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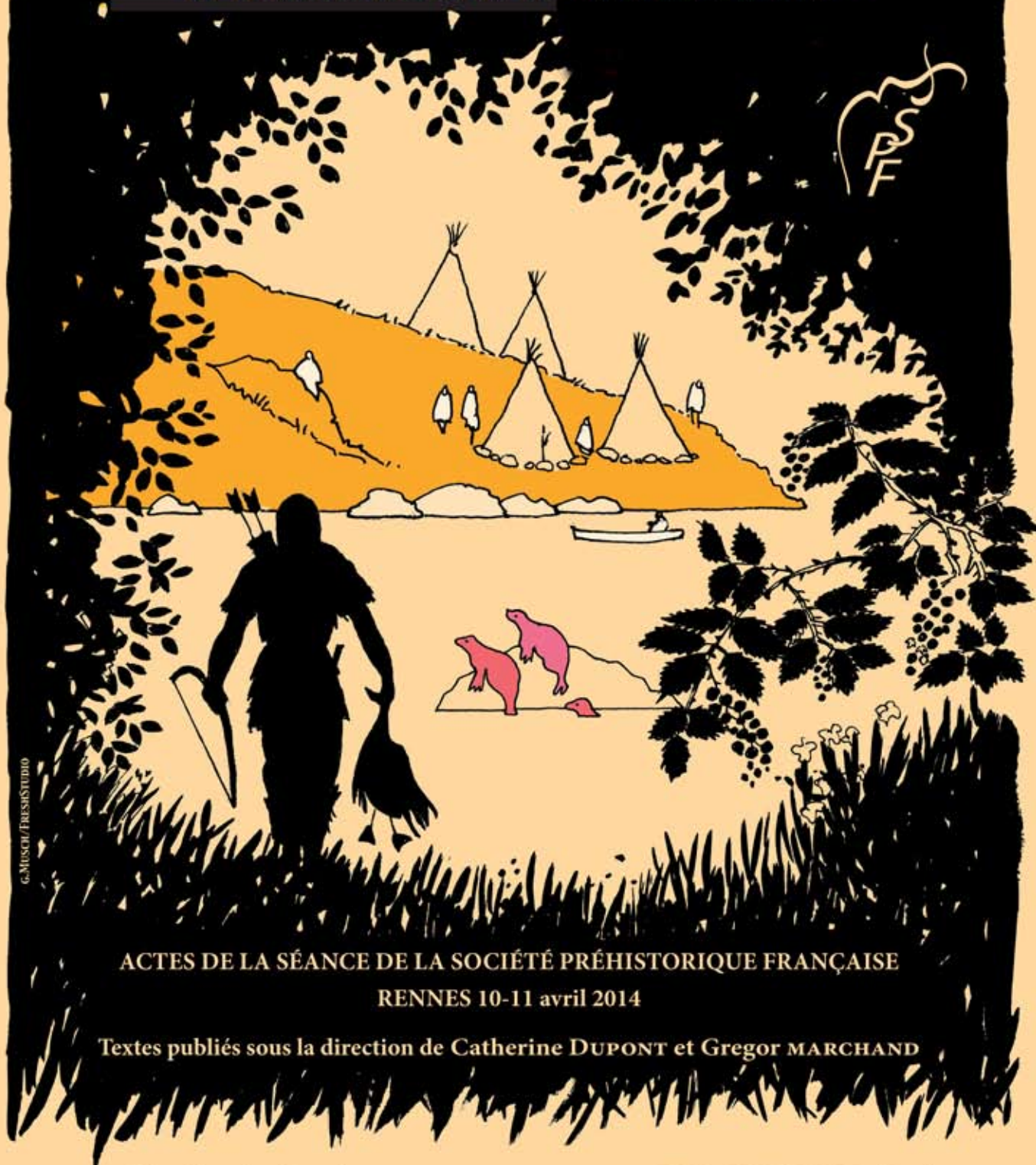
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ARCHÉOLOGIE DES CHASSEURS-CUEILLEURS MARITIMES

DE LA FONCTION DES HABITATS
À L'ORGANISATION DE L'ESPACE LITTORAL

ARCHAEOLOGY OF MARITIME HUNTER-GATHERERS

FROM SETTLEMENT FUNCTION
TO THE ORGANIZATION OF THE COASTAL ZONE



ACTES DE LA SÉANCE DE LA SOCIÉTÉ PRÉHISTORIQUE FRANÇAISE

RENNES 10-11 avril 2014

Textes publiés sous la direction de Catherine DUPONT et Gregor MARCHAND

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6

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Cette manifestation scientifique internationale n'aurait pas pu se dérouler sans le soutien logistique de l'UMR 6566 « CReAAH ». Plusieurs de nos collègues du laboratoire Archéosciences (université Rennes 1) ont assuré à la fois l'accueil et le déroulement des pauses de cette séance, avec leur efficacité et leur bonhomie légendaire : Francis Bertin, Annie Delahaie, Catherine Louazel, Catherine Gorlini et Laurent Quesnel. Nous remercions également Diana Nukushina et Helena Reis pour leur aide au bon déroulement des séances. Nous sommes gré à Franck Wellmann de l'université Rennes 1 qui nous a apporté le support informatique et multimédia de la salle de conférence. Nous remercions Louise Byrne pour la correction et la révision des textes en anglais.

L'organisation de cet événement a également été soutenue financièrement par de nombreux organismes publics et des projets de recherche : le projet européen « Arch-Manche » (Interreg IVA 2 Mers, fonds FEDER), le projet « SeaMeso » de la Maison des sciences de l'homme en Bretagne, le CNRS (DR 17), l'Observatoire des sciences de l'Univers de Rennes (OSUR), le ministère de la Culture (service régional de l'Archéologie de Bretagne) et la région Bretagne. L'université Rennes 1 a permis l'utilisation de l'amphithéâtre Donzelot. Enfin, nous tenons à remercier la Société préhistorique française d'avoir accepté de labelliser cet événement « Séance de la Société préhistorique française ».

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De la fonction des habitats à l'organisation de l'espace littoral
Archaeology of maritime hunter-gatherers.
From settlement function to the organization of the coastal zone*
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Continuity or Discontinuity?

The Exploitation of Aquatic Resources in the Portuguese Estremadura during the Atlantic Period: the São Julião and Magoito Shell Middens as Case Studies

Ana Catarina SOUSA and Antonio M. MONGE SOARES

Abstract: The shell middens of São Julião and Magoito, located on the Atlantic coast of the Lisbon peninsula, are the only sites of the Portuguese Estremadura that feature occupations from the Atlantic period. These sites present occupations of the Early Mesolithic and successive reoccupations in the Late Mesolithic (S. Julião), the Early and Middle Neolithic (S. Julião, Magoito), Late Neolithic (Magoito), Chalcolithic (S. Julião), and Bronze Age (Magoito). There is a great continuity in site structure throughout these periods, which is very specialized for the specific and episodic exploitation of aquatic resources. The reoccupations are found in distinct loci, showing a horizontal stratigraphy. Continuities and/or discontinuities of settlement during the Boreal/Atlantic transition period in Central and Southern Portugal are matter of debate. The gap recorded in Estremadura, during the Atlantic period, is analyzed by taking into account the taphonomy, the state of research, the environment and an economic and social model. This paper attempts a review of the known data, but also presents new results for São Julião.

Keywords: Atlantic period, shell midden, Portugal, Mesolithic, Neolithic.

Résumé : Les amas de coquillages de São Julião et Magoito, sur la côte atlantique de la péninsule de Lisbonne (Portugal), sont les seuls sites de l'Estremadura portugaise comportant des occupations de la période Atlantique. Ces sites ont été occupés au Mésolithique ancien et réoccupés successivement au cours de la phase finale du Mésolithique (S. Julião), puis au Néolithique ancien et moyen (S. Julião, Magoito), au Néolithique récent (Magoito), au Chalcolithique (S. Julião) et à l'âge du Bronze (Magoito). Il y existe une grande homogénéité des structures du site tout au long de ces périodes, avec une spécialisation dans l'exploitation spécifique et épisodique des ressources aquatiques. Les réoccupations ont eu lieu dans des zones distinctes de l'habitat, formant une « stratigraphie horizontale ». Les continuités et discontinuités des occupations à la transition entre le Boréal et l'Atlantique dans le Portugal central et méridional font l'objet de débats très actuels. L'absence de données dans l'Estremadura portugaise au cours de l'Atlantique est une des conclusions développées dans cet article qui tient compte des données taphonomiques, de l'état de la recherche, de l'environnement et du modèle économique et social adopté. Cet article procède d'un examen des données déjà connues, mais présente aussi de nouveaux résultats en ce qui concerne São Julião.

Mots-clés : Atlantique, amas coquillier, Portugal, Mésolithique, Néolithique.

SÃO JULIÃO AND MAGOITO: TWO CASE STUDIES ON THE COASTAL PLATFORM NORTH OF SINTRA

THE PRESENT study focuses on the Lower Portuguese Estremadura, a long and narrow peninsula, delimited by the River Tagus to the east and by the Atlantic Ocean to the west.

The São Julião and Magoito shell midden sites are located at the south-western edge of this peninsula, lying only 8 km apart from each other in the same landscape unit: the platform coastline north of Serra de Sintra (fig. 1). This is an area of eroded limestone and sandstone plains, which is crossed by small rivers that flow into the Atlantic Ocean. São Julião and Magoito have a similar location: the estuarine part of a small river, among generations of consolidated dunes, in an area that has undergone changes of the

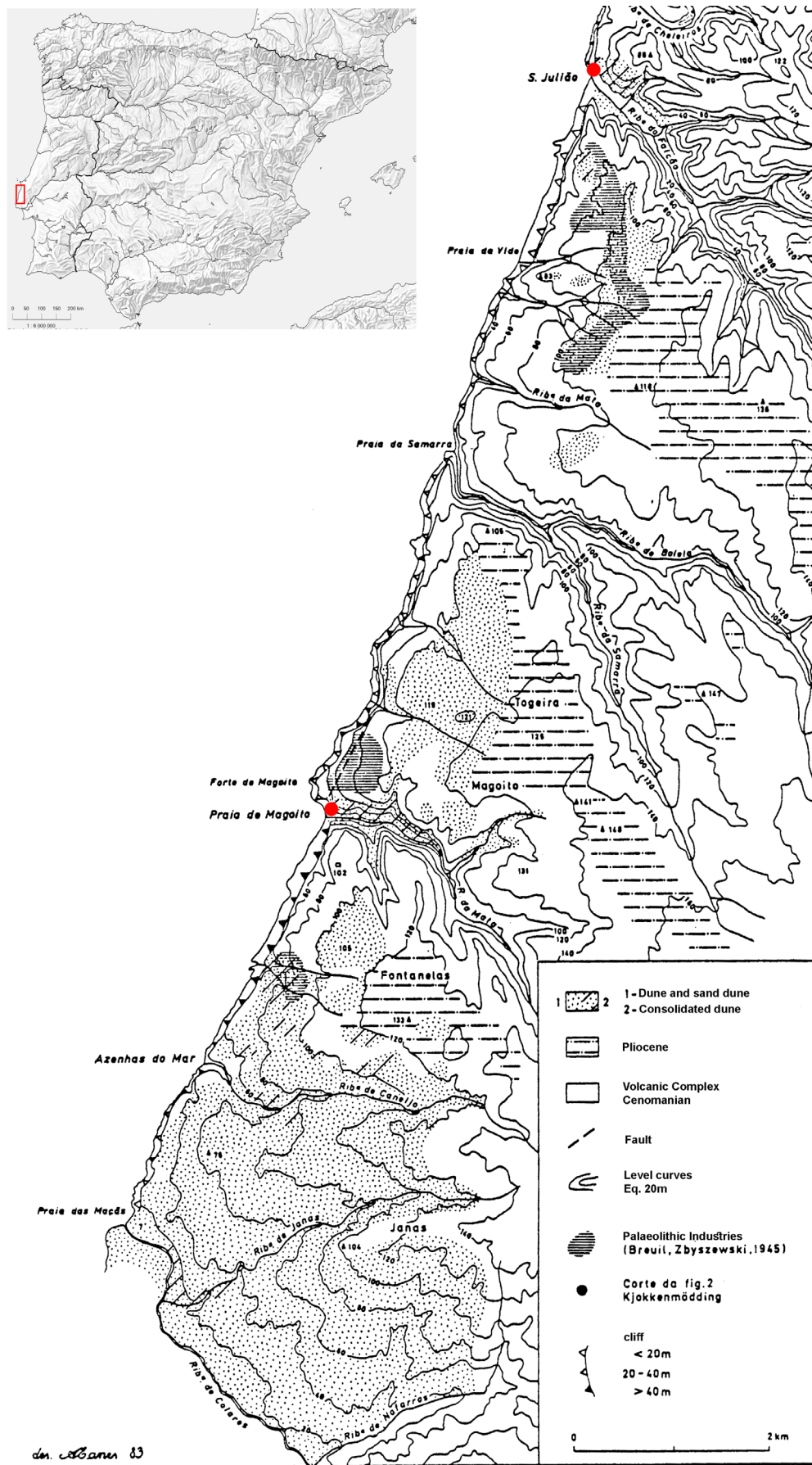


Fig. 1 – The Magoito and São Julião sites in the regional environment (Pereira, 1983, adapted) and in the Iberian Peninsula.
 Fig. 1 – Les sites de Magoito et São Julião dans l'environnement régional (Pereira, 1983, modifié) et dans la péninsule Ibérique.

coastline during the Holocene. At present, these sites are located on beaches, with strong threats of erosion and construction due to tourism activities in the region

THE SÃO JULIÃO SITE

The São Julião shell middens are located in the municipality of Mafra, Lisbon district, at the mouth of the Falcão River, a small stream that flows into the Atlantic Ocean.

On the northern slope of the Falcão River, the valley bottom lies filled by two generations of dune, an aeolianite deposit that formed during the last interstadial of OIS 3 (c. 32,000 BP) and a mobile dune (Soares et al., 2012). The occasional erosion of the most recent mobile dune allows the identification of a discontinuous level of about 200 m of shell middens along the northern border (fig. 2).

History of investigations

The identification of the São Julião shell middens goes back to 1985, as a result of a geomorphologic study carried out by A. Ramos Pereira and E. Borges Correia (Pereira and Correia, 1985).

The archaeological research has been undertaken in two phases by different teams in different loci of the site. In 1986, 1987 and 1988 J. Morais Arnaud carried out excavations in two loci: São Julião A and São Julião B (Arnaud, 1987 and 1993; Arnaud and Pereira, 1994). The second phase of the research began under the direction of one of the authors (A. C. S.) together with M. Miranda. Between 1999 and 2001, the field work (rescue excavation) focused on the western locus, denominated São Julião C, already published in several articles and a monograph (Sousa, 2004; Miranda, 2004; Queiroz and Leeuwaarden, 2004; Soares and Sousa, 2004). More recently, in 2007, preventive archaeological work was carried out in a new locus, São Julião D, located between São Julião C and São Julião B. In 2014, the action of the winter tides exposed more archaeological contexts, leading to a small excavation in the western part of São Julião C.

The loci

São Julião A

This locus presents a possible area of about 100 m². It is located about 300 m from the coastline (Arnaud,



Fig. 2 – The loci of São Julião shell midden.

Fig. 2 – Les loci de l'amas coquiller de São Julião.

1987), presenting a conchiferous compact layer with a maximum thickness of 1 m (Arnaud and Pereira, 1994, p. 62).

According to J. Morais Arnaud, a variety of shellfish species were recorded in this locus, which, however, was dominated by the common cockle (*Cerastoderma edule*) and the European flat oyster (*Ostrea edulis*). Also according to the same author, the (unpublished) lithic industry is archaic (residual flakes of flint or quartzite, prismatic core for bladelets, bladelets; Arnaud, 1994).

The radiocarbon dating of several samples (charcoal or shells) indicates a chronology of the 7th millennium BC (table 1).

São Julião B

This locus is located in the most rearward position in relation to the shoreline, currently within a fenced area. Here, a thin occupation layer (0.3 m thickness), with several fireplaces, was identified on the top surface of the aeolianite deposit (Arnaud and Pereira, 1994, p. 63).

The fauna presents a scarce variety of exploited ecosystems, indicating an estuarine exploitation (Arnaud and Pereira, 1994, p. 63).

Radiocarbon dates indicate a chronology between the second half of the 8th and the first half of the 7th millennium BC (table 2), so far the oldest occupation at São Julião.

São Julião C

São Julião C is located in the western part of the site, in the beach area, and is under serious threat due to tides and erosion. The area under study was greatly affected by the construction of a modern building. At São Julião this is the locus with the largest excavated area, 108 m² in total (1999, 2001 and 2014).

The shell midden of São Julião C (fig. 3) has a reduced thickness (about 0,25 m) developing in a marked slope, presenting nine fireplaces: five structured fireplaces built with local raw materials in an irregularly sub-circular feature and four unstructured fireplaces, with scarce amount of shells.

The few lithics collected during the archaeological excavation (only fifty-two artifacts) point to the presence of two types of debitage: lamellar and flakes. Flint is the dominant raw material (59.6%). Few tools were identified: bladelets (four pieces), retouched flakes (one piece) and one long symmetrical trapeze arrowhead, the most significant artifact of the small assemblage.

The malacological fauna is composed of a few dominant species (Miranda, 2004): cockles (*Cerastoderma edule*), mussels (*Mytilus* sp.), limpets (*Patella* sp.) and oysters (*Ostrea* sp.). Other species appear to be less frequent: the netted dog whelk (*Nassarius reticulatus*), the barnacle (*Balanus perforatus*), the thick topshell (*Monodonta lineata*), the common periwinkle (*Littorina littorea*), the red-mouthed rock shell (*Stramonita haemastoma*) and the cross-cut carpet shell (*Venerupis*

Laboratory ref.	Sample ref.	Sample type	$\delta^{13}\text{C}$ (‰)	Radiocarbon date* (BP)	Calibrated date** 2σ (cal BC)
ICEN-78	S.Julião A F1	Charcoal	- 24.72	7810 ± 90	7030–6470
ICEN-151	S.Julião A Q2 F1b C	<i>Cerastoderma edule</i>	- 0.65	7940 ± 140***	
ICEN-83	S.Julião A F1 C1	<i>Cerastoderma edule</i>	- 1.33	9090 ± 60***	
ICEN-84	S.Julião A F1 C2	“	- 0.33	9060 ± 50***	
ICEN-73	S.Julião A E1,1	Charcoal	- 23.42	7610 ± 80	6630–6260
ICEN-77	S.Julião A E1,2	Charcoal	- 24.12	7580 ± 70	6590–6260
ICEN-106	S.Julião A E1 C1	<i>Cerastoderma edule</i>	- 2.51	8060 ± 50	
ICEN-107	S.Julião A E1 C2	“	- 1.23	8130 ± 50	6650–6430

* The intermediate fraction date of a marine sample (we use the initial letter of the Latin species name plus number 1 or 2 in the Sample Reference for the intermediate and inner fraction, respectively) is merely an index of reliability for the inner fraction date.

** According to the calibration curves IntCal13 (samples of the terrestrial biosphere) and Marine13 (samples of marine biosphere) of Reimer et al. (2013), and using CALIB rev 7.0 (Stuiver and Reimer, 1993) program. A ΔR value of 95 ± 15 years ¹⁴C was used for the calibration of marine sample dates (Soares and Dias, 2006).

*** Outlier.

Table 1 – São Julião A, radiocarbon dates.

Tabl. 1 – São Julião A, datations ¹⁴C.

Laboratory ref.	Sample ref.	Sample type	$\delta^{13}\text{C}$ (‰)	Radiocarbon date* (BP)	Calibrated date** 2σ (cal BC)
ICEN-179	S.Julião B Q5 A1	Charcoal	- 24.74	8120 \pm 100	7450–6710
ICEN-108	S.Julião B Q5 A1 C1	<i>Cerastoderma edule</i>	+ 0.38	8400 \pm 50	
ICEN-109	S.Julião B Q5 A1 C2	“	+ 5.70	8550 \pm 70	7340–6920
ICEN-152	S.Julião B Q2 A2 C1	<i>Cerastoderma edule</i>	- 0.18	8430 \pm 60	
ICEN-153	S.Julião B Q2 A2 C2	“	- 1.75	8340 \pm 45	7000–6660
ICEN-154	S.Julião B Q2 A2 O	<i>Ostrea</i> sp.	- 1.53	7390 \pm 90***	

* See table 1.

** See table 1.

*** See table 1.

Table 2 – São Julião B, radiocarbon dates.

Tabl. 2 – São Julião B, datations ^{14}C .

decusata). The marine shell assemblages collected close to the fireplaces have several differences between them, namely those related to the proportions of the different species.

In environmental terms, the anthracologic data seem to indicate the beginning of the Atlantic, with little expression of pine (*Pinus sylvestris*) and the presence of a Mediterranean type vegetation (Queiroz and Leeuwaarden, 2004).

The radiocarbon dates (table 3) indicate a more recent chronology than those of loci A and B. Hearths A, B, and C (fig. 4) are dated to the transition from the 7th to the 6th millennium, whereas hearth G (fig. 5) is dated to the second quarter of the 6th millennium BC. This chronology clearly suggests a Mesolithic age for this occupation.

However, it should be noted that the dates from São Julião C are less reliable than those determined for the other two loci mentioned before. We believe that the

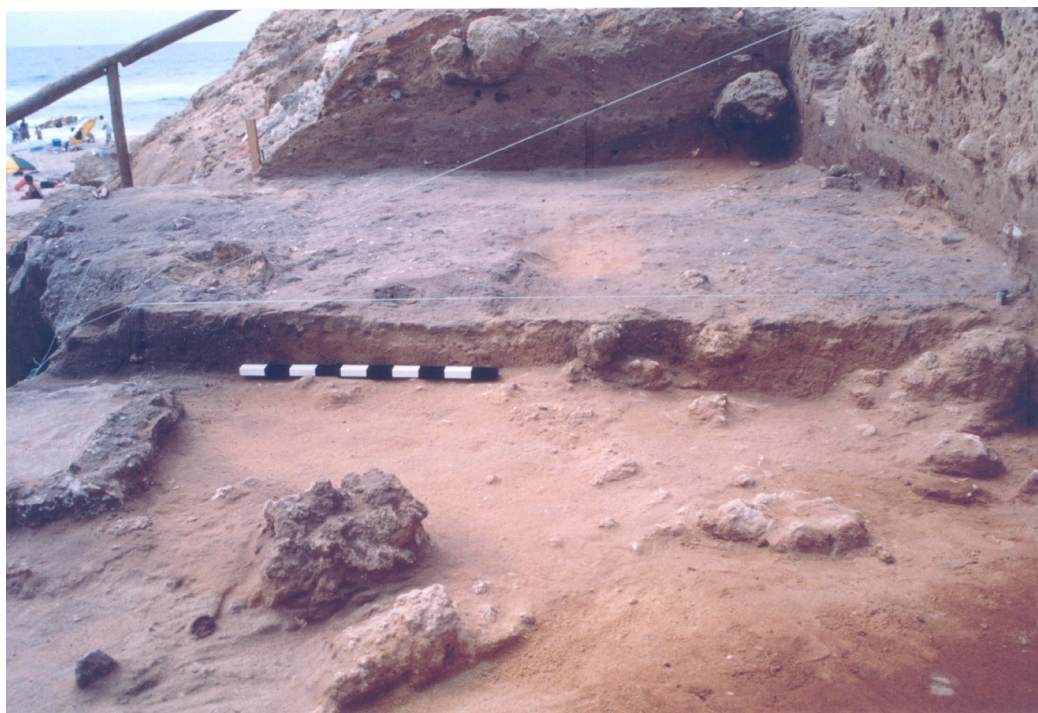


Fig. 3 – The conchiferous level of São Julião C.

Fig. 3 – Le niveau coquillier de São Julião C.

Laboratory ref.	Sample ref.	Sample type	$\delta^{13}\text{C}$ (‰)	Radiocarbon date* (BP)	Calibrated date** 2σ (cal BC)
Sac-1720	S. Julião C QC6 2A M	Mytilus sp.	- 0.73	5700 ± 60***	
Sac-1795	S. Julião C QB6 2A C1	<i>Cerastoderma edule</i>	- 0.57	6820 ± 60	
Sac-1796	S. Julião C QB6 2A C2	“	- 0.57	7520 ± 70	6080–5770
Sac-1721	S. Julião C QC7/C8 2B C	<i>Cerastoderma edule</i>	- 0.92	7650 ± 80	6240–5890
Sac-1723	S. Julião C Q E6/D61 2C C1	<i>Cerastoderma edule</i>	- 6.30	8470 ± 70	
Sac-1724	S. Julião C QE6/D61 2C C2	“	- 7.12	7630 ± 60	6190–5920
Sac-1800	S. Julião C QE6/D62 2C C1	<i>Cerastoderma edule</i>	0	7170 ± 90	
Sac-1801	S. Julião C QE6/D62 2C C2	“	- 2.94	7460 ± 60	6000–5740
Sac-1802	S. Julião C QC3 2G V1	<i>Venerupis decussata</i>	0	6390 ± 90	
Sac-1803	S. Julião C QC3 2G V2	“	0	7200 ± 90	5810–5470

* See table 1.

** See table 1.

*** See table 1.

Table 3 – São Julião C, radiocarbon dates.

Tabl. 3 – São Julião C, datations ^{14}C .



Fig. 4 – Structured fireplace (U.E. 2C) in São Julião C.

Fig. 4 – Foyer structuré (U.E. 2C) à São Julião C.

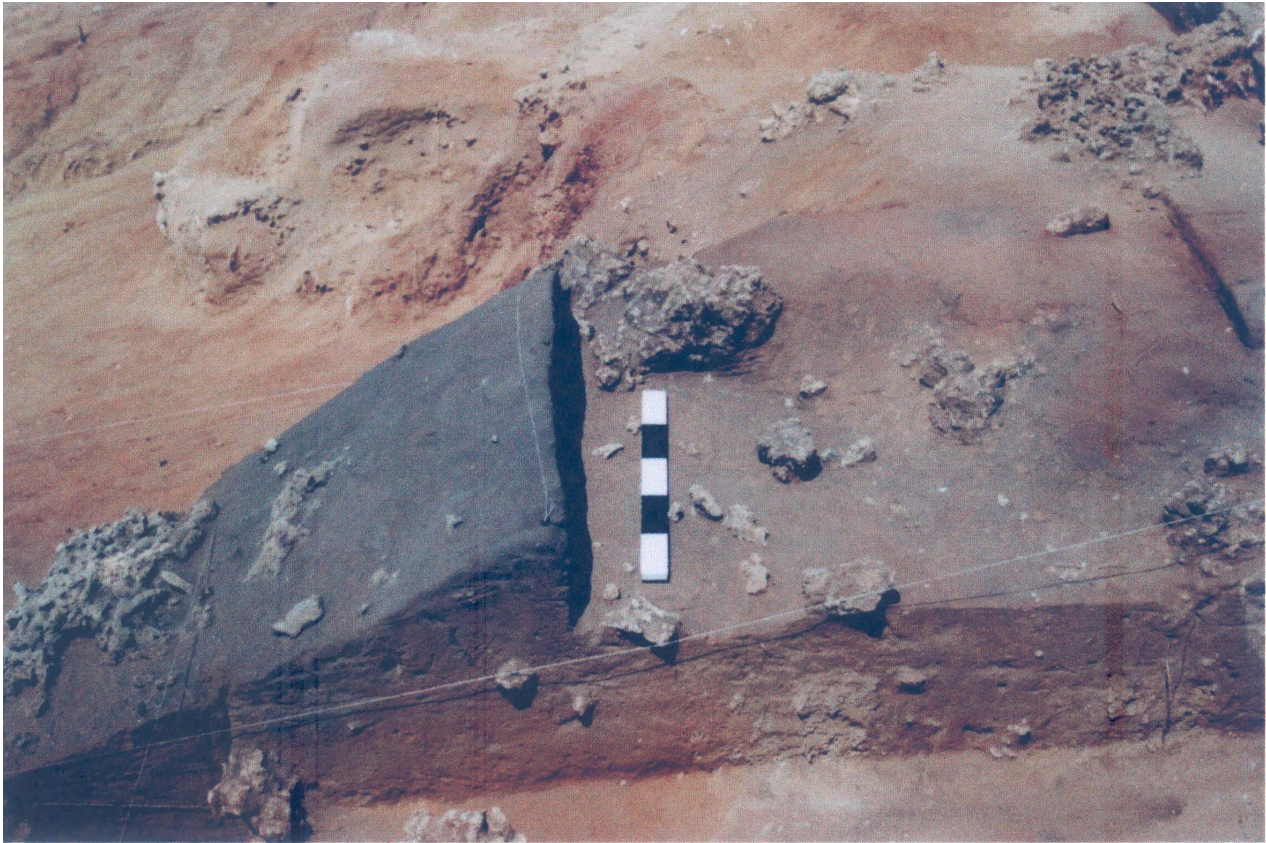


Fig. 5 – Open fireplace (U.E. 2D) in São Julião C.
Fig. 5 – Foyer ouvert (U.E. 2D) à São Julião C.

problem arises from the high fragmentation of most of the constituents of the samples and moreover the archaeological remains were found very close to the surface. These facts should have led to serious phenomena of dissolution and recrystallization of the carbonates that form the mollusc shells.

São Julião D

Locus D was excavated in 2007 (A. C. Sousa and M. Miranda) following a preventive action. The survey (18 m²) revealed a good stratigraphic condition.

This locus is located in the vicinity of locus C, near the seashore, in the beach area, but apparently there is no stratigraphic continuity between these two loci. São Julião D presents archaeological contexts (fig. 6) that differ from those recorded at São Julião C, regarding the fauna composition, structure types and conchiferous deposits. At São Julião D the conchiferous deposits were preserved only in association with the hearths (fig. 7 and fig. 8), one of which was built with stones (fig. 7).

The almost complete absence of artifacts should also be mentioned. In locus D only one artifact was recovered, an atypical and undiagnostic (quartzite) flake.

The archaeological features identified in this locus show great differences as regards their morphology and the faunal remains they contained. In two of the hearths the dominant species was the common cockle (*Cerasto-*

derma edule), and in the remaining two the blue mussel (*Mytilus edulis*) dominated (larger specimens).

Radiocarbon dates (table 4) make it possible to define the temporal period for this locus.

The faunal composition and the structure of the fireplaces indicate the existence of two distinct realities, confirmed by radiocarbon dating.

Thus, the shells of the fireplaces (U.E.2) similar to those found in locus C, yielded a Late Mesolithic age, at the transition from the 7th to the 6th millennium BC (Sac-2966). For the second feature (U.E. 4), two dates (Sac-2964, Sac-2961) clearly indicate a Chalcolithic age as they can be dated to the second and third quarters of the 3rd millennium BC. This context presents similarities, as can be seen below, with the Neolithic and Bronze age contexts of the Magoito site (Soares, 2003), namely the large size of the mussels (*Mytilus*). The radiocarbon dates obtained for São Julião D confirm the long-term occupation of São Julião, from the Boreal to the Atlantic chronozone.

Overall interpretation

Despite the separation of the loci in this site being somewhat artificial, the stratigraphic information and the chronometric data show differences among them and it is very probable that a horizontal stratigraphy exists at this site.



Fig. 6 – Shell midden contexts at São Julião D.

Fig. 6 – Contextes coquilliers à São Julião D.



Fig. 7 – Structured fireplace (U.E. 2) in São Julião D.

Fig. 7 – Foyer structuré (U.E. 2) à São Julião D.



Fig. 8 – Open fireplace with conchiferous deposit (U.E. 4) in São Julião D.

Fig. 8 – Foyer ouvert avec dépôts coquilliers (U.E. 4) à São Julião D.

Laboratory ref.	Sample ref.	Sample type	$\delta^{13}\text{C}$ (‰)	Radiocarbon date* (BP)	Calibrated date** 2σ (cal BC)
Sac-2965	S. Julião D UE2 C1	<i>Cerastoderma edule</i>	- 0.26	7620 \pm 40	
Sac-2966	S. Julião D UE2 C2	“	- 0.10	7580 \pm 45	6150–5860
Sac-2963	S. Julião D UE4 M1	<i>Mytilus</i> sp.	- 0.48	4460 \pm 40	
Sac-2964	S. Julião D UE4 M2	“	- 0.22	4490 \pm 40	2750–2460
Sac-2961	S. Julião D UE4 P1	<i>Patella</i> sp.	- 0.63	4360 \pm 40	
Sac-2962	S. Julião D UE4 P2	“	- 0.25	4410 \pm 50	2650–2330

* See table 1.

** See table 1.

Table 4 – São Julião D, radiocarbon dates.

Tabl. 4 – São Julião D, datations radiocarbonees.

Moreover, despite the long timespan, the four loci seem to indicate a continuity model of the occupation of the site: artifacts are very scarce, faunal remains are constituted exclusively by marine molluscs (gastropods and bivalves) and the only recorded structures are those related to combustion. These evidences suggest short stays at the site, probably logistical in nature.

The archaeological operations in the four loci (A, B, C, D) show the long occupation of the right bank of the Falcão River: during the Boreal in the loci A and B and during the Atlantic in locus C and D.

Regarding the occupation during the Atlantic period, an occupation from the Late Mesolithic to the Chalcolithic seems to be attested. So far, the most

recent occupations from the Atlantic period are confined to the most western edge of the right bank of the Falcão River.

Regarding the Late Mesolithic, the occupation in São Julião is only documented in loci C and D, during the transition from the 7th to the 6th millennium BC. The shortage of archaeological material naturally complicates any chronological and cultural framework, since the anthropic presence is expressed only in the hearth structures and the consumption of shellfish.

The radiocarbon dates obtained for São Julião C and D match those obtained for other shell middens for example Moita do Sebastião, Cabeço da Amoreira, Cabeço da Arruda in the Tejo valley (Bicho et al., 2013) or Vale de Romeiras, Arapouco, Cabeço do Rebolador and Várzea da Mó in the Sado valley (Diniz and Arias Cabal, 2012).

However, data collected in S. Julião C and D present a very similar picture to that found in Pre-Boreal and Boreal sites as Toledo, Vale Frade (Araújo, 2011 and

2012, Araújo et al., 2014) or even São Julião A and B. The low density of artifacts, the restricted faunal spectrum and the morphology of the structures point to a site with occupations of short duration, indicating residential mobility of small groups, both being inherent characteristics of the Early Mesolithic.

The apparent contradiction between the archaeological record and the absolute dating can only reflect information gaps for the Portuguese Estremadura. Specialised sites arise in a wide chronology, such as the Neolithic shell midden of Medo Tojeiro (Silva and Soares, 1997). The model of the Late Mesolithic of the Tagus and Sado valleys, with large residential sites apparently is not confirmed in the Estremadura, where the same economic and social model is maintained over a long period of time.

Although no Early Neolithic radiocarbon dates were obtained, the presence of a significant isolated find, a complete vessel (fig. 9), suggests an occupation of the site during the initial phases of the Neolithic.



Fig. 9 – Early Neolithic vase found in São Julião (photo V. S. Gonçalves; Gonçalves, 2005).

Fig. 9 – Vase du Néolithique ancien trouvé à São Julião (photo V. S. Gonçalves; Gonçalves, 2005).

THE MAGOITO SITE

The archaeological site of Magoito is located not far from Sintra, Lisboa district, in the estuarine area of the Mata River, at its northern margin. Here, a consolidated dune, more than 10 m thick, covers a shell midden located up to 200 m east of the coast (Pereira, 1983). Geomorphological studies (Zbyszewski 1943; Daveau et al., 1982) and chronometric data (Soares, 2003) evidenced a Holocene age for the aeolianite formation, when the shoreline was located approximately 3 miles west, in a period of rapid sea level rise (Pereira, 1983).

A few meters above the river level, on the flank of the consolidated dune, another shell midden is recorded (fig. 10).

History of investigations

The identification of Magoito shell middens goes back to 1943. G. Zbyszewski (Zbyszewski, 1943) identified two archaeological sites with conchiferous deposits related to the aeolianite formation.

In the cliff, a conchiferous level with charcoal and animal bones was identified under the consolidated dune and dated to the Würm stage. On the other hand, on the flank of the dune, a deposit of larger shells was also detected. Subsequently, G. Zbyszewski (Zbyszewski, 1958,

p. 69) proposed a Neolithic or later chronology for this last shell midden, given its location above the dune and just a few meters above the river level, the large size of the shells and the presence of pottery.

The problem of the chronology of the thick consolidated dune was recurrently debated until the first radiocarbon date was obtained for the shell midden (GrN-11229: 9580 ± 100 BP) pointing to a Holocene age for both the site and also for the aeolianite deposit. In 1987, J. Moráis Arnaud carried out a survey at the Epipaleolithic midden (Arnaud, 1994).

The chronometric study of the entire archaeological site was later addressed by one of the authors (Soares, 2003), who incorporated the site into a broader research concerning the radiocarbon ocean reservoir effect off Portugal during the Holocene. Surveys were carried out from 1986 to 1989 (Soares, 1993 and 2003) including graphic and photographic recording.

The loci

The Epipaleolithic midden

The ancient Mesolithic occupation was located on the present shore line, in a cliff, currently hidden by a thick Holocene aeolianite deposit.

The stratigraphic section was recorded in 1989 during construction works on the top of the cliff (fig. 11, fig. 12 and fig. 13). These contexts indicate the large extent of



Fig. 10 – The loci of the Magoito shell midden.
Fig. 10 – Les loci de l'amas coquiller de Magoito.

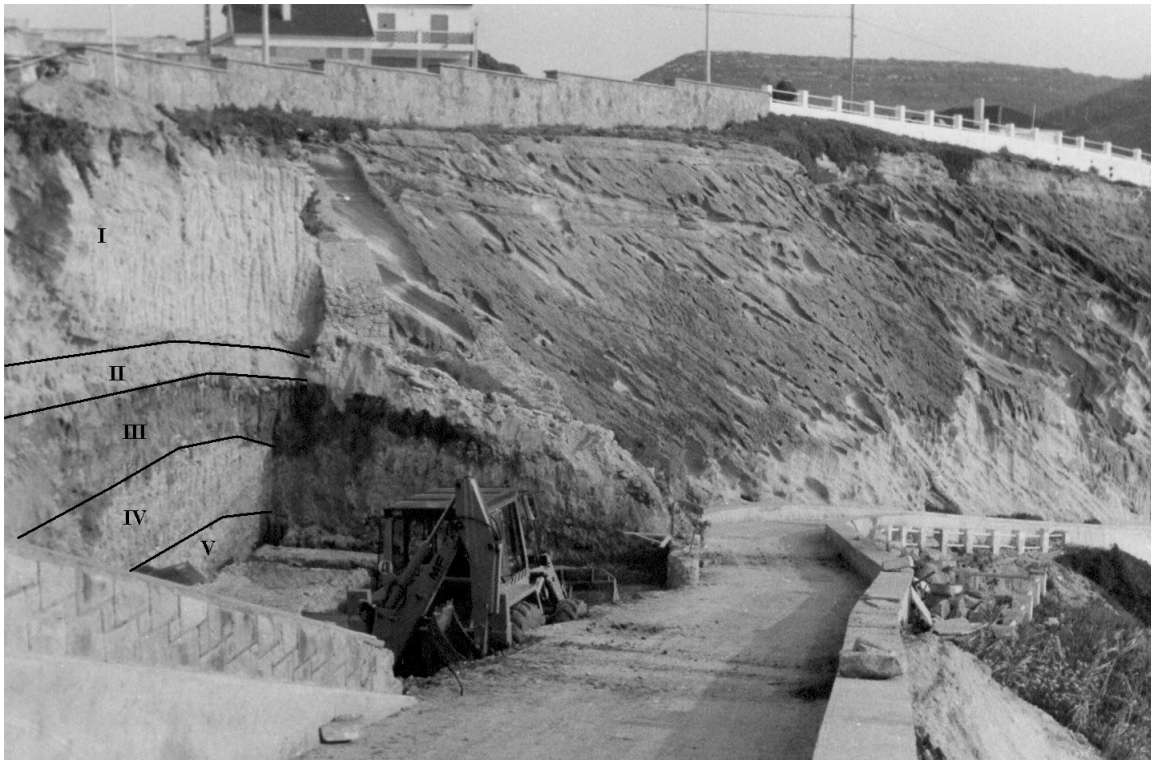


Fig. 11 – Magoito, general appearance of the profile section through the access ramp near the top of the beach. I: the beach access ramp near the top of the consolidated dune; II: whitish released sands with Helix; III: Epipaleolithic shell midden; IV: red sand with some rolled stones; V: Marly limestone of Cenomanian.

Fig. 11 – Magoito, aspect général de la coupe de la rampe d'accès dans la partie haute de la plage. I : rampe d'accès à la page près du sommet de la dune consolidée; II : sables blanchâtres avec Helix; III : amas coquillier épipaléolithique; IV : sable rouge avec quelques galets et des pierres; V : calcaire marneux du Cénomaniens.

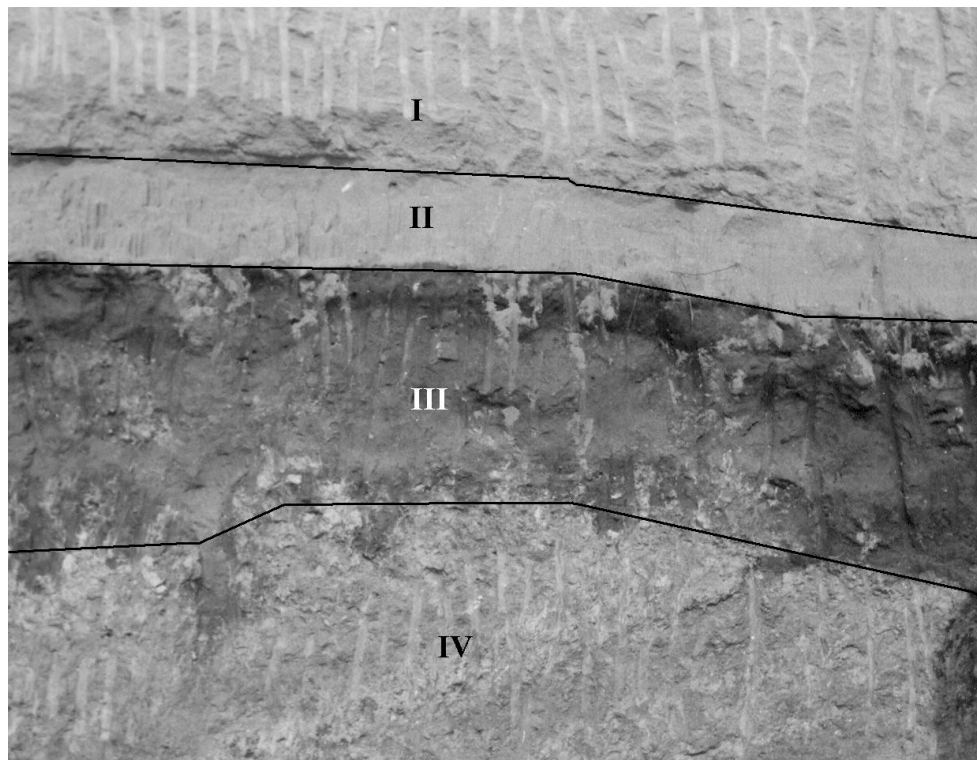


Fig. 12 – Magoito, partial aspect of the profile section. Notation similar to the stratigraphy of fig. 11.

Fig. 12 – Magoito, aspect partiel de la coupe. Référence similaire à la stratigraphie de la fig. 11.



Fig. 13 – Present aspect of the consolidated dune of Magoito along the beach. The black line indicates the location of the Epipaleolithic shell midden that currently is not visible.

Fig. 13 – Aspect actuel de la dune consolidée de Magoito le long de la plage. La ligne noire indique l'emplacement de l'amas épipaléolithique, actuellement non visible.

the shell midden, deposited along the slope, with abundant organic materials and evidence of several hearths.

The radiocarbon dates (table 5) point to a Pre-Boreal age, possibly corresponding to a short period of occupation.

The middens on the flank of the aeolianite deposit

The occupations recorded on the flank of the aeolianite deposit reveal a complexity that could not be anticipated based on the descriptions of G. Zbyszewski (Zbyszewski, 1943 and 1958). Three different occupation areas were identified (see fig. 10 and fig. 14).

Locus A is located about 200 m from the Epipaleolithic shell midden close to a depression that cuts the aeolianite formation. The area in which these contexts were detected, possibly forming a palimpsest, recently (2002) was seriously affected by municipal works, generating increasing erosion.

Two phases were recorded (table 6): the earlier one assigned to the Early/Middle Neolithic (second half of the 5th millennium BC) and the more recent occupation to the Late Neolithic (last quarter of the 4th millennium BC). Only Late Neolithic pottery was discovered.

Moreover, it seems that the marine species collected during these two periods were different. During the 5th millennium limpets (*Patella* sp.) and red-mouthed rock shells (*Thais haemastoma*) were preferentially collected,

whereas mussels (*Mytilus* sp.) were preferred during the Late Neolithic.

Loci B and C were located in a flattened area, at the bottom of the dune, on the right bank of the Mata River, about 50 m from the shore. In both locations, the presence of mussels (*Mytilus* sp.) and pottery were recorded. It is possible that some of the material, more particularly the material recovered from locus B, was in a secondary position. These occupations should be assigned to the Late Bronze Age, perhaps related to funerary practices, when taking into account the typology of the vessels.

Overall interpretation

Although the number of radiocarbon dates (10) is reasonable and a significant number of archaeological materials are associated with the Atlantic contexts, the available information is scarce, overall corresponding to isolated, circumstantial collections.

Thus, the Magoito site recorded a long history of occupation, although there is no evidence of a continuity of this occupation. It starts during the mid-9th millennium BC and ends at the beginning of the 1st millennium BC, including occupations dated to the second half of the 5th millennium BC and to the last quarter of the 4th millennium BC.

Contrary to what happens in São Julião, the westernmost locus corresponds to the earliest phase of occupation. Also, no contexts or materials from the beginning of the Atlantic have so far been recognized.

Laboratory ref.	Sample ref.	Sample type	$\delta^{13}\text{C}$ (‰)	Radiocarbon date (BP)	Calibrated date* 2σ (cal BC)
GrN-11229	Magoito (1A)	Charcoal	–	9580 \pm 100	9250–8660
ICEN-52	Magoito 1B	“	– 24.56	9490 \pm 60	9130–8630
ICEN-80	Magoito 1B M	<i>Mytilus</i> sp.	+ 2.34	9970 \pm 70	9110–8680
ICEN-81	Magoito 1B P	<i>Patella</i> sp.	+ 2.75	9790 \pm 120	8980–8300
ICEN-82	Magoito 1B C	<i>Cerastoderma edule</i>	+ 1.33	9910 \pm 100	9100–8550
ICEN-577	Magoito 1C M	<i>Mytilus</i> sp.	+ 0.54	9880 \pm 80	9030–8560

* According to the calibration curves IntCal13 (samples of the terrestrial biosphere) and Marine13 (samples of marine biosphere) of Reimer et al. (2013), and using CALIB rev 7.0 (Stuiver and Reimer, 1993) program. A ΔR value of 95 ± 15 years ^{14}C was used for the calibration of marine sample dates (Soares and Dias, 2006).

Table 5 – Epipaleolithic shell midden of Magoito, radiocarbon dates.

Tabl. 5 – Amas coquillier épipaléolithique de Magoito, datations radiocarbonees.



Fig. 14 – Magoito, archaeological deposits on the flank of the dune.

Fig. 14 – Magoito, dépôts archéologiques sur le flanc de la dune.

Laboratory ref.	Sample ref.	Sample type	$\delta^{13}\text{C}$ (‰)	Radiocarbon date (BP)*	Calibrated date** 2σ (cal BC)
ICEN-424	Magoito 2A P1	<i>Patella</i> spp.	+ 0.96	6080 \pm 80	
ICEN-425	Magoito 2A P2	“	+ 3.71	6030 \pm 80	4590–4240
ICEN-471	Magoito 2A T	<i>Thais haemastoma</i>	+ 4.05	5970 \pm 120	4610–4040
ICEN-426	Magoito 2A M1,1	<i>Mytilus</i> sp.	+ 2.10	4720 \pm 45	
ICEN-427	Magoito 2A M1,2	“	+ 2.13	4690 \pm 60	3020–2660
ICEN-539	Magoito 2A M2,1	<i>Mytilus</i> sp.	0	4890 \pm 45	
ICEN-540	Magoito 2A M2,2	“	+ 0.82	4970 \pm 45	3360–3080

* The intermediate fraction date of a marine sample (we use the initial letter of the Latin species name plus number 1 or 2 in the sample reference for the intermediate and inner fraction, respectively) is merely an index of reliability for the inner fraction date.

**See table 5.

Table 6 – Shell middens on the flank of the dune, radiocarbon dates.

Tabl. 6 – Amas coquilliers sur le flanc de la dune, datations radiocarbonees.

THE EXPLORATION OF MARINE RESOURCES IN THE LOWER EXTREMADURA DURING POSTGLACIAL TIMES : A BRIEF OVERVIEW

We can generally consider that the level of knowledge about the prehistoric occupation in Lower Estremadura is relatively high: history of research in this area dates back to the 19th century and the area has been heavily targeted for preventive archaeology.

A diachronic analysis of the occupation of this territory (fig. 15 and fig. 16) reveals a contrast between the occupations of the Pre-Boreal and Boreal periods (Epipaleolithic or early Mesolithic) and those of the Atlantic period (Late Mesolithic and Early Neolithic).

With regard to the occupation panorama during the Pre-Boreal and Boreal climatic stages it should be noted that eight of the 26 sites matching this chronology recorded in the Portuguese territory are located in Lower Estremadura (Araújo, 2011).

Most of these sites are located along the coastline, with direct evidence of shell middens, including Toledo (Araújo, 2011 and 2012), Curral, Pinhal da Fonte (Araújo, 1994), São Julião and Magoito. Ponta da Vigia had direct positioning on the shoreline but without a shell midden (Zilhão et al, 1987; Zambujo and Lourenço, 2003).

In general, only small-scale work has been carried out in the region, but the data are relatively well explored, as regards both the number of absolute dates and the level of theoretical reflection (Araújo, 2003, 2011, and 2012).

In most of these Early Holocene shell middens functional specialization is evident, but the corresponding additional terrestrial occupation sites remain to be identified.

According to the model presented by A. C. Araújo, high mobility could include functional complementarity between this area and the Middle and Upper Estremadura (Araújo, 2003). In this same area, but during an earlier cultural period (Upper Paleolithic), J. Zilhão established mobility diagrams for functional inter-site variability between these regions (Zilhão, 1997a, p. 168-169).

On a closer scale, there is scarce evidence of inland occupation that can be associated with the shell middens of the Estremadura coast.

The case of Cova da Baleia, Mafra county, Lisbon district, located 18 km from the coast line is particularly significant (Sousa, 2010; Gonçalves et al., 2013; Sousa and Gonçalves, 2015). This site, excavated by one of the authors (A. C. S.) in 2007, is a complex of 110 clay hearths, with an absolute chronology in the second half of the 8th millennium cal. BC (Gonçalves, et al., 2013). Cova da Baleia shows a poor preservation of organic materials, namely bones. However, a small deposit of shells of common cockle (*Cerastoderma edule*) was identified in the upper levels, which demonstrates contacts with the coast. A sample of this deposit has been radiocarbon dated, but the $\delta^{13}\text{C}$ value is too low (-6.89‰) invalidating the use of the obtained date.

Evidence is scarce concerning the Atlantic period, especially in relation to the late Mesolithic. Despite the long history of research in this area, São Julião C-D *loci* present the only radiocarbon dated contexts that can be integrated to the Late Mesolithic in the Lower Estremadura. The new dates for São Julião D presented here confirm the presence of a late Mesolithic occupation of this archaeological site. The presence of this occupation has been interpreted in different ways. Ana Cristina Araújo highlights the problems of shell dating and the difficulties in applying the radiocarbon reservoir effect (Araújo, 2015). João Zilhão does not clearly refer to São Julião, highlighting the discontinuity of a Boreal/Atlantic occupation in Estremadura (Zilhão, 1997a; 2003, and 2011). António Faustino Carvalho incorporates São Julião in the late Mesolithic (Carvalho, 2009).

This absence of settlement at the beginning of the Atlantic period has been explained with reference to environmental conditions. J. Zilhão (Zilhão, 2003) and A. M. Soares (Soares, 2004) advanced the hypothesis that this gap could be associated with the 8.2 ka BP Bond event, which would have caused important geomorphological and environmental changes. However, recent research by N. Bicho seems to date the beginning of the occupation of the Muge River after 8.2 ka BP, which would have filled the Muge valley with brackish water and which enabled the first occupations recorded in the shell midden (Bicho, 2009, p. 139; Bicho et al, 2010). N. Bicho also refers to decreased upwelling just after the 8.2 ka BP event, although the basis of this is not explained.

The Bond event 5 (the ‘8.2 cal ka BP event’) had a catastrophic character due to the large amount of fresh cold water injected into the Labrador Sea and, therefore, into the North Atlantic, that occurred during a very short time interval, which led to an abrupt sea level rise. While the Magoito value for the radiocarbon marine reservoir effect is indicative of an active upwelling, the values determined on samples from São Julião A and B and also from the Castelejo shell midden—all dated after the Magoito Epipaleolithic shell midden but prior to the ‘8.2 ka BP event’—are not indicative of active upwelling (Soares, 2004; Soares and Dias, 2006). Only after Bond event 5 an increase in the radiocarbon ocean reservoir effect off Portugal starts to be recorded in Portugal, and not the opposite as stated by N. Bicho (Bicho et al., 2010). It is probably the ‘8.2 ka BP event’ and not any drastic change in the upwelling phenomenon off Atlantic Iberia that caused the abandonment of habitats by the people who lived along the coastline.

Beyond these facts, we should still consider it unlikely that the Lower Estremadura was a ‘no-man’s-land’; instead, it is more plausible that it was a territory of marginal economic exploitation (Carvalho, 2009). It will be important to complement other existing inland contexts that are insufficiently documented such as Cova da Baleia (Gonçalves et al., 2013) or other evidences identified in surveys at Mafra and Sintra, as for example Zibreira (Sintra) or Casal do Catarino (Mafra), both unpublished.

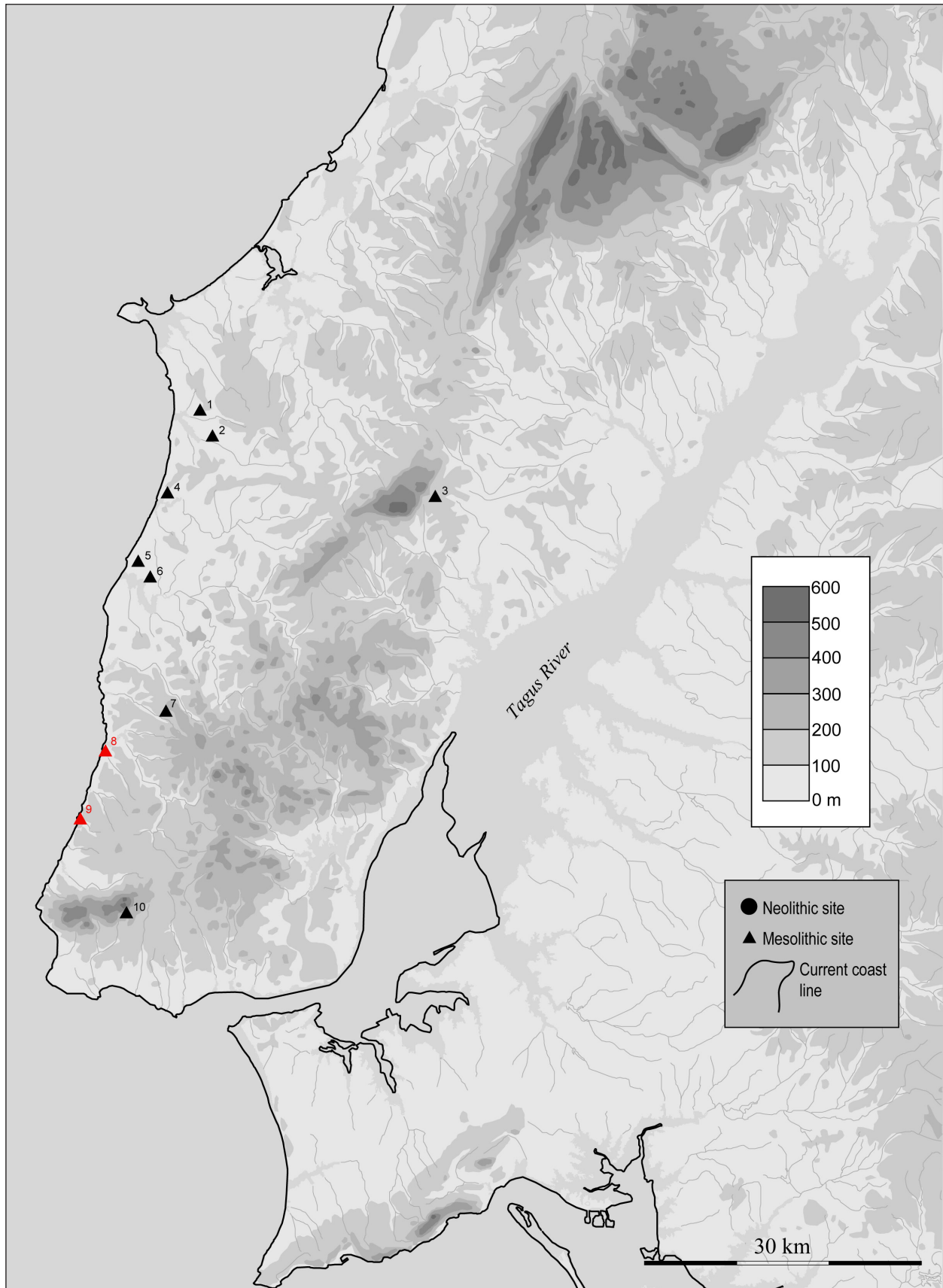


Fig. 15 – Early Mesolithic sites of Central Portugal (Estrémadura). 1: Vale Frade; 2: Toledo; 3: Camarnal; 4: Ponta da Vigia; 5: Curral Velho; 6: Pinhal da Fonte; 7: Cova da Baleia; 8: São Julião; 9: Magoito; 10: Penha Verde.

Fig. 15 – Sites du Mésolithique ancien dans le centre du Portugal (Estrémadura). 1 : Vale Frade; 2 : Toledo; 3 : Camarnal; 4 : Ponta da Vigia; 5 : Curral Velho; 6 : Pinhal da Fonte; 7 : Cova da Baleia; 8 :São Julião; 9 : Magoito; 10 : Penha Verde.

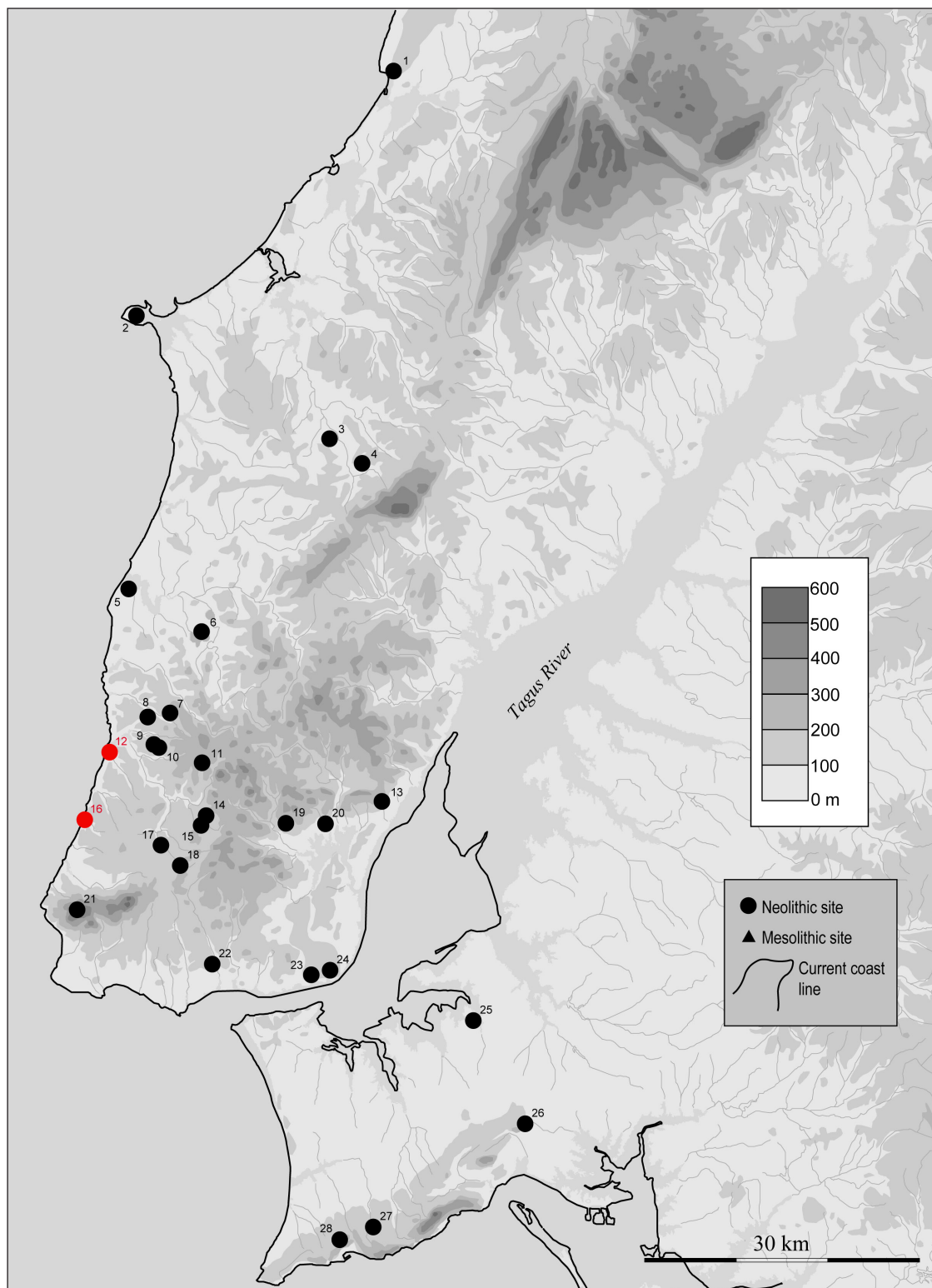


Fig. 16 – Early Neolithic sites in Central Portugal (Estremadura). 1: Meu Jardim; 2: Furninha; 3: Lapa Suão; 4: Gruta das Pulgas; 5: Cova da Moura; 6: Vale da Mata; 7: Cova da Baleia; 8: Sobreiro; 9: Gorcinhos; 10: Gonçalvinhos; 11: Cabeço Alcaíça; 12: São Julião; 13: Moita da Ladra; 14 and 15: Negrais; 16: Magoito; 17: Lameiras; 18: Cortegaça; 19: Correio Mor; 20: Salemas; 21: São Pedro de Canaferrim; 22: Carrascal; 23: Palácio Lumières; 24: Encosta de Santana; 25: Gaio; 26: Casal da Cerca; 27: Fonte de Sesimbra; 28: Lapa do Fumo.

Fig. 16 – Sites du Néolithique ancien dans le centre du Portugal (Estrémadure). 1 : Meu Jardim ; 2 : Furninha ; 3 : Lapa Suão ; 4 : Gruta das Pulgas ; 5 : Cova da Moura ; 6 : Vale da Mata ; 7 : Cova da Baleia ; 8 : Sobreiro ; 9 : Gorcinhos ; 10 : Gonçalvinhos ; 11 : Cabeço Alcaíça ; 12 : São Julião ; 13 : Moita da Ladra ; 14 et 15 : Negrais ; 16 : Magoito ; 17 : Lameiras ; 18 : Cortegaça ; 19 : Correio Mor ; 20 : Salemas ; 21 : São Pedro de Canaferrim ; 22 : Carrascal ; 23 : Palácio Lumières ; 24 : Encosta de Santana ; 25 : Gaio ; 26 : Casal da Cerca ; 27 : Fonte de Sesimbra ; 28 : Lapa do Fumo.

With the necessary caution, it can be stated that human settlement of the Portuguese Estremadura seems to disappear prior to the Early Neolithic. The occupation of the Lisbon peninsula must have occurred only during a second phase of the Neolithic colonisation, i.e. during a late phase of the Early Neolithic.

Cardial pottery is rare and most of the dates match the transition between the 6th and the 5th millennium ensuing the known occupation of Estremadura limestone massif, in particular the sites of Carrascal, Oeiras (Cardoso et al., 2008; Cardoso, 2011), São Pedro de Canaferrim, Sintra (Simões, 1999) or Lameiras (López-Dóriga and Simões, 2015).

There seems to be an absence of sites indicating systematic exploitation of aquatic resources during the Atlantic period, contrary to what happens in other areas of Portugal as the Algarve coast or the southwestern Alentejo coast.

The cases of Magoito and São Julião are exceptions within this scenario in Estremadura. These sites are the only ancient Mesolithic middens of the Lower Estremadura presenting Neolithic occupations.

As regards São Julião we highlight the discovery of a single complete vessel, with a bag shape and incised decoration. It was recovered in 1960 during building works without any archaeological supervision, near locus B. Considering the excellent condition of the vessel, there are several possible explanations. Among other vessels, dated to the Early Neolithic, it was found in an isolated position. Some authors proposed that it was a votive deposit (Simões, 1999, p. 87). This proposal was made before the new data from São Julião C and D became available. On the other hand, surveys on the hilltop at São Julião found unclassifiable fragments of prehistoric pottery. Whether for ritual or functional purposes, it is acknowledged that São Julião was occupied in the Early Neolithic. Using formal parallels namely with pottery found at São Pedro de Canaferrim or at Gruta do Correio Mor (Simões, 1999; Cardoso, 2003), it is plausible that this vessel can be dated between the last quarter of the 6th millennium and the first quarter of the 5th millennium BC.

The contrary is the case as regards the site of Magoito, because it yielded absolute dates, but no artifacts related to the Early-Middle Neolithic. The two dates from the mid-5th millennium BC (ICEN 425 and ICEN-771) may correspond roughly to the same timescale of São Julião, but there is no associated material culture.

Besides these two cases, it must be noted that a shell midden, located 100 km north of Lisbon, at Nazaré, was recently identified (Valera and Santos, 2010). In this shell midden, named 'Meu Jardim', remains of domestic fauna and abundant decorated pottery were recorded, indicating a broad economic spectrum and a possible residential site. No radiocarbon dates are available.

Although Early Neolithic sites are quite abundant in the Estremadura, the associated information is scarce, but everything indicates that aquatic resources have played an important role in these communities. Aquatic

resources are present in Lameiras (Sintra), a site located only 15 km from São Julião (Teresa Simões, personal communication) and Carrascal, in the municipality of Oeiras (Cardoso, 2011).

During the Late Neolithic, the importance of aquatic resources is also recorded in this area, particularly in settlements such as Parede (Pombal, 2006; Gonçalves, 2003), Vale de Lobos (Valente, 2006), Penedo do Lexim (Sousa, 2010; Miranda, 2005) and Leceia (Cardoso et al., 1996). During the Chalcolithic period the importance of aquatic resources is registered, particularly in fortified villages such as Penedo do Lexim or in open air sites such as Casal Cordeiro 5 (Sousa, 2010 and 2013). These sites are located in the vicinity of Magoito and São Julião.

The significance of aquatic resources in the Setúbal peninsula during the Late Neolithic/Chalcolithic transition is particularly significant, with conchiferous deposits in fortified settlements such as Rotura and Outeiro Redondo (Cardoso and Coelho, 2012).

In addition to the complementary function of aquatic resources among the ancient peasant farming societies of the 4th and 3rd millennium BC, the presence of sites specialized in aquatic resources is also recorded. In the Setúbal peninsula, and in other places on the western coast, these sites such as Ponta da Passadeira, Barreiro (Soares, 2013), Possanco, Comporta (Soares and Silva, 2013), or the site of the ETAR of Vila Nova de Milfontes (Silva and Soares, 1997) have been recorded. In some of these sites the exploitation of salt and marine shellfish is also present (Soares and Silva, 2013). These were termed 'agro-maritime economies' by J. Soares and C. Tavares da Silva.

In the Lisbon peninsula scarce contexts are clearly associated with aquatic resources in the Atlantic period. Magoito and St. Julião are the only radiocarbon-dated sites. It should be mentioned that the type of occupation, as mentioned above, is quite similar to that identified in the Epipaleolithic sites. In some cases, only radiocarbon dating enables a chronological assignment.

The scarcity of these contexts over such a long time span (Mesolithic to Chalcolithic) can be explained in several ways. Taphonomy and preservation issues must be addressed, namely in relationship with the Late Mesolithic contexts. On the other hand, there are disparities in research across the coast of Estremadura, creating false gaps. Finally, with proper precautions, it seems clear that there is a move away from the Atlantic coast of the Estremadura since the beginning of the Atlantic period, either for environmental reasons (Late Mesolithic) or due to the new dynamics of farming societies, in which marine resources played a secondary role. The Magoito and São Julião sites show that the coast of Estremadura was not a 'no-man's-land' during the Atlantic period.

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