

Submarine prehistoric archaeology of the North Sea

Research priorities and collaboration with industry

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Front cover: The cranium of a young woman at the Tybrind Vig submerged site, Denmark (© Hans Dal)

Back cover: computer-generated perspective of the British Isles colour-coded to show the sea level and topography at 22,000 BP (© Justin Dix:University of Southampton)

1 The wider significance of submerged archaeological sites and their relevance to world prehistory

by Geoff Bailey

Abstract

This paper addresses the history of scepticism that exists in the wider archaeological community about the value of underwater prehistoric archaeology, and the need to articulate the intellectual problems that justify underwater research. Four preconceptions inform that scepticism: (a) that underwater archaeological remains have not been preserved or are too difficult and costly to retrieve; (b) that in any case they are unlikely to provide information that could not be more easily obtained on land; (c) that coastal settlement and marine palaeoeconomies are marginal to the main patterns of world prehistory, a belief reinforced by 19th-century ethnographic accounts of coastal societies; and (d) that the search for underwater civilisations advocated by amateur enthusiasts is a further symptom of a marginal field of study. In this paper I argue that coastal environments have always been advantageous to prehistoric populations and played a central rather than a marginal role in human development, that underwater archaeology is no more difficult or more subject to problems of differential visibility, loss and destruction than archaeology on dry land, and that underwater work, in consequence, is a necessity rather than an optional luxury if we are properly to understand some of the most important developments in world prehistory.

Introduction

The community of individuals and institutions interested in the ancient land surfaces and archaeology now submerged on the sea floor is a wide one that brings together many different disciplines, nationalities, and interest groups. However, it is important for us to recognise that, at least on the archaeological side, we are part of a much larger community which in general is far from convinced of the virtues of investigating submerged prehistoric archaeology, inclined to regard it as the playground of diving enthusiasts, or an extremely costly enterprise with very uncertain rewards. This climate of scepticism has a long and diverse history, and it is important that we understand something of that history if we are better to address the doubts of the sceptics.

It is also important that we place our interests in the North Sea and the Baltic within a larger-scale international perspective and indeed a global one, because it is at this larger scale that the big questions of cultural transformation and human development considered to be of greatest importance by archaeologists are often posed.

At the outset it may be useful to distinguish two sorts of archaeologically relevant information obtainable from underwater, even at the risk of making a rather arbitrary division. First there is the potential information about the submerged land and the archaeology associated with the use of that 'landscape'. In effect we are talking here about an extension of terrestrial archaeology to examine the ways in which prehistoric people occupied land that is now submerged. A second type of information has to do with the use of early coastlines and the long-term history of human use of aquatic and marine resources, which we might perhaps characterise as the long-term history of the human 'seascape'.

The first theme has been well explored in a number of ways, notably in Bryony Coles' (1998) discussion of the North Sea. It is also certainly apparent to many of us who have engaged in studies of Palaeolithic archaeology on dry land elsewhere that what we are looking at is a truncated fragment of the total picture, and that our results point increasingly to the now submerged portion of the Quaternary landscape as a critical missing part of our regional reconstructions (cf Bailey 1997). I take it as axiomatic that analysing the changing palaeogeographical configuration of land masses and terrestrial environments associated with sea-level change is fundamental to our understanding of Palaeolithic and Mesolithic ecological and cultural dynamics. However, I want to concentrate here on the second theme, because I believe the role of coastlines has been seriously underestimated in the conventional view of human development, and that this is a theme where underwater research could have a big impact. I therefore want to examine, briefly, two issues. First I want to examine why coastlines and the use of marine resources have been discounted in the conventional archaeological accounts of world prehistory. Second I want to make the argument for why coastlines ought to be accorded much greater significance than has been the case until now.

Why have prehistoric coastlines been discounted?

Absence of evidence due to sea-level change

Undoubtedly one of the most potent factors has been the extreme rarity of coastal sites or evidence of marine activity before the postglacial period. In European terms coastal sites such as shell middens or other sorts of coastal settlements with evidence of maritime activities such as fishing or sea-mammal hunting are typically associated with the Mesolithic period, and even here only in abundance from about 6000 BP onwards. A similar pattern can be found elsewhere in the world. Shell mounds, often of great size like the Ertebølle shell mounds of southern Scandinavia, are found in their tens of thousands around the coastlines of the world after about 6000 years ago. Before that date they are rare. Occasional sites or groups of sites with quite substantial marine indicators, though scarcely on the scale of later shell middens, are found dating from 12,000 to 6000 years ago, notably in the coastal caves of northern Spain, the Mediterranean basin and South Africa, on the coast of California in both cave and open-air locations (Erlandson 2001), and at the Natsushima oyster mound of Tokyo Bay in Japan (Sugihara and Serizawa 1957). Before 12,000 BP there is almost nothing except a few Upper Palaeolithic limpet shells in some

European coastal caves, until we reach back to the previous period of high sea levels associated with the last interglacial (Fig 1.1).

Compared to the long sweep of human development over the past one million years, even over the period of the past 100,000 years, a date of 6000 years ago seems very recent — even by comparison with the development of agricultural economies, which by common consensus can be traced back to at least 10,000 years ago, with roots that go even deeper in time. Quite elaborate arguments have been constructed to explain this late development of interest in marine resources, and usually focus on supposedly high labour costs or technical difficulties as barriers to exploitation until technological development, human population growth, or decline in availability of plants and animals on land forced people to explore new sources of food (eg Osborn 1977).

However, there is a simpler and increasingly popular explanation for these time trends. The date of 6000 years ago coincides quite closely with the period when the postglacial sea-level rise associated with the melting of the continental ice sheets reached its present level. On this argument, the appearance of coastal sites in great numbers throughout the world after about that time is a simple function of visibility and preservation of evidence. Before 6000 years ago sea levels were lower, shorelines further out to sea, and most of the evidence of their use now

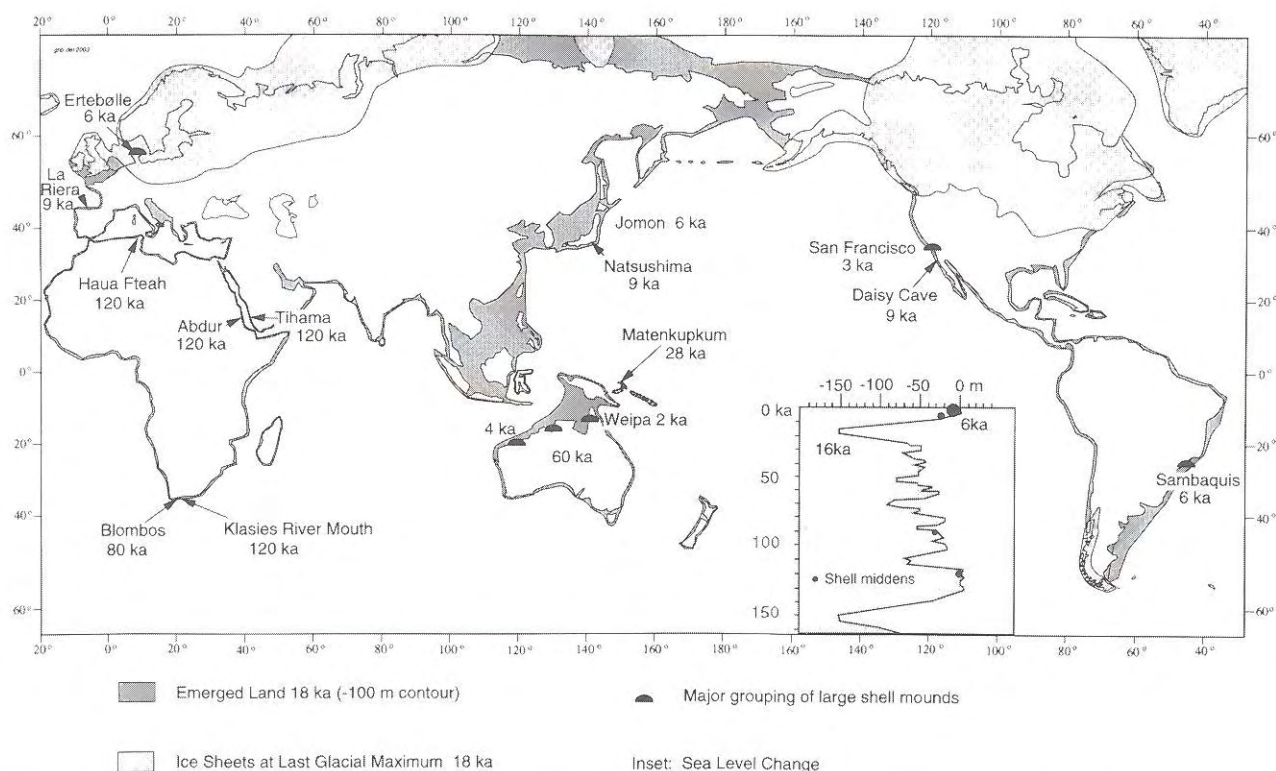


Figure 1.1 Map of the world showing the extent of Continental Shelf exposed at the maximum marine regression, sites mentioned in the text, and the pattern of sea-level change and its relationship to shell midden occurrences over the last glacial-interglacial cycle

submerged or destroyed. The rare sites in the 12,000 to 6000 BP time period are usually to be found either on steeply shelving coastlines or in privileged positions of preservation, in caves for example, where shorelines in the final stages of sea-level rise would have been quite close to the present shoreline, or on coastlines that have since undergone isostatic or tectonic uplift. Progressive increase in marine shells in late glacial and postglacial deposits in long coastal cave sequences is also demonstrably correlated with sea-level rise and progressive narrowing of the distance between seashore and cave location, the presumption being that when the seashore was further away molluscs and other marine foods were processed closer to the contemporaneous shore in what are now underwater locations (Bailey and Craighead 2003). Archaeological deposits with significant numbers of marine shells have also been found in association with the high sea levels of the last interglacial period at various locations in Africa and the Red Sea Basin, which tends to reinforce the correlation between sea-level change and visibility or preservation of evidence.

In spite of this growing body of indirect clues to the possible existence of earlier coastal and marine-oriented societies, there is still very little hard evidence. Sceptics might point out that the underwater sites so far discovered and excavated, for example, in the Baltic (Fischer 1995b) or the eastern Mediterranean (eg Galili *et al* 1988), are of relatively recent date and tell us little that we could not already find out from sites of equivalent date on land. It is one thing to say that evidence could have existed but has been destroyed or buried, and quite another thing to demonstrate that such evidence actually existed. And it is very easy to move from the statement that the evidence could have existed, but cannot be recovered, to the belief that the evidence never existed at all.

Land-based views of world prehistory

Another powerful factor in discounting the importance of coastlines is the prevailing view to be found in textbooks of world prehistory that the general course of human development has been a land-based one, progressing from gathering and scavenging to big-game hunting, and thence to the domestication of plants and animals, and the growth of population fuelled by agricultural surplus. This view has of course gained much of its currency from the absence of early coastal evidence already noted, but also reinforces a negative attitude to coastal settlement as a mode of existence that is believed to have been generally late in date, geographically marginal, or in some way anomalous. From this terrestrial viewpoint, coastlines are seen literally as margins on the edge of continental land masses, rather than as

centres of innovation and pathways for movement and communication. Lowered sea levels are interpreted largely in terms of their effects in creating land bridges which allowed big-game hunters to colonise new continents, rather than in terms of their palaeogeographical effects on coastal environments and the visibility of coastal archaeology (cf Gamble 1993; Klein 1989). Australia, as the exception to this rule, with its evidence of precocious maritime skills and planned sea journeys dating back at least 50,000 years, is easily dismissed as the continent of hunters and gatherers, bypassed by the main currents of human cultural development (cf Lourandos 1997).

Ethnographic bias

Coastal hunters and gatherers have also been poorly served by the descriptions of early European travellers and ethnographers. Charles Darwin's (1839, 235–6) descriptions of the Indians of Tierra del Fuego are not untypical though they have been particularly influential:

These are the most abject and miserable creatures I anywhere beheld ... Viewing such men, one can hardly make oneself believe that they are fellow-creatures, and inhabitants of the same world ... The habitable land is reduced to the stones which form the beach; in search of food they are compelled to wander from spot to spot, and so steep is the coast, that they can only move about in their wretched canoes ... How little can the higher powers of the mind be brought into play! What is there for imagination to picture, for reason to compare, for judgement to decide upon? To knock a limpet from the rocks does not require even cunning, that lowest power of the mind.

This language of 'wretchedness' can also be found in the early descriptions of the Bushmen of the Cape coast of South Africa by the early Dutch explorers such as Van Riebeeck (Tooke 1908) or of the Aborigines of Australia (Dampier 1697).

As sea-borne travellers these early European explorers had no intermediate gradations of culture, such as an overland traveller might have experienced, to prepare them for what they would find on first landfall. The discovery of 'primitive' indigenes in distant lands after weeks or months at sea must have seemed as shocking as the discovery of new life forms on a distant planet by a galactic explorer. Coastal hunters and gatherers were, by definition, the first people to be encountered, and have thus been especially exposed to Eurocentric misconceptions.

These ideas soon entered European prehistory. Sir John Lubbock explicitly used the Indians of Tierra del Fuego as an analogy for the

inhabitants of the Ertebølle shell mounds, recommending Darwin's description as 'a very good account' of the way of life to be associated with a diet dominated by shell-fish (Lubbock 1865, 189). Gordon Childe's comments in the first edition of the *Dawn of European Civilization* carry a clear echo of Darwin's youthful comments nearly 100 years later. Referring to the Mesolithic shell middens in the coastal caves of Asturias in northern Spain, Childe described them in the following terms: 'The Asturian was the creation of a miserable population of food-gatherers who dwelt in caves on the shore and lived largely on shell-fish ... No originality has ever been claimed for this poverty-stricken remnant of the Magdalenian'. (Childe 1925, 17).

This type of derogatory description gained added impetus in the European context by the wish to highlight the contrast between a supposedly degenerate Mesolithic and a dynamic Neolithic bearing the new elements of agriculture and civilization from the Near East that were believed to be the foundation of our modern world, thereby creating a fault line between Mesolithic and Neolithic studies that persists to this day (Zvelebil 1996).

Even Grahame Clark, early student and champion of the Mesolithic, could find little better to say than that 'a diet in which shell-fish are a mainstay is normally associated with a low level of culture, a proposition which is hardly contradicted by the attainments of the Capsians of the Tagus Valley, the Tardenoisians of the islands off Morbihan, the Obanians of western Scotland or the Ertebølle people of the Litorina coasts of Denmark' (Clark 1952, 63).

Not until the latter part of the 20th century did the very different descriptions of the Indians of the north-west coast of North America begin to influence interpretations of Mesolithic coastal archaeology as examples of 'complex' hunters and gatherers with many of the economic and social attributes once believed to be exclusively associated with agricultural societies (Renouf 1984; Rowley-Conwy 1983). Moreover, it is a notable fact that some of our best ethnographic descriptions of coastal hunters and gatherers, and indeed some of the most abundant archaeology, are in the southern hemisphere or at high latitude in the northern hemisphere, regions that are generally viewed as marginal to the main highways of human development. And this is no coincidence, for marine ecological productivity, unlike productivity on land, tends to increase with increasing latitude, and many of the most productive coastal waters in the world are to be found at higher latitudes in both northern and southern hemispheres. Moreover the marginality of these higher latitude regions for agriculture means that hunters and gatherers have survived long enough to enter the modern era as targets of European observation.

Thus both historical and geographical factors have conspired to reinforce the notion of primitiveness or marginality associated with coastal hunters and gatherers.

Promotion by non-archaeologists

Finally we should give due acknowledgement to the impact both positive and negative of those who have promoted the significance of coastlines in human evolution, a group notable for the absence of archaeologists until the end of the 20th century. First among these must surely be Lewis Henry Morgan who in his great work on *Ancient Society or Researches on the Lines of Human Progress from Savagery through Barbarism to Civilization* expressed what must count as one of the most prophetic insights into the significance of marine and aquatic resources, and one that it has taken archaeologists more than 100 years to follow up:

Fish were universal in distribution, unlimited in supply, and the only kind of food at all times attainable ... Upon this species of food mankind became independent of climate and of locality; and by following the shores of the seas and lakes, and the courses of rivers could, while in the savage state, spread themselves over the greater portion of the earth's surface. ... In reliance upon fruits and spontaneous subsistence a removal from the original habitat would have been impossible (Morgan 1878, 21).

This theme was later taken up by the American geographer Carl Sauer in his 1962 paper 'Sea-shore-primitive home of man?', though his immediate inspiration was Sir Alister Hardy's provocative 1960 paper 'Was man more aquatic in the past?'. Later treatments include Elaine Morgan's 1982 gender version of Hardy's hypothesis, *The Aquatic Ape*, Stephen Oppenheimer's 1998 *Eden in the East: the drowned continents of Southeast Asia*, Richard Rudgley's 1998 *Lost Civilisations of the Stone Age*, and Grahame Hancock's 2002 *Underworld: the mysterious origins of civilisations*.

None of these authors can claim primary competence in archaeology, and some of these treatises are frankly journalistic in style, something which, in its turn, has no doubt reinforced the sceptical attitude of archaeologists and palaeo-anthropologists. They are a testament both to the powerful fascination for 'lost civilisations' and the intellectual vacuum created by lack of interest on the part of professional archaeologists. Even Sandra Bowdler's (1977) coastal colonisation hypothesis for Australia has generally received short shrift at the hands of the critics, all the more surprising in a continent which must have been colonised in the first instance by sea-borne

journeys and which has some unusually early, 33,000-year-old, evidence for fishing and shell-gathering at the cave of Matenkupkum (Gosden and Robertson 1991).

Why are early prehistoric coastlines important?

Increasingly I believe that the conventional picture of world prehistory should be turned on its head and that we should regard the use of shorelines as the primary human adaptation, one that has played a significant role in all the large-scale transformations of human development. This is not a plea for a return to the 'aquatic ape' hypothesis, which focused primarily on anatomical and physiological adaptations to a semi-marine existence, a hypothesis that remains controversial. Nor is it to advocate that we should ignore plants and animals on land or that we should imagine periods of human existence when humans or proto-humans lived on nothing but marine foods. It is, rather, to highlight a simple point about the attractions of shorelines, one that applies with particular force to sea coasts, but which can also be generalised to lakeside settings and the littorals of major rivers. These sorts of environments are manifestly attractive for human settlement and probably have always been so, because they offer the following advantages:

- 1 Diversity of food supplies within close proximity, including marine resources which in favourable conditions can occur in great abundance
- 2 More equable climatic conditions
- 3 High water tables and good water supplies
- 4 Fertile conditions for plant and animal life on land
- 5 Availability of aquatic resources including 'gathered' and 'hunted' resources, many of which would have been accessible with little or no special equipment, including intertidal molluscs, fish caught by hand or trapped in natural fish traps, and the scavenged carcasses of sea mammals and seabirds
- 6 Other easily collected bounties exposed along the shoreline such as cobbles for making stone tools or other raw materials
- 7 A variety of niches offering opportunities for circumventing competition with other 'hunters' and 'gatherers', ie specialised carnivores or plant-eaters, or for avoiding predation
- 8 Easy pathways of communication and population movement, especially with the aid of simple water craft

It is clear that some of these advantages, such as improved local climate and water supplies, apply to the terrestrial environment in a coastal or littoral setting as well as the aquatic

environment, and could have had an important impact on the landward aspect of early human economies as well as the maritime aspect. That, of course, is an added reason for taking seriously the study of now-submerged coastal regions, which may have represented some of the most attractive territory for terrestrial hunting and gathering in a Palaeolithic context. Here I want to emphasise the potentials for marine and aquatic exploitation. Perhaps the most comprehensive case in support of this viewpoint is Erlandson (2001; see also Bailey and Milner 2002), who has summarised the evidence for the role of aquatic resources at all periods of human evolution including the earliest period of human emergence in the African Rift. Here I shall concentrate on just two issues.

Human dispersal and migration

The influence of coastlines and marine subsistence in facilitating the dispersal of early human populations 'out of Africa' from an ancestral source of origin in the African Rift has already been alluded to in reference to the comments of Lewis Henry Morgan. In recent years new discoveries and the reinterpretation of older ones have brought to light extensive, if scattered, evidence for the use of shell-fish and other marine resources in a number of deposits dated to the high sea levels associated with the last interglacial period at about 125,000 years ago or the earliest stages of the last glacial period a little later. Notable here are the deep deposits found in long cave sequences such as the Haua Fteah in Libya (McBurney 1967), and Klasies River Mouth (Deacon and Shuurman 1992) and Blombos Cave (Henshilwood *et al* 2001) in South Africa. To these should be added the recently discovered open air site of Abdur in Eritrea (Walters *et al* 2000), where hand axes are reputedly associated with oyster shells and animal bones on a raised coral terrace of the Red Sea clearly dated to 125,000 years ago (Fig 1.1). This coincidence of dates has led to the idea that the consumption of marine resources was an innovation of anatomically modern humans (AMH), which facilitated their dispersal out of Africa.

This is an attractive idea, but its main difficulty, leaving aside arguments about 'out of Africa' versus 'multi-regional' models of AMH origins, is the assumption that the earliest visible evidence of shellgathering is the earliest actual evidence. There seems no more reason to accept this assumption than the once popular assumption that the first appearance of shell mounds in the mid-postglacial represents their earliest possible existence. Many Lower Palaeolithic sites are found in coastal locations, often eroding out of raised coastal beaches or raised river terraces in Africa and Europe, as Sauer (1962) long ago pointed out. Actual survival of biogenic remains is

rare, Terra Amata (de Lumley 1969) being an exception where a small number of marine shells has been claimed in association with Lower Palaeolithic artefacts. The vagaries of preservation of organic materials in what are mostly open-air sites, and the variable proximity to the nearest adjacent contemporaneous shoreline, are two factors that leave open the question of what marine component was associated with the settlement of these much earlier sites. Certainly higher and earlier terraces formed by progressive opening of the Red Sea Rift and associated with Palaeolithic artefacts are present along the Arabian coastline (Zarins *et al* 1981), offering an opportunity to test the interpretation of the Abdur evidence in earlier contexts.

One thing is certain, however, and that is that any human or hominid dispersal out of Africa would have required intimate contact with coastlines, and the crossing of water barriers to a greater or lesser extent, with the possible exception of a narrow corridor across the Sinai Peninsula. Even the Sinai route, however, hugs the Mediterranean coastline and would also have required negotiation of the Nile Delta. The possibility of very early sea crossings and contact across the narrowest parts of the Mediterranean and the Bab el Mandeb Straits at the southern end of the Red Sea is now under active investigation (see Flemming *et al* 2003; Stringer *et al* 2000; Stringer 2000).

Similar considerations are now being applied to the Pleistocene colonisation of the Americas, where the traditional concept of a migration across the Bering land bridge and through the so-called ice-free corridor of the North American ice sheet is increasingly being called into question in favour of a coastal route (Erlandson 2000). The case for the nature and antiquity of sea crossings in South-East Asia and across the Wallace Line to Australasia remains an active and controversial issue (see Bednarick 2003 and comments). The expansion of human settlement into the British Isles, whether we are dealing with the earliest evidence in the Middle Pleistocene, or the reoccupation of newly exposed land after the last glacial period might well benefit from a similar perspective.

Emergence of 'complex' societies

The notion of complex hunters and gatherers that emerged twenty years ago has been closely associated with maritime societies and in the European context with Mesolithic shell mounds such as the Danish Ertebølle. Complexity here refers to features such as sedentary settlement, increased population size, food storage, and development of social hierarchies. The classic ethnographic example is the Indians of the north-west coast of North America (Rowley-Conwy 1983). The correlation of such characteristics

with coastal environments is no surprise, given their advantages outlined above, especially on coastlines with shallow embayments and river estuaries providing conditions of high ecological productivity and abundant supplies of marine foods.

On shallow shorelines and river estuaries with extensive mud flats providing suitable habitat for vast quantities of bivalve molluscs, the large quantities of discarded shell accumulated over many centuries have resulted in massive mound deposits. Oyster mounds such as those of the Ertebølle are often several hundred metres long and up to 5m thick, and a single such mound can contain literally billions of mollusc shells. These sizes and quantities are typical, and such sites are widely distributed throughout the world with particular concentrations in large bays and river estuaries, including such famous examples as the mounds of San Francisco Bay, the Jomon mounds of Japan, the Brazilian sambaquis, and the Weipa shell mounds of northern Australia (Fig 1.2 and Fig 1.3).

In some cases, it seems that the shells have accumulated as the simple byproduct of domestic consumption and settlement repeated in the same place over many generations, literally under the feet of the inhabitants, rather like a Near Eastern tell. In other cases, the sites seem to have been used primarily as shell dumps for the processing of the molluscs and the removal of their meat for



Figure 1.2 Aerial view of shell mounds on the east bank of the Hey River near Weipa on the Cape York Peninsula of northern Queensland, taken in March 1993 at the end of the wet season. There is one cluster of shell mounds in the middle of the picture, an isolated mound to the left and another one to the right. The mounds are partly obscured by large trees growing on them. The sites are located on flat and marshy open ground. The open ground immediately in front of this is flooded by high tidal water and separated from the main river channel by a thick belt of mangrove vegetation. (Photo by author)



Figure 1.3 Close up of shell mound on the east bank of the Hey River; taken during the dry season of 1972. (Photo by author)

consumption at settlements elsewhere. In the low latitude subtropical regions of the world, the shell middens often form steep-sided dome-shaped or conical mounds that can reach spectacular dimensions, like those of northern Australia, or the sambaquis of Brazil, the tallest of which are 20m high (Gaspar 1998). Although the concentration of shells in this manner may be related in part to the self-selecting effect of using a dry camping spot in a seasonally waterlogged environment, it seems certain that these mounds must have formed impressive features of the landscape that could easily have acquired ritual or symbolic connotations. Luby and Gruber (1999) have noted the many human burials found in the California mounds and have suggested that feasting on shell-fish might have been an important part of the burial rite, and the heaping up of the discarded shells a deliberate act designed to emphasise the site as a marker of the ancestral burial site, analogous to the artificially constructed earth and stone mounds built over burial chambers by many agricultural societies. Many shell mounds in other parts of the world also contain human burials alongside evidence of domestic activities. At least one of the Brazilian mounds, Jabuticabeira II, seems to have been used solely for burial of the dead and associated ritual, since it has failed to produce any indicators of daily settlement and subsistence activity despite extensive excavation (Gaspar 1998).

Such features are of course closely consonant with the notion of a complex hunter-gatherer society. The fact that the shell mounds that are so often the archaeological marker of complexity make a relatively late appearance fits nicely with a conventional ladder of progress in which complex forms of social organisation appear relatively late in the sequence alongside other social and economic developments such as early agriculture and urbanism. The corollary of such a view, of course, is that we should not expect to find shell mounds like these at significantly earlier

periods of the Pleistocene. But if the coastlines on which such sites might be found are now submerged, such a notion cannot be tested without underwater exploration. And if coastal shell mounds were to be found on substantially earlier coastlines, that would have a dramatic impact on our conventional understanding of the general course of world prehistory.

What is the likelihood that coastal sites of this type might have existed during periods of lower sea level and survived subsequent inundation? A first task is to identify periods and areas where the appropriate environmental conditions once existed. This may not be as easy as we imagine. Estuarine mudflats are quite short-lived in geological terms, and may require time lags of up to several thousand years between stabilisation of sea level after a period of rapid change and the build up of sufficient sediments to create suitable molluscan habitats. Rocky shorelines are less sensitive to habitat change resulting from rapid sea-level change, but they also generally support fewer molluscs. If shell mounds of substantial size were accumulated at an earlier period of stable sea level, they might not be easy to distinguish from natural shell banks in acoustical surveys. However, shell deposits with the steep-sided and domed or sub-conical shape of the shell mounds at Weipa or the sambaquis of Brazil have a very distinctive morphology, and if they survived inundation, might have a better chance of being detected.

Conclusion

As far as the wider archaeological community is concerned, it will not be enough to demonstrate that ancient land surfaces and *in situ* archaeological materials of prehistoric date can be preserved underwater after inundation by rising sea level, or that they can be located, excavated, and analysed in the same way as terrestrial materials. What the sceptical archaeologist will want to know is what difference, if any, such discoveries can make to our understanding of prehistory. What new information can underwater prehistoric archaeology bring to light that cannot be obtained more easily and much more cheaply on land?

I think there are two clear answers to this question. The first is that unless we go underwater whole areas of understanding about world prehistory will go by default, especially the early history of shorelines and marine resources, and the benefits that they could have brought in facilitating the expansion and growth of human populations, and stimulating social and cultural change. The convention that coastlines were of little significance until very late in the human story is just that, a convention. The main burden of this paper has been to demonstrate just why

this convention should now be subjected to the most critical scrutiny. The belief that there is no need to investigate earlier coastlines because there is no evidence there is tantamount to saying that there is no need to go out and look for new evidence because we already know in advance what the answers are!

The second answer to the sceptic's question has to do with the relative difficulties, costs, and benefits of underwater work as compared with similar investigation on land. The easy assumption is that underwater work is necessarily far more costly and more uncertain than on land. Apart from the added problem of seeing through the water column or moving underwater, the presumption is that the original land surface has been exposed underwater to much greater forces of erosion, disturbance, displacement, or burial under subsequent sediment than would have been the case on dry land, and indeed in some areas to the additional damage of human impact resulting from such activities as the 'ploughing' of the sea bed by trawling nets. On top of that are the large costs of boat hire and diving gear, and the teams of specialists with different expertise that need to be assembled. But how different is this really from terrestrial archaeology? Large-scale operations have long become the norm in archaeology above modern sea level, involving operations spanning many years and even decades, large teams of specialists, the use of specialist and often expensive equipment, and various forms of remote sensing to improve visibility, including aerial photography, satellite imagery, and drilling beneath alluvial and colluvial sediments. Moreover, much of the earth's surface has been heavily disturbed by subsequent processes such as agricultural development, ploughing, and the more general impact of modern development, to say nothing of erosion and sedimentation whether induced by natural processes or human activity. As on land, underwater erosion is often a two-edged process, making material available for discovery, but also exposing it to subsequent displacement, degradation, and destruction. To the problems of

sub-aerial weathering and bacterial and chemical decomposition on land, we also have to add the destructive effects of generations of pilfering, looting, and excavation. This is not to say that working underwater might actually turn out to be easier and more productive than on land, but rather to emphasise that the balance of advantage and disadvantage is by no means obviously weighted in any one direction. Discovery of archaeological sites underwater remains a more haphazard process than on land, for example, while conditions of preservation underwater can be spectacularly better.

In short, there are no good excuses for not promoting and pursuing the investigation of prehistory underwater. One of the great axioms of archaeological field survey on land, which also applies in a more abstract way to much intellectual endeavour, is that often we do not find anything until we know what we are looking for, and we do not know what we are looking for or even where to start looking until we find something. This is a paradox—probably a universal one—which can only be resolved by many trials and errors in which we develop simultaneously both the techniques of observation that enable us to make finds, and the theoretical frameworks that give us expectations and predictions about what to look for and where to look for it. As on land so underwater, progress will depend on elaborating problems in need of investigation that make the search worth pursuing, targeting likely areas for discovery of relevant material, and developing strategies of survey and recovery. Often those different elements of research will be pursued separately, but the more they can be brought into interaction, the faster will be the rate of progress.

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