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Social complexity in a long term perspective

Session B15

Edited by

Joaquina Soares

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Foreword

This book includes contributions in the form of new arguments to explain the dynamics of growing complexity in Prehistoric stocieties. The ways in which Humanity has managed to improve socio-political solutions in different geographical areas, environmental changing contexts and different scales of interaction are matters that interest modern societies.

Coming from several researcher teams of universities and museums, the authors bring new knowledge on the theme in debate; so the Past will not be a strange territory, but a promising laboratory for a better understanding of the Other and for planning an auspicious future.

Since its foundation in 1974, the Museum of Archaeology and Ethnography of the District of Setúbal (MAEDS – www.maeds.amrs.pt), integrated after 2014 in the Association of Municipalities of the Region of Setúbal (AMRS), has encompassed the strategic domain of research. This high ranked social function is crucial for a sustained cultural intervention. In this field, MAEDS has been publishing *Setúbal Arqueológica* journal since 1975, and this publication has often been dedicated to proceedings of scientific meetings. We highly value this special issue of the *Setúbal Arqueológica* journal with the papers presented at the B15 session of the Burgos UISPP Congress, which expresses the contemporary trend in archaeological research, intersecting local contexts with worldwide perspectives.

Finally, I would like to thank the authors and the organizers of the XVII World UISPP Congress for its commitment in the promotion of this interesting and decisive field of research for a structural understanding of our species.

Rui Manuel Marques Garcia
President of the Association of Municipalities of the Region of Setúbal (AMRS)

Foreword to the XVII UISPP Congress Proceedings

UISPP has a long history, starting with the old International Association of Anthropology and Archaeology, back in 1865, until the foundation of UISPP itself in Bern, in 1931, and its growing relevance after WWII, from the 1950's. We also became members of the International Council of Philosophy and Human Sciences, associate of UNESCO, in 1955.

In its XIVth world congress in 2001, in Liege, UISPP started a reorganization process that was deepened in the congresses of Lisbon (2006) and Florianópolis (2011), leading to its current structure, solidly anchored in more than twenty-five international scientific commissions, each coordinating a major cluster of research within six major chapters: Historiography, methods and theories; Culture, economy and environments; Archaeology of specific environments; Art and culture; Technology and economy; Archaeology and societies.

The XVIIth world congress of 2014, in Burgos, with the strong support of Fundacion Atapuerca and other institutions, involved over 1700 papers from almost 60 countries of all continents. The proceedings, edited in this series but also as special issues of specialized scientific journals, will remain as the most important outcome of the congress.

Research faces growing threats all over the planet, due to lack of funding, repressive behavior and other constraints. UISPP moves ahead in this context with a strictly scientific programme, focused on the origins and evolution of humans, without conceding any room to short term agendas that are not root in the interest of knowledge.

In the long run, which is the terrain of knowledge and science, not much will remain from the contextual political constraints, as severe or dramatic as they may be, but the new advances into understanding the human past and its cultural diversity will last, this being a relevant contribution for contemporary and future societies.

This is what UISPP is for, and this is also why we are currently engaged in contributing for the relaunching of Human Sciences in their relations with social and natural sciences, namely collaborating with the International Year of Global Understanding, in 2016, and with the World Conference of the Humanities, in 2017.

The next two congresses of UISPP, in Paris (June, 2018) and in Geneva (September, 2020), will confirm this route.

Luiz Oosterbeek
Secretary-General

Introduction

This volume is mostly constituted of articles based on the communications presented at Session B15, entitled "*Social complexity in a long-term perspective*", in the framework of the XVII World UISPP Congress that took place in Burgos (Spain), in September 2014.

The main aspects that oriented the debate were summarized as follows:

i) Social complexity should be approached in a long-term perspective, giving meaning to the studies of social complexity in Mesolithic hunter-gatherer societies;

ii) Social complexity is in substance a multidimensional subject therefore the selection of a broad set of criteria such as economy, demography, territory, politics, location, religion, art and ideological behaviors is desirable for its study;

iii) Social complexity is perhaps one of the most recurrently discussed archaeological themes, often debated according to a strict evolutionist perspective. Without neglecting the importance of this approach, it can be very useful to cross several relational scales of analysis, searching for variability and unpredictability in contextual sphere and trying to find structural trends in the long run on a global scale.

iv) Complexity and social stratification, in other words, the emergence of the State as the most inflexible and coercive form of social organization had been underlying most of the discussions, even if the chronology of that emergence is not consensually accepted for our geography.

v) The main question put forward in the agenda of the debate is crucial for the contemporary world, and archaeological thinking must of course provide it with engaged contributions: can Humanity achieve equality in increasingly complex societies? In other words, is there any possibility for the separation of inequality and social complexity? I do not believe that a straightforward answer has been provided, but I hope this volume can contribute to open new avenues for thinking about social complexity. The shared research efforts of the authors of these studies leading to a better understanding of the process of rising social complexity were centred in the Iberian Peninsula.

I would like to thank the contributors of this volume, to the organizers of the XVII World UISPP Congress for including session B15 in the program, to the Secretary-General of UISPP and to the President of AMRS for their interest and support.

Joaquina Soares
Museu de Arqueologia e Etnografia do Distrito de Setúbal

Around the category 'prestige' and the archaeology of the 'social complexity' in Prehistoric societies

Diego Pedraza*

Resumé

Selon les paradigmes du néo-évolutionnisme et le fonctionnalisme systémique de l'archéologie processuelle l'étude de l'évolution sociale des sociétés a été enrichie avec des nouvelles méthodologies et catégories d'analyse. En utilisant des catégories telles comme «la complexité sociale», ou avec des typologies de classification descriptives de cette évolution sociale, ethnographes et archéologues ont cherché des preuves de «grands hommes» ou «chefs», entre autres, lesquels ont été associés à certaines fonctions et des comportements sociaux, ainsi que le «prestige». Nous allons essayer de fournir des nouvelles perspectives d'analyse à partir des études du matérialisme historique et du féminisme, mettant l'accent sur le concept de «prestige», lequel est considérée comme une production sociale.

Mots Clés
Catégories; Néo-évolutionnisme; évolution sociale; complexité sociale; prestige.

Abstract

Under the paradigms of neoevolutionism and the systemic functionalism of processual archaeology the study of the social evolution of societies has been enriched with new methodologies and categories of analysis. Using categories such as 'social complexity', or with descriptive classificatory typologies of this social evolution, ethnographers and archaeologists looked for evidence of 'Big men' or 'chiefs', among others, who were associated with certain functions and social behaviours, as well as 'prestige'. We will try to provide new perspectives of analysis from historical materialism and feminist studies, focusing on the concept 'prestige', which is understood as a social production.

Keywords
Categories; Neoevolutionism; social evolution; social complexity; prestige.

1. Introduction

Our aim is to explore some terms and expressions such as 'prestige', 'prestige objects', 'economies of prestige goods' or 'prestigious people', that usually appear in the archaeological bibliography. However, these terms are rarely defined, nor do they refer to a specific definition and they are often employed in a non-critical way.

Although this issue may be controversial, we believe it is necessary to address the theoretical discussion in terms of some of the concepts and categories we usually employ. Furthermore, it is necessary and important to review the epistemological and ideological implications of these concepts in the scientific process of knowledge creation in archaeology.

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These appreciations can be applied across the board to the various dominant paradigms in archaeology and, naturally, to the ones that have been hegemonic roughly since the 1950s, such as neo-evolutionism and the systemic functionalism of processual archaeology. But it is also evident in the critiques of these schools made by postprocessual or postmodern archaeology since the closing decades of the last century.

Significantly, the criteria applied to consider an object, person, structure or context as prestigious are not usually specified. There appears to be an implicit acceptance that the use of a rare raw material or of specific technologies in the production of an item automatically categorizes it as a 'prestige object'.

In addition, we often employ other categories like 'simple societies' and 'complex societies', or talk about 'social complexity', often with the same level of ambiguity.

2. Simple and complex societies

If we focus on the hegemonic paradigms such as neoevolutionism, functionalism and systemic approaches and processual archeology, which gained influence in the USA after the 2nd World War, we can confirm these claims.

An example can be taken from the evolutionary proposals in which it became common to distinguish between 'simple' and 'complex' societies. In this sense, the cultural anthropologist Elman Service created in 1962 his famous classification of the evolution of societies into 'bands', 'tribes', 'chiefdoms' and 'states' in a process of social and historical change from simple to increasingly complex (1962, p. 107, 140-142, 170-177). In a similar way, Morton Fried elaborated his own classification, with the social types: 'egalitarian', 'ranked', 'stratified societies' and 'states' (1967, x-xi).

Some years later, in 1972, Kent Flannery, from his systemic approach, offered us his definition of complexity. In his proposal he addressed the evolutionary development of societies, following the schemes of Service and Fried, with the emergence of processes of 'segregation' and 'centralization' between the different subsystems that make up any society (Flannery, 1972, p. 409). However, the model of Flannery has been criticized because it does not define the specific elements needed to qualify a society as complex. In practice, this term was reserved for those classifiable in the stages of leadership, stratification and civilization or State, while the term simple was associated with bands and tribes (Lull and Micó, 2007, p. 208).

In this context, the ethnography was used to create these categories and classifications in the process of social and historical evolution. At the same time, processual archaeology proceeded to classify objects found in the archaeological record in agreement with those classificatory typologies, associating some particular objects into a level or stage of evolution. But some criticisms argued that these proceedings accepted the premise that the variety of the previously classified ethnographic record comprised all existing human diversity, present and past. Furthermore, the heuristics limitations of this approach led to the proliferation of new categories of classifications and subdivisions, in an attempt to include those phenomena that did not fit inside the previous classifications (Lull and Micó, 2007, p. 219, 226).

But there is another approach to define complexity. In this sense, it is usually used to refer those societies with inequalities, hierarchies or social stratification. However, this approach also poses problems. Usually, it refers to the existence of exploitation of certain people based on the idea of 'surplus'. The term surplus is usually understood in the sense of excess production, once a society's basic needs have been satisfied (*i.e.* Hayden, 1995, p. 24; Johnson and Earle, 2000). But from the perspective of historical materialism surplus refers to a situation in which one person or group appropriates part of the product and achieves a social position of domination over the rest of the society (Gassiot, 2002, p. 8; Chapman, 2003, p. 97).

At this point we want to stress that, despite the critical tone of the above paragraphs, we recognize the importance of these attempted explanations of social phenomena. Especially because systemic approaches represented a break with the previous paradigm, the historical particularism, which avoided

proposing explanatory laws of social change. But this acknowledgement does not imply that we reject some of the criticisms made in recent decades. Our aim is to review this functionalist/adaptative perspective by starting from another proposal, also materialist, but with a greater presence of the 'social' (Soares, 2013, p. 60), as we will argue below.

We focus our work in hunter-gatherer-fisher societies (HGFS). In this framework, we note that, in the 1960s and early 1970s, it was common to see these groups as bands or simple societies, and some ethnographies were used to describe their basic characteristics (e.g. Bushmen, Australians, Eskimos, etc). However, other HGFS were described as complex and they were considered as an 'anomaly' or 'exception' (Testart, 1982, p. 11; Pálsson, 1995/1988, p. 190-191; Burch and Ellanna, 1996/1994, p. 61-62; Chapman, 2003, p. 85; Sassaman 2004, p. 228; Vila and Estévez 2010a, p. 11), such as some archaeological studies of the Mesolithic, or ethnographic and archaeological examples from the northwest coast of America (NWC) (e.g. Service, 1966, p. 3 or Murdock, 1968, p. 15). This began to change in the 1970s, when many archaeologists focused their attention on these groups. Since then NWC studies are considered as the most important example of complex hunters and gatherers, they are not an anomaly; they are now seen as the paradigmatic example of complexity and as the 'origins of inequalities', a subject of study that has become progressively more important among archaeologists.

These examples can now serve to illustrate our subject and how certain terms are commonly used. Moreover, these cases serve to define complex HGFS, as opposed to bands. They are defined by the existence of individuals with different social positions: 'status' or 'high status'; 'social inequalities' and 'social hierarchies'; various forms of 'authority' and 'power', and finally 'prestige'.

3. The sociology of power of Max Weber

The term prestige is often accompanied by other concepts such as 'power' and 'status'. The underlying source of reference here, often not mentioned, is Max Weber and his sociology of power. His influence has been felt throughout the twentieth century and was introduced into American archeology and cultural anthropology from the work of the sociologist Talcott Parsons, after 2nd World War (Keyes, 2002, p. 236-237).

As we know, Weber's sociology of power was developed around the 'social action' of individuals, based on the notions of 'authority', 'power' (*Match*) and 'domination' (*Herrschaft*). Weber defined domination (*Herrschaft*) as:

> 'the probability that certain commands (or-all commands) will be obeyed by a given group of persons. It thus does not include every mode of exercising "power" (*Match*) or "influence" over other persons. Domination (*Autorität*) in this sense may be based on the most diverse motives of compliance: all the way from simple habituation to the most purely rational calculation of advantage. Hence every genuine form of domination implies a minimum of voluntary compliance, that is, an *interest* (based on ulterior motives or genuine acceptance) in obedience." (Weber, 1978/1921, p. 212).

Weber paid special attention to the legitimacy of the exercise of power. He developed a classification of 'types of domination', which had great influence later. He distinguished three types of 'legitimate domination' (Weber, 1978/1921, p. 215):

1 - 'Rational': based on the belief in the legality of an established order.

2 - 'Traditional': based on the belief of the sanctity of the traditions.

3 - And finally 'charismatic': based on the characteristics of heroism or exemplarity shown by one person. In charismatic domination, some qualities or attributes of individuals sustain trust, belief and follow-up of others.

It was precisely in the simple societies (bands and tribes, as we saw above) where Weber's notion of 'charisma' and 'charismatic leader' was applied. Furthermore, as it is well known, evolutionary cultural anthropology developed certain types of characters, the 'Big Men'- individuals without the capacity of

coercive power who were capable of organizing production, exercising influence on others and taking a differential position within their social groups.

These individuals are characterized by 'high status'. For Weber the status is understood as a specific situation inside the network of social relationships ('status situation') which is associated with a specific 'social estimation of honor', positive or negative (Weber, 1978/1921, p. 932). 'Status', 'honor' and 'prestige' are terms often used interchangeably and they are understood as having a particular social value in some individuals or groups who occupy a specific position in society, but who are not necessarily correlated with the accumulation of wealth. Numerous ethnographic examples of mentioned Big Men show us these features: society bestow them renown but they do not accumulate a distinct level of wealth, a practice that would lead to social sanction or rejection.

However, numerous ethnographic examples as well show that the 'charismatic leader', in its various forms (hero, leader, ruler), will accumulate material wealth in order to consolidate his prestige (Weber, 1978/1921, p. 244). This brings us back again to Weber's proposal of legitimation in all forms of domination:

> 'In general, it should be kept clearly in mind that the basis of every authority, and correspondingly of every kind of willingness to obey, is a *belief*, a belief by virtue of which persons exercising authority are lent prestige' (Weber, 1978/1921, p. 263).

Up to this point we have briefly reviewed some of the terms and concepts used and developed in recent decades by evolutionary anthropology and processual archeology, and also the sociology of power of Weber. Now we will try to expose some examples to illustrate these concerns.

4. An example of the archaeology of prestige from the NWC

We have just described above the particularly illustrative case of the NWC, which accumulates an extensive ethno-historical and archaeological record that documents the existence of social inequality, unusual in HGFS. The Canadian archaeologist Brian Hayden is one of the authors who has focused on this area and he has been widely quoted in recent decades, with regard to the NWC itself, and in analyses of other archaeological sites as a general reference point for the study of social complexity in HGFS, and in the origin of inequalities.

Hayden's approach is a clear example of the functionalist, neo-evolutionary and ecological paradigms that we introduced above. He calls his proposal 'political ecology' or 'paleo-political ecology', and argues that economic inequalities appear and become consolidated due to the rise of certain individuals who pursue their own interest (Hayden, 2008, p. 28-29; 2010, p. 93).

His idea is that in all societies there is a genetic disposition that appears in certain subjects who display a characteristically selfish personality which searches to accumulate power and wealth; a personality he calls 'triple A', because they are 'ambitious', 'aggressive', and 'accumulative'. These individuals are known as 'aggrandizers' (1995, p. 18-20; 2008, p. 49-50; 2010, p. 97-98; Hayden and Villeneuve, 2010, p. 99).

For Hayden, the existence of a certain abundance of resources and a certain level of technological development (e.g. the ability to store goods) which allows the management of surplus –in the sense described above of excess production once the minimal needs of the community have been satisfied - eventually triggers a series of social changes which initially provide more security and stability in times of scarcity, but inevitably lead to the emergence of social complexity and inequality (Hayden, 1996/1994, p. 227-229).

In this dynamic of social evolution Hayden distinguishes between different kinds of leaders, depending on their level of control and influence, which he calls 'despots', 'reciprocators' and 'entrepreneurs' and compares them with the ethnographical terms 'great men', 'head men' and 'big men', respectively (Hayden, 1995, p. 25). In this sense Hayden created his own evolutionary categories, parallel to the Service and Fried classifications. He distinguished between 'egalitarian' and 'trans-egalitarian' HGFS,

associating the firsts with the traditional bands and the latter as an evolution of those when the requisites of resources and technological development are acquired. Then aggrandizers appear with his strategies to persuade relatives and friends to cede part of the surplus and promoting competitive feastings and creating networks with neighbouring communities (Hayden, 1995, p. 24; 2010, p. 90; Owens and Hayden, 1997, p. 125).

In the context of competitive feasts, Hayden defined his concept of 'prestige technology':

'Prestige technology refers to the production of goods that maximizes available labor inputs and that only loosely meets performance requirements, as opposed to practical technology that maximizes efficient manufacturing and tool performance' (Hayden, 1995, p. 24).

The presence of prestige objects is an indicator of the existence of private property in trans-egalitarian societies. They are highly valued and are produced by intensive labor. They are also used as strategy by aggrandizers in feasts, exchanging them for other products and creating debts. Prestige technology serves, in contrast to practical technology, to resolve socio-political problems (Hayden, 2010, p. 98, 104).

Other approaches to the archaeological study of social complexity and the origin of inequalities follow a similar line, for example Blanton (1995), Ames (1995) or Matson (2010), also in the NWC; or Jeanne Arnold (1992, 1995) in the archaeology of sites in the northern islands of the Santa Barbara Channel in California. With some differences between them, all these authors quote Hayden in their works. From neo-Darwinian approaches, some authors also use some of these proposals but in these cases highlighting the natural selection in the emergence of prestige as an adaptation in human evolution (Henrich and Gil-White, 2001, p. 167; Plourde, 2009, p. 267).

5. Outline for a definition of prestige relevant in Prehistoric archaeology

We will dedicate the rest of the article to propose a definition of prestige to be applied in Prehistoric archaeology. This proposal is based on the thesis provided by historical materialism and some studies by anthropologist and archaeologist feminists in recent decades.

5.1. Social production and reproduction

Historical materialism provides us with some concepts and categories, as well as theoretical and methodological tools, which are clearly useful in the historical study of humans as social species. Humans live in society, although, as argued by Godelier (1981), we should say that humans produce society in order to live. Along these lines, Marx' sociological theory offers an analysis of social production, with work as its central process. Work is a process; it is a relationship between people and matter. In this sense, human beings establish social relationships with each other and with nature in a dialectical process composed by the subprocesses of production (*stricto senso*), distribution and consumption (Marx, 2002/1857-58; 1904/1859, p. 11; 1976/1867, p. 283; Castro *et al.,* 1998, p. 173-174). In all societies, past or present, we organize production by means of work to survive.

On the other hand, some feminist studies have highlighted the great importance of reproduction, which Marx paid attention to in relation with the reproduction of the labor force in capitalist production, but in a limited form (Haug, 2010). As a society, we need to produce but we also need to reproduce ourselves: as individuals, as a species, and to reproduce the social and material conditions for our existence. Without the reproduction of people and society, human beings obviously cannot exist.

These feminist approaches (Bouvoir, 1949; Caulfield, 1985; Wylie, 1991) maintain that reproduction is a particular form of production, however, with their own characteristics. Considering production and reproduction separately has a methodological and operational purpose, it is often difficult to distinguish them, but it will help us to highlight the dialectical character of the two processes: the production of goods and objects, and the reproduction of people.

Also, the analysis of the contradiction that

exists between both processes and possible ways of its resolution will be of great importance to us, especially in hunter-gatherer societies. In this case, the reproduction of people is decisive compared with the production of goods and the conditions that allow it. However, the production of goods compromises reproduction. This is the 'Theses of the Principal Contradiction' which exists between both productions production (Estévez *et al.,* 1998, p. 11-12; Barceló *et al.,* 2006, p. 191).

Traditionally the study of human reproduction has been mainly analyzed from its biological aspects (Harris and Young, 1979, p. 28; Echard, 1985, p. 37--38; Tabet, 1985, p. 62), ignoring the social elements that are also present. Various phenomena such as human sexuality, relationships between women and men or the sexual division of labor, have often been studied from their genital and biological characters (Bouvoir, 1949; Harris and Young, 1979, p. 28; 1981, p. 110--111; Moore, 1988, p. 20; Conkey and Gero, 1991, p. 8, 12; Wyle, 1991, p. 34; Lewontin *et al.,* 1984; Lewontin, 2000; Vila *et al.,* 2010, p. 202). However, social aspects have rarely been addressed in reproduction. In addition, some areas of human existence, as subsistence, have been used as an explanatory factor of change in societies, rather than reproduction (Vila and Estévez, 2010b, p. 11).

These criticisms also stress that human sexuality is expressed with great flexibility and diversity, as is easily verifiable from the historical and ethnographical record. Recognizing biological factors does not preclude ignoring historical and social elements in which human sexuality shows great plasticity; it is culturally conditioned and it is clearly characterized by the symbolic (Tabet, 1985, p. 98-100; Davis, 1985, p. 343-344).

This may seem surprising or strange because we usually consider reproduction as something essentially biological. But in human reproduction, we understand that we establish social relationships as well, between women and men, and around work. In this case, we invest work in the production of people.

Finally, we highlight the importance of some theoretical and methodological aspects of these approaches, because many of the explanations we provide become ways to naturalize the phenomena we study; and there are serious social and political implications in our work.

Reproduction, as a type of production, can result from social relationships of exploitation and domination (Tabet, 1985). Ethnographical, archaeological or historical records show us different social and historical forms of how human societies organize social relations of production and reproduction, with the possible presence of different degrees of exploitation. They are the particular manifestation, the phenomenal expression, of different ways of establishing social production and reproduction relationships.

These forms of exploitation can also be seen in the ideological constructs created to legitimize this domination. In this sense, myths and symbolic representations are an important source of analysis (Mathieu, 1985, p. 226-227), and in this case ethnoarchaeology becomes an important discipline for implementing and contrasting archaeological models (Vila, 2006, p. 61). The study of particular societies that organize their social relations of production and reproduction in a specific (historical) manner can help us to carry out this implementation. However, we should avoid using these examples as mere ethnographic analogies to project into the past.

5.2. The value of the processes of production and reproduction

In speaking of the production of objects or people, the next step is to address the question of value, the production of value, or the value of production. Here we distinguish between two types of value (Barceló *et al.,* 2006, p. 192):

Objective value. As the classical economists, from Adam Smith to Marx argued, the value of producing something is defined by the amount of labor invested in its production process (Marx, 1976/1867, p. 129). It is, more or less, easy to obtain: the number of hours of labor, number of workers, etc.

Assigned value. The second kind of value is more difficult to define. At first it derives from the

use value of the product, but it is not surprising to note that it may be relatively independent of it. This is because it is an assessment of political character.

By comparing the two types of value, we can deduce the possible degree of exploitation in a particular way of organizing the social relationships of production and reproduction. For example, we can compare two objects that have the same objective value, the same amount of work invested to obtain them, such as food obtained by hunting or gathering. Usually we observe in ethnographical record that meat is more appreciated than gathered products. Perhaps this can be explained by different reasons, but usually we can see that different products are valued differently by social subjects. This is because social subjects assign different values to different objects, depending on their position in the network of social relationships in production and reproduction.

The way in which the two kinds of values are quantified archaeologically poses various problems. The objective value can be estimated approximately from the material remains in the archaeological record as the average quantity of hours invested using a specific technology, by applying techniques of experimental archaeology, traceology and ethnoarchaeology (Barceló *et al.,* 2006, p. 192-193; Vila *et al.,* 2010, p. 203, 205). However, the assigned value is much more difficult to estimate because of its symbolic nature, and therefore difficult to detect in the archaeological record in regard of our methodologies.

From the perspective of historical materialism, we understand that social subjects develop their subjectivities on the basis of processes of experiences within the material conditions of their existence, creating different forms of consciousness from their particular position in the world both inside and outside the network of social relationships of production and reproduction in which subjects are both 'agents' and 'products'. They are agents because they participate actively in the institution of social relationships; they are also products, since they are the result of these processes (Castro *et al.,* 1998, p. 173). As Marx said (1904/1859: 11), we establish social relationships of production that finally become independent of us. Living predates our thinking; life is thought of from the specific position that we occupy in the world and from the objective conditions that we contribute structurally to build it (Lull, 2005, p. 9).

6. Defining prestige

Finally, with the theoretical tools just discussed, we can now propose a definition of prestige:

a) In the (re)production of people we can distinguish between two types of value:

1 - The objective value: in the production of social subjects through the appropriated investment of work and socialization, for their insertion as women/men within the social organization with a specific position in the network of social relationships, participating in production, distribution and consumption, in a clearly differentiated form from other social subjects.

2 - The assigned value: politically determined, given by individuals in a particular way of establishing social relations within a given social organization. The comparison of the assigned value with the objective value can give us the degree of exploitation.

b) In connection with the production of objects. Associating these objects with certain social subjects, allows them to become 'prestigious people' or people 'with prestige'. These productions are also subdivided in objective value and assigned value.

Thus, our thesis is that prestige is a form of double valorization, objective and assigned, which can appear (as a possibility) in production processes: in the reproduction of people, in the production of goods or in the conditions of existence concerning them.

The consequence of all this legitimizes these people, but only these people, to perform certain actions in the processes of production, distribution and consumption, such us the organization of the tasks associated with the production, the management of

the distribution, or trade, etc. Similarly, the community here is entitled to require such persons to perform these activities, which is only possible or permitted by the legitimate position that these subjects occupy in the network of historically instituted social relations.

With regard to reproduction of people, prestige also legitimizes the position of women and men who participate in this process, which may include domination and exploitation.

Thus, prestige is understood here not as an 'aura' of certain people because of their 'innate' attributes or some 'economic logic' governing the behavior of human beings by their particular nature, but 'prestige' is understood here from and for social production and reproduction. It allows for social and individual survival and, ultimately, the survival of the species itself. It has the character of both 'product' and 'instrument'.

Prestige, as we understand, is a product because it is the consequence of the processes of production and reproduction that social subjects perform in order to produce society. But prestige is also an instrument because it constitutes a 'technology' that contributes to maintaining and reproducing society, allowing society to legitimize certain social behaviors, to create rules and norms, prohibitions and sanctions. It also enables society to generate and maintain social differences, to create forms of regulation of social relationships and, finally, to organize the running of society for its continuity. Its instrumental character allows for the survival of society.

7. Conclusions

In the previous pages we analyzed synthetically some of the categories created by systemic-functionalist approaches during the last decades around the term adaptation, and their point of view of social evolution from simple to various forms of increasing complexity. In this context, complex societies, related with the emergence of inequalities, were described by the sociology of power provided by Max Weber, around terms such as status, leaders, charisma, and others. Most models combine a mixture of different patterns: ecological, environmental, social and political and also genetic, paying attention in the behavior of individuals and their social actions.

Here, we have provided a new definition for the term prestige from a different point of view, using historical materialism and feminist approaches. Thus, we understand prestige from and for social production and reproduction, as a product, consequence of the processes of work that human beings, as social subjects, perform to survive; and as an instrument, because it allows the continuity of a society over time.

In this sense, we understand that nobody exists isolated in the world as mere autonomous individuals in 'adaptation'; but we understand humans as people producing ourselves in the process of producing society in order to live.

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The Pleistocene-Holocene transition on the Portuguese southwest coast. A zero stage of social complexity?

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Joaquina Soares*

Abstract

The analysis introduced here is based on the results obtained in the archaeological works developed in the shell middens of Pedra do Patacho (Vila Nova de Milfontes) and Medo da Fonte Santa (Aljezur) on the southwest Portuguese coast, radiocarbon dated from the end of the Younger Dryas, transition to the Pre-Boreal. Marine-estuarine invertebrates (no mammals, fish or birds bones were present) constitute exclusively the faunal assemblages of these sites, although they were about 5km far from the coeval seashore in accordance with the bathymetrics of -60/-50m (Vanney and Mougenot, 1981; Dias *et al.*, 2000). Much of the archaeological record of this period might have been submerged and destroyed by sea level rise that brought the shoreline to the current position, creating strong difficulties to the reconstruction of the settlement pattern.

The most striking and innovative aspects of the Epipaleolithic hunter-gatherer social behavior in the context of a supposedly environmental crisis is the very specialized shell-fishing economy, practiced probably by task groups (logistical mobility) in short term camps, presumably articulated with few base-camps like the sites of Vale Boi (layer Z of the 2006/07 fieldworks) (Infantini and Mendonça, 2012) and Palheirões do Alegra (Vierra, 1992). This regional version of the labelled Broad Spectrum Revolution (*sensu* Flannery, 1969, 1986; Zeder, 2012) would open avenues for a new dialogue between culture and nature, moulding the social action for the onward domestication of animals and plants, that would be assimilated in southern Portugal only in the middle of the sixth millennium cal BC (Soares, 1992, 95, 97; Soares and Tavares da Silva, 2003). In comparison with Magdalenian culture, the material culture of the Epipaleolithic period is quite poor and scarce, suggesting a cultural and social regression. However, the ecological challenges successfully faced by the hunter-gatherers in the transition to Early Holocene indicate their ability to adapt social organization, using mechanisms of demographic control to maintain low densities, opting probably for seasonal social fission, and putting in practice a broad spectrum subsistence strategy. The optimal resource zones, even marginal areas, were exploited, with the awareness of the carrying capacity of the environment. Thus the question about social complexity can be addressed.

Keywords

Younger Dryas; Pre-Boreal; Epipaleolithic; marine-estuarine invertebrates; short-term camps; logistical mobility; Broad Spectrum Revolution.

* MAEDS - Museum of Archaeology and Ethnography of the District of Setúbal; UNIARQ - Archaeological Centre of the University of Lisbon.

Locative patterns

Pedra do Patacho

The shell-midden of Pedra do Patacho has been excavated and published by the authors in 1993 (Soares and Tavares da Silva, 1993, 2004; Tavares da Silva and Soares, 1997). It locates on the north bank of the Mira paleo-estuary (Vila Nova de Milfontes), facing a vast plain about 5km wide, currently submerged by the Flandrian transgression. The archaeological layer stretches out about 50m along the seashore and includes a huge amount of faunal remains exclusively from marine-estuarine invertebrates: marine molluscs, mostly *Littorina littorea* followed by *Mytilus* sp. and *Patella* sp., and estuarine molluscs of sandy/mud intertidal environments as *Scrobicularia plana*, *Ostrea edulis*, *Cerastoderma edule* and *Venerupis decussata* (Figs. 1-2; table 1). These species were available all year round, but they would be gathered especially in spring and autumn (avoiding the winters strongest hydrodynamism and the high toxicity of some aquatic plants in the summer).

Figs. 1-2 - Location of Pedra do Patacho in the Mira estuary (Vila Nova de Milfontes). Map (CMP) in the scale - 1:25.000.

Table 1 - Faunal assemblage of the Pedra do Patacho shell-midden, that is constituted exclusively by marine and estuarine invertebrates. After Tavares da Silva and Soares, 1997.

TAXA	Layers			
	2A		2B	
	P. (gr.)	%	P. (gr.)	%
MOLLUSCA				
Patella sp.	144,50	15,20	82,40	7,55
Littorina littorea	554,00	58,26	579,00	53,05
Gastropods undet.	30,00	3,15	13,70	1,26
Mytilus sp	120,90	12,71	302,00	27,67
Ostrea edulis	0,50	0,05	5,00	0,49
Cerastoderma edule	0,80	0,08	0,80	0,07
Venerupis decussata	1,60	0,17	0,00	0,00
Scrobicularia plana	98,60	10,37	108,50	9,94
Total	950,90	100,00	1091,40	100,00

Medo da Fonte Santa

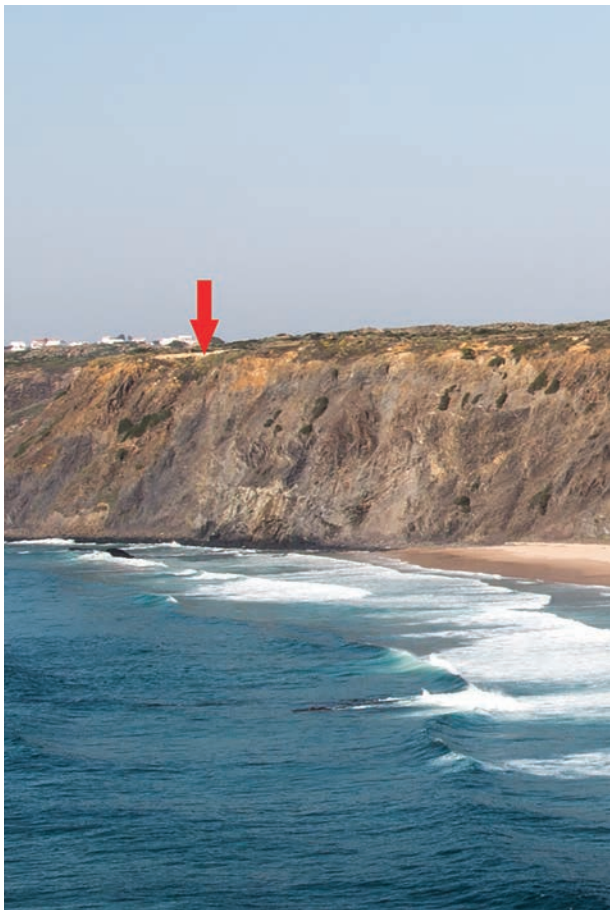
The shell-midden of Medo da Fonte Santa (Aljezur) was discovered in a field survey by Manuel Marreiros, Carlos Tavares da Silva and Luis Barros, and it is being studied by the authors in the context of a research project about neolithization of the Portuguese southwest coast, supported by the Archaeological Centre of the Museum of Archaeology and Ethnography of the District of Setúbal (MAEDS). The site (37º 19' 37,8"N; 8º 51' 55,8" W), about 60m above the modern sea level, was installed on aeolian sands deposited over the Plio-Pleistocene formations, which are overlapping the schist from the Palaeozoic base-

ment (Oliveira, 1979, 1984, 1999). The site locates in the geomorphological unity of Arrifana (Pereira, 1990, 1995, 1997) that integrates the littoral platform. The name of Medo da Fonte Santa originates from the Holocene dunefield (Medo) that covers the shell-midden layer and from the existence of water springs in the littoral cliff (Fonte Santa) accumulated between clays from the Carboniferous schist alteration and Plio-Pleistocene sediments. The drinking water shortage in this coast stretch gives much value to the accessible aquifer in the Fonte Santa cliff. Nowadays Medo da Fonte Santa overlooks a very narrow beach (Figs. 3-6), but at the transition to Pre-Boreal there was a large littoral plain with 5-4 km extension in accordance with the bathimetrics of -60/-50m (Vanney and Mougenot, 1981; Dias *et al.*, 2000)[1].

The archaeological layer (L.2), with the average of 0,30m thickness, was exposed by aeolian deflation in an area of c. 80m^2 and it is a shell midden formed by a huge amount of invertebrate fauna cemented by means of the carbonate calcium dissolution from thousands of mollusc shells (Figs. 7-10). In the base of the shell midden layer (L. 2B; 0,15m thickness) the aeolian sands were not concretionated. Marine invertebrates exclusively consti-

Figs. 3-4 - Location of Medo da Fonte Santa (Aljezur) in Google maps.

1 - The Aljezur stream Basal Unit I deposited over Paleozoic basement before 8220 BP "corresponds to a high energy fluvial deposit composed of azoic muddy sandy gravel containing clasts of schist, greywacke, quartzite and quartz". Fluvial and incipient estuarine conditions (Unit II) only appeared between 8220 and 7800 BP (Freitas *et al.*, 2011).



Figs. 5-6 - Medo da Fonte Santa view from Pedra da Atalaia.

tute the faunal remains (Table 2): mostly molluscs like *Patella* sp., *Littorina littorea*, *Nucella lapillus*, *Mytilus* sp. whose habitat is a rocky intertidal zone, and a few decapod crustaceans of the Brachyura infraorder.

In spite of their low caloric content, the shellfish provides essential protein, carbohydrates and mineral salts. Edible plants (unfortunately not preserved in the empirical record) would complete the diet. Totally absent at Pedra do Patacho, the *Nucella lapillus* (dog-whelks) is abundant at the

Fig. 7 - View from Medo da Fonte Santa to southwards till Pedra da Atalaia; 1 - dunefield, 2 - shell-midden, 3 - Plio-Pleistocene formations.

TAXA	Layers									
	2A						2B			
	NR	%NR	NMI	%NMI	P	%P	NR	%NR	NMI	%NMI
CRUSTACEA										
Decapoda	-	-	-	-	-	-	1	0,4	1	0,6
MOLLUSCA										
Patella sp.	204	52,3	107	73,3	190	60,9	182	63,9	139	80,3
Littorina littorea	24	6,2	10	6,8	32,4	10,4	17	6,0	5	2,9
Nucella lapillus	127	32,6	27	18,5	78,2	25,1	55	19,3	23	13,3
Mytilus sp	35	9,0	2	1,4	11,2	3,6	30	10,5	5	2,9
Total	390	100	146	100	312	100	285	100	173	100

NR - Number of remains

NMI - Minimum number of individuals

P - Weight (gr.)

Table 2 - Faunal assemblage of the Medo da Fonte Santa shell-midden, that is constituted exclusively by marine and estuarine invertebrates (sample of 5l of sediments).

Table 3 - Medo da Fonte Santa. Shells fragmentation patterns obtained through the ratio: number of remains/complet shells/100 (Álvarez Fernández, 2007; Gutiérrez Zugasti, 2009).

TAXA	Layers					
	2A			2B		
	NR	ICOM	IF	NR	ICOM	IF
Patella sp.	204	36	0,06	182	69	0,03
Littorina littorea	24	4	0,06	17	3	0,06
Nucella lapillus	127	3	0,42	56	3	0,19
Mytilus sp	35	0	0,00	-	-	-

NR - Number of remains

ICOM - complet shells

IF - Shells fragmentation pattern

Figs. 8-9 - Aeolian deflation surface with the concretionated shell-midden layer exposed.

Fig. 10 - Detail of the shell-midden layer (concheiro) with emphasis on the species *Patella* sp. and *Littorina littorea*. Scale in cms.

shell-midden of Medo da Fonte Santa. Its small size and high degree of intentional fragmentation (Fig. 14; Table 3) indicate a probable use for extraction of red-purple and violet dyes, colours that could be used for adornments (Biggam, 2006; Fechter and Falkner, 1993, p. 54) and for objects dyeing.

Chronology

An abrupt and brief cold event has long been recognized in the transition from the Late Glacial to the Holocene interglacial in the northern Atlantic basin (Broecker *et al.*, 1988), in the time span of 12.900 to 11.700 cal BP, but its regional expressions in our latitudes needs much more study.

Only in June 2009 the Quaternary System/ /Period that encompasses the most recent 2.58 million years had been ratified by the Executive Committee of the International Union of Geological Sciences (IUGS EC), as proposed by the International Commission on Stratigraphy (ICS). Thus, the Quaternary System/Period is officially subdivided into the Pleistocene and Holocene series/epochs, with the beginning of the Holocene assigned at 11,700 calendar years before AD 2000 (Gibbard, Head and Walker, 2010; Head, Gibbard and Kolfschoten, 2013). This date has been obtained through a GSSP at the NorthGRIP ice core from Greenland (Walker *et al*., 2009) and it corresponds to a sharp change "in deuterium excess values that reflect the start of climatic warming following the Younger Dryas/ Greenland Stadial 1 cold phase" (Head, Gibbard and Kolfschoten, 2013, p. 78).

AMS radiocarbon dates from the first human occupation phase of Medo da Fonte Santa confirm its integration in the transition to the Holocene, partially contemporaneous of the "concheiro" of Pedra do Patacho -Vila Nova de Milfontes (Soares and Tavares da Silva, 1993; Tavares da Silva and Soares, 1997) (Table 4; Fig. 11). The shell-midden of Medo da Fonte Santa had been dated by two AMS ^{14}C

Table 4 - Radiocarbon dates of Pedra do Patacho and Medo da Fonte Santa. Program Calib 6.1.0 (Stuiver and Reimer, 1993) and calibration courb marine 09, ΔR=0 (Reimer *et al*., 2009).

SITE	LAB. CODE	SAMPLE	14C BP	CAL BP 1σ	%	CAL BP 2 σ	%	REF.
Pedra do Patacho	ICEN-748	Marine shells	10760 ± 80	12041-12339	100	11909-12407 12444-12541	93 7	Soares and Tavares da Silva, 2004
Pedra do Patacho	ICEN-207	Marine shells	10740± 60	12028-12270	100	11925-12372 12506-12511	99,8 0,2	Soares and Tavares da Silva, 2004
Pedra do Patacho	ICEN-267	Marine shells	10450± 60	11380-11688	100	11283-11770 11775-11859	94	Soares and Tavares da Silva, 2004
Pedra do Patacho	ICEN-266	Marine shells	10380± 100	11244-11444 11461-11632	57 43	11191-11770 11775-11859		Soares and Tavares da Silva, 2004
Medo da Fonte Santa	Beta-191458	Marine shells	10510±70P	11419-11502 11599-11894	20 80	11331-11958	100	This article
Medo da Fonte Santa	Beta-433478	Marine shells	10490±30P	11414-11509 11577-11738	33 67	11389-11770 11775-11860	90 10	This article

determinations on marine shells (Table 4, Fig. 11): a sample of *Littorina littorea* (Beta-191458) gave a result of 10510±70 BP (11331-11958 cal BP at 2 sigma-95% probability, with ΔR=0±0); a sample of limpets (P*atella* sp.), Beta-433478, gave a statistically similar result, 10490±30BP (11389–11860 cal BP, at 2 sigma, with ΔR=0±0). The evaluation of the ocean reservoir effect in the Pre-Boreal shell-midden of Magoito, for now the nearest analysed site in chronological and geographical terms, gave the result of 160± 60 ^{14}C yr (Soares and Dias, 2006, p. 56). In general, the upwelling intensity has been very variable (Abrantes, 1988, 1991, 2000; Soares, 2005), and in the transition to the Holocene it decreased; in the Holocene, after the 8.2 kyr event "it dropped below current levels" (Haws and Bicho, 2007, p. 40). Thus, we decided for now not to apply the correction of the local ocean reservoir.

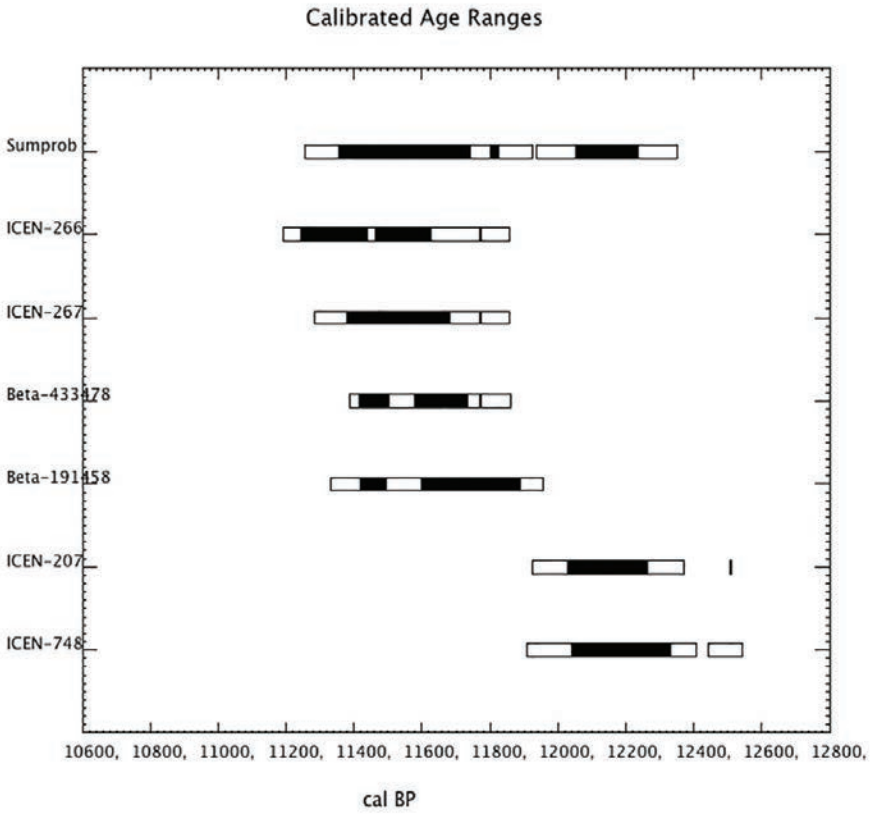


Fig. 11 - Radiocarbon chronology of Pedra do Patacho and Medo da Fonte Santa. Calibration at 1 and 2 sigma BP.

The radiocarbon determinations (Soares and Tavares da Silva, 2004) obtained for the shell midden of Pedra do Patacho, statistically similar to those of Medo da Fonte Santa, also support our statement about the cold invertebrate faunal association that characterizes the end of the Younger Dryas in the southwest coast (Tavares da Silva and Soares, 1997).

Paleoenvironment

As already referred, changes in the coastline associated to the Flandrian transgression have triggered the configuration of the new Holocene landscapes and seascapes (Dias *et. al.*, 2000; Haws and Bicho, 2007; Vanney and Mougenot, 1981). Both sites of Medo da Fonte Santa and Pedra do Patacho, at the Pleistocene/Holocene transition, gave evidence of an intense marine shellfish exploitation strategy, exclusively based on invertebrate fauna, mainly molluscs, inhabitants of the intertidal zone, that indicates colder ocean temperatures than nowadays by the relevant presence of *Littorina littorea*. The available information shows an increasing trend of the regional exploitation of the marine and estuarine resources, mainly in the Atlantic chronozone (Soares, 1996; Soares and Tavares da Silva, 2004). The upwelling off the Portuguese coast would create conditions for a rich marine ecosystem: shellfish, fish, shorebirds and marine mammals. Meanwhile terrestrial faunal resources (large preys) seem to decline (Davis and Detry, 2013). This would be more patent on the outer coast, especially during cold events, taking in consideration that the upwelling intensity correlates positively with terrestrial aridity (Shi *et al*. 2000).

The Epipaleolithic shell midden of Magoito in the littoral of Estremadura, estuary of the Mata River, dated to the Preboreal (GrN-11229: 9580±100 BP, cal BC, 2 sigma = 9250-8630; ICEN-52: 9490±60 BP, cal BC, 2 sigma = 9140-8610) is another site with a narrow spectrum economy almost exclusively constituted by *Mytilus* sp., *Tapes decussata*, *Cardium edule*, *Scrobicularia plana*, *Patela* sp., and *Littorina littorea* (Daveau, Pereira and Zbyszewski, 1982; Soares, 2003). This evidence highlights a general trend to specialization and intensification of the exploitation of marine resources articulated with a component of diet diversification among post-Pleistocene hunter-gatherers. Three species of molluscs consumed by hunter-gatherers on the Southwest Coast and Estremadura seem to be good climatic indicators: *Littorina littorea*, *Phorcus lineatus* and *Thais haemastoma*. The former, more adapted to cold waters, is abundant in the Younger Dryas and Pre-Boreal (Pedra do Patacho; Medo da Fonte Santa; Magoito), the remnants species are absent in these periods. In the Boreal shell-middens of S. Julião (Miranda, 2004) and Toledo (Araújo, 1998), in Estremadura, *Littorina littorea* drops to a very residual presence, being replaced by *Phorcus lineatus*; at the Boreal shell-middens of Castelejo and Montes de Baixo (Tavares da Silva and Soares, 1997), on the southwest coast, *Littorina littorea* is absent and *Phorcus lineatus* is well represented. The *Thais haemastoma*, adapted to warmer conditions, is present with residual values, at the Boreal sites of S. Julião and Montes de Baixo but it will increase onwards in the Atlantic period, e. g. in Samouqueira, Montes de Baixo, Armação Nova (Soares, Tavares da Silva and Canilho, 2005-07).

The Younger Dryas event had been in southern Portugal an abrupt return to cold conditions, with a marked decline in arboreal species, documented by the results of the pollen analysis of a sediment sequence from Lateglacial and Holocene in the Guadiana estuary. William Fletcher *et al.* (2007) describe the vegetation dynamics of Younger Dryas as a "[...] forest decline (*Quercus*) and expansion of pinewoods, xeric scrub and open ground habitats with *Juniperus*, *Artemisia*, *Ephedra distachya* type, *Centaurea scabiosa* type under arid and cold conditions [...]". The CM5 Guadiana core, for sub-zone CM5-II, that corresponds to Early Holocene vegetation, c. 11.860–8960 cal BP, shows that a "mixed woodland and scrub landscape continues into the Early Holocene, with relative high frequencies for a number of open ground herbaceous types (Centaurea, Erodium, Serratula type) and shrub taxa (Coronilla type, Cistaceae and Ericaceae)" (Fletcher, 2005, p. 216-17). Paleoenvironmental information obtained by the SU81-18 core of the

Alentejo coast covers a period of c. 25.000 to 1.000 BP (Turón, Lézinel and Denèfle, 2003). Species adapted to cold conditions decrease between 15.000 and 12.000 BP, but at the end of the Pleistocene a climatic deterioration and cold adapted species increased (Dryas III event). After this cold fluctuation, the cooling conditions disappeared and gave space to a mild-warm and humid climate. At the regional scale, the impact of climatic amelioration at the transition to Holocene can be observed in the Mediterranean taxa, more adapted to warmer conditions after c. 10.000 cal BP. In the Guadiana estuary, a forested landscape (with *Pinus* sp., *Quercus* sp., *Olea* sp., *Phillyrea* and *Pistacia* sp.) emerged only at 9800--8960 cal BP (Fletcher, 2005, p. 260).

Lithic industry

The relatively small lithic assemblage sample of the temporary campsite of Medo da Fonte Santa cannot be considered to statistically test for significant differences. It allowed a first glance to a very general characterization of the lithic productive system. It consists of:

- an expediently organized knapping component, on dolerite, greywacke and quartz (Table 5, Fig. 12), raw materials locally available in the form of cobbles, whose reduction trajectory is cores >heavy core-tools (mainly carinated scrapers)> flakes. The lithic artefacts of this subsystem are constituted by cores, cobble tools and flakes used without previous retouch, probably for cutting and scraping activities.

- a curated technological subsystem on flint (Tables 5-13, Fig. 13), that indicates an improvement of techno-environmental efficiency, with two main varieties of flint, from Cape S. Vincent, with about 18% (white, pinkish white, light gray, light yellowish brown), and mostly (c. 54%) from the mountain of Alte (e.g. yellowish red, dark yel-

Table 5 - Medo da Fonte Santa. Raw materials of the lithic assemblage.

Raw materials	N	%
Dolerite	2	3,0
Greywacke	5	7,6
Quartz	1	1,5
Chert	1	1,5
Flint undetermined	9	13,6
Flint from Cape S. Vincent	12	18,2
Flint from Alte	36	54,5
Total	66	100

Table 6 - Medo da Fonte Santa. Flint colour.

Flint colour		N	%
N 9	white	1	1,7
10 R 4 / 6	red	1	1,7
10 R 5 / 2	weak red	1	1,7
10 R 6 / 2	pale red	1	1,7
10 R 8 / 2	pinkish white	1	1,7
10 Y 8 / 2	pale greenish yellow	1	1,7
10 YR 5 / 4	moderate yellowish brown	7	12,1
10 YR 6 / 2	pale yellowish brown	1	1,7
10 YR 6 / 4	light yellowish brown	3	5,2
10 YR 6 / 6	dark yellowish orange	7	12,1
10 YR 7 / 2	light gray	2	3,4
10 YR 7 / 4	grayish orange	2	3,4
10 YR 8 / 2	very pale orange	2	3,4
5 R 6 / 2	pale red	1	1,7
5 YR 4 / 4	reddish brown	4	6,9
5 YR 5 / 4	reddish brown	9	15,5
5 YR 5 / 6	yellowish red	10	17,2
5 YR 6 / 2	pinkish gray	1	1,7
5 YR 6 / 6	reddish yellow	1	1,7
5 YR 7 / 1	light gray	1	1,7
5 YR 7 / 2	pinkish gray	1	1,7
Total		58	100,0

Table 7 - Medo da Fonte Santa. Lithic assemblage on flint. Platform type.

Platform type	N	%
Cortical	6	13,0
Unfaceted	9	19,6
Faceted	10	21,7
Punctiform	15	32,6
Absent	6	13,0
Total	46	100,0

lowish orange, reddish brown) (identification by Paulo Fonseca, Professor of Geology from the University of Lisbon). There is also a residual variety of chert generally associated with green schist.

It is possible to reconstruct two hypothesis of flint procurement:

1) raw materials procurement embedded in the scheduled foraging and hunting expeditions;

2) inter-groups exchange.

For the first hypothesis, flint would arrive by two quite different pathways: littoral, about 48km far, that takes about 10 hours of walking; inland--littoral, about 85 km far, that takes about 18 hours of walking.

Flint is available in the Meso-Cenozoic sedimentary rocks of the Algarve basin, but it is almost absent in the remaining southwest littoral platform, an extension about 120Km, until the Cape of Sines.

Table 8 - Medo da Fonte Santa. Lithic assemblage on flint. Bulb of percussion.

Bulb of percussion	N	%
Prominent	11	23,9
Double bulb	1	2,2
Moderate	14	30,4
Partially eliminated	4	8,7
Diffuse	11	23,9
Absent	5	10,9
Total	46	100,0

Table 9 - Medo da Fonte Santa. Lithic assemblage on flint. Debitage strategy.

Debitage	N	%
Direct percussion	12	25,5
Indirect percussion	31	66,0
Undetermined	4	8,5
Total	47	100

Table 10 - Medo da Fonte Santa. Lithic assemblage on flint. Cortex.

Cortex	N	%
0%	35	60,3
Residual	12	20,7
<=25%	3	5,2
>25 <=50%	6	10,3
>50 <=75%	1	1,7
>75 <=100%	1	1,7
Total	58	100

Table 11 - Medo da Fonte Santa. Lithic assemblage on flint. Cross section of blade and bladelets.

Cross section	Bladelet	Blade	Total
Trapezoidal	1		1
Triangular	9		9
Undetermined		1	1
Total	10	1	11

The rare cores discovered at Medo da Fonte Santa are exhausted by extractions of flakes and bladelets. Probably the Epipaleolithic group brought already formatted flint cores that were “overexploited” in *situ*. Not only an emphasis on the latter stages of core reduction, but also the low overall presence of

Table 12 - Medo da Fonte Santa. Lithic assemblage. Curated technological subsystem on flint. Measurements (mm). Means of the maximum dimensions and weight of the techno-typological categories of the analysed sample.

Techno-typological categories	N	%	Length max. (mm) N'	$\bar{X}$	S	Width max. (mm) N'	$\bar{X}$	S	Thickness max. (mm) N'	$\bar{X}$	S	Thickness / Width N'	$\bar{X}$	S	Weight (gr.)
Cores	5	8,6	5	23,0	± 9,9	4	18,3	± 4,3	4	11,8	± 4,3	4	0,66	± 0,27	26,6
By-products (of knapping)	11	19,0	11	19,7	± 6,3	11	15,8	± 5,5	11	7,4	± 2,3	11	0,54	± 0,26	18,8
Debitage products	11	19,0	9	17,7	± 4,3	10	17,6	± 4,0	10	6,3	± 2,8	10	0,39	± 0,27	16,8
Retouched tools	21	36,2	17	21,1	± 6,6	19	14,5	± 6,5	19	5,4	± 2,3	19	0,40	± 0,2	46,4
Unretouched tools (with macro use-wear traces)	10	17,2	6	23,3	± 3,9	10	11,9	± 3,7	10	4,2	± 1,4	10	0,36	± 0,1	11,8

N' - Number of artefacts whose measurements were considered. The weight has been obtained for all artefacts (N).

Typology	N	%
Cores	**5**	**8,6**
Discoidal	1	1,7
Exhausted	4	6,9
By-products (of knapping)	**11**	**19,0**
Debris	5	8,6
Flake	6	10,3
Debitage products	**11**	**19,0**
Flake	9	15,5
Blade	1	1,7
Bladelet	1	1,7
Retouched tools	**21**	**36,2**
Endscrapers	3	5,2
Carenated	1	1,7
Simple on flake	1	1,7
Unguiform	1	1,7
Perforators	1	1,7
Perforator on flake	1	1,7
Burins	2	3,4
Burin simple on breaks	2	3,4
Truncations	3	5,2
Flake with truncation	1	1,7
Bladelet with truncation	2	3,4
Notches and denticulates	9	15,5
Notches on flake	2	3,4
Flake denticulated	6	10,3
Blade denticulated	1	1,7
Various	3	5,2
Pointed flake	1	1,7
Pointed bladelet	2	3,4
Unretouched tools (with macro use-wear traces)	**10**	**17,2**
Flake	6	10,3
Bladelet	4	6,9
Total	58	100

Table 13 - Medo da Fonte Santa. Lithic assemblage. Curated tecnological subsystem on flint.

cortex (Table 10) and the low percentage of by-products of knapping activity (Tables 12--13) indicate that most of the initial core reduction would be done in a different space, probably another campsite.

A total of 58 lithic artefacts were analysed from the collection of Medo da Fonte Santa (Tables 12-13). This includes 5 cores, 11 by-products of knapping, 11 pieces of debitage, 21 retouched tools and 10 unretouched tools, with macro use-wear traces. The debitage products (where bladelets are well represented) are in general mainly microlithic artefacts (Table 12).

The retouched pieces belong mostly to the group of common and non-specialized tools like notches and denticulates; in the scrapers, it worth referring the presence of unguiform type; several flakes and bladelets were slightly retouched or show macro-use--wear traces (edge-damage); few bladelets have a truncation on the distal edge. These lithic artefacts have been recovered directly inside the shell-midden that is in *situ* and in fragments of the shell-midden scattered and disaggregated by erosion (lithics with calcium carbonate deposit conserved on its surfaces).

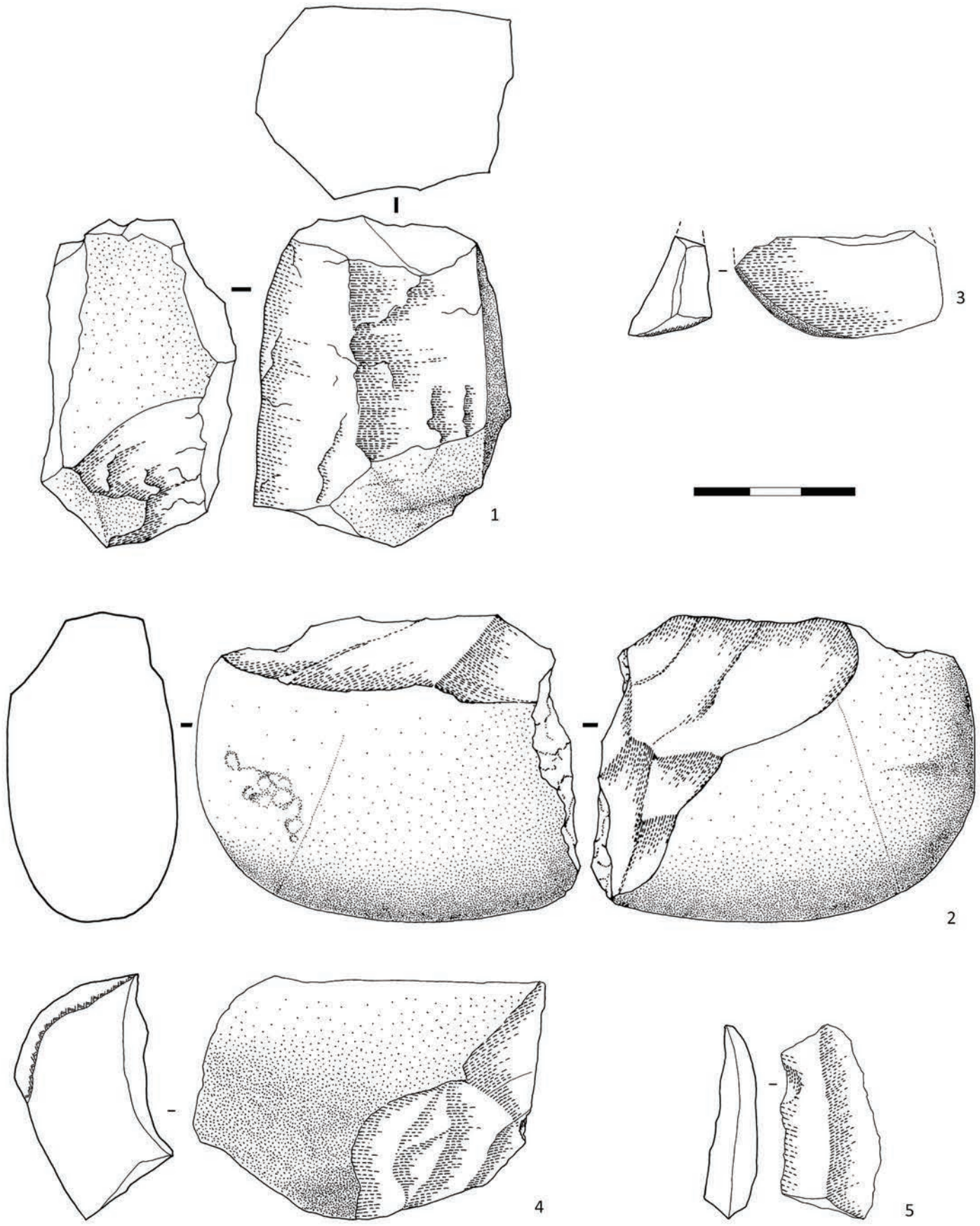


Fig. 12 - Medo da Fonte Santa. Lithic assemblage. Expediently organized technological subsystem on cobbles. 1 - flake core on quartz (MFS.191); 2 - cobble scraper on dolerite (MFS.147); 3 - flake on dolerite (MFS.188); 4 - flake with macro use-wear traces on greywacke (MFS.189); 5 - flake with notch on greywacke (MFS.187). Drawings by Fernanda Sousa.

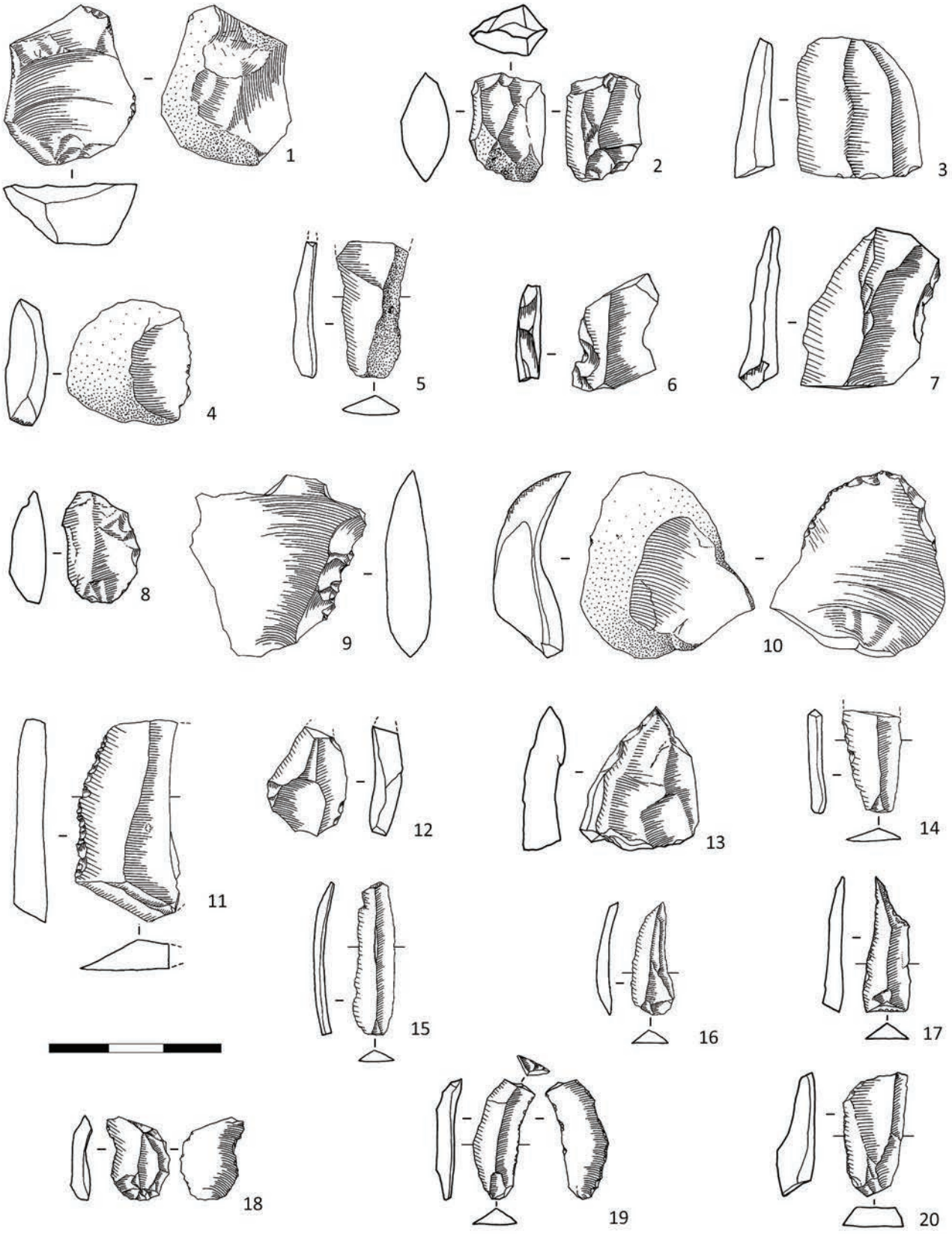


Fig. 13 - Medo da Fonte Santa. Lithic assemblage. Curated technological subsystem on flint. 1 - exhausted core (MFS.206); 2 - exhausted core (MFS.100); 3 - flake (MFS.210); 4 - flake (MFS.9); 5 - blade (MFS.199); 6 - flake with multiple notches (MFS.103); 7 - denticulated flake (MFS.33); 8 - denticulated flake (MFS.137); 9 - denticulated flake (MFS.204); 10 - denticulated flake (MFS.207); 11 - denticulated blade (MFS.209); 12 - flake with macro use-wear traces (MFS.96); 13 - pointed flake (MFS.14); 14 - bladelet with macro use-wear traces (MFS.201); 15 - bladelet with macro use-wear traces (MFS.200); 16 - Pointed bladelet with macro use-wear traces (MFS.203); 17 - retouched pointed bladelet (MFS.104); 18 - flake with truncation (MFS.149); 19 - bladelet with truncation (MFS.86); 20 - bladelet with truncation (MFS.151). Drawings by Fernanda Sousa.

Social complexity (?)

An increasing valuation of marine resources in human subsistence and a greater focus on the littoral settlement had been proposed for postglacial hunter-gatherers not only at a regional scale (Soares and Tavares da Silva, 2004; Vierra, 1992) but also at the remnant European Atlantic coast (Schulting, 2015).

The shell middens of Medo da Fonte Santa and Pedra do Patacho, containing only concentrations of marine invertebrate fauna, seem to reveal a new regional pattern of coastal adaptations, by hypothesis under the stress of a demographic-ecological imbalance (Soares and Tavares da Silva, 1993, 2004; Tavares da Silva and Soares, 1997). This subsistence strategy is quite different from the cultural pattern of the Pleistocene simple bands, with low population density, highly mobile and focused on the hunting of large herbivores. Evidence of marine exploitation, probably in occasional occurrences, has been documented in the Portuguese coast at the Middle and Upper Palaeolithic, but not in a specialized gathering mode and dissociated from hunting activities; on the contrary, it was characterized by

Fig. 14 – Fragmentation pattern of *Nucella lapillus* shells (dog-whelks).

the exploitation of a great diversity of species of marine mammals, fish, shellfish, shorebirds, consumed, for example, at the cave of Figueira Brava in Arrábida by Neanderthals (Antunes, 2000a, b) or at the site of Vale Boi in Algarve from the Gravettian to the Magdalenian (Stiner 2003).

The proposed scenario of resources depletion can explain the broadening of the subsistence base (broad dietary patterns) of hunter-gatherers in the transition to Early Holocene. The food diversification strategy was complemented by foraging/hunting intensification and specialization on particularly available and abundant food items, like shellfish or red deer, to maximize the exploitation of food resources in all the accessible biotopes (see the Broad Spectrum Revolution theory in Flannery, 1969; Zeder, 2012).

In spite of the regional differences, the analysis of the final phases of Tardiglacial adaptations in the Vasco-Cantabrian and Pyrenean regions done by Lawrence G. Straus (1990/91; Strauss *et al*., 1980) arrived to similar results to those of the southwest coast: evidence of specialization on a particular species (red deer), decline of large ungulates, and exploitation of a wider range of species, including aquatic resources (molluscs and crustaceans); situations of overexploitation of deer and limpets were observed suggesting a demographic-ecological imbalance (Straus, 1990/91, p. 15-16).

The economic specialization of Medo da Fonte Santa and Pedra do Patacho supposes:

1) A diet enriched in vegetarian components that unfortunately were not preserved in the studied archaeological contexts;

2) A logistical mobility strategy (*sensu* L. R. Binford, 1980), in which task groups of the band could move for abundant and reliable seafood probably embedded in scheduled pathways of raw materials procurement (Soares, 1996). This economic strategy supposes increasing social differentiation, associated with division of labour inside the bands, in probable accordance with age and gender. Kuhn and Stiner (2006) attributed to Upper Palaeolithic diet diversification the origin of gendered division of labour, and this would provide advantage over Neanderthal populations;

3) Marine resources could support exchange networks, not only for food consumption purposes but also for ornaments. *Nucella lapillus*, for example, could be used for extraction of red-purple and violet dyes. The small size of the shells and the fragmentation pattern observed in Medo da Fonte Santa fits well with this hypothesis (Table 3 Fig. 14). It was probably a very valuable item as colour source. "Colours act as important means of constructing difference in the form of adornments and body paints" (Jones and MacGregor, 2002, p. 12). As Alfred Gell (1992) stated in his concept of "technology of enchantment", colour is "a powerful way to objectify and differentiate people and actions so it has capacity to create solidarities and tensions". Goods exchange networks and social tensions could stimulate social complexity, as defended by Sahlins (1972).

4) Thus, in a long term perspective, these economic and cultural changes and the more territorialized control of ecological transformations among the hunter-gatherer societies, possibly still egalitarians, put them in the way of a progressive economic intensification, precondition for growing cultural and social complexity, which is very well expressed by Íñigo García-Martínez de Lagrán (2008, p. 54), when he argues that the economic intensification in the Mesolithic hunter-gatherers "es uno de los elementos fundamentales y primigenios para el desarrollo de la complejidad en todos sus ámbitos".

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Graphic Holocene expressions on the Atlantic European façade. Portugal

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Abstract

Engraved and painted symbols in rock-shelters and on rock outcrops, dolmens, menhir, statues and steles, are the most visible signs of human activity. In recent years, a large number of finds have been made in Portugal, where some graphic expressions (Palaeolithic or painted schematic art) were thought not to exist. The questions these latest discoveries pose can be extrapolated to the rest of the Iberian Peninsula and open new paths in a more archaeological panorama different from the Atlantic/ /Mediterranean dualism that has dominated the interpretation of recent prehistoric groups in the south--west of Europe.

Keywords

Prehistoric art; Style V; megalithic art; steles; menhir.

Introduction

Post-glacial graphic activity has tended to be left out of the integrality of the models reconstructing the behaviour of recent prehistoric groups in Iberia. However, the symbols and their ideological connotation are essential as another element of material culture if they are analysed with fully archaeological protocols, in addition to observing formal parallels of greater or lesser significance (Bueno & Balbín, 2000; Bueno *et al*., 2014a).

Few subjects in the Iberian Peninsula were more important than this secondary position of the study of post-glacial symbology, in addition to discussions about the chronological and cultural position of the techniques of paintings on one hand and engravings on the other hand (Bueno *et al.,* 2008a). Each one represented a contrasting cultural idiosyncrasy, as well as different chronologies: painting belonged to the Mediterranean Neolithic and engraving to Atlantic megalithism and its later development in the Bronze Age. A profound relationship between the theoretical position of researchers and the recognition of the symbolic world forced the weight of some of the assertions that still require further archaeological documentation (Bueno & Balbín, 2009).

It was at the end of last century when interpretations were more closely associated with the

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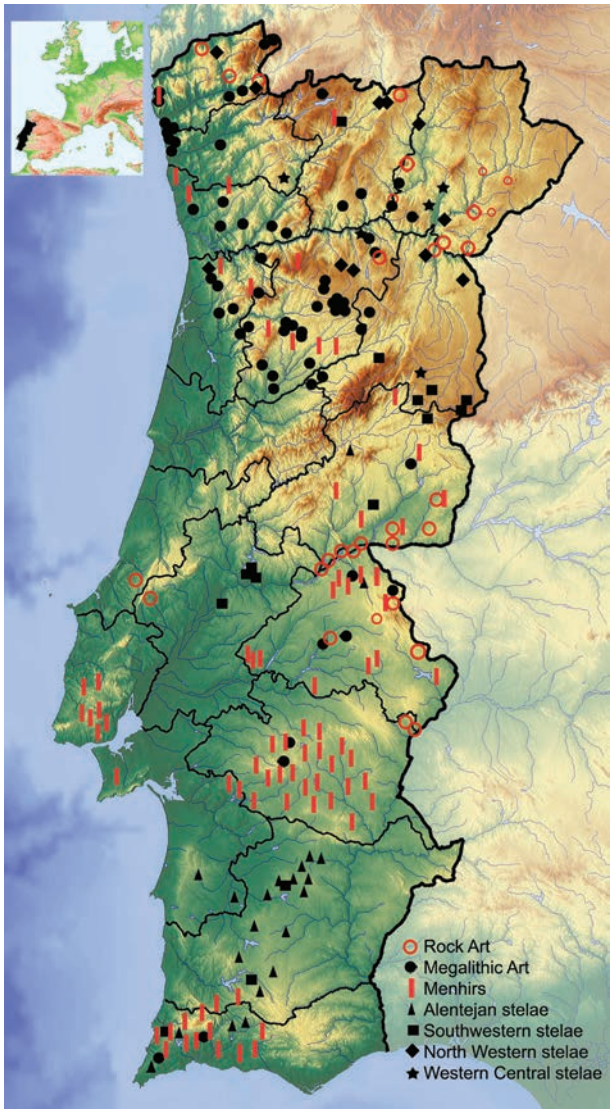


Fig. 1 - Position of Portuguese postpalaeolithic graphic expressions.

archaeological reality of the rock surfaces, portable artefacts and sculptured objects displaying the symbols discussed here. Two clear tendencies appeared. On one hand the assumption of a hiatus between Palaeolithic art and the later Neolithic art (Jordá 1966). On the other, marked differences between expressions in the rest of Europe and those in Mediterranean areas, such as the Iberian Peninsula, southern France, Italy and the islands (Baptista, 1986; Gomes, 2002; Jorge, 1983; Martínez, 2006; Santos Junior 1940; Valdez-Tullet, 2013). In these two cases, closed compartments were created; in time (Palaeolithic/Neolithic) and in space (Mediterranean/Atlantic). These projected an unconvincing image of the development of engraved and painted symbols in European prehistory (Bueno *et al*., 2012).

The study of inequality has hardly been attempted in connection with engraved, painted and sculpted expressions in the Neolithic, Chalcolithic and Bronze Age (Bueno & Balbin, 2006a). The exception is the analysis of armed figures and more precisely of later steles, as the identification of inequality is found in the exhibition of prestigious objects, especially weapons (Harrison 2004). The fact is that this type of singular evidence, at times on a large scale, especially visible and exhibiting adornments, is rooted in the funerary world of the megalithic monuments. This suggests, like some of the motifs discussed here, a long period for the construction, development and persistence of the symbols of human groups in post-glacial Europe (Bueno *et al*., 2005).

In the current state of our knowledge, some patterns can be established in the social value transmitted by the graphic representations. The ensembles in rock-shelters and engravings in the open-air have always suffered from the problem of the significantly low number of archaeological sites. However, their geographic position itself is indicative of their importance for the groups who created them, as they defined use, territories and, probably, identities (Bueno *et al*., 2004, 2006) (Fig. 1).

Megalithic sites are an objectifiable source for an archaeological study of post-glacial graphisms. The technical complexity of such studies and the options of direct and indirect dating, as well as the variety of motifs and the evidence of their relationship with a specific *chaîne opératoire*, form a reasonable starting point (Bueno *et al*., 2015a). Following the theoretical standpoint of archaeology of death, the comparison between funerary discourses and those observed in the territory of the megalith builders, are the basis of powerful arguments to establish parameters for the assessment of open-air art (Bueno & Balbín, 2000; Bueno *et al.,* 2004).

From a territorial point of view, in which the symbols are the most visible signs of human activi-

ty, it is possible to establish premises with which to understand their evolution and their role in the landscapes of western Iberian from the thirteenth to first millennia cal BC. It is precisely in this period of time, which coincides with the situation in Portugal, that most discoveries have been made in recent years, as certain graphic expressions (Palaeolithic art, painted schematic art) that seemed to be non-existent have been fully verified (Sanches ed., 2012). The challenges posed by some of these finds can be extrapolated to the rest of the Iberian Peninsula and southern Europe, opening new interpretations for a more archaeological and realistic sequence of the symbols used by Prehistoric groups.

Symbols of tradition: hunter-gatherers

Portugal and other parts of south-west Iberia were thought to uninhabited in the Palaeolithic, as a way to explain the arrival of colonists in unoccupied territory. A single decorated cave was known in the inventory of rock art sites (Lejeune, 1997). However, since the 1990s, a hypothesis unimaginable until then has gained strength in research: the presence of open-air Palaeolithic art as a form of archaeological documentation of the Upper Palaeolithic. If this is one of the most important new aspects of Iberian prehistory in the twenty-first century, the documentation of Holocene phases at these sites is equally significant as it lengthens the time in which Palaeolithic graphic systems persisted. A slow change in the classic Palaeolithic records between the thirteenth and eighth millennia cal BC is the basis for the formalisation of the contents that are well known in the representations of Neolithic groups (Bueno & Balbín, 2016a; 2016).

Two patterns break with the data provided by the decorated rocks and portable art in the Douro, Tagus and Guadiana valleys; the sudden disappearance of Palaeolithic parietal art in about 10.000 BC and that of the population, as the symbols were produced by human groups of which we are beginning to find highly interesting open-air deposits (Aubry *et al*., 2014; Arias *et al*., 2005; Baptista and Santos, 2013; Cacho *et al.,* 2014; Gomes, 2007; Figueiredo *et al.,* 2014; Fábregas *et al.,* 2015; Monteiro-Rodrigues, 2012).

As we have described elsewhere, animals elongated in shape, with their bodies filled with lines and small in size, are arranged in typically Palaeolithic patterns (one behind the other in profile, or one beneath the other). Mainly cervids and caprids, as well as horses and bovids, as well as some unusual animals, such as fish. Signs such as triangles and lines in *fil de fer* complete a range of representations in which figures in classical canons are still produced. Sites like Sabor and Côa will fix the chronological evolution of these patterns since the large number of plaques and their stratigraphic position will be fundamental for determining it, when their study is published (Baptista and Garcia 2002; Figueiredo *et al*., 2014, 2015). The presence in these deposits of pebblestones decorated in the Azilian style adds another factor of cultural diversity to the range of late glacial symbols. Both at Côa and further inland in the Douro valley, at Peña de Estebanvela, the pebbles reproduce the classic forms in the south of France, demonstrating interactions with one of the most important sectors in southern Europe in the Palaeolithic (Bueno *et al.,* 2007a; Garcia and Cacho, 2015).

Another element indicates the level of these interactions. This is the possibility that at Côa and probably further inland, there is evidence of floors decorated with pebbles painted with anthropomorphic motifs, like those documented at Italian sites (Dalmeri *et al*., 2011). We are currently studying one of the pebbles from Fariseu. This was published as a painted pebble whose motif has been identified as an anthropomorph in a study still in progress (Aubry and Sampaio, 2012). With the evidence of the large number of pebblestones in the tenth millennium cal BC. level at this site, many of them with remains of paint, together with T. Aubry, L. Luis and C. de Juana, we proposed a revision of all the stones to explore the possibility of a floor decorated with painted pebbles.

Since the 1980s it has been hypothesised that the "Azilian" decorated pebbles and the plaques with animal figures are totally contemporary (Lorblanchet, 1989). However, the novelty lies in the

Fig. 2 - Val de Jose Esteves, Coa. Left: detail of incised triangles with *fil de fer* (Museum of Coa). Right: Up, decorated plaquette of layer 4 from Fariseu site with schematic filled cutting upon back. Down, incised red deer of Jose Esteves site with the same convention. Photos by Rodrigo de Balbín.

documentation of identical motifs on rock outcrops at Côa, Siega Verde and in some caves, especially Ojo Guareña (Corchón *et al.,*1996). This latter ensemble has been dated directly by radiocarbon, and demonstrates that Palaeolithic art did not disappear suddenly. This has encouraged a more detailed study of a period of time of great interest in southern regions of Europe (Bueno *et al.,* 2007a, 2009a).

The traditional name of Levantine Art masks a more varied reality in the geographic area of Spanish Levant, which certainly includes Palaeolithic Art as well as the Tardiglacial and Early Holocene phases of which increasing evidence is being found (Utrilla and Bea, 2015; Villaverde, 2015). Archaeological sites like Abrigo del Angel (Utrilla and Villaverde, 2004) contain identical graphisms to those on the Tardiglacial plaques and rock outcrops at Côa. Recent dating of oxalates has shown that "Levantine Art" or rather some of the graphisms that are included within it, were completed by the sixth millennium cal BC (Ruiz *et al*., 2006; Viñas *et al.,* 2016). Scenes like the one in Val de Jose Esteves rock-shelter, associated with triangular signs with *fil de fer*, are an example of a time of formulas that conserve certain naturalism together with schematic depictions, much more widespread than the classical category names were able to conceive (Bueno and Balbín, 2012). Fraga d'Aia rock-shelter in northern Portugal with two very different panels, one of them showing an archer chasing a cervid (Jorge *et al.,*

1988; Sanches, 1997), acquire meaning in a context of symbolic expressions of hunter-gatherers not limited exclusively to the Spanish Levant. (Figueiredo *et al.,* 2014,2015; Gomes, 2007; Sanches and Teixeira, 2014) (Fig. 2).

The most interesting aspect of this new research line is that the Iberian Peninsula possesses a large number of sites that can help to improve our knowledge of this period and they form a necessary point of reference. Work carried out in Portugal in recent years combine archaeological and graphic sites, while direct dates obtained at Cova Eirós in Galicia have been published (Aubry *et al.,* 2014; Bueno and Balbín 2016a; Fábregas *et al*., 2015; Santos *et al*. 2015).

From the Neolithic to the Bronze Age. Constructing recent Prehistoric symbols

The relationship between neolithisation and Mediterranean ideologies has been very successful in the Iberian Peninsula and other parts of southern Europe, where schematic paintings play an important role (Maclure *et al.,* 2008). However, this hypothesis did not take into account that all these areas were also occupied in the Upper Palaeolithic and we now know that they were rich in symbolic expressions that did not disappear.

This is the case of the motifs on pottery whose antecedents are the geometric lattices seen on Tardiglacial plaques. As we have recently explained, geometric patterns always resemble one another, but if we compare them with those in older decorations, the possibility that at least a part of them was based on these repertoires is plausible (Mateiciucovä, 2004). This is more easily seen in the case of anthropomorphic motifs on Neolithic pottery and the representations documented on late Palaeolithic pebblestones (Bueno and Balbín, 2016a).

The fact of the prolonged use of some types of objects, such as the pebbles is an argument in favour of the interpretation being proposed. The sixth millennium cal BC date for the decorated pebble at Casa Montero in Madrid refers to an anthropomorph associated with a large axe and a bow, and at the ends, a series of triangles that resemble those dated in Ojo Guareña cave to about the eleventh millennium cal BC (Bueno and Balbin, 2012). A cluster of symbols is evidently associated with neolithisation, especially the objects used to work the land and to control animals. Yet these are associated, once again, as in the case in decoration on pottery, with an ancient symbol, a triangle, that evokes female vulvae and with a technique, pecked engraving, that is commonly documented in Palaeolithic art (Bueno, 2009, 2016).

The concept of the Mediterranean ambit of schematic paintings left the western part of Iberia empty of such representations, as it was thought that this area received the Atlantic influences that led to megalithism and the most abundant symbolic expression in these monuments: engravings. This absence of the Mediterranean influence was also an absence of the first farmers, and this has been shown to be untrue along the whole Atlantic seaboard of Europe (Joussaume *et al.,* 1979). The Neolithic existed before the building of the monuments in all the megalithic zones of the Iberian Peninsula, and Portugal is no exception (Neves *et al.,* 2008).

In a quite contradictory way, paintings on northern megaliths were only supposed to exist in the area of Viseu, where the presence of rock-shelters with painted schematic art was not accepted (Shee-Twohig, 1981; Pinto, 1929). However, the work of several research teams has revealed a very different situation (Alburquerque e Castro and Veiga Ferreira 1961; Alves, 2009; Figueiredo and Baptista, 2013; Gomes, 1989; Martins, 2013, 2015: Martins *et al.,* 2004; Sanches, 1990; Sousa, 1989): painted schematic art is found abundantly on rock outcrops in a very similar way to the open-air engravings. Surfaces with small panels were chosen, not only inside rock-shelters or even beneath an overhang. Motifs totally comparable with classic schematic art are found. The possibilities for dating these graphisms directly have led to studies at sites like Buraco da Pala and Fraga d'Aia, which are points of reference that agree with the dates recently obtained in rock-shelters and caves with schematic art in Andalusia (Carrasco *et al*., 2006; Sanches *et al.,* 1993).

Fig. 3 - Images of painted rock-shelters from South of Portugal. Left. White reticulate design from Igreja dos Mouros. Rigth: Up: Scene of anthropomorph from Lapa de Gaviôes. Down. Dots nad lines from Lapa de Gaivôes. Photos by Rodrigo de Balbín.

The latest research at rock-shelters with schematic art in the south of Portugal has provided very old dates that indicate the close relationship between Style V and the first phases of schematic art (Oliveira *et al.,* 2014). At the same time, these representations are found throughout Portugal, even in the absence of continuity in research in many areas. The same is true of the Spanish area, as the use of surveying in search of paintings, applying tested location models, has produced positive results (Bueno *et al.,* 2004, 2006; Caninas *et al.,* 2016) (Fig. 3).

Associations with other archaeological sites are evident. This is the case of rock-shelters in the surroundings of Neolithic or Chalcolithic settlements, where they exercised the role of the symbolic definition of dwelling areas. Another relationship is easily established with the highest geographic features in the areas used by the artists, especially if these hills are connected with springs. In sum, territory (in its subsistence aspect) and identity (culture and uses) seem to be the main factors in these representations.

The capability of megalithic art to determine chronologies and analyse diverse techniques is exceptional. The polychrome paintings show that this technique was known to the same groups who usually painted on other surfaces in a simpler way. There-

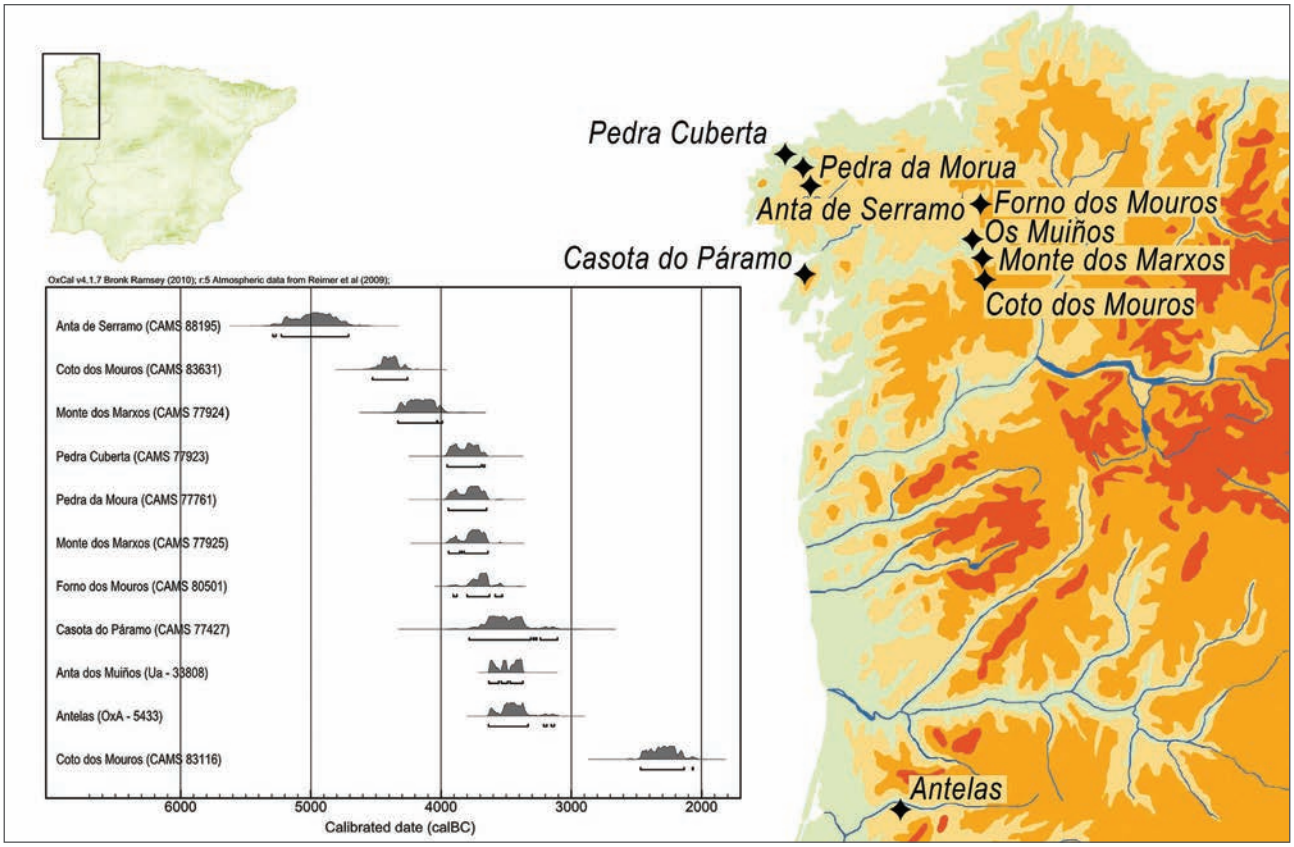


Fig. 4 - C14 dates in painted western Iberian megaliths, from Carrera and Fábregas 2002, adding C14 of Os Muiños megalith.

fore, this technique was displayed in the framework of actions intended to underscore the importance of the funerary discourse. The same is true of engravings. Megalithic art reveals the coetaneity of paintings and engravings and thus disproves the general greater age of the former technique than the latter, despite specific sequences in each monument (Bueno *et al*., 2015b; Bueno and Balbín, 2016b). The possibility of dating paintings directly offers a new way to determine the age of open-air art, in addition to proposing more precise dates for the megalithic monuments themselves (Bueno *et al.,* 2007b; da Cruz, 1995; Carrera and Fábregas, 2002) (Fig. 4).

We now know that the paintings in the Viseu dolmens are not unique. They are comparable with motifs in other parts of Iberia and Europe and suggest closer connections than traditionally supposed for these representations in all Europe (Bueno *et al.,* 2015a; Bueno and Balbin, 2016b).

As well as an elaborate geometric design in red, black and white, supported by engravings of various kinds which have been associated with representations of clothing in the style of those on decorated plaques, the orthostats exhibit scenes, especially in the frontal part of the chamber (Bueno and Balbin, 1992, 1994). Some of them are hunting scenes, perhaps commemorating hunting as the activity of ancestors. Anthropomorphs unusual in schematic art are the most commonly represented type in megalithic art. The close relationship between some of their formulas, especially among the types in the form of "skeuomorph" (Shee, 1981) in the north-west, can be used to establish identitary styles, as Leroi-Gourhan noted for the specialisa-

tion of symbols in Palaeolithic art (Bueno and Balbín, 2000, 2006b; Bueno *et al.,* 2014b; Jorge, 1997; Sanches, 2006, 2010) (Fig. 5).

Some classically schematic motifs have not only been confirmed in northern Portugal, as we know from the rock-shelters mentioned above, but their chronology has been situated in the early fourth millennium cal BC, which is currently the best-established age for schematic paintings in Iberia (Bueno *et al.,* 2007b; Carrera and Fábregas, 2002; Cruz and Santos, 2013).

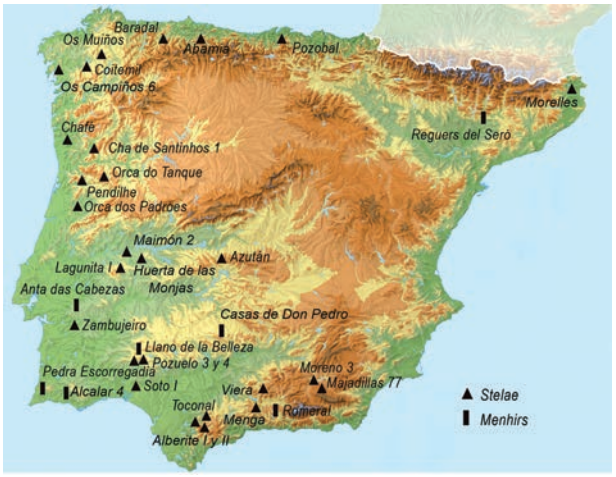
The use of white as a foundation for the application of red and black is widespread in the best preserved dolmens in the Viseu area, as in Galicia and other parts of the Iberian Peninsula. However, Portugal possesses the clearest examples of the pictorial use of white; i.e. motifs in white in the dolmens. This is the case of Mámoa da Cimo da Vila (Carrera, 2011, p. 213) reminiscent of similar cases both in rock-shelters in Serra de Sâo Mamede (Oliveira, 2016), and in some open-air ensembles in the south-west of Spain.

Another craft specialisation is clearly found in these funerary sites. The decorated plaques in the south, with a few examples further north, stand out as an identitary expression in the deposits. The existence of workshops and regionalisation in decorations was proposed some time ago, and one classic type, consisting of horizontal bands full of compartmentalised triangles, was noted as the most widespread geographically and chronologically. Thus, the painted plaque in the dolmen of Madorras (Gonçalves and da Cruz, 1994, p. 207), and in dolmen of Mamaltar de Vale das Fachas (Coelho, 1931) and the one engraved plaque from dolmen of Areita (Gomes *et al.*,1998) belong to this classic type which reaches the north of the Iberian Peninsula in open-air representations, which we have called the Peña Tú-type of "panel-steles". These hypotheses are increasingly convincing and support the idea of ancient crafts connected with symbolic production that, according to the dates of some painted orthostats, might be fixed in at least the late fifth millennium cal BC. The persistence of this type of product coincides with the persistence of megalithic art itself, generating powerful symbolic processes in Iberia, as at European sites

Fig. 5 - Decorated megalithic sites: Up: Antelas; Down, Antelas and Arquinha da Moura. Photos by F. Carrera.

(Bueno, 1992, 2010; Bueno *et al*., 1985; Bueno *et al.,* 2010a; Lillios, 2004; Thomas *et al.,* 2009).

However, if there is an aspect that singularises Neolithic graphic expressions in Portugal it is undoubtedly the concentration of large stones, many of them decorated. Menhir, cromlechs, steles and alignments signify that the west of the Iberian Peninsula is identical, graphically speaking, to Brittany, acknowledged as the original core area of Atlantic megalithism. These large stones were raised in the same period of time as schematic paintings and engravings were produced in the open-air, emphasising the variability of expressions of post-glacial art and, above all, the little importance of the frontiers drawn by classical historiography. The Atlantic and Mediterranean



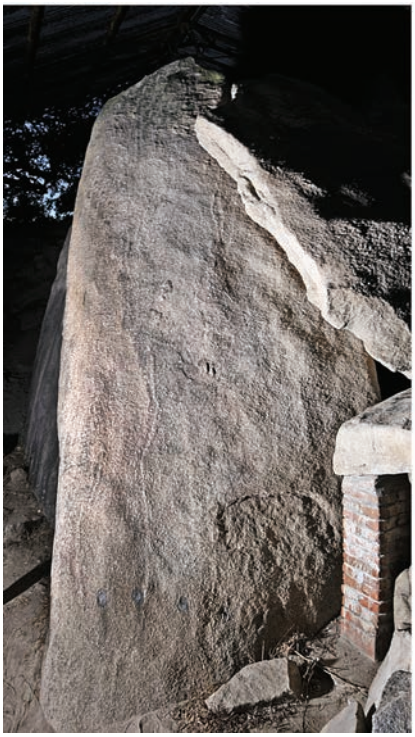


Fig. 6 - Sites with reutilised stele and menhir in Iberian Peninsula from Bueno *et al.,* 2014b. Reutilised slabs from Anta Grande de Zambujeiro. Photos by Rodrigo de Balbín.

worlds are found together in many of the Iberian symbolic ensembles dated in the Holocene, suggesting the possibility of similar situations in other parts of Europe.

Their chronology in the early Neolithic is an argument in favour of an Atlantic ideology, similar to that documented in northern Europe in the raising of decorated timbers in Mesolithic settlements or later also in the early Neolithic (Bueno *et al.,* 2007b; Calado, 2000; Calado and Rocha, 2010; Gomes, 1994; Gonçalves *et al.,* 1997; Jones, 2013; Oliveira, 1997, 2016; Rust, 1943). Staffs, axes, snakes and suns were engraved in low relief on anthropomorphic figures tending towards phallic forms which reproduce similar formulas to those in Brittany. The presence of paintings is more than likely and in fact they are still preserved in a few cases (Gomes, 1997).

Advances in the study of Iberian megalithic art have revealed another situation. Not only were menhirs and open-air steles used to build monuments in the first stages of the development of megalithism but this menhir-orthostat process was a constant throughout the time of dolmen-building. Some monuments and some necropolises were signalled by one or several menhirs, and an increasing number of examples in which menhir were used to seal the use of monuments are being documented: Palacio III, Peña de la Abuela, Anta de Soalheira, Anta Grande de Zambujeiro…etc (Bueno *et al.,* 2004, p. 688; Bueno *et al*. 2010b ; Soares and Tavares, 2010). In other cases, the menhirs were raised at exactly the same time as the monuments were built (Moreno and Delibes, 2007) (Fig. 6).

There was a quantitative leap in the use of menhirs in Chalcolithic constructions (Bueno *et al.,* 2014b; Bueno *et al*., 2015c; Gomes, 1994). Therefore menhir and dolmens were linked more closely than would be imagined in an "antecedent-derived" sequence. Long use-cycles are beginning to be identified in which menhir persisted until late times in recent prehistory (Rocha, 2003). This diachronic interpretation of menhir and dolmens attests the close symbolic connection between the first farmers and the megalith builders, as the massive stones, their human images and the attributes accompanying

Fig. 7 - Menhir upon tumulus of the megaliths: Granja de São Pedro (Idanha a Velha), Anta de Soalheira, Evora. Photos by Rodrigo de Balbín.

Fig. 8 - Foundation Stele of dolmen from Telhal, Arraiolos, from Bueno *et al.*, 2015b.

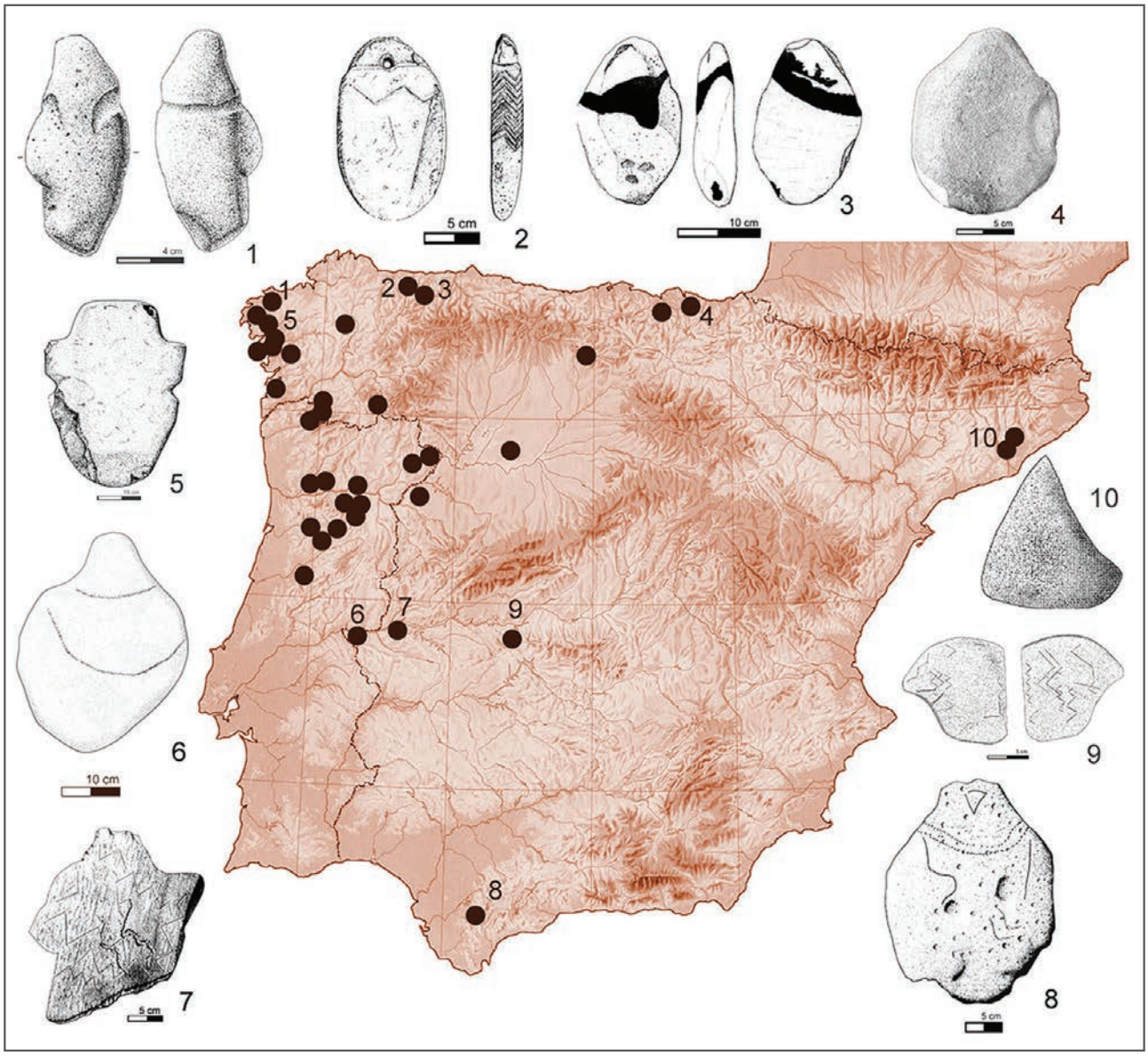


Fig. 9 - Antropomorphic figurines on open air areas of Iberian megaliths, from Bueno *et al.*, 2005.

them form part of the collective imaginary world in the full course of megalithism (Fig. 7).

Protocols applied to the study of orthostats, of their shaping, engravings and paintings have succeeded in reconstructing the biography of some monuments through the sum of the biographies of their orthostats, stones with their own significance and previous experiences (other dolmens, steles or menhirs). Many of these restorations are really reconstructions of monuments upon monuments, either because they were enlarged or because they were completely rebuilt. The evidence of repainting that has been dated (Carrera, 2008) and of engravings moved to positions in the monuments where they are not visible proves that the rebuilding was much more common, quantitatively speaking, than previously thought. The maintenance of these burial sites is another aspect that can be approached

through meticulous analysis of their decoration Bueno *et al.,* 2007, 2014b, 2015b, 2015c; Bueno *et al.,* 2015d, 2016b) (Fig 8).

If the walls reflect graphic discourses of great chronological significance, some portable anthropomorphic objects, mainly small figurines made from pebblestones of different forms, indicate possible mobility of some items from the visible areas. The external position of these statuettes, of which the most-studied example is Dombate, suggests their role in the exhibition of ancestors, as they may have been gathered together and placed in the most important monuments (Bueno *et al.,* 2008b). Portela do Pau, Lameira da Cima and Madorras are some of the best-known examples in the north of Portugal, while others may be found in the south of the country, as has occurred in Spanish areas (Baptista, 1997; Bueno *et al.,* 1999; Gonçalves and Cruz, 1994; Gomes, 1996) (Fig. 9).

Economic intensification versus symbolic intensification. Past as exhibition

The demographic and economic intensification observable in the late fourth and whole third millennia cal BC was characterised in specific symbolic factors that can be summarised as: long phase of paintings and engravings in the open air, reconstruction of monuments using old monuments, steles and menhirs, and raising armed steles. On one hand intensification in traditional symbolic production and on the other intensification in singular human images with their origins in megalithic mortuary structures. From the thematic point of view, the Chalcolithic has been interpreted as a time of ideological transition. Once again, the arrival of Eastern colonists has been used to explain the major role of depictions of the Goddess (representations with eyes) in connection with symbolic pottery and the imaginary realm associated with bell beakers (Gonçalves, 2016, p.157).

Several factors have now come together to propose a very different view. Megalithic decoration, rock-shelters with schematic paintings engravings in the open air, (Baptista, 1981; Bettancourt *et al*., 2012; Cardoso *et al.,* 2015; Gomes, 2000; Gomes *et al.*, 1994; Jorge, 1983; Santos, 2008), steles, statues and menhir (Bueno *et al.*, 2005; Jorge and Jorge, 1993; Vilaça, 2011), and symbolic pottery (Carrasco *et al.,* 2006; Garrido and Muñoz, 2000; Martin and Camalich, 1982), repeat a spectrum that is clearly documented from the early Holocene onwards, in associations of anthropomorph/sun and quadruped/ /sun. Some realities, such as the fact that Iberian bell beakers are the only ones with figurative motifs, should make us reflect on the capacity of the Iberian Peninsula to generate schematic codes that are widespread in Europe.

The noticeable increase in Chalcolithic sites with schematic paintings in the Almeria area is a reality in many less-studied parts of the peninsula (Martínez, 2006). A good example is the spectacular ensemble of oculate figures at Serra dos Passos in the north of Portugal (Sanches, 2016). The recent dating of calcite covering similar figures in the interior of the Iberia situates these ensembles in similar chronologies to the classic sites (Ruiz *et al.,* 2012), as S. Jorge (2000) demonstrated some time ago for the Chalcolithic settlements and manufactured products in northern Portugal. Is the same from the South (Valera, 2015).

However, the increasing evidence of statues in Portugal is unquestionable proof of two factors that help to define Chalcolithic social organisation: the capacity of exchange for the purpose of exhibition, especially in connection with bell beakers; and the intensification in singular representations. Statues with clear Mediterranean roots, together with others rooted in megalithism (central-western statues) reflect with their third millennium weaponry a chronology that is quite contemporary with the development of bell-beaker pottery (Balbín and Bueno, 2016; Bueno *et al.,* 2010a, 2011; Cruz and Santos, 2011).

Both aspects reiterate the ideological weight of mortuary sites, where the symbolic arguments of cohesion and power are concentrated. The construction of new pasts is placed within previous pasts. Megaliths upon megaliths, statues and ancient menhir added in later times, as well as the same signs on walls and rocks, reflect a systematic action of reworking the past in favour of specific social groups.

The role of human images in post-glacial gra-

phism finds in the representations on Late Bronze Age and Iron Ages steles the most advanced stage of a long process. The formulas engraved on free-standing objects associated with funerary sites are the best known, with the added interest that in Portugal their antecedents are very clear. The Alentejana steles (Gomes and Monteiro, 1977) reproduce the exhibition of weaponry like those that were being produced at a similar time on the *massi incisi* in the Alps or in some panels in Galicia. The difference lies in the apprehension of common symbols by social groups that connects them with their singular burials, indicating events of individualisation of great interest for an understanding of the late Bronze Age steles. A similar time for these steles and some of the statues described above is more than plausible, as we have argued (Bueno *et al.,* 2005, 2011).

The hypothesis that Bronze Age steles are a response to eastern influences has many nuances today. Especially as we learn more about previous examples that acted as a strong local foundation on which objects of display are added, from both the western Mediterranean and the Atlantic. A systematic situation that we can easily recognise in the movement of prestigious objects associated with megalithic mortuary displays, above all after the second half of the fourth millennium and particularly in the third millennium cal BC.

Perhaps what now remains to be determined is the territory over which these kinds of displays extended, as it has increased noticeably in the west (Alves and Reis, 2011; Vilaça *et al.,* 2011), including Galicia (Reboreda and Nieto, 2012), some inland areas (Chapa and Pereira, 2016) and as far as southern France (Bueno *et al.,* 2009b). This area cannot be separated from the one reconstructed from the mobility of such important objects in the European Chalcolithic as the decorated plaques (Bueno, 2010). These are common in the south-west, with evidence in the north-west including Galicia and part of the northern coast, and also in inland areas reaching the south of France.

Some other new aspects include the continuity of schematic paintings that we can still find on Iron Age pottery. Another is the diversity of Iron Age engravings that the meticulous research in the Côa area has brought to light and is being corroborated in the Sabor area (Luis, 2009; Neves and Figueiredo, 2015). Warriors on horseback, domestic scenes and a wide range of geometric symbols reminiscent of some European ensembles; a new facet still being studied that underscores the transcendence of the use of engraved and painted symbols in the open air and particular contexts, as one of the basic systems for materialising the ideology of the groups who created them.

Future lines of research for an interpretation of recent Prehistoric symbols

Prehistoric art has usually been looked on as a series of symbols mainly with religious significance. From the Palaeolithic "shrines" in caves to the Levantine sanctuaries, the images of human and animal figures and geometric forms were religious rather than a language or markers of territory. Of the intangible world rather than the quotidian archaeological context.

Only compact social and cultural fabrics can sustain well-structured codes that reveal common ideologies, the organised transmission of contents and methods of production, as one of the best tools for cohesion. The symbols shared by hunter-gatherer groups, like those in the Upper Palaeolithic, show their capacity to construct, exchange and enhance complex messages.The symbols formed part of their way of understanding the territory and the group, and codes were developed that stayed useful for nearly 40.000 years (Bueno and Bahn, 2015; Bueno *et al.* 2016c). An acknowledgement of the persistence and transformation of these systems in the course of recent prehistory appears reasonable with data currently available. No human group abandoned their symbolic references with the disappearance of the ice, and instead they probably intensified them, creating them on very different surfaces and in different circumstances, due to long previous experience both on the social and cultural level of their use and on the purely technical level (Bueno, 2016).

One fundamental aspect of the evidence of graphic activity is connected with the location of the groups, as it suggests a much larger territory that was

traditionally believed for the Holocene occupation of the Iberian Peninsula. Engravings and paintings as another form of evidence of occupation constitute an interesting support for a more integral archaeology, as shown by the documentation in Côa, on the Spanish Plateaus and in Spanish Levant.

Even in the absence of necessary nuances and observations, the hypothesis of a Style V as the continuity of Palaeolithic graphic expression and its gradual transformation, is now an increasingly forceful line of research. It is very likely that documentation in Italy, together with the Iberian and French research, will be able to propose more precise sequences with which to establish how long the classic canons of Palaeolithic art continued in use, the role of elongated animals filled with lines, together with smaller deconstructed modules, how the series of anthropomorphic motifs became increasingly important, and when the first evidence of schematic art appeared. In the current state of our knowledge, schematic art seems to convince as a transformation of contents after the Upper Palaeolithic, with the period of time of Style V the most coherent to establish some of its oldest formulas, especially the anthropomorphs (Bueno and Balbín, 2016a).

The wide range of surfaces used for Neolithic graphisms is a reality that implies different scales and techniques, as well as a diversity of contexts: quotidian, extractive, storage and mortuary. Paintings and engravings provide a full repertoire in which anthropomorphs, suns, quadrupeds and such geometric forms as lines and circles are repeated in multiple combinations. Their locations are connected with the positions of other forms of evidence (habitat, burials and extractive areas), creating networks of graphic markers that probably helped organise movements, uses and ownership of these areas. We now know of a large number of sites in the western area, and the supposed differences of megalithic territories, as areas with few painted symbols, can no longer be sustained.

The great representativeness of menhir, steles and statues opens an encouraging panorama to integrate these symbolic products in the general European framework, bearing in mind the significant role of the Iberian Peninsula in the development of some graphic models. The exchanges that characterise megalithic funerary displays increase in the third millennium cal BC, especially during the time of greatest use of bell-beaker pottery. The Iberian Peninsula must have played a fundamental role in the interactions of materials, ideas and even people, between the Atlantic and the Mediterranean. The position of Andalusia and western regions made them unavoidable areas for maritime transport. Similarly, the inland plateaus, easily accessible along the Douro, Tagus and Guadiana valleys, were terrestrial routes for the movement of products and ideas towards the plains of central Europe.

The large symbolic ensemble dated in more recent periods, the late Bronze Age and the Iron Age, well-documented in Portugal, reveals the long duration of execution of the community's symbols, both in the most visible locations in everyday activity and in the most hidden mortuary places. The Iberian Peninsula and especially the western regions, together with other rock art ensembles in Europe, confirm that late Prehistoric groups continued to employ graphic systems until the arrival of the Romans.

The technical, thematic, territorial and cultural connections we can establish for a diachronic analysis of these sequences in southern Europe constitute a rich source of studies on the identity, social and economic contents which remained to be explored more fully.

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Bodies in space and time: rethinking the Other in Later Iberian Prehistory

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Dedicated to the memory of Rui Boaventura

Abstract

Prior to the development of radiocarbon dating, the Other, from the eastern Mediterranean, was privileged with the role of stimulating the development of social complexity in the Iberian Copper and Bronze Ages. With the advent of radiocarbon dating and the recognition that many of the hallmarks of social complexity, such as metallurgy and megaliths, actually predated their supposed ancestors in the eastern Mediterranean, the Other faded into the distance. Now, with the development of methods, such as strontium isotope studies, a DNA, and dental morphology, and their application to the analyses of human populations in later Iberian prehistory, the Other is once again making its appearance as an actor in the play of Iberian social evolution.

How should we envision this Other and reframe their role in Iberian history? This paper employs a multiscalar perspective to explore the identification of the ancient Other and their possible relationship to social history and change during the Late Neolithic and Copper Age of the Iberian Peninsula. I draw from two projects and two scales of analysis: 1) excavations at the mortuary rockshelter of Bolores (Torres Vedras), and 2) investigations of populations living in the Sizandro Valley of Portugal.

Keywords

Alterity; the Other; identity; Portugal; Copper Age.

Introduction

This paper is a preliminary attempt to pose and explore a series of questions about the identification of ancient 'others' and their possible relationship to social history and change between the Late Neolithic and Copper Age of Southwest Iberia. It suggests ways that we may begin to productively incorporate and conceptualize new information on mobility and long-distance exchange in the study of dynamic period of the Iberian past.

During the 19th and early 20th centuries, prehistorians credited east Mediterranean colonists for the developments of the Iberian Copper and Bronze Ages. Many scholars proposed that the Copper Age resulted from the arrival of eastern Mediterranean colonists, who came to Iberia in search of metals and set up outposts (Siret, 1913). Some understood the Argaric as the consequence of an invasion of the 'bronze' people (Siret, 1913, p. 57-70) or the subsequent overthrow of the colonists by the indigenes (Blance, 1961). After archaeologists began applying

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radiocarbon dating in the 1970s, they increasingly recognized that material practices, such as megalith-building, predated their supposed exogenous models (Chapman, 1990, p. 35-53). As a result, they turned to local social or economic factors to account for the changes between the fourth-second millennia cal. BCE, and discredited migrationism and diffusionism as explanatory vehicles. Instead they replaced their models with a "radical autochthonism" (Aranda Jiménez *et al.*, 2015, p. 55).

With the development of analytical technologies to source raw materials and track the mobility of people, as well as new archaeological discoveries, the Other – both in the form of non-local individuals and exotic materials - is once again making its appearance in narratives of late prehistoric Iberian social history. Ivory objects found in Copper and Bronze Age contexts have long pointed to long-distance exchange networks, though, prior to the analyses of Schuhmacher *et al.* (2009), these ivory objects were presumed to be relatively few in number and to originate from sources (elephants, hippopotami) in North Africa and Egypt (Harrison & Gilman, 1977). Recent studies suggest that the exchange was larger in scale than imagined and that Asian elephants were sometimes used, as well as African and Pleistocene elephants. Schuhmacher (2013) has also pointed to the marked similarities between an alabaster stele from Mari, Syria, dated from the early third millennium BCE, and the biomorphic engraved stone plaques of Southwest Iberia. The Mari stele has the same ocular imagery and geometric designs sometimes found on the Iberian plaques, with the stags depicted on the stele only found (occasionally) on Symbolkera-mik, such as at Quinta do Anjo (Soares, 2003). With the trade in ivory, Schumacher suggests that it would not be surprising to find common symbols in Iberia and the Near East. Recent analyses of amber have shown that Baltic amber made it first appearance on the Iberian Peninsula during the Copper Age, although sources within the Peninsula were used since the Paleolithic (Murillo-Barroso & Martinón-Torres, 2012). The analyses of a suite of other materials used by third millennium BCE Iberians, including variscite (Villalobos García & Odriozola, 2016), oolitic flint (Nocete *et al.,* 2005), amphibolite (Lillios, 1997), rock crystal (Morgado Rodríguez *et al.,* 2015), cinnabar (Hunt-Ortiz *et al.,* 2011), gold (Murillo-Barroso *et al.,* 2015), and copper (Müller *et al*., 2007), reveal extensive inter-regional connections within the Peninsula, which not only brought people into contact with 'others', but likely made them an 'other' by virtue of their travel and interactions with these 'others'. Those trafficked objects and materials embodied specialized crafting knowledge, and, thus, by crafting these goods artisans transformed themselves into 'others' (Helms, 1993). Finally, those individuals or groups who acquired those goods – through exchange or theft – would have themselves been seen as a kind of 'other' who could harness these objects from distant lands that required esoteric knowledge to produce.

The bodies of non-local individuals recovered in Late Neolithic/Copper Age burial contexts in Iberia have also been identified, primarily through strontium isotope studies, and some sites appear to have particularly high percentages of these individuals. At Cova da Moura, for example, 4 of the 12 individuals sampled were found to be of non-local origin (Waterman *et al.,* 2014). At Perdigões, 6 out of the 8 individuals sampled were non-local (Hillier *et al.,* 2010), in marked contrast to the burial samples studied from Carcavelos and Estria, which had primarily local individuals. At other 'special' sites in southern Spain, similarly high proportions of individuals were discerned to be non-local. For example, at Valencina de la Concepción, 11 out of the 33 individuals sampled were non-locals, and at La Pijotilla, 5 out of 17 were non-local (Díaz-Zorita Bonilla, 2013, p. 265). The significance of these data is highlighted when compared to the results of work carried out at the Middle Neolithic site of Algar do Bom Santo. There, all 14 samples were "non-local or at least mobile for part of the year" (Price, 2014, p. 156). When compared to the Argaric site of Gatas, where all 33 individuals analyzed showed local values (Díaz-Zorita Bonilla *et al.,* 2012), it would appear that the mobility of people in southern Iberia decreased, overall. Nonetheless, some people were still highly mobile even in the Late Neolithic, and some burials of that time housed between 33 to 75% non-local individuals.

It is important to note, however, that strontium signatures do not tell us anything about the cultural geographies in which people lived their lives nor how they identified themselves. People with a similar strontium isotope ratio could have grown up in the same geological region, but self-identified as members of different social groups. If they lived in a large/homogeneous geological region, they may nonetheless have migrated, but that will not be observable in the strontium isotope ratio. Alternatively, in a region with a high level of geological heterogeneity, people who manifest different strontium isotope signatures could have grown up in close proximity to each other and shared similar social identities. Furthermore, a child of a migrant might still culturally identify as a member of a migrant population although they would generate a local strontium isotope signature (Knudson, 2011).

With the heightened recognition of the mobility of objects and people in southern Iberia during the Late Neolithic and Copper Age, and the realization that burial practices were more diverse than previously imagined (Valera, 2012), it seems an appropriate moment to consider the relationship between human mobility, material culture, and social identity, including difference and alterity. This intervention will help us consider the significance of these 'others' of the Iberian past without resorting to old diffusionist or migrationist arguments. There is a vast anthropological and archaeological scholarship that engages with these issues and related concepts, such as plurality, culture contact, hybridity, and ethnogenesis (Jones, 1997; Insoll, 2007; Voss, 2008, 2015; Card, 2013; Beaudry & Parno, 2013; Leistle, 2016, etc.). It is useful to consider, however, that much of this literature draws from colonial (or post-colonial) historical contexts in which alterity served to justify political domination (Said, 1978). In non-colonial or non-state contexts, alterity and social difference may have had different valences.

Nonetheless, a key point is that creating a self or group identity involves constructing a sense of otherness or alterity through a psychosocial process. To see one's self as a self or one's group as distinctive, one needs an Other. Sometimes phenotypic differences can be deployed as markers of alterity. However, alterity does not necessarily translate into biological difference, just as biological similarity does not necessarily translate into social identity. Class, religion, cuisine, language, occupation, experiences, and other factors can also shape people's notions of what makes them who they are and who they are not. For this reason, biological differences, such as non-local strontium isotope signatures, are not enough for us to propose alterity. Because of this complexity, alterity, as purposeful cultural contrast, has resisted archaeological treatment (Lau, 2012, p. 8).

For the purposes of this discussion, I take alterity to be agentive and reflexive. It is at the same time the outcome of social practice and the instigator of that practice. Thus, how can we as archaeologists translate these material 'facts' about non-local peoples and exotic things into lived social realities or social practices? How should we envision alterity in Iberian prehistory and reframe its role in historical transformations? How does biological difference map onto or intersect with spatial or material distinctions?

To address with these questions, I draw from two projects that engage with these questions at different scales of analysis:

1. Excavations at the mortuary rockshelter of Bolores (Torres Vedras) (Lillios *et al.*, 2010, 2014, 2015);

2. Investigations of burial populations of the Sizandro Valley of Portugal (Thomas, 2011; Waterman *et al.,* 2014; Lillios, 2015; Irish *et al.,* in prep.).

Excavations at the mortuary rockshelter of Bolores (Torres Vedras)

Bolores (Torres Vedras) is a semi-artificial rockshelter on the Sizandro River Valley, about 15 m from the Atlantic coast (Fig. 1). Following testing in 1986 (Zilhão, 1987), four seasons of excavation were conducted (Lillios *et al.*, 2015). The aim of this interdisciplinary project was to gain insights into the nature of social difference during the Late Neolithic/ /Copper Age through the analysis of material culture and human skeletal remains. Our team carried out spatial and bioarchaeological analyses, with particular attention devoted to identifying distinct individuals and analyzing their diet, mobility, and health.

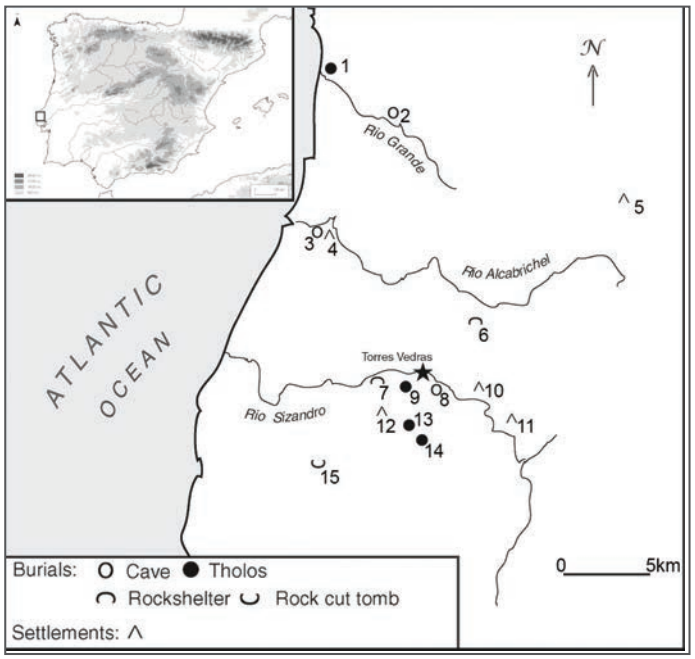

Fig. 1 - Location of Bolores (#7), and other Late Neolithic/ Copper Age burials and settlements in Torres Vedras region). 1. Paimogo, 2. Feteira, 3. Lapa da Rainha, 4. Pico Agudo, 5. Pragança, 6. Algar do Bom Santo, 7. Bolores, 8. Cova da Moura, 9. Charrinho, 10. Fórnea, 11. Penedo, 12. Zambujal, 13. Serra da Vila, 14. Barro, 15. Cabeço da Arruda. Map by Anna J. Waterman.

Bolores is a small tomb (about 5m x 3m) built into an outcrop of soft Jurassic sandstone, which ancient peoples divided into three burial chambers through the placement of large sandstone boulders on the shale bedrock (Fig. 2). They also placed flat limestone slabs on the surface within these chambers, and grouped their dead around these slabs (Fig. 3). We excavated approximately 70% of the site, and thus, we feel we have a fairly representative understanding of the practices that occurred at

Fig. 2 - Bolores. Photograph by Katina Lillios.

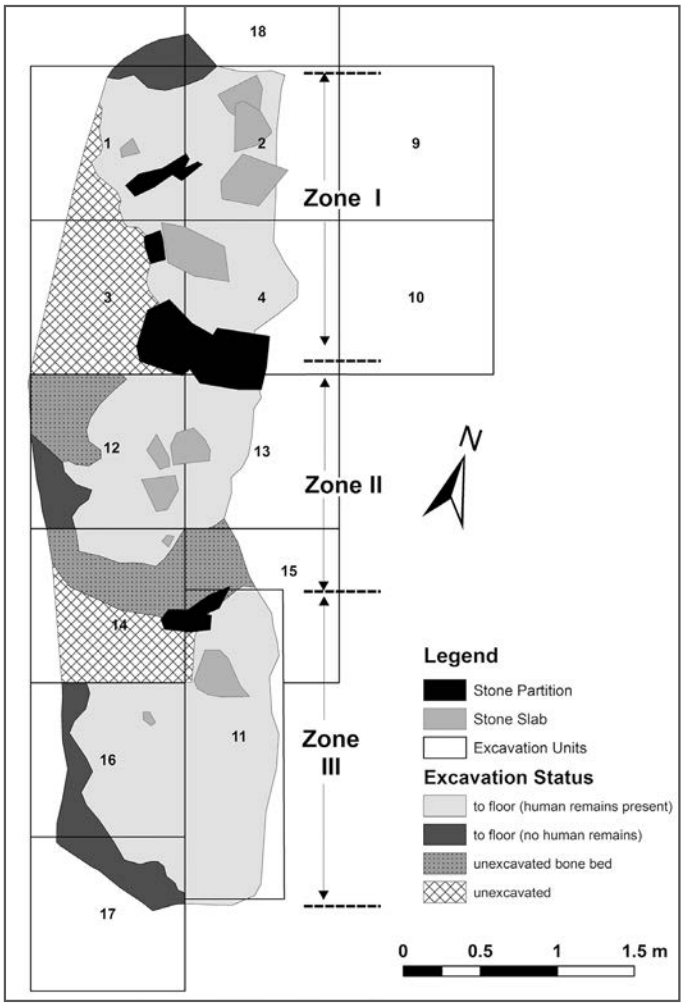

Fig. 3 - Plan of Bolores, showing stone partitions and slabs. Plan by Joe Alan Artz.

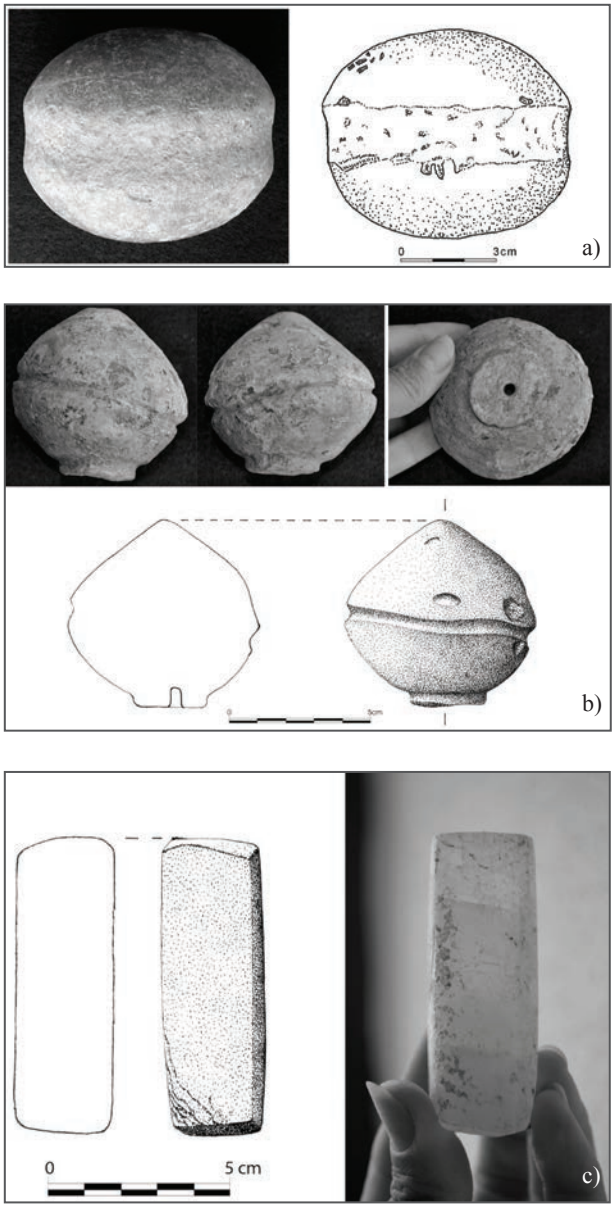

Fig. 4 - Some artifacts found at Bolores. A) Quartzite mace. B) Limestone 'idol'. C) Calcite betyl (BOl.16.2.M008). Drawings by Leonel Trindade, Photographs by Katina Lillios.

the site. We obtained eleven AMS dates from distinct individuals at Bolores, which dated the site between 2800-2600 cal. BCE, with a short period of use around 1800 cal. BCE. The MNI was 36, which included adults, adolescents, and subadults, who were found in all three zones of the site. That is to say, there was no spatial segregation of individuals by age group. Material culture was relatively scarce and consisted of stone and shell beads, stone 'idols' of various forms, flint blades, and ceramic vessels (Fig. 4).

As for many collective burials of the Iberian Late Neolithic and Copper Age, distinguishing between individuals at Bolores was difficult because of the fragmented and commingled state of the human remains, the result of repeated use of the site, including the movement of remains to the sides and back of the rockshelter to make space for newer bodies. Analysis of the bones using the methods of archeothanalogy (Lillios *et al.,* 2015, p. 121-141) revealed that most of the bodies were originally placed in the tomb as primary burials, most likely wrapped in some kind of cloth or container. However, a bone bundle was also found (representing the bones of at least two individuals), indicating the practice of secondary burial, as well. The individuals analyzed for stable isotopes (Sr, C, N, O), including both

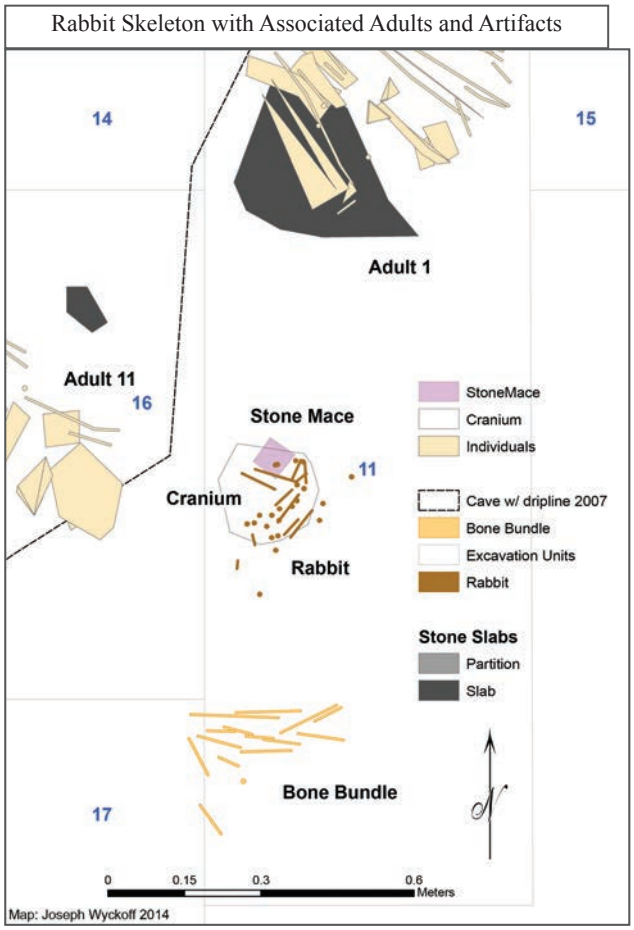

Fig. 5 - Bone bundle and child skull with rabbit skeleton. Plan by Joseph Wyckoff.

adults and subadults, all presented evidence for a fairly homogeneous population, at least in terms of diet (terrestrial proteins) and mobility (local) (Waterman, 2012, p. 233; Lillios *et al*., 2015, p. 86-90). The relative scarcity of material culture found at the site also contributed to an overall impression of homogeneity. The artifacts that were found appear to have been made from local materials, such as flint, calcite, limestone, shale, bone, ceramic, and shell.

It would be easy to aggregate the finds from Bolores and characterize its population as a homogeneous group of people buried over a fairly short period of time (perhaps 200 years, or so). However, a closer look at the practices involved in their burial suggests that social distinctions were being made at the site throughout its history. First, we need to consider why Bolores was constructed at all, when there was at least one other tomb in the Sizandro Valley - Cova da Moura - that had been in use and continued to be used at the same as Bolores (and did not require any labor to construct, and was about 3 km to the east). Were the people who buried their dead at Bolores not permitted to use Cova da Moura, or did they want to assert a distinctive identity from those buried at Cova da Moura (or both)? (Lillios, 2015) Some human remains were even found at Zambujal (Kunst *et al.*, 2014), the settlement located closest to Bolores and contemporary with the use of Bolores, which also begs the question: why were some individuals deposited at the settlement, while others found at a more 'formal' burial site? Some clues are available about the nature of the people buried at Cova da Moura, which I discuss in the next section.

Second, it appears that Bolores was originally used as a tomb without any chambers. Some human bones were found beneath one of the sandstone boulders used to divide the burial space, and thus, for a time, all the dead could 'rub shoulders' with each other. After a period of time, the chambers were created. The construction of these chambers was the result of some planning, as the chambers are very similar in area, and coordination of labor, as some of the stones would have likely required at least two to three able-bodied individuals to move and put into place.

Within each chamber, individuals of different ages and sexes were housed: adults, adolescents, and children, women, and men. Thus, age and sex distinctions do not seem to have been the most important marker at death. The dead, however, were grouped around flat stone slabs, suggestive of social groups within these chambers. The existence of such slabs in burial contexts is not unknown in Late Neolithic/Copper Age Iberia (see Gonçalves, 1999, p. 96; Navarrete *et al.*, 1992; Juárez Martín *et al.,* 2010), but they are fairly unusual. In general, the bodies at Bolores were found as primary burials, which were moved within the tombs to make room presumably for later burials.

Some individuals were treated in distinctive ways, however, and these seem to be concentrated in Zone III. In addition to the bone bundle, a child was buried with a rabbit buried beneath its head in

Zone III (Fig. 5). This was the zone in which all the stone idols were also found. Thus, at least spatially, the dead were distinguished, and certain individuals ritually treated in markedly different ways.

How do the material and spatial distinctions found at Bolores correlate with biological difference? In terms of overall diet and health, the population was largely healthy, although cases of arthritis were evident (Lillios *et al.*, 2015, p. 70-90). No significant differences in diet were found; their diet was based mostly on C_3 plants and terrestrial animals. Of the 19 individuals analyzed for strontium isotope ratios, all appeared to be local. Biological distinctiveness was more apparent in dental traits (Lillios *et al*., 2015, p. 91-94). Some of the individuals have dental traits that are more commonly found in North African populations (notably Cusp 7, Bushman Canine, and three-rooted UM2). What is striking is that while these individuals may have had a non-local ancestry, they appear to have spent their lives in the area. There are also suggestions that these individuals were spatially and materially marked, as their teeth were found in Zones I and II, but not in Zone III, where the unusual finds of the bone bundle, the rabbit/child burial, and the stone idols were recovered.

The archaeology at Bolores suggests a burial population that was relatively homogeneous in terms of mobility patterns, health, and diet. Some individuals appear to have had ancestors from North Africa, and they may have been spatially or materially marked, although they were found in association with individuals who do not appear to have had North African ancestry. What is most notable about the spatial/material patterning at Bolores is

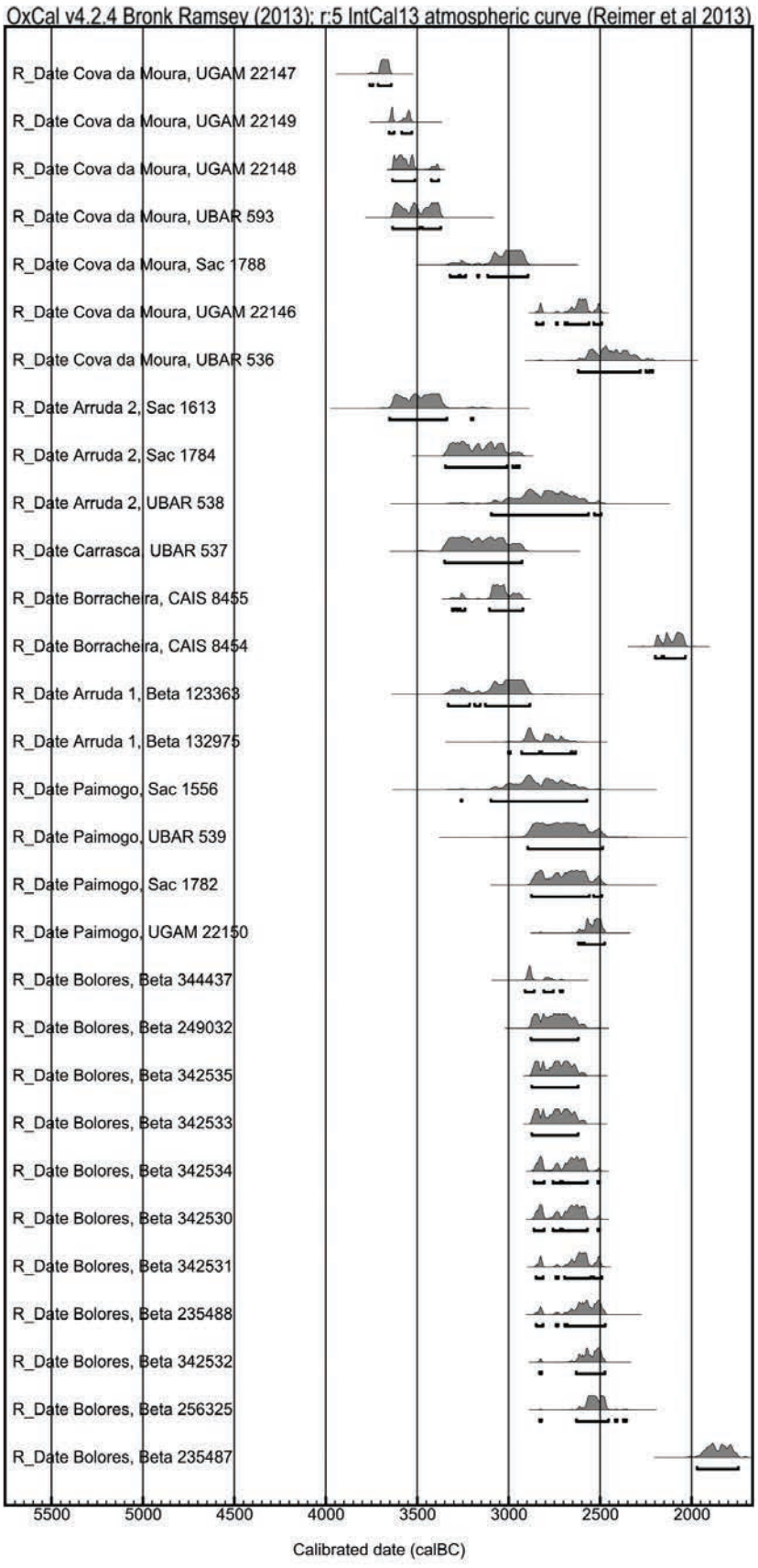

Fig. 6 - Radiocarbon dates for Sizandro Valley burials.

that the unusual grave goods, as well as ritual practices, appear to have been located in one zone of the site, suggestive of some kind of social distinction being made. Compared with other sites in the region, in terms of material goods (relatively few in number, some unusual idol forms), architecture (semi-artificial cave), and ritual practices (such as the placement of stone slabs), Bolores is distinctive. More importantly, the fact that Bolores were even constructed, requiring some labor, while there were other local burial sites available, does seem to indicate a conscious attempt to mark some kind of social difference. But it is difficult to speak about social difference by analyzing one site, particularly a small site like Bolores. A comparative study, which draws on multiple sites, is more meaningful.

Burial populations of the Sizandro Valley (3700-1800 cal. BCE)

Thus, in conjunction with the excavations at Bolores, interdisciplinary investigations of Neolithic and Copper Age burial populations of the Sizandro Valley were also undertaken (Fig. 1). These investigations included analyses of material culture, specifically beads (Thomas, 2011), bioarchaeological studies (Waterman, 2012; Waterman *et al*., 2014; Waterman *et al.,* 2015), and diachronic studies of practices involved in the construction of tombs (Lillios, 2015). Other than Bolores, the burials included in these investigations were excavated by other archaeologists, using different methods; thus, direct comparisons between these sites are often challenging. Nonetheless, comparative studies, for which there are a suite of radiocarbon dates for excavated sites in a river valley (or in neighboring valleys), provide a critical source of information on long-term history and change from both cultural and biological perspectives. They also provide a framework for interpreting individual sites, such as Bolores.

As elsewhere in the Estremadura, the dead of the Sizandro were buried in a variety of collective tombs – including caves, artificial caves, and tholoi (Kunst & Trindade, 1990). Cave burials are the oldest, beginning 4000–3700 cal. BCE in the Sizandro (Fig. 6). Later, around 3300 cal. BCE, artificial caves were constructed and used as burials. However, cave sites overlapped in use with artificial caves towards the latter quarter of the fourth millennium BCE, and, by 3000 cal. BCE, all tomb types, including tholoi, were in use by populations to bury their dead. Thus, a proliferation of tombs and tomb types developed over the course of the fourth and third millennia BCE in the Sizandro, as in the Iberian Peninsula as a whole (Lillios, 2015).

Bioarchaeological analyses were carried out to compare the diet, biological affinity, and mobility pattern of individuals housed in some of these burials, including Cova da Moura, Cabeço da Arruda I, Paimogo, Zambujal, and Bolores (Waterman 2012; Waterman et al. 2014; Irish et al. in prep.). Several burials, most notably Cova da Moura (MNI=90), were found to house individuals with significantly enriched delta $^{13}C_{ap}$ values without corresponding enriched delta $^{13}C_{co}$ values – which suggest they had access to C4 or CAM products (Waterman *et al.*, 2015). The Bolores population does not evidence access to these plants. Therefore, it appears that some dietary differences existed between Sizandro burial populations.

In order to assess the biological affinity of burial populations in the region, Irish compared up to 36 nonmetric dentals traits from the Arizona State University Dental Anthropology System (Scott & Turner, 1997; Irish *et al*., in prep.) for samples from three of the burials in the region: Cova da Moura, Paimogo I, and Bolores. These were the three sites that generated large enough samples of dental remains to allow for statistical analyses to be conducted. Analyses showed that the populations at Bolores and Cova da Moura do not differ significantly (MMD [mean measure of divergence] =.045; $p<0.025$), which is suggestive of short-term population continuity in the Sizandro valley (given that Cova da Moura is an older site than Bolores, though overlapping in date). What is of particular interest is that some dental traits at Cova da Moura (as with Bolores) are common in North Africans.

A comparative study of 55 individuals sampled from six Neolithic/Copper Age burials in the Torres Vedras region were carried out to discern variation in mobility patterns (Waterman *et al.*, 2014). Of the 55 individuals analyzed, only 5 were non-local, but 4 of these 5 came from one site: Cova

da Moura. A recently obtained radiocarbon date of one of the non-local individuals from Cova da Moura indicates that this person returned the oldest date we have for the site - approximately 3700 cal BCE (4820±25 BP; UGAMS 22147).

Biological difference is not in itself a marker of alterity. As purposeful action, alterity is marked through material, including spatial, means. Analyses of the material culture of these sites, however, also points to Cova da Moura as being particularly distinctive. It is the richest site in the region in terms of the number and diversity of burial goods (Thomas, 2011). For example, it has the largest number of engraved slate plaques in the area (22 plaques or plaque fragments). It also has the largest number of beads of any burial in the region (1536), and it has beads made from the largest diversity of raw materials, including ivory, variscite, and jet.

With a site used for such a long period of time as Cova da Moura and with so many individuals (at least 90), it is unfortunately impossible to know which goods were associated with which individuals. The aggregate picture we have, however, is of a site with a deep history, which was settled by people who appear to have had a North African ancestry and whose strontium isotope signatures appear to be pointing to a larger population of non-local individuals than other burials in the region, and who were buried with a large amount of exotic goods, particularly beads made of distinctive stones. The association of biological difference and material difference of the Cova da Moura population, in comparison to others in the area, is suggestive of migrant (or refugee) population that maintained distinctive material and spatial practices, such as placing slabs on the floor of the tomb and producing/using unusual stone 'idols'.

Discussion

The fourth-second millennia cal. BCE in southern Iberia was a time of important social transformations. This paper examines some of the material, spatial, and biological expressions of these transformations from a multi-scalar perspective, incorporating evidence for an individual site – Bolores, and comparing Bolores to other burials in the Sizandro Valley region. It also draws on an agency-based model of social practice. What is apparent throughout this long historic period is that Iberians engaged in many ways of marking difference – by constructing different forms of tombs, by segregating their dead within these tombs, and by acquiring and consuming distinctive or non-local raw materials.

How can we understand these practices? Why did people living in southern Iberia engage in this labor-intensive work of marking difference? One thing that is striking is that these practices emerged at the same time as increasing territoriality, in the form of constructing fortified settlements and ditched enclosures. I would like to suggest that there is a relationship between these patterns, as Whittle (1996) and Robb (2001) have argued for other regions of Europe in the Neolithic. That is, as people came to be increasingly tethered to places and landscapes (perhaps an outcome of economic lifeways), those who traveled (traders, migrants) and things that came from far afield (exotic goods), increasingly took on a powerful valence. Alterity can pose as both a potential threat but also a source of cosmological power (Helms, 1988). It is this engagement of 'self' and 'other' that triggered new forms of marking social difference, and not simply the movement of peoples from 'elsewhere'.

However we interpret the appearance of non-local peoples and things in the late Iberian prehistory, we must avoid the pitfalls of diffusionism and migrationism. We must work to better understand why people moved at all, and the factors – both the 'pulls' and 'pushes' - that might have activated this mobility (Anthony, 1990). And finally, we need to remember that social identity and alterity are, fundamentally, cultural constructions and the outcomes of social practices, which are not always isomorphic with phenotypic or biological markers.

Acknowledgments

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Social complexity in the third millennium cal BC in southern Portugal

Joaquina Soares*

In other words, what aspects of the production and exchange systems of
Copper and Bronze Age Europe
opened up the opportunity for effective long-term
exploitation by a ruling minority?
(Antonio Gilman, 1981, p.4)

Abstract

The starting point of this paper is the extensive archaeological fieldwork developed at the Chalcolithic fortification of Porto das Carretas on the left bank of the Middle Guadiana River (Soares, 2013). The well-preserved stratigraphy and correlated radiocarbon dates of Porto das Carretas enabled a new and deep insight into the third millennium cal BC, displaying environmental, economic and social transformations from the first to the second half of the millenium. Furhermore, the integration of the local scale into the regional, and supra-regional levels of interaction have created a key framework for the construction of a dynamic model of increasing social complexity (Fig. 1).

Thus, a proposal of a complex tribal organization of stable communities, during the first half of the third millennium cal BC is presented. They shared a kinship structure inherited from the megalithic societies and an economy based on intensive agriculture (cart, plow). This model of social organization began to collapse in the third quarter of the same millennium, mostly as a probable result of the development of craft specialisation, mainly metallurgy (copper-arsenic alloys). The control of metallurgy integrated in the European exchange network of prestige goods (Bell Beaker package) gave the elites a new source to amass significant wealth for their own immediate benefit, and also coercive power to impose an unequal and very hierarchical social structure similar to chiefdom.

Keywords

Middle Guadiana River Basin; Porto das Carretas; Chalcolithic; complex tribal organization; copper-arsenic metallurgy; exchange networks of Bell Beaker prestige goods; chiefdom.

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Introduction. The theoretical framework

We use the concept of social complexity as a process of social differentiation, associated with increasing inequality (Brumfiel, 1995; Hayden, 1995; Manzanilla, 1997; Mcguire, 1983; Sarmiento, 1992; Soares 2013, p. 63-67). Our purpose is to document the growth of social complexity in the non-stratified societies of the third millennium cal BC, trying to explain the emergence of complex hierarchical societies from the Late Neolithic onwards. The third millennium has been a proficuous laboratory to study complex non-state societies; this is due to the interface character of this period (Soares and Tavares da Silva, 1998; 2000) between the peak of the development of megalithic societies, which reached in some areas a very centralized social organization, possibly with a theocratic power structure (Bueno and Balbin, 1997; Gomes, 1997a-b; Soares, 2013; Soares and Tavares da Silva, 2010a) and the strongly hierarchical societies of the Southwest Middle Bronze Age (Soares and Tavares da Silva, 2016) or the stratified Southeast societies from El Argar onwards (Lull and Risch, 1995; Cámara and Molina, 2011).

In the southwest of Iberia, social stratification had been developed clearly in the Early Iron Age (Soares and Tavares da Silva, 2016), when the Late Bronze Age hereditary elites were integrated in the Mediterranean-Atlantic exchange system (Ruiz-Gálvez, 2009). This integration had been consolidated by the stable and long-distance Phoenician

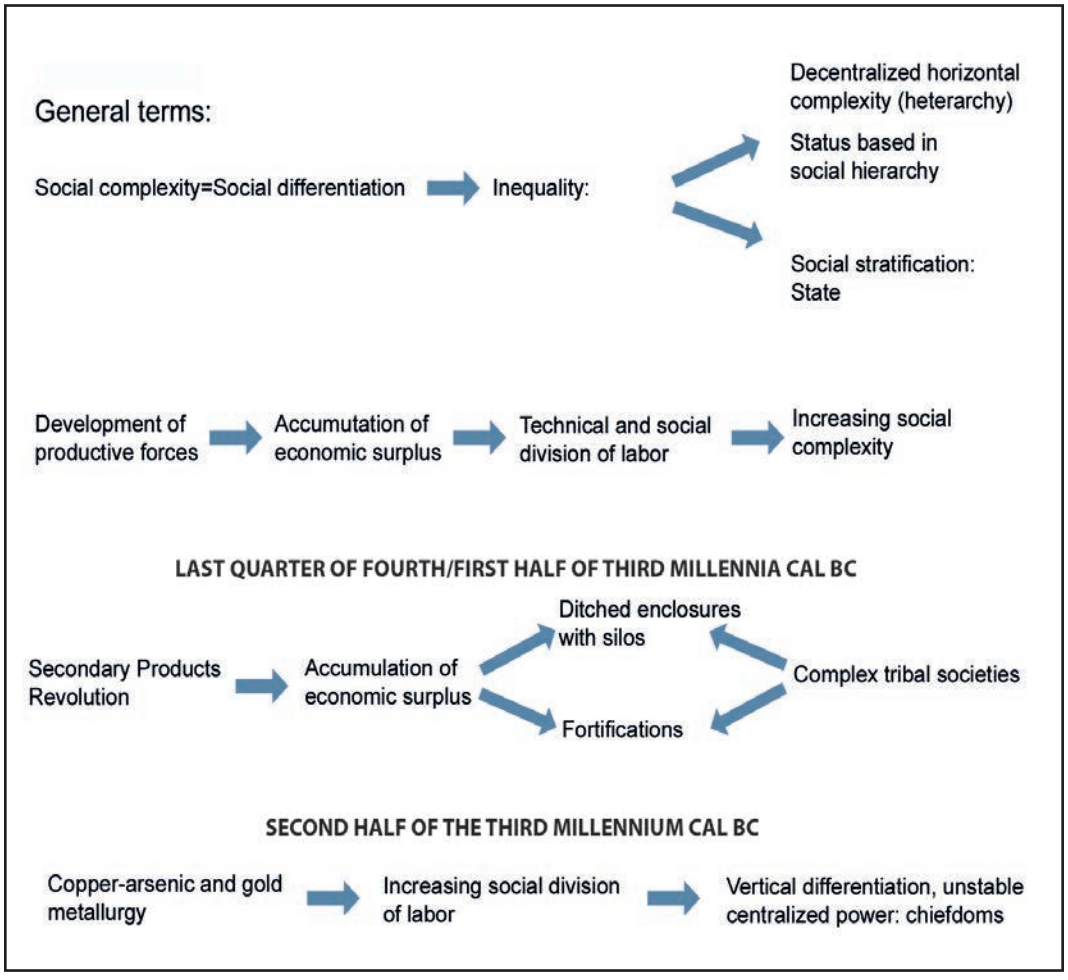


Fig. 1- A general framework of social complexity in the Late Prehistory of southern Portugal.

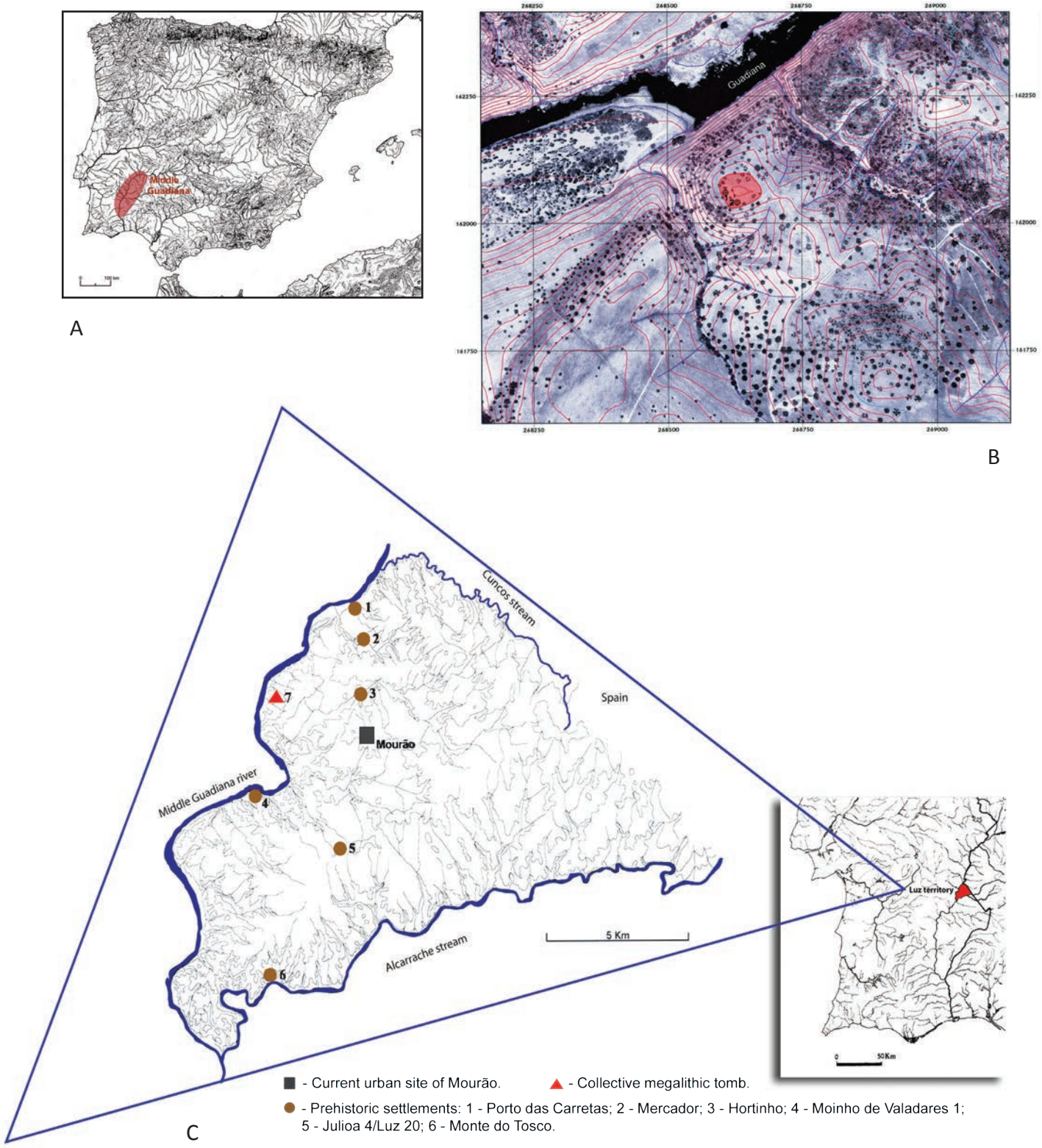


Fig. 2 - Geographical setting of the empirical record referred in the text. A- the Middle Guadiana River Basin in the Iberian Peninsula; B- location of Porto das Carretas (red); C- the local productive system of the Luz territory during the first half of the third millennium cal BC. Apud Soares, 2013.

maritime trade of foodstuffs, metals and luxuries (Mayet and Tavares da Silva, 2000). Indirectly, the upper class of the eastern early empires were ruling this interregional trade, reaping the major benefits for themselves (Aubet, 1994; Frank, 1993; Polanyi, 1957).

Social complexity has been recognized as a process internal to cultural contexts, resulting from the dynamics of the social system, its interaction with environmental changing factors, and its integration in supra-local/regional scales. Thus, the pathways to complexity can be quite diversified according to resources availability, power and political organization, forms of religiosity, history and sociabilities (Mcintosh, 1999). Despite the recognized multidimensional character of social complexity, in our approach, we are focusing attention on the major economic transformations – Secondary Products Revolution and metallurgical specialization – which this paper propounds to be the prime mover of the cultural change in the direction of stratification (Soares, 2013); the economic and technological innovations mentioned were quite powerful to provoke increasing rates in the volume of production and productivity.

In order to analyze the settlement systems from the end of the fourth to the first half of the third millennia cal BC we considered the anthropological concepts of unilocal/plurilocal clan and conical territory (Friedman and Rowlands, 1982; Sahlins, 1963). In the conic clan the affinity of primary segments of the tribal society is replaced by the growing hierarchization of lineages with unequal status legitimated by the genealogical distance from the mythic ancestor (Sahlins, 1963). The tribal internal tensions could escape through inter-tribal conflict zones. Furthermore, we take into account the multiple forms of transition between the horizontal political territories of simple segmented societies and the vertical political organization of State (Clark and Blake, 1999; Carneiro, 1981; Earle, 1991, 1997; Gailey and Patterson, 1988; Garrido-Pena, 2006; Hayden, 1995; Lillios, 1992; Mcintosh, 1999).

The Middle Guadiana River Basin is the geographical setting of the main archaeological record used in this paper (Fig. 2A) with a particular focus on Porto das Carretas (Fig. 2B), a small and permanent fortification (about 1 ha) directly overlooking the Guadiana on its left bank (Municipality of Mourão). In addition to its defensive function, farming was probably a core activity as indicated by material culture, faunal remains and botanic information (charcoal analysis), as well as by the availability of productive soils in its proximity (Soares, 2013; Tereso *et al*., 2011). Thus, the evidence we use for reading sociopolitical complexity came mostly from domestic contexts and settlement patterns (Fig. 1). Indeed, we put less emphasis on funerary practices. As a case study, we shall look at the material culture of Porto das Carretas (Tavares da Silva and Soares, 2002; Soares, 2013) but in articulation with a set of coeval (Table 2) Prehistoric settlements (Fig. 2C), representatives of a probable *community of practice* (Bourdieu, 1977, Wenger, 1999). The majority of these sites was object of the Alqueva rescue excavations program (Tavares da Silva, Soares, Mascarenhas, 1986; Soares and Tavares da Silva, 1992; Soares, 2013, Valera, 2013). This way it will be possible to achieve the probable connections between local, regional and even supra-regional scales (Hurtado 2003, 2008), and so it will be defendable to address social complexity in a relational approach.

In sum, we are trying to build a dynamic image of the wider social organization of the Middle Guadiana River Basin in the third millennium cal BC, through the selection of the two major economic transformations (SPR and metallurgical craft):

I - The Secondary Products Revolution (SPR), mainly plow agriculture (cart, plough and integration of bovine cattle in agriculture), occurred in the Late Neolithic of Iberia, about 3250-2900 cal BC (Sherratt, 1981, 1983; Soares, 2003, 2013). The SPR induced a remarkable acceleration in the growth rate of all the indicators of socio-economic development: productivity; volume of production; increase in population density and in social interaction. Sedentism was reinforced. The population got concentrated in macro-villages surrounded by ditches and appointed with silos and other storage facilities to keep economic surplus (Díaz-Del-Rio, 2008; Castro Lopez *et al.,* 2008; Zafra de la Torre

et al., 1999, 2010). Besides the function of settlement delimitation, these ditches would also operate as important reservoirs of water supply (Díaz-Del--Rio, 2003) and in some cases they could integrate hydraulic features possibly for irrigation programs in dry environments, like the Middle Guadiana Basin e.g. the site of Águas Frias (Calado, 2006) or the Middle-Upper Sado Basin e.g. the site of Porto Torrão (Rodrigues, 2015). In the external borders of each tribal territory, regardless of size, the permanent settlements were generally fortified. In the case of the supposed tribal territory of La Pijotilla to which Porto das Carretas would belong, the ecological border of Guadiana River was strongly defended on its left bank by a line of fortresses (Fig. 12) located close to the natural crossings of the river (downstream):

- San Blas - 16km to the north of Porto das Carretas, a powerful macro-village (about 30ha of residential area and 20ha of necropolis) with a very complex fortification system formed by an inner citadel, surrounded by a wall, a ditch and a harbor entrance defended by towers. An external wall was also identified with about 2km in length, reinforced by a ditch and bastions (Hurtado, 2004);

- the middle and small sized fortifications of Porto das Carretas, Monte do Tosco, Cerros Verdes, Outeiro de S. Bernardo (Bubner, 1979), Cerro dos Castelos de S. Brás (Parreira, 1983) and the surveillance site of Moinho de Valadares 1 (Soares, 2013, Figs. 42, 256).

In southern Portugal, the traction power of the bovine cattle that pulled the ploughs and carts was represented by engravings in the open-air rock art shrine of Escoural superimposed by a Chalcolitic fortified settlement (Gomes *et al.,* 1983, 1994), and by bone pathology in the metatarsal, observed on faunal remains of *Bos taurus*, namely from the site of Mercador, a satellite open site of Porto das Carretas (Moreno and Valera, 2006). Animal traction substantially increases the area a person can work with hoe and allows the cultivation of the thickest and most fertile soils, thereby increasing profit and lessening the fallow cycle.

The intensification of agriculture generates economic surplus, precondition for social division of labour (weaving, metallurgy, etc.), consequently providing economic sustainability not only for settlement stability and large communities, but also for substantial environmental changes and greater social inequalities caused by changes in the social relations of production.

As defended by Antonio Gilman (1981; see also Chapman, 1990), the intensification of subsistence clearly precedes the emergence of elites in the Late Prehistory of Iberia.

II - The metallurgical craft specialization on copper-arsenic alloys and gold was developed in the middle/third quarter of the third millennium cal BC. The metallurgical production increased social division of labour; metal artefacts brought new growth rates of productivity on overall subsistence production, and provided means for a more hierarchical political economy; power and prestige items such as weapons, adornments, means by which elites displayed their superiority, could be the engine factors for a large exchange system of prestige goods. Weapons, fine and exotic goods are associated to elite burials, like that of Quinta da Água Branca, Vila Nova de Cerveira, in northern Portugal (Armbruster and Parreira, 1993, p. 36-39; Fortes, 1905--1908) or the Amesbury tomb (Fitzpatrick, 2002), in England. Although our main focus is not the funerary space, for searching vertical differentiation in the archaeological record of the second half of the third millennium cal BC, it become indispensable to take into account the individual "aristocratic" graves, where the paramount chiefs were exhibited and deposited with prestige goods and weapons, signs of their political power. In the dawn of the Bronze Age we can observe that political action is organized through conspicuous vertical control hierarchies that can be seen as a social organization alternative to class societies.

Commodities in exotic raw materials and rare rocks (Schuhmacher, Cardoso and Banerjee, 2009; García Sanjuán *et al.* 2013) such as amber, ivory, ostrich eggs (Hurtado, *et al.* 2002), green stones,

and metals are also present in the central-places[1]of the third millennium settlement systems of southern Iberia, like Marroquíes Bajos (Zafra de la Torre *et al*., 1999, 2003), Valenciana de la Concepción or La Pijotilla (Hurtado *et al.,* 2002). Long-distance exchange of foodstuffs was beyond the capacity of the Chalcolithic transport system, not prestige goods. The specialized production of copper and gold as ideological values and coercitive items, mainly for display, burials and votive deposits, could have a strong social meaning that gave a central role to prestige goods exchange in the legitimation of political leadership (Kipp and Schortman, 1989). So, *the similar but different* (Case, 2004) Pan-European Beaker package (Guerra Doce and Liesau, 2016) is a reflection and agent of interconnections, alliances and allegiances at local, regional and supra-regional scales.

In short (Fig. 1), no single theory of the increasing social complexity in the path to social stratification can encompass the multitude of cultural circumstances (contingency). Therefore, admittedly a strictly structural analysis is made in the present article that provides two quite different forms of political economy in a diachronic approach that really requires the broadening of the empirical base. This attempt to explain the preconditions of the State formation assigns a central role, in sequential moments, to agriculture intensification (Soares, 2003) and interregional prestige goods trade (Brumfiel and Earle, 1987) related namely with the metallurgical specialization (Soares, 2013). Specialization and social division of labour (weaving, metallurgy, management and military activities) are inherent to the process of increasing social complexity and emergence of hereditary elites. Besides, once again we agree with A. Gilman (1981) when he argues that exploitation rather than management could be the main purpose of the political elites, and subsequently of the ruling classes.

1 - Central-place is used in this text as meaning the more qualified site of the tribal territory, from where decision-makers would act. For the seminal meaning of this concept see Christaller, 1966.

Chalcolithic settlement system: the Luz territory

The dam of Alqueva gave the opportunity to construct a database that represents the archaeological remains in a territorial perspective (Soares, 2013; Soares and Tavares da Silva, 1992; Tavares da Silva, Soares and Mascarenhas, 1986; Valera, 2013). The blue triangle of Figure 2C illustrates the hydrographic borders of the Luz territory which represents, in this theoretical model, the minimal area of an organized community: a *local productive system* with a shared geography (Figs. 2, 8-10, 12, 13).

In the Luz territory the first cluster of sedentary sites took place during the last quarter of the fourth millennium cal BC (Late Neolithic) (table 3):

i) the large ditched enclosure (about 5 ha) of Julioa 4 / Luz 20, located in the most fertile area of the territory (Tertiary deposits), with a panoramic view (Figs. 2, 8-9, 12-13; Table 3);

ii) a small surveillance site (Moinho de Valadares 1), on soils merely adequate for herding of sheep and goats, probably embedded in a more general agricultural strategy. Moinho de Valadares 1 is located on a cliff over the Guadiana River, the external western border of the territory (Figs. 2, 8-10, 12-13);

iii) a collective megalithic tomb with a polygonal chamber and a short corridor (Fig. 2C) (Oliveira, 2000).

In the Luz territory a demographic peak occurred in the Chalcolithic, first half of the third millennium cal BC (Table 3), as indicated by the great number of archaeological sites (Table 3): fortifications of Porto das Carretas and Monte do Tosco; the surveillance site of Moinho de Valadares 1; the main settlement of Julioa 4/Luz 20; Mercador and Hortinho, both small satellite sites of Porto das Carretas (Table 3, Figs. 8-13). All the Chalcolithic sites were interconnected; their resources were exploited in a very skilled way, with the aim of obtaining successful results for the whole local productive system (Figs. 8-13).

In the second half of the third millennium cal BC the previous local productive system of the

Luz territory had presumably collapsed. The demographic pressure over the landscape of Porto das Carretas seems reduced, enhancing the development of the Mediterranean forest with the growth of *Quercus faginea*, as well as the development of the riparian forest *(Fraxinus angustifolia*) (Duque Espino, 2004, Soares, 2013, tabes 7-8).

Population density had probably decayed along with the number of sites (Table 3). Seemingly, the main settlement of Julioa 4/Luz 20 was abandoned. Its coordination functions would be transferred to the nearby macro-village of San Blas. This site had reached its peak of demographic aggregation by the middle of the millennium, with about 30 ha of residential area and 20 ha of necropolis as already mentioned (Hurtado, 2004). A reduction of the dwelling spaces even in the macro-villages (Pajuelo Pando and López Aldana, 2016) seems to be a general trend, connected to deep social changes. At the end of the millennium the abandonment process would be evident, beside the occurrence of the dispersion of settlements (social fission) and power concentration in skilled trade-persons who were also connected with the control of metallurgy. This new economic sector (not regulated by the traditional peasant society) could be the starting point for the formation of the hereditary elites of the Bronze Age societies.

Stratigraphy and radiocarbon chronology of Porto das Carretas

The stratigraphy and radiocarbon chronology of Porto das Carretas showed two occupational phases separated by the occurrence of a large fire and subsequent abandonment. This hiatus probably lasted no longer than a century (Fig. 3, Table 1).

The first occupation corresponds to the first half of the third millennium cal BC and the second occupation, to the third quarter of the same millennium associated with Bell Beaker material culture (International Beaker-style pottery) and copper-arsenic metallurgy; both phases had been radiocarbon dated.

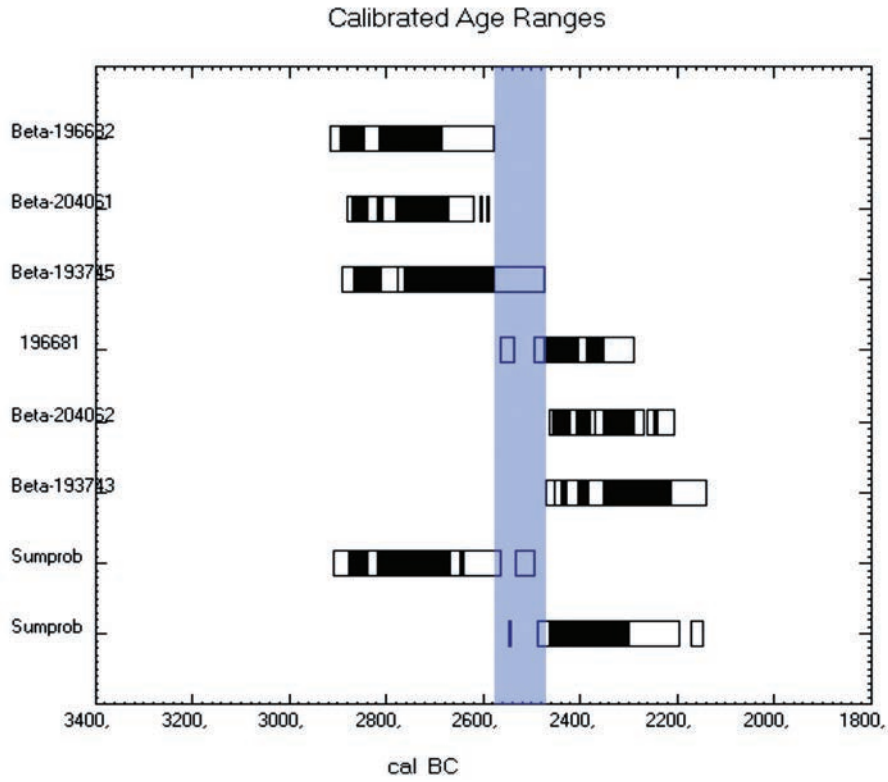


Fig. 3 – The stratigraphy and radiocarbon chronology of Porto das Carretas showed two phases of occupation separated by an abandonment caused by an extensive fire. Phase 1 corresponds to the first half of the third millennium cal BC, and phase 2 occurred in the third quarter of the same millennium.

Table 1- Radiocarbon dates of Porto das Carretas. After Soares, 2013.

	Ref. Lab.	Context	Sample	Date ^{14}C (BP)	Calibrated date (cal BC) 1σ	2σ
Phase I Chalcolithic	Beta-196682	Corte H, Sector XXXVI, Q.J13, C.4B2 (área de combustão)	Charcoal (*Pinus* sp.)	4200±70	2890-2670	2920-2580
	Beta-204061	Corte A, Sector XXXVI, Q.M8, C.4B2 (área de combustão)	Charcoal (*Vicia faba*)	4150±40	2870-2630	2880-2580
	Beta-193744	Corte A, Sector XXXVI, Qs.K-L/13-14, C.4B2 (área de combustão sobre piso de argila)	Charcoal (*Quercus* sp.)	4130±120	2890-2490	2930-2360
	Beta-193745	Corte A, Sector XXXVI, Q.L12, C.4B (área de combustão)	Charcoal (*Pinus* sp.)	4110±60	2860-2580	2880-2480
Phase II Bell Beaker Period	Beta-196681	Corte A, Sector XXXVI, Q. N-O/12-13,C.2B2 ("Torre" M13; Lareira D)	Charcoal (*Pinus pinea*)	3920±40	2470-2340	2490-2290
	Beta-204062	Corte A, Sector XXXVI, Q.M14, C.2B2 ("Torre" M13; Lareira B)	Charcoal (*Pinus pinea*)	3860±40	2430-2280	2460-2200
	Beta-193743	Corte A, Sector XXXVI, Q.L13, C.2B2 ("Torre" M13; Lareira A)	Charcoal (*Olea* sp.)	3840±60	2430-2200	2470-2130

Phase I (Chalcolithic): 2890-2580 cal BC at 1 sigma; 2920-2480 cal BC at 2 sigma. Program Calib 5.0.1 (Stuiver and Reimer, 1993) and calibration courb IntCal04 (Reimer *et al*., 2004). Hiatus: less than a century. Abandonment subsequent to an extensive fire. Phase II (International Bell Beaker phase): 2470-2200 cal BC to 1 sigma; 2490-2130 cal BC to 2 sigma.

Table 2 – Radiocarbon dates from the settlements of the Luz territory in the third millennium cal BC (Soares, 2013; Valera, 2013). Apud Soares, 2013.

	Site	Phase	Sample	Ref.	BP	cal BC 1 Sigma	2 Sigma
Second half third millenium	Moinho de Valadares 1	Aband.	charcoal	OxA-12715	3726±29	2200-2030	2210-2030
	Mercador	Phase II	human bone	OxA-11981	3664±29	2116-1973	2134-1926
			fauna	Sac-1900	3720±80	2271-1980	2399-1885
			fauna	Sac-1933	3790±60	2295-2138	2458-2032
	Porto das Carretas	Phase II	charcoal	Beta-204062	3860±40	2430-2280	2460-2200
			charcoal	Beta-193743	3840±60	2430-2200	2470-2130
			charcoal	Beta-196681	3920±40	2470-2340	2490-2290
First half third millenium	Moinho de Valadares 1	Phase II	seeds	OxA-12714	4167±30	2880-2670	2880-2620
	Porto das Carretas	Phase I	charcoal	Beta-193745	4110±60	2860-2580	2880-2480
			seeds	Beta-204061	4150±40	2870-2630	2880-2580
			charcoal	Beta-196682	4200±70	2890-2670	2920-2580
			charcoal	Beta-193744	4130±120	2890-2490	2930-2360

Table 3 - The main settlements of the Luz territory. They emerged in the Late Neolithic, reached its peak of demographic increase in the first half of the third millennium and declined in the second half of the same millennium.

2500 - 2000/ 1800 cal BC Bell Beaker Period/ Early Bronze Age	Porto das Carretas Phase II	Mercador Phase II	Monte do Tosco I Phase II			
2900 - 2500 cal BC Chalcolithic	Moinho de Valadares 1 Phase II	Porto das Carretas Phase I	Mercador Phase I	Monte do Tosco 1 Phase I	Julioa 4/Luz 20	Hortinho
3250 - 3000 cal BC Late Neolithic	Moinho de Valadares 1 Phase I	Julioa 4/ Luz 20				

Architectural reconstruction, economy and functional structure of Porto das Carretas

Phase 1. First half of the third millennium cal BC

Architectural features

A small fortification spanning 0,5-1 ha was built (Figs. 2B, 4-5), constituted of three lines of walls, with a large bastion and a tower, whose technique of construction and architectural plan are characteristic of the first half of the third millennium of the Iberian Peninsula. Many similarities can be found in other stone-walled settlements, although of different sizes and geographical settings, such as Castelo Velho (Jorge, 1998), Zambujal (Kunst, 2007; Sangmeister and Schubart, 1981), Chibanes (Tavares da Silva and Soares, 2014), Monte da Tumba (Soares, 1994; Tavares da Silva and Soares, 1985, 1987), São Pedro (Mataloto *et al*., 2007), Los Vientos de la Zarcita (Piñon Varela, 1995), the fortresses of Los Millares (Molina *et al.,* 2004; Monks, 1999).

The domestic structures of Porto das Carretas, namely huts, were built of perishable materials, except for hut "P4" which was constructed with a masonry foundation (0,60m in width) of schist and clay, with an external diameter of 5m. It was surrounded by a concentric courtyard, also defined by stone foundation, with an inner diameter of about 12 m (Soares, 2013).

Economy

The economy of Porto das Carretas in phase 1 (and its satellite Mercador) was based on an integrated and intensive agroforestry-livestock strategy of the territory exploitation oriented to the production of economic surplus (Soares, 2013, p. 350-360), complemented by hunting and riverine fishing. This variant of the *Mediterranean polyculture* agro-managerial model (Gilman, 1981) generated a special man-made landscape, referred to as *montado* (Soares, 1994, 2013; Stevenson and Harrison, 1992). The understory of the mediterranean forest of *Quercus rotundifolia* and *Quercus suber* (montado) was exploited for pig grazing, taking advantage of the huge production of holm oak acorns. *Sus domesticus* was the main species consumed

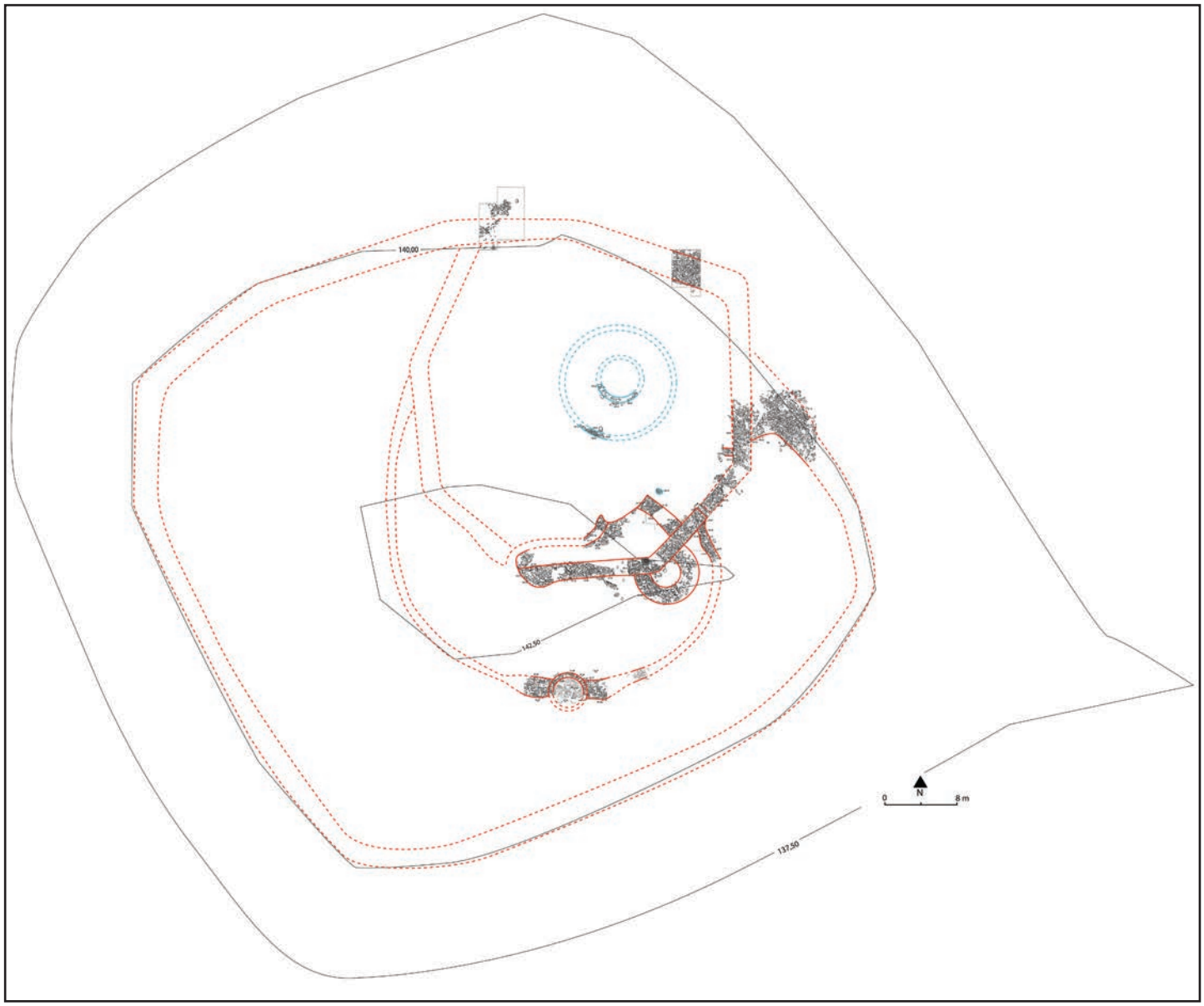


Fig. 4 - Plan of the fortification of phase 1 of Porto das Carretas, with 0,5-1ha with three lines of walls. In blue, the only hut (P4) built with a masonry foundation, surrounded by a courtyard also with stone foundation. First half of the third millennium cal BC. After Soares, 2013.

by Chalcolithic regional population. Regarding to capital-intensive subsistence technologies (plow agriculture, vine and olive cultivation and irrigation systems) in the Luz territory, cereals cultivation with plow pulled by bovine cattle was complemented by vegetables (*Vicia faba minuta*); fruit trees like olive (*Olea europaea*) and pear/apple tree (?) (*Pyrus* sp.) (Tereso *et al*., 2011) were at least manipulated.

In the Chalcolithic macro-village of Alcalar, from southern Portugal (Algarve), the preservation of a large set of macro-botanic remains completes the previous framework with the cultivation of cereals (*Triticum aestivum*, *Hordeum vulgare*), beans, peas (*Vicia faba*, *Pisum fabacea*), linen *(Linum usitatissimum)*, *Papaver somniferum* and vines *(Vitis vinifera L.)*. Alcalar, with about 20 ha of residential

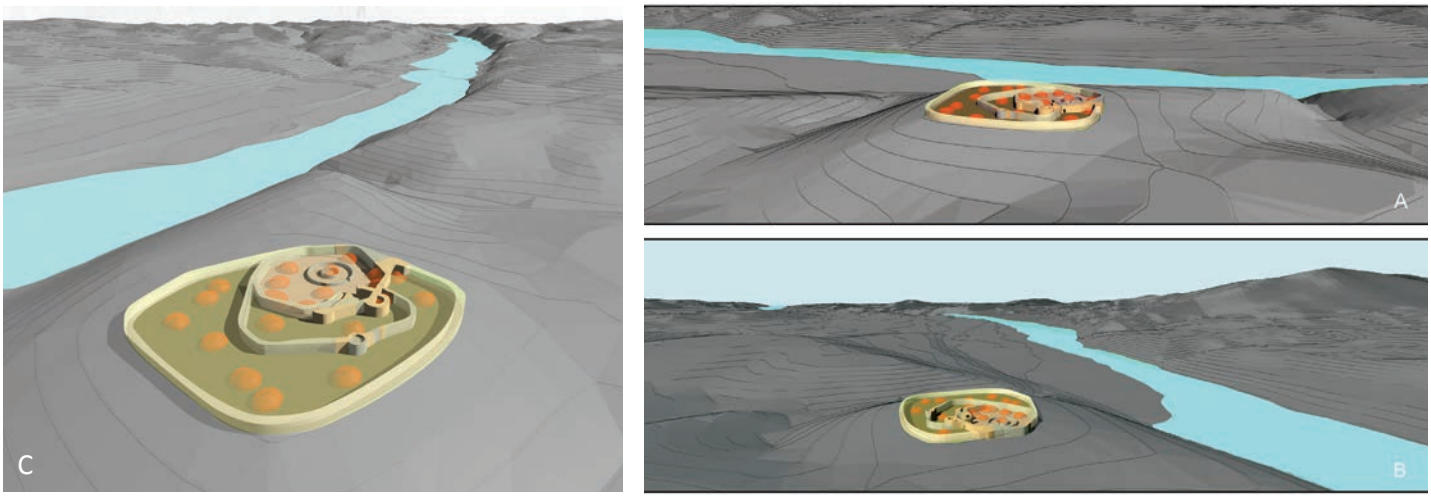


Fig. 5 -Architectural reconstruction of Porto das Carretas, phase 1, by António Alfarroba in Soares, 2013. A- southeast view; B-view from east to downstream; C- from Southwest to upstream. The two main locative factors were the good position for the surveillance of the Guadiana River and the proximity of fertile soils.

area and necropolis (Morán, 2014), was probably a central-place of a politically organized territory. Its monumentalized necropolis, namely the very impressive *tholos* 7, had been built at the beginning of the Bell Beaker phase. It could not only have funerary function but also religious purposes (Morán and Parreira, 2004).

Functional structure and social relations

The functional structure of the innermost sector of Porto das Carretas (Fig. 6) did not exhibit evidence of wealth concentration. Only elements of millstones were collected in the more elaborated hut (P4). These lead us to believe that P4 probably was a granary whose content has been saved before the fire. The weaving was the only craft activity that showed capacity for spatial segregation (Fig. 6) in relation to the remaining domestic chores. Zones J and I were dedicated to it. In Zone I there was, among a concentration of loom weights, an engraved schist plaque, with a characteristic textile decoration pattern, that can be interpreted as an expression of a close rapport between weaving and the ancestor megalithic feminine divinity associated with death (Fig. 7).

Interaction networks

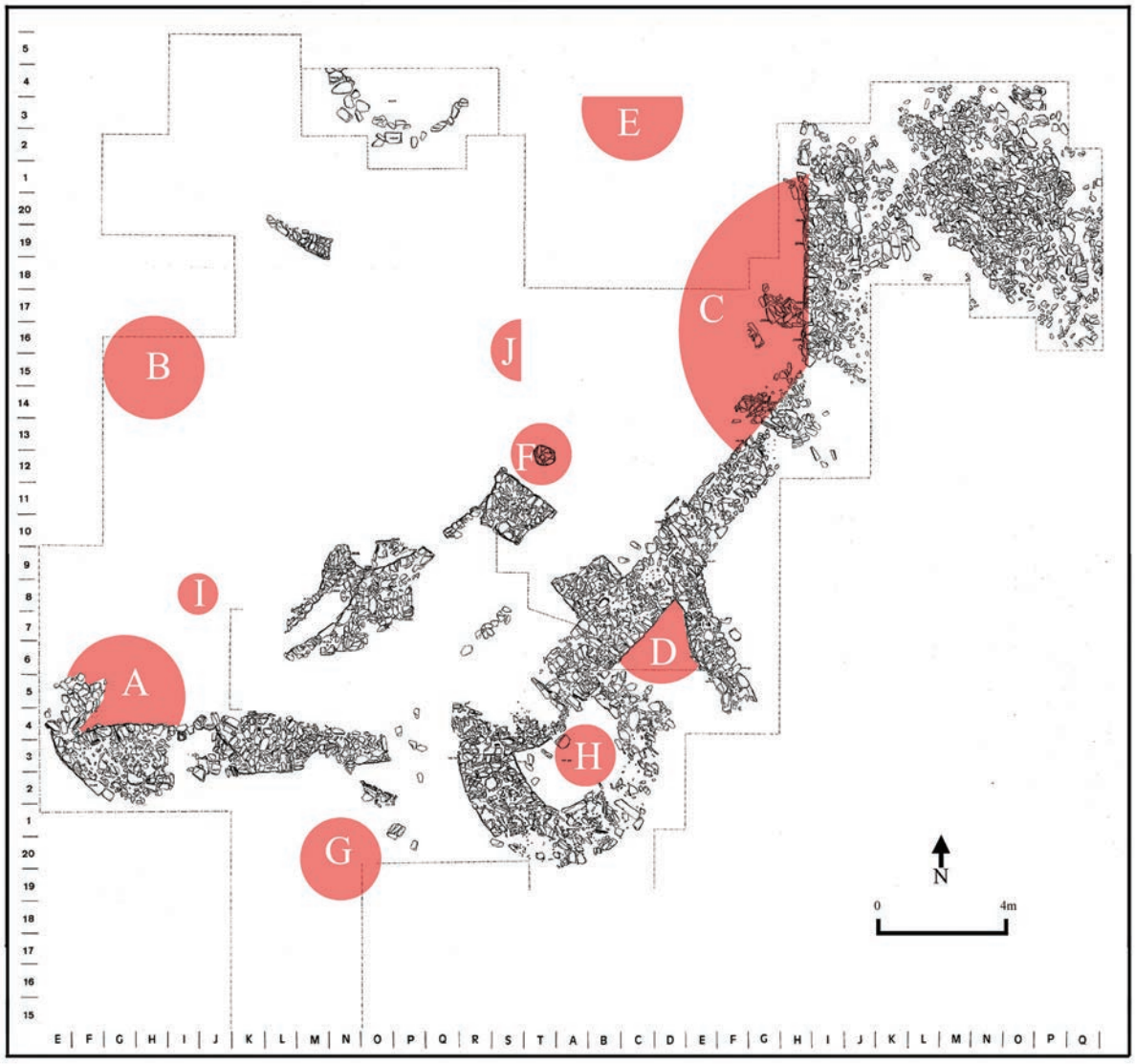
As already referred, Porto das Carretas couldn't survive on its own. It acquires significance and importance when integrated in the local productive system of the Luz territory.

The intervisibility network (Fig. 9), economic scope and ranking size of each site as well as their interdependence in relation to critical resources allow the hypothesis of a hierarchical settlement system where inequality was masked by mechanisms of reciprocity and solidarity inherited from the megalithic kinship structure. It had been possible to distinguish a settlement hierarchy with 3 decreasing levels:

- 1) the major site (a ditched enclosure) which should control the local productive system – Julioa 4 / Luz 20 (Becker and Valera, 2012; Valera, 2013);

- 2) sites that had coercive functions – the fortifications of Porto das Carretas and Monte do Tosco;

- 3) small and open sites that were satellites

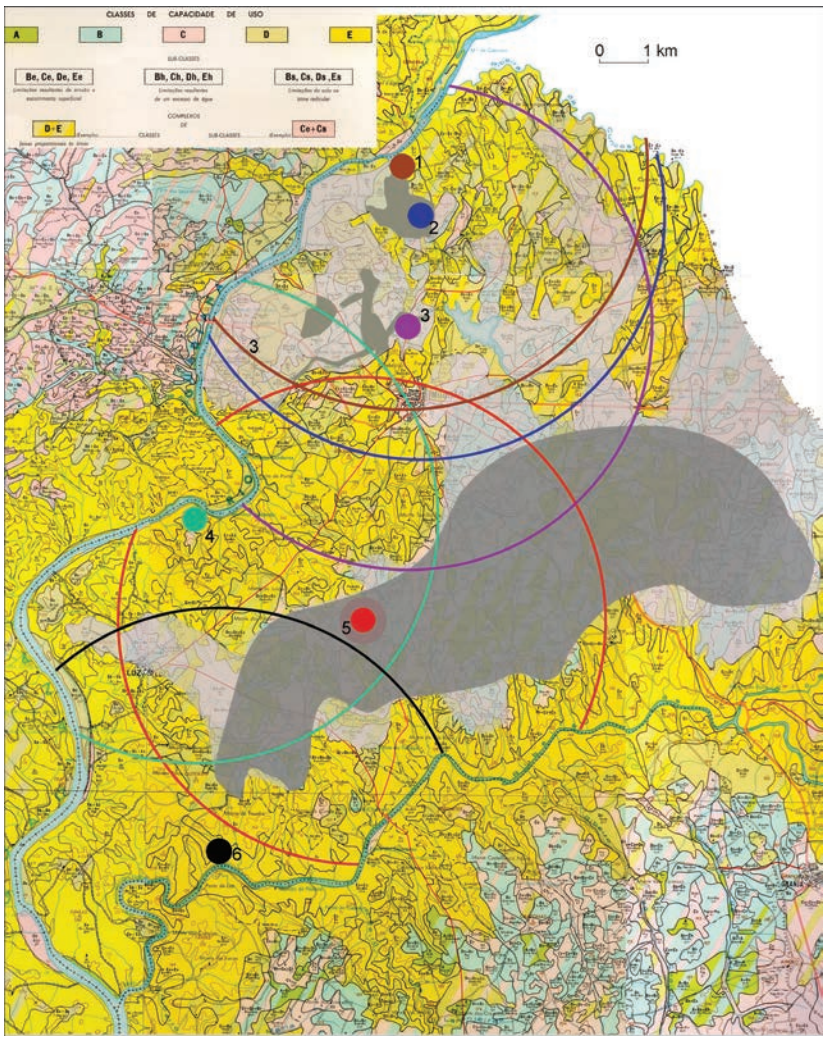


Materials	Concentrations									
	A	B	C	D	E	F	G	H	I	J
Burnt clay with branches impressions	+++	+++	+++	+++	+++	+	?	-	++	+
Curated lithic flaked industry	-	++	+++	+	-	+++	-	++	-	-
Polished and pecked lithic industry	-	-	+++	++	+++	-	++	-	-	-
Millstones	-	+	+++	-	+++	+	-	-	-	-
Pottery: plates and bowls	++	++	+++	+	+++	++	+++	+++	-	+
Pottery: hemispherical bowls	+++	+	++	-	+	++	++	++	+	+
Pottery: storage pots	+++	+++	+++	-	+++	++	++	++	-	-
Loom weights (plaques)	+++	++	+++	-	-	+	+	-	-	-
Loom weights (*crescentes*)	+++	+++	+++	-	+++	++	-	-	+++	+++

- Absent or with very low concentration
+ Weak concentration
++ Moderate concentration
+++ Strong concentration

Fig. 6 - The functional structure of the innermost sector of the Porto das Carretas fortification. Phase 1. The typology of pottery is presented in Fig. 18.

Fig. 7 - Porto das Carretas. Phase 1. Engraved schist plaque and loom weights (plaques and *crescentes*).



Upper ranked agricultural soils adequate for cereal cultivation (classes A+B).

Middle ranked agricultural soils (class C).

Low ranked agricultural soils, suitable for cattle herding (class E).

Archaeological sites:
1 - Porto das Carretas; 2 - Mercador; 3 - Hortinho; 4 - Moinho de Valadares 1; 5 - Julioa 4/Luz 20; 6 - Monte do Tosco1.

Fig. 8 - SROA map of land use capacity classes. The 5 km ratio circles used in the site catchment analysis (Higgs, 1975) illustrate the interconnections of the settlements inside the local productive system of the Luz territory. After Soares, 2013.

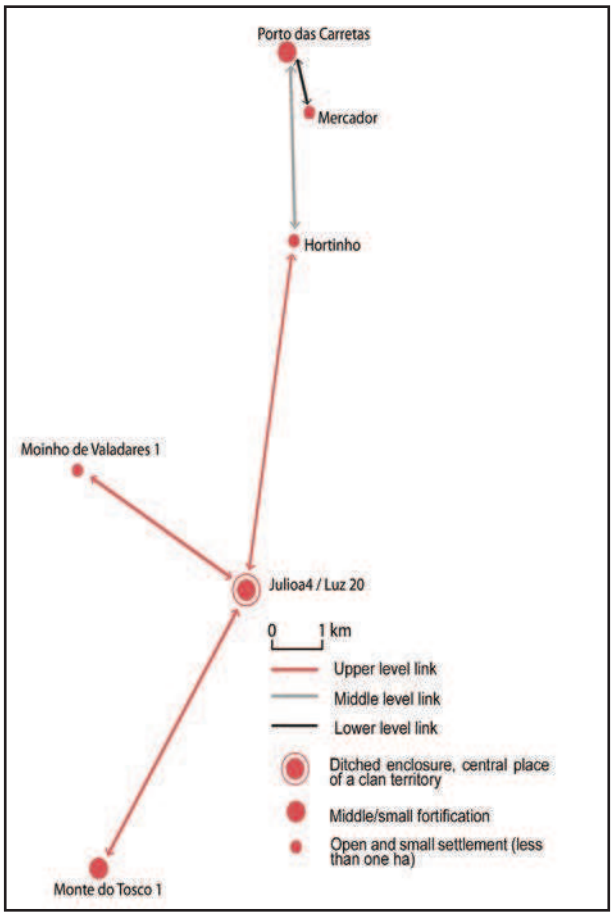


Fig. 9 - Settlement hierarchy of the Luz territory in accordance with the intervisibility and size ranking networks:
upper level – the Julioa 4/Luz 20 ditched enclosure that controlled the local productive system;
middle level – the fortifications of Porto das Carretas and Monte do Tosco;
lower level – the small and open sites of Mercador and Hortinho, satellites of Porto das Carretas; the surveillance site of Moinho de Valadares 1, even in direct connection with Julioa 4/ Luz 20.

of those of the second level. As theoretically expected, Porto das Carretas, Mercador and Hortinho shared a strong intervisibility (Fig. 10).

The local productive system of the Luz territory could correspond to a segment of a tribal society (Figs. 12, 13), whose main centre would be located at La Pijotilla (Badajoz), the largest macro-village known in the Middle Guadiana River Basin, with about 80 ha, located in the most productive soils of the region, from the alteration of Miocene deposits (Hurtado, 2003, 2008).

General remarks

During the transition to the Chalcolithic, the megalithic society incorporates substantial productivity gains as a result of the SPR; the surplus accumulated could support the intra-social division of labour (weaving and defense) and inter-social division of labour (socio-territorial division of labour), organized in estuarine areas with an agro-maritime economy of shellfish gathering, fishing and salt exploitation in a traditional domestic mode of production (Soares, 2001, 2008, 2013b), peripherally integrated in the hegemonic Chalcolithic mode of production (Soares, 2013, p. 7, table 94).

The Chalcolithic society could achieve the coordination for political action, as the previous megalithic organization, by hypothesis, through assemblies, consensus, local solidarity, communal rituals and collective graves. The political power could be shared among multiple *loci*, preventing the growth of hierarchy and State formation.

Segmentary lineages or tribal systems have two components of complexity archaeologically expressed:

In the more open configuration, peasant communities with free access to communal resources (communal land) dispersed over the territory; the political integration would be probably realised by fertility and ancestor rituals. A particular kind of polity based on ritual power and religious authority could mobilize a significant amassing of labour and wealth for communal purposes, preventing social fission in a scenario where intra-social coercion or military control were probably not quite effective.

In these kin-based societies the other component was the macro-village in which a large population aggregation, central functions of religiosity, social coordination, craft specialization, trade and other networks of interaction, generated conditions for increasing complexity and inequality. To the macro-villages would converge tribute paid by segments dispersed over the territory.

Progressively, increasing contradictions might occur related to the raise of inequality in the core/periphery relations of each tribal redistribution system. These relations, pretending to be submit-

Fig. 10 - Porto das Carretas, Mercador and Hortinho shared a strong intervisibility. Porto das Carretas and Moinho de Valadares 1 have a strategic position over the riverine border. The Prehistoric site of S. Cristóvão (not yet excavated) in the right bank, looking to the megalithic necropolis of Reguengos de Monsaraz, seems not linked to the river. Its study is outside the scope of this work. Map of soil classes (A-E). Adapted from António Alfarroba in Soares, 2013.

ted to a communitarian/parental ideology, could in practice include unequal distribution of extra goods, in favor of the centre of each subsystem. To a certain limit, internal stresses had probably been directed to the inter-tribal conflict zone. Typical border fortifications (Cara Barrionuevo and Rodríguez López,

Fig. 11 –Visual control of the Porto das Carretas fortification over the Guadiana river (downstream). After Soares, 2013, Fig.52, p.106.

1989) like the ones in the tribal territory of La Pijotilla in the Middle Guadiana River Basin (Hurtado, 2003, 2008; Soares, 2013) could serve not only for military purposes, but also as "gateways" to control the circulation of commodities and people between the competitive neighboring territories of Porto Torrão extended west towards the Atlantic coast (Valera and Filipe, 2004; Rodrigues, 2015), and Valencina de la Concepción, eastwards in the Guadalquivir Basin (Costa Caramé *et al*., 2010).

In sum, we propose, for the first half of the third millennium cal BC, a complex tribal organization in which mainly status and horizontal inequality (heterarchy) could be hidden in the kinship structure inherited from megalithic society. The theoretical model introduced here gives coherence to the Luz territory when integrated in the whole tribal context. This was presumably managed by the macro-village of La Pijotilla (Figs. 12-13), which would accumulate surplus coming from the exploitation of peripheral social segments. It is possible that uneven wealth distribution and social inequality were imposed by psychosocial pressure inside the kinship structure rather than by coercive means. The inter-tribal sphere could have been the escape valve for conflict.

Phase 2. Third quarter of the third millennium cal BC. Bell Beaker International Group. Collapse of the local productive system of the Luz territory

Architectural features

After the abandonment of Porto das Carretas that may have lasted about a century, in consequence of an extensive fire, a rebuilding started to take place on the site. A set of three monumentalized and terraced towers, three huts and a metallurgical furnace had been constructed in an open area higher up (Figs. 14-16).

The central tower, N7, has an internal diameter of 5.70m; its walls are 0.90m and 1.5m wide. The best similarities may be found in the tower of Miguens 3, on the opposite bank of the Guadiana, and in the subcircular tower of Monte da Tumba, with 12m of external diameter; all of them were built in the Bell Beaker period (International group).

The architectural features of this phase can be interpreted as a metaphor for the emerging social organization. The communitarian enclosure has

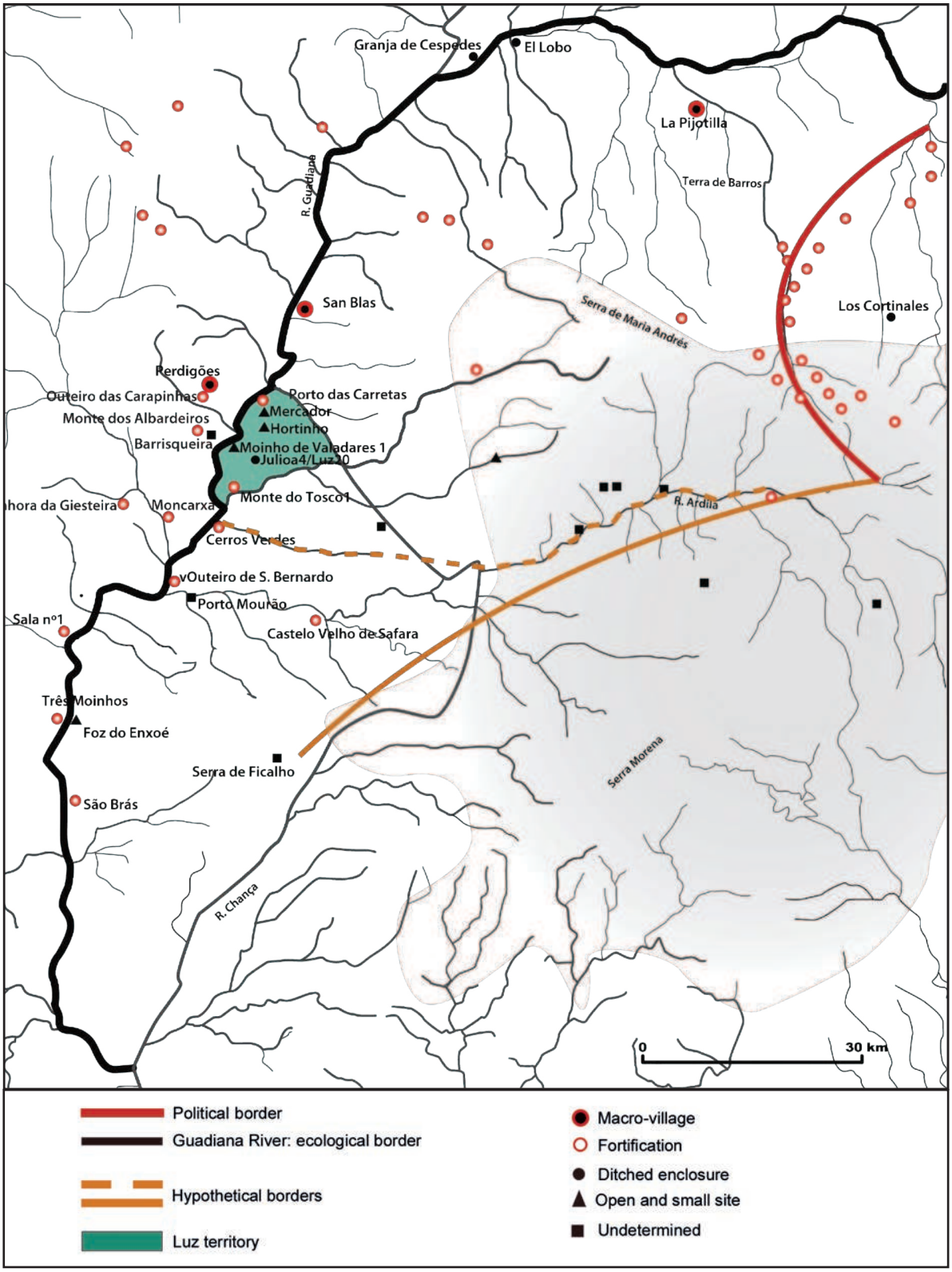


Fig. 12 –Reconstruction of the hypothetical tribal territory of La Pijotilla. The Luz territory (green) draws its importance when placed in the whole tribal context.
Map sources: Hurtado, 2008; Enríquez Navacués, 2007; Soares, 1992; Soares and Tavares da Silva, 1992; Soares, 2013.

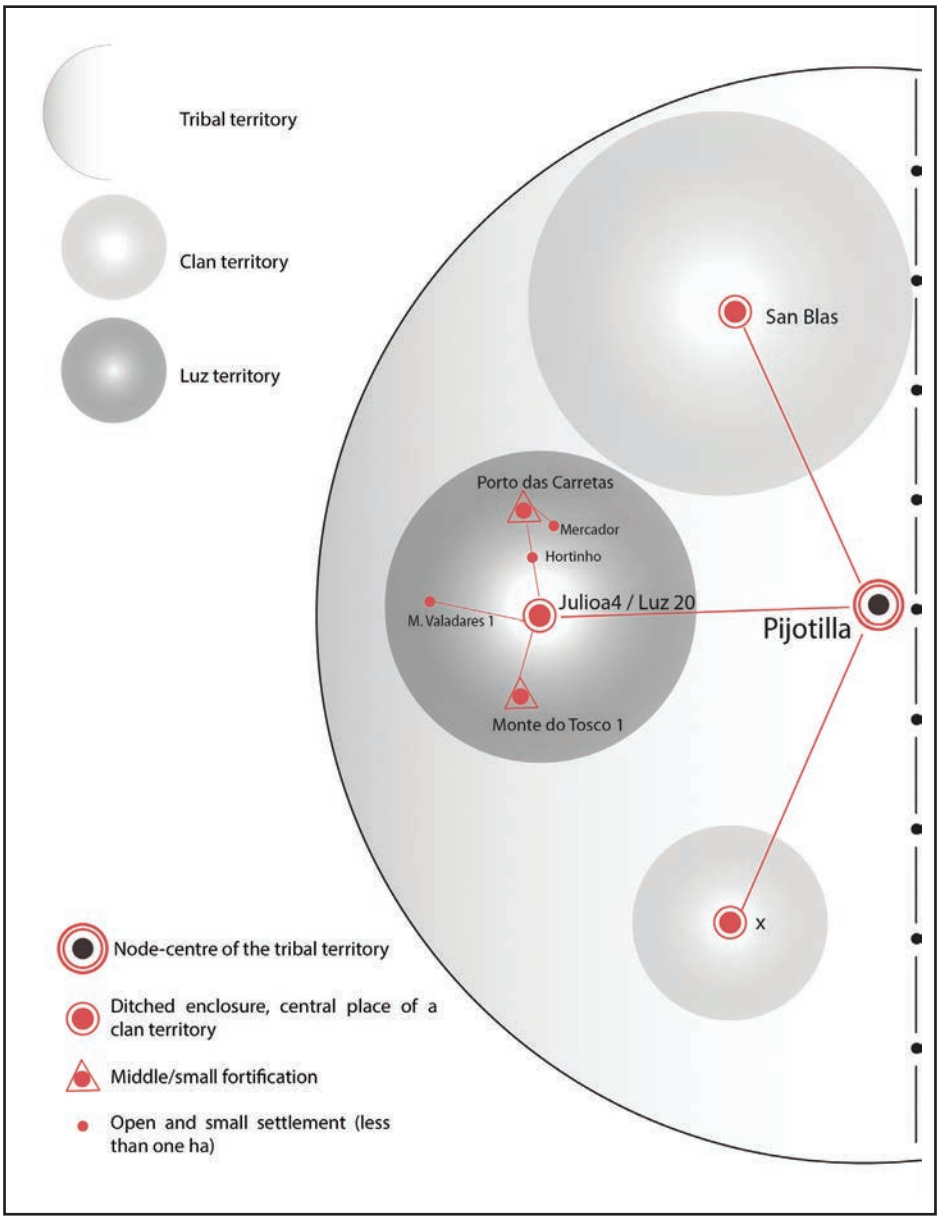


Fig. 13 - A complex tribal organization model for the Middle Guadiana Basin in the first half of the third millennium cal BC commanded by La Pijotilla. The Luz territory could correspond to a clan segment.

disappeared and had been replaced by monumentalized fortress-towers.

These architectural features reflect the emergence of elites that controlled political power. The material culture indicates an economy of prestige goods, supposing a social integration of the site at a supra local scale.

Economy

The subsistence economy was most likely based on cereals and livestock (*Sus* sp., *Bos taurus*, *Ovis aries*/*Capra hircus*); the millstones are better represented than in phase 1 (Soares, 2013, table 33), which can indicate that the resident elite might

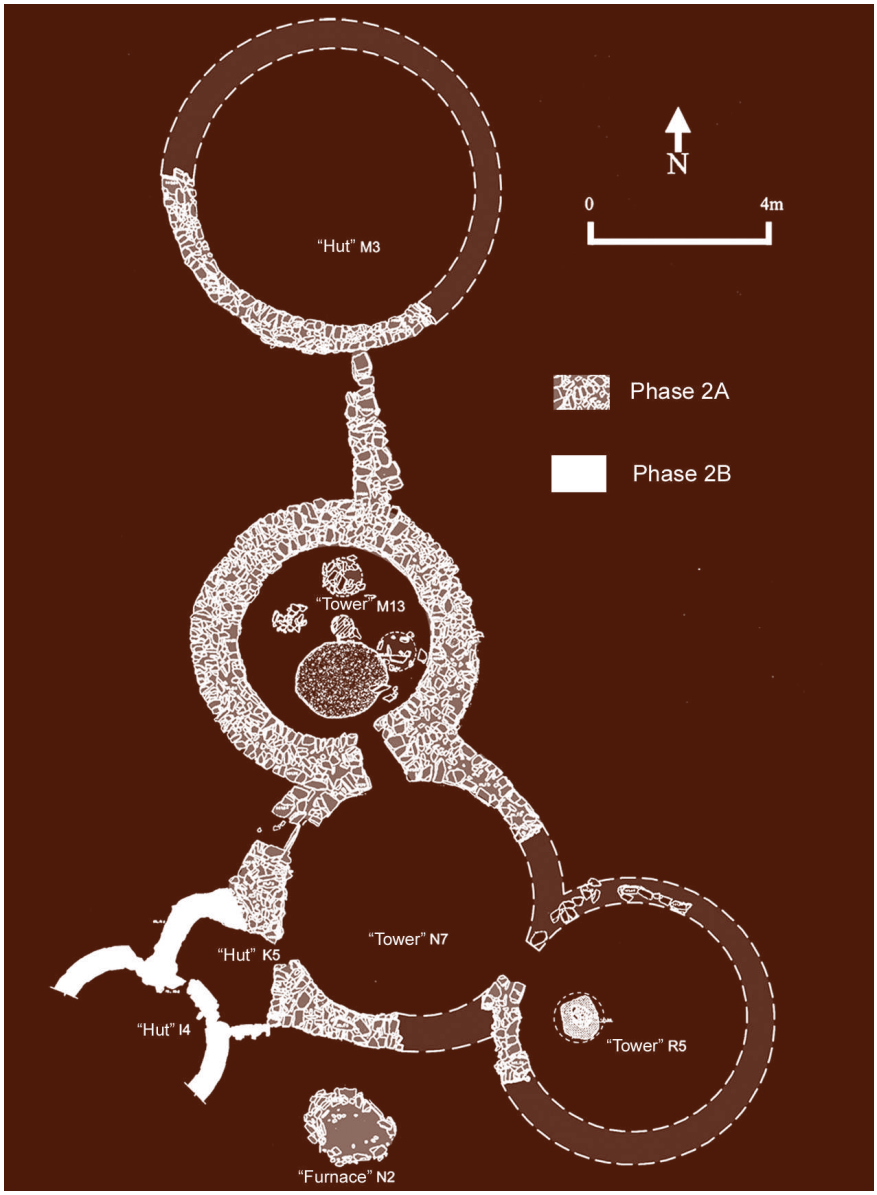


Fig. 14 - Architectural plan of Porto das Carretas. Constructive phases 2A and 2B (Bell Beaker period – International group), constituted by a set of three terraced and monumentalized towers interconnected, three huts and a metallurgical furnace, built in open space.

be receiving tribute from peasant households. The increase of hunting for big species is quite remarkable, namely *Cervus elaphus* and *Bos primigenius* ("aristocratic hunting") as observed at the Bell Beaker occupation of Monte da Tumba in the Middle Sado River Basin (Antunes, 1987, p. 125); riverine fishing is also documented by fishing net weights. The weaving activity reached a peak of development (Soares, 2013, p. 305-312). The typology of loom weights (*crescentes*) and the high quality of linen revealed by a painted fragment of linen from the necropolis of Belle France in Algarve, directly dated from the second half of the third millennium (Soares and Ribeiro, 2003), illustrate the technological development of weaving craft in southern Portugal. It might be an advantage of southwest compared to other regions of the Iberian Península (Cardito Rollán, 1996; Soares, 2013).

The most striking economic differences compared to phase 1 are the local arsenical copper metallurgy and the participation in the regional trade of marine resources (most likely salt associated with shellfish). Porto das Carretas is about 170km far from the River estuary (about 34 hours of walking),

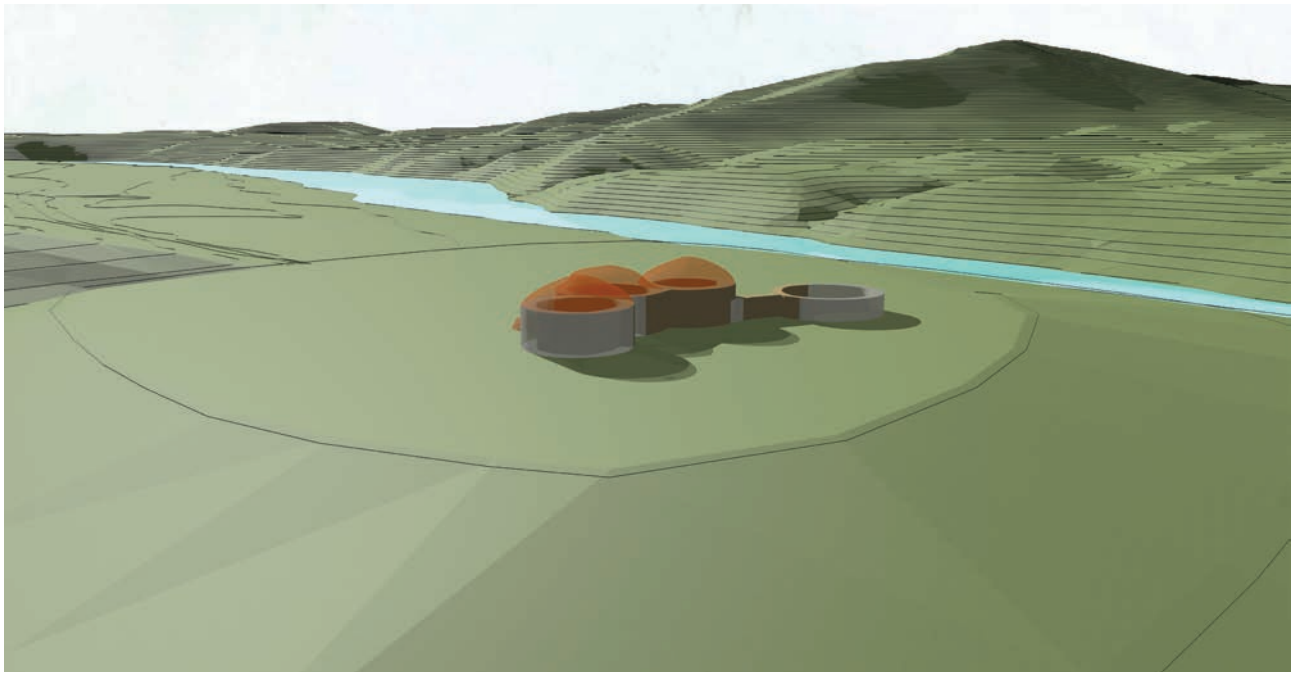
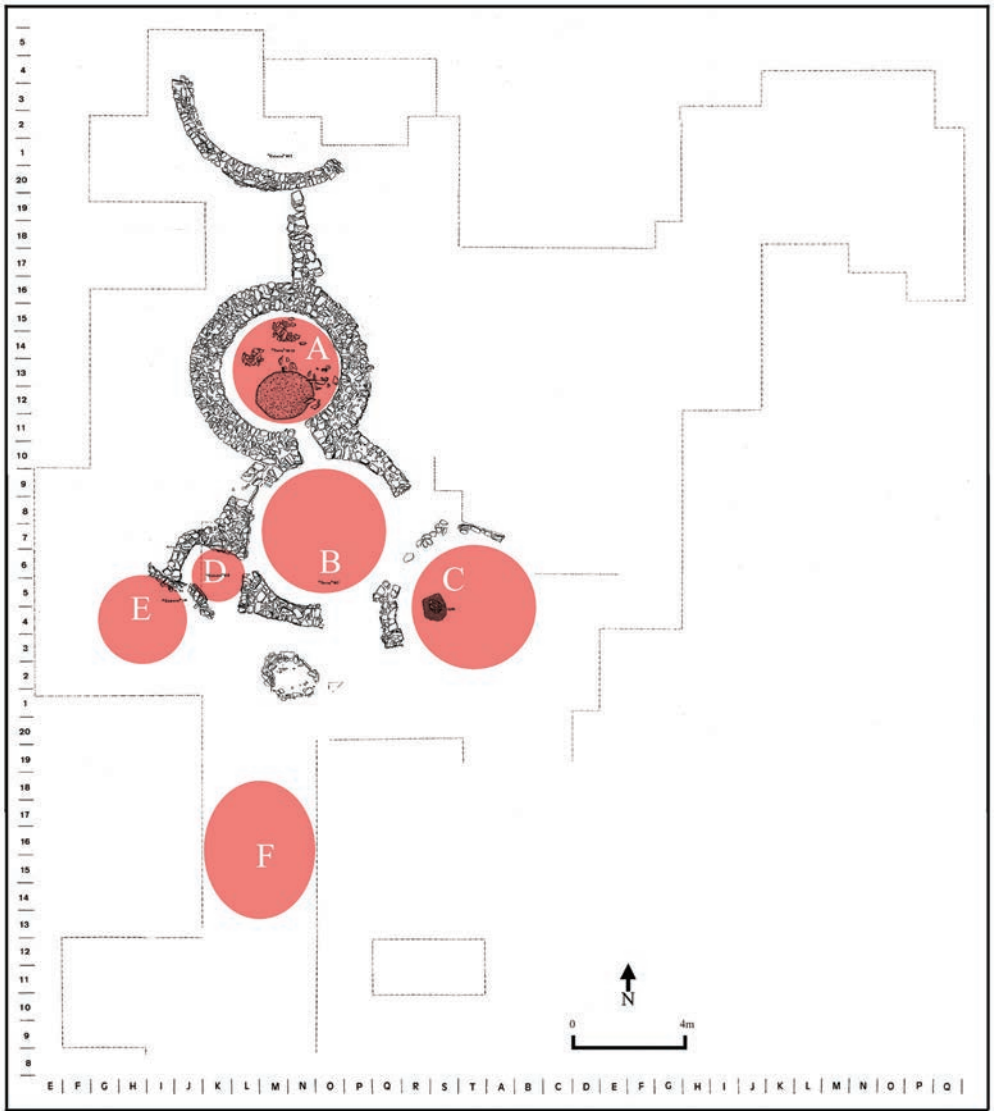


Fig.15 - Architectural reconstitution of Porto das Carretas in phase 2A, integrated in the geomorphological context. After Alfarroba, in Soares, 2013.

Fig. 16 - Fortress-towers reconstitution of Porto das Carretas in phase 2A. Southwest view. Drawing by Cristina Menezes.



Materials	Concentrations A	B	C	D	E	F
Burnt clay with branches impressions	+	+	+	-	+	?
Curated lithic flaked industry	+++	++	+	+	+	-
Fishing net weights	+++	+	-	-	-	-
Millstones	+	+	+	+	+	+
Pottery: plates and bowls	++	+++	+	+++	+++	+++
Pottery: hemispherical bowls	++	+++	+	+++	+++	++
Pottery: storage pots	++	++	++	+++	++	+
Bell Beakers vessels	+++	+	-	-	-	-
Loom weights	++	++	+	++	+++	++
Copper-arsenic tools	+++	-	-	-	-	-
Copper minerals	-	-	-	+++	-	-

- Absent or with very low concentration
+ Weak concentration
++ Moderate concentration
+++ Strong concentration

Fig. 17 - The functional structure of the innermost sector of the Porto das Carretas. Phase 2B. Tower M13 (zone A) concentrates the most qualified artefacts (Bell Beaker ceramics, copper implements and prestige polished stone artefacts. In hut 14 (Zone E) was concentrated weaving activity and hut K5 (Zone D) was dedicated to storage. The typology of pottery is presented in Fig. 18.

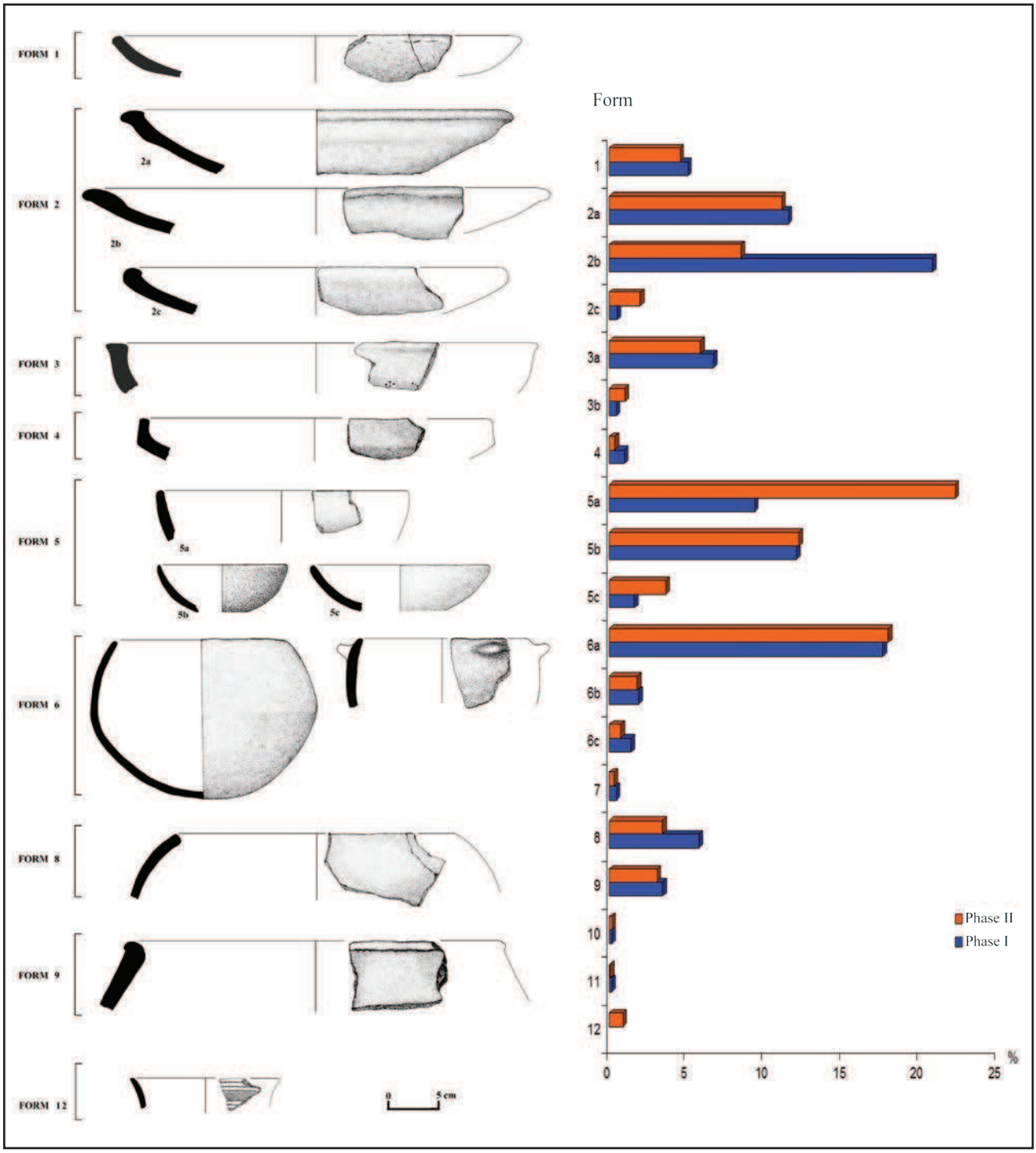


Fig. 18 - Porto das Carretas pottery (phases 1 and 2). Morphology of vessels. This typology is applicable to Chalcolithic domestic contexts of southern Portugal. In Soares, 2013, p. 280.

Common pottery, mostly without any decoration, is very abundant in both phases of Porto das Carretas, with a total of 121045 fragments of vessels. A sample of 1367 pieces from phase 1 and 1602 from the phase 2 had been studied (Soares, 2013). Pottery is the main cultural link between both occupational phases, only with quantitative differences. Large plates probably for collective use (form 2b) are more abundant in phase 1, and small hemispherical bowls (form 5a) hypothetically for individual use are more abundant in phase 2. The exception to this pattern is the fine International Bell Beaker pottery (form 12) that appears in Porto das Carretas only in the phase 2, concentrated in the tower M13.

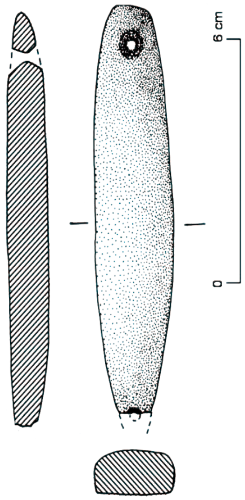


Fig. 19 - Porto das Carretas. Phase 2. Wristguard polished on quartzite with a high-tech quality.

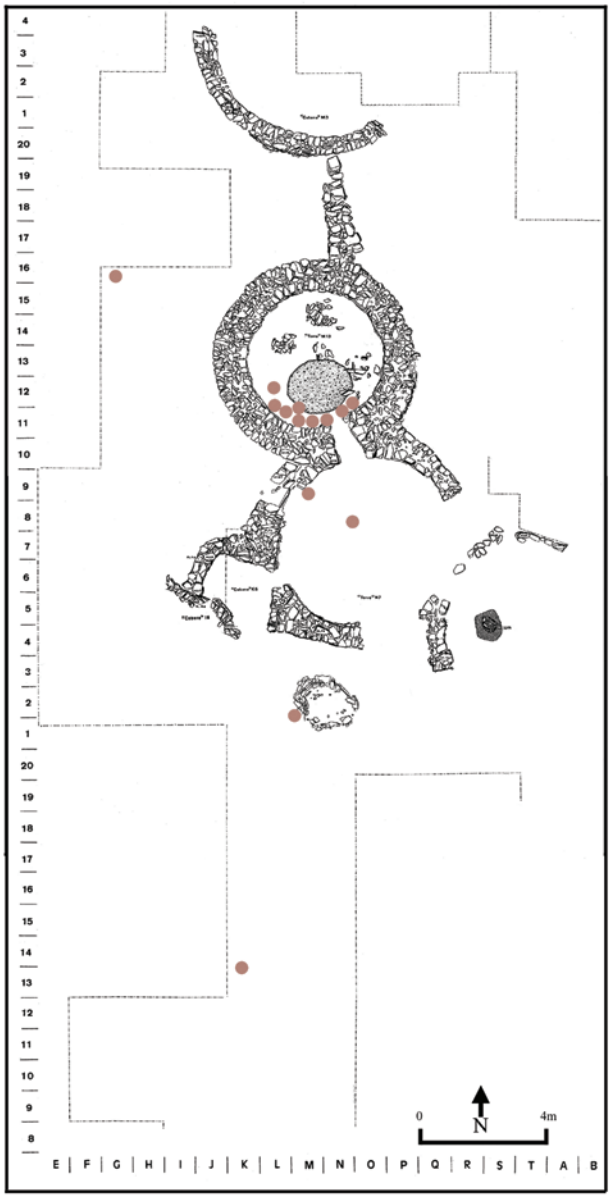


Fig. 20 - Porto das Carretas. Phase 2. Spatial distribution of the Bell Beaker ceramic.

and about 80km from La Pijotilla (about 16 hours of walking), supposedly the main regional market for the marine salt (Fig. 24). In phase 2, the river didn't seem to be anymore a rigid boundary, as it was in phase 1, but an axis of interaction. Finally, a set of 14 International or Maritime style Bell Beaker vessels, regionally manufactured (Fig. 21), connects this site with a long-distance exchange network, in an economic system of prestige goods, with sub-continental expansion.

The valuation of copper

The curated management of copper with recycling (Gil and Guerra, 1987) can explain the shortage of metal artefacts in dwelling spaces as well as the constitution of metal deposits (hoards) for votive purposes like that of the tholos of Alcalar 3 (Estácio da Veiga, 1889) or for smelting reuse as the deposits of the settlements of Outeiro de S. Bernardo (Cardoso *et al.*, 2002) and Cerro dos Castelos

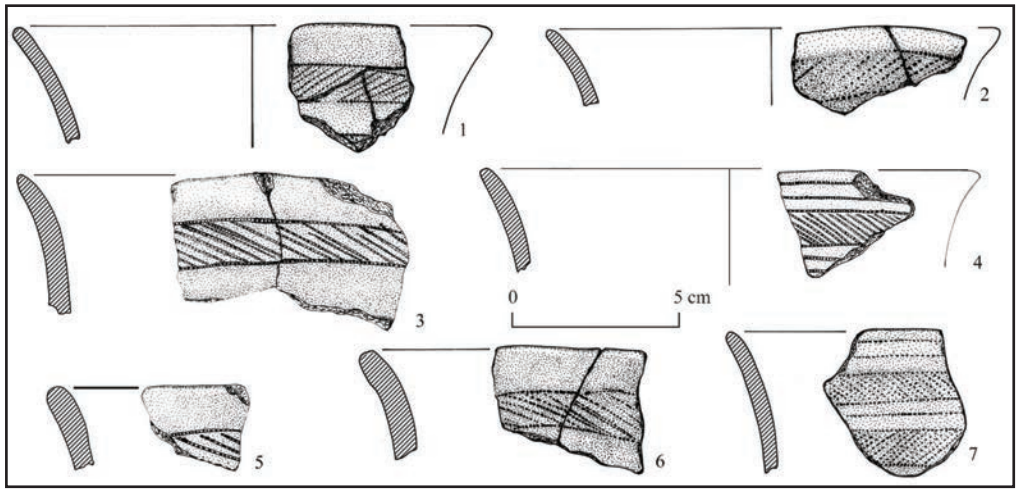


Fig. 21 - Porto das Carretas. Phase 2. Bell Beaker pottery (International style).

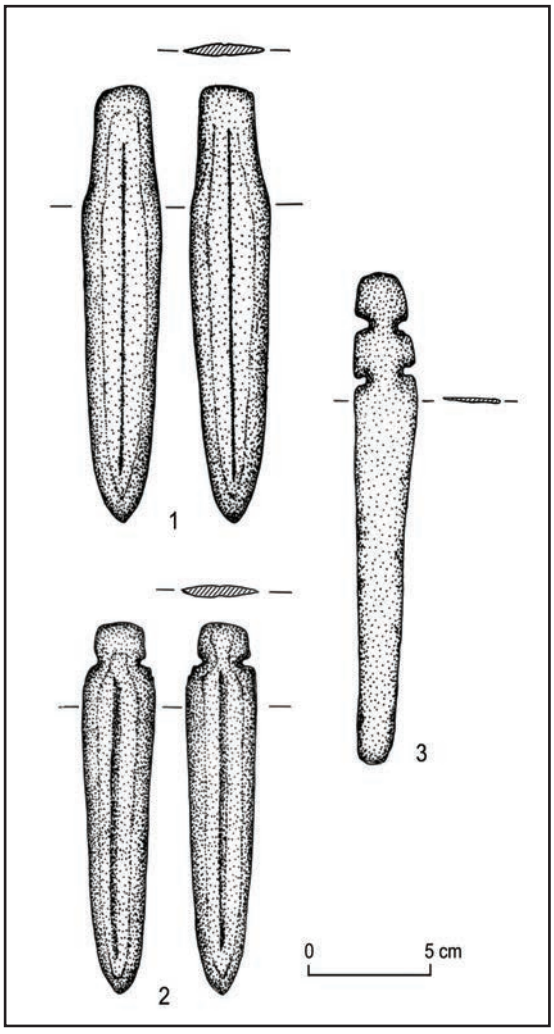


Fig. 22 -Weapons in arsenical copper included in the deposit of Cerro dos Castelos de São Brás (Serpa). The metallic artefacts were inside a ceramic storage pot (form 6, Fig. 18).
1. Tanged dagger; 149x32x4mm; Weight: 74,2grs; inv. CAST.BR/21.
2. Tanged dagger with a pair of opposite side notches for hafting; 129x29x2mm; Weight: 32grs; inv. CAST.BR /19.
3. Dagger with two pairs of opposite side notches for hafting; 170x25x1.5mm; weight: 19grs; inv. CAST.BR /20.

de S. Brás (Soares, 2013, p. 400-407). The metallurgic items recovered at Porto das Carretas (Soares, 2013, p. 315-319) represent different phases of the productive chain: minerals, furnace, slags, vitrified pottery (crucibles) and metal artefacts made of copper arsenic alloys as observed in the settlement of San Blas. This site is closely connected with La Pijotilla in regards to metallurgy (Hunt *et al.,* 2009) and Bell Beaker pottery production (Odriozola, 2012). They shared the economic chain of metallurgical activity: San Blas was a very important copper production centre and La Pijotilla, without evidence of copper smelting, was supplied by San Blas in metallic artefacts (Hunt *et al*., 2009), ensuring its redistribution. The metals from the deposits of Outeiro de S. Bernardo and Cerro dos Castelos de S. Brás are also mostly in copper arsenic alloys. The largest known deposit in Guadiana Basin is that of Cerro dos Castelos de S. Brás (Soares, 2013) with 25 work tools and 3 weapons (daggers) (Fig. 22), which weights in total 6,356 Kg. Regardless of the underlying purposes of the deposit constitution, the wealth in the form of metal is a suitable equivalent for exchanges and very adequate for storage.

The Middle and Lower Guadiana River Basin encompasses a very rich area in copper ore deposits: the Ossa Morena domain and the Iberian Pyrite Belt (Barriga and Carvalho, 1983). This corridor (Fig. 25) was a perfect scenario for craft specialization in metallurgy to which (in articulation with prestige goods exchange) is here assigned a central role in the increasing social complexity. Over the Iberian Peninsula, in regards to metallurgy, craftsmanship is well expressed in some sites dedicated to mining/

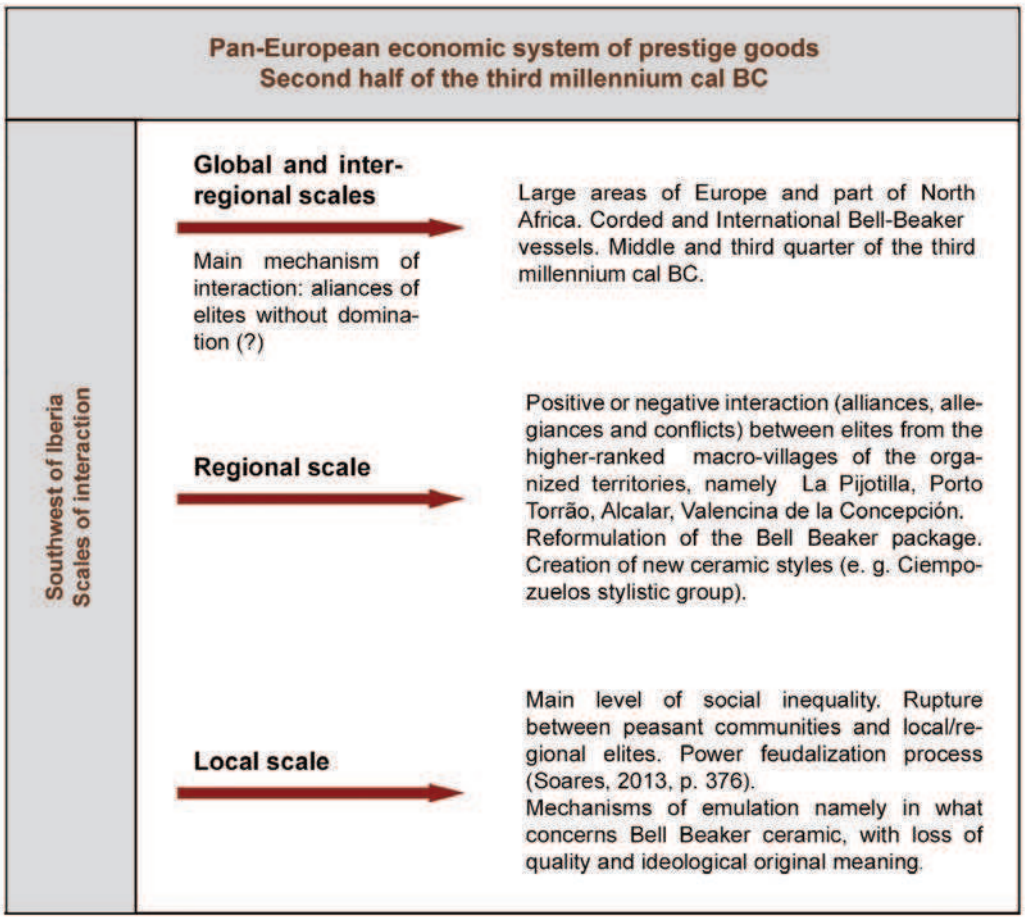


Fig. 23 - Outline of the main interaction scales during the second half of the third millennium in the Southwest Iberia.

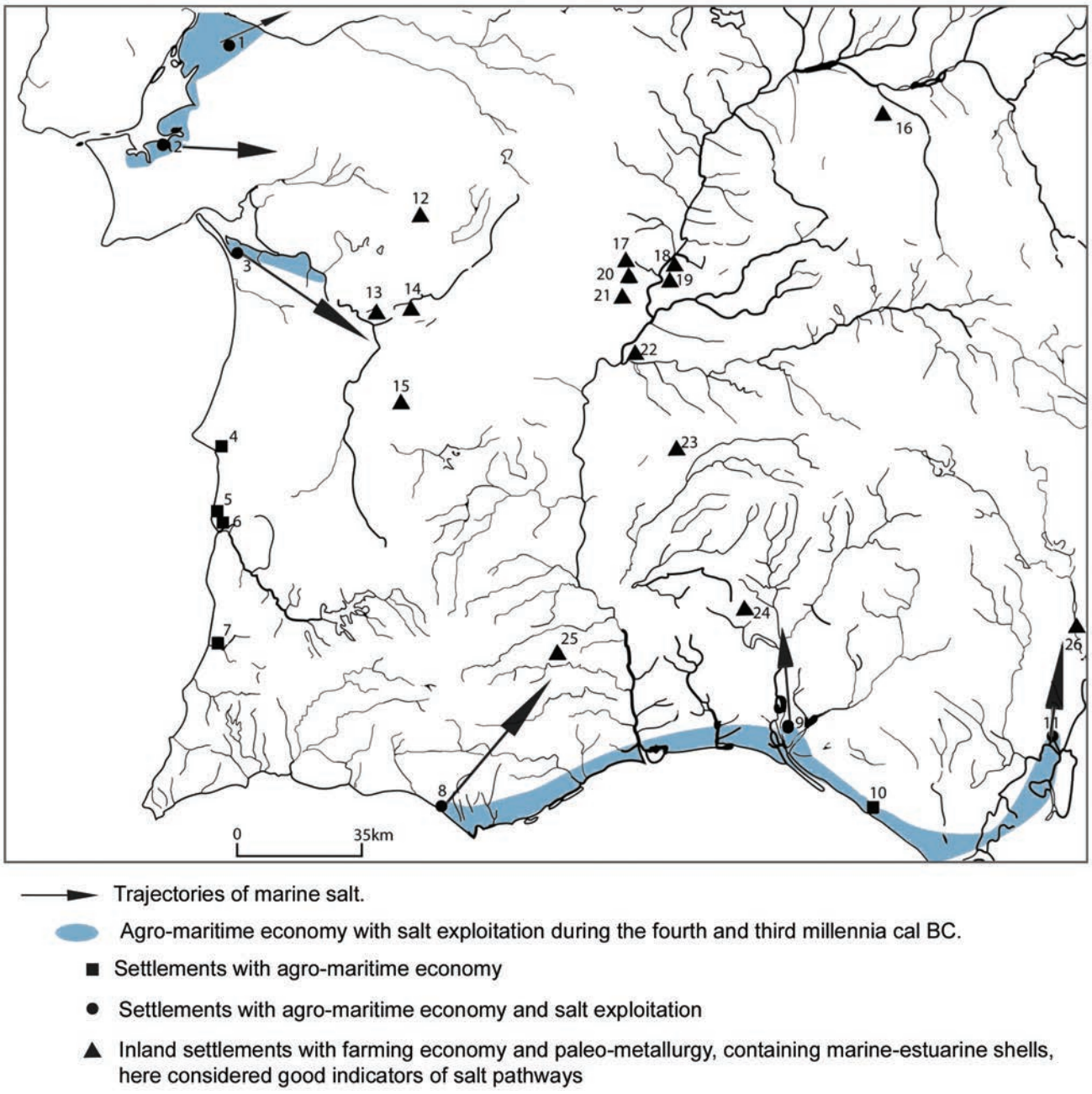


Fig. 24 - Probable trajectories of the marine salt exchange networks during the fourth and third millennia cal BC, with emphasis on the Guadiana and Sado Rivers Basins.

Settlements with agro-maritime economy:
1 - Monte da Quinta 2 (Benavente), 2 - Ponta da Passadeira (Barreiro), 3 - Possanco and Barrosinha (Comporta), 4 - Vale Pincel II, 5 - Palheirão Furado, 6 - Etar de Vila Nova de Milfontes, 7 - Montes de Baixo, 8 - Praia do Forte Novo (Quarteira), 9 - El Rincón (Huelva), 10 - Asperillo, 11 - Marismilla.

Inland settlements with farming economy and paleo-metallurgy, containing marine-estuarine shells, here considered good indicators of salt pathways:
12 - Escoural, 13 - Barrada do Grilo, 14 - Monte da Tumba, 15 - Porto Torrão; 16 - Pijotilla, 17 - Monte Novo dos Albardeiros, 18 - Porto das Carretas, 19 - Mercador, 20 - Perdigões, 21 - Sítio 3 da Torre do Esporão TESP3, 22 - Outeiro de S. Bernardo, 23 - Igreja Velha de S. Jorge (Vila Verde de Ficalho), 24 - Cabeço Juré, 25 - Cerro do Castelo de Santa Justa, 26 - Valencina de La Concepción.

/metallurgical activities like Cortadouro (Tavares da Silva and Soares, 1976-77), Santa Justa (Gonçalves, 1989), Cabezo Juré (Sáez *et al.,* 2003), Malagón (Keesmann *et al*., 1991-92), La Loma da la Tejeria (Montero Ruíz *et al*., 2008), La Profonda, León (Blas Cortina and Suárez Fernandéz, 2009). Other settlements had specialized metallurgical sectors like San Blas (Hunt *et al.,* 2009; Hurtado, 2004), Valencina de la Concepción (Costa Caramé *et al*., 2010; Nocete *et al*., 2008), Chibanes (Tavares da Silva and Soares, 2014).

Functional structure and social relations

The social inequality in phase 2 was expressed not only in the monumental architecture of the "fortress-towers" in contrast to the invisibility of the remaining site, certainly made out of perishable materials, but also in the distribution of artefacts (Fig. 17). Tower M13 (Zone A) contained the most valuable materials: Bell Beaker pottery, copper implements, polished stone prestige goods such as a spatula on amphibolite and a wristguard on quartzite (Fig. 19). The exclusively Bell Beaker International ceramic style had a very selective distribution: nine in Tower M13, two in Tower N7, one in the metallurgical furnace N2, and the remaining two vessels outside the architectural ensemble (Fig. 20). This spatial segregation of Bell Beaker pottery has been also observed at Miguens 3 (Alandroal), in the innermost part of the fortress-tower (Calado, 2006), and at San Blas, in hut J27. Returning to the functional structure of Porto das Carretas (Fig. 17), Zone E (hut I4) was specialized in weaving and Zone D (K5 hut) was dedicated to storage.

Interaction networks

In the third quarter of the third millennium cal BC, the complex tribal society was exhausted probably due to excessive territorial segmentation, which blocked the development of the productive forces (metallurgy, weaving and interregional trade).

The central settlement of the previous local productive system (Julioa 4/Luz 20), as already referred, was most likely abandoned, and the population density decayed in the Luz territory. Porto das Carretas got integrated probably in a more extended territory, polarized by the macro-village of San Blas; the importance of the Guadiana River as an avenue of communication is reinforced in the new reorganization of settlement patterns (Fig. 25). The central place of the politically organized territory of the Middle Guadiana River Basin continues to be established in La Pijotilla as illustrated by material culture. La Pijotilla participated in the trade of prestige goods (Bell Beaker package), which extended through large areas of Europe and North Africa (Guilaine *et al.*, 2009). La Pijotilla was most likely connected to this new European enlarged social network of emerging elites, through southeast France (Hurtado and Amores, 1982).

The distribution of Bell Beakers[2] in the region reveals the differences in access to prestige items, which can be interpreted as a reflection of the hierarchy of the settlement system. In La Pijotilla, Bell Beakers have a widespread distribution (multiple contexts of appropriation) and a great diversity in decorative styles and techniques (Kohring, 2011). San Blas, Porto das Carretas and Miguens 3 have displayed a very different distribution pattern of Bell Beaker pottery, quite restricted to selected and central contexts of use. At other sites within the same regional network, such as Los Cortinales, Bell Beaker ware is rare (Gil-Mascarell and Rodríguez 1987; Hurtado 1999), or even absent as in Mercador (Valera, 2013).

Regarding the Middle Guadiana Bell Beaker exchange networks (García Rivero, 2006; Soares and Tavares da Silva, 1984, 2010b), it is possible to isolate several sequential hierarchical interaction modes in connection with the settlement system that

2 - Bell Beaker pottery is currently considered a prestigious and ideological element of the Beaker package (plus tanged arrowheads, copper daggers, archer wristguards, v-perforated buttons, gold jewels), even if it is a local/regional production, associated with the strategic sphere of political interaction. Bell Beaker pottery would create a sense of shared identity namely in the context of feasts between elites (Rojo-Guerra *et al*., 2006, 2008; Guerra, 2006).

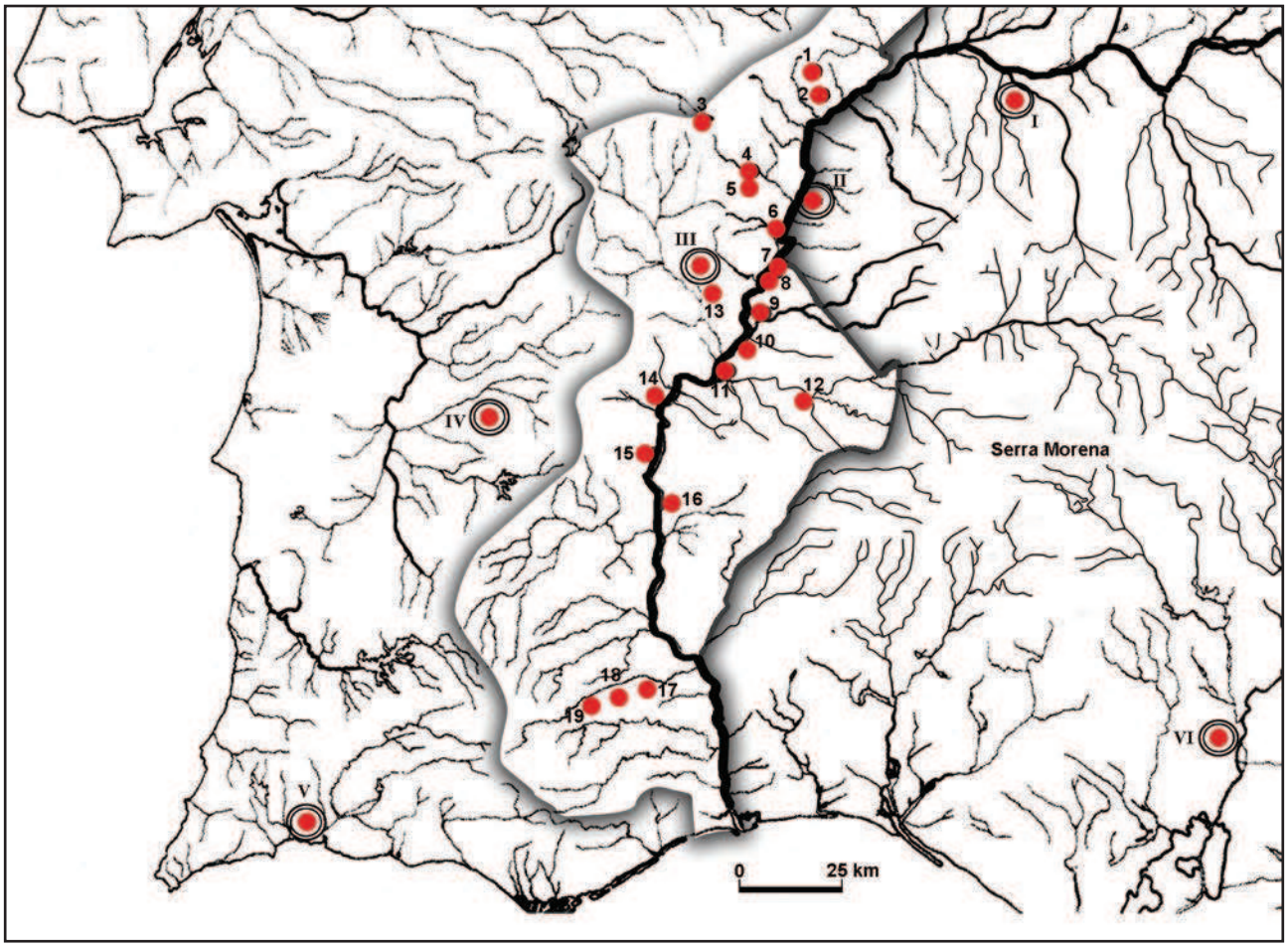


Fig. 25 -Archaeological sites from the Middle/ Second half of the third millennium cal BC in the Portuguese Middle - Lower Guadiana River Basin.

1 – Terrugem; 2 – Famão; 3 – Fonte Ferrenha; 4 – São Gens; 5 – São Pedro; 6 – Miguens 3; 7 – Porto das Carretas; 8 – Mercador; 9 – Monte do Tosco 1; 10 – Cerros Verdes; 11 – Outeiro de São Bernardo; 12 – Castelo Velho de Safara; 13 – Monte Novo dos Albardeiros; 14 – Sala nº1; 15 – Três Moinhos; 16 – Cerro dos Castelos de S. Brás; 17– Cerro do Castelo de Santa Justa; 18 – Cerro do Castelo das Mestras; 19 – Cerro do Castelo de Corte João Marques;

Macro-villages ((•)) of the southwest of Iberia:
I – La Pijotilla; II – San Blas; III – Perdigões; IV – Porto Torrão; V – Alcalar; VI – Valencina de la Concepción.

Map sources: Nocete, 2001; Soares, 1992; Soares, 2013, Valera, 2013

illustrates the construction of a complex network of social relations. They moulded the solidarity or competitiveness/exploitation at each relational level and are quite eloquent about the complexity of the pos-egalitarian and pre-stratified social organization of the Late Copper Age/Early Bronze Age of southern Portugal and Iberia (second half of the third millennium cal BC). From the top to the base of the interaction networks (Fig. 23):

-First level. Global interaction. Long distance exchange networks with the participation of macro--villages (chiefdom central places): Pijotilla, Porto Torrão, Alcalar, Valencina de la Concepción. The main indicator of this interaction process is the ap-

pearance of the corded Bell Beaker pottery style in the middle of the third millennium cal BC.

-Second level. Interregional interaction. Regional exchange networks between central places and between these settlements and the more ranked sites in their dependence: La Pijotilla, San Blas, Porto das Carretas, S. Brás; Porto Torrão, Monte da Tumba, Perdigões, Miguens 3, among others. The main indicator of this interaction process is the appearance of the international and the geometric pointillé Bell Beaker styles, in the third quarter of the third millennium (Soares and Tavares da Silva, 2010b).

-Third level. Intraregional interaction. Reformulation of Bell Beaker pottery and creation of regional decoration styles, like the Ciempozuelos group, which is well represented in the Middle Guadiana River Basin (La Pijotilla, San Blas, Monte do Tosco, Outeiro de S. Bernardo, Perdigões) with consistent use of incised decoration often incrusted with white paste mostly made of biogenic apatite (crushed bones) (Odriozola, 2012). This identity--based community in the Middle Guadiana River Basin was probably fed by a shared ideological system, and was extending influence westwards till the Atlantic coast. Porto das Carretas was abandoned as well as its symmetric site Miguens 3 on the opposite bank of the river. The maximum development of the Ciempozuelos Bell Beaker group occurred in the last quarter of the third millennium, and it may have prolonged up to about 1800 cal BC (Liesau *et al*., 2014; Ríos Mendoza, 2011; Soares and Tavares da Silva, 2010b).

- Fourth level. Local interpretations (emulation process) of the Bell Beaker Ciempozuelos ware, which spread through peripheral small sites on the plain without any defensive structures as Barrada do Grilo in the Sado paleo-estuary (Santos, Soares and Tavares da Silva, 1972) and Vale Vistoso, located on the Alentejo coast (Soares and Tavares da Silva, 1976-77). These ceramics are very coarse and low quality, which can indicate the loss of skill and previous ideological meaning. The end of the third/beginning of the second millennia corresponds to a sociopolitical disregulation, with many shadows in the archaeological record. The local scale could be increasingly isolated towards self-sufficiency.

The important socioeconomic position of La Pijotilla in the regional settlement system during the whole third millennium is expressed by material culture and more recently by the isotope analysis of $^{87/86}$ SR and ^{18} O (Díaz-Zorita and Waterman, 2014). The results of these analyses indicate that mobility performed a crucial role in the macro-villages of La Pijotilla and Valencina de la Concepción in opposition for example to Palacio III where all the individuals analysed were of local origin. A minimum of 29% of the population from La Pijotilla (sample of 17 individuals from tomb 3) was immigrant. Similar results (31,6%) for immigrants were obtained in the macro-village of Valencina de la Concepción.

General remarks

The regional engine activities of the new economic system of prestige goods seem to be metallurgy, weaving and the trade of copper and marine salt (Fig. 24). Political power was likely vertical and personalized. The elites that controlled production and distribution of metals also appropriate the right to use coercive means, such as weapons and fortress-towers. This could be the beginning of a new type of social organization (chiefdom). As this process advanced, the old world of tribal societies and the correlated communitarian ideology entered a profound crisis.

Conclusion

Striking social changes took place in the third quarter of the third millennium cal BC (phase 2 of Porto das Carretas). The complex tribal organization of the first half of the third millennium was exhausted, probably due to excessive territorial and social segmentation, which was blocking the development of productive forces (craft activities of weaving and metallurgy, and trade).

The main changes, compared to the previous complex tribal society, can be listed as follow:

1) weakening of kinship networks *versus* strengthening of residential solidarities;

2) power centralization + knowledge-based political economy linked to personalized leaderships integrated in extended networks of prestige goods exchange (D`Altroy and Earle, 1985; Earle, 1999; Graham *et al*., 2000; Soares, 2013) –› unstable and "omniscient" leaderships (Soares, 2013, p. 69-70) based on the control of esotheric and ecological knowledge systems, using the rhetoric of heritage (Lash and Urry, 1999; Soares, 2013, p. 386--388) –› fluidity of territorial boundaries.

3) development of copper-arsenic metallurgy –› gains in productivity;

4) development of metallurgy of gold and production of other precious commodities, such as ivory artefacts, green stone beads, fine textiles and garments (Murra, 1962) –› expansion of production and standardization of prestige items;

5) intensification of the social division of labour –› skilled craftsmen –› skilled merchants in extended exchange systems –› managerial activities –› political leaderships.

In synthesis, in the second half of the third millennium cal BC, we find evidence of an unstable politic power, still without capacity for hereditary perpetuation, which fits well with the anthropological concept of chiefdom.

The early State constitutes perhaps the most unequal sociopolitical organization (Clastres, 1974; Foucault, 1978); thus, the arguments to support its emergence and consolidation require a careful analysis based on a much larger and qualified archaeological record than what is currently available (Nocete, 2001). Chiefdom is used here according to the neo-evolutionist American anthropology as a standard category of society previous to the emergence of State. Chiefdoms are redistributive societies with a centralized coordination for action that controls socio-political and religious activities (Service, 1962, 1975).

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Technique and social complexity: development trajectories of peasant societies with metallurgy during the Bronze Age of western Iberia

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Abstract

Technological change has been usually correlated with complexity change. Namely metallurgical practice from the ancient peasant societies was for a long time perceived as an "engine" of social development. Such a perception revealed itself not only inaccurate but it must also be seen as largely varying according to geographical place and civilization characteristics.

Nevertheless, in ancient peasant societies technological development remains one of the most promising indicators of the growing of social complexity even if it is by no means the only possible one and such growth must always be analysed accordingly to regional constraints.

In what concerns the Iberian Peninsula, and particularly its western facade, first metallurgies seem to appear as a consequence of socioeconomic developments leading to first social elites coming into being. The metallurgical products can then be seen to fulfil the need to express social status, lacking real technomic significance. Development of metallurgical technologies and products will, nevertheless, accompany and interact with parallel developments in social complexity from the Chalcolithic to the Early Iron Age when, for the first time, metals seem to assume a full technomic role.

Palavras-Chave

Social complexity; sociotechnical transformation; archaeometallurgy; Bronze Age; western Iberia.

Résumé

Le changement technologique a été généralement considéré en corrélation avec le changement de la complexité. Notamment la pratique métallurgique des anciennes sociétés paysannes a été perçue depuis longtemps comme un «moteur» pour le développement social. Une telle perception se révèle non seulement inexact, mais elle doit aussi être considérée comme largement varier en fonction des caractéristiques de la civilisation, lieu et géographie.

Néanmoins, dans les anciennes sociétés paysannes le développement technologique reste un des indicateurs les plus prometteurs de la complexité culturelle et sociale, même s'il n'est pas le seul et si une telle croissance doit toujours être analysée en conséquence des contraintes régionales.

En ce qui concerne la Péninsule Ibérique, et en particulier sa façade ouest, les premières métallurgies semblent apparaître comme conséquence de l'évolution socio-économique qui donne naissance aux premières élites sociales.

L'apparition des premiers produits métallurgiques peut alors être perçue comme faisant face au besoin d'exprimer des statuts sociaux, manquant de réelle signification technomique. Néanmoins, le développement des technologies et des produits métallurgiques accompagne et interagit avec les développements parallèles dans la complexité sociale depuis le Chalcolithique jusqu'au Premier Âge du Fer quand, pour la première fois en Ibérie, les métaux semblent jouer un plein rôle technomique.

Mots-clés

Complexité sociale; transformation sociotechnique; archéométallurgie; Âge du Bronze; Ibérie occidentale.

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The complexity of complex...

To begin with the first obvious question: What is complexity?

We think that complexity is usually seen as a safety pin of reasoning related to things perceived to be complex. So the key concept here is *complex* which we understand to be "any structure or system with multiple interconnected parts which function as independent variables". In this sense, human societies can always be seen as complex, the difference lying in a question of degree where the number and internal arrangement of its parts provides the way to assess and compare them.

In *historical/archaeological explanation*, the concept of complexity is generally applied to all periods in a comparative and evolutionary way.

Assuming the operationality of the complexity concept for archaeological thinking, *technology* usually constitutes the most immediate means to assess complexity presence/change in social systems. Growth in technology is usually considered as a growth in complexity since the three ages system comes into being. However, it is by no means the only possibility. Speaking only of archaeographic data, analyses of habitats intra-site organization and funerary practices (for example) constitute other important sources of evidence for complexity transformations in social behaviour, a potential that is shared by other artefact analysis outside the realm of technology.

Following what A. Valera has been calling the "empirical revolution" (Valera, 2009) of the last two decades, and assuming a non-linear evolutionary tendency in the Prehistory of Iberian peasant societies (Neolithic to LBA[1]), the Chalcolithic constitutes a clear peak of complexity, either due to their dimensions and different organizational levels of the regional settlement systems, the diversification of funerary/ritual practices within them or the origins of metallurgy.

This peak of complexity is followed by a general collapse (differently dated between 2400--2200 BC in the different regional areas). Regional peculiarities notwithstanding, we can generalise and say that mainly three discontinuities in the field data materialise these changes[2]: (1) the decline, abandonment and/or restructuration of settlement systems; (2) the individualization of funerary practices; and (3), linked to the above mentioned two items, the emergence of a new symbolic system is revealed by the fading of feminine iconographic representation, the development of an andriarcal iconography, and the role of metal weapons and jewellery as social markers of prestige and power (Senna-Martinez, 2007, p.120).

Does western Iberia Early Bronze Age represent an immediate leap in complexity comparatively to the Chalcolithic?

In a simplistic evolutionary perspective it is a common assumption to think that the Bronze Age represents an immediate leap in complexity in relation to the Chalcolithic. This is something we do not believe to be true, namely for western Iberia.

That surely doesn't happen in the settlement systems that happen to be archaeographically simpler and less visible (Jorge, 1996/1997).

All the diverse and complicated funerary and ritual collective arrangements (megalithism and so on – Senna-Martinez, 2014) linked to the agricultural cycle as a metaphor for the perception of life and death collapse at the end of the Chalcolithic and are replaced by an individual treatment of the dead

1 - We consider the Bronze Age of Western Iberia to consist of a sequence of 3 periods: Early Bronze Age (EBA – c. 2250-1750 BC); Middle Bronze Age (MBA – c. 1750-1250 BC); Late Bronze Age (LBA – c. 1250-750/450 BC).

2 - One of us (SM) first proposed this understanding of the transition Chalcolithic/Early Bronze Age in Iberia at an unpublished conference in 2004 (*Turres Veteras* VII), then developed it in the classroom the following years until it was finally published in 2007 (Senna-Martinez, 2007, p. 120).

that concentrate some wealth and status display in very few masculine individuals.

Finally, the elaborate female representations linked to Chalcolithic ritual disappear and a new and very restricted status iconography appears which is based on the male gender and on metallic weapons and jewellery.

In short, the higher communitarian investment in ritual and social regulation is in its maximum complexity in Middle Chalcolithic western Iberia settlement systems[3]. It collapses in the Late Chalcolithic and is replaced by simpler, individualized systems.

We could even wonder if what is in question in the beginning of the Bronze Age is not, ultimately, the replacement of systems requiring a great collective effort in the construction and maintenance of various architectural types used for burial and ritual by more economic ones. In the new EBA systems the larger collective investment of the Chalcolithic is replaced by a smaller one, now individualized and related to the first masculine power figures.

Nevertheless, we think some indicators exist that complexity will increase during the Bronze Age, and some will begin early.

Technological aspects as a means to assess eventual complexity changes during the three periods of the Bronze Age in western Iberia.

Taking into account the previous reflexions, let us focus on some technological aspects as a means to assess eventual complexity changes during the three periods of the Bronze Age in Western Iberia:

1. Pottery as an indicator of social complexity growth?

The use of fine wares of restricted use (e.g. "copos canelados" and "bell-beakers") can already be detected during the Chalcolithic in some areas within western Iberia. It suggests that some individuals within the local communities were becoming less equal than others, perhaps within the above referred development of contradictions opposing the neolithic matrilineages to the first expressions of andriarcal power.

Finer wares, preferentially dedicated to funerary use, are the rule during Early and Middle Bronze Ages in contrast to what happens previously during the Late Neolithic and most of the Chalcolithic, when all domestic ceramic types found their way into funerary use (Senna-Martinez, 2009, p. 468).

In the EBA, "2nd generation" beakers can be preferentially used in some regional areas, while different and new pottery types[4] predominate in others.

In North-western Iberia and Beira Alta (we simply don't have enough information for other areas) we can document new technical improvements in general use vessels during the Early and Middle Bronze Ages (Luís, 2013, 2010; Senna-Martinez, 1984, 1993a, 1993b). Namely, better clay and temper preparation, flat bottoms generalization, roll handles, and composite profiles appear.

In the LBA a clear split in pottery production between finer table wares and heavy-duty kitchen and storage ones generalizes (Senna-Martinez, 1993b). Meanwhile, fewer finer pottery productions in some areas hint at a possible incipient specialization within a system of generalized domestic production (Reprezas, 2010).

So pottery production definitely shows some indication of growth in technology during western Iberia Bronze Age.

2. Do metals make the world go round?

The first independent use of copper in Ibe-

3 - Perhaps as a way to cope with the growing contradictions opposing the Neolithic matrilineages to the first expressions of andriarcal power (Gilman, 1987).

4 - As, for exemple, in the case of the so called Siret's type 6 (Castro Martínez, *et alii.*, 1993-94, p. 102), the tronco-conic vessels of central and northern Portugal areas (Senna-Martinez, 1993 e 2000: 107) and the "*rippenvase*" or "*zonenvase*" from the Southwest (Schubart, 1975, p. 46-49).

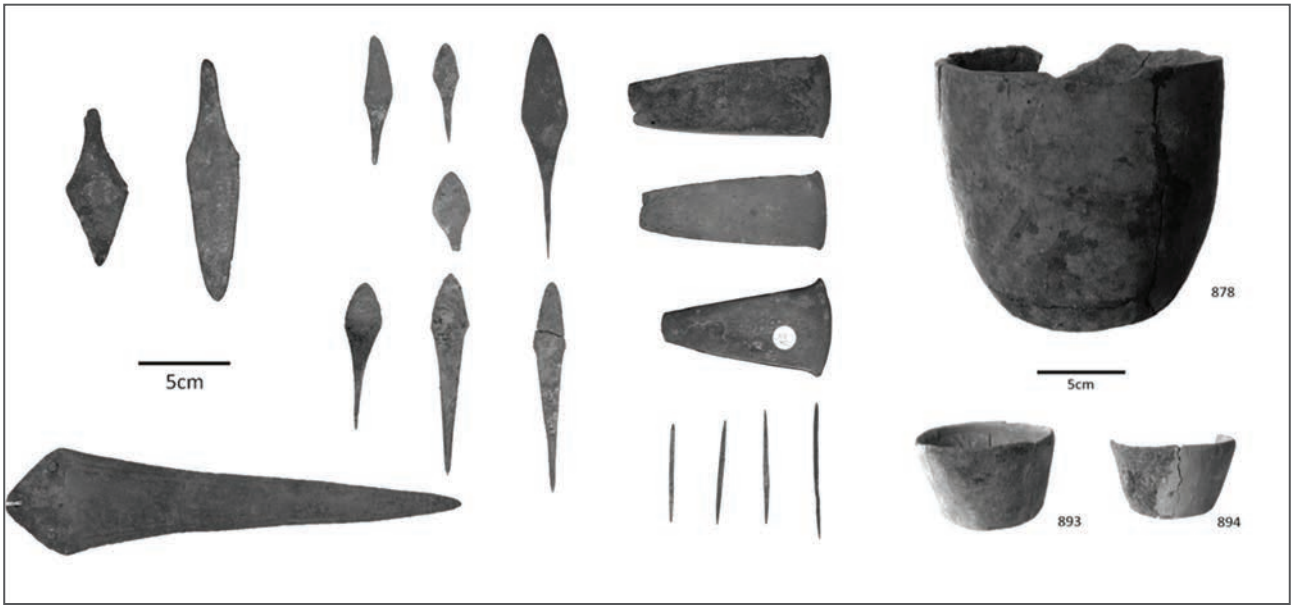

Fig. 1 – Left: Tongue-daggers, Palmela points, axes, Halberd and awls of arsenic copper. Right: Three Tronco-conic pottery vessels. The large set of metallic artefacts and some of the pottery vessels from the EBA individual burial from Gruta das Redondas in central Portugal.

ria emerges in the southeast a little before 3000 BC (Montero Ruíz, 1994; Rovira Llorens e Gómez Ramos, 2003; Roberts, 2009). From there: (1) in the Atlantic facade of Iberia, copper metallurgy will extend westwards, reaching the southwest during the first quarter of the third millennium BC (Soares e Cabral, 1993; Valera, in press); (2) in central Portugal (Estremadura) the first copper artefacts will be produced within the second quarter of the third millennium BC (*Idem*); (3) the interior of central Portugal – the Portuguese Beiras – as well as the northwest of Iberia – Minho, Trás-os-Montes and Galicia – will see the first copper artefacts well within the second half of the third millennium BC. But these will only have some regional significance with the first evidences of a regional copper metallurgy in the last quarter of the millennium and with the beginning of the EBA (Senna-Martinez, 1994a e 2002; Valera, 2007).

Since Gordon Childe (1930) metallurgical practice by the ancient peasant societies was for a long time perceived as an "engine" for social development. Such perception revealed itself not only inaccurate but it must also be seen as largely varying according to geographical place and cultural characteristics (Senna-Martinez, 2013a).

In the Iberian Peninsula and particularly in its western facade first metallurgies seem to appear as a consequence of socio-economic developments leading to first social elites coming into being.

During its Chalcolithic beginnings (an "experimenting and incipient phase") copper artefacts seem to replicate earlier stone ones (axes, knife blades, awls, etc. – Senna-Martinez, 2013a). But soon a new package appears (with the beginning of the EBA), mainly of funerary use, mixing the first arsenical copper weapons and gold jewelry (Fig. 1). So, from a few initial Chalcolithic utilitarian models, EBA in western Iberia will see the metallurgical products change to fulfil the need to express social status. In several situations they will go together with what we usually call "second generation" bell-beakers (of the Palmela/Geometric and Late Ciempozuelos groups) that we believe take part in the EBA transformation (Senna-Martinez, 2002; Soares e Silva, 1974/1977; Valera, in press). Nevertheless, the available data show that the scale of metallurgical operations is very small and simple,

producing metal mainly through use of open-vessel reduction of copper oxides and/or carbonate ores (Rovira, and Ambert, 2002).

As for the Chalcolithic, the scarcity of the items produced in copper or arsenical copper – not to mention the scarcity of items in gold or silver – and their main association as funerary offerings of select few burials, since the EBA, everything points towards a non-technomical character for the EBA metallurgy of western Iberia (Roberts, 2009: 472). That is something we have to have in mind when we compare it with other European or non-European situations that can be very different (Roberts, Thornton and Pigott, 2009).

The idea explained by Roberts that "…*metallurgy in Western Europe in the 4th and 3rd millennia BC was not a dynamic or innovative technology, but was practised sporadically and at small-scale, to specifications outlined by consumers whose requirements were highly conservative*…" (Roberts, 2009: 473) can easily be expanded to encompass all the Iberian peasant societies with metallurgy from the Chalcolithic to the Late Bronze Age.

Nevertheless, the investment of metal artefacts with new social symbolic meanings during the EBA and MBA goes well together with the growing complexity of a new type of symbolic practices that probably gives legitimacy to the new social order. Namely and besides artefact deposition as select funerary offerings: (1) The first situations of metal artefacts ritual deposition as land or water "deposits" occur during the EBA; (2) These exceptional "packages" of weapons and jewellery items can also appear as iconographic depiction, either *per si*[5] or (less often) as paraphernalia of the first "power anthropomorphic representations"[6].

MBA will see some changes in artefactual types[7] and the appearance, from north to south alongside western Iberia, of the first tin bronze production[8]. However, the scale of metal production remains in a small scale and metal artefacts' use will still be a "luxury" few could afford (Senna-Martinez, 2013a). Moreover, with the exception of the Northwest and Estremadura, the majority of the actual finds, which nevertheless represent a very small part of the total metal finds of the period (still mainly made of arsenical copper), are awls, chisels, riveted daggers and very rare halberds of Cano type[9]. For instance, the earliest binary bronze production in the Southwest (Malhada do Vale da Água, Ferreira do Alentejo – Valério, *et al*., *in press*) seems to occur only in the third quarter of the second millennium BC, closer to the LBA, with only small items, while co-smelting of cassiterite with Cu carbonates and oxides remains the preferential technique to obtain bronze.

In LBA we detect a generalization of binary bronze production to all Iberia regions as well as the first evidences for tin procurement through trench mining. Yet, bronze still is produced, from north

5 - This is both the case of the engraved stone schist slabs covering cist-burials in the Southwest First Bronze Age (Early and Middle – Barceló, 1991; Gomes & Monteiro, 1977) as well of the Galician petroglyphs (Costas Goberna, *et al*. 1997).

6 - As in the case of some stelae and menhir-statues from the Portuguese Beiras and Trás-os-Montes (Sanches and Jorge, 1987; Jorge and Jorge, 1990) as well as the stelae from the Southwest (Barceló, 1991; Gomes, 1994; Gomes & Monteiro, 1977).

7 - So, riveted-hilt swords will replace long daggers (or tongue-swords); riveted daggers replace the previous tongue-daggers; long tanged points replace Palmela points; axes with large cutting edges replace halberds.

8 - The first evidences of binary bronze production can be documented in northwestern Iberia (Sola, Minho – Bettencourt, 2000 – and Fraga dos Corvos, Trás-os-Montes – Senna-Martinez, *et al*. 2011b) in the 2nd quarter of the second millennium BC. The main artefact type produced is the axe of Bujões type.

9 - With only three exemplars made of binary bronze: one from Vila Nova de S. Pedro (Soares, 2005), one from the "covacha" burial of Belmeque (Serpa – Soares, 1994) and another from a probable cist burial from Antas (Tavira – Senna-Martinez, *et al.*, 2013).

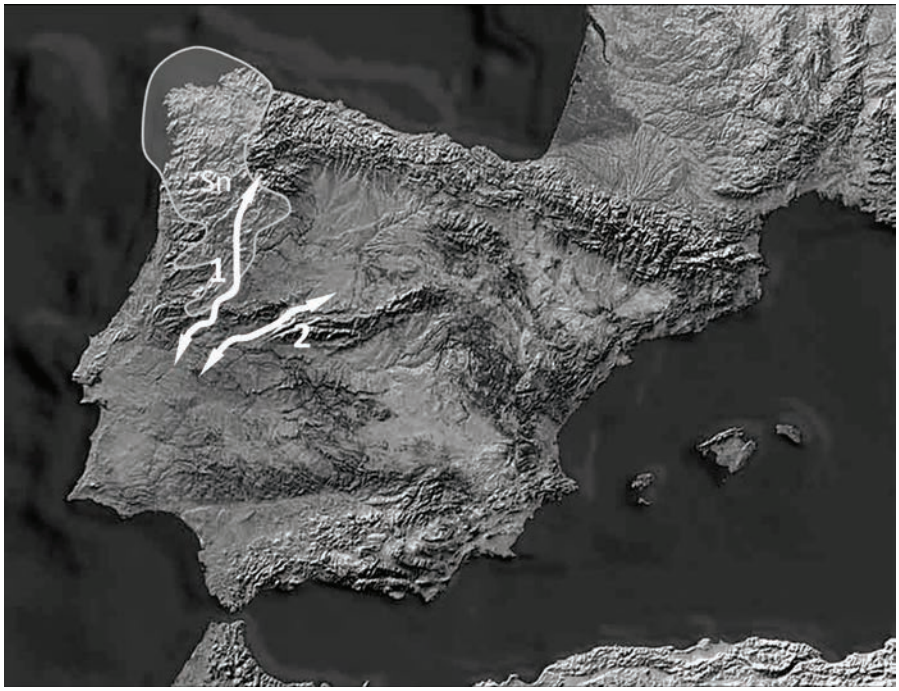

Fig. 2 - The two main north-south passages, from the alluvial tin producing areas (Sn), through the Iberian Central Massif: 1- Beira Transmontana/ /Northeast Alentejo; 2- Salamanca/Caceres.

to south all along western Iberia, through the cosmelting, in open vessel, of cassiterite with copper carbonates and/or oxides[10].

Generalization of binary bronze production to all Iberia regions is probably one of the turning points at the beginning of the LBA in this peninsula. Binary bronze production can be radiocarbon-dated to the last quarter of the second millennium BC almost everywhere in Iberia (Castro Martínez, Lull and Micó, 1996). Namely alongside the Atlantic facade from the Northwest (Bettencourt, 1999, 2001; Sampaio and Bettencourt, 2011) through the Portuguese Beira Alta (Senna-Martinez, *et al*. 2011a), Beira Interior (Vilaça, 1997) to the Southwest (Soares, *et al*. 2007).

In terms of scale of production this is clearly a period in which some intensification occurs (new casting techniques – *cire perdue*, overcastting and multiple part molds – and several new artefactual types) alongside generalization of binary bronze production. However this intensification did not significantly change the scale of local ateliers still functioning at household level[11] and for systems largely of self-consumption and little circulation (Senna-Martinez, 2005). Metal in Iberian LBA was still a luxury prestige item[12].

Tin is the critical element in bronze production in Iberia. Early impressions[13] pictured an Iberian Peninsula divided by the Central Massif into a southern copper producing area and a northwestern one producing tin. The realization that the actual

10 - Recently the same producing method was proven for the working area of Entre Águas 5 site (Serpa – Valério, *et al.* 2013) in southern Portugal.

11 - For instance, in the culture groups of the Portuguese Beiras (Baiões/Santa Luzia and Beira Interior) there is evidence of small scale local production in every habitat site excavated in the last three decades (Senna-Martinez, 2011a, p. 287).

12 - For instance, the previously suggested un-economic nature of metal production among the Baiões/Santa Luzia cultural group (Senna-Martinez, 1996) was clarified during the METABRONZE project (2006/2009 – cf. Senna-Martinez, *et al.* 2011a) which confirmed and developed most of the previous research results besides advancing new results and hypotheses. Namely it has been shown that the main productive activities of subsistence land exploitation could well coexist, for some specialized individuals, with small scale mining and metal artefact producing. These were shown to be compatible to be performed inside the settlements, at a "domestic" and "part time" level, as archaeological field data already suggested (Senna-Martinez, *et al.* 2011a, p. 421).

13 - And some not so early – cf. Harding, 2000, p. 197-241, where Iberian data is clearly underestimated, if not sometimes completely ignored.

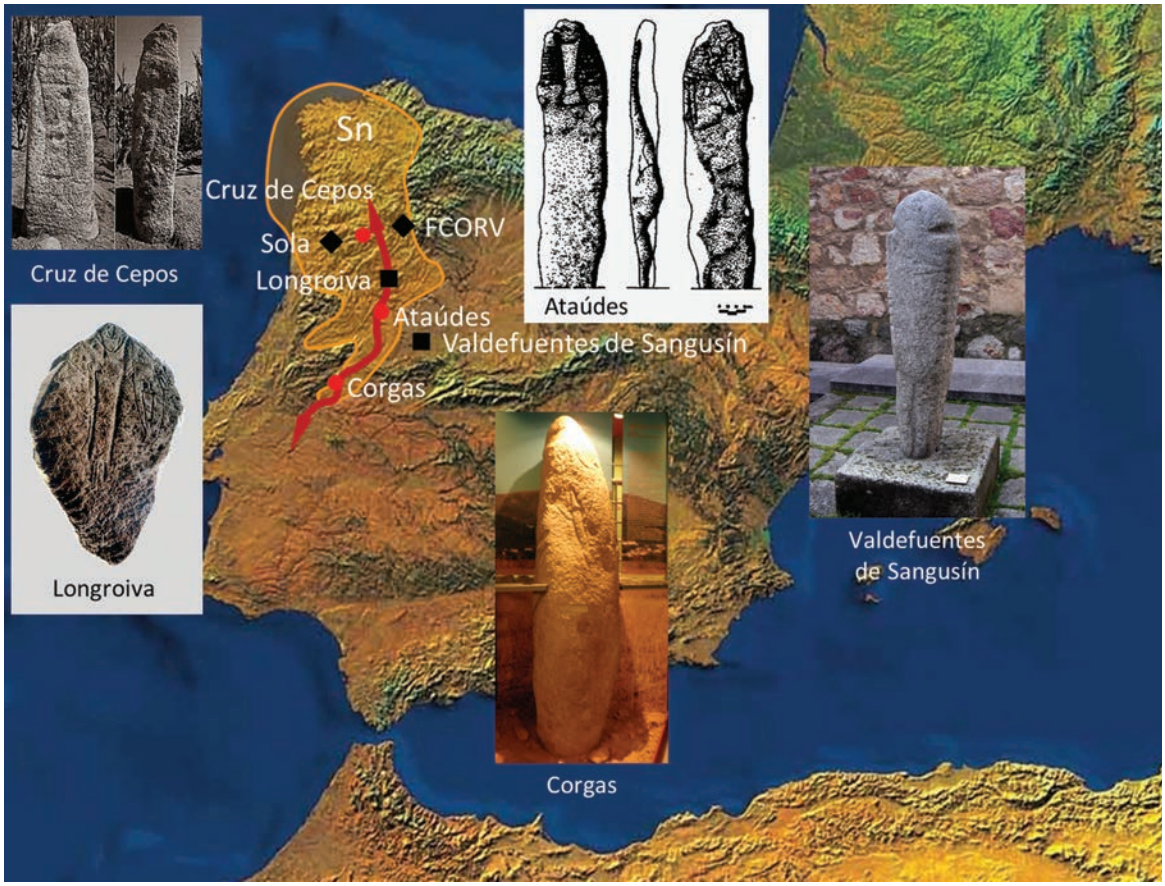

Fig. 3 - The Iberian Peninsula, westerly main "tin-route" and stelae with weapons for the First Bronze Age: Sn – the area rich in alluvial tin placers; ■ EBA stelae; ◆ MBA habitat sites; ● MBA stelae.

quantities of metal produced in Iberia during the Bronze Age were indeed small made it necessary to take into consideration available small sources for copper. Those sources, mainly secondary gossams from sulphides' ores, are available throughout Iberia, completely changing the picture of copper availability (Geirinhas, *et al*. 2011).

Considering tin, a large area – encompassing all the Northwest and extending through the Portuguese Beiras till the Tagus River – is rich in alluvial deposits with tin and sometimes gold placers. Even taking into consideration that LBA is the period when first evidences for tin procurement through trench mining appear in Iberia[14], alluvial cassiterite and gold probably constituted the main source for both metals till the beginning of the Iron Age[15] (Senna-Martinez, 2011).

Whatever we consider to be the way tin cir-

14 - For instance in the cases of the Logrosan (Cáceres – Rodríguez Díaz, et al. 2001) and Orgens mines (Viseu – Correia, Silva and Vaz, 1979; Senna-Martinez, *et al.* 2011a, p. 412).

15 - That will probably explain why generalization of binary bronze production to all Iberian regions only happened with the beginning of the LBA (c.1250-1000 BC).

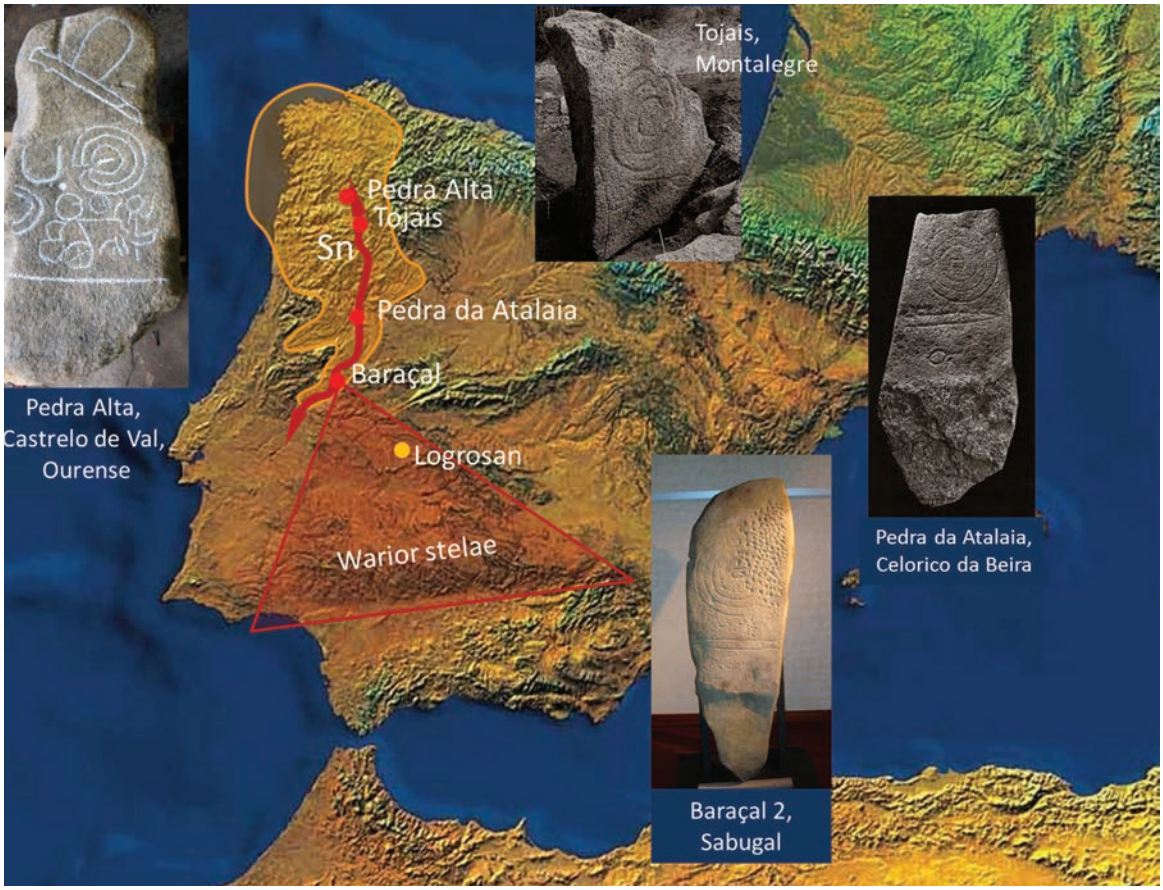

Fig. 4 - The Iberian Peninsula, westerly main "tin-route" and LBA "Warrior stelae": Sn – the area rich in alluvial tin placers; ● new "panoply variant stelae"; ● Logrosan mine.

culated[16], the question of land-routes is capital for its understanding in the Bronze Age. The two main north-south passages, from the alluvial tin producing areas, through the Iberian Central Massif (Fig. 2) are the Beira Transmontana/Northeast Alentejo, westerly, and the Salamanca/Caceres corridors which makes a slightly eastwards detour necessary (Senna-Martinez, 2013a, b).

Already during the EBA and MBA the western corridor through the Portuguese Beiras is signalled by the first "power figures", materialized in the menhir-statues with weapons placed alongside it from Beira Baixa to southern Galicia[17]. This is one of the routes followed by social and techno-

16 - As there is no evidence for mercantile circulation in Iberia before the Early Iron Age, and then only for its southern half, personally we think that the most probable way that circulation of tin occurred was through the same hand-to-hand chains of solidarities between local/regional elites that were sustained probably through bride exchange, and that could also explain other situations of cultural know-how circulation (Senna-Martinez, *et al*. 2011a, p. 413-414).

17 - From south to north (cf. Senna-Martinez, 2013): Corgas (Fundão – Banha, Veiga and Ferro, 2009); Ataúdes (Figueira de Castelo Rodrigo – Vilaça *et al.*, 2001); Valdefuentes de Sangusín (Salamanca – Santonja Gómez and Santonja Alonso, 1978); Nave (Moimenta da Beira – Cruz, D. and Santos, A.T., 2011); Longroiva (Mêda – Almagro, 1966: Lâm. XXX); Chaves e Faiões (Jorge and Jorge, 1990); Cruz de Cepos (Montalegre – Alves e Reis, 2011) and Tameirón (A Gudiña-Riós, Ourense – Comendador-Rey, Rodríguez Muñiz and Manteiga Brea, 2011).

logical exchanges between the north and south of the Tagus basin (Fig. 3). It could also be one of the routes followed to convey both the know-how and cassiterite necessary to binary bronze production (Senna-Martinez, et. al. 2013; Senna-Martinez, 2013a).

During the LBA the above referred western route will continue to be marked by the presence alongside it of the so called "warrior stelae" (*Estelas de Guerrero* – Nunes, 1960; Nunes and Rodrigues, 1957; Ruiz-Gálvez and Galán Domingo, 1991; Galán Domingo, 1994). The distribution of the "panoply" variant of the warrior stelae (Galán Domingo, 1994, p. 47), concentrated in Beira Interior and Spanish Estremadura, is now proved to extend northwards till southern Galicia (Fig. 4) alongside the route we have been discussing[18].

Despite north-south and middle/long distance contacts alongside the above discussed corridor, all the available evidence accounts for low intensity economic exchanges which focused on fashion and prestige items, which characterize Iberian interregional contacts during the Bronze Age (Senna-Martinez, 2013a, b).

So, a clear increase in complexity exists during the Bronze Age regarding metallurgical technology. Nevertheless, since metals in western Iberia Bronze Age seem to have an ideotechnical rather than technomic function, only in this sense can we say they have something to contribute to make the world go round and seem to do it in a very conservative way.

Social structure, technology and social complexity: hierarchy versus heterarchy in western Iberia Bronze Age

Production of explanatory models for the western Europe Bronze Age has been dominated by the *Chiefdom* concept, originally proposed by Service (1962). But, since the nineties of the twentieth century, the mechanic assumption of that concept has been increasingly criticized (Kristiansen, 1991; Levy, 1995). A predominantly hierarchic type of explanation came together with the chiefdom concept and was also subject to criticism. The alternative was the new concept of "Heterarchy"[19].

The idea that the initial chiefdom concept was a too vague and rigid formulation to account for all the nuances of the transformation processes of the European Bronze and Iron Age societies gradually made its way and extended to encompass other regional areas (Ehrenreich, Crumley and Levy, 1995; Macintosh, 1999).

Earle's (2002) revision and split into two of the chiefdom concept[20] and the parallel concept of "decentralised complexity" proposed by Kristiansen (2010) are particularly interesting to our subject area study, Western Iberia Bronze Age, and both open a path to consider what the main evidences available for Western Iberia Bronze Age imply for social complexity.

In western Iberia Bronze Age, both the previously mentioned existence of "power figures" and individual "high status burials" (mostly male, and with an accompanying funerary package of metallic weapons and jewelry) are usually presented as an argument towards the existence of

18 - From south to north (cf. Senna-Martinez, 2013a, b): Pedra da Atalaia 2 (Celorico da Beira – Vilaça, Santos and Gomes, 2011); Tojais (Montalegre – Alves and Reis, 2011) and Pedra Alta (Castrelo do Val, Ourense – http://ccaa.elpais.com/ccaa/2012/02/03/galicia/1328301594_419900.html).

19 - "A formal structure, usually represented by a diagram of connected nodes, without any single permanent uppermost node. [From Greek heteros other, different + archē sovereignty]". (http://www.thefreedictionary.com/heterarchy.

20 - The proposed dichotomy between chieftaincies and strict sense chiefdoms (2002, p. 69)

a hierarchic society. We think that they probably account for social stratification and ideotechnique differentiation of some male elements, but we also think that other data possibly point towards a degree of heterarchy.

We currently have a deficit of information about EBA and MBA settlement systems in western Iberia. Susana Oliveira Jorge (Jorge, 1996/1997) has recognized this situation to be probably due to the proliferation of smaller, more disperse and consequently less archaeographically visible settlements after the "Chalcolithic collapse".

For the areas where we have some information[21], there is not anywhere evidence of the existence of special "chief's houses", much less of a hierarchical settlement system or central food storage facilities, thus implying the lack of evidence of centralized accumulation.

The end of MBA seems to correspond to a partial collapse situation recovered with the beginning of the LBA, where the more abundant evidence for regional settlement systems[22] shows sites that have higher archaeographic visibility, and are clearly positioned as to visually control the surrounding territory but with no real evidence of fortification. Nevertheless, because of their small size (generally much less then 1ha) and population (generally less than 300 inhabitants) they probably constituted equivalent and surely cooperative nodes in the regional networks without evidence of any regional "central place", much less of a "capital". Food storage in the LBA seems also to maintain domestic characteristics without centralized facilities, and there are no evidences for "chief's houses" too.

All the available data on settlement systems in western Iberia during the Bronze Age seems thus to contradict the "chiefdom hypothesis". "Power figures" without archaeographically visible "power sees" seem to be the rule. We will have to wait to the second half of the LBA in Alentejo for the appearance of the first settlements large and complex enough to be proposed to assume such a role (Serra, 2014).

The above discussed technological changes that we can detect during the Bronze Age, for instance in pottery or metallurgy, are few and don't seem to affect the settlement patterns or their internal arrangements. Likewise, both metal artefacts typologies in burial context and the iconography of "power figures" may see some typological changes in the metal paraphernalia present but don't change what we think to be their meaning as "symbols of power" (Senna-Martinez, 1996, 2009, 2014).

While "elite burials" dominate the EBA and MBA[23] the overall picture for Iberia's LBA will see cremation becoming the preferred form of body disposal associated to an almost complete lack of burial offerings (Senna-Martinez, 2014, 41). This suggests the loss of importance of burial as a means of status enhancement and thus its transfer to other forms of representation, namely in the realm of the living. The generalized reconfiguration of settlement systems that occurs in the beginning of the LBA in Iberia opens up new spaces and opportunities of social representation (Jorge, 1995). Of these new opportunities, the banquet or "symposium" surely occupied a preeminent place (Senna-Martinez, 1996; Armada, 2013, 2011).

In short, the absence of "capital" places, the undifferentiated housing within settlements, the domestic nature of storage, the probable domestic nature of the main craft productions – namely pottery and metal artefacts - together with clear burial,

21 - Mostly from the Southwest, Portuguese Estremadura and Northern Portugal.

22 - For instance in the Portuguese Beiras (Senna-Martinez, 1996, 2013b; Senna-Martinez *et al*., 2011a; Vilaça, 1995) and Minho (Bettencourt, 1999).

23 - Nevertheless, we should take into account that – with the possible and recent exception of the Southwest – the evidence for Western Iberia EBA and MBA burial practice seems to be biased towards "elite burials".

iconographic and metal possession status differentiation (in between other aspects) all points towards a social model approaching Earle's chieftainship concept. I.e. with heterarchic structures, together with network type strategies and wealth financing of its economy (Earle, 2002, p.69).

Concluding...

The few technological novelties that we can detect along the western Iberia Bronze Age don't seem to very much influence the organizational strategies we think correspondent to its societies. These strategies seem to correspond to organizations that privilege network strategies over more corporate ones. The tendency for situations that seem to adopt "wealth finance" solutions to legitimate social status probably constitutes the reason to this state of affairs which could better accommodate more heterarchic social solutions.

So we think that technological development doesn't always equate to social complexity growth, especially in situations, like in western Iberia Bronze Age, where there is no direct technomic progress derived.

So, it does not seem possible to uncritically maintain hierarchic models like *chiefdom* or *state* to account for the social formations of western Iberia Bronze Age.

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Iberian Southwest Middle Bronze Age Reading social complexity in greenstone beads from the cist necropolis of Sines

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Abstract

The results of chemical and mineralogical analysis of a set of greenstone beads from the Middle Bronze Age cemeteries of Provença and Pessegueiro in the region of Sines (southwest Portuguese coast) showed that these adornments were not made out of variscite, but of raw material available in the geological structure of Serra do Cercal. The regional scarcity of this type of artefacts and its association with gold and silver grave goods in the most qualified burials of both cemeteries allows an inquiry on material expressions of social complexity in the Bronze Age of the southwest of the Iberian Peninsula.

Keywords

Iberian Southwest Middle Bronze Age; cist necropolis of Provença and Pessegueiro; social complexity; single graves; non-variscite greenstone beads.

1. Introduction

The presence of body ornaments made from green stones in the western European Late Prehistory has been documented since the 19th century in both megalithic tombs and settlements of the Copper Age (e.g. Damour, 1864; Forde, 1930; Ferreira, 1951). A problem arose almost from the very beginning, which still persists today. It came about when the body ornaments made from green stone were classified as *callaite* or '*perles du callais*'. On the one hand is the conceptual confusion that surrounds the term *callaite* – see Vázquez Varela (1975) – and on the other, the issue of placing different minerals under this definition, e.g. variscite, muscovite, serpentinitic/ anfibolitic talc… – see Dominguez-Bella (2012).

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From that point on, little by little, green beads and pendants have been recovered from sites affiliated with different '*archaeological cultures*' and time periods. Octávio da Veiga Ferreira published the first paper about the distribution in Portugal of prehistoric artefacts made in '*callaite*' at 1953. In the 1960s, Ana María Muñoz Amilibia drew up a map of '*callaite*' distribution across the Iberian Peninsula, which back then pertained to the Portuguese (west) and Millarense-Argaric (south-east) settlements and tombs, the Basque megaliths (north) and the Catalan pit graves (north-east); in other words, the outlying areas of the Peninsula (Muñoz Amilibia 1965, fig. 104). Over time, more zones were added, such as the north-west (Guitán Rivera and Vázquez-Varela 1975; Fábregas Valcarce 1991, fig. 100), and other inland areas such as the Duero (Campano Lorenzo *et al.* 1985), Guadiana (Odriozola *et al.* 2010), Tagus (Flores 2011; Odriozola *et al.* 2016b), Ebro (Baldellou *et al.* 2012) and Guadalquivir basins (Odriozola and García Sanjuán 2012), La Mancha (Odriozola *et al*. 2016a), Portuguese Alentejo and Estremadura (Odriozola *et al.* 2016c).

A glance at subsequent distribution maps (Villalba *et al.* 2001, fig. 1; Dominguez Bella 2004, fig. 4; Odriozola *et al.* 2010, fig. 1) shows how the gaps have been gradually disappearing, which suggests that the use of green ornaments was a convention that extended across the entirety of Iberia and, as with the megalithic phenomenon and the Maritime Bell-Beaker culture, it transcended regional culture traits during 3rd millennium B.C.

To date, most papers devoted to body ornamentation continued to use '*calaite*' and variscite as synonyms. However, the increase in geochemical analyses of green mineral sources has been paralleled by an increase in the number of analyses of '*calaite*' beads, and thus in the knowledge of the exact minerals used in beadmaking. Beads have been found to include green mica, chlorite, steatite, turquoise, talc, amphibolite, etc (Villalba *et al.* 2001). As the number of analysed beads increases, it is becoming apparent that Neolithic, Copper Age, and Bronze Age communities used nearly any available green mineral for beadmaking.

In this paper, stone body ornamentation from Provença and Pessegueiro necropolis in Sines

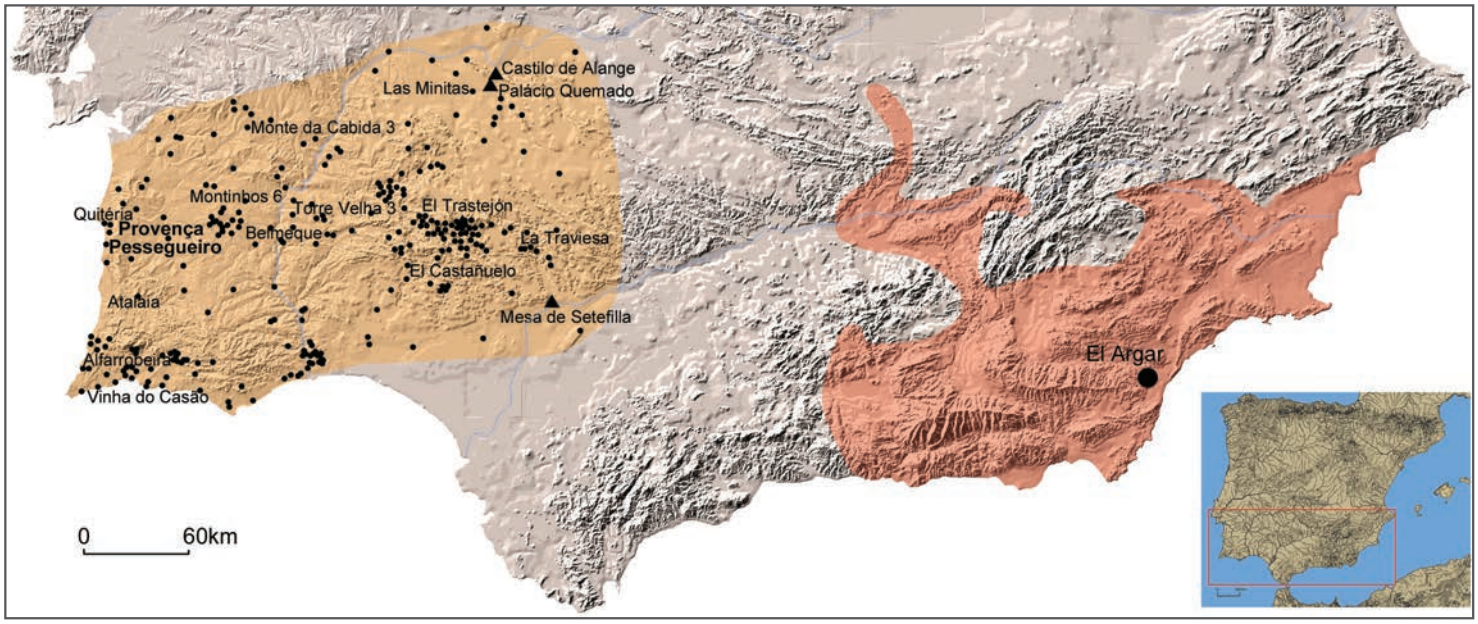

Fig. 1 - Southern of Iberia with the main territories of Southwest Middle Bronze Age Culture (yellow) and El Argar State (red). The most important archaeological sites of the Southwest Middle Bronze Age are located (black). After Soares & Tavares da Silva, 2016.

region (southwest Portuguese coast) will be approached by focusing on raw material characterization, beads chronological and contextual patterning, and social dynamics.

2. Archaeological context

2.1. The necropolis of Provença

The cist cemetery of Provença is located on a littoral zone, about 7 km south of Sines, and only 1,7 km to the Atlantic shore. The geodesic coordinates of the central point of the necropolis are: 37°55'46.92"N; 8°47'17.69"W (Fig. 1). The site belongs to the parish and municipality of Sines.

The spatial organization of Provença showed two funerary monuments with cist graves, about 100 meters far from each other. Approximately equidistant from them there was a contemporaneous settlement, with perishable architectural features. The western monument was destroyed by mechanical agriculture in 1965. The archaeological excavation of the Monument I (eastern) took place in 1972 (Santos, Soares and Tavares da Silva, 1974, 1975). This monument had 32 small cist graves, but only 28 were preserved. The graves were aggregated in two funerary nuclei about 2 meters apart from each other (Fig. 2).

The cist graves of Provença have a rectangular plan with the exception of the cist 19, with a polygonal shape. The graves were dug in the soil and implanted in the schist bedrock; the walls and the covers were made of schist slabs (from local origin), exception for cist 15, whose walls were made in dunar consolidated sandstone, available in the nearby S. Torpes bay, and the lid of cist 1 that was carved in ferruginous sandstone. Each grave was protected and monumentalised by a *tumulus* with a rectangular outline engirdled by small raised schist slabs; *tumuli* were constituted by clayey sediment containing pottery sherds and stone blocks. Inside the *tumulus* of cist 1, two complete ceramic vessels were recovered. The *tumuli* enclosures are connected to each other and sometimes interpenetrate, forming a type of aggregate honeycomb, which developed from the founder grave.

The larger graves and *tumuli* were constructed with an approximate north-south orientation and form the earlier core of Monument I. In the more recent graves the longest axis were preferably positioned east-west. In general, the dimensions of the cist rarely exceed 1 m in length; both its width and depth measure about 0.50/ 0.60 m.

The funerary ritual, as occurred in the other cemeteries of the Iberian Southwest Middle Bronze Age, was characterized by individual burials where the body was deposited in crouched position and in lateral decubitus, in an aerobic atmosphere. In fact, sediments did not usually cover the bodies and the grave goods, although over time soil would have infiltrated the chambers. Some of the cists could be reused sequentially for single depositions.

At the cemetery of Provença the occurrence of edaphic and chemical unfavourable post-depositional conditions did not allowed the preservation of the bone remains; only small fragments have been found. Therefore, these findings did not give sufficient anthropological information nor enough collagen could be collected for radiocarbon chronology.

Many of the burials had no grave goods, not even revealing signs of perturbation; some contained only a small ceramic vessel; in fact, cist 23, which was sealed by a lid, provided only one fragment of a vessel (Santos, Soares and Tavares da Silva, 1974 Fig. 2), which seems to prove the mere symbolic nature of this deposit; on contrary, the cist 12, on the northern periphery, contained a rich offerings, well differentiated from the other burials (Fig. 5).

2.1.1. Cist 12

The cist 12 is located in the northern periphery of the southern nucleus of the monument I. It is integrated in a *tumulus* with rectangular plan, measuring 2,20m x 1,20m. The southern side of this *tumulus* connects the enclosure of the severely damaged cist 29; to the east, it confined by the *tumulus* of cist 13, and to the west, by the enclosure of the cist 23.

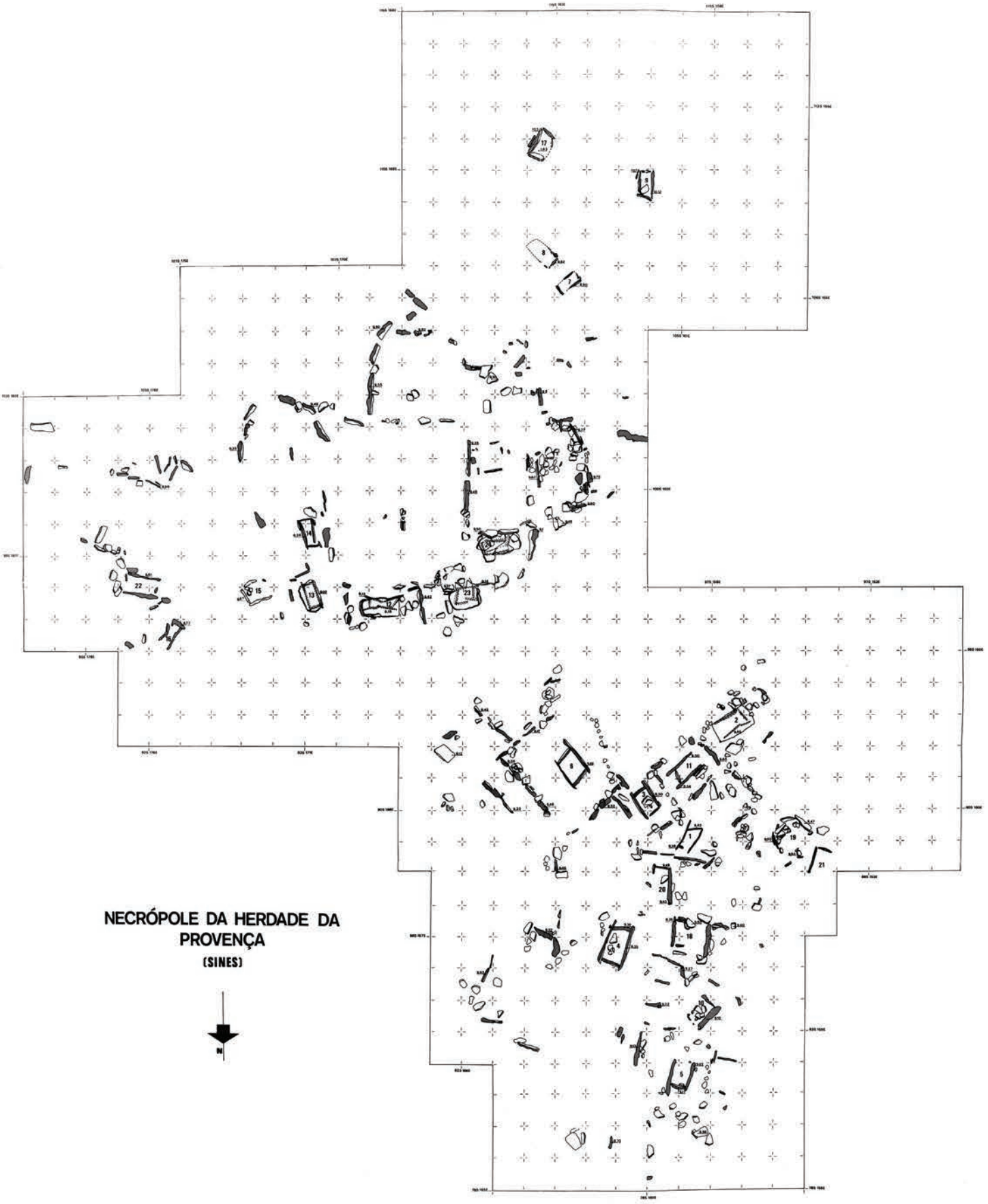

Fig. 2 - Plan of the Monument I of the necropolis of Provença (Sines). After Tavares da Silva and Soares, 1981.

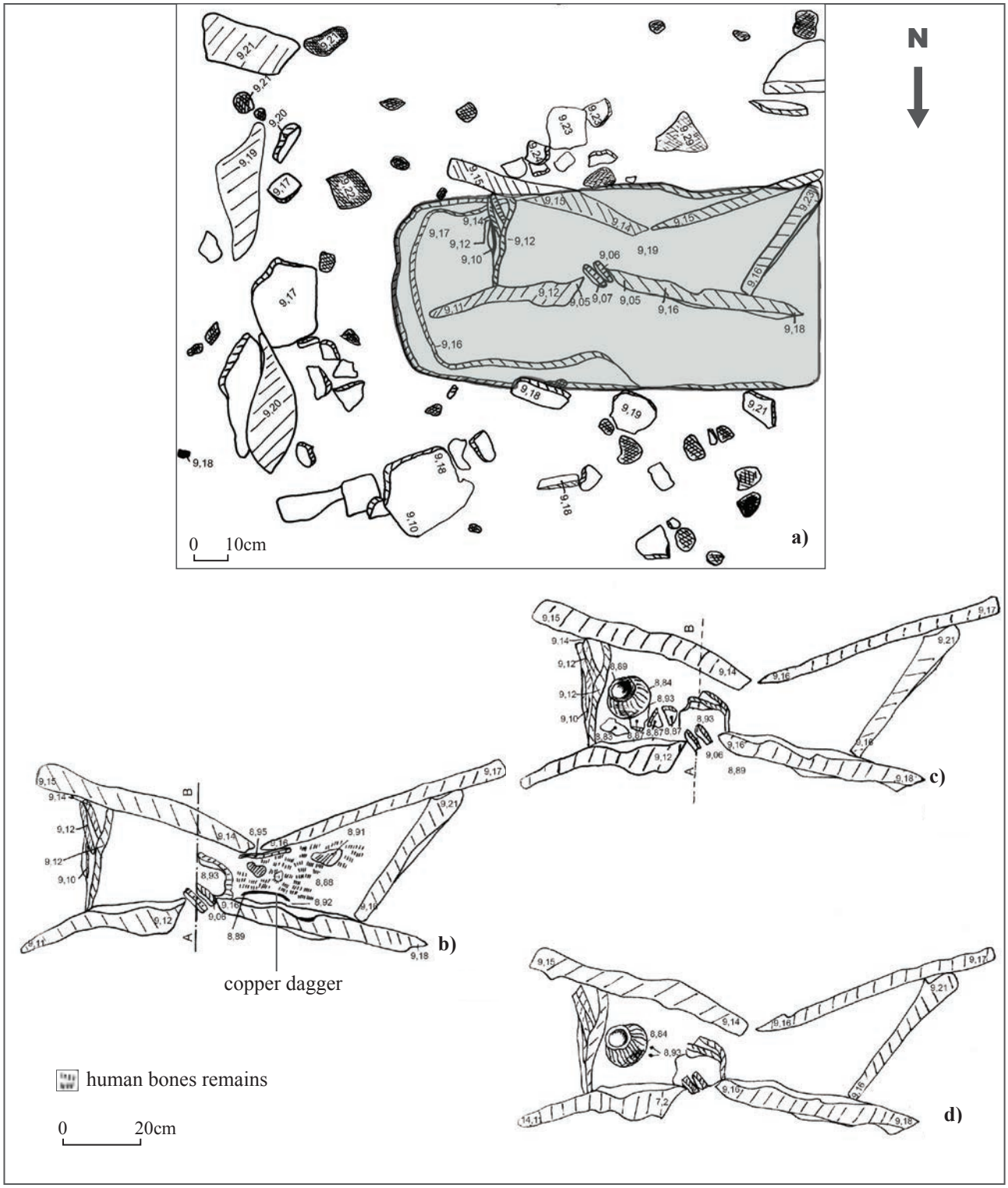

Fig. 3 - Field drawings of the plans from the last burial in cist 12 (cemetery of Provença): a) grave with lid and *tumulus* remains; b) the appearence of the arsenical copper dagger; c) plan with the ceramic vessel with strangled neck; d) ceramic vessel, greenstone and gold beads. After Tavares da Silva and Soares.

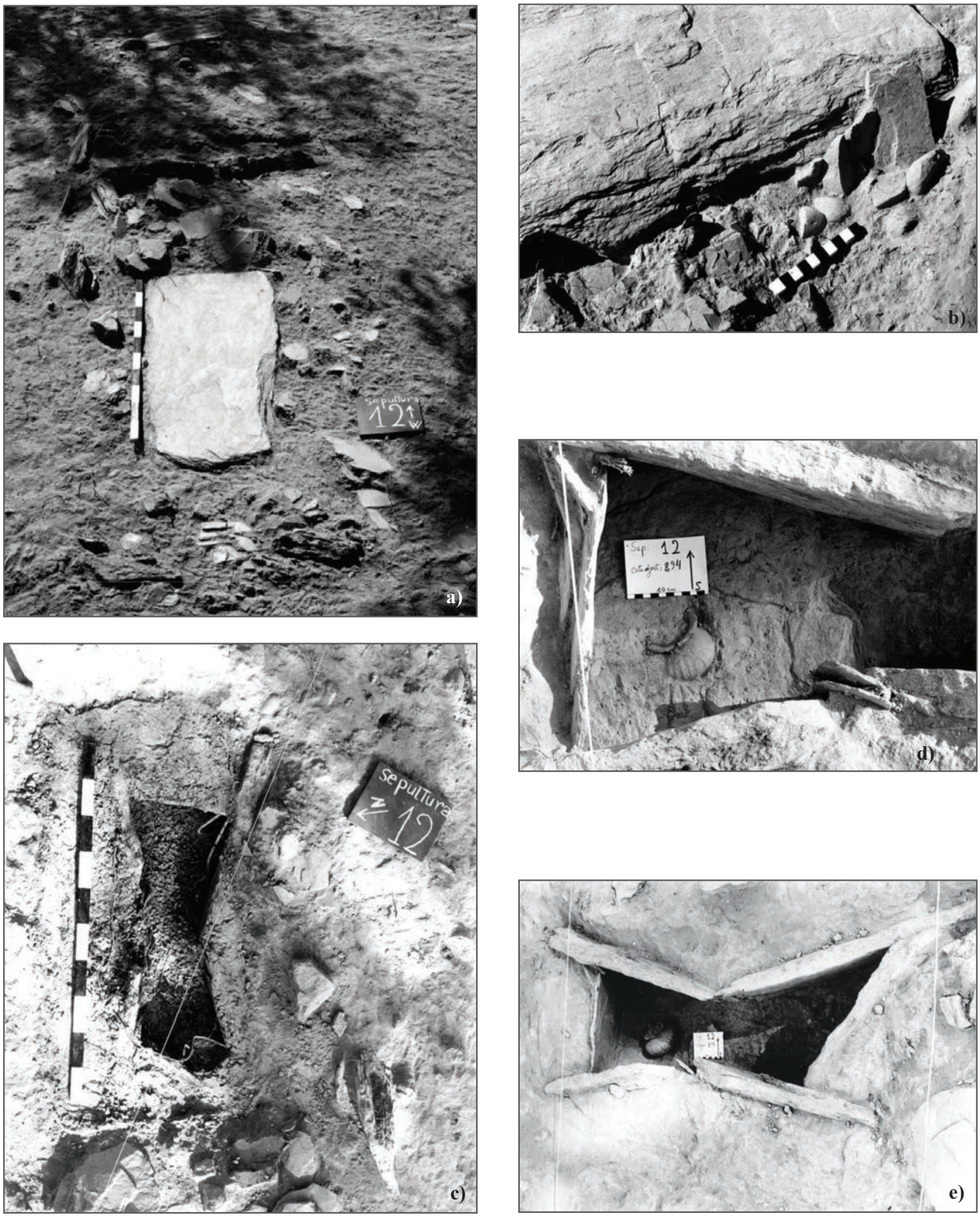

Fig. 4 - Cist 12 of the cemetery of Provença (Sines). Sequencial phases of the excavation. Photograph by Carlos Tavares da Silva.

The grave's longest axis was positioned east west. A rectangular monolithic lid in schist that measures 1,25m in length, 0,56m in width and 0,07m in it's maximum thickness covered the cist (Figs. 3a and 4a). Sediments did not fill the cist 12, as others (Fig. 4c); its original rectangular plan was deformed; the lateral wall slabs, inserted into the bedrock, had been fragmented by external pressures, although the existence of an interior reinforcement. The funerary chamber measured 1,20m in length, 0,43m in width and 0,50m in depth. Over the lid, remains of the *tumulus* were found constituted by clayey sediment with pebbles, schist blocks and some ceramic sherds (Fig. 4b).

Cist 12 contained two sequential burials. From the first funerary deposition, human remains were not preserved, but a small low carinated bowl, in a normal position, was recovered; The last burial of this grave, separated from the former by a schist slab, contained very small fragments of human bones, and a rich set of grave goods constituted by:

- An arsenical copper dagger with rivets deposited along the northern wall slab; the blade was pointed to the east, what fits well with a crouched inhumation in lateral decubitus oriented east (head) – west, and facing the north;
- A globular ceramic vessel with a vertical strangled neck and extroverted rim, smoothed and burnished walls, fired in reducing conditions, decorated by lobes. It had been deposited in a normal position, probably between the hands and the chest of the deceased (Figs. 3c, d and 4d, e). Mário Varela Gomes (2015, p. 86) suggested that the shape of such prestigious container could be inspired by the opium poppy (*Papaver somniferum* L.). This is an interesting hypothesis, but needs further research, namely analysis of consumption traces.

Close to the bottom of the ceramic vessel there was a spiral gold bead and two beads carved in green stone, with a discoid shape and a central cylindrical perforation (Tavares da Silva and Soares, 1981), subject to chemical and mineralogical analysis presented in this paper.

The absence of enough collagen in the human bones fragments did not allow a radiocarbon analysis. Nevertheless, this burial can be dated by the small-strangled neck pot, a characteristic funerary pottery type from the late phase of the Middle Bronze Age of the Iberian Southwest (Schubart, 1975). The Belmeque hypogeum at Serpa (Alentejo) was radiocarbon dated by a sample of human bones - ICEN-142: 3230±60 BP, 1660-1400 cal BC, 2 sigma (Soares, 2004); among the burial offerings there was a ceramic vessel belonging to the same typological group.

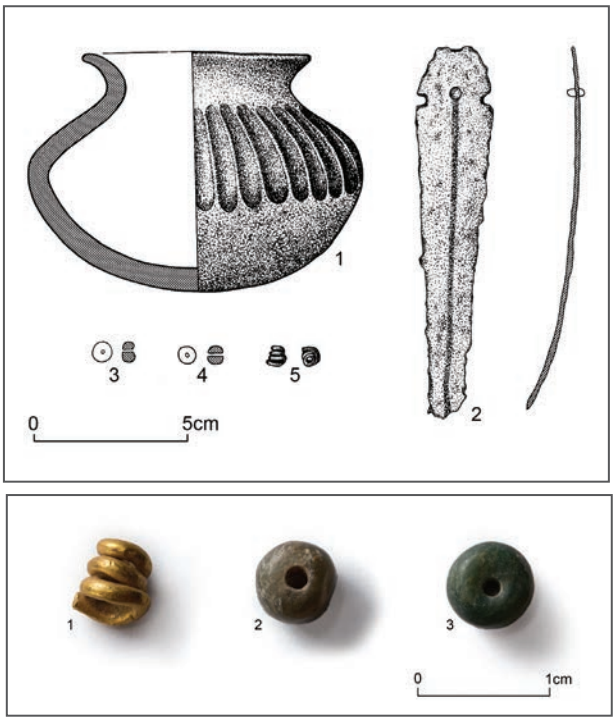

Fig. 5 - Necropolis of Provença, cist 12. Grave goods from the last burial: 1 - ceramic vessel; 2 - arsenical copper dagger; 3, 4 - greenstone beads; 5 - gold spiral. After Tavares da Silva and Soares, 1981.

2.2. The necropolis of Pessegueiro. Monument II

The necropolis and the settlement of Pessegueiro are located in a littoral zone, close to the sandy beach of Pessegueiro, that belongs of the municipality of Sines and to the parish of Porto Covo. The centre of the necropolis has the following geodesic coordinates: 37°49'59. 92"N; 8°47'10. 53"W (Fig. 1).

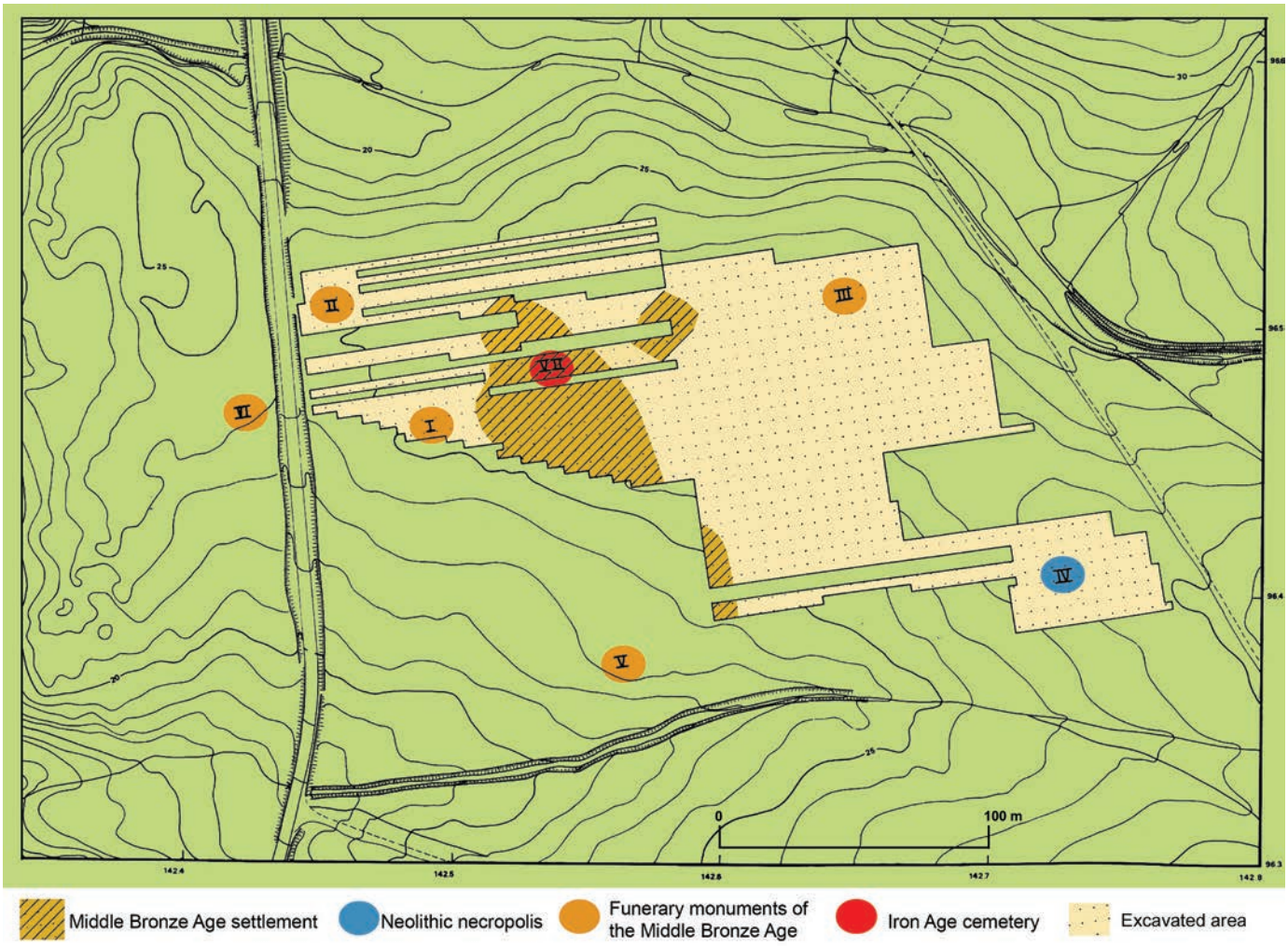

Fig. 6 - Pessegueiro. Excavated area. After Tavares da Silva and Soares, 2009.

This archaeological site is situated on a sandy plain with about 1 ha, limited by two small streams that converge in the Corgo do Pessegueiro. The geological substratum is constituted by Plio-Pleistocene sandstone.

The settlement has about 0,5 ha. Its stratigraphy revealed one single occupation contemporaneous of the necropolis. Several domestic structures had been recovered, just as fireplaces, postholes, cobbled pavements and wall foundation alignments of small raised schist slabs; huts had rectangular plans, and were built mostly out of perishable materials (Tavares da Silva and Soares, 1981).

The cemetery is constituted by at least five monuments (Fig. 6) adjacent and surrounding the inhabited area.

The beads studied in this paper came from the cist 1 of the Monument II (Figs. 7, 8). This oval shaped monument is about 16m in its largest axis, with an east-west direction, and 14m in its north--south axis; it is located only 50 m far from the settlement and is formed by 27 graves of small stone cists type with a rectangular plan. Monument II can be desegregated into four nuclei of stone cists, probably related with the kinship structure of the Pessegueiro community; each grave was built with four slabs

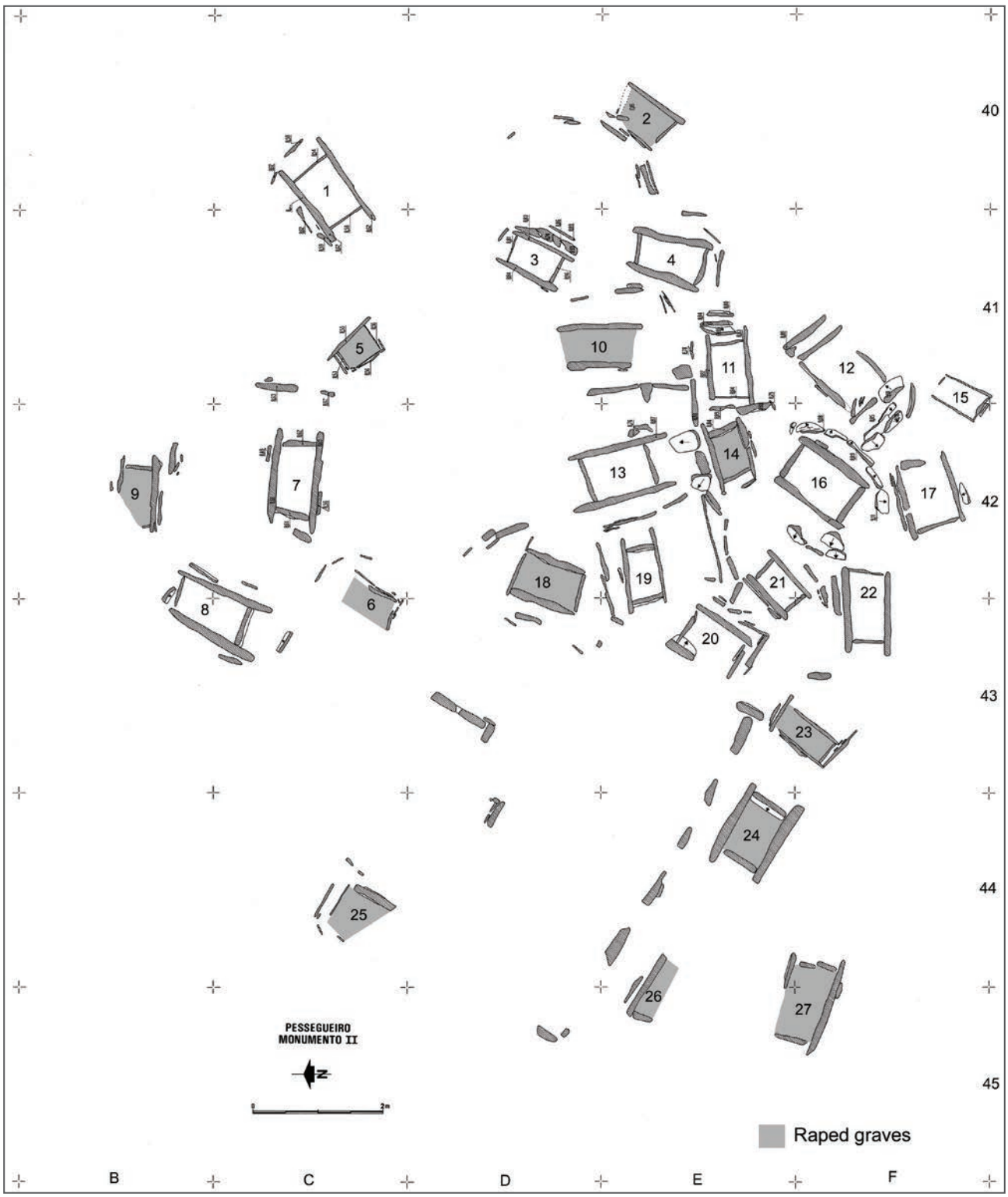

Fig. 7 - Plan of the Monument II of the necropolis of Pessegueiro (Sines). After Tavares da Silva and Soares, 2009.

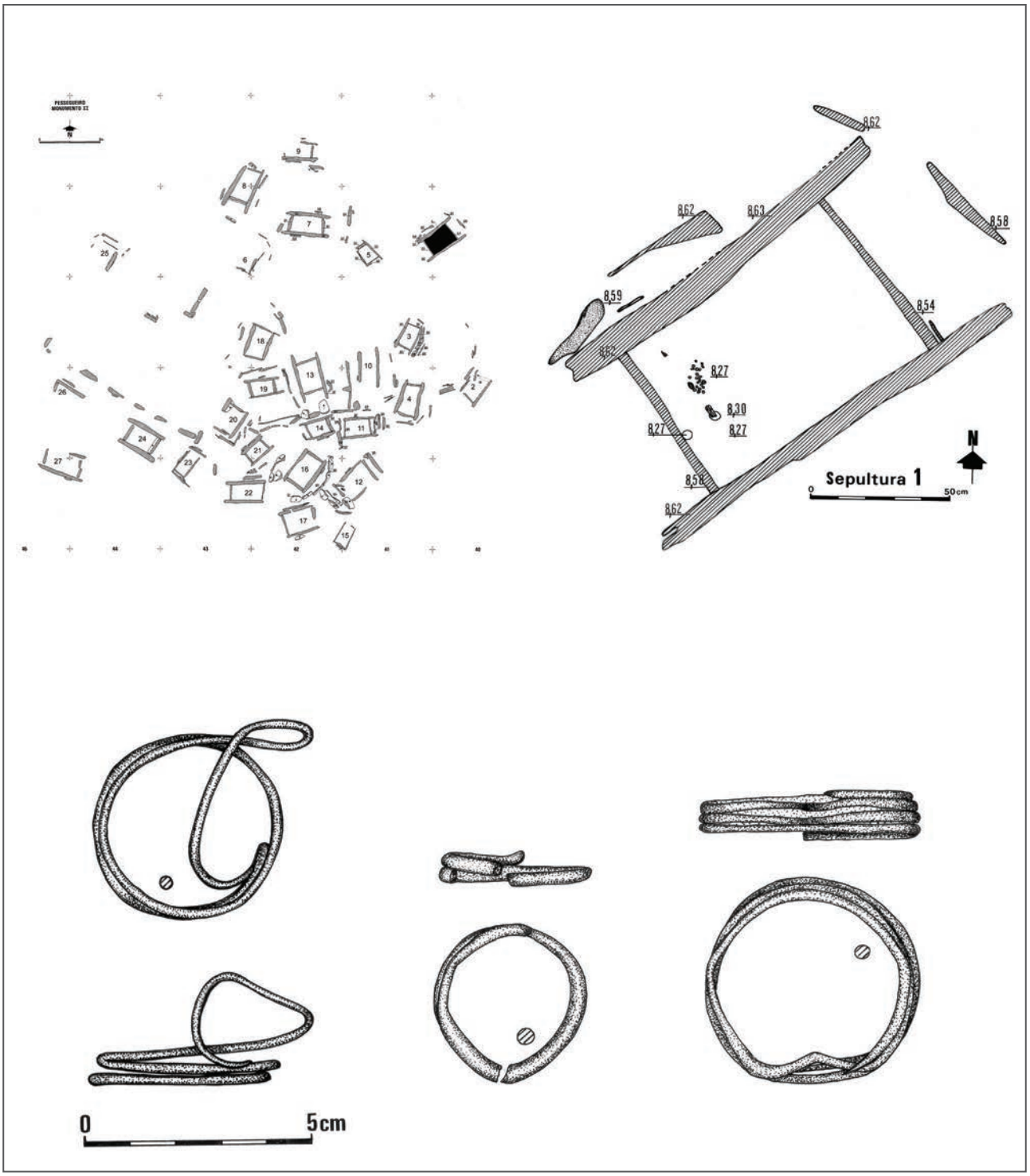

Fig. 8 - Monument II of the necropolis of Pessegueiro (Sines). Plan of the cist 1 and silver spirals from it. After Tavares da Silva and Soares, 2009.

of schist and/or dunar sandstone, and covered by a monolithic lid. The grave was positioned inside an enclosure also with rectangular plan defined by small raised stone slabs that contained the *tumulus* for protecting and monumentalising the ancestor's memory. These funerary enclosures were linked, raising a complex network with a honeycomb like shape, commanded by the founder´s grave. Furthermore, each *tumuli,* by symbolic reasons or practical convenience, included sediments probably from the settlement, indicated by small fragments of numerous domestic ceramic vessels (Tavares da Silva and Soares, 2009).

Only cist 16 (nucleus C) gave anthropological remains, in which two individuals were buried at different moments. The former was a male adult approximately 30 years old at the time of the burial. However, later on, the grave was reused and the previous human remains were rearranged close to one of the lateral slabs inside the grave. In the later burial a female corpse was found in a foetal and right lateral decubitus position with the head pointing towards northeast; she was about 35-45 years of age and about 150 cm tall; considering categorisation, they both belong to the Mediterranean gracile subtype (Tavares da Silva and Soares, 2009, p. 403; Fernandes, 2009). The radiocarbon chronology of this grave had been obtained by two determinations on the human bones from both individual burials. Earlier inhumation: ICEN-867: 3270±45 BP (1679-1442 cal BC, 2 sigma); later inhumation: ICEN-868: 3030±40 BP (1407-1131 cal BC, 2 sigma) (Soares and Tavares da Silva, 2016).

In what concerns the grave goods of Monument II only seven cists had preserved artefacts accompanying the deceased; three of them contained one ceramic vessel; two graves had a ceramic vessel and a copper awl; one cist held a ceramic recipient and a long copper dagger; the grave goods of cist 1 from nucleus A, subject of the present study, was composed by three silver spirals and 23 stone beads (Fig. 8); 7 graves had no offerings and the remaining 13 graves were emptied before our intervention.

The hierarchical spatial organization inside the necropolis, the architecture of the tombs, the grave goods typology and the mortuary ritual of Monument II indicate a very unequal local society from a later phase of the Middle Bronze Age.

2.2.1. Cist 1

Cist 1 is located in the periphery of nucleus A; it has a rectangular plan, and its main axis was oriented northeast-southwest. This stone cist measures (interior): 0,92m in length, 0,65m in width and 0,49m in depth. The grave had been built with schist slabs. The lid disappeared before the archaeological excavation (Fig. 7). The *tumulus* connects with that of grave 5.

Three silver spirals appeared next to the minor side (south-western) of the grave, together with 23 perforated stone beads: 20 with sub spherical shape, a central cylindrical perforation (4 to 6 mm in diameter) and green colour; 2 with sub spherical shape (6 to 9mm in diameter) and pinkish white color; 1 with sub cylindrical shape and brown colour. Dimensions: 11mm in diameter and 17mm in thickness (Figs. 9, 10, 11).

3. Materials and Methods

The mineralogical identifications of beads in this paper (24 samples from the sites of Provença and Pessegueiro II in Sines, Portugal) are based on the chemical composition measured by an Oxford Instrument XMET-7500 portable energy dispersive x-ray spectrometer (EDX) with an Rh tube, a silicon drift detector (SDD), and an automatic 5-position filter changer. Quantification was obtained with the SOILS-LE program.

Beads have been labelled in the order the bracelet was set in the Museum of Archaeology and Ethnography of the District of Setubal

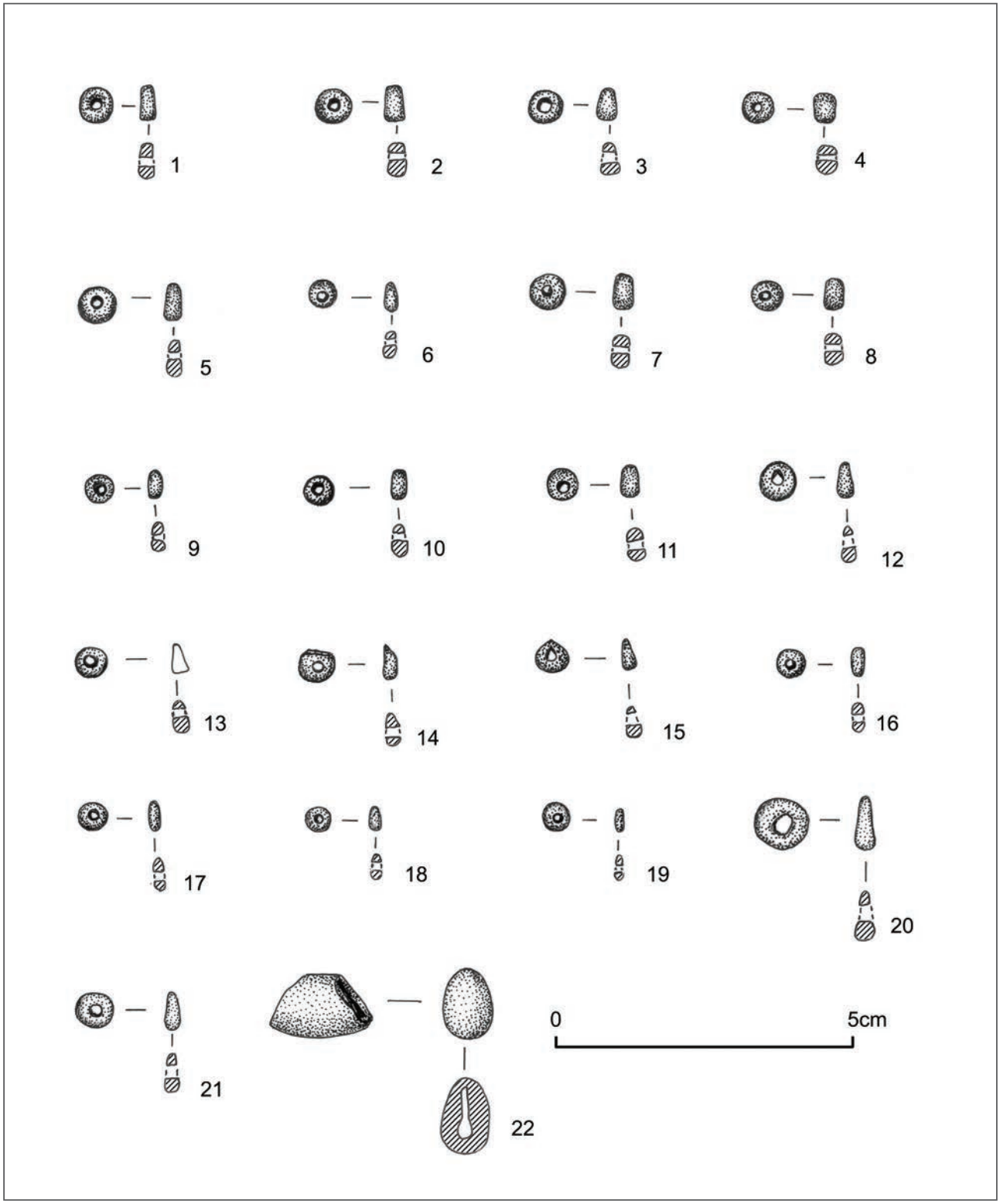

Fig. 9 - Monument II of the necropolis of Pessegueiro (Sines). Greenstone beads from cist 1. After Tavares da Silva and Soares, 2009. Correspondence with Fig. 10: 1 – Pes 7; 2 – Pes 6; 3 – Pes 13; 4 – Pes 19; 5 – Pes 9; 6 – Pes 20; 7 – Pes 8; 8 – Pes 15; 9 – Pes 18; 10 - Pes 17; 11 – Pes 5; 12 – Pes 16; 13 – Pes 2; 14 – Pes 4; 15 – Pes 14; 16 – Pes 21; 17 – Pes 22; 18 – Pes 3; 19 – Pes 1; 20 – Pes 10; 21 – Pes 12; 22 – Pes 11.

Fig. 10 - Beads assemblage of cist 1 of Monument II of the necropolis of Pessegueiro (Sines). All beads are scaled. Photograph by Carlos P Odriozola.

(S.E.M./10030_10051), that is with the biggest bead in the middle and the shorter ones in the ends –see photograph (Fig. 10).

4. Results

EDX analysis (Table 1) of the 22 beads from Pessegueiro II tomb 1 are compatible with the chemical composition of green micas, e.g. muscovite, except for samples 11 and 13. Both samples, 11 and 13, have a high Mg value which makes their chemical composition compatible with that of biotite/phlogopite mica type and/or chlorite.

The most common green stones shaped into beads in prehistoric Iberia are variscite, mica, talc-steatite, chlorite and serpentine – *chrysotile, antigorite and lizardite.* The mineralogical classification of beads by means of portable analytical devices is not a straightforward task and deserves a full-length paper in its own right. However, differentiating between green stone types formed by sheet silicates (micas, talc-steatite, chlorite or serpentine), although possible is a highly complicated task.

Micas have a Si-to-Al ratio that ranges from 1-3 depending on the type of mica: muscovite [$KAl_2[OH,F]_2AlSi_3O_{10}$], biotite [$K[Mg,Fe]_3[OH,F]_2AlSi_3O_{10}$] and phlogopite [$KMg_3[OH,F]_2AlSi_3O_{10}$]) have K and a variable amount of M^{+2} substitutions (Mg, Fe) (Roberts *et al.*, 1990; Deer *et al*., 1992). Chlorites [$A_{4-6}Z_4O_{10}(OH)_8$, where A = Al, Fe^{2+}, Fe^{3+}, Li, Mg, Mn^{2+}, Ni; Z = Al, B, Fe^{3+}, Si] (Roberts *et al.*, 1990; Deer *et al.*, 1992), have a Si-to-Al ratio ranging from *c.* 1.7-8 and a variable amount of Fe, Mg and Mn. To differentiate between these two aluminosilicates we look at the Si-to-Al atomic ratio and the amount of Fe, Mg and K.

Si-to-Al ratio in all samples, except of sample pes11, ranges from 0.9 to 1.3 which make these samples compatible with the Si-to-Al ratio of muscovite type micas. In addition to this, substitutions of Al^{+3} for Fe^{+3} ions may occur in this mica type mineral what allows for atomic concentration values of Fe^{+3} of 0.76±0.24%.

The amount of Mg recorded from sample pes13 together with the recorded K makes the

Table 1 - EDX analysis with the chemical composition of the greenstone beads from Monument II of Pessegueiro and Provença necropolis expressed as percentage of atoms.

SITE	Mineral	Mg	Al	Si	S	Cl	K	Ca	Ti	V	Cr	Mn	Fe	Co	Cu	Zn	Rb	Sr	Zr	Ba	Height	Width	Perforation	Weight	L	C	h
Pessegueiro	mica	0,00	47,06	41,80	0,16	1,57	8,00	0,32	0,109	0,000	0,056	0,000	0,879	0,000	0,001	0,000	0,009	0,015	0,001	0,016	2,05	4,37	1,19	0,05	61,00	19,42	124,50
Pessegueiro	mica	0,00	45,07	41,76	0,24	1,89	9,90	0,10	0,128	0,000	0,083	0,000	0,792	0,000	0,000	0,000	0,012	0,010	0,000	0,010	2,47	4,43	0,92	0,07	50,00	19,79	149,50
Pessegueiro	mica	0,00	45,54	41,62	0,17	1,72	9,71	0,10	0,112	0,213	0,000	0,000	0,786	0,000	0,000	0,000	0,012	0,008	0,000	0,013	1,87	4,57	1,12	0,07	37,00	7,21	146,30
Pessegueiro	mica	0,00	45,91	43,11	0,18	2,01	7,23	0,56	0,067	0,000	0,023	0,000	0,841	0,000	0,000	0,000	0,011	0,020	0,000	0,038	2,96	5,21	1,17	0,12	62,00	12,53	118,60
Pessegueiro	mica	0,00	41,67	45,88	0,17	1,28	9,73	0,16	0,082	0,000	0,110	0,000	0,887	0,000	0,000	0,000	0,011	0,009	0,000	0,015	3,79	5,58	1,16	0,19	61,00	15,65	153,40
Pessegueiro	mica	0,00	41,16	46,74	0,20	2,00	8,68	0,08	0,155	0,000	0,034	0,000	0,912	0,000	0,000	0,000	0,009	0,003	0,000	0,022	2,85	6,14	1,54	0,18	60,00	17,49	120,96
Pessegueiro	mica	0,00	47,39	40,60	0,19	1,76	8,80	0,22	0,107	0,000	0,038	0,000	0,813	0,000	0,003	0,000	0,013	0,016	0,000	0,038	3,90	5,91	0,72	0,23	57,00	14,32	155,22
Pessegueiro	mica	0,00	44,30	43,44	0,17	1,24	9,41	0,15	0,103	0,000	0,249	0,000	0,884	0,000	0,005	0,000	0,012	0,010	0,000	0,030	3,62	6,03	0,94	0,20	54,00	24,21	141,71
Pessegueiro	mica	0,00	42,70	43,56	0,10	0,86	11,35	0,15	0,158	0,000	0,000	0,000	1,066	0,000	0,002	0,000	0,007	0,002	0,000	0,037	2,34	6,25	1,36	0,11	59,00	13,89	120,26
Pessegueiro	mica	0,00	41,75	42,96	0,20	1,23	12,56	0,54	0,170	0,000	0,000	0,000	0,553	0,000	0,000	0,000	0,009	0,009	0,009	0,018	2,66	7,70	3,69	0,18	62,00	35,74	72,07
Pessegueiro	mica	0,00	45,86	41,89	0,16	1,15	10,57	0,13	0,124	0,000	0,000	0,000	0,077	0,000	0,000	0,000	0,012	0,003	0,004	0,011	2,51	6,34	1,64	0,16	66,00	36,69	72,55
Pessegueiro	mica	13,97	33,55	30,28	0,14	1,34	0,00	0,31	0,057	0,000	0,000	0,361	19,591	0,000	0,337	0,029	0,002	0,000	0,000	0,020	3,48	5,94	1,92	0,21	46,00	1,00	90,00
Pessegueiro	mica	0,00	45,99	41,78	0,13	1,23	9,58	0,13	0,119	0,000	0,060	0,000	0,915	0,000	0,014	0,000	0,013	0,013	0,000	0,020	2,35	6,01	1,97	0,11	35,00	18,79	115,20
Pessegueiro	mica	0,00	45,34	43,17	0,13	1,34	9,05	0,16	0,100	0,000	0,000	0,000	0,642	0,000	0,003	0,000	0,015	0,017	0,000	0,035	2,55	5,40	1,26	0,14	55,00	19,92	107,53
Pessegueiro	mica	0,00	43,21	42,67	0,25	1,86	9,86	0,26	0,148	0,000	0,064	0,000	1,567	0,000	0,067	0,000	0,012	0,011	0,000	0,031	2,78	5,61	1,20	0,13	46,00	17,09	110,56
Pessegueiro	mica	0,00	46,26	42,45	0,12	1,18	8,69	0,23	0,173	0,000	0,036	0,000	0,787	0,000	0,000	0,000	0,010	0,030	0,000	0,031	3,44	5,41	0,97	0,16	44,00	21,21	135,00
Pessegueiro	mica	0,00	46,40	41,68	0,13	1,42	9,34	0,08	0,086	0,000	0,061	0,000	0,752	0,007	0,002	0,000	0,011	0,009	0,000	0,020	2,49	5,09	1,32	0,11	42,00	20,62	140,91
Pessegueiro	mica	0,00	46,52	41,62	0,13	1,24	9,49	0,05	0,082	0,203	0,000	0,000	0,642	0,000	0,000	0,000	0,011	0,009	0,000	0,013	2,20	4,91	0,98	0,09	42,00	8,54	159,44
Pessegueiro	mica	0,00	46,82	40,86	0,17	1,84	9,09	0,12	0,140	0,000	0,035	0,000	0,862	0,000	0,000	0,000	0,013	0,014	0,000	0,029	3,01	4,69	0,87	0,11	41,00	17,69	132,71
Pessegueiro	mica	0,00	46,55	40,23	0,25	1,77	9,92	0,18	0,151	0,000	0,073	0,000	0,841	0,000	0,000	0,000	0,011	0,010	0,000	0,014	1,69	4,51	0,41	0,07	54,00	17,69	132,71
Pessegueiro	mica	0,00	43,96	41,55	0,19	1,75	11,12	0,11	0,101	0,000	0,168	0,000	1,045	0,000	0,000	0,000	0,008	0,002	0,000	0,000	1,22	4,00	0,00	0,00	53,00	20,00	143,13
Provença	mica	0,00	40,02	46,24	0,28	1,54	9,96	0,21	0,103	0,000	0,019	0,000	1,575	0,000	0,000	0,000	0,012	0,011	0,000	0,019	5,67	6,29	1,53	0,32	34,00	19,65	104,74
Provença	mica	0,00	44,15	43,40	0,14	1,10	9,49	0,24	0,230	0,000	0,123	0,000	1,074	0,000	0,000	0,000	0,012	0,017	0,004	0,027	4,60	6,61	1,09	0,33	35,00	16,97	135,00
Pessegueiro	talc	42,56	2,73	52,75	0,08	0,71	0,00	0,34	0,028	0,000	0,000	0,009	0,700	0,000	0,086	0,000	0,000	0,001	0,000	0,000	16,86	11,48	2,32	2,00	14,00	15,00	36,87

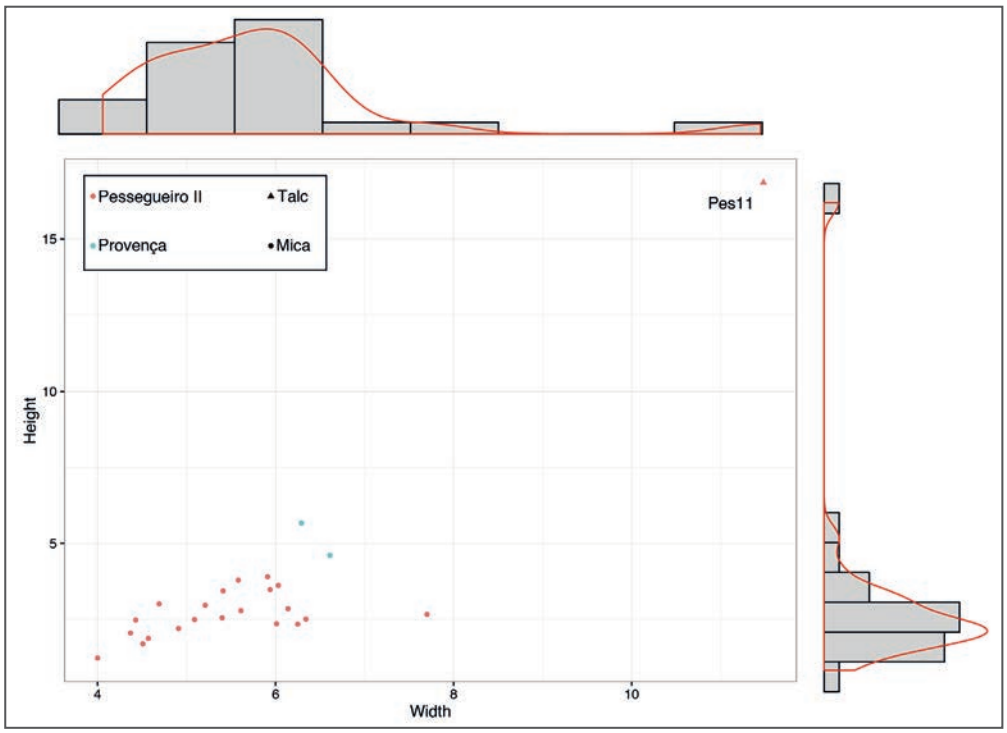

Fig. 11 - Beads' width vs. height plot (measurement unit mm).

chemical composition of this sample compatible with the chemical composition of black micas, e.g. biotite, and incompatible with chlorite, talc or serpentine, as neither of this mineral accounts for K on its constituents. In addition to this, the colour of the bead is black, what is in agreement with its classification as black mica (biotite).

Mg values for sample pes11 are way too high to make its chemical composition compatible to that of the mica family minerals. This together to its Al value, 1.29%, makes its chemical composition compatible with that of chlorites. However, its Si-to-Al ratio (20.1) is high above the upper threshold for chlorites (8). Therefore, the small amount of aluminium and the high content on magnesium and silica makes its chemical composition compatible with that of serpentines and talc derived from ultramafic lithologies.

Serpentine $[A_3Si_2O_5(OH)_4$, where A = Mg, Fe^{2+}, Ni] (Roberts *et al*. 1990), and talc $[Mg_3Si_4O_{10}(OH)_2]$ (Roberts *et al.* 1990; Deer *et al*. 1992) are magnesium silicates and have no or small amounts of aluminium, thus the Si-to-Al atomic ratio should clearly differentiate these minerals from the former. However, to differentiate between them we should again look at the Si-to-Al atomic ratio because serpentines have no Al, whereas talc may have Al substitutions in small quantities. The quantity of Mg and Fe also contributes to differentiate between these two minerals, as talc tends to have more Mg and Fe than serpentine.

To this point pes11 sample's chemical compositions seems to be compatible with that of talc due to its low aluminium content, absence of potassium and high content of silica and magnesium. Although neither pes11 nor the other samples mineralogical identification can be assured unless x-ray diffraction or any other mineralogical characterization technique is applied.

It happens that muscovite type micas colour is white to colourless, but it can be tinged various colours by impurities. Samples pes10 and pes12 are of a yellow pale colour that means that it presents some compositional differences with the greener hues muscovites. These hue differences may derive from the fact that these two samples do not account for Cr and accounts for less Fe than

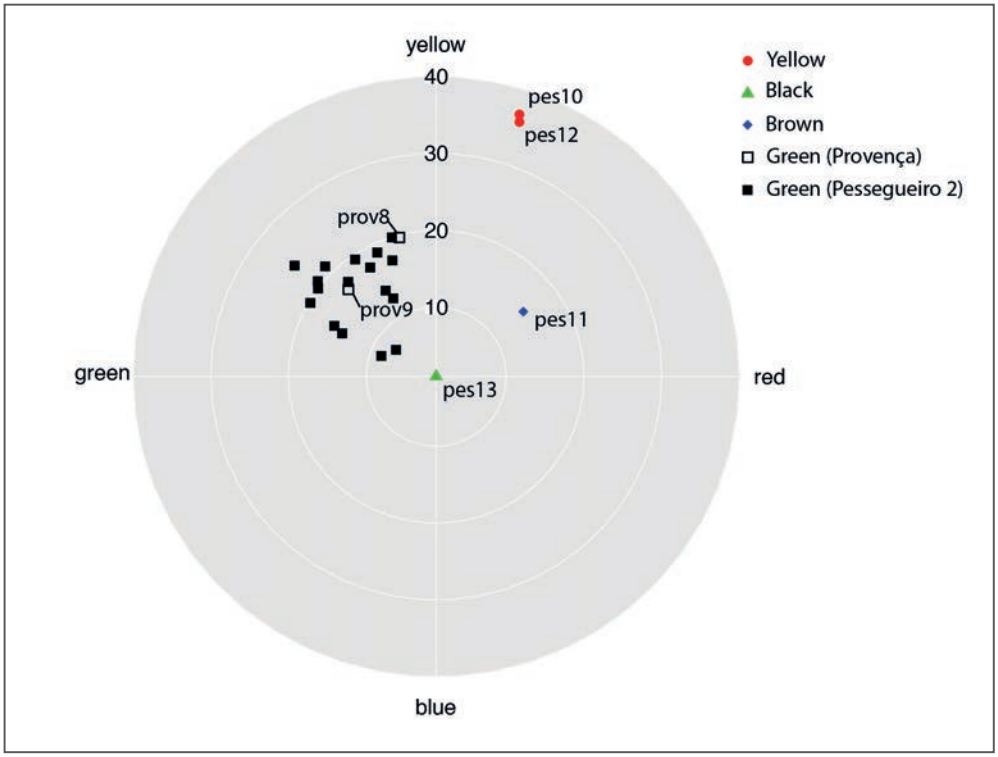

Fig. 12 - LCh color space coordinates plot (C,hº).

the greener hues. Both, Cr and Fe, are believed to be responsible for the green colour.

As for Pessegueiro (Table 1) II EDX analysis of the 2 beads from Provença are compatible with chemical composition of green micas. They have, indeed almost identical chemical composition to the 21 beads from Pessegueiro II that have been identified as micas.

To this extent, sample pes11 seems to be made of a different raw material; green mica or most likely talc derived from ultramafic rock probably a weathered dunite. However, this is not the only difference between this bead and the assemblage. Bead pes11 also has differences in colour

Table 2 - Radiocarbon available dates for green mica beads.

Lab code	Site	Years BP	Years BP SD	Column1	Years cal BC	Reference
Beta-68667	Castillo de Alange (c/ Umbria 3/ N. II)	3080	90	1518	1056	(Pavón Soldevila, 1994)
KIA-18997	Fuenta Álamo (tomb 11)	3470	25	1878	1698	PINGEL V. (2004)
KIA-18998	Fuenta Álamo (tomb 112)	3165	27	1497	1406	PINGEL V. (2004)
OxA-4971	Fuenta Álamo (tomb 52)	3610	50	2133	1782	PINGEL V. (2000)
OxA-4973	Fuenta Álamo (tomb 75)	3635	50	2137	1887	PINGEL V. (2000)
OxA-4972	Fuenta Álamo (tomb 75)	3545	65	2110	1692	PINGEL V. (2000)
OxA-5047	Fuenta Álamo (tomb 90)	3435	55	1883	1625	PINGEL V. (2000)
Beta-142035	Las Minitas (tomb 15)	3430	50	1886	1640	(Pavón Soldevila, 1994)

PINGEL V. (2004): "Radiocarbonfür die Graber 111 und 112 sowiezu den Siedlungsbefunden am Südhang von Fuente Álamo", Madrider Mitteilungen 45, pp. 80-87.
PINGEL V. (2000): "Dataciones radiocarbónicas de Fuente Álamo 1977-1991", Fuente Álamo. Las Excavaciones Arqueológicas (1977-1991) en el Poblado de la Edad del Bronce, (Schubart, H., Pingel, V. y Arteaga Matute, O., editors), Junta de Andalucía, Sevilla, pp. 91-98.
Pavón Soldevila, I., 1994. El mundo funerario de la edad del bronce en la Tierra de Barros: una aproximación desde la bio-arqueología de Las Minitas. Mem. Campaña Urgenc. De 2008–141.

and shape (Table 1, Fig. 12).

We have recorded the height, width, perforation diameter and weight of every bead. When these variables are compared, we find that pes11 has higher values than the other beads (Fig. 11, Table 1), and that the beads from Provença shows up slightly bigger and aspherical than the ones from Pessegueiro II.

As can be seen in figure 11, pes11 sample is much bigger than the rest of the assemblage and has a cylindrical or barrel shape, defined as width/height<1 (sensu Villalobos García 2015). It can also be derived from this figure 11 and following Villalobos García (2015) that the assemblage accounts for three primary shapes, discoidal (54%), aspherical (42%) and cylindrical (4%).

As for beads' colour it can be seen in figure 12 that green hues are heterogeneous (h) and not very pure having a low saturation (C_{max}=21.26). It is also possible to see that there is no difference in raw material choice between both tombs, as Provença and Pessegueiro II green beads have similar colour values and therefore organoleptic properties.

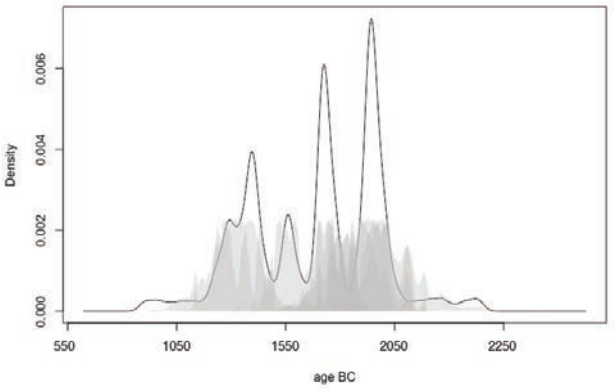

Fig. 13 - Estimate of activity levels on Bronze Age non-variscite greenstone bead consumption (full Bayesian Gaussian mixture model fit to the radiocarbon dates on table 2).

5. Disscusion

Odriozola *et al*. (2016c) have recently proposed that from ~ 2500 BC onwards variscite use began to decline, but not in favor of other greenstones, the use of which had already declined in favour of variscite (Villalobos García 2012). Rather, this coincides with increased availability of copper-based metals (Murillo-Barroso and Montero Ruiz 2012), and new 'exotic' resources such as Asian and African Ivory (Schuhmacher *et al*. 2009; Schuhmacher 2012), Baltic and Sicilian amber (Murillo-Barroso and Martinón-Torres 2012). However, a residual use of greenstone for body ornamentation continues to exist. Several examples of greenstone use for body ornamentation can be found on Las Minitas, Castillo de Alange (C/ Umbria 55) or Fuente Álamo during 2nd millennium BC (Table 2, Fig. 13). Albeit Argar necropolis accounts for the largest set of green beads, c. 1085 (Costa *et al*. 2011), it is difficult to state to which extent the use of non-variscite stones may be related to the exhibition of power during social action. Non-variscite beads are no longer made of rare or 'exotic' raw materials, instead they are made of mundane local raw materials as can be exemplified on the use of micas, serpentines, clinochlores (Odriozola *et al.* 2016c). The consumption pattern of greenstones for body ornamentation resembles the pattern observed for the 5th-4th millennia BC, where a more diversified consumption is recorded, than the 3rd millennium BC pattern with a consumption focused on variscite-like minerals (Odriozola *et al*. 2016c).

6. Petrological and mineralogical provenance

From the regional geological point of view, we believe that the source of the major lithological artifacts, including body ornaments, is the Cercal Palaeozoic structure (Oliveira, 1984). The north-south aligned Palaeozoic structure of Cercal do Alentejo is one of the major geomorphological structures (Fig. 14). From the Roman times until the present days, it has been exploited for its iron, manganese, copper, lead, zinc, gold and silver in mines that belong to the so called Iberian Pyrite Belt (Munhá, 1983). Lithologically, it is mainly a felsic volcano-clastic outcrop with some amphibolites and chloritic veins

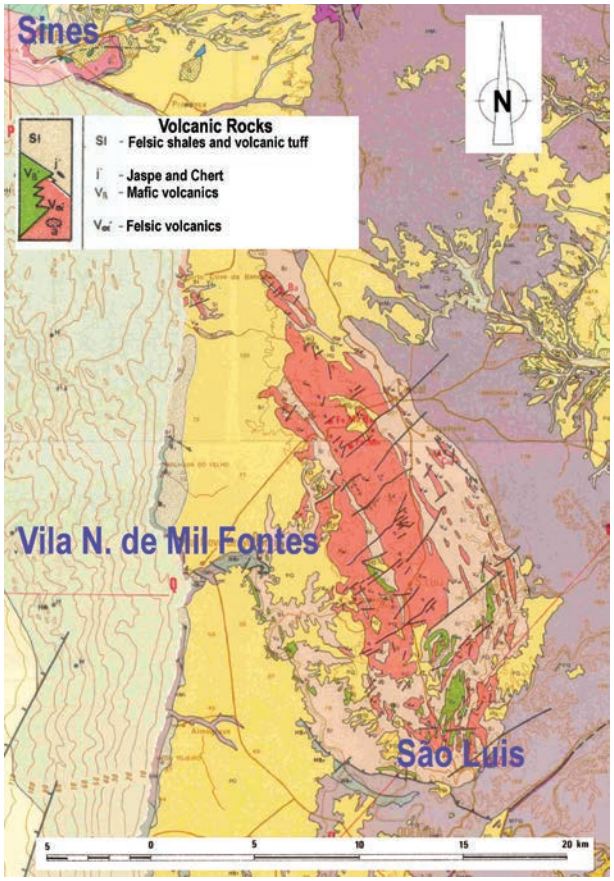

Fig. 14 - Geological map of the Alentejo Coast, with Serra do Cercal struture. In green and red, outcrops that could be used to exploit raw materials for greenstone beads production (modified from Oliveira, 1984).

from a tectono-methamorphic complex structure at the green schist facies composed by a small gossan (iron hat) area with jasper and chertic intercalations. Furthermore, minor ultramaphic veins (serpentine) could be detected in the open pit zone.

The anticline Cercal stratigraphic sequence begins with a rio-dacitic (felsic) succession (St. Luis formation), at the base, and it is composed by the mafic and locally small amounts of ultramafic lithologies, at the top of the sequence (Carvalho, 1971, 1976, 1985; Albardeiro and Costa, 1988). The occurrence of biotite/phlogopite minerals, as artifacts, could be either explained by the vicinity of Cercal structure or by some phyllossilicates hydrothermal veins at the sienite Sines massif.

7. Conclusions

The beads from Pessegueiro II and Provença necropolis had been worked out of regional raw materials, most likely coming from the geological structure of Serra do Cercal (micas and ultramafic derived sepentines), some 20/21 Km away from the necropolis of Pessegueiro and Provença. This pattern can be seen in other 2nd millennium BC necropolis in SW Iberia, suggesting a change in green stone personal ornament consumption patterns, that for the 3rd millennium BC was focused on variscite-like minerals. If the studied greenstone beads of the necropolis of Sines region in a first glance could hardly be considered prestigious items concerning its raw material, they were indeed included in the most qualified grave good sets of these cemeteries. In fact, in both cemeteries, greenstone beads appeared associated with silver and gold adornments, artefacts very scarce in the Middle Bronze Age burials of Southwest Iberia. This must be highlighted in the scenario of cemeteries mostly with a strong paucity of funerary offerings (Soares and Tavares da Silva, 2016) and with a huge differentiation between the richest and the poorest graves. Asymmetries are also noticeable under the common typology of the graves, namely in size differences, architectural features, the deceased's position inside the funerary space organisation. This evidence can be interpreted as the result of a hierarchical social structure, where inequality was quite sharp even inside a local community, probably dominated by a leading family headed by a charismatic leader. The presence of rich children graves in the Southwest Middle Bronze Age (Soares and Tavares da Silva, 2016) implies a trend towards increasing social complexity, since status seems to be inherited (not acquired in life), as in state societies. Hence, the power legitimation does not need the exhibition of knowledge and wealth, as in Chalcolithic societies. But the general tendency in southern Iberian Middle-Late Bronze Age towards the establishment of a power structure where ruling functions were obtained via inheritance is not enough to reconstruct a clear picture of their regionalisms. In what concerns the Southwest, it is possible that it have been a domi-

nated periphery of the early state of El Argar (Earle, 1997; Gailey and Patterson, 1988; Garcia Sanjuan, 1999; Soares and Tavares da Silva, 2016). In the archaeological record it is hard to identify features that can indicate signs of the proposed asymmetric core-periphery interaction between the Southwest and El Argar. Trying to achieve material expressions for our statement, we chose the emulation mechanism. It could play a central role in the ideological process of unequal interactions. Several aspects of material culture (such as metallurgy) (Valério *et al*., 2014), funerary rituals, and the close spatial relation between necropolis and settlement seem to reveal a cultural influence from El Argar (Arteaga, 1992; Cámara and Molina, 2011). Greenstone beads although in regional raw materials could have been subject to a restricted access probably by symbolic reasons in the proposed scenario of emulation as a way of ideological feeding of core-periphery relations. The high concentration of greenstones beads (mostly serpentines) in the necropolis of El Argar should also be noted (Caramé *et al*., 2011).

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Dynamic social changes in the Bronze Age society of Sardinia (Italy)

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Abstract

Social complexity in the Bronze Age society of Sardinia is studied by means of 'Ceramics Technology', analysing under a petrographic microscope 256 vessels sampled during 2013 and 2014, from 7 different nuragic settlements in the Marmilla region in south-central Sardinia.

Petrographic analysis highlighted great fabric variability: 42 different 'paste recipes' were identified, further clustered into 8 main fabric groups.

This approach demonstrates how, in addition to the choice of specific raw materials from different collecting sites in replicating their own technological traditions, artisans from distinct co-residential units and perhaps of different cultural affiliation shared knowledge regarding fabric preparation typical of their peculiar 'communities of practise'.

Keywords

Ceramics; technology, Bronze Age; Sardinia, social complexity.

Résumé

Complexité sociale dans la société de l'âge du bronze de la Sardaigne est étudié au moyen de 'Céramique Technologie'. 256 échantillons de céramique ont été étudiés à l'aide du microscope polarisant de sept établissements nuragiques dans la région Marmilla dans le sud-centre de la Sardaigne.

L'analyse pétrographique a souligné la grande variabilité dans la céramique: 42 «recettes de pâte» différents ont été identifiés, en outre regroupés en huit principaux groupes.

Mots-clés

Céramique; technologie; l'Âge du Bronze, Sardaigne; complexité sociale.

Introduction

Social complexity in the Bronze Age society of Sardinia is studied by means of 'Ceramics Technology', analysing under a petrographic microscope 256 vessels sampled during 2013 and 2014 from 7 different nuragic settlements in the Marmilla region in south-central Sardinia.

Sardinia is the second largest island in Italy, located in the central part of the Western Mediterra-

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nean basin. These settlements refer to the time span, locally called 'Nuragic Society', starting around the Middle Bronze Age (1700 - 1365 BC) and continuing through the Recent Bronze Age (1365 - 1200 BC) to the Final Bronze Age (1200 - 1000 BC).

In this research, a theoretical framework combining analytic techniques with social theory was developed. This is due to the fact that technology is an active process structured by the environment, resources and social roles, continually reproduced and modified during everyday life (Pfaffenberger, 1992; Michelaki, 2006). Indeed, ceramic fabric variability among selected common nuragic vessel forms, closely connected with domestic architecture, was analysed. This represents an innovation with respect to previous studies of pottery in Sardinia, which have principally focused on stylistic attributes and their use in assessing chronological typology. Methodological studies point out that it is almost impossible to fit ceramics into clearly defined homogeneous taxa that change their characteristics in an orderly way over space and time (Michelaki, 2007, p. 147). There are always 'intermediate categories', and as a result, archaeologists keep creating more types and questioning whether they are real or not and what their relation is to other types, all of which remain constructs (Michelaki, 2007, p. 147-148). Typology fails to account for ceramic variability, which should be studied by analysing complete 'operational sequences', starting from the way raw materials are selected, prepared and then shaped into vessels, to their surface finishing, firing, use, and discarding.

In particular, starting from these pre-existing Sardinian typologies, I tested them using the concept of 'technological style' and challenged their interpretation in terms of social organisation and chronological significance.

The present analysis focuses on pottery found within domestic structures. Households, representing the most basic components of human organization and the primary unit of consumption in prehistoric societies, largely reflect conservative and highly culture-specific behaviour (Aldenderfer, 1993; Bourdieu, 1977, 1990; Giddens, 1984; Madella *et al.,* 2013; Rapoport, 1990; Stark, Clark, and Elson, 1998). Moreover, although domestic units normally produced a large percentage of the resources they consumed, they were never completely self-sufficient (Halstead and O'Shea, 1989) and had to engage in various reciprocal exchange arrangements for labour, goods and food procurement (Hagstrum, 2001).

This study traces, spatially and temporally, continuity and change in ceramics technology, using: 1) *ceramic petrology,* which is the systematic description of pottery materials, their compositions and organization in hand specimens and prepared samples or thin-sections, using a polarising microscope*;* 2) the concept of '*chaine operatoire*', the sequence of technical and mental gestures performed by potters during vessel manufacture, use, repair and discarding; 3) *a raw materials provenance study* which, using analytical and geological approaches, helps in establishing whether the corpus of vessels under study was produced using clays and other naturally or intentionally added materials obtained from the area investigated or far away from it. These raw materials, once analysed, constitute a basis against which to interpret potters' choices and compare them with the archaeological material under study; 4) *experimental archaeology,* which provides opportunities to confirm potential hypotheses and conclusions with multiple trials and repeatable tests in a chemical/mineralogical laboratory and which are used, starting from the identified steps in the 'operational sequence', to reproduce nuragic ceramic pastes.

Understanding how and where nuragic people in Marmilla collected their raw materials can be linked to the ways they must have perceived their landscape and its resources, indirectly informing us about other possible activities taking place in the same area.

As suggested by the wide corpus of ethnographic and ethno-archaeological studies of ceramic technology at the local level, domestic pottery is one of the most sensitive material culture items, reflecting conscious and unconscious elements of technological choices tending to be stable throughout time (Stark, 2003; Stark *et al.,* 1998, p. 208-231). The alternatives selected by artisans in their choice of raw materials (or 'technological styles') reflect an internalized understanding

of manufacturing traditions, learned through an early '*motor habit'*, and passed on from one generation to the next. Once acquired, it is the most resistant part of the sequence to change (Arnold, 1994; Gosselain, 1988, 1999a, 1999b, 2000; Michelaki, 2006, 2007; Roux & Corbetta, 1990; van der Leeuw, 1993). This is because learning how to shape a pot requires a focused effort on the part of both the teacher and the apprentice, with the former always promptly correcting mistakes and guiding the apprentice's hands in the appropriate gestures and posture (Michelaki, 2007). Moreover, the various steps in the operational sequence of ceramics production, regulated by social rules guiding everything from the choice of raw materials to 'proper' bodily behaviour, by the way tradition dictates the 'correct' way to shape and use objects and by gender ideologies determining who could or could not make certain objects or use them (Dobres, 2010, p. 109) and taboos of various types, were fully embedded in the community's social and economic systems. For this reason, they can be useful in providing clues to social behaviour (Dobres, 2010; Gosselain, 1998, p. 87-91).

Prescriptions and taboos related to the proper clays to be used to make good vessels are well known in ethno-archaeological records, but cannot be clearly recognized during prehistoric pottery studies. Nonetheless, they should be acknowledged in analysis, as they can help to understand the potters' choices not explained by technological requirements.

Initial results of the study

Three corridor nuraghi, which are long low irregular stone platforms with an internal corridor and one or a few small chambers linked to it, and one single tower nuraghe, a truncated high round tower built of large blocks of local rock set without mortar in regular horizontal rows and roofed by corbelled vaults, both from the Middle Bronze Age (1700 - 1365 BC), were sampled. They were inhabited during that period and then permanently abandoned (Fig. 1). They are:

1) *Corridor Nuraghe Brunku Madugui (Gesturi plateau)*: 27 samples;

2) *Corridor Nuraghe Sa Fogaia (Siddi plateau)*: 16 samples;

3) *Corridor Nuraghe Conca 'e Sa Cresia (Siddi plateau)*: 28 samples;

4) *Single tower nuraghe Is Trobas (Lunamatrona)*: 16 samples.

These are the only Middle Bronze Age archaicuraghi partially excavated in the region (except for Nuraghe Su Mulinu at Villanovafranca, for which sampling permission was not granted by its excavator), and their pottery represents the first ceramic materials produced during the initial period of the Nuragic society in the area.

Three complex nuraghi (corridor nuraghi or simple tower nuraghi progressively enlarged with the addition of multi-tower complexes and hut villages) were sampled as well, selecting the Middle Bronze Age, when present, and then moving on to the Recent (1365 BC - 1200 BC) and Final Bronze Age (1200 BC - 1000 BC). They are:

5) *Nuraghe Genna Maria (Villanovaforru)*, from which 18 Middle Bronze Age samples were taken;

6) *Nuraghe Ortu Comidu (Sardara)*, for which 52 thin-sections were kindly provided by Dr Paul Nicholson, Department of Archaeology of the University of Cardiff (UK), part of the team studying ceramics from the excavations directed by Prof. Miriam Balmuth, Tufts University (USA) during 1975, 1976 and 1978. These ceramics come from the northern area, radiocarbon dated to the Recent-Final Bronze Age and from the south tower of the complex nuraghe, radiocarbon dated to the Final Bronze Age--First Iron Age (Phillips, Nicholson, and Patterson, 1986).

7) *Nuraghe Arrubiu (Orroli),* which is not part of the Marmilla region but was chosen as an element for comparison with the region under study for three principal reasons: the first is that it is one of the largest and best excavated nuraghi on the island; the second is its geographical setting on a basaltic plateau similar to those of Gesturi and Siddi, located approximately 25 kilometres further east; the third is the presence of a huge quantity of ceramics of all types and ages from which to select

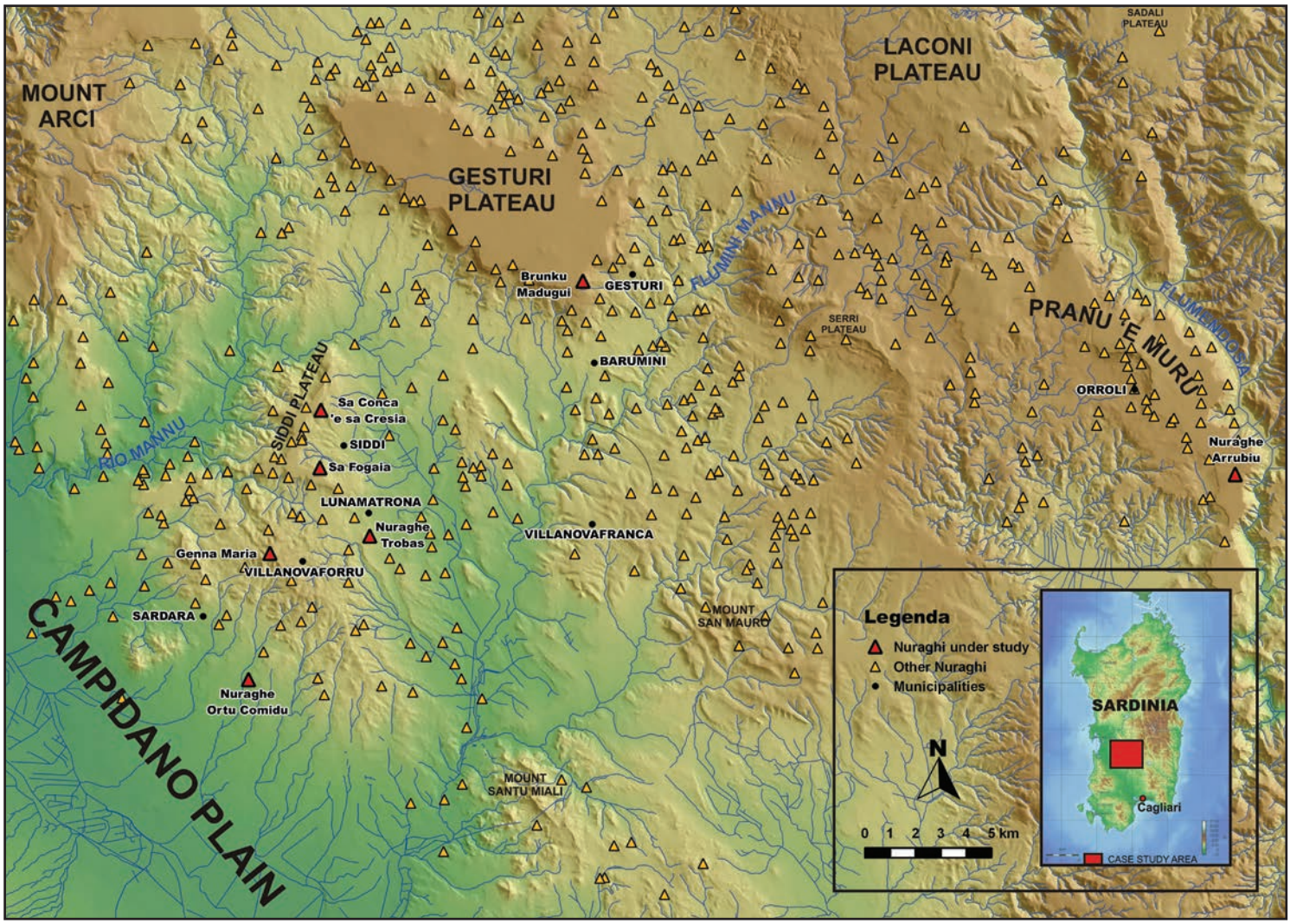

Fig. 1 - The area under study. From Lilliu C., 1985; www.tharros.info. Drawings: V. G. Anardu and M. G. Gradoli.

samples to be studied. This permitted me to shed light on possible exchange networks not only within the Marmilla region but also between the latter region and the nearby Sarcidano area. Twenty-nine samples were selected from ceramics coming from courtyard B (Middle Bronze Age), while sixty samples were taken from Tower A (Recent Bronze Age).

To better contextualise the beginning of Nuragic culture during the Middle Bronze Age in the area, twenty Pre-Nuragic samples (Final Neolithic, Eneolithic, and Early Bronze Age), coming from the same region and currently on display at the Archaeological Museum in Villanovaforru, were sampled as well. No settlement was excavated in the region during this period: they come from one rock-cut tomb ('Domus de Janas') and several surface finds. They were sampled to determine whether or not there was continuity in fabric manufacture between the two different periods.

Petrographic analysis was carried out on 0.030 mm thick thin-sections taken from the sherds in their original state, using a Brunel SP-300-P polarising microscope equipped with a Canon 1100D camera. The method and terminology applied were those proposed by Whitbread (1989, 2001). A descriptive vocabulary was used to better maintain ob-

jectivity during data recording and separate interpretation from description.

One of the most striking characteristics of these ceramics is the great variability in their fabrics: 42 different 'paste recipes' were identified, clustered into 8 main fabric groups (Fig. 2). They are:

1) FABRIC GROUP 1. PLUTONIC. Includes 134 samples divided into 15 subgroups;

2) FABRIC GROUP 2. VOLCANIC. Includes 86 samples divided into 5 subgroups;

3) FABRIC GROUP 3. METAMORPHIC. Includes 20 samples divided into 9 subgroups;

4) FABRIC GROUP 4. SHELL TEMPERED. Includes 8 samples divided into 4 subgroups;

5) FABRIC GROUP 5. MIXED SANDS. Includes 11 samples divided into 6 subgroups;

6) FABRIC GROUP 6. BURNT ORGANIC MATERIAL. Includes 3 samples.

7) FABRIC GROUP 7. VERY FINE ORANGE CLAYS (with very rare quartz micro-inclusions). Includes 1 sample;

8) FABRIC GROUP 8. FINE SANDS WITH VOIDS (in a red matrix). Includes 1 sample.

Two main fabric groups (the Plutonic and Volcanic ones) are the most representative of pottery manufacturing in the area. In particular, the Plutonic one shows how local potters used the same raw materials having a great variety of micro-morphological characteristics and inclusion dimensions, while the uniformity of the volcanic subgroups implies a well-rooted shared manufacturing tradition within the region. These two fabrics groups are present, at the same time and during the whole Bronze Age, among the seven settlements considered and were used to produce different categories of domestic vessels, such as pans, saucepans, large and small storage jars, as well as large and small bowls and cups, made by producing a finer fabric. It is also interesting to note that these two fabric groups were the most common among those present in the area during the Pre-Nuragic period as well, confirming a manufacturing continuity of several millennia in the tradition of the area studied, regardless of their varying use context (habitation or burial), shape and presence of peculiar decorations.

Several vessel-building techniques were observed in the macro samples studied:

a) '*Pinching*', especially for small cups and bowls and for the rounded bases of small vessels.

b) '*Coiling*', of different thickness and shape. Sometimes, coil presence seems to have been obliterated by use of the turntable.

c) '*Slab-building*', mainly for large vessels;

d) '*Paddle and anvil*'.

Looking in detail at the way pottery was made in the Marmilla region, I can say that potters used more than one defined technique in shaping their vessels. Different parts of the same vessel were often prepared separately (such as handles and lugs or the rims of large storage vessels) and then added to the body of the vessel being manufactured. This fact, indeed, increases ceramic variability among the different domestic structures of the region.

Surface treatment and finishing techniques also vary, as follows:

a) '*Textured or rough*': vessels used on the fire, such as pans and saucepans, have corrugated or textured exterior surfaces, believed to be better transmitters of heat; their internal surfaces are smooth in the attempt to reduce surface permeability. Jars and storage vessels have corrugated or smooth external surfaces to be easily grasped and moved, and smooth internal ones.

b) '*Brushing*': this kind of surface treatment was sometimes observed in jars and the exterior part of cooking vessels;

c) '*Plain*', both interior and exterior surfaces;

d) '*Burnishing*': different stages of the process were noted among the vessels. Vessels may be lightly burnished, well burnished or highly burnished;

e) '*Smudging*': this type of surface treatment involved those vessels called by local authors '*Ceramica Nera Lustrata*' ('Black Lustrous Ceramics');

f) '*Slipped*': sometimes, a black, reddish or light beige slip, made of very fine clay, was hand-applied to one or both of the vessel surfaces, masking their original colours due to firing conditions.

Decoration on external or internal surfaces, while rarely present and only during the Middle Bronze Age/ First part of the Recent Bronze Age (11 samples of 256 examined), consists of impressed vertical lines, a single row of dots, dots or impressions filling the internal

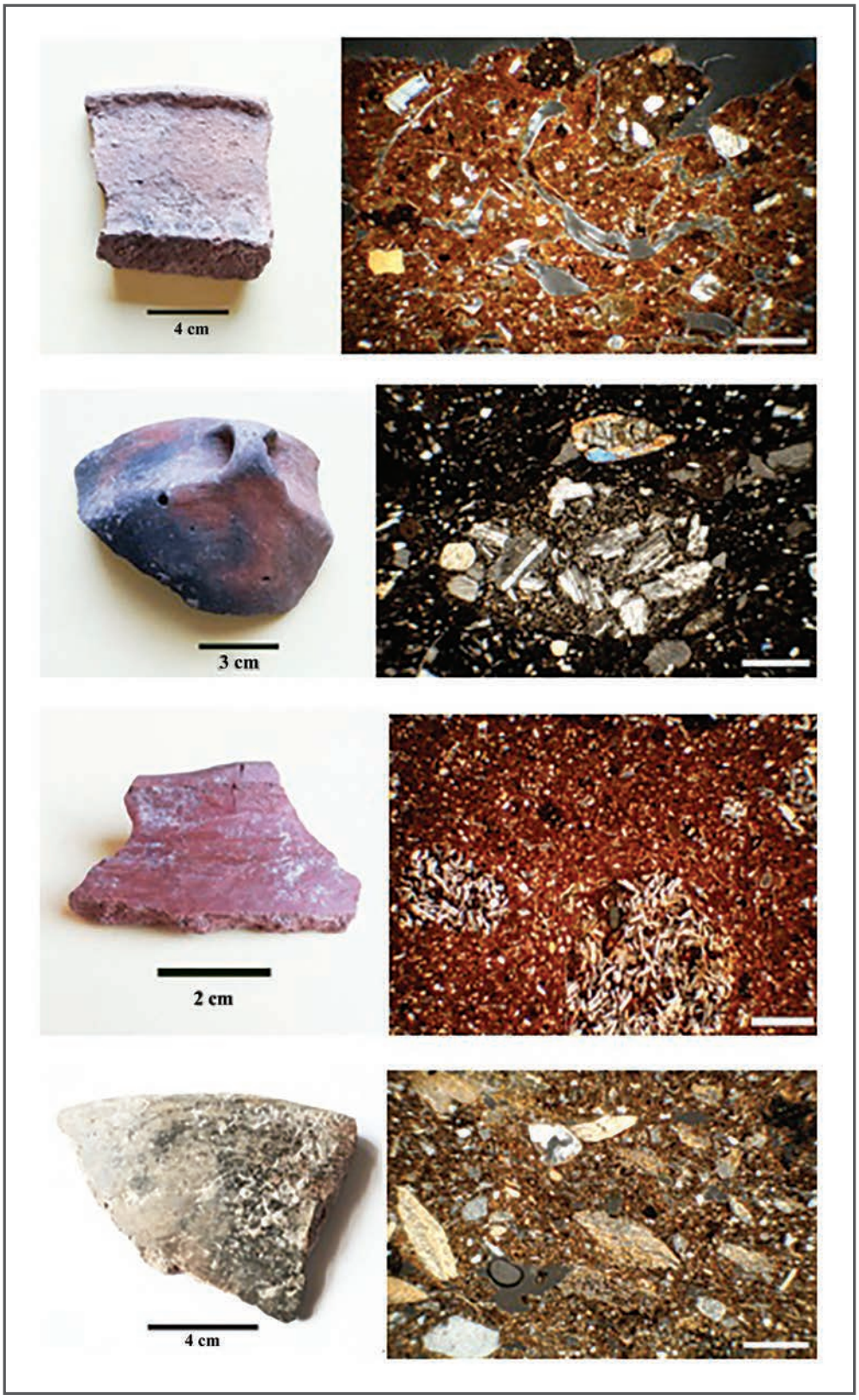

Fig. 2 - Middle and Recent Bronze Age pottery from the studied area. White scale bar 500µm. Macro and photomicrographs: M. G. Gradoli.

part of an impressed triangle shape and, in one rare case, horizontal thin brown painted lines.

External and internal surface colours, when not slipped, reflect different firing conditions: red-reddish or orange, grey and black, light beige or brown denoting oxidising or reducing atmospheres or, more frequently, mixed firing conditions. Nonetheless, the use of a slip of a different colour could also reflect potters' decision to create vessels with specific colours not produced technologically, perhaps due to the fact that oxidising or reducing conditions could not be kept stable for long periods. This fact indirectly provides information on the structures used to fire them (open or pit fires).

During the Recent Bronze Age, pottery assemblage is similar to that of the previous Middle Bronze Age, except for the appearance of some well-burnished necked jars and bowls locally called 'Nuragic Grey Ware'. Its main characteristic is its external colour (light grey) and thin walls (approximately 4 mm).

Under the polarising microscope, it can be classified within the '*Metamorphic fabric group*' but in a new sub-group, due to its fine grained aplastic inclusions.

Thin-walled vessels of this type can be obtained by manipulating raw materials during their preparation with the addition of fine temper or using clays that are naturally rich in these inclusions. The fact that, at least for the samples analysed to date, the temper is made of very small grains of metamorphic rock, similar in composition to those used for the other vessels but less rounded, may lead to the conclusion that the same fluvial metamorphic raw material was intentionally refined. This permitted the creation of thin-walled vessels that were then fired at high temperatures in a reducing atmosphere. According to Rice, such conditions increase strength during firing which, in turn, produces lightweight, very durable containers particularly suited for liquid storage (Rice,1987, p. 228). This type of surface finish is achieved in the presence of insufficient oxygen, when the carbonaceous matter in the clay cannot be completely oxidized: the gases present reduce iron oxides to a lower oxidation state, producing this typical grey colour (Michelaki, 2006, p. 97).

Fig. 3 - Round pebble from Nuraghe Arrubiu at Orroli. Scale bar: 2 cm. Photo: M. G. Gradoli

At the moment, no information regarding possible firing temperatures and the type of firing structures used is known, as no open pits or remains of kilns were found during excavations in the area. Thus, the potters' clear intention of producing thin-walled resistant vessels, fired in a reducing atmosphere, seems one possible hypothesis. Some 'nuragic grey ware' jars often have 'plain' internal walls (without surface treatment), perhaps due to the necessity of having a 'porous surface' which, for relatively short water storage, could help to keep the liquid cool (Rice, 1987, p. 231). Nonetheless, the inner part of their necks is always burnished. Associated with these pottery vessels, some round fluvial pebbles were found during sampling, perhaps representing one of the possible tools used to burnish their surfaces (Fig. 3).

Other necked jars or vessels having a different shape and the same temper composition but thicker walls (from 4 to 6-7 cm), seem to have been smudged instead. This is particularly clear under the polarising microscope and even to the naked eye: a thin

black deposit, due to the presence of carbon in colloidal form settled on the pottery as soot, penetrated the pores and turned the surface a permanent, lustrous black (Michelaki, 2007, p. 97).

Smudging is generally carried out at the end of the firing process by covering both the burning fuel and pottery with a smoke-producing substance, such as manure, green branches or leaves (Kaiser, 1984, p. 249-250 cited by Michelaki).

Regarding the study of the Final Bronze Age in the area, it may be useful to anticipate the results of the re-examination of 52 pottery thin-sections coming from the Nuraghe Ortu Comidu (Sardara). Considering their typology and microscopic character, the excavators and experts studying the ceramics described two different mineralogical homogenous fabric groups found in two different archaeological settings: the North Area from the Recent/Final Bronze Age and the South Tower from the Final Bronze Age/First Iron Age (Phillips, Nicholson & Patterson, 1986, p. 225). In the Plutonic Fabric Group and subgroups I defined, ceramics coming from the 'North Area' are all made of coarse or fine sand tempered with plutonic rock pieces, while ceramics coming from the 'South Tower', were manufactured using coarse or well-sorted loose plutonic sand without plutonic rock pieces in their fabrics. On the whole, it may be inferred that during the Recent-Final Bronze Age, pottery fabrics found in the 'North Area' were intentionally tempered with plutonic rock pieces, while during the later period, corresponding to the use of the South Tower, pottery was tempered using loose plutonic sand, probably collected from a different part of the landscape. The use of analytical methodology other than pottery petrology, for instance chemical analysis, would not have permitted this differentiation, as ceramics coming from both areas would have shown the same chemical and mineralogical composition, even if the 'temper' used had a different material consistency.

These two subgroups of plutonic origin are well represented in the Marmilla region in all the nuraghi analysed since the Middle Bronze Age, and even during the Pre-Nuragic period, confirming the conservative millenarian tendency of local pottery communities to continue using the same raw materials, easily available in that part of the landscape, even if shape and decoration changed in the course of time.

Conclusions

The great fabric variability observed under the petrographic microscope - 42 different 'paste recipes' clustered into 8 main fabric groups - reflects deliberate choices, early in the manufacturing process, which are not easily explained by possible raw materials physical constraints. Comparing petrographic and typological categories in all seven settlements considered, each fabric group encompasses a range of different shapes and, even when a new type of ware (such as '*nuragic grey ware*') appears, it does not involve changes in technology practises. The first conclusion drawn from these observations is that '*fabric diversity associated with homogeneity in vessel external characteristics*' seems to result from the activity of different extended familiar groups inhabiting the same region. Moreover, it indicates recurrent small-scale pottery production, secondary to other housekeeping tasks, in the absence of an overriding system of control able to impose technological homogeneity.

In particular, considering architectural settlement type and distribution, the Marmilla region during the Middle Bronze Age seems to have been inhabited by small groups of people sharing basic rules of pottery manufacturing, raw material choices and accessibility, along with similar external vessel shapes. No precious or 'prestige vessel' or any kind of craft specialisation or standardisation was observed in their domestic assemblages, leading to the preliminary conclusion that the same landscape was occupied by small, independent households with a high degree of mobility, sharing and exchanging technological knowledge, from distinct co-residential units through extensive 'cultural networks'. The same pattern seems to be confirmed for the other 135 ceramic samples of the Recent/Final Bronze Age studied to date.

Such a new scenario of the Middle and Recent Bronze Age way of living in the Marmilla region challenges previous interpretations of 'Nuragic social complexity' and the overestimated power held by

local 'elites'. The well-known assertion of the emergence of '*new elites*' proposed for Nuragic Society for several decades, fails to account for such 'petrographic fabric variability'.

Social complexity, not only in Sardinia, has always been equated with hierarchy and power centralisation, which I believe do exist, but must be evident on several analytical scales. Undue emphasis is often at the basis of vertical political differentiation assuming the existence of institutionalised, hereditary leadership, even when it is possible that the data available could be interpreted in terms of different forms of social organization and control (Kienlin, 2012, p. 18). Indeed, this domestic pottery production shows very little evidence of 'social inequality' on a local scale. Kienlin and Kohring, among others, suggest the use of a 'bottom-up' approach to understanding social complexity and begin analysing complexity not from the elite viewpoint but using the notions of 'equality' or 'inequality' (Kienlin, 2012, p. 19; Kohring, 2011, p. 148, 2012). Equality is, actually, a utopian idea: in all human groups, people will differentiate between their fellow men and_women on the grounds of performance or other types of qualities, as equality or inequality is socially constructed. Hierarchy should not be equated with complexity, as a group may be complex even without institutionalised ranking (Rowlands, 1995; Wynne-Jones & Kohring, 2007; Souvatzi, 2007), and authority and political power may operate at different levels, from households to kinship groups, through collective forms of decision-making in everyday life and in small-scale integrative units or via clans, lineages or larger entities such as the tribe (Kienlin, 2012).

In this research, I concentrated on the analysis of ceramics from single households or different parts of the same household, exploring the links between social knowledge systems and technology among 'communities of practise' from the same region. A community of practise is a group of people learning and sharing the same techniques of pottery manufacture and the same way of structuring their general meanings and understanding of the world (Wenger, 1998). Such groups, to which people belong and into which they are incorporated, should be regarded as the arena in which daily encounters occur and individuals share practical and cosmological knowledge, recalling Bourdieu's consideration that the practises surrounding material culture establish social relationships. Indeed, communities of practise frame encounters mediating between shared structuring principles and the individual-embodied '*chaine operatoire*'. In addition, they create a sense of shared identity by affirming links within and between communities (Kohring, 2011, p. 156). This approach demonstrates how, in addition to the choice of specific raw materials from different collecting sites in replicating their own technological traditions, artisans from distinct co-residential units and perhaps of different cultural affiliation shared knowledge about fabric preparation typical of their peculiar 'communities of practise'.

Acknowledgements

I would like to thank the Soprintendenza Archeologica di Cagliari and Sassari, and in particular Chiara Pilo and Nadia Canu, for granting me permission to sample the ceramics; the Nuraghe Arrubiu excavation directors, Fulvia Lo Schiavo and Mauro Perra; and Mauro Perra for his assistence during sampling.

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ABSTRACTS

Craft production and specialization during the third millennium in the southwest of Iberian Peninsula

Nuno Inácio*
Francisco Nocete*
Moisés R. Bayona*

Abstract

Since Gordon Childe that economic and craft specialization has been analyzed within the historical process that led to the emergence of the so-called "complex" societies. In the Iberian Peninsula, this topic has been preferably debated by technological paradigm, emphasizing the lack of economic and craft specialization during the Third Millennium BCE. In recent years, an intense research about the first specialized mining and metallurgy in southwestern Iberia, highlighting the theoretical and empirical limitations of the postulates based on sophistication or complexity technological criteria. This is the opportunity to discuss the economic and social models of metallurgical and ceramic production during the Third Millennium BCE.

Keywords

Economic specialization; pottery production; metallurgy; mining, southwestern Iberian Peninsula, third millennium BCE.

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Material vs. immaterial evidences of interrelations. Population size, mating networks and technological transfer in Sicily during Early and Middle Bronze Age

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Abstract

Introduction:

The evaluation of indigenous community development in southern Italy, through the analysis of the dynamics of interaction with the eastern Mediterranean during the Bronze Age, is one of the most significant issue in the later prehistory of the central Mediterranean. A long tradition of studies (Vagnetti, 1983; Peroni, 1983; Bietti Sestieri, 1985; Kilian, 1983; Smith, 1987), influenced by the World System Theory and the concept of peer polity interaction, claimed a socio-economic interdependence in structuring indigenous complexity. The preliminary results of on-going research, here presented, provide a complementary perspective, focused on indigenous behavioral patterns development in structuring socio-cultural complexity in Sicily, since the later Early Bronze Age. Through the analyses of settlements and specific ceramic assemblages as well as observations on exploitation of raw material sources, hypothesis on interaction patterns between indigenous communities are suggested.

Materials and methods:

Typological analysis carried on RTV-style ceramic assemblage from Mursia, as well other works, showed coexistence of different stylistic pottery assemblages within the same context, as in Serra del Palco di Milena (Palio, 2006), Manfria (Orlandini, 1960). Settlement/household spatial analyses have been personally conducted (e.g. Mursia). Other datasets concerning settlement dynamics have been acquired from well-preserved multiphase sites, as Muculufa, by bibliographical tool. Site catchment analysis by buffering technique permitted to identify presumably exploited raw material sources.

Results:

Typological analysis results suggest remarkable interaction phenomena, especially in central-southern Sicily, on the base of co-occurrences of different pottery assemblages within the same site. Mursia datasets show that Pantelleria has been involved. Spatial analysis showed increasing complexity in organizing spaces both between households and within them. Progressive population growth, even if difficult to point out, can be proposed for such dynamics. Similarly, scholars hypothesized population growth trends both in the Etna district (Cultraro, 1997) and in southern central Sicily at La Muculu-

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fa (McConnel and Bevan, 1999) in the same chronological framework. On the other hand, buffering zone elaborations demonstrated that several and different sites (La Muculufa, Serra del Palco, Branco Grande) could have had easy access to local raw material sources for pottery production.

Conclusions:

Although population growth and ceramic assemblages suggest interaction patterns, site catchment analysis results do not appear to support this hypothesis. As provenance studies on pottery vessels from Ramacca district demonstrated, indeed, previously identified RTV - style imported objects were produced by using surrounding clay sources (Agodi *et al.*, 2006). Taking into account population dynamics and typology results, this aporia can be solved by hypothesizing interactions involving not only objects but potters and mating strategies. Type-groups variability in ceramic assemblages within the same site shall be interpreted as innovative products of "outlander" potters – likely married to local people – forced to deal with new exploitation strategies. In this perspective, technological changes in pottery production shall be useful to explain socio-cultural complexity by extrapolating behavioural patterns developments related to them.

Cultural and social complexities of Bronze Age sites in southeast Iran

Mehdi Mortazavi*
Fariba Mosapour Negari**

Abstract

Today, every scholar knows that complexity is generally used to characterize something with many parts where those parts interact with each other in multiple ways, therefore a complex society could be considered as a system with many sub-systems. On the other hand, "system" may be described as a complex of interacting components together with the relationships among them that permit the identification of a boundary-maintaining entity or process. Role and importance of sub-systems, which are directly or indirectly related to each other, are different in a system, but all of them are organized to support the whole system.

Complex societies of southeast Iran such as Shahr-i-Sokhta, Jiroft, Tepe Yahya, Shahdad and Bampur, which were separately functioned as a system, could be considered as a whole system in southeast Iran during the third millennium BC. The main aim of this paper is to examine why and how of cultural and social complexities of these societies during the mentioned period.

At first glance, scholars are not able to examine the above aim, because southeast of Iran and especially the above sites are located in a fragile environment and in the vicinity of the famous desert named as Dasht-i-Lut with 80 000 sq km., it is believed that the same environmental conditions were active during the prehistoric times, or at least few changes have been occurred. In this paper, it is attempted to explain that Dasht-i-Lut was the main factor for the complexity of the above societies. It seems that these sites were located close to this huge desert to function as intermediary between different areas. However, they should had some regional capabilities such as metal and semi precious stone mines to support them.

Keywords

Complexity; social; cultural; southeast Iran; Bronze Age; system; environment.

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