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SITE-INTERNAL SPATIAL ORGANIZATION OF HUNTER-GATHERER SOCIETIES: CASE STUDIES FROM THE EUROPEAN PALAEOLITHIC AND MESOLITHIC

Papers submitted at the session (C58) »Come in … and find out: Opening a new door into the analysis of hunter-gatherer social organisation and behaviour«, held at the 15th U.I.S.P.P. conference in Lisbon, September 2006

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SPATIAL ORGANIZATION AT FONT DEL ROS, A MESOLITHIC SETTLEMENT IN THE SOUTH-EASTERN PYRENEES

The reconstruction of daily life of prehistoric hunter-gatherers

Previous studies of spatial organization at Late Glacial sites in the Paris Basin (Audouze 1987a), the Neuwied Basin (Street et al. 2006) and around Lake Neuchâtel (Leesch 1997) have provided detailed information on the social organization of prehistoric hunter-gatherers. In several cases these interpretations have largely focused on the »palaeoethnographic« approach, following research conducted at Pincevent (Leroi-Gourhan / Brézillon 1966; 1972). Large scale open air excavations and the connections between areas established by the refitting of lithics, bones or burnt stones provide a set of tools with which to evaluate the length of occupation and internal site organization (Enloe / David 1989; Julien et al. 1992; Karlin 1992). Focusing on the distribution of artefacts and their association with features (e. g. stones, hearths, pits) enables a better understanding of the processes of accumulation and discard that are indicators of everyday activities. As a consequence, the study of spatial organization enables us to ask questions regarding the underlying behaviours of these activities (Cahen et al. 1979; Karlin 1992). This inference is not widely accepted as can be seen from the debate concerning the interpretation of the »habitation n°1« at Pincevent (Audouze 1987b; Binford 1978; Carr 1991; Julien et al. 1987; Leroi-Gourhan / Brézillon 1966).
Moreover, several ethnoarchaeological observations demonstrate that this model is not necessarily accepted. Numerous factors, such as the size of the group, the type of activities and the length of occupation of the site, all affect patterns of spatial organization (see Kroll / Price 1991). These observations demonstrate that, besides the need to establish contemporaneity, there is a need to evaluate the role of site formation processes so as to determine their inferential utility (Villa 1982; 2004).
One element that should not be forgotten, however, is that observations of socio-spatial organization are based on the study of a relatively small sample of Late Glacial sites from Western Europe and, from a climatic perspective, are associated with specific environmental conditions. It is possible that the impact of the onset of Holocene conditions had a strong influence on the organization of the daily life of these human groups.
In this article, we shall present the current status of patterns of spatial organization at Font del Ros, an open air postglacial site located in the southern Pyrenees (Mora et al. 1991; Pallarés 1999; Pallarés / Mora 1999; Martínez-Moreno et al. 2006a). We discuss the notion of intra-site contemporaneity, a key element in understanding the activities undertaken at the site. While these inferences are not necessarily representative of the social organization of Mesolithic hunter-gatherers in a general sense, they nevertheless provide information on the spheres of technology, subsistence and social organization of these groups during the early Holocene.
The arguments to support this assertion must be based on the characterisation of those elements that demonstrate temporal contemporaneity across the site, along with the need to establish spatial relations within a large surface area, as well as a description of the associated activities. Finally we will discuss the

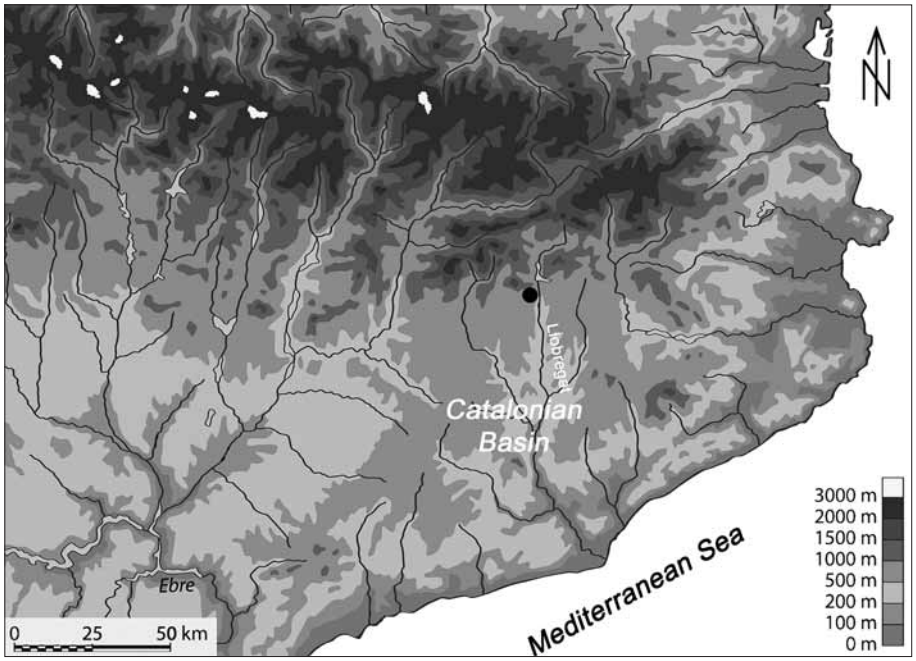


Fig. 1 Geographical setting of Font del Ros. Black dot marks the location of the site.

social implications from the observed patterns of spatial organization. These questions will allow us to determine to what extent Font del Ros can be considered a large scale, organized camp-site or, alternatively, is consistent with a different socio-spatial model.

The site of Font del Ros

Font del Ros (42° 05'N; 01° 5'E) is an open air site located at 680 m a.s.l. at the junction of the south-eastern sierras of the foothills of the Pyrenees (Serra de Queralt) where the Llobregat river flows out of the Pyrenean valleys. This topographic situation marks the contact zone between a montane environment with abrupt changes of altitude over a few kilometres, and the plains that extend to the foothills of the south-eastern Pyrenees. The proximity of the site to the Llobregat suggests that the river was used to facilitate movement between the interior valleys of the Pyrenees and the Central Catalonian Basin (**fig. 1**).

The site is located on the edge of the suburbs of the town of Berga, 90 km to the north of Barcelona (Spain), and was discovered some 2 m below the surface, during the construction of a building (**fig. 2**). The site was the subject of a rescue excavation, which revealed deposits extending over at least 1 200 m^2. The pattern of distribution of the archaeological remains suggests the deposits originally spread over a much larger area, as can be seen from a series of find accumulations, which were partially destroyed before the excavation began.

The surface was excavated in a sequence of successive spits, establishing coordinates for lithic artefacts, fragments of bone and macro-botanical material, as well as material from local sedimentary contexts such

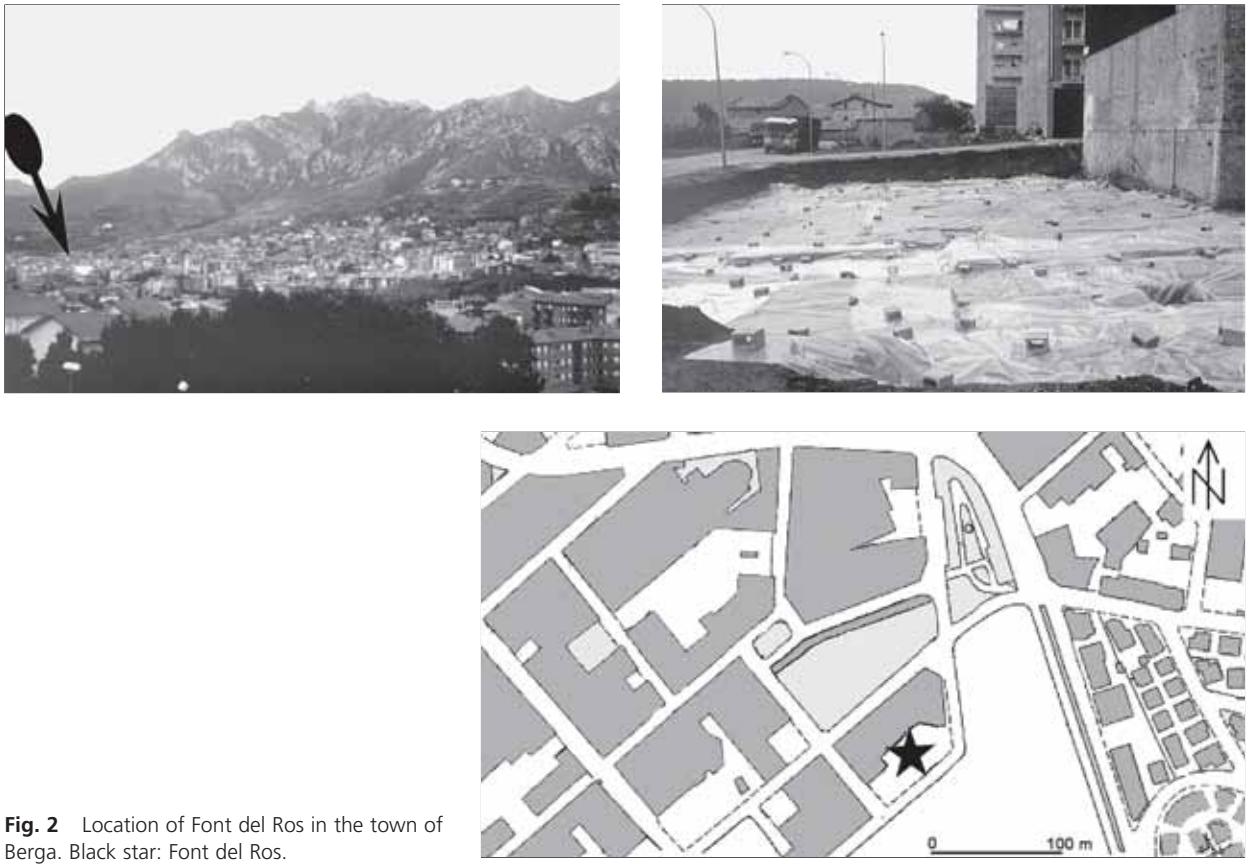


Fig. 2 Location of Font del Ros in the town of Berga. Black star: Font del Ros.

as cobbles and angular fragments (Mora et al. 1991). The sediment was systematically wet-screened, recovering all finds more than 5 mm in size. The archaeological level is embedded in a soil bioturbated by roots (Jordá et al. 1992).

The deposits are associated with a spring, as evidenced by travertine formations. This spring was active during the Mesolithic occupation of the site and the flow of water led to the burial of materials exposed on the surface. The hydrological flow appears to have been gentle. This observation is corroborated by the absence of any traces among the artefacts of sorting by water action (more than 60 % of the fragments are less than 1 cm) and by the numerous fragments of charcoal present at the site.

The presence of vegetation also played a role in bone preservation. This intense edaphic activity, particularly extensive root action, resulted in the presence of small fragments of bone (less than 2 cm), some of which had also been burnt, and fragmentary teeth. These conditions make it difficult to conduct a detailed zooarchaeological study, although it was possible to identify *Cervus elaphus*, *Capra pyrenaica*, *Sus scrofa*, *Bos* sp. and *Oryctolagus cuniculus*, indicating the presence of mosaic landscape in the immediate vicinity of the site.

The palaeobotanical assemblage also provides useful data for the reconstruction of the immediate environment of the site. A study of the charcoal and macrobotanical remains from 2 500 samples provides abundant evidence for temperate taxa such as *Quercus*, *Buxus sempervirens* and *Corylus avellana*, as well as *Ulmus* sp., *Salix* sp. and *Sambucus* sp., all species associated with wet conditions. These associations suggest dense deciduous woodland typical for the Boreal period (Jordá et al. 1992).

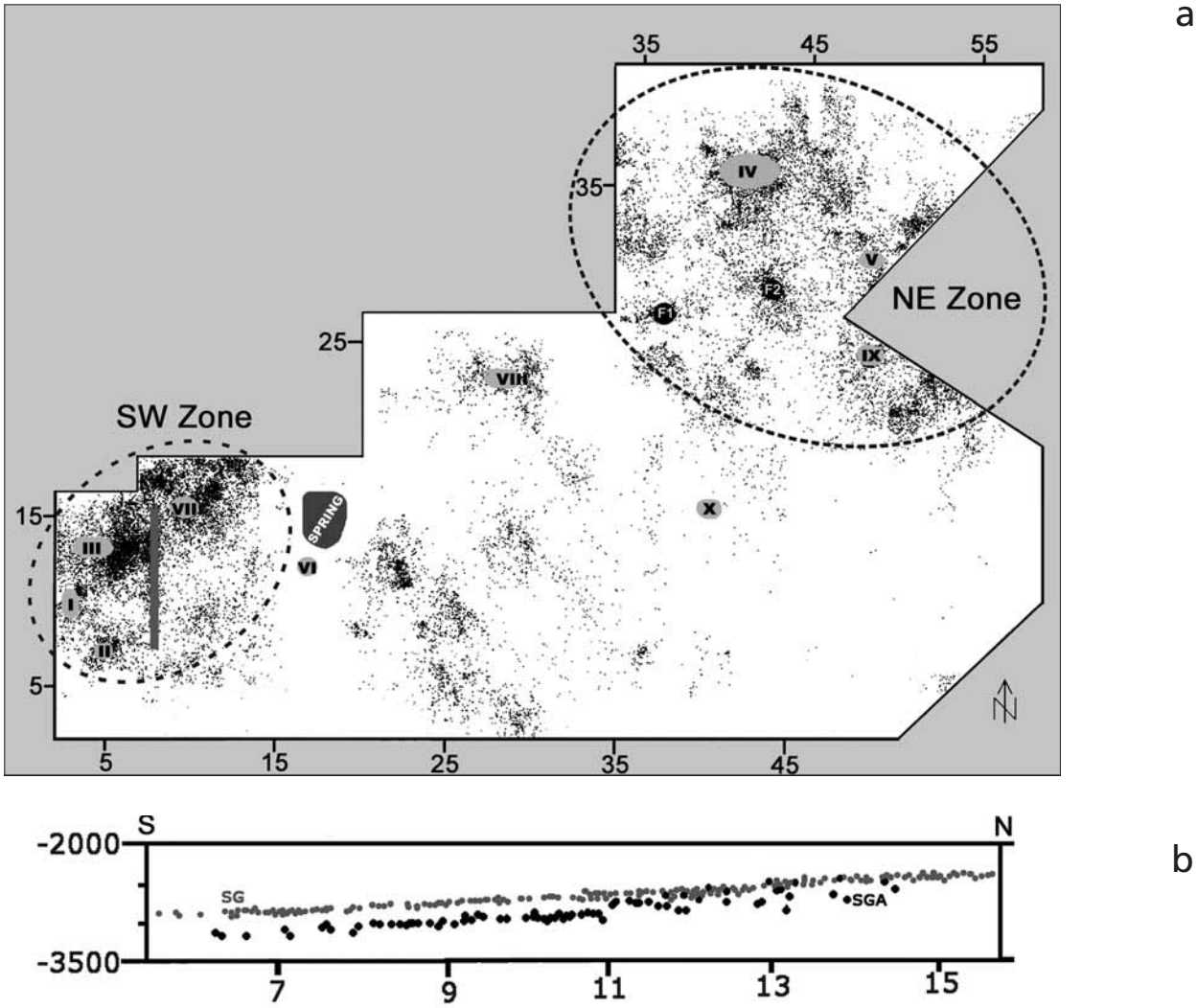


Fig. 3 **a** general map of the distribution of coordinates showing the two assemblages of finds detected from the exploratory visual analysis and the location of the spring. Roman numerals indicate position of hearths. – **b** N-S plot of the section X= 7, Y= 5-16 (indicated as a grey line in a) showing vertical distribution of the finds from the overlapping archaeological contexts SG and SGA.

Patterns of horizontal distribution

The excavations at Font del Ros produced more than 20 000 lithic artefacts, 2 600 bones and 2 500 macrobotanical specimens. These were recovered from ten areas that seem to be related to the presence of hearths and two pits. These areas cover an area of 1 200 m^2 and comprise the archaeological context SG (Mora et al. 1991). However, it should be noted that this distribution is neither homogeneous nor random. The majority of the remains were found in hearths and pits, while other zones have very low artefact density (fig. 3).

An exploratory visual analysis allowed us to identify two principal zones. The first zone, referred to as the SW zone, spreads over a surface area of 100 m^2 (corresponding to coordinates X=5-15, Y=5-15), and is associated with hearths I, II, III and VII. The second zone is located in the NE sector, covers a larger area – some 350 m^2 (X=35-55, Y=20-40) – and is associated with hearths (IV, V, IX) and the two excavated pits

Level	Context	Zone	# Laboratory	^{14}C	STD	$^{13}C‰$	Sample	Method	Cal BP (p 95%)
SGA-1	isolated charcoal	SE	UBAR-345	8800	360	-26.3	Ch	CON	10770 - 9050
SG-1	Hearth VII	SE	Beta-210732	8690	60	-24.2	*Cor*	AMS	9850 - 9490
SG-2	Hearth IV	NW	UBAR-185	8050	150	-	Ch	CON	9410 - 8490
SG-3	Hearth V	NW	UBAR-165	8150	590	-	Ch	CON	10560 - 7760
SG-4	Hearth IX	NW	UBAR-329	8270	200	-23.4	Ch	CON	9680 - 8720
SG-5	isolated charcoal	NW	UBAR-397	8400	180	-26.2	Ch	CON	9740 - 8940
SG-6	Hearth IV	NW	Beta-210733	7800	50	-24.6	*Cor*	AMS	8700 - 8460

Tab. 1 ^{14}C dates for Font del Ros, comprising charcoal samples (Ch) and charred fragments of *Corylus* (Cor). The chronological range has been calibrated using the SFCP 2005 age model with 2σ. – (Weninger et al. 2006).

F1 and F2. These principal areas of artefact accumulation had been partially destroyed during the construction of the building and it seems that they probably extended into areas adjacent to the site.
The artefacts were recovered from a horizon with an average depth of 10-15 cm, which became thicker in areas close to hearths or to other areas related to combustion activities. The areas of high artefact density are characterized by concentrations of lithics, bones and plants (charcoal and fruits). No post holes or other evident structures have been found which could indicate the presence of huts or other dwellings.
The aforementioned travertine delimits the SW extension of the site (**fig. 3a**). Hearth VI was found just a few metres to the south of the spring, and, unlike the other hearths, is characterised by an absence of finds, which would be consistent with a zone affected by water.
One question prompted by this preliminary visual analysis is whether there are elements that can provide reliable spatio-temporal resolution for these two zones, in order to ascertain to what extent they represent contemporary or diachronic occupations. For example, does the limited thickness of the archaeological level (10-15 cm) justify the description of the site as an extensive, well organized camp occupied by different domestic groups? In the following, we shall propose a number of different analytical approaches in an attempt to answer this question.
A useful temporal indicator supporting a long-term occupation was detected during the excavation of the SW zone. Here, the context SG is represented by a gently sloping sub-horizon (5° to the South) that extends southwards until it divides into two discrete archaeological levels (**fig. 3b**). The lower level (SGA) may originally have extended over an area of 50 m^2. In the SW zone it is possible to identify a series of occupations which are temporally discontinuous. Although this phenomenon appears only in this sector, it suggests that it is important to analyse the vertical dispersion of artefacts and the relationships between this and adjacent features (Martínez-Moreno et al. 2004) before discussing contemporaneity.

Site chronology

An important element in evaluating the long-term dynamics of the site – in its broadest sense – is the evidence provided by radiometric dating. If we assume that it is possible to detect temporal intervals among the archaeological remains, then radiometric dating may allow us to determine whether we are dealing

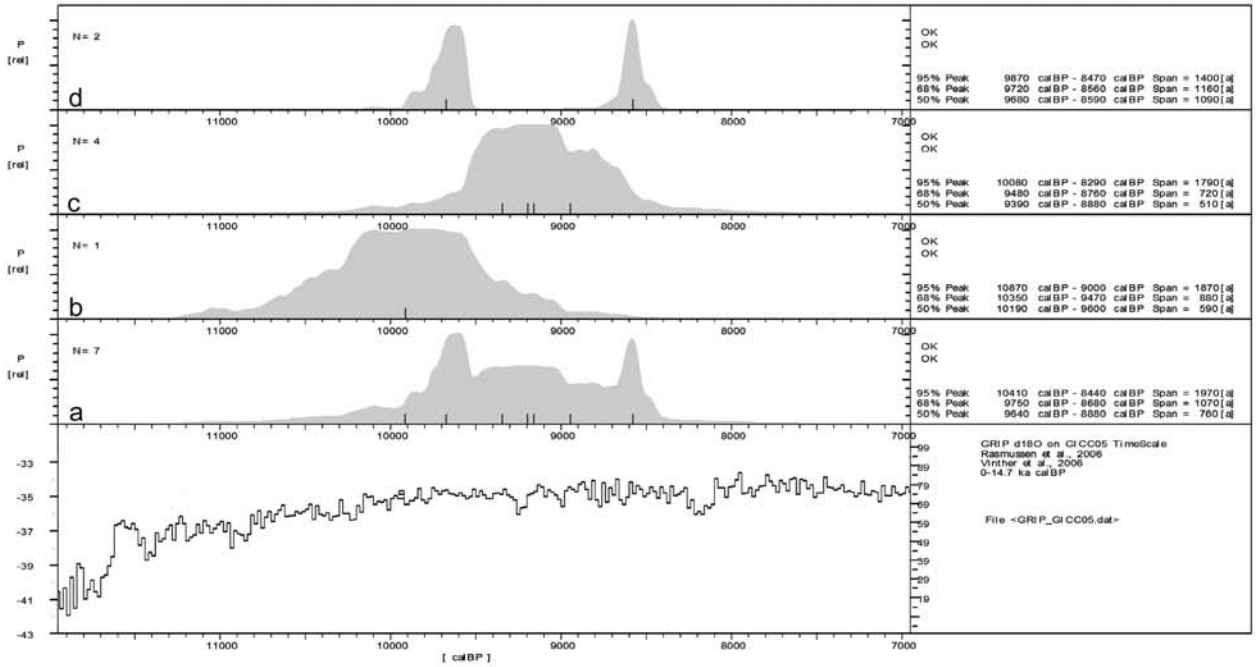


Fig. 4 Graphic representation of the probability distribution of the ^{14}C (CalPal version May 2006): – **a** showing the complete series, – **b** distribution of the dates of SGA, – **c** distribution of conventional ^{14}C dates for SG, – **d** distribution of ^{14}C AMS dates for SG.

with a homogeneous surface or with a series of occupations, separated by discrete time intervals. Currently, there are seven dates available for the site, all of which have been calibrated with the CalPal 2005 SFCP age model (CalPal software, version May 2006: Weninger et al. 2006) using a standard deviation of 2σ (**tab. 1**). The chronometric range has been compared with oxygen isotope variations ($^{18\sigma}\delta$) over the GICC05 time scale (Andersen et al. 2005) (**fig. 4**).

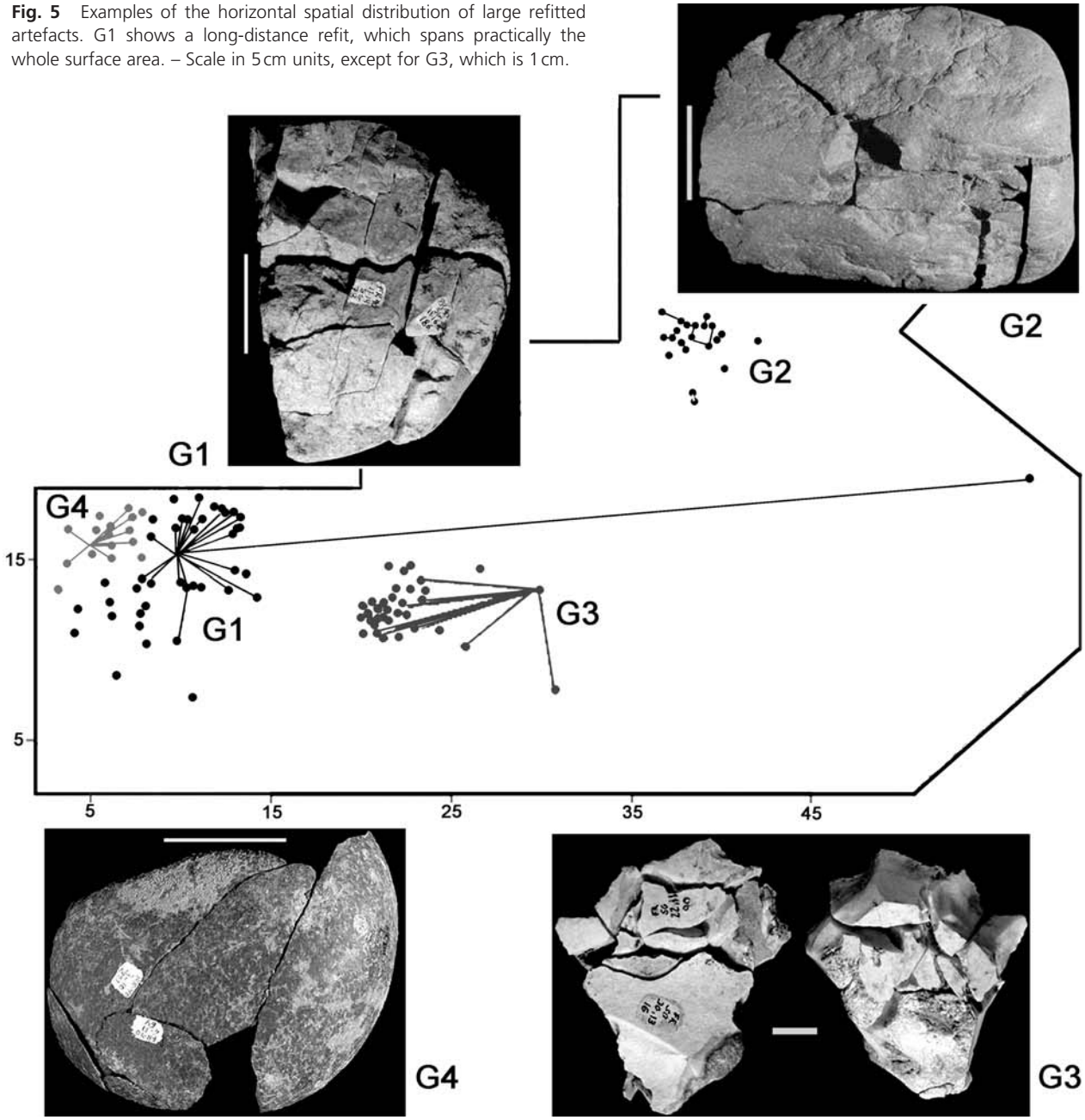
The radiometric series presents a time range of approximately 10 400-8 450 cal BP (**fig. 4d**) which places the site firmly in the Boreal climatic period, a designation that is also supported by the charcoal analysis (Jordá et al. 1992). Additionally, there is a conventional ^{14}C date for context SGA (**fig. 4c**) as well as four dates for level SG (**fig. 4b**) derived from charcoal. Although these dates are not of high precision, they do mark the temporal interval detected during the excavation.

The chronological distribution of the dates of SG, although restricted in range, is relatively imprecise, given their large standard deviations. These factors impede our understanding of the long-term trajectory (**fig. 4b**). In addition, these four dates derive from the NE zone, an area where the chronological sequence is much too broad to detect potential intra-site discontinuities. Two ^{14}C AMS dates obtained from burnt hazelnuts have produced a more precise temporal sequence, indicating that depositional events of remains from the SW and NE zones are separated by more than 800 years (**fig. 4a**).

Spatial distribution and relations between assemblages

Another line of research that can contribute to a better understanding of intra-site contemporaneity is the refitting of lithic artefacts. This approach can provide us with the means of determining which stone arte-

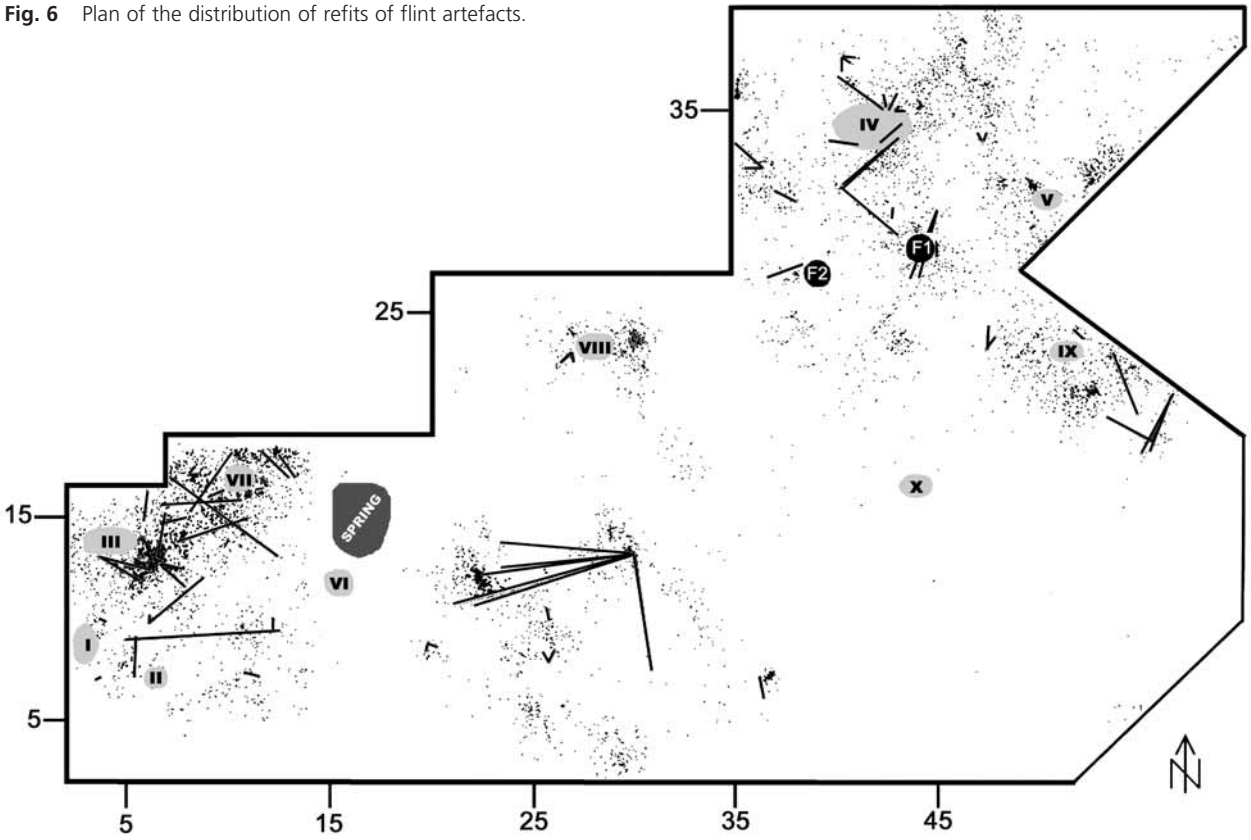
Fig. 5 Examples of the horizontal spatial distribution of large refitted artefacts. G1 shows a long-distance refit, which spans practically the whole surface area. – Scale in 5 cm units, except for G3, which is 1 cm.



facts were associated with various domestic activities at the site, in addition to demonstrating that their spatial distribution may have resulted from a number of different causes. Some rocks have been knapped to obtain stone tools, while others are related to combustion structures or other domestic processes. The movement of artefacts and their trajectories allow us to construct specific hypotheses to enable a better understanding of temporal »synchrony« and site formation processes (Cziesla 1990; Karlin 1992; Leroi-Gourhan / Brézillon 1966; Villa 1982).

Lithic refitting was carried out on a sample of 15 380 specimens. Some 1 132 lithic artefacts (7.35 % of the sample) could be refitted in 393 sets. A substantial amount of quartz, limestone and particularly flint was knapped; the latter material (flint) producing the majority of refits ($n = 204$).

Fig. 6 Plan of the distribution of refits of flint artefacts.



In this paper, we focus on refits defining general patterns of artefact dispersal. The majority of these (n=260) represent sets composed of only two pieces; there are only three refits comprising ten or more items. The most common spatial distance covered by the refits is less than 0.5 m (244), with 255 over a distance of less than 2 m. Groups of artefacts dispersed over more than 20 m, for example those related to the SW and NE zones, comprise nine refit sets. The implications of these associations will be explained by some examples (fig. 5).

Refits have been recorded which cover long distances, for example extending from one end of the excavated surface to the other (G1), but the largest set covers a narrow area of distribution with a radius of 5 m (G2 and G4), suggesting these artefacts were discarded at the place where they were produced. A similar pattern of dispersal is also apparent in the case of flint artefacts (G3) which were manufactured in an area where we find the majority of the refitted pieces; they are distributed within a 7 m radius. This suggests that we are dealing with activities that were carried out expediently.

A few refitted artefacts connecting the SW and NE zones have a distribution of more than 10 m. Only two examples (fragments of a quartz pebble and of andesite), each related to flake production or retouching, connect the two zones.

An additional argument supporting the idea of minimal interaction within and between the large assemblages is derived from the refitting of flint artefacts (fig. 6). There are very few related pieces of flint tools. Refit sets connect only 2 or 3 fragments, with the exception of a series of knapped pieces which are not related to either of the two main zones, but are associated with G3 (fig. 5). In any case, it has not been possible to establish any connection between the assemblages in the NE and SW zones, nor to observe any spatially distinctive areas within the zones themselves.

This suggests a major discontinuity in the lithic distribution. The two zones seem to represent areas that functioned independently. The areas of low find density located at the centre of the site between the two main accumulations could have functioned as satellite zones (Olive 1992) related to a first occupation of the site. However, it seems more plausible that they either represent peripheral areas extending outside the limits of the excavation or the remains of the find-horizon destroyed during recent building construction (fig. 2). The relatively low number of connections prompts another consideration. The majority of refits comprise only two finds suggesting major disruptions in the »chaîne opératoire«. The limited identification of refit sets can be related to the quality of the raw material used or to other factors such as frequent fractures, which complicate the refitting analysis (fig. 5). These observations are contradicted somewhat by the relatively thin archaeological deposit (15 cm on average). What we are proposing is that the artefacts, despite their limited stratigraphic distribution, could have been generated by an indeterminate number of events. The result is an incoherent picture, where it is difficult to reconstruct the artefact reduction sequences.

Hearths and domestic activities

In studies dealing with the organization of spatial patterning, hearths have been objects of special attention, since it has been assumed they contain basic information for the reconstruction of subsistence and maintenance activities (see contributions in Olive / Taborin 1989; Julien et al. 1992).

At Font del Ros relationships between high densities of material and the presence of combustion structures, suggests that tool production and the processing of plant and animal residues took place in the vicinity of the hearths (fig. 3). Indirectly, we can infer other activities, such as the preparation of animal skins. However, there are examples of various combustion structures that are not related to accumulations of artefacts, such as hearth X.

All the hearths are relatively small (less than 1 m in diameter), except for hearth IV which covers an area of 8 m^2. It is composed of a surface comprising closely packed pebbles and other angular fragments displaying the effects of direct exposure to intense heat. It is not possible to determine the outer limits of the hearth and in its periphery there are groups of burnt stones. Refitting shows these artefacts were originally located in the hearth area (fig. 7).The evidence of »vidanges« (removal of burnt material) suggests that the distribution of ashes and stones resulted from the periodic cleaning, maintenance and possible reuse of hearths. In hearth IV, the majority of the fire-cracked stones has been moved away from the centre of the fire, suggesting the hearth was dismantled and the hot rocks dispersed over a large surface area for use later in different domestic activities.

One problem related to this interpretation concerns the potential interrelationships between the hearths. The four hearths located in the SW zone extend over an area of less than 100 m^2, however, it is difficult to determine whether or not they are contemporaneous. It has been possible to identify a number of refits of artefacts and stones between hearths III and VII, suggesting they correspond to the same occupation phase. However, it should be noted that the connections identified here are less convincing than those of the other hearths in the vicinity (I and III) (fig. 6).

In this case, although we are assuming a possible contemporaneous relationship between the hearths, it is difficult to ascertain if they had different functions in the sense proposed for the Paris Basin sites (Julien et al. 1987; Leroi-Gourhan / Brézillon 1966; Olive 1992). At Font del Ros hearths are related with subsistence practices concerning maintenance of daily routines, as the following discussion will demonstrate.

The presence of micro-debitage, waste (chunks, broken flakes) and cores reveals that the elaboration of lithic tools was carried out in all areas of artefact accumulation in the vicinity of the hearths. The fire-

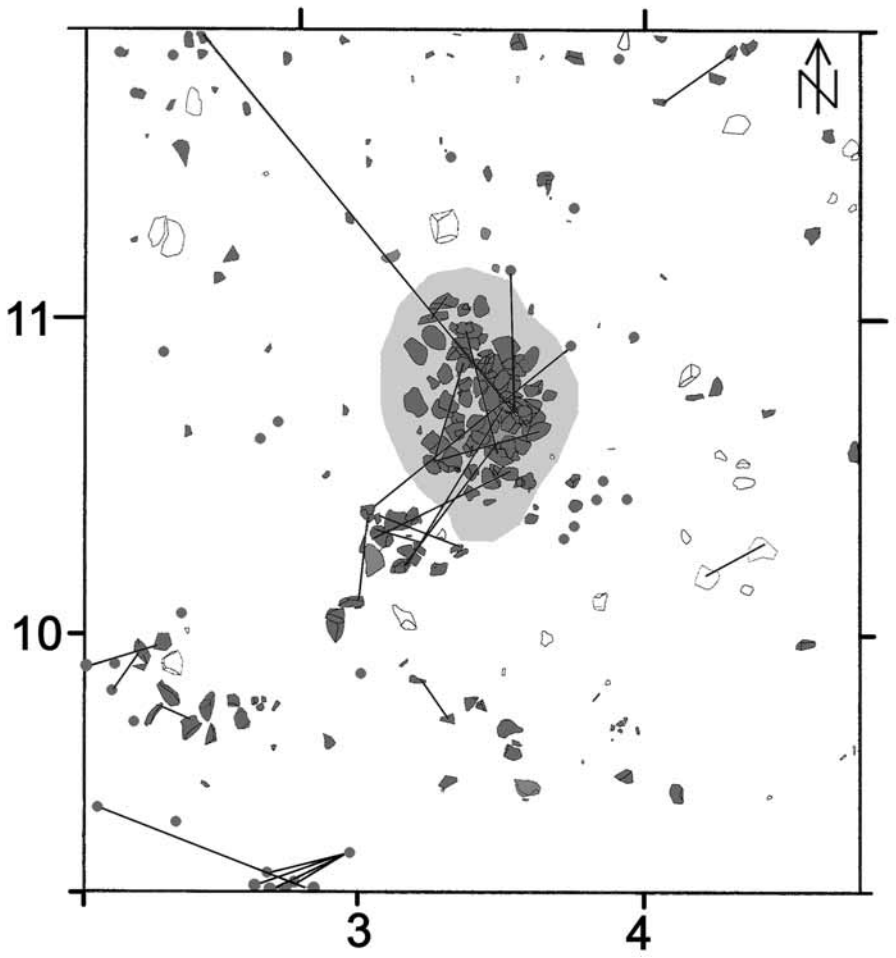


Fig. 7 Hearth I. The thermally-altered area and burnt stones are marked in grey. In the SW corner there is a group of stones, which derive from the area of combustion.

cracked appearance of many artefacts is probably accidental, although some flint nodules do show traces suggesting they may have been heated prior to being worked, as has been described for many Mesolithic sites (Guilbert 2001).

Adjacent to the hearths there are accumulations of ash, charcoals and burnt stones associated with iron oxide stains. The presence of iron oxide staining has previously been related to the working of hide (Audoin / Plisson 1982; de Beaune 2000), in which rocks are employed as hammer stones to crush the minerals used to cure hides. In addition, we have identified tools in the lithic assemblage with traces of use-wear associated with this activity.

Two pits were excavated in the NE zone. These are relatively common at post-glacial sites (Verjux 2000), although in many cases their function is not clear. The pits at Font del Ros, for example, provided large cobbles of ochre, suggesting that they were caches where pigments, among other things, were stored prior to use.

The charcoal samples, apart from providing evidence of their use as fuel, also indicate the type of environmental conditions in the immediate vicinity of the site. In addition, seeds of fruits such as Rosaceae, *Pyrus*, and Maloidae, and especially *Corylus avellana*, the second most abundant taxon in the charcoal analysis, have been identified (Jordá et al. 1992). The surface of the living-floor is covered with shells of burnt hazelnut, suggesting that they were part of the diet. There are also residues of *Quercus* (Juan 1997), although it is not possible to identify their related fruits. This type of evidence points to the role of gathering during the Holocene in the Pyrenees (Zapata 2000).

Retouched Artefacts	
Denticulates and Notches	186
Side scrapers	126
Splintered pieces	91
End scrapers	22
Burins	17
Borers	3
Backed points	2
Backed bladelets	6
Truncations	1
Undetermined	5
Σ	459

Tab. 2 Lithic tool categories at Font del Ros.

Although animal bones are present in all of the concentrations, various processes have reduced the majority of these finds to very small fragments (less than 2 cm), so that identifications to anatomy and species are difficult to make. Above all, their poor state of conservation makes it difficult to speculate on patterns of transport and/or distribution (Enloe / David 1989). In some cases, however, their spatial location suggests transportation of parts of individual animals, as is the case with some molars of *Bos* sp.
More than 80 % of the 2 600 bones recorded up to now have been found either within the hearths or in close proximity to them, and show traces of burning (Shipman et al. 1984). The sheer intensity of this process of prolonged heating suggests that the material was used for purposes of combustion (Théry-Parisot / Costamagno 2005), a suggestion that seems to be at odds with the abundance of wood in the area, as inferred from the charcoal analysis.

An unspecialised lithic tool-kit?

In addition to the poor state of bone preservation, the absence of microlithic armatures makes it difficult to assess the role of hunting at this site. The lithic assemblage is characterised by an abundance of scrapers, end-scrapers, denticulates and scaled pieces, the so called »fond commun« (Rozoy 1999), which contrasts with the almost complete absence of backed bladelets and points or geometric tools (**tab. 2**).
There are more than fifteen distinctive lithological groups; among these are quartz, various types of volcanic rock, quartzite and limestone. These materials are from the terraces of the Llobregat River, adjacent to the site. Poor quality flint was transported from sources in the neighbouring mountains more than 10 km away (Terradas 1995) and used preferentially for retouched pieces. In general, the assemblage was made from local materials, demonstrating a restricted choice of raw materials and favouring the quantity and availability of materials that could be easily obtained. The site produced a large number of flakes and »informal« cores which were rapidly abandoned due to their tendency to shatter easily (Pallarés / Mora 1999).
Refitting shows that knapping methods were designed to extract small and short flakes by direct, hard percussion, with no previous preparation (**fig. 8a**). Although it is unusual to reconstruct such a large series of

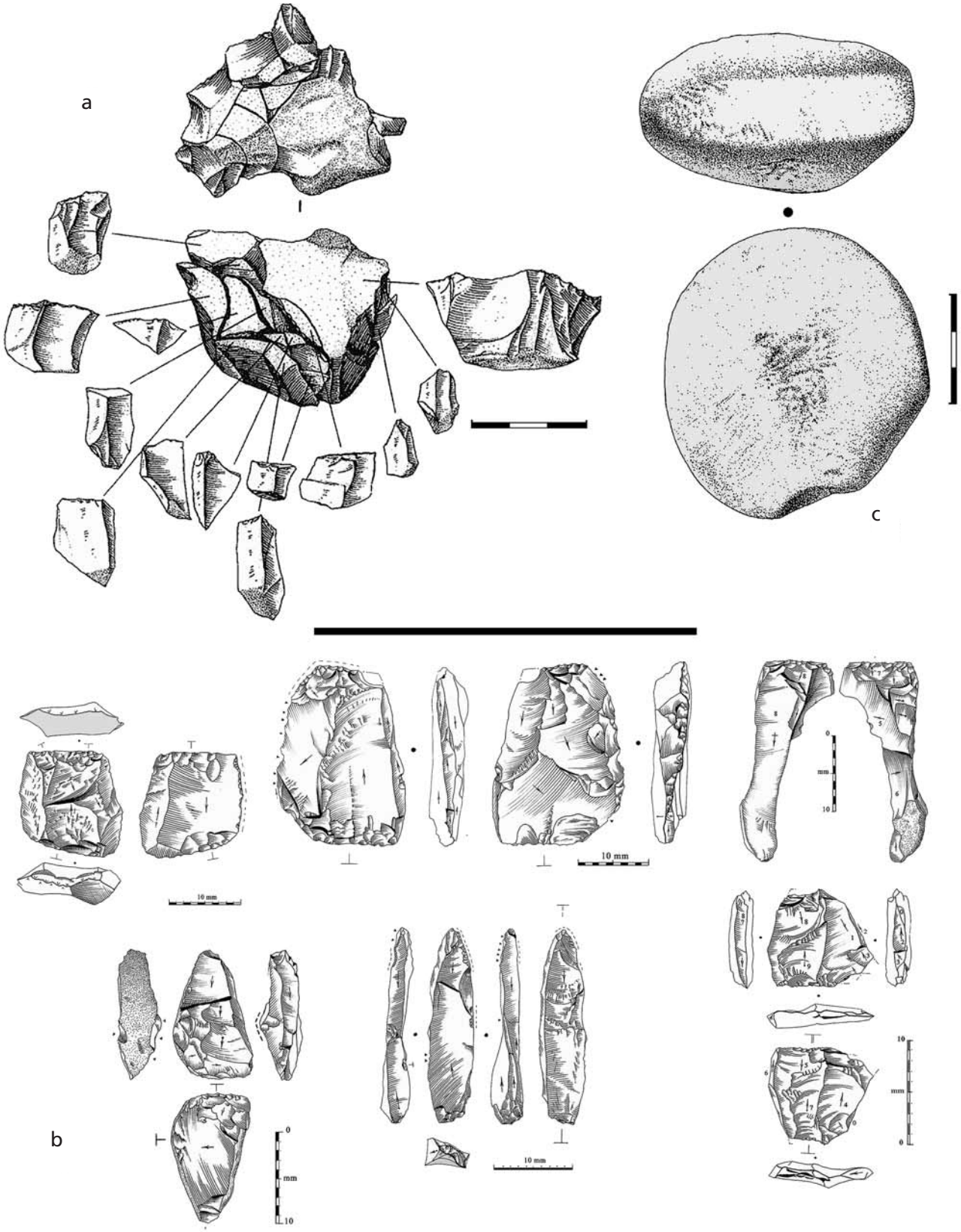


Fig. 8 Elements of the lithic techno-complex: – **a** unipolar flint core which produced morphometrically standardized bladelets and flakes (group G3); – **b** pieces with macroscopic traces of use; – **c** cobble with central percussion pits and abrasions on the edge related to processing plants. – (Drawings a. c J. Ariza, b M. Martzluff).

refits, these examples demonstrate that this simple and expedient method produces morphometrically standardized pieces (Martínez Moreno et al. 2006a; 2006b).
Another strategy is the bipolar technique, employing cobbles as anvil stones (Le Brun-Ricalens 1989). At the same time, artefacts show evidence of intentional fracturing on their dorsal and ventral surfaces and along the edges, so as to produce small thin pieces (**fig. 8b**). Although it is not possible to determine their function, they have all been intentionally obtained and in some cases it is possible to see macro use-wear traces. Their small size (2 cm) suggests that they were probably utilised as composite artefacts or hafted tools (Martínez-Moreno et al. 2006b).
The relatively small number of retouched pieces (some 459 out of 10 000 artefacts) suggests the use of flakes in preference to more »formal« or classic types of retouched artefacts. This implies less investment in the production of artefacts and also the easy replacement of simple tool forms. What we see at Font del Ros is the intentional production of simple tools from easily obtainable materials using chipped and flaked artefacts without retouch.
The majority of the retouched pieces can be classed under »fond commun«, tools that have been largely ignored since interest has focused almost exclusively on armatures (Rozoy 1999). By contrast, use-wear analysis undertaken at nearby sites such as Balma Margineda, which is similar to Font del Ros in techno-typological terms and chronology, demonstrates that these types of artefacts are essentially multi-purpose tools (Philibert 2002). In other words, these simple tools were employed in a wide range of functions, forming an essential part of daily life.
Another indicator is the abundance of cobbles or cobble fragments that appear to have served as multi-function tools. One of the uses of these cobbles has been described in the context of heat-altered stones such as granite, limestone and sandstone, which functioned as heat-retaining stones in the cooking of food or for heating liquids (Julien et al. 1992; Pagoulatos 1992).
In addition, there are percussion marks on some 50 stone artefacts, as well as abrasions on their surfaces and edges. These artefacts have stimulated relatively limited interest. However, these tools allow us to make inferences about subsistence activities (Adams 1988; de Beaune 2000; Procopio / Treuil 2002). Particularly common are stones with a prominent central depression and pronounced circular abrasion marks around their periphery (**fig. 8c**), which may be related to the splitting and grinding of nuts. Such a conjecture appears justified in the case of Font del Ros, where it has been possible to detect starch residues of *Corylus* and *Quercus* on some stones (Juan 1997). Large blocks of limestone with percussion and abrasion marks, suggesting their use as anvils for splitting bones and fresh plants and nuts, were located in areas adjacent to the hearths. Additionally there are sandstone slabs and smoothed cobbles (some with traces of ochre) which suggest these are implements related to hide-working.
In summary, from the above evidence, we can describe a lithic assemblage characterised, above all, by its expedient nature, with a focus on simplification of technical processes and the selection of locally abundant materials and the use of non-specialised tools. This all suggests that the dominant attribute is the notion of structural simplification, pointing to changes in the orientation of Mesolithic techno-complexes in the south-eastern Pyrenees (Martínez-Moreno et al. 2006b). Similar transformations have been recognised throughout the southern Pyrenees and the Ebro valley (Alday 2006) spanning a temporal range similar to Font del Ros.

Discussion

The spatial organization observed at Font del Ros enables a discussion on a number of methodological considerations. For example, and following Bordes (1975; 1980), how do we recognise possible organization-

al contemporaneity across the site? Intra-site temporality is a basic problem in discussions of site spatial organization. At Font del Ros there is evidence to suggest that the various components of the archaeological assemblage were not all deposited at the same time. For example, in the SW zone it is possible to detect at least two separate, although partially overlapping, occupations (fig. 3). While similar phenomena were not detected elsewhere, this does not imply that there were no other reoccupations of the site. In this sense, another indicator of the longevity of site occupation is provided by the ^{14}C dates, which suggest that there is a difference of 800 ^{14}C years between the SW and NE areas (fig. 4; tab. 1).

Temporal discontinuity could explain the paucity of interaction between the two main spatial areas of find accumulation. Plots of refitted artefacts reveal that, despite their large number, refit sets have a limited distribution across the site and there are few connections between the two principle assemblages. Especially notable is the absence of flint refits between the SW and NE zones, thus reinforcing the idea that we have discontinuous spatial units, representing separate occupations. At the same time, the temporal relation between these zones and the intermediate areas cannot be solved (figs 3. 6).

There is no evidence for the existence of huts, windbreaks or other types of dwelling. Features such as the large blocks in the vicinity of the hearths, seem to be related to activity areas rather than some form of dwelling structure.

The hearths provide the focal point for the understanding of the organizational patterns of the areas of find accumulation. Normally, they are small in size and show no evidence of construction or internal phasing indicative of regular re-use. This suggests that they were lit for only short periods of time. Additionally, »vidanges« suggest their expedient use related to activities such as cooking food and heating liquids. However, this provides little information on the overall duration of occupation and they represent, individually, very short periods of time.

The cores and the few retouched pieces found in the vicinity of the combustion structures reflect an unspecialised techno-complex, unexceptional from a typological perspective. This pattern is similar to that recorded at other Mesolithic sites across the Iberian Peninsula also defined by expedient technical processes (Martínez-Moreno et al. 2006b; Pallarés / Mora 1999).

The poor conservation of the faunal material makes it difficult to evaluate the role of hunting. At Font del Ros there is a diverse faunal assemblage dominated by red deer, *Bos* sp., wild pig and ibex. Notable is the low representation of rabbit, a species commonly found at Late Glacial and Mesolithic sites in the southern Iberian Peninsula (Aura et al. 2002).

The bone assemblage shows evidence of exposure to fire, which implies that the hearth areas were locations for the preparation and consumption of hunted prey. Despite limited evidence, hunting was probably a major activity and its importance can be deduced indirectly from evidence such as the working of hide. The accumulations of ash and charcoals associated with stones marked by traces of ochre clearly suggest that these tasks were carried out mainly around the hearth areas.

Another activity carried out around the hearths was the processing of plant remains, as suggested by seeds of *Pyrus*, *Prunus* and Maloidae and others identified from starch residues (*Quercus*) (Juan 1997). The abundant presence of burnt shells of *Corylus* implies the importance of gathering activities. Such information suggests plant preparation activities and consumption, as also indicated by the battered cobbles (fig. 8c). The accumulation of plants in association with hammer stones and anvils in the vicinity of the hearths suggests that roasting formed part of food preparation (fig. 9).

All this implies that hearths acted as focal points for carrying out everyday activities. These features illustrate not only subsistence-related tasks but, more importantly, permit us to speculate on the daily life of the people who occupied these spaces. The model of spatial organization around the hearth areas of Font del Ros, far from identifying »specialised« zones where specific tasks are assigned to certain activities,

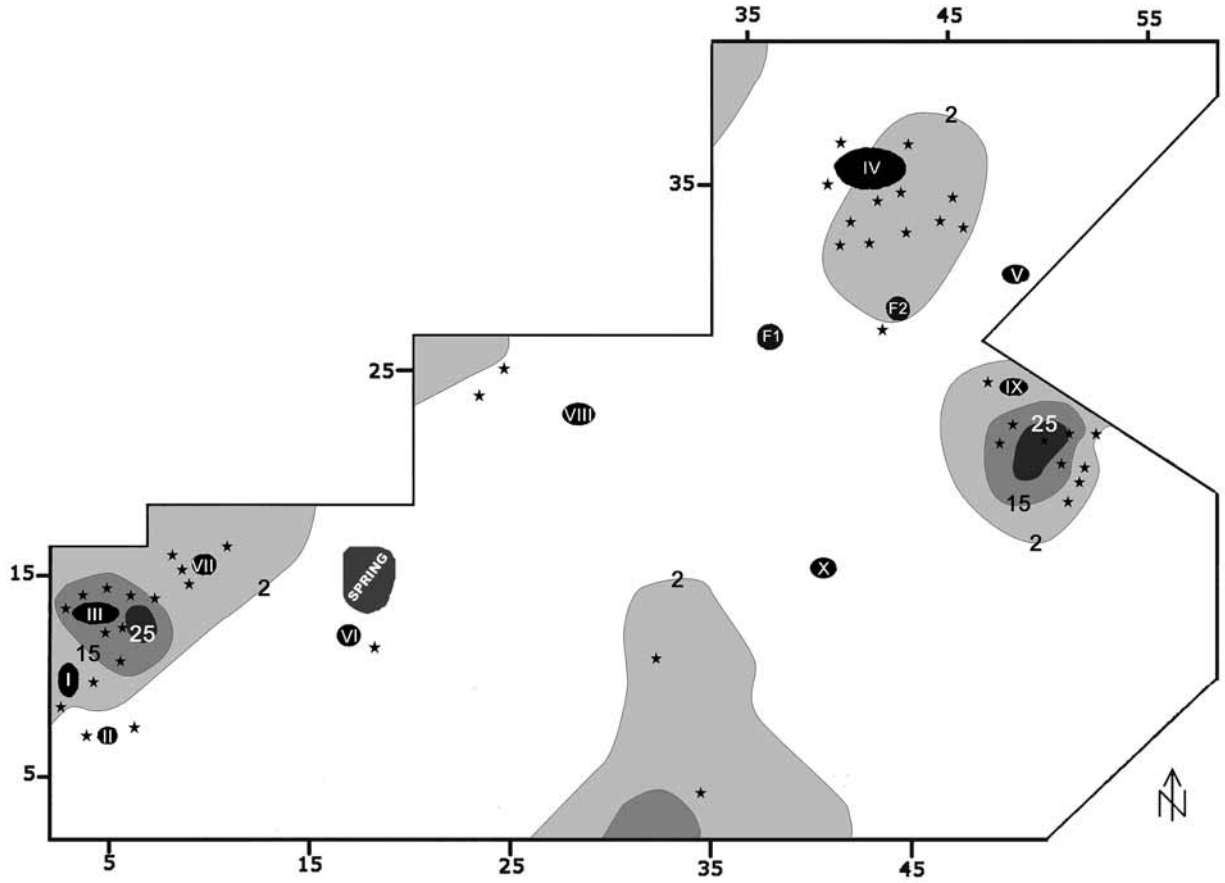


Fig. 9 Density of hazelnut shell fragments, their association with particular hearths and traces of use related to the processing of plant remains (black stars).

instead reflects instead best described as multipurpose areas (Pallarés 1995). These spatial clusters define different tasks that are essential and, at the same time, complementary.

At Font del Ros, tool making, working of hides, butchering of animals and processing of plant materials constitute different activities which converge spatially, suggesting that they are closely related. This interpretation is compatible with non-specialized activities and / or the use of raw materials which were easy to acquire. Here, it is worth noting that practically all the activities described above do not require complex technical skills. In the same way, the work related to the preparation and tanning of skins or the processing of animal and plant materials does not necessarily indicate the organization of activities with respect to either age or gender. From the point of view of social organization, we can envisage autonomous groups which were fully integrated and collaborated closely in daily subsistence activities.

The absence of tools related to hunting (e.g. microlith armatures) and poor bone preservation suggest, at first sight, that this activity could be considered of marginal importance. However, various arguments challenge this interpretation. Hunting is an undertaking which affects and is linked to other activities, such as the working of animal hides. Another link is related to the acquisition of flint, a raw material that does not appear in the immediate vicinity of the site, being found in the adjacent mountains (Terradas 1995). Hunting of montane ungulates and provisioning with flint could have been complementary activities, especially if we take into account the reduced size of the transported blanks (fig. 8a).

The general organization of the site provides no evidence consistent with known systems of hunting involving the capture of a significant quantity of prey over short time intervals, with a view to intensive butchering and processing. The faunal assemblage is principally composed of medium-sized ungulates associated with a variety of ecosystems, such as montane and woodland areas. Due to poor preservation few faunal bones can be identified, nor can it be said with certainty which types of animals were captured in the ecological mosaic forming the immediate environs of the site.

Studies of charcoal at Font del Ros have shown that during this period changes in the environment occurred in the southern Pyrenees. The environmental conditions favoured the spread of prey across the landscape, although at Font del Ros it is difficult to identify significant concentrations of ungulates as described at other Late Glacial sites. One added difficulty would be that in dense or closed forests, the level of precision of weapons such as bows and arrows would be severely reduced. However, even more important than the possession of this type of hunting weaponry, which has not been found at Font del Ros, would be the knowledge of the seasonal cycles and behaviour of the prey, thus providing advantages that would help minimize the risks of hunting and compensate for the generally low effectiveness of this type of prey procurement.

These inferences force us to consider the introduction of individual animals and their immediate consumption as the most viable strategy. This possibility is consistent with the size of the assemblages observed at the site, the expediency of the production and use of tools and the spatial distribution of the refitted lithic material in relatively restricted zones. Combined together, these ideas suggest that the patches of artefacts were generated by small autonomous groups whose activities were focused on daily subsistence routines.

Font del Ros thus cannot be considered as a hunting campsite in the terms commonly used to describe Late Glacial sites. This latter model is based on large-scale occupations where relatively large groups of humans lived and worked in a co-ordinated way. They carried out tasks requiring a degree of specialization or sophisticated working techniques (Julien et al. 1992), or functional tasks related to the processing and short-term storage of large quantities of prey acquired from single hunting events (Audouze 1987a), suggestive of food-sharing (Enloe / David 1989; Karlin 1992).

It is not possible to recognise the circulation of products (artefacts, butchered carcasses) with respect to different spatial units at Font del Ros. The periodic reutilization of these spaces is probably related to natural environmental rhythms, which determined the seasonal occupation of the site. The presence of water and fruit trees would have allowed the prediction of locations in which abundant natural resources could be collected, hence favouring the periodic reoccupation of the site. The topographic position of Font del Ros at the end of the Pyrenean valleys would have given the site a strategic advantage in the routes utilised by small itinerant bands who favoured short-term occupation strategies at particular locations.

The analysis of remains at Font del Ros has allowed us to derive inferences about the way of life of Boreal hunter-gatherers in the southern Pyrenees. This climatic period was characterised by forest expansion, which very likely resulted in profound changes and, at the same time, produced new opportunities for the exploitation of environmental resources. The intensive exploitation of local resources ultimately defines the flexibility of this social system based on domestic units, implying a high level of autonomous organization. This hypothesis, however, is difficult to define and has, not surprisingly, been the subject of substantial debate with respect to its implications and general utility (Hendon 1996).

From our perspective, the concept »domestic unit« is related to small-scale social groups, primarily concerned with daily subsistence and sharing technological and social organizational rules that form the basis for specific sets of decisions and actions. In addition, these units act as nodes in the maintenance of the elaborate networks that form the basis for internal social cohesion, while at the same time, facilitating con-

nections with other groups. As a function of particular contingent circumstances, these would give rise to possible fission / fusion processes, which although difficult to recognise in the static archaeological record, can be deduced from the analogous evidence provided by abundant anthropological observations (Kelly 1995).

The basic nature of these ideas is manifest in the apparently simple material assemblages at Font del Ros. From our perspective, this model shares general attributes employed to define the Mesolithic hunter-gatherer lifestyle (Clarke 1976; Gamble 1986).

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References

Adams 1988: J. L. Adams, Use-wear analysis on manos and hide-processing stones. Journal of Field Archaeology 15 (3), 1988, 307-315.

Alday 2006: A. Alday (ed.), El Mesolítico de muescas y denticulados en la cuenca del Ebro y el litoral mediterráneo peninsular. Memorias de yacimientos Alaveses 11 (Vitoria 2006).

Allué 2002: E. Allué, Dinámica de la vegetación y explotación del combustible leñoso durante el Pleistoceno Superior y el Holoceno del Noreste de la Península Ibérica a partir del análisis antracológico [Ph. D.-thesis, University of Rovira i Virgili 2002].

Andersen et al. 2005: K. Andersen / A. Svensson / S. Johnsen / S. Rasmussen / M. Bigler / R. Röthlisberger / U.Ruth / M. Siggaard-Andersen / J. Peder/ D. Dahl-Jensen / B. Vinther / H. Clausen, The Greenland Ice Core Chronology 2005, 15-42 ka. Part 1: constructing the time scale. Quaternary Science Reviews 25 (23-24), 2005, 3258-3267.

Araújo / Almeida 2003: A. C. Araujo / F. Almeida, Barca do Xerez do Baixo: balanço de quatro anos de trabalhos arqueológicos. Revista Portuguesa de Arqueología 6, 2003, 17-67.

Astruc et al. 2006: L. Astruc / F. Bon / V. Léa / P.-Y. Milcent / S. Philibert (eds), Normes techniques et pratiques sociales: de la simplicité des outillages pré- et protohistoriques. Actes des XXVI[e] rencontres internationales d'archéologie et d'histoire d'Antibes 2005 (Antibes 2006).

Audoin / Plisson 1982: F. Audoin / H. Plisson, Les ocres et leurs témoins au Paléolithique en France. Cahiers du Centre de Recherches Préhistoriques de Paris I 8, 1982, 33-80.

Audoin-Rouzeau / Beyries 2002: F. Audoin-Rouzeau / S. Beyries (eds), Le travail du cuir de la Préhistoire à nos jours. Actes des XXII[e] rencontres internationales d'archéologie et d'histoire d'Antibes (Antibes 2002).

Audouze 1987a: F. Audouze, The Paris Basin in Magdalenian times. In: O. Soffer (ed.), The Pleistocene Old World (New York 1987) 183-200.

1987b: F. Audouze, Des modèles et des faites: les modèles de A. Leroi-Gourhan et de L. Binford confrontés aux résultats récents. Bulletin de la Société Préhistorique Française 84, 1987, 243-252.

Aura et al. 2002: J. E. Aura / V. Villaverde / M. Pérez-Ripoll / R. Martínez-Valle / P. R. Guillem, Big game and small prey: Paleolithic and Epipaleolithic economy from Valencia (Spain). Journal of Archaeological Method and Theory 9 (3), 2002, 215-268.

de Beaune 2000: S. de Beaune, Pour une archéologie du geste (Paris 2000).

Binford 1978: L. R. Binford, Dimensional analysis of behavior and site structure: learning from an Eskimo hunting stand. American Antiquity 43, 1978, 330-361.

Bordes 1975: F. Bordes, Sur la notion du sol d'habitat en Préhistoire. Bulletin de la Société Préhistorique Française 72, 1975, 139-144.

1980: F. Bordes, Question de contemporanéité: l'illusion des remontages. Bulletin de la Société Préhistorique Française 77, 1980, 132-133.

Bratlund 1996: B. Bratlund, Hunting strategies in the Late Glacial of northern Europe: a survey of the faunal evidence. Journal of World Prehistory 10, 1996, 1-48.

Carr 1991: C. Carr, Left in the dust: contextual information in model-focused archaeology. In: Kroll / Price 1991, 221-256.

Cahen et al. 1979: D. Cahen / L. Keeley / F. Van Noten, Stone tools, toolkits and human behaviour in Prehistory. Current Anthropology 20 (4), 1979, 661-683.

Clarke 1976: D. L. Clarke, Mesolithic Europe: the economic basis. In: G. de G. Sieveking / I. H. Longworth / K. E. Wilson (eds), Problems in economic and social archaeology (London 1976) 449-481.

CRPES 1985: CRPES, Sota Palou. Campdevànol. Un centre d'intervenció prehistòrica postglaciar a l'aire lliure (Girona 1985).

Cziesla 1990: E. Cziesla, On refitting of stone artefacts. In: E. Cziesla / S. Eickhoff / N. Arts / D. Winter (eds), The Big Puzzle. International symposium on refitting stone artefacts, Monrepos 1987. Studies in Modern Archaeology 1 (Bonn 1990) 9-44.

Enloe / David 1989: J. Enloe / F. David, Le remontage des os par individus: le partage du renne chez les Magdaléniens de Pincevent. Bulletin de la Société Préhistorique Française 86, 1989, 275-281.

Gamble 1986: C. Gamble, The mesolithic sandwich: ecological approaches and the archaeological record of the early postglacial. In M. Zvelebil (ed.), Hunters in transition: Mesolithic societies of temperate Eurasia and their transition to farming. New Directions in Archaeology (Cambridge 1986) 33-42.

Guilbert 2001: R. Guilbert, Le Sansonnet et les Agnels, exemples de fragmentation thermique intentionnelle du flint au Sauveterrien. Paléo 12, 2001, 245-250.

Hendon 1996: J. Hendon, Archaeological approaches to the organization of domestic labour: household practices and domestic relations. Annual Review Anthropology 25, 1996, 45-61.

Jordá et al. 1992: J. Jordá / R. Mora / R. Piqué, La secuencia litoestratigráfica y arqueológica del yacimiento de la Font del Ros, Berga. Cuaternario y Geomorfología 6, 1992, 21-30.

Juan 1997: J. Juan, Font del Rós (Berga). Estudio de residuos conservados en el instrumental lítico de molido y triturado [unpublished manuscript 1997].

Julien et al. 1987: M. Julien / C. Karlin / P. Bodu, Pincevent: Où est le modèle théorique aujourd'hui? Bulletin de la Société Préhistorique Française 84, 1987, 335-342.

Julien et al. 1992: M. Julien / C. Karlin / B. Valentin, Déchets de flint, déchets des pierres chauffées de l'intéret des remontages à Pincevent. In: J. L. Hofman / J. G. Enloe (eds), Piecing together the past: applications of refitting studies in archaeology. BAR Int. Ser. 578 (Oxford 1992) 287-295.

Karlin 1992: C. Karlin, Connaissances et savoir-faire: comment analyser un processus technique en Préhistoire: Introduction. In: R. Mora (ed.), Tecnología y Cadenas Operativas Líticas (Barcelona 1992) 99-162.

Kelly 1995: R. L Kelly, The Foraging Spectrum. Diversity in Hunter-Gatherer Lifeways (Washington 1995).

Kroll / Price 1991: E. M. Kroll / T. D. Price (eds), The Interpretation of Archaeological Spatial Patterning (New York 1991).

Le Brun-Ricalens 1989: F. Le Brun-Ricalens, Contribution a l'étude des pièces esquillées: la présence de percuteurs à »cupules«. Bulletin de la Société Préhistorique Française 86, 1989, 196-201.

Leesch 1997: D. Leesch, Hauterive-Champréveyres: un campement magdalénien au bord du lac de Neuchâtel. Archéologie neuchâteloise 19, Service et musée cantonal d'archéologie de Neuchâtel (Neuchâtel/Hauterive 1997).

Leroi-Gourhan / Brézillon 1966: A. Leroi-Gourhan / M. Brézillon, L'habitation magdalénienne nº 1 de Pincevent près Montereau (Seine-et-Marne). Gallia Préhistoire 9, 1966, 263-385.

1972: A. Leroi-Gourhan / M. Brézillon, Fouilles de Pincevent: Essai d'analyse ethnographique d'un habitat magdalénien (la section 36). VII^{ème} supplément à Gallia Préhistoire (Paris 1972).

Martínez-Moreno et al. 2004: J. Martínez-Moreno / R. Mora / I. de la Torre, Methodological approach for understanding Middle Palaeolithic settlement dynamics at La Roca dels Bous. In: N. J. Conard (ed.), Settlement Dynamics of the Middle Paleolithic and Middle Stone Age vol. II (Tübingen 2004) 393-413.

Martínez-Moreno et al. 2006a: J. Martínez-Moreno / M. Martzluff / R. Mora / J. Guilaine, D'une pierre deux coups: entre percussion posée et plurifonctionnalité. Les poids des comportements »opportunistes« dans l'Épipaléolithique-Mésolithique pyrénéen. In: Astruc et al. 2006, 147-160.

2006b: J. Martínez-Moreno / R. Mora / J. Casanova, El Mesolítico de los Pirineos surorientales: una reflexión sobre el significado de las »facies de fortuna« del Postglaciar. In: Alday 2006, 163-192.

Mora et al. 1991: R. Mora / X. Terradas / C. Plana / J. Martínez-Moreno, Les ocupacions mesolítica i neolítica de la Font del Ros (Berga, Berguedà). Tribuna d'Arqueologia 1989-1990 (1991), 19-29.

Olive 1992: M. Olive, En marge des unités d'habitation d'Étiolles: les foyers d'activité satellite. Gallia Préhistoire 34, 1992, 85-140.

Olive / Taborin 1989: M. Olive / Y. Taborin (eds), Nature et fonction des foyers préhistoriques. Actes du Colloque International de Nemours (Nemours 1989).

Pagoulatos 1992: P. Pagoulatos, The re-use of thermally altered stones. North-American Archaeologist 13, 1992, 115-129.

Pallarés 1995: M. Pallarés, Cuestiones teórico-metodológicas sobre la organización de los asentamientos cazadores-recolectores. II Coloquio Internacional de Arqueología e Informática (Bilbao 1995) 387-408.

1999: M. Pallarés, Teoria i mètode sobre l'anàlisis espacial en Arqueologia. La gestió de l'espai social a l'interior de l'assentament de la Font del Ros (Berga, Barcelona) [unpubl. Ph. D.-thesis, Universitat Autònoma de Barcelona 1999].

Pallarés / Mora 1999: M. Pallarés / R. Mora, Organizational hunter-gatherer strategies in the IXth Millennium BP along the eastern Pyrenees. In: A. Thévenin (ed.), Épipaléolithique et Mésolithique en Europe (Paris 1999) 65-71.

Philibert 2002: S. Philibert, Les derniers sauvages. Territoires économiques et systèmes techno-fonctionnels mésolithiques. BAR Int. Ser. 1069 (Oxford 2002).

Rozoy 1999: J. G. Rozoy, Le mode de vie au Mésolithique, Épipaléolithique et Mésolithique en Europe. In: A. Thévenin (ed.), Épipaléolithique et Mésolithique en Europe (Paris 1999) 39-50.

Shipman et al. 1984: P. Shipman / G. Foster / M. Schoeninger, Burnt bones and teeth: an experimental study of color, morphology, crystal structure and shrinkage. Journal of Archaeological Science 11, 1984, 307-325.

Street et al. 2006: M. Street / F. Gelhausen / S. Grimm / F. Moseler / L. Niven / M. Sensburg / E. Turner / S. Wenzel / O. Jöris, L'occupation du bassin de Neuwied (Rhénanie centrale, Allemagne) par les Magdaléniens et les groupes à Federmesser (Azilien). Bulletin de la Société Préhistorique Française 103 (4), 2006, 753-780.

Terradas 1995: X. Terradas, Las estrategias de gestión de los recursos líticos del Prepirineo catalán en el IX milenio BP: el asentamiento prehistórico de la Font del Ros. Treballs d'Arqueología 3 (Bellaterra 1995).

Testart 1988: A. Testart, Some major problems in the social anthropology of hunter-gatherers. Current Anthropology 29, 1988, 1-31.

Théry-Parisot / Costamagno 2005: I. Théry-Parisot / S. Costamagno, Propriétés combustibles des ossements. Gallia Préhistoire 47, 2005, 235-254.

Villa 1982: P. Villa, Conjoinable pieces and site formation processes. American Antiquity 47, 1982, 276-290.

2004: P. Villa, Taphonomy and stratigraphy in European Prehistory. Before Farming 1, 2004, 1-20.

Verjux 2000: C. Verjux, Creuser pour quoi faire? Les structures en creux au Mésolithique. In: P. Bodu / C. Constantin (eds), Approches fonctionnelles en Préhistoire (Paris 2000) 239-248.

Weninger et al. 2006: B. Weninger / O. Jöris / U. Danzeglocke, CalPal – University of Cologne Radiocarbon Calibration Program Package, 2006. http://www.CalPal.de.

Zapata 2000: L. Zapata, La recolección de plantas silvestres en la subsistencia Mesolítica y Neolítica. Datos arqueobotánicos del Pais Vasco. Complutum 11, 2000, 157-169.

Abstract

Spatial organization at Font del Ros, a Mesolithic settlement in the South-Eastern Pyrenees

Font del Ros is an open air site extending over almost 1 200 m^2, which has produced an important assemblage of lithic, faunal and macro-botanical remains associated with a variety of hearths. The present study is designed to analyse and evaluate to what extent this archaeological assemblage can be identified as a large encampment in which different social units interacted in an organized way. Following a discussion of the patterns of spatial organization, radiometric dating, the lithic assemblage and subsistence activities, we shall present a model of the daily life of Mesolithic hunter-gatherers in the Southern Pyrenees.

Key words

Font del Ros / exploratory visual analysis / spatial organization / lifestyle / Mesolithic