

NHPP 3AI: Unknown Marine Assets and Landscapes

The social context of submerged prehistoric landscapes



Samson Flats submerged prehistoric field system, Isles of Scilly, UK. Photograph: F. Sturt

English Heritage Project no. 6593

Meeting Report: July 2013

Title: The social context of submerged prehistoric landscapes

Date of last revision: 09/10/13

Version: 1.1

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Status: Final

Origination Date: 31/07/13

File Name:

Soton_NHPP_203AI_Project6593_Meeting_Report.docx

Reviser(s): B. Gearey, C. Johns, J. Last, G. Momber, I. Oxley, E. Salter, K. Westley

Approval: J. Last

Summary

This report documents a meeting of twenty specialists with interests in the prehistory of England, marine and maritime archaeology and management of the archaeological resource. It identifies that if we wish to contextualise the submerged landscapes that we are now becoming more adept at locating and describing, we may need to change the methods we employ to investigate them. Currently, the shift from landscape description to more human archaeological accounts is challenged by the different qualities of the records created on land and at sea. The text below makes clear that there is no one way of addressing this issue, but, through learning from work overseas and by carefully considering key research questions for prehistory, we can begin to discern what an appropriately multi-scale seamless approach to prehistory may look like.

Introduction and Background

This project was commissioned by English Heritage to draw together an international group of experts on prehistory, maritime archaeology and marine geoarchaeology for a one day meeting. Their brief was to consider the social context and significance of England's submerged prehistoric landscapes. Specifically, the following aims and objectives for the meeting were set out in the tender document:

- a. Enhance our understanding of the results of previous offshore projects by:
 - Discussing the current state of knowledge
 - Describing current key concerns for each period and considering how the submerged record may contribute to understanding them
 - Reflecting on recent work in other regions and using the knowledge gained to reappraise the English record
- b. Develop/describe new approaches to England's submerged prehistoric landscapes:
 - Hold focused discussion on current knowledge/approaches to assessment and modelling of the archaeological potential and significance of mapped palaeo-landscapes
 - Assess the potential of new approaches to these spaces in order to stimulate new research
 - Investigate how/if we can ascribe significance to particular landforms/offshore features.
 - Learn from methods employed in on-going projects overseas and consider their applicability to the UK
 - Evaluate the range of different options available to us from both practical and theoretical standpoints
- c. Evaluate how to disseminate the results of the project to as wide an audience as possible:
 - Produce a freely available report on the outcomes of the meeting
 - Assess the value of producing a volume on this subject, and if appropriate create a plan for it

To this end twenty specialists met at the National Oceanography Centre (Southampton) on Thursday 27th June 2013. Those in attendance were:

Martin Bell, Jonathan Benjamin, Rachel Bynoe, Justin Dix, Antony Firth, Duncan Garrow, Ben Gearey, Jonathan Last, Jim Learey, Garry Momber, Peter Murphy, Ian Oxley, Hans Peeters, Josh Pollard, Matt Pope, Ed Salter, Tyra Standen, Fraser Sturt, Louise Tizzard, Kieran Westley

This reflects a sub-set of people who were all available at the same time and date from a more widely circulated invitation. However, a broader consultative list allowed those who could not be present in person to submit pre-circulated papers for discussion and have their views aired. The opportunity to do this was taken by Vince Gaffney, Simon Fitch and Charles Johns. In addition, this report has been made widely available for comment prior to finalisation. As such, it is hoped that the thoughts expressed below reflect a broad cross section of the archaeological community.

Context

Antiquarians and archaeologists have long noted the presence of prehistoric material along shorelines and submerged beneath our oceans and seas. Recent work funded by the Marine Aggregates Levy Sustainability Fund (MALSF), and advances in earth science understandings of England's offshore zone, have seen a step change in our ability to quantify and describe the broader landscape (Ward 2006; Gaffney *et al.*, 2007, 2009; Brooks *et al.*, 2011; Bradley *et al.* 2011; Bicket 2011). As the tender document for this project noted, the significance of this work "cannot be over-estimated in terms of taking understanding of submerged landscapes from the realm of speculation to one where we have a substantial data-base which permits informed inferences about long term environmental change and prehistoric human activity".

However, whilst acquisition of data for the offshore zone has continued apace, similar space has not been created within England to consider the implications of this new data for our understanding of past societies, nor time set aside to consider how the discipline might best advance in this rapidly expanding topic. As Reid (1913, 10) noted, "we desire to know not merely what was the sea-level at each successive stage", but need to carefully consider the lives of those who lived within those spaces, as well as charting how the environmental changes we can now describe affected people in the past. Finds such as those made by Wessex Archaeology within area 240 (Bicket 2011), the HWTMA at Bouldnor Cliff (Momber *et al.* 2011), and on-going work along the East Anglian coast (Parfitt *et al.* 2005, 2010) all point to the survival of in-situ material offshore in England's territorial waters (see figure 1 for location of sites mentioned). Recent palaeogeographical modelling (Brooks *et al.* 2011, Sturt *et al.* 2013) and archaeological review (Dix and Westley, 2006; Peeters *et al.* 2009; Hijma *et al.* 2012; Garrow and Sturt 2011; Ransley *et al.* 2013) have also helped to highlight the time-depth that needs to be considered; from Palaeolithic land-surfaces dating back over 750,000 years along the East Anglian coastline (Westley and Bailey 2013), to the dramatic late Neolithic and Early Bronze Age coastline reconfiguration of the Isles of Scilly (Charman *et al.* in prep.). However, bridging the gap between known palaeogeography and interpreted archaeological significance has not proven easy.

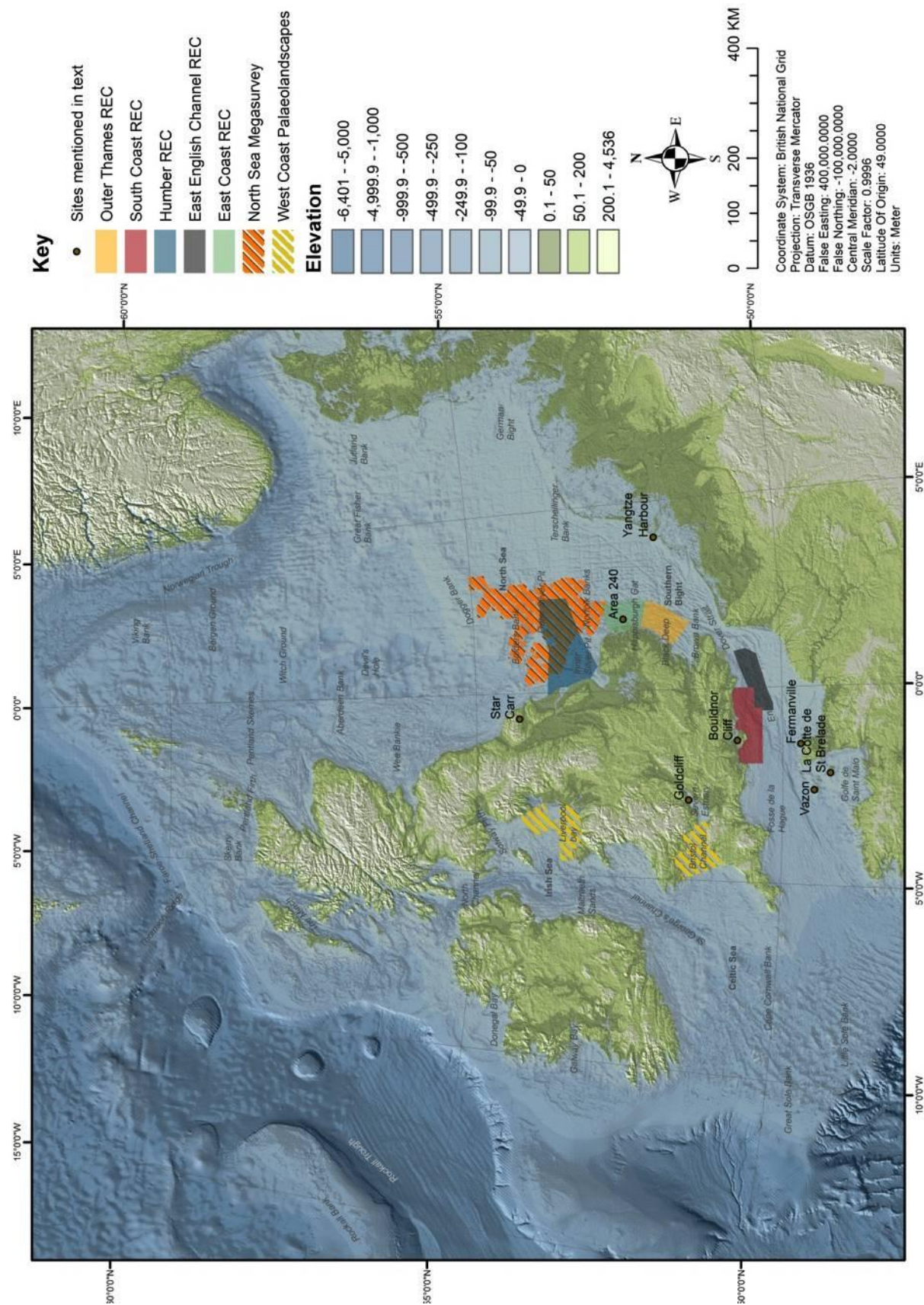


Figure 1 Map showing sites mentioned in the text and major survey areas/regional projects. Topography and bathymetry from GEBCO_08 version 20100927 (<http://www.gebco.net>). Undersea feature names extracted from the National Geospatial-Intelligence Agency GEOnet Names Server (<http://earth-info.nga.mil/gns/html/index.html>)

To push towards a more refined understanding of these themes is not a new call, but echoes those made by Coles (1998, 1999) in her seminal analysis of these issues, more recent focused attention on the social impacts of environmental change (Murphy, 2010; Leary 2009, 2011), considerations of the broader offshore record (Ransley *et al.* 2013; Peeters *et al.* 2009) and pan-European efforts to improve both method and theory with regard to the archaeology of submerged prehistoric landscapes (www.splashcos.org) and underwater archaeology more generally (www.sasmap.eu). The significant change is that the substantial investment made by the MALSF, matched with recent developments along the continental coast (Weerts *et al.* 2012), means that we are now better placed to assess the archaeological significance and interpretive implications of the offshore record, as well as the suitability of different methods to investigate it.

In addition, just as advances have been made offshore, significant developments have occurred with regard to our knowledge of the terrestrial record (Blinkhorn 2012). Thus, as advocated by Chapman and Lillie (2004), there is an opportunity to draw together the recent knowledge gained in both spheres to create a revised understanding of prehistoric lifeways from c. 1,000,000 BC to the beginning of the early Roman period. In turn this will allow for a better understanding of the potential of the offshore zone.

Taking this step forward with regard to contextualising the offshore record should not be seen as the finessing of an established dataset, or a simple process of veneering. Instead, as documented by the discussion below, it represents an opportunity to review key archaeological questions in order to focus research priorities for the future, as well as the chance to consider the efficacy of the methods we adopt to investigate this area. Archaeology has long maintained that as a discipline we are more than simply collections of anthropogenic material or a suite of field methods; our work only has meaning when it is placed within a human context (cf. Wheeler 1954). Thus, this project's background stems directly from a longstanding archaeological tradition of contextualising both material and associated deposits in order to create an intelligible account of life in the past. We have made great advances over the last two decades in resolving the stories tied up in sedimentary sequences, but have made less progress offshore in directly relating them to a material record and associated social context.

The sections below provide an account of the key points raised in discussion under each of the major headings (points a-c) given on page two. The aim of this report is not to be a definitive statement on how best to approach the social context of submerged landscapes, but a document of record outlining current principal concerns and potential avenues for future research, as well as giving some suggestions for ways in which the discipline may like to move forward.

Enhancing our understanding

Our understanding of the bathymetry and geology of the offshore zone has improved dramatically over the last few decades. This change has been enabled by improvements in geophysical data collection and processing techniques, increasing amounts of offshore development and associated surveys, as well as greater data sharing between interested parties. One of the highest profile examples of this has been the work carried out by Gaffney *et al.* (2007, 2009), making use of the 3D seismic data from the North Sea Megasurvey (the extent of which is shown in figure 1) to map remnants of prehistoric submerged landscapes. In addition, the MALSF funded Regional

Environmental Characterisation (REC) projects have helped draw together the available ecological, geological and archaeological record for key areas, providing useful synthesis for archaeological consideration.

As figure 1 makes clear, these projects, along with Fitch and Gaffney's (2011) West Coast Palaeolandscapes survey, have helped to refine our understanding of offshore sequences and recorded archaeological signatures for large swaths of England's territorial waters. When added to the large amounts of work carried out along the shores of the Severn Estuary (Bell 2007), in the Fenlands of East Anglia, and the large-scale coverage of the Rapid Coastal Zone Assessments, a positive image is given of the scale and extent of investigative coverage. However, significant areas still exist where smaller scale surveys and cursory assessments offer the most up-to-date, yet fragmentary, accounts of the offshore zone. In addition, all too frequently the accounts of the sub-tidal, inter-tidal and terrestrial record are split; resulting in a denuded archaeological understanding where key concerns and patterns of interest do not map onto each other.

The fragmented nature of our approach to these areas has meant that attempts to determine significance and potential are somewhat stymied. This is clearly apparent in the one synthesis to date that has sought to draw together the data on submerged landscapes from around the UK. The Waterlands project (Goodwyn *et al.* 2010) successfully compiled varied pertinent datasets for the offshore zone, from artefact finds and environmental records, to mapped offshore river systems. However, when attempting to determine archaeological potential, the lack of detailed knowledge we have of this area meant that large swaths had to be defined as high potential (and rightly so), because of our inability to more accurately differentiate. Sadly, the result of this does more to highlight our current lack of understanding of this zone, and an uncertainty within the community as to how we should engage with it, than it does our confidence in its archaeological value. This deadlock thus presents a critical problem from both a regulatory and research perspective, and complicates the communication of the complexity of these issues with developers. It was noted that addressing this issue may best be begun by better stitching together terrestrial, wetland and near shore data in a seamless approach. This would allow us to make best use of the exceptional results from decades of wetland and site specific archaeological research (e.g. at Goldcliff, Langstone Harbour and Bouldnor cliff). However, for reasons discussed below, it was also noted that this could not answer all the critical questions that have emerged over the last decade of intensive research in this area.

All present at the meeting agreed that our ability to identify submerged landscapes had improved considerably, with a clear methodology now in place to integrate geophysical and geotechnical data. However, it was noted that there remains a distinct challenge in resolving the chronology of identified features, and in moving beyond landscape orientated accounts alone. Thus, while we have come to learn that there is more than Doggerland to consider (that this is a complex landscape whose subtle changes through time are archaeologically significant) we still struggle to populate these spaces and consider them at a human level. Thus, there is a risk of creating empty landscapes which stand out in contrast to our rendering of more heavily excavated modern terrestrial spaces. This mismatch is one of our own creation, reflecting the sorts of archaeological work carried out in these different areas, rather than being a reflection of the record itself.

It was noted that the following research themes identified in Peeters *et al.*'s (2009) North Sea Prehistory Research and Management Framework (NSPRMF) remain current:

Theme C: Global perspectives on inter-continental hominin dispersals

Theme D: Pleistocene hominin colonisations of northern Europe

Theme E: Reoccupation of northern Europe after the last Glacial Maximum (LGM)

Theme F: Post-glacial land use dynamics in the context of a changing landscape

Theme G: Representation of prehistoric hunter-gatherer communities and lifeways.

While we have improved our understanding of the offshore zone, it is only through tightening our understanding of the chronology of change, and the location of surviving landscape features from different eras, that we can shed new light on themes C-E. Themes F and G resonate with a broader issue that a number of participants noted; that to move beyond landscape alone we have to change the ways in which we encounter the archaeological record offshore. At present, the vast majority of work is geophysical and geotechnical in nature. While this work is fundamental to any understanding of the offshore zone, presently it restricts us to a landscape scale account. To date there have been very few site level prehistoric investigations carried out in English Waters (with Bouldnor Cliff and Area 240 being notable exceptions). One potential solution to this was suggested; that we adopt a staged approach and target areas that are most easily accessible to gain a better understanding of landuse and human ecology in earlier prehistory. This would involve more work along our exposed inter-tidal zones, in former marine areas that have subsequently been transformed into terrestrial landscapes (e.g. the Fenland of East Anglia) and shallowly submerged near shore waters. Here we could build on lessons learnt from excavations at sites such as Goldcliff and Bouldnor to improve our base level knowledge of the Paleolithic and Mesolithic. It was recognised that such an approach would only allow access to a restricted variety of palaeoenvironmental contexts, and for the most part be restricted to a late Pleistocene and early Holocene record. Thus, while useful, these areas may not be representative of potentially larger areas further offshore. Such work could thus serve to add to a specific knowledge base, but not address larger issues. However, it would allow for the development of specific skill sets relevant to working in marine and maritime contexts.

Overall it was agreed that we can currently identify submerged terrestrial landscapes and argue that they will have been home to past populations, but without more direct sampling it is hard to be confident in deciding where potential is greatest, or how important these spaces were at different times. It was agreed that it would not be straightforward for us to apply a model such as Fischer's (1995) for determining site location without more of the work identified in the above paragraph. This has significant implications for heritage management and development control. It was thus suggested that if we wish to engage with landscape dynamics and the nature of hunter-gatherer communities in these areas, we need to consider different forms of intervention. This issue will be returned to in the discussion below, with regard to what we can learn from archaeological practice in different parts of the world.

The above point was seen to be particularly significant for our understanding of earlier prehistory. Specialists in the Palaeolithic and Early Mesolithic suggested that our knowledge of the land use and

ecology of people at this time is poorly resolved. This may in part be due to the fact that the majority of excavations have been restricted to the current dry-land areas, with the potential productive ecotones of the North Sea plain, and enlarged coastal margin missing. Thus, any presumption as to settlement and intensity of activity over this period of time is potentially flawed. This has been amply proven through Conneller *et al.*'s (2012) work at Star Carr (where simply opening a larger area around the site has transformed our understanding of Early Mesolithic land use practices and settlement size) and on-going work at Le Cotte on Jersey by Pope *et al.*. Thus, as the draft Mesolithic Research and Conservation Framework makes clear (Blinkhorn and Milner *in prep.*, 8) the archaeology of the submerged landscapes of England should be regarded as of significant potential for changing our understanding of the period. Importantly, as the work of Bell *et al.* (2000, 2001), Bell (2007), Fitch and Gaffney (2011), Momber *et al.* (2011), Ransley *et al.* (2013), Sturt *et al.* (2013) and Wenban-Smith (2002) has made clear, this potential extends well beyond the North Sea basin alone to encompass large areas of the present English territorial waters.

Significantly, it was also noted that if we wish to consolidate a change in direction in how we approach the submerged cultural heritage, we may need to shift our regulatory stance. At present the Ancient Monuments and Archaeological Areas Act (1979) does permit scheduling of sites below the Mean Low Water mark. However, beyond inter-tidal field system remains in the Isle of Scilly, it has not been applied to submerged prehistoric sites. The key legislative measures offshore relate to the designation and protection of wrecks (Protection of Wrecks Act 1973) and salvage of material from the sea floor (Merchant Shipping Act 1995). Thus within commercial contexts the focus often shifts to the wreck record as it is the easiest to identify and has the highest potential for legislative protection. In some respects this issue reflects broader difficulties in categorisation and protection of ephemeral, yet significant, earlier prehistoric remains on land as well.

Based on discussion of the above themes, the following points were identified as being worthy of further consideration:

1. There is a strong need to improve our knowledge of the chronology of landscape change, and the locations at which deposits from specific periods can now be found offshore.
2. Relying on the fragmentary terrestrial Palaeolithic and Mesolithic records as a proxy for the potential of the offshore zone may be flawed, as they potentially represent very different landscapes and histories of use.
3. If we wish to move beyond landscape level accounts and begin to consider the social context of submerged landscapes we need to develop the methodologies through which we engage with the offshore zone. However, in order to justify any change/development in method, the research questions will need to be very clearly articulated. In part this move has already begun through the Maritime Archaeological Research Agenda (Ransley *et al.* 2013), the Paleolithic Research Framework (Pettit *et al.* 2008), the new Mesolithic Research and Conservation Framework (Blinkhorn and Milner, *in prep.*) and publications such as Leary's (2009, 2011) and Murphy (2010).
4. We should adopt a seamless approach to landscape and the archaeological record, aiming to integrate onshore and offshore data. As part of this we should carefully consider the different resolution of data gathered on land and at sea, and the different

qualities of these datasets. Current work funded by English Heritage at Happisburgh is seeking to do this on a limited scale.

5. Modern national boundaries are not helpful when attempting to understand much of the earlier prehistoric record. There is a need to improve our connections with continental colleagues and their regional records. This will allow us to better understand the potential and significance of any material recovered offshore.
6. Any attempt to define the potential of the offshore zone is currently hampered by the limited number of site level investigations that have been carried out in English waters.
7. The impact of our current legislative approach to earlier prehistoric sites, and submerged cultural heritage more broadly, needs to be considered in light of its leading effect on archaeological practice.

All of the above indicates that there is a considerable amount of work ahead if we wish to better quantify and appreciate the potential of the submerged resource. In addition, these lacunae in our knowledge mean that we must maintain the ability to respond flexibly to situations as and when they arise. The case of Area 240 was discussed as a good example of this; where the identification of archaeological material in dredged aggregate led to a detailed archaeological investigation.

While the discussion on this theme was productive, it was agreed that more focused period specific meetings may prove beneficial in future. An effective alternative would be for clearer integration of maritime themes within regional and national research and conservation frameworks. This has already begun with the on-going drafting of the Mesolithic research and conservation framework, but has occurred less evenly within regional research frameworks. In addition, it was suggested that rapid coastal zone assessment guidance might benefit from more detailed description of key features/concerns for earlier prehistory to assist identification in the field.

New approaches to England's submerged prehistoric landscapes

As noted above, it was agreed by all present that our current approach to the mapping of offshore landscapes is well established (Bicket 2011, Gaffney *et al.* 2007, 2009, Westley *et al.* 2011), with effective guidance notes already in place for geotechnical and geophysical work (Cowrie 2007, 2011; Pletts *et al.* 2013). The nature of marine geophysical datasets, matched to detail from geotechnical work, has allowed us to create detailed knowledge of these spaces, with the proviso that more needs to be done to resolve the chronology of deposits. Taking this step would help to integrate the models created with the archaeological questions articulated by researchers such as Leary (2009, 2011) and Sturt *et al.* (2013) with regard to the pace and nature of change in relation to marine transgression and regression.

With regard to the questions set out in the project brief, the problem was seen to come with the issue of ascribing significance and potential to particular landforms. It was agreed that for this to be effectively carried out, the chronology of change needed to be well resolved and (crucially) our baseline understanding of the behaviour of people at the time within that region. Thus, for later periods in prehistory we could begin to work towards these ideas (for example, the issue of the possible presence of low lying island remnants of Doggerland's being lost in the Neolithic, or the large scale change of the East Anglian coastline due to the inundation of the fens, could be addressed), but, for earlier periods a little more work is required. That being said, for the Lower

Palaeolithic, first order representations of the scales of change that occurred could be created that might match the resolution of the terrestrial record. Here, large scale questions as to the nature of England's connection to the continent and dating of the loss of the Weald-Artois ridge were indicated as areas of key concern.

The most active area of discussion under this heading came with the topic of what can be learnt from overseas practice and recent work in the UK. This directly addressed the issue raised in the section above with regard to the nature of archaeological intervention. The four exemplar studies discussed were: Bouldnor Cliff, Area 240 in England, the Yangtze Basin Harbour (in the Netherlands) and numerous examples from Danish work (Staalby, the Storebelt programme, Amager Strandpark, and other projects run by Jørgen Denker for the Viking Ship Museum, Roskilde's Marine Archaeology Cultural Resource Management team).

The drowned landscape of Bouldnor Cliff, UK

The Mesolithic site at Bouldnor Cliff lies on the southern slope of the submerged valley in the western Solent. It has provided the opportunity to study an archaeologically rich prehistoric palaeo-landscape, cost effectively and in detail since 1987 (Momber *et al.* 2011, 4). Its investigation has addressed key research questions, helped to build expertise in the study of submerged prehistory and the results have helped to inform decision makers when addressing the impact on comparable sites ahead of offshore development impacts.

Analysis of geophysical survey data from the seas around Europe have revealed a network of pre-inundation landscapes with relict river channels, lakes and sheltered lowlands. The western Solent is an example of such a landscape that has become accessible. During the Mesolithic it was a resource rich valley cut by a river floodplain that proved to be suitable for occupation. Like other fluvial systems that drained the UK at the end of the last glaciation, it filled with estuarine silt as sea level rose. Today, the process of sedimentation has reversed following the formation of a new waterway; the Solent. As a consequence, erosion has cut a natural section through a 7m thick accumulation of brackish water silts, to expose a submerged forest 11m below UK Ordnance Datum. Once exposed, erosion can be up to half a metre a year.

Today, underwater at Bouldnor Cliff, a 1km long corridor of extremely well preserved landscape is exposed. Within it, four archaeological sites have been identified and two are being investigated in detail. One site is associated with a fluvial sand bar and is dominated by worked and burnt flint, while the other is a site of industrial activity with well-preserved worked timbers suggesting the construction of a log boat.

Over the last 10 years, a range of methods have been employed to excavate and record material from the palaeo-deposit. Box sampling was used for recovery of fine environmental and archaeological material, while larger pieces of worked timber were raised individually. To date over a thousand pieces of worked and burnt flint have been recovered from just 9 square metres while over 600 have been recovered in the last 2 years following the natural erosion of a 5 metre wide section. Dozens of timbers, pieces of string and extensive samples of charcoal have also been recovered.

The period of occupation is late Mesolithic but the discovery of tangentially split timber and a carefully prepared bi-facial flint axe demonstrate technologies not apparent until the British Neolithic. In addition, the use of obliquely blunted blades, akin to tool types found in the Paris Basin, infer cultural links with the continent. The site brings into focus patterns of Mesolithic occupation, it queries our understanding of regional technological capabilities and raises questions about human dispersal during the final severance of Britain from mainland Europe. While inferences can be drawn from the archaeological record in adjacent lands, the archaeological material that is being discovered underwater contains unique evidence from this time of great change.

For additional information: <http://www.maritimearchaeologytrust.org/submerged>

Area 240, UK

In 2008, 124 Palaeolithic artefacts including handaxes, flakes and cores, and bone (woolly mammoth, bison and reindeer) were discovered at a Hanson Aggregates Marine Limited (HAML) wharf in the Netherlands (Bicket 2011; Wessex Archaeology Online 2013). The finds had been recovered from a discharge heap by local palaeontologist Jan Meulmeester and were reported under the Protocol for Reporting Finds of Archaeological Interest (Bicket 2011). It was established that the material had been dredged from license Area 240. In response Hanson Aggregate Marine Limited set up a voluntary exclusion zone to preserve any *in situ* archaeological material that remained within the area and allow time for further study.

Between 2008 and 2011 a multi-staged project was subsequently undertaken to evaluate the archaeological potential of the Area 240 exclusion zone. The geological context of Area 240 was investigated through the detailed re-examination of geophysical and geotechnical data from industry surveys, followed by an intensive geophysical survey of the area that had produced the artefacts and faunal remains. Sampling strategies were also devised to establish the presence and distribution of the archaeological material, along with the acquisition of a series of vibrocores in order to obtain a sedimentary sequence from the area. The palaeoenvironmental assessment, analysis and scientific dating of 12 samples from these cores enabled the reconstruction of the palaeo-landsurfaces within the area (Bicket 2009; Wessex Archaeology Online 2013).

In addition, three seabed sampling techniques were trialled during the project in order to establish the presence of any additional remaining archaeological material. These included: clamshell grabs, still photographic survey and beam trawl (Wessex Archaeology Online 2013). The sampling techniques, along with the monitoring of vessel and wharf dredge loads, resulted in the recovery of 124 pieces of work flint. The locations of these finds also indicated that the artefacts had not been confined to a small, isolated zone but were in fact more widespread (Wessex Archaeology 2013).

The chance discovery and reporting of the finds from Area 240 has been of great significance for British Archaeology, as they have shown that the potential for discovering now-submerged ancient prehistoric sites is perhaps greater than once believed (Bicket 2009). In addition, the work on Area 240 has demonstrated that although time consuming, monitoring of dredging activity and targeted sampling can provide beneficial data for archaeological purposes. Although the Area 240 project was completed in March 2011, further work has since continued through an industry-funded project.

Wessex Archaeology Online 2013. *Submerged Prehistory: Area 240*. Accessed 22/08/13 at: http://www.wessexarch.co.uk/projects/marine/alsf/seabed_prehistory/area-240

Yangtze harbour

In 2010, evidence of a Mesolithic hunter-gatherer site was discovered submerged in 17m of water in the Yangtze harbour, Rotterdam. The discovery was made during archaeological investigations conducted prior to the Maasvlakte 2 expansion of Rotterdam harbour, part of which involved the dredging of the Yangtze harbour to 22m.

Further archaeological research was deemed necessary after a preliminary desk-based survey had identified the possible presence of river dunes located under the proposed construction area. These findings were potentially archaeologically significant as previous excavations within the region (e.g. the Hazendonk and Hardinxveld sites) had documented the seasonal presence of Mesolithic hunter-gatherers on river dunes. Furthermore sand dredged up from the nearby North Sea floor, which had been used to create the artificial beach at Maasvlakte 1, had also produced many Mesolithic artefacts, thus indicating the possible presence of archaeological material below Yangtze harbour (Weerts *et al.* 2012).

The fieldwork conducted in 2010 demonstrated the existence of a drowned early Holocene fluvial landscape, lying underneath younger shallow marine deposits (Weerts *et al.* 2012). Three areas of high archaeological potential were identified within this submerged landscape, based on the analysis of shallow seismics, existing cone penetration tests and 17 new piston cores with a penetration range from 2.2-4.5m (Weerts *et al.* 2012). As Area 3 was difficult to access due to shipping traffic, Areas 1 and 2 were selected for additional detailed landscape research. This involved the use of new cone penetration tests, high resolution shallow seismics and 52 additional piston cores that yielded almost 200m of undisturbed sediment (Weerts *et al.* 2012).

The presence of a river dune was confirmed in Area 1, whilst thirteen of the piston cores from the area produced archaeological remains. These comprised predominantly of charcoal but also included (burnt) bone and flint fragments, indicating high intensity prehistoric activity. A fluvial channel was identified in Area 2, which core descriptions indicated had later become reoccupied by a tidal channel. No archaeological material was recovered in Area 2.

The finds from Area 1 resulted in a more detailed underwater investigation in the autumn of 2011, using a special crane on a pontoon in the Yangtze harbour. Sediment was removed to just above the level containing archaeological remains at three locations along the dune. A special scraping grab, with refined horizontal and vertical positioning, was used to carefully excavate this level (Weert *et al.* 2012). The excavated sediment was transferred into big bags on board the pontoon, before being sieved (10mm and 2mm mesh) on the Yangtze harbour quay using water from the harbour. This process resulted in the recovery of many very well preserved Early Mesolithic remains, including organic material, all from bulk samples with x,y and z coordinate attributes.

Although successful, establishing the presence of archaeological material within the area had been challenging due to the size of the proposed dredging area, which was over 3 kilometres in length and

500 metres wide, with the water depth at the time being 17 metres. The success of this research has therefore been attributed to the combination of knowledge of Mesolithic human adaptation in a drowning delta derived from earlier research, modern surveying techniques and landscape modelling (Weerts *et al.* 2012). It also demonstrates a refinement of the approach adopted in Area 240, made possible by the high level of archaeological material attested to in the core data.

Staalby

Excavation of submerged prehistoric sites has a long tradition in Scandinavia, with work at Møllegabet I (Grøn 1995; Grøn and Skaarup 1991) and Tybrind Vig (Andersen 1987; Malm 1995) in the late 1970s serving to establish methods, train a generation of specialists and place the subject firmly in the minds of the wider populous. This knowledge base and clear demonstration of the potential of submerged sites to contribute to archaeological understanding has had a significant impact on engagement with submerged prehistory in research and commercial contexts. The result has been an approach that in many ways mirrors that adopted in terrestrial contexts across Europe. The relatively shallow and clear waters of the Baltic have enabled a more direct engagement with the submerged archaeological record than has occurred elsewhere. A good example of this can be seen in the work of Jørgen Dencker on a number of commercial projects.

Recent work on a windfarm export cable near Staalby (Dencker and Johansen 2011) revealed a Maglemose/Kongemose site in 12-13m of water. The process via which the area was identified as being of high potential resonates with practices currently adopted in England. The first stage of the project saw the team working closely with the engineers planning the survey strategy for the cable route. Once geophysical and geotechnical data had been collected it was used to generate a palaeogeographic model, noting channel locations etc. This model was then compared against current understanding of Mesolithic land-use strategies, and zones of potential identified. The significant next step was that these zones were then subject to additional investigation, via remote sensing and trial trenching by archaeologists diving on given locations.

Through following this approach over a number of years it has been possible to improve understandings of land-use practices and likely site locations in submerged areas. Significantly, trial trenching and sampling strategies also target areas away from the highest potential zones to help establish a base line understanding. As such, the Danish approach in this instance can be seen as having an additional step to that practiced in England. This step allows testing of hypotheses and improvements in predicative capability. However, it has only been possible due to a close and positive working relationship with industry.

The Yangtzeharbour and Danish examples were seen as being demonstrative of what can be gained through adopting different approaches to the offshore record. While grab sampling in the case of the Yangtzeharbour was seen as destructive and potentially damaging to contextual relationships (limiting what could be said from the record), it was also recognised to be a time-effective response, and matched the resolution of questions being asked (distribution of activity, rough date range etc.).

The high-resolution nature of the geophysical and geotechnical work mitigated this loss of contextual data to a degree, through allowing a detailed understanding of formation processes and site dynamics. The Danish examples offered more direct analogies to traditional terrestrial practice (evaluation test pits and trenches combined with landscape geophysical and geotechnical methods), but in turn this reflects the conditions in Danish waters (generally shallow with little tidal action). The conclusion was that no one approach can ever be determined to be 'best', but instead we should look at a suite of options. The most significant aspect of the above projects was seen to be the concerted effort to ascertain if material culture was present or not. It was pointed out by one member of the panel that no one would have predicted the finds from Area 240, and as such any sampling has to remain flexible rather than be based on rigid models.

All present acknowledged that pushing for more direct sampling had time and cost implications. As such, thought should be given as to how this might take place, the spatial resolution required and the questions such work might answer. One idea raised was that it might be prudent to carry out some trial work to better establish how such work could best proceed. It was noted that thanks to the landscape level of analysis we can now identify specific palaeo-lake margins, river systems and appropriate interfluvies on which such a project could take place.

At the end of this discussion those working at a landscape level and within the geotechnical and geophysical arenas made the very valid point that although well established, more work could be done to improve our base level understanding of key offshore regions. While the methodology is sound, data coverage is not even and very few areas have had detailed dating programmes carried out. As such, it was suggested that we should seek greater integration with other parties interested in the offshore zone (CEFAS, Natural England etc.) to permit coordinated work. This should include everything from smaller scale high-resolution data collection (swath surveys etc.) to allow time series analysis of site development through to international drilling programmes across our marine areas. These projects would add significantly to our understanding of the resource and how best to manage it.

Training of future professionals and knowledge sharing amongst disciplines was also raised as a critical area for development. PhD's within this field are rare, and those that develop the skills to work across datasets and disciplines even more so. As such, it was suggested that we work towards creating a cohort of PhD's across institutions working on key identified questions from both methodological and theoretical perspectives. This may be achievable under the new RCUK block grant schemes, and CDA funding. All present agreed that such projects would be a cost effective method of rapidly developing our knowledge base and ensuring the discipline rapidly advances in future years. The need to help build capacity and capability at undergraduate and masters level was also raised for similar reasons. This was noted to potentially have a greater impact on the discipline given the large number of people entering the commercial sector with qualifications of this nature. Participants at the meeting recognised that training was changing on degree programmes, but that more could be done to give specific skills pertinent to this field.

Finally, all agreed that we need to do more to facilitate knowledge sharing between archaeologists working in the UK and along the opposite shores of the continent. Methods through which this could be achieved were discussed; from blog sites and databases through to conferences every two years. This is clearly an issue that needs to be addressed, but the exact format is hard to pick out as

it will depend on funding sources and community interest, with an excellent groundwork already laid by the SPLASHCOS initiative.

Key points:

1. Consideration needs to be given to direct sampling of offshore deposits with a view to identification of material cultural remains. This might take a variety of forms from dredging; grab sampling through to test pits. It would not be suitable at all locations, but should not be ruled out as a matter of course. Establishing potential and significance without such work is very difficult and poses problems to regulators and researchers alike.
2. There needs to be closer integration between heritage bodies and others working in the offshore zone to harmonize data collection and data sharing.
3. Although methods for offshore geophysical and geotechnical analysis are well established, we should not confuse this with a comprehensive understanding of the study area. We should continue to push for both small scale and more ambitious large-scale projects to allow data to be improved and better integrated over both space and time.
4. Training and knowledge sharing is a critical issues. Collaborative PhDs may be one way in which this could be addressed, with industry more closely integrated into this process. It was noted by those who do not work offshore that one of the interesting parts of the meeting was how closely university and unit based researchers integrated and understood each other's fields. This was seen as a strength that should be built upon, helping to recognise the depth of experience and expertise that has been developed in the commercial sector.
5. There is a need to ensure clear channels of communication with continental colleagues continue post SPLASHCOS.

How to disseminate the results of the project to as wide an audience as possible?

It was agreed that publication is moving rapidly and an increasing number of volumes on this topic are emerging (Bicket 2011; Benjamin 2011; Evans *et al.* 2014; Firth 2000, 2004, 2010, 2011). This, added to the recent NSPRMF (Peeters *et al.* 2009) and Marine and Maritime Research Framework from England (Ransley *et al.* 2013), means that any additional volume would have to be very carefully targeted to address the questions raised in these publications and in the above discussion. In this sense, although the meeting was designed to address the social context of our submerged prehistoric record, any further work might have to specifically consider the interface between method and theory. As Lucas (2012) has argued, the methods we adopt create the archaeological record we interpret. Thus, it is difficult for us to simply extract the social context of the submerged archaeological record beyond broad landscape level issues without changing our mode of engagement.

However, there was also a strong feeling among all those present that meetings like the one documented here occur relatively regularly, with large pan-European network projects such as SPLASHCOS significantly widening and increasing the frequency of discussion. While these had proven to be extremely useful, within the context of the archaeology of England there was a need to move beyond discussion of potential. As such, there may be scope for a volume that clearly sets out to address the problems and research questions identified in the published research agendas and directly identify areas where pilot work might go ahead. Such a document could then be used to help transform mitigation practice and inform research grant applications. Such an output may be best created in a discursive format and made freely available in the fashion that key guidance note documents have been already. Finally, a non-technical article promoting the outcomes of this meeting in a relevant industry publication was suggested and is considered to be a good means of ensuring rapid dissemination.

Key Points

1. Consideration should be given to producing a targeted volume on developing England's approach to the submerged prehistoric record. It would need to have a clearly agreed audience and ensure non-duplication of agendas already set out (and still pertinent) within the NSPRMF, *People and the Sea* and SPLASHCOS documents.
2. A non-technical rapid communication in an industry publication should also be considered to emphasise the need for a partnership approach to the offshore zone. By working with industry to address the above issues we will improve our knowledge of the record and our ability to manage it. This should serve to satisfy both the archaeological community and the needs of developers to resolve the issues surrounding the uncertainty of 'potential'.

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