Shiant Isles/Skye	73038	817357	Garrow and Sturt 2017, p.143-164, 174; https://canmore.org.uk/site/9797/south-uist-an-doirlinn
Ardroil	FS	Lewis	1		gneiss (grey and white)	igenous	cushion macehead	unusual plano-convex shape more marked than other macehead from Great Bernera listed as BA by Gibson but DtPfM 1959 lists as one of 6 cushion maceheads (others being Neo) known from Lewis	local	151280	961290	DtPfM 1959, p.256; Gibson 1944; https://canmore.org.uk/site/4062/lewis-ardoil

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Balallan, Loch Airigh Na Ceardaich	FS	Lewis	3		unspecified		stone axe heads	probably deposited as a hoard, found by shore of loch, pending analysis	2/5 may be axe factory, 3 almost certainly local	127700	922300	DES 1981, p.50; https://canmore.org.uk/site/4147/lewis-balallan-loch-airigh-na-ceardaich
Balallan, Loch Airigh Na Ceardaich	FS	Lewis	2		unspecified, axe factory		stone axe heads	probably deposited as a hoard, found by shore of loch, pending analysis	2/5 may be axe factory, 3 almost certainly local	127700	922300	DES 1981, p.50; https://canmore.org.uk/site/4147/lewis-balallan-loch-airigh-na-ceardaich
Balallan, Loch Standish	FS NL	Lewis	1		unspecified		carved stone ball	6-knob, type 4b		128000	920000	Marshall 1976, 68; https://canmore.org.uk/site/4148/lewis-balallan; Marshall, D N. 1979a, p.68; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE4148;
Barpa Carinish	E	North Uist	24		flint	sedimentary	worked stone	nodular material that has begun to be smoothed and battered by water action, i.e. beach pebbles	no mention of provenance, although assemblage may 'reflect some pressure on the availability of raw material'	83697	860308	Crone 1993, p.375
Barpa Carinish	E	North Uist	10		quartz	oxide	worked stone	angular pebbles	no mention of provenance, although assemblage may 'reflect some pressure on the availability of raw material'	83697	860308	Crone 1993, p.375

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Barpa Langass	E	North Uist	5		flint	sedimentary		flakes	local	83766	865733	Henshall 1972, 156, https://canmore.org.uk/site/10236/north-uist-barpa-langass
Barpa Langass (area)	E	North Uist	1		pitchstone	igenous, very fine grained	flake	aphyric (non-porphyritic), light brown with minuscule light and dark crystallites, indicates procurement from the east-coast of the Isle of Arran, debitage	Arran	83590	865890	Ballin 2008?, p.2-3, 8
Barpa Langass (area)	E	North Uist	8		flint	sedimentary	debitage, tool	fine-grained, lack of cortex, 7 debitage, 1 tool (piece with bifacial retouch)	most flint artefacts in the OH appear to have been locally source and thus the same can be assumed here	83590	865890	Ballin 2008?, p.2-3, 8
Barpa Langass (area)	E	North Uist	173		quartz	oxide	cores, scrapers, debitage	all white milky quartz, 149 debitage, 21 cores, 3 tools (scrapers)	seems to have been procured from veins of pegmatitic rock (course-graned granite), dykes of which may be present in the heavily dominated gneiss area of NU (Fettes et al. 1992, p.98)	83590	865890	Ballin 2008?, p.2-3, 8

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Barpa Langass (area)	E	North Uist	4		rock crystal (quartz)	oxide	debitage	a transparent form of quartz	seems to have been procured from veins of pegmatitic rock (course-graned granite), dykes of which may be present in the heavily dominated gneiss area of NU (Fettes et al. 1992, p.98)	83590	865890	Ballin 2008?, p.2-3, 8
Beinn Bheag	FS	Lewis	1		unspecified		stone axe	not described		122230	935690	https://canmore.org.uk/site/4151/lewis-beinn-bheag
Bharabhas	FS	Lewis	2		unspecified		leaf-shaped arrowhead	found on a predominately Beaker/BA site		135000	951700	Rivett 2018, p.74
Bharabhas	FS	Lewis	1		unspecified		obligque arrowhead	found on a predominately Beaker/BA site		135000	951700	Rivett 2018, p.74
Biruaslam	S	Vatersay	5		flint	sedimentary	pebbles, flakes	2 pebbles, 3 flakes found in midden along with Neo pottery and stated by Branigan and Foster 2000, p.322 with confidence as Neo occupation site	local	61125	796320	Branigan and Foster 2000, p.49, 322; https://canmore.org.uk/site/335599/biruaslum; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE143012;
Biruaslum	S	Vatersay	5		flint	sedimentary	pebbles, flakes	2 pebbles, 3 flakes	local	61125	796320	HER; https://canmore.org.uk/site/335599/biruaslum; Branigan and Foster 2000, p.49

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Bragar	FS	Lewis	2		porcellenite, Group IX	sedimentary, fine grained	stone axe	petrological analysis by McK Clough and Cummins 1988, potentially one of the axes mapped by Ritchie 1968, p.125	Tievebulliagh or Rathlin	129000	948000	McK Clough and Cummins 1988, p.238
Buaile nam Bodach	FS	Barra			flint (pieces)		worked	from Copper 2015, p.376		71538	801643	https://canmore.org.uk/site/335600/buaile-nam-bodach-neolithic-site; Brannigan, K. (2000) The Buaile nam Bodach Project (can't find)
Buaile nam Bodach	FS	Barra	1		unspecified		stone axe	from Copper 2015, p.376		71538	801643	https://canmore.org.uk/site/335600/buaile-nam-bodach-neolithic-site; Brannigan, K. (2000) The Buaile nam Bodach Project (can't find)
Callanish	E	Lewis	2		chert	sedimentary				109000	933000	
Callanish	E	Lewis	4		flint	sedimentary		course and heterogeneous, pebble flint probably from nearby beach source		109000	933000	
Callanish	E	Lewis	34		quartz	oxide	flakes, chip, scraper	vein quartz probably quarried from nearby outcrop (the cnoc Dubh quartz quarry sited c. 3.5 km se of Calanais), white (milky quartz)		109000	933000	
Callanish	E	Lewis	2		glass	igneous				109000	933000	

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Carishader	FS NL DM	Lewis	1		flint (grey)	sedimentary	barbed-and-tanged arrowhead	uncontexted, dontated to museum	local	109000	933000	https://canmore.org.uk/site/4041/lewis-carishader; Proc Soc Antiq Scot, vol. 47, 1912-13. Page(s): 341
Carishader	FS NL DM	Lewis	1		quartz (white)	oxide	barbed-and-tanged arrowhead	uncontexted, dontated to museum	local	109000	933000	https://canmore.org.uk/site/4041/lewis-carishader; Proc Soc Antiq Scot, vol. 47, 1912-13. Page(s): 341
Carishader	FS NL DM	Lewis	1		unspecified		stone axe	cutting edge of polished axe		109000	933000	https://canmore.org.uk/site/4041/lewis-carishader; Proc Soc Antiq Scot, vol. 47, 1912-13. Page(s): 341
Carishader	FS NL DM	Lewis	1		unspecified		stone axe	portion of the cutting edge of polished stone axe		109000	933000	https://canmore.org.uk/site/4041/lewis-carishader; Proc Soc Antiq Scot, vol. 47, 1912-13. Page(s): 341
Clettraval	E	North Uist	1		pumice	igneous		pumice object found in NW corner of cairn	drift	74998	871369	Scott 1935, 495; https://canmore.org.uk/site/10106/north-uist-south-clettraval
Clettraval	E	North Uist	9		quartz	oxide	quartz pebbles (some split)	water-worn white quartz pebbles (some split) appeared intentionally placed around the cairn	local	74998	871369	Scott 1935, 498; https://canmore.org.uk/site/10106/north-uist-south-clettraval

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Creed	FS NL	Lewis	1		schist	metamorphic, unspecified type	stone axe	slightly polished pebble of schist 10 ins. x 4 1/2 ins. x 1 1/2 ins, perforated 2 1/2 ins from one end		140000	932000	https://canmore.org.uk/site/4330/lewis-creed
Dalmore	E	Lewis	19		flint	sedimentary	roughouts, scrapers	1 arrowhead roughout, 18 scrapers	local	121410	945030	DES 1980, p.43; DES 1983 p.38-39; https://canmore.org.uk/site/4206/lewis-dalmore
Dalmore	E	Lewis	29		mylonite (possibly)	metamorphic, cataclasite?	spearhead, arrowheads, roughouts, scrapers	1 spearhead, 4 arroweads, 4 arrowhead roughouts, 20 scrapers	listed as 'mylonite', 'geological enquiries continue n possible sources for mylonite' DES 1981, p.50, local?	121410	945030	DES 1980, p.43; DES 1981, p.50; DES 1983 p.38-39; https://canmore.org.uk/site/4206/lewis-dalmore
Dalmore	E	Lewis	40		quartz	oxide	arrowheads, roughouts, scrapers	vast quantity inc. 6 arrowheads, 4 arrowhead roughouts, 30+ scrapers	local?	121410	945030	DES 1980, p.43; DES 1983 p.38-39; https://canmore.org.uk/site/4206/lewis-dalmore
Dalmore	E	Lewis	1		unspecified		axehead	broken		121410	945030	DES 1983 p.38-39; https://canmore.org.uk/site/4206/lewis-dalmore
Dunasbroc	E	Lewis	1		agate (orange)	oxide, a type of chalcedony, forms in lava at relatively low temperatures as a precipitate from silica-rich solutions	stone tools	possible broken leaf-shaped arrowhead	imported	147137	962004	Macleod et al. 2009, p.125, 133; DES 2005, p.148; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE69532

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Dunasbroc	E	Lewis	31		flint	sedimentary	flakes, blades, cores, chunks, pebbles	grey or white in colour (1 orange indicating import), no debitage present, flakes (21), blades (3), cores (3), chunks (3), pebble (1)	derives from beach pebble source likely to have been available in small amounts on local beaches	147137	962004	Macleod et al. 2009, p.125, 130; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE69532
Dunasbroc	E	Lewis	61		quartz	oxide	flakes, blades, chunks, pebbles, chips	grey-white opaque (79% fragmented and crystalline) (the rest clearer form and fine-grained body), flakes (43), blades (3), chunks (12), pebbles (1), chip (2)	all would have been available in immediate locality. Prevalence of chunks indicates use of quarried quartz	147137	962004	Macleod et al. 2009, p.125, 130; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE69532
Dunasbroc	E	Lewis	2		siliceous agate (banded)	a type of chalcedony, forms in lava at relatively low temperatures as a precipitate from silica-rich solutions	flake, pebble	grey or white in colour (1 orange indicating import), flakes (2), pebble (1)	derives from beach pebble source likely to have been available in small amounts on local beaches	147137	962004	Macleod et al. 2009, p.125, 130; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE69532
Eilean an Tighe	E	North Uist	1		porcellanite, group IX	sedimentary, fine grained	flake	petrologically examined by Mck Clough and Cummins 1988	Tievebulliagh or Rathlin	84240	873100	Jope 1952, Mck Clough and Cummins 1988, p.241; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		chert	sedimentary	flake		local	84240	873100	Scott 1951, p.35; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Eilean an Tighe	E	North Uist	4		cobbles	not enough info	worked tool	Three heavy elongated cobbles with convex rounded surface and one unfinished ex	local	84240	873100	Scott 1951, p.36; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	18		flint	sedimentary	scrapers, flakes	6 scrapers, 12 flaked protions foud during Beveridge's excavation		84240	873100	Beveridge 1911, p.222 in Henley 2003, p.35; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	60	+	flint	sedimentary	scrapers, flakes, knife (possible), cores, arrowhead	dark, white, light-grey flint, 60 plus fragments (9 flakes, 1 blade, 1 leaf-shaped arrowhead, 1 core, 10 scrapers)	local	84240	873100	Scott 1951, p.34; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		flinty crush	pseudotachylite	flake	struck flake	can be matched amongst the flinty-crush belt of the eastern side of the OH'	84240	873100	https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		gneiss (granitic)	metamorphic or meta-igneous	worked tool	Globular implement, artificially pecked over whole surface	local	84240	873100	Scott 1951, p.36; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Eilean an Tighe	E	North Uist	1		meta-dolerite (altered)	meta-igneous, medium-grained basic rock, amphibolite?	pebble	Flat oval pebble. 'May have been derived from one of the local minor quartz dolerite intrusions and is perhaps an altered tholeite'	local	84240	873100	Scott 1951, p.36; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		mylonitised gneiss	metamorphic from thrust zone (cataclasite?)	flake	struck flake of mylonitised gneiss veined by flinty-crush	can be matched locally'	84240	873100	https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	29		pumice	igneous			local?	84240	873100	Scott 1951, p.37; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		quartz	oxide	worked tool	Globular implement, similar to S15	local?	84240	873100	Scott 1951, p.36; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist		(numerous)	quartz	oxide		very numerous flakes of quartz of which some are certainly human struck	local	84240	873100	https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe; Scott 1951, p.34

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Eilean an Tighe	E	North Uist	1		serpentised peridotite	igneous, occurs in folded metamorphic rock	axe fragment	Petrologically examined. 'Rocks of this type may be matched with types occurring as minor instrusions in the Lewisian gneiss of Harris and NU'	Harris or North Uist	84240	873100	Mck Clough and Cummins 1988, p.241; Scott 1951, p.34; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		serpentised peridotite	igneous, occurs in folded metamorphic rock	flake	Petrologically examined. 'Rocks of this type may be matched with types occurring as minor instrusions in the Lewisian gneiss of Harris and NU'	Harris or North Uist	84240	873100	Mck Clough and Cummins 1988, p.241; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		vein quartz or quartzite	oxide	hammerstone		can be matched locally'	84240	873100	https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe; Scott 1951, p.36
Eilean an Tighe	E	North Uist	1		arkosic sandstone (medium-grained)	sedimentary, medium-grained	pebble	flat oval pebble, polished, probably a rubbing implement. 'May have been drived from the Torridonian deposits around Stornoway or from boulders of Torridonian sandstone in the drift... as ultimate source is mainland'	Torridonian from Stornoway or pebbles from drift from Shiant Isles or mainland?	84240	873100	Scott 1951, p.36; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Eilean an Tighe	E	North Uist	1		unattributed		polished flake	petrologically examined	unattributed	84240	873100	Mck Clough and Cummins 1988, p.241; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		unspecified		flat pebble with hammerstone utilisation marks			84240	873100	https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		unspecified		soft, course pebble			84240	873100	https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		argillaceous siltstone	metasedimentary, fine-grained, perhaps similar to calcic metamorphic found at Allt Chrisal	flake		Torridonian pebbles from drift or Stornoway or Shiant Isles/mainland?	84240	873100	Scott 1951, p.36; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Eilean an Tighe	E	North Uist	1		argillaceous siltstone	metasedimentary, fine-grained, perhaps similar to calcic metamorphic found at Allt Chrisal	worked tool/axe fragment	Petrologically examined. 'Rectuangular plano-convex object polished and bevelled. 'This rock has perhaps been slightly metamorphosed and might be matched among the Torridonian pebbles found in the Hebridean drift' (Scott 1935, p.35)	Torridonian pebbles from drift or Stornoway or Shiant Isles/mainland?	84240	873100	Mck Clough and Cummins 1988, p.241; Scott 1951, p.34-35; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		basalt	basic igneous rock, pseudotachylite?	adze	miniature polished stone adze found by Beveridge, Listed on Canmore as donated to the NMAS over the years although no other record exists		84240	873100	Beveridge 1911, p.222 in Henley 2003, p.35; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		felstone	did they mean felsite/rhyolite?, fine-grained volcanic rock (igneous) of light colour and composed mainly of feldspar and quartz	axe	half of a smoothly wrought stone axe found by Beveridge		84240	873100	Beveridge 1911, p.222 in Henley 2003, p.35; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Eilean an Tighe	E	North Uist	2		pumice	igneous		Beveridge's excavation, lumps of abraded pumice, DM		84240	873100	Beveridge 1911, p.222 in Henley 2003, p.35; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	1		sandy phyllite	metasedimentary, foliated fine-medium grained, low-grade (regional) metamorphism of pelitic sediments	worked tool	Flat, parallel-sided object, polished. Specifmen may have been derived from drift as its ultimate source is the mainland	Drift? Ultimate source mainland?	84240	873100	Scott 1951, p.36; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean an Tighe	E	North Uist	3	NG (several)	unspecified		hammerstones	Beveridge's excavation, DM		84240	873100	Beveridge 1911, p.222 in Henley 2003, p.35; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean Domhnuill	E	North Uist	1		fine-grained igneous	pitchstone, trachyte?	stone axe, miniature	polished green stone	imported material'	74696	875332	henley 2003, p.60; Armit 1990, p.16; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill, armit 1996, p.61

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Eilean Domhnuill	E	North Uist		NG (minimal)	flint	sedimentary	flakes, pebbles		beach pebbles	74696	875332	Armit 1990, p.16; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill, armit 1996, p.59-60
Eilean Domhnuill	E	North Uist	1		unspecified		stone bead			74696	875332	https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill
Eilean Domhnuill	E	North Uist	1		unspecified		stone pounder			74696	875332	Armit 1990, p.16; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill
Eilean Domhnuill	E	North Uist	2	NG (minimal)	chert	sedimentary	flakes	seems to have been used in place of flint		74696	875332	Armit 1990, p.16; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill, armit 1996, p.59-60

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Eilean Domhnuill	E	North Uist	1		garnet-amphibole-plagioclase	metamorphic, primarily amphibole, commonly hornblende, course-grained with well-developed foliation or schistosity, porphyroblasts, particularly of granet, may be present, medium-high grade metamorphism of igneous rocks such as dolerites	carved stone ball	one decorated (garnet) found in wall collapse from phase 1 houses accompanied by UW		74696	875332	Armit 1990, p.24, Armit 1988, p.24 in Henley 2003, p.45, 61; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill; Armit 1996, p.62-63
Eilean Domhnuill	E	North Uist	5	numerous	pumice	igneous				74696	875332	Armit 1990, p.16; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill
Eilean Domhnuill	E	North Uist		NG (quantities)	quartz	was not recovered		seems to have been used extensively for basic tasks in place of more limited flint and chert, was not recovered		74696	875332	Armit 1990, p.16; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill, armit 1996, p.59-60

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Eilean Domhnuill	E	North Uist	7		unspecified		carved stone balls	illustrated (armit 1996, p.62-63), all undecorated (one pyramidal in shape), found throughout all phases		74696	875332	Armit 1990, p.24, Armit 1988, p.24 in Henley 2003, p.45, 61; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill; Armit 1996, p.62-63
Eilean Domhnuill	E	North Uist	11		unspecified		saddle querns	1 oval saddle quern found in context 330 of trench C		74696	875332	Armit 198, p.24; Henley 2003, p.45, 62; Armit 1990, p.16; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill
Eilean Domhnuill	E	North Uist	1		unspecified		saddle quern	Beveridge's excavation		84240	873100	Beveridge 1911, p.198 in Henley 2003, p.35; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe
Eilean Domhnuill	E	North Uist	1		unspecified		stone pounder	Beveridge's excavation		84240	873100	Beveridge 1911, p.198 in Henley 2003, p.35; https://canmore.org.uk/site/10372/north-uist-loch-nan-geireann-eileann-an-tighe

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Eilean Domhnuill	E	North Uist	3	NG (a number)			hammerstones			74696	875332	Henley 2003, p.45, 62; Armit 1990, p.16; https://canmore.org.uk/site/10069/north-uist-griminish-dun-olavat-eilean-domhnuill
Geirisclett	E	North Uist	8	-	flint	sedimentary	blade, flakes	1 blade, 7 flakes	local	76840	875200	Dunwell et al. 2003, p.19; https://canmore.org.uk/site/10033/north-uist-geirisclett
Geirisclett	E	North Uist	1030	-	quartz	oxide	lumps and flakes	586 >10mm, 270 pieces between 10mm and 5mm, 174 <5mm; 660 chunks, 209 splinter flakes, 139 flakes (evidence of in situ knapping) (209-444 possible debitage); can't say what percentage is knapping and what percentage is broken quartz for ritual purposes	local	76840	875200	Dunwell et al. 2003, p.19; https://canmore.org.uk/site/10033/north-uist-geirisclett
Glen Cross	FS	Lewis	1		unspecified variegated		cushion macehead	found during peat digging (1948 by Mr Angus Murray) at depth of 9ft on low ridge between the Cross and Swainbost rivers		151280	961290	Stevenson 1949, p.218-219; https://canmore.org.uk/site/4440/lewis-cross-glen-cross
Habost	FS	Lewis	1		unspecified		carved stone ball	unevenly smoothed ball of orthocite found in this souterrain in 1942		151163	963969	DES 1986, p.46; https://canmore.org.uk/site/4425/lewis-carnan-a-ghrodhair

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Hacklete	FS	Great Bernera	1		schist (hard)	metmorphic, greenschist?	cushion macehead	hard schist with white and grey-green bands running down length; Found on croft with IA materials, 'No doubt the macehead had been brought to the spot as a 'find' by inhabitants of a later culture, and it is considerably weathered and abraded by consequent (mis)use'		115260	934590	Stevenson 1949, p.219; Burgess and Church 1997; https://canmore.org.uk/site/4108/great-bernera-hacklete; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE4108;
Iochdar	FS NL	South Uist	1		unspecified		axe	DM	unattributed	79900	846800	Mck Clough and Cummins 1988, p.241
Knock, Knock Point	FS	Lewis	1		porphyritic rhyolite with riebeckite felsite	igneous, volcanic eruption	cushion macehead	found in 1904 by Mr George Macleod at Knock, on top of a gravel bed under 5ft of peat'. 'T.M. Findlay suggested it to be of porphyrtic rhyolite/riebeckite felsite (only other known ex. in Northmaven, Shetland) (Gibson 1933, p.432, 1944, p.20) (contra Ritchie 1968, p.132)	If porphyritic rhyolite with riebeckite felsite would mke provenance Shetland, although Ritchie feels thin sectioning necessary	149000	931000	Gibson 1933, 430; 1944, 20; Ritchie 1968, 132; https://canmore.org.uk/site/4306/lewis-knock
Laxdale Parish, Stornoway	FS NL	Lewis	1		gneiss (hornblende)	metamorphic	carved stone ball	6-knob, found on croft	occurs locally (Gibson 1933, p.428)	142000	934000	Gibson 1933, 428; canmore.org.uk/site/4328/lewis-laxdale

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Loch a' Choire	S	South Uist	65		flint	sedimentary	retouched pieces, scrapers, leaf-shaped arrowhead	2 scrapers, 1 leaf-shaped arrowhead, 1 possible cutting tool	cortex present suggests that raw materials were derived from beach pebbles which is interesting given the nearest source is Barra (Wickham-Jones and Collins 1978, p.11 in Henley 2012, p.196)	76788	814522	DES 2000, p.99; henley 2013, p.194; https://canmore.org.uk/site/187059/south-uist-loch-a-choire
Loch a' Choire	S	South Uist	3		pumice	igneous		one features grooves	drift	76788	814522	DES 2000, p.99; henley 2013, p.196-197; https://canmore.org.uk/site/187059/south-uist-loch-a-choire
Loch Boisdale or Loch a'Bharp, North Lochboisdale	FS NL	South Uist	1		schist (black and white speckled)	metamorphic, black and white inclusions mica?, biotite (high proportion of mica), muscovite (rich in silvery muscovite), or kyanite schist (quartz, feldspar and mica)?	carved stone ball	four low knobs, found in peat digging. Listed in canmore in two separate entries although both reference some artefact in Marshall		77920	820730	Marshall 1976, 65; DtPfM 1966-67, pp.269; https://canmore.org.uk/site/9786/south-uist-loch-boisdale; https://canmore.org.uk/site/9854/south-uist-north-lochboisdale-loch-a-bharp; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE9786; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE9854;

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Mingulay	FS NL	Mingulay	1		unspecified		axehead	perforated cobble found in a pit at 0.6m, tentatively identified as axe-hammer		56200	783340	https://canmore.org.uk/site/21354/mingulay; Buxton 1981. The Archaeology of Mingulay Bay, Diss for BA in Arch, Uni of Durham
Northton	E	Harris	1		hornfels	metamorphic, fine-grained	flake		possibly Skye hornfels (Murphy and Simpson 2003, p.107)	97536	891259	Simpson et al. 2006, 71; Murphy and Simpson 2003, p.107; https://canmore.org.uk/site/10502/harris-northton
Northton	E	Harris	1		igneous rock 'basalt', fine-grained	fine-grained basic rock, porphyritic basalt?, can't be porcellanite bc it is sedimentary...	basalt' knife borer	fine to very fine-grained fragmentary looking igneous rock, light olive-grey colour	Appears to be of non-local origin (Meighan pers comm.). Nature of working and lack of debitage may indicate its importation (Murphy and Simpson 2003, p.107). Possibly from Skye although description is similar to porcellanite flake from Eilean an Tighe… (Simpson 2006, p.72)	97536	891259	Simpson et al. 2006, p.71-72, 233; Murphy and Simpson 2003, p.107; https://canmore.org.uk/site/10502/harris-northton
Northton	E	Harris	1		indurated/banded mudstone	sedimentary	blade fragment	fine to very fine-grained indurated mudstone, light olive-grey colour	source uncertain although possibly derived from Jurassic rocks of the Shiant Isles or IH (Skye or Raasay)	97536	891259	Simpson et al. 2006, p.70, 233; Armit 1996, p.61; https://canmore.org.uk/site/10502/harris-northton

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Northton	E	Harris	14		flint	sedimentary	flakes (debitage)	9 from Neo horizon 1, 5 from horizon 2, all represent debitage only	small beach pebbles probably sourced locally	97536	891259	Simpson et al. 2006, 71; https://canmore.org.uk/site/10502/harris-northton
Northton	E	Harris	180		pumice	igneous	some worked	Quantity inc. beaker layers. Almost all brown, similar in composition to pumice from Barra (Simpson 2006, p.232), chemically correlated to the dacitic pumice found elsewhere in Scotland, Norway and Iceland (Simpson 2006, appendix 3)	presumably drift collected from local beaches	97536	891259	Simpson et al. 2006, 69; https://canmore.org.uk/site/10502/harris-northton
Northton	E	Harris	28		quartz	oxide	worked stone	4 pieces from Neo horizon 1, 24 from horizon 2	vein quartz perhaps derived from granite pegmatite running along SE side of Ceapabhal on Toe Head	97536	891259	Simpson et al. 2006, 71; https://canmore.org.uk/site/10502/harris-northton
Northton	E	Harris	1		unspecified		macehead	with an hour glass perforation, found some years ago in Teampuill Park		97200	891400	https://canmore.org.uk/site/10508/harris-northton
Ranish, Lochs	FS	Lewis	1		gneiss	metamorphic	cushion macehead	4.8 inch found in 1922 during roadwork at Raerenish (Ranish)	local	140378	924840	DtPfM 1952, p.201
Rubh' a' Charnain Mhoir / Screvan Quarry	E	North Uist	2		bloodstone	oxide, minerals	pieces	no description given	Rhum	90577	878737	Henley 2003, p.83; DES 2000, p.101; https://canmore.org.uk/site/140108/berneray-causeway

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Rubh' a' Charnain Mhoir / Screvan Quarry	E	North Uist	32		flint	sedimentary	worked stone	the predominance of quartz and the use of flint for retouched tools suggests that flint, available locally only in the form of small beach pebbles, is used to produce formal tools, possibly for symolic use, whilst quartz is used more expediently	local beach pebbles	90577	878737	Henley 2003, p.83; copper 2015, p.332; DES 2000, p.101; https://canmore.org.uk/site/140108/berneray-causeway
Rubh' a' Charnain Mhoir / Screvan Quarry	E	North Uist	1		gneiss	metamorphic	macehead (broken)	found at edge of pit containing pottery	local	90577	878737	Henley 2003, p.83; DES 2000, p.101; https://canmore.org.uk/site/140108/berneray-causeway
Rubh' a' Charnain Mhoir / Screvan Quarry	E	North Uist	1		gneiss	metamorphic	spall		local	90577	878737	Henley 2003, p.83; DES 2000, p.101; https://canmore.org.uk/site/140108/berneray-causeway
Rubh' a' Charnain Mhoir / Screvan Quarry	E	North Uist	217		quartz	oxide	chipped	more expedient meaning readily available locally	local	90577	878737	Henley 2003, p.83; copper 2015, p.332; DES 2000, p.101; https://canmore.org.uk/site/140108/berneray-causeway
Rubh' a' Charnain Mhoir / Screvan Quarry	E	North Uist	1		chalcedony	oxide, minerals	piece	no description given		90577	878737	Henley 2003, p.83; DES 2000, p.101; https://canmore.org.uk/site/140108/berneray-causeway
Shulishader	FS	Lewis	1		porcellanite	sedimentary	axe with haft	haft is roaceous wood (probably Hawthorn), found during peat cutting	Antrim	153200	934400	Armit 1996, p.61; https://canmore.org.uk/site/71061/lewis-shulishader

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Sideval, Loch Seaforth (shore)	FS	Lewis	3		flint	sedimentary	flake	1 flake, 1 retouched flake (found in 'wall' around stone in circle), 1 struck flake (erosion)	local	127810	916620	DES 2007, p.202; https://canmore.org.uk/site/4135/lewis-loch-seaforth
Sideval, Loch Seaforth (shore)	FS	Lewis	9		quartz	oxide	flake, chunk, core, scraper	1 secondary flake (found due to rabbit activity around blackhouse over earlier stone circle), 1 chunk, 1 struck flake (found in 'wall' around stone in circle), 1 core, 1 retouched flake, 1 scraper, 2 struck flake (erosion)	local	127810	916620	DES 2006, p.180; DES 2007, p.202; https://canmore.org.uk/site/4135/lewis-loch-seaforth
Sideval, Loch Seaforth (shore)	FS	Lewis	1		baked shale	metasedimentary	flake	secondary flake, found due to rabbit activity around blackhouse over earlier stone circle		127810	916620	DES 2006, p.180; DES 2007, p.202; https://canmore.org.uk/site/4135/lewis-loch-seaforth
Sound of Harris	FS NL	Berneray	1		unspecified		Ovoid macehead	Ovoid C group, elongated and less thick than average		93674	884383	Roe 1968, p.150, 157
Stornoway	FS NL	Lewis	1		volcanic tuff, Group VI	igeneous, fine-grained volcanic tuff	axe	petrological analysis by McK Clough and Cummins 1988, Group VI not certain	Great Langdale	143000	933000	McK Clough and Cummins 1988, p.238
Swordle	FS NL	Lewis	1		schistose (grey)	highly foliated medium-grained metamorphic rock having similar laminar structure to schist	stone axe	found at Swordle, Stornoway. Listed under small perforated axe-hammer, is it a macehead?		149449	930895	https://canmore.org.uk/site/4309/lewis-swordale

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
The Udal	E	North Uist	1		basalt (porphoritic and vesicular)	basic igneous	hammerstone	small	local	82420	878430	Ballin Smith 2018, p.179; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
The Udal	E	North Uist	1		basalt/dolerite	igneous, fine-medium grained basic	hammerstone/anvil	used repeatedly as hammerstone then later used as anvil, probably for the working of quartz tools	local	82420	878430	Ballin Smith 2018, p.178-179; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
The Udal	E	North Uist	1		dolerite, possibly metadolerite	igneous, fine-medium grained basic or meta-igneous, medium-grained basic rock	axehead	in terms of shape it corresonds well to the piece illus. by Evans (189, fig. 80) found near Cottenham, Cambridgeshire	common rock in North Uist (fettes 1992, p.81)	82420	878430	Ballin Smith 2018, p.176; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
The Udal	E	North Uist	1		feldspar	mineral found in gneiss or granite	pounder	some of the gneiss or granite from local area has exceptionally large feldspar (and probably quartz and mica) crystals, approaching migmatite or pegmatite in nature	local in gneiss or granite	82420	878430	Ballin Smith 2018, p.180; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail

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The Udal	E	North Uist	112		flint	sedimentary	flakes, waste, retouched	all greyish-white	small, rolled pebbles of flint, most likely from local beaches	82420	878430	Ballin Smith 2018, p.123, 127; Crawford 1980, p.4, 1986, p.7; Squair 1998; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
The Udal	E	North Uist	1		gneiss	metamorphic	hammerstone	light coloured, reused as pinning stone for Great Auk stone	local	82420	878430	Ballin Smith 2018, p.180; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
The Udal	E	North Uist	1		gneiss	metamorphic	pounder	light coloured, reused as pinning/choking stone for Great Auk stone	local	82420	878430	Ballin Smith 2018, p.180; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
The Udal	E	North Uist	1		gneiss (banded)	metamorphic	grinder	small, formed part of cairn capping the cist, probably discarded during late Neo/early BA	local	82420	878430	Ballin Smith 2018, p.180; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail

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The Udal	E	North Uist	1		gneiss (pink banded)	metamorphic	hammerstone/grinder	pink banded gneiss, found in phase c west of phase b structure but given high disturbance of phase c may have derived from Neo contexts	local	82420	878430	Ballin Smith 2018, p.179; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
The Udal	E	North Uist	1		granodiorite/diorite	igneous, course-grained intermediate, forms as intrusions or dyke	hammerstone	small scars may have been the result of natural damage from being in the sea	Dykes exist across southern parts of WI, most notably Barra (Fettes et al. 1992, p.41)	82420	878430	Ballin Smith 2018, p.176; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
The Udal	E	North Uist	1		metadiorite, microdiorite or granodiorite	meta-igneous or igneous, course-grained intermediate	stone ball	Pecked all over. Essentially uncontexted/stratified	Dykes exist across southern parts of WI, most notably Barra (Fettes et al. 1992, p.41)	82420	878430	Ballin Smith 2018, p.177; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
The Udal	E	North Uist	1		pseudotachylite (probably)	metamorphic, a rare glassy rock formed by melting during extreme dyanimc metamorphism (Allaby) (perhaps cataclasite?)	pebble polisher	black and shiny, phase E mixture of natural and disturbed contexts beneath Neo settlement		82420	878430	Ballin Smith 2018, p.180; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail

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The Udal	E	North Uist	237	-	pumice	igneous		includes BA phases. Of 133 analysed, 56 were Neo.	dactic pumice (brown) typical of other sites and probably from Katla Vocano, Iceland	82420	878430	Ballin Smith 2018, p.165-66, 169; Crawford 1980, p.4, 1986, p.7; Squair 1998; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
The Udal	E	North Uist	4975		quartz	oxide	96% debitage, 3% cores, 1% tools (inc. 5 hammerstones)	almost entirely white milky quartz	impurities indicate local rock formations, gneiss and granite that contain mica, hornblende and feldspar	82420	878430	Ballin Smith 2018, p.132-133; Crawford 1980, p.4, 1986, p.7; Squair 1998; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
The Udal	E	North Uist	1		amphibolite (likely)	metamorphic, primarily amphibole, commonly hornblende, course-grained with well-developed foliation or schistosity, porphyroblasts, particularly of granet, may be present, medium-high grade metamorphism of igneous rocks such as dolerites, similar to carved stone ball from Eilean Domhnuill?	flake	likely amphibolite (Pellant 1992, 215)	Eilean Domhnuill example possibly from Lewis	82420	878430	Ballin Smith 2018, p.180; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
The Udal	E	North Uist	1		banded amphibolite	metamorphic, primarily amphibole, commonly hornblende, course-grained with well-developed foliation or schistosity, porphyroblasts, particularly of granet, may be present, medium-high grade metamorphism of igneous rocks such as dolerites, similar to carved stone ball from Eilean Domhnuill?	hammerstone/pounder	dark coloured, reused as packing stone for Great Auk stone	Eilean Domhnuill example possibly from Lewis	82420	878430	Ballin Smith 2018, p.179; Crawford 1980, p.4, 1986, p.7; Squair 1998, p.421; https://canmore.org.uk/site/10319/north-uist-coileagan-an-udail
Unival	E	North Uist	1		pumice	igneous	pendant	trapezoidal and uniform thickness, found at the junction of burial deposits and later fill	local?	80033	866859	henshall 1972, p.156; https://canmore.org.uk/site/10234/north-uist-unival-leacach-an-tigh-chloiche
Unival	E	North Uist	8		quartz	oxide	flakes		local?	80033	866859	henshall 1972, p.156; https://canmore.org.uk/site/10234/north-uist-unival-leacach-an-tigh-chloiche

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
Unival	E	North Uist	1		unspecified		ball	4in in diam. Pecked surface, in some places worked in vague facets. Deeper pitting on one side due to use as a hammerstone. Found below funeral deposits		80033	866859	henshall 1972, p.156; https://canmore.org.uk/site/10234/north-uist-unival-leacach-an-tigh-chloiche
unlocated	FS NL	Eriskay	1		unspecified		perforated stone adze	macehead?		79627	810921	https://canmore.org.uk/site/9811/south-uist-eriskay; HER; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE9811
unlocated	FS NL	Great Bernera	1		unspecified		carved stone ball	6-knob (not very prominent), no context		116000	936000	Marshall 1976, 67; https://canmore.org.uk/site/4093/great-bernera; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE4093
unlocated	FS NL	North Uist	1		unspecified		axehead	donated from the Mackenzie collection, 'probably from North Uist'		80000	860000	DtPfM 1977, p.381; https://canmore.org.uk/site/10230/north-uist
unlocated	FS NL	North Uist	1		unspecified		macehead	donated from the Mackenzie collection, 'probably from North Uist'		80000	860000	DtPfM 1977, p.381; https://canmore.org.uk/site/10230/north-uist
unlocated (NW coast, north of Bragar?)	FS NL	Lewis	1		porcellanite, Group IX	sedimentary, fine grained	stone axe	two listed on map by Ritchie, one may be Bragar stone axe, second unidentified	Tievebulliagh or Rathlin	136522	953325	P.R. Ritchie 1968, 124

Findspot	Findspot Method	Island	Quantity	Quantity Description	Material	Material Description	Object Type	Object Description	Provenance	Easting	Northing	Reference
unlocated, 'edge of a cliff at the southern extremity of Benbecula'	FS NL	Benbecula	1		unspecified		carved stone ball	4-knobbed carved stone ball found 'at the broken edge of a cliff at the southern extremity of Benbecula'		76635	850080	Marshall 1976, 65; https://canmore.org.uk/site/9965/benbecula; DtPfM 1953, p.183
unlocated, from 'Kyle's Parish' although no such parish exists	FS NL	Harris	1		unspecified		carved stone ball	8-knob		99800	888000	Marshall 1976, 69; https://canmore.org.uk/site/10461/harris-kyles; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE10461;
Vatersay	S	Vatersay	7		flint	sedimentary	unspecified	found in temporary Neo rock shelter along with Neo pottery AC	local	63700	797700	Branigan and Foster 2000, p.322; http://www.cne-siar.gov.uk/smr/SingleResult.aspx?uid=MWE143012; https://canmore.org.uk/site/335600/buaile-nam-bodach-neolithic-site;
					13 porcellanite		stone axes	Armit (1996, p.61) claims 13 axes of Irish provenance have been found in OH (and Skye)				
			18595									

Cairn	Island	Type	Certainty	Preservation	Easting	Northing	Source
Airidh na h-Aon Oidche	Benbecula	long (round) cairn (unclassified)	C		81702	852488	HER; Hensall p.495; https://canmore.org.uk/site/10205/benbecula-airidh-na-h-aon-oidhche
Airidh nan Seilicheag	North Uist	Hebridean (long) cairn	C	severly mutilated long cairn	83662	868793	HER; Henshall p.496; https://canmore.org.uk/site/10238/north-uist-airidh-nan-seilicheag
Allt an-t-Sniomh (40m N)	Lewis	chambered cairn	C		145188	938683	HER; https://canmore.org.uk/site/4298/lewis-upper-coll
Balnacraig	Barra	Hebridean (long) cairn	C		67620	801200	HER; Henshall p.498; https://canmore.org.uk/site/9735/barra-borve-balnacraig
Barp Frobost	South Uist	Hebridean (round) cairn	C		75471	824960	Henshall p.499; https://canmore.org.uk/site/9852/south-uist-barp-frobost
Barp Hacklett	North Uist	chambered cairn (unclassified)	C	severely robbed	85390	859930	Henshall p.500; https://canmore.org.uk/site/10165/north-uist-knock-cuien-barp-hacklett
Barpa Langass	North Uist	chambered cairn	C	passage grave, largely intact	83766	865733	HER; Henshall p.500; https://canmore.org.uk/site/10236/north-uist-barpa-langass

Cairn	Island	Type	Certainty	Preservation	Easting	Northing	Source
Barpa nam Feannag	North Uist	chambered long cairn	C		85684	872050	HER; Henshall p.503; https://canmore.org.uk/site/10346/north-uist-barpa-nam-feannag
Beinn A'chlaidh, Berneray, Borve	Berneray, North Uist	chambered cairn	C		91081	880619	https://canmore.org.uk/site/10480/berneray-borve-beinn-achlaidh
Borve Lodge	Harris	chambered cairn (unclassified)	C		103000	894948	HER; Henshall p.430; https://canmore.org.uk/site/10544/harris-borve
Caisteal Mhic Creacail	Lewis	chambered cairn	C		154303	936675	HER; Henshall p.460; https://canmore.org.uk/site/4388/lewis-shulishader-caisteal-mhic-creacail
Caravat Barp, Cairinish, Bharpa	North Uist	chambered long cairn	C	eastern half severely disturbed	83697	860308	HER; https://canmore.org.uk/site/10254/north-uist-carinish-caravat-barp
Carn a'Mharc, Gress, Carn A' Bhare	Lewis	chambered cairn	C		147225	943846	HER; Henshall p.462; https://canmore.org.uk/site/4336/lewis-carn-a-mharc
Carnan Beag	Great Bernera	chambered cairn	C		114449	934554	HER; https://canmore.org.uk/site/158181/great-bernera-carnan-beag

Cairn	Island	Type	Certainty	Preservation	Easting	Northing	Source
Carnan nan Long	North Uist	chambered (long) cairn	C	severely mutilated	79057	863670	Henshall p.506; https://canmore.org.uk/site/10005/north-uist-baleshare-carnan-nan-long
Clettraval, South Clettraval, Garry Tighary, Cleitreabhal A Deas	North Uist	Clyde (long) cairn	C	reused, severely disturbed	74998	871369	Henshall p.506; https://canmore.org.uk/site/10106/north-uist-south-clettraval
Cnoc a'Phrionnsa, Breasclete	Lewis	chambered cairn	C		121041	935514	HER; Hensall p.460; https://canmore.org.uk/site/4149/lewis-breasclete
Cnoc na Croich	Lewis	chambered cairn	C		141730	932320	HER; https://canmore.org.uk/site/71507/lewis-cnoc-na-croich
Cnoc Nan Dursainean, Garabost	Lewis	chambered cairn	C		152394	933081	HER; Hensall p.464; https://canmore.org.uk/site/4393/lewis-garrabost-cnoc-nan-dursainean
Coir Fhinn, Nisabost, Coire na Feinne	Harris	chambered cairn	C		104721	896623	HER; https://canmore.org.uk/site/10533/harris-nisabost-coir-fhinn
Cornaig Bay	Vatersay	chambered cairn	C		63600	796987	Branigan and Foster 2000, p.323-324; HER; https://canmore.org.uk/site/21400/vatersay-cornaig-bay

Cairn	Island	Type	Certainty	Preservation	Easting	Northing	Source
Craonaval (200m WNW of)	North Uist	chambered (round) cairn (unclassified)	C	greatly robbed chambered cairn	83309	862726	HER; Henshall p.512; https://canmore.org.uk/site/10293/north-uist-craonaval
Craonaval, Loch Glen Na Feannag (480m NE-next to pond)	North Uist	chambered cairn	C	largely robbed	83875	862892	HER; Henshall p.522; https://canmore.org.uk/site/10251/north-uist-loch-glen-na-feannag
Dun Bharpa	Barra	chambered cairn	C		67191	801912	HER; Henshall p.513; https://canmore.org.uk/site/9734/barra-borve-dun-bharpa
Dun na Carnaich	North Uist	Clyde (square) cairn	C	severely mutilated	76994	866168	Henshall p.514; https://canmore.org.uk/site/9981/north-uist-westford-dun-na-carnaich
Dunan, Upper Coll	Lewis	chambered cairn	C		145073	938199	HER; Henshall p.463; https://canmore.org.uk/site/4295/lewis-upper-coll-dunan
Geirisclett	North Uist	chambered cairn	C	eroding	76840	875200	HER; Henshall p.515; excavated by Beveridge 1911, Armit 1996, Dunwell 1997; https://canmore.org.uk/site/10033/north-uist-geirisclett

Cairn	Island	Type	Certainty	Preservation	Easting	Northing	Source
Glac Hukarvat	South Uist	Hebridean (round) cairn	C		77885	836203	Henshall p.517; https://canmore.org.uk/site/9878/south-uist-glac-hukarvat
Grianan	Barra	chambered cairn	C		67663	801223	HER
Leaval, The Witches Grave	South Uist	unclassified chambered cairn (square)	C	ruined	75397	815098	HER; Cummings et al. 2012, p.119-120; Henshall p.520; https://canmore.org.uk/site/9785/south-uist-leaval-the-witches-grave
Loch a'Bharp (1200m SSW of Beinn-ri-Oitir)	South Uist	Hebridean round cairn	C		77747	821468	HER; Henshall p.520; https://canmore.org.uk/site/9851/south-uist-north-lochboisdale-loch-a-bharp
Marrogh; Tigh Cloiche	North Uist	chambered cairn	C	little disturbed	83314	869586	HER; Henshall p.522; https://canmore.org.uk/site/10214/north-uist-marrogh-tigh-cloiche
Nask (Gortein, Goirtein)	Barra	heel-shaped, chambered cairn	C		64700	797685	HER; https://canmore.org.uk/site/86049/barra-nask
Oban Nam Fiadh	North Uist	Hebridean (round) cairn	C		84294	862450	Henshall p.524; https://canmore.org.uk/site/10252/north-uist-oban-nam-fiadh
Reinval, Barp (275m S of Loch an Ath Ruaidh,Daliburgh)	South Uist	Hebridean round cairn	C		75494	825972	HER; Hensall p.524; https://canmore.org.uk/site/9818/south-uist-reineval

Cairn	Island	Type	Certainty	Preservation	Easting	Northing	Source
Sig More, Carnan	South Uist	chambered (round) cairn	C		80983	845483	Henshall, p.526; Cummings et al. 2012, p.119-120; https://canmore.org.uk/site/10161/south-uist-carnan-sig-more
South Clettraval, Tigh Cloiche, Garry Hougary	North Uist	Hebridean cairn	C	reused, severly disturbed	75160	871010	Henshall p.526; https://canmore.org.uk/site/10081/north-uist-south-clettraval-tigh-cloiche
Stiaraval	Benbecula	chambered cairn and shieling	C		81228	852604	HER; Henshall p.527; https://canmore.org.uk/site/10204/benbecula-stiaraval
Suidheachadh Beag	Benbecula	probable chambered cairn (with stone circle)	C		82470	855220	HER, Henshall vol 1 p.528; https://canmore.org.uk/site/10187/benbecula-suidheachadh-beag
Tigh Cloiche	South Uist	long cairn	C		79192	844722	Henshall p.529; Cummings et al. 2012, p.119-120; https://canmore.org.uk/site/9944/south-uist-tigh-cloiche
Unival, Leacach An Tigh Chloiche	North Uist	Hebridean (square) cairn	C		80033	866859	Henshall 529; excavated by Scott 1935, 1939 (1950); https://canmore.org.uk/site/10234/north-uist-unival-leacach-an-tigh-chloiche

Cairn	Island	Type	Certainty	Preservation	Easting	Northing	Source
Tota Mhor Na Leaccaich, Gortan	South Uist	possible chambered cairn	PO		81030	814340	Cummings et al. 2005, p.36, 2012, p.119-120?; HER; Henshall p.529; https://canmore.org.uk/site/10132/south-uist-gortan
Cnoc na Moine	Lewis	Neolithic burial cairn	PR		122060	945580	HER; https://canmore.org.uk/site/72084/lewis-cnoc-na-moine
Dun Trossary	South Uist	possible chambered (long) cairn	PR	much mutilated	75969	816612	Henshall p.514; Cummings et al. 2005, p.36, 2012, p.119-120; https://canmore.org.uk/site/9784/south-uist-dun-trossary
Eilean Chalium Cille	Lewis	prehistoric cairn	PR	navigation cairn placed on top of prehistoric cairn	138337	920934	HER; https://canmore.org.uk/site/335984/ecc-21-eilean-chalium-cille
Loch Sgardam	Lewis	burial chamber	PR		121035	936165	HER; https://canmore.org.uk/site/77609/lewis-breasclete-loch-sgardam
Sandray Sy71	Sandray	chambered cairn (rectangular)	PR	collapsed	64475	791104	Branigan and Foster 2000, p.73; https://canmore.org.uk/site/337590/sy71-sandray

Cairn	Island	Type	Certainty	Preservation	Easting	Northing	Source
Sideval (LSFH 5.14)	Lewis	cairn	PR		128025	916709	https://canmore.org.uk/site/335957/lsfh-514-sideval
Sidhean Cleite Thog	Lewis	prehistoric cairn	PR	probable	113864	925539	HER; https://canmore.org.uk/site/78949/lewis-sidhean-cleite-thog

Site Name	Site Type	Island	Easting	Northing
Borvemore	standing stone and site of stone circle	Harris	102050	893909
Clach Mhic Leoid	standing stone	Harris	104090	897200
H9 Horgabost	standing stone	Harris	104209	896697
Swainbost	standing stone	Lewis	150719	963814
Aird Mhic Caoilt	standing stone	North Uist	78495	875807
Leac Nan Cailleachan Dubha	standing stones (possible cairn)	North Uist	79080	876500
Port Nan Long, Crois Mhic Jaman	standing stones	North Uist	89370	878190
Sy135 Sandray	standing stone	Sandray	65506	791084
Crois Chnoca Breaca	standing stone	South Uist	73400	833660
Sligeanach Kildonan	standing stone	South Uist	72730	828600
Stoneybridge, Crois Chnoca Breaca	standing stone	South Uist	73400	833660
S58 Skallary	standing stone	Barra	68868	798444
Beinn Ruilibreac	standing stones and enclosure	Benbecula	62775	793919
Gramisdale	stone circle	Benbecula	82508	856141
Ruisgarry, Bruist, Loch Bhruist, Cladh Madlrithe	possible stone circle	Berneray	92420	882880
Ensay	standing stone	Harris	98041	886679
Abhainn Na Muilne (Callanish 39)	standing stone	Lewis	128880	919170
Aird A'chaolais, Callanish 8a	standing stone	Lewis	116500	934000
Beinn Bheag	standing stone, cairns and shielings	Lewis	122240	935663
Beinn Chleiteir, Loch Erisort	stone circle	Lewis	129180	919500
Beinn Fuathabhal	stone circle	Lewis	116195	931261
Cnoc Fillibhir (Bheag) (Circle III)	stone circle and stone settings	Lewis	122504	932688
Cnoc Fillibhir Bheag	standing stone	Lewis	122470	932820
Cnoc Leathann	standing stone	Lewis	121530	936230
Eilean Ceabhagh	stone setting	Lewis	119968	935054
Eilean Ceabhagh	standing stone	Lewis	119771	935098
Garynahine, Sron A'Chail, Ceann Hulavig (Circle IV)	stonce circle	Lewis	122970	930420
Loch Crogach, Callanish 18	standing stone	Lewis	124400	929230
Loch Erisort, Beinn Chleiteir (Callanish 38)	standing stone	Lewis	129370	919480
Loch Erisort, Beinn Chleiteir, A' Chlach Chrom (Callanish	standing stone	Lewis	128870	919410
Loch Raoinavat, South Shawbost, Cnoc Laoiran	stone circle	Lewis	123387	946182
Loch Seaforth, Sideval	stone circle and possible cairn	Lewis	127825	916644
Sideval	standing stone	Lewis	127984	917345
Sideval LSFH 5.12	standing stone	Lewis	127909	917407
Beinn a Chaolais	stone circle	North Uist	90506	878026
Loch An Duin	standing stone	North Uist	88000	873000
Maari	standing stone	North Uist	86427	872937

Site Name	Site Type	Island	Easting	Northing
Rubna Sheader	stone setting	Sandray	62990	792100
Sandray, Aird Pabbach	standing stone	Sandray	64030	790400
Sheader	standing stone	Sandray	63220	792070
An Carra, Loch An Athain	standing stone	South Uist	77039	832118
Beinn Ruilibreac	standing stones and enclosure	Vatersay	62775	793919
Vs64 South Vatersay	standing stone	Vatersay	64125	794522
Berneray, Borve, Cladh Maolrithe, Cladh Maolruibhe, Beir	standing stone	Berneray	91223	880683
Cladh Maolrithe, Cladh Maolruibhe, Beinn A'chlaidh	standing stone	Berneray	91261	880654
Airigh Mhaoldonuich, Callanish 20	stone setting	Great Bernera	117700	934500
Bernera Bridge	stone setting	Great Bernera	116385	934255
Ard Na Moine, Aird Na Moine	standing stone	Lewis	121580	934860
Breasclete Park (new park)	stone circle	Lewis	121920	934260
Buaile Chruaidh, Callanish 19	standing stone	Lewis	121800	933100
Calanais/Tursachan (Circle I)	stone setting	Lewis	121301	932992
Clach an Tursa	standing stones and enclosure	Lewis	120419	942954
Cleiter (Callanish 37)	standing stone	Lewis	128790	919700
Cliacabhadh, Callanish 16	standing stone	Lewis	121300	933800
Cnoc Ceann a Gharraidh, Ceann A'Gharaodh, Loch Roag	stone circle in Calanais complex	Lewis	122211	932574
Cnoc Gearraidh Nighean Choinnich	stone circle	Lewis	122180	934840
Cnoc Gearraidh Nighean Choinnich	stone circle	Lewis	122211	932574
Cuialachbeg	stone setting	Barra	63000	799400
Cuialachbeg	stone setting	Barra	62900	799700
Rubha Leathann	standing stone	Lewis	124580	916680
Cuialachbeg	stone setting	Barra	63100	799400
Cringraval	stone setting	North Uist	81161	864453
Westford, Clach Mhor A'che, West Ford	standing stone	North Uist	77004	866194
Cnoc Leathann	standing stone	Lewis	121540	936010
Sheader	stone setting	Sandray	63520	792580
Cuialachbeg	stone setting	Barra	63000	799600
Layaval, Leaval	standing stones	South Uist	75380	814950
Ecc 2.13 Eilean Chalium Cille	standing stone	Lewis	138345	921016
Sheader	stone setting	Sandray	63470	792450
South Clettraval	standing stone and chambered cairns	North Uist	75012	871234
B31 Borve Valley	standing stone	Barra	67344	802039
Sheader	stone setting	Sandray	63340	792460
Cuialachbeg	stone setting	Barra	62900	799500
Cuialachbeg	stone setting	Barra	62500	799500

Site Name	Site Type	Island	Easting	Northing
My1 Mingulay	standing stone	Mingulay	56856	783575
Sheader	stone setting	Sandray	63260	792390
Shader Riverside	possible stone circle	Lewis	138030	954330
An Carra, Beinn A'Charra, Clach Barnach Bhraodac	standing stone	North Uist	78647	869089
Pollachar	standing stone	South Uist	74597	814414
Breibhig	standing stones	Barra	68907	799034
Clach Stein	stone setting	Lewis	153478	964189
Glen Shader	stone circle with central monolith	Lewis	139630	953670
Cnoc Gearraidh Nighean Choinnich	stone circle	Lewis	122200	934750
Clach an Trushal	standing stone	Lewis	137560	953779
Blashaval, Na Fir Bhreige	standing stones	North Uist	88736	871734
Priests Glen, Laxdale	stone circle	Lewis	141110	935190
Druim Dubh	stone circle	Lewis	138251	930534
Druim Na H-aon Choich, Callanish 17	standing stone	Lewis	123700	932000
Carinish	stone circle	North Uist	83241	860219
Pobull Fhinn, Sornach Coir'Fhinn	stone circle	North Uist	84274	865010
Suidheachadh Sealg	stone circle, possible chambered cairn	Benbecula	82470	855220
Leacach an Tigh Cloiche	standing stone with chambered cairn	North Uist	80041	866852
Loch a'Phobuill, Sornach a'Phobuill	stone circle	North Uist	82861	863048
Garadh Steishal	standing stone	Lewis	104854	935405
Leac a'Mhiosachan	recumbent stones	North Uist	83485	862614
Marrogh, Tigh Cloiche	standing stone	North Uist	83240	869520
Skealtraval	stone setting	North Uist	85300	870700
Creagan Carrach	possible stone circle	Lewis	138120	954100
Loch Nan Geireann	standing stones	North Uist	85000	872000
Stonefield, Callanish 12	standing stone	Lewis	121550	934960
Croir	standing stone	Great Bernera	114530	940279
Cul a'Chleit (Circle VI)	standing stones	Lewis	124654	930343
Garry-baleloch	standing stone	North Uist	74026	872952
Loch na Buail'Iochdraich	standing stone	North Uist	80158	866521
Cringraval, Clachan	standing stones (possible cairn)	North Uist	81519	864525
Loch Na Muilne	stone setting	Great Bernera	116700	936920
Cnoc nan Dursainean, Garrabost	standing stone and cairn	Lewis	152819	933411
Airigh Mhaoldonuich	fallen standing stone	Lewis	117749	934595
Clach Stein (Lower Bayble)	standing stone	Lewis	151650	931740
Druim nam Eum, Nan Dromannan (Cicle X)	stone circle	Lewis	122970	933620
Barra, Brevig, Druim A'Charra, Breibhig, Heaval, Breivig, (	standing stones	Barra	68900	799030

Site Name	Site Type	Island	Easting	Northing
Stiaraval, Rueval Stone	standing stone	Benbecula	81430	853134
Airigh Na Gaoithe	standing stone	North Uist	82587	867679
Suidheachadh Beag	standing stone	Benbecula	82500	855285
Achmore	stone circle	Lewis	131735	929262
Clach Stei Lin	stone circle and enclosure	Lewis	139703	954550
Borve Valley	standing stone	Barra	66200	800700
Shader, Ballantrushal	stone circle	Lewis	137690	953660
Toroghas, Fir Bhreige	standing stones	North Uist	77000	870290