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Laure Fontana, François-Xavier Chauvière

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# The total exploitation of Reindeer at the site of Les Petits Guinards What's new about the annual cycle of nomadism of Magdalenian groups in the French Massif Central?

Laure FONTANA\* & François-Xavier CHAUVIÈRE \*\*

## ABSTRACT

The site of Les Petits Guinards in Creuzier-le-Vieux (Allier, France) yielded 1,230 fragments of Reindeer antler. This assemblage, which is unique for the Upper Palaeolithic of the Massif Central, comprises 43 fragments of hunting weapons and tools (shafts and projectile points, chisels) and a minimum of 30 waste products. Only a small proportion of this toolkit was manufactured at the site, mainly from Reindeer shed antler of medium and small modules. Another portion of artifacts, made prior to the occupation of Les Petits Guinards, comes from the exploitation of large modules. It reflects the transport of more or less finished items (or even of male Reindeer shed antlers) from some unknown location of manufacture, which might be located in the northern source area of procurement of their allochthonous flint. The integration of data stemming from the zooarchaeological and technological analysis allows to document the patterns of Reindeer antler acquisition and exploitation, at the scale of the site as of an annual cycle of nomadism within a geographical area whose boundaries remain to be defined.

**KEYWORDS:** French Massif Central; Magdalenian; Reindeer; Economic system; Reindeer antler procurement and exploitation; Settlements patterns.

## RÉSUMÉ - L'exploitation du Renne aux Petits Guinards : nouvelles données sur le cycle annuel de nomadisme des Magdaléniens du Massif Central.

Le gisement des Petits Guinards à Creuzier-le-Vieux (Allier, France) a livré 1230 fragments de bois de Renne. Cette série, exceptionnelle pour le Paléolithique supérieur du Massif Central, comprend 43 fragments d'armes de chasse et d'outils (préhampes et pointes de projectiles, ciseaux, baguettes) et un minimum de 30 déchets de fabrication. Seule une faible part de cet équipement en bois de Renne a été confectionnée sur place, principalement à partir de bois de chute de moyens et petits modules. Une autre partie des objets, fabriquée antérieurement aux occupations des Petits Guinards, provient de l'exploitation de gros modules. Elle témoigne du transport d'objets plus ou moins finis, voire de bois de chute de rennes mâles, depuis des lieux de fabrication inconnus qui pourraient se situer dans la région septentrionale d'approvisionnement en silex allochtone. L'intégration des données issues des études archéozoologiques et techniques permet de documenter les modes d'acquisition et d'exploitation du bois de Renne, tant à l'échelle du site qu'à celle d'un cycle annuel de nomadisme au sein d'un espace qui reste à délimiter.

**MOTS CLÉS :** Massif Central ; Magdalénien ; Renne ; Économie ; Cycle annuel de nomadisme ; Acquisition et exploitation du bois de Renne.

## INTRODUCTION

Focusing on Reindeer (*Rangifer tarandus*) exploitation across different regions, our research aims at reconstructing the nomadic annual cycle of Upper Palaeolithic human groups by characterizing the patterns of mineral and animal resource exploitation. This type of investigation, which may lead to the identification of a geographical area used by certain groups of hunter-gatherers, is particularly interesting in the case of the French Massif Central. Indeed, Gravettian, Solutrean and Magdalenian groups of that extensive region, unlike their

contemporaries (at the scale of western Europe), made the vast majority of their lithic industry in a distant non-local flint. This massive and systematic supply, carried out over 200 kilometers and for at least 15,000 years, raises the issue of group mobility and their economic system. This questioning is all the more granted by the fact that winter hunts are not documented to date; thus, the annual cycle of nomadism is only partially represented (Fontana 2005 & in press). Using these two sets of information (presence of distant allochthonous flint and absence of winter sites), we

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\*CNRS-UMR 6636 Maison Méditerranéenne des Sciences de l'Homme, 5, rue du Château de l'Horloge BP647, 13094 Aix-en-Provence Cedex 02, France. lfontana@mmsh.univ-aix.fr

\*\* Office et musée d'archéologie de Neuchâtel, Laténium, Espace Paul Vouga, 2068 Hauterive, Suisse. chauvierfx@yahoo.fr

are interested to find out if the groups who were exploiting the Massif Central at least part of the year (from spring to autumn) were systematically spending the cold season in the northern bordering area, corresponding to the present southern Touraine, the source area of their flint. In order to do so, we try to best characterize the economy of animal and mineral resources in an attempt to locate sites within the annual cycle. This methodological exercise is quite delicate, since it requires common questionings and a true integration of data (see Fontana *et al.* 2009).

One key to understanding the economic system and mobility pattern of human groups in this region is their exploitation of Reindeer, one of two main game hunted in the Massif Central from 24,000 BP onward. Whereas this exploitation is insufficiently documented throughout the whole region due to the small number of sites and the nature of their occupation, nothing was known about it in the northern sector. It was a real problem since it constituted the necessary route groups would take toward the supply area of northern flint and thus represents a key sector in

our reconstruction of the annual cycle of nomadism. The excavation of the site Les Petits Guinards, located in this area and has yielded an exceptionally a rich industry of Reindeer antler, gave us the opportunity to start filling in this gap with unexpected data from an integrated study on the exploitation of Reindeer, focusing on its antlers.

## THE SITE

The presence of a site located in the Massif Central, along the Allier River and a few miles North of Vichy, is known since 1981, thanks to surface collection carried out on the slope of a land plot (Fig. 1). It lies at the foot of a steep slope with a very specific topography marked by the presence of mounds of varying size attributed to solifluction flows. Whereas it was initially characterized as an open-air site, the stratigraphic and taphonomic study conducted in 2002 in new soundings on the slope itself allowed us to identify these deposits as secondary, due to land sliding (Fontana *et al.* 2003a, 2003b & in press). This lens of sliding sediment originated from the filling of a rockshelter

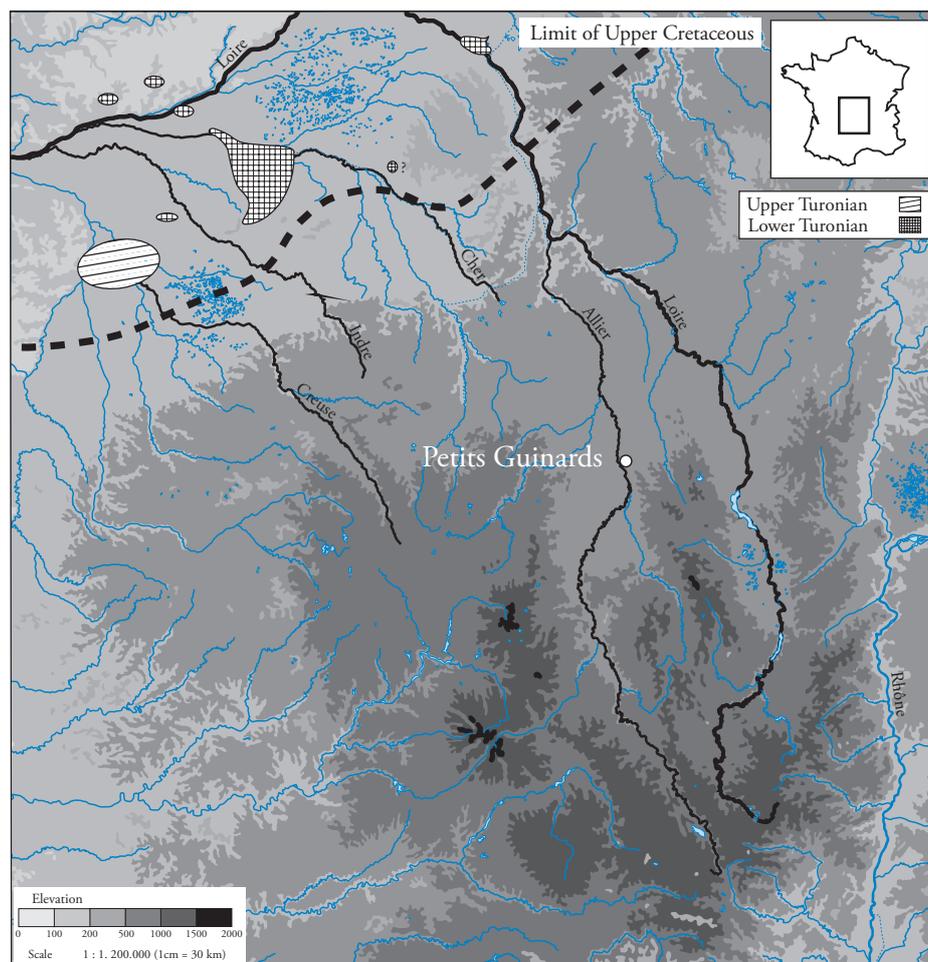


Figure 1: Les Petits Guinards - Site Location.

located at the top of the slope and of which only remains a limestone cliff about twenty metre wide. The on-going geomorphological study of deep soundings dug between the initial position of the shelter and the current location of the archaeological deposits shows that the alteration and evolution of the limestone cliff wall had led to its gradual retreat and that the pedological formations were eroded down the slope - following a sliding plane running deep in the substratum - in blocks that were not affected by any major sediment reworking (F. Sellami, in progress). Thus, we excavated this archaeological deposit, despite its secondary position, which yielded a stratigraphy generally well-preserved over a surface area of about 20 m<sup>2</sup>. The sedimentary matrix of this archaeological layer corresponds to sandy loams associated with limestone blocks of all sizes and our sedimentological observations were not able to distinguish any sub-layers within this archaeological level. The lithic industry previously collected testified, according to the discoverers, of Upper Magdalenian occupations while a radiocarbon date (Ly 2737: 17,420 ± 330 BP), obtained in 1982 on a batch of 400 grams of bones, hinted at an older presence (Lower Magdalenian

and/or Badegoulian). The study of the newly uncovered lithic and osseous industries, as well as the dating (AMS <sup>14</sup>C) of 13 bone remains (including bone industry), show that this site was actually occupied at various periods - spanning between 19,500 and 13,230 BP - by Solutrean and particularly Magdalenian groups (Fontana *et al.* 2009, in press & in prep.). The exploitation of mineral resources is reflected mainly by the production of very small backed bladelets, predominant in the lithic assemblage (Fig. 2) and obtained through an independent production of relatively standardized bladelets (M. Digan, in progress). These blanks were produced on site, predominantly from a blonde flint (Type 07 of A. Masson [1981]), also found in the other sites of the Massif Central and originating from Upper Cretaceous marine formations of the southern Paris Basin, specifically outcrops in the Indre and Cher valleys (X. Mangado & T. Aubry, in progress; Fontana *et al.* 2009) (see Fig. 1). Alongside this allochthonous flint of excellent quality, which alone accounts for 80% of the raw materials used to produce the entire industry, there is a wide variety of lithic raw materials (about fifteen types).

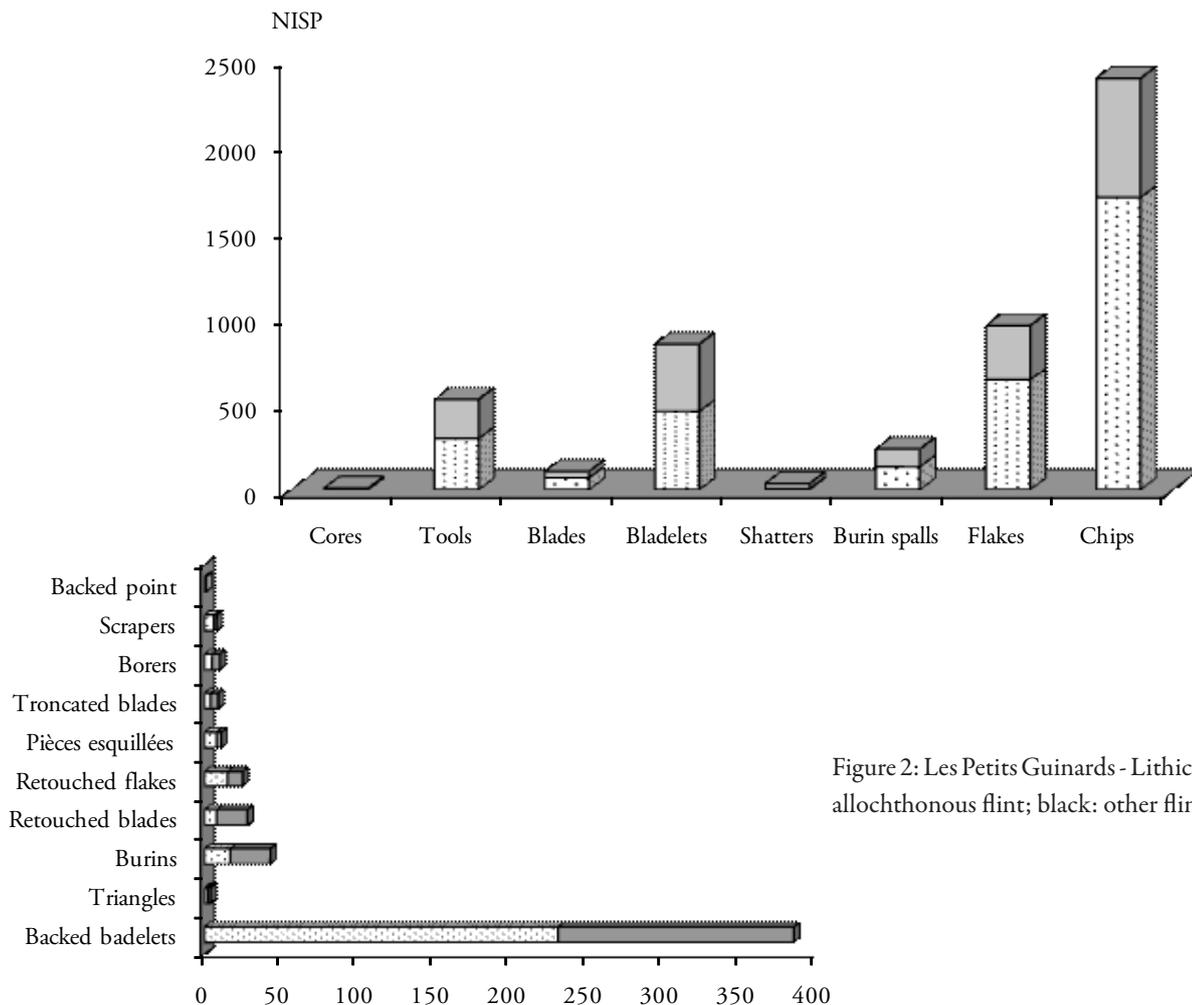


Figure 2: Les Petits Guinards - Lithic industry (white: allochthonous flint; black: other flints).

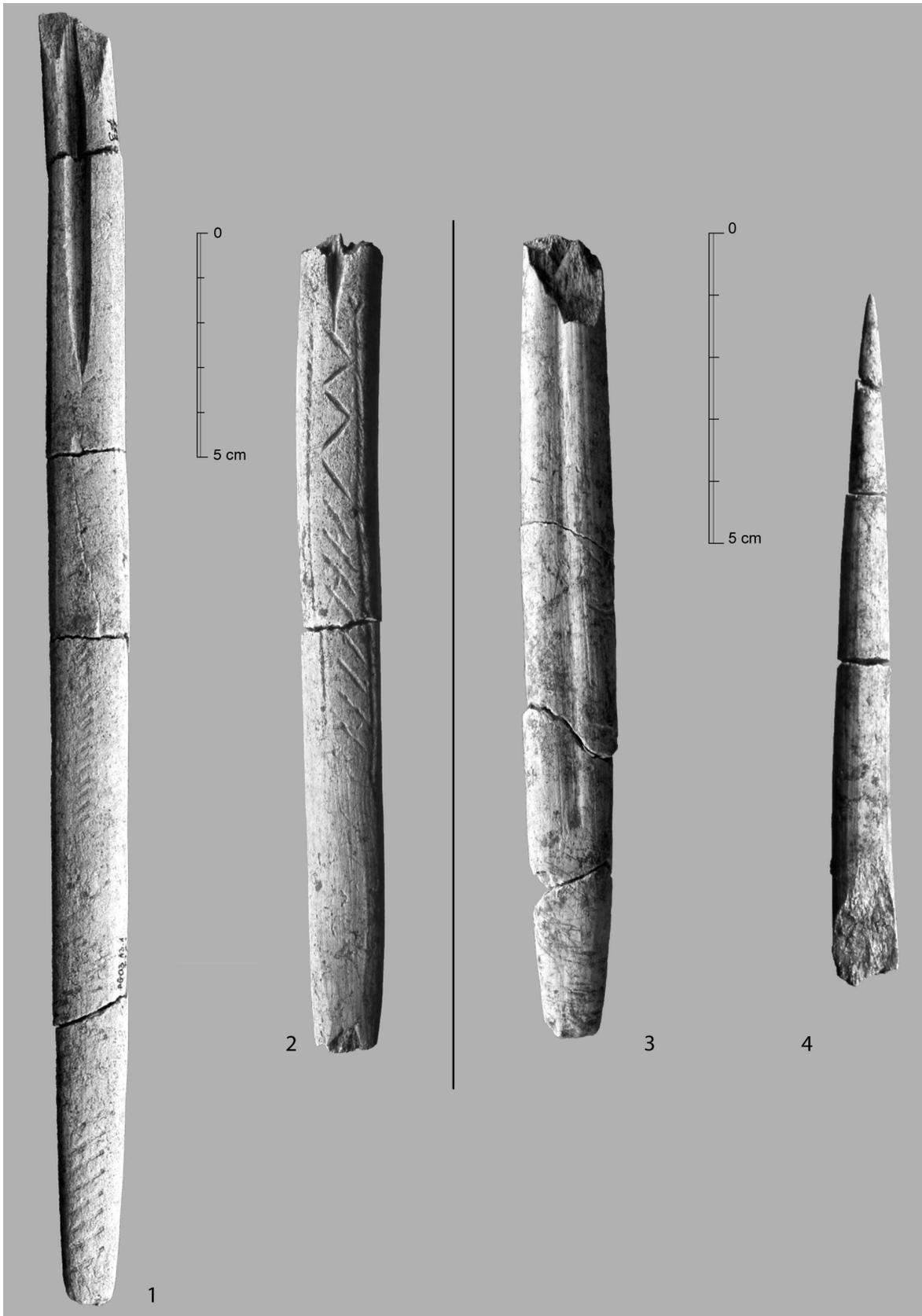


Figure 3: Les Petits Guinards - Reindeer antler industry.

Numerous osseous and dental remains (dietary and manufacturing waste products, artifacts) document the exploitation of animal resources (Fontana & Chauvière in progress) and represent the species commonly hunted during the Late Upper Palaeolithic<sup>1</sup>. At the scale of the Massif Central, faunal remains are only abundant (and well preserved) in a few sites, shelters or caves, often located in the upper valleys of the southern sector; thus, the assemblage of Les Petits Guinards, located in the extreme northern part of the region, constitutes an exception. This feature is reinforced by the abundant and original industry on Reindeer antler (Fig. 3), which is quite unexpected for the Massif Central where sites yield no or very few bone artifacts (Chauvière *et al.* 2006 & in press), with the exception of Le Rond-du-Barry (De Bayle des Hermens 1969). We present in this paper the first observations regarding the exploitation of Reindeer antlers at Les Petits Guinards and we compare them with our whole dataset on Reindeer exploitation for the French Massif Central.

## REINDEER EXPLOITATION

### REINDEER PROCUREMENT PATTERNS

What is the proportion of Reindeer on this site in terms of game hunted and materials exploited? Reindeer, whose bones, teeth and antlers account for 60-70% of the 2,000 identified remains, is the most abundant hunted game (Fig. 4). Horse (*Equus caballus*) is the only other species well represented (35% NISP). This important proportion of the Horse confirms that this game was more important in this northern area of the Massif Central than in the southern area (Loire and Allier upper valleys) where Reindeer was even more intensively hunted (Fontana 2000; Fontana in press).

Among the 73 remains of bone industry, Reindeer is also very well represented, as artifacts and manufacturing by-products made of Reindeer bone and antler account for 70% of the identified remains and Reindeer antler (*ca.* 55% of remains) is the skeletal material predominantly represented (Fig. 5). The only bone industry we could compare these first data with is that of the Magdalenian horizon at Le Rond-du-Barry still unpublished, which is quite unfortunate because this industry is the only

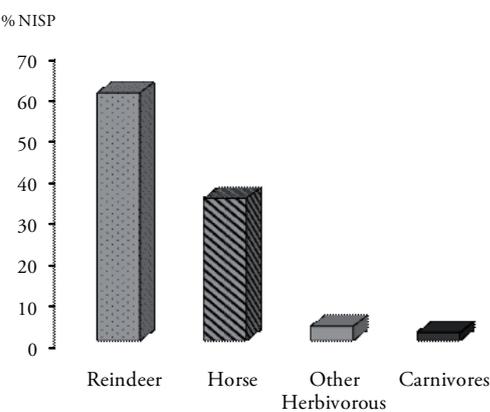


Figure 4: Les Petits Guinards - Identified taxa (Large Mammals), NISP: 2,000.

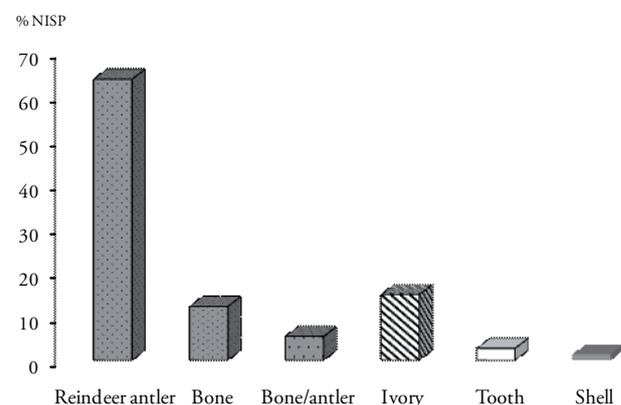


Figure 5: Les Petits Guinards - Proportion of the materials for the osseous industry, NISP: 73.

important collection of this type for the Massif Central (de Bayle des Hermens 1969, 1981, 1986). Ivory, Herbivore tooth and shells are the other exploited materials.

What about hunting-collecting strategies and procurement seasons? Concerning the hunting strategies, the on-going study of Reindeer dental remains does not yet allow to know the proportion of the different age classes (all) represented and whether hunting was not selective, as in most sites of the French Upper Palaeolithic (Fontana 2000, in press & in prep.). Preliminary data on sex ratio indicate the over-representation of adult females, young and sub-adults; we do not know if adult males are represented because we are still not sure that the three largest bases of unshed antlers belong to adult males (Fig. 6)<sup>2</sup>. Furthermore, the current study on the characteristics

<sup>1</sup> Data regarding bird, fish and micromammal remains are not presented here (Mourer-Chauviré, Müller & Jeannet, in progress).

<sup>2</sup> The identification of male and female antlers is, especially concerning unshed antlers, a great problem because a large corpus of measurements of base antlers (circumference and *compacta* thickness) would be required and is still missing. If it seems that the antler basal circumference of an adult male Reindeer is larger than 9 cm and its *compacta* thickness is up to 5 mm, such statement has to be confirmed. Moreover we do not know the exact upper limits of adult female antlers (see Agoudjil 2004; Baumann 2007; Bonnissent 1993; Bouchud 1966; Liolios 1999; Voeltzel 1996 & 1998).

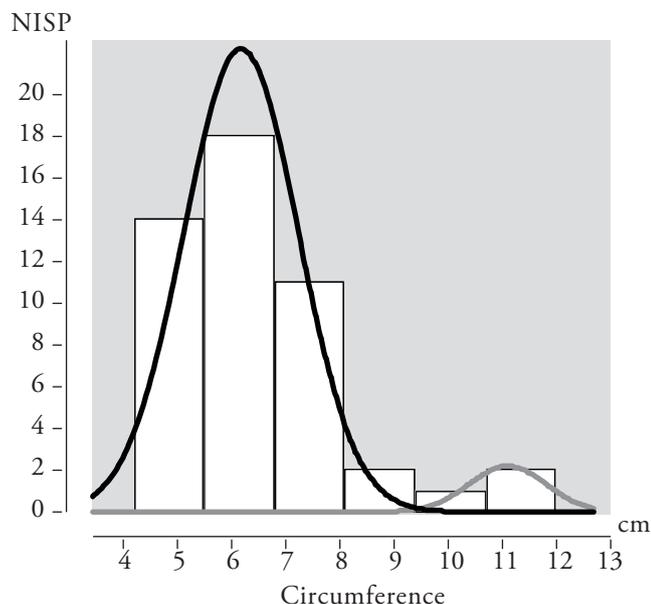


Figure 6: Circumference measurements of Reindeer unshed antler bases.

of sub-adult and adult female unshed antler bases suggests that Reindeer was hunted at different times between April/May and August/September. If the three largest bases of unshed antlers belong to adult males, it bears witness to one or several hunts between August and October. Along with these preliminary results, other data from the study of first year Reindeer teeth indicate the presence of 2-5 month and 10-12 month-old individuals<sup>3</sup>.

If we turn to antler procurement, the contribution of shed and unshed antlers is difficult to assess since it is not possible to know the initial proportion of shed antlers (since those taken away from the site do not leave any trace, unlike the unshed antlers). Nonetheless, unshed antlers were an important material at Les Petits Guinards since they are very well represented (53 bases among the 80 bases of Reindeer antler currently accounted for). Moreover, it appears that shed antlers, belonging to a large majority to adult females, were collected at the end of spring. If we consider that they were picked up by the same groups who occupied the site from the beginning of spring, it is highly likely that the collecting location was near the site<sup>4</sup>.

<sup>3</sup> A lower jaw belonging to a two-month-old Chamois has also been identified.

<sup>4</sup> We will never be able to test this hypothesis since the collecting location will always remain unknown.

<sup>5</sup> At least 50 individuals (MNIc).

<sup>6</sup> Studies in progress: Zooarchaeology, Bone industry, and Use-Wear (A. Pasquini 2006).

<sup>7</sup> Even if we take into account the fact that a minimum number of 45 Reindeer represents several phases of human occupation spread over time and that these acquisitions may have been smaller but regular, we should not forget that this sample comes from a lens of archaeological deposit of only 20 m<sup>2</sup>.

<sup>8</sup> In fact, these are 27 waste products and 3 *baguette* fragments.

Finally, the comparison of the 22 measurable shed antler bases with the 48 unshed ones indicates that the former fall within the category of adult females and subadults - with one or two exceptions - although their modules seem to be slightly higher than those of unshed antlers, reflecting perhaps a choice in their collection (Fig. 7).

It seems thus that adult females as well as young and subadults of both sexes<sup>5</sup> have been killed and their antlers have been collected in the "good" season (from beginning of spring to beginning of autumn). The hunting of adult males (still isolated from the groups of females between April and August) and the collecting of their antlers seem to have been occasional or absent (a single shed antler for all of the human occupations), phenomenon which is not unusual across the French Upper Palaeolithic (Fontana 2000 & in prep.).

#### REINDEER ANTLERS: EXPLOITATION PATTERNS

The study of carcass exploitation<sup>6</sup> indicates that products for dietary and non-dietary use were collected (*i.e.* meat, marrow, skin, bone, frontal appendices, tendons). If the respective proportion of these various products is very difficult to assess, the removal of antlers on killed reindeers seems to have been - as mentioned above - quite important, at least 45 individuals<sup>7</sup>. Now we need to know to what extent this acquisition of Reindeer shed and unshed antlers was followed by the manufacturing of artifacts *in situ*. For that purpose it is not sufficient to identify the different phases of the *chaîne opératoire* or even to assess their respective proportion: the main information concerns the ratio raw material/modified products (including waste products and finished objects). Moreover, the comparison of modules of the finished artifacts, the waste products and the bases is required to document an on-site production. On that respect, the study of Les Petits Guinards is a good illustration of this demonstration. Of the 1,230 fragments of Reindeer antler identified, there are 43 artifacts and 30 waste products<sup>8</sup>, whereas 94% of antler remains do not show any signs of anthropic modification (Fig. 8). The

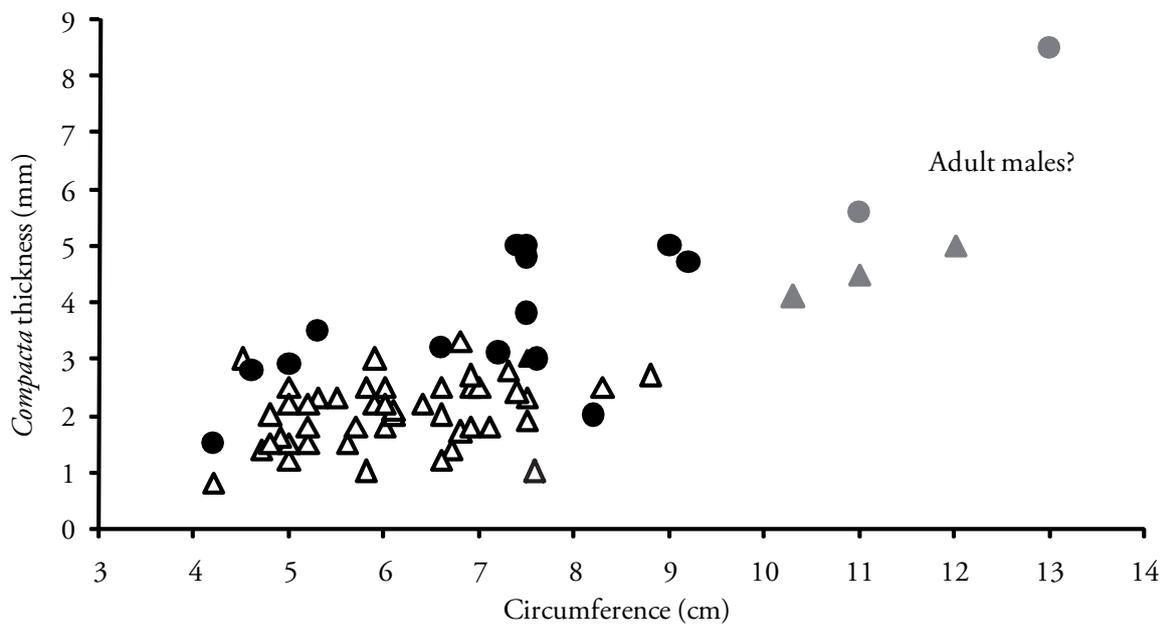


Figure 7: Circumference and *compacta* thickness measurements of shed (circles) and unshed (triangles) antler bases

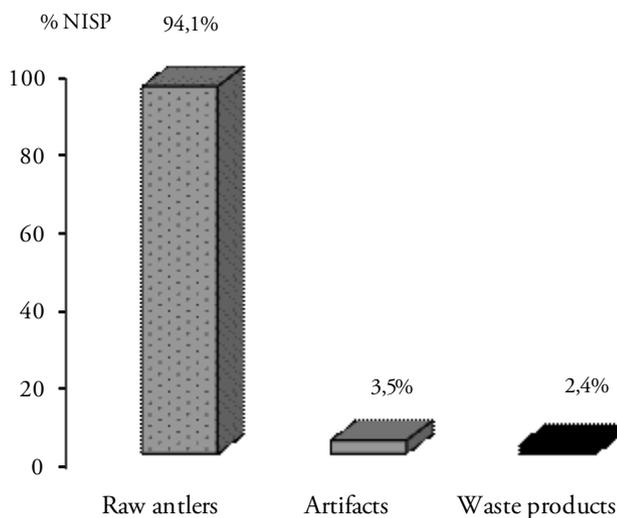


Figure 8: Count of Reindeer antler (raw, waste products, artifacts), NISP: 1,230.

presence of the 53 unshed antler bases at least bears witness of their removal, but not necessarily of the transformation of beams at the site. Conversely, the 27 shed antler bases suggest an on-site manufacture (the separation of the base from the beam is not required for transport). Thirty debitage wastes suggested that such an activity has indeed taken place there, and 43 finished items could also be attributed to this production. Thus what could a further examination reveal? We chose to measure the *compacta* thickness of the shed and unshed antler bases, as well as the waste products and finished objects, and compare them.

As illustrated by Figure 9, which presents the results of this comparison, we may offer the following observations:

- the modules of shed antlers are indeed higher than those of unshed ones;
- the variability of unshed antlers is small: it represents indeed a homogeneous population of female adults, subadults and fawns. The three larger bases that could belong to adult males (isolated by our analysis) are exceptions (*cf* note 2.);
- the modules of waste products is higher than those of unshed antlers and partly of shed ones, indicating that at least half of the waste products is not stemming from the measured antlers accounted. This indicates that part of the manufacturing taking place at the site was performed from beams and/or preforms brought onto to the site as such;
- the uniformity of modules of the waste products and finished objects indicates that half of the waste may be stemming from the on-site production of at least a few of the objects represented. Another possibility is that these waste products reflect the on-site manufacturing of items that were taken away whereas the artifacts present at this site may have been brought in as such;
- objects with *compacta* thickness greater than 8 mm were not all made on site from the only shed antler with a similar module – and the shed antlers that could have not been measured are also smaller. Some of the abandoned items were not produced at the site, either from beams or preforms brought in.

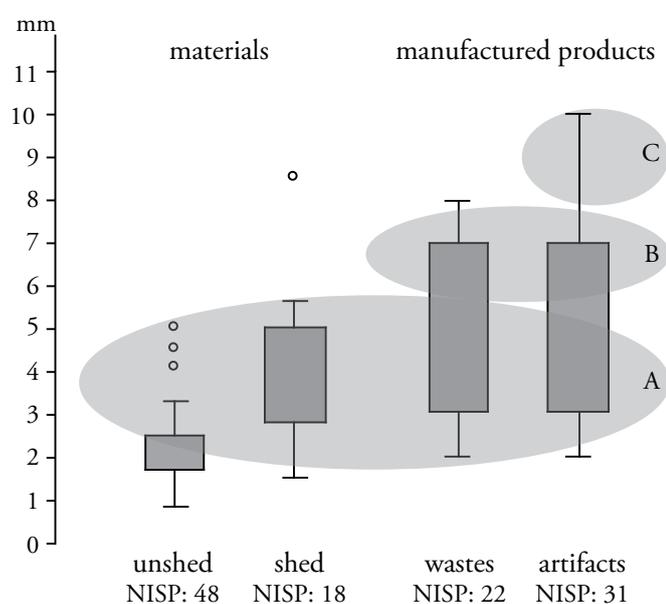


Figure 9: Comparison of *compacta* thickness of four categories of antler remains (bases of shed and unshed antlers, artifacts, waste products)

These data highlight one important fact. More than half of the items recovered at Les Petits Guinards (groups B & C, cf. Fig. 9) were not manufactured from antlers acquired during the phases of human presence, which was already suggested by the low number of waste products (22) compared with the 31 finished objects. This observation is reinforced by the fact that the *compacta* thickness of the measured objects is underestimated since the shaping phase has necessarily reduced it, thereby increasing the gap between the thickness of artifacts and that of antler bases and waste products. Moreover, this gap is even larger if we consider the fact that the *compacta* thickness is larger at the basis than along the beam which is the selected part to extract material: in this case study, finished objects<sup>9</sup> belong to antlers whose basis *compacta* thickness was in fact larger than the one we have measured on the artifacts. So the manufacture of items from large modules has been very occasional and conducted largely from beams or preforms brought onto the site as such.

In conclusion, despite the large number of antler fragments and artifacts recovered at the site (compared to other sites in the Massif Central), it seems that the on-site

manufacture of items from Reindeer antlers was marginal and carried out from small and medium-sized modules that were mostly corresponding to shed antlers (group A, cf. Fig. 9); some large objects were made somewhere else from a few beams with a large module and brought onto the site as such.

### REINDEER EXPLOITATION AT THE SCALE OF THE MASSIF CENTRAL : WHAT'S NEW ABOUT THE ANNUAL CYCLE OF NOMADISM?

The recent synthesis of our work on Reindeer exploitation at sites in the Massif Central (Chauvière & Fontana 2005; Chauvière & Fontana in press; Fontana in press) has highlighted several facts. On the one hand, Reindeer was one of two main game, hunted - like other game - at different times of the year, but exclusively between spring and autumn. On the other hand, if antlers were sought after (taken from killed Reindeer and collected in summer for female antlers), the location of manufacture of the corresponding osseous industry - rather rare - is still not identified (with perhaps two exceptions<sup>10</sup>). A potential obstacle to antler supply related to the hunting season could not be at the root of this practice. Indeed, in early summer, females are without antlers (as in Le Blot) - since they lost them a few weeks earlier - so that their antlers may have been collected on the ground; moreover, at the end of summer and during fall (seasons of occupation documented at Cottier, Tatevin, Le Pont-de-Longues, and Le Rond-du-Barry), adult males have then joined the females in the herds and their antlers are mature. This raw material was thus available. Should the scarcity of the manufacture of artifacts in Reindeer antler be paralleled to that of such remains in the sites of the Massif Central?

We stressed the fact that the Upper Paleolithic sites of the Massif Central reflected mostly modest occupations, of rather short duration. By contrast, sites yielding numerous remains, abundant industries and indications of more permanent facilities (such as Le Rond-du-Barry) were extremely rare. We also equated the lack of winter occupations with the northern and

<sup>9</sup>The situation is similar for the waste products stemming from an advanced - or even the final - stage of tool production: their thickness of *compacta* is equally small. This is not the case at Les Petits Guinards since only three by-products of (resection) fall within this category whereas all the other waste products come from the first stages of manufacture and preserve the initial thickness of their *compacta*.

distant origin of at least half of the Cretaceous flint found at the sites of the Massif Central (see below). Thus we put forward the hypothesis of groups moving between the high valleys of the Massif Central and the southern part of the Creuse Basin, with highly seasonal patterns of Reindeer and blond flint procurement and exploitation. How did our preliminary observations on Reindeer exploitation at Les Petits Guinards modify this assumption on the annual cycle of nomadism of Upper Palaeolithic societies of the Massif Central; and how to formulate it now more precisely?

The number, nature and variety of Reindeer antler remains that have been discovered at Les Petits Guinards are exceptional at the scale of the region (with the site of Le Rond-du-Barry). What is also unexpected and unique is its northern location and the fact that it was attended regularly for at least 8,000 years. Taking into account both of these characteristics within our reasoning, we may go forward with the following remarks. First, this discovery demonstrates the use of tools and weapons made of Reindeer antler across the whole Massif Central (and not only in the southern part) by groups exploiting thus this material.

Moreover, the fact that the low proportion of objects (abandoned or not) were manufactured at this site mostly from shed antlers with small modules reminds us of familiar situations: once again, antlers of adult females hunted between spring and autumn, were not selected as the raw material; moreover, despite a human presence in the fall, which constitutes a great opportunity for acquiring mature antlers with large modules, only a few adult males were killed and it is not at the site that antlers were transformed. The fact that unshed antlers from adult females were not the preferred material may be explained by the hunting season (April-November), which corresponds to the time of fall and regrowth of antlers - thus not mature. As for the absence of adult male unshed antlers, it necessarily reflects the absence of adult males among the Reindeer herd killed since the removal of beams would leave fractured and identifiable bases. Yet the base fragments (for the identification issues of male/female antlers, see below) belonging to

slaughtered adult males account to three, and we have not identified any at the site of Le Pont-de-Longues, located further south along the Allier River (Fontana 2000). It seems increasingly likely that males were not (or rarely) hunted in the fall in the northern sector of the Allier valley. Since this situation also prevails in the southern part of that same valley (*e.g.* Le Blot; see Chauvière & Fontana 2005), was it the same in the upper Loire valley? Only a detailed study of the exploitation of Reindeer antler at Le Rond-du-Barry will allow to address this fundamental issue where is at stake to explain this apparent lack of adult males hunted from late summer to late fall.

We now understand how the data stemming from this study of Les Petits Guinards contribute to the analysis of the economic system and mobility patterns of hunter-gatherers in the Massif Central. By confirming the low frequency in the manufacturing of artifacts made of Reindeer antler at sites in this region, our observations demonstrate the use and discard of many items (shafts, chisels, *baguettes*, tips) that were manufactured in other sites, not yet identified in the Massif Central. It seems that the osseous industry made in Reindeer antler might have been more important than it is simply suggested by the number of remains counted at the sites: was it in part or in totality made elsewhere, for instance near the locations of antler procurement and during the winter months?

## CONCLUSIONS

Studying the total exploitation of Reindeer, we try to identify the economic status of this animal. We therefore try to understand the respective contribution (for dietary purpose or as raw materials) of the multiple materials extracted, and the organisation of their acquisition and exploitation throughout an annual cycle and a geographical space whose boundaries need to be defined. Regarding the Magdalenian societies of the French Massif central, the challenge of our study is very specific in that the extent of the space annually exploited is exceptional because of the siliceous material preferentially selected: in such a context, was the exploitation of animal resources - especially Reindeer - different and how? Our

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<sup>10</sup> The exploitation of Reindeer antlers at the two sites that have yielded a rich industry (Le Rond du Barry and Neschers) is still not analysed.

analysis of Reindeer antlers from Les Petits Guinards allowed to identify procurement and exploitation patterns that support the rare data gathered at a few other sites and document for the first time the transport of objects (more or less finished) and even of shed antlers (e.g. the male shed antler), from manufacturing sites currently unknown. The lack of antlers with large modules (at Les Petits Guinards, as elsewhere) leads us to put forward the working hypothesis that adult males were not or rarely hunted. Unshed antlers of Reindeer adult males from the Massif Central were not a source of raw materials for this osseous industry. If this latter one was manufactured from shed antlers of adult

males (possible but not provable), its production is not documented across the region. It is therefore possible that the favoured location of Reindeer antler procurement was the same as that of the bone industry manufacture: an area of the Massif Central not yet documented - and on that matter the study of Le Rond-du-Barry is imperative - or another region, such as the supply area of the Lower Turonian flint located further north. The goal is now to identify winter occupations (at least in part) that would be characterised by the acquisition of male antlers (among others) and whose exploitation would suggest the production of artifacts for a delayed use.

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