

Rethinking human responses to sea-level rise:

The Mesolithic occupation of the Channel Islands

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This work provides new insights into human responses to and perceptions of sea-level rise at a time when the landscapes of northwest Europe radically changing. These issues are investigated through a case study focused on the Channel Islands. We report on the excavation of two sites, Canal du Squez in Jersey and Lihou (GU582) in Guernsey, and the study of museum collections across the Channel Islands. We argue that people were drawn to this area as a result of the dynamic environmental processes occurring and the opportunities these created. The evidence suggests that the area was a particular focus during the Middle Mesolithic, when Guernsey and Alderney were already islands and while Jersey was a peninsula of Northern France. Insularisation does not appear to have created a barrier to occupation during either the Middle or Final Mesolithic, indicating the appearance of lifeways increasingly focused on maritime voyaging and marine resources from the second half of the 9th millennium BC onwards.

Key words: Sea-level rise, Mesolithic, marine resources, Channel Islands

Introduction

The drowning of Doggerland and the Channel Plain has been the focus of increasing archaeological attention over the past decade and considerable effort has been expended in reconstructing these submerged prehistoric landscapes (Gupta et al. 2007, Gaffney et al. 2007, Lericolais et al. 2003, Wessex Archaeology 2007). However, despite increasing knowledge of the topography of these areas, there has been, as Chapman and Lilley (2004) and Leary (2009) note, little discussion of human perceptions of, and responses to, this inundation. This is partly due to current uncertainties over the rate and timing of the inundation. However there is also a

perception that such issues are inaccessible until more submerged sites themselves are excavated (eg. Momber et al. 2011).

By contrast, we would argue that ample resources already exist to permit us to address this question, in the form of terrestrial and inter-tidal sites. Nuanced understandings of human responses to the environmental changes associated with sea-level rise have already been achieved through work on inter-tidal areas, most notably by Bell (2007) in the Severn Estuary. However, more could be made of terrestrial sites located in areas affected by local sea-level change, and here we would argue that islands have a special role, representing vital resources for understanding human responses to sea-level rise. In cases where land transforms from continental mainland, to coastal peninsula, to island, people will have needed to reconfigure their pattern of mobility and exploitation as the proportions of different environments altered and significant climatic and vegetational changes occurred.

The Normanno-Breton Gulf during the course of the Upper Palaeolithic and Mesolithic exemplifies just such a situation. In the late Pleistocene, this was a cold, sparsely vegetated and extensive plain (the Normanno-Breton Plain), dominated by the Channel River which flowed to the North of Alderney. This was a massive anastomosing system, with valleys up to 45km in width, into which flowed a number of high energy, braided rivers from southern England and Northern France (Antoine et al. 2003, Gupta et al. 2007). Pettitt (2008) has suggested the Channel River formed a major barrier to the colonisation of the British Isles from the south from Middle Palaeolithic times onwards. From the end of the Pleistocene, this vast area was progressively drowned by the rising Holocene sea-level until only the Channel Islands remained above water.

The Channel Islands, the focus of this paper, thus preserve aspects of the archaeology of the now drowned Normanno-Breton Plain. Over the course of the Late Palaeolithic and Mesolithic period, they were gradually transformed from small hills scattered over the upland areas of the Plain, lying to the south of the great Channel River Valley, to peninsulas of northern France and finally islands. The archaeology of the islands therefore represents a record of how people responded to these changing landscapes.

A significant number of Upper Palaeolithic and Mesolithic sites are now known from the Channel Islands. Most of these are surface scatters, but this paper also reports on two recent excavations, on Lihou (GU582), Guernsey, and at Canal du Squez, in Jersey. While radiocarbon dates are currently limited to Lihou, recent advances in understandings of the

typochronology of the Northern French Mesolithic can provide a broad chronology for these sites. This is of sufficient resolution to understand whether Mesolithic occupation occurred before or after each of the Channel Islands became an island and thus examine human responses to insularisation.

The Channel Islands have a long history, both geographically and culturally, as part of Northern France. Alderney, the closest of the Channel Islands to France, is only 13 kilometres from the current coast of Normandy. Lithic traditions on the islands, thus as might be expected, are analogous to those of Northern France. Northern France is thus the logical place to seek a chronological scheme in which to place the assemblages of the Channel Islands Mesolithic.

The Mesolithic of Northern France

The Mesolithic of Northern France has been the focus of increasing attention over the past few decades, often in the context of developer-funded archaeology. Particularly important for chronological considerations has been Ducrocq's work (2001) on the Somme and sites in Picardy more broadly (Ducrocq et al. 2008). The focus on small, single episode occupation sites and the favourable contexts for preservation in these northern French river valleys have permitted a well dated typological sequence to be constructed for the Mesolithic east of the Seine. New work has also been undertaken west of the Seine, in areas closer to the Channel Islands, in particular by Souffi (Ghesquière et al. 2000, Souffi 2004, 2008) and Ghesquière (Ghesquière et al. 2000, Ghesquière 2010, 20, 2011) in Normandy and by Marchand (2005, 2007, 2013) in Brittany. The contexts of many of these sites are less favourable for organic preservation and many appear to be palimpsests on sandy sediments lacking internal stratigraphy, making the construction of chronologies rather more difficult. However enough is known to provide a chronology within which to fit the Mesolithic sites of the Channel Islands. The Mesolithic in Northern France, as in most of Europe as a whole, is divided into three phases: An Early Mesolithic dominated by simple obliquely blunted points and large triangles; a Middle Mesolithic with basally modified points and increasing numbers of backed bladelets and scalene triangles; and a Late/Final Mesolithic characterised by the appearance of trapezes.

Early Mesolithic

Assemblages dating to the Preboreal in Northern France are characterised by obliquely blunted points and smaller quantities of trapezes and isosceles triangles (table 1). The earliest dated Mesolithic assemblage in Northern France is Warlius secteur IIIb (Ducrocq et al. 2008, Ducrocq 2013). This material is similar to Star Carr type assemblages found across England and Wales, that also seem to mark the earliest Mesolithic in Britain (Reynier 2005). On the banks of the Seine, Closeaux, Reuil-Malmaison, secteur IV, is slightly later, but also belongs to this period (Lang and Sicard 2008). Similar assemblages are also known west of the Seine at Acquigny WXY/61-62 in Haute-Normandie (Souffi 2008) and at les Vingt-Deux Boisselées in Brittany (Marchand 2008), though these are currently undated.

Middle Mesolithic

From around 8500BC, broadly equivalent to the start of the Boreal, new assemblages dominated by segments and basally truncated points appear, sometimes termed the northern Beuronian A (Ducrocq et al. 2008) or Beuronian with crescents (Ducrocq 2013). The latest dates for Beuronian A sites seem to fall into the 8700BP radiocarbon plateau. These assemblages are found at several sites north of the Seine and are dated at Saleux les Baquets 294a and 294b, Warlius 2c and Hangest IIN (table 1) (Fagnart et al. 2008, Ducrocq et al. 2008). Basally truncated pieces can have either a transverse truncation (Saleux Les Baquets 244b), an oblique or concave (Horsham-type) truncation (Saleux La Vierge Catherine) or both. Some assemblages contain just segments and basally truncated pieces; however in others (Warlius IIC and Saleux les Baquets 294a), obliquely blunted points are also present. West of the Seine these assemblages are also present in Haute-Normandie at the undated sites of Acquigny B and Acquigny E/69-70 (Souffi 2008) and possibly at l'Organais in Brittany (Marchand 2008). Segments appear to be a particularly useful chronological indicator as they are only characteristic of this phase, whereas other types, in particular obliquely blunted points, persist throughout the first two millennia of the Mesolithic. Recent work suggests that the northern Beuronian A is associated with the appearance of denser forests containing hazel and a focus on the predation of wild boar (Séara et al. 2010).

The record for the middle and late part of the Boreal is less clear. East of the Seine, an assemblage from Closeaux Secteur II (Lang and Sicard 2008) is characterised by basally truncated pieces and narrow backed bladelets and dated to between 7820-7570BC. Collections with a component of backed bladelets and small scalene triangles probably appear from around 7700BC. From around 7400BC, until at least 6600BC, assemblages containing *feuilles de gui*

(mistletoe points) and other pieces with inverse invasive retouch appear, sometimes termed the Rhine-Meuse-Scheldt complex or RMS A (Gob 1985, Ducrocq 2014). These are accompanied by backed bladelets, sometimes truncated, and small scalene triangles. The few faunal assemblages of this period suggest a greater range of animals predated than during the Beuronian, with remains of roe deer, red deer, pig and aurochs recovered. This period is one of the least well known in northern France (Ducrocq et al. 2013).

While sites to the west of the Seine are less well dated and tend to represent palimpsests, existing evidence suggests that within this broad sequence varied regional chronologies and technical traditions exist. In Brittany the Bertheaume group, dated at around 8400-7600BC is characterised by narrow backed bladelets with one or two sides retouched and small scalene triangles (Marchand 2005, 48, Blanchet et al. 2006). Obliquely blunted points and basally modified points are present, but rare. Hyper-microlithisation is a notable feature of this industry. In Normandy the sequence appears similar to the Paris Basin: industries with basally modified pieces and backed bladelets are common in the first half of the Boreal, accompanied by scalene triangles and simple obliquely truncated points. Crescents are rare. These are exemplified by the dated sites of Flamanville-Centrale EDF (8990±190BP; Gif-89334) and Auderville, Roc de Gîte (8460±170BP; Gif-89337) (Ghesquière et al. 2000). The latest Middle Mesolithic assemblages (though undated) in Basse-Normandy are considered to be Flamanville Le Coquet and Rozel Station 56. These are characterised by the presence of mainly symmetric basally modified points, simple obliquely truncated points, the increased presence of scalene triangles (≤40%) and diminished number of backed blades (not greater than 9%) (Ghesquière et al. 2000). *Feuilles de gui* do not appear to the west of the Seine and the river seems to have formed an important cultural barrier towards the end of the Boreal. Broadly to the west of the Seine, early Boreal assemblages appear to be characterised by obliquely blunted points and basally modified pieces, with increasing quantities of narrow backed bladelets. In the later part of the Boreal, scalene triangles increase in number at the expense of backed bladelets (Ghesquière 2010).

Final Mesolithic

The Final Mesolithic (or Second Mesolithic) marks a shift in both microlith types and technology. Assemblages with trapezes and regular blades made through pressure flaking or indirect percussion appear across Europe (apart from Britain and Ireland), reaching northern France around 6200BC (Costa and Marchand 2006, Perrin et al 2009). Sites in northern France

are not well dated, but have yielded symmetrical and asymmetric trapezes and triangles and crescents with flat inverse retouch. In Picardy, three phases are present: the first consisting of small trapezes, the second of large trapezes with offset bases, and the final phase (Terminal Mesolithic) consisting of asymmetric trapezes and a range of triangular forms with flat inverse retouch (Ducorcq 2014). In Normandy two phases have been proposed, the first characterised by the presence of asymmetric trapezes and scalene triangles, the second by triangles with flat inverse retouch (Artur et al. 2008). In Brittany the Tévévian (Rozoy 1978) is characterised by the presence of symmetrical and asymmetric trapezes and triangles. New work suggests that sites (such as Beg-er-Vil) characterised by symmetrical trapezes are succeeded by sites (Hoëdic, Beg-an-Dorchenn) where levels of asymmetric trapezes and triangles increase (Marchand and Musch 2013). The arrival of the Neolithic in Northern France dates to between 5300 and 4800BC and these groups used a very similar set of armatures to the last Mesolithic people (Perrin et al. 2009, Marchand 2007).

From Northern France to the Channel Islands

Mesolithic material from the Channel Islands bears greatest similarity to material from Normandy. Though radiocarbon dates have been obtained for two Normandy Mesolithic sites, both appear to be palimpsests, making the construction of a precise typo-chronology for the Channel Islands problematic. However, though significant regional variation is present in Northern France, sufficient broader patterning in typological change exists to permit the use of material from well dated contexts to gain a broad understanding of the chronology of the occupation of the Channel Islands. Without further radiocarbon dating, this chronology is invariably imprecise; however the present resolution is sufficient to understand broadly the relationship between colonisation, occupation and insularisation.

The Channel Islands

The Channel Islands are an archipelago in the Normanno-Breton gulf, consisting of the two largest islands Jersey and Guernsey; the smaller islands of Alderney, Sark and Herm; and the islets Lihou, Jethou, Brecqhou and Burhou (figure 1). None of these islands are particularly large, Jersey, the largest measures only 19km across, while the islets can be measured in hundreds of metres. There are also a number of reefs, mainly around Jersey, that consist of only a few rocky areas at high tide, but are extensive at low tide. The Minquiers at low tide are half

the size of Guernsey; the Ecrehous larger than Alderney (Sebire and Renouf 2010). The Channel Islands have one of the largest intertidal ranges in the world, at 12m around the coast of Jersey. This may have been lower in the past (Sebire and Renouf 2010), however it creates a large boundary of uncertainty in assessing the timing of sea level rise and the process of insularisation.

The combination of a large tidal range and a shallow surrounding sea-bed mean that sea-level rise is played out in microcosm daily. Low tides reveal intermittently, some of the landscapes drowned by the inundation. Tree stumps from a submerged forest have been encountered in peat deposits in St Ouen's Bay, Jersey, sometimes accompanied by Neolithic flint, pottery and cattle bones (anon 1797, Sinel 1909). Peat, tree stumps and artefacts from periodic exposures are also known from Vazon Bay in Guernsey (Campbell 2000), while artefacts have also been found in association with intertidal peats at Longis Bay in Alderney.

Mesolithic material was first noted in the Channel Islands in Guernsey by Kendrick (1928), who mentions flint chipping areas at La Corbinerie, at Creve Coeur, and on the tidal island of Lihou and illustrates microliths from La Corbinerie and l'Islet. Hawkes (1937) in her equivalent survey of Jersey, considered Mesolithic influence to be absent or negligible, yet also illustrated microliths from l'Etacquerel and Grosnez. None of these, with the exception of l'Islet (which is a megalithic tomb), came from excavated contexts, instead they were collected from ploughed fields or areas of coastal erosion.

Further Mesolithic sites were brought to light by Mark Patton (1993) through a survey of museum collections from Jersey, Guernsey and Alderney during the course of doctoral research. Patton suggested a basic chronology of these sites: He identified Le Canal du Squez, Le Col de la Rocque and Câtel de Rozel in Jersey, La Corbière and Creve Coeur in Guernsey and Porcieux/Mannez in Alderney as Middle Mesolithic in date; Grosnez Hurel in Jersey and l'Emauve in Alderney were considered to potentially be late Mesolithic. Mesolithic material was also noted by Keen in his surveys of the islands in the 1970s and 1980s.

Since Patton's synthesis, much new Mesolithic material has come to light through the work of certain dedicated amateur archaeologists, in particular Brian Phillipps in Jersey. New excavations have also been undertaken recently, at Lihou (GU582), Guernsey, by Tim Schadla-Hall between 2001 and 2003, and at Canal du Squez, Jersey, initially by Mark Patton in 1993 and then by the Quaternary Archaeology and Environment of Jersey project (Bates, Conneller, Pope, Scott, Shaw; henceforth QAEJ) in 2010.

This article presents the results of the excavations at Lihou and fieldwork by QAEJ at Canal du Squez. An assessment of material held by Guernsey Museum (2007), Jersey Museum (2010 and 2012) and Alderney Museum (2012) was undertaken by Chantal Conneller in order to place the excavated sites into the broader context of the occupation of the Channel Islands. In addition to the sites discussed by Patton, Mesolithic material can be confirmed at Grosnez Racecourse, Les Marionneux, l'Etacquerel, Bruno's site (Corbière), '100 Foot Gulch' (Blanches Banques), Plemont, St Ouen's Mill, Portlet Common, Tete de Quennevais, L'Ouziere and the Mourier Valley, all in Jersey (figure 2) and at Port Soif, Fort Pembroke, Hommet Bennest and 18-20 Le Pollet, in Guernsey (figure 14).

Jersey

Jersey is the largest of the Channel Islands with an area of 118 sq km (Jones et al. 1990). The majority of the island consists of a north-south sloping plateau topped by loessic deposits, drained by valleys running mainly north-south. The north of the island is dominated by high (up to 130m) cliffs of plutonic and volcanic rocks with a conglomerate forming the lower plateau in the northeast. In the south and southeast lies a c2km wide coastal plain, overlooked by the ubiquitous fossil cliff line, trimmed in Middle and Upper Pleistocene times, but with its origins at least in the early Tertiary (Lautridou 1989, Renouf 1993).

Jersey has the largest number of Mesolithic sites of all the Channel Islands (figure 2). This is partly a function of its size, but is also a result of the extensive fieldwork of Mr Brian Phillipps, who has located a series of Mesolithic sites in the west and north of the island. Phillipps' meticulous collection strategies - focused on total recovery of even the smallest chips - has resulted in the recovery of numerous microliths, facilitating attribution of his sites to the Mesolithic period.

Jersey has also seen the majority of palaeoenvironmental work in the Channel Islands (Jones et al. 1987, 1990). While most evidence covers the mid-Holocene onwards, some data does exist for latest Pleistocene and earlier Holocene landscapes. Jones and colleagues (2004) describe a tundra landscape of Younger Dryas age from Queen's Valley in the east of the island. A core from near Quetivel Mill in St Peter's Valley in the south east of the island reveals that at around 9200BC peat began to form in a wetland environment of grasses, sedges and ferns. On the valley side and plateau top was open woodland of birch with smaller quantities of pine

and hazel. This horizon is associated with high charcoal levels, though whether this is anthropogenic or natural is uncertain.

A core from Le Port, St Ouen's Bay reveals a picture of the early Holocene environment on the coastal plain in the west of the island, and is located only 5km from the Mesolithic site of Canal du Squez (Jones et al 1987). The pollen assemblage from the lowest level indicates an open grassland landscape with a variety of herbs and shrubs such as willow. Birch, pine and hazel are also represented, but in general trees were sparse. This vegetation may be broadly representative of that of the now drowned Normanno-Breton Plain to the west and north of Jersey. Jones et al (1990) suggest that large areas of the plain were covered by deposits of coversand. This and rising sea level may have maintained an open landscape across much of the coastal plain. A radiocarbon date from the lower part of the overlying clay peat provides a minimum date of 8720 ± 70 BP (SSR-2839) (8160-7580BC) for this landscape, indicating it is broadly contemporary with early Boreal sites on the island such as Canal du Squez.

The pollen spectra from the overlying clayey peat is dominated by hazel, oak, birch and pine, indicating developed tree cover in drier areas and willow, sedges and meadowsweet in wetlands. The lower peat is separated from an upper peat by a sand layer possibly caused by costal instability. A water-table rise caused by rising sea-level led to the demise of these oak-hazel woodlands that dominated drier areas of the coastal plain during the Boreal. The upper peat, with a radiocarbon date of 7090 ± 60 BP (SSR-2836) (6060-5840BC), formed in a freshwater swamp and fen, dominated by alder, which probably developed landward of a sand barrier, as sea-level slowed. A core from l'Ouzière, around 1km north of le Port, records undated sediments probably belonging to the later part of the Mesolithic from around 5900BC. This core paints a similar picture to Le Port of a well wooded landscape of hazel and oak, with rising quantities of alder late in the sequence. Willow, birch and alder indicate the present of freshwater swamp and fen in the proximity of the site. A tranchet axe from l'Ouzière may belong in this landscape; however in Northern France these are seen as more indicative of early Neolithic activities (Artur et al. 2008).

Le Canal du Squez

Le Canal du Squez is located within a shallow, hanging valley on the elevated northwest corner of Jersey, in an area of coastal heathland known as Les Landes (figure 2). The valley was the

location of a pollen core (le Beau Vallee) taken during palaeoenvironmental survey of the island (Jones et al. 1990), but was undated, and is thought to contain only sediments dating from the mid-Holocene onwards. The Mesolithic site was discovered by Brian Phillipps of the *Société Jersiaise* in the early 1990s, at a location where material had been eroded from the sandy subsoil due to the incision of paths which meander through the locale (figure 3). Phillipps' collection is comprehensive and particular attention has been paid to the recovery of small material, both microliths and debitage. The material is divided into pieces collected from the south side or the north side of the valley. In all, Phillipps' collection from the site numbers 8760 pieces. Additional collections derive from Canal du Squez, such as the Percival collection of nearly 300 pieces.

The path which flanked the south side of the valley was subjected to controlled collection by Mark Patton and the *Société Jersiaise* which pinpointed the origin of the lithic material along either side of a path and isolated potential concentrations (Patton 1993, 1994). This work was followed up by direct excavation within the base of the valley itself, which failed to reveal any *in situ* flintwork.

Erosion has continued substantially during the course of the past two decades and Mesolithic flintwork is abundantly visible on the existing paths. Erosion had proceeded in places through to the underlying granite bedrock leading to the destruction of the site in areas. Elsewhere this ongoing process had resulted in the denudation of physical matrix within which the material is held. As a result fieldwork was undertaken by the QAEJ project in 2010 in order to contextualise the material and assess the threat posed to the scatter by ongoing erosion.

This project built on Patton's work by directly targeting the areas of concentrated flintwork identified through his collection survey. In contrast to the previous research which targeted the down-slope valley, testpits were located along the southern, uphill, flank of the path (figure 4). Six test pits were excavated along an 80m transect down to the top of the solid geology. As the largest area of coastal heathland on the island, Les Landes is a Jersey Site of Scientific Interest (SSI). In order to keep impact to a minimum, each testpit was only 0.5 x 0.5m in size. In addition, a gridded surface collection of the path was undertaken to provide a record of the current threat to the archaeology through erosion.

Geoarchaeological investigations

A series of boreholes were drilled across the site to integrate with the test pit data recorded in the archaeological interventions. All indications from the sediment confirm the notion that the site lies within a small basin-like feature draining to the west. The sediments are dominated by sand-sized sediments derived from erosion of the local bedrock that was washed into the basin via sheetwash and potentially minor rills and gullies draining into the main axial drainage across the site. It is possible that localised patches of blown sand are also present within the sequence, being derived from local sources on the basin margins as well as more distant locations to the west at lower elevations.

Finds

208 lithic artefacts were recovered from excavated contexts at Canal du Squez, with each 0.5m testpit yielding between 15 and 63 pieces (table 2). 623 pieces of flint were also recovered during gridded fieldwalking along 100m of the Le Squez footpath (figure 4). The presence of in situ lithic material in testpits and gridded fieldwalked collection stretching for c120m, along with Brian Phillipps' observation that material can be collected for c200m along the path of the south side of Le Squez confirms the large size of the Mesolithic occupation area.

Tools

The excavated material is dominated by debitage, with tools relatively rare (table 2). Four microliths were recovered: a broken obliquely blunted point with possible basal modification from testpit 4 and a narrow backed bladelet and two scalene triangles from testpit 6 (figure 5). One of the triangles (figure 5d) is unfinished and this and a proximal microburin also excavated from this testpit indicates microlith production and retooling in this area. This testpit also had a high proportion of burnt flint, perhaps indicative of proximity to a hearth, which might be expected for an area of microlith manufacture.

The only other tool recovered from excavation was a bevel ended tool from testpit 3, along with three additional fragments of imported stone. These elongated stone artefacts are a common feature of the Middle Mesolithic of northern France and the Channel Islands (Ghesquière et al. 2000). Some have ends that have been rubbed smooth through abrasion, others appear to have been used for percussion, probably as hammer stones.

More tools were recovered in the gridded fieldwalking. Microliths were again the most common type with six examples recovered; most of these were fragmentary, though a complete obliquely blunted point was recovered. A much larger sample of microliths derive from Brian

Phillipps' collections: 25 obliquely blunted points, five partially backed bladelets, six segments, six basally modified pieces, two isosceles triangles, six scalene triangles, two narrow backed bladelet and one truncated backed bladelet (figure 6). Assemblages dominated by obliquely blunted points, segments and basally modified pieces are indicative of early Boreal assemblages spanning 8500-7600BC. Segments in particular appear to have a relatively spatially restricted distribution. Isosceles triangles can be indicative of an even earlier Preboreal date, but also have been suggested to occur with obliquely blunted points and large scalene triangles (two of which are also present at Canal du Squez) in mid-Boreal assemblages, as at Saleux Les Baquets 295, which has 3 dates centring on 7400BC. Scalene triangles are found in France from around 7900BC (Rozoy 1978), as are narrow backed bladelets. Truncated backed bladelets appear in Normandy and the Channel Islands to be associated with late Boreal assemblages. Overall while the majority of the microliths indicate an early Boreal date, there are likely to have been some later Boreal visits to the area.

Beyond microliths, three microburins were recovered from the QAEJ gridded fieldwalking and a further 15 from Brian Phillipps' collection, indicating widespread microlith production in the vicinity. Other tools were relatively rare in the gridded fieldwalking, a scraper fragment and oblique truncation.

A broader variety of tools are present in the Phillipps collection. This includes some later prehistoric material, as indicated by a handful of Neolithic trapezes and transverse arrowheads. Though late/final Mesolithic and Neolithic armatures are similar, these pieces are larger and more irregular than Mesolithic examples from the Channel Islands and Northern France. Data from the gridded fieldwalked collection suggests that later prehistoric material increases nearer the coastal cliff. Other tools in the Phillipps collection may also be of later prehistoric date. Core/denticulates, core scrapers and chunky denticulated pieces are a feature of later prehistoric flintworking, but are also present amongst some Mesolithic assemblages in the region, such as Auderville in Normandy and Lihou, Guernsey (see below). These sites are mid/late Boreal in date. 17 scrapers were recovered, some of which may be Mesolithic; others would sit more comfortably in later prehistoric assemblages. Also present in the collection are two burins, which are represented in low numbers in the Middle Mesolithic assemblages of the Cotentin, but could also be of Neolithic date.

More likely to be of Mesolithic date are a series of truncations, often oblique, on neat bladelets. These are a feature of the Normandy Middle Mesolithic and are also common on other

Mesolithic sites in Jersey. Some of these appear to have been used as for piercing, and are very similar to some of the awls recovered, that consist of an oblique truncation, with additional retouch around the point. Also of likely Mesolithic date are the 32 bevel-ended tools amongst the Phillipps collection. These are a key feature of the Middle Mesolithic of Normandy. Numerous imported flat stones (plaquettes) were also recovered, as were rounded pebbles that were sometimes used as hammerstones.

Technology

The technological schema is focused on blade and fine flake production. Blades represent 9.7% of the total collection. There is notably more effort expended in the production of regular pieces than in later Boreal sites such as Lihou, Guernsey, where blades represent only 5.6% of the assemblage. Skill, and effort to maintain the life of a core is in evidence at Canal du Squez: platforms were prepared and rejuvenated; cresting occurred. Cores are either single platform examples, mainly with removals part of the way round and a cortical back or two platform examples, with either opposed platforms or platforms at 45° or 90°. A few multi-platform cores are also present. Some cores have been established on large flakes. Rather than simply using the ventral surface of the flake as a platform, as is common amongst Middle Mesolithic sites of the Cotentin, these are often multi-platform examples where most of the original ventral surface of the flake has been removed by *plein debitage*. Both flakes and blades show neatly abraded platforms, plain platforms and diffuse bulbs of percussion. It seems likely that knapping took place using a soft hammer or perhaps a soft stone hammer.

The raw material used was all flint. This ranges in colour from grey speckled, brown speckled, honey coloured, dark brown and red. The material ranges in quality from translucent fine grained material to coarser flint with a more cherty appearance. Cortical pieces display the heavy pitting typical of beach material and indicate that raw material was exclusively obtained from local beaches. As far as can be ascertained, beach pebbles were the only source employed in the Channel Islands during the Mesolithic period. The original source of this flint was probably a now inundated chalk source north of Alderney (Callow and Cornford 1986), since flint beach pebbles increase in quantity and size on northern beaches, with Alderney having the best supplies of all the Channel Islands (Keen nd.). Beach pebbles can be of very poor quality, but some effort appears to have been made to collect larger and better quality nodules at Canal du Squez in comparison with other sites such as Lihou. Some tested nodules or minimally reduced cores are have been recovered, perhaps suggesting that pebbles were tested

at source for quality before being imported to site. 20% of debitage in the collection are primary or secondary flakes, a proportion that is compatible with this strategy.

Grosnez

The Grosnez area is just to the northeast of Canal du Squez, on the northern part of Les Landes (figure 2). Grosnez Hurel is Jersey's only other excavated site, which was investigated in 1925 by Godfray, Rybot, Mourant, Richardson and Thompstone. Lithic material is recorded as lying within a mound of sandy loam, 3 feet deep and 36 feet in diameter, around 200 yards southeast of Grosnez Castle. Mourant recorded that there were well over 100 flints found. In the collection from Jersey Museum 64 flint artefacts remain. Amongst these were an asymmetric trapeze, a denticulated core/scrapper and an invasively flaked scraper. Grosnez Hurel was noted by Patton (1993) as the only late/Final Mesolithic site on the island. This is indicated by the presence of the asymmetric trapeze (figure 7). However the remainder of the material from the excavation is probably of mixed date, as it seems to display different technological characteristics and conditions, with both patinated and unpatinated material present. The extant collection does however contain a large number of bladelets (25 examples), as well as fine flakes which display platform abrasion and narrow platforms which are of Mesolithic date. Also present amongst the collection were a number of plaquettes and four bevel ended tools made of imported mica-schist (Patton 1993), two of which had evident signs of use in percussive activities. Two hammer stones were also found, one of flint, one of stone.

Grosnez Hurel represents just one area of Mesolithic activity amongst many at Grosnez. A large collection of material comes from Grosnez racecourse, around 100m to the south of Grosnez Hurel. Amongst this are 8 microliths, including a single asymmetric trapeze (figure 7), very similar to the example recovered from Grosnez Hurel. Both the trapezes from Grosnez are lateralised to the left, a feature of late Mesolithic sites in Normandy and Brittany, in contrast to sites north of the Seine, where right is the predominant lateralisation (Artur et al. 2008). The remaining microliths from the racecourse are all obliquely blunted points, partially backed pieces and basally modified pieces indicative of an early Boreal date. 70 bladelets were amongst the debitage. Several of these were very regular, perhaps indicative of the presence of late/Final Mesolithic Montbani style debitage associated with the trapeze. Also recovered from the general Grosnez area are two further partially backed microliths and two core tools.

Col de la Rocque

Le Col de la Rocque is an area of Mesolithic flintworking located on headland on the northern coast of Jersey (figure 2, figure 8). Recent collections have come from fields 149 and 151a, immediately to the south of the rocky outcrop of la Rocque; however Mesolithic material can also be collected from paths to the west of this area, either side of a small valley with a stream, indicating a large spread of Mesolithic occupation. Earlier collections from the site have been made by Baal, Watson, Rybot, Lawson and Dawson; more recent collections by Peter d'Sousa, James Main and Brian Phillipps.

After Canal du Squez, the collection from Col de la Rocque is second largest in Jersey, numbering nearly 2500 pieces in total. Most of this material is Mesolithic, however a substantial component of later prehistoric material is present, including two transverse arrows, a barbed and tanged arrow, thumbnail scrapers and a fragment of Les Fouillages style Neolithic pottery. Many – though not all – microliths and bladelets are patinated, while obviously later prehistoric material is unpatinated.

The collection from the site is recorded in table 3. Of the 23 microliths, 9 are scalene triangles, with the remainder obliquely blunted points and a single basally modified piece (figure 9). The basally modified piece is relatively elaborate and highly reminiscent of sites from the Cotentin, with examples known from Auderville and Flamanville (Ghesquière et al. 2000). This high proportion of triangles suggests that at least some of the occupation at Col de la Rocque occurred during the second half of the Boreal. The presence of microburins indicates on site microlith manufacture.

Of the other tools, scrapers dominate; however most of these are likely to be later prehistoric in date; in general they are unpatinated. Truncations, usually oblique examples, are the next most common tool. These are common in surface collections with a significant Mesolithic component. Five burins are present. Though these may be Mesolithic, burins are also present in Neolithic assemblages, and seem relatively rare on middle Mesolithic sites of the Cotentin. Three awls were also recorded.

Core reduction is focused on the production of bladelets and fine flakes. As at Canal du Squez, cores tend to be single platform examples on beach pebbles, with reduction proceeding part of the way round the core, leaving a cortical back. Also common are two-platform pyramidal

cores, with one primary platform, and a second platform at 45° located at the apex of the pyramid. In contrast to examples from Guernsey and the Cotentin, cores on flakes, using the ventral surface of the flake as the platform are uncommon. Some flake cores are present where bladelets and flakes are removed from the lateral edges of a large, thick flake, using a truncation on the distal end of a thick flake as a platform. These pieces are not patinated so may be later in date. Cores show careful preparation, with neat platform abrasion and overhang removal used to trim the platform/core face angle. Core tablets demonstrate platforms were rejuvenated. Blades show neat platform abrasion; this is less common on flakes. Crested blades indicate this method was sometimes used to initiate blade production.

Les Marionneux

Les Marionneux, St Mary's, is on headland overlooking the Devil's Hole on the northern coast of Jersey (figure 2). The site is only 0.6km from Col de la Rocque and the two sites are intervisible (figure 10). Lithic material has been recovered from field 168 by J.M. Storey and Brian Phillipps. The majority of lithic material at Les Marionneux is patinated and the small amount of non-patinated material seems mainly of later prehistoric date. As a result, only the patinated material is included in counts for this site. In total 894 pieces have been recovered.

12 microliths are present in the collection: three obliquely blunted points, two partially backed pieces, two basally modified pieces and four scalene triangles, indicating a likely late Boreal date (figure 11, table 3). Two microburins were also recovered, indicating microlith manufacture at the site. Beyond the microliths a range of tools were recovered. Truncations were the most common tool, with four examples. The three oblique examples could have been used as borers or graters. One burin was present in this collection, though this may also have served as a bladelet core. Two scrapers were found; one an endscraper, the other a core/scraper. In all, the assemblage indicates a wide range of activities were carried out at the site. Burnt material is also present in large quantities, possibly indicating hearth debris.

Cores are mainly single platform examples with reduction part of the way round and a cortical back. One core has an anterior crest and the presence of a crested blade in the collection indicates that formal methods of core reduction were sometimes used, even on relatively poor quality beach pebbles. Cores tend to display platform abrasion and overhang removal. While regular bladelet cores are present, other cores are more irregular in their flaking. Bladelets are

common in the assemblage. These tend to be between 5mm and 8mm in width and less than 50mm in length. Only two exceed 50mm. Some large flake debitage is present, often corticated, indicating the early stages of core reduction are present.

L'Etaquerel

A small assemblage of Mesolithic flint derives from an unknown location in the vicinity of l'Etaquerel battery (figure 2). At least some of the collection was collected in 1919 and may be the 'flint scatter area' in field T632. This is another cliff-top coastal location, around 1km to the west of the larger site of C atel de Rozel. Two microliths, both obliquely blunted points and a possible microburin are present in the collection (figure 12, table 3). Also present are three cores, an opposed platform bladelet core, a pyramidal core and a single platform core. Bladelets number 74, while 65 flakes and fragments are present. Debitage displays evidence for careful preparation with platform abrasion and narrow butts. The l'Etaquerel collection is unusual for a fieldwalked assemblage from the eastern part of the north coast in that it does not appear to have a significant later prehistoric component. The only microliths recovered are obliquely blunted points, which could suggest an early Mesolithic date; however the small number recovered and the continued presence of obliquely blunted points in Middle Mesolithic contexts urges caution. An additional obliquely blunted point has been recovered from la T ete des Hougues, which is the name given to the headland adjacent to l'Etaquerel.

C atel de Rozel

C atel de Rozel is a promontory fort, on the Rozel headland in the northeast corner of the island (figure 2). The fort's ramparts were constructed in the late Bronze Age/Early Iron Age, over an earlier bank of possibly late Neolithic/Early Bronze Age date (Cunliffe 1992). A large lithic assemblage of mixed date derives both from fieldwalking and excavations of the earthwork undertaken by Barry Cunliffe between 1988 and 1990. Later prehistoric flintwork dominates the collection, but Mesolithic material has also been recovered. Two microliths are present, a backed bladelet from the excavation of the earthworks, and a basally modified piece from an older collection from the area. An additional microlith in Jersey Museum is recorded as recovered from the Rozel area (figure 12). These pieces are patinated, as is fine flake and bladelet debitage from the collections, in contrast with obviously later prehistoric material

which is unpatinated. It seems that in this corner of this island patina is a good indicator of Mesolithic date. The microliths suggest a middle Mesolithic date for the occupation.

Mesolithic debitage is concentrated in particular areas of C  tel de Rozel. Amongst the Oxford University fieldwalking, Mesolithic material comes from field 567/8 (figure 13). Systematic fieldwalking of the area was also undertaken by the *Soci  t   Jersiaise* (Matthews 1984). A scatter was recorded in this same field and into the adjacent field, with the greatest amount of material deriving from a slight rise. Mesolithic material was also recovered during the Oxford University excavations of the earthworks. This derives mainly from loessic soil and turf layers used to construct the rampart (Cunliffe 1992). This loess seems to have been removed from the interior of the fort, to the east of the rampart. It thus is likely to derive from a similar area to the field 567/8 scatter, which is also to the east of the rampart. Additional Mesolithic material was recovered from trench 8, which was excavated within the interior of the fort, to the east of the field 567/8 scatter. All this material was within the ploughzone, as ploughing had occurred down to bedrock in this area (Cunliffe 1992).

Bruno's site, Corbi  re

In contrast to the preceding sites, Bruno's site is located in the south west corner of the island, in the Corbi  re area, close to a disused desalination plant. The collection numbers 1500 pieces and is mostly of Mesolithic date, though some later material also appears to be represented. Amongst the collection are four microliths, an obliquely blunted point and two narrow triangles with a transverse truncation, and a small geometric fragment (figure 12). In Normandy and the Channel Islands triangles with straight truncations appear to be common in late Boreal assemblages, and their presence is likely to indicate a similar date for this site.

Apart from the microliths, tools are relatively rare in the assemblage. Only a scraper and an irregular retouched piece are present, and though such pieces are found in late Boreal assemblages, they are also common on later prehistoric sites. Blades and bladelets are lower in frequency than other assemblages on the island. The presence of large cortical flakes may suggest a specialised function for this site – the decortification and shaping of cores, with relatively low levels of *plein debitage*.

'100 foot gulch', Blanches Banques

Mesolithic material has been collected eroding from this blowout in the Blanches Banques area of Les Quennevais by Brian Phillipps. Though significant quantities of the lithic collected by Mr Phillipps are Mesolithic in date, Neolithic material is also common in the blowout, as indicated by finds of pottery and a shale bracelet. Amongst the Mesolithic material is a microlith, an unfinished microlith fragment, an oblique truncation and a couple of scrapers (figure 12). Debitage numbers 618 pieces of which 41 are bladelets. The microliths recovered suggest a broadly Middle Mesolithic date.

Smaller collections

In addition to the above sites, Mesolithic material can be recognised at several other locations on the island. On the north coast, around 1km to the east of Grosnez, lithic material has been recovered from Plemont by Attenborough, Hill, Keeley and Rybot in 1921. Though no microliths are present in the collection, the tools recovered and methods of debitage suggest a Mesolithic date for at least some of this material. One burin is present, as are two oblique truncations, and these latter in particular are common on Mesolithic sites in Jersey. Fine flakes and blade debitage was also recovered. Also on the north coast a collection from the Mourier Valley, immediately north of Les Marionneux, contains fine flakes and bladelet debitage.

In the west of the island, a microburin and a truncation have been recovered from St Ouen's Mill and an obliquely blunted point and a neat bladelet core from le Tete de Quennevais (figure 12). In the south, Mesolithic material has also been recovered from Portelet Common.

Guernsey

Guernsey, the second largest of the Channel Islands, has an area of 65 sq km (figure 14). The island consists of a plateau, capped by loess deposits, with cliffs up to 100m above sea level in the south. The plateau drops down to coastal plains in the north and the west, where there are a series of bays and promontories (Sebire 2005).

While Kendrick suggests Neolithic people were the first colonisers of Guernsey (Kendrick 1928, 8), he also noted the presence of chipping floors containing retouched 'pygmy' flints at

La Corbinerie (probably la Corbière; Sebire pers. comm.), and from the central cist of the megalithic remains at l'Islet (ibid, 39). He also records knapping stations containing chips and small blades – though no retouched ‘pygmies’ at Lihou and Crève Coeur. All these sites are now understood to preserve Mesolithic remains, and further examples were added through Patton’s synthesis (Patton 1993). More recently a number of sites with Mesolithic material have been discovered by Guernsey Museum in the course of excavations in advance of development (Sebire 2005).

Lihou Island (GU582)

Lihou is a small tidal island situated off the west coast of Guernsey. Site GU582 is located on a low sea cliff on the northeast tip of the island (figure 14, figure 15). The presence of material of likely Mesolithic date on Lihou was first mentioned by Kendrick (1928, 39) in his survey of the archaeology of Guernsey. This material may have derived from the current site GU582; however lithic material can be found more generally across Lihou, so another source is possible. Collections of surface material by Ruse in the early 1960s, numbering more than 1000 pieces, revealed the presence of a series of lithic scatters on Lihou. One of his clusters of material was recovered from the cliff face between 244789 and 244792, thus encompassing the GU582 site. Lihou is also mentioned as one of the most prolific sites in the Channel Islands for worked flint in the surveys of the geologist David Keen, who undertook a study of Guernsey in 1972-3 (Keen nd.). Keen collected material from east side of the northeast tip of Lihou (244792), describing how the site was ‘under periodic attack from the sea and many of the flints were collected loose at the foot of small cliff sections.’ In this area he noted the in situ presence of worked flint in soils of wind-blown sand, extending up to 60cm below the current ground surface. Further material was located by Mike Hill on 19 April 1981 at 244791, in the general vicinity, but possibly a bit to the south, of the GU582 site. His collection, which includes 4 microliths, is consistent with a Middle Mesolithic date and similar to the types recovered from GU582.

In 1999, twenty pieces of flint were collected from within a few metres of an eroding cliff edge by Mick Atha who reported these finds to Dave Lane. The latter then located a flint horizon exposed in the cliff and has been instrumental in promoting awareness of this material - and the threats to its existence caused by marine erosion - to a wider audience, leading to the site’s subsequent excavation between 2001 and 2003. Since 1999 Lane and other members of the

Guernsey Museum Archaeology group have been monitoring the erosion of the cliff edge. With his kind permission, his material recovered from these erosion surfaces has been included in the main site analysis. In addition members of the group have located other findspots on Lihou, to the southwest of GU582, by the weather station and also in the vicinity of the priory.

Excavations 2001-3

Excavations were undertaken between 2001 and 2003 by Tim Schadla-Hall. A trench, measuring 4x2m was excavated over 3 seasons. In 2003 four further testpits measuring 0.5m across were excavated to the north of the main trench (figure 16). Nearly 15,000 pieces of worked flint were recovered from this small area of excavation (figure 17), of which the vast majority derived from the main trench (table 4). Intensive flintknapping activities must have occurred in this area and are associated with a cluster of large burnt stones, which may represent a partially destroyed stone-built hearth (figure 18). A radiocarbon date of 8310 ± 39 (OxA-15198) (7497-7192BC) derives from burnt hazelnuts associated with this structure.

Geoarchaeological investigations

In addition to the sequences exposed in testpits, the adjacent cliff section provided an exposure where sediments could be recorded. Below the turf and root-matter were layers of fine grey, compact windblown sand, around 25cm thick, which contained the Mesolithic material. Beneath this, at the base of the testpit, and in the cliff sections were layers of pale yellow/grey fine silts, interpreted as loessic deposits, which may be reworked.

Micromorphology, undertaken by Richard MacPhail, on the implementiferous deposits, indicates that they are composed of aeolian coarse silts and fine sands accompanied by humic A-horizon formation. Acidic surface soil conditions are implied by the arrangement of relict organic sediments in the lower contexts. Human activity is indicated by anomalous coarse grained rock fragments and compacting, both likely to have been caused by trampling.

The worked flint

The material recovered from GU582 is typologically Middle Mesolithic date. This accords well with the radiocarbon date, placing it in the second half of the Boreal. The raw material employed was almost always flint, which varies in colour from speckled grey to brown to opaque grey/white. This is a more restricted set of colours than at Canal du Squez. A moderate proportion of the assemblage has undergone a certain degree of patination. The material ranges

in quality from translucent fine grained material to courser flint with a more cherty appearance. A handful of pieces of worked quartz are also present. As with other Channel Island sites, the flint derives from beach pebbles. The majority of the material is of relatively poor quality, even in comparison with other Mesolithic sites, suggesting a lack of selectivity in collection strategies. Internal flaws (mainly marine fossils and quartz crystals) are relatively common. The choice of beach pebbles as raw material and their abundance close to these sites permitted knappers to be relatively wasteful.

Technology

The technology employed can be broadly characterised as expedient, though more attention was paid to the production of certain blanks and artefacts. In general preparation was kept to a minimum and techniques to maintain and prolong the life of the core are rare. Mistakes, unsurprisingly given the poor quality of the raw material, are common. Siret flakes and step and hinge fractures are frequent. The majority of the flintknapping appears to have been undertaken with a soft stone hammer, though a hard hammer was sometimes used, particularly for the removal of large cortical flakes. The many stones that were brought to the site, including the bevel ended tools, would have been suitable hammerstones. A few fine bladelets display a diffuse bulb of percussion and a lip, which could indicate occasional use of a soft hammer.

An important task at the site appears to have been the shaping of unmodified beach pebbles into cores. Ten tested and partially reduced nodules were recovered from the excavations. Large, thick, cortical flakes are common and primary flakes comprise 5% of the total assemblage (table 5). In all 43.6% of all complete flakes and blades are cortical or partially cortical. Many of these pieces display thick plain or cortical butts and have rarely undergone any preparation, such as abrasion or overhang removal, the aim simply appears to have been to remove natural protuberances from a nodule and produce a core suitable for *plein debitage* with as little effort as possible and without any object to conserve raw material. However these thick supports were not simply discarded, as several were used for the production of large denticulate scrapers.

The lack of attention to preparation continued into *plein debitage*. True crested blades were never used to initiate knapping, instead knapping proceeded along natural ridges and ridges created by previous removals. Few pieces can be grouped as core maintenance pieces, designed to maintain and prolong the life of the core. Core tablets are relatively rare (21 examples) and the presence of some multi-platform cores (23) suggests that knappers moved to a new platform

as frequently as rejuvenate the old one. Step fractures tended to be removed through detaching a thick flake from the same platform rather than an opposed one, a technique that is less effective. Failure to remove step fractures led to the abandonment of several cores.

The majority of cores are single platform examples, knapped part of the way round, and with a cortical back. Only two were worked around the whole circumference of the core. Of these single platform cores, five are pyramid cores. Eleven cores have two platforms, of which three have opposed platforms, six have platforms perpendicular to each other, two at angles of 45 degrees and three have knapping either side of a ridge. Nine are multiplatform examples, four with knapping either side of a ridge and five more irregular examples. An idiosyncratic feature of the Lihou assemblage is the establishment of cores on large thick flakes. Knapping was initiated using the distal part of the ventral surface of the flake as a platform. This appears to be one way of creating a flat platform and a flaking angle of less than 90 degrees. The use of large flakes for cores appears a feature of the northern French Middle Mesolithic, however the particular way the Lihou flakes were used appears more typical of the Middle Mesolithic sites of Brittany (Marchand 2005) and Basse-Normandie (Ghesquière et al. 2000).

Debitage is in the style 'Coincy' as defined by Rozoy (1978). This is broadly laminar, but without the careful preparation of the 'Montbani' style. Blades tend to have one rather than two arises. Flakes and blades from *plein debitage* display a varying amount of preparation, a attribute also evident at other middle Mesolithic sites in Northern France, and, as Lefebvre reports for the site of Flamanville, preparation has in general been kept to a minimum (Ghesquière et al. 2000). Often pieces would have little or no preparation, or overhangs would simply be removed (see table 6). Few pieces have more extensive platform abrasion. Blades are much more likely to have this type of preparation than flakes (55.6% as opposed 16.9%), indicating greater concern with blade production. Blades are also less likely to bear cortex than flakes (only 16.1% have cortex compared to 50.7% of flakes). Though some fine blades and bladelets are present in the assemblage, these are relatively rare (c5%), in comparison with northern French sites of a similar date, where frequencies of bladelets seem to vary between 20-30%. It could be argued that, given the small area excavated, bladelets could have been removed to another area of the site for preparation or use, or even removed from the site to be used elsewhere in the landscape. However few of the cores even display extensive bladelet scars; instead the removal of fine, and less fine flakes, appears to have been more common.

Tools

A similar expedience is evident amongst many of the tools. With a few exceptions, these tend to be relatively amorphous pieces, lacking clearly defined forms. Awls, microliths and truncations were well made. Scrapers, denticulates and core tools seem more expedient, with amorphous forms that grade into each other. Microliths are by far the most common tool type, with 219 examples (tables 3 and 4, figures 19 and 20); other types are relatively rare. Scalene triangles are the most common microlith type with 29 examples (figure 19). Most scalene triangles have two retouched edges, though the third edge can also be partially or totally retouched. The dominance of scalene triangles fits well with the typology constructed by Ghesquière et al (2000), in that the frequency of scalene triangles appears to increase in the second half of the Boreal. On many of the triangles the angle begins to approach a right angle. These grade into small truncated narrow backed bladelets, which are represented by eight examples (figure 19). Seven of these are examples with only one edge backed, the last one is much smaller, narrower and is double backed. This last type is common amongst the Breton Bertheaume group of Middle Mesolithic sites of Northern Brittany. Truncated bladelets with a single edge backed are seen at the Cotentin site of Rozel, station 56 (Audouard 1986); this site is undated but considered to belong to the late Boreal. Truncated backed bladelets also make up an important component of the microliths from RMS assemblages with feuilles de gui, characteristic of the Middle Mesolithic after c7500BC west of the Seine. The date of Lihou suggests truncated backed bladelets can also perhaps be considered a marker of the later part of the Middle Mesolithic east of the Seine. Narrow backed blades without this truncation, an important type in Normandy Boreal assemblages (Ghesquière et al. 2000) are poorly represented at Lihou. Five examples were recovered, all fragmentary; some may be broken triangles.

Obliquely truncated points are the next most common type amongst the microliths (figure 20). These are represented by 22 pieces. Points with basal retouch are represented by 13 examples. Both obliquely blunted points and backed bladelets can have this additional basal modification. Basal modification can consist of a straight basal truncation or a rounded base. Basal retouch varies from abrupt retouch across the whole base, to very slight retouch, often on the ventral surface. A large number of microliths (33) are too fragmentary to assign to a particular category. Of these, six are fragments of geometric microliths and thus would have originally been either scalene triangles or backed blades. Two are fragments of either obliquely backed points or basally modified points. 23 microburins were recovered, along with four micro-intermediates. These indicate on site microlith production.

Notches and denticulates are the second most common tool category, represented by 20 examples (figure 21). Most of these are crude, heavy-duty pieces made on thick flakes, cores or shatter fragments. Thick cortical flakes were frequently selected as supports for these tools (in 13 cases). Also present are three finer denticulates made on bladelets. Eleven saws or serrated pieces were recovered. The majority of these (seven) were on bladelets, two were on flakes and the final two were fragmentary.

Eight awls/borers were recovered (figure 21). These consist of single or convergent oblique truncations. Three are on bladelets, four on flakes and the final example fragmentary. These grade into the truncation category, of which were recovered five straight and one oblique truncation. Two were on blades and three on flakes, including a thick semi-cortical flake. The final example was a fragment. Scrapers, of which eight were recovered, range considerably in morphology. One endscraper on a blade was recovered, but the others are more irregular in form, including flake scrapers, a 'nosed' scraper and a sidescraper. Two scraper spalls were also recovered, including a spall from a denticulated scraper, indicating production/resharpening of these artefacts at the site.

A characteristic of the Lihou assemblage is the presence of amorphous tools which are difficult to categorise. These encompass 56 miscellaneous retouched pieces, several which have more extensive retouch. This includes five partially or entirely bilaterally retouched pieces. Three core tools were recovered, mainly nosed pieces, up to 6cm in length (figure 21). It is not impossible some of these represent heavily worked core fragments (see Marchand 2005 for a discussion), and it is worth noting that there is similar ambiguity between some cores and artefacts in the denticulate scraper category, which were also made on thick flakes. The large amorphous tools from Lihou are similar to pieces recovered from the Cotentin site, Auderville-Roc de Gîte. Auderville is a similarly intensively occupied site, with occupation focused around stone features, and has a similar radiocarbon date to that of Lihou (Ghesquière et al. 2000).

Imported stone

Quantities of imported stone were also recovered from the site. Unfortunately the majority of this was inadvertently destroyed prior to analysis, during building work on the Institute of Archaeology basement. The material recovered consisted of hearth stones, many of which had been heated to point of fragmentation. Also present were a series of elongated bevel-ended tools. As with similar examples recovered from Jersey and the Cotentin Middle Mesolithic sites, some of these appear to have been used as hammerstones, others were smoothed by wear.

Activities on Lihou

Flintknapping was a major activity at GU582. People carried flint pebbles from the beach to the site. Here they removed the cortex from these nodules and worked them into manageable cores. Both blades and flakes were produced during *plein debitage*, with in general greater care taken to produce blades. Large numbers of microliths were produced on site, and composite tools repaired. Scrapers were manufactured or maintained. Certain activities were undertaken which required the production of heavy duty denticulated pieces and the use of bevel-ended tools. Food preparation and cooking are also likely to have taken place, as indicated by quantities of carbonised hazelnut shells. Unfortunately bone is not preserved in the acidic soil.

There is some evidence for spatial variation in activities. The main trench appears to have been the centre of activities, though flint densities remained high as far as (and no doubt beyond) the current cliff edge. The main trench was the centre of microlith production and retooling, which is likely to have taken place around a hearth, which would have been needed for mastic production. Processing of hazelnuts, and thus cooking more generally may also be associated with this hearth. The density of lithic artefacts in the main trench indicates that it is likely to represent a palimpsest, though the lithic material indicates that most of this reoccupation took place during the second half of the Boreal. This repeated occupation appears focused on a cluster of large stones which may indicate a hearth area that was re-used and remodified over many years.

Moving north, evidence for activity declined, from a density of around 4000 pieces of flint per square metre in the main trench to 32 pieces per square meter in GU582D. Microliths also decline significantly: there were 199 in the main trench and 10 in GU582A, but both GU582B and C lack microliths entirely and GU582D has only one. Quantities of burnt material also reduced significantly moving west, suggesting the main trench was also the focus of heating/cooking activities. Material in GU582A seems to represent the edge of the activities occurring in the main trench, both are relatively similar in their artefact composition. Smaller scale and short term tasks seem to be represented to the north, probably short-term core reduction activities.

La Corbière

La Corbière, Forest, probably the site Kendrick erroneously refers to as La Corbinerie (Sebire and de Jersey pers. comm.), is a surface collection represented by 316 pieces (table 3) and after Lihou the largest collection of Mesolithic material in Guernsey. The site is on a headland on the western part of the north coast of the island, overlooking the sea and has been collected now for over a century. Any admixture with later material appears relatively minor, and seems confined to the small Ruse collection, which is not included in counts. Three microliths have been recovered from the site (figure 22): one simple obliquely blunted point and two backed bladelets (one of these is missing, but is illustrated by Kendrick). This is a very small collection, consistent with a Middle Mesolithic date, but may be slightly earlier than Lihou. Microlith production seems to have been an important task, as three microburins and a micro-intermediate (unsnapped microlith/microburin) were also recovered. Also present amongst the tool component was a fine awl, the tip formed by convergent truncations, two amorphous retouched pieces and two flat, elongated pebbles, which appear to have been used as hammerstones. This latter form is also found at Lihou and is common at Mesolithic sites in Normandy. In terms of technology, the La Corbière assemblage seems to demonstrate more care and preparation in knapping in comparison to Lihou. Blade percentages are very high, but this may be because this is a selectively collected assemblage. Core technology employs mainly single platform cores, worked part of the way round the platform, including an example on a flake. Crested blades are common in comparison to Lihou, including examples that appear to have been used to initiate knapping, perhaps suggesting an earlier date for this collection.

Creve Coeur

Creve Coeur, on the north-east coast of the island, is a second Guernsey site which has been described in the literature as Mesolithic (Patton 1993). This collection however appears rather more mixed in date. Two microliths have been recovered from the site (a basally modified piece and a narrow backed bladelet), also an awl and a burin spall, all of which are compatible with a middle Mesolithic date (figure 22). Furthermore the assemblage of 289 pieces in Guernsey Museum contains ten finely worked bladelets. However bipolar knapping using an anvil is a common feature of the collection and this technology is prevalent amongst later prehistoric assemblages from the Channel Islands.

Smaller collections

Microliths are known from the Neolithic long mound at Les Fouillages (Ghesquière pers comm.). These were found beneath the first phase of the monument in a deep forest soil, with tree throws indicating the presence of dense woodland (Sebire 2005). Microliths have also been recovered from Port Soif (Keen coll.), Fort Pembroke (Atha collection) and a possible fragment from Hommet Benest (Atha/Sebire coll.), while an additional example is figured in Kendrick (1928, fig. 13) from l'Islet. A small amount of Mesolithic material may also be present at l'Eree. A bevel-ended tool has been recovered from Omptolle Island and at 18-20 Le Pollet, St Peter Port, a recent rescue excavation yielded a small microblade fragment and dihedral burin from layers of colluvium. The technology tends to suggest a mixed date for these collections, with quantities of Mesolithic material relatively small. Only Port Soif and Hommet Benest perhaps seem to have more significant proportions of Mesolithic debitage. The microliths recovered from these smaller sites tend to be fairly fragmentary, Les Fouillages has the largest collection (5), consisting of obliquely truncated points and backed bladelets (Ghesquière pers comm), other sites tend to have single examples of obliquely blunted points or backed bladelets. All these sites are consistent with a Middle Mesolithic date, with the possible exception of the microlith from Fort Pembroke which could be late Mesolithic. Given the fact that simple obliquely blunted points are well represented, and scalene triangles absent these sites could also be earlier than Lihou.

Alderney

Alderney is the most northerly of the Channel Islands and lies only 13km from the Cotentin peninsula. A strong current is present in the waters between Alderney and the Cotentin, making the stretch of water dangerous to traverse. High cliffs rise to the south and west, while the east is lower lying. Alderney is considerably smaller than both Jersey and Guernsey, measuring just 4.8 by 2.4km, and as a result has fewer Mesolithic sites.

Two major areas of Mesolithic activity have been recognised, in the south west, at l'Emauve and in the east at Mannez/Les Pourciaux (figure 23). These two sites represent Final Mesolithic and Middle Mesolithic settlement respectively. Blade-based material has also been collected from inter-tidal peats at Longis Bay which currently lacks diagnostic tools and may have a Mesolithic, or even an Upper Palaeolithic component, but is most likely to be of Neolithic date.

A key feature of the Alderney sites is the larger and better quality raw material present, a result of the closer proximity of Alderney to now submerged primary flint sources, leading to the presence of larger nodules on Alderney beaches (Callow and Cornford 1986). This has resulted in the presence of a series of larger knapping products than from the other Channel Islands.

Mannez/Les Pourciaux

Mannez/Les Pourciaux is an area of high ground overlooking Longis Bay in the east of the island (figure 23). Lithic material has been collected by a variety of individuals from ploughed fields or from erosion patches. Also included in the Mannez/Pourciaux collection is material from Mannez enclosure which appears to be of later prehistoric date and is unpatinated, or has a light patina. This material has been excluded from counts. The Mesolithic assemblage, by contrast tends to have a thick white patina.

The Mesolithic assemblage from the site numbers 431 (table 3) and is characterised by a series of well-made blades and fine flakes, with fine butts and neat platform abrasion. Crested blades and core tablets are both present. Cores and microliths are rare, though this may be due to lack of recognition by collectors, rather than reflecting Mesolithic activities. Only three cores were recovered, two single platform cores with cortical backs and a two-platform core, with perpendicular platforms. Microliths also number three examples, one scalene triangle and two basally modified pieces, indicating a Middle Mesolithic date (figure 24). Also present were three oblique truncations, two scrapers and a burin. In addition, two burin spalls were present, both showing that the edge of the original flake was trimmed before removal of the burin spall.

L'Emauve

L'Emauve is a large spread of material, extending several hundred metres to the north and south of the coastal track in the southwest of the island, just to the south of the airport (figure 23). The lithic material has been collected by numerous individuals, both from areas of erosion adjacent to the track and a coastal path to the south and as a ploughzone scatter from a field to the north of the track. The site is to the east of a hanging valley with a convenient water source (figure 25). To the east and west are two other areas where lithic material has been collected, Plat Cotil and Sylt, both of which collections appear to be composed of later prehistoric

material, though both may have a Mesolithic component. Similarly later prehistoric material appears present at l'Emauve, in particular early/mid Neolithic material, though a small amount of unpatinated late Neolithic/Bronze Age material is also present. Given the similarity of late Mesolithic and Early Neolithic assemblages in Northern France, both in terms of technology and common tool representation, it is difficult to distinguish the extent of Mesolithic and Neolithic material at l'Emauve. The whole coastal area from Sylt to Plat Cotil can perhaps be thought of as a persistent place (Schlanger 1992, Barton et al. 1995) throughout prehistory.

Technology

Technology appears focused on the production of blades, bladelets and large regular flakes. The assemblage is more noticeably focused on blade rather than bladelet production, in contrast to other Channel Island assemblages. This is probably partly chronological, though the larger flint nodules available in Alderney are also likely to be an important contributing factor. Some blades are very regular and characterised by two parallel arrises. This is a feature of late Mesolithic Montbani style blade production; however the early Neolithic of the region is also characterised by regular blade production (Pailler et al. 2008). Blades and bladelets have been neatly trimmed and display thin, plain butts.

Cores are variable in nature. While some well-made bladelet cores are present, more ad-hoc flake cores were also recovered. Single platform cores, with removals part of the way round are dominant (25 examples), followed by opposed platform examples (7 examples), and multiplatform cores (5). Most of the single platform cores have cortical backs. Core tablets are present in low numbers (3) and a single crested blade indicates more elaborate methods of core preparation were rarely followed.

Large cortical flakes are a common feature of the assemblage, suggesting the importation and shaping of unmodified or tested beach cobbles at the site. Two tested nodules were also present in the assemblage. The valley to the west may have provided a route down to the shore where nodules could be collected.

Tools

In contrast to other Mesolithic sites in the Channel Islands, there is a clearly dominant late/final Mesolithic occupation at l'Emauve. This is indicated of a small series of trapezes, which dominate the microlithic component of the site (table 3, figure 26). These consist of three asymmetric trapezes, two lateralised to the left, and one to the right. A fourth, symmetric

trapeze, though small is on a thick support and is unpatinated. This could be either of Mesolithic or Neolithic date. An elongated obliquely blunted piece with concave base could also be part of this group, but could equally be of Middle Mesolithic date. A fragment with concave oblique truncation may be a trapeze that has broken during manufacture. A thick isosceles triangle could date to several different stages of the Mesolithic. Triangles are common in final Mesolithic assemblages, but tend to have inverse, low angle retouch (Artur et al. 2008), a feature absent in this example (though its tip is broken). In all, while Middle Mesolithic may be present, the entire microlithic assemblage could fit within the late/final Mesolithic. The presence of a large transverse arrowhead indicates a Neolithic presence at the site.

The trapezes recovered from l'Emauve bear some similarities to those found in Normandy. They tend, as with other examples to the west of the Seine, to be lateralised to left, and convexity is common, as in Normandy examples. However no triangles with inverse low angle retouch are present and these are common on Norman sites such as Bieville-Beuville, but rare in the Seine (Artur et al 2008). Artur and colleagues (ibid.) suggest there may be a chronological component to this distinction, with simple asymmetric trapezes belonging to an earlier phase of the late Mesolithic than triangles with inverse low angle retouch. By contrast, in Brittany, sites with asymmetric trapezes, may postdate those with symmetric trapezes, suggesting l'Emauve could date to a late stage of the late Mesolithic.

A range of other tools were recovered from the site, of which truncations and scrapers were the most numerous (figure 26). As at Middle Mesolithic sites, truncations are common. These can be either oblique or straight truncations, some with a marked concavity. In contrast to truncations from other Mesolithic sites in the Channel Islands, these examples are often made on regular blades, rather than bladelets (fig). Several scrapers were also recovered: several were well made endscrapers, but core/scrapers and denticulated core-scrapers were also present. Scrapers and truncations are found on both Mesolithic and Neolithic sites in the region. A patinated flake amongst the assemblage has been reshaped during a later period into a thumbnail scraper, indicating later prehistoric scavenging of the lithic debris generated in the late Mesolithic and early Neolithic.

Two burin spalls were present, indicating activities involving burins on the site even though none were recovered. Though present on Mesolithic sites, burins are more typical of the early Neolithic of the region (Artur et al. 2008). Core tools were recovered from the site. These include a triangular pick and a bifacially flaked fragment. A couple of elongated hammerstones

were recovered, however bevel-ended tools, so common on Middle Mesolithic sites in the region, were absent.

Activities

A broad range of activities involving lithic material appear to have occurred at the site. Procurement of nodules from nearby beaches seems to have been an important activity. These nodules were then prepared and reduced on site, and tools manufactured. The presence of two microburins indicates that trapezes were manufactured as well as discarded on site, while two primary burin spalls indicate burin production. As might be expected of a site that was repeatedly reoccupied, a wide range of tools are represented, from projectile points, to scrapers, truncations and core tools, indicating a wide range of activities occurred in the area.

Longis Bay

The only other site with potentially Mesolithic material is that of Longis Bay (figure 24). Longis is a large bay that dominates the south east of the island. Lithic material was collected from intertidal peats, exposed after a storm and visible in 2005 and 2006. Much of the material was collected by R. Simonet, who regularly monitored the exposures, though other individuals also recovered artefacts.

The assemblage consists almost entirely of debitage and numbers 106 pieces in total. The artefacts recovered are large in size, even by Alderney standards and almost half the pieces recovered are blades, ranging up to 10cm in length. Some smaller bladelets are also present. The greater size of the material may be due to its context of collection, with smaller material winnowed by the tides. Technologically, the debitage bears similarities to the l'Emauve assemblage, in the presence of regular well made blades and flakes. Some of these have neat abrasion, others, though regular, show little evidence for preparation. Butts tend to be thicker than at l'Emauve. Two cores were recovered, one a multi-platform example, the other an opposed platform blade core with a preferential platform. Several blades bear traces of cresting. Only one tool is present, an oblique truncation.

This small assemblage, lacking diagnostic tools could be late Mesolithic, early Neolithic or Late Upper Palaeolithic in date, or even a mixture of different dates. Technologically the material is most likely to be early Neolithic, which is supported by a mid Holocene date for at

least some of the Longis Bay peats (Campbell et al. 2001), though the presence of earlier material cannot be ruled out.

Sark, Herm and Jethou

Little is known of the Mesolithic of the smaller Channel Islands. Just two miles to the east of Guernsey on the small island of Jethou a concave truncation and a blade fragment could be either later Palaeolithic or Mesolithic in date. On the neighbouring island of Herm, a small series of well-made bladelets and flakes, found at Le Monceau appear Mesolithic in date.

Mesolithic activities in the Channel Islands

Most of the Channel Island Mesolithic sites are surface scatters with a later prehistoric component and, given the uncertainty associated with the correct chronological attribution of certain tools, particularly scrapers, it is difficult to discern the full range of activities taking place during the Mesolithic sites. Using a modified form of Mellars' (1976) basic tool frequencies, it seems that most sites are microlith dominated (table 7). Several (Canal du Squez, Col de la Rocque, l'Etaquerel, les Marionneux, Lihou and la Corbière) have microburins, indicating widespread microlith manufacture on the islands. Only Col de la Rocque and l'Emauve fit the definition of a balanced assemblage, with relatively equal numbers of awls, burins, microliths and scrapers. Lihou seems the most securely microlith dominated assemblage, yet in reality is a lot more varied, however this variability is manifested through the large amount of amorphous retouched pieces, which number 88, and which from their morphology seem suited to a variety of different tasks. Overall the assemblages reveal that microlith production and use were important tasks on sites in the Channel Islands thus far discovered. At no single site though are microliths the only tool recovered, other tasks were always undertaken at the same time. The evidence from Lihou, composed of varied activities, extremely high lithic densities and structural evidence in particular suggests perhaps residential or longer lasting occupation. The evidence from Lihou is similar to that from the Cotentin site of Auderville-Roc de Gîte. This site also yielded vast quantities of lithic material, with 100,000 pieces recovered over an area of 130m². These two sites perhaps point to the presence of a logistical system of site organisation, at least in the mid-late Boreal. It is important to remember

though that all sites are likely to be palimpsests and thus were probably reoccupied at different times for different purposes.

Persistent Places

Many Mesolithic sites in the Channel Islands, particularly in Jersey, tend to be located on the top of relict sea cliffs, created in earlier interglacials. During the time of occupation, though the sea might be some distance away, the high cliffs would give good views over a shrinking coastal plain, dissected by river valleys (table 8). This pattern may be partly taphonomic: sea cliffs are areas of erosion; thus these sites are more likely to be discovered than those in other areas, such as inland valleys covered by alluvium, and low-lying coastal sites are likely to have been inundated. However there is evidence to suggest the cliff top location is a real pattern, as these sites are mostly focused on the sides of the island that would have faced out to sea, rather than towards France/the land of the Normanno-Breton Plain. A similar focus on 'le côté sauvage' has been noted by Marchand (2013) in his survey of Mesolithic use of the islands off the coast of Brittany. Mesolithic sites are also found on sea cliffs on the Cotentin Peninsula, Normandy (Ghesquière et al 2000). Why these sites face the sea, on exposed areas buffeted by prevailing winds, rather than France and the remnants of the Normanno-Breton Plain is an interesting question. This patterning may suggest that views over the sea were more important than views over the land, and indicate an increasing maritime focus. Access down to the coastal plain and the sea beyond also seems to have been important in the location of sites. Several are adjacent to (Col de la Rocque, Les Marionneux), or above small valleys (Canal du Squez, l'Emauve) that may have served as routeways down to the lowlands. Proximity to flint sources may also have been key. All assemblages are made from beach pebbles, and the beaches along the northern coast of Jersey currently have the best supply on the island, perhaps accounting for preferential location of Mesolithic sites along the north coast.

Another common characteristic of Channel Island Mesolithic sites is the proximity of water. All sites are located within 1km of water, with some, such as Canal du Squez, Col de la Rocque and l'Emauve adjacent to small streams. Lihou appears to be the only exception; however this site is at lower altitude than the others, and the surrounding area has been more affected by sea level rise, thus a proximate water source may have been originally present.

These sites share key characteristics that seem to have been favoured by Mesolithic populations: good views and proximity to water. They thus appear to have been 'persistent places' (Schlanger 1992), places that through desirable, fixed affordances acted as magnets for

prehistoric groups. These areas seem to have been repeatedly revisited over time, as indicated by the large extent of most of these scatters, and the extremely dense spread of material at Lihou in particular. In addition to the natural affordances of these places, the presence of a stone-built, likely hearth structure at Lihou, which appears to have been reworked, may have focused reoccupation upon that specific location.

Sea level rise

However in order to fully understand the nature of the Mesolithic occupation of the Channel Island, a knowledge of the form and pace of topographic change associated with sea level rise is essential. In the remainder of this paper we attempt to correlate the archaeological evidence with a new model for sea level rise in the region. However it must be noted that attempting to map the successive positions of the coastline is fraught with difficulties for the following reasons:

1. A local sea level curve for the Channel Islands does not currently exist (Sebire and Renouf 2010) and therefore regional sea level curves (e.g. Lambeck 1997, 2014) have to be used which may be only partially applicable to the study area.
2. An understanding of tidal regimes is required and tidal ranges are difficult to construct for the past; indeed the amplitude of the tidal regime currently varies within the area of the Channel Islands, increasing from 10m around Guernsey to 13m at the head of the Normanno-Breton Gulf (Sebire and Renouf, 2010).
3. The available bathymetry of the sea bed is probably only a crude approximation of the actual seabed topography (certainly at a scale of mapping that may be relevant to reconstructing past coastal geographies).
4. The available bathymetry does not necessarily reflect the topography of the pre-inundation landsurface; subsequent patterns of erosion and deposition will have modified the topographic template.

For these reasons, attempts to model in detail the history of coastal inundation and the transgression of the shore zone in a landwards direction is complex and potentially unreliable without detailed bathymetric survey, sub-bottom seismic profiling and ground truthing using coring devices to return samples from beneath the sea floor for analysis and dating.

Three recent models address sea-level change in the Channel Islands: Sebire and Renouf's (2010) model, focused on Guernsey, has produced a series of reconstructions attempting to pinpoint the timing at which the Channel Islands landmass was successively transformed into the series of islands we know today. A factor to be taken into account that has been ignored in Sebire and Renouf's model is the impact of erosion and deposition on/into the topographic template that was flooded. Similar modelling, based on bathymetry and regional sea-level curve models, have been used by Marchand (2013) to investigate the consequences of sea-level rise primarily along the southern coast of Brittany, but also incorporating the Channel Islands. Finally, a new regional model of sea-level rise across Britain and Northern France, that draws upon a new glacial-isostatic adjustment model (Bradley et al. 2011) and incorporates a variety of different data-sources, has been produced by Sturt and colleagues (2013). This model also however relies primarily on bathymetric data for the Channel Islands.

These methods of reconstruction are similar to ours and where discrepancies occur these may be due to inconsistencies between the base mapping data (i.e. sea bed bathymetry). Marchand suggests, for example, an earlier severing of Jersey from the continent (during the second half of the middle Mesolithic) from that of Sturt and colleagues (at the start of the Neolithic). Such imprecision is to be expected without more in-depths work on local sea-level rise.

We present here a model specifically focused on the Channel Islands. The sea-level curve used is provided by Lambeck et al. (2014). The bathymetric model comes from the latest combined data sets produced by the European Marine Observation and Data Network (EMODnet - <http://www.emodnet.eu/bathymetry>). This is a combination of different data at different resolutions as provided by the partner countries (EU Nations) combined with the GEBCO 2014 (General Bathymetric Chart of the Oceans) digital bathymetry. GEBCO operates under the joint auspices of the Intergovernmental Oceanographic Commission of UNESCO. As tidal range is unknown, the images presented (figures 27 to 30) show both msl and the modern tidal range (taken as 12m). This model suggests the following:

1. At -52 (9000BC), at the beginning of the early Mesolithic, coastal geography consists of a largely open coastline with Guernsey and Alderney representing major peninsulas (figure 27).
2. At -40m (8000BC), corresponding with the early part of the Middle Mesolithic, both Guernsey and Alderney are islands, at least inter-tidally. Guernsey is a relatively large island (Greater Guernsey), also incorporating Herm and Jethou,

though Sark is becoming a separate island. Jersey has developed into a major peninsula to the south of a large estuary (figure 28).

3. At -30m (7300BC) in the later part of the Middle Mesolithic, the coastline is now one of embayed features. A large lagoonal feature has developed to the east of Jersey (figure 29).
4. The period 7000-6000BC saw dramatic sea level rise, leading to the insularisation of Jersey and the breakup of the larger island of Greater Guernsey. At -4m (5500BC), corresponding to the late/final Mesolithic, Jersey has become an island. With the tidal range now likely to be similar to the present, at least towards the end of this period, the insularisation of Jersey is likely to have been a long process, the area becoming an intertidal island from some time before 6000BC, and finally completely severed around 500 hundred years later (figure 30).

This model of sea level rise indicates a complex relationship between insularisation and Mesolithic demography. In Guernsey and Alderney, which became islands relatively early in the Holocene, Mesolithic occupation took place after insularisation; by contrast Jersey witnessed most Mesolithic occupation whilst it was a peninsula of northern France. In the following section we discuss the shifting focus of occupation of the Channel Islands in relation to our model.

Discussion: The Mesolithic occupation of the Channel Islands

Late Pleistocene/early Holocene (figure 27)

In general the area does not seem to have been highly attractive to human populations during the later Palaeolithic and earliest Mesolithic. Occupation of the Channel Islands at the end of the Pleistocene is attested only by the Magdalenian sites of Les Varines, Jersey (Blinkhorn et al. in prep) and Crevichon Landing, between Crevichon and Jethou, and by material from the Royal Hotel, St Peter Port, Guernsey (Sebire 2011). The latter, represented by three fine partially backed bladelets, approaching Blanchere points, is similar to projectiles from Auvours, Sarthe (Allard 2013) which is considered to belong to the *industries à pointes à dos rectiligne* (Marchand 2008) and is likely to indicate occupation of the area around the Pleistocene/Holocene transition. The occupation of the Royal Hotel probably took place when

the shrinking of the Plain was becoming increasingly obvious in that area and Guernsey had become a peninsula (figure 27).

Mesolithic sites, by contrast, appear relatively common in the Channel Islands, particularly in Jersey (table 9). This is probably partly a function of the larger size of this island, but also the efforts of Brian Phillipps, who has discovered a large number of sites in recent years. However some periods of the Mesolithic are better represented than others. Early Mesolithic sites currently appear rare or absent on the islands. The only true Early Mesolithic site may be at l'Etacquerel in Jersey, however the number of microliths recovered are too few to assign a definite attribution. It is worth noting that obliquely blunted points appear more common on Channel Island Mesolithic sites than on the Cotentin. This may be a regional characteristic, but could also point to the presence of a component of Early Mesolithic material within predominantly Middle Mesolithic collections. The paucity, or even absence, of Early Mesolithic sites is echoed on the Cotentin peninsula (Ghesquière 2010).

Middle Mesolithic (figures 28 and 29)

During the Middle Mesolithic the area changed dramatically: Guernsey and Alderney became islands, and Jersey a peninsula. However, in contrast to the early Mesolithic, Middle Mesolithic sites are common across the region, both on the various Channel Islands and the Cotentin Peninsula. It appears the broader area was attractive to settlers in the Middle Mesolithic; the dynamism of these rapidly changing landscapes does not seem to have been a barrier to occupation, but may have in fact encouraged it. Mesolithic occupation spanned a range of different environments, but focused mainly on peninsulas and islands, landscapes that were produced and continually reproduced by sea-level rise. This may suggest a range of marine adaptations was in place by this time, though the focus of many sites of this date, with views over the coastal plain, suggests the monitoring of the movements of terrestrial animals was also important.

The range of microliths recovered suggests occupation of the islands during both the early (figure 28) and late (figure 29) parts of the Middle Mesolithic period. Canal du Squez probably has the earliest occupation, with large quantities of obliquely blunted points, segments and a small number of basally modified pieces. Such sites in northern France date between 8400 and 7600BC (Ducrocq et al. 2008). Also present though are small quantities of scalene triangles

and narrow backed bladelets, indicating smaller scale later Middle Mesolithic occupation of the site. Most of the assemblage from Grosnez racecourse is likely to be of a similar date, consisting of obliquely blunted points, partially backed bladelets and basally modified pieces. C atel de Rozel may also belong with this group, having yielded a basally modified piece and a possible broken segment. These sites would have been on high ground with views across an extensive plain, crossed by a major river, and with views towards the sea to the northwest. In Guernsey the small assemblages of la Corbi ere and Creve Coeur probably belong to the first half of the Boreal, being characterised by obliquely blunted points, partially backed points and occasional narrow backed bladelets. These sites were occupied when both Guernsey and Alderney had become islands, at least intertidally (figure 28). Mannez/Pourciaux on Alderney, which has a broadly Middle Mesolithic occupation is included on both figures 29 and 29.

Four additional sites appear to date to the second half of the Boreal (figure 29), the largest of these is Lihou GU582, dating to 7497-7192BC (8310±39BP, OxA-15198). Lihou is characterised by obliquely blunted points, basally modified pieces, scalene triangles and truncated backed bladelets. Bruno's site, Corbi ere, Les Marionneux and le Col de la Rocque in Jersey probably also date to this period. Both sites are characterised by a dominance of scalene triangles and obliquely blunted points. A notable feature of the Lihou assemblage is the expedient nature of the technological schema, with a lack of crestring and preparation in comparison to other sites such as Canal du Squez. This may be a chronological feature; however the two Jersey sites do not provide sufficient evidence to confirm this. Both of these are surface collections containing quantities of later prehistoric material. It is thus difficult to determine whether expedient technology belongs with the Mesolithic or later prehistoric component.

The Middle Mesolithic occupation of Guernsey occurred while it was the relatively large island of Greater Guernsey, which consisted of Guernsey, Herm and Jethou. The varied resources likely to be present on land of this size suggests that the island was more than a simple stopping off place for fishing expeditions. This is supported by the evidence from Lihou, where the lithic assemblage suggests a varied set of activities took place, and lithic densities and structural evidence potentially suggests long stays. The reliance on poor quality local material at the site and expedient knapping strategies could also be interpreted as an effect of insularisation.

Jersey witnessed considerable occupation throughout the Middle Mesolithic; however in contrast to Guernsey and Alderney, this occurred when Jersey was part of mainland Europe. In

the Middle Mesolithic Jersey was a peninsula, jutting into the Normanno-Breton Gulf, and it may have been this topographical configuration which made it an area of repeated occupation, as also occurred on the Cotentin peninsula at the same time (Ghesquière et al 2000). Numbers and locations of sites are similar throughout the middle Mesolithic, with sites on high ground, overlooking a shrinking coastal plain below.

Currently there is no evidence for occupation of the Channel Islands in the 7th millennium BC. In this period east of the Seine assemblages with *feuilles de gui* are present; the nature of microlith types to the west, prior to the arrival of trapezes is uncertain. Ghesquière (2012) has suggested that points with semi-invasive inverse retouch found on the Cotentin may be equivalent to *feuilles de gui*. A single example of this type has been recovered from le Col de la Rocque; however in the absence of dates from either the Cotentin or the Channel Islands, this must currently remain speculation.

It is worth noting that during this period there was significant change in the configuration of 'Greater Guernsey', which was reduced in size significantly between 7000 and 6000BC, with Herm/Jethou finally cut off from Guernsey just before 6000BC. There is currently little evidence for Final Mesolithic occupation on Guernsey and it is possible that the forms of residential mobility that were practiced during the Middle Mesolithic were not possible when the island became smaller, perhaps because populations of large herbivores became too vulnerable to over-exploitation. However we also need to consider the effects of the perception of the inundation of land, which could have caused loss of faith in the occupation of the area (see Leary 2009 and Wenninger et al. 2008 for further examples of this phenomenon). Sturt et al. (2013) suggest that the inundation of Greater Guernsey was of sufficient rapidity to be perceptible at the level of inter-generational cultural memory. It may be that this change was simply too dramatic and led to the abandonment of the Guernsey area.

Final Mesolithic (figure 30)

Final Mesolithic sites, which appear from c6200BC, are present on the islands, but are rarer than Middle Mesolithic assemblages. Such sites are only known from Grosnez Hurel/Racecourse in Jersey and l'Emauve in Alderney, both characterised by mainly asymmetric trapezes. The assemblage from Grosnez Hurel/Racecourse is of mixed date and Final Mesolithic technological characteristics are difficult to isolate. However there is a marked difference in technology used at l'Emauve: here larger and more regular blade blanks were produced, consistent with late Mesolithic *montbani* style debitage. Late/Final Mesolithic

occupation is probably absent from Guernsey, with the possible exception of a single trapeze from the Royal Hotel and a microlith from Fort Pembroke.

The Final Mesolithic occupation of Jersey took place after it had become an island – or at least an intertidal island - and indicates that, while settlement appears to have diminished after insularisation, it did not cease. Later Mesolithic evidence in Jersey is relatively ephemeral, perhaps suggesting rather small-scale occupation of the island. It may have served as a stop off point on sea journeys and fishing trips. The Final Mesolithic site of l’Emauve in Alderney is rather more substantial, and suggests a different type of occupation. Alderney is the island nearest to France and it may be that l’Emauve and sites on the French coast played a complimentary role in a single system of mobility, as Marchand (2013) has argued for the islands off the west coast of Brittany (though it should be noted that the crossing between Alderney and the Cotentin is currently particularly treacherous). The decrease in occupation of the Channel Islands during the Final Mesolithic makes an interesting contrast with the various islands off the coast of Brittany, where there appears to have been limited middle Mesolithic occupation, but a substantial increase in Final Mesolithic sites, including the shell midden cemetery of Hoëdic and the densely occupied site of Bordelann on Belle-île (Marchand 2013). Marchand (pers.comm.) has noted the similarity of the trapezes from l’Emauve with those from Teviec, perhaps suggesting far-flung maritime mobility. In this region a maritime culture appears to have flourished, though population focus seems to have shifted over time from the Channel Islands and Normandy in the Middle Mesolithic to Brittany and its islands in the Final Mesolithic, perhaps as a result of the new configurations of the landscape that sea-level produced.

Maritime Connections

Sea-faring has been recognised as a notable characteristic of Mesolithic life across Europe (eg. Warren 2005, Bjerk 2009, Garrow and Sturt 2011, Anderson-Whymark et al. 2015). In Northwest Europe, the colonisation of Ireland and the Isle of Man in the 8th millennium BC, the consistent presence of Mesolithic material along the Hebridean archipelago and the shell midden cemetery of Hoëdic, have all been taken to reflect the ability to undertake often dangerous sea-crossings on a regular basis. To this list can be added Middle and Late

Mesolithic sea crossings to the Channel Islands. The evidence from this region, based on considerable similarity of Middle Mesolithic microlith types, suggests strong connections between the islands and the Cotentin Peninsula in particular. The presence of a couple of Breton Bertheaume type microliths at Lihou may also suggest occasional journeys between Guernsey and Brittany. In the Final Mesolithic, longer distance connections appear to have pertained, with similarities between trapezes at the Alderney site of l'Emauve and those from the island of Teviec. Such patterns are reinforced by the finds of asymmetric trapezes *à base décalée* from Old Quay, St Martin's, Isles of Scilly (Anderson-Whymark et al. 2015), which bear greatest similarities to those from the east of the Seine. We can perhaps imagine large-scale Final Mesolithic journeying, with east-west journeys along the Channel taking place with some regularity (Marchand 2015).

The broader question remains as to the extent of north-south journeys at this time, and the relationship between the Middle and Final Mesolithic of Northern France and the Channel Islands with the British Isles (Jacobi 1976). Was the crossing to the British Isles made after the Straits of Dover were breached? Similarities in microlith forms, after all, continue after the breaching of the Straits of Dover: Basally modified pieces, for example, are present in northern France, but also in southern Britain, in the form of the Horsham assemblages of southeast England and the Honey Hill type industries of the Midlands. Ghesquière (2012) has suggested the presence of Horsham points in northern France shows the cultural unity of the Channel region in the first half of the Boreal. These types are rare however in France, amongst an extremely variable range of basally modified types. He also suggests that similarities between Honey Hill type microliths and certain basally modified pieces from the Cotentin (also present in Jersey) may indicate seafaring and contact between Britain and Normandy in the second half of the Boreal. Currently however we need to be cautious. Horsham and Honey Hill types are under-researched. In particular Ghesquière's suggestion of cultural connections between Honey Hill and Normandy in the second part of the Boreal is difficult to substantiate, given the likely date of Honey Hill industries in the first half of the Boreal and their predominant distribution in the Midlands and East Anglia. Further typological comparison – and dating - is needed. However both the evidence presented in this paper and a number of recent finds (Anderson-Whymark et al. 2015, Larson 2015) indicate that we should no longer see insularisation as a barrier to movement; in fact, we should perhaps expect the reverse.

Conclusions

In general it is assumed that sea-level rise resulted in loss and devastation for Mesolithic people. In some areas this is likely to have been true, as ancestral lands were inundated, but in other areas these changes created opportunities. The Channel Islands were an area of the Normanno-Breton Plain that saw relatively little occupation during the late Upper Palaeolithic and early Mesolithic. Changes in the topography and resources of the area however created many opportunities that Middle Mesolithic people took up, most likely in the context of a mixed economy that incorporated increasing quantities of marine resources.

During both the Middle and Late Mesolithic relict sea cliffs were favoured areas for the location of sites. These permitted views over and access down to (via adjacent river valleys) a narrow coastal plain, and to the sea beyond. Both mainland peninsulas and islands were repeatedly reoccupied, and the presence of similar types of sites on both the peninsulas and islands suggests they were often used in similar ways. Greater Guernsey is likely to have been large enough to allow both terrestrial prey and marine resources to be exploited during the Middle Mesolithic, in a similar way to the peninsulas of the mainland. Alderney may have been a convenient stopping off point for groups used to making sea voyages during both the Middle and Late Mesolithic, and may also have been attractive for its superior flint sources. While occupation of Jersey and Guernsey decreased in the Final Mesolithic, occasional visits were still made to Jersey, while Alderney and various islands off the coast of Brittany became more of a focus of occupation.

The evidence from the Channel Islands indicates that the Middle Mesolithic saw a new focus on maritime lifeways, as sea-level rise (that would have been at its most rapid at this time) created opportunities for maritime travel and access to a greater quantity of marine resources. The focus of Mesolithic sites towards the sea indicates its importance for Middle Mesolithic groups, a feature more usually associated with the Final Mesolithic of the region (Marchand 2013). These seafaring lifeways, initiated in the Middle Mesolithic, appear to have paved the way for fully marine-focused, complex coastal groups in the late Mesolithic of the region (Schulting 1996, Marchand 2013).

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