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## Settlement and Landscape

### Poças de São Bento and the local environment

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CHAPTER TWENTY-ONE

SETTLEMENT AND LANDSCAPE:  
POÇAS DE SÃO BENTO  
AND THE LOCAL ENVIRONMENT

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**Abstract**

The study of large settlement sites with graves from the Late Mesolithic has changed our conception of this period. Sites of this kind have long been known in Western Europe, and are well represented in the coastal area of western Iberia. One such site is Poças de São Bento, located near the River Sado in southern Portugal. The results of the excavation give interesting perspectives on specific ecological conditions within the local environment as well as a general view of the regional landscape. The preservation of shell, bone and antler permits an analysis concerning the use of different ecological niches.

**Introduction**

In 1984 I was excavating a complex of two large sites with cemeteries from the Late Mesolithic along with settlements in a former lagoon in the southernmost part of Sweden (Larsson 1995, 2004). This excavation gave a profoundly new picture of the Late Mesolithic of Southern Scandinavia, permitting a new understanding of the hunter-gatherer societies. Just a few sites along the Atlantic coast of Europe have presented a similar combination of settlements and cemeteries, the majority of these being located along the coast and the rivers of central Portugal.

At a symposium I met Dr José Morais Arnaud, who invited me to take part in his project on settlement along the River Sado. This invitation was very tempting. The result of this cooperation was the excavation at Poças de São Bento, southern Portugal, which was carried out in three seasons 1986–1988 and contributed interesting perspectives on coastal settlement in general and shell middens in particular. The investigation area is situated some 100 km south-east of Lisbon, in the valley of the River Sado. The lower course of this river comprises a broad delta and a valley that cuts deeply into sands and clays. In the latter stretch of the river's course there is a group of shell middens that all appear today to be inland sites, since they lie about 30 km upstream from the estuary (Arnaud 1989) (Fig. 21.1).

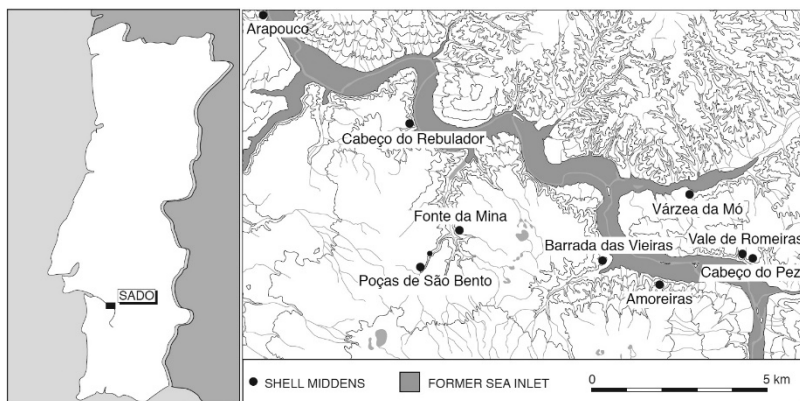


Fig. 21.1. The location of Poças de São Bento and other shell middens along the River Sado.

In the Late Atlantic period, when the level of the ocean was higher, the present river valley was transformed into a very narrow inlet, reaching far inland. Even nowadays, tides affect the river's current several kilometres from the estuary, but in the Atlantic period this effect was stronger, because of the higher sea level. The supply of fresh water from what was then a shorter river was combined with an increased inflow of salt water through the effect of the tides. This helped maintain the regular variation of the salinity level and a continuous supply of nutrients, which favoured several aquatic species. The occurrence of molluscs in large quantities along with fish bones and the remains of shellfish at the sites along the river shows that the water up to the inlet was saline to some degree. This unusually productive environment is the most important reason for the

accumulation of shell middens. The fact that the level of the valley floor rose only slightly in a long stretch of its course meant that the tides had a noticeable effect on the shape of the inlet. At ebb tide a stretch of the valley floor several kilometres long was partly dry, but covered with a nutrient-rich layer of mud, in which molluscs and crabs found shelter until the next high tide came in.

## **The Excavation**

The Sado Project research area was a stretch of the river valley. Here the valley is between 500 and 800 m wide, and the valley sides vary in shape from gentle slopes to steep banks. The difference in level between the valley floor and the surrounding terrain is up to 50 m. When the excavation started about ten shell middens were known in the neighbourhood, five of which had previously been investigated in excavations of varying scales (Arnaud 1989). The shell middens varied in size from about 50 square metres to around 8000 square metres. With a few exceptions, they were situated at the top of the valley slope.

One shell midden—Poças de São Bento—to the south of the river is in a location that differs significantly from that of the other investigated middens, since it lies about 3 km from the valley. It nevertheless has occupation layers with a high content of shell. In addition, the site is of considerable size, some 4000 square metres. Poças de São Bento lies on a rise in an area of sand dunes formed during the Late Pleistocene. Immediately to the east of the site there is a pronounced ravine leading down to the river. The ravine has a flow of water from springs even during the summer. The difference in height between the shell midden site and the bottom of the river valley is about 80 m.

An excavation of this site was undertaken at the end of the 1950s under the leadership of Professor M. Heleno. The investigation involved digging several one-metre-wide test trenches, the same approach used in other shell midden excavations in the Sado valley at the time (Fig. 21.2). The aims of the excavation were to define the area of the shell midden and to search for the remains of burials. Graves were found in one of the trenches which led to the excavation of a wider area. A total of twelve graves were then found. Unfortunately, most of the documentation has been lost. The location of the site and the interesting results from the earlier excavation were the reasons for undertaking a new excavation. This was carried out as a joint Swedish-Portuguese project.

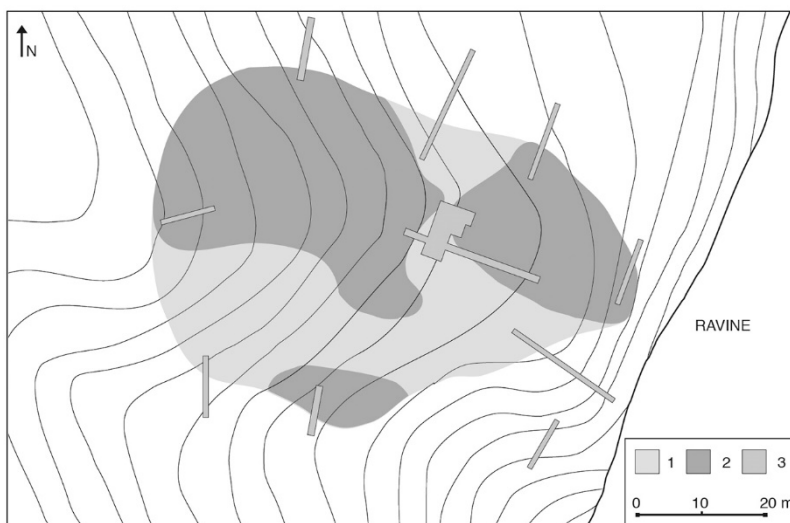


Fig. 21.2. Plan of the excavated area. Symbols: 1: the extent of the settlement site; 2: the extent of the shell-bearing layers and 3: excavated areas. The trench in the middle comprises the excavations in 1987–1988. The levels are marked by contours every half-metre.

## Stratigraphy and Features

The initial fieldwork included intensive augering, carried out in order to provide an idea of the stratigraphy of the settlement site. This showed that it comprised at least three distinguishable accumulations of shells, varying in terms of the thickness of shells. Areas lacking shells were also found within these accumulations. The work of the next two seasons (1987–88) was concentrated on excavating a continuous area of 20 square metres (Fig. 21.3). This lay next to the large trench of 12 square metres in which graves had been discovered during the previous excavation in the late 1950s.

The new excavation gave a good idea of the layout of the site. It turned out that the shell-rich layers in this shell midden, as distinguished by augering, were not a continuous formation. The layers of shells had an extent of just a few square metres and can best be described as accumulations of shells up to a metre thick on the original ground surface. The highly uneven upper surface of the shell layer gives the impression that these piles of refuse arose as a result of a short-term accumulation of

shells. Refuse from a few days' consumption of mussels may have been collected in baskets and then emptied in a place designated for that purpose.



Fig. 21.3. Compilation of areas excavated in the late 1950s and in the 1980s. Symbols: 1: the extent of the shell-layers, 2: colourings left by post-holes, 3: pits and 4: large stones.

The complicated stratigraphy is seen in a section through the excavated area, and projected onto this are the finds from a 0.2-metre-wide slice behind the section (Fig. 21.4). In this area the shell-less occupation layer was of limited size. Layers with a greater or lesser admixture of shell predominated. The majority of bone finds were unearthed in the layers with shell. It is not possible, however, to discern any clear correlation

between the distribution of stone artefacts and any particular layer. The number of artefacts decreases with depth.

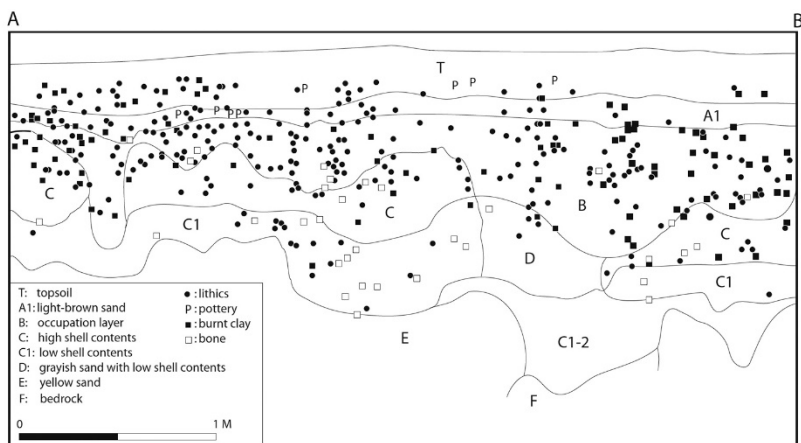


Fig. 21.4. Section through the investigation area, on to which are projected finds from a 0.2 m thick slice behind it.

This sequence, however, should not be assumed to characterise the remainder of the site as well. In other places there was a considerable quantity of artefacts in the shell-rich layers. The number of bones in the shell layers varied significantly, from almost total absence in some occupation layers to a high quantity in others.

Shells of *Cerastoderma edule* (common cockle) and *Scrobicularia plana* (peppery furrow-shell) were overwhelmingly predominant in the refuse, although other species did occur, such as *Theodoxus fluviatilis* (river nerite) and *Hinia reticulata* (netted dog-whelk). In some cases, concentrations of shells from a particular mollusc species hinted that the remains of a single shell gathering episode had been dumped in one place.

Between the accumulations of shells and partly overlying them was a sooty occupation layer containing a large quantity of stone tools and refuse from tool-making. Remains of hearths in the form of fire-cracked stones and burnt clay were documented in the occupation layers.

One of the pits under the find-bearing layers contained large quantities of red ochre. There were no remains or discolouration to suggest that a person had been buried in the pit. The analysed charcoal samples mainly consist of stone pine.

In a few cases it was clear that the molluscs at the bottom of the assemblage had been subjected to heat. The accumulation of charcoal shows that this heating was done on the site. The limited spread of heat-exposed shell shows that the fireplaces were small. These then served as fixed points for the accumulation of shell remains. In a few cases a shell-filled pit was the base for an accumulation of shells.

Features of particular interest are the soil discolorations left by substantial post-built structures. It was possible to document occasional post-holes associated with a late settlement on the site. Most of the discolorations left by posts, however, were documented in the layers under the shell. The structure or structures built here had thus been used during a phase preceding the accumulation of shells. This is also corroborated by the fact that the post-holes rarely contained any shell. The holes had a diameter of between 10 and 30 cm and a maximum depth of 60 cm. This suggests that certain holes contained really heavy posts. The excavated area is much too small, however, to distinguish any clear pattern in these post-holes. Some post-holes suggest that the structure was substantial, perhaps serving as a frame for one or more houses. Other functions may also be suggested, such as drying or smoking frames. There were also distinct stains left by trees or bushes that had grown on the site before it was used for habitation.

A total of twelve graves had been found in the course of the earlier excavation in the lower part of the shell layer or in the underlying sand. It is evident from the stratigraphy that the graves were dug both before shell accumulated and in conjunction with shell deposition. However, at the time of excavation these graves were not available for study.

The trial excavation of 1986 uncovered a skull, which can be associated with a previously documented collection of human bones (grave XI) (Fig. 21.3). The stratigraphy clearly shows that the deceased individual had been placed in a shallow pit, which had been dug down from an almost shell-free sand surface, since the fill contained only a small amount of shell. The skull was dated to  $5390 \pm 110$  BP, 4400–3980 cal. BC (Ua-425).

From the limited documentation that survives, we know that parts of the buried bodies were missing, which may be due in part to poor preservation conditions and later digging. Despite this, it was evident that the deceased had been buried in a crouched position. No grave goods that can be firmly associated with the burial were found. A few beads in the form of perforated shells, found close to a skeleton, may have belonged to the dead person's ornaments. Stones were found over a couple of skeletons, perhaps the remains of a grave structure.



Yet another skeleton, but lacking a skull and much of the axial skeleton, probably on account of varying preservation conditions, was found in the course of the new excavation, but at a distance of a few metres from the previously documented concentration of graves (grave XIII) (Fig. 21.3). Unlike the latter, the newly-discovered grave had been placed directly above the surface of the shell layer, which means that it cannot be assumed to be of the same age as the Mesolithic settlement.

## **The Material Culture**

A variety of raw materials were used for tool manufacture. Flint—often of low quality and in small pieces—was preferred, but basalt, quartz and rock crystal were also used. Most of the raw materials are not locally available. The artefact inventory is limited, microblades made from small one-sided cores being the most common form (Fig. 21.5). The microblades were either used in unmodified form or reshaped into microliths, the most common form being the narrow segment, but triangular and narrow trapezoid shapes also occur. Few other stone tools are represented. A limited number of scrapers and burins were found. The lithic material has later been analysed by Ana Cristina Araújo (1997).

Long, narrow pieces of slate were cut and shaped into tools with a round-oval or pointed-oval section. Some fragments have a form resembling that of a knife blade. The function of these tools, which occur in varying sizes, is difficult to interpret. They might have been used as skinning knives.

In relation to the number of bone finds, the number of tools made of bone or antler is very small. Some bone points and a few percussors made of short antler tines were found. On the other hand, there are finds of perforated fish vertebrae used for decoration. Bored holes in some mussel shells show that ornaments were also made from this material.

Two radiocarbon dates were obtained, giving dates of  $7150 \pm 70$  BP, 6126–5892 cal. BC (Lu 2769) and  $7050 \pm 60$  BP, 6033–5789 cal. BC (Lu 2770), which indicate a rather short settlement phase.

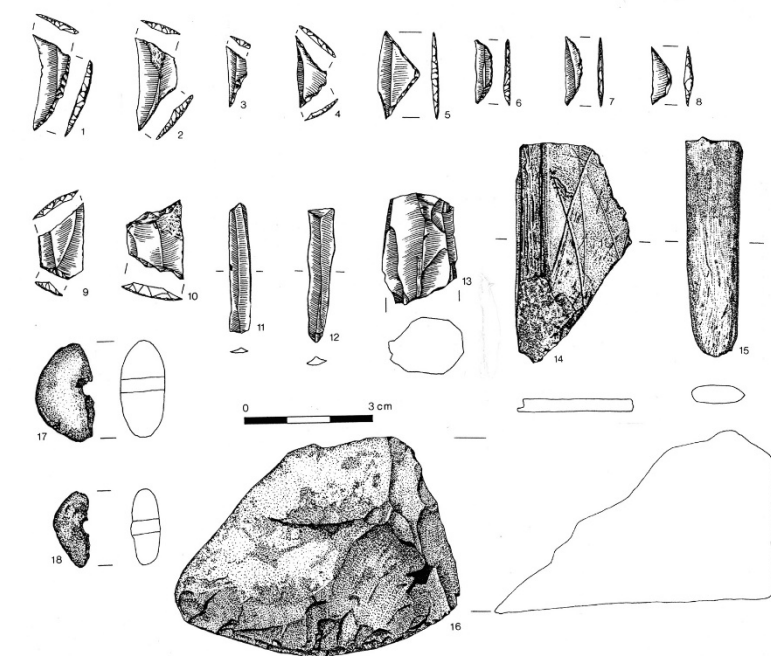


Fig. 21.5. Forms of tools from the settlement site: 1–4 narrow trapezes, 5 triangle microlith; 6–8 segments; 9–10 broad trapezes; 11–12: microblades, 13: microblade core, 14: piece of slate with traces of cut furrows; 15 fragments of a slate knife, 16: stone scraper; 17–18 fragmentary beads of burnt clay. Drawings by Björn Wallebom.

### Physical and Social Environment

Finds of animal bones give an insight into the range of different ways that the society used its surroundings. The predominant mammal is rabbit, with far less numerous bones of hare. Of the larger mammals wild boar seems to be most frequent, with red deer as the second most common and just one find of roe deer. Evidence of aurochs, along with numerous rabbit and hare bones, nevertheless shows that the hunting grounds around the site were covered with sparse forest that had ample undergrowth. Fox, badger, wildcat and lynx were also present at the site. A couple of dog bones indicate the presence of the only domesticated animal. Tortoise and lizard are present in the osteological material.

Apart from the mussel shells, it is the fishbones and parts of crab claws which indicate that a significant part of the food was brought here from the narrow inlet. Among the fish there are several species of shark and skate as well as mackerel, meagre, black bream and grey mullet.

To carry the mussels from the river valley up to the site might have expended more calories than the meat in the shells could actually provide. It should have been more rational to empty the mussels from their shells close to the riverbank. However, processing methods, a plague of insects such as mosquitoes or social rules might have required the gatherers to make the three kilometre climb.

As we have seen, Poças de São Bento is only one of several shell middens around the former inlet. The others are located directly above the sides of the river valley with a good view of the former inlet (Fig. 21.1). Radiocarbon dates indicate that some of the settlement sites were used roughly simultaneously, and those that have been excavated show a combination of occupation layers and graves (Arnaud 1989, 1990; Soares 2013). However, the size of these settlement sites varies considerably, from about 50 to roughly 8000 square metres. In addition, the number of graves does not appear to be related to the size of the settlements. Small sites can contain many graves and big sites can have few graves. The amount of refuse, apart from shells, also differs greatly, as does the number of stone tools and refuse from tool-making.

In the Sado area cemeteries have been documented at five excavated shell middens. The number of graves in relation to the size of the site reveals certain interesting aspects. Twenty-seven graves were investigated at the Cabeço de Pez site (Fig. 21.1), which covers about 8000 square metres. At Romeiras, which is situated only a few hundred metres away and is separated from the large site by a rather small ravine, twenty-two graves were investigated beneath a shell midden covering about fifty square metres. There is thus nothing in this and other examples from the valley of the River Sado to give a clear indication of a distinct relationship between the number of graves and the size of the site. Also, the graves at these find locations occur in groups within a relatively limited area. In one case, Romeiras, a clear distribution of the graves can be distinguished: they were laid out radially in a semicircle. This is a strong indicator that, for a considerable period, there was a clear structural and organizational influence on the placing of the graves.

## Settlement Pattern

Another aspect to be considered in the study of the settlement pattern is that only find spots with shell have been noticed. The presence of shell has made these places easy to discover, and in many cases it is the shepherds of the district who have drawn attention to them. In conjunction with the excavation of Poças de São Bento we received information about shell finds on the ground surface a few hundred metres from the site. When the place was visited, shell remains were observed strewn across an area of a few square metres. Within a slightly larger area there were occasional pieces of debitage and tools. This suggests that there are settlement remains which were deposited during short periods of occupation. Other sites might be impossible to detect by prospection without intensive auguring. If there were settlement sites down on the shore of the river valley, then their remains have probably been either buried or else destroyed as a result of the large-scale erosion of the steep slopes of the river valley.

The distances between the shell middens vary from a few hundred metres to roughly five kilometres. The differences observed between the shell middens along the River Sado are probably due to their having been used by the hunter-gatherer societies as campsites for varying lengths of time during an annual cycle, depending on the availability of various resources. Shell middens are known from the Early Mesolithic in Portugal, but it is during a late stage of the Mesolithic that a connection develops between cemeteries and settlement sites of this type (Araújo 2003). This might mean that antagonism and stress between groups connected with the presence of rich resources within a small part of the landscape entailed changes in the worldview, such as changes in mortuary practices.

It is evident, despite the limited archaeological investigations in the Sado area, that burial was no casual, unpremeditated phenomenon. Graves were grouped, occasionally with a distinct structure. One could see this as a clear marking of a structured settlement pattern in which the known settlement sites were part of a sedentary utilization pattern.

In relation to the other sites, Poças de São Bento can be seen as a settlement site with a rather high number of graves, few bones from forest animals, but relatively many fishbones, copious remains of molluscs and other shellfish, and plenty of refuse from tool making (Arnaud 1989). Poças de São Bento is thus not the settlement site with the least marine orientation, as the distance from the inlet might suggest; on the contrary, we see a distinct preference for marine food, with mussels, crabs, and marine fish. Why then is the site located so far from the lagoon? One

explanation could be that other assets were of greater significance in the choice of settlement site. Today there are richly flowing springs a few hundred metres from the site, which may also have existed in the Mesolithic. It cannot be ruled out that this important supply of fresh water played a major role in the location of the camp, especially during the dry summer. Other resources may have tempted people to settle here, such as food plants. Despite extensive flotation, no fruits or seeds were recovered.

We should not forget that in the conceptual world in those days there might have been other reasons for selecting a particular site, which may be difficult or impossible for modern Man to understand.

Spatial analysis has over-valued ecological factors. A society constructs its own social geography, which is associated with resource use, power structure, and social and symbolic strategies. If one were to judge only according to the significance of the ecological factors, one might conclude that in many respects Poças de São Bento is misplaced. For practical or social reasons, different groups within a community used different resources at different distances from the site. Here one can distinguish sedentary from mobile resources. The former include fruit, seeds and molluscs, and perhaps small game, while the latter refer to big game and certain kinds of fish. From the point of view of the optimal use of an area, the site ought to have been located beside an easily accessible and almost constant resource—in this case the molluscs. Yet this is not the case. Transporting large quantities of such a low-calorie resource as mussels from the inlet, without first processing them, must have involved a direct loss of energy.

It is important to consider the local conditions when trying to understand the settlement pattern. These habitation sites are located in an inland area which obtained a special character because of the formerly existing narrow inlet. This first came about as a result of rises in sea level in the Late Atlantic period. The surrounding landscape was relatively sparsely populated. Only for a few centuries was there a high-yield environment providing opportunities for denser settlement. Such a change probably gave rise to increased contacts between people, with consequences of both a positive and a negative kind. Various forms of protective mechanisms connected with the social and ideological sphere must have been developed. The role of the marine environment, but also its inconstancy, may have been important factors in the conceptual world.

The valley leading up to Poças de São Bento is one of the most pronounced along this part of the river valley. The settlement site is located where the valley meets the gently undulating hinterland. Poças de São Bento may thus have been deliberately located at this point to mark

the relation between the river valley and inland. Accordingly, the mollusc shells may have had a deeper meaning than merely refuse. They marked a sense of affinity with the environment, which, by virtue of its productivity, had a special meaning for human needs and conceptions. They may also have played a role as markers when the site was not being used. The combination of sooty sand and shell fragments marks out the area very distinctly. This marking may also have been developed into a mental meaning: a marking of the tamed sphere—the settlement site—in relation to the untamed surroundings. In a changeable world, various ways of influencing the forces of nature may have been attempted. Accumulations of shells may thus have functioned as a metaphor for a desire to retain a status appropriate for the population.

### Acknowledgements

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