Spain: Underwater Exploration on a Narrow Continental Shelf

13

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Abstract

In spite of Spain's long coastline (nearly 8000 km) and its well-established tradition in underwater archaeology, the prehistoric settlement of the continental shelf is practically unknown with very few finds. Underwater research has focused on naval archaeology and, until very recently, no attempt had been made to look for prehistoric underwater sites. In the past decade, new research projects have been launched to explore selected areas on the Cantabrian shelf and offshore of Gibraltar. This chapter summarises the currently available evidence of submerged prehistoric archaeology and the preliminary results of these new projects.

Keywords

Continental shelf · Submerged landscapes · Neanderthal · Mousterian · Upper Palaeolithic · Mesolithic · Neolithic · Bronze Age · Votive deposits

13.1 Introduction[1]

Occupying roughly five sixths of a large peninsula, Spain has a long coastline of some 7905 km. This includes Atlantic and Mediterranean-facing shores—1075 km in the Bay of Biscay, 1761 km facing the Atlantic Ocean and 2058 km along the Mediterranean Sea, plus 1428 km in the Balearic Islands and 1583 km in the Canary Islands. Moreover, some of the most fertile regions and largest concentrations of population are in coastal regions, so Spain can be defined as a maritime country. From another point of view, the Iberian Peninsula, located at a geographic crossroads of Europe, was densely populated throughout prehistory and possesses some of the most important Palaeolithic sites in Europe, notably the caves of northern and south-eastern Spain and Gibraltar, a very high density of Mesolithic coastal sites and important cultures of the Neolithic, Bronze and Iron Ages. This suggests considerable potential for research on the prehistoric settlement of the continental shelf.

As a largely coastal country, it is not surprising that Spain enjoys a rich tradition in the field

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[1]The Iberian Peninsula comprises the sovereign states of Spain, Portugal and Andorra and the British Overseas Territory of Gibraltar. In terms of its Stone Age prehistory, it forms a single geographical entity. For convenience, the evidence from Portugal is considered separately in Chapter 14, and that from Gibraltar is included in this chapter.

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Fig. 13.1 Location of sites and research projects mentioned in the text. Site information from the SPLASHCOS Viewer http://splashcos-viewer.eu. Drawing by Moritz Mennenga

of underwater archaeology (Blánquez and Martínez Maganto 1993; Nieto 2009; Nieto and Bethencourt 2014). This has focused on naval history, with hundreds of shipwrecks and other remains of trade and warfare from the Phoenician, Greek and Roman periods and from the Modern Age, when the Spanish Crown became one of the world's main naval powers, all of which are well represented in the recently refurbished National Underwater Archaeology Museum (*Museo Nacional de Arqueología Subacuática*-ARQUA) in Cartagena. There is a small but significant number of underwater finds ranging from the Palaeolithic to the Bronze Age, mostly discovered by chance (Fig. 13.1), and recent projects dedicated to underwater survey of the continental shelf, which suggests considerable potential for future discoveries. This chapter summarises data on known prehistoric underwater sites, the results of recent offshore surveys and the potential for future research.

13.2 Conditions of Preservation and Discovery

One of the deterrents to underwater investigation on many coastlines, especially those in the Bay of Biscay associated with the large concentrations of Palaeolithic sites in the Cantabrian region, is that sea conditions are challenging for underwater archaeological exploration and potentially unfavourable for the preservation of prehistoric remains, due to strong currents, large waves and a predominance of erosional processes over sedimentation (Moura et al. 2017). Moreover, administrative responsibility for the continental shelf is divided between a number of regional and central government agencies, leading to considerable bureaucratic complexities in the organisation of underwater work aimed at the search for submerged landscapes, and these can act as a further disincentive. Although Spain is not formally a federal state, the regions (autonomous communities) hold considerable legislative and administrative power in numerous fields. One of them is culture, and particularly archaeology, which has been fully devolved to the regions (Martínez Díaz 1992, 1993). However, the management of the continental shelf is the exclusive responsibility of the central government. This duality causes considerable bureaucracy and also hinders the rational planning of research and protection of the heritage, as conflicts of authority and demarcation disputes between the different administrations can easily occur.[2] In fact, despite a few attempts (directed mainly towards naval archaeology), a national management plan for underwater archaeology has still not been devised.

Another factor that has to some extent deterred interest and investigation in offshore prehistoric material is the fact that the Spanish continental shelf is quite narrow (Fig. 13.1); apart from Galicia in the north-west and sections of the Mediterranean coast, relatively little territory has been submerged by postglacial sea-level rise, especially in comparison with northern Europe, weakening the incentive to conduct underwater investigation on the assumption that it would make little difference to current understandings of Palaeolithic and Mesolithic patterns of settlement and adaptation.

This is counterbalanced by a series of positive factors. In the first place, on many coastlines, there is a high density of Palaeolithic and Mesolithic sites. This is especially true of Cantabrian Spain, which displays the highest concentration of coastal Palaeolithic sites in Europe (Straus 1992, 2018; Fano 2004). The density of Mesolithic sites is even higher: in eastern Asturias, around 130 sites have been recorded along only 50 km of coast (see Fano 2004, Arias and Fano 2009). On the other hand, the continental shelf is particularly narrow, averaging 15 km, so the hypothesis can be proposed that the recorded Palaeolithic sites on land are just a part of a larger coastal settlement system which is not too extensive to be explored efficiently but which may include important evidence of sites and activities that are not represented on land in the present-day coastal region. In fact, there is indirect evidence showing that Palaeolithic groups in Cantabrian Spain and elsewhere maintained regular contact with the sea. Even at the maximum lowering of sea level at the Last Glacial Maximum, the shoreline was within quite easy reach of coastal caves that are on or close to the present-day coastline. Some of these coastal caves have stratified deposits with cultural material that reach back to the time of the Last Glacial Maximum or earlier, and it is clear from the faunal remains in these earlier deposits that the now submerged plain was a very significant area of lowland territory for the large mammals that formed an important part of the Palaeolithic subsistence economy and an important part of the territory used by the occupants of these cave sites.

The submerged coastline was also a source of marine foods and close enough to the present-day

[2]As an example, the P5 Cant Project, described below, required permission from three state organisations (Harbour Master's Office, Port of Santander and Civil Guard), two regional government organisations (Directorate General of Culture and Directorate General of Fishing and Food), a hospital (belonging to another department of the regional government) because of safety regulations associated with diving and the Santander Town Corporation (for permission to place a geolocation aerial on land).

shoreline that some of these resources were brought back to caves on the modern coast for processing and consumption. Mollusc shells, in particular, are present in these Palaeolithic deposits, and sometimes quantities of fish bone, for example, at La Riera Cave in Asturias (Straus and Clark 1986), Nerja and Bajondillo in Andalusia (Morales et al. 1998; Cortés-Sánchez et al. 2008, 2011) and Gorham's Cave and Vanguard Cave on the Gibraltar Peninsula (Finlayson et al. 2006; Stringer et al. 2008). Occasionally, remains of marine mammals such as seals or cetaceans are also recorded (Corchón et al. 2008; Álvarez-Fernández 2011; Álvarez-Fernández et al. 2014; Morales et al. in press). The quantities of marine food remains in these Palaeolithic deposits are not as great as those present in later deposits, such as the Asturian shell middens, many of which fill the mouths of small caves and are stratified above deposits with Palaeolithic cultural remains (González Morales 1982). However, that may simply reflect the greater distance between these sites and the contemporaneous palaeoshorelines of the Palaeolithic and early Mesolithic period and the likelihood that only a portion of the marine catch was carried inland while the rest was processed and consumed closer to the coastline and left its archaeological mark on sites that are now submerged (Bailey and Craighead 2003).

Other evidence of contact with the coast during periods of lower sea level is the existence of depictions of marine animals in Palaeolithic art, such as the representations of fish on the walls of El Pindal (Alcalde del Río et al. 1911; Morales and Roselló 1984–1985) and Altxerri (Fig. 13.2; Altuna 1997) or portable art objects, notably the

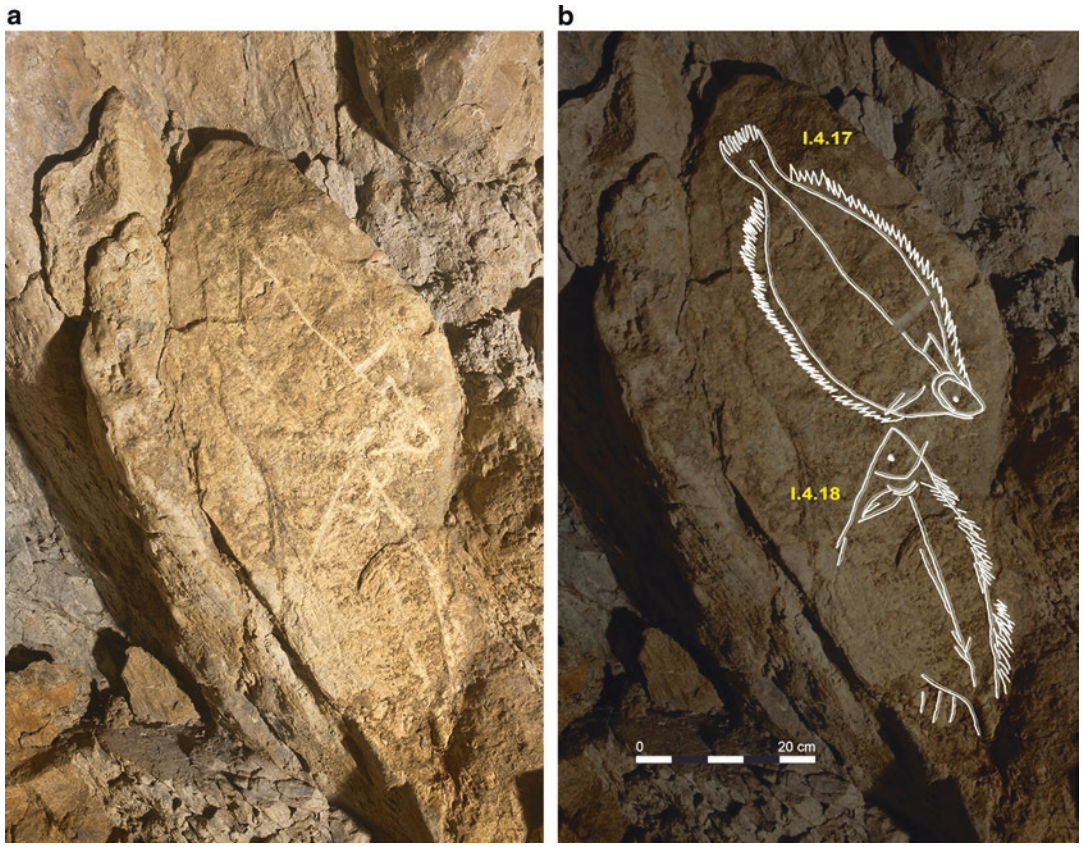

Fig. 13.2 Rock engravings representing Pleuronectiform fish (probably flounder—*Platichthys flesus*) on the walls of the cave of Altxerri (Basque country). (**a**) Photo of the engravings. (**b**) The same image with the outlines of the fish highlighted and a scale added. Photo by J. Altura and X. Otero; interpretation after Ruiz 2014

Fig. 13.3 Representation of a bison and a whale on a sperm whale tooth from layer VIIIb (middle Magdalenian) of the cave of Las Caldas (Asturias). Scale in cm. Photo of the original (upper row) and digitally enhanced interpretation of the photo (lower) after Rivero 2015

representation of a cetacean on a sperm whale tooth from the cave of Las Caldas in Asturias (Fig. 13.3; Rivero 2015; Corchón 2017). Moreover, isotopic values demonstrate marine diet for some individuals (unpublished results from Cueva de Los Canes in Asturias). All of these suggest that the submerged areas of continental shelf were densely occupied and that the narrowness of the submerged shelf is, therefore, an incentive to more detailed underwater exploration rather than a deterrent.

A third advantage of working offshore, and this is well demonstrated on the Cantabrian coast, is that the region is rich in karst geology, which in some cases continues beneath the sea, and these are good environments for human settlement and for the preservation of archaeological remains. Similar comments apply to other coastlines, particularly in south-east Spain and Gibraltar. The presence of numerous occupied caves and rock-shelters in these regions of karst geology raises the prospect of discovering submerged cliff lines with caves where terrestrial deposits may have been protected from the destructive effects of sea-level rise (see also Canals et al. 2017).

Mention should also be made of inland lake basins. These offer good examples of underwater preservation. The most important of these is Lake Banyoles (Catalonia). Here, a large-scale research project at the early Neolithic site of La Draga has documented a settlement of one of the earliest farming communities in the western Mediterranean, with magnificent preservation of organic remains such as wooden artefacts and plant fibres, dating between c. 5300 and 5000 cal BC (Bosch et al. 2000, 2011, 2012; Piqué et al. 2015). Other examples are the Mesolithic sites of Albufera de Anna in Valencia (Aparicio 1975) and some megalithic monuments flooded by reservoirs in Extremadura (Matamoros et al. 2013–2015).

13.3 Archaeological Overview

13.3.1 Palaeolithic and Mesolithic Finds

One interesting case, because of its potential, is La Peñica or Punta del Faro, a poorly known site that was found in 1980 when the port of Puerto de Mazarrón in Murcia was being dredged. Here, at 3.5 m depth, beneath a layer with Roman material, was a Palaeolithic deposit overlying a fossil

beach. The artefacts appear to have been eroded from a nearby rockshelter and are of Middle Palaeolithic affinity, but no further details are available (Montes 1985, 1989). Also in the same region, there is the cave of Los Aviones near Cartagena, where a Mousterian deposit is being eroded from the cave by wave action (Montes 1985, 1989, 1991).

Other cases are known of totally or partially flooded caves in which strata or at least prehistoric materials have been documented. Of particular interest is the cave site of Cova del Gegant near Sitges, south of Barcelona (Daura et al. 2005, 2010). The cave is partly above modern sea level but is only accessible by sea or from above through a narrow, vertical chamber. The deposits inside the cave have been partially eroded by wave action, but some sediments are slightly above sea level and have preserved a stratigraphy with a time span of c. 100–40 ka, with remains of Pleistocene fauna, Mousterian artefacts, a Neanderthal mandible with a uranium series date of 52.3 ± 2.3 ka and some isolated Neanderthal teeth.

We can also mention some Mesolithic sites on the coast of the Bay of Biscay such as La Silluca, Cuevas del Mar and Río Purón (Llanes), which consist of Asturian shell middens located in caves which are currently flooded at high tide (González Morales 1982). A similar case on the Mediterranean coast is Cave C-6 near Cape Cope (Águilas, Murcia), where late Neolithic remains have been found (San Nicolás and Martínez 1987).

More difficult to interpret are the prehistoric remains that have appeared on beaches, of which there are numerous Mesolithic examples, for example, at Bañugues and other sites in the Cape Peñas area of Asturias (Blas et al. 1978) and in the Mongrí area of Gerona. It is difficult to determine whether these represent materials eroded out from submerged coastal sites and redeposited on the shore or more simply reflect the concentration of Mesolithic activities along the present-day shoreline.

Mention should also be made of the remains of Pleistocene fauna that have been occasionally dredged up by fishing boats at different points on the Spanish continental shelf, such as the proboscidean teeth from Catalonia mentioned by Canals et al. (2017, pp. 323–324). However, unless it can be clearly established that they can be related to human activity, they should be regarded as palaeontological deposits, as is the case with the above examples, which include species such as the mastodon which were extinct before the arrival of hominins in the Iberian Peninsula.

13.3.2 Neolithic and Bronze Age Votive Deposits

A number of finds fit into this category, although most are accidental discoveries resulting from commercial fishing or dredging. The only known find associated with systematic archaeological activity is a Neolithic polished axe recovered in an underwater survey in the port of San Vicente de la Barquera in Cantabria (Casado et al. 1992). A copper axe was found in the same area, at Puente de la Maza (Jorge 1953; Arias et al. 2005).

The most significant case in an offshore context of this kind is a late Bronze Age carp's tongue sword, picked up in a fisherman's net two miles off the coast between Matalascañas and Mazagón, Huelva (Meijide 1988, p. 113).

Other finds were discovered in estuaries or ports by dredging and therefore have limited or non-existent contextual information. The most significant of these is the Ría de Huelva hoard, found in a large estuary formed by the confluence of the Rivers Tinto and Odiel. Here, in 1923, a dredger found one of the most significant late Bronze Age assemblages in Europe, a fundamental reference for the transition from Late Bronze Age 2 to 3, the Blackmoor/Braud/Huelva phase according to the seriation proposed by Brandherm (2007; see also Burgess and O'Connor 2008 and Brandherm and Burgess 2008). It comprises 400 objects, including 88 swords or sword fragments, 29 daggers, 85 spearheads, 49 ferrules and arrowheads, 4 helmets and 9 elbow fibulae, buttons, fasteners, pins, torc fragments and harness elements. For many years, this assemblage was attributed to a Bronze Age shipwreck (Almagro 1940, 1958). However, a later reappraisal (Ruiz-Gálvez 1995) suggests that it is an example of a

Bronze Age hoard (Bradley 1990). From this point of view, the Huelva material may be interpreted as a votive offering deposited in an estuary in the late tenth century cal BC.

A similar example occurs in the estuary of the River Ulla in Galicia, where dredging recovered a large group of Late Bronze Age objects: at least two rapiers, five swords, two palstaves and a spearhead (Ruiz-Gálvez 1982; Peña 1985). It is possible that we can add to this list some swords recovered in the large area, currently emerged, corresponding to the former estuary of the River Guadalquivir.

13.4 New Projects

Two exploratory underwater projects have been initiated in recent years, one in Cantabria and the other in Gibraltar, both involving a combination of underwater mapping and diver exploration.

Starting in the north, the project 'El Paleolítico Sumergido: Paisajes y Poblamiento Prehistóricos en la Plataforma Continental Cantábrica' (P5 Cant) (The Submerged Palaeolithic: Prehistoric Landscape and Human Settlement on the Cantabrian Continental Shelf) was carried out between 2015 and 2017.

As noted earlier, there are challenges to underwater exploration in this area because of variable sea conditions, frequent poor weather and the likelihood of erosion of underwater material by strong currents, but also advantages because of the high density of known sites on land that provide clues to target areas for underwater survey.

The aim of the P5 Cant Project was to test for the presence of submerged archaeology, and three areas were selected for surveying according to the following criteria:

- Shallow waters (<30 m).
- Existence of karst massifs, particularly where the caves faced inland (towards the south).
- Proximity to significant concentrations of on-land Palaeolithic sites.
- Association with rapid transgression phases or with former estuaries and bays.
- Absence of large sand banks.

Areas considered most promising according to these criteria were around the karst massif of Mt. Buciero in Santoña, the vicinity of the Cape Mayor and the Santander Bay and the Cuchía area between the palaeovalleys of the Rivers Besaya and Pas. With the means available for the project, only one of these could be explored intensively, and the Cape Mayor-Santander Bay sector was chosen because of its optimal conditions. Surveying focused on two areas with detailed bathymetric survey using a multibeam echosounder (Reson SeaBat 7125), RTK (Real-Time Kinematic) techniques and the production of digital elevation models (Fig. 13.4).

Using this bathymetry, two underwater survey campaigns were carried out, one of them more extensive, with a 'Triggerfish' model ROV of the 'Deep Ocean Engineering' company, directed by Xabier Guinda of the Hydraulic Institute at the University of Cantabria, and the other by diving, led by the archaeologist Pablo Saiz Silió and his team. These explorations succeeded in locating a series of places with potential for the conservation of Palaeolithic or Mesolithic remains: caves (Fig. 13.5), rockshelters and other karst forms (dolines, canyons), and some anomalous concentrations of mollusc shells. In addition, numerous sediment and rock samples were collected and, together with the bathymetric information, this has identified the continuation under the sea of geological and geomorphological structures known on land (Fig. 13.6; Sánchez Carro et al. 2017).

To sum up, the P5 Cant Project was able to produce worthwhile results in the reconstruction of the landscape and geological structure and the location of numerous sites with potential for future research. No less important has been the refinement of the methodology and the formation and training of a highly motivated interdisciplinary team with which the topic can be addressed in the future on realistic foundations.

In Gibraltar, a programme of underwater exploration was initiated in 2005, as a pilot project involving collaboration between the University of York, the Hampshire and Wight Trust for Maritime Archaeology and the Gibraltar Museum with a follow-up season in 2008 including exca-

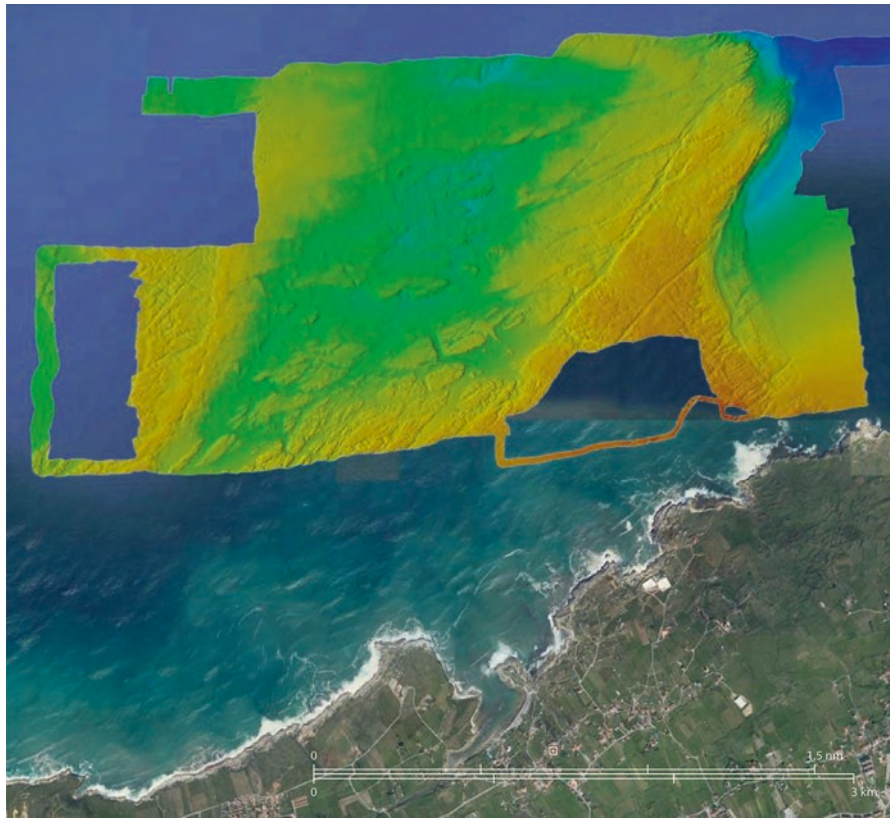

Fig. 13.4 High-resolution bathymetry of La Vaca area, northwest of Santander. Image by V. Bruschi, based on I. Galpasoro

Fig. 13.5 Exploring a submerged cave between the islets of Mouro and La Corbera, near Santander. Photo by P. Saiz Silió

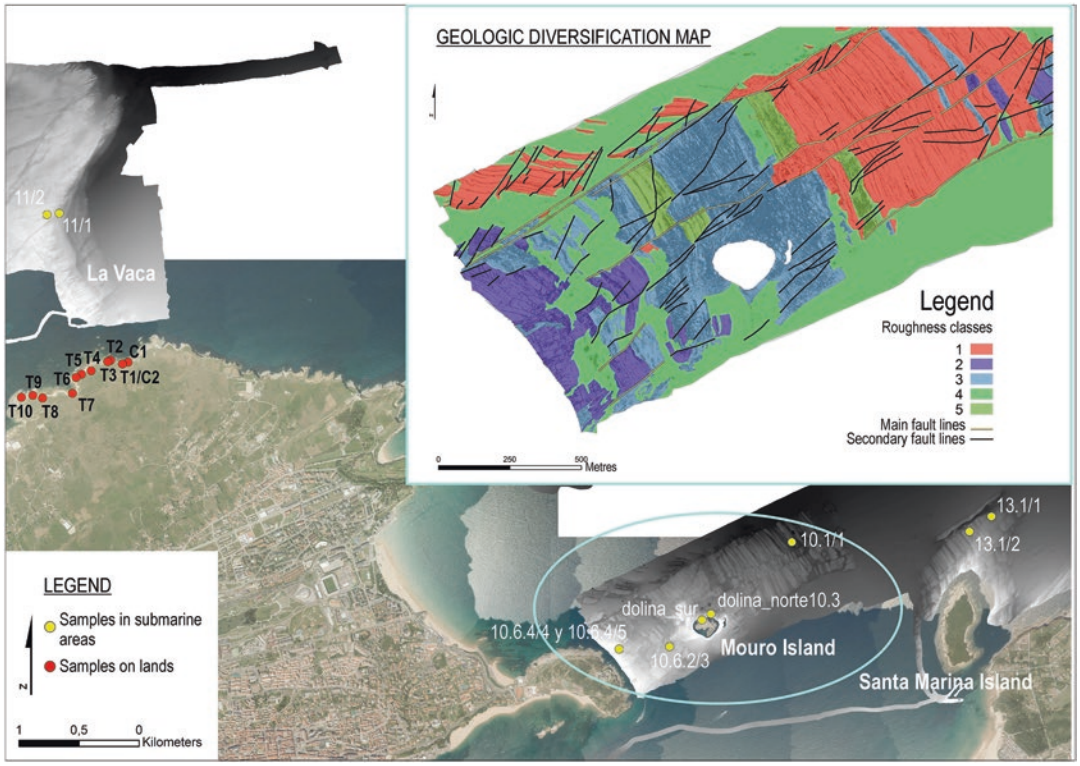

Fig. 13.6 Sampling programme for analysis of the underwater geology in the Cape Mayor-Santander Bay region. Sampling area and rugosity map after an ArcGis analysis showing the alternation of lithology and the continuity of fractures (corresponding to the blue circle in map). After Sánchez Carro et al. 2017

vation of an underwater cave (Bailey 2011). Gibraltar has many coastal caves including Gorham's Cave, Vanguard Cave, Devil's Tower and Forbes Quarry, all of which are famous for their Neanderthal fossils and archaeological sequences (Stringer et al. 2000; Finlayson et al. 2006). The submerged shelf around the Gibraltar Rock forms a relatively compact area, no wider than about 4–5 km, suitable for a detailed underwater landscape survey. Underwater work included landscape survey of most of the Gibraltar shelf using multibeam, sub-bottom profiling and side scan, diver mapping of the caves and their immediate surroundings and diver inspection of ridges and pinnacles on the eastern side of the shelf (Fig. 13.7). A submerged reef, known as Vladi's Reef lies about 200 m offshore and extends over a distance of c. 2 km. A cliff on the north side of the ridge contains a number of cave openings at its base at a depth of about 18–22 m below present sea level, formed by marine solution during an earlier period of high sea level. The two largest of these are clearly large enough for human occupation: Finlayson cave measuring 12 m wide, 4.5 m deep and 1.8 m high from the cave roof to the top of the infill at its entrance and Momber Cave 3.3 m wide, 3.6 m deep and 1.5 m high. These caves appeared on preliminary inspection to have a cave fill, and their aspect, facing away from the open sea and towards the mainland shoreline, suggested the possibility of discovering terrestrial deposits that had been protected from wave erosion during sea-level rise. Preliminary excavations were undertaken at Momber Cave, selected because it was judged to have a better prospect of preserving terrestrial deposits, and a trench 2 m1 m × 0.6 m deep was excavated in the mouth of the cave (Fig. 13.8). The deposits comprise marine cobbles and sands, but further excavation was impeded by closely

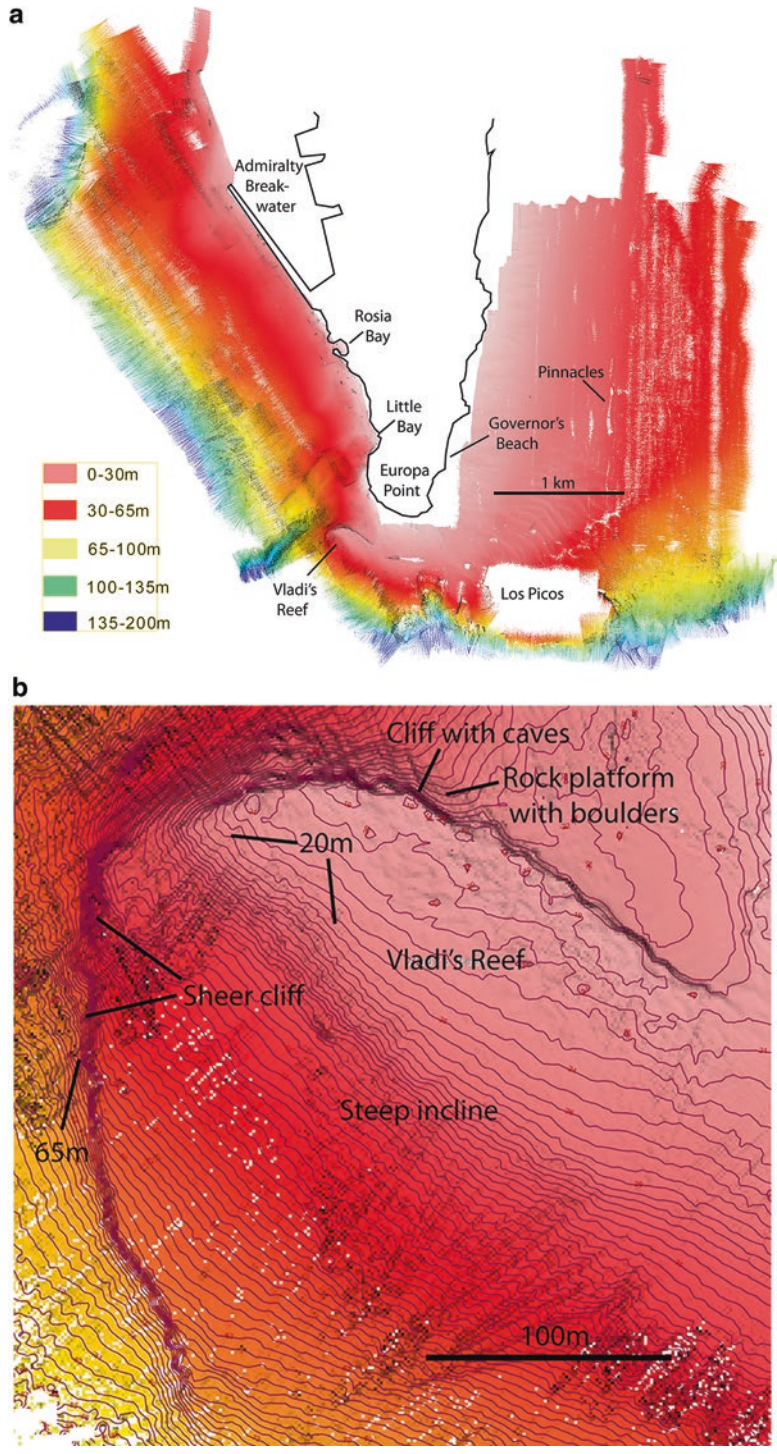

Fig. 13.7 Topography of the continental shelf around the Gibraltar Peninsula, showing Vladi's Reef and other submerged features. (**a**) General depth contours. (**b**) Close-up of Vladi's Reef showing detailed bathymetry and location of underwater caves. After Bailey 2011, Figs. 10 and 11, p. 323

packed boulders at the base of the trench. Major engineering solutions will be required to discover whether terrestrial deposits are preserved beneath these boulders or beneath the boulder field immediately in front of the cave entrance, and no further work has been undertaken. This research

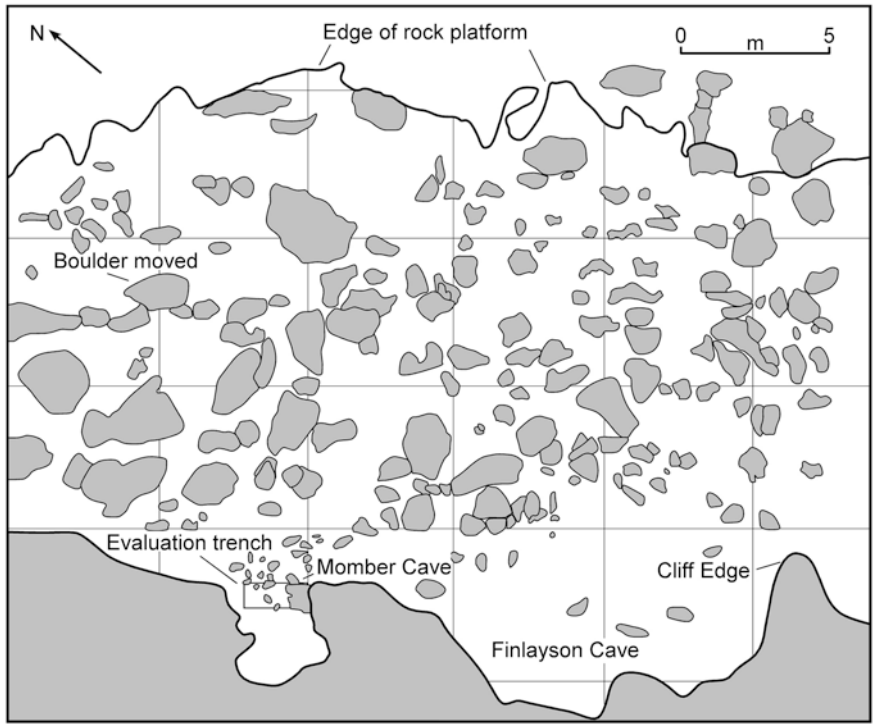

Fig. 13.8 Map of the submerged features on the north side of Vladi's Reef after 2005 survey and excavation. After Bailey 2011, Fig. 12, p. 324

constituted pioneering work on excavation in deep submerged caves, providing experience in the varied technical challenges of this kind of archaeological investigation.

13.5 Concluding Remarks

The Spanish continental shelf holds great potential for archaeological exploration aimed at finding and studying prehistoric sites, particularly Upper Palaeolithic deposits. The survey projects carried out in Cantabria and Gibraltar demonstrate both the challenges and the opportunities of systematic underwater survey. In both cases, the results have provided a better understanding of localised topographic features exposed at lower sea levels and targets suitable for more detailed archaeological investigation and excavation. It is to be hoped that these will be continued as other sectors of the coast are explored. Only in that way will it be possible to approach a fuller understanding of coastal occupation by Pleistocene and early Holocene communities and analyse the use of the littoral environment by hunter-gatherer societies during these earlier periods on a more realistic basis.

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