

INSIGHTS ON THE CHANGING DYNAMICS OF CEMETERY USE IN THE NEOLITHIC AND CHALCOLITHIC OF SOUTHERN PORTUGAL. RADIOCARBON DATING OF LUGAR DO CANTO CAVE (SANTARÉM)

IDEAS SOBRE TRANSFORMACIONES EN LAS DINÁMICAS DE UTILIZACIÓN DE CEMENTERIOS NEOLÍTICOS Y CALCOLÍTICOS DEL SUR DE PORTUGAL. LAS DATACIONES RADIOCARBÓNICAS DE LA CUEVA DE LUGAR DO CANTO (SANTARÉM)

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Abstract: Lugar do Canto Cave is one of the most relevant Neolithic burial caves in Portugal given not only its extraordinary preservation conditions at the time of discovery but also the quality of the field record obtained during excavation. Its material culture immediately pointed to a Middle Neolithic cemetery but recent radiocarbon determinations also allowed the recognition of an apparent two step phasing of its use within the period (ca. 4000-3400 cal BC): an older one characterized by a single burial and a later reoccupation as a collective necropolis.

Comparisons with other well-dated cave cemeteries in Southern Portugal permitted the recognition of changing funerary practices and strategies of cemetery use during the later stages of the Neolithic and the Chalcolithic: 1) ca. 3800 cal BC as the possible turning point from the practice of individual to collective burials; 2) alternating periods of intensive use and deliberate abandonment of cemeteries (evidenced by their intentional closure). Research avenues to investigate the social organization and ideological context underlying these aspects of the Neolithic communities in greater depth are tentatively pointed out in this paper.

Key-words: Burial-caves; megaliths; Neolithic; Chalcolithic; Portugal; funerary practices

Resumen: El yacimiento de Lugar do Canto es una de las grutas-necrópolis neolíticas más relevantes de Portugal, no solo por las extraordinarias condiciones de preservación en el momento de su descubrimiento, sino también por la calidad del registro arqueológico obtenido durante las excavaciones. Aunque su cultura material apuntaba que estábamos ante un yacimiento del Neolítico Medio, las dataciones radiocarbónicas recientemente obtenidas indicaron aparentemente dos fases en su periodo de utilización (ca. 4000-3400 cal BC): una fase más antigua, caracterizada por una deposición funeraria singular, seguida de una reocupación como necrópolis colectiva.

La comparación con otras grutas-necrópolis bien fechadas del sur de Portugal permitieron el reconocimiento de transformaciones en las prácticas funerarias y en las estrategias de uso de las necrópolis durante las fases tardías del Neolítico y el Calcolítico: 1) La sustitución de las prácticas funerarias individuales por las colectivas alrededor del 3800 cal BC; 2) La existencia de alternancias durante el uso funerario dilatado en el tiempo de las necrópolis y su abandono deliberado (evidenciado por el sellado intencional de las mismas). En este artículo se apuntan de forma tentativa algunas líneas de investigación posibles para profundizar en el contexto social e ideológico subyacente a estos aspectos de aquellas comunidades neolíticas.

Palabras clave: cuevas-necrópolis; megalitos; Neolítico; Calcolítico; Portugal; prácticas funerarias

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1. INTRODUCTION

The Portuguese Neolithic is famous for its numerous megalithic monuments that punctuate the landscape across the country. These burial mounds and architectures soon attracted the attention of scholars, such as F.A. Pereira da Costa (1868) who wrote a first general synthesis on the phenomenon as early as the mid-19th century, on the monuments of the Upper Alentejo, one of the most notable “megalithic regions” in Portugal. As result of this early beginning of the research, there is presently a countless number of excavated megaliths. Some work has been dedicated to regional studies aimed at characterising architectures and material cultures and their changes through time, and to spatial analysis within site clusters and between these and the surrounding landscapes in order to approach territories and land use strategies. Bioanthropological studies of human remains, or ideological and symbolic interpretations of the megalithic phenomenon—namely through its engraved or painted art motifs—are also being undertaken. Many of these major research projects have been taking place during the last quarter of a century (for a general, updated overview, see Cardoso 2007).

However, the mentioned research is seldom carried out as systematic projects; more importantly, it results in disparate perspectives on megalithism, which is due to bias in the preservation conditions of archaeological records, different quantities and qualities of data, or intrinsic historical contingencies of the Neolithic communities themselves, not to mention the authors’ theoretical perspectives on the matter. Aspects such as the origins and internal phasing of the phenomenon or the dynamics of necropolis and landscape uses by megalithic builders are thus usually overemphasized in either general evolutionary schemes or isolated particularistic perspectives.

Indeed, two major prevailing factors have been restraining solid, fine-grained absolute chronologies from being obtained. One is the frequent lack of human remains due to the soil acidity that predominates in the granitic and schistose regions where most of the megalithic monuments are known. The other is what could be called the “charcoal prejudice”, a holdover of pre-AMS technique times when bulk samples of charcoal were the key-dating material instead of short-lived individual samples. Both limitations converged in very long, but mostly unreliable and contradictory lists of radiocarbon dates from Portuguese megalithic sites. As pointed out elsewhere, “[...] in spite of the analytical effort and critical synthesis carried out by some authors

—for example, Cruz (1995)—, the nature and meaning of dated samples can hardly be considered as objectively acquired data (Soares 1999), whereby the proposed chronology of the appearance and development of Portuguese megalithism is still markedly hypothetical” (Carvalho 2012: 186; Spanish original).

On the other hand, burial caves—which, with very few exceptions, are located in the Estremadura and Algarve limestone regions of Southern Portugal—revealed large collections of human remains and material culture items. Like their megalithic counterparts, many were excavated with inadequate methodologies. Stratigraphic and cultural sequences, burial structures, funerary practices and rituals or particular contextual associations were not usually recorded in detail. Human remains and grave goods of very distinct periods of occupation—in some cases ranging from the Cardial Neolithic to the Bronze Age—were merely published as the cave’s archaeological contents. As evident in many publications, stratigraphic profiles do not exist or exhibit a single layer from where all the materials were exhumed. Observations on stratigraphy or funerary practices are rather laconic but sometimes very suggestive of scientifically rich contexts. In sum, the scientific potential of these excavations is nowadays restricted to *a posteriori* deductions and do not provide inherently sound scientific contributions by themselves. Only in the last three or four decades have we witnessed the thorough excavation of cave sites.

Lugar do Canto Cave is clearly one of the latter cases. This Middle Neolithic cave was accurately excavated in 1975-76 and published by Leitão *et al.* (1987), who provided a detailed record of its funerary deposits (including drawings and photographs) and the list of associated artefacts and their plotting in excavation plans. It immediately became emblematic of the Middle Neolithic in Southern Portugal. Such a careful methodology also allowed recent reanalysis and reinterpretations of the exhumed human remains and associated material culture. The former analysis have been undertaken by Silva *et al.* (2012 in press a, in press b) and resulted in the publishing of evidence on demography, diseases and traumas; the latter reanalysis was performed by Cardoso and Carvalho (2008).

Thus, Lugar do Canto plays a special role within Neolithic research in Portugal for two main reasons. First, it presented a relatively well preserved funerary context where individual depositions and associated grave goods could be identified. It should be stressed that many caves in Estremadura contain complex ossuaries or were subject to successive reuse events and

more or less severe post-depositional disturbances, either natural or human induced. Second, it is coeval with the emergence of the “megalithic phenomenon”. This aspect is crucial and offers far-reaching possibilities since a large array of convergences seem to exist between natural caves and built cemeteries (hypogea, vaulted chamber tombs and megalithic graves), from material cultures to funerary practices and rituals. Such convergences suggest the same, common culturally determined strategies of death management. Therefore, empirical data (field observations, human remains, grave goods, etc.) from burial caves may help furnish a framework for the interpretation of the latter type of necropolises where deficient bone preservation conditions prevent more complete pictures from being obtained.

The aim of this paper is, thus, a brief presentation of the Lugar do Canto Cave and its radiocarbon determinations, which will be used in conjunction with chronometric data from other burial-caves to evaluate and discuss: 1) The long standing theoretical perspective according to which the development of Neolithic communities encompasses a transition from individualized to collective burials and 2) The frequency and duration of each occupation phase from the Middle Neolithic onwards and the possible causes underlying such processes. Both aspects are thus retrieved from cave records but bear important consequences in the broader understanding of the changing strategies of death management taking place during the Neolithic and Chalcolithic in Southern Portugal.

2. LUGAR DO CANTO CAVE

Lugar do Canto Cave is located in the southeast sector of the Limestone Massif of Estremadura, central Portugal (fig. 1). Its discovery was accidental: it took place during the excavation of a well in the village of Alcanede in 1975. The rapid intervention of the then-called Geological Survey Services permitted a salvage excavation and the protection of the archaeological site from further destructions.

It is formed by two main galleries (“upper gallery” and “lower gallery”) which are connected by a third, transversal gallery that extends also to deeper sections of the cave (fig. 2). Next to the entrance, in the “upper gallery”, there is also a large room. For designation purposes, the cave was divided into five sectors –named from A to E– by the authors of the excavation. According to Leitão *et al.* (1987) and unpublished



Figure 1. Sites mentioned in the text: 1. Lugar do Canto; 2. Ossos; 3. Cadaval; 4. Barrão; 5. Casa da Moura; 6. Feteira; 7. Bom Santo; 8. Porto Covo; 9. Poço Velho; 10. Bugio; 11. Cabeço da Areia; 12. Escoural; 13. Sobreira de Cima; 14. Mina das Azenhas 6; 15. Barradas, 16. Castelo Belinho; 17. Goldra. For site types see text.

records, all sectors contained funerary deposits but, apparently, only sectors A, B and C were excavated.

Leitão *et al.* (1987) also present a preliminary study of the exhumed population. This consisted of a minimum number of 48 individuals, among which it was possible to identify 19 women and 14 men (40% and 29%, respectively). In average, the age of these individuals was calculated to be from 20 to 35 years old; however, several long bones pertaining to more than ten immature and juvenile individuals and a cranium of

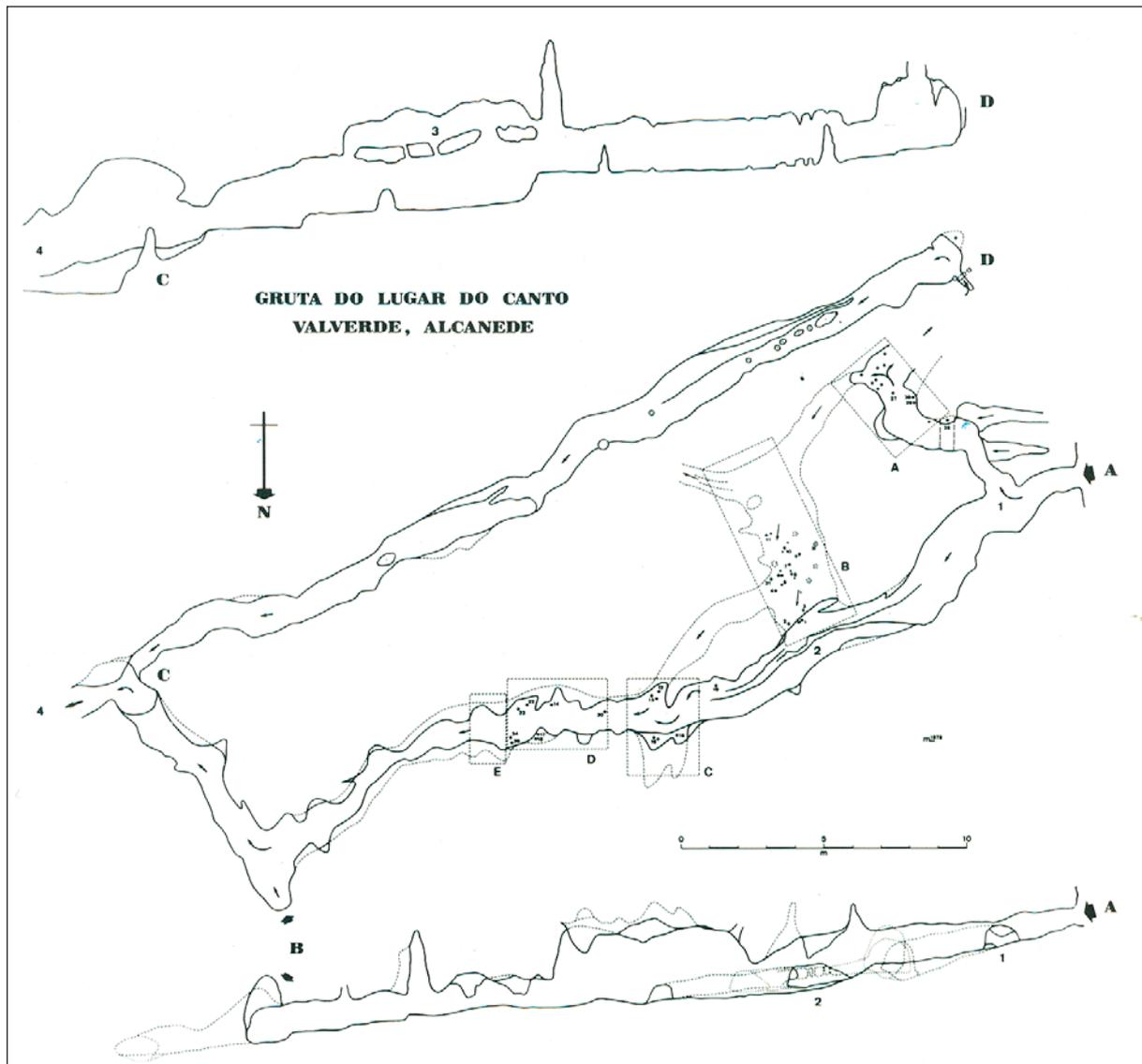


Figure 2. General excavation plan of the Lugar do Canto Cave with indication of the excavation sectors.

a >50 year-old individual indicate the presence of individuals belonging to other age categories. Estimates on statures indicate that men and women were 1.68-1.59 m and 1.60-1.52 m tall, respectively. Pathologies are represented by fractures, traumas and infections in more than half of the population. According to the authors, this high percentage of injuries may be due to activities taking place in the inner mountains and plateau of the limestone massif, such as the herding of sheep/goat or interpersonal violence.

This site's material culture is notable for the lack of pottery. Knapped stone tools, on the other hand,

are abundant: 21 flint bladelets and small blades, 35 geometrics (mostly trapeziums), two microburins, and five cores. Polished stone tools are also numerous: 12 axes, 16 adzes and one gouge. These were made with metamorphic stones, some of which were imported from other regions. Bone tools are represented by polished perforators made by splitting long bones from deer and sheep/goat. Personal adornments consist of one schist bead (a disc), 79 tubular beads obtained by sectioning of *Dentalium* sp. shells, and four bracelets made of dog cockle (*Glycymeris glycymeris*) shells.

Table 1. Lugar do Canto Cave: Radiocarbon dates of human bone samples*

Provenance	Sample	Lab.	$\delta^{13}\text{C}$ (‰)	Date BP	Cal BC (95.4% prob.)
Sector A, H32	skull 32	Beta-276510	-20,50	4720 ± 40	3635–3552 (34.6%) 3541–3493 (20.7%) 3468–2274 (40.0%)
Sector A, H35	skull 35	Wk-30208	-19,90	4742 ± 34	3636–3499 (74.9%) 3432–3379 (20.5%)
Sector A, H36	skull 36	Wk-30209	-19,60	4849 ± 29	3701–3631 (80.2%) 3578–3573 (0.8%) 3565–3536 (14.4%)
Sector B, H3	tibia 1	Wk-30211	-19,70	4733 ± 29	3635–3550 (48.5%) 3543–3498 (20.9%) 3436–3378 (26.0%)
Sector B, H6	skull 6	Beta-276509	-20,00	4770 ± 40	3644–3507 (85.5%) 3427–3381 (9.9%)
Sector B, H7	tibia 17	Wk-30212	-20,30	4772 ± 30	3641–3516 (93.5%) 3398–3385 (1.9%)
Sector C, H15	ribs	Sac-1715	-20,32	5120 ± 80	4223–4209 (0.7%) 4157–4132 (1.3%) 4068–3707 (93.4%)
Sector C, H15	humeri	Sac-2710	-20,14	5000 ± 60	3948–3662 (95.4%)
Sector C, H15?	radius 15	Wk-30210	-19,80	4819 ± 32	3658–3623 (33.3%) 3602–3524 (62.1%)

* References: Sac-1715: Cardoso (2002; Cardoso and Carvalho 2008); Beta-276509 and Beta-276510: Silva et al. (in press a); Wk-30208 to Wk-30212 and Sac-2710: Carvalho and Petchey (2013).

Although the authors of the excavation state that this community “[...] practiced secondary depositions, which is more in accordance with pastoral or nomadic populations” (Leitão *et al.* 1987: 55; Portuguese original), the available excavation plans and photos, as well as the excavators’ tagging options, clearly indicate the presence of some individuals deposited in anatomical connection, at least partially. These took place on the cave’s surface and cannot therefore be considered “burials” in the strict sense of the term. The original disposition of the cadavers is, however, difficult to reconstruct rigorously due to small-scale post-depositional disturbances and the absence of any kind of funerary architecture.

A first radiocarbon date on a human rib (Sac-1715) had already been obtained when the reanalysis of the material culture items began (Cardoso 2002; Cardoso and Carvalho 2008). In the framework of the bioanthropological studies conducted by Silva *et al.* (2012 in press a, in press b) two more samples of human bones were dated (Beta-276509 and Beta-276510). In the context of a research project on the Bom Santo Cave—a burial-cave similar to Lugar do Canto on many accounts (see Carvalho

[2014] for its monographic study and Fig. 1 for site location)—another five samples of human bones were dated at the University of Waikato for comparison purposes (dates Wk-30208 to Wk-30212; Carvalho and Petchey 2013). Finally, another determination was obtained (Sac-2710) to clarify pending questions (see below).

All determinations are compiled and presented in Table 1, which must be taken into account hereafter for details on sample type, provenience and calibration probability intervals. These dates were (re)calibrated with the IntCal13 curve (Reimer *et al.* 2013) and plotted with version 4.2 of the OxCal program (Bronk-Ramsey 2009).

In the following sections, radiocarbon determinations, as well as other relevant field observations, from the three excavated sectors of the cave are presented and discussed.

2.1. Sector A (fig. 3)

Deposition H32 - Only a flint geometric was associated with this individual. The corresponding radiocarbon

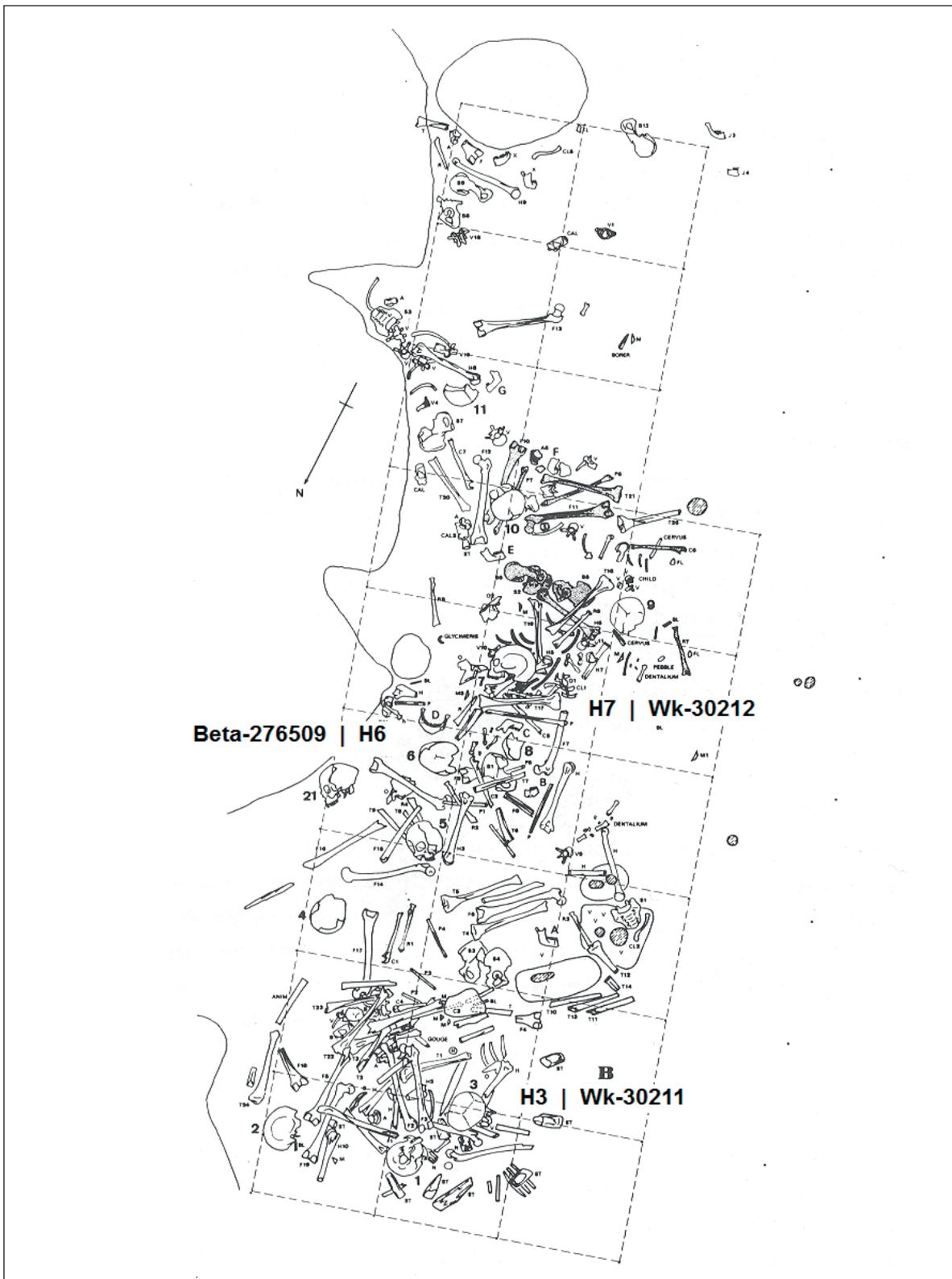


Figure 4. Plan of Sector B with location of Depositions H3, H6 and H7

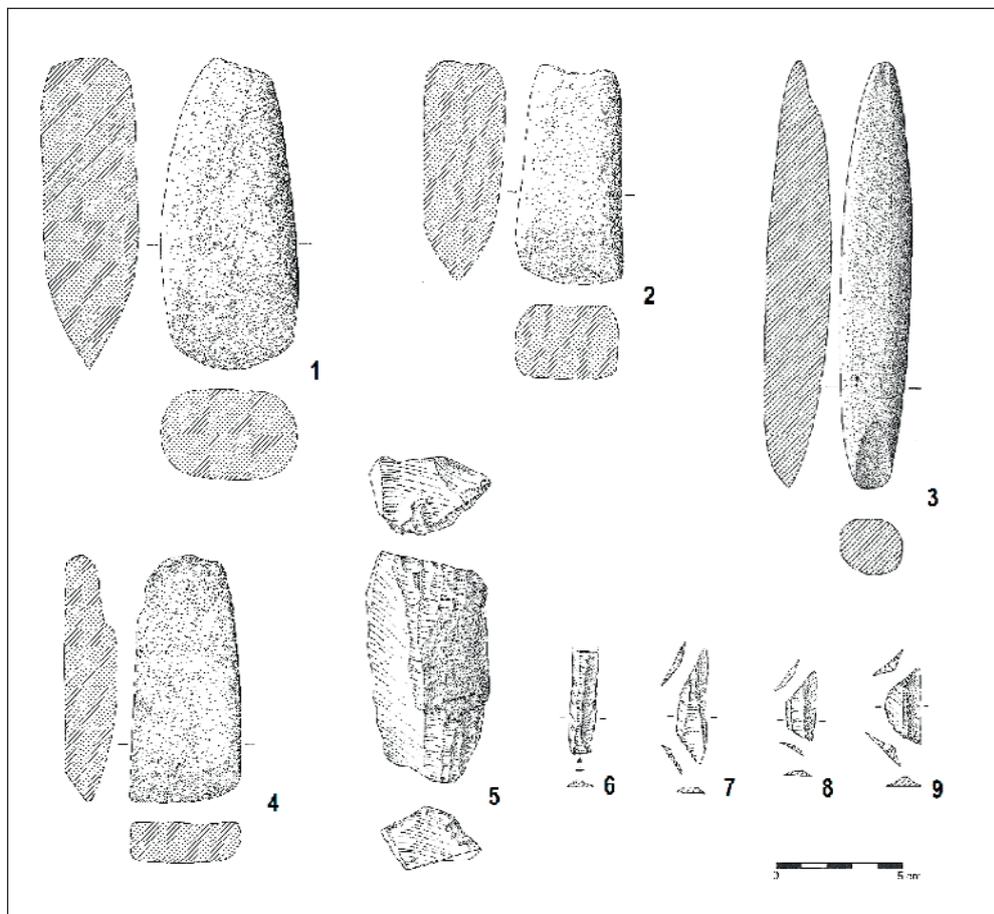


Figure 5. Plan of Sector B and grave goods associated with Deposition H3. Captions: 1. and 2. polished stone axes; 3. polished stone gouge; 4. polished stone adze; 5. prismatic core; 6. unretouched bladelet; 7. to 9. geometric trapeziums.

Deposition H6 - According to Silva *et al.* (in press b), this is probably a female. No artefacts could be associated with this deposition; moreover, all surrounding depositions (H5, H8 and H21) are devoid of any funerary goods. The radiocarbon date of Deposition H6 obtained by Silva *et al.* (in press a) is Beta-276509 (4770 ± 40 BP).

Deposition H7 - One bracelet made with a dog cockle (*Glycymeris glycymeris*) shell is the only artefact found in close association with this deposition. Its radiocarbon date is Wk-30212 (4772 ± 30 BP).

The direct dating of the above individuals from Sector B indicates their deposition inside the cave took place around 3600-3400 cal BC. This means they are roughly contemporaneous with the Sector A depositions.

2.3. Sector C (figs. 6 and 7)

Deposition H15 in Sector C received the most complete description by the authors of the excavation,

also including a photo. Given its importance to the study of Lugar do Canto, this description deserves to be fully cited: “In the northern area of ‘Sector C’ [...] there was the most complete, and “apparently the oldest”, mortuary deposition in the site [...], lying down, flexed and turned on the deceased’s left side; only the skull was missing. The associated items consisted of a bone perforator, a bone dagger, three microliths (two with a notch on the shortest side), a burin made with the microburin technique, 64 beads of *Dentalium* shell and two intact bracelets of *Glycymeris glycymeris*” (Leitão *et al.* 1987: 42, our emphasis; Portuguese original). Some of these items are illustrated in Fig. 6 and 7.

Owing to its importance as acknowledged by the excavators, this deposition was the first to be radiocarbon dated at the site (Cardoso 2002; Cardoso and Carvalho 2008), providing the following result: 5120 ± 80 BP (Sac-1715), which is calibrated to 4068-3707 cal BC at 93.4% probability.



Figure 6. Photo of Deposition H15 in Sector C (after Leitão *et al.* 1987: fig. 7).

In the context of the Bom Santo radiocarbon dating project, a further sample from this deposition was dated but revealed a rather distinct result: 4819 ± 32 BP (Wk-30210), corresponding to 3658-3524 cal BC (95.4% probability).

As observed, Sac-1715 stood out because of its older result, not only if compared with Wk-30210 but also when compared to radiocarbon determinations from the other sectors of the cave. Thus, a third radiocarbon date of a bone sample from Deposition H15 became necessary to correctly evaluate this discrepancy, which gave a result of 5000 ± 60 BP (Sac-2710), calibrated to 3948-3662 cal BC (95.4% probability).

This third result turned out to be consistent with the first. The observed discrepancy is thus probably due to

tagging problems that prevented the correct attribution of the human remains to individual depositions, in spite the good quality of the field record made by the excavators. In any case, it is evident –namely through its plotting in Fig. 8– that determinations Sac-1715 and Sac-2710 are consistent among themselves and they both cover the first quarter of the 4th millennium BC; Wk-30210 must therefore refer to another, later individual. That Deposition H15 is indeed older than the others and is not affected by a hypothetical marine component in the individual's diet is confirmed by similar $\delta^{13}\text{C}$ values of both determinations – -20.32‰ (Sac-1715) and -20.14‰ (Sac-2710)^{3/4} indicating a diet based mostly in terrestrial food sources. Although $\delta^{15}\text{N}$ determinations would be necessary to effectively assert this

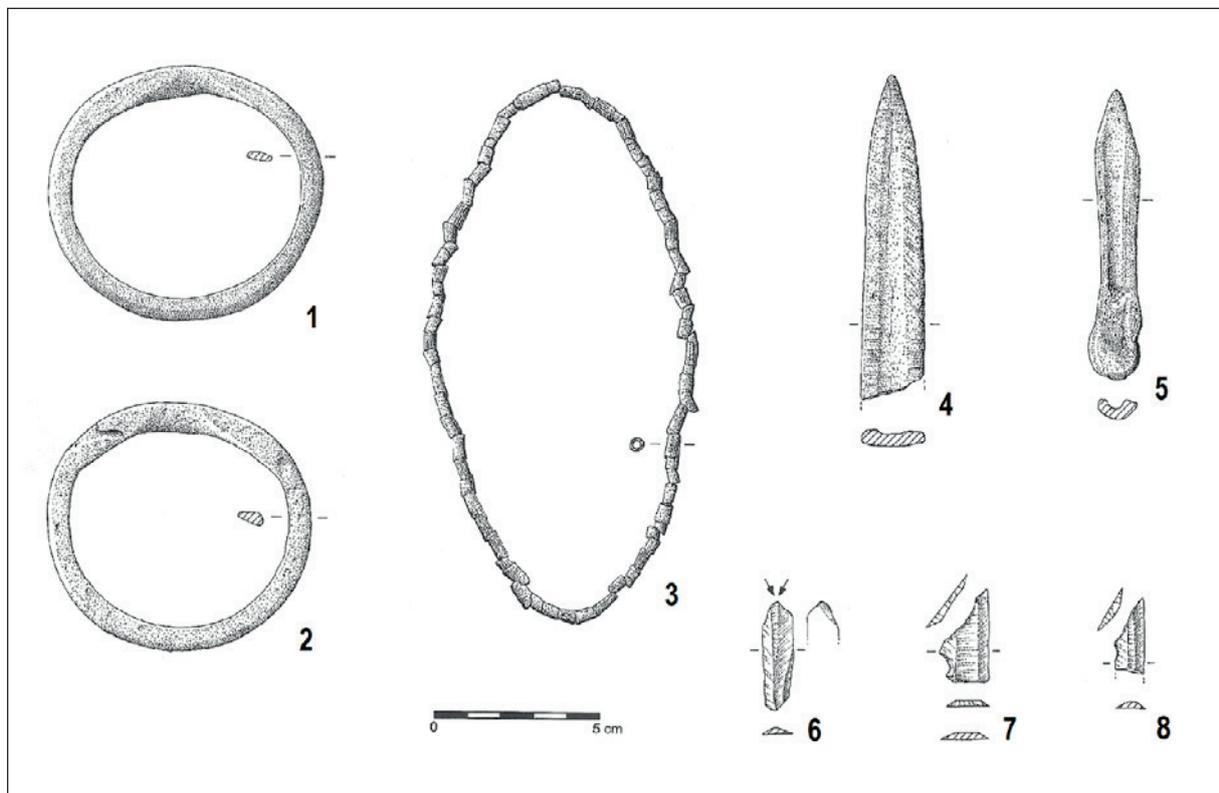


Figure 7. Associated grave goods. Captions: 1. and 2. bracelets made of dog cockle (*Glycymeris glycymeris*) shells; 3. necklace made of tubular beads of *Dentalium* sp.; 4. bone perforator; 5. bone dagger; 6. microburin; 7. and 8. geometric trapeziums.

conclusion, the fact that Wk-30210 revealed a slightly different $\delta^{13}\text{C}$ value (-19.80‰) points definitively to the conclusion that we are dealing with the remains of different individuals.

2.4. Synthesis

We were able to corroborate the conclusion put forward by Leitão *et al.* (1987) according to whom Deposition H15 is in fact the oldest at the site (fig. 8). If this is confirmed by further radiocarbon determinations, we may have detected the “founder” of the necropolis, which is dated to around 4000-3700 cal BC. A second phase of occupation, encompassing the 3700-3400 cal BC time interval, is represented by all other directly dated individuals. Unfortunately the observations (stratigraphic? topographic? artefactual?) upon which the claim that Deposition H15 was the oldest at the site were not provided by the authors of the excavation. Furthermore, there are no significant differences in funerary practices and grave goods between

the “founder” and subsequent depositions, which suggests a strong cultural continuity between both phases. In sum, after a first moment of cave use for an individual deposition (thereafter “founder phase”), it was immediately converted into a collective necropolis, with individuals deposited next to each other in the same cave rooms with no evident individualizing funerary structures (thereafter “collective phase”).

3. DISCUSSION

3.1. Is there a transition from individual to collective burials in the Neolithic of Southern Portugal at c. 3800 cal BC?

When a first chronological integration of Lugar do Canto was attempted, we claimed this cave would be the archetype of the Middle Neolithic in Southern Portugal in its funerary dimension (Cardoso and Carvalho 2008). Indeed, its archaeology is similar to that of other cave sites, such as Ossos (Oosterbeek 1993), Layer C

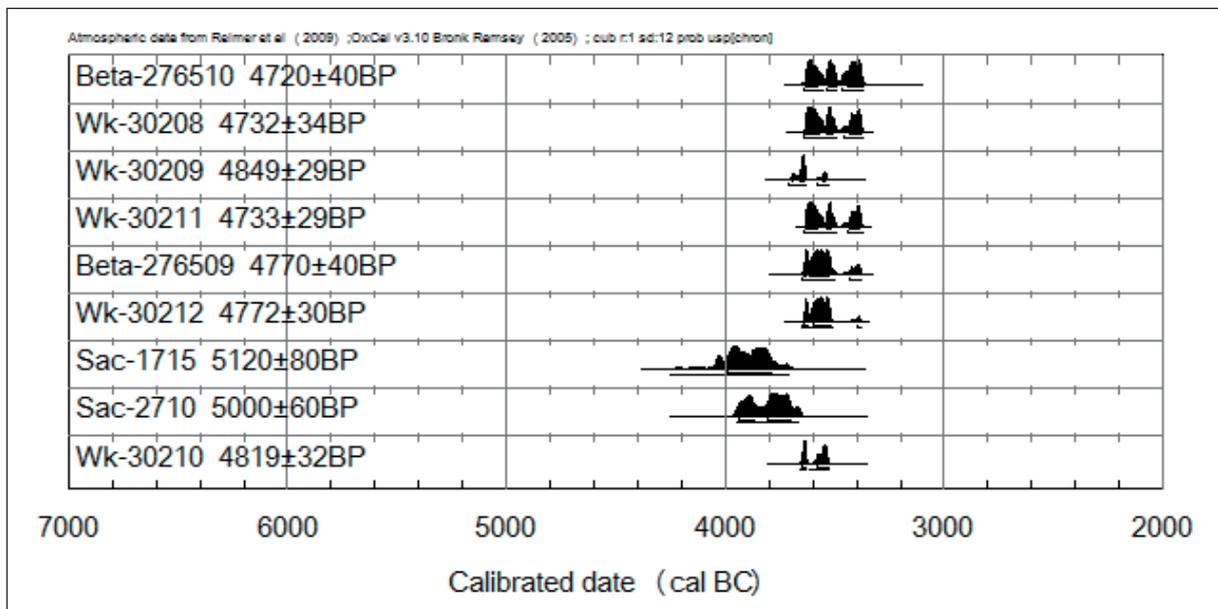


Figure 8. Radiocarbon determinations for Lugar do Canto Cave calibrated with the IntCal13 curve (Reimer *et al.* 2013) and plotted with version 4.2 of the OxCal program (Bronk-Ramsey 2009).

in Cadaval (Oosterbeek 1985), Barrão (Carvalho *et al.* 2003), Layer 3 in Feteira (Zilhão 1984) and Bom Santo (Carvalho 2014) in Estremadura; Escoural (Araújo and Lejeune 1995) in Alentejo; and Goldra (Straus *et al.* 1992) in Algarve (fig. 1).

All these caves are collective cemeteries and their radiocarbon dates point to, and thus strengthen, Boaventura's (2011: 163) model according to which typical collective, megalithic practices emerged in those regions in the 4th millennium BC, "between its second and third quarters" (a stage within megalithism the author calls the "pre idol-plaques" phase). This new form of mortuary practice took place in dolmens characterized by polygonal chambers and short passages (when present), which find their archetype in Dolmen 1 at Poço da Gateira, located in the "megalithic region" of Reguengos de Monsaraz (Leisner and Leisner 1951). Given its material culture and absolute chronology, Lugar do Canto's "collective phase" (3700-3400 cal BC) clearly corresponds to this period of megalithic building.

On the other hand, Lugar do Canto's "founder phase" (4000-3700 cal BC) raises the question of the earliest megalithic tombs. According to the perspective of some mid-20th century prehistorians, mainly M. Heleno (unpublished work; see Rocha 2009/10) and the Leisner couple (e.g. 1951; Leisner 1967), small graves built with stone slabs for individual (or double) burials (therefore, not collective) with scarce

grave goods—flint blades and trapeziums, polished stone tools, scarce pottery—constituted the earliest form of megalithism in the southern regions of Portugal, mainly on the plains of central Alentejo. Larger tombs, with passages and polygonal chambers like those described above, would be the architectural outcome of these simpler stone structures. This evolutionary framework has been adopted ever since as a viable interpretation of the available evidence by the majority of the Portuguese researchers working in the region, such as Moita (1956), Arnaud (1978), Silva and Soares (1983), Cardoso (2002, 2007), and Rocha (2009/10). In more recent years, those small, presumably earlier tombs have been included under the term "Proto-megalithism" (Silva and Soares 2000). Classic examples of these small graves would be, among others, Azinhal 3 (Leisner 1967) or Areias 10 and Falcoeiras (Leisner and Leisner 1951) in central Alentejo, or Palmeira and Buço Preto, in the funerary complex of the Monchique Mountain of the Western Algarve (Formosinho *et al.* 1953). More recently, other sites have been added to this list: Marco Branco and Pessegueiro (Silva and Soares 1983, 2000) in coastal Alentejo, Torrão 2 (Lago and Albergaria 2001) and Atafonas (Albergaria 2007) in the inner areas of Alentejo, or Couto da Espanhola 6 (Cardoso *et al.* 2003) and Eira da Vinha (Santos and Figueira 2011) north of the Tagus Valley in the Beira Baixa province.

With the exception of Marco Branco (Silva and Soares 1983) and Atafonas (Granja and Fernandes 2007), the problem is that these sites have not yielded organic materials, namely human remains, and are therefore unsuitable for radiocarbon dating. Ironically, the only small tomb dated by means of its human remains is Cabeço da Areia, located in the Montemor-o-Novo “classic” area of Proto-megalithism (fig. 1), but it revealed a mid-4th millennium date (Rocha 2009/10), suggesting either the reuse of this type of funerary architectures or continuity in their construction throughout the whole Neolithic period (see below).

Comparable cave contexts for Lugar do Canto’s “founder phase”, with well-described funerary practices and structures, are also very scant. Layer D in Cadaval (fig. 1) is perhaps the only case. Here, two individual burials were radiocarbon dated in Rooms 1 and 2 (fig. 9). Clearly, the recorded funerary structures aimed at their individualization: according to Oosterbeek (1995), in Room 1 the human remains were found in a corner of the cave contoured by limestone blocks, while in Room 2 the inhumation took place inside an enclosure of blocks covered with slabs.

Large-scale excavations at the important open-air cemetery of Castelo Belinho, in the Western Algarve (fig. 1), uncovered what is surely the best Neolithic example of the systematic practice of individual burials: it revealed 14 burial-pits –only two of them with double interments– in a circumscribed graveyard that was consistently dated to the c. 4500-3900 cal BC interval (Gomes 2010, 2012).

In sum, starting as early as the Cardial Neolithic –as indicated by the Caldeirão Cave evidence (Zilhão 1993)–, the terminal phase of systematic practices of individual interments may have taken place around 3800 cal BC, according to the available radiocarbon determinations from Lugar do Canto’s “founder phase”, Cadaval’s Layer D and Castelo Belinho. Collective practices may have emerged from that moment on.

Indeed, those sites seem to represent the last Neolithic cemeteries purposely built for individual burials. Three possible exceptions, however, deserve further comments:

— Cabeço da Areia. This tomb (a closed, rectangular chamber with no passage) was excavated in the 1930’s and revealed the remains of two individuals: one adult and one child of indeterminate sexes (Rocha and Duarte 2009). From the architectonic view point, it should therefore be integrated with the Proto-megalithic tombs presumably dated to the 5th millennium; however, as mentioned above, its

“late” radiocarbon chronology (Beta-196091: 4650 ± 40 BP; 3621-3356 cal BC) indicates either reuse events or a real late chronology for the building of such types of tombs. Little can be done to resolve this issue with the available evidence.

— Bugio Cave. This cave site was excavated in the late 1960s by Monteiro *et al.* (1971). Questions of chronostratigraphic and cultural interpretation have been raised by several authors on the basis of contradictions between radiocarbon results and material culture evidence. This is the case of date GrN-5628 for charcoal from a supposed Bell Beaker grave but pointing to the mid-4th millennium (4850 ± 45 BP; 3713-3523 cal BC). According to the material culture, three main phases of funerary occupation are recognizable (Cardoso *et al.* 1992): Late Neolithic, Early Chalcolithic and Bell Beaker. A radiocarbon date on a sample of a bone hairpin typologically attributed to the former period was also obtained (OxA-5507: 4420 BP ± 110; 3496-2872 cal BC), thus in good accord with a Late Neolithic occupation (Cardoso and Soares 1995). An important aspect of this burial-cave is the putative identification of 12 individual interments in the bottom layer, thus presumably Late Neolithic in age. Although other references to supposed Late Neolithic and Chalcolithic individual interments in caves exist in the older literature –this is the case of Alqueves (Rocha 1900), Galinha (Sá 1959) and Ponte da Laje (Cardoso 2010/11) caves, all located in the Estremadura region–, this is to our knowledge the most explicitly recorded case. However, such an understanding of the Bugio interments is not exempt from chronological and definitional problems. Indeed, very long lists of grave goods presumably associated with each grave include Bell Beaker sherds in Graves 1, 4 and 5, Chalcolithic limestone votive objects in Graves 1, 2, 5 and 6, or a copper tool in Grave 9, which overall constitute pieces of evidence that strongly suggest a much more complex stratigraphic and cultural scenario. Moreover, a recently-found plan of the excavation by one of the authors (O. da Veiga Ferreira; see reproduction in Cardoso 2008: fig. 87) indicates the presence of simple interments in shallow graves (with the exception of Grave 9) rather than in individualized stone structures (aligned vertical stone slabs) for formal depositions of the dead, as previously thought (Monteiro *et al.* 1971; Cardoso *et al.* 1992). In sum, Bugio can only be considered a collective necropolis.

— Mina das Azenhas 6. In this cemetery was found a single interment, of an adult of indeterminate sex, in a burial-pit. Despite the fact that there was not a single grave good—a limitation preventing any cultural relatedness—, its direct dating (Beta-318380: 4590 ± 30 BP; 3499-3126 cal BC) indicates the second half of the fourth millennium (Tomé *et al.*, 2013), a time period when large ditched enclosures and highly complex associated burial contexts (vaulted chambered tombs, pits, ditches) and practices (primary and secondary depositions, ossuaries, and post-burial manipulation of skeletal remains) are documented in the Alentejo region (e.g., Valera 2012; Valera *et al.* 2014). However, Mina das Azenhas 6 has been excavated only in a small portion of its presumed total area. The lesson we draw from the present-day evidence of this kind of site is that other funerary structures and behaviours related with this particular pit may still await discovery. Thus, its interpretation *per se* is clearly insufficient for an interpretation of Mina das Azenhas 6 as a strong case for individualized burials in the second half of the 4th millennium BC.

3.2. Rate and duration of funerary occupations in caves

The distribution of radiocarbon dates from burial caves with larger numbers of determinations (fig. 9) allows some conclusions to be drawn which overall seem to testify a double phenomenon: sites with a single, continuous occupation encompassing a few hundred years, and sites with several occupations separated by very clear hiatuses. This pattern seems to reveal the existence of specific dynamics or strategies of cave use from the 5th millennium onwards.

The first situation is particularly clear at Escoural (Araújo and Lejeune 1995) and Bom Santo (Carvalho 2014), an inference that is also corroborated by their highly homogeneous material cultures. At Bom Santo in particular, it was observed during the excavation that it may have been deliberately closed with a huge limestone boulder (Duarte 1998), a behaviour that echoes the so-called “condemnation structures” also recorded in many megalithic tombs of Portugal. Just to mention two Middle Neolithic hypogea located in the Algarve and Alentejo regions, respectively (fig. 1), this may also be the case of the earth mound covering the single entrance at Barrada (Barradas *et al.* 2013) or the large amphibolite slab that was used to block the

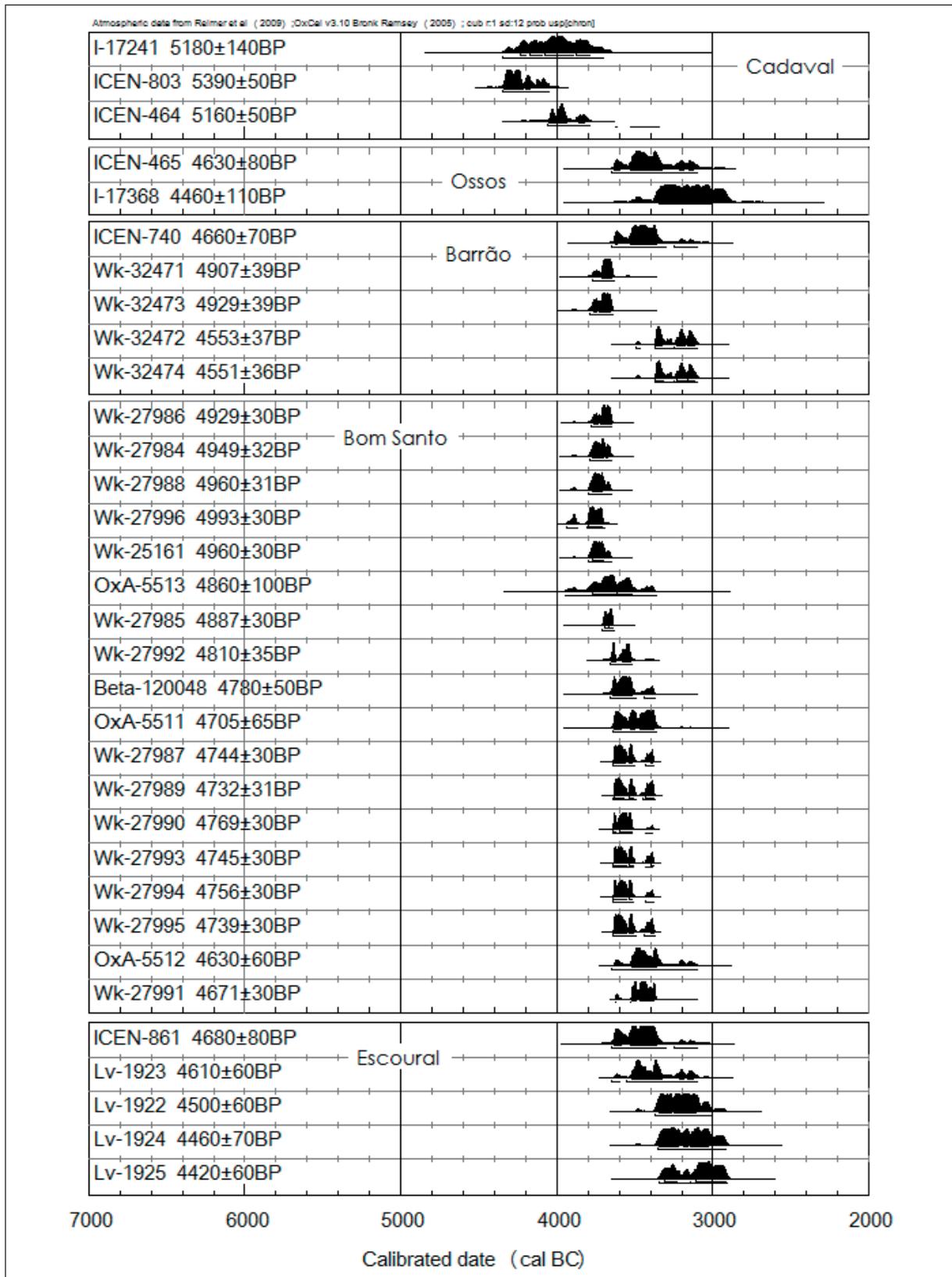
entrance of Sepulchre 1 at Sobreira de Cima, and later covered with clayish sediments during which process amphibolite ingots were also ritually deposited (Valera 2013). This is surely the reason why subsequent occupations are not recorded in any of these cemeteries. Coincidentally, radiocarbon results indicate around four centuries of continuous use, both in the case of the mentioned natural caves and the Sobreira de Cima hypogeum.

A different situation is recorded in Casa da Moura, Poço Velho and Porto Covo caves (figs. 1 and 9).

According to its radiocarbon determinations—which are, with one exception only (see below), all on human remains— at Casa da Moura (Carvalho and Cardoso 2010/11) there are apparently four periods of occupation. Its oldest Holocene occupation is dated to the evolved Early Neolithic (5000-4800 cal BC); a second phase is evident in a batch of eight determinations distributed without discontinuities in the 4000-3400 cal BC time span (i.e., Middle Neolithic), thus separated from the previous by almost the entire 5th millennium; its third occupation is clearly attributed to the Late Neolithic by its material culture items and supported by OxA-5506 date on a bone hairpin; and, finally, a set of three radiocarbon dates coherently point to a Chalcolithic occupation in the 2800-2600 cal BC interval. These dates and corresponding material cultures—which are thoroughly discussed elsewhere (Carreira and Cardoso 2001/02; Carvalho and Cardoso 2010/11)— clearly indicate successive reoccupation events of funerary nature after more or less long periods of abandonment.

Poço Velho and Porto Covo caves (Gonçalves 2008, 2009) present a similar pattern in which two occupations are separated by a hiatus of 200 and 300 years, respectively. Indeed, the 12 dates available for the former cave reveal a first occupation of c. 300 years duration (3400-3100 cal BC) corresponding to the Late Neolithic and a second of about 500 years during the Chalcolithic (2900-2400 cal BC). The latter site was first occupied during c. 300 years (3700-3400 cal BC) in the Middle Neolithic (determination Beta-244818 is inconclusive given its large calibration interval) while its second occupation is represented by determination Beta-245135, which covers approximately the first half of the 3rd millennium (2880-2490 cal BC).

Both types of cave use—single occupations or successive occupations separated by hiatuses— constitute a repeated behaviour observed in the architectures and use strategies of megalithic tombs, thus indicating similar patterns and dynamics of cemetery use.



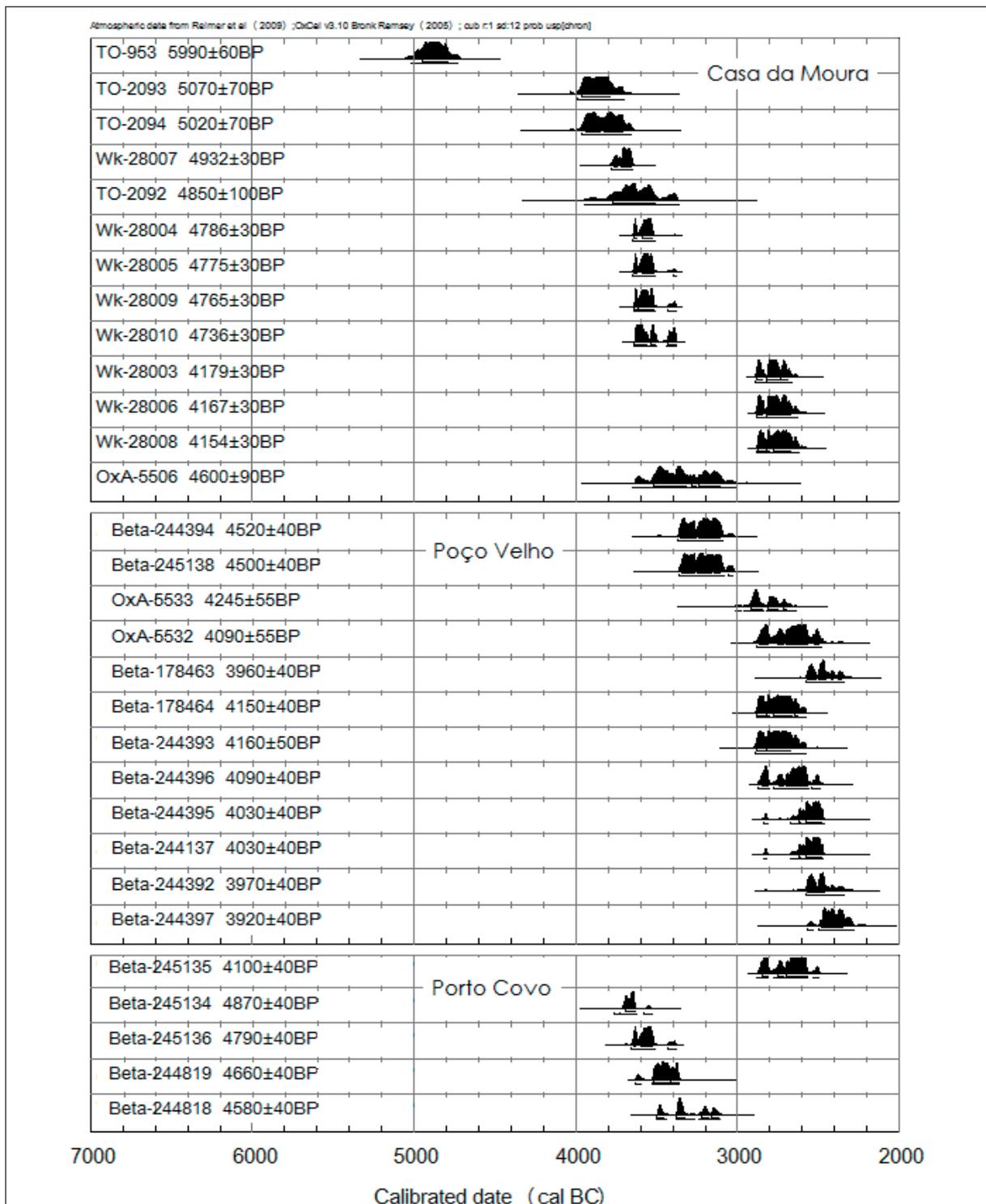


Figure 9. Radiocarbon determinations of comparable burial-caves calibrated with the IntCal13 curve (Reimer *et al.* 2013) and plotted with version 4.2 of the Oxcal program (Bronk-Ramsey 2009). All determinations on human bone samples, with the exception of Beta-244390 from Casa da Moura, which is on a sample of a bone hairpin.

4. CONCLUSIONS

This paper has discussed new radiocarbon evidence that is inherently indicative of cave use behaviours from the Middle Neolithic onwards in Southern Portugal which turn out to be correlative on all accounts with the strategies underlying the building, first use and reuse episodes of megalithic and other funerary monuments.

In light of the evidence from Lugar do Canto and other cave cemeteries in Southern Portugal we preliminarily propose 3800 cal BC as the likely turning point from individualized to collective burial practices in this part of the country. From this moment on, a dramatic variability regarding funerary architectures and spaces emerges and develops throughout the rest of the 4th and most of the 3rd millennia BC. All the evidence points to the fact that hypogea, various types of dolmens, alongside natural caves and “proto-megalithic” tombs –and vaulted chamber tombs from the 3rd millennium onwards– seem to coexist.

The same pattern of variability seems to be true also in the southern strip of the Beira Baixa province, where another type of megalithic monument –“horse-shoe”-like chambered tombs for single or double inhumations– were still being built in the later phase of the Neolithic (and even during the Chalcolithic) alongside large, architectonically more complex passage graves (Cardoso *et al.* 2003). Such facts indicate not a unilinear evolution from simple to complex but instead long periods of coexistence of different types of graves and, probably, of funerary practices. Until a larger dataset of direct radiocarbon dates from human remains exhumed from “proto-megalithic” tombs is obtained little else can be said about their real chronologies and role in the emergence of megalithism.

This phenomenon takes place alongside varying rates and durations of site use and periods of abandonment, as evidenced both in caves (as discussed in this paper) and megalithic constructions. Such behaviour may be inherent in the organization and internal dynamics of Neolithic and Chalcolithic societies, which have been more or less consensually understood –although not always explicitly defined– by Portuguese prehistorians as having kinship as their main social organizing feature, e.g., framed under the notion of “segmentary societies”. Some authors (e.g., Soares and Silva 2010) even consider that Chalcolithic societies are still segmentary in their structuring principles and dynamics, despite their acknowledged higher levels of social complexity.

In the theoretical framework of “segmentary societies” (e.g., Renfrew [1974]; but see, among others,

Feinman and Neitzel [1984], Hayden [1995] and Arnold [1996] for criticisms), aspects such as economic intensification and development of mechanisms of social differentiation –for example, through the rise of individuals within kinship groups or of lineages within larger communities– in conjunction with increasing pressure over resources and territories may have lead each segment or lineage to take explicit possession over the landscape and to negotiate with neighbouring groups the frontiers of their economic and social territories. Demographic growth throughout most of the Neolithic-Chalcolithic time span (visible, among other aspects, in the increasing size and number of cemeteries and buried individuals and in the appearance of large aggregation sites) may have also played a decisive role in this scenario.

Anthropological theory also concurs to the notion that among segmentary societies frontiers change over time, and that the abandonment or the reshaping of territories –whether negotiated or determined by external human or environmental factors– can also take place. We suggest this may be the theoretical context within which explanations on why caves (and built cemeteries) were used, deliberately closed or abandoned, or eventually reused after more or less long hiatuses, can be formulated. Occupation hiatuses observed at the sites discussed above –with consequences also on the way territories were occupied and exploited– may thus be the reflex of these rather complex social and cultural features of later Neolithic communities.

However, the mentioned funerary dynamics of cave use observed in the available radiocarbon evidence urges for further support, both theoretical (i.e., detailed anthropological modelling of Neolithic and Chalcolithic societies in Southern Portugal) and empirical. Indeed, sounder evidence is needed to evaluate the mobility patterns of these megalithic builders, namely through systematic use of palaeo-isotopic analyses of human remains. Interpretations that only a small percentage (9%, or 5 out of 55 analysed individuals) in Late Neolithic and Chalcolithic funerary sites from the Torres Vedras region in the Estremadura province are “non-locals” (Waterman *et al.*, 2014) contrasts with results from the neighbouring Middle Neolithic burial cave of Bom Santo, where four fifths of the individuals (79%, or 11 out of 14) were classed as “non-locals” (Price 2014). This discrepancy clearly requires further similar projects to test and explain on more solid ground the hypothesis of an abrupt decrease in human mobility from the mid– to the late 4th millennium BC in Southern Portugal.

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