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IVORY OBJECTS FROM THE CHALCOLITHIC FORTIFICATION OF LECEIA (OEIRAS)

Thomas X. Schuhmacher* & João Luís Cardoso**

RESUMO

O marfim constitui um material introduzido, uma novidade, observada na Estremadura Portuguesa no início do Calcolítico, cerca 3000/2900 a.C. Tratando-se de uma matéria-prima exótica, foi, desde os inícios da investigação arqueológica, objecto de particular interesse, considerando-se desde logo reflexo dos contactos comerciais estabelecidos por via marítima com regiões extra-peninsulares. S. P. M. Estácio da Veiga (1886, 1891), já falava a favor de uma importação de objectos acabados e da própria matéria-prima, em bruto, a partir do Norte de África. L. Siret (1913) estabeleceu, depois, diferenças entre artefactos feitos a partir de dentes de elefante e de hipopótamo. Ambos os grupos de peças foram por ele considerados como oriundos do Egipto. J. C. Serra Ráfols (1925), ao contrário, chamou a atenção para a ausência de critérios seguros que, segundo ele, poderiam ser invocados a favor de uma origem egípcia, devendo antes considerar-se o Noroeste Africano como origem de tais produções. Pela mesma altura, A. Gotze (1925) negou a utilização local de marfim fóssil, de época plistocénica, considerando-o demasiado frágil para poder ser trabalhado. Finalmente, A. Jodin (1957) e G. Camps (1960), relacionaram a ocorrência de exemplares manufacturados de marfim no território peninsular, com a ocorrência de cerâmicas campaniformes no Norte de África; desde então, a origem norte africana para as peças de marfim peninsulares tem sido comummente aceite.

As análises efectuadas por um de nós (T. X. S.), em conjunto com o Dr. A. Banerjee, de objectos de marfim da necrópole de Los Millares, suportam a conclusão de que o conhecimento da tecnologia do trabalho de marfim, provirá do Próximo Oriente, tal como, em parte, a própria matéria-prima, provavelmente pela via da Síria ou da Palestina. De facto, as análises efectuadas indicaram a existência dominante de marfim de elefante asiático (*Elephas maximus*) entre as produções mais antigas do Calcolítico analisadas daquela estação; assim, está-se em condições de diferenciar os objectos de origem próximo-oriental dos que provieram, ulteriormente, do Norte de África. Um elemento do conjunto millarense revelou tratar-se de *Elephas antiquus*, realidade que é ainda difícil de explicar, embora não seja viável admitir o recurso a marfim fóssil, pelo menos em quantidades significativas. Também uma das duas peças de Leceia analisadas pelo Prof. Banerjee indicou tratar-se de marfim atribuível a *Elephas antiquus*. Talvez a explicação resida na existência de uma espécie norte africana próxima de *Elephas antiquus*, a qual, no território português se extinguiu cerca de 33 000 anos atrás. O único dente completo provém do terraço baixo do Tejo, perto do Carregado, cerca de 30 km NNE de Lisboa, a que se junta um outro fragmento, mais antigo, reportável ao Cromeriano, existente no Museu Monográfico de Conímbriga; tanto um como outro, pelo seu comportamento muito quebradiço, não poderiam ter sido aproveitados para a manufactura de peças de marfim.

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No entanto, descobertas como a da necrópole de Rouazi-Skhirat, indicam a utilização de marfim norte africano entre as produções da primeira metade do terceiro milénio a.C.. A relação de tais produções com o território peninsular parecem tornar-se mais evidentes e visíveis ulteriormente, no decurso da expansão do "fenómeno" campaniforme, especialmente a partir de meados do referido milénio.

No que a Leceia diz respeito, a segunda das duas peças seleccionadas para análise no Laboratório da Universidade de Mainz pelo Dr. A. Banerjee, mostrou tratar-se de marfim de elefante africano de savana, tendo, deste modo, sido o primeiro exemplar deste tipo de marfim a ser comprovadamente identificado no território peninsular. A cronologia pré-campaniforme deste artefacto, reportável ao Calcolítico Inicial da Estremadura, datado em Leceia entre cerca de 2900/2800 e 2600/2500 cal BC, vem mostrar, pela primeira vez, que as relações comerciais da Península Ibérica com o Norte de África se terão iniciado, embora de forma discreta, ainda antes da plena afirmação do "fenómeno" campaniforme, época a partir da qual são bem conhecidas.

1 – HISTORY OF INVESTIGATION

Ivory constitutes a new introduced material, an innovation, whose starting point on the Iberian Peninsula coincides with the beginning of the Chalcolithic (around 3000 BC). As an exotic and in the Metal Ages on the Iberian Peninsula no more locally available material, it was from the beginning of archaeological investigation of special interest. So it was supposed to give clear hints on prehistoric contacts and exchange by sea. S.P.M. Estácio da Veiga already speaks in favour of an import of finished ivory objects from Northern Africa, among several portions to be transformed into artefacts (VEIGA, 1886-1891, vol. 1, p. 268-270; vol. 2, p. 212). L. Siret differentiated between pieces made of elephant and others from hippopotamus ivory (SIRET, 1913, p. 33). For both groups he thought about an import of the finished objects from Egypt. J.C. Serra Ráfols on the contrary pointed out, that there are really no arguments for an origin of the ivory from Egypt, but that we should consider Northwest Africa (SERRA RÁFOLS, 1925, p. 87). At the same time, A. Götze denied a use of local fossilized ivory, because he thought it to be too fragile and brittle (GÖTZE, 1925, p. 87). A. Jodin and G. Camps finally related the finds of ivory on the Iberian Peninsula with the appearance of Bell Beakers in North West Africa (JODIN, 1957; CAMPS, 1960). Since then a Northwest African origin was widely accepted[1].

The Leisners in their monumental work about megalithic tombs from the Iberian Peninsula also delivered a list of ivory objects for the southern part of the peninsula (LEISNER & LEISNER, 1943). Later, A. Gilman and R. Harrison gave for the last time an inventory list from all ivory objects known by bibliography (HARRISON & GILMAN 1977). In the immediate sequence of this study, the relationships between the Iberian peninsula and the Nortwest Africa during the Bell Beaker period are specifically studied (POYATO-HOLGADO & HERNANDO GRANDE, 1988). After that only a few regional works have been published, those of K. Spindler for Portugal and of J.L. Pascual Benito for the País Valenciano (SPINDLER, 1981; PASCUAL-BENITO, 1995).

One of us had already published the most important piece of ivory found at Leceia (CARDOSO, 2003), now re-examined (Fig. 5). In that contribution, this artefact was discussed in the context of other Chalcolithic ivory occurrences, both in the Portuguese territory as well as in South-East Spain.

[1] HARRISON & GILMAN, 1977; SPINDLER, 1981, 99f. Critical on this point POYATO & HERNANDO, 1988.

2 – INVENTORY OF OBJECTS

A new interdisciplinary project started in October 2005 conducted by the German Archaeological Institute in Madrid[2]. The publication of a catalogue, as complete as possible, of all ivory objects from the Iberian Peninsula dated from the beginning of the Chalcolithic at about 3000 BC until the end of the Early Bronze Age about 1650 BC in the Southeast, is the aim of this project. Although the inventory work is still not finished, it is already clear that the number of prehistoric ivory objects and therefore the scale of ivory exchange are much greater than expected until recently. In fact, until now we could register 1050 objects from 130 sites.

Although the exact chronology of the objects in many cases, especially in the Chalcolithic, is difficult to establish, we can present some preliminary conclusions. It seems like the number of ivory objects increases significantly from the beginning of the Early Chalcolithic to the end of the Early Bronze Age by 1650 BC (in the Southeast). So the total number passes from 127 in the Early Chalcolithic to 212 in the Final Chalcolithic and finally 350 in the later Early Bronze Age. Studies based on the total weight of the ivory objects are still in course.

What refers to Portugal, there are not very many ivory objects known as such from bibliography. This might be in parts due to the existing difficulties in identifying ivory correctly. On the other hand in many cases the bone industries of the different settlements are not fully studied and therefore some ivory objects might still rest undiscovered. Until now no systematic search or register of ivory objects was ever undertaken. So the last inventory list for Portugal was published by K. Spindler (SPINDLER, 1981, p. 99, 243, Pl. 46). He did a compilation of the objects published as such, only a few of them were studied by him in the museums.

Therefore in this new investigation project we are trying to study all the objects mentioned in bibliography as made of ivory or possibly made of ivory. At the same we are looking up the bone industry of some of the most important complexes of the time period under study, which might include ivory too. During this investigation we could identify five ivory objects among the bone industry of the chalcolithic settlement of Leceia.

3 – THE IDENTIFICATION OF IVORY

First of all we should give some dates about ivory and the identification of ivory (KRZYSZKOWSKA, 1988; BANERJEE & SCHNEIDER, 1996; BANERJEE, 2004; DRAUSCHKE & BANERJEE, 2007). Ivory in the original meaning of the word only includes the material obtained from the tusks of elephants. These could come from one of the living elephant species or from extinguished elephants or mammoths. But in most cases the canines of hippopotamus, the upper canines of walrus and the teeth of narwhal and sperm whale are included too. On the other hand we do have so called vegetable ivory, like ivory (tagua) nut or ivory palm. But we do not consider here alternative materials like teeth of other animals, especially boar tusks.

Identification of ivory and differentiation of ivory from bone can sometimes be hard, especially if we are dealing with very small or highly polished objects. Sometimes we may observe still part of the spongy bone structure. But normally these parts are eliminated. Bone will show remnants of the vascular system of the bone structure (Haversian structure). This usually shows up as small pores, but it could also be present as dark streaks.

[2] The present project "Die Kontakte zwischen der Iberischen Halbinsel und dem Maghreb wärend des Chalkolithikums und der Frühen Bronzezeit. Studien zum Austausch von Elfenbein" is financed by the Deutsche Forschungsgemeinschaft, Bonn (Sachbeihilfe/Eigene Stelle: SCHU 1539/2-1; Directors: Prof. Dr. H. Parzinger and PD Dr. Thomas X. Scuhmacher) and undertaken in cooperation with the International Centre of Ivory Study (INCENTIVS) of the University of Mainz (Germany) (Director: Dr. A. Banerjee).

Fig. 1 – Overview of river valley of Barcarena. Within a circle, the prehistoric fortified site of Leceia, and the location of the settlement in the Iberian Peninsula. Photo C. André.

Fig. 2 – Aerial view of the excavated area. Photo G. Cardoso.

On the other hand only elephant and mammoth ivory does have the characteristic Schreger lines. These lines make a unique crosshatch pattern and are commonly referred to as cross-hatchings or engine turnings. But these are not always easily observable and other than elephant ivory does not have them. Hippopotamus ivory on the contrary shows concentric rings in cross section.

Ivory of elephants and hippopotamus is composed mainly of dentine which is formed in a persistent manner in the pulp cavities of the tusk or the canines. Old ivory preserved under archaeological conditions in most cases has split completely along the lamellae in typical cone-in-cone fashion or at least we can observe regular parallel or concentric cracks. The lamellae of hippopotamus ivory are a bit more wavy and discontinuous.

But in some cases a macroscopic observation of the objects might not be enough and only a more accurate analysis could clear out doubts.

4 – CULTURAL, CHRONOLOGICAL AND ECONOMIC CONTEXT OF THE FINDS

Based on the available data, it is usual to consider, for the Chalcolilthic of the Portuguese Estremadura, three principal cultural phases. Such phases can be found stratified at Leceia in a paradigmatic form, corresponding to archaeological levels with different characteristics and contents. Among these stand out the ceramics, of which some types can be understood as true markers, or stratigraphic fossils to use an expression from the geological world, with validity at Leceia (Figs. 1, 2), as in other settlements of the same cultural area. We will take a look at, therefore, the principal characteristics of these phases, identified stratigraphically (Fig. 3).

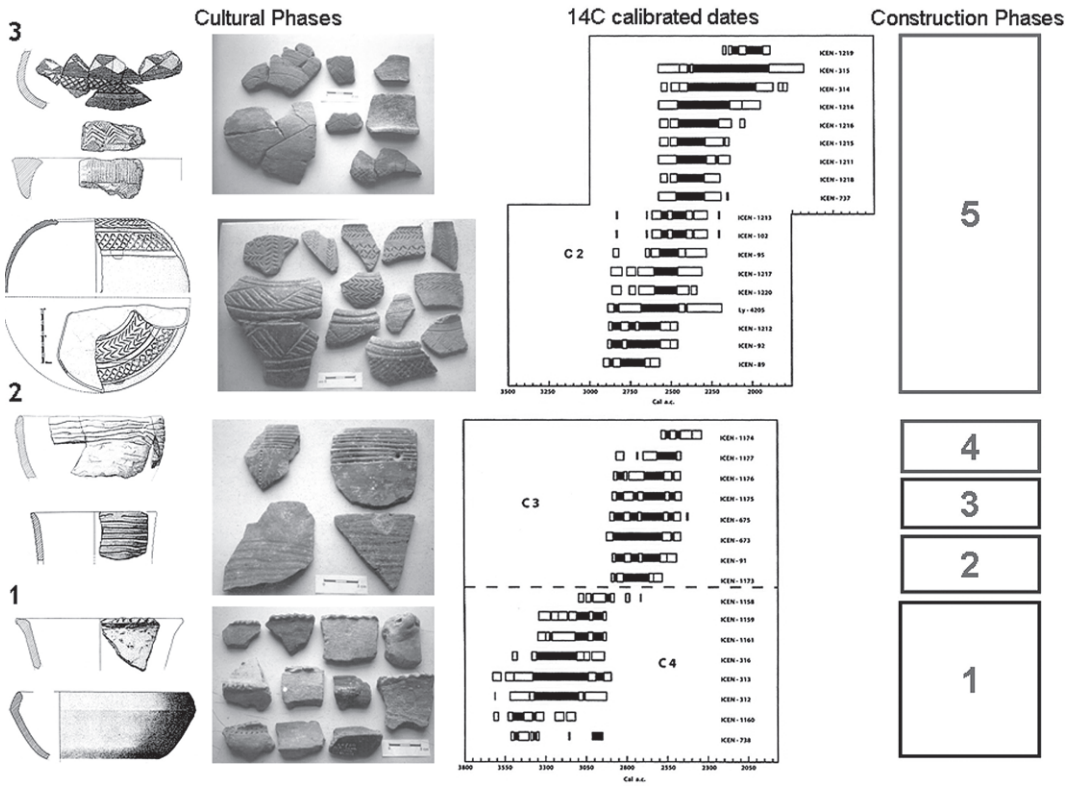

Fig. 3 – Relationship between the Cultural phases, the Construction phases, and the Absolute chronology in the prehistoric fortified site of Leceia, after J. L.Cardoso.

4.1 – The Early Chalcolithic

At Leceia after a period of abandonment, which might have lasted between 30 and 150 years, but probably some decades (CARDOSO & SOARES, 1996), there occurred in the beginning of the Early Chalcolithic, situated around 2900 cal BC, the construction of an imposing fortification (Fig. 2), created on the geological substrate, as well as on the level corresponding to the occupation of the Late Neolithic (CARDOSO, 1989; 1994; 2000). Such a defensive complex respected a plan previously defined and methodically brought to practice. The discordance which one can observe between this occupation and the Neolithic pre-existent settlement, does not necessarily mean, however, the existence of ruptures at the cultural level (there must have certainly existed breaks of a socio-economic nature) and, much less, justified the conclusion of the arrival of new foreign peoples to the region. On the contrary, one can perceive in this fortification the logical consequence of a period of instability generated in the Late Neolithic indicated by the preference for the occupation of sites naturally defended.

In Leceia, the Early Chalcolithic can be dated with high precision. The nine available radiocarbon dates permit the construction of a graph of cumulative probability (based on the CALIB program) and, from this, the calculation of diverse intervals of confidence. In this way, for a probability of 50%, the duration of the Early Chalcolithic can be situated between 2770 and 2550 cal BC and, for a probability of 95 % between 2870 and 2400 cal BC (CARDOSO & SOARES, 1996).

It is appropriate to remember, however, that the interval of 50% represents the *floruit* of the assemblage (see a discussion of this concept in SOARES & CABRAL, 1993, p. 220). In this way, one can affirm that the Early Chalcolithic would have had a shorter duration than the Late Neolithic, corresponding to the interval of 2900/2800 – 2600/2500 cal BC. This being the case, the first fortification at Leceia, built immediately after the beginning of the Early Chalcolithic, would extend to around 2800 cal BC, or perhaps some decades earlier.

Leceia documents, thus, in addition to the two comparable and better-known cases of the Estremadura region – Vila Nova de São Pedro (Azambuja), where hundreds of flint arrowheads have been recovered in veritable caches, perhaps constituting ballistic arsenals, in the *stratum* Vila Nova 1 of A. do Paço (PAÇO, 1964, p. 145), and Zambujal (Torres Vedras) – the more evident characteristics of the settlement of the Estremadura region, based upon large fortified centres, with proto-urban characteristics, whose location was determined by a conjunction of natural conditions for defence, in connection with agricultural valleys of high fertility, dominating natural routes to the adjacent region; geomorphologic conditions that were favourable and high agricultural potentials of the soils were, thus, the two dominant aspects for determining the selection of such fortified sites.

The successive phases of construction, reinforcement and addition of the structures, observed at Leceia throughout the Early Chalcolithic, as at Zambujal and at Vila Nova de S. Pedro, respected, as did the initial construction, a global plan and planned readjustments; they reveal, as well, the maintenance and, perhaps, the worsening of social stability throughout the Early Chalcolithic, a period of around 300 years, during the 1st half of the 3 millennium BC. The imposing quality of these constructions reveals, as well, a society that was hierarchized at the inter- and intra--community level. The tribal model, which presupposes egalitarianism, strengthened by consanguineous ties, cannot be adapted totally to the observed reality; it is more adequate to suppose a complex and sedentary society, clearly established in the territory whose openness to exogenous stimuli would have encouraged and favoured the arrivals of outsiders; their presence would have accentuated a growing intra-community social differentiation. This explanation is supported by the existence of diverse residential structures of differing construction quality and size, depending on the greater or lesser privilege that they had inside the walls, probably proportional to the social ranking that its respective inhabitants attained. Such is the case of a large house of circular plan situated in the best defended area, while the others, of smaller size and poorer quality, were situated in zones that were more exposed to eventual attacks.

On the other hand, in the construction of this notable fortification – whose area of construction approximates that of Vila Nova de S Pedro (ca. 1,5 ha) and which is smaller than that of Zambujal (more than 2,5 ha, if we consider the

third and fourth defensive walls) one finds implied the existence of subsistence surpluses making possible the support of productive activities of the most active segment of the population, for a long period of time.

At last, there is evidence not only for the division of labour (as in any tribal community), but the actual hierarchization of their function, with the elite of the community coordinating the work of all. The Early Chalcolithic corresponds unquestionably, in the Estremadura, to a period of economic growth, revealed by the improvements obtained in productive capacity.

4.2 – The Full Chalcolithic

The following cultural phase – the Full Chalcolithic of the Estremadura – whose beginning can be situated ca. 2600/2500 cal BC – in general can be well-documented in the settlements occupied or founded in the earlier cultural phase.

The eighteen available radiocarbon dates for Leceia, together with the respective dates for the other cultural dates there represented, make this settlement the best characterized of the Estremadura region. A greater precision is, at the moment, impossible, given that the available calibration curve is weak and has many oscillations. The *terminus* of this cultural phase can, in the same way, be situated at around 2200 cal BC.

At Leceia, there were produced, in this phase, in restricted areas of the inhabited space (as the presence of slag and drops of melted metal show), a variable copper industry, with an emphasis on small artefacts, such as awls, chisels, and punches. The preference shown for these kinds of artefacts can be explained by the scarceness of the metal at that time: copper would have been a better material than stone for the specific functions that they were used for. The large copper axes – no complete example of which has been found at Leceia – would have corresponded more to objects of prestige, of ritual character or, only, simple ingots, without practical function.

It is clear that pure copper, of which they were made, could not compete, in terms of durability and resistance, with any amphibolite axe, which was much less costly to obtain. Copper can be seen, in this way, only as an extension of the Secondary Products Revolution (SPR), when taking into account the improvement of the efficiency of determinate instruments of production or of transformation, contributing to the diversity and specialization of consumer goods, namely subsistence. In this context, we do not believe one should value its action too strong as an agent of economic or social change. In the Early Chalcolithic of the Estremadura, the scarcity of copper artefacts is evident, not only at Leceia, but also at Zambujal and Vila Nova de S Pedro.

The late generalisation of copper artefacts in the Estremadura accompanies, simply, that of other technological novelties, typical of the SPR, in the 3rd millennium BC, such as the secondary transformation of milk (the sieves for cheese and butter production are completely absent in the Early Chalcolithic). For this proposition it is interesting to observe, with all the reservations for the methods of excavations that were not rigorous and the archaeometric analyses that were equally undeveloped, that A. do Paço (1964, p. 146) had also mentioned, in reference to Vila Nova de S. Pedro, that "The economic conditions that underwent a change with the arrival of the copper metallurgists, present now more indications with the industries of weaving, of the manufacture of dairy products…"

Already in the 1950s, there was related the progression of the constructors of the *tholoi* – identified with populations of prospectors and copper metallurgists – with the diffusion of the use of this metal, from Andalusia, to the Estremadura, passing through the Alentejo (FERREIRA & VIANA, 1956). The dates of the Chalcolithic settlements of the Southwest Group (Including the Lower Alentejo and the Algarve regions) appear to confirm this proposition (SOARES & CABRAL, 1993).

If one finds demonstrated the mutual influence of a transregional character between the Chalcolithic cultural areas of the Baixo Alentejo and the Estremadura, the subject of a pioneering study (SILVA, SOARES & CARDOSO, 1995), there can be found, equally, such a phenomenon between geographic areas even more distant. We are referring to the

omnipresent Chalcolithic female divinity of Mediterranean origin; the presence in the Estremadura, under several representations, of the "Mother Goddess", some of them with evident oriental characters, suggests the arrival of several exogenous influences along the third millennium BC. In a world marked by profound social transformations, in part resulting from its extreme openness to the exterior, the diffusion of practices and ideas would naturally be possible (Figs. 13, 14).

It is in this way that the yet-to-be confirmed recent discovery of Chalcolithic Anatolian ceramics (of the Early Bronze Age II, ca. 2600-2200 BC) in Andalusia, in "a context characteristic of the Southeast Copper Age – of the Millares – El Malagón types, associated with Beaker ceramics" can be interpreted (GONZÁLEZ PRATS *et al*., 1995).

Whatever the case, the apparent disarticulation of Chalcolithic social structure, accompanied by the full expression of the Beaker ceramics, in the Estremadura, particularly after the middle of the 3rd millennium BC (CARDOSO & SOARES, 1990/1992), corresponds, in reality, to an increase in social hierarchy. In fact, the establishment of trade networks over large areas is a reality, proved by the standardization of artefacts of large diffusion: the artefacts of the Beaker "package": vessels, Palmela points, daggers, wrist guards, bone buttons and, for the first time, gold implements, as evidence of a social process, which would come to be fully expressed later, during the Bronze Age (CARDOSO, 2001 a).

Preferring a gradual transition to abrupt leaps in social evolution, such remains reflect the slow passage to a new social regime, based on the figure of a chief, surrounded by an elite with whom it competed for the maintenance and overseeing of the determined territory, a hypothesis supported by the well-known Beaker panoply, mentioned above, which made increasing use of arms, with the rise, at the end, of long daggers or short swords. The transition to a socially stratified society, such as that of the Bronze Age, was reflected, gradually, by the Chalcolithic society. The proto-urban characteristics of their settlements, the inter and intra-social differentiation and the clear cultural contacts that the respective inhabitants maintained with the Mediterranean world, made the Estremadura a privileged zone where, over a space of around one thousand years, one can witness the internal transformations of a dynamic society, in constant change, along all the third millennium BC.

The general environment of Mediterranean character, prevalent throughout the Chalcolithic of the Estremadura – reinforced by its geographic position – had favoured in diverse adjacent regions identical internal evolutions and phenomena of convergence. Furthermore, the valorisation of the commercial component in the diffusion of the architectonic tradition, of metallurgy, and of prestige objects was previously argued (PARREIRA, 1990, p. 29).

It is in this context of social differentiation and the gradual expression of the power of the elites, that we can consider the existence of several types of ivory implements, related to the Early and Full Chalcolithic occupation of Leceia.

The specific location of each finding is indicated in Fig. 4.

5 – TYPOLOGY AND PARALLELS OF THE FINDS

5.1 – Pin with a nails head

A fragment of a pin has the upper extremity in form of a nails head (Fig. 5)[3]. The head is not horizontal but slightly inclined. The fragment is 4,3 cm long, the point is missing, and the shaft has got a diameter of 0,6 cm. In this case there exists no doubt about the material. On the head we can see perfectly a net of crossing and alongside the shaft parallel and slightly wavy dark lines, the so called Schreger lines. So we are even able to talk about elephant ivory (Fig. 3).

[3] Centro de Estudos Arqueológicos do Concelho de Oeiras, Inventory Number Lc/02/C3/Entre O e G.

Fig. 4 – Plan of the area excavated with the location of the ivory artefacts studied, after J. L. Cardoso.

Fig. 5 – Pin with a nails head from Layer 3, Early Chalcolithic (cf. Fig. 4, nº. 1). Photo J.L. Cardoso.

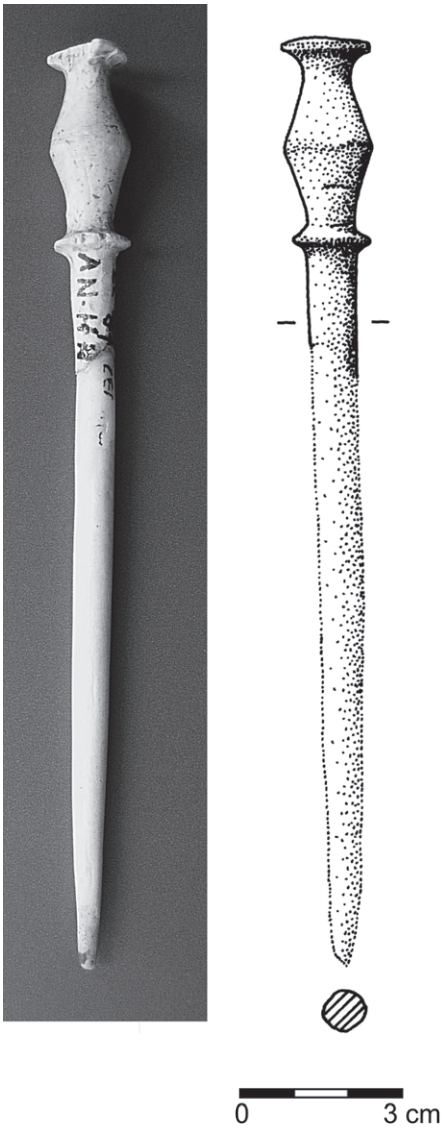

Fig. 6 – Vase headed pin from Layer 2, Full Chalcolithic (cf. Fig. 4, nº. 2). Photo J. L. Cardoso. Drawing B. Ferreira.

The number of parallels for this kind of pins is very small. We can only name at least four similar bone pins from Vila Nova de São Pedro and another one from Pragança (JALHAY & PAÇO, 1945, Pl. 14, nº. 38; Pl. 15, nº. 16, 17; Pl. 16, nº. 10; PAÇO, 1960, Fig. 3, nº. 11, 13; SAVORY, 1968, Fig. 47h; CAMPS-FABRER, 1991). Camps-Fabrer dates the pieces from Vila Nova de São Pedro and Pragança in the Bell Beaker period. But we really do not have any stratigraphical hint for the three. In fact, Vila Nova de São Pedro and Pragança are settled from the Early Chalcolithic on, so that nothing speaks against giving these three pins the same dating as the one from Leceia (GONÇALVES, 1990/92).

This piece belongs to the Early Chalcolithic, and was found inside the second defensive line, during the 2002 campaign, in a layer of greyish colour (Layer 3 of the general sequence record) (CARDOSO, 2003, Figs. 2, 3). Thus, their chronology lies between 2900/2800-2600/2500 BC.

There is also some similarity to an ivory pin from Las Angosturas (Gor, Granada)[4], although in this case the head is longer and in fact conical.

One of us (J. L. C.) had already compared the pin with some of the cylindrical idols of bone or ivory, with narrowed neck, which sometimes show an inclined head, namely those from Lapa do Bugio, a funerary cave of the Sesimbra region (CARDOSO, 1992).

5.2 – Vase headed pins

Two of the so called vase headed pins from Leceia seem also have to been made out of ivory.

Three more pins from Leceia seem to be made of ivory. But in fact the name vase headed does not seem best fitting for this group, or we should differentiate at least two types. Much clearer for one of the types and for our examples is their French denomination “épingle à balustre”, so their head does have the form of a little column or baluster. Between two conical or annular endings extends a cylindrical or biconical middle part. Besides there are also slight differences between both pins from Leceia.

The first of our examples from Leceia shows a cylindrical middle part with conical endings between two conical end parts (Fig. 6)[5]. The narrower part of these endings is directed to the middle of the head. The conical shaft of the pin is much narrower than the head. It is completely preserved and has got a length of 7,8 cm. Only the upper ending of the pin is slightly damaged. In the break we can see a structure of parallel wavy lines going along with the length of the pin, a quite clear indication of ivory. The pin, from the Layer 2, belongs to the Full Chalcolithic, is brown and highly polished.

The head of another example made out of ivory has got a biconical middle part and two annular endings (Fig. 7)[6]. Only the upper part of the shaft is conserved. The pin, from Layer 2, correlated to the Full Chalcolithic, is ivory-coloured and polished. It too has got a slight damage on the upper ending with the typical parallel and vertical line structure of ivory.

There are several vase headed pins of bone in Middle Portugal (SPINDLER, 1981, p. 238, Pl. 44). We know thirteen of them from Vila Nova de São Pedro (PAÇO, 1960, Fig. 3, nº. 41, 43-53, 55), besides examples from Olelas (SERRÃO & PRESCOTT, 1958, p. 111, Est. 8, nº.13, 14), Pragança (SAVORY, 1968, Fig. 47, f, g; SPINDLER, 1981, p. 238), Zambujal (JIMÉNEZ, 1995, Fig. 7, 9) and maybe Casainhos (LEISNER, ZBYSZEWSKI & FERREIRA, 1969, p. 72 Pl. Q, nº. 91). Recently, one of us (T. X.S.) could confirm that probably two of the vase headed pins from Vila Nova de S. Pedro are also made out of ivory[7].

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[4] Museu Arqueológico y Etnológico de Granada, Inv. No. 11375 (=AG 40011) (unpublished).

[5] Centro de Estudos Arqueológicos do Concelho de Oeiras, Inventory Number Lc/01/C2/a S de GA

[6] Centro de Estudos Arqueológicos do Concelho de Oeiras, Inventory Number Lc/87/C2/a N de HH

[7] Museu Arqueológico do Carmo. Lisboa. Nº. Inv. VNSP 974. JALHAY & PAÇO, 1945, Pl. 16, nº. 7.

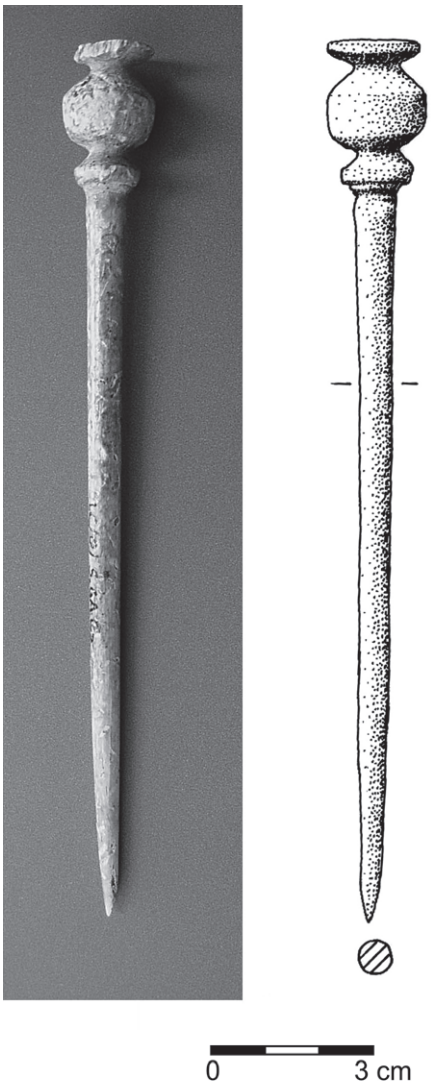

Fig. 7 – Vase headed pin from Layer 2, Full Chalcolithic (cf. Fig. 4, n.º 3). Photo J. L. Cardoso. Drawing B. Ferreira

With one exception, which has got a moveable head, the vase headed pins in Middle Portugal are always made out of one piece. But there are other differences. The one from Zambujal is a real vase or poppy headed pin; it does not have a lower profiled ending of the head like ours. The two from Pragança and both from Olelas we should better call baluster headed pins like the ones from Leceia. In Vila Nova de São Pedro both types are present.

Spindler supposes the vase headed pins to be derived from pins of the Late Neolithic with moveable head like the one from Cova da Moura (SPINDLER, 1981, p. 88, Pl. 23, nº. 356). A. do Paço and E. Sangmeister, on the other hand, compare them with vase headed pins from the Eastern Mediterranean (PAÇO & SANGMEISTER, 1956, p. 225). So for example, we can find a similar form in copper in the cemetery of Chalandriani (Syros), although in this case it is a real vase headed pin (RAMBACH, 2000 a, Pl. 46, nº. 1 (tomb 343); 2000 b, p. 357 Fig. 26; MARAN, 1998, p. 135-152, Pl. 81). Unfortunately this piece is a singular object on the Cyclades. The tomb where it comes from seems to belong to the Aplomata group (Early Cycladic IIa). The Aplomata/ Chalandriani-complex as a whole should date from the older Early Helladic II until the Early Helladic II to III transition, what means between 2650 and 2250 BC.

From Troy IIc we know a pin of bone nearly identical to one of our pieces (BLEGEN *et al*., 1950, p. 266, Pl. 364, 37-615; KORFMANN, 2001). Troy II is dated from ca. 2550 to 2250 BC, and therefore contemporaneous to the Aplomata/ Chalandriani complex, and to but probably slightly later than our pins from Leceia.

5.3 – Cylindrical idol with narrowed neck

A fragment of a cylindrical idol with narrowed neck ("cilindros ou ídolos de gola") seems also to be worked in ivory (Fig. 8)[8]. The upper surface is slightly inclined and not totally horizontal. The lower end is missing, because of an oblique break of the objects body.

[8] Centro de Estudos Arqueológicos do Concelho de Oeiras, Inventory Number Lc/99/C2/Muralha FT

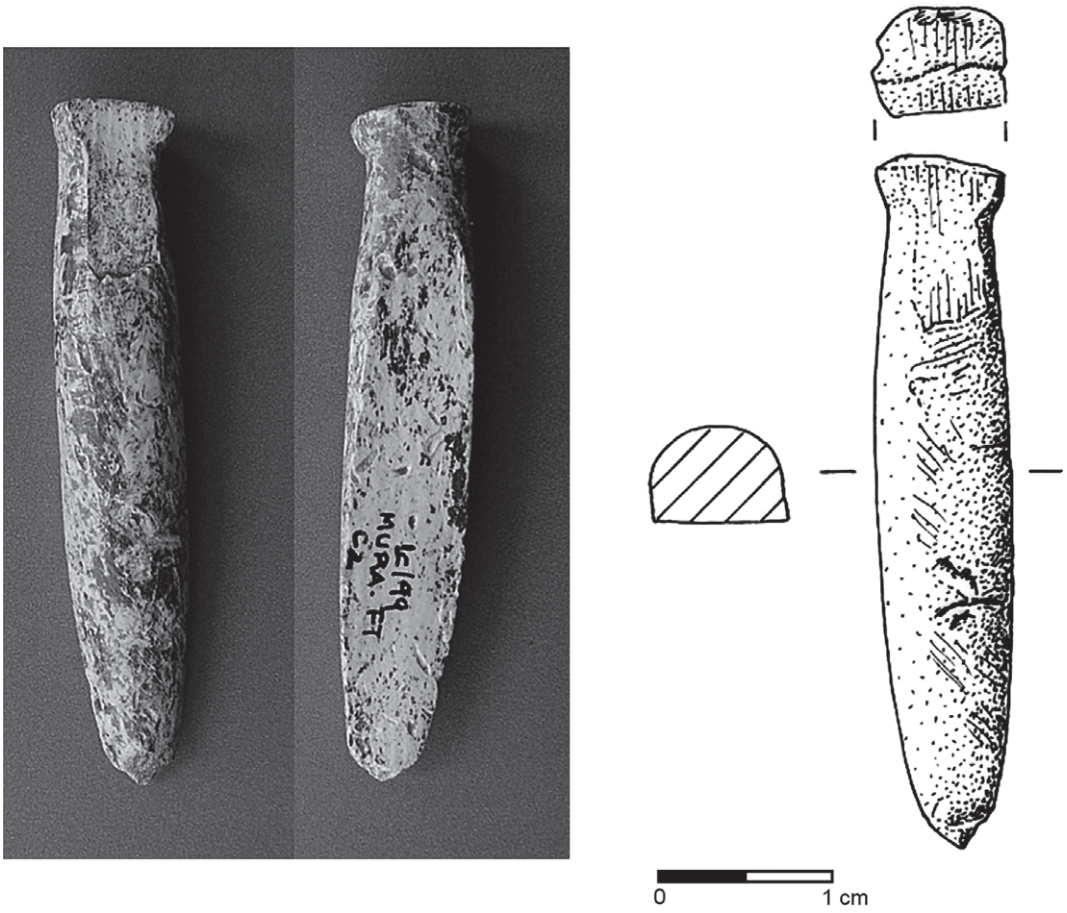

Fig. 8 – Cylindrical idol with narrowed neck from Layer 2, Full Chalcolithic (cf. Fig. 4, nº. 4). Photo J. L. Cardoso. Drawing B. Ferreira.

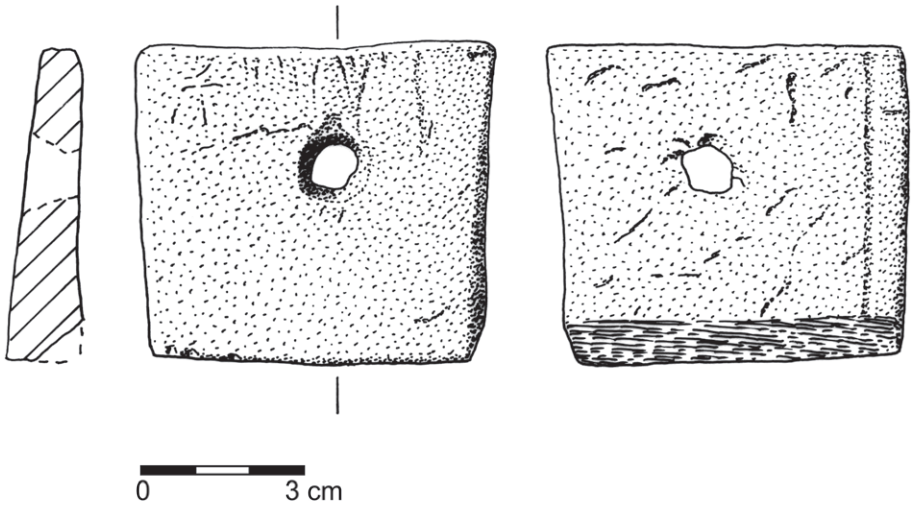

Fig. 9 – Perforated plaque from Layer 2, Full Chalcolithic (cf. Fig. 4, nº. 5). Drawing B. Ferreira.

This piece belongs to a whole group of similar objects, which we find exclusively in the Tejo estuary (SPINDLER, 1981, p. 97, Pl. 45, c; CARDOSO, 2003). Similar objects from France and Switzerland are only roughly comparable (BARGE-MAHIEU *et al*., 1992).

Only a few of the cylindrical idols with narrowed neck are made of ivory, so the ones from the Gruta do Castelo (Pragança, Cadaval), S. Martinho (Sintra, Lisbon), Barro (Torres Vedras, Lisbon) and Lapa do Bugio (Azoia- Sesimbra, Setúbal) (GONÇALVES, 1990/1992, Fig. 2, nº. 1; SALVADO, 2004, Pl. 3, nº. 2-4; 6; LEISNER, 1965, p. 69, Pl. 50, nº. 31; MONTEIRO *et al*., 1971; HARRISON, 1977, p. 106 SN 21; CARDOSO, 1992, Pl.3, nº. 9; Pl. 5, nº. 17; Pl. 20, nº. 21, 22; Pl. 46, 1-4).

We do not want enter here into a profound debate about the function of these objects. Spindler pointed out that they are very scarce in settlements but are quite frequent in *tholoi* tombs, what might speak for a cultic function (SPINDLER, 1981, p. 97).

Only two contexts can help us to clear the chronological setting of this kind of objects. In the funerary monument of Praia das Maçãs idols with narrowed neck are missing in the western chamber but are present in the main chamber, reutilized in the Chalcolithic (LEISNER, ZBYSZEWSKI & FERREIRA, 1969, p. 15 Pl. B, nº. 62, 85, 88; Pl. E, nº. 16; Pl. F, nº. 38, 41). We think it to be possible to date the finds of the Chalcolithic found in this sector of the monument, with the only exception of some intrusive Bell Beakers, in a younger phase of the Pre-Beaker Chalcolithic, that is proximate to the following Bell Beaker period[9].

This goes together with the situation in Leceia (CARDOSO, 1989, p. 117, Fig. 110, nº. 7, 10). So two more idols of this type come from Layer 3, inside the second defensive line. Layer 3 belongs to Phase II, with channelled decorated cylindrical vessels ("copos"), characteristic of the Early Chalcolithic period.

5.4 – Perforated plaque

The last object made of ivory is a quadrangular flat plaque (Fig. 9)[10], from Level 2, correlated with the Full Chalcolithic occupation of the site. It measures 2,7 x 2,6 cm and is 0,6 cm thick, one side is partially broken. And it is here were we see parallel slightly wavy lines. It has got one perforation slightly moved out of the centre of the basic area. Clearly it was thought to be fixed on an object of perishable material, supposedly wood.

The only examples for plaques of this type on the Iberian Peninsula come from the Bell Beaker period. So in the rock-cut tomb 5 of Los Algarbes (Tarifa, Spain) various little quadrangular plaques of ivory with one central perforation have been found (POSAC, 1975, Pl. 8, 9). They are somehow smaller and measure only 0,9cm to 0,9cm. Because there are other little elements in form of triangles and flat spoons it seems like they have been used as beads on a collier. But in the same tomb there are other rectangular and bigger flat plaques with two or three perforations which should have formed ivory attaches of a wooden box.

[9] JIMÉNEZ, 1995, 163-174, Fig. 9; KUNST, 1995. The ^{14}C –dates give for Phase 3 a time span from 2850-2210 cal BC (GrN-7002. 7003. 7004. 7006; KN-I.117) with the exception of the younger date KN-I.115: 3530+/-65 BP = 1950-1760. For Phase 4 we get a dating from 2860-1890 cal BC (GrN-6668. 6669. 7007C. 7664) (CORDES *et al*., 1990, Fig. 2). All ^{14}C dates in this article have been calibrated by OxCal Version 3.10 (BRONK & RAMSEY, 1995, 2001).

[10] Centro de Estudos Arqueológicos do Concelho de Oeiras, Inventory Number Lc/00/C2/GA

6 – ORIGIN OF THE RAW MATERIAL

In 1977 R.J. Harrison and A. Gilman did work out a hypothesis on the ivory exchange between Northern Africa and the Iberian Peninsula, going back on works of A. Jodin and G. Camps (HARRISON & GILMAN, 1977; JODIN, 1957; CAMPS, 1960). They thought about an exchange of prestige-goods, ivory and ostrich egg-shells for metallic and ceramic productions of the Iberian Peninsula, Palmela points, tanged swords, halberds, axes and Bell Beakers. In fact, it seems like this kind of exchange really can be demonstrated for the Bell Beaker period because of the quite big quantity of such products of Iberian typology in Northern Africa, both along the Mediterranean as the Atlantic coast.

But Harrison and Gilman already noticed the difficulties to apply this scheme to the Pre-Bell Beaker Chalcolithic too, because "… no characteristic Millaran or VNSP pieces have been found in Northern Africa". And they asked themselves, "… why were no VNSP channelled, pattern-burnished *copos* (the so called *Importkeramik*) sent to North Africa like the luxury ware of a later time (Beakers)?". But nevertheless they argued that the hypothesis need not be discarded out of hand.

In the margin of our investigation project of one of us (T.X.S.) the INCENTIVS group of the University of Mainz (Germany) under the direction of Dr. A. Banerjee did analyze 34 ivory objects from the Iberian Peninsula by macroscopic analysis (Schreger lines) and Fourier Transform Infrared (FTIR-) spectroscopy (DRAUSCHKE & BANERJEE, 2007)[11]. From these, five objects belong to the Early Chalcolithic and come from the necropolis of Los Millares (Santa Fé de Mondújar, Almería, Spain). Following the results of this analysis four out of five analyzed objects originate from the Asiatic elephant (*Elephas maximus*). One is supposed to be made out of ivory from *Elephas antiquus*, what could mean fossilized ivory.

Among the objects made of Asiatic ivory we can find an idol in form of a bowling pin ("ídolo tolva"), a votive sandal and a supposed blade of a votive axe (Fig. 10)[12]. With exception of the idol in form of a bowling pin, the others do not have any or very few parallels on the Iberian Peninsula and therefore on archaeological arguments always have been considered as "exotic" (JALHAY & PAÇO, 1941, p. 123-126; LEISNER & LEISNER, 1943, p. 470, 587; ALMAGRO BASCH, 1959, p. 178-182).

A cylindrical undecorated container of ivory from Los Millares tomb 7 also consists of Asiatic ivory[13]. It belongs to a whole group of hollow cylinders, decorated and undecorated (SIRET, 1913, p. 39, 85; SPINDLER, 1981, p. 93-97; CAMPS-FABRER, 1993, p. 206; SALVADO, 2004, p. 58-60). These appear in first line on the Lisbon peninsula, so that we can suppose there a production centre. Outside this area there are only a few of them and most of these are made of ivory. They are supposed to be containers for cosmetics and appear mostly in funerary contexts. The base is always missing and shuld have been made out of organic material.

The only sound parallels which come from the same chronological period are some boxes from First Dynasty Egypt (EMERY, 1958, 83 pl. 102; DREYER *et al*., 2000, p. 111, Fig. 22b). Although these are very similar in form, the

[11] On this occasion one of us (T.X.S.) would like to thank all the responsible persons of the Archaeological National Museum in Madrid and the Provincial Archaeological Museums in Alicante and Seville for their collaboration and help, as well as the Spanish Ministerio de Cultura, the Generalitat Valenciana and the Junta de Andalucía, who gave us their permission to export these objects temporally for their analysis to Mainz. The other author (J.L.C.) are deeply grateful for the confidence and support he received since the beginning of the "Leceia Archaeological Project" by the President of the Oeiras Municipality, Dr. Isaltino Afonso Morais.

[12] Museo Arqueológico Nacional, Madrid, Inventory Numbers 1976-I-Mill-5-99; 1876-I-Mill-40-1829. LEISNER & LEISNER, 1943, 23-25, 36, Pl. 10, 1, 144; Pl. 11, 19; Pl. 16, 72.

[13] Museo Arqueológico Nacional, Madrid, Inventory Number 76-I-Mill-7-88.

Fig. 10 – Distribution of the idols with narrowed neck ("ídolos de gola") and others in form of a bowling pin ("idolos tolva"). 1 Pai Mogo; 2 Gruta das Lapas (Pragança); 3 Vila Nova de S. Pedro; 4 Gruta do Curral das Cabras Gafas; 5 Gruta do Castelo; 6 Serra das Mutelas; 7 Cabeçço da Arruda; 8 *Tholos* de Barro; 9 Serra da Vila; 10 Samarra; 11 Praia das Maçãs; 12 São Martinho; 13 Cascais; 14 São Pedro do Estoril; 15 Agualva; 16 Gruta da Moura e Leceia; 17 Lapa do Bugio; 18 Palmela; 19 Cueva de Las Motillas; 20 Cuesta de la Sabina *28*; 21 Hoya de Los Castellones *19*; 22 Torrecillas *107*; Llano del Jautón *1*; 24 Los Millares; 25 Rambla de Huéchar *2*; 26 Terrera Ventura; 27 Rambla de Los Pozicos *8*; 28 Los Rurialillos *4*. Triangles: Idols with narrowed neck; squares: idols in formo f a bowling-pin. Filled symbols: ivory.

decoration of Portuguese and Spanish boxes is quite different. On the other hand the formally longer and narrower cosmetic containers of bone from third millennium Levant show similar decorations (GENZ, 2002).

So it might be possible, that in the early Third millennium BC, on one hand finished objects made of Asiatic ivory were imported on the Iberian Peninsula from the East maybe via the Levant. But what is about the local production of ivory objects? Until know we have only the proof of the existence in some of the *tholoi* of Alcalar of portions of unworked ivory; the most important of them was found in Alcalar 4: it corresponds to a longitudinal-sectioned tusk, with a correspondent diameter of 0,10 m (VEIGA, 1889, p. 213, 223). Chronologically this necropolis belongs probably to a evolved phase of the Copper Age, the only absolute radiocarbon analysis indicates the second half of the Third millennium BC (MORÁN & PARREIRA, 2004, p. 117). Thus, we do not know any finds of ivory raw material or of half--finished objects in settlements of the first part of the Third millennium BC, both in Portugal and Spain, in contrary

to the situation in the Spanish territory during the second part of the same millennium, and especially the Early Bronze Age. But this does not speak against a local production of ivory objects. We have to keep in mind that in the Early Chalcolithic nearly all of our ivory objects come from tombs and funerary caves and only a few out of settlements, whereas in the Early Bronze Age the settlements of the El Argar, Bronce Valenciano and La Mancha Bronze Age cultures delivered quite a lots of ivory[14]. On the other hand in the Early Chalcolithic most of the ivory objects represent local, others oriental forms. So we will have all of the three, the import of finished ivory objects, the imitation of Levantine or Egyptian originals in Asiatic ivory in local workshops and the beginning of an authentic local ivory manufacture.

Several points are interesting. Ivory and ivory manufacture is one of various innovations that start on the Iberian Peninsula at the beginning of the Third millennium BC, as well as copper metallurgy, fortified settlements with towers or bastions and others. An East Mediterranean influence for all these innovations has been a long time in discussion (SIRET, 1913, p. 2-3, 45, 89; BLANCE, 1961, p. 192; 1971, 1995; KORFMANN, 1995). A great deal of data and numerous objects were cited – whether justifiably or not – as arguments for the existence of this relationship (KORFMANN, 1999, p. 381 with references). Later the 'issue of colonists' in the Chalcolithic on the Iberian peninsula ultimately turned into a heated debate, with the use of the term 'colony' rightly subjected to criticism (RENFREW, 1967; CHAPMAN, 1990, p. 30-34. See on this also ARTEAGA, 2001, p. 165-171). The autochthonous nature of Copper Age cultures was especially emphasised under a functional and processual point of view, also by Portuguese archaeologists, such as C. Tavares da Silva (SILVA, 1992) and one of us (CARDOSO, 2002, 2004). Nowadays no one would speak of 'colonists' from the eastern Mediterranean in this connection.

In our opinion, however, several of the arguments put forward as evidence for contacts between the Iberian Peninsula and the eastern Mediterranean still remain cogent (CORDES *et al*., 1990; KORFMANN, 1995, 1999; SCHUHMACHER, in press). The results of our analysis of ivory objects now for the first time may deliver a scientific argument for such contacts. Whether these worked in the way of direct long-distance contacts or were undertaken with the help of a series of short-distance "stepping stones" is another problem we will have to resolve, as we still will have to develop exact functional models of these interactions.

On the other hand we still have difficulties to explain the presence of *Elephas antiquus* ivory in our analysis. *Elephas antiquus* appears to have survived in Spain and Portugal until 33.000 BP (CARDOSO, 1993, p. 67, 291-293; VAN DER MADE & MAZO, 2001; SANTONJA & PÉREZ-GONZÁLEZ, 2005). Our analysis therefore seems to confirm a use of fossilized ivory in some pieces from Spain. But here we have to keep in mind that the model of an exchange of North African elephant ivory for ceramics and metal products of the Bell Beaker complex really appears to work, although it is difficult to assume the same for earlier periods (HARRISON & GILMAN, 1977; SOUVILLE, 1988).

The North African elephant, extinguished in late Roman time, is supposed to have been of *Loxodonta africana cyclotis* (African forest elephant) species (ZEUNER, 1963, p. 279-283; SCULLARD, 1974, p. 60-63; CARDOSO, 2001 b), but the problem is that this species does not show up in our analysis. The problem might be the correct identification of the North African elephant, which seems to depend in first place on Punic and Roman images and literary sources. So there exists a whole literal tradition saying that African elephants are smaller than Indian ones, what appears to fit only to *Loxodonta a. cyclotis* but not to *Loxodonta a. africana* (African savannah elephant). But as R. Sukumar says, size is not a good criteria to differentiate between the different species, as even among living *Loxodonta a. africana* we can observe a great variation in size depending on their living conditions (SUKUMAR, 2003, p. 86f). So he mentions various alternatives to resolve this problem, among them the possibility that North African elephants might have been in fact of a species or subspecies dissimilar of *Loxodonta a. cyclotis*, so maybe *Loxodonta a. africana* or a completely

[14] See, for exemple, the supposed ivory manufactory in El Acequión (MARTÍN *et al*., 1993, p. 34; FERNÁNDEZ-MIRANDA *et al*., 1994, p. 266)

different one, as suggested by recent genetic evidence. We will have to challenge palaeontology on behalf of the evolution of elephants in Northern Africa and ask, whether it would not be possible that the species *Elephas,* maybe in form of *E. iolensis,* survived much longer than supposed and derived in the North African elephant, extinguished in Late Roman times (compare TODD, 2001, p. 696 claiming for a revision of the African *Elephantidae*).

That there actually could have been certain exchange with North West Africa from the end of the Neolithic or the beginning of the Chalcolithic on, could be underlined by the results of the Neolithic necropolis of Rouazi-Skhirat (Rabat, Morocco). So here among other items beads made out of ostrich eggshells, arm-rings and cylindrical receptacles of ivory have been found (DAUGAS, 2002, p. 147-151; BOKBOT, 2005, p. 145, Figs. 27-29). All these objects seem to relate the necropolis to the early Iberian Chalcolithic. Until now we only do have one ^{14}C-date from human bone and a TL-date of ceramics from Rouazi-Skhirat which fall apart. But comparing the results with the dates of a nearby shell midden, supposed to be contemporaneous, the most plausible dating seems to be the end of the Fourth or the beginning of the Third millennium BC. So the problem could be that, like already Harrison and Gilman supposed, we still do not have enough funerary records of Northern Africa of this time period and therefore we still can not identify the Iberian imports in that time.

If we look at the geographical distribution of the ivory objects in the Early Chalcolithic, we see that they concentrate mainly in the three main centres of Early Chalcolithic culture, the estuaries of Tejo and Guadalquivir and South-eastern Spain, in a second order the Guadiana valley (Fig. 11). First of all this clearly indicates that the raw material and the imported objects came there by sea. The main centres of ivory consumption are in clear connection with the main sea routes whether from Central and Eastern Mediterranean or from Atlantic North West Africa or Algerian Oran to the Iberian Peninsula. This last way is clearly demonstrate, for the first time, in the Iberian peninsula, by the nail-headed pin from Leceia, as it is made from an savannah elephant tusk (*Loxodonta a. africana*), according to the analysis made by Dr. A. Banerjee, object of a further and more detailed paper.

7 – CONCLUSIONS

On the Iberian Peninsula at end of the Fourth millennium BC (Final Neolithic) we notice a process of concentration of population in big centres in the regions more favourable for agriculture (MOLINA & CÁMARA, 2005, p. 100-108). In the Portuguese Estremadura region, one can also observe the formation of a hierarchical settlement, with proto-urban fortified sites, corresponding to a complex social structure, based on the different access to the economic goods. The elites, in order to legitimate their power by the exercise of the authority, have a growing need for exotic materials, among them are ivory and ostrich eggshells. So ivory begins to be consumed from the beginning of the Third millennium BC on. The developing middle-range and maybe long-range exchange networks admit the acquisition of ivory raw material and also finished products.

Scientific analysis of ivory from the necropolis of Los Millares support the idea that the know-how of ivory carving, finished objects and probably part of the raw material came from the Eastern Mediterranean probably via Syria or Palestine. So the analysis confirmed a certain quantity of Asiatic elephant (*Elephas maximus*) ivory among the ivory of the Older Chalcolithic. And we seem to be able to differentiate objects with eastern Mediterranean influences or provenience.

The presence of *Elephas antiquus* ivory in the analysis is still difficult to explain. But we do not believe in the possibility of a use of fossilized ivory, at least in big quantities.

In what concerns the Portuguese data, the unique almost complete tusk of Pleistocene *Elephas antiquus* known, coming from a lower terrace level of the river Tagus – Terrace of Carregado, Azambuja (Lisboa) – is too fossilized and also too fragile to allow any utilization for carving. The same is true for the fragment kept in the

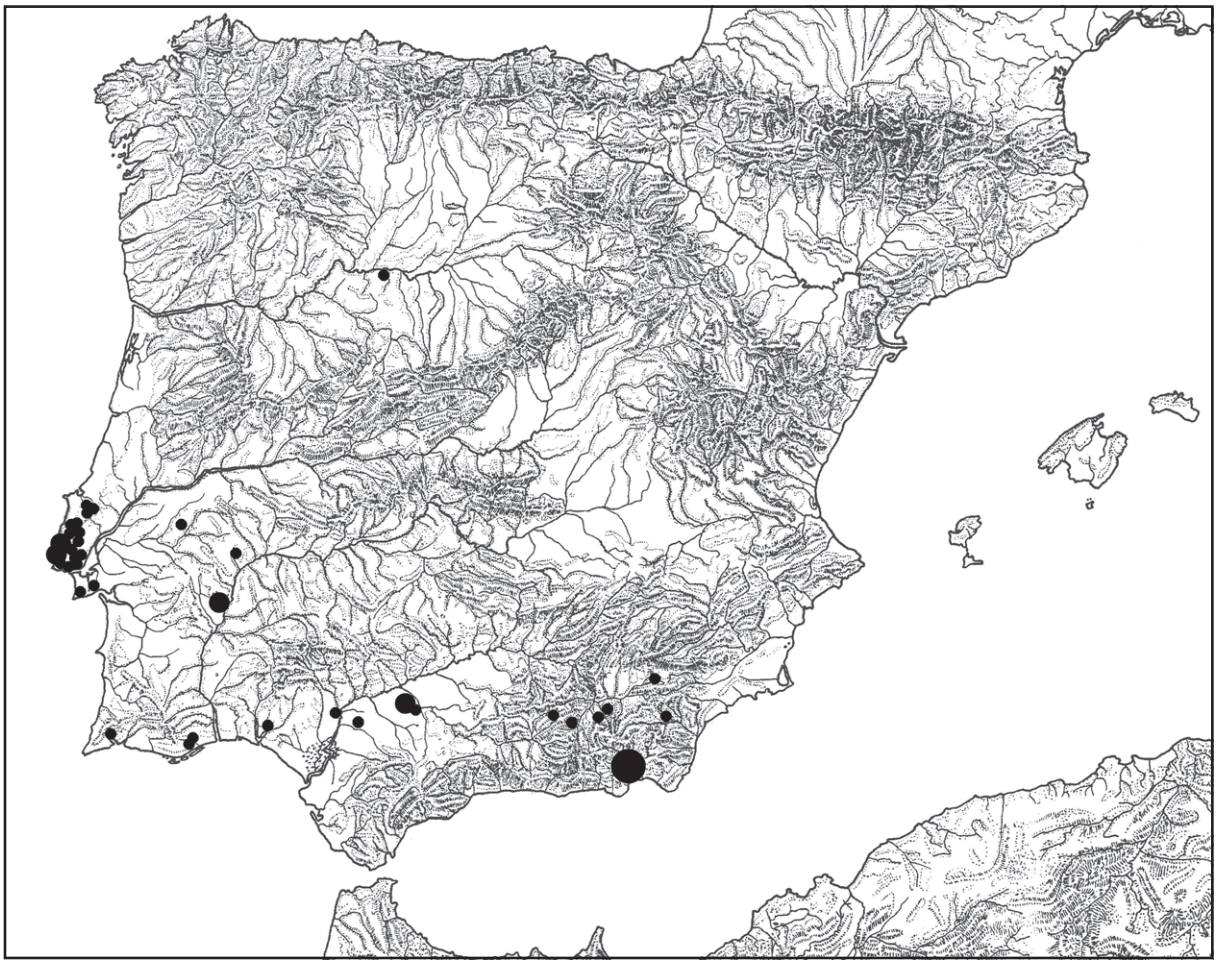

Fig. 11 – Pre-Beaker Chalcolithic. Geographical distribution of the ivory objects by number (l1-5 objects; l6-20 objects; lmore than 20 objects).

Museu Monográfico de Conimbriga, even older, as it was attributed to the Cromerian (ANTUNES & CARDOSO, 1992).

Finds like the necropolis of Rouazi-Skhirat argue for the participation of North West African ivory among the ivory manufacture in the first half of the Third millennium BC. This early relationship between the Iberian Peninsula and North West africa was for the first time documented by one of the pins found in Leceia, as it clearly belongs to the savannah african elephant and seems easily visible later, in the Bell Beaker period. But, as the ivory plaque was attributed, as other peninsular finds, to *Elephas antiquus*, extinct during the Late Pleistocene, maybe the problem is an erroneous identification of the north west african elephant and this in fact was close to *Elephas antiquus*, so that this part in our analysis would represent north west african ivory. But on this point investigation has to go on before we will be able to confirm this hypothesis.

The geographical distribution of ivory finds in the Early Chalcolithic predominating in the Tejo and Guadalquivir estuary, the Spanish Extremadura and South East, not only underlines the importance of these early Chalcolithic centres and their emerging elites, but also speaks in favour of an import by sea. So this concentration of ivory find spots near natural harbours, estuaries and bays coincides with the end-points of the most important sea-routes between Central and Eastern Mediterranean and North West Africa with the Iberian Peninsula.

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