

# The Bell-beaker complex in Portugal: an overview

## O fenómeno campaniforme em Portugal: uma síntese

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### ABSTRACT

This article points out the diversity and heterogeneity of the available data concerning the Bell-beaker complex in the Portuguese territory. The significant amount of knowledge gathered in the last years concerning all the regions of the country, justifies an attempt of systematization, and the discussion of the main issues presented in this article: 1 – radiocarbon dating that points out to an early chronology of the Bell-beaker complex, during the 2<sup>nd</sup> quarter of the 3<sup>rd</sup> millennium BC, in some regions of the Portuguese territory, such as Estremadura; 2 – the long time span of the maritime style, usually considered the most ancient, that lasts until the first centuries of the 2<sup>nd</sup> millennium BC, according to the available radiocarbon dates and therefore points out to the coexistence with other regional beaker productions, such as geometric-stippled and incised decoration style; 3 – the coexistence between decorated beaker productions and regional decorated ceramics in the same archaeological site, suggesting the existence of two populations socially differentiated; 4 – Finally, in the lower Estremadura region the identified correlation between the beaker productions typology and the archaeological sites location: in fact, during the 2<sup>nd</sup> half of the 3<sup>rd</sup> millennium the majority of the maritime vessels are recovered in the height fortified settlements and the other productions, most of them generally coarser manufacturing, were recovered in the nearby open settlements that shows a social differentiation between those who used the maritime vessels for drinking or ritual functions in the height fortified settlements, and the majority of the population, inhabited the open settlements, living of agricultural and livestock activities, used the containers of a generally coarser

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manufacturing and with a clear functional use for the storage of cereals and other cultivated products.

Key-words – Bell-beaker – Portuguese territory – Overview

## RESUMO

A diversidade e heterogeneidade dos dados relativos ao complexo campaniforme no território português está na origem deste artigo. Com efeito, a quantidade significativa da informação reunida nos últimos anos relativamente a todas as regiões do país justificou esta tentativa de sistematização, a qual será seguida pela discussão das principais questões por aquela sugeridas. Como questões de maior importância relevam-se as seguintes: 1 – a cronologia absoluta relativamente recuada do fenómeno campaniforme em algumas áreas do território português, com destaque para a Estremadura, situando o seu início inquestionavelmente no segundo quartel do 3.º milénio a. C.; 2 – a longa diacronia do estilo marítimo clássico, considerado o mais antigo, o qual atingiu os primeiros séculos do 2.º milénio a. C. considerando as datações disponíveis, que em consequência, conviveu ao longo de toda a sua existência com as produções campaniformes de carácter regional, como o estilo geométrico-pontilhado e o inciso; 3 – a coexistência entre cerâmicas decoradas campaniformes e produções decoradas regionais, por vezes segregadas em uma mesma estação, sugerindo a existência de duas populações socialmente distintas; e, finalmente, 4 – a correlação, na região da Baixa Estremadura, entre a tipologia dos recipientes campaniformes e as características de implantação dos sítios onde ocorrem, observando-se, no decurso da 2.ª metade do 3.º milénio a. C., a presença dominante de vasos marítimos nos povoados de altura fortificados e das restantes produções, em geral mais grosseiras, nos sítios abertos situados nos espaços adjacentes. Deste modo, parece observar-se segregação social, denunciada pelo uso diferenciado de recipientes campaniformes, com os elementos mais proeminentes de cada comunidade a ocuparem os pontos altos, utilizando vasos marítimos, destinados a beber e eventualmente associados a práticas rituais, enquanto que nos pequenos povoados abertos vivia a parte mais numerosa da população, entregue às atividades agropecuárias, utilizando produções mais grosseiras, por vezes de grandes dimensões, relacionadas com o armazenamento.

Palavras-chave: Campaniforme – Portugal – Síntese

## 1. INTRODUCTION

The characterization of the Beaker productions, covering the entire Portuguese territory, while being easily recognizable, constitutes a highly complex economic, social and cultural phenomenon, as it was demonstrated by the advances produced in recent years, thanks to the addition of fieldwork throughout the Portuguese geographical space. Thus, this paper will limit itself to make a synthesis of current knowledge, especially valuing the characterization of the most significant components of material culture: the decorated ceramics, which will be addressed by considering their formal characteristics, geographic distribution, absolute chronology and the nature of the archaeological sites where they occur.

## 2. ABSOLUTE CHRONOLOGY AND DIVERSITY OF BEAKER CERAMIC PRODUCTIONS

Undoubtedly, the fortified settlement of Zambujal is the most interesting one for this discussion. Having been carefully and systematically excavated by a team directed by E. Sangmeister and H. Schubart, between 1964 and 1973 (Sangmeister and Schubart, 1981), the remains recovered have since been studied alongside new excavations and new radiocarbon dates, under the direction of M. Kunst. The first absolute dates for Beaker artefacts in Portuguese territory were obtained in this remarkable archaeological site, where these productions are represented primarily by classical marine vases, and have occurred consistently since the 2<sup>nd</sup> phase.

In fact, the antiquity of Beaker productions in Lower Estremadura has become clear by its distribution across the identified five construction phases: they are present in all these five phases and are known since the oldest one (Phase 1),

although, naturally, occurring with different frequencies. Of the 336 fragments of Beaker pottery that could be associated to a given building phase, the lowest level of incidence corresponds to Phase 1 and the highest to Phase 5 (Kunst, 1987; 1996, fig. 6). Though there are only two fragments corresponding to Phase 1, there are 12 at Phase 2 (Kunst, 2010), which offers a reliable indication of their effective presence in this phase. As the chronology of the building sequence has now been complemented by the calibration of older radiocarbon dates and by new radiocarbon analyses (Kunst and Lutz, 2008; 2010/2011), Phase 2 was found to correspond to the period of approximately 2700 to 2600 cal BC for 2 sigma (personal information Miguel Kunst, 25/5/2016), thereby confirming the antiquity of the Beaker presence in the Estremadura region.

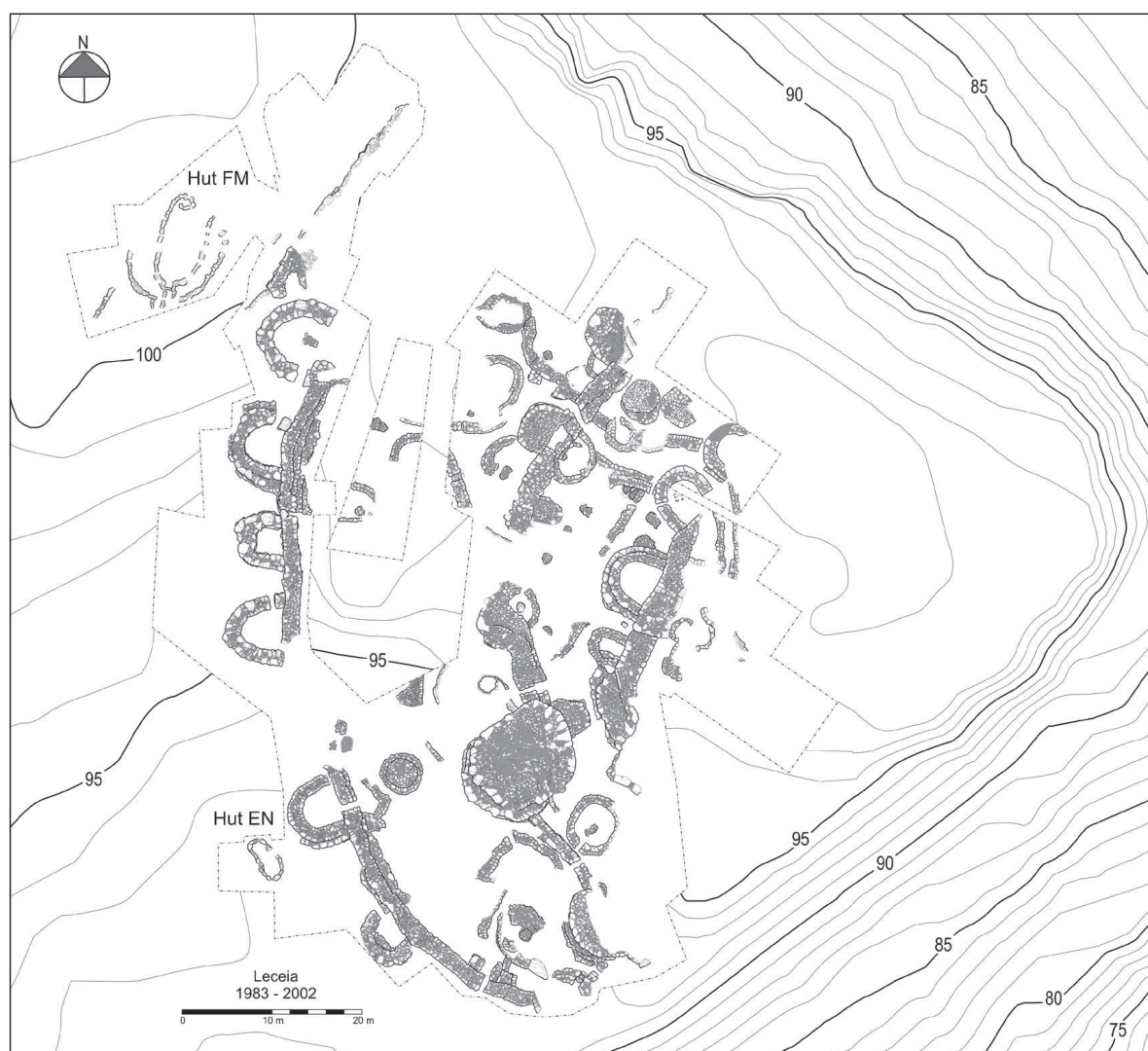


Fig. 1 – Leceia. Plant of the prehistoric settlement and its implantation in the topography with the two Beaker huts identified outside the defensive dispositive (after J. L. Cardoso).

These results were confirmed at the fortified settlement of Leceia (fig. 1), as it was in fact pointed out, over 20 years ago, based on the radiocarbon results obtained in the FM hut (Cardoso and Soares, 1990/1992).

Due to its importance, as already discussed in several publications (Cardoso, 1997/1998; Cardoso, 2000; 2001; 2004), a detailed description of this structure should be provided here. Located outside the walled area, this structure would have housed a small community, perhaps a family group. It consisted of a large hut, formed by two lines of large blocks, with an ellipsoidal ground plan (fig. 2).

As this residential unit is built on a regular platform in the highest part of the

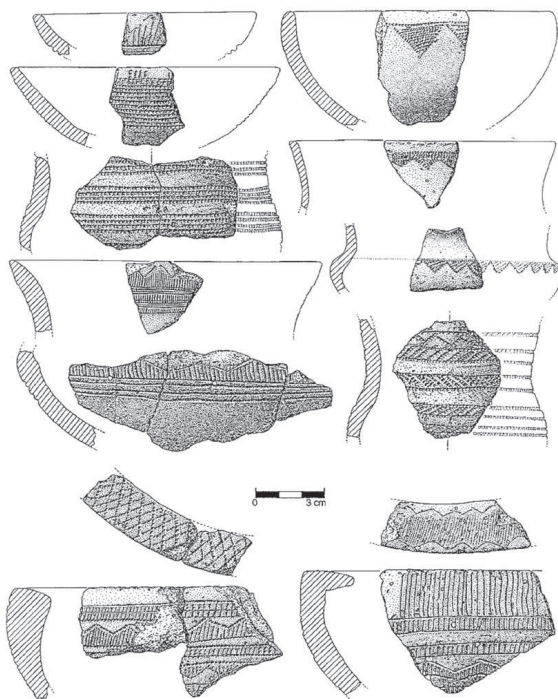


Fig. 2 – Leceia. Detail of the entrance of the hut FM, defined by the transverse threshold and selection of Beaker ceramic there collected (after J. L. Cardoso).

archaeological site, it is unlikely that natural agents had transported any materials to that place from other parts of the site. This conclusion is confirmed by the absolute lack of rolled or eroded Beaker fragments. It is also unlikely that they belonged to different periods because there is an absolute absence of other decorated regional materials, such as fragments bearing the well-known fluted decoration, belonging to the Early Chalcolithic, or the acacia-leaf pattern, belonging to the Full Chalcolithic. In fact, in the area outside the walls occupied by this structure, no other Chalcolithic presence has been recognized. The structure is set directly upon the Late Neolithic layer, which has been radiocarbon-dated to the second half of the 4<sup>th</sup> millennium BC (Cardoso and Soares, 1996).

Hence, there is a gap of several hundred years with regard to the bone remains used for radiocarbon analysis, which, given the results obtained, cannot belong to any context other than that of the Beaker hut in question, where they were collected. So, we can conclude that the 108 Beaker decorated fragments gathered inside this hut correspond to waste produced during its occupation, which would certainly have been for a limited period of time.

The pottery is very fragmented and comes from many different vessels. However, this is to be expected in the excavation of a large

housing unit like this one: it measures approximately 12 m × 5 m at its largest points (Cardoso, 1997/1998), in which the waste of successive communities of occupants would have been only partially rejected from the inhabited area. This would also explain the very incomplete state of most of the vessels. Complete or almost complete vessels would only be found in such a well-defined context if the last occupants had left, leaving behind the vessels that were in use in that moment (presuming, of course, that it were possible to isolate the last occupation during excavation).

In this case, it is plausible that all the Beaker fragments correspond to a single occupation, as it is highly unlikely that two Beaker communities would have occupied the same domestic unit at different times; indeed, there is no evidence of any remodelling work associated to different periods, and, of course, such a perishable structure would have to be completely rebuilt from scratch.

The considerations presented to justify the contemporaneity of the Beaker productions found inside of the Hut FM, can also justify a direct relation between them and the dated bone fragments. These were also found in large quantities and have fresh, unrolled surfaces, an indication that they had originally been left there. As with the pottery fragments, they are cracked but not rolled or eroded, compatible to waste produced by the inhabitants of that housing structure. The first result, carried out using animal bones from the terrestrial biosphere, yielded the following result:

Sac-1317 – 4220 ± 50 BP (2920-2630 cal BC, 2σ).

The Beaker decorated ceramics collected exclusively from inside this structure have the following distribution:

- Maritime vessels with stippled decoration – 13
- Maritime vessels with incised decoration – 3
- Maritime vessels with stippled linear decoration – 3
- Smooth-profile vessels with stippled decoration – 1
- Carinated vessels with stippled decoration – 4
- Carinated vessels with incised decoration – 2
- Shoulder vessels with incised decoration – 11
- Large vessels with stippled decoration – 2
- Large vessels with incised decoration – 3
- Palmela bowls with stippled decoration – 7
- Palmela bowls with incised decoration – 7
- Spherical vessels with stippled decoration – 1
- Calotte-shaped bowls with stippled decoration – 23

- Calotte-shaped bowls with incised decoration – 3
- Unclassifiable fragments with stippled decoration – 15
- Unclassifiable fragments with incised decoration – 10

We can see the predominance of the stippled technique (69 fragments) compared to the incised (39 fragments).

After these results were first published (Cardoso, 1997/1998), some colleagues informally raised a few doubts. They can be divided into two types of questions: firstly, the diversity of the Beaker ceramic materials suggests that there was some mixing at different times; secondly, the doubts with regard to the early chronology obtained by dating persisted, because the sample submitted for dating may have included materials from the Late Neolithic.

In order to clarify this issue, two samples were selected from the Beaker context (i.e., stratigraphically associated with the construction and occupation of the hut), which were then dated by AMS. The results were as follows:

- Beta-260297 –  $4140 \pm 40$  BP (2880-2590 cal BC,  $2 \sigma$ ) on a humerus of *Sus* sp.
- Beta-260299 –  $4100 \pm 40$  BP (2870-2500 cal BC,  $2 \sigma$ ), on a metacarpal of *Bos taurus*.

These results confirmed the value obtained earlier by the conventional method, which used around 100/150 g of bones, corresponding to some 15 pieces. The results of the two dates obtained are consistent with each other and prove that the chronology of the FM hut, and, consequently, that of its contents, is from the second quarter of the 3<sup>rd</sup> millennium BC, which is prior to the chronology of the Beaker presence inside the fortification.

The early chronology of the Beaker pottery collected at the FM hut at Leceia is one of the most important aspects of this study, following the demonstration of the contemporaneity of the incised and stippled Beaker productions, already present there. This means that it is not possible, from the typological point of view, and in relation to the Estremadura, to isolate the oldest Beaker productions from the most modern ones, contradicting the former criteria, which consider the existence of three successive groups of Beaker ceramic productions: the International Group; the Palmela Group (equivalent to the geometric stippled productions) and the Incised Group (Soares and Silva, 1974/1977).

Other evidence found in several sites of the country also point in the same direction. For example, in the north of the country, the excavation of the megalithic tomb of Chã do Carvalhal 1 has revealed the contemporaneity of several ceramic Beaker productions that were typologically very distinct. This is an exceptional set, including fragments of a classical stippled maritime vessel, a stippled geometric

vessel, two vessels with incised decoration, and one Palmela bowl with stippled decoration (Cruz, 1992) (fig. 3). This set, found in a closed tomb, related to a single deposition, contrasts with the scarcity of Beaker findings in the north of Portugal. The funerary deposit also includes seven copper artefacts (two daggers and five Palmela points), reinforcing its unique character, in the context of Chalcolithic metalwork in the north of the country. It suggests the tomb of a foreigner in that large megalithic necropolis of the mountain of Aboboreira.

We should stress the diversity and the contemporaneity of the Beaker vessels found in this single tomb, a reality that reinforces the comments made about the FM Hut from Leceia.

In the south of the country, although dated Beaker contexts are rare, a remarkable diversity of ceramic productions was also documented.

Thus, in the settlement of Porto das Carretas (Mourão), where the Beaker occupation can be placed in the third quarter of the 3<sup>rd</sup> millennium cal BC according to the radiocarbon data, the collected Beaker fragments belong exclusively to classical marine vessels, decorated with the dotted technique

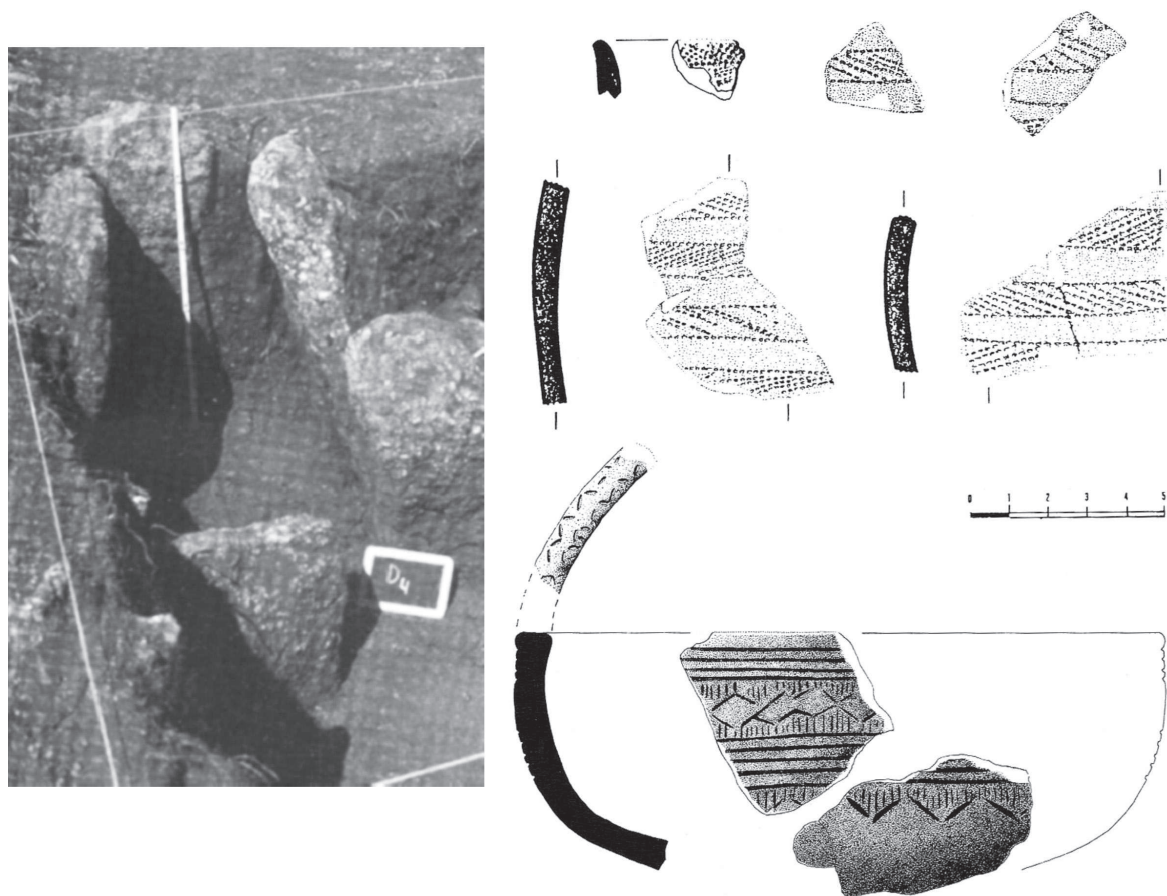


Fig. 3 – Chã do Carvalho. View of the megalithic monument and Beaker materials collected therein (after D. J. Cruz).

(Soares, 2013). A similar situation is observed in Miguens 3 (Alandroal), where a Beaker set, represented by productions integrating maritime vases with speckled geometric decoration, falls within the same time span (Mataloto and Boaventura, 2009).

On the contrary, other sites, which, though not dated, could be included in the same chronological period, are characterized by typologically very distinct Beaker sets, as it is the case of the Monte do Tosco 1 (Mourão), situated about 10 km from Porto das Carretas, where only incised ceramics were found, denoting an evident influence from the Spanish Meseta/Ciempozuelos Group (Valera, 2000b; Valera and Rebuge, 2011).

This reality, highlights the complexity of the discussion at hand, where the productions types have more to do with cultural affiliations of each human group than to chronological differences between them. In this case, we assume that the community from Porto das Carretas had probably privileged relationships with Portuguese Estremadura, while the community from Monte do Tosco had dominant ties with the group of Ciempozuelos, in the Meseta, in the same period.

Only in the large sites, like Porto Torrão and Perdigões (personal information, António Valera 25/5/2016), the different Beaker stiles coexists, as a result of mixing people from different geographical areas.

Recently published dates of Beaker occurrences in northern Portugal (Bettencourt, 2011, p. 370) confirm the conclusions above presented.

In Crasto de Palheiros, Murça, the two dates obtained by Maria de Jesus Sanches (CSIC-1280 – 4087±34 BP and Ua – 22284 – 4035±45 BP) correspond to the intervals, calibrated to 2 sigma, of 2861-2494 cal BC and 2850-2466 cal BC respectively. Both dates are related to Layer I of the Inner Unit, where 18 Beaker vessels of various types (maritime, stippled geometric and incised) were collected (fig. 4). Thus, this parallel is clearly very important for the interpretation of the situation found in the FM Hut at Leceia, where there is a similar diversity, with the exception of the presence of Palmela bowls.

Finally, still in the northeastern Portugal, dates were also obtained for the Beaker contexts of Level 1 of Buraco da Pala (Mirandela): ICEN -310 – 4120±80 BP; ICEN-311 – 4120±50 BP; and GrN-19101 – 3955±25 BP. Calibrated to 2 sigma, these yielded the following intervals: 2888-2490 cal BC; 2876-2572 cal BC; and 2569-2348 cal BC. The materials associated with these findings reveal local interpretations of the decorative motifs of classical Beaker vessels (Sanches, 1997) (fig. 5).

Given all this, we may conclude that the north of Portugal, despite the few Beaker occurrences recorded and dated (Bettencourt, 2011), has contributed decisively to demonstrate the antiquity of Beaker productions, which clearly date back to the second quarter of the 3<sup>rd</sup> millennium BC.

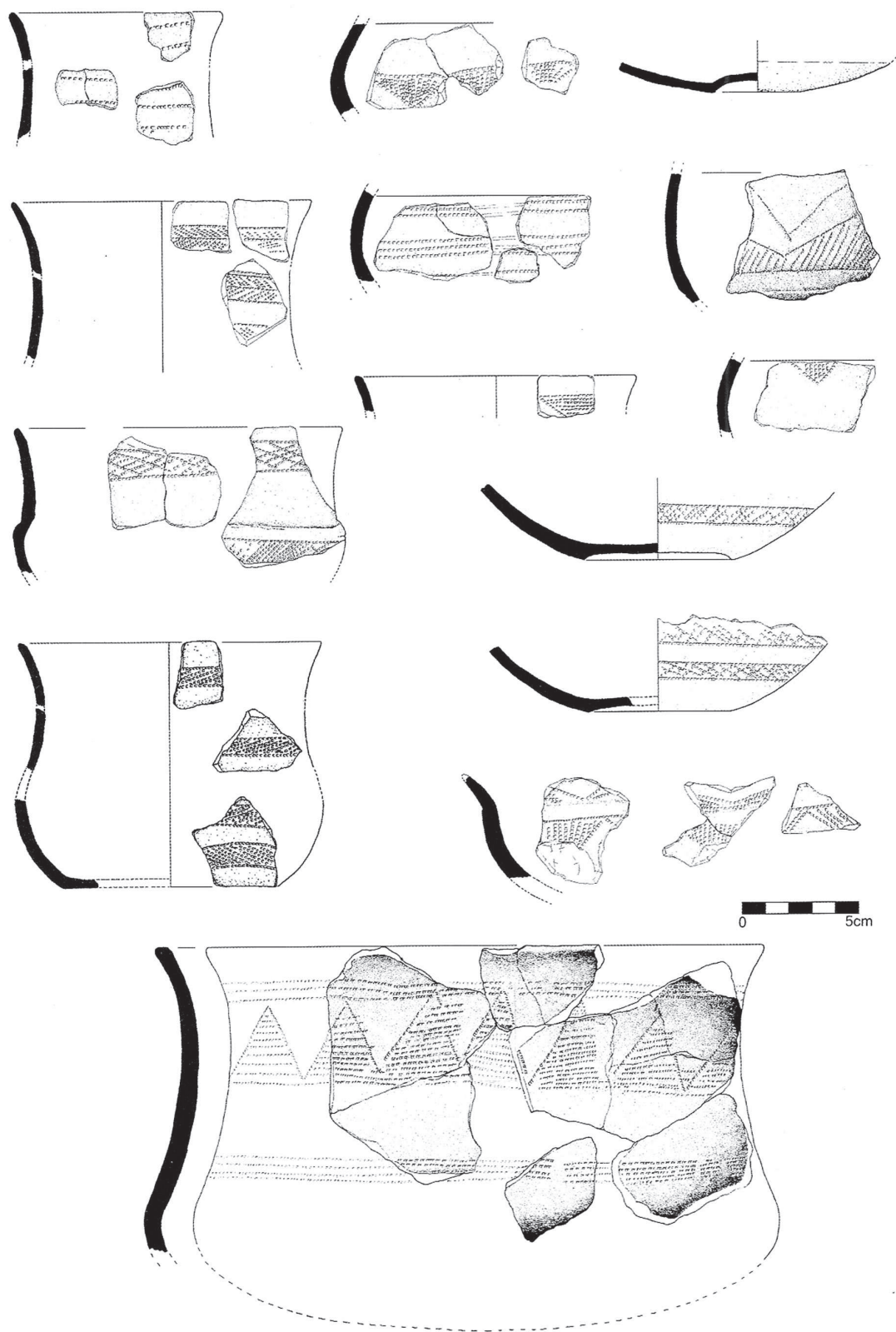


Fig. 4 – Crasto de Palheiros. Beaker ceramics (after S. Barbosa and M. J. Sanches).

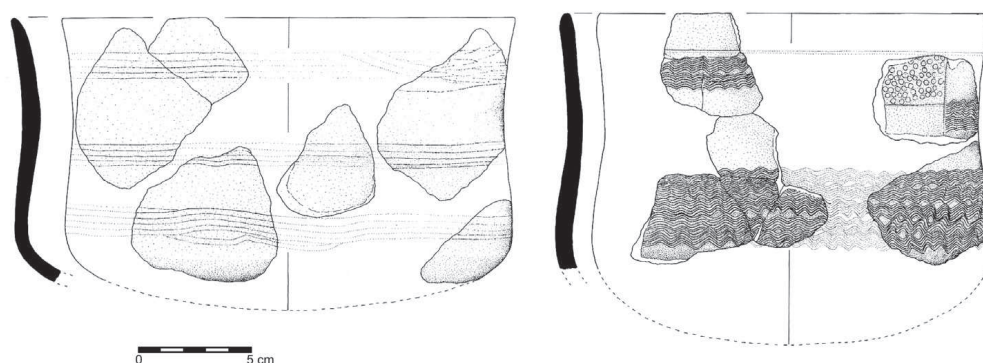


Fig. 5 – Buraco da Pala. Beaker ceramic of local imitation (after M. J. Sanches).

From the above, it can be concluded that the origins of the Beaker phenomenon in most of the Portuguese territory (Estremadura, Southern and Northern Portugal) is to be found between about 2700/2600 cal BC, according to the available radiocarbon dates, with its terminus around 2000/1800 cal BC (Mataloto, Martins and Soares, 2013, Table V) corresponding to a short transition period from the Chalcolithic to the Bronze Age (Ferradeira horizon, in the south, and Montelavar horizon, in the center and the north of the country), that some authors attribute to the Early Bronze Age (Bettencourt, 2013). This last conclusion is illustrated by an extremely important information recently published, from Quinta do Castelo 1, Beja (Valera, Calvo and Simão, 2016): the chronology of an individual grave

accompanied by a single maritime vessel, gave the result of 16B/0304 – 3550+/-30 BP corresponding to the interval of 1980-1770 cal BC (2 sigma). This result shows that the production of maritime vessels continued along the first centuries of 2<sup>nd</sup> millennium BC, at the same time that, for the first time, an individual Beaker burial in pit was documented in the Portuguese territory.

### 3. GEOGRAPHIC DISTRIBUTION

Until recently, the Beaker productions in Portuguese territory were essentially limited to the coastal areas, focusing especially in Estremadura (fig. 6), with sparse and occasional occurrences in the center and north of the country.

Vast areas of the interior were completely devoid of occurrences. That situation only began to change nearly two decades ago and presently significant sites are known.

In the north, thanks to the work integrated in several research projects, this situation changed, and today it is possible to have a comprehensive and updated overview of the geographical distribution of the documented occurrences (Bettencourt, 2011).

In the center of the country, the new information is due also to several research projects (Senna-Martinez, 1994; Valera, 2000a).

In Upper and Lower Alentejo, it was the mega-operation towards the minimization of the environmental impacts resulting from the construction of the multipurpose hydroelectric complex of Alqueva, on the Guadiana river, that provided almost all of the information obtained during the last 15 years (Valera and Rebuge 2011, Valera, 2013). Finally, in Algarve, where the occurrence of Beaker productions was completely unknown until 2005, it was necessary to wait for the archaeological intervention towards the recovery and valorization of one of the most remarkable collective tombs of the necropolis of *tholoi* at Alcalar, Portimão, explored in the late nineteenth century by Estácio da Veiga – Alcalar 7 – in order to find for the first Beaker fragments, at the level of the monument construction, and dating from the mid-3<sup>rd</sup> third millennium BC (Moran and Parreira, 2004) (fig. 7).

Presently, although not uniformly distributed, ceramic Beaker productions are to be found across the entire Portuguese territory. But the extraordinary concentration of the maritime vessels in the Lower Estremadura, quantified by Laure Salanova (Salanova, 2001, Figure 5; Salanova, 2004), justifies, after this author, the role of this region in the genesis of the maritime vessels.

In fact, one of the possible justifications for this reality was recently presented by Elisa Guerra Doce (Guerra Doce, 2016), having in account the evident similitude between the standard vessel (shape and stippled decoration) and the esparto baskets used eventually to the transport of salt, one of the more important

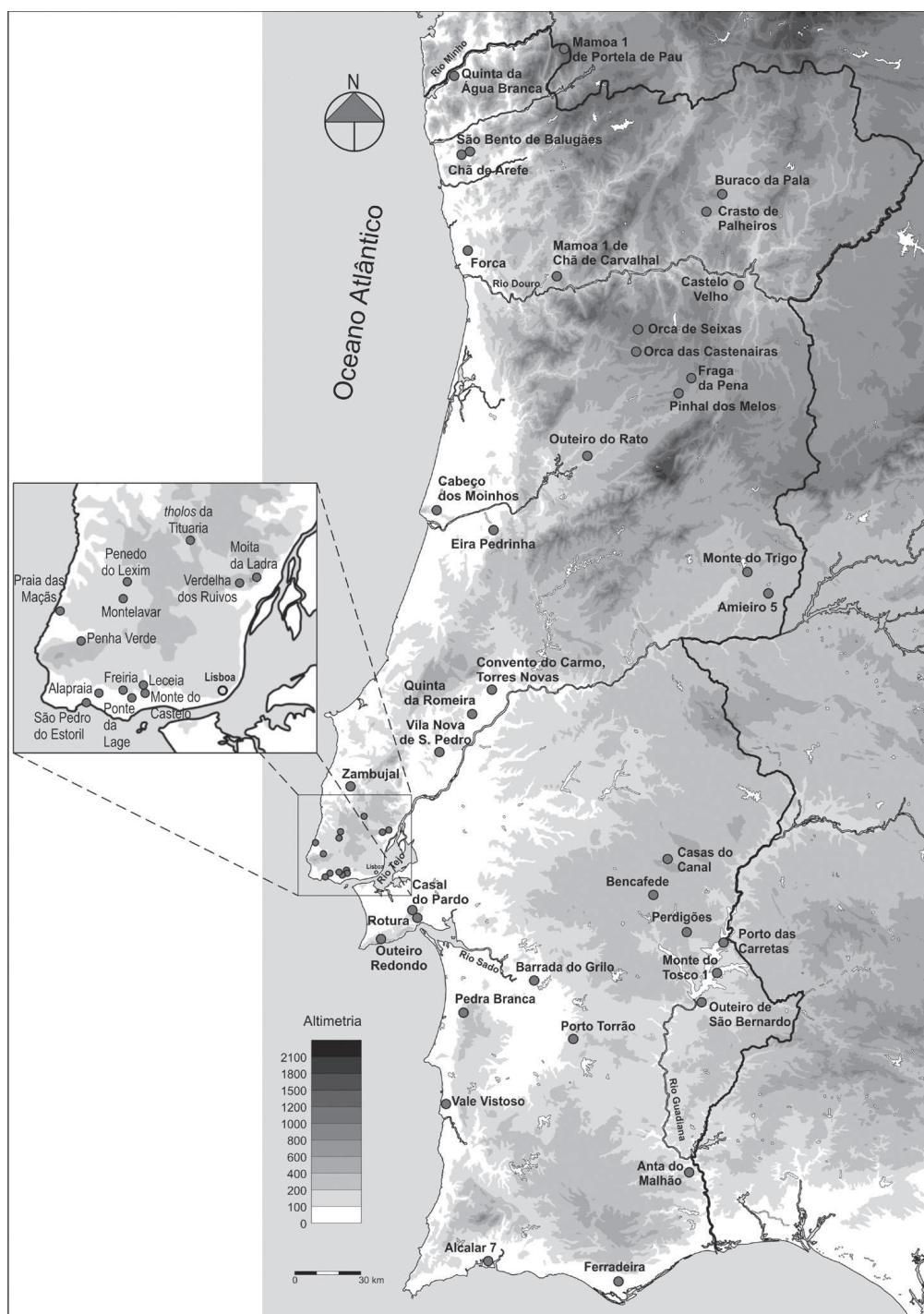


Fig. 6 – Main Beaker occurrences in the Portuguese territory (after J. L. Cardoso).

products already commercialized in that epoch. Having in consideration the existence of two salt factories in the Tagus estuary, although from the Late Neolithic/Early Chalcolithic of Monte da Quinta, Benavente (Valera, Tereso and Rebuge, 2006), and Ponta da Passadeira, Barreiro (Soares, 2014) the existence of

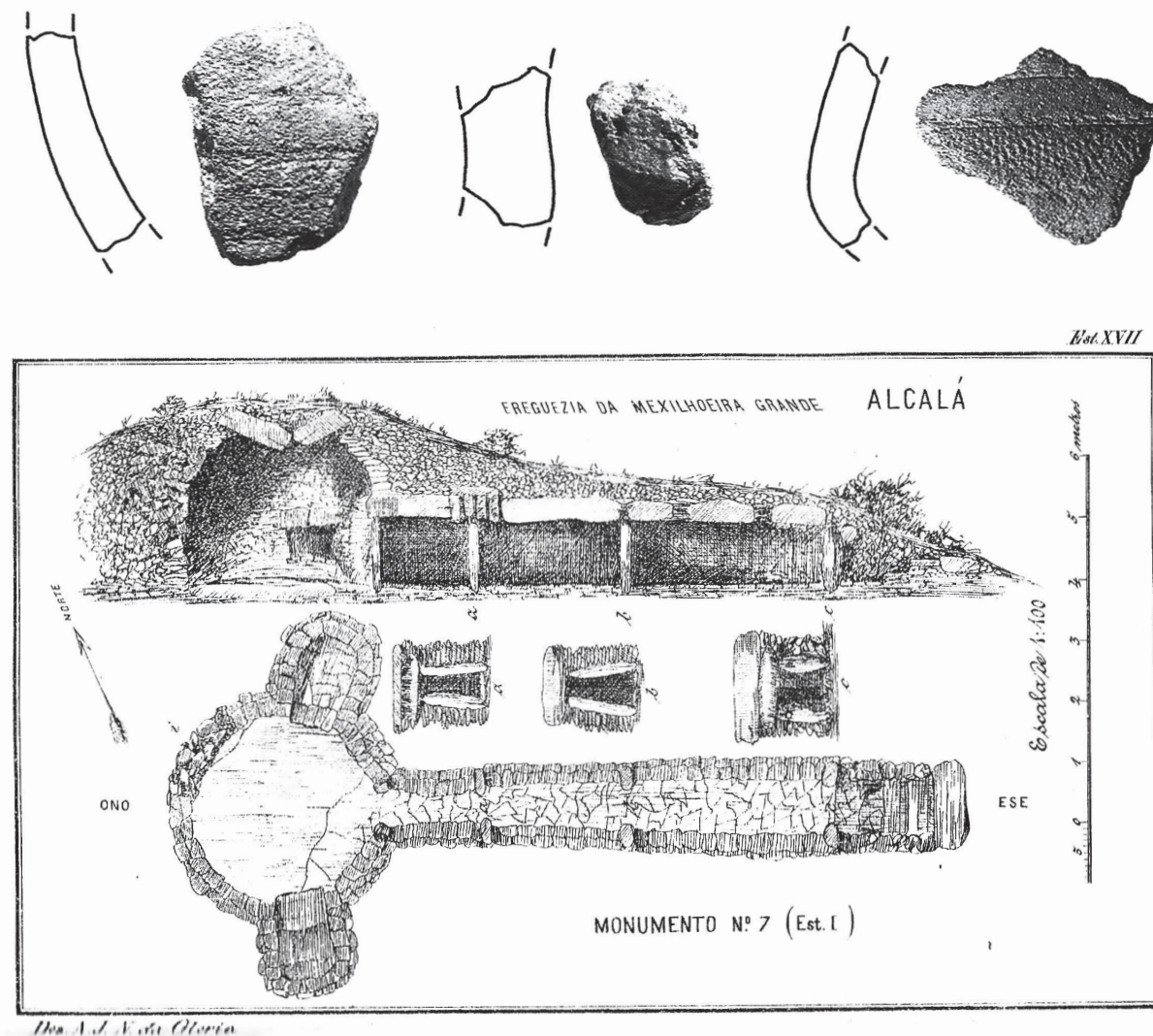


Fig. 7 – Fragments of Maritime vessels from the construction levels of *tholos* Alcalar 7 (after E. Morán & R. Parreira, and S. P. M. Estacio da Veiga).

salt factories along the Tagus estuary during the Beaker presence in the region is not only suggestive but probable.

#### 4. TWO CULTURAL AND SOCIAL GROUPS IN CHALCOLITHIC PORTUGUESE ESTREMADURA?

The diversity of dated sites in Portuguese Estremadura has made clear two distinct realities. In higher places, formerly fortified and which continued to be occupied during the second half of the 3<sup>rd</sup> millennium BC (Zambujal, Vila Nova de S. Pedro, Leceia), alongside the then firstly occupied sites (Penha Verde and Moita da Ladra), maritime and geometric dotted vessels were dominant; on the contrary,

in small sites, corresponding to agro-pastoral small-scale production units, incised large vessels are much more abundant, although both type of sites appeared to be contemporaneous, as shown by the radiocarbon dates (Cardoso, 2014).

Such a reality allows one to admit that high and fortified sites corresponds to the residence of the emerging elites, as a result of a process towards increasing social complexity, initiated since at least the end of 4<sup>th</sup> millennium BC. This is also suggested by the use of vessels of remarkable quality, mainly for drinking (the maritime vessels). Note that the consumption of alcoholic beverages has been associated to maritime vessels (Delibes de Castro, Guerra Doce and Tresseras Juan, 2009), which further stresses the special nature of these containers, and its connotation with the dominant segment of society, even admitting their use in a mere everyday basis.

On the other hand, small farming units were occupied by an undifferentiated population, using containers of a generally coarser manufacturing and with a clear functional use for the storage of cereals and other cultivated products. This justification give to the maritime vessels a special role, directly associated to a specific segment of each community.

## 5. BEAKER AND INDIGENOUS?

Given the numerical representativeness of Beaker productions, it can be concluded that, in Lower Estremadura, not only did various types of Beaker settlements coexisted, but also various types of Beaker productions, which prevents any attempt at a periodization based on the typology of such recipients.

Since the 1970s, there has been evidence of the stratigraphic coexistence, in high places, of maritime vessels and geometric dotted patterns along with regional ceramic productions, typical from Lower Estremadura and decorated with the well-known patterns of «acacia leaves», «quadrifolia» and associated motifs, attributed to the Full Chalcolithic.

This fact, first observed in the settlement of Rotura, Setúbal (Ferreira and Silva, 1970; Silva, 1971; Gonçalves, 1971), but not given its due importance at the time, was later confirmed in the settlements of Zambujal (Kunst, 1987), Leceia (Cardoso, 2000), and, more recently, in those of Penha Verde (Cardoso, 2010/2011) and Moita da Ladra (Cardoso and Caninas, 2010; Cardoso, 2014). This situation points to a reality in which the Beaker productions appear to be coeval but independent from non-Beaker productions of regional origin. In this respect, the findings made in Leceia assume some importance, as the FM Hut, despite being adjacent the outer line of the defensive system, featured an exclusively Beaker decorated set, dating from a very early epoch, which can be placed around 2700/2600 cal BC, while in the inside of the fortification, no such productions were used yet.

From the above, it seems to result the possibility of coexistence between two socially and culturally distinct communities, apparently sharing the same geographical area without signs of conflict.

This situation lasted most of the second half of the third millennium BC. Indeed, based on the record of Leceia, the interaction initially established (ca. 2700-2600 cal BC) between the two communities would have been very limited, as their material culture is not found mixed together (for example, the FM Hut, with exclusive Beaker productions and the coeval levels inside of the fortification without Beaker materials).

Later, the occurrence of Beaker materials stratigraphically associated with non-Beaker productions inside of the fortification, as it was already observed in other settlements in the region mentioned above, indicates that some kind of interaction would have been established.

The Beaker communities would have mingled with the previous occupants of such sites, and may have taken control of the associated territories.

This hypothesis gains credibility if one reviews the small farm units, in adjacent areas of Leceia, where exclusively Beaker decorated ceramics occur. These units assured the effective agro-livestock exploitation of the surrounding territory. This is the case of Monte do Castelo (Cardoso, Norton and Carreira, 1996) and Freiria (Cardoso, Cardoso and Encarnação, 2013).

At the same time, we should also appreciate the absolute or almost absence of Beaker spoils in some important Chalcolithic fortified settlements in Lower Estremadura. This is the case of the settlements of Penedo do Lexim, Mafra (Sousa, 2010) and Outeiro Redondo, Sesimbra (Cardoso, 2013).

The situation of Penedo do Lexim, a fortified site located on top of a volcanic chimney, deserves further discussion. There, the first excavations (Arnaud, 1974/1977) uncovered no Beaker ceramics whatsoever, and during the ulterior extensive excavations of the site these ceramics were classified as residual, since only two fragments were found (Sousa, 2010). This is so despite the fact that the settlement had been occupied at the same time as such productions were proliferating in the surrounding region, as indicated by the date Beta-142541, 3820 $\pm$ 40 BC which, calibrated at two sigma, corresponds to the interval 2310-2200 cal BC.

The same situation was found in the fortified settlement of Outeiro Redondo, Sesimbra, located some 30 km south of the Tagus estuary, and where such productions are equally exceptional. In fact, only a scarce set of fragments were found in the surface layer of the stratigraphic sequence, although that site had also been intensely occupied throughout the second half of the 3<sup>rd</sup> millennium BC (Cardoso et al., 2010/2011), and it is located within a geographical area of maximal concentration of the Beaker productions.

These two situations suggest that the inhabitants of both sites simply did not use those types of vessels or, in alternative, that the groups using Beaker pottery did not occupied the settlement.

## 6. BEAKER CERAMICS AND ITS TRANS-REGIONAL CIRCULATION IN PORTUGUESE TERRITORY

The possibility of maritime vessels of Estremadura origin occurring both in Galicia and even further away, on the coast of Britain, or vice versa, is a tempting hypothesis, supported by the similarities of shapes, techniques and decorative motifs (Salanova, 2000). However, the scarce ceramographic studies done so far on Maritime vessels, like those carried out in Leceia, do not make it possible to consider this hypothesis as sufficiently demonstrated, since these studies suggest local productions, even for maritime vessels (Cardoso, Querré and Salanova, 2005). However, this line of research should clearly be encouraged.

In the northern and an in the central interior of the country, there was another type of interaction, this one more easily demonstrable.

Thus, in the north of the country, Beaker productions, belonging to maritime and geometric dotted pattern vessels (Bettencourt, 2011) as, for example, those of Crasto de Palheiros, Murça (Barbosa, 1999; Sanches, 2008), shows the appropriation by local communities of Beaker decorative patterns with some particular features, as the use of a comb for the execution of incised horizontal bands equivalent to those appearing in Maritime vessels. It is also the case of the fragments collected on the housing/ritual site of Buraco da Pala, Mirandela, a space using a vast cave opened in an Ordovician quartzite ridge, in Trás-os-Montes northeastern region (Sanches, 1997) (fig. 5).

In the centre-interior of the country is located the important site of Fraga da Pena, Fornos de Algodres, whose occupation dates back to the last quarter of the 3rd/early 2<sup>nd</sup> millennium BC (Valera, 2000a). The site is implanted between large blocks of a remarkable granitic *thor*, where Beaker productions from both non-local and local origin were collected, as concluded from the study of the pastes.

The coarser local production feature patterns with unguiform decorations, differs from the maritime and the geometric dotted vessels (Dias et al., 2000) (fig. 8). Thus, it becomes evident that the presence of Maritime vessels clearly assumes an exogenous nature.

The cross-regional circulation of Beaker productions in Portuguese territory is also clearly stressed by the geographical distribution of Palmela bowls. This type of recipient is typical of the region adjacent to the Tagus and Sado rivers, and its presence quickly dissipates as the distance to this nuclear area increases. Indeed, in the Beira Litoral region only the complete bowl collected in the natural

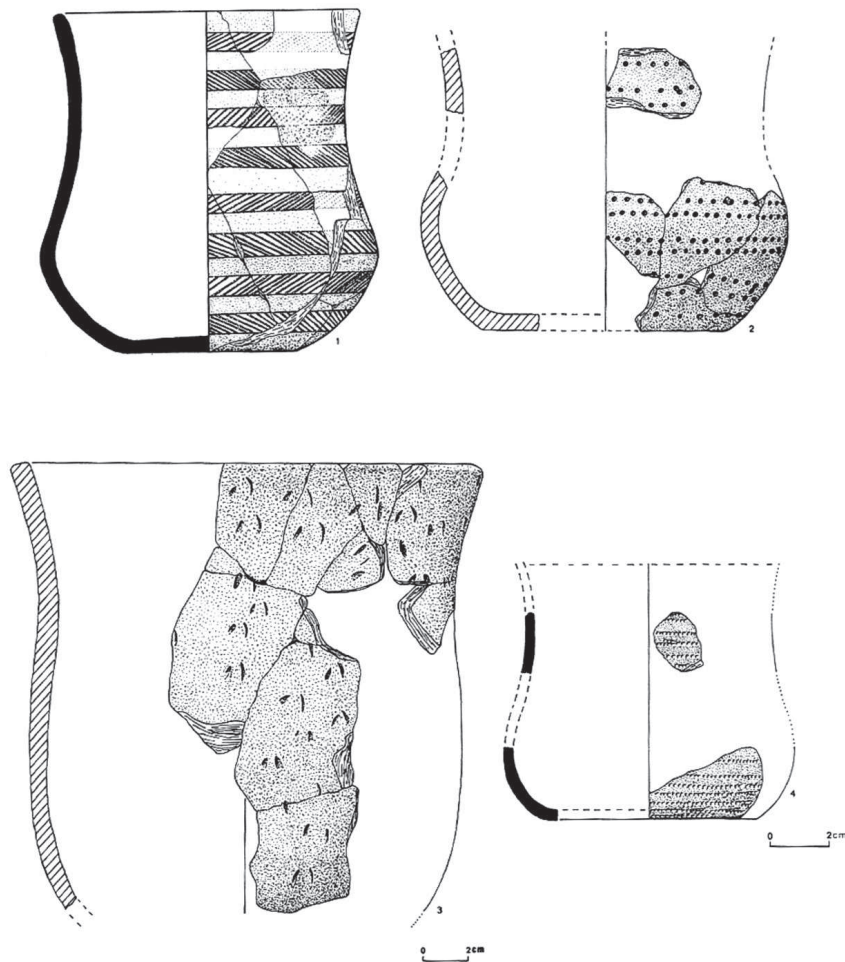


Fig. 8 – Fraga da Pena. Overall view of the granitic *thor* and Beaker items of both local and exogenous production (after A. Valera).

cave of Eira Pedrinha, Condeixa (Corrêa and Teixeira, 1949), and the fragments belonging to other two Palmela bowls, both were collected at the Cabeço dos Moinhos dolmen, Figueira da Foz (Leisner, 1998) are known. These fragments join two other Beaker fragments from Crasto, probably also related to a grave (Rocha, 1971, p. 146).

In the Douro Litoral region, the northernmost occurrence of a Palmela bowl corresponds to Chã do Carvalhal 1, a megalithic grave mentioned above (Cruz, 1992).

To the south of the Sado river, only one occurrence of a Palmela bowl has been documented, the fragment found in the settlement of Vale Vistoso, Sines (Silva and Soares, 1981, fig 106). This site probably correspond to the fixation of a community coming along the littoral from the Tagus region, like some sites situated in the lower Sado river basin, like Barrada do Grilo, Alcácer do Sal (Santos, Soares and Silva, 1972), where the incised productions are exclusive, represented at the same time by a fragment of a Palmela bowl (op. cit., Est. 8, n.º 37) and vessels with evident affinities with the Ciempozuelos Group (op. cit., Est. 7, n.º 36).

In the interior of the Alentejo region, only one fragment of a Palmela bowl with stippled geometric decoration was registered, from Aljustrel (Schubart, 1975, Abb. 12 a).

The scarce Palmela bowls registered in the interior of the Alentejo region, like the pieces from Barrada do Grilo and Aljustrel, shows the scarce penetration of the influences from the Estremadura region, substituted by the influences from the Meseta region.

In fact, there is yet another evidence of the circulation of Beaker productions in the south of the country, represented by the occurrence, on the Atlantic coast, of vessels with internal decoration, typical from the Ciempozuelos group. It is the

case of one fragment from Freiria, Cascais (Cardoso, Cardoso and Encarnação, 2013, fig. 30, n.º 3), associated with several fragments with pseudo-excised patterns, some with interior padding of white paste (Cardoso, Cardoso and Encarnação, 2013, fig. 7, n.º 8).

It is interesting to note the existence, in the intermediate region between the Atlantic and the Iberian Meseta, of a quite remarkable number of these productions which have their origin in/or have received some influence from the latter (group Ciempozuelos) (Valera, 2013). Some domestic settlements, such as Perdigões, Reguengos de Monsaraz (Lago et al., 1998) and Monte do Tosco 1, Mourão (Valera, 2000b) and Outeiro de São Bernardo (Bubner, 1979) present the



Fig. 9 – Anta de Bencafede. Fragment of Beaker vessel of the Ciempozuelos group (photo by J. L. Cardoso).



Fig. 10 – View of Monte do Trigo, the only site in the bordering region of Beira Interior where Maritime vessels were collected (courtesy of R. Vilaça).

most remarkable assemblage of Ciempozuelos ceramics; among the funerary sites the reuse of the dolmens of Bencafede, Évora (Cardoso and Norton, 2004) (fig. 9), and Herdade de Casas do Canal, Estremoz (Leisner and Leisner, 1955) also are associated to these type of productions.

However, the complexity of the circulation of those productions does not allow generalizations. This can be illustrated by the occurrence of a small set of fragments of Maritime vessels, with obvious Atlantic affinities, in the settlement of Monte do Trigo, Penamacor (Vilaça, 2008) (fig. 10), near the Spanish border. Here, it would be more expectable the occurrence of productions from the Ciempozuelos group. The same consideration is valid to the situation observed at Porto das Carretas, mentioned above, near the Guadiana river, and where the occurrence of Maritime vessels, in spite of productions of the Ciempozuelos group, considering its geographic position, is unusual.

In fact, Maritime vessels, although evidencing coastal incidence, occupy vast area of the Iberian Meseta (Bueno Ramirez, Barroso Bermejo and Vázquez Cuesta, 2008, figure 13.1).

## 7. MEANING AND USE OF BEAKER VESSELS

Much has been written about the meaning and use of Beaker vessels, from being a simple fashion, well delimited in time, to their being pieces of apparatus and ostentation, or their use in ceremonial practices, including those of funerary nature. No doubt they could have played these last two functions, since it has been demonstrated, from the analysis of their contents, their use as contain-

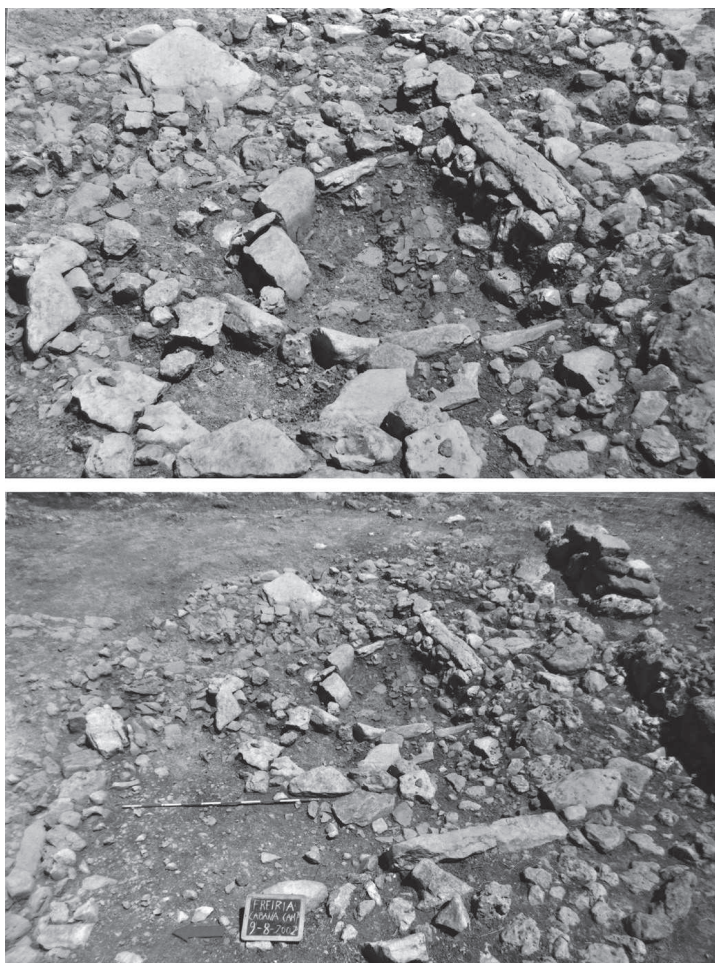


Fig. 11 – Freiria. Combustion structures located within a hut with a sub-circular plant (after J. L. Cardoso, G. Cardoso and J. d'Encarnação).

ers for drinking beer (Delibes de Castro, Guerra Doce and Tresseras Juan, 2009), a beverage that, by its nature, is not difficult to associate with ritual libations, restricted to the «elites». Indeed, throughout this work, some of these uses have already been admitted implicitly, by linking the use of Maritime vessels and associated forms, in Lower Estremadura, to the daily life of the elites, having their base on the high and fortified sites. It is, after all, a legitimate analogy with the use that found more than 1000 years later, during the Late Bronze Age, when, in the same region, the production of fine ceramics with burnished geometric patterns. This type of productions was almost exclusive of well defended sites, occupied by the elites of the time, while in the farming units of adjacent territories such productions were rarely used (Cardoso, 2004b; Cardoso, 2015).

Finally, the abundant presence of other Beaker decorated productions, to the point of becoming exclusive, in small domestic sites that is not difficult to associate to farming units or open settlements, such as the site of Freiria, Cascais (fig. 11), contradicts the hypothesis that it might be an exceptional use, of ceremonial nature. This evidence legitimates the conclusion that only the Maritime vessels could be considered as a distinctive attribute of a particular social group.

## 8. BEAKER FUNERARY PRACTICES

In Portuguese territory, Beaker funerary structures (positive or negative) are almost absent. The four most important exceptions are, from North to South: 1) the small megalith of Chã do Carvalhal 1, mentioned above; 2) an artificial cave, probably well-shaped, without corridor, still unpublished, excavated during 2014 under the direction of A. F. Carvalho at the Convento do Carmo, in the

urban area of the town of Torres Novas. The artefacts recovered are exclusively of Beaker typology, with Maritime vessels (personal information of A. F. Carvalho); 3) and the natural cave located at Verdelha dos Ruivos, Vila Franca de Xira, the third necropolis known in the Portuguese territory exclusively characterized by Beaker implements (Leitão et al., 1976); and 4) the individual grave pit of Quinta do Castelo 1, Beja (Valera, Calvo and Simão, 2016), mentioned above.

Instead, there is the systematic reuse of earlier funerary spaces, either natural caves and shelters, artificial caves, dolmens or even false-vault tombs. In the north of the country, such occurrences were recently inventoried (Bettencourt, 2011), revealing the higher frequency of dolmens reuse, since these are the most common type of tomb in that region.

The same situation is observed in the center of the Portuguese territory and sometimes it has been possible to isolate individual burials, such as the one made in the corridor of the dolmen of Seixas, Tondela, containing maritime vessels, a Palmela point and a wristguard (fig. 12) (Senna-Martinez, 1994, fig. 8 and 9).

In the Lower Estremadura, it is rare that any Neolithic or Chalcolithic necropolis, regardless of falling under any of the categories listed above, had not known a Beaker reuse. This is the case of the famous artificial caves of Casal do Pardo/Quinta do Anjo, Palmela, which knew successive reuses throughout the Chalcolithic. Salient among other productions found here are the two of the better-known items of Beaker productions, named after this site: the Palmela bowls and the Palmela points. In one of these artificial caves (fig. 13), a Mari-

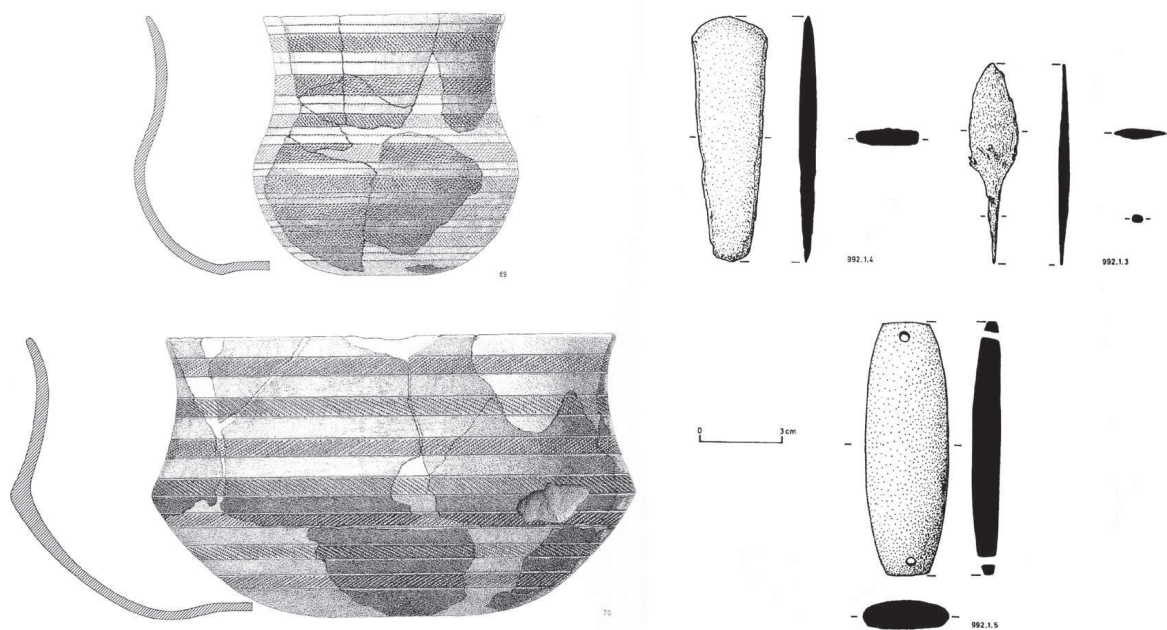


Fig. 12 – Orca de Seixas. Beaker set associated with burial held in the corridor of the megalithic monument, during its reuse (ceramics after V. Leisner; remaining spoils, after J. C. Senna-Martinez).



Fig. 13 – Artificial Cave 2 in Casal do Pardo/Quinta do Anjo, Palmela (photo by J. L. Cardoso).



Fig. 14 – Maritime vessel from one of the artificial caves of Palmela, containing a human vertebra and femur (archive of O. da Veiga Ferreira/J. L. Cardoso).

time vessel was found containing therein a lumbar vertebra and an intact human femur (fig. 14), with the latter dating, after calibrated to two sigma, from 2705-2399 cal BC (GrN-10744 - 4040+/-70 BP) (Cardoso and Soares, 1990/1992, table 1). Unfortunately, most of these necropolis were explored in early times, without noting any eventual sets represented by such depositions. Anyway, there are three situations that, with regard to the Lower Estremadura, are worth mentioning, being the exception to that reality:

- The first was observed in the artificial cave of São Pedro Estoril, Cascais, corresponding to an alignment of 11 buttons of Beaker types, made out of bone and/or ivory, and identified as representing the deposition of a body dressed in a buttoned jacket or tunic (Leisner, Paço and Ribeiro, 1964, Est. C).

- The second corresponds to the reuse of the burial chamber of the *tholos* of Tituaria, Mafra, after the collapse of the false vault that covered it. These burials, apparently individual, were delimited by reused slabs, taken from the false vault (Cardoso et al. 1996).

In this excavation, interesting Beaker materials were collected. It is the case of a fragment of Palmela bowl with a representation of red deers.

The stylized representations of red-deers, exclusive of Beaker productions, sometimes reduced to the frames alone, constitute one of the most expressive manifestations of

religious iconography of these communities. Several occurrences were inventoried, almost of them from funerary contexts (Cardoso et al., 1996), the later identified at the settlement of Freiria (Cardoso, Cardoso and Encarnação, 2013) (fig. 15). They have parallels both in the Meseta (Obermaier, 1917) and in Andalusia (Harrison, Bubner and Hibbs, 1976, n.º 248). The significance of this motif, was previously discussed, and more recently, in the study of a Ciempozuelos-type vessel, collected in Almenara de Adaja, Valladolid (Delibes de Castro and Guerra Doce, 2004).

- The third situation refers to the use of the small funerary cave of Verdelha dos Ruivos, Vila Franca de Xira, exclusively occupied by Beaker burials (Leitão et al., 1976; Cardoso, 2014), which should have been carried out during a short time span, as indicated by several radiocarbon dates, corresponding to the mid-3<sup>rd</sup> millennium BC (Cardoso and Soares, 1990/1992). Exceptionally it was possible verify that all the corpses were deposited at decubitus dorsal with arms and legs dressed suggesting foetal position.

In the south of the country, two cases of reuse of megalithic monuments are worth mentioning:

- The dolmen of Casas do Canal, Estremoz, above mentioned, whose corridor was used for the burial of an individual, accompanied by various spoils, in which stands out a Ciempozuelos-type vessel with decoration on the inner side along the edge (Leisner and Leisner, 1955);

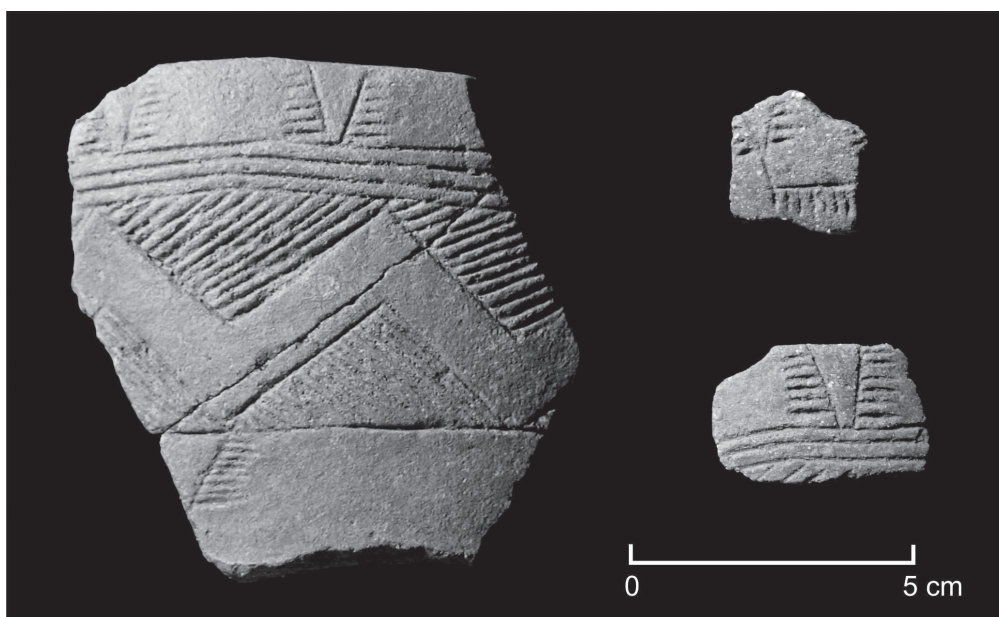


Fig. 15 – Representations of cervids in three different Beaker vessels of Freiria (after J. L. Cardoso, G. Cardoso & J. d'Encarnação).

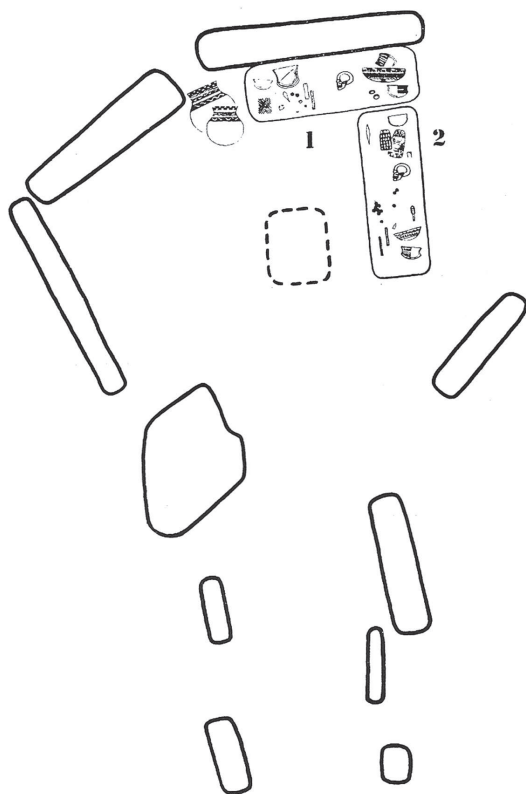


Fig. 16 – Pedra Branca dolmen. The two sets of Beaker spoils belonging to the two individual identified burials in the chamber of that monument, corresponding to its reuse (after O. da Veiga Ferreira and coll.).

- The dolmen of Pedra Branca, Melides, whose camera was used for two Beaker unstructured burials, each of them with abundant Beaker spoils (Ferreira et al., 1975) (fig. 16).

In conclusion, the systematic reuse of various types of collective necropolis by the Beaker populations has been observed throughout the Portuguese territory, being exceptional the foundation or the *ex-novo* building of burials. This fact shows that the symbolic significance associated to those places was still very much alive by then. Accordingly, the Beaker communities opted for appropriating themselves of such spaces, thus legitimizing the ownership and use of the same territories. The absence of documented conflicts between the communities bearing Beaker productions and the communities that cohabited with them in the same geographical space is corroborated by the funerary reality, as it is expressed by the continuity of funerary practices in the same places.

## 9. THE PRESENCE OF CORDED BEAKER CERAMICS

In Portuguese territory, the presence of corded ceramics (AOC group) is exceptional, and they are noticed in two extreme geographic areas. In the north, two pieces have been published, and in the south, only another one, separated by the vast space corresponding to the center of the country including the Estremadura.

The first known occurrence is from the settlement defended by several ditches of Porto Torrão, Ferreira do Alentejo (Arnaud, 1993), whose chronology falls probably in the second half of the 3<sup>rd</sup> millennium BC.

This was followed by the identification of another production in the walled settlement of Castelo Velho (Jorge, 2002), whose chronology is not yet clearly defined, globally spanning almost the entire 3<sup>rd</sup> millennium BC.

It is also mentioned in the literature one mixed corded fragment, from the enclosure of Forca, Maia, defined by a single ditch, whose chronology is located, with about 95% probability, between 2625-2337 cal BC (Beta 258088-3980 +/-50 BP) (Bettencourt, 2011, p. 370; Bettencourt and Luz, 2013).

Thus, it can be concluded that there is no any chronological differentiation between the corded Beaker remains and the other Beaker productions, and that

it may that the former, being exceptional, correspond to imported vessels, a conclusion that only a detailed archaeometric study could prove.

Notice that the wide geographic distribution of the occurrences of corded Beaker – particularly its complete absence in the area with the highest concentration of Beaker productions, the Lower Estremadura – configures the existence of cultural relations with other peninsular areas, where such productions are known, but always exceptional.

Its geographical distribution (Jorge, 2002, fig. 8) is essentially coastal, especially in Catalonia and the Basque Country, as well as in Galicia and Andalusia.

#### 10. EPILOGUE: THE FERRADEIRA AND MONTELAVAR HORIZONS

In Portuguese territory, specific names have been assigned, based on geographic origin, to the transition phase from the Chalcolithic to the Bronze Age, which could also be called as the Early Bronze Age. In the south, this transition was characterized by H. Schubart, who named it as «Ferradeira Horizon» (Schubart, 1971), based on the spoils found in cist-type, individual graves identified in Alentejo, in Algarve and in Western Andalusia, which had already been excavated many years before. This designation comes from the grave found in the local of that name, in the municipality of Faro, explored in the 1940s (Franco and Viana, 1948), which included a group of at least three individual graves.

It was based on these and other archaeological findings, but without archaeological context, that such «Horizon» was defined. However, its actual existence is well confirmed through excavations in funerary monuments of various kinds, reused during that period. Among these, there is the dolmen of Malhão, Alcoutim (Gradim and Cardoso, 2010), whose chamber was used for a single burial, accompanied by a Palmela point and a long dagger, both of arsenical copper, the latter a transition model to the Argaric-type productions, and two non-decorated vessels (fig. 17). In Southern Portugal the lack of elements concerning the absolute chronology of this horizon is almost total. The most important exceptions are the graves identified in the *tholoi* of Monte da Velha 1 and Centirã 2, respectively from the 3<sup>rd</sup> quarter and the 2<sup>nd</sup> half of the third millennium BC (Soares, 2008; Henriques et al., 2013).

The entire territory north of the Tagus would be included under a different name, the «Montelavar Horizon», a designation proposed by R. J. Harrison (Harrison, 1980), initially based on even weaker evidence than those that led to the previous designation. Indeed, the Montelavar site, located in Lower Estremadura, in the municipality of Mafra, corresponds to a disappeared grave whose characteristics are not known exactly, probably also of cystoid type such as Ferradeira, and where a tongued dagger and two Palmela points were collected (Zbyszewski and Nogueira, 1943).

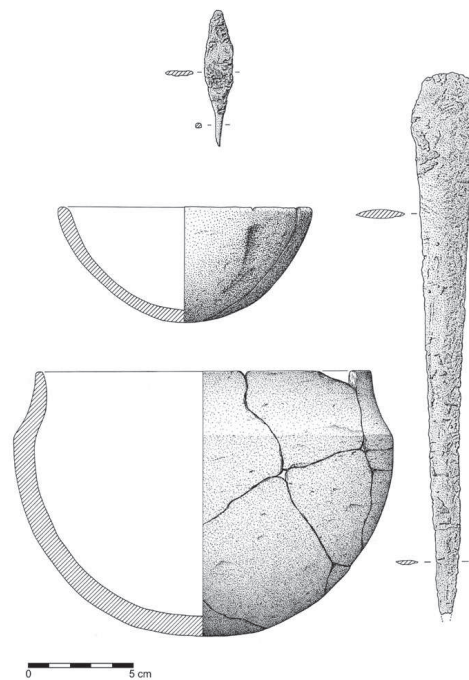


Fig. 17 – Anta do Malhão. Spoils from an individual burial identified in the chamber megalithic monument belonging to the Ferradeira Horizon (after J. L. Cardoso & A. Gradim).

Despite strong limitations on the representativeness of this set, possibly incomplete, this term was extended to the entire Portuguese territory north of the Tagus, also covering the Iberian Meseta (Harrison, 1980, figure 82). Such an option took into account some scant evidence known at the time, the most important

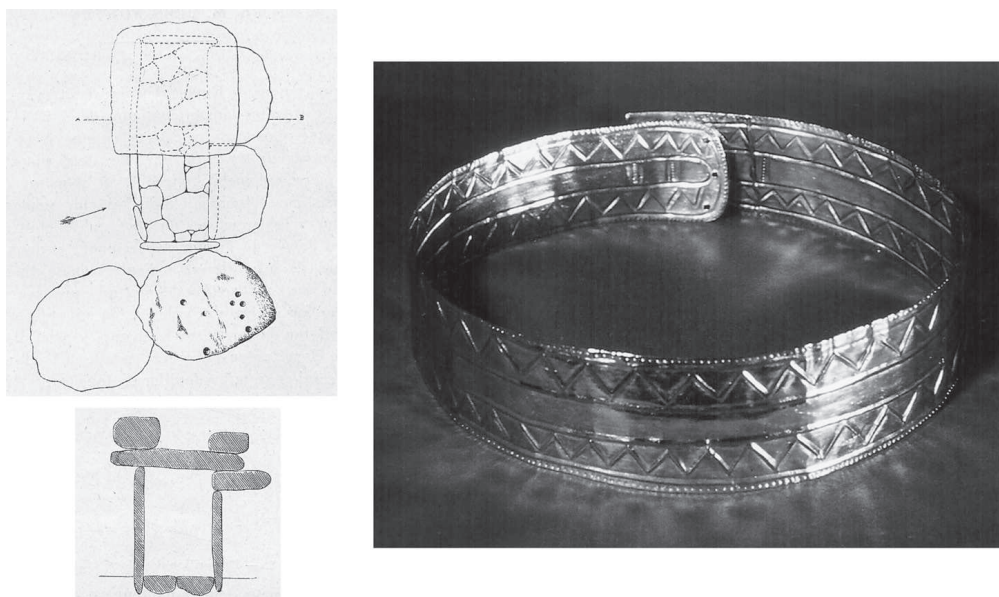


Fig. 18 – Cist of Quinta da Água Branca. Plan and section of the structure and a gold tiara found inside from the National Archaeological Museum (after J. Fortes and archive of M. Farinha dos Santos/J. L. Cardoso).

being the cist grave in the Quinta da Água Branca, Vila Nova de Cerveira, located near the Galician border. The individual buried there was accompanied by a tiara of beaten gold leaf (fig. 18), with geometric decoration, two spirals and two rings, also of gold, and a large tongued dagger, made of arsenical copper and with 35 cm in length (Fortes, 1905/1908).

Such individual graves are representative, in the entire Portuguese territory, of the transition phase to the Bronze Age. Here, the Beaker ceramic productions didn't occur and are replaced by smooth-faced containers, associated with the remaining items of that «set», such as the Palmela points, the wristguards and the tongued daggers or related items (Mataloto, 2006; Cardoso, 2007). They all fall chronologically in a period whose *terminus*, in the south (the Ferradeira Horizon) has been situated in the first quarter of the 2<sup>nd</sup> millennium BC, between 1950 and 1800 cal BC (Mataloto, Martins and Soares, 2013, table V), while in the north, the chronology obtained for the very cist of Quinta da Água Branca, between 2109-1755 cal BC (Bettencourt, 2011) can be considered as the *terminus* of that period. Considering the dates mentioned above to the graves of Monte da Velha 1 and Centirã 2, the beginning of the Ferradeira horizon must be situated during the second half of the 3<sup>rd</sup> millennium BC. The same chronology could

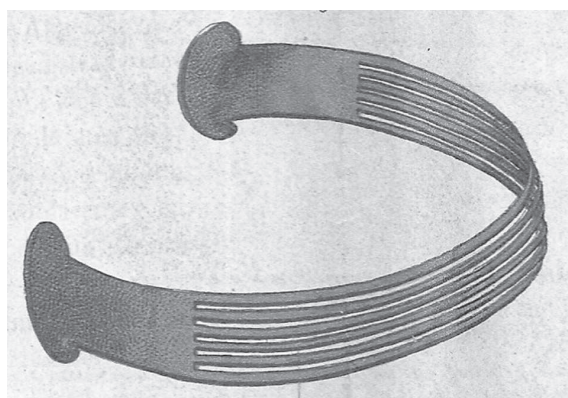


Fig. 19 – Gold necklace of São Bento de Balugães (after S. P. M. Estacio da Veiga).



Fig. 20 – Sword of Pinhal dos Melos, made of arsenical copper (from the Association of Portuguese Archaeologists, courtesy of J. Arnaud; photo J. Pessoa).

be extended to the Montelavar Horizon, included by A. M. Bettencourt in the Early Bronze Age that could begin in 2330/2200 BC (Bettencourt, 2013, p. 66). This means that both horizons lasted for several centuries and were contemporary to other cultural expressions, such as the Beaker assemblages.

It is then that the gold pieces used in clothing become prominent, such as those already mentioned above, and to which one can also add the gold necklace of São Bento de Balugães (fig. 19), now disappeared but published in the XIX century (Veiga, 1891). These items are a sign of social differentiation, which then reached its maximum relevance, alongside the full expression of weapons, which evolved from short to long tongued daggers into the first swords, such as the isolated sword of the Pinhal dos Melos, Fornos de Algodres, with a length, if complete, of at least 60 cm (fig. 20) (Paço and Ferreira, 1957).

On the other hand, it is during the Beaker period that the importation of ivory from North Africa would have reached its maximum expression, as indicated by the occurrence of Beaker ivory buttons, identified in Estremadura (Schuhmacher, 2012; Cardoso and Schuhmacher, 2012), revealing in a very clear way that the Lower Estremadura region stood frankly open to trade, as proved, in the opposite sense, by the occurrence of Beaker materials in Moroccan territory (Poyato Holgado and Hernando Grande, 1988).

#### ACKNOWLEDGMENTS

To António Faustino Carvalho, who genteelly provided information about the Beaker necropolis, recently excavated under his direction at Convento do Carmo, Torres Novas. To Raquel Vilaça and José Arnaud (President of the Associação dos Arqueólogos Portugueses), who provided fig. 10 and fig. 21, respectively. To the anonymous referee who provided important suggestions that benefitted the manuscript.

## REFERENCES

- ARNAUD, J. M. (1974/1977) – Escavações no Penedo do Lexim (Mafra)/1975. *O Arqueólogo Português*. Lisboa. Série 3, 7/9, p. 398-406.
- ARNAUD, J. M. (1993) – O povoado calcolítico de Porto Torrão (Ferreira do Alentejo): síntese das investigações realizadas. *Vipasca*. Aljustrel. 2, p. 41-60.
- BARBOSA, S. (1999) – *O Crasto de Palheiros – Murça. Contributo para o entendimento do fenómeno campaniforme em contexto doméstico no norte de Portugal*. Porto: Faculdade de Letras da Universidade do Porto. Dissertação de Mestrado em Arqueologia.
- BETTENCOURT, A. M. S. (2011) – El vaso campaniforme en el norte de Portugal. Contextos, cronologías y significados. In PRIETO-MARTINEZ, M. P.; SALANOVA, L. coord. – *Las comunidades campaniformes en Galicia. Cambios sociales en el III y II milénios BC*. Pontevedra: Diputación de Pontevedra. p. 363-374.
- BETTENCOURT, A. M. S. (2013) – A Pré-História do Noroeste português. In OOSTERBEEK, L., dir. – *Territórios da Pré-História em Portugal*. Braga; Tomar: Centro de Pré-História do Instituto Politécnico de Tomar. v. 2. (Arkeos; 36).
- BETTENCOURT, A. M. S.; LUZ, S. (2013) – A corded-mixed Bell Beaker vase at the monumental enclosure of Forca, Maia, North of Portugal. 15-20. In PRIETO MARTÍNEZ, P.; SALANOVA, L., ed. lit. – *Current researches on Bell Beakers*. Santiago de Compostela: Universidad de Santiago de Compostela, p. 15-20.
- BUBNER, T. (1979) – Ocupação campaniforme do Outeiro de São Bernardo (Moura). *Ethnos*. Lisboa. 8, p. 139-151.
- BUENO RAMIREZ, P.; BARROSO BERMEJO, R.; VÁZQUEZ CUESTA, A. (2008) – The Beaker phenomenon and the funerary contexts of the International Tagus. In BUENO-RAMIREZ, P.; BARROSO-BERMEJO, R.; BALBÍN-BEHRMANN, R., ed. lit. – *Graphical markers and megalithic builders in the International Tagus, Iberian Peninsula*. Oxford: BAR. p. 141-155. (International Series; 1765).
- CARDOSO, J. L. (1997/1998) – A ocupação campaniforme do povoado pré-histórico de Leceia (Oeiras). *Estudos Arqueológicos de Oeiras*. Oeiras. 7, p. 89-153.
- CARDOSO, J. L. (2000) – O «fenómeno» campaniforme na Estremadura portuguesa. In *Congresso de Arqueologia Peninsular, 3, Vila Real, 1999: Actas.* Porto: Associação para o Desenvolvimento da Cooperação em Arqueologia Peninsular. 4, p. 353-380.
- CARDOSO, J. L. (2000) – The fortified site of Leceia (Oeiras) in the context of the Chalcolithic in Portuguese Estremadura. *Oxford Journal of Archaeology*. Oxford. 19: 1, p. 37-55.
- CARDOSO, J. L. (2001) – Le phénomène campaniforme dans les basses vallées du Tage et du Sado (Portugal). In NICOLIS, F., ed. lit. – *Bell Beaker today. Pottery, people, culture, symbols in pre-historic Europe (Riva del Garda, 1998)*. Trento: Provincia Autonoma di Trento. 1, p. 139-154.
- CARDOSO, J. L. (2004a) – An interpretation of the Bell Beaker cultural sequence in the Tagus estuary region: data from Leceia (Oeiras). *Journal of Iberian Archaeology*. Porto. 6, p. 147-156.
- CARDOSO, J. L. (2004b) – *A Baixa Estremadura, dos finais do IV milénio a. C. até à chegada dos Romanos: um ensaio de História Regional*. Oeiras: Câmara Municipal de Oeiras. (*Estudos Arqueológicos de Oeiras*; 12).
- CARDOSO, J. L. (2007) – *Pré-História de Portugal*. Lisboa: Universidade Aberta. CD-rom anexo.
- CARDOSO, J. L. (2010/2011) – O povoado calcolítico da Penha Verde (Sintra). *Estudos Arqueológicos de Oeiras*. Oeiras. 18, p. 467-552.
- CARDOSO, J. L. (2013) – O povoado pré-histórico do Outeiro Redondo (Sesimbra). Resultados da primeira fase de escavações arqueológicas (2005-2008). *Estudos Arqueológicos de Oeiras*. Oeiras. 20, p. 641-730.
- CARDOSO, J. L. (2014) – Absolute chronology of the Beaker phenomenon North of the Tagus estuary: demographic and social implications. *Trabajos de Prehistoria*. Madrid. 71:1, p. 56-75.
- CARDOSO, J. L. (2014a) – O povoado calcolítico fortificado da Moita da Ladra (Vila Franca de Xira, Lisboa): resultados das escavações efectua-

- das (2003-2006). *Estudos Arqueológicos de Oeiras*. Oeiras. 14, p. 217-294.
- CARDOSO, J. L. (2015) – Between the Atlantic and the Mediterranean: the Late Bronze Age around the Tagus estuary (Portugal). Economic, social and cultural aspects. *Rivista di Scienze Preistoriche*. Firenze. 65, p. 149-170.
- CARDOSO, J. L.; CANINAS, J. C. (2010) – Moita da Ladra (Vila Franca de Xira). Resultados preliminares da escavação integral de um povoado calcolítico muralhado. In *Colóquio Internacional Transformação e Mudança no centro e sul de Portugal: o 4.º e o 3.º milénios a.n.e.*, Cascais, 2005: Actas. Cascais: Câmara Municipal de Cascais. p. 65-95.
- CARDOSO, J. L.; GRADIM, A. (2010) – A anta do Malhão (Alcoutim) e o «Horizonte de Ferradeira». In *Encontro de Arqueologia do Algarve, 7, Silves, 2009: Actas*. Silves: Câmara Municipal de Silves. p. 56-72. (Xelb; 10).
- CARDOSO, J. L.; NORTON, J. (2004) – As caçoilas campaniformes da anta de Bencafede (Évora). *Revista Portuguesa de Arqueologia*. Lisboa. 7: 1, p. 129-136.
- CARDOSO, J. L.; SCHUHMACHER, T. X. (2012) – Marfiles calcolíticos en Portugal. Estado de la cuestión. *Elfenbeinstudien. Marfil y elefantes en la Península Ibérica y el Mediterráneo occidental*. Darmstadt; Mainz: Verlag Philipp von Zabern. p. 95-110. (*Iberia Archaeologica*; Band 16, Faszikel 1).
- CARDOSO, J. L.; SOARES, A. M. Monge (1990/1992) – Cronologia absoluta para o campaniforme da Estremadura e do Sudoeste de Portugal. *O Arqueólogo Português*. Lisboa, Série IV, 8/10 (1990/1992), p. 203-228.
- CARDOSO, J. L.; SOARES, A. M. Monge (1996) – Contribution d'une série de datations C14, provenant du site de Leceia (Oeiras, Portugal), à la chronologie absolue du Néolithique et du Calcolithique de l'Estemadura Portugaise. In *Actes du Colloque de Périgueux*. Rennes: [s.n.]. p. 45-50. (*Supplément à la Revue d'Archéométrie*).
- CARDOSO, J. L.; CARDOSO, G.; ENCARNAÇÃO, J. d' (2013) – O campaniforme de Freiria. *Estudos Arqueológicos de Oeiras*. Oeiras. 20, p. 525-588.
- CARDOSO, J. L.; LEITÃO, M.; FERREIRA, O. da Veiga; NORTH, C. T.; NORTON, J.; MEDELROS, J.; SOUSA, P. F. (1996) – O monumento pré-histórico de Tituaria, Moinhos da Casela (Maфра). *Estudos Arqueológicos de Oeiras*. Oeiras. 6, p. 135-193.
- CARDOSO, J. L.; NORTON, J.; CARREIRA, J. R. (1996) – Ocupação calcolítica do Monte do Castelo (Leceia, Oeiras). *Estudos Arqueológicos de Oeiras*. Oeiras. 6, p. 287-299.
- CARDOSO, J. L.; QUERRÉ, G.; SALANOVA, L. (2005) – Bell Beaker relationships along the Atlantic coast. In *Understanding people through their pottery*. Lisboa: Instituto Português de Arqueologia. (*Trabalhos de Arqueologia*; 42).
- CARDOSO, J. L.; SOARES, A. M. Monge; ARAÚJO, M. F. (2002) – O espólio metálico do Outeiro de São Bernardo (Moura): uma reapreciação à luz de velhos documentos e de outros dados. *O Arqueólogo Português*. Lisboa. Série IV, 20, p. 77-114.
- CARDOSO, J. L.; SOARES, A. M. Monge; MARTINS, J. M. M. (2010/2011) – Fases de ocupação e cronologia absoluta da fortificação calcolítica do Outeiro Redondo (Sesimbra). *Estudos Arqueológicos de Oeiras*. Oeiras. 18, p. 553-578.
- CORRÊA, A. Mendes; TEIXEIRA, C. (1949) – *A jazida pré-histórica de Eira Pedrinha (Condeixa)*. Lisboa: Serviços Geológicos de Portugal.
- CRUZ, D. J. (1992) – *A mamoa 1 de Chã de Carvalho (Serra da Aboboreira)*. Coimbra: Instituto de Arqueologia da Faculdade de Letras da Universidade de Coimbra. (Conímbriga/Anexos; 1).
- DELIBES de CASTRO, G.; GUERRA DOCE, E. (2004) – Contexto y posible significado de un cuenco Ciempozuelos com decoración simbólica de ciervos hallado en Almenarade Adaja (Valladolid). In BAQUEDANO E., ed. lit. – *Miscelánea en Homenaje a Emiliano Aguirre*. Alcalá de Henares: Museo Arqueológico Regional. 4, p. 116-125.
- DELIBES de CASTRO, G.; GUERRA DOCE, E.; TRESSERAS JUAN, J. (2009) – Testimonios de consumo de cerveza durante la Edad del Cobre en la Tierra de Olmedo (Valladolid). In VALDIVIESO, M. I.; MARTÍNEZ SOPENA, P. dir. – *Castilla y el mundo feudal. Homenaje al Profesor Julio Valdeón*. Valladolid: Junta de Castilla y León; Universidad de Valladolid. 3, p. 585-599.
- DIAS, M. I.; PRUDÊNCIO, M. I.; PRATES, S.; GOUVEIA, M. A.; VALERA, A. C. (2000) – Tecnologias de produção e proveniência de matéria-prima das cerâmicas campaniformes da Fraga

- da Pena (Fornos de Algodres – Portugal). In *Congresso de Arqueologia Peninsular*, 3, Vila Real, 1999.. Actas. Porto: ADECAP, 4, p. 253-268.
- FERREIRA, O. da Veiga; SILVA, C. Tavares da (1970) – A estratigrafia do povoado pré-histórico da Rotura (Setúbal). Nota preliminar. In *Jornadas Arqueológicas*, 1, Lisboa, 1969: Actas. Lisboa: Associação dos Arqueólogos Portugueses. 2, p. 203-225.
- FERREIRA, O. da Veiga; LEITÃO, M. [s.d.] – *Portugal Pré-Histórico. Seu enquadramento no Mediterrâneo*. Mem Martins: Publicações Europa/América.
- FERREIRA, O. da Veiga; ZBYSZEWSKI, G.; LEITÃO, M.; NORTH, C. T.; SOUSA, H. R. (1975) – Le monument mégalithique de Pedra Branca auprès Montum (Melides). *Comunicações dos Serviços Geológicos de Portugal*. Lisboa. 59, p. 107-192.
- FORTES, J. (1905/1908) – A sepultura da Quinta da Água Branca (Idade do Cobre). *Portugalia*. Porto. 2, p. 241-252.
- FRANCO, M. L.; VIANA, A. (1948) – Cemitério da Idade do Bronze nos arredores de Faro. *Trabalhos de Antropologia e Etnologia*. Porto. 11: 3-4, p. 299-305.
- GONÇALVES, V. S. (1971) – *O castro da Rotura e o vaso campaniforme*. Setúbal: Junta Distrital de Setúbal.
- GUERRA DOCE, E. (2016) – Sal y campaniformes en la Península Ibérica: el yacimiento Ciempozuelos de Molino Sanchón II (Zamora). In *Colóquio Internacional Sinos e Taças. Junto ao Oceano e mais longe. Aspectos da presença campaniforme na Península Ibérica*. Lisboa: Faculdade de Letras da Universidade de Lisboa. Comunicação apresentada em maio de 2016.
- HARRISON, R. J. (1980) – *The Beaker folk. Copper Age archaeology in Western Europe*. London: Thames & Hudson.
- HARRISON, R. J.; BUBNER, T.; HIBBS, V. (1976) – The beaker pottery from El Acebuchal, Carmona (Prov. Sevilla). *Madridrer Mitteilungen*. Heidelberg. 17, p. 79-141.
- HENRIQUES, F. J. R.; SOARES, A. M. Monge; ANTÓNIO, T. F. A.; CURATE, F.; VALÉRIO, P.; ROSA, S. P. (2013) – O Tholos Centirã 2 (Brinches, Serpa) – construtores e utilizadores; práticas funerárias e cronologias. In JIMÉNEZ ÁVILA, J.; BUSTAMONTE, M.; CABEZAS, M. G., eds. – *Encuentro de Arqueologia del Suroeste Peninsular*, 6, Villafranca de los Barros, 2012: Actas. Villafranca de los Barros: Ayuntamiento de Villafranca de los Barros. p. 319-355
- JORGE, S. O. (2002) – An all-over corded bell beaker in Northern Portugal: Castelo Velho de Freixo de Numão (Vila Nova de Foz Côa): some remarques. *Journal of Iberian Archaeology*. Porto. 4, p. 107-129.
- KUNST, M. (1987) – *Zambujal. Glockenbecher und kerblattverzierte Keramik aus den Grabungen 1964 bis 1973*. Mainz am Rhein: Verlag Philipp von Zabern (Madridrer Beiträge; 5, Zambujal Teil 2).
- KUNST, M. (1996) – As cerâmicas decoradas do Zambujal e o faseamento do Calcolítico da Estremadura portuguesa. *Estudos Arqueológicos de Oeiras*. Oeiras. 6, p. 257-287.
- KUNST, M. (2010) – Zambujal. A dinâmica da sequência construtiva. In GONÇALVES, V. S.; SOUSA, A. C., ed. lit. – *Transformação e mudança no centro e sul de Portugal: o 4.º e o 3.º milénios a.n.e., Cascais*, 2005. Cascais: Câmara Municipal de Cascais. p. 131-153.
- KUNST, M.; LÜTZ, N. (2008) – Zambujal (Torres Vedras, Portugal). Zur Prazision der absoluten Chronologie durch Untersuchungen na der vierten Befestigungslinie. *Madridrer Mitteilungen*. Madrid. 49, p. 29-63.
- KUNST, M.; LÜTZ, N. (2010/2011) – Zambujal (Torres Vedras), investigações até 2007. Parte 1: sobre a precisão da cronologia absoluta decorrente das investigações na quarta linha da fortificação. *Estudos Arqueológicos de Oeiras*. Oeiras. 18, p. 419-466.
- KUNST, M. (1987) – *Zambujal. Glockenbecher und Kerblattverzierte keramik aus den Grabungen 1964 bis 1973*. Mainz am Rhein: Verlag Philipp von Zabern. (Madridrer Beiträge; Band 5).
- LAGO, M.; DUARTE, C.; VALERA, A.; ALBERGARIA, J.; ALMEIDA, F.; CARVALHO, A. F. (1998) – Povoado dos Perdigões (Reguengos de Monsaraz): dados preliminares dos trabalhos arqueológicos realizados em 1997. *Revista Portuguesa de Arqueologia*. Lisboa. 1:1, p. 45-152.
- LEISNER, G.; LEISNER, V. (1955) – *Antas nas herdades da Casa de Bragança no concelho de Estremoz*. Lisboa: Fundação da Casa de Bragança; Instituto de Alta Cultura.

- LEISNER, V. (1998) – *Die Megalithgräber der Iberischen Halbinsel. Der Westen*. Berlin: Walther de Gruyter (Madrider Forschungen; Band 1).
- LEISNER, V.; PAÇO, A.; RIBEIRO, L. (1964) – *Grutas artificiais de São Pedro do Estoril*. Lisboa: Fundação Calouste Gulbenkian.
- LEITÃO, M.; NORTH, C. T.; NORTON, J.; ZBYSZEWSKI, G.; FERREIRA, O. da Veiga (1984) – The prehistoric burial cave at Verdelha dos Ruivos (Vialonga), Portugal. In GUILAINE, J., ed. – *L'Âge du Cuivre européen. Civilisations à vases campaniformes (Nice, 1976)*. Paris: CNRS. p. 221-239.
- MATALOTO, R.; BOAVENTURA, R. (2009) – Entre vivos e mortos nos IV e III milénios a.n.e. do sul de Portugal: um balanço relativo ao povoamento com base em datações pelo radiocarbono. *Revista Portuguesa de Arqueologia*. Lisboa. 12: 2, p. 31-77.
- MATALOTO, R. (2006) – Entre Ferradeira e Montelavar: um conjunto artefactual da Fundação Paes Teles (Ervedal, Avis). *Revista Portuguesa de Arqueologia*. Lisboa. 9: 2, p. 83-108.
- MATALOTO, R.; MARTINS, J. M. M.; SOARES, A. M. M. (2013) – Cronologia absoluta para o Bronze do Sudoeste. Periodização, base de dados, tratamento estatístico. *Estudos Arqueológicos de Oeiras*. 20, p. 303-338.
- MORÁN, E.; PARREIRA, R., coord. (2004) – *Alcalar 7. Estudo e reabilitação de um monumento megalítico*. Lisboa: IPPAR. (Cadernos; 6).
- NOGUEIRA, A. M.; ZBYSZEWSKI, G. (1943) – Túmulo da época do Bronze. *Comunicações dos Serviços Geológicos de Portugal*. Lisboa. 24, p. 95-97.
- OBERMAIER, H. (1917) – *Yacimiento prehistorico de Las Carolinas (Madrid)*. Madrid: Comisión de Investigaciones Paleontológicas y Prehistoricas. (Memoria; 16).
- ODRIOZOLA, C. P.; VILLALOBOS GARCIA, R.; BOAVENTURA, R.; SOUSA, A. C.; MARTÍNEZ-BLANES, J. M.; CARDOSO, J. L. (2013) – Las producciones de adorno personal en rocas verdes del SW peninsular: los casos de Leceia, Moita da Ladra y Penha Verde. *Estudos Arqueológicos de Oeiras*. Oeiras. 20, p. 605-622.
- PAÇO, A.; FERREIRA, M. E. (1957) – Espada de cobre do Pinhal dos Melos (Fornos de Algodres). In 23.º Congresso Luso-Espanhol para o progresso das Ciências, 23, Coimbra, 1956. Actas da 7.ª Secção – Ciências Históricas e Filológicas. Coimbra: Associação Portuguesa para o Progresso das Ciências. p. 357-364.
- POYATO HOLGADO, C.; HERNANDO GRANDE, A. (1988) – Relaciones entre la península Ibérica y el Norte de África. Marfil y campaniforme. In *Actas del Congreso Internacional El Estrecho de Gibraltar*, Ceuta, 1987: Actas. Madrid: Universidad Nacional de Educacion a Distancia; Ayuntamiento de la ciudad de Ceuta. p. 317-329.
- ROCHA, A. S. (1971) – *Memórias e explorações arqueológicas. 2. Estações pré-romanas da Idade do Ferro nas vizinhanças da Figueira*. Coimbra: Imprensa de Coimbra. p. 146 (*Acta Universitatis Conimbrigensis*).
- SALANOVA, L. (2000) – Mécanismes de diffusion des vases campaniformes: les liens franco-portugais. In *Congresso de Arqueologia Peninsular*, Vila Real, 1999. Porto: ADECAP. 4, p. 399-409.
- SALANOVA, L. (2001) – Technological, ideological or economic European Union? The variability of Bell Beaker decoration. In NICOLIS, F., ed. lit. – *Bell Beaker today. Pottery, people, culture, symbols in prehistoric Europe, Riva del Garda, 1998*. Trento: Provincia Autonoma di Trento. 1, p. 91-102.
- SALANOVA, L. (2004) – Le rôle de la façade atlantique dans la genèse du Campaniforme en Europe. *Bulletin de la Société Préhistorique Française*. Paris. 101, p. 223-226.
- SANCHES, M. J. (1997) – *Pré-História recente de Trás-os-Montes e Alto Douro*. Porto: Sociedade Portuguesa de Antropologia e Etnologia. 2 vols.
- SANCHES, M. J. (2008) – *O Crasto de Palheiros*. Braga: Câmara Municipal de Murça.
- SANGMEISTER, E.; SCHUBART, H. (1981) – *Zambujal. Die Grabungen 1964 bis 1973*. Mainz am Rhein: Verlag Philipp von Zabern. (Madrider Beiträge; 5, Zambujal Teil 1).
- SANTOS, M. Farinha; SOARES, J.; SILVA, C. Tavares (1972) – Campaniforme da Barrada do Grilo (Torrão-vale do Sado). *O Arqueólogo Português*. Lisboa. Série III, 6, p. 163-192.
- SCHUBART, H. (1971) – O horizonte de Ferradeira. Sepulturas do Eneolítico final no Sudoeste da Península Ibérica. *Revista de Guimarães*. Guimarães. 81: 3/4, p. 189-215.

- SCHUBART, H. (1975) – *Die Kultur der Bronzezeit im Südwesten der Iberischen Halbinsel. Text.* Berlin: Walter de Gruyter & Co. (Madrider Forschungen; Band 9).
- SCHUHMACHER, T. X. (2012) – El marfil en España desde el Calcolítico al Bronce antiguo. Resultados de un proyecto de investigación interdisciplinar. In *Marfil y elefantes en la Península Ibérica y el Mediterráneo occidental.* Darmstadt; Mainz: Verlag Philipp von Zabern. p. 45-68 (*Iberia Archaeologica*; Band 16, Faszikel 1).
- SENNA-MARTINEZ, J. C. (1994) – Notas para o estudo da génese da Idade do Bronze na Beira Alta: o fenómeno campaniforme. *Trabalhos de Arqueologia da EAM.* Lisboa. 2, p. 173-200.
- SILVA, C. Tavares; SOARES, J. (1981) – *Pré-História da área de Sines.* Lisboa: Gabinete da Área de Sines.
- SILVA, C. Tavares (1971) – O povoado pré-histórico da Rotura. Notas sobre a cerâmica. In *Congresso Nacional de Arqueologia, 2,* Coimbra, 1970: Actas. Coimbra: Junta Nacional de Educação. 1, p. 175-192.
- SOARES, A. M. Monge (2008) – O Monumento Megalítico Monte da Velha 1 (MV1) (Vila Verde de Ficalho, Serpa). *Revista Portuguesa de Arqueologia.* Lisboa. 11:1, p. 33-51.
- SOARES, J.; SILVA, C. Tavares (1974/1977) – O Grupo de Palmela no quadro da cerâmica campaniforme em Portugal. *O Arqueólogo Português.* Lisboa. Série 3, 7/9, p. 102-112.
- SOARES, J. (2013) – Sal e conchas na Pré-História portuguesa. O povoado da Ponta da Passadeira (estuário do Tejo). *Setúbal Arqueológica.* Setúbal. 14, p. 171-196.
- SOARES, J. (2013) – *Transformações sociais durante o 3.º milénio AC no sul de Portugal. O povoado do Porto das Carretas.* Évora: EDIA. (Memórias d’Odiana; 2.ª série, 5).
- SOUSA, A. C. F. A. B. (2010) – *O Penedo do Lexim e a sequência do Neolítico Final e Calcolítico da Península de Lisboa.* Lisboa: Faculdade de Letras da Universidade de Lisboa. Tese de doutoramento em História, Especialidade em Pré-História.
- VALERA, A. C. (2000a) – O fenómeno campaniforme no interior centro de Portugal: o contexto da Fraga da Pena. In *Congresso de Arqueologia Peninsular, 3,* Vila Real, 1999: Actas. Porto: ADECAP. 4, p. 269-290.
- VALERA, A. C. (2000 b) – O Monte do Tosco 1: uma análise preliminar no contexto do povoamento calcolítico e do início da Idade do Bronze na margem esquerda do Guadiana. *ERA-Arqueologia.* Lisboa. 2, p. 33-51.
- VALERA, A. C. (2013) – *As comunidades agropastoris na margem esquerda do Guadiana. 2.ª metade do 4.º aos inícios do 2.º milénio AC.* Évora: EDIA. (Memórias d’Odiana; 2.ª série, 6).
- VALERA, A. C.; REBUGE, J. (2011) – O campaniforme no Alentejo: contextos e circulação. Um breve balanço. In *Jornadas de Arqueologia do Norte Alentejano, 3, Fronteira, 2005.* Lisboa: Edições Colibri; Câmara Municipal de Fronteira. p. 111-121.
- VALERA, A. C.; TERESO, J. P.; REBUGE, J. (2006) – O Monte da Quinta 2 (Benavente) e a produção de sal no Neolítico Final/Calcolítico do estuário do Tejo. In *Congresso de Arqueologia Peninsular, Faro, 2004.* Faro: Universidade do Algarve. 4, p. 291-305.
- VALERA, A. C.; CALVO, E.; SIMÃO, P. (2013) – Enterramento campaniforme em fossa da Quinta do Castelo 1 (Salvada, Beja). *Aparentamentos de Arqueologia e Património.* Lisboa. 11, p. 13-19.
- VEIGA, S. P. M. Estácio da (1891) – *Antiguidades Monumentaes do Algarve.* Lisboa: Imprensa Nacional. Vol. 4.
- VILAÇA, R. (2008) – The Chalcolithic in Beira interior (Central Portugal): data and problems. In BUENO-RAMIREZ, P.; BARROSO-BERMEJO, R.; BALBÍN-BEHRMANN, R., ed. lit. – *Graphical markers and megalithic builders in the International Tagus, Iberian Peninsula.* Oxford: BAR. p. 157-170. (International Series; 1765).