

ZILHÃO, J. - *Middle Paleolithic Settlement Patterns in Portugal*,  
in CONARD, N. (ed.) - «Settlement Dynamics of the Middle Paleolithic  
and Middle Stone Age», Tübingen, Kerns Verlag, 2001, p. 597-608.

## CHAPTER 27

### MIDDLE PALEOLITHIC SETTLEMENT PATTERNS IN PORTUGAL

JOÃO ZILHÃO



**Abstract.** *Although the data are scant, settlement-subsistence systems, which fall well within the range of the forager type, seem to characterize the human use of the Portuguese territory before the Last Glacial period. Lithic raw-material procurement systems are overwhelmingly based on the exploitation of local resources. The composition of faunal assemblages recovered in caves also suggests the exploitation of the immediate environment, including marine resources. A comparison between OIS 4 and OIS 3 sites suggests a contraction in the size of territories as a result of the change to a warmer climate and a temperate woodland environment after ca. 40 Kyr ago.*

**Résumé.** *Malgré le manque de données, les systèmes de peuplement du Paléolithique moyen du Portugal semblent bien correspondre au type "forager". L'approvisionnement en matières-premières lithiques est basé dans l'exploitation des sources locales. La composition des ensembles fauniques fouillés dans des sites de grotte indique aussi une exploitation de l'environnement immédiat, y compris en ce qui concerne les ressources marines. La comparaison entre les sites du stade isotopique 4 et du stade isotopique 3 suggère une contraction dans la taille des territoires à mettre en rapport avec le changement vers un climat plus chaud et un environnement de bois tempéré après 40 Kyr BP environ.*

#### INTRODUCTION

The functional analysis of variability in habitat location requires the control of many different factors: the definition of meaningful territorial units, the establishment of an overall contemporaneity between the different sites analyzed, the knowledge of the season of occupation, and of the activities carried out at each different site or site component. In the Portuguese case, one faces serious difficulties when trying to meet each one of these prerequisites. Indirect evidence provides some clues to the spatial behavior of Middle Paleolithic groups. Given the scarcity of the data, however, the hypotheses derived from such clues should be considered as testable propositions, useful for guiding the research that needs to be conducted on these issues, rather than

as solid reconstructions of actual human behavioral patterns in the time range under consideration.

### CHRONOLOGY

Table 1 presents the chronometric data currently available for the Portuguese Middle Paleolithic. Whether such industries already existed in OIS 5 or earlier is currently unknown, but the most common assumption is that Acheulian industries survived in Portugal until the end of this stage. The earliest result possibly associated with the Middle Paleolithic is the U-Th date on elephant bone obtained for the open-air site of Santo Antão do Tojal (Loures): ca. 81.9 Kyr BP (Raposo 1995). However, the association between the elephant material and the archaeological context featuring Mousterian lithics and burnt bones is not established beyond reasonable doubt. At the other end, the Middle Paleolithic is bracketed by a series of radiocarbon and U-Th dates that securely establish its survival at least until ca. 30 Kyr ago (Antunes et al. 1989; Antunes 1990-91; Raposo 1995; Zilhão 1995, 1997a; Zilhão and McKinney 1995; McKinney 1996; Raposo and Cardoso 1998a).

Given that we are dealing with a time interval of some 50 Kyr, chronological control is a major issue. Chronometric dating in this time range, however, is characterized by large errors and, in Portugal, the number of *in situ* occurrences found in geological conditions warranting the use of available methods is small. Furthermore, the systematics of lithic industries of the late Lower Paleolithic and the Middle Paleolithic is still too under-developed to provide technological or typological indicators of time (Cunha-Ribeiro 1999).

Therefore, the following discussion will be restricted to the sites which provide at least a minimum degree of chronological information (fig. 1). In order to reduce the impact of poor resolution and to control in as much as possible for the impact of environmental change in perceived patterns of behavior, sites will be grouped in two very broad chronological clusters: those that probably belong to OIS 4 and those that probably belong to OIS 3. The cave sites of Gruta de Salemas and Gruta do Pego do Diabo are excluded from the discussion given the failure of dating attempts (see comments to table 1).

### OIS 3 SITES

Seven sites have chronological results that are compatible with an OIS 3 chronology. Only one faunal assemblage, however, has so far been the object of a modern archaeozoological study. At Foz do Enxarrique (Ródão), a late Middle Paleolithic open-air site, U-Th dated to ca. 33.6 Kyr BP, the bones represent for the most part a natural accumulation along the river margin. The human occupation coincided topographically but not behaviorally with the bone scatter, except, perhaps, in the case of red deer (Brugal and Raposo 1995).

It has been suggested that another open-air site, Conceição (Alcochete), is broadly contemporary with Foz do Enxarrique on the basis of a ca. 27.2 Kyr BP OSL-date

on wind-blown sediments covering the archaeological level (Raposo and Cardoso 1998a). Since a major geological unconformity separates the two, the age of the occupation cannot be securely established, particularly since a second OSL result places the deposits underlying the archaeological level at ca. 74.5 Kyr ago. In any case, no faunal remains were preserved at this site.

Level 2 of *Gruta da Figueira Brava* (Sesimbra), radiocarbon dated to ca. 30.9 Kyr ago, contained a rich fauna associated with Mousterian lithics (Cardoso and Raposo 1995). Paleontological data are available, and the fact that more than 2,000 lithic artifacts (mostly quartz) were recovered suggests that the accumulation is anthropic at least to a certain extent. Human collection of seafoods is in any case documented by the significant numbers of *Patella* shells present in the deposits, as well as, possibly, by the remains of seal and great auk. According to Cardoso and Raposo, the deposit shows clear signs of having been reworked, so the length of time represented by the assemblages of large mammals as well as the association of the latter with the available  $^{14}\text{C}$  date remains open to question. Since that date was obtained from a sample of *Patella* shells, however, it seems reasonable to assume that the other marine species were incorporated in the deposit at about the same time, that is, at the end of OIS 3. This suggests that the late Neanderthal populations of Iberia were exploiting aquatic resources, an inference that is significantly reinforced by similar finds recently reported from a >50 Kyr old fireplace in Gibraltar's Vanguard Cave (Barton et al. 1999).

Preliminary results are available for another late Middle Paleolithic assemblage, levels 8-9 of *Gruta da Oliveira*, in the Almonda karstic system (Torres Novas), which have been radiocarbon dated to between ca. 32 and ca. 38-40 Kyr BP. Preliminary results (Brugal n.d.) indicate that red deer is the only large herbivore represented among the ca. 300 identified specimens recovered therein. Cut-marks have been identified which, in conjunction with the presence of burnt bone fragments, suggest a largely anthropic accumulation. This is reinforced by the fact that, in terms of NISPs, carnivores are outnumbered 6:1 by large herbivores; furthermore, hyena is absent. Long bones are under-represented, which is probably related to the large amounts of unidentifiable shaft fragments (more than 50% of the assemblage), and may result either from deliberate breakage for marrow extraction or from the secondary action of carnivores (fox, lynx, panther, and bear are represented) over the bones left by humans. Tortoise remains, both shell and post-cranial, are common, and one scapula was cut-marked. Rabbit bones are only marginally more numerous than those of tortoise and may constitute further evidence for the exploitation of small game. The composition of the faunal assemblage suggests the hunting of the local resources provided by the immediate environment, which, given that composition, can be reconstructed as a temperate woodland.

The Middle Paleolithic sequence in *Gruta do Caldeirão* (Tomar) is capped by a radiocarbon date of ca. 27.7 Kyr BP. Faunal remains are abundant but artifacts are scarce, suggesting a mostly natural accumulation of the bones (Zilhão 1995, 1997a).

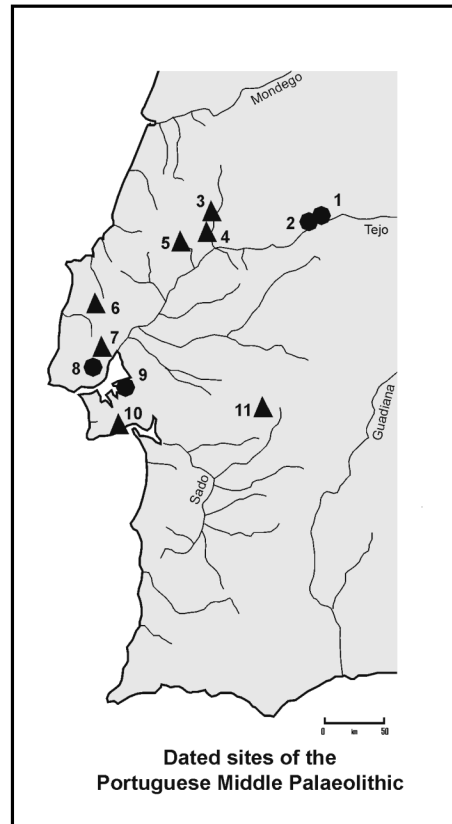
**Table 1. Radiometric results for the Middle Paleolithic of Portugal (sources: Antunes et al. 1989; Antunes 1990-91; Raposo 1995; Zilhão 1995, 1997; Zilhão and McKinney 1995; McKinney 1996; Raposo and Cardoso 1998; Zilhão, unpublished data).**

Site	Level	Sample	Method	Lab Reference	Age BP	Comment
Almonda, EVS	EVS Cone	Equus (tooth enamel)	U-Th	SMU-231E1	35,000±2,000	Low <sup>230</sup> Th/ <sup>232</sup> Th ratio
Almonda, Gruta da Oliveira	8	Burnt bone	AMS <sup>14</sup> C	GrA-10200	31,900±200	Alkaline fraction dated
	8	Burnt bone	AMS <sup>14</sup> C	OxA-8671	32,740±420	
	9	Burnt bone	AMS <sup>14</sup> C	Beta-111967	40,420±1,220	
	9	Burnt bone	AMS <sup>14</sup> C	GrA-9760	38,390±480	Alkaline fraction dated
	11	Burnt bone	AMS <sup>14</sup> C	OxA-8672	42,900±1,20	
Mousterian Cone		Equus (tooth enamel)	U-Th	SMU-308-247E2	53,000±5,600-5,300	Average of the two determinations, ca. 62,000
				SMU-247E1	70,250±9,000	
Gruta do Caldeirão	K top (J6)	Cervus	AMS <sup>14</sup> C	OxA-5541	18,060±140	Low collagen content (0.32%N; 3.66%C; 0.53%H)
	K base (K5)	Capra	AMS <sup>14</sup> C	OxA-5521	23,040±340	Low collagen content (0.32%N; 2.39%C)
	K top	Cervus	AMS <sup>14</sup> C	OxA-1941	27,600±600	
Conceição	C	Sediments	OSL	QTL5-CNC11	27,200±2,500	Layer C overlies the archaeological level; result is minimum age
	E	Sediments	OSL	QTL5-CNC12	74,500±11,600-10,400	Layer E underlies the archaeological level; result is maximum age
Gruta do Escoural	Test 3a, 90-100	Bos (tooth enamel)	U-Th	SMU-248	26,400±11,000-10,000	Low uranium content
	Test 3a, 80-90	Cervus (tooth enamel)	U-Th	SMU-249	39,800±10,000-9,000	Low uranium content (3.4%)
	Test 3a, 60-70	Equus (tooth enamel)	U-Th	SMU-250	48,900±5,800-5,500	
Gruta da Figueira Brava	2	Patella sp. shells	<sup>14</sup> C	ICEN-387	30,930±700	
	2	Cervus (tooth enamel)	U-Th	SMU-232E1	30,561±11,759-10,725	
	2	Cervus (tooth enamel)	U-Th	SMU-233E2	44,806±15,889-13,958	
Foz do Enxarrique	C	Equus (tooth enamel)	U-Th	SMU-225	32,938±1,055	Average of the three results, 33,600±500
	C	Equus (tooth enamel)	U-Th	SMU-226	34,088±800	
	C	Equus (tooth enamel)	U-Th	SMU-224	34,093±920	

## MIDDLE PALEOLITHIC SETTLEMENT PATTERNS IN PORTUGAL

Table 1. cont.

Site	Level	Sample	Method	Lab Reference	Age BP	Comment
Gruta Nova da Columbeira	16 (=7)	Carbonaceous earth	<sup>14</sup> C	Gif-2703	26,400±700	Inadequate dating material
	7	Tooth enamel	U-Th	SMU-235E1	35,876±27,299-35,583	
	7	Tooth enamel	U-Th	SMU-238E1	54,365±22,240-27,525	
	20 (=8)	Carbonaceous earth	<sup>14</sup> C	Gif-2704	28,900±950	Inadequate dating material
	8	Tooth enamel	U-Th	SMU-236E1	60,927±27,405-35,522	
					101,487±38,406-55,919	
Lapa dos Furos	4	Helix nemoralis shells	<sup>14</sup> C	ICEN-473	34,580±1,160-1,010	Layer 4 underlies the archaeological level, result is maximum age
Gruta do Pego do Diabo	3	Bone collagen	<sup>14</sup> C	ICEN-491	18,630±640	Impure collagen
Pedreira de Salemas	1	Bone collagen	<sup>14</sup> C	ICEN-366	29,890±1,130-980	
Gruta de Salemas	T.Vb	Bone collagen	<sup>14</sup> C	ICEN-379	24,820±550	Dated level contains a mix of Middle and Upper Paleolithic artifacts
Santo Antão do Tojal	2	Elephas (bone)	U-Th	SMU-305	81,900±4,000-3,800	
Vilas Ruivas	B	Sediments	TL	BM-VRU1	51,000±13,000-12,000	Average of the two results, 54,000±12,000-11,000
	B	Sediments	TL	BM-VRU2	68,000±35,000-26,000	



**Fig. 1.** Dated sites of the Portuguese Middle Paleolithic. ▲ = cave sites. ● = open air sites. 1) Foz do Enxarrique; 2) Vilas Ruivas; 3) Lapa dos Furos; 4) Gruta do Caldeirão; 5) Gruta da Oliveira (Almonda); 6) Gruta Nova da Columbeira; 7) Pedreira de Salemas; 8) Santo Antão do Tojal; 9) Conceição; 10) Gruta da Figueira Brava; 11) Gruta do Escoural.

Gruta do Escoural (Montemor-o-Novo) is U-Th dated to ca. 48.9 Kyr ago (McKinney 1996). According to Gautier (1996), in the Middle Paleolithic levels, large carnivores, including hyena (represented both by its bones and characteristic large coprolites), constitute 26% of the total number of identified specimens, suggesting that the contribution of carnivores to the faunal assemblage was far more important than that of humans. The basal Middle Paleolithic level of the fill of a shaft

exposed by quarrying at Pedreira de Salemas (Loures), radiocarbon dated to ca. 29.9 Kyr ago, is clearly a natural accumulation with sparse artifacts in derived position (Antunes et al. 1989; Cardoso 1993). The same is probably true at Lapa dos Furos (Zilhão 1995, 1997a).

#### OIS 4 SITES

Three sites have chronological results that are compatible with an OIS 4 chronology. The "Mousterian Cone" is a small (less than 2 m<sup>3</sup>) sandy deposit found in 1989, in the labyrinth of narrow fossil galleries above the spring of the Almonda River. At the time of discovery it was interpreted as the secondary deposition of sediments and archaeological materials that originally had been part of the filling of a collapsed cave. This was confirmed when the eboulis and breccia that sealed the entrance to the latter were removed from the outside. The site thus reopened is the Gruta da Oliveira, whose OIS 3 deposits, at the top of the stratigraphic sequence, were discussed in the preceding section. The Mousterian Cone corresponds, therefore, to an exposure of the basal levels of the Gruta da Oliveira's stratigraphy, whose overall thickness is estimated at about 6 m. U-Th dating on the enamel of a horse tooth provided an age for the Mousterian Cone from between ca. 53 and ca. 70 Kyr ago (Zilhão and McKinney 1995). Red deer, horse and ibex are the dominant species, and rabbit, turtle and rhino are also represented. The high percentage of burnt material (30%) among the ca. 150 large mammal bone fragments and the absence of carnivores indicate an anthropic accumulation. Some 250 artifacts were collected, about half of them flint, the rest being quartzite (ca. 30%), quartz (ca. 20%) and limestone (<1%). The flint material is characterized by the debitage of large and thin flakes (and some blades), and has a strong Levallois component.

One TL result on sediments for the open-air site of Vilas Ruivas (Ródão) suggests an age of ca. 68 Kyr ago (Raposo 1995). Another result, however, places the site at ca. 51 Kyr ago. No faunal remains were preserved but the site contained extremely well-preserved features. Two hearths lined by large quartzite blocks and filled with small pebbles were found incrusting in semi-circular stone alignments that are reminiscent of the hunting blinds reported by Binford (1983) among the Nunamiut. These hearths are identical in size and complexity to those documented in the Gravettian sites of the Côa Valley, 150 km to the north (Zilhão 1997b; Aubry 1998).

The densest human occupation in the Middle Paleolithic sequence of Gruta Nova da Columbeira (Bombarral) is that documented in basal levels 7-9 (Raposo and Cardoso 1998b). These levels form a 50 cm thick package rich in archaeological remains, overlain by 1.5 m of deposits which, although poor in artifacts, are still entirely Middle Paleolithic (levels 4-6). Radiocarbon dated on carbonaceous sediments to between 26.4 and 28.9 Kyr BP, levels 7-9 were also dated by U-Th. In spite of their very large errors, the U-Th results indicate a much earlier age, centering on the interval between ca. 54 and ca. 61 Kyr ago. The laboratory argued that the radio-

carbon age of ca. 26 Kyr BP for Level 7 must be rejected due to the inadequate nature of the dated material (Delibrias et al. 1986). Given the site's stratigraphy, this conclusion finds additional support in the fact that its acceptance would entail a long-term contemporaneity between the Mousterian industries in levels 4-6 and the Upper Paleolithic of the rest of the country. Hyena represents 9% of the total number of 255 identified remains of large mammals in levels 6-8, the majority of which are of red deer (Cardoso 1993; Raposo and Cardoso 1998b). Tortoise is very abundant, particularly in Level 8, where 338 remains were identified by Jiménez Fuentes et al. (1998), who refer them to the taxon *Agrionemys* (= *Testudo*) *hermanni*, with *Emys* or *Mauremys* being represented only by a very few fragments. Level 8 is also where most of the large herbivore remains were recovered, charcoal flecks and ash lenses were more common, and lithic artifacts more abundant—1,832 artifacts, excluding chips. Although an adequate archaeozoological study of the assemblage is unavailable, this positive correlation suggests a mostly anthropic accumulation for the fauna (including the tortoise remains) recovered in the site's lower levels.

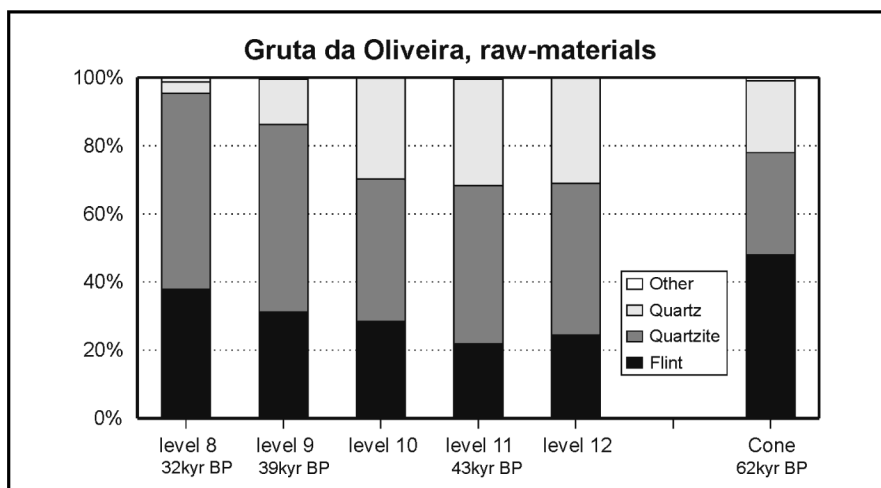
#### DIACHRONIC TRENDS

In the Mousterian Cone/Gruta da Oliveira sequence, the composition of faunal assemblages seems to undergo some diachronic change. Horse and ibex are present in the lower levels and absent in the upper ones. However, this is likely to be related to environmental change rather than to behavioral change. A magnetic susceptibility study (Ellwood et al. 1998) for the basal Mousterian-through-Solutrean deposits of the Caldeirão sequence suggests that, in the region, OIS 3 climates were relatively warm, particularly between ca. 40 and ca. 30 Kyr ago. This is supported by other lines of evidence. The ca. 34.5 Kyr BP *Helix nemoralis* mollusk fauna dated at Lapa dos Furos, for instance, is indicative of an open woodland/maquis environment (Callapez 1999), and the pollen profiles studied by Diniz (1993a, 1993b) suggest a landscape of heathland and pine on the coast and on the sandy soils of the interfluvies, with oak forests covering the low altitude limestone massifs. These relatively wooded landscapes may have restricted the distribution of open space species such as horse and forced the retreat of ibex into the higher mountains.

The other change documented in this sequence is the decrease in the use of flint (fig. 2). In the Mousterian Cone, flint dominates, especially when the Levallois reduction system is used. Levels 8-9 of Gruta da Oliveira, in contrast, are quartzite dominated (even among Levallois products), and this domination would be even more marked if debris were excluded from the counts. A similar tendency towards a decrease in the use of flint in the latest Middle Paleolithic also characterizes the Gruta do Caldeirão sequence, where flint represents 40% of the assemblage in lowermost levels O-L and only 13% in uppermost Level K. Other assemblages dated to the very end of the Middle Paleolithic with a sufficient degree of reliability feature quartz- or quartzite-dominated assemblages, even if located in areas where flint is available within a short distance: flint sources are known within less than 10 km of



## MIDDLE PALEOLITHIC SETTLEMENT PATTERNS IN PORTUGAL



**Fig. 2.** *Diachronic changes in raw material use at Gruta da Oliveira.*

Figueira Brava, for instance, but this raw material represents only 5% of the lithic assemblage recovered at the site.

Changes in the relative abundance of flint may be of importance in evaluating the size of the territories exploited from any given residence and, therefore, the degree of group mobility. This is because in the littoral regions between the Tagus and Mondego rivers, quartzite and quartz cobbles can be found almost anywhere in the landscape, given the abundance of Tertiary and Quaternary alluvial deposits accumulated by rivers draining the interior Paleozoic massif, while flint sources have a more discrete distribution. Alternative explanations are changes in cultural preferences, in the visibility/availability of flint, or in the geographical range of exchange networks. The overall impression, however, is that raw material procurement systems are overwhelmingly based on the exploitation of local sources. This is brought to light in flint-poor areas when the composition of Middle and Upper Paleolithic assemblages is compared. At Gruta do Escoural, for instance, quartz represents 99% of the Middle Paleolithic assemblage, while the assemblages of the Upper Paleolithic are almost entirely of flint (Otte 1996). Therefore, it is quite likely that the changes in the use of flint during the Middle Paleolithic may indeed reflect changes in the meaning of “local” or, put another way, may signal the expansion or contraction through time of the size of the territories exploited from the different sites.

### **INFERENCES REGARDING SETTLEMENT**

Thus, if confirmed by future research, the diachronic change in the frequency of flint observed at Gruta da Oliveira and Gruta do Caldeirão may stand for a restriction in

the size of territories. As is the case with the hints of change in the composition of anthropic faunas, such a reduction may have been a consequence of the change from more open to more wooded environments which occurred as the climatic patterns characteristic of OIS 3 progressively settled in.

In contrast, the dichotomy in assemblage composition between open-air and cave sites does not seem to change between OIS 4 and OIS 3 periods. Open-air sites tend to feature high percentages of cores and low percentages of retouched tools, the reverse being true of cave sites. For instance, at Conceição, tools represent 3.0% of the lithic assemblage and cores 24.3% (Raposo and Cardoso 1998*a*), while in Columbeira's Level 8 tools are 13.6% and cores 3.6% (Raposo and Cardoso 1998*b*). This most likely represents economizing behavior, particularly since notches and denticulates always dominate tool assemblages.

A more logistic use of caves could be hypothesized, but no data at present support this notion. In fact, while small, temporary, highly specialized sites located in mountainous country are well known in the Upper Paleolithic, such types of occupations are totally unknown in the Middle Paleolithic. In caves, Mousterian occurrences always seem to represent palimpsests of functionally repetitive residential occupations alternating with episodes of large carnivore denning. In the open, sites tend to appear, archaeologically, as extensive, often quite spread out, occupation surfaces where discrete activity areas cannot be identified, suggesting a similar pattern of redundancy. It cannot be excluded, however, that this may well have resulted from the action of geological processes affecting the formation of the sites, which tend to be contained in riverside deposits.

The above suggests that settlement-subsistence systems well within the range of the forager type as defined by Binford (1983) were the rule in Portugal before the Last Glacial. The absence of ibex in the OIS 3 levels of Gruta da Oliveira also suggests that the exploitation of resources was restricted to the immediate environment of sites, since a more logistical system might have been able to cull the ibex herds that in all likelihood continued to thrive at higher altitudes in the nearby Serra de Aire, which rises to more than 600 m. This hypothesis could well explain the presence of marine species at Figueira Brava, a site very close to the beach ca. 30.9 Kyr ago, and their absence at all other sites known, all being more than 20 km inland. The patterns of local procurement of raw materials and of high redundancy in the occupation of favorable locations that seem to characterize the Middle Paleolithic are also compatible with this hypothesis and suggest a high degree of residential mobility inside relatively small territories.

Progress in the evaluation of this model requires the discovery and adequate excavation of a much larger number of sites, as well as adequate archaeozoological studies of the faunal assemblages. Seasonality data, in particular, are of paramount importance in evaluating the hypothesis that the residential use of caves represents short-term episodes of occupation that may have taken place at any time of the year. The research carried out since 1989 in several Lower and Middle Paleolithic loca-

tions in the Almonda karstic region, including the Gruta da Oliveira, will hopefully help in reducing the large uncertainty currently associated with any study of the settlement patterns of the Portuguese Middle Paleolithic.

## REFERENCES

- Antunes, M. T. 1990-91. O Homem da Gruta da Figueira Brava (ca. 30 000 BP). Contexto ecológico, alimentação, canibalismo. *Memórias da Academia das Ciências de Lisboa. Classe de Ciências XXXI*: 487-536.
- Antunes, M. T., J. M. P. Cabral, J. L. Cardoso, J. Pais, and A. M. Soares. 1989. Paleolítico médio e superior em Portugal: Datas  $^{14}\text{C}$ , estado actual dos conhecimentos, síntese e discussão. *Ciências da Terra* 10: 127-38.
- Aubry, Th. 1998. Olga Grande 4: Uma sequência do Paleolítico superior no planalto entre o Rio Côa e a Ribeira de Aguiar. *Revista Portuguesa de Arqueologia* 1 (1): 5-26.
- Barton, R. N. E., A. Carrant, Y. Fernandez-Jalvo, C. Finlayson, P. Goldberg, R. MacPhail, P. B. Pettitt, and C. B. Stringer. 1999. Gibraltar Neanderthals and Results of Recent Excavations in Gorham's, Vanguard and Ibex Caves. *Antiquity* 73: 13-23.
- Binford, L. 1983. *In Pursuit of the Past*. London: Thames and Hudson.
- Brugal, J.-Ph. n.d. Les faunes de Gruta da Oliveira. Unpublished manuscript.
- Brugal, J.-Ph., and L. Raposo. 1995. Foz do Enxarrique (Ródão, Portugal): First Results of a Bone Assemblage from an Open-Air Middle Paleolithic Site. Paper presented at the ESF Conference, Neuwied, Germany, 1995.
- Callapez, P. 1999. Paleoecologia e polimorfismo do helicóide *Cepaea* (*Cepaea*) *nemoralis* (Linné, 1758) (Mollusca, Gastropoda) do Plistocénico superior da Lapa dos Furos (Ourém, Portugal). *Revista Portuguesa de Arqueologia* 2 (2): 5-14.
- Cardoso, J. L. 1993. Contribuição para o conhecimento dos grandes mamíferos do Plistocénico Superior de Portugal. Oeiras: Câmara Municipal de Oeiras.
- Cardoso, J. L., and L. Raposo. 1995. As indústrias paleolíticas da Gruta da Figueira Brava (Setúbal). In *3ª Reunião do Quaternário Ibérico, Actas*, pp. 451-6. Coimbra: Universidade de Coimbra.
- Cunha-Ribeiro, J. P. 1999. O Acheulense no Centro de Portugal: O vale do Lis. Contribuição para uma abordagem tecno-tipológica das suas indústrias líticas e problemática do seu contexto cronoestratigráfico. Tese de doutoramento pela Universidade de Lisboa.
- Delibrias, G., M.-T. Guillier, and J. Labeyrie. 1986. GIF Natural Radiocarbon Measurements X. *Radiocarbon* 28 (1): 9-68.
- Diniz, F. 1993a. Aspectos de vegetação e do clima de formações quaternárias entre Óbidos e Peniche. In *El Cuaternario en España y Portugal*, pp. 337-441. Madrid: Asociacion Española para el Estudio del Cuaternario.

- 1993b. Aspectos paleoflorísticos e paleoclimáticos do Plistocénico português. Análise polínica da jazida de Vale Benfeito (Ferrel). In *3ª Reunião do Quaternário Ibérico, Coimbra, 27 de Setembro a 1 de Outubro de 1993. Programa. Participantes. Resumos*: 45.
- Ellwood, B. B., J. Zilhão, F. B. Harrold, W. Balsam, B. Burkart, G. J. Long, A. Debénath, and A. Bouzouggar. 1998. Identification of the Last Glacial Maximum in the Upper Paleolithic of Portugal Using Magnetic Susceptibility Measurements of Caldeirão Cave Sediments. *Geoarchaeology* 13 (1): 55-71.
- Jiménez Fuentes, E., J. L. Cardoso, and E. G. Crespo. 1998. Presencia de *Agrionemys* (=Testudo) *hermanni* (Gmelin, 1789) en el Paleolítico Medio de la Gruta Nova da Columbeira (Bombaral, provincia de Estremadura, Portugal). *Studia Geologica Salamanticensia* 34: 123-39.
- Gautier, A. 1996. Les restes animaux de la grotte d'Escoural, Fouilles 1989, 1990, 1991. In *Recherches préhistoriques à la grotte de Escoural, Portugal*, ed. by M. Otte and A. C. Silva, pp. 323-36. Liège: ERAUL 65.
- McKinney, C. 1996. Datations by Uranium Series. In *Recherches préhistoriques à la grotte de Escoural, Portugal*, ed. by M. Otte and A. C. Silva, pp. 349-50. Liège: ERAUL 65.
- Otte, M. 1996. Industries paléolithiques. In *Recherches préhistoriques à la grotte de Escoural, Portugal*, ed. by M. Otte and A. C. Silva, pp. 91-105. Liège: ERAUL 65.
- Raposo, L. 1995. Ambientes, territorios y subsistencia en el Paleolítico Medio de Portugal. *Complutum* 6: 57-77.
- Raposo, L, and J. L. Cardoso. 1998a. Las industrias líticas de la Gruta Nova de Columbeira (Bombaral, Portugal) en el contexto del Musteriense final de la Península Ibérica. *Trabajos de Prehistoria* 55 (1): 39-62.
- 1998b. *O Paleolítico Médio da Conceição (Alcochete)*. Montijo, Lusoponte.
- Zilhão, J. 1995. O Paleolítico Superior da Estremadura portuguesa. Ph.D. diss., Universidade de Lisboa.
- 1997a. *O Paleolítico Superior da Estremadura portuguesa*. 2 vols. Lisboa: Colibri.
- Zilhão, J., ed. 1997b. Arte Rupestre e Pré-história do Vale do Côa. Trabalhos de 1995-1996. Relatório científico ao governo da República Portuguesa elaborado nos termos da resolução do Conselho de Ministros nº 4/96, de 17 de Janeiro. Lisboa: Ministério da Cultura.
- Zilhão, J., and C. McKinney. 1995. Uranium-Thorium Dating of Lower and Middle Paleolithic Sites in the Almonda Karstic System (Torres Novas, Portugal). In *3ª Reunião do Quaternário Ibérico. Actas*, pp. 512-16. Coimbra: Universidade de Coimbra.