UNESCO SCIENTIFIC COLLOQUIUM ON FACTORS IMPACTING THE UNDERWATER CULTURAL HERITAGE
10th Anniversary of the Convention on the Protection of the Underwater Cultural Heritage

Royal Library of Belgium, Brussels, Belgium.
13th & 14th December, 2011.

The role of archaeologists in understanding and preventing the impacts of marine industries on the prehistoric environment

Martin R. Bates, School of Archaeology, History and Anthropology, University of Wales Trinity Saint David, Lampeter, Ceredigion, Wales. SA48 7ED, ***m.bates@tsd.ac.uk***

Abstract

A wide range of impacts are caused by marine industries on the seabed and in some instances these impacts may affect archaeological remains associated with the seabed or buried in sediments beneath the seabed. Where we understand something of the nature of the submerged landscapes (such as the southern North Sea), these impacts can be mitigated through a range of approaches. In other areas deemed to be 'unknown' or of low archaeological potential it is very difficult to develop an approach to seabed prehistory because of a set of preconceptions about the nature of the seabed among both archaeologists and developers.

In order to help educate and inform maritime industries about the nature of the archaeological problems associated with submerged prehistory it is therefore important that as an industry we are clear about what our aims and objectives are when considering developing projects in the marine sector. Too often we only have vague notions of what we mean when we discuss the prehistoric record and there is little consideration for example that approaches to late Palaeolithic/Holocene prehistories require different strategies to those dealing with the Lower and Middle Palaeolithic.

Introduction

The survival of evidence relating to the human use of formerly dry areas presently submerged beneath the marine waters surrounding our coasts is now well attested (Bailey 2008). Archaeological remains from the Solent in Southern England (Momber 2011), the English Channel (Cliquet *et al*. 2011) and the North Sea (Verhart 2008; Van de Noort, 2011) (Figure 1) clearly demonstrate that before sea levels attained modern elevations our ancestors accessed and used areas of the continental shelf that have, at times, been dry. Geophysical evidence for such palaeolandscapes has been well publicised through the work in the southern North Sea by Gaffney and others (Gaffney *et al* 2007; 2009; Tizzard *et al* 2011) that has demonstrated the variety of topography and the scale of inundated valleys and hills of the area now known as Doggerland. A common feature of the landscapes that have been investigated is the extensive spreads of sediment containing a record of the inundated environment either through a series of superimposed depositional events such as those found in the southern North Sea Basin (Gaffney *et al*. 2007) (Figure 2A, Figure 3), as terraces and estuarine infills in former valley systems (Bellamy 1995) (Figure 2B) or as sequences built up at the foot of slopes (Cliquet *et al*. 2011) (Figure 2C).

The archaeological potential of these landscapes is however hard to ascertain. Despite the abundance of information pertaining to these previous landscapes, except in the shallowest waters close to the modern coast (Momber *et al*. 2011; Tizzard *et al*. 2011), relatively little archaeological material has been systematically recovered from such contexts. This is in part a function of the vast scale of the landscapes which would have been open to settlement and activity by local populations, but is also a function of the environments of deposition of the artefacts. Consequently there are considerable difficulties in discovering human artefacts that directly confirm a human presence in these landscapes

By contrast with the aggradational environments there have been few attempts to investigate those parts of the shelf area that are dominated by bedrock where deposits that may contain the archaeology are few and erosion may be the dominant mechanism in operation (erosional environments) (Bates *et al*., submitted). In such situations (e.g. around the Channel Island of Jersey or in Orkney) there appears to be a presumption towards minimal archaeological preservation and consequent low potential. Additionally these areas contain little in the way of mineral aggregates and have seen only minimal investigation. Such areas may characterise extensive tracts of the English Channel as well as the interfluves between major drainage basins. However, rather than being barren tracts of relatively sterile landscape with low archaeological potential, such areas may contain pockets of sediment with their own unique archaeological signal. Understanding the nature of this submerged record in these situations requires a different approach in order to obtain an archaeological narrative.

This paper considers some of the problems of investigation both in depositional and erosional environments with particular reference to the Palaeolithic record and concludes with a few thoughts on future avenues of investigation. It places particular emphasis on issues that we as an industry need to clarify in order to be able to communicate clearly (with a unified voice) with industry developing areas of the marine sector.

Palaeolithic archaeology: problems, contexts and strategies

Our consideration of the Palaeolithic resource in the marine area needs to acknowledge a number of factors that include:

1. The nature and values of that resource.
2. Problems of investigating the resource and establishing significance.
3. Defining contexts and the use of terrestrial models in the marine zone.

The Palaeolithic archaeological resource that we find in terrestrial situations today occurs in a range of depositional environments, but by far the greatest occur in association with fluvial and lacusterine

sediments of the major river valleys of southern England (Figure 4A) (Wymer 1999). Within these sediment bodies artefacts commonly occur as derived material within coarse grained (cold climate) sediments (Figure 4B) or more rarely as *in situ* material within finer grained sands and silts (sometimes associated with interglacial regimes (Figure 4C)). Commonly *in situ* discoveries are considered to be of greater significance than reworked artefacts because of the behavioural implications that can be drawn from a knapping scatter or butchery episode such as those at the site in Boxgrove, West Sussex (Roberts and Parfitt 1999). This stance is clearly taken in many of the recently published guidelines for investigating the Palaeolithic redsource in the UK (English Heritage, 1991, 1998, 1999, 2008). However, this perspective requires clarification and careful consideration of the importance of the questions that an individual may like to ask in relation to the information attached to an individual discovery (Bates and Wenban-Smith, 2011). For example, a knapping scatter made one afternoon at Boxgrove may provide significant information on an individuals activities however it cannot provide information on long term population trends or trajectories in tool types and technologies over the course of the Lower Palaeolithic. Questions relating to these latter issues can only be answered by reference to large collections of aretefacts such as those from derived contexts in river gravels. In such instances, where patterns being examined change at the scale of glacial/interglacial timescales, the time averaged sediment packages associated with river gravels and terraces are ideal base units for study. These considerations have important implications for the prioritization and collection of material from the seabed and will influence both the foci of investigation and methods of collection of samples.

Turning now to our ability to investigate the Palaeolithic resource we find ourselves presently in an area of some controversy. Until very recently many of the investigations of our terrestrial Palaeolithic resource over the last 30 years have come from the reinvestigation of sites previously discovered in quarrying or other forms of ground works (e.g. Swanscombe (Conway *et al*. 1996), Barnham (Ashton *et al*. 1998), High Lodge (Ashton *et al.* 1992)). Other sites have been discovered accidentally during quarrying (Boxgrove (Roberts and Parfitt 1999); Lyndford (Boismier, in press)) or in the course of major construction projects (Southfleet Road elephant site; Wenban-Smith *et al*. 2006). By contrast purposive exploration for new sites has been, at best, only marginally successful. This is in part a function of an absence of universally applicable sets of procedures for site investigations (when compared with guidelines for later periods) including even notions of what constitutes an appropriate project design for investigating the Palaeolithic record in most instances. Where investigation has been undertaken the scale and levels of investigation vary widely from county to county and usually reflect the familiarity (or not) of the development control officers with Palaeolithic archaeology. This lack of purpose impacts on what developers perceive as acceptable levels of investigation and makes determination of the significance of the discovery of, for example, a single artifact within a sequence of sediments, difficult to determine. As a consequence we are typically facing a varied response to the Palaeolithic in different areas and no universally accepted level of investigation to follow.

There is also the problem of the scale of the area of investigation. For example, the Palaeolithic resource within the Thames Valley (Wymer 1968, 1999) has been built through nearly 150 years of research mainly through the quarrying industry. Collectors and more recently archaeological teams have focused on the recovery and/or excavation of artefacts from sites while geologists and biologists have contextualized, correlated and created environments of deposition for these finds. Despite this intensity of research significant problems remain regarding the nature of the basic record, how artefacts behave in these active systems and how we should interpret the results from these studies. In the marine sector we

have virtually no historical data and only a basic understanding of the geology, correlation of deposits and associated environments of deposition.

Finally a major problem we face within the marine sector is the applicability of the terrestrially derived logic for determining significance within a body of sediment. The relationship between major mapped sediment bodies within the fluvial systems in southern England and their associated artefacts is an important factor in many instances in deteremining potential. For example in southern England the fluvial archive within the river Thames appears to suggest the younger terraces of the river contain fewer Palaeolithic artefacts than those associated with the higher terraces (Ashton and Lewis 2002). This information has been used to model changes in population densities within the UK over these time frames and the implications of this logic has been used by curatorial staff when determining strategies in advance of construction. However, projecting terrestrail sequences and terraces into the offshore zone and onto the shelf area at times of lowered sealevels is fraught with difficulties and at present has not been demonstrated anywhere around the UK (Figure 5). Furthermore it is likely that fluvial processes and sedimentary architectures in those areas are likely to be different to those operating in what is now the lower reaches of our river valleys. Consequently it is difficult to determine at present how relevant data derived from study of terrestrial situations is to submerged contexts.

The implications for investigating the Palaeolithic resource within the marine zone are therefore considerable and include:

1. The scale of the systems being investigtated and minimal levels of information available for study.
2. An absence of suitable baseline data sets from terrestrial situations to compare against marine derived information.
3. The strong possibility that processes operating in landscapes intermittently exposed at times of lowered sea levels may be very different to those operating higher in the fluvial systems at the same time.
4. The impact of repetitive transgressions and regressions across these areas.

The nature of submerged landscapes and the associated archaeology

The concept of a submerged landscape is one that can be traced back to at least Clement Reid's work in the late 19th century in which he considered the significance of the fossil forests around our coastline (Reid 1913). Today we tend to think of submerged landscapes as relicts of former "dryland" systems in which we have evidence for rivers, estuaries, coasts etc. These tend to be within areas of net deposition in which evidence for these former systems are coincident with the seabed or where the deposits lie close to the seafloor. The southern North Sea (Figure 3) is a case in point in which continued subsidence over the Pleistocene has resulted in the vertical aggradation of sequences within the tectonic basin. In such systems archaeological remains associated with the final Palaeolithic and Mesolithic periods are likely to

be buried close to the seabed or actually lying on the seabed surface. Consequently the contemporary landscape for these periods is that immediately beneath the seabed in most cases.

By contrast evidence for the much of the Palaeolithic record is likely to be deeply buried within the sedimentary stack at the site and where (as a result of erosion) only fragments of former landscapes are likely to survive. As a result there will be considerable difficulties in reconstructing these landscapes as well as recovering direct evidence for human activity except in those locations where local factors bring older sediments to the surface or where older beds reach the surface as sequences thin towards the margins of the basin.

Away from major zones of deposition in emergent zones or zones of net uplift erosion will become an increasingly important process in operation. This will result in considerable tracts of bedrock lying close to the sea bed or actually forming rock skerries on the seabed. In this case there is usually the presumption that evidence for submerged landscapes are absent, or at best fragmentary and that this will also apply to the archaeological signature. Hence the archaeological potential for these areas is low. While this is undoubtalby true in many locations localized pockets of sediment (perhaps containing important archaeological remains) may exist and therefore the potential for preserving archaeology is more complex that those in areas of well preserved buried landscapes.

It is now clear from the discussion above that future investigations of the seabed should clarify at the outset the differences between investigating the Lower and Middle Palaeolithic archaeological resource from the latest Palaeolithic/Holocene archaeological resource. Different approaches, methods, questions and scales of investigation will be required to investigate each area. This is recognized in terrestrial situations where (usually) guide lines for Palaeolithic investigations (English Heritage 1998, 2008) differ from those for Mesolithic investigations. Recognition of these factors in the marine sector will immediately instill clarity where ambiguity presently exists.

A way forward: an example from the English Channel and Channel Islands

The Palaeolithic site at La Cotte de Saint Brelade (Figure 6) on Jersey (Callow and Cornford 1986) preserves a long record of human occupation perhaps spanning nearly 250,000 years. Although today the site overlooks the Norman/Breton Gulf, for much of the time during its long occupation a very different view would have greeted occupants of the cave as lowered sea levels revealed extensive lowland vistas to the west. The landscapes are dominated by a variety of underlying rock types including granite, limestones and conglomerates and erosion dominates throughout much of the area. Today it is clear to us, as Palaeolithic archaeologists, that any attempt to understand human activity at the site must model these landscapes associated with it. However attempts to do so will be hampered by fragmentary evidence, incomplete sequences, poor dating control and an absence of material to examine the faunal

and floral aspects of the landscapes. Coupled to these problems is the likelihood that landscapes do not have modern analogues today. However, there are approaches to the site and its landscape that can be taken when we consider the context of La Cotte at three discrete scales:

1. Macro-scale landscapes at the scale of the context of the English Channel/Manche (Figure 7) and the marine isotopic record at 100k year cycles, where even a relatively coarse temporal framework can be achieved using the available dating methods. Such frameworks are useful for considering human distribution/dispersal within macro regions and across the full occupation history of the site. Data sets suitable for this include regional bathymetries, bedrock and superficial sediment maps and a refined Marine Isotope curve.

2. Meso-scale landscapes at the scale of the Breton/Norman Gulf (including the Channel Islands) (Figure 8) where geographies at smaller scales and shorter time intervals may potentially be reconstructed. For example seabed data including bathymetric maps, regional geologies and seabed samples can provide information at a scale typically of less than 100km and with temporal resolutions probably down to 10,000 years or less. For example within the study area core and grab sample data from the seabed indicates a scatter of fossiliferous units indicating the presence of former strand lines (Danukalova and Lefort 2009) at number of locations suggesting that in the future it might be possible to map still stand phases within the Weichselian. This scale probably approximates to the regional foraging territory of the human groups that might have occupied La Cotte and such a map would have considerable potential significance when compared against changing behaviour indicated from stone tool assemblages within the site.

3. Micro-scale (site) landscape at the scale of travelling distance from La Cotte (1-2 hours, 4-10km radius) (Figure 9) where detailed survey and sampling may provide records of events at the finest scale including evidence such as buried landsurfaces, local stratigraphies etc. may be present (Figure 10).

Indeed mapping of the seabed close to La Cotte (Figure 10) has already altered our perception of the site within its local terretory. We can now view La Cotte as comanding a presence across a lowland landscape within which La Cotte sits at the end of a blind valley leaving the plains and entering the uplands of modern Jersey.

Conclusions

Previously much of the investigation into submerged landscapes of the British coastline has focused on methodological approaches to identifying the presence, on or beneath the seabed, of sediments relating to former landscapes and, where possible, locating and excavating archaeological remains associated with elements of this landscape. This might be viewed as a pioneer phase in working in the marine environment and perhaps we as group can now move forward towards a phase of colonizing these areas with targetted questions and by beginning to address the nature and potential of the resource in both predominantly depositional and erosional landscapes by formulating nested hierarchys of questions at a variety of scales appropriate to individual sectors of the landscape.

Understanding our submerged heritage is not always about the identification of large, complex and well preserved landscapes but can also include small scale surveys of packages of sediments preserving important archaeological remains in areas of our seas that at first seem hostile to preserving such records. Until now it has been reasonable to focus attention on those large, well preserved landscapes in order to highlight the importance of the submerged archive however now we have to move forward as a discipline and embrace those areas in which we have to look more closely for the archaeological archive.

In developing methodologies for landscapes in which erosion dominates we need to be far more focused on what information we are trying to extract from the seabed and how that information relates to a range of archaeological questions that we should be asking of our surveys. It is only by carefully constructing our research designs in such a fashion that we can meaningfully investigate such areas and, perhaps more importantly, convince industry that the resources we request from them are being wisely spent.

Bibliography

Ashton, N.M., Cook, J., Lewis, S.G. & Rose, J. 1992. *High Lodge: Excavations by G. de G. Sieveking 1962–68 and J. Cook 1988*. British Museum Press, London.

Ashton, N.M., & Lewis, S.G. 2002. Deserted Britain: declining populations in the British late Middle Pleistocene. *Antiquity* 76, 388-396.

Ashton, NM., Lewis, S.G. and Parfitt, S.A., 1998 *Excavations at Barnham 1989-94.* British Museum Occasional Paper 125.

Bailey, G. 2008. Mesolithic Europe: overview and new problems. In G. Bailey and P. Spikins (eds.), *Mesolithic Europe,* 357-72. Cambridge: Cambridge University Press.

Bates, M.R. and Wenban-Smith, F.F. 2011 Palaeolithic Geoarchaeology: palaeolandscape modeling and scales of investigation. *Landscapes 2011 (1),* 69-96.

Bates, M.R., Bates, C. R., Dawson, S., Nayling, N., and Wickham-Jones, C.R. submitted A multi-disciplinary approach to the archaeological investigation of a bedrock dominated shallow marine

landscape: an example from the Bay of Firth, Orkney, UK. Submitted to *Journal of Archaeological Science*

Bellamy, A.G. 1995. Extension of the British landmass: evidence from shelf sediment bodies in the English Channel. 47 – 62. In (Preece, R.C., ed.) *Island Britain: a Quaternary perspective.* Geological Society Special Publication No. 96.

Boismeier, W.A. in press *Neanderthals among Mammoths: excavations at Lynford Quarry, Norfolk.* English Heritage.

Callow, P. and Cornford, J.M. 1986 *La Cotte de St. Brelade. 1961-1978. Excavations by C.B.M.McBurney.* Geobooks: Norwich.

Caston, V.N.D. 1977 *Quaternary deposits of the central North Sea.* Institute of Geologial Sciences Report 77/11. HMSO: London.

Cliquet, D., Coutard, S., Clet, M., Allix, J., Tessier, B., Lelong, F., Baltzer, A., Mear, Y,. Poizot, Patrick Auguste, E., Alix, P., Olive, J., & Guesnon, J, 2011. The Middle Palaeolithic Underwater Site of La Mondrée, Normandy, France. In Benjamin, J., Bonsall, C., Pickard, C. & Fischer, A. (eds) *Submerged Prehistory*. Oxford: Oxbow Books.

Conway, B.W., McNabb, J and Ashton, N. 1996 *Excavations at Barnfield Pit, Swanscombe, 1968-72.* British Museum Occasional Paper 94. British Museum Press: London.

Danukalova, G. and Lefort, J-P. 2009 The contribution of malacology in dating the Pleistocene submarine levels of the English Channel. *Journal of the Geological Society of London 166*, 873 – 878.

English Heritage. 1991. *Exploring our Past: Strategies for the Archaeology of England.* Historic Buildings and Monuments Commission for England, London.

English Heritage. 1998. *Identifying and Protecting Palaeolithic Remains: Archaeological Guidance for Planning Authorities and Developers*. English Heritage, London.

English Heritage. 1999. *Research Frameworks for the Palaeolithic and Mesolithic of Britain and Ireland*. English Heritage, London

English Heritage. 2008. *Research and Conservation Framework for the British Palaeolithic*. English Heritage, London

Gaffney, V., Thomson, K. And Fitch, S. 2007. *Mapping Doggerland*. Oxford: Archaeopress.

Gaffney, V., Fitch, S. and Smith, D. 2009. *Europe's Lost World, the rediscovery of Doggerland*. York: CBA Research Report 160.

Momber, G. 2011. Submerged Landscape Excavations in the Solent, Southern Britain: climate change and cultural development. In Benjamin, J., Bonsall, C., Pickard, C. & Fischer, A. (eds) *Submerged Prehistory*. Oxford: Oxbow Books.

Momber, G., Tomalin, D. and Scaife, R. 2011 *Mesolithic Occupation at Bouldnor Cliff and the Submerged Prehistoric Landscapes of the Solent.* Council for British Archaeology Report.

Reid, C. 1913 *Submerged forests*. Cambridge University Press: Cambridge.

Roberts, M.B and Parfitt, S.A. 1999 Boxgrove. *A Middle Pleistocene hominid site at Eartham Quarry, Boxgrove, West Sussex.* English Heritage Archaeological Report 17. English Heritage, London.

Shackleton, N.J., 2000. The 100,000-year Ice-Age cycle identified and found to lag temperature, carbon dioxide and orbital eccentricity. *Science 289*, 1897 – 1902.

Tizzard, L., Baggaley, P.A. & Firth, A.J. 2011. Seafloor Prehistory: investigating palaeolandsurfaces with Palaeolithic remains from the southern North Sea. In Benjamin, J., Bonsall, C., Pickard, C. & Fischer, A. (eds) *Submerged Prehistory*. Oxford: Oxbow Books.

Van de Noort, R. 2011. *North Sea Archaeologies, a maritime biography, 10,000 BC – AD*

1500. Oxford: Oxford University Press.

Verhart, L. 2008. New Developments in the Study of the Mesolithic of the Low Countries. In G. Bailey and P. Spikins (eds.), *Mesolithic Europe*, 158-81. Cambridge: Cambridge University Press.

Wenban-Smith, F.F, Allen, P., Bates, M.R., Parfitt, S.A., Preece, R.C., Stewart, J.R., Turner, C. and Whittaker, J.E. 2006 **The Clactonian elephant butchery site at Southfleet Road, Ebbsfleet, UK. *Journal of Quaternary Science 21*, 471-483.**

Wymer, J.J. 1968 *Lower Palaeolithic Archaeology in Britain as represented by the Thames Valley.* John Baker: London.

Wymer, J.J. 1999. *The Palaeolithic Occupation of Britain*. Wessex Archaeology, Salisbury.

List of Figures

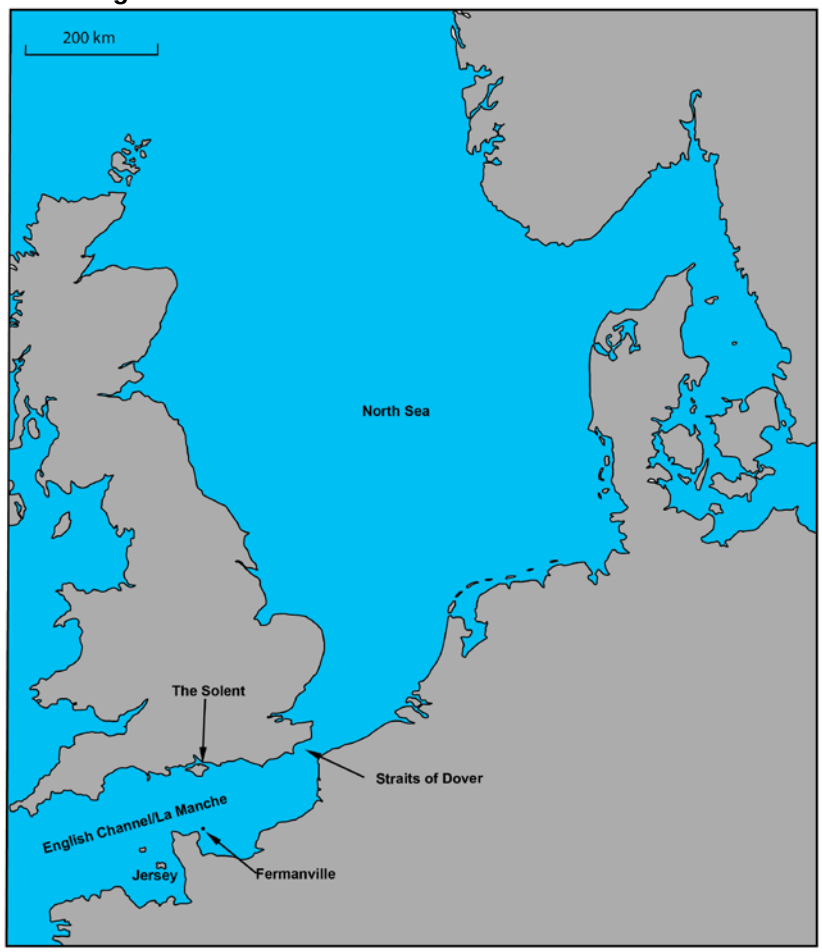

Figure 1. Site location for sites and areas within English Channel and North Sea.

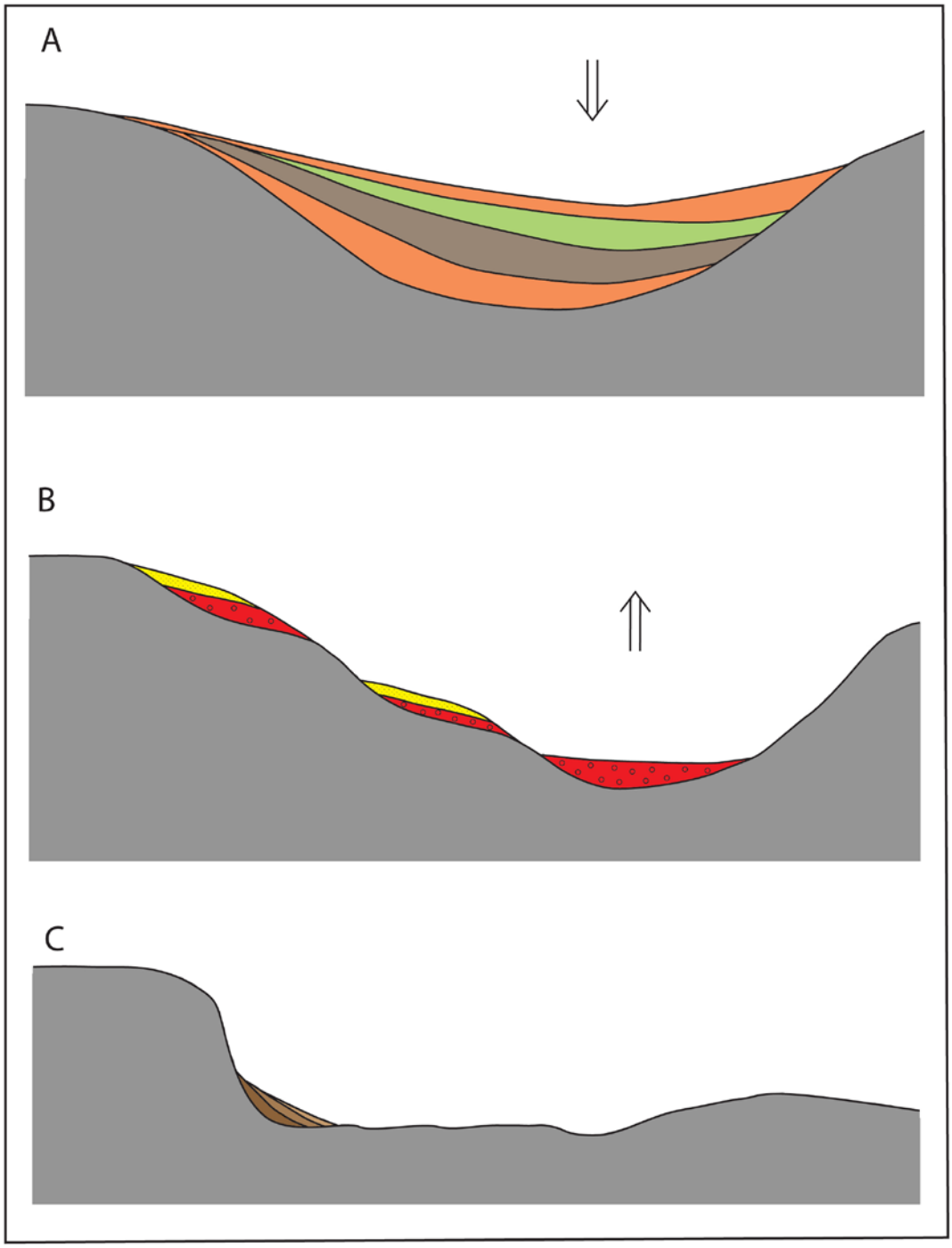

Figure 2. Schematic illustrations indicating geological situations of key terrain types in study area. **A:** Basin structure such as present in the southern North Sea characterizing a subsiding situation. **B:** Terraces within a valley system undergoing long term uplift such as in the English Channel. **C:** Cliffs with associated scree slopes such as at La Mondrée.

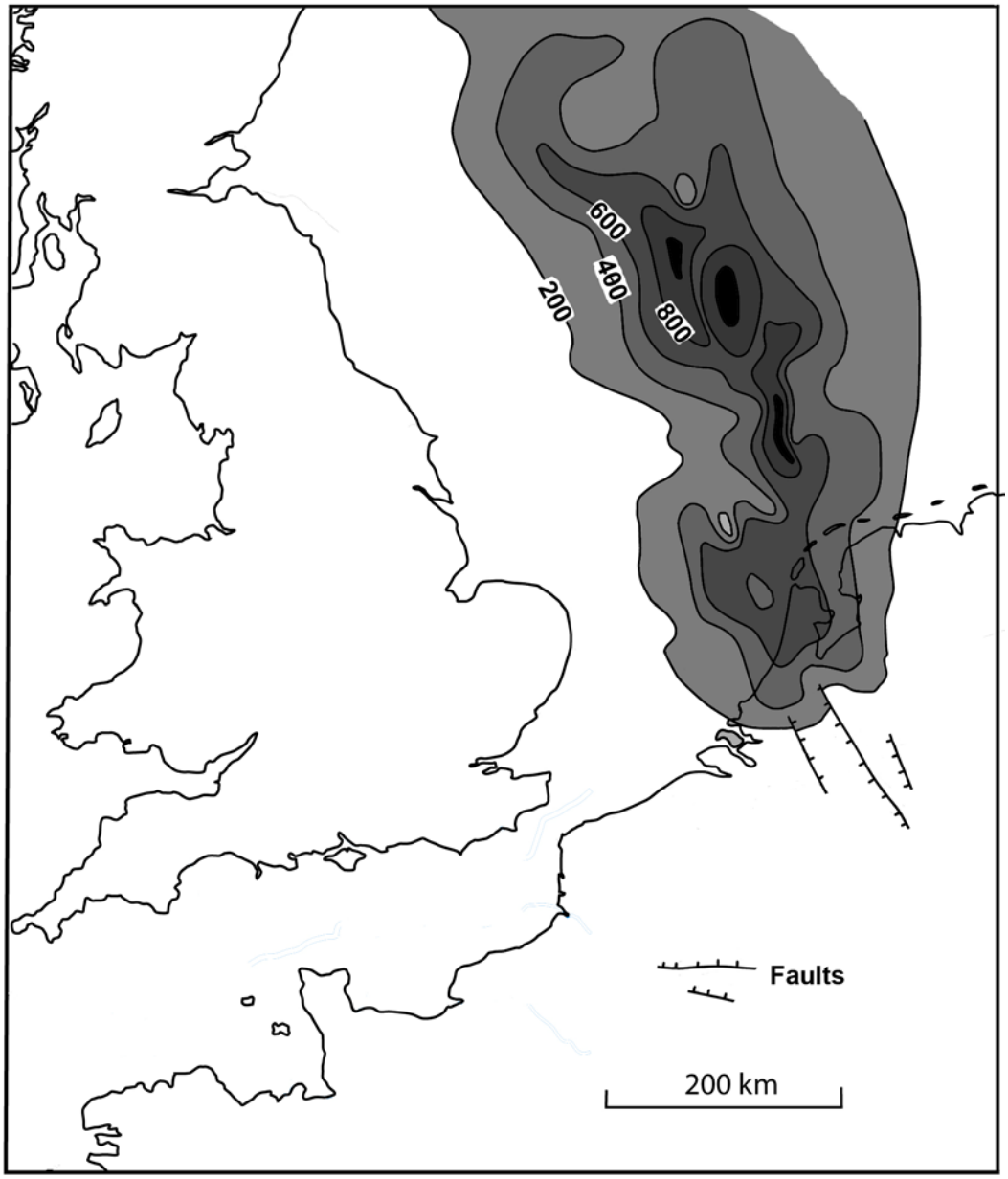

Figure 3. Map showing sediment thickness with the southern North Sea basin (area of subsidence based on Caston (1977)).

Figure 4. A: Fluvial and lacusterine sediments containing Clactonian artefacts and the bones of a straight tusked elephant (grey sediments) beneath river gravels containing handaxe. **B:** Handaxe within fluvial gravels at Southfleet Road. **C:** Large core lying within fine grained sediments at Southfleet Road.

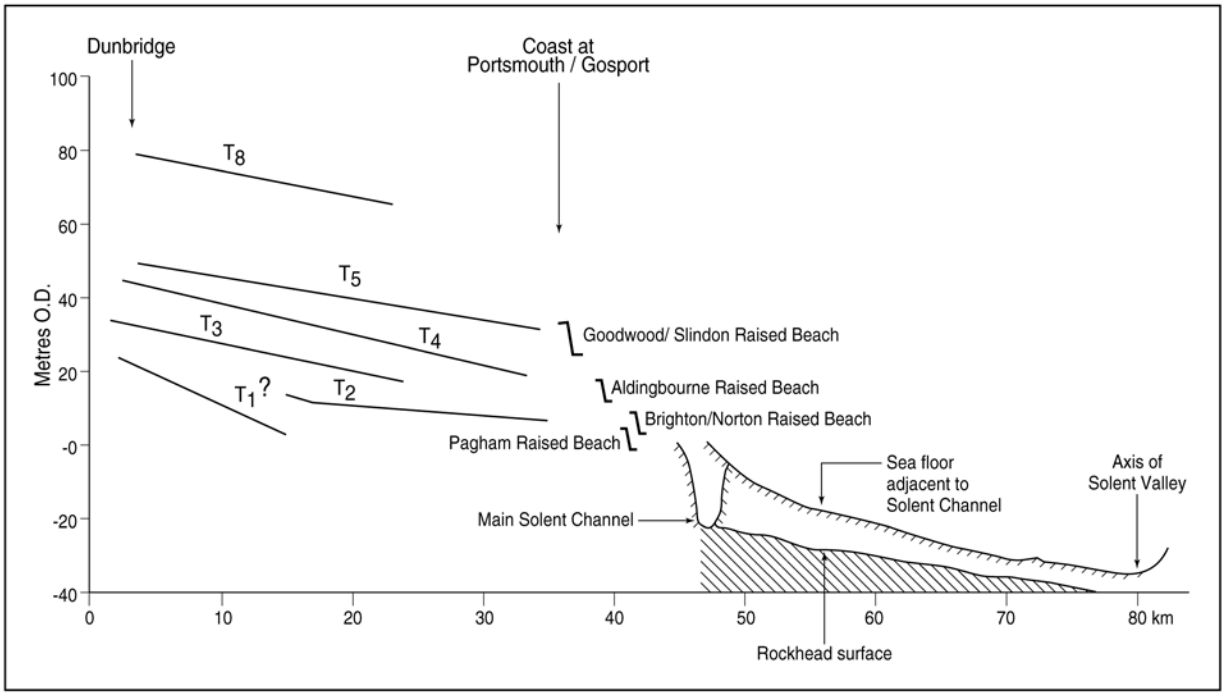

Figure 5. Schematic profiles of terraces of the Solent system east of the Test and the seabed within the Solent illustrating the difficulty of terrace projection across the transition zone.

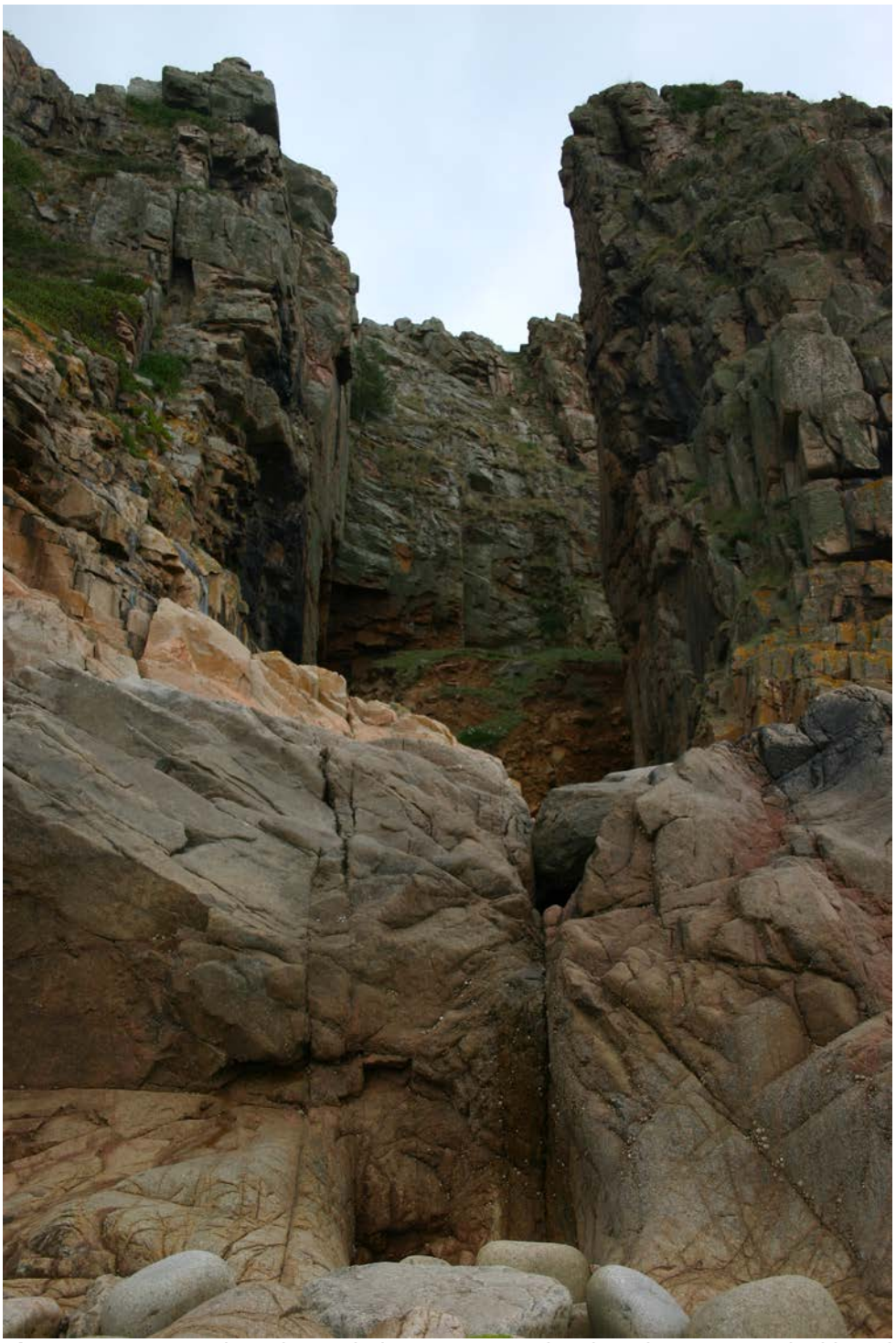

Figure 6. La Cotte de Saint Brelade, Jersey. A view into the sea cave looking along the western ravine towards the cone of Weichselian deposits from which Neanderthal remains were recovered.

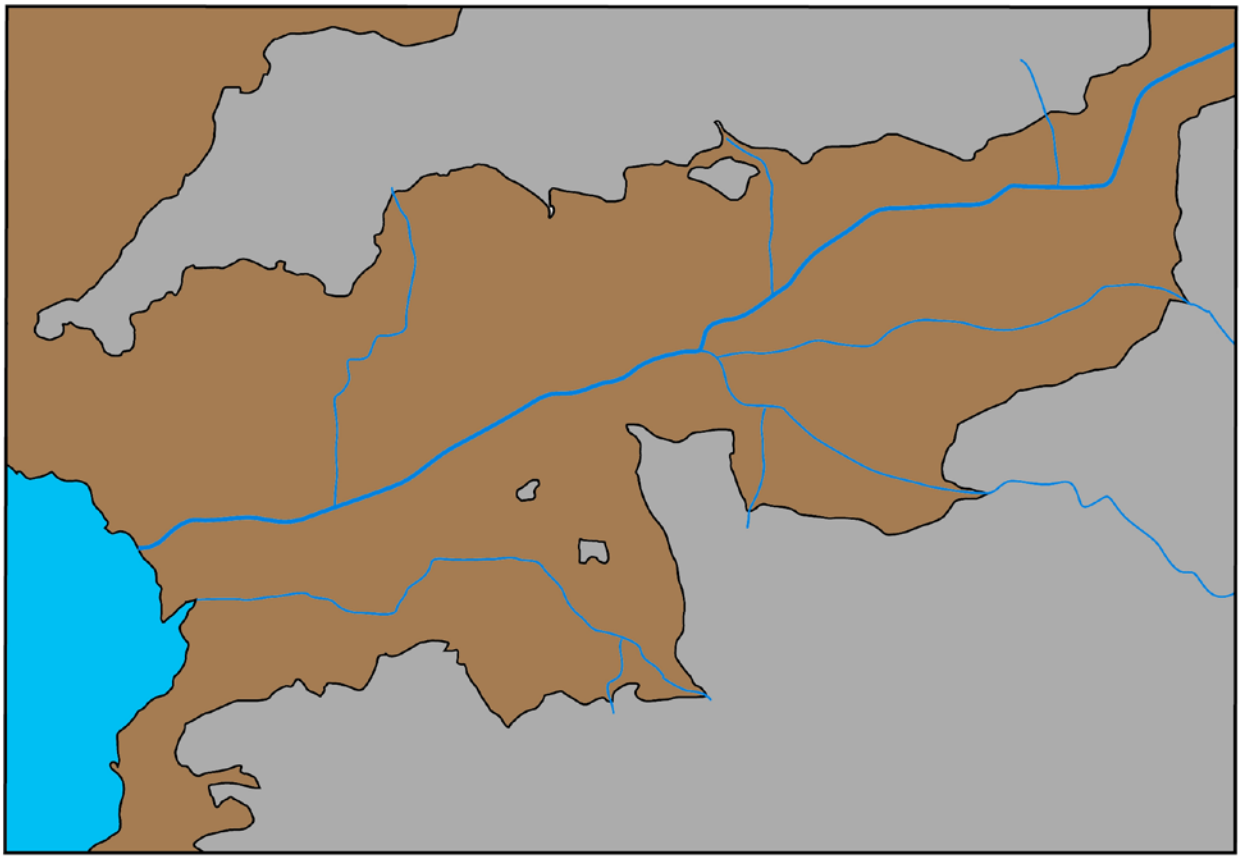

Figure 7. Drainage network on floor of the English Channel at times of lowered sea levels during the Weichselian.

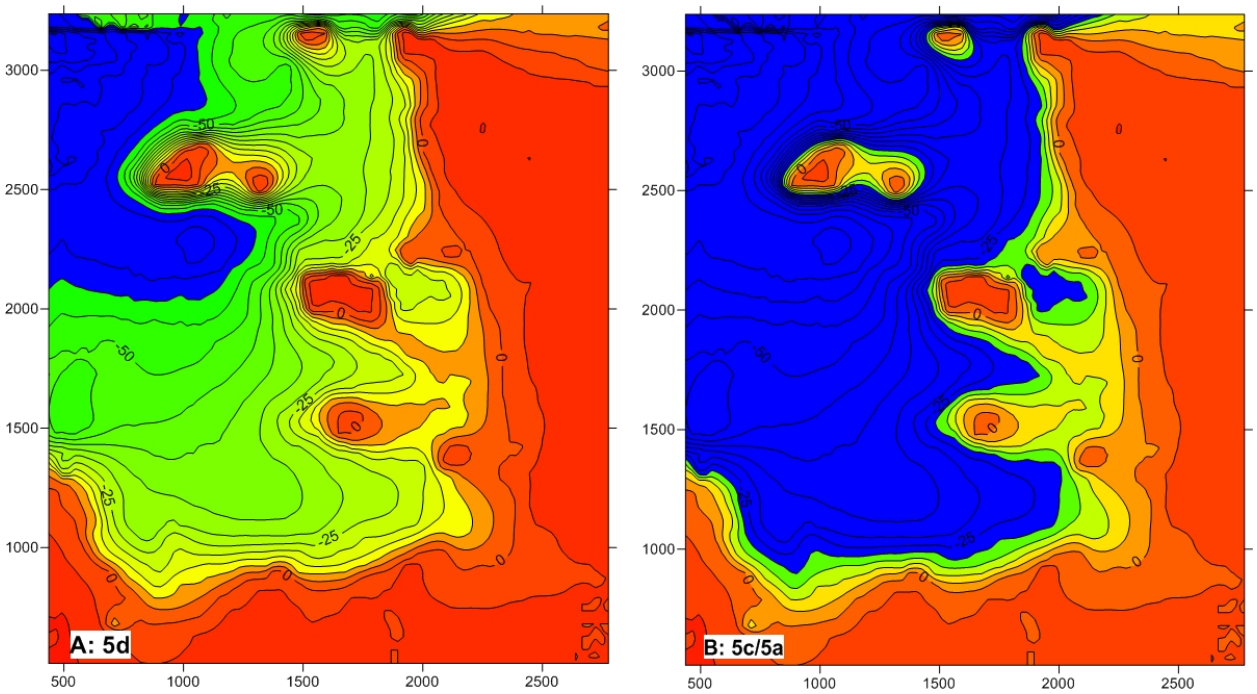

Figure 8. Topography of the seabed around the Channel Islands showing the position of the coasts during A: MIS 5d and B: MIS 5c/5a.

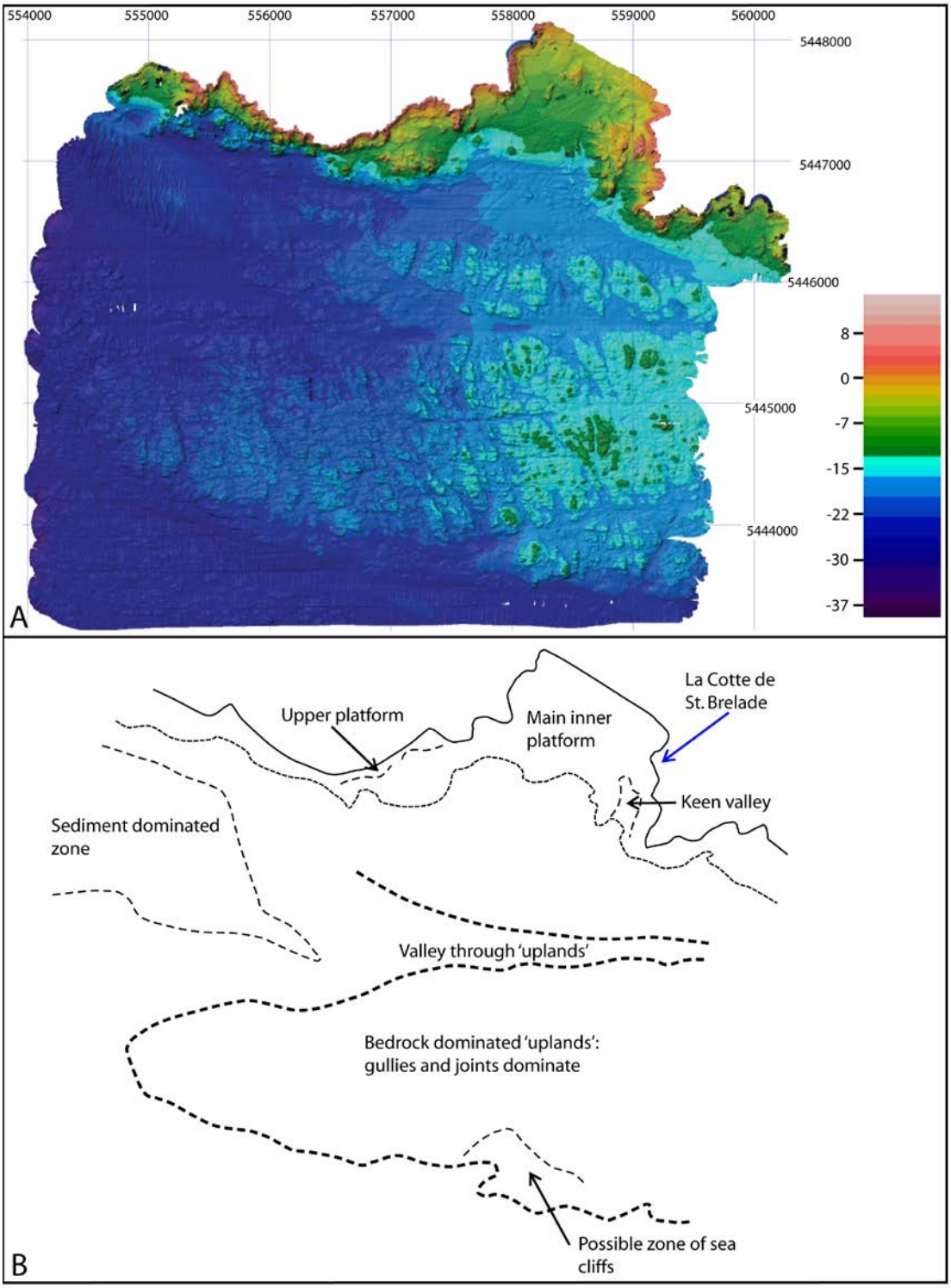

Figure 9. **A:** Bathymetry for the seabed south of La Cotte de Saint Brelade, Jersey. **B:** Geomorphological interpretation of the seabed topography south of La Cotte de Saint Brelade, Jersey.

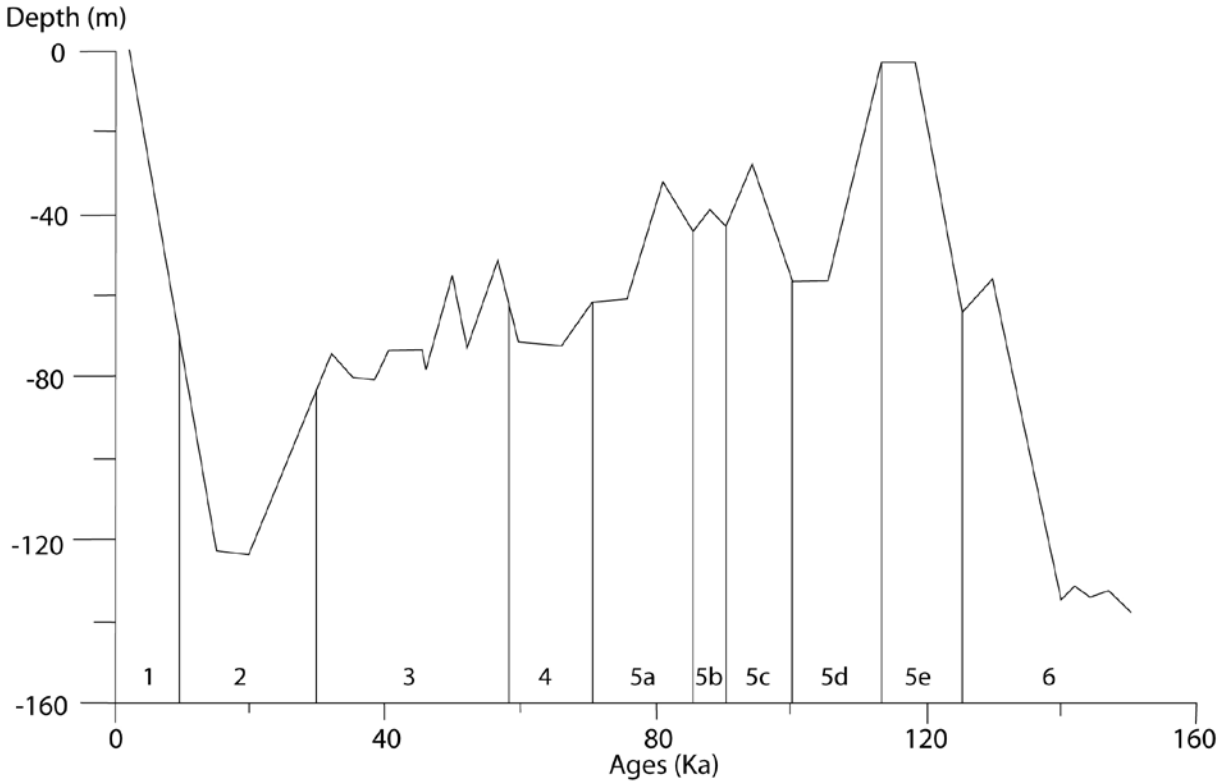

Figure 10. Sea level curve for the last 160,000 years based on Shackleton (2000).