The Middle-to-Upper Paleolithic transition in Portugal: an Aurignacian phase or not?

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ABSTRACT Several hypotheses to explain the absence in stratigraphic sequences of the Sicó limestone massif that span the Middle-to-Upper Paleolithic transition of lithic assemblages that can be techno-typologically classified as Aurignacian on the basis of the criteria adopted in southwestern Europe are discussed in light of the evidence from the technological analysis of Middle Paleolithic and recent Aurignacian assemblages from open air sites near flint sources from two regions of Portugal. This approach suggests that a certain lack of coherence exists in the choice of the criteria that have been utilized in the classical scheme to define breaks in sequences and to isolate cultural phases.

This study uses a technological approach to define operational schemes and flaking techniques present in lithic assemblages recovered from sites in central Portugal. It is an attempt to clarify the available data and to discuss the criteria used for the characterization of Middle and Early Upper Paleolithic cultural-technological phases. The assemblages from this cluster of sites, located at the western extremity of Eurasia, have been studied according to Middle and Upper Paleolithic schemes of classification used in southwestern France. However, the dating results obtained in the past decades have revealed a distinct chrono-stratigraphic sequence. It is generally accepted (Zilhão, 1993, 1997; Raposo and Cardoso, 1998; Zilhão and Trinkaus, 2002) that Portugal has been the "end of the line" for the diffusion of the "Aurignacian package" associated with the expansion of modern humans. This is represented by the persistence, at least until 30 000 BP, of an operational scheme and stone tools considered to be Middle Paleolithic markers, and of Neandertal manufacture.

Two transition models have been proposed for Portugal. In the first, artifacts recovered in the area of the open air settlements of Rio Maior, plus a few "Dufour" bladelets recovered in caves (Zilhão, 1993, 1997; Thacker, 2001; Zilhão and Trinkaus, 2002), are attributed to a final phase of the Aurignacian technocomplex. This indicates a permanent settlement of the region during a final phase of the "classical" Aurignacian sequence, as proposed for the southern part of Spain (Soler and Maroto, 1993). In this version, the scarcity of Aurignacian and Early Gravettian evidence is not related to population density but explained as the result of a destruction of settlements during a major erosional phase between 27 000 and 25 000 BP (Zilhão and Trinkaus, 2002). Others (Bicho, 2000; Marks, 2000; Straus et al., 2000) consider that no assemblage in Portugal can definitely be attributed to the Aurignacian technocomplex. They also conclude that assemblages considered as Aurignacian by Zilhão and by Thacker could be of a more recent age and, therefore, correspond to an undefined phase of the Magdalenian, or even of more recent times. Under this hypothesis and using the number of recorded sites as an indication of population density, these authors consider that the Gravettian occupations dated to about 25 000 BP correspond to the first permanent phase of occupation of Portugal by modern humans.

The goal of this study is to examine new data in order to reach a better understanding of this "transitional" phase, through taphonomical and technological analyses of lithic assem-

blages recovered recently in the Sicó region. This area has yielded many stratified sequences preserved in limestone caves and rock shelters. For comparison, we considered a recently discovered cluster of open air sites, associated with Bajocian flint sources. Finally, we compared these data to the Rio Maior open air assemblage of Vale de Porcos, attributed by Zilhão to the Aurignacian, located on good quality Cenomanian flint sources, 50 km to the south.

Data from the Sicó cave and shelter sequences

A research project begun in 1991 has permitted us to recognize Middle and Early Upper Paleolithic lithic assemblages preserved in occupation levels of caves and shelters in the Sicó area. This is a limestone highland rising to less than 600 m and located 40 km east of the Atlantic coast (Fig. 1).

Buraca Grande is a cave located on the northern slope of a deeply incised valley formed in Middle Jurassic limestone. The site was discovered during a systematic survey and excavated between 1991 and 2002 (Aubry et al., 1997). Two distinct sequences were recognized: 1) at the entrance and in the first hall of the cave, and 2) in the second hall, where excavation work uncovered a 3 m thick sequence of Holocene and Pleistocene occupation levels (Fig. 2). The bottom of the sequence, consisting of layers 9a, 9b and 10, was excavated in a small area

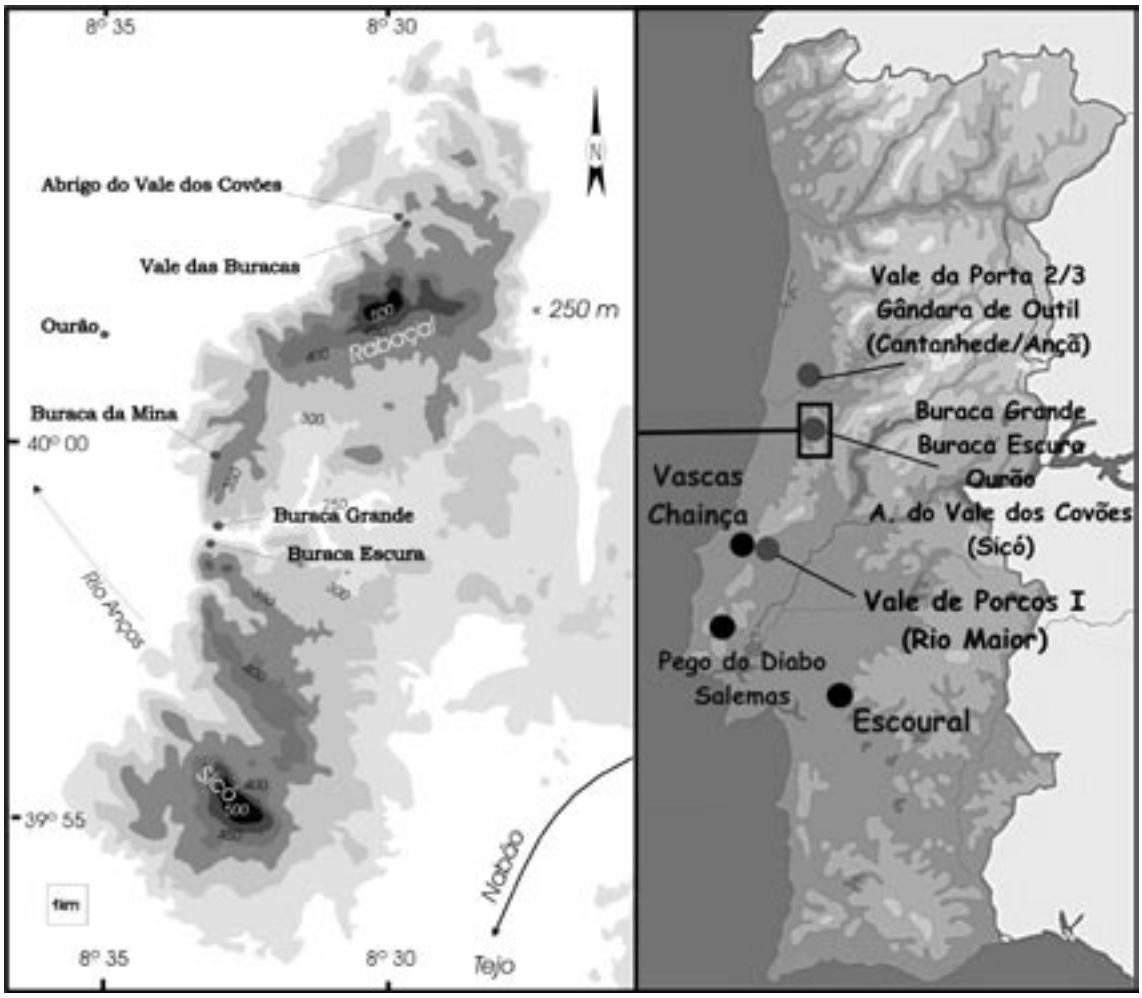

FIG. 1 – Location of the studied sites.

of <4 m². During the last excavation in 2002, new geological and archeological subdivisions were distinguished in unit 9b (9b1, 9b1-base, 9b2) (Fig. 2). Layers 10 and 9b2 contained a few *Capra ibex* remains and scarce artifacts (three quartz flakes and one quartzite flake obtained through a Levallois reduction process). Level 9b1-base showed evidence of erosion by runoff and contained a lithic assemblage of <100 flint pieces, the only retouched tools being notches (Fig. 2). The assemblage of layer 9b-1 is impossible to date on the basis of bone material; preliminary analysis in the Gif laboratory showed that the bones did not contain enough collagen. Level 9b yielded backed and truncated bladelets, as well as retouched bladelets, in its upper part, and microgravettes in the lower part (Fig. 2). The latter were produced from truncated burin cores or from splintered pieces. An AMS date on a charcoal fragment collected in layer 2b of the entrance, overlying layer 2a (which contained retouched tools and reduction processes similar to those of layer 9b), yielded a date of 23 920±300 BP (GifA-93048).

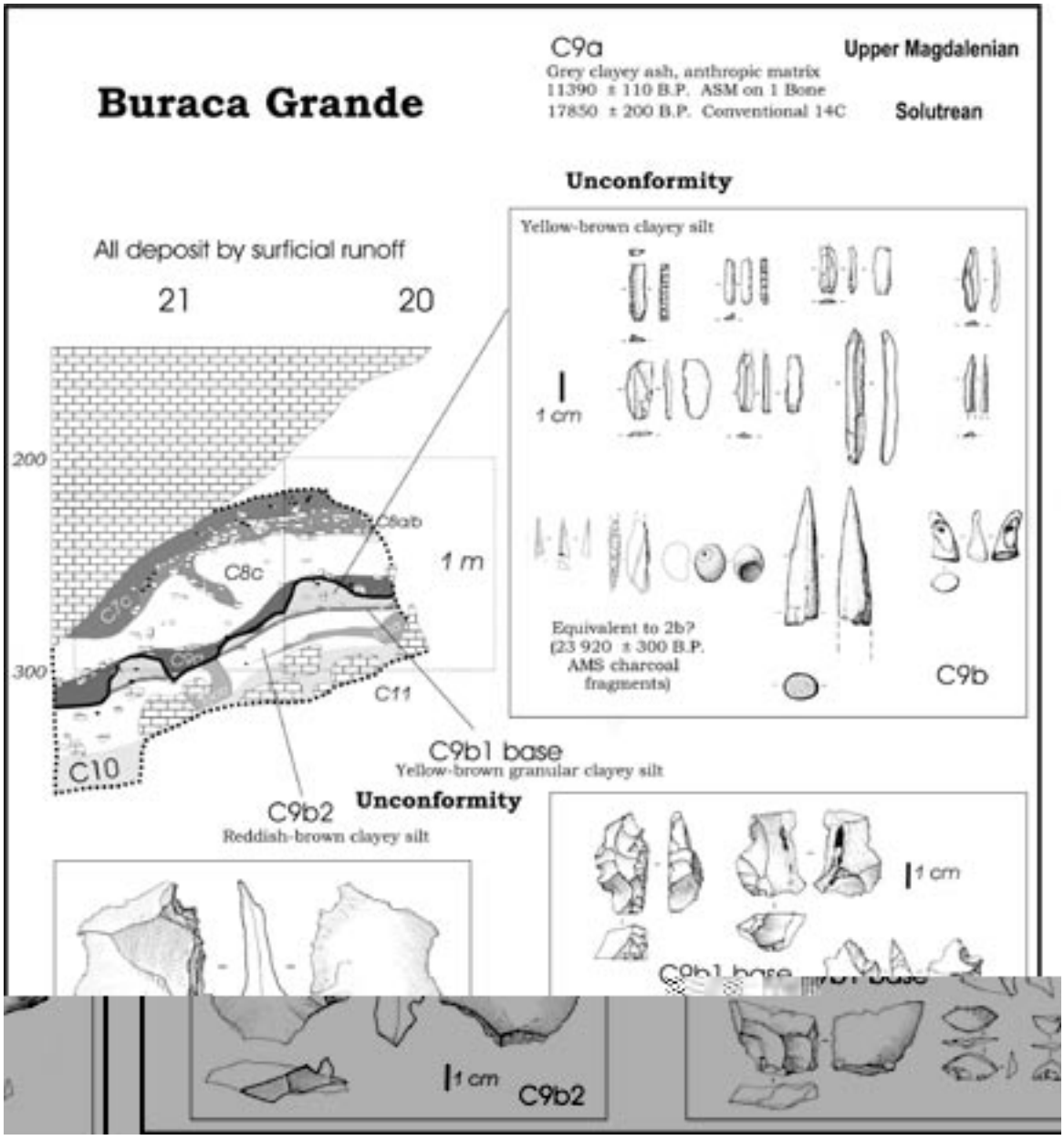

FIG. 2 – Buraca Grande. Profile, and a selection of artifacts from different archeological levels of the cave.

The Buraca Escura cave is located in the same valley as Buraca Grande, but on the opposite slope. Excavations conducted at the same time revealed a Middle Paleolithic sequence of occupation (Fig. 3). There were fewer than 15 flaked stone pieces in two levels excavated over some 12 m², all produced (but not in the cave) from Levallois, discoidal and bipolar cores, and with a hard hammer (Almeida et al., 2003). Animal bone accumulations were related to carnivore activity at the cave (Aubry et al., 2001). Three dates obtained by the U-Th method have a large statistic error and show an inversion: 70 000 BP (40 000/100 000)±30 000; 50 000 (20 000/70 0000)±30 000 BP; and 81 000 (65 000/97 000)±16 000 BP. Locally in the cave, Early Upper Paleolithic deposits are preserved (Fig. 3) in a sequence dated by AMS on bones with high collagen content (Aubry et al., 2001). Level 2e contained a single fragment of a Gravette point, associated with *Capra ibex* remains and dated to 26 560±450 BP (GifA-97258). As indicated by Zilhão and Almeida (in Zilhão and Trinkaus, 2002), the association of these bones with the Gravettian material is not clear, but artifact typology is distinct from the middle and recent Gravettian of Portugal (Zilhão, 1997), and the chronology obtained is compatible with the French sequence.

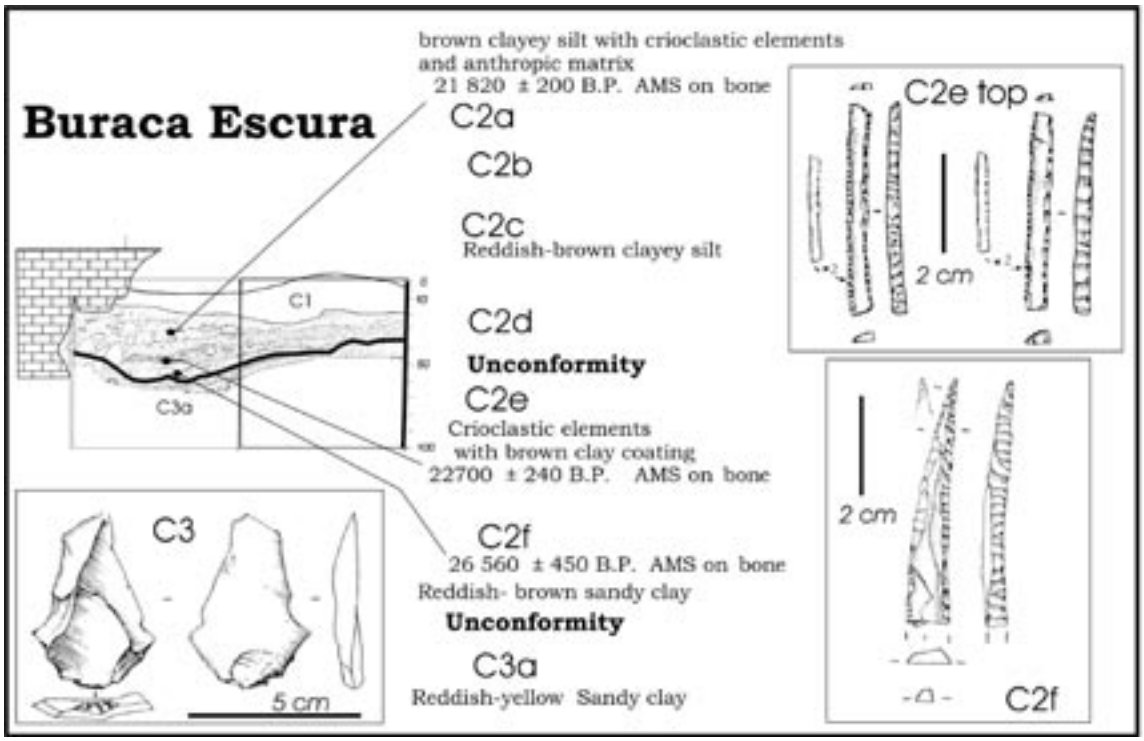

FIG. 3 – Buraca Escura. Profile, and a selection of artifacts in the lithic assemblages from the cave.

Five kilometers to the north, in a small intensively karstified limestone hill, two caves were excavated under the direction of Jean Roche and João Pedro Cunha Ribeiro (Ribeiro, 1982; Zilhão, 1997). One of these two cavities, with a vertical entrance that was originally filled with deposits, revealed a Neolithic funerary occupation. Excavations during 1995 and 2002 showed that the Neolithic occupation was underlain by older occupations in a 1 m thick sequence (Fig. 4). Macrofauna is rare and does not contain collagen, and the stalagmitic floor formations are not pure enough for dating. Technologically, cores were reduced by a process of progressive centripetal flaking with a hierarchy of face preparations and with faceting of the striking platforms (Almeida et al., in press). This process is associated with a Kombewa

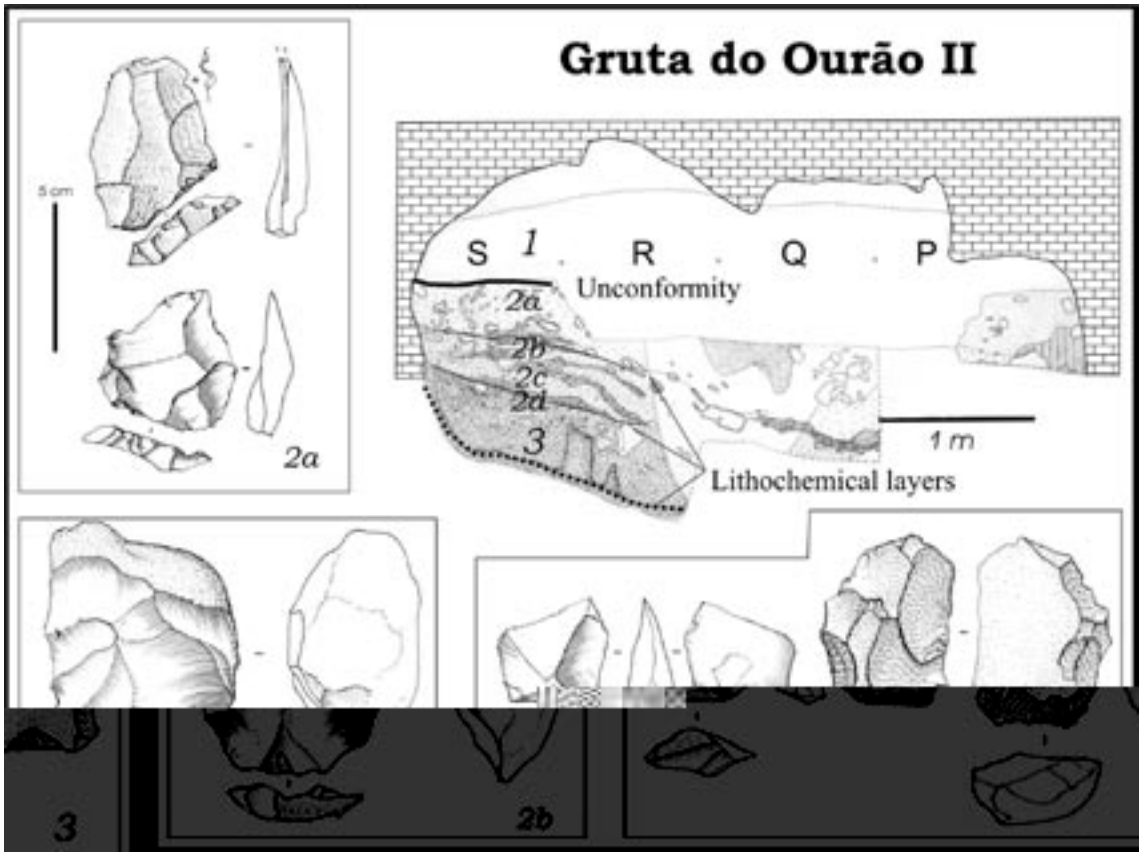

FIG. 4 – Ourão. Profile, and a selection of artifacts in the lithic assemblages from the cave.

reduction process, as seen also in the Buraca Escura assemblage (Almeida et al., 2003) and in assemblages from other sites (Marks et al., 2001).

Eight kilometers northeast (Fig. 5), the same project excavated two other sites in a similar incised valley on the western limit of the relief. The first sequence, in secondary position, comprises three layers. The lowermost layer contained micrograveттes and retouched bladelets. The core reduction process was bidirectional bladelet production from burin cores with facetted striking platforms and removal by soft hammer.

The second sequence was preserved in a limestone shelter, named Abrigo do Vale dos Covões, located 1 km downstream. The shelter (Fig. 5) was tested during 2001 and then 9 m^2 of it were excavated in 2004. The almost 2 m thick stratigraphic sequence consisted of eight layers and revealed at least three different cultural-technological phases of human occupation (Fig. 5). The 211 pieces recovered in the base of layer 8b include two "Dufour bladelets", five fragments of retouched bladelets, and a bone point fragment. Analysis of the lithic assemblage and refitting work indicates that bladelet production used a soft-stone hammer on carinated and burin cores and is associated with a blade production using a soft-stone or soft organic hammer. The typological association of backed bladelets and bladelets with alternate retouch is not similar to that in the tool assemblage from level 2b of the Pego do Diabo cave, where bladelet retouch is either alternate or, when direct, marginal (Zilhão, 1997). The rich lithic assemblages in layers 5 to 7 contained more than 250 fragments of micrograveттes and backed bladelets obtained from truncated burin cores. Layers 3 and 4 contained micro-retouched bladelets extracted from flakes by a carinated core process.

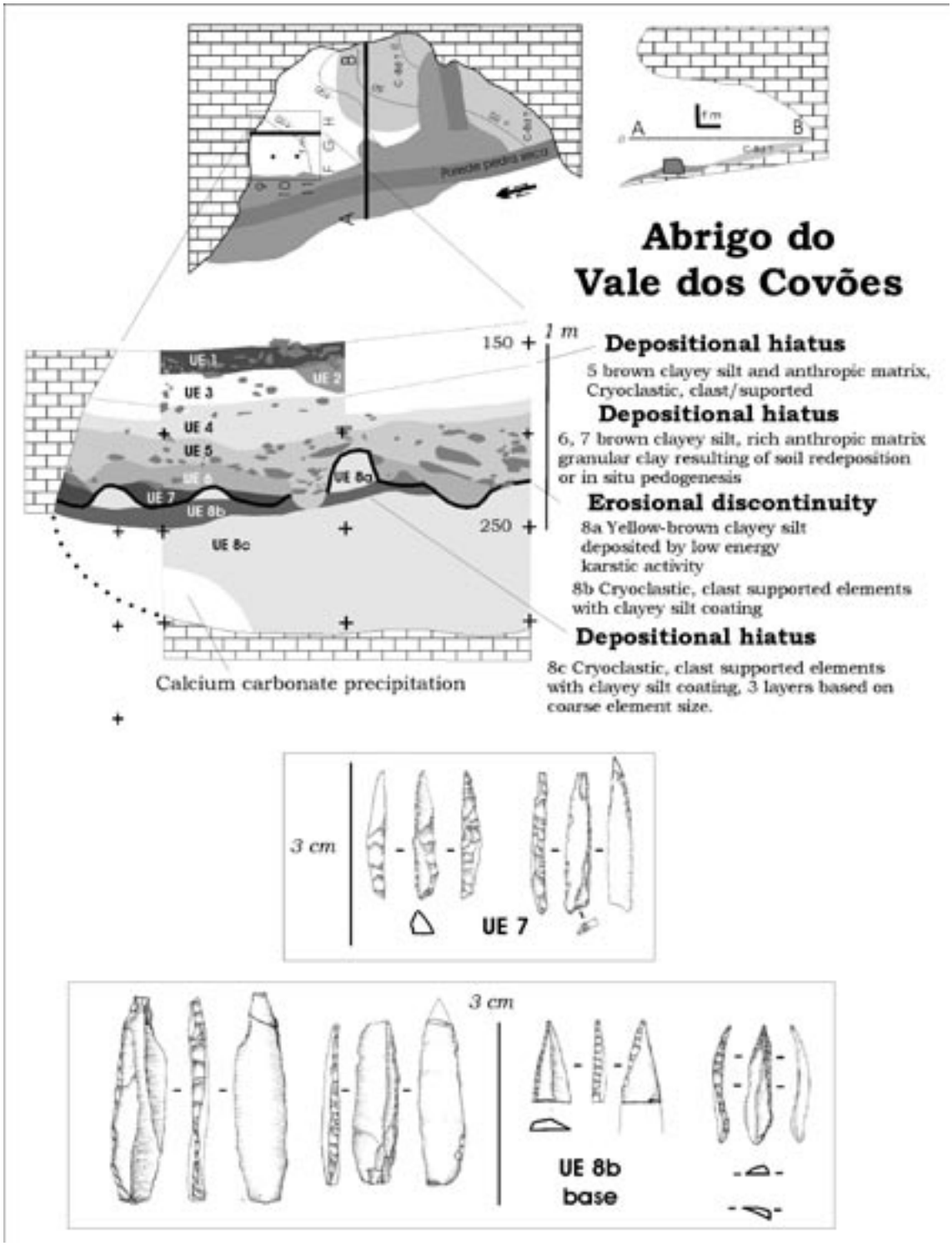

FIG. 5 – Vale dos Covões. Profile, and a selection of artifacts in the lithic assemblages from the rock shelter.

Open air occupations on the Cantanhede/Ançã Bajocian flint sources

The Cantanhede/Ançã region is located in the Geria river basin, a left bank tributary of the Mondego, 20 km north of the Sicó relief (Fig. 1). In this area, the same Bajocian limestone formation bears large and numerous poor quality flint nodules in primary position, and bet-

ter quality ones in secondary position. This limestone has been intensively exploited for stone construction materials, mainly for the city of Coimbra. Exploration of the formation has revealed some caves but no archeological sites have yet been detected.

The two open air sites of Vale da Porta 2 and 3 were discovered and excavated under the direction of Miguel Almeida and Maria João Neves, during salvage work related to a highway project. These sites lay on the two banks of a secondary tributary of Vale da Grota River, directly on Bajocian flint outcrops (Almeida et al., in press; Almeida and Neves, in press). The stratigraphic sequence of deposits overlying the limestone has been studied by D. Angelucci (2002) (Fig. 6).

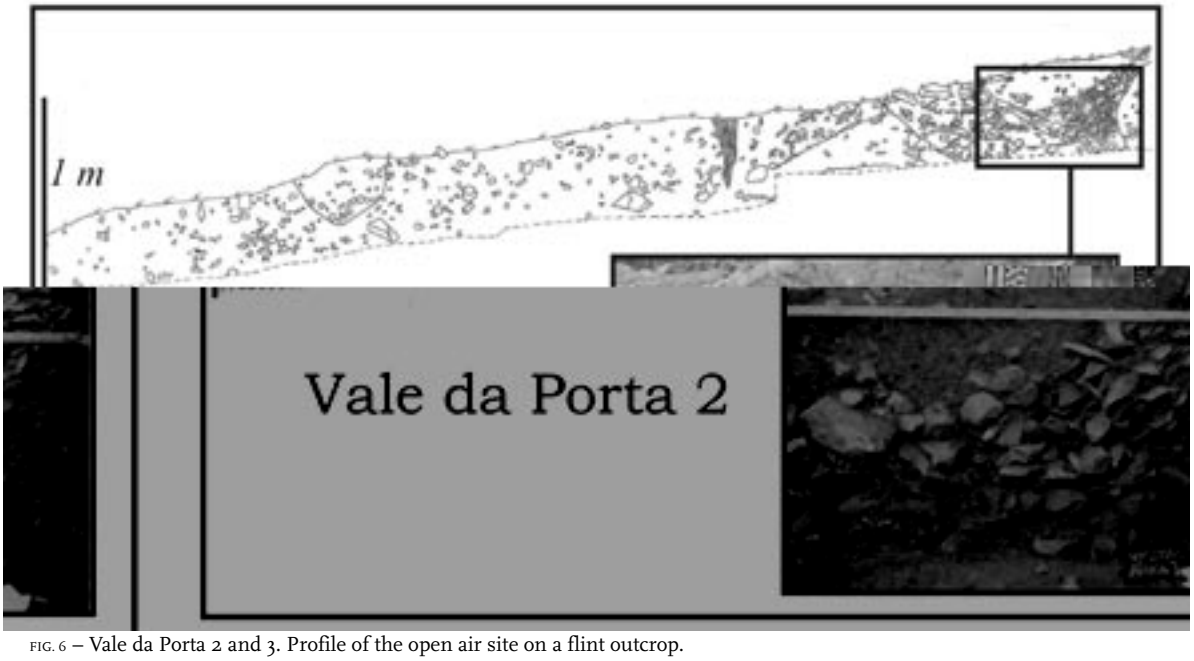

FIG. 6 – Vale da Porta 2 and 3. Profile of the open air site on a flint outcrop.

Several thousand flaked stone blanks and shatter, obtained exclusively by hard stone hammer removal, exhibit a centripetal discoidal and Levallois production of triangular, circular, and oval flakes. In association with this centripetal concept, small flakes and "bladelet--like" flakes were produced using a carinated core scheme. Blade-like flakes and flakes were also produced using a hard stone hammer, on prismatic unidirectional or bidirectional cores prepared by cresting in an "Upper Paleolithic" manner (Fig. 7). OSL dating of wind-deposited sediments, below and above an archeological level, is in progress.

Not directly on the flint outcrop, and 1 km from Vale da Porta, the site of Gândara de Outil 1 was discovered during a systematic survey after deep soil preparation for tree plantation. The section cut by the road shows a thick wind-accumulated deposit. The lithic assemblage (1784 pieces) exhibits a primary core reduction strategy based on carinated burin and busked burin techniques. These were produced from flakes made by hard hammer following a discoidal core reduction method; their extraction, however, was carried out elsewhere, and those flake blanks introduced into the site. Manufacture of bladelets discarded on the site was done with a hard stone hammer, with technological analysis indicating that some bladelets are missing (Fig. 8). Associated with this process is the production of flakes and large bladelets removed by hard hammer from prismatic cores, both uni- and bidirectional.

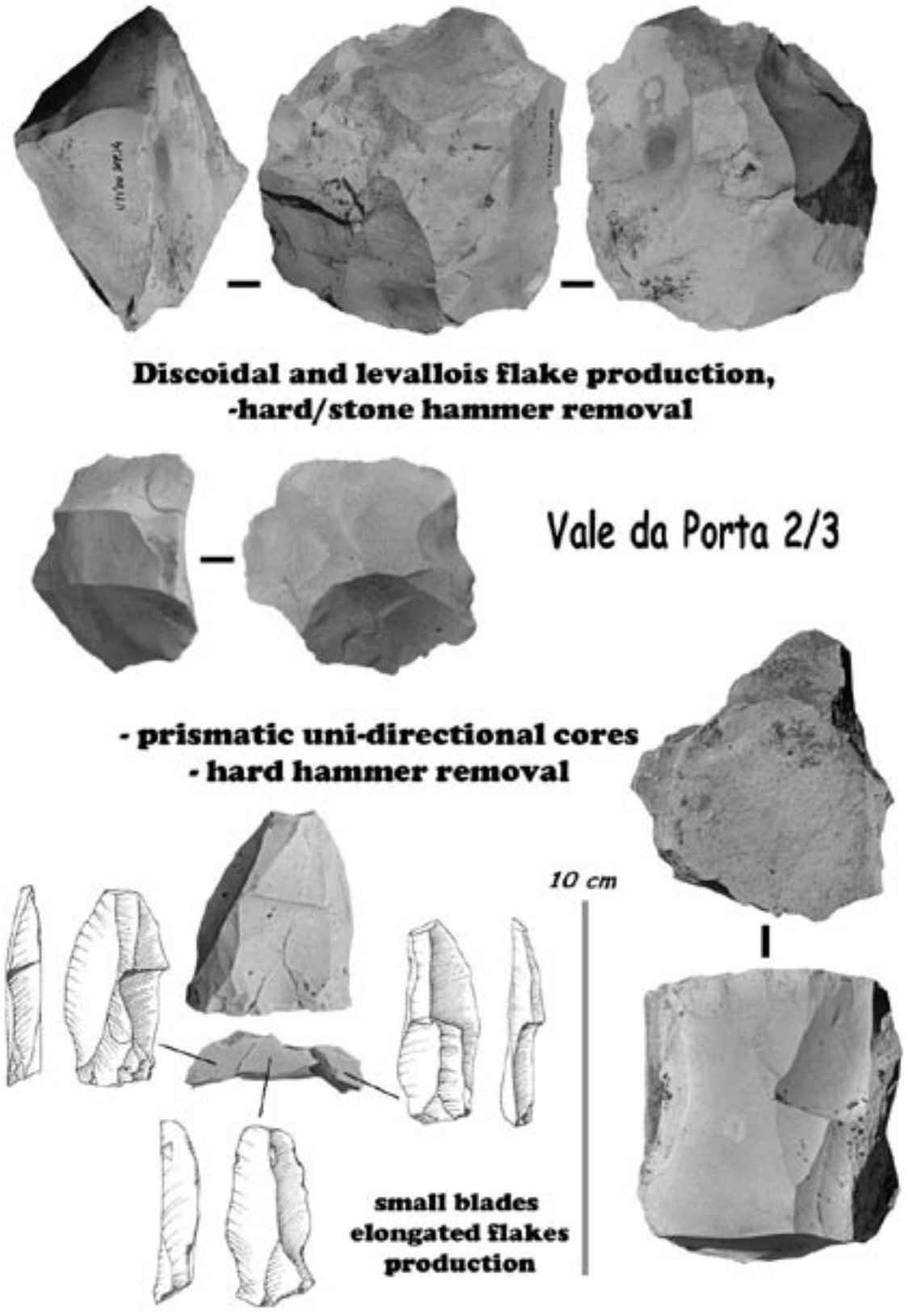

FIG. 7 – Vale da Porta 2 and 3. Stone tool technology and operational scheme represented in the lithic assemblage.

FIG. 8 – Gândara de Outil. Operational scheme represented in the lithic assemblage and carinated core reduction sequence.

The evidence from the Mondego basin: Aurignacian occupation or not?

The only flaked stone assemblage recovered from the cave and shelter sequences of the Sicó area that could correspond to the typo-technological attributes of the Aurignacian as described in the southwest French "classical model sequence" is the lithic assemblage uncovered in the basal level of the Abrigo do Vale dos Covões (Fig. 5). However, the typological similarity of the Dufour and retouched bladelets with some of the *fléchettes* from level 5 (rear) of the Abri Pataud (Bricker, 1995) must be pointed out. Dates for this level are of 28 150 BP±225 BP (GrN-4634) and of 28 400 BP±1100 (OxA-169), identical to the single result available in Portugal for a sample accepted to be in association with a lithic assemblage containing the same type of retouched bladelets, that obtained on bone fragments from level 2b of Pego do Diabo cave: 28 120/+860/-780 BP (ICEN-732) (Zilhão, 1997).

In the other regional cave sequences, layers containing typo-technological Gravettian assemblages overlie levels containing few stone artifacts where blade and bladelet production is completely lacking. Those artifacts were all produced by hard hammer removal from Levallois discoidal cores (Almeida et al., 2003) and, in one case (level 9b base of Buraca Grande), are typologically dominated by notches.

Two interpretations have been proposed to explain these patterns. Bicho (2000), Marks (2000) and Straus et al. (2000) think that Middle Paleolithic assemblages (technologically defined) survived until 30 000 BP or later, and that the Aurignacian would be represented only by "incursions" originating from northern Iberia. In the second interpretation, the Aurignacian I is lacking and the expansion of modern humans took place in a recent phase of the Aurignacian (Zilhão in Zilhão and Trinkaus, 2002, 2003). The scarcity of sites from this phase could be explained by geological bias induced by post-depositional processes eroding away Aurignacian and initial Gravettian occupation levels in open air sites (Zilhão, 2001). However, it is difficult to argue along these lines to explain the absence of diagnostic Aurignacian remains, in secondary

position, not only in the open but also in the Middle-to-Upper Paleolithic sequences of every single hydrological karst system of Portugal. In this respect, it must be noted that some "Dufours bladelets" were indeed identified in early Upper Paleolithic palimpsests that also contained Gravettian material at the caves sites of Salemas and Escoural, and that technologically "Aurignacian" blades were recovered in secondary position in fluviatile deposits at the open air sites of Arneiro and Passal, in the Rio Maior basin, downstream from Vale de Porcos (Zilhão, 1997).

These patterns may also be used to support an explanation of Aurignacian subsistence/settlement patterns as being distinct from Middle Paleolithic and Gravettian ones, along the lines suggested by White (1982) for the Middle-to-Upper Paleolithic transition in southern France. As a matter of fact, all Middle Paleolithic and Gravettian occupation levels in caves and rock shelters seem to correspond to seasonal/logistic explorations of highland faunal resources, and not to residential sites, which are still missing (Zilhão, 1997; Aubry et al., 2001).

It is also possible that the interassemblage variability of Middle and Early Upper Paleolithic flaked stone assemblages was greater than generally accepted when we try to apply the classical French sequence. This kind of problem appears obvious when we analyze the Vale da Porta 2 and 3 assemblages according to the classical chrono-cultural classification of the Paleolithic.

The carinated core reduction process represented in the Gândara assemblage may be typo-technologically compared to the most recent Aurignacian phase of the southern French classical sequence (Bordes, 2002). However, we must keep in mind that such a bladelet production process on flake cores has been described in Final Gravettian, Magdalenian and Mesolithic assemblages as well, and thus is not chronologically meaningful (Almeida, this volume). In a French site, recent dating of bones associated with artifacts attributed to the Aurignacian (Lebrun-Ricalens and Brou, 2003) has revealed an age compatible with a Tardiglacial chronology for an assemblage previously attributed to a recent Aurignacian phase.

To examine this issue objectively, we compared the Gândara assemblage with the flaked stone artifacts of the Vale de Porcos site, considered by Zilhão (1997) to belong to the final phase of the Aurignacian in Portugal.

Comparison with the Vale de Porcos lithic assemblage

The only possible typo-technological comparisons with other sites in Portugal are with the lithic assemblages from the Rio Maior region (50 km to the south), excavated by Manuel Heleno in 1952-1953. The sites of Vascas and Vale de Porcos I are both located on Cenomanian flint sources, a good quality material available in large quantities as regular nodules. We discuss here only the assemblage from Vale de Porcos I (783 pieces), studied by João Zilhão. In his work, he identified a change in the morphological attributes of blade platforms as one progressed along the core reduction sequence (Zilhão, 1997).

Technological analysis and preliminary refitting of this assemblage by Thierry Aubry and Miguel Almeida identified a phase of core preparation by cresting, flakes being removed by hard hammer, and a phase when blades were produced by soft organic hammer, with linear, unfaceted or faceted striking platforms, as observed by Zilhão (1997). The cores resulting from this production are morphologically distinct from those published for the initial Aurignacian phase in France and northern Spain (Bon, 2002; Bordes, 2002). They were reused to obtain elongated flakes, blade-like flakes, and large bladelets, removed by a hard stone hammer, after reaching a width of about 1,5 cm (Fig. 9). Refitting shows that some thick flakes removed with a hard stone hammer were used for bladelet production on carinated cores, or for a distinct reduction sequence of flakes using a discoidal method (Fig. 9).

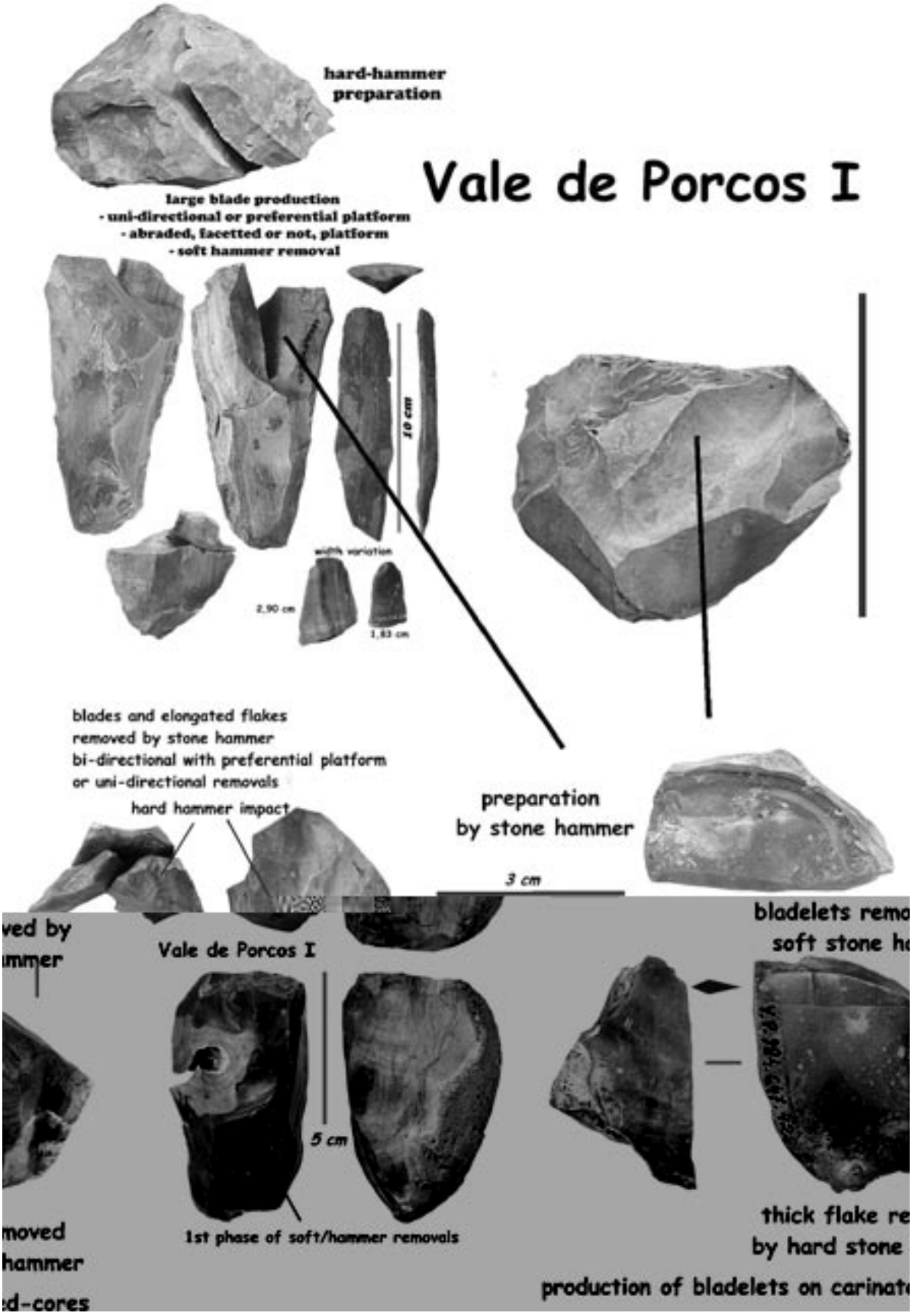

FIG. 9 – Vale de Porcos. Operational scheme represented in the lithic assemblage.

The chronology of these assemblages recovered from open air sites, where no material for dating has been found, has been established on the basis of geological inference and morphological correlation of bladelets produced from flake cores (Zilhão, 1997). Retouched Dufour bladelets recovered from the sites of Pego do Diabo, Escoural and Salemas have also been used for typological dating. Zilhão (1997) has used these positive correlations and the presence of a production of large blades unlike any other in the entire Upper Paleolithic sequence to suggest that these assemblages are the result of functional specialization between Aurignacian workshops located on flint outcrops and Aurignacian logistical sites located in caves and dominated by Dufour bladelets, residential sites still having not been found. The only date accepted to be in association with such occupations is that of ca.28 000 BP mentioned above for level 2b of Pego do Diabo. This date corresponds with the younger limit of the statistical distribution of dates obtained for occupations attributed to a final Aurignacian phase in southern Spain (Zilhão and Trinkaus, 2002). The similarity with some bladelets with alternate retouch found in Perigordian IV assemblages from the Dordogne, however, must not be forgotten. The dating of charcoal in stratigraphic association with the lithic assemblage at the base of level 8b of Abrigo do Vale dos Covões may eventually contribute to clarify these issues.

Bicho (2000) has criticized this model and suggested a Magdalenian chronology for the Rio Maior workshop sites. His solution, however, is not convincing, because the association of bladelets produced from flake cores with large blades removed by direct percussion with soft hammer is unknown in the entire Magdalenian of Portugal and Spain (Zilhão, 1997; Bicho, 1998).

Concluding remarks

In Portugal, the variability and chronology of the Middle Paleolithic sequence is still under evaluation (Raposo and Cardoso, 1997; Marks et al., 2001; Zilhão and Trinkaus, 2002; Almeida et al., in press), with blade and bladelet production sequences being one possible component of flaked stone production (Zilhão, 2001). The comparison of the data obtained by the technological study of the newly discovered Gândara assemblage and of level 8b of Abrigo do Vale dos Covões, comparisons with the classical French sequence, the features of the lithics from Vale de Porcos, and the morphological and technological correlation of "Dufour bladelets", all argue for an attribution to a recent phase of the Aurignacian or to an initial Gravettian. This proposition will be verified by radiochronometric dating of Gândara do Outil 1 burnt stone pieces (TL) and sediments (OSL), as well as of charcoal (^{14}C) uncovered in basal level 8b of the Abrigo do Vale dos Covões. Technological differences between these lithic assemblages and the southern French series must be explained through the integration of flake production in the reduction sequence of blade cores, the strategy of preparation of large blade cores, and the reduction processes used in the production of blades and bladelets. If, on the basis of available data, Zilhão's proposal seems to us to be the most parsimonious, there are problems that remain unexplained and that do not yet allow for other chronological hypotheses to be removed from further consideration.

A combined archeological and geological approach to both cave and open air site sequences would probably allow us to establish the real biases introduced in the data set by the differential preservation of regional deposits dated to the time of the Middle-to-Upper Paleolithic transition. Such an approach might also allow us to define a method for the detection of open air residential sites in the hydrographic basins now covered by dunes that are located between the limestone highlands and the coast.

In the course of this study, based on a technological approach, and on a comparison with the "classical French sequence", we observed a European-wide lack of information on technology and raw-material sourcing concerning the later Aurignacian and the transition to the Gravettian, in contrast with the special attention given in the last decade to the Aurignacian I. Moreover, it is apparent to us that the establishment of sequences is usually based on a kind of circular reasoning where the typologies of bone tools and ornaments, accepted as markers of the age and unity of the different phases of the Aurignacian, mask the great diversity in flaked stone production methods and in types of retouched tools. This diversity may in turn obscure the complex contacts and exchanges that may have existed between very distinct contemporaneous cultural groups living in the vast geographical area encompassed by the Aurignacian phenomenon.

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