

SKYLLIS

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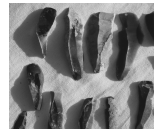
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The wrecks and artifacts discovered in the excavations indicate that the harbor began gathering silt at its western end soon after the mole was constructed to form the harbor basin. In time, as the silting progressed eastward and sth



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Titelmotiv

Large rectangular mortises along the upper edge of the wale and mortise-and-tenon assemblage without peg between the wale and the previous strake.

Aus: Marie-Pierre Jézégou - Patrick Andersch Goodfellow - Jonathan Letuppe - Corinne Sanchez, Underwater Construction and Maintenance, Abb. 7.

Vorwort

Bei der Öffnung der Sendung wird man bei aufmerksamer Betrachtung dieses Heftes bemerkt haben, dass sich der Untertitel verändert hat. Statt "Zeitschrift für Unterwasserarchäologie" lautet er jetzt "Zeitschrift für maritime und limnische Archäologie und Kulturgeschichte". Das hat gute Gründe. Allzu oft wird - auch in archäologischen Fachkreisen - Unterwasserarchäologie immer noch lediglich als Hilfstechne zur Dokumentation und Bergung unter Wasser geratener Objekte angesehen. Blättert man aber die wachsende Zahl ausländischer Zeitschriften und Periodika durch, zeigt sich sogleich, dass das internationale Verständnis sich erheblich erweitert hat, auch wenn in den Titeln der Publikationen wie auch in den Namen der herausgebenden Institutionen manchmal noch engere Begriffe wie "underwater archaeology", "archeologia subacquea" usw. vorkommen. Tatsächlich erstreckt sich heutzutage deren Arbeitsgebiet trotz notwendiger Schwerpunktbildungen prinzipiell über alle Perioden der menschlichen Entwicklung, durch alle Kulturen und über sämtliche Regionen der Erde. Dabei bilden Wasserfahrzeuge aller Art, ihre Bauweise und nautischen Eigenschaften, ihre Ladung und der durch Schifffahrt bewirkte Kulturaustausch zwar besonders wichtige Arbeitsbereiche, aber auch alle Wasserbauten wie Häfen, Befestigungen, Küstenschutz, Brücken, Seezeichen, ans Wasser gebundene Siedlungen sowie Einrichtungen für Fischfang und Jagd zu Wasser gehören dazu, d.h. alles was dem Leben des Menschen auf oder an Meeren, Seen und Flüssen dient und seiner Kultur ein besonderes Gepräge gibt. Dieses schließt die künstlerische Verarbeitung nautischer oder maritimer Themen ebenso ein wie Sitten und Gebräuche, weltliche und religiöse Vorstellungen und Begehungen, Mythen und Legenden, Arbeits- und Verhaltensweisen gewässernaher Bevölkerungen, also ethnographische, anthropologische und soziologische Aspekte und Fragestellungen - nicht anders, als in den herkömmlichen archäologischen Fächern auch!

Einem ebenso breiten Verständnis des Begriffs "Unterwasserarchäologie" ist diese Zeitschrift seit dem ersten Heft verpflichtet. Die Erfahrung hat aber inzwischen gelehrt, dass eine solche Einstellung auch nach außen deutlich gemacht werden muss. Mit "maritim" und "limnisch" soll auf Meer und Binnengewässer hingewiesen werden, "Archäologie" bleibt als zentraler Begriff erhalten, erfährt aber durch "Kulturgeschichte" eine wesentliche Erweiterung im oben beschriebenen umfassenden Sinne und unterstreicht, dass die Arbeit keinesfalls mit dem Auftauchen des Forschers aus dem Wasser beendet ist oder sich gar von nicht archäologisch geschulten Tauchern erledigen lasse.

Langjährigen SKYLLIS-Lesern ist das alles vertraut. Neue Abonnenten, die immer herzlich willkommen sind, können sich gleich in diesem Heft von der thematischen Breite der Beiträge überzeugen, von denen die ersten zehn aus der Jubiläumstagung "In Poseidons Reich XX" hervorgegangen sind, die die DEGUWA im Jahre 2015 dank der Gastfreundschaft und Unterstützung des Germanischen Nationalmuseums in dessen Räumen abhalten konnten.

Der Bogen ist zeitlich von der Eiszeit bis in die frühe Neuzeit gespannt. Garry Momber und Sara Rich folgen den unter Wasser geratenen Spuren des Menschen während seiner Landnahme im damals trockenen Nordseegebiet und Laura Sanna berichtet über neue Forschungen in der größten, schon lange für ihre prähistorischen Funde verschiedener Epochen bekannten Karsthöhle der ligurischen Küste. Alexander Fantalkin und Oren Tal führen uns in die nahöstliche Eisenzeit und legt dar, wie es die Assyrer als typische Landmacht verstanden, das Mittelmeer und die darin mündenden Flüsse logistisch zu nutzen. Marta Bajtler eröffnet uns erstmals Einblicke in die Unterwasser-Forschungen Montenegros an dessen kurzer Adria-Küste und macht einige hellenistische

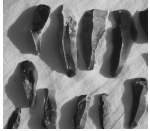
Amphoren- und andere Keramikfunde eines neueren Surveys bekannt. Wasserfahrzeuge kann man nicht nur zum Befahren von Gewässern benutzen, sondern damit auch einen Dammbbruch schließen. Das wußten aber auch schon die alten Römer, wie Marie-Pierre Jézégou mit ihrem Team an einem spätantiken Fund aus den Sumpfgeländen von Narbonne demonstriert. Mit Shelley Wachsmanns Beitrag gelangen wir abermals in den Orient: wir begleiten ihn auf der Suche nach dem einstigen Hafen von Jaffa. Massimo Capulli führt anhand einer kleinen Insel die Beziehung zwischen Mensch und Lagunen-Umwelt bei Venedig vor. Gleich zwei Beiträge, nämlich die von Ana Crespo-Solana sowie von Koldo Trápaga Monchet und António Rocha Santos, beschäftigen sich mit der staatlichen Sorge um Schiffbauholz auf der Iberischen Halbinsel in der frühen Neuzeit. Vesna Zmaić Kralj schließlich macht dem Tagungsort Nürnberg ein besonderes Geschenk, indem sie eine bedeutende Fundgruppe von Kostbarkeiten nürnbergischen Kunsthandwerks des beginnenden 17. Jhs. aus einem leider schon weitgehend geplünderten Wrack vor der kroatischen Küste bekanntmacht. Soweit die aus der Tagung in Nürnberg hervorgegangenen Beiträge - weitere folgen im nächsten Heft.

Die drei letzten Artikel sind unabhängig von DEGUWA-Tagungen eingesandt worden. Vladimir R. Chepelev schildert uns - gewissermaßen als Fortsetzung seiner früheren Berichte - das Schicksal weiterer Zarenboote, diesmal vom Alten und Neuen Ladoga-Kanal. Buche und Esche als Schiffbauhölzer sind schließlich die Gegenstände zweier Beiträge von Nili Liphshitz, die sich ebenfalls einer ganzen Serie ähnlicher Studien anschließen. So hofft die Redaktion, den Leserinnen und Lesern abermals eine recht bunte Palette an Themen bieten zu können.

Die Redaktion
Juni 2016

Postglacial human dispersal across the north-west European landscape

Garry Momber – Sara Rich



Abstract – This paper examines some of the evidence of human movement in the lands adjacent to the North Sea basin following the Last Glacial Maximum. Specifically, it identifies the potential for preservation and survival of archaeological material underwater by reviewing examples from coastal sites that have become exposed due to coastal change, and it will assess recent evidence from submerged sites in the southern North Sea and English Channel. It shows how these site types hold sources of data that can provide new information on human dispersal and adaptation. These include palaeo-environmental, sedimentological, sedaDNA as well as organic and inorganic archaeological material.

Inhalt – Dieser Beitrag untersucht einige Zeugnisse menschlicher Wanderbewegungen in den an die Nordsee grenzenden Gebieten nach dem letzten glazialen Maximum. Insbesondere klärt er die Möglichkeiten der Erhaltung und des Fortbestehens archäologischen Materials unter Wasser mittels Durchsicht von Beispielen von Küstenfundplätzen, die durch Küstenveränderungen freigelegt wurden, und würdigt neue Erkenntnisse aus überfluteten Plätzen der südlichen Nordsee und des Englischen Kanals. Er zeigt, wie diese Typen von Fundstellen neue Informationen zur menschlichen Ausbreitung und Anpassung liefern können. Diese umfassen altumweltliche, sedimentologische und sedaDNA-Befunde sowie organisches und anorganisches archäologisches Material.

1. Introduction

The Last Glacial Maximum (LGM), or Devensian, was the coldest phase of the Pleistocene glacial period. It resulted in a sea level drop of over 120 m when it reached its peak about 22,000 years ago (Lambeck – Chappell 2001; Hubbard et al. 2009; Lambeck 1995; Shennan et al. 2000; Bailey 2011). The exposed continental shelf formed a corridor of land from Spain to Scandinavia. At the height of the LGM, ice sheets reached into northern Germany and deep

into southern Britain making

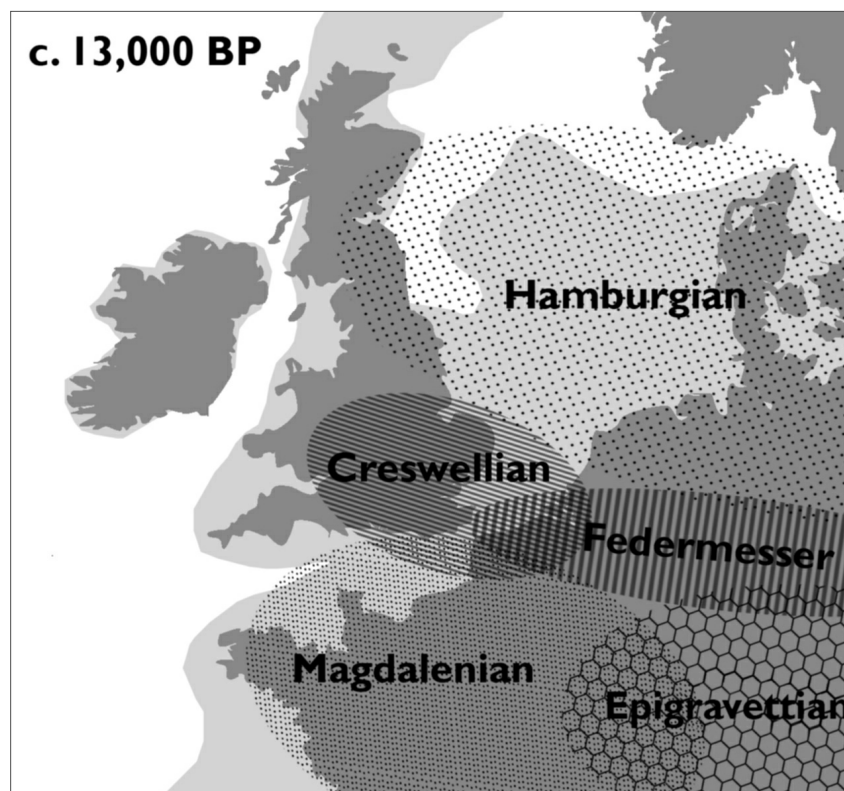


Fig. 1: Cultural distribution across northwest Europe towards the end of the relatively warm Windermere or Bølling/Allerød interstadial. The light grey area represents dry land at this time. It can be seen that large portions of the Two Seas area were accessible for human occupation.

human occupation of northern Europe untenable.

occupation occurred during a warmer period, but these warm phases

As the climatic setting began to improve ca. 16,000 years ago, pioneering groups of Magdalenian hunter gatherers moved towards northern France and into the southern North Sea region. The earliest evidence that the North Sea Basin was crossed comes from Kents Cavern in southern Britain where human remains have been dated to 14,275 ± 120 BP (Jacobi – Higham 2011; Miller 2012, 211). This oc-

were interrupted by colder ones, during which human populations retreated. However, the overall trend was one of amelioration, and people were quick to return when conditions allowed. The quick returns indicate that they did not go far, unlike the long distances travelled during the harshest climatic conditions of the Devensian, and with each reoccupation came modifications in cultural characteristics.

2. Human movement across the North Sea

The first cultural variant of the Magdalenian arrived a little after 14,000 cal BP. These were the Hamburgian people, and they ranged from northern France, the Netherlands, northern Germany, Poland, and west as far as Scotland (Audouze – Enloe 1991; Ballin et al. 2010; Rensink 1995; Street 1998). A thousand years later, additional groups included the Federmesser, the Creswellian and the Azilian (Barton et al. 2003; Jacobi 1991; Bodu – Mevel 2008) (Fig. 1).

The Federmesser culture spanned the North European Plain, ranging from the Ukraine to Britain. They consumed a varied spectrum of foodstuffs and have been recorded at short-lived dwelling places located adjacent to rivers and lakes. The archaeological evidence indicates high mobility and seasonal resource exploitation (Baales 2004; Crombé et al. 2003; 2013; Peeters – Momber 2014). The site complexes of the Paris Basin and western Belgium have technologies in common suggesting there were links between the two although they are several hundred kilometres apart (De Bie – Van Gils 2009; Miller 2012, 220). Marine shells from the Bois Laiterie in Belgium provides evidence of human activity on the lands now lost below the Two Seas to the west. At the time, sea levels were around 50-60 m lower than today, putting the coastline hundreds of kilometres away and exposing land that would have presented ideal lowland fluvial conditions for hunting and gathering. The archaeological assemblages

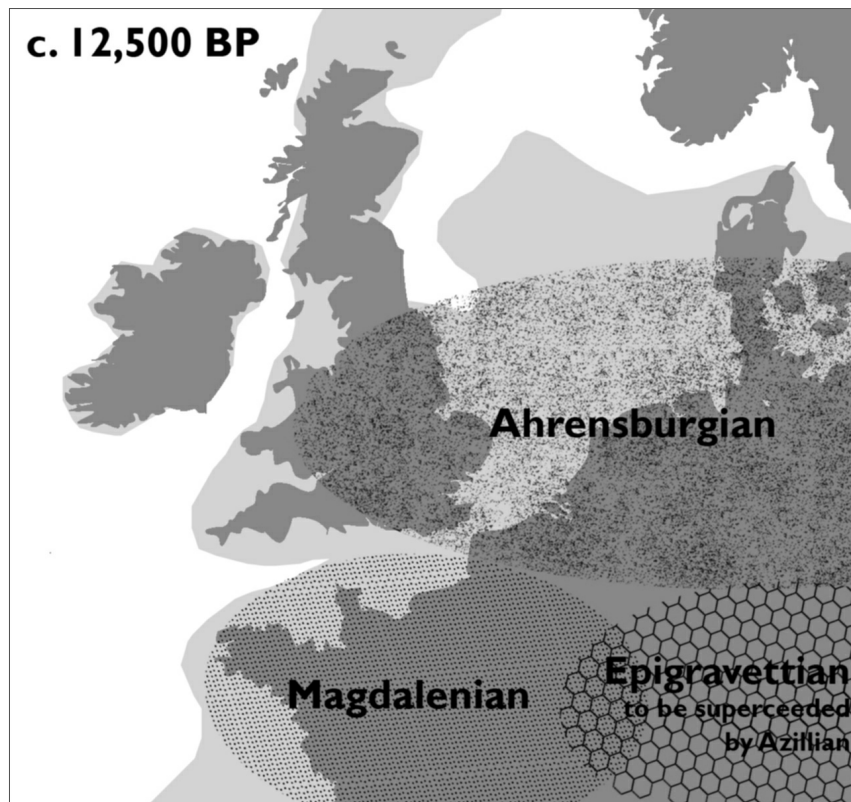


Fig. 2: Immediately prior to the Younger Dryas cold phase, the Ahrensburgian culture dominated the lands across the northwest European loess belt and into the UK. During this period it is possible that the Two Seas area offered an exploitable refuge when the higher land was frozen and depleted of running water.

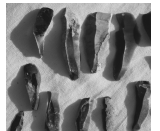
with exotic artefacts show there were either large territories or extensive social networks.

The Creswellian technologies form a cultural techno-complex that appears to be geographically centred in the drowned lands of the North Sea (Peeters – Momber 2014). The name is derived from the caves of Creswell Crags in north-east England, but the technology has been identified further south in England, in the Netherlands and Belgium (Jacobi 1991; Barton et al. 2003). The Azilian culture, like the Creswellian, is believed to be a derivation of the late Magdalenian. It emanated from the Basque region and is found in the foothills of the Alps and in the Paris Basin, where it persisted until the end of the Pleistocene.

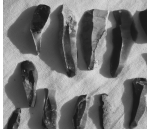
Around 13,000 years ago there was a further short-lived cool period that brought permafrost south once more. This resulted in the freezing of drainage systems with the drying of rivers and lakes. Evidence from the Moervaart pa-

laeolake Federmesser sites in Belgium, where populations abandoned their favoured areas during the coldest phases, shows how climate had a direct impact on some hunter gatherer communities (Crombé et al. 2013). As the cold took away the water and the ecosystem that relied on it, people were forced to move further south or perhaps towards the permafrost-free areas in the lowlands of the North Sea Basin.

The Windermere ended with a short final warm phase before being terminated by the particularly cold Younger Dryas stadial. The downturn in climate heralded extensive changes in subsistence strategies as forested areas in the north were replaced with steppe and tundra, and exploitation patterns were adapted to meet the new challenges. As the forests retreated and the land opened up, large herds of reindeer were able to move across the North European Plain. The herds were followed by the Ahrensburgian, a culture that ranged from north-east France to northern Ger-



many and across the North Sea in Britain, where their culture (Fig. 2) is known as the 'long-blade' tradition (Barton 1998). These hunter gatherers preferred the river valleys and lakes of mature river systems, patterns of subsistence that were favoured by the Early Mesolithic (Baales 2004).



In the closing stages of the Upper Palaeolithic and into the Early Mesolithic, reindeer were a primary source of food. Although migration routes into the North Sea basin remain speculative (Ban-Anderson 2003), controlling factors that dictated the movement of large mammals would have been access across open land and nutrient rich vegetation upon which to graze. Large mammals need mineral rich soils to aid growth and health. Alluvial soils, as would have been found in flood plains, can be particularly attractive as they contain concentrations of calcium that is essential for healthy bone development. Before the North Sea Basin flooded it would have provided appropriate conditions that were suitable for reindeer migrations and the establishment of set routes would have allowed human hunters to set up camps at the most advantageous hunting locations. As the Ice Age drew to a close, the aeolian dune systems that formed across the flood plains of the southern North Sea area would have offered ideal elevated vantage points for the Upper Palaeolithic and early Mesolithic groups.

As the sea level rose, rivers turned into estuaries then finally open sea. This forced people to adapt and adopt different subsistence strategies as the process interrupted the migration route for the large herds of mammals, which disappeared as a primary resource. During this transition, the aeolian dune systems continued to act as important focal points for human activity where they formed riverbanks or islands in deltaic systems. This was the case for a site in the Rhine/Messe palaeo-estuary system that is now 20 m below sea level. The site was associated with the palaeo-deltaic

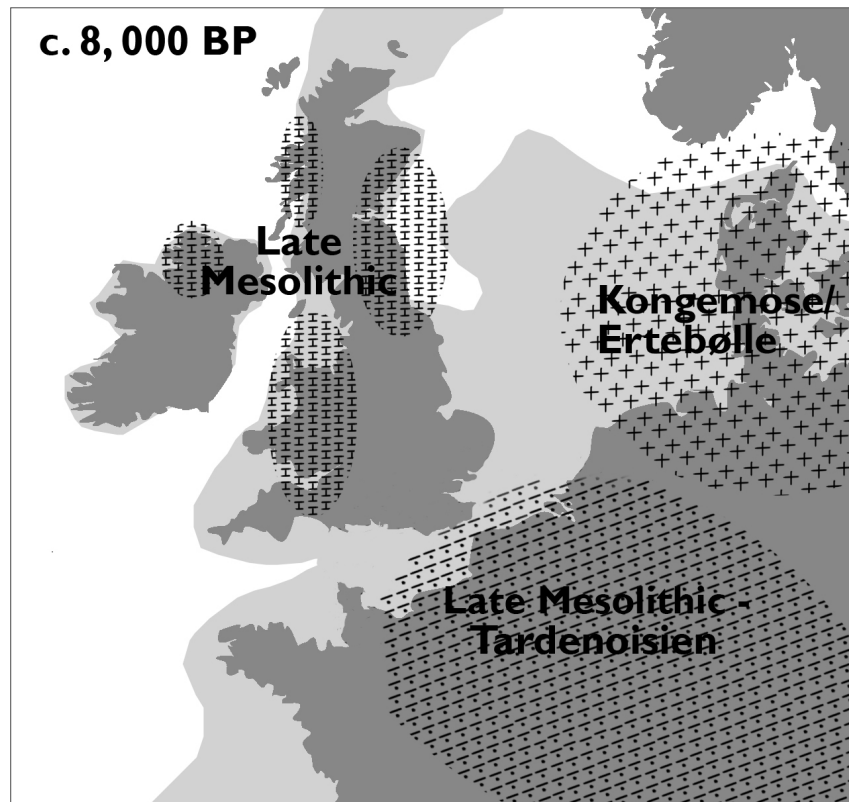


Fig. 3: By 8,000 BP, the area of dry land between Great Britain and the continent was reducing quickly. Until this time, common technological traits are seen across the North Sea area.

dune system and was located during the construction of the Yangtze Harbour, Rotterdam. Archaeological material recovered shows how Mesolithic communities modified subsistence strategies to exploit the resources of the encroaching estuary systems. As the water blocked the movement of herding animals, people became more dependent on plants, tubers, nuts and small mammals rather than reindeer (Moree – Sier 2015, 287-317). Meanwhile, the obstructive waterways became arteries rather than barriers, providing access into the hinterland and out to the coast.

3. The arrival of the Mesolithic and the loss of a landscape

The sharp rise in temperature around 11,450 cal BP that marked the beginning of the Holocene also saw the arrival of the Mesolithic (Alley – Clark 1999; Alley 2000; Alley et al. 2010). The first Mesolithic culture to have a presence on both sides of the North Sea basin

was the Maglemosian (Bang-Anderson 2003; Clark 1936; David 2009). This culture ranged from Scotland to Poland, and their arrival signalled an ongoing influx of human migrants. These people could now live in the open and were not so dependent on caves for shelter (Clarke 1954; Conneller 2009; Leakey 1951; Reynier 2000). The well watered plains that have since been flooded by the North Sea provided living space and formed a springboard to Britain: a fact that is validated by discoveries of large Early Mesolithic and early Late Mesolithic structures on the eastern side of Great Britain (Conneller et al. 2012; Suddaby 2007; Waddington 2007).

The large huts found on the British mainland during the early stages of the Mesolithic are not dissimilar to their contemporary sites in continental Europe. However, unlike their British counterparts, these sizable structures continue to be used throughout the Later Mesolithic, particularly by the Kongemose and the Ertebølle (Pederson

et al 1997; Grøn 2003; Fischer 2004; Skarrup – Grøn 2004; Jenson 2009). The structures express a cultural link that would have extended across the North Sea basin, so it is probable that comparable sites existed in between (Fig. 3). Locating and investigating such sites, however, has been and is problematic as their footprint on the seabed is hard to detect. In addition, an assumption that most artefacts would have been lost to erosion has repressed enthusiasm to look for them. Even so, the archaeological and geomorphological evidence along the coastline infers a high potential for the existence of such sites.

Additional evidence from the north-east coast of England can be found at the mouth of the River Tees and the beaches around Hartlepool, where there are sequences of intertidal forests dating back over 5,000 years. At Withenssea, to the south in Yorkshire, an exposed prehistoric landscape of tree stumps became known as Noah's Woods following its discovery in 1839, and an intertidal forest running for about 20 km between Grimsby and Skegness was recorded even earlier in the eighteenth century (Hazel 2008;). These exposures have revealed artefacts as well as ecofacts. Mesolithic flint scatters and organic remains within the relict landscapes include an Upper Palaeolithic barbed bone point and a Mesolithic barbed antler harpoon from below the water at Hornsea, in the Tees estuary and another found close to the low tide mark at Barmston (Brigham et al 2008). There have also been midden deposits and a worked red deer antler from the Tees Estuary dated to 8700 ± 180 cal BP (BM-80) (Waughman et al 2005, 8; Tolan-Smith 2008; Bonsall 1984; Mellars 1970), while there are a wealth of Mesolithic artefacts in and adjacent to the low-lying east coast ria estuaries from the Humber to the Thames (Wilkinson – Murphy 1995; Bridges 1998; Wymer – Robins 1994, Robertson et al 2005). On the east side of the North Sea,

within the aforementioned Rhine/Meuse estuarine complex, the development of marine conditions through the Holocene has been tracked by analysing geotechnical cores (Peeters 2007). Interpretation of this buried landscape aided the discovery of the Yangtze Harbour Mesolithic sites (Vos et al. 2010).

Preservation is facilitated by marine inundation into sheltered tidal inlets as rising sea levels force the water table upwards to form anaerobic peat bogs, mires and sedimentary sinks. The process is progressive resulting in extensive deposits protected within networks of palaeo-channels. The majority of finds come from channels in the intertidal zone that have been formed in this way. Wherever investigations are carried out beneath coastal peat or palaeo-estuarine deposits, either well preserved environmental or prehistoric archaeological material is found (Bell 2007; Waughman et al 2005; Sheppard 1912), and many of these channels are the shoreward extent of systems that continue below water. These drowned palaeo-features have been detected by geophysical surveys in the North Sea and Channel where they remain an understudied archive of data that can contribute to our understanding of human dispersal and colonisation (Gaffney et al. 2007; Gupta et al. 2008; Tizzard 2013).

4. Insights from a drowned palaeo-landscape

Knowledge of artefacts within the submerged landscapes can be traced back over 100 years when tree remains, bone and antler implements were recovered from the sea floor by fishermen (Bailey 2011; Clark 1936; Coles 1998; Flemming 2004; Gaffney et al. 2009; Louwe Kooijmans 1971; Reid 1913). In the North Sea, one of the earliest finds was the 'Colinda point' dated to $11,740 \pm 150$ BP and found on the Leman or Ower Banks in 1931 (Godwin – Godwin 1933). Increasing numbers of worked tools and organic artefacts have also been

fished up from the Brown Bank and Eurogeul area off the Dutch coast with the advent of more intrusive bottom trawling fishing methods (Glimmerveen et al. 2004; Verhart 2004). Oyster trawlers in the British strait of the Solent have recovered hundreds of items and over 120 Palaeolithic artefacts have been sampled from aggregate extraction 'Area 240' (Momber et al 2011; Tizzard et al. 2013).

Submerged sites that currently have the greatest potential wealth, quality and quantity of archaeological material are De Stekels near Brown Bank in the southern North Sea, Maasvlakte-Europoort off the Dutch coast, and Bouldnor Cliff in the Solent (Momber 2011). More than 100 artefacts and human remains have been trawled-up from the area of De Stekels over the past two decades (Glimmerveen et al. 2004). The artefacts consist of well preserved lithics, bone and antler. The human remains comprise two lower jaws and several cranial fragments which may point to the presence of Mesolithic burials. Tools include perforated and socketed adzes along with mace heads. The good state of preservation suggests limited transport of objects since their deposition and exposure on the seafloor.

At Maasvlakte-Europoort near Rotterdam in the Netherlands, over 500 bone and antler implements, mainly harpoon points, were collected in the 1970-80s. The exceptionally high number of harpoon points from Maasvlakte-Europoort has parallels at Star Carr, Britain, and Hohen Viecheln, Germany. Investigations during the development of the Yangtze extension zone of the Rotterdam Harbour between 2005 and 2014 revealed the presence of a Mesolithic occupation site in 17-22 m of water on an intact Late Glacial to Mid Holocene sequence. In 2011, the excavation of over 300 cubic metres of sediment uncovered 46,067 plant-based ecofacts and artefacts. The occupation area was located on the side of a relict fluvial dune system that was occupied



through the Dutch Early and Middle Mesolithic (9500-8600 BP to 8600-7800BP (Moree – Sier 2015; Vos et al. 2010). The vast quantities of material have cast a light on resource exploitation and the communities' adaptability in the face of environmental changes. The identification of Wommersom quartzite and amber indicate movement or trade links had reached at least 147 km across the country (Moree – Sier 2015, 198-194). Access through the estuaries and along the seascape of this semi-marine environment would have had to be facilitated by water transport.

4.1 Bouldnor Cliff flint assemblage

Bouldnor Cliff is the other key site of the Mesolithic (Momber et al. 2011; Momber 2014). It lies 11 m below British Ordnance Datum, off the northwest coast of the Isle of Wight in Great Britain (Figs. 4-5).



Fig. 4: Garry Momber, Maritime Archaeology Trust, with flints recovered from the sea floor after eroding from the submerged 8,000 year old site of Bouldnor Cliff.

Excavations have been limited, yet the discoveries have pointed to high levels of sophistication and links with the continent. Of the retouched tools recovered and analysed, one is an obliquely blunted blade similar to the Azilian category of 'une pièce tronquée' as recorded from sites in the Paris basin (Tomalin in: Momber et al. 2011, 152). The same form of blade is also found at the Powell site at Hengistbury Head (Barton 1992, 229). By contrast, a detached cutting tip of a bifacially prepared flint axe blade was carefully formed with shallow skimming flakes. The regular blade edge has a weak S-shaped profile, and it appears that



Fig. 5: A selection of flakes and bladelets recovered from the seabed at Bouldnor Cliff.

the cross-section of the axe was a shallow regular ellipse. 'The care and symmetry displayed in this work is usually associated with Neolithic craftsmanship. The occurrence in a Mesolithic context is certainly unusual but perhaps not without Continental analogy' (Tomalin in: Momber et al. 2011, 152). Many flint picks and tranchet axes have been found in the region and dragged up from the Solent by oyster fishers. Two detached tranchet axe flakes were also found in the underwater deposits at Bouldnor Cliff. The abundance of these tools in the Solent compares favourably with sites from northern France.

4.2 Bouldnor Cliff wood assemblage

While the Bouldnor Cliff lithic assemblage suggests a range of influences from the European continent, the same can be said of the worked wood from the site. One particular piece measuring 0.94 m long and 0.41 m wide, and dated to 6240-6000 cal BC (Beta 249735), represents a fraction of a much larger timber that was converted from the trunk of a massive slow-grown oak that would have been a couple of metres in diameter and in the order of several tens of metres high (Taylor in: Momber et al. 2011). Unfortunately, recent exposure has resulted in the whole-

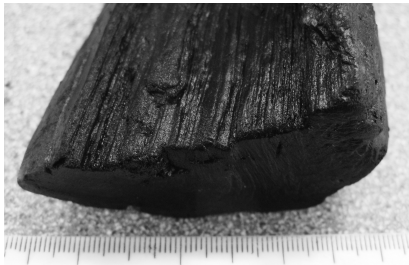


Fig. 6: Tangentially split round wood from the Bouldnor Cliff timber assemblage. Scale in centimetres.

sale loss of most of the original structure to marine erosion. The material remains, including wood chippings, charcoal, carbonized wood, stockpiles of heated flints, and fragments of string, infer a wood working site where residents were most probably constructing a log boat. If this is the case, it would be the oldest boat building site in the world. Even without a certain identification of the activities of the site, the wood working technology used to split the oak tangentially is remarkable. This is something that is not seen again in the UK until the Neolithic, when it is used in the construction of Haddenham Long barrow ca.3600 BC (Evans – Hodder 2006, 185-187).

The organic material, which includes some 50 pieces of worked wood to date, contains several examples of timbers fashioned by tangential splitting (Fig. 6). Some preserve enigmatic workings and unexplained cut marks (Fig. 7). For example, there are several long pieces (~40 cm) that are plank-like on one side and rounded on the other. Some of these were tangentially split, using a more difficult woodworking process to take advantage of the natural curvature of the original roundwood. Others, however, were radially converted, with the rounded side having been intentionally carved out from the original wedge-shape. Although more labour-intensive to fashion a rounded side from a flat one, radially converted wood tends to be stronger and more resistant to warping, a quality that may have been necessary in an increasingly wet physical environment.

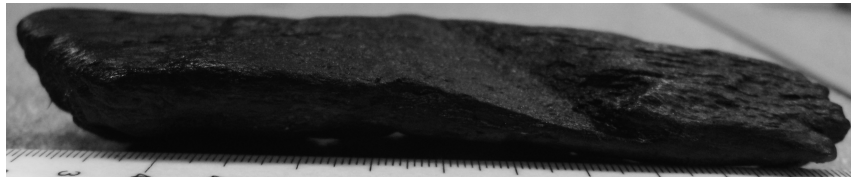


Fig. 7: Shaped timber with well defined cut marks. Scale in centimetres.

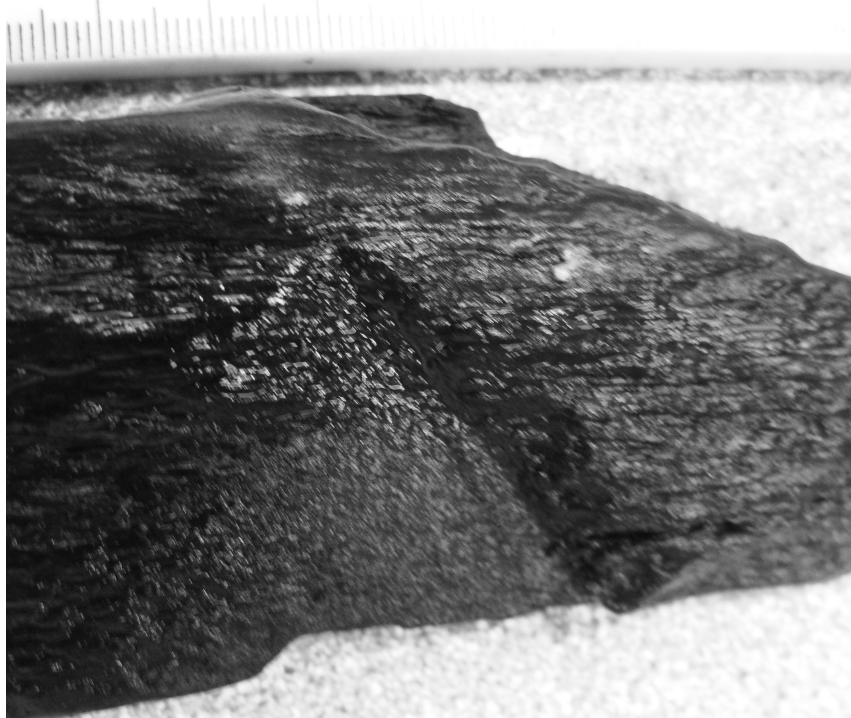


Fig. 8: Small plank with a cut across the grain showing possible wedge marks. Scale in centimetres. This is a detail of the timber shown in Figure 7.

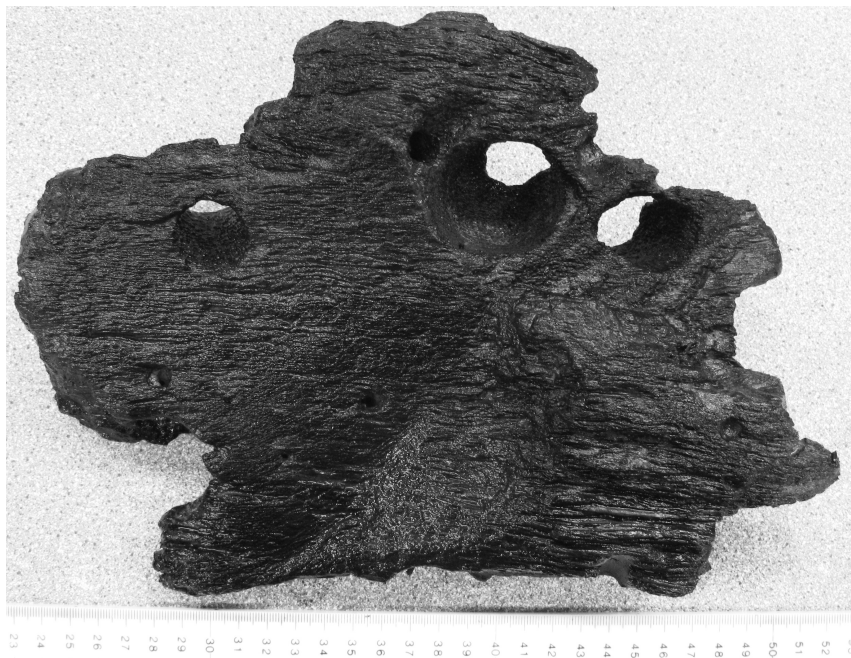


Fig. 9: Round plank that appears to have been hollowed. Scale in centimetres.

In close proximity to the tangentially split oak plank mentioned above was another plank-like piece of worked oak that preserves clear

tool marks (Fig. 7 + 8). One such mark is a cut that runs straight across the wood, and next to it is a second mark from the same tool,

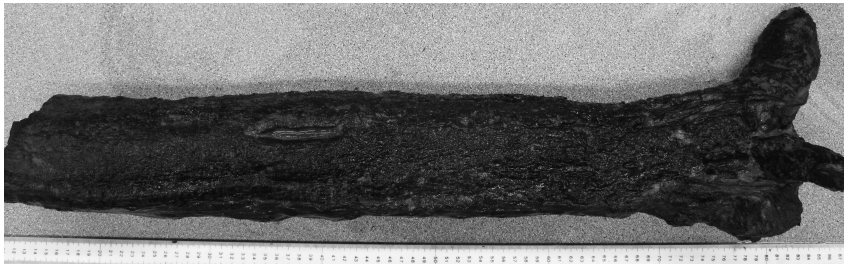
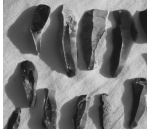


Fig. 10: Post from a pine stump loosed from the ground by digging out and cutting the roots. The transverse section shows a notch that had been cut into one side of the post, presumably to secure rope or leather ties at that height. Scale in centimetres.



evidence of a second run where a wooden wedge or adze was partially removed and then sent in again in the same place, splitting further on the second blow. Another worked timber in this same area features the traces of a long, curved cutting edge (Fig. 9). The curvature of this scooping or hollowing mark does not appear to have been made with a stone axe or adze, but could possibly suggest the use of wood or bone chisels instead. While wood and bone tools do not often survive into the archaeological record, or are attributed to other functions, the tool marks from wood at Bouldnor Cliff hint at the necessity of a reappraisal of the kinds of tools available to and used by woodworkers in the British Mesolithic.

Several posts in the form of roundwood with root stubs have also been recovered from Bouldnor Cliff (Fig. 10). These young pine trees display cut and tear marks around the roots of the parent tree, where the protective soil was removed and the roots hacked and torn away until the tree was freed of its position. After it was cut to length, the stump could be transported to where the post was to stand, using the root stubs to secure it back in the ground. This method would have produced sturdy posts for a variety of purposes: lashing watercraft, erecting tents, setting enclosures, etc. There is also a great deal of xylic debitage from the site – wood chips which indicate that a major woodworking project was underway, perhaps the construction of a logboat or a wooden shelter. The significance of these findings within the context of the British

Mesolithic is difficult to understate, and when the complex wood-working techniques are seen in relation to other premature developments at Bouldnor Cliff, one can recognize that this site represents a threshold in human innovation and the mobility of goods, industry, and ideas to north-western Europe.

4.3 SedaDNA from Bouldnor Cliff

The extraction of sedimentary ancient DNA (sedaDNA) has revealed further information about activities on the site at Bouldnor Cliff. This groundbreaking work analysed two samples that were recovered from an archaeological horizon, 10.8 m below British Ordnance Datum within a relic fluvial sand-dune context (Allaby et al. 2015a; Momber et al. 2011). A small twig dated the sample to 7935 to 7790 Cal BP (Beta-406961), was recovered from below peat deposits (Allaby et al. 2015b). Analysis revealed *Canis* (either wolf or dog), Bovide *Bos* (Aurochs), deer, members of the grouse family, rodents and wheat (einkorn). The DNA compares favourably with the archaeological and site evidence which has included the recovery of an auroch's ankle bone dated to 8170 to 7970 Cal BP (Beta-366541) and an extensive system of burrows, most probably the product of rodents contemporary with the Mesolithic occupation. Significantly, however, the analysis demonstrates there was farmed wheat at a UK site. This is 2,000 years before previously recorded. The results indicate a high concentration of sedaDNA in this particular area of the site showing that it was a dis-

crete sample. This suggests an area of processing rather than the signature of cultivation.

The 2,000 year disparity between the dated wheat at Bouldnor Cliff and the arrival of farming on mainland Britain appears great; however, viewed from continental Europe, the difference in dates is not so extreme. The Neolithic Cardinal culture is first seen to travel from the Mediterranean into western France around 7600-7400 BP (Tresset – Vigne 2007) with Neolithic practices recorded in western France around 7400 cal BP (Marchand 2007). Farming is evident in the Rhine/Maas delta region around 7300 BP (Louwe Kooijmans 2007) and as the investigations during the Yangtze Harbour excavation demonstrate that transport networks utilised inland waterways and coastlines at this time. The transport of lithics across extensive ranges through travel or trade networks is reinforced by the presence of a quartzite hammer stone from Bouldnor Cliff that came from Devon or Dorset at least 70 km to the west (Tomalin in: Momber et al. 2011, 142). This is in keeping with the discoveries of Wommersom quartzite and amber at Yangtze Harbour and the increasing studies into Late Mesolithic mobility, including recent distribution investigations of antler mattocks that indicate the development of large-scale maritime networks from the early 7th millennium BP (Elliot 2015). The growing body of evidence demonstrates a level of mobility along coastal routes and across neighbouring territories. It is therefore not inconceivable that influences from pioneering Neolithic cultures reached the south of Britain from western France or the lower Rhine Basin along estuaries and coastlines at the western end of the 'proto channel' with the aid of watercraft.

5. Conclusion

The end of the Younger Dryas glaciation saw sustained recolonisation of north-west Europe. Despite

this, major underwater discoveries from the North Sea have been few, which makes it possible to infer that population densities were small. However, when we understand that survival of material is dependent on burial conditions and that the process of inundation can fill palaeo-valleys with many metres of sediment, it is surprising that we have found any sites at all. By contrast, evidence for human dispersal across northwest Europe is extensive, confirmed by the distribution of comparable material remains on both sides of the North Sea.

In the Upper Palaeolithic and Early Mesolithic, assemblages of artefacts with common traits were widely distributed. This indicated extensive travel by individual tribes of hunters, possibly tracking herds of megafauna, or uninterrupted links between cultural groups across a relatively open landscape. By the Late Mesolithic, cultural signatures were becoming more idiosyncratic. This would have resulted from fragmentation of the landscape by forestation and rising sea level that, in turn, facilitated human technological adaptations. When sea level rise accelerated at the beginning of the Holocene, the estuaries pushed inland and life in the North Sea Basin was changed irrevocably, forcing increasing resourcefulness and changes in subsistence strategies. Doggerland, the landmass that witnessed the most dramatic changes, is now underwater. Indeed, notwithstanding isostatic rebound in the most northern reaches of the continent, all the coastlines that were attractive to the Late Mesolithic people have since become inundated.

The work at Yangtze Harbour shows how people modified their lifestyle to take advantage of an increasingly dominant marine environment. The larger territories covered by the Upper Palaeolithic and Early Mesolithic groups diminished, but long-distance links did not. The distribution of essential raw materials like quartzite and amber, and the culturally compara-

ble items such as antler mattocks found all around the fringes of the North Sea, provide evidence for trade links. Moreover, the discoveries of wheat, advanced woodworking technologies and a range of influences within the lithic assemblage at Bouldnor Cliff reinforce the notion that there were progressive technical adaptations, which would have been informed by extensive networks and information sharing.

Despite the limited number of sites discovered to date, they have proved to be very rich in information, showing that the footprint of early human activity on the drowned lands of the continental shelf is significant and tangible. The archaeological evidence that confirms there were cultural connections across the North Sea and the Channel, coupled with the variety of artefactual material recovered from known sites, means that we cannot overlook the existence and significance of the submerged prehistoric cultural heritage. These sites so far discovered have demonstrated that submerged sediments can retain and preserve organic material and DNA for many millennia. This is an archive of information that is unparalleled on land, and the data it has provided so far is forcing us to rethink the technical capabilities of our Stone Age ancestors. The remains at Bouldnor Cliff and the targeted discovery in Yangtze Harbour indicate that there could be many more well preserved sites remaining encapsulated within the palaeo-landscape.

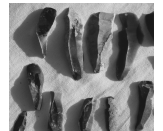
Acknowledgements

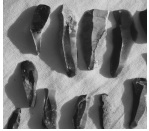
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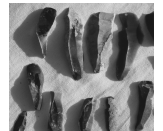
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