MARKS, A.; MONIGAL, K.; ZILHÃO, J. - *The lithic assemblages of the Late Mousterian at Gruta da Oliveira, Almonda, Portugal*, in ZILHÃO, J.; AUBRY, Th.; CARVALHO, A. F. (eds.) - «Les premiers hommes modernes de la Péninsule Ibérique. Actes du Colloque de la Comission VIII de l'UISPP, Vila Nova de Foz Côa, Octobre 1998», Trabalhos de Arqueologia 17, Lisboa, Instituto Português de Arqueologia, 2001, p. 145-154.

The lithic assemblages of the Late Mousterian at Gruta da Oliveira, Almonda, Portugal

ANTHONY MARKS* ▮ KATHERINE MONIGAL* ▮ JOÃO ZILHÃO**

The presence of a very late Middle Paleolithic in southern Spain and central Portugal is now accepted (Zilhão, 1993; Raposo and Cardoso, 1998). There is no longer any doubt that the Mousterian survived in these areas, at least until 30 000 BP and, possibly, even later. While the dating has become clear over the past few years (Antunes et al., 1989; Hublin et al., 1995; D'Errico et al., 1998), very little is known about the specific nature of the latest Middle Paleolithic technology and typology. Partly, this is because few late Mousterian sites are known in southwestern Iberia, compared with Cantabria or southwestern France, although ongoing excavations at Gibraltar (Barton and Stringer, 1998) and the publications for Cova Negra (e.g., Villaverde, 1984) have party redressed this problem for southern Spain. The late Middle Paleolithic along the western edge of Iberia, in Portugal, however, is still basically unknown.

In Portugal, such sites as Gruta Nova da Columbeira were excavated long ago in thick geological levels, and, although the materials recently have been published in detail (Raposo and Cardoso, 1998), it is impossible to be certain just which artefacts are truly contemporary and form real assemblages. Other recently excavated sites, such as Figueira Brava, while having a late date (Antunes, et al., 1989), have not yet had their assemblages studied and published and there is reason to question the stratigraphic controls. Still others, such as Buraca Grande, while well excavated, are still undated and unstudied or, as at Escoural (Leotard et al., 1996; Otte, 1996), a derived Mousterian assemblage has been described but not yet placed into a meaningful context. Thus, we are left with mainly undated open sites for our knowledge of the Portuguese Mousterian, late or otherwise (Raposo, 1995). In spite of this, there is a general perception, based as much on the southern Spanish materials as on those in Portugal, that the tendency to exploit quartz and quartzites, rather than cherts and flints, resulted in assemblages which appear to be "primitive" or crude, since such materials are not well suited for well-controlled flaking (e.g., Moloney, 1996; Moure, 1996). While it is, perhaps, still premature to define the technological and typological nature of the Portuguese late Middle Paleolithic, recently recovered assemblages do permit a preliminary description of well excavated assemblages, as well as a preliminary examination of the assumption that non-flint materials must have resulted in inferior products produced with simplified technologies. The data for this reassessment come from the uppermost two late Mousterian occupations at the Gruta da Oliveira at Almonda, Portuguese Estremadura. The following paper is not meant to be an exhaustive description of the materials, but merely an introduction to the assemblages, and to the effects of raw material variability on technological choices and the resulting products. In addition, there is evidence of possible diachronic changes in technology as the Middle Paleolithic approached its end in Portugal.

Ongoing excavations at the Gruta da Oliveira (Zilhão et al., 1993), under the direction of J. Zilhão, to date have uncovered four undisturbed Mousterian occupations (Zilhão, 1998). The uppermost, Level 8, is temporally very late, with AMS dates of 31 900 ± 200 BP and 32 740 ± 420 BP. The underlying Level 9, is more comfortably

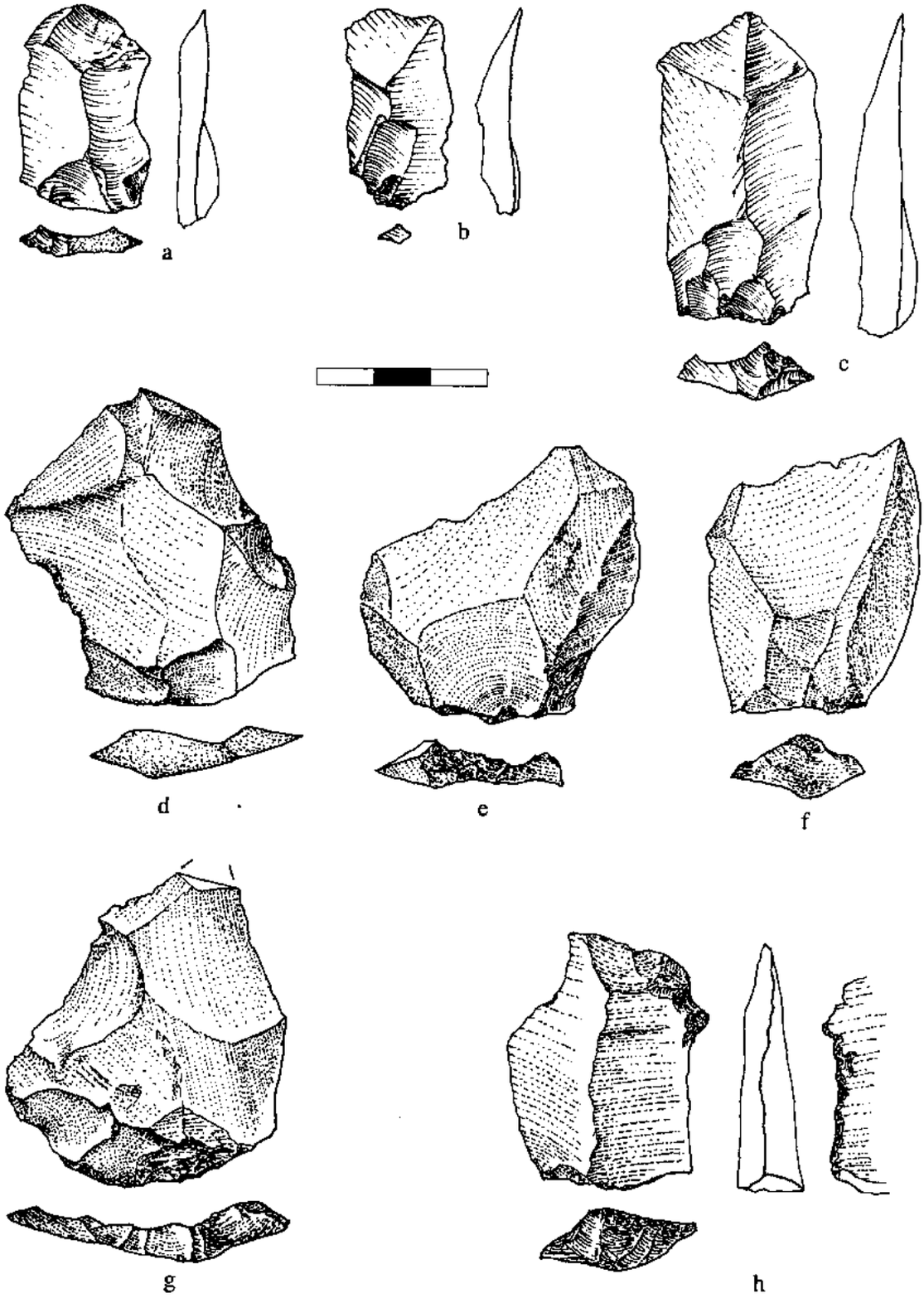

FIG. 1 – Oliveira Level 8: a-c–Levallois flakes (flint); d-g–Levallois flakes (quartzite); h–inversely retouched piece (quartz).

Mousterian in age, with two AMS dates of 38 390 ± 480 BP and 40 420 ± 1220 BP. Both levels constitute true assemblages and the technological and typological characteristics of each can safely be assumed to be part of a single lithic system. The ca. 7000-year difference in age provides a preliminary opportunity to see the extent to which the very late Portuguese Mousterian might have differed from its local antecedents.

Level 8 was occupied after the main portion of the cave had collapsed. The occupation lies in front of the collapse, when the site was more like a rock shelter than a true cave. The area occupied was small — only about 17 square meters — and the assemblage including chippage amounts to 184 pieces, of which almost 60% is flaking debris. Level 9, on the other hand, represented a true cave occupation, being well within the existing gallery. Although its full area has not been excavated, a total of 13 square meters have been uncovered. Artifact distributions are not uniform, as there is a strong clustering of artifacts and bone in a two square meter area. This assemblage is also relatively small; a total of 279 items were recovered, of which about 64% is flaking debris.

The samples used in this preliminary study include all tools and debitage exceeding 2,5 cm in greatest dimension; anything smaller was considered debris, as were irregular chunks caused by shatter. When the few cores were also removed from the sample — five in Level 8 and eleven in Level 9 — the sample sizes were 84 items in Level 8 and 101 items in Level 9. These samples, while small, confirm the generally accepted notion that retouched tools are proportionately rare in the Portuguese Middle Paleolithic. Level 8 contains a total of five retouched tools, only one of which had even continuous retouch — the others are either somewhat questionable single notches or denticulates. In Level 9, there are only three notches, four denticulates, and two marginally retouched pieces (Fig. 2), while a single example can be classified as an atypical inverse Tayac point (Fig. 2h). Thus, for neither level is it possible to characterize the "tool assemblage", although it is tempting to claim a Denticulate Mousterian status for both. Doing so, however, would be misleading given the extremely small numbers of "tools". Because of this, raw material selection and the technology of blank production are the only reasonable bases for both description and comparison.

Non-cortical flakes account for the bulk of artifacts in both Levels 8 and 9 at Oliveira; primary flakes (having more than 50% cortex) and blades are rare. While twice as many blades were produced in Level 8 than in Level 9, in the later level, only one piece in ten is blade-proportioned. These pieces are not derived from a blade reduction system, but rather are by-products of the same reduction that produced the flakes, and are best thought of as simply elongated flakes (see Fig. 3). Levallois flake production, however, was well developed in both assemblages (Figs. 1a-g and 2b-e) and, most surprisingly, the majority of Levallois elements in both assemblages were made on non-flint materials, mainly on various types of fine-grained quartzites.

The use of multiple kinds of raw material, from quartz to flint, is a known characteristic of the Iberian Mousterian (e.g. Raposo, 1998). These assemblages from Gruta da Oliveira are no exception: in both levels, flint accounts for a minority of the raw material (between 30-40%) and is still less common when debris is removed. The general dominance of quartzite and quartz in Iberian Middle Paleolithic assemblages has led to the perception that the technology must necessarily have been crude, and different from those situations where flint was the dominant raw material. Such assumptions can easily be tested for the assemblages from Oliveira, since both flint and quartzite were used in equal proportions, with quartz only moderately represented (Table 1).

TABLE 1

Raw Material and Artifact Types.

LEVEL 8	Flakes		Primary Flakes		Blades		Primary Blades		CTE		Cores		Total	
flint	20	30,3%	1	14,3%	4	40,0%	–	–	–	–	3	60,0%	28	31,5%
quartz	4	6,1%	2	28,6%	–	–	–	–	–	–	1	20,0%	7	7,9%
fine quartzite	5	7,6%	1	14,3%	–	–	–	–	–	–	–	–	6	6,7%
red/brown quartzite	20	30,3%	1	14,3%	3	30,0%	1	100,0%	–	–	–	–	25	28,1%
other quartzite	16	24,2%	2	28,6%	3	30,0%	–	–	–	–	1	20,0%	22	24,7%
limestone	1	1,5%	–	–	–	–	–	–	–	–	–	–	1	1,1%
Total	66	74,2%	7	7,9%	10	11,2%	1	1,1%	–	–	5	5,6%	89	100,0%

LEVEL 9	Flake		Primary Flake		Blade		Primary Blade		CTE		Cores		Total	
flint	33	40,2%	3	25,0%	3	60,0%	–	–	2	100,0%	2	18,2%	43	38,4%
quartz	7	8,5%	3	25,0%	1	20,0%	–	–	–	–	3	27,3%	14	12,5%
fine quartzite	14	17,1%	–	–	–	–	–	–	–	–	2	18,2%	16	14,3%
red/brown quartzite	19	23,2%	2	16,7%	–	–	–	–	–	–	2	18,2%	23	20,5%
other quartzite	9	11,0%	4	33,3%	1	20,0%	–	–	–	–	2	18,2%	16	14,3%
Total	82	73,2%	12	10,7%	5	4,5%	–	–	2	1,8%	11	9,8%	112	100,0%

There is no simple dichotomy of flint versus quartzite use at Gruta da Oliveira; rather, the quality of quartzites varies from particularly fine-grained and homogenous to coarse-grained and non-homogenous. In this study, therefore, three groups of quartzites were recognized. One is a very fine-grained quartzite red brown in color. Another group is equally fine-grained and homogenous in structure, but varies in color from dark green to dark red. The third group includes all the coarse-grained quartzites. While none of these quartzites appears to take marginal or invasive retouch well, flake production using fine-grained quartzites appears fully comparable to the flake production using flint, based on their technological attributes.

Contrary to the commonly held perception that quartzites were used preferentially for larger, "heavy duty" tools, at least in Iberian Paleolithic contexts (e.g., Straus, 1996; Bernaldo de Quirós and Cabrera Valdés, 1996), artifact proportions in the assemblages from Oliveira are nearly identical, no matter what the raw material. Figure 3 demonstrates no significant size clustering according to raw material, and preliminary statistical examinations, including t-tests, on dimensional attributes indicate no significant differences (with the caveat that sample sizes for individual raw material types are small, and their standard deviations large). While larger sample sizes would be more conclusive, these preliminary results suggest that raw material did not affect artifact dimensions. In fact, the length/width and width/thickness ratios for the flint and quartzites are essentially identical (Table 2).

Characteristics usually thought to be most strongly associated with the use of flint, such as fine and careful platform faceting, actually occur in much higher proportions among the fine-grained quartzites than among the flint, and are even marginally higher among the less fined grained quartzites (Table 3). In the assemblages from Gruta da Oliveira, the faceting index is moderate in Level 8 (IF=31.7) and higher in Level 9 (IF=45.2) when all types of raw material are combined.

TABLE 2

Dimensional Attributes of Debitage and Tools (>25 mm).

LEVEL 8		Length	Width	Thickness	L/W	Th/W
flint	Mean	**37,29**	**28,31**	**6,97**	**1,42**	**0,25**
	N	23	25	25	23	25
	S.D	9,13	8,50	3,32	0,47	0,08
fine quartzite	Mean	**57,07**	**44,38**	**14,78**	**1,33**	**0,31**
	N	4	5	5	4	5
	S.D	24,79	14,20	10,06	0,12	0,14
red/brown quartzite	Mean	**49,02**	**37,40**	**9,03**	**1,45**	**0,27**
	N	19	25	25	19	25
	S.D	11,83	10,87	2,83	0,52	0,13
other quartzite	Mean	**44,74**	**41,56**	**10,25**	**1,08**	**0,25**
	N	18	21	21	18	21
	S.D	12,99	14,02	4,23	0,33	0,08
LEVEL 9		**Length**	**Width**	**Thickness**	**L/W**	**Th/W**
flint	Mean	**43,46**	**35,34**	**8,82**	**1,30**	**0,25**
	N	40	40	41	39	40
	S.D	14,00	9,10	3,67	0,46	0,07
fine quartzite	Mean	**37,20**	**32,47**	**7,76**	**1,19**	**0,24**
	N	13	14	14	13	14
	S.D	14,78	6,84	3,95	0,46	0,13
red/brown quartzite	Mean	**46,62**	**37,40**	**7,70**	**1,28**	**0,21**
	N	21	21	21	21	21
	S.D	17,18	10,49	2,39	0,36	0,06
other quartzite	Mean	**52,92**	**36,60**	**10,14**	**1,50**	**0,28**
	N	12	13	13	12	13
	S.D	14,89	8,11	3,96	0,49	0,10

TABLE 3

Percentages of Platform Types According to Raw Material.

LEVEL 8	Multiple faceted	Unfaceted	Cortex	Chapeau de gendarme
flint	22,7%	63,6%	13,6%	–
fine quartzite	25,0%	50,0%	25,0%	–
red/brown quartzite	47,8%	30,4%	17,4%	4,3%
other quartzite	26,3%	47,4%	26,3%	–
Total	32,4%	47,1%	19,1%	1,5%
LEVEL 9	**Multiple faceted**	**Unfaceted**	**Cortex**	**Chapeau de gendarme**
flint	35,1%	45,9%	16,2%	2,7%
fine quartzite	58,3%	25,0%	–	16,7%
red/brown quartzite	50,0%	25,0%	15,0%	10,0%
other quartzite	38,5%	30,8%	30,8%	–
Total	42,7%	35,4%	15,9%	6,1%

Other differences between the levels are evident, as well. Most notably, different flake shapes and different scar patterns appear to be associated with different raw materials in Level 8, but not in Level 9 (Tables 4 and 5). In Level 9, ovoid-shaped flakes dominate all raw materials, as do radial scar patterns, and the most typical Levallois flakes, with fine multi-

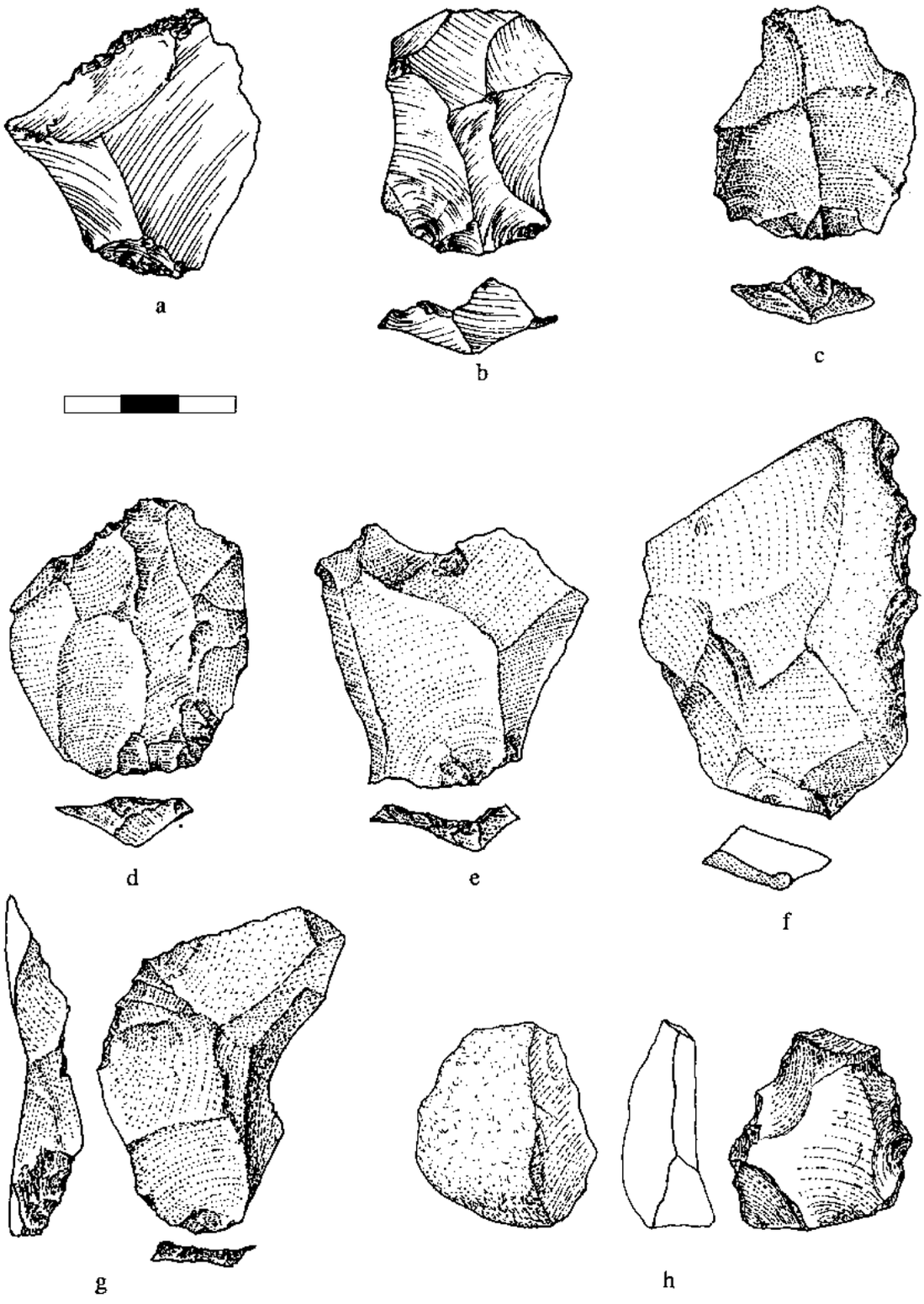

FIG. 2 – Oliveira Level 9: *a*–retouched flake (flint); *b*–Levallois flake (flint); *c, e*–Levallois flakes (quartzite); *d-f*–denticulates (quartzite); *g*–debordant Levallois flake (quartzite); *h*–inversely retouched Tayac point (quartz).

ple faceted platforms and symmetric ovoid shapes, were produced on quartzites, not on flint. In the latest Mousterian of Level 8, a high proportion of flakes made on fine-grained quartzites continue to be ovoid or trapezoidal in shape, associated with radial or less regular scar patterns. Flint flakes, on the other hand, now have rectangular shapes and uni- or bi-directional scar patterns. This appears to reflect a change in both core shape and how cores were reduced. Yet, this change does not indicate any significant tendency toward increasing overall elongation of the flakes produced.

TABLE 4

Percentages of Identifiable Blank Shapes According to Raw Material.

LEVEL 8	Rectangular	Ovoid	Triangular	Trapezoidal
flint	**39,1%**	8,7%	17,4%	34,8%
fine quartzite	25,0%	0,0%	25,0%	**50,0%**
red/brown quartzite	17,4%	**39,1%**	21,7%	21,7%
other quartzite	20,0%	35,0%	5,0%	**40,0%**
Total	25,7%	25,7%	15,7%	32,9%

LEVEL 9	Rectangular	Ovoid	Triangular	Trapezoidal
flint	21,1%	**55,3%**	10,5%	13,2%
fine quartzite	23,1%	**46,2%**	7,7%	23,1%
red/brown quartzite	6,7%	**40,0%**	13,3%	40,0%
other quartzite	21,4%	**28,6%**	21,4%	28,6%
Total	18,8%	46,3%	12,5%	22,5%

TABLE 5

Percentages of Identifiable Scar Patterns According to Raw Material.

LEVEL 8	Radial	Unidirectional	Bidirectional	Other
flint	13,0%	**43,5%**	30,4%	13,0%
fine quartzite	20,0%	–	–	**80,0%**
red/brown quartzite	37,5%	20,8%	8,3%	**33,3%**
other quartzite	**40,0%**	26,7%	20,0%	13,3%
Total	28,4%	28,4%	17,9%	25,4%

LEVEL 9	Radial	Unidirectional	Bidirectional	Other
flint	**51,4%**	16,2%	–	32,4%
fine quartzite	**57,1%**	14,3%	–	28,6%
red/brown quartzite	**65,0%**	5,0%	5,0%	25,0%
other quartzite	37,5%	**50,0%**	–	12,5%
Total	54,4%	16,5%	1,3%	27,8%

While there does appear to be limited dimensional intra-assemblage variability between the flint and quartzite products, the length/width patterning of each assemblage as a whole demonstrate less size clustering in Level 8 than in Level 9 (Fig. 3). In this very general attribute, the earlier Level 9 exhibits greater size standardization than does Level 8.

While the assemblages from Levels 8 and 9 of Oliveira can hardly document significant diachronic patterning, the two assemblages do hint at some rather unexpected technological differences, which need to be confirmed using similar data sets from other Mous-

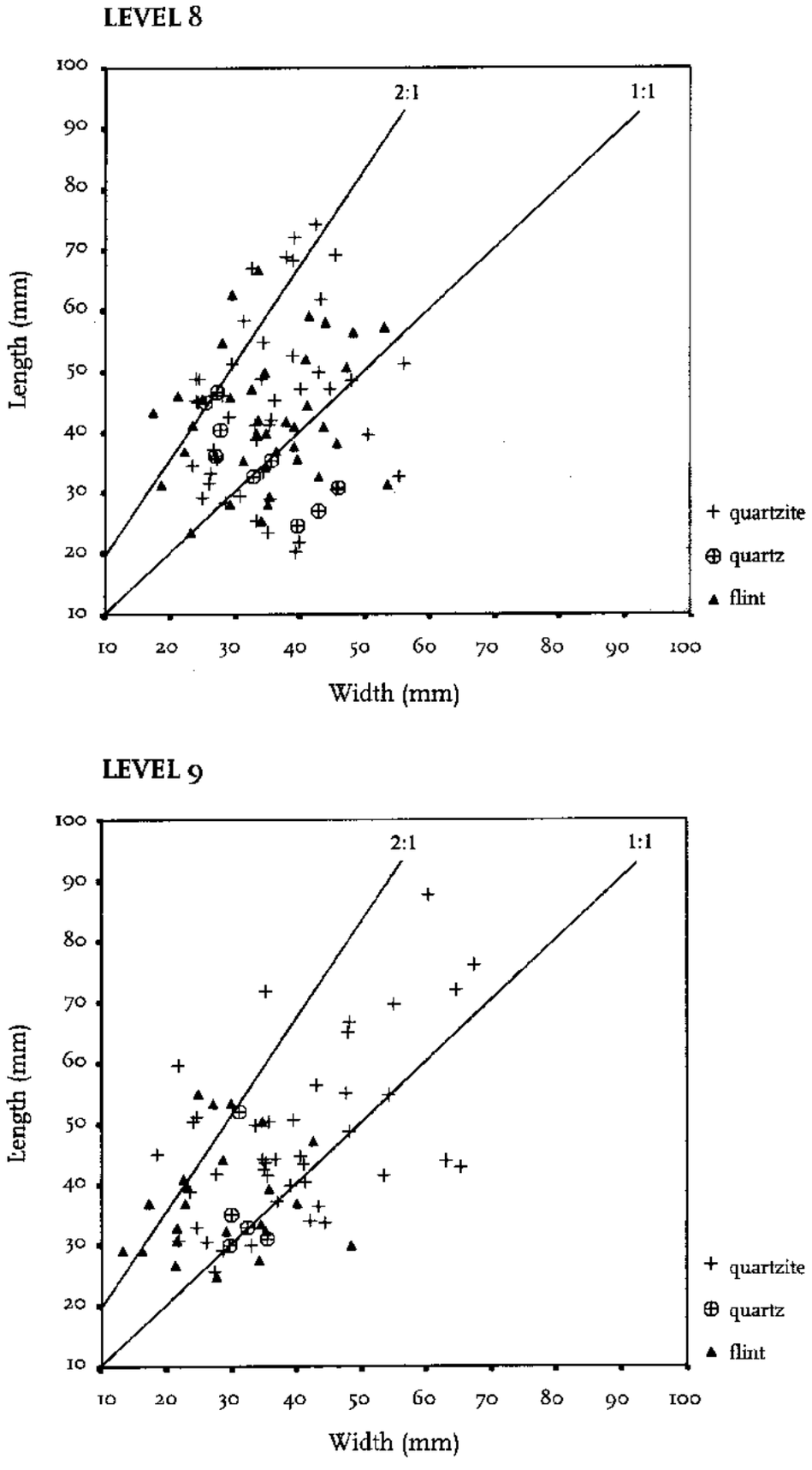

FIG. 3 – Oliveira Levels 8 and 9: Length/Width and Width/Thickness scatterplots of debitage and tools by raw material.

terian sites. Most importantly, these assemblages seem to refute the commonly held belief that the use of quartzites, by their very nature, called for special and crude flaking techniques. In particular, the strong and finely executed Levallois technique in both assemblages at the Gruta da Oliveira is manifest more clearly in the fine-grained quartzite materials than in the flint. In addition, the apparent shift right at the end of the Mousterian, within a consistently dominant Levallois technology, toward smaller and rectangular shaped flakes among flint artifacts suggests that, in Portugal, at least, technological change did not follow patterns seen elsewhere in Europe.

* Department of Anthropology • Southern Methodist University • PO Box 750336 • Dallas TX 75275 • USA.
** Instituto Português de Arqueologia • Av. da Índia, 136 • 1300-300 Lisboa.

REFERENCES

ANTUNES, M.; CABRAL, J.P.; CARDOSO, J.; PAIS, J.; SOARES, A.M. (1989) - Paleolítico médio e superior em Portugal: datas C14, estado actual dos conhecimentos, síntese e discussão. *Ciências da Terra*. Universidade Nova de Lisboa. 10, p. 127-138.

BARTON, N.; STRINGER, C. (this volume) - The Middle-Upper Paleolithic sequence in Gibraltar and its wider implications for interpreting Late Pleistocene human behavior.

BERNALDO DE QUIRÓS, F.; CABRERA VALDÉS, V. (1986) - Raw material in the Paleolithic of Cueva del Castillo and in the Cantabrian region. In MOLONEY, N.; RAPOSO, L.; SANTONJA, M., eds. - *Non-Flint Stone Tools and Paleolithic Occupation of the Iberian Peninsula*. Oxford: BAR (International Series; 649), p. 21-32.

d'ERRICO, F.; ZILHÃO, J.; JULIEN, M.; BAFFIER, D.; PELEGRIN, J. (1998) - Neanderthal acculturation in Western Europe? A critical review of the evidence and its implications. *Current Anthropology*. 39 (Supplement; 44).

HUBLIN, J.-J.; BARROSO RUIZ, C.; MEDINA LARA, P.; FONTUGNE, M.; REYSS, J.-L. (1995) - The Mousterian site of Zafarraya (Andalucia, Spain): dating and implications on the Paleolithic peopling processes of Western Europe. *Comptes Rendus de l'Académie des Sciences de Paris*. 2:321, p. 931-937.

LÉOTARD, J-M.; FRANÇOIS, P.; ENGESSOR, K. (1996) - Industrie lithique des sondages 3 et 4, le débitage. In OTTE, M., ed. - *Recherches Préhistoriques à la Grotte d'Escoural*. Liège: ERAUL, p. 91-105.

MOLONEY, N. (1996) - The effect of quartzite pebbles on the technology and typology on Middle Pleistocene lithic assemblages in the Iberian Peninsula. In MOLONEY, N.; RAPOSO, L.; SANTONJA, M., eds. - *Non-Flint Stone Tools and Paleolithic Occupation of the Iberian Peninsula*. Oxford: BAR (International Series; 649), p. 107-124.

MOURRE, V. (1996) - Les industries en quartz au Paléolithique, terminologie, méthodologie et technologie. *Paléo*. 8. p. 205-223.

OTTE, M. (1996) - Industries paléolithiques. In OTTE, M., ed. - *Recherches Préhistoriques à la Grotte d'Escoural*. Liège: ERAUL, p. 91-105.

RAPOSO, L. (1995) - Ambientes, territorios y subsistencia en el Paleolítico medio de Portugal. *Complutum*. 6. p. 57-77.

RAPOSO, L.; CARDOSO, J.L. (1998) - Las industrias líticas de la Gruta Nova de Columbeira (Bombarral, Portugal) en el contexto del Musteriense final de la península Ibérica. *Trabajos de Prehistoria*. Madrid. 55: 1, p. 39-62.

STRAUS, L. (1996) - The use of quartzite in the Upper Paleolithic of Cantabrian Spain. In MOLONEY, N.; RAPOSO, L.; SANTONJA, M., eds. - *Non-Flint Stone Tools and Paleolithic Occupation of the Iberian Peninsula*. Oxford: BAR (International Series; 649), p. 107-124.

VILLAVERDE BONILLA, V. (1984) - *La Cova Negra de Xátiva y el Musteriense de la Región central del Mediterraneo español*. Valencia: Servicio de Investigaciones Prehistóricas.

ZILHÃO, J. (1993) - Le passage du Paléolithique moyen/ Paléolithique supérieur dans le Portugal. In V. CABRERA VALDÉS, V., ed. - *El Origen del Hombre Moderno en el Suroeste de Europa*. Madrid: UNED. p. 127-146.

ZILHÃO, J.; MAURÍCIO, J.; SOUTO, P. (1993) - Jazidas arqueológicas do sistema cársico da nascente do Almonda. *Nova Augusta*. Torres Novas. 7, p. 35-52.

ZILHÃO, J. (1998) - Le Paléolithique moyen du réseau karstique des sources de l'Almonda (Portugal). Paper presented at the UISPP meeting, Commission VIII, Vila Nova de Foz Côa, October 22/24.