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Foreword to "The Archaeology of Europe's Drowned Landscapes"

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This book describes the archaeology of all known submerged prehistoric remains and their regional context for the whole European continental shelf. They were inundated by the postglacial rise of global sea level. Over 2600 submerged Stone Age artefact sites, settlements, and anthropogenic indicators have been identified on the seabed of the European marginal seas, and their significance is analysed to show how the underwater remains influence our understanding of early exploitation of coastal and marine resources and early seafaring. The scope of this study is unique, since no attempt has been made previously to assemble and integrate submerged archaeological data on this geographical scale. It articulates fully the range of archaeological issues to which underwater prehistoric discoveries are relevant in Europe.

The finds extend over a time range from the earliest human presence north of the Alps in the Early Palaeolithic nearly one million years ago up to the establishment of modern sea level about 5000 years at the end of the Neolithic. Some later material is presented where coastlines have continued to subside.

The book begins with a succinct overview of the Ice Age cycles of sea-level change and the causes of submergence of prehistoric settlements and artefacts in the various geomorphologically contrasting European seas: from the Baltic, which behaves almost like a large estuary to the Atlantic margins with a huge tidal range and exposure to colossal storms, round to the Mediterranean and Black seas, where the postglacial rise of sea level is combined with local earthquakes and vertical earth movements. The reasons that prehistoric peoples lived on or crossed the exposed continental shelves differed in each case, and the regional environment, fauna, and flora influenced their culture, subsistence techniques, and their methods for exploiting the resources of the sea and coast. Submerged remains have been found on all types of coasts. The most extensive seabed archaeological deposits are on

wide or undulating shelves, with relatively few on steep rocky coasts. A web-based catalogue of all recorded sites with details of the archaeology is publicly available. This provides a resource for future research.

The main thrust of the book is contained in 19 richly illustrated chapters that describe the archaeology of submerged sites in each regional sea, nation by nation. Since both archaeology and oceanography continue seamlessly across national maritime jurisdictional boundaries, there are overarching reviews of each marine basin from coast to coast. A concluding section considers the universal issues of legal and regulatory regimes and interactions with offshore industries and cultural heritage laws,

Europe has one of the longest traditions of research on the prehistoric archaeology and submerged landscapes of the continental shelf anywhere in the world, extending back to the nineteenth century in some countries, and the largest currently known concentrations of submerged prehistoric archaeological sites. This is especially the case in the western Baltic and to a lesser extent in the southern North Sea, the southwest corner of the Black Sea, and the Levant coast of the eastern Mediterranean.

Prehistoric populations depended intimately on the ecosystem of which they were a part. Thus, the understanding of how people lived, and died, is inextricably linked to the landscape, fauna, and flora that surrounded them and the seasonal variations or migrations of species. Northern and northwest Europe were occupied and abandoned several times during successive glacial cycles. Underwater finds are therefore likely to be of great significance in filling some very large gaps in the Stone Age record, and an increasing number of finds have come to light in the past two decades.

The SPLASHCOS Action described in this book involved more than 120 experts from prehistoric archaeology and the marine geosciences working together. The issues of the Quaternary landscape of the exposed continental shelf, and its variability through time and space, are analysed in a separate

volume that has already been published. This book is thus a twin volume, and the two books enable researchers and students to study the details of the archaeological record in the context of the immediate local environment and the wider landscape of the previously exposed shelf.

The types of remains and their frequency of occurrence vary between regions. In northern Europe, the low sea levels exposed thousands of square kilometres of undulating plains, marshes, estuaries, and lakes. In the Mediterranean, where steep mountainous coasts are more common, and the shelf narrower, a drop of sea level does not produce so much new habitable land except in the Adriatic and Aegean seas and the western Black Sea shelf. Notwithstanding this limitation, important remains have been found in caves in the south of France and in Greece. In areas of extensive sedimentation, such as the southern Baltic parts of the Mediterranean coast of Croatia and Israel and the Bulgarian coast of the Black Sea, groups of settlements have been preserved with stratigraphic integrity, including organic remains such as leather, cloth, rope, burials, and food remains, including items which are seldom preserved on dry land. In the southern Baltic, finds include fish weirs, dugout canoes, bows, spear shafts, fibres, and woven fabric preserved in anaerobic sediments. Bows are made of elm wood and fish hooks are made from bone. Food remains include seals, dolphin, and whale. Unique examples survive of different types of wood for making different tools and hearths with burnt wood and food remains. In Britain, the submerged Mesolithic site at a depth of 11 m off Bouldnor Cliff near the Isle of Wight exhibits worked timbers, hut foundations, twine, and food remains. Where large numbers of sites are known, it is advantageous to organise regional integration and multidisciplinary studies so as to derive the spatial interaction between changes of climate, sea level, and the human response. The best example of this is the SINCOS project in the southern Baltic where researchers found 50 new sites and excavated 8 of them underwater.

Most of the documented prehistoric remains have been found in shallow water, not near the shelf edge. Sea level 12,000 years ago was 60 m below

present and had risen to within a metre of present sea level by 5000 years ago. This time span embraces the final stages of the Palaeolithic, with predominantly mobile hunter-gatherer communities largely lacking evidence of constructed habitations, no pottery, no agriculture, and no metal tools, through to the final Neolithic and Early Bronze Age when there were small towns, sophisticated decorated pottery, complex utensils made of bronze, and early stages of writing. These dramatic changes in the capability of human communities took place against a background of warming European climate, melting ice caps, and rising sea level. The context of social evolution against a background of changing climate, ecosystems, and rainfall has been examined by archaeologists for over one hundred years, but the interaction with rising sea level has been much less studied. This is for the simple reason that most of the evidence is on the present sea floor, and the missing data are brought together and recorded here for the first time. In some cases, the submerged discoveries reveal that technical skills, food types, and materials were already in use thousands of years before their earliest occurrence on the present dry land.

A few sites described in this book are older than 20,000 years, and thus predate the Last Glacial Maximum, and some are even older, going back through several glacial cycles. These early sites tell us how Palaeolithic communities interacted with the sea and its resources. The ability to cross sea straits in some form of floating craft certainly existed tens of thousands of years ago. Submerged sites in the time range 20,000 to 120,000 years, that is, pre-Last Glacial Maximum, confirm that prehistoric material in context can survive multiple marine transgressions. These include a remarkable cave in the south of France in which there are wall paintings, a settlement preserving flint tools and evidence of flint knapping at a depth of 20 m off the north coast of France, and a concentration of early Palaeolithic materials beneath sediments in the North Sea.

Contrary to popular expectation, a large number of prehistoric materials have survived in the intertidal zone on coasts where they are exposed to storm waves and tidal currents. Among the most distinctive of these intertidal finds

are the human and animal footprints preserved in intertidal sediments in many locations, especially at Goldcliff East. The earliest, at Happisburgh, are dated between 0.78 and one million years ago. Large numbers of intertidal records survive around the coast of Britain and northern France. The British sites are often beneath submerged forests or drowned peat beds, while the French remains are mostly megaliths and stone tombs on a rocky coast with a large tidal range.

Major discoveries have resulted from collaboration between archaeologists and commercial operations, especially during the building of the Great Belt Fixed Link in Denmark and excavation of the harbour basin Maasvlakte 2 in the North Sea at Rotterdam. While industrial projects bring powerful machinery to bear on the seabed, controlled by acoustic positioning and monitoring equipment, academic research projects are increasingly using high-technology positioning and survey equipment underwater, resulting in large

data sets of both palaeoenvironmental data and archaeological finds. Three-dimensional photogrammetry has been valuable at many sites, and there is increasing use of remotely operated vehicles (ROVs).

One of the problems that occur repeatedly is the difficulty of first finding and then confirming the nature of a presumed prehistoric feature. There is no technology available at present that can detect at a distance of a few metres deposits of wood and worked flint contained within sediments of sand, mud, or gravel. Visually, anthropogenic materials can be detected on the surface by high resolution photography or directly by observations by divers, but these methods can only search small areas slowly. As a result, most submerged prehistoric sites to date have been found by chance, by trawlers, dredgers, coastal engineering, or geophysical coring carried out for other reasons. As soon as the first artefacts are identified and reported, archaeologists respond with the appropriate technology and controls.

The application of modern high technology has a vital role to play. Marine

geoscientific surveys of the continental shelf that measure the properties of Pleistocene sediments or processes should be conducted with the prehistoric implications in mind. In some cases, projects may conduct such surveys specifically for archaeological purposes, but more often there are other reasons, often industrial or commercial, and in these cases the archaeological benefits should be extracted from the archived data.

When a prehistoric deposit has been identified on the sea floor, the application of trained divers supported by technology, depending on the depth, becomes essential. It is important to note that some phases of work can be conducted quite cheaply, and the apparent cost of the most sophisticated projects should not be interpreted as a deterrent. As the knowledge of existence of a site is confirmed by the first finds, so the application of technology can be ramped up to include comprehensive analysis of the surrounding landscape, topography, drowned river drainage, ecosystem indicators, ancient sedimentary DNA, 3D photogrammetry, and so on. The volumes of data obtained, or archived, describing all aspects of palaeolandscapes, palaeoclimate, and palaeoecosystems, plus the archaeology and preserved artefacts, are truly enormous, requiring the most advanced techniques of data retrieval and data management.

Seabed prehistoric research has made huge advances in the last two decades, and results are presented in this book. A combination of new intellectual insights and goals with new technology guarantees that this progress will continue in future. We hope that early-stage researchers will adopt this research, with increasing support from academic and commercial institutions.

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