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Introduction to North Sea submerged landscapes and prehistory

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This special issue of the *Netherlands Journal of Geosciences* (NJG) collects a number of review papers covering the geology, palaeogeography and prehistoric archaeology of the southern North Sea. The past few years have seen increasing awareness among academics and heritage managers that submerged palaeoland surfaces and sediments yield a vast record of prehistoric archaeological and palaeoenvironmental remains. The recovery of many thousands of Quaternary mammalian remains and, to a lesser extent, prehistoric implements and human remains in fishing nets have especially attracted the attention of palaeontologists and archaeologists. In 2008, this brought together a number of experts from the Netherlands and the UK to discuss the scientific importance of the southern North Sea and define priorities for research and heritage management. The meeting, held in Amersfoort, set the baseline for the *North Sea Prehistory Research and Management Framework* (NSPRMF), published in 2009 (Peeters et al., 2009). The NSPRMF is primarily a strategic document and was not intended to be an in-depth account of the current state of knowledge. Several initiatives have subsequently led to the embedding of the framework in a broader context of research and seafloor management, as well of publication of various papers and volumes (Benjamin et al., 2011; Peeters, 2011; Hijma et al., 2012; Salter et al., in press).

This special issue of NJG provides an in-depth overview and critical assessment of current insights into the nature of the palaeolandscape and archaeological records as we have come to know them in recent years. The papers included provide baselines for future research, as well as for science-based heritage management as proposed in the NSPRMF. The need for such baselines becomes particularly apparent from the SPLASHCOS project (EU Cost Action TD0902), which ended in 2013 and brought together a large number of researchers from 23 European countries concerned with the prehistoric submerged archaeology

and landscapes on the continental shelf (Bailey et al., 2012). Such needs are further addressed globally in IGCP and INQUA projects on continental shelf records (Cohen & Lobo, 2013). Subregions of the North Sea continental shelf differ greatly in their histories of geological evolution and human occupation, and the scientific value of seafloor records can only be understood when the respective subareas are thoroughly studied and assessed in relation to one another.

The papers in this issue deal with palaeogeographical reconstruction, submerged landscape mapping, and Pleistocene and Holocene prehistoric archaeology. One paper addresses aspects of practical approaches to the management of the marine prehistoric environment, a subject that is perhaps not naturally expected in this journal. However, as Ward et al. (2014) state, there is a 'need to develop a clearly defined set of questions about the marine prehistoric resource, with which more targeted scientific research can be designed, both as part of the regulatory process and of marine management generally'. Indeed, in order to do so it is necessary to understand natural and anthropogenic contexts and their interrelationships. We feel this is not an issue particular to the marine environment, although in the submerged setting and over vast areas there is really no way to get around it. In general, understanding of the behaviour of prehistoric people (and of hunter-gatherers in particular) and the patterning of the archaeological record cannot do without an integral approach to these contexts.

This becomes all the more clear in the papers that deal with the Pleistocene and Holocene archaeology (Roebroeks, 2014; Peeters & Momber, 2014). The southern North Sea covers large swaths of former land surfaces that were used by prehistoric people. For too long these 'lost lands' have been approached as natural bridges that connected Britain with the continent instead of parts of continuous landscapes that were inhabited by an array of hominin species and groups of

hunting-fishing-gathering people in many different social and cultural settings. Although the foundations of the concept of 'Doggerland' go back to the early 20th century, it was with Bryony Coles' (1998) synthesis of geological and archaeological evidence from the southern North Sea that the 'Doggerland' idea took a new turn. New questions arose with regard to the 'role' of the North Sea area in the context of occupation dynamics during the Palaeolithic and Mesolithic, or even the Neolithic. The many questions raised in the papers by Roebroeks (2014) and Peeters & Momber (2014) in the context of the Palaeolithic and Mesolithic occupation histories of northwest Europe clearly demonstrate the importance of the southern North Sea region. But they also demonstrate the necessity to increase our efforts to investigate this area to enable a reassessment of the terrestrial archaeological record that has guided the hypotheses about occupation dynamics and landscape use for a long time. At the same time we have to bear in mind that major problems have to be tackled to get at least some grip on what could have been going on in this submerged black box.

From Coles' paper it was clear that the geological data available were insufficiently detailed to provide answers to important questions about the stratigraphy, changes in palaeogeography and survival of palaeolandscapes from different periods. A major step forward was the work of Vince Gaffney, Simon Fitch and the late Ken Thomson (University of Birmingham) on legacy seismic data from the oil and gas industry, which made it possible to identify palaeolandscape structures under the seafloor. The paper by van Heteren et al. (2014) demonstrates that the reconstruction of palaeolandscapes from 3D and high-density 2D seismic data is achievable, but also that many challenges still remain. On the one hand there are gaps in the data that need to be filled, both spatially and temporally. On the other hand there is much to gain from increased and optimised data integration across national borders. The gain can be high: not only will this allow for a better spatial coverage of, for example, models of archaeological potential (see Ward et al., 2014), it will also help to optimise future data collection.

The increase in spatial and temporal resolution is possibly one of the most urgent priorities for the next few years. Palaeolandscape mapping, as discussed by van Heteren et al. (2014), particularly adds to the spatial improvement of models. However, additional efforts are required to improve temporal control. Although spatial models permit differentiation between palaeolandscape entities relatively in time, they do not make it possible to relate various features within a chronologically anchored dating framework. However, recent work by Hijma et al. (2012) demonstrates that considerable progress can be made through data integration and regional synthesis. The elements that come together in palaeogeographical reconstructions of the complex landscape evolution of the southern North Sea are discussed by Cohen et al. (2014). This paper makes clear that at this stage we base reconstructions of

Pleistocene North Sea palaeolandscapes on coarse chronologies and geological mapping schemes.

Insight into the complex processes of sedimentation and erosion is needed to develop improved palaeogeographical maps that are of major importance in understanding the archaeological record. Beyond any doubt, this is also crucial for the interpretation of the many palaeontological remains that are extracted in tons from the North Sea every year. Several papers published over the past decade report AMS-dated samples of mammal remains from the North Sea (Glimmerveen et al., 2004, 2006; Mol et al., 2006). These dates, together with information on the species composition of find associations, make clear that we are mostly dealing with mixed assemblages with materials of Early, Middle and Late Pleistocene, as well as Holocene age. However, the taphonomical processes are, as yet, not well understood, nor is it even clear how reliable many dates (especially those close to the limit of AMS dating) actually are. Nonetheless, many finds are quite spectacular and have scientific value, for example because of the preservation of aDNA or specific features such as the palaeopathology identified on a Neanderthal frontal bone that originates from the Dutch part of the southern North Sea, off the Zeeland coast (Hublin et al., 2009).

As the palaeontological record has been discussed in several recently published overview papers, this issue does not include any paper dealing with bone remains. We should bear in mind, however, that this is a resource that provides important clues to the landscape dynamics that characterised the southern North Sea area. The same can be said with regard to palaeovegetation. As yet, very little has been done in the field of palynological research (Glimmerveen et al., 2004), but vegetation is an integral aspect of these now submerged landscapes. In fact, submerged forests ('Noah's woods') that were encountered along the British coast stood at the basis of initial hypotheses about drowned landscapes by Clement Reid as early as 1913 (Reid, 1913). Linking palynological data to lithologically and seismically mapped entities in their relatively dated order, together with independent numeric age control (AMS ^{14}C , OSL) seems a logical way forward to build contexts for the various research disciplines that should find interest in the southern North Sea. In addition, it will certainly help to put across the message that the southern North Sea has a very important archaeological archive from critical periods of palaeoenvironmental change in human history.

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