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SOUTHERN PORTUGAL

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Introduction

While during the 5 year period before the 2006 UISPP meetings, the number of excavations of new Upper Paleolithic sites in Portugal was fairly large (Aubry & Bicho 2006), for the second half of the decade, corresponding to the present *Bilan* the number of sites has severely decreased, especially in the South. The same is true for ongoing excavations, with Vale Boi as the only exception in southern Portugal (Bicho *et al.* 2010a). Thus, Vale Boi is the main focus of the present report.

The amount of data, however, resulting from analysis of the materials recovered during the last decade has increased exponentially, due mostly to the conclusion of various M.A. theses and one Ph.D. dissertation. In fact, since 2006, there have been five M.A. theses and one Ph.D. dissertation presented at the University of Algarve on a diversity of Upper Paleolithic technological topics. These covered the various lithic technological periods, Gravettian, Solutrean and Magdalenian (respectively, Marreiros 2009a; Cascalheira 2009; Mendonça 2009) and are the basis for on going Ph.D. projects covering the whole of southern Iberia. Another study focused on the organic weaponry of southern Portugal with a stronger focus on the Vale Boi materials (Évora 2007). She has now moved to a much larger doctoral project, with a similar topic, but covering most of southwestern Iberia. More recently, Regala (2011) just concluded a study of the technology of production of the Vale Boi Upper Paleolithic pendants. Finally, Pereira's doctoral work (Pereira 2010) focused on a diachronical perspective on the use of quartzite and other non-chert raw materials during the Upper Paleolithic.

In addition to these academic studies, a three year project was funded during this period by the Portuguese National Foundation (FCT – Fundação para a Ciência e Tecnologia) - PTDC/HAH/64184/2006. This project was entirely dedicated to the study of Upper Paleolithic of Vale Boi. Some of the results of that project, coming to an end during the first semester of 2011, have been published and presented in many international congresses in both Europe and USA. Probably some of the most interesting aspects are the very early dates found for the older Gravettian horizons and the presence of a clear very wide diet breadth, including the earliest evidence of grease rendering, since the very beginning of the Upper Paleolithic in Vale Boi (Aubry & Bicho 2006; Manne & Bicho 2009; Manne *et al.* in press).

A very important discovery at the end of the 2010 field season was the location of what seems to be a Mousterian layer, between an early Upper Paleolithic horizon (still not dated or described in the present paper) and the earliest Gravettian level radiocarbon dated to *c.* 28 RCYBP. Results on radiocarbon dating are expected any moment for all these levels. Based on this evidence, Wenner Gren Foundation has funded a new short term project to investigate the transition from the Middle to the Upper Paleolithic in Vale Boi.

The new data

Gravettian

In the Vale Boi Rockshelter an approximate area of 20m^2 has been excavated, in which three consecutive levels are attributed to the Gravettian, Solutrean and Magdalenian. The Magdalenian materials are very scarce and probably the human occupation extends to the southern side off the excavation area (Mendonça 2009). Both Gravettian and Solutrean (Cascalheira 2010) deposits are sealed bellow the limestone boulders that, around the Last Glacial Maximum, collapsed from the shelter cover (Bicho *et al.* in press). The Gravettian collection is fairly small with flakes, cores and double backed points, and marked by the presence of faunal remains well preserved. The dispersion of the artifacts and fauna, however, seem to suggest some kind of erosive process took over the deposit.

There are two Gravettian levels in the Terrace section of the site. The remains from the upper occupation are associated with a hearth, that contained charcoal dated to c. 24 K RCYBP. The lower level contains a high concentration of lithic and faunal remains, with a date on charcoal of c. 28 RCYBP. Although there is a thick hiatus and sediment changes between the occupations, from the technological perspective both industries are similar, even though double backed points are only associated with the lower level.

Gravettian lithic assenblages at Vale Boi are composed of chert, quartz and greywacke, each element comprising different kinds of reduction strategies. Most lithic raw materials were acquired regionally, from deposits located no more than 20 km from the site (Verissimo 2005). Though technological and functional qualities are different, quartz and greywacke exploitation appears to be rather simple and similar in the assemblages at Vale Boi. This is not, however, the case for chert (Bicho *et al.* 2010a). Chert technology presents distinctive reduction sequences. The nodules found at Vale Boi are small and of low quality, which characteristics undoubtedly influenced the technological sets. Thus, during the Early Upper Paleolithic, chert nodules were reduced without shaping or preparation and maintenance of the core, resulting in simple cores with no more than two platforms. These were intended to produce primarily flakes (Cascalheira *et al.* 2008; Marreiros 2009b; Marreiros *et al.* 2009).

Prismatic reduction sequences and technology for producing elongated blanks are rare. In fact, the marginal presence of these blanks is highly evident when compared with patterns established for typical Gravettian technology; still, bladelets are present while blades were not produced (Marreiros et al. in press). The low frequency of preparation or rejuvenation elements, such as crested pieces, core tablets and core trimming elements, reflects a technology without major configuration of the striking platform or debitage dorsal surface. Thus, chert cores were predominantly used for flake production (Marreiros et al. in press).

The initial phase of debitage aimed the preparation of the flaking surface through a circular pattern of flake extraction. The following phase focused on the production of, flakes and bladelets, each obtained from two different strategies. Flakes are the most common blanks in the entire collection and were produced from simple, yet not prepared platform. Flakes were used as blanks for bladelet cores through two different ways: (1) cortical and non-cortical flakes were used as blanks to make retouched tools, such as burins and carinated and other thick endscrapers, (2) or for both daily tasks or as bladelets cores. Bladelets were extracted from carinated endscrapers and burins, and then shaped into microlithic tools. The most interesting aspect of these Gravettian occupations is the absence of typical Gravettian weaponry, such as La Gravette or Micrograve points.

The lower level (*c.* 27 Kyr) is characterized by the presence of a singular type of backed tool: double backed points. With no known parallels in other Early Upper Paleolithic assemblages from the Iberian Peninsula, it was identified in different assemblages across Western Europe. In the case of Mediterranean Europe always matches Early Gravettian occupations (Pesesse 2006; Boscato *et al.* 1997).

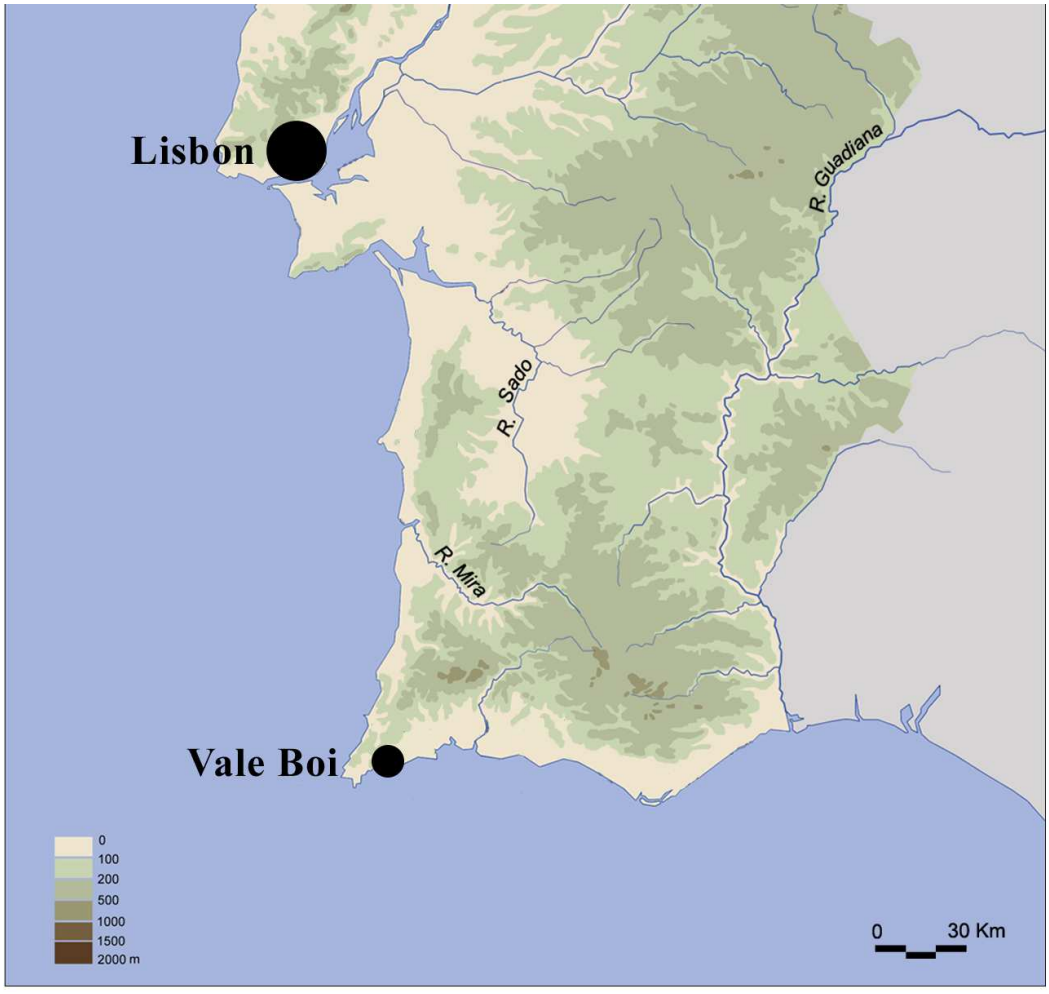

Figure 1 – Location of Vale Boi in southern Portugal.

The upper level (*b*24 Kyr) has similar technological patterns. The tool kit is marked by, in addition to the double backed and double pointed tips, it has simple backed bladelets. Still, there is an absence of typical Gravettian armatures. The macro and micro use-wear analysis show that these double pointed tools were used as projectiles. Impact fractures are present in 4 of the 12 backed pieces indicating that they were used in hunting activities.

Proto-Solutrean

The Proto-Solutrean is present in the Slope and Terrace areas. In the case of the Terrace where the lithic assemblages have been analyzed, materials are present in the top artificial levels of layer 4. Unfortunately, there are not radiometric dates at the moment. Like the underlaid Gravettian, the most common raw materials are chert, quartz and greywacke. Their technological traits are, however, distinctive. Quartz is the most common raw material in the assemblage like what is known in Portuguese Estremadura (Almeida 2000). For the first time, there are exotic raw materials: jasper, quartzite, probably both exogenous to the area, and chalcedony, a local mineral. Flakes dominate the quartz blank assemblage, while elongated products are rare. Quartz flakes were used as blanks for notches, endscrapers, sidescrapers and scaled pieces.

Chert is the raw material that presents wider range of technological classes. From these one can note the common frequency of bladelets. Unlike the Gravettian technology, the presence of trimming elements indicates that core preparation in order to configure prismatic cores for bladelet production. The relevant frequency of cortex on cores suggests that reduction sequences were carried out at the site. The tool kit is mostly represented by tools made on chert. It seems evident that certain classes and retouched tool types such as endscrapers, elongated blanks with continuous retouched in one or both edges, denticulates, were intentionally made on local chert.

Jasper was exclusively used to make Vale Comprido Points. The closest source for this his exogenous rock can be found in secondary position in the river banks of the Guadiana River, close to 100 km from the site (Francisco Almeida, personal communication). The Vale Comprido points are known for the Portuguese Estremadura as type-fossils for the Proto-Solutrean (Zilhão 1997), the transition culture between the Gravettian and the Solutrean.

Solutrean

Although some points à face plan have been identified in the early Solutrean levels in the Slope area of Vale Boi, the existence, in Southern Portugal, of a Middle Solutrean occupation, in its traditional definition, still cannot be confirmed. Thus, only Upper Solutrean lithic technology can be clearly described, based at the moment, exclusively on the materials recovered from the Rockshelter section.

While in techno-typological terms the Solutrean lithic industries are naturally different from the Gravettian assemblages, the choice and use of raw materials was essentially the same. Local chert, quartz and greywacke were the most used materials. The differences can be found in much lower percentages of quartz than in the previous phase, and in the sporadic use of chalcedony for the manufacture of bifacial implements. Quartz and greywacke maintain, also, their functional dichotomy either as knappable materials for, mainly, flake production or as pounding elements associated with activities involving heating, such as stone-boiling for bone-grease rendering (Manne *et al.* in press).

In the case of chert, the patterns of exploitation indicate favored debitage sequences, relatively simple, through which it would be obtained, by a well-structured management of the nodules, all the blanks needed for the manufacture of both bifacial and non-bifacial tools.

The decortication of chert nodules, as well as their initial preparation, was generally performed on-site. This is demonstrated by the constant presence of debitage elements with full cortex, and from the various by-products of core preparation, including crested pieces. The cortical products resulting from this first phase were mainly used for the production of endscrapers and common tools, such as notches and denticulates. After this initial stage, two types of debitage sequences were employed. The first involved a unidirectional sequence for the extraction of flakes and elongated products, while the second utilized a mixed sequence. The latter would involve prismatic exploitation of, frequently, two opposed platforms and less often, three platforms, with one isolated platform located on the back of the core.

Though still within a context of flake dominated reduction sequences, a greater focus on blade extraction than in the previous technocomplexes is evident in the assemblage. The blanks were then transformed into a great variety of tools including small *à cran* backed points and the rarer and larger Atlantic à cran points with invasive retouch. Other projectile points, such as the traditional Solutrean laurel and false willow leaf bifacial points, as well as the stemmed Parpalló points were also produced on-site (attested by the presence of a good quantity of bifacial thinning flakes and bifacial preforms) and within the sequences mentioned, mostly by the progressive bifacial thinning of thick and large flakes. Heat treatment has been identified (Gibaja & Bicho, in press), but is only observed from final production phases of bifacial elements, when meticulous retouch by pressure was applied to finish the pieces (Cascalheira 2010).

Stemmed projectiles appear at Vale Boi in a great variety of subtypes, including the so-called "pedonculated arrow" (Zilhão, 1997) present in Portugal only at the Solutrean assemblages of Salemas cave. There is also a unique, very small, flattish type, stemmed only by one notch in each side and semi-abruptly retouched on both sides to make it pointed. On the other hand, and within this diversity, a gradual assimilation of the concept of the stemmed point was possible to identify. In fact, the differentiation between layers for this type of projectile seems to reveal a first phase of its adoption, around 20,000 BP. It is represented by the presence of wider, thicker, and coarser retouched elements, passing through an intermediate stage in which the morphologies are more varied and the improvement of the bifacial technology is well-evident. This phase culminates in a decrease in the percentage of these points, but the projectiles became

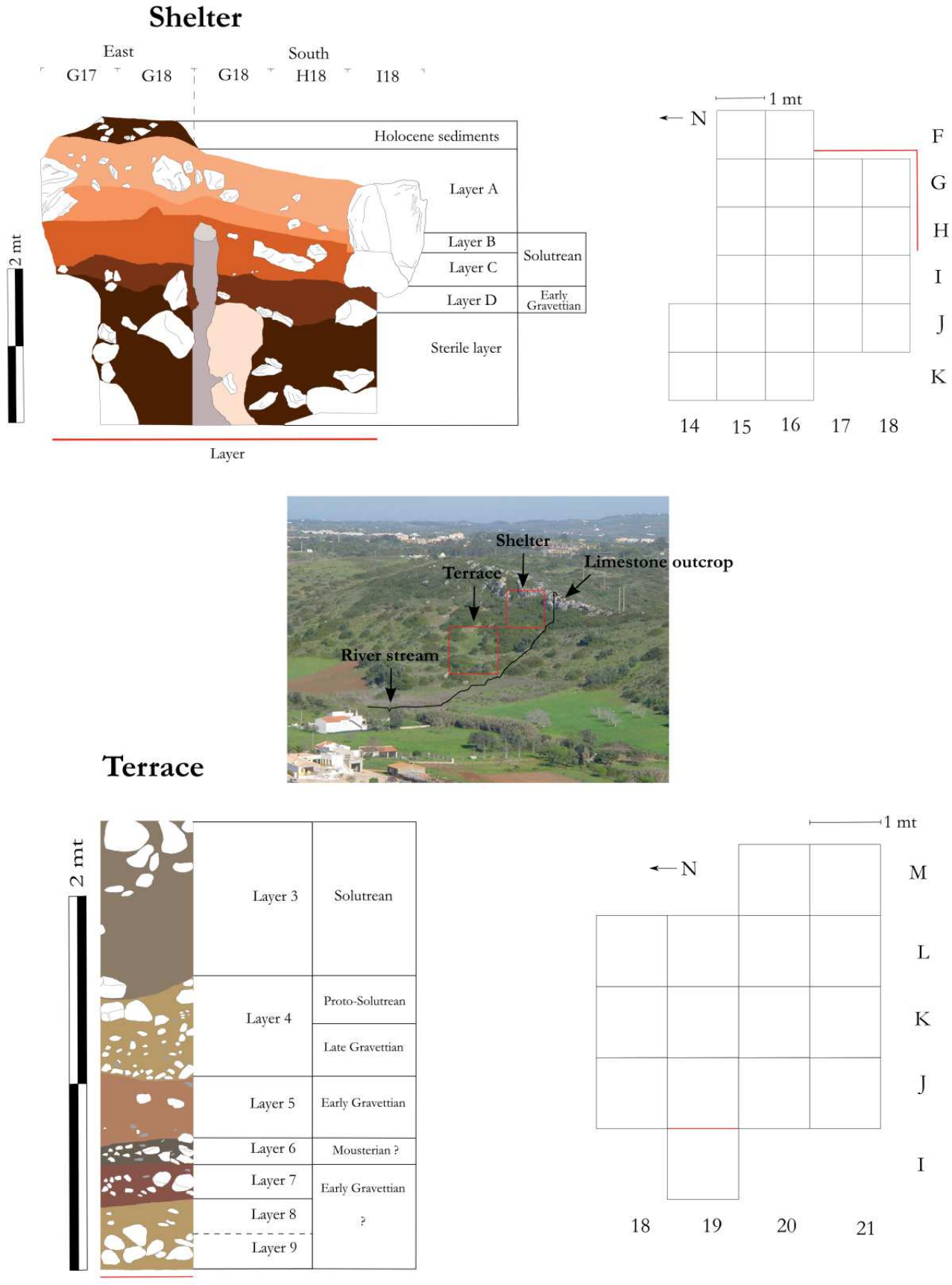

Figure 2 – Profiles from the Terrace and Rockshelter, Vale Boi.

the most standardized in terms of technical detail. Furthermore, the gradual disappearance of the stemmed bifacial elements is accompanied by a tendency of increased microlithization through time, with a propensity for the miniaturization of weaponry (Cascalheira 2010; Gibaja & Bicho in press).

Magdalenian

Data on the Magdalenian of southern Portugal are still relatively scarce, although there are a few sites where it is known (Vale Boi, Vale Santo 4, Ponta Garcia, Cruz da Pedra, Lagoa do Bordoal and Praia da Galé). The new information comes only from Vale Boi, since no other sites was object of either field work or more extensive analyses (Aubry & Bicho 2006). In fact, and although there is only one absolute dating by OSL to the Magdalenian of Algarve (*c.* 14,800 cal BP), a recent technology analysis carried out seems to point to the presence of at least two internal chronological phases: a Magdalenian early/middle and final Magdalenian (Mendonça 2009). The existence of a Solutreo-Gravettian has been suggested by Zilhão (1997), but its presence was never confirmed.

There seems to be a tendency for microlithization. However, this trend is mostly marked in a later phase of the Magdalenian. Although, an increase in back bladelets seems to be present in the Magdalenian (Mendonça 2009), is never comparable to that seen either in the Valencian region, the traditional area where the Solutreo-Gravettian is better known (Cascalheira 2010), or in Portuguese Estremadura.

The lithic industries show a preference for local raw materials, and technological choices through simple and expeditious forms in the case of the quartz, greywacke and quartzite and in the case of the chert, it seems to be simpler when compared to that from the Portuguese Atlantic facade (Cortés et al. in press; Mendonça 2009). The models for the regional exploitation of the various raw materials appear to be the result of an adjustment to the regional lithology, such as the size of the flint nodules from the siliceous deposits of Vila do Bispo, usually with small and poor quality (Veríssimo 2005).

In the regional Magdalenian technological model the production of elongated elements is clearly marginal, with a few bladelets and very rare blades. Naturally, this fact led to a composition of the tool kit based on flake tools (scaled pieces, denticulates, notches, endscrapers and rarer burins) although bladelet tools are present, but in very low frequencies (Mendonça 2009). The truth is that in the Upper Paleolithic of Algarve the backed elements are quite rare, so this feature may be more than a Magdalenian technology gap. On the other hand, scaled pieces are very abundant during the whole Upper Paleolithic in Algarve.

Although not comparable to the numbers of Gravettian and Solutrean, there are mollusc remains (limpets and cockles) in Vale Boi pointing to the use of the coastal system (both rocky and sandy bottoms), as in the previous periods. The Mammalian faunas are still marked by the presence of the same previous main species, red deer and rabbits, which seemed to have increased in the Magdalenian, probably associated with improved climatic conditions (Manne & Bicho 2009). Albeit in small numbers, the aurochs and the horse continued to be hunted, but there is no trace of wild boar, goat or any equids. This absence may be linked to the insignificant size of the faunal sample. Anyway, it seems clear that, as in the Portuguese Estremadura, the overall picture is of diversification and intensification of the exploitation of food resources.

The non-chert raw materials

One of the most striking characteristics of the Upper Paleolithic in central and southern Portugal is the constant presence of macrolithic assemblages along with blades and bladelets. Despite being widely present in flint and quartz assemblages, these technology and tool kits are particularly present in one raw material: quartzite. In a general way, they tend to be composed by stepped, prismatic and centripetal cores, lacking any preparation. As a result, they are often fit in the category of "choppers". The flakes coming from these cores tend to present cortex in the lateral sections, cortical striking platforms and unidirectional scars on the dorsal face. The typical retouched artifacts composing the tool kits during the Upper Paleolithic, though rare, include notches, retouched flakes, denticulates, sidescrappers, *rabots* and choppers.

Internally very homogenous fine grained is very abundant in alluvial deposits. Cobbles and pebbles have relatively standardized sizes and shapes due to intensive fluvial erosion. This mosaic of features made knapping very stable and predictable, and the alluvial cobbles certainly represented reliable resources. In some coastal regions, such as the case of Algarve, another coarse raw material is usually available: greywacke. By opposition to quartzite around Vale Boi, that raw material is usually found in the shape of angular tablets with 30 cm long, dispersed throughout the landscape and only as cobbles along the Atlantic shoreline. It tends to be formed by fine to from very coarse sand sized particles, with abundant quartz veins. This mosaic of particularly features results in softer material, higher friability, meaning that is more unpredictable during knapping.

Recent results on quartzite/greywacke in the Southwest Iberia seem to show significant differences on the macrolithic production during the Upper Paleolithic (Pereira 2010). Based on technological and typological analysis that included intensive refitting, it seems those differences are related to the morphology of the selected blocks, their transportation (as whole or as fragments or flakes), the technological concepts associated to the reduction sequences, the characteristics of the desirable blanks and the range of desired and produced retouched tools. These differences seem to have a chronological organization that is closely associated with the Upper Paleolithic sub-division in Gravettian, Solutrean and Magdalenian. Thus, the macrolithic production was an integral part of those cultural packages and not only an opportunistic solution. This idea is opposed to previous assertions that claim the absence of that change during this period (Almeida 2000; Zilhão 1997).

During Gravettian, extensive cores reductions were frequent and aimed to split big rounded cobbles into big flakes for their use as cores. Production was based on stepped reduction sequences while prismatic ones were rare. In the Solutrean, the

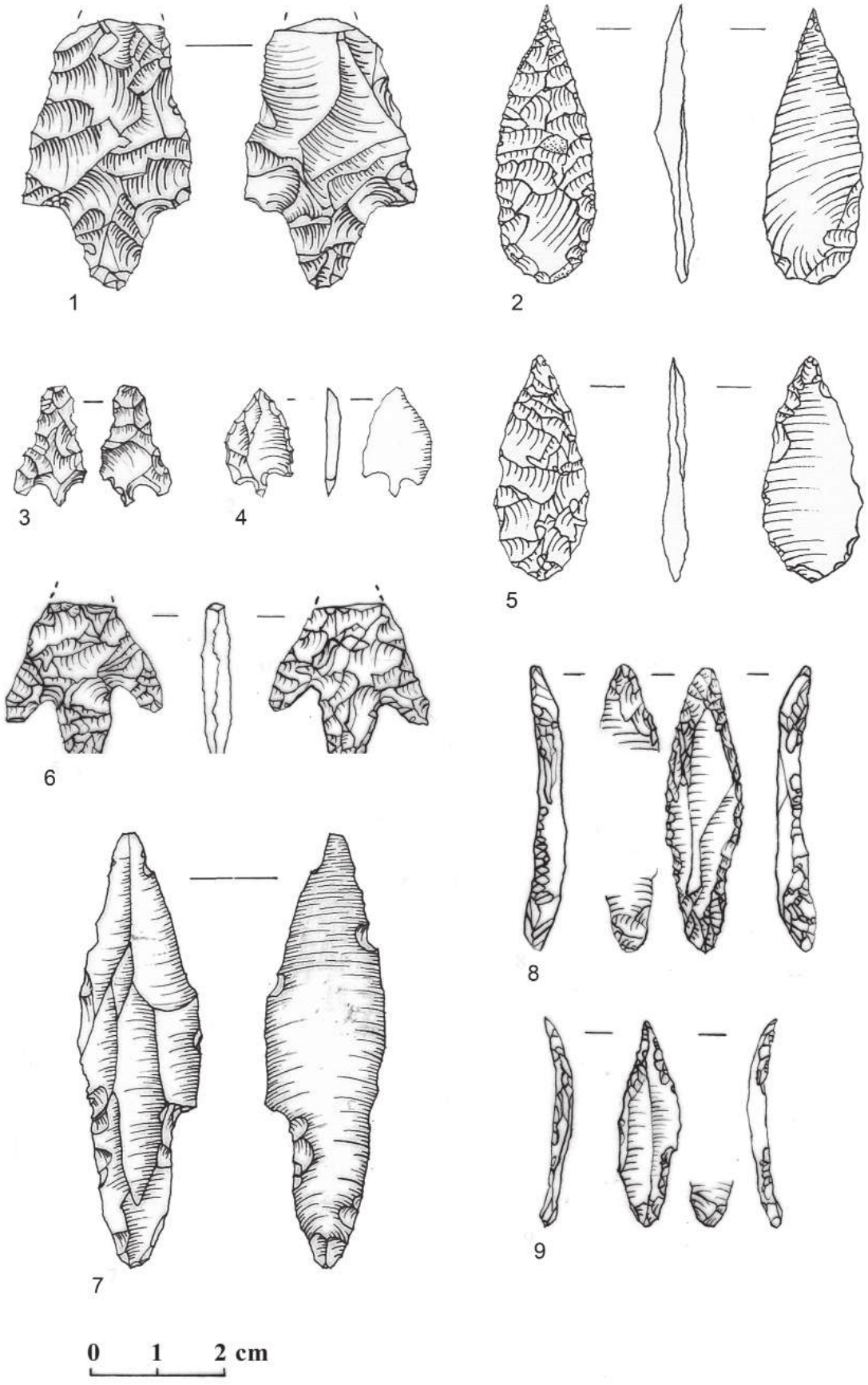

Figure 3 – Solutrean points from Vale Boi.

relative quantity of prismatic cores increased and became as common as the stepped ones. Extensive reduction sequences reduced considerably and aimed to produce pre-determined flakes with a sharp distal edge. These blanks were recovered in the top Solutrean layers of Caldeirão (Estremadura) and in Layer A of Vale Boi Rockshelter along with a Parpalló point. Since this type of blank production was not found in other Solutrean phases in Portugal, this could indicate that their production only occurred in the Upper Solutrean.

Finally, in the Magdalenian blank production was based on prismatic cores, although stepped cores are still present. The extensive reduction sequence still exists but their reduction focused on the production of big thick flakes with a sturdy distal edge, often presenting functional damage.

During the whole Upper Paleolithic, centripetal cores were always present, but less frequent during Solutrean. Retouched tools are dominated by notches, denticulates and sidescrappers during the Gravettian. In the Solutrean, notches and retouched flakes dominated, while denticulates decrease and sidescrappers increase considerably. Only two Laurel Leaf points were identified: one in Vale Almoinha, Portuguese Estremadura and other in Vale Boi-Slope. Finally, during Magdalenian, typical Upper Paleolithic tools such as endscrappers or burins made on quartzite are more frequent than any previous period.

Final words

The short summary on Upper Paleolithic lithic technology presented in this Bilan seems to reveal significant differences between the southern Atlantic coast and the rest of Iberian Peninsula. The same holds true for the typological characteristics of these assemblages, presenting local marks as the doubled pointed and double backing during the Gravettian, the general low presence of backing and of backed points such as La Gravette, Dufour Bladelets or Azilian points, and the extensive presence at all times of scaled pieces. Nevertheless, these assemblages though different, can be included in the general traditional definition of Gravettian, Solutrean and Magdalenian assemblages seen in Western Europe.

Some cultural and chronological aspects of the Upper Paleolithic are still weakly defined in Southern Portugal. Still, there are a couple of aspects that should be noticed here: 1) It seems that there is no Aurignacian and that the Gravettian follows immediately the Mousterian, perhaps with a complete absence of an hiatus; 2) The presence of a regional facies during the Gravettian with doubled backed and doubled pointed microlithic points; 3) It seems that only Upper Solutrean exists in Southern Portugal and that it is earlier than anywhere else in Iberia; and 4) there are no evidences for the presence of Solutreo-Gravettian. In any case, all these ideas need to be tested against more hard evidence, including more excavations and dating, both of Vale Boi and other, hopefully, new sites in southern Portugal.

Acknowledgments

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Figure 4 – Refitting of quartzite core with blade production.

Cultural Context	Area	Layer	Lab. Ref.	Sample	BP Age
Early Neolithic	Terrace	2	Wk-17030	Bone	6036±39
Early Neolithic	Terrace	2	OxA-13445	Bone	6042±34
Early Neolithic	Terrace	2	Wk-17842	Bone	6095±40
Early Neolithic	Terrace	2	Wk-17843	Bone	6018±34
Mesolithic	Terrace	2	TO-12197	Human tooth	7500±90
Solutrean	Terrace	3	Wk-13685	Charcoal	8749±58*
Solutrean	Terrace	3	Wk-24761	Charcoal	8886±30*
Solutrean	Slope	2	Wk-12131	Bone	17634±110
Solutrean	Shelter	B6	Wk-24765	Shell	18859±90
Solutrean	Shelter	C1	Wk-24763	Charcoal	19533±92
Solutrean	Shelter	B1	Wk-17840	Charcoal	20340±160
Solutrean	Shelter	C4	Wk-26800	Charcoal	20620±160
Solutrean	Shelter	D2	Wk-26802	Charcoal	20570±158
Proto-Solutrean	Slope	2	Wk-12130	Bone	18410±165**
Gravettian	Shelter	D4	Wk-26803	Shell	21859±186
Final Gravettian	Slope	3	Wk-16415	Shell	21830±195
Final Gravettian	Slope	3	Wk-13686	Bone	22470±235
Early Gravettian	Terrace	4	Wk-24762	Charcoal	24769±180
Early Gravettian	Terrace	5	Wk-26801	Charcoal	27720±370
Early Gravettian	Slope	3	Wk-12132	Charcoal	24300±205
Early Gravettian	Slope	3	Wk-16414	Shell	23995±230
Early Gravettian	Slope	3	Wk-17841	Shell	24560±570

Table1 – Absolute dating from Vale Boi, Portugal.
*Problematic date, probably the result of vertical migration of charcoals from a surface of Mesolithic age, which has been eroded away.
** Since the % of N(.18) is very low, the result should be considered as a minimum age.

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