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Gravettian societies in North-western Europe: new sites, new data, new readings

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The site of Ormesson – Les Bossats (Seine-et-Marne, France) around 31 ka cal. BP:

Contribution of the Lithic Industry to the Understanding of Site Function and Occupation of the Paris Basin during the Early Gravettian

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Résumé

Au sein d'une séquence stratigraphique complexe, le gisement de plein air d'Ormesson – Les Bossats livre une occupation gravettienne relativement bien conservée, et renfermant de nombreux restes fauniques fossiles et non fossiles, et parfois travaillés, ainsi que divers témoins d'aménagement de l'espace. La présente contribution est consacrée à la caractérisation de l'abondante industrie lithique associée à ces vestiges. Sont ainsi définis les principes structurants d'une production laminaire dédiée à l'obtention de supports rectilignes et plutôt étroits, couplée à une production lamellaire multimodale comprenant à la fois des solutions intégrées au débitage laminaire et des schémas opératoires autonomes. L'outillage retouché se singularise par l'écrasante domination des burins et des microgravettes, ces dernières correspondant aux composants lithiques d'armes de chasse. La confrontation des données tirées de l'examen du matériel lithique avec les autres catégories de vestiges représentées permet de reconstituer une occupation de type campement résidentiel occupé sur plusieurs semaines au minimum et dédié en partie à l'acquisition d'une quantité potentiellement très importante de ressources d'origine animale. À l'issue d'une décennie de recherche, le site des Bossats ouvre ainsi une fenêtre d'observation d'une remarquable résolution sur le fonctionnement des sociétés de chasseurs-cueilleurs au Paléolithique supérieur ancien.

Mots-clés : Gravettien, Bassin parisien, industrie lithique, technologie lithique, fonction de site.

Abstract

Within a complex stratigraphic sequence, the open-air site of Ormesson – Les Bossats yields a relatively well-preserved Gravettian occupation containing numerous faunal remains, both fossil and non-fossil and sometimes transformed, as well as various remains related to spatial organization. This contribution aims at characterizing the abundant lithic industry associated with these remains. We define the main principles of a laminar production dedicated to the extraction of rectilinear and rather narrow blades, associated with a multimodal bladelet production which comprises solutions that are integrated into blade production, as well as autonomous productions. The retouched tools are characterized by an overwhelming proportion of burins and microgravettes, the latter corresponding to the lithic components of hunting weapons. The comparison of the data drawn from the examination of the lithic material with the other categories of remains makes it possible to reconstruct a residential camp occupied during several weeks at least, and dedicated in part to the acquisition of a potentially very significant quantity of animal resources. After a decade of research, the site of Les Bossats allows for very precise observations of the functioning of hunter-gatherer societies during the Early Upper Palaeolithic.

Keywords: Gravettian, Paris Basin, lithic industry, lithic technology, site function.

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1. Introduction

The site of Ormesson – Les Bossats is part of a small group of recently discovered (or sometimes rediscovered) open-air sites in the northern half of France, demonstrating evidence of well-preserved Early Upper Palaeolithic occupations that make it possible to develop palethnographic research programmes, almost for the first time in this spatio-temporal framework (Kildea *et al.*, 2013; Paris *et al.*, 2017; 2019; Goval and Hérisson [dir.], 2018; for a site identified a little earlier see also Klaric *et al.*, 2018). These occupations, as is the case at Les Bossats, often belong to the Gravettian period, and more occasionally to the Aurignacian or to the Chatelperronian.

On a micro-regional scale, the site of Les Bossats compensates for Gravettian documentation that is known to have been extremely rich (Doigneau, 1873-1874; 1884; Nouel, 1936; Daniel and Daniel, 1953; Delarue and Vignard, 1959; 1963; Cheynier [dir.], 1963; Béraud *et al.*, 1965; Schmider, 1971; Poulard *et al.*, 1984; Rinck, 1997), but on which we often have limited information, with the notable exception of the site of La Pente-des-Brosses (Schmider and Senée, 1983; Schmider, 1986). This documentation is only partially preserved in some cases, as significant parts of several assemblages have been lost (Klaric, 2013; Touzé, pers. obs.). In addition, the available assemblages generally include only lithic artefacts because they mostly come from sites that are located in an environment of acidic Stampian sands (Schmider and Roblin-Jouve, 2008). From this point of view too, Les Bossats proves to be essential at the regional level, since the presence of loess deposits allowed a fairly good preservation of faunal remains (n > 3,400 excluding chips; Lacarrière, this volume). Only two other sites provided small faunal assemblages. These consist of a few hundred bone fragments, including reindeer, at La Pente-des-Brosses (Seine-et-Marne; Boyer-Klein *et al.*, 1983), and horse teeth and fragments of reindeer antler at Hault-le-Roc (Seine-et-Marne; Nouel, 1936). Thanks to the information available in the literature and to recent studies conducted on a few sites (see references mentioned above and also Klaric, 2003; 2013; Touzé, 2019), typological and technological data related to lithic industries indicate that the site of Les Bossats is located in an area with numerous Early Gravettian sites and several Recent Gravettian sites. The Middle Gravettian was undocumented until recently, but new radiocarbon data obtained by P. Bodu and yet to be published suggests that it may also be represented, even if the typical artefacts of this phase (Noailles burins, Raysse bladelet cores and Picardie bladelets) are absent. The Early Gravettian lithic industries, which are specifically interesting with regard to Les Bossats (see below), are mostly characterized by the systematic association of microgravettes and tanged points (see Klaric, 2013 and Touzé, 2019 for overviews).

The present contribution constitutes a first step in the analysis of the lithic technical system represented at Les Bossats. We give a general presentation of both the retouched tools and the different *schémas opératoires* implemented, before confronting the data obtained with those acquired from the other categories of remains. This comparison leads us to propose an interpretation of the function of the site during the Gravettian, whose solidity will be tested over the future analyses.

2. Presentation of the site

The site of Les Bossats is located near the village of Ormesson (Seine-et-Marne), in a dry valley that cuts the Gâtinais Plateau along a west-east axis and leads to the left bank of the Loing river (fig. 1). Facing south, the site is located within a cirque formed by sandstone boulders offering protection against the prevailing winds, as well as discreet observation posts on the valley. The immediate proximity of a double narrowing of the valley, likely to constrain the movements of herds of herbivores circulating between the plateau and the Loing valley, was certainly also a strategic advantage for groups of hunters. These different aspects, combined with the possibility of getting good quality flint 2.5km from the site in the Loing valley, made Les Bossats undeniably attractive for Palaeolithic communities, as evidenced by the long archaeological sequence recorded by this open-air site, which extends from the late Middle Palaeolithic to the Middle Solutrean (Bodu, Dumarçay *et al.*, 2014; Bodu, Salomon *et al.*, 2014; Lacarrière *et al.*, 2015; Bodu *et al.*, 2017; Bodu *et al.*, 2019).

The Gravettian occupation is preserved in the western part of the site between 35 and 40 cm below the current ground level, which is explained by the erosion of the deposits post-dating the Last Glacial Maximum in this area. The occupation is contained in loess deposits corresponding to the southern extension of the Weichselian Upper Pleniglacial loess of Northwestern Europe (Antoine, 2002, Antoine *et al.*, 2003, Haesaerts *et al.*, 2016). Its shallow burial is at the origin of the discovery of the site since hundreds of artefacts became exposed to the surface during agricultural work.

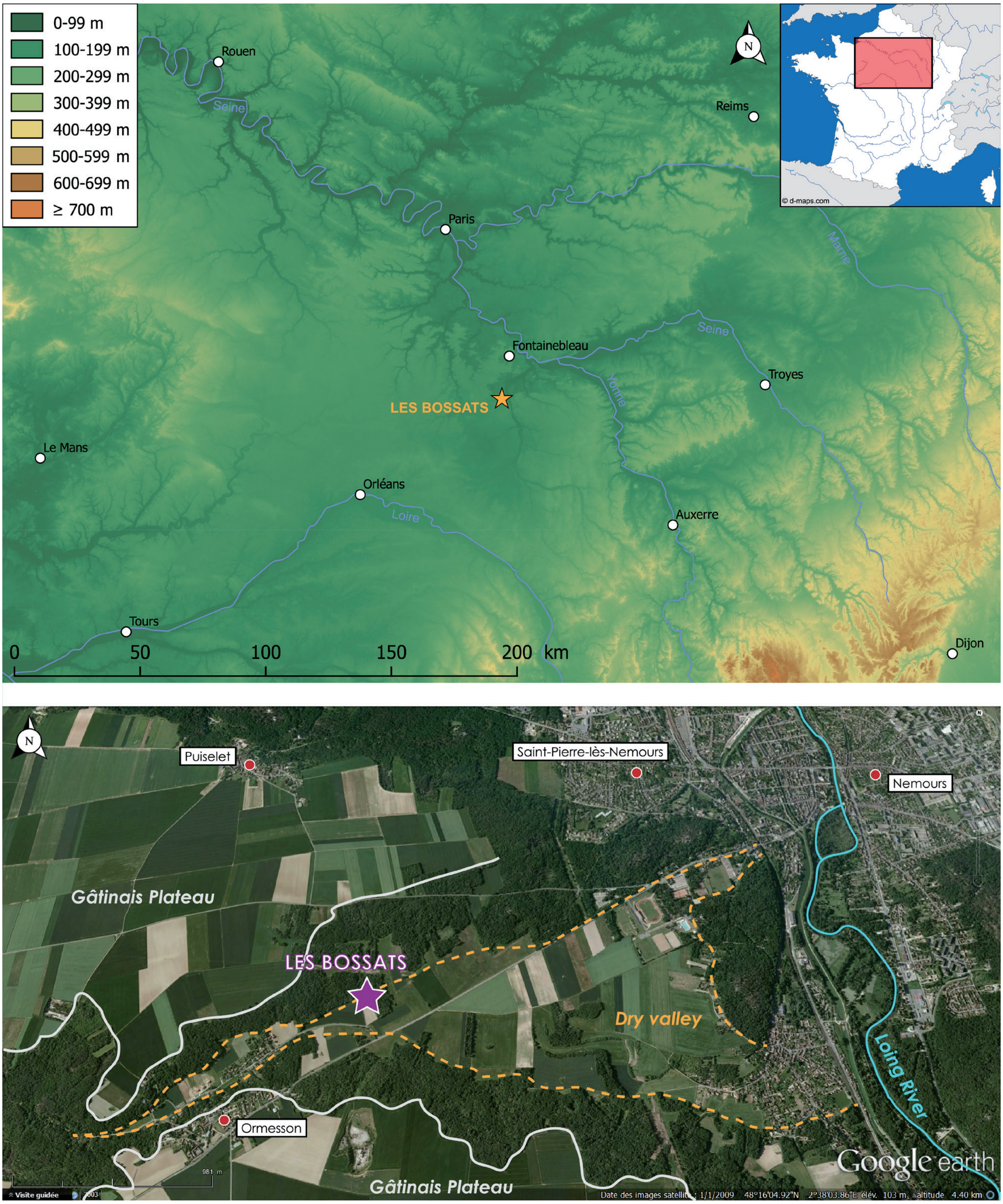

Fig. 1 – Location of the site of Les Bossats (top map: O. Touzé; bottom map: M. Leroyer and O. Touzé).

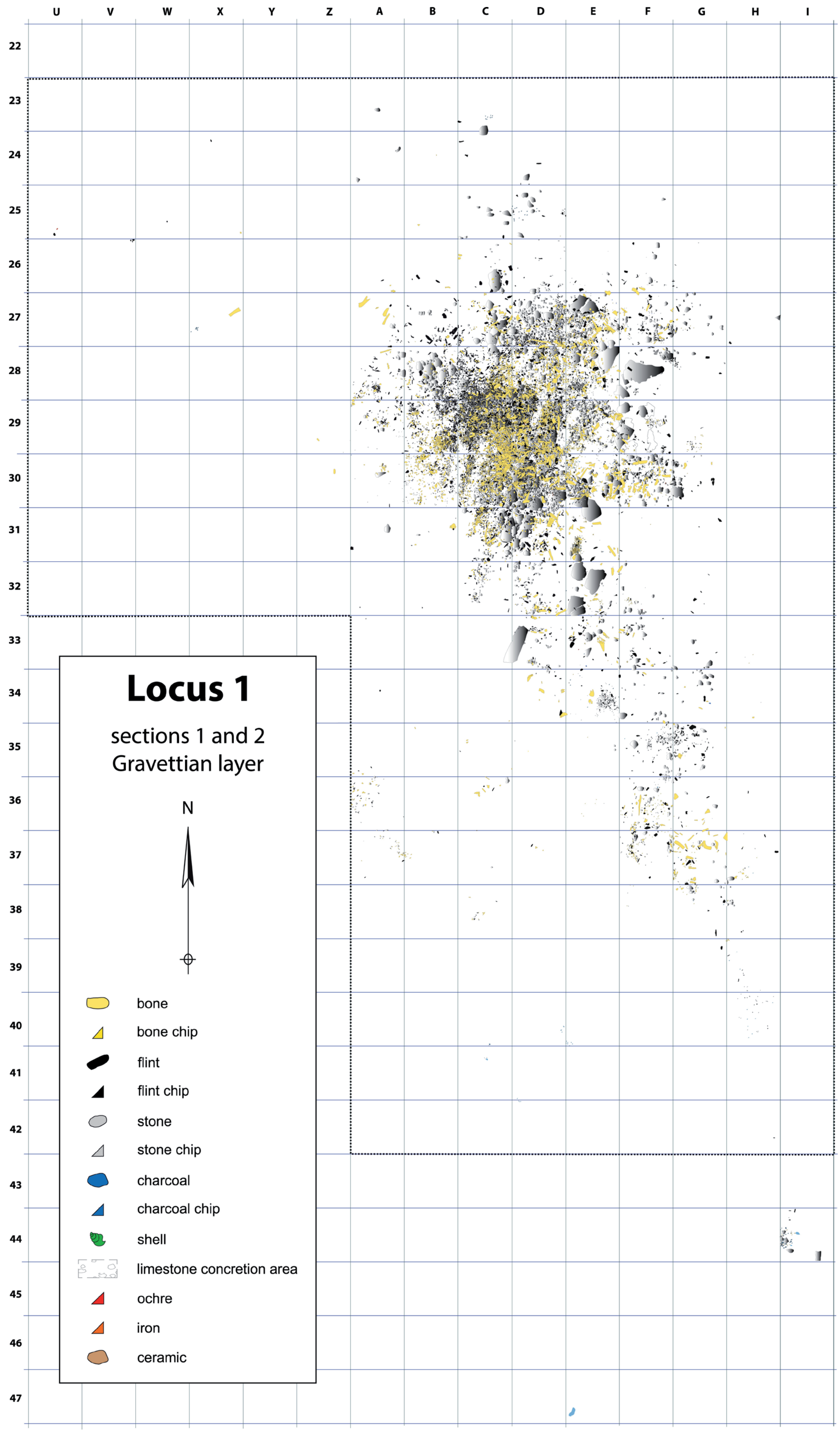

Fig. 2 – Map of the Gravettian occupation of Les Bossats in 2019 (CAD: M. Ballinger, J. Suire and O. Touzé).

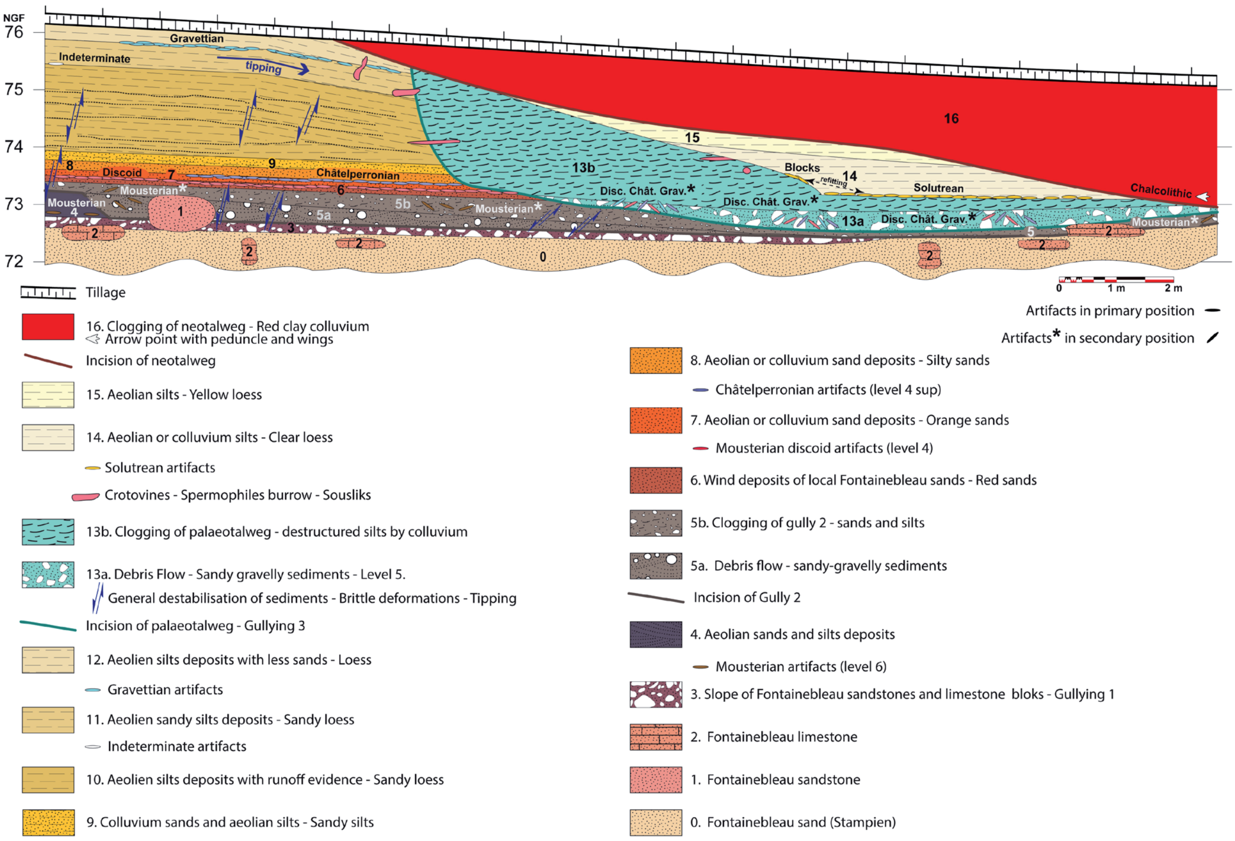

Fig. 3 – Stratigraphy of the eastern part of Les Bossats (CAD: H.-G. Naton).

The Gravettian archaeological layer (fig. 2) is documented over 80m² and shows a relatively well-preserved spatial organization with the anthropogenic installation of a bed of gravels, and the presence of two combustion areas around which are concentrated very numerous lithic and faunal remains. However, this layer was partially dismantled in the east by a talweg dug by a sudden and massive water flow that occurred between the Gravettian and the Solutrean occupations (fig. 3, event 13a). This phenomenon was probably triggered by the alternation of long episodes of climatic deterioration (Heinrich Events 3 and 2) favouring the development of permafrost, and short warming phases (Dansgaard-Oeschger Events 4 and 3) generating thaw phases. This taphonomical problem is confirmed by the presence of microgravettes associated with older (Chatelperronian and Mousterian) material at the bottom of the talweg, and also by radiocarbon dating. Indeed, nine similar dates were obtained on bone and charcoal samples coming from the archaeological layer (n = 3), the talweg (n = 3) and the surface (n = 3). The results give an age comprised between about 31,4 and 30,4 ka cal. BP that places the Gravettian occupation between the second half of the GS 5.2 and the GI 5.1 (Rasmussen *et al.*, 2014). This attribution is consistent with the results of archaeozoological, isotopic and anthracological studies that evoke a rigorous climate (Lacarrière *et al.*, 2015). In chrono-cultural terms, the occupation can be correlated with the early phase of the Gravettian period, which is also supported by the association of microgravettes and rare tanged points (n = 2)[1] in the lithic assemblage (see below).

3. Material

The data presented below are based on the examination of the lithic material excavated between 2009 and 2014. Surface artefacts collected during the systematic surveys that preceded the excavations, and also gathered by a prospector, C. Pommier, at the beginning of the 2000s were also included in the study. Although ploughing displaced some of the remains, and at the same time provoked some vertical dispersion, the incorporation of surface material into the analysis is nevertheless justified by its strict contemporaneity with the archaeological layer. This contemporaneity is demonstrated by the convergence of several facts:

- Two refittings associate pieces coming from the archaeological layer, the basis of the ploughed soil and the surface, including artefacts belonging to the Pommier collection.
- The geomorphology of the site suggests that surface remains can only originate from the Gravettian occupation. Indeed, the Solutrean layer documented in the eastern part of the site is located in the depression created by the talweg and is too deeply buried in consequence. With the exception of the Gravettian layer, this remark also applies to the Chatelperronian and Mousterian occupations encountered west of the talweg, since none of these are buried less than 70cm deep. Therefore, these two occupations are also out of reach of deep ploughing.
- The Gravettian layer is the only one to deliver a few clear negatives of furrows testifying to the contact of a ploughshare.
- The surface material includes 18 backed pieces allowing a clear comparison with the Gravettian material discovered in primary position. The main technological characteristics of these materials are also similar.
- As mentioned above, the three dates made on bones collected from the surface gave results consistent with those obtained on the Gravettian layer. A fourth result obtained on a horse bone can be excluded here, since it is clearly much too young with regard to the Gravettian occupation (Erl 8227: 2,396 ± 50 BP; Bodu, Bignon *et al*., 2011).

The studied material totals 12,018 pieces excluding chips (tabl. 1). Based on the sharpness of edges and ridges, it appears in a good state of preservation. *Débitage* waste represents 96% of the material and retouched tools only 4%. This difference reflects a significant knapping activity that generated numerous blanks and waste products. Indeed, flakes account for 39.33% of the material, while lamino-lamellar blanks are in equivalent proportion with 37.95%. Similar percentages of blades (18.19%) and bladelets (19.76%) are also found, which, together with the characteristics of the 92 associated cores, demonstrate the dual purpose of the lithic production in terms of blanks. The tool-kit includes 465 retouched pieces and 17 blanks with at least one edge wearing limited and regular scarring that potentially evokes macro-traces of use.

Since lithic material is very significant quantitatively, study of blank production was based on the examination of all the cores and retouched tools and on a 20% sample (n = 952) of the 4,561 unretouched lamino-lamellar products. This sample includes 4.5% tertiary flint pieces in order to take into account the limited proportion of this raw material (see below). In addition, even if no dimensional class or specific technical status was favoured, the best preserved blades and bladelets (complete products and representative fragments) were studied in priority to ensure a good readability of their metric, morphological and technical characteristics.

4. Results

4.1. *Raw material*

The siliceous raw materials used are not diversified, and only include a secondary flint and a tertiary flint. However, these flint types occupy very different economic places in the lithic technical system.

Secondary flint is available 2.5km to the east, along the Loing which erodes Campanian deposits. The proximity factor undoubtedly explains why this flint is overrepresented in the industry: with a total of 11,675 pieces (chips excluded), it represents 97% of the lithic remains. The Campanian flint therefore appears to support almost all the production of lithic blanks and tools.

Tertiary flint is exogenous since the closest deposits are located about thirty kilometres to the north-west, and about forty kilometres to the north-east. Pending a more in-depth analysis of the raw materials used, these distances must however be considered as minimum estimates. There is a total of 343 pieces in tertiary flint (chips excluded), representing only 3% of all lithic remains. This material is dominated by bladelets, while blades are slightly more numerous than flakes. We also note the total absence of cortical flakes, the scarcity of semi-cortical flakes, as well as a significant number of lamellar products extracted on the edge of a blank (= burin spalls or bladelets whose morphology is close to that of burin spalls) which can be directly correlated with the strong bladelet component that characterizes the tertiary flint (see below). Cores, on the contrary, are rare (n = 3), and they mainly provided bladelets once introduced on the site. Retouched tools are also poorly represented with only 18 pieces dominated by backed pieces made on bladelets. Put together, these different elements show that only the last stages of the *chaîne opératoire* are represented on the site. The stock of tertiary flint introduced at Les Bossats was thus limited, and likely consisted of a small stock of blades associated with some reduced cores intended to provide mostly lamellar blanks.

	Excavation 2009-2014	Survey 2009	Survey 2007	Pommier	**Total**	%
Tools	354	3	10	115	**482**	4.01
Cortical flakes	130	5	4	3	**142**	1.18
Semi-cortical flakes	1066	68	81	99	**1314**	10.93
Flakes	1778	88	101	87	**2054**	17.09
Laminar flakes	481	2	3	2	**488**	4.06
Lamellar flakes	693	9	4	1	**707**	5.88
Tablets	13	1	3	5	**22**	0.18
Blades	1611	90	111	374	**2186**	18.19
Bladelets	2186	38	85	66	**2375**	19.76
Blade cores	29	1	2	22	**54**	0.45
Bladelet cores	23	1		9	**33**	0.27
Flake cores	2			1	**3**	0.02
Rough-outs			1		**1**	0.01
Tested blocks	1				**1**	0.01
Burin spalls	708	10	52	30	**800**	6.66
Debris	1208	66	52	30	**1356**	11.28
Total	**10283**	**382**	**509**	**844**	**12018**	**100**

Chips	*39690*	*123*	*1169*	*7*	***40989***

Table 1 – Count of the Gravettian lithic material studied.

4.2. *Retouched tools*

4.2.1. Presentation of the retouched tools

The 465 retouched tools are 90% dominated by two typological categories equally represented: burins (46%) and backed pieces (44.5%). These categories are dominated respectively by dihedral burins (28.2% of all retouched tools), and microgravettes and probable fragments of microgravettes (39.4% of all retouched tools; tabl. 2). The other typological categories are poorly represented, but also little diversified. We mainly count 18 blades retouched on one or two edges, nine end-scrapers, as well as a tanged point (fig. 6, no. 6) and a shouldered piece.

The selection of tool blanks reflects the dual purpose of the knapping process, which is both focused on obtaining blades and bladelets. A few flakes were also selected occasionally for making tools, but since no autonomous flake production is documented, this phenomenon certainly refers to the selection of by-products of blade production.

4.2.2. Backed pieces

a) Dimensional categories

The backed pieces category is marked by some dimensional variability. These objects measure between 2 and 14mm in width with a mean of 6.3mm, and between 1 and 8mm in thickness with a mean of 2.6mm. Their length is difficult to estimate because of their very high fragmentation rate. Only 13 backed pieces are complete or sub-complete, representing only 6.3% of the population. These pieces measure between 25 and 47mm in length with a mean of 37.1mm. However, these measurements should be considered as indications because three fragmented individuals have a length comprised between 48 and 66mm.

Types			N	%
Gravettes			13	2.8
Microgravettes			183	39.4
Nanogravettes			11	2.4
Total backed pieces			***207***	***44.5***
Burins	dihedral	simple	118	25.4
		double	13	2.8
	on truncation	simple	35	7.5
		double	3	0.6
	on break	simple	12	2.6
		double	3	0.6
	on natural facet	simple	3	0.6
	mixed	double	18	3.9
		triple	1	0.2
	undetermined	simple	8	1.7
Total burins			***214***	***46.0***
End-scrappers			9	1.9
Denticulates			1	0.2
Pointed blades			1	0.2
Truncated blades			1	0.2
Blades with 1 retouched edge			17	3.7
Blades with 2 retouched edges			1	0.2
Retouched flakes			3	0.6
Tanged points			1	0.2
Shouldered pieces			1	0.2
Mixed tools			1	0.2
Undetermined fragmented tools			8	1.7
Total			**465**	**100**

Table 2 – Count of the retouched tools studied.

The dimensional variability of backed pieces seems to justify the creation of subgroups in order to express the diversity of the sizes represented, although it is important to emphasize the necessarily arbitrary character of any subdivision. In the case of Les Bossats, we opted for a distinction based on the width. The thickness of backed pieces shows less variation from one individual to another, so the use of this parameter would introduce too much overlap between the different groups. As for the criterion of length, sometimes used on Gravettian lithic assemblages (Pesesse, 2008, p. 44), it must be discarded here because of the very small number of complete backed pieces. As far as the state of preservation of the backed pieces allows to judge and despite some morphological differences, these artefacts match the usual definition of the Gravette category (de Sonneville-Bordes and Perrot, 1956). Also, no example of complete backed bladelet, truncated backed piece or other types of backed pieces were identified. Consequently, the fragmentary backed pieces which have no diagnostic part (*e.g.* mesial fragments) were attributed to this category. The following subgroups have therefore been defined:

- **Gravette**: complete or fragmentary piece, with a width greater than or equal to 11mm.
- **Microgravette**: complete or fragmentary piece, with a width greater than or equal to 4mm and lower than 11mm.
- **Nanogravette**: complete or fragmentary piece, with a width lower than 4mm[2].

The backed pieces of Les Bossats are largely dominated by microgravettes (88.4% of all backed pieces), while artefacts of higher and lower calibres form marginal subgroups.

b) Blank selection and transformation

The selected blanks are usually bladelets coming from the *plein débitage*, even though some blades were also used. Four bladelets extracted on the edge of a blank are also counted thanks to the identification of a *pan-revers*. The recognition of these particular blanks can be correlated with the presence of burin-cores in the industry. Although these cores played an important role in bladelet production (see below), the very small number of blanks extracted from them identified among the backed pieces could be explained by the fact that the *pan-revers*, because of the angle that it forms with the ventral surface, is selected to create the back and is in consequence entirely removed in most cases by the abrupt retouch. Of the four identified backed pieces made on bladelets coming from burin-cores, the back is systematically prepared on the *pan-revers*. In general, blanks selected for the preparation of backed pieces have a straight profile, but a slight curvature is also observed sometimes.

Blank transformation implies a limited set of operations:

- The preparation of the back aims to create a straight non-cutting edge, in most cases using direct retouch. Crossed retouch is also observed occasionally, regardless of the size of backed pieces, but its use seems to be determined by specific situations (regularization of particular zones, removal of small bumps, creation of the back on a *pan-revers*). Opposed to a convex or rectilinear cutting edge, the back is indifferently prepared on the right or on the left edge of the blank. Its preparation is more or less invasive depending on the artefact, which implies that the reduction of the width of the blanks is variable. If some pieces have a relatively invasive back that reaches completely or partially a ridge of the dorsal surface (fig. 4, nos. 1-3), others, conversely, are characterized by a completely or partially marginal back (fig. 4, nos. 5-6 and 8). Furthermore, a preliminary search for diagnostic pieces based on the criteria highlighted by J. Pelegrin (2004) suggests the use of several techniques. The association of several elements on certain artefacts suggests that direct percussion is probably favoured (irregular negatives, significantly blunted edges, unproductive percussions due to repetitive strikes, traces of impact situated at good distance from the edge, presence of bumps on the back), although indications of the use of rubbing (marginal back, semi-abrupt to abrupt removals, slightly blunted edges) and pressure (regular negatives, micro-denticulation of the edges, micro overlapping overshots) are also noted. These last two techniques are apparently used respectively for the preparation of the smallest blanks, and for the finishing of the nanogravettes, which can be explained by the fragility of these pieces.

- The preparation of an inverse retouch at the ends concerns 69 individuals, that is to say two thirds of the backed pieces of which at least one of the ends is preserved (n = 103). This retouch is semi-abrupt to flat, and is almost always made on the cutting edge following an oblique axis relative to the longitudinal axis of the tool, which sometimes tapers the retouched end (fig. 4, no. 1). Inverse retouch is moreover encountered on the three defined calibres of backed pieces, and mainly concerns the proximal end of the blank (n = 47), and to a lesser extent its distal end (n = 16), or both ends (n = 5; one case is undetermined). Though the underrepresentation of distal and mesio-distal fragments (n = 35) relative to proximal and proximo-mesial fragments (n = 55) can partially explain the quantitative difference between distal and proximal retouch, part of the explanation could be somewhere else. When it is proximal, inverse retouch reduces or removes the convexity of the bulb, while also contributing to the removal of the butt. We note that only seven pieces still have their butt out of a total of 68 proximal and proximo-mesial fragments and complete pieces. It is thus possible that the search for these two characters could possibly explain the higher frequency of proximal retouch, unless these are only consequences—fortuitous or desired—of the intentional blunting of part of the cutting edge in view of the fixation of the microgravette using a tie (Soriano, 1998, p. 85). Since the inverse retouch is both short and made on the cutting edge, no overlapping zone usually exists between this retouch and the back, making it impossible to establish the chronology of these two features. In some cases this zone exists but is too small to allow a reliable diagnosis, which can only be proposed on 13 pieces that have a sufficiently significant overlap. In these 13 cases, inverse retouching is usually done after the creation of the back (n = 11), and much less frequently before it (n = 2, although it is not possible in these cases to rule out the possibility that both operations were carried out simultaneously).
- Lastly, seven microgravettes and one nanogravette present direct complementary retouch on the cutting edge. This retouch is exclusively located at the ends of the artefacts: four distal ends and four proximal ends are concerned. Despite their state of preservation, it seems that direct retouch tapers their ends (fig. 4, no. 7), although the main goal might also be to blunt part of their cutting edge just like the inverse retouch.

c) Functional observations

A preliminary functional study was carried out on a total of 91 backed pieces in order to determine whether these artefacts show evidence of weapon use. Weapon armatures are identified on the basis of combinations of traces, the observation of which requires different scales of analysis (Rots and Plisson, 2014). For the purpose of the present study, only low magnification observations are included, with a focus on breaks and scars (for a definition of the terms used, see Coppe and Rots 2017). The observations were made with a Zeiss V12 binocular stereoscopic microscope (magnifications between ×8 and ×100) using an external shearing light source. We registered the traces according to the classification system recently proposed in Coppe and Rots (2017) that was developed and gradually refined during the analysis of about 500 armatures (varying morphologies and propulsion modes). Interpretations of the archaeological pieces are primarily based on a subset of the experimental reference collection consisting of 120 gravettes and microgravettes (for details on the experimental protocol, see Coppe and Rots, 2017). For the archaeological material, pieces that present at least two fractures (breaks or scars) suggestive of impact have been interpreted as "potential" weapon elements, while pieces that show a combination of at least three such features are interpreted as "probable" weapon elements (fig. 5; for further detail see Coppe, 2020).

Ten out of the 91 analysed pieces show a combination of at least three features indicative of impact, and 17 others present a combination of two features. On these 27 pieces, we recorded a total of 99 fracture phenomena. Out of these, 76 are consistent with an impact action (see tabl. 3) and the rest (n = 23) are bending-initiated snaps. The characteristic features can be divided into four main categories (tabl. 3), amongst which diagonally oriented scars on a lateral edge are the most frequent (42%). They are initiated from a surface and oriented toward the base of the pieces (fig. 5a, d, e). These scars are mainly initiated in bending, but rare cone or mixed initiations also occur (fig. 5c). The second group is constituted by (mainly conchoidal) scars initiated from an earlier bending break surface and terminating on a surface or an edge (26%; fig. 5f; fig. 5c). The third category involves bending-initiated breaks initiated from a surface (dorsal or ventral) and terminating on the opposite surface (24%; fig. 5b). The least common are bending-initiated breaks that start from a surface (dorsal or ventral) and terminate on an edge (left or right; 8%).

These observations indicate that armatures are present among the backed pieces, though further confirmation is required by also integrating high magnification under incident light in order to look for diagnostic associations with MLITs (microscopic linear impact traces; Moss, 1983; Rots, 2016; Rots and Plisson, 2014), amongst others.

4.2.3. Burins

With 214 pieces, burins are the best represented tools, together with the backed pieces. Dihedral burins (fig. 6, nos. 1-2) represent 61.2% of all burins, and thus clearly dominate this tool category. Burins on truncation are also well represented (17.8%). They include a group of 13 simple burins and 3 double burins that stand out for the creation of very narrow bevels measuring between 1 and 3mm. This group is also characterized by the preparation of oblique, slightly concave or rectilinear truncations, as well as by the thinness of the selected blanks that generally do not exceed 10mm (fig. 6, nos. 3-4). Even though the narrowness of the bevels is not specific to this group (20 dihedral burins, nine burins on break and four mixed burins have bevels comprised between 2 and 3mm), this particular group could evoke the Noailles burins typical of the Middle Gravettian (Demars and Laurent, 1989; Bosselin and Djindjian, 1994), but also known in the earliest Gravettian assemblages of the Pyreneo-Cantabrian region (Foucher *et al.*, 2008; Simonet, 2009; Klaric, 2010; de la Peña Alonso, 2011). However, none of the burins on truncation with narrow bevels of Les Bossats display the characteristic notch of this specific type of burin. Nor do they present, at least for the majority of them, the reduced dimensions often associated with Noailles burins. In consequence, it is currently difficult to establish a strict parallel with this type, even though it would be interesting to see whether they were used for similar technical purposes. The other types of burins are more marginal and comprise less than twenty individuals each (tabl. 2).

The selection of blanks favours blades with a straight or slightly curved profile, preferably coming from a *plein débitage* sequence. The use of blades of different technical status is frequent, however, as evidenced by the selection of several under-crested and anterolateral blades, but neo-crested blades and initialization products are rarely used, just like flakes.

The burin category shows a great dimensional diversity with widths comprised between 9 and 56mm with a mean of 23.5mm, and thicknesses situated between 4 and 26mm with a mean of 9.7mm. This aspect, together with the presence of burins on truncation with narrow bevels, could indicate possible functional differences among the burins. Preliminary traceological observations tend to support this hypothesis, but a more in-depth study is currently underway to define the precise role(s) of burins within the technical system (Rots, in progress). Furthermore, recent observations made on several osseous remains show that they wear grooving traces mostly characterised by a narrow V-shaped section, suggesting that some burins at least were possibly used to work bone (Goutas *in* Bodu [dir.], 2018).

4.3. *Blank production*

Analysis of unretouched lamino-lamellar products, as well as tools made on blades and bladelets, indicates the search for rectilinear or slightly curved blanks. These blanks are overall quite narrow and thin as they rarely exceed 25mm in width and 12mm in thickness. The length of the complete blades usually does not exceed 8cm, but some artefacts attest to the production of blades that can reach up to 13 centimetres.

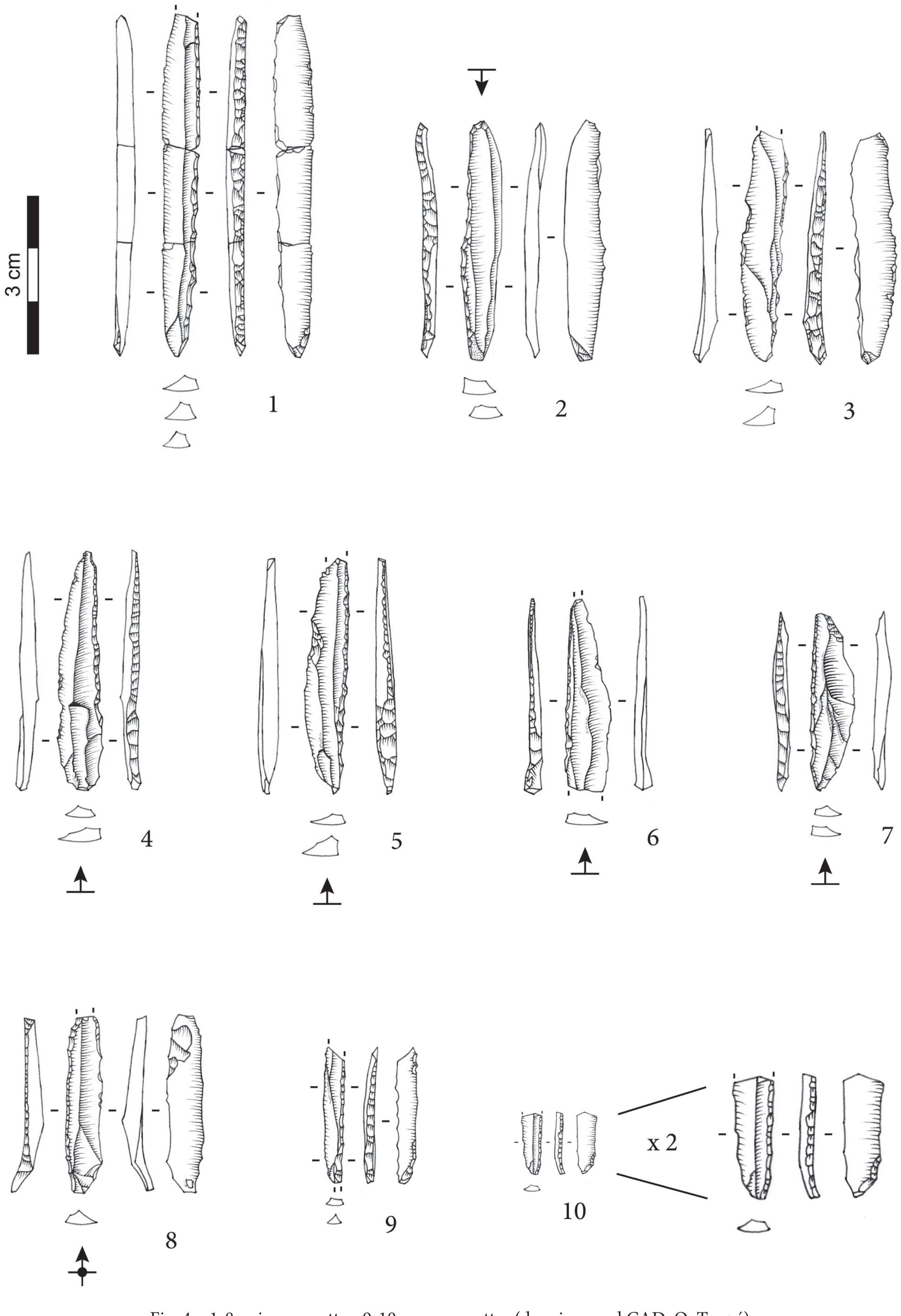

Fig. 4 – 1-8: microgravettes; 9-10: nanogravettes (drawings and CAD: O. Touzé).

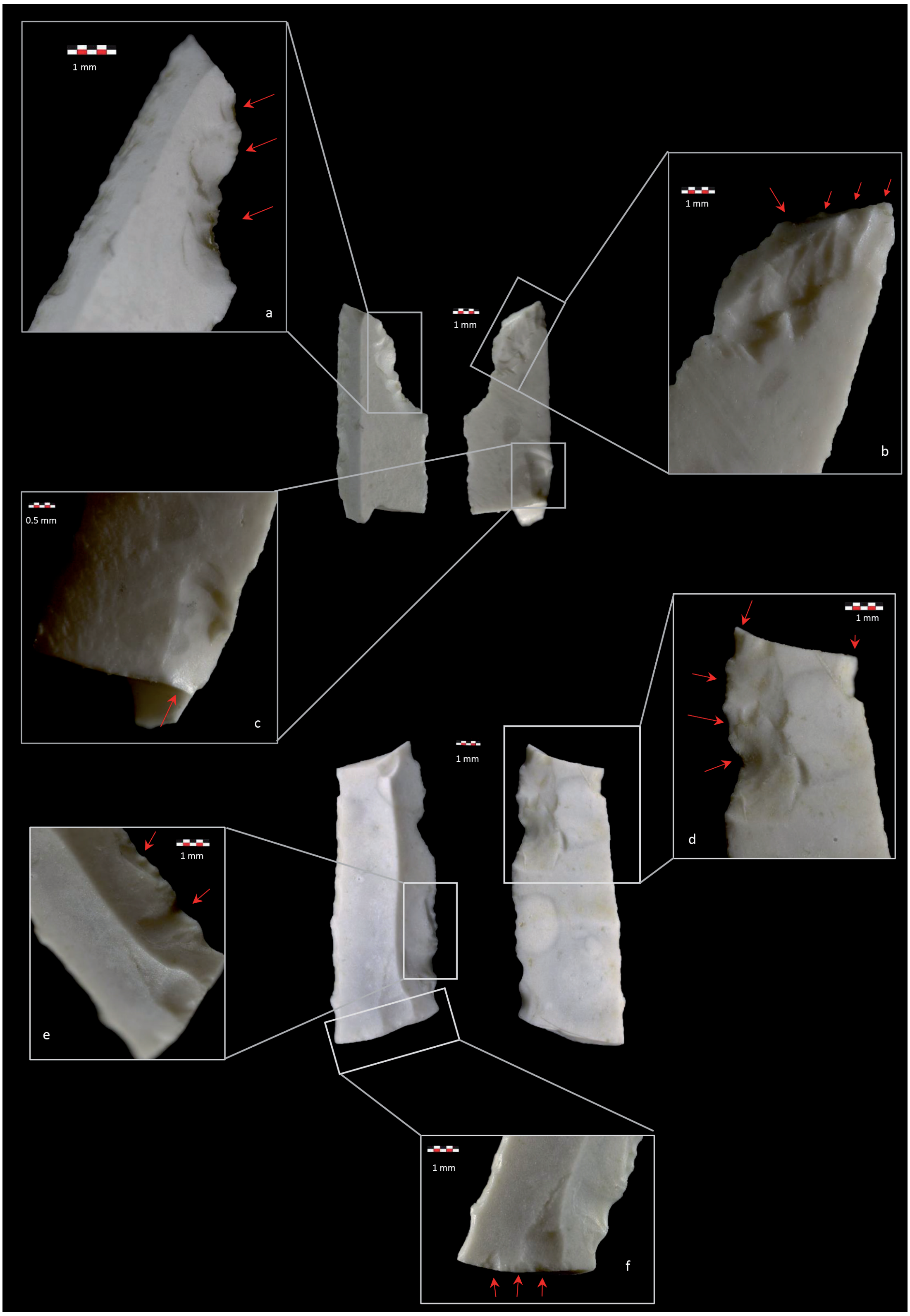

Fig. 5 – Two examples of pieces interpreted as probable weapon elements. They present a combination of more than three fractures characteristic of impact and with consistent orientation. The first piece (on top) shows the combination of multiple oblique oriented lateral scars propagated on the dorsal surface of the piece (a). In the apical location multiple scars are initiated from the termination side of a precedent bending break (b). Finally in the proximal part, a scar is initiated from the initiation side of a precedent bending break (c). The second piece (bottom) shows the combination of multiple oblique oriented lateral scars propagated on the dorsal and ventral surface of the piece (d, e). In the apical location two scars are initiated from the initiation side of a precedent bending break (d). Finally, in the proximal part, multiple scars are initiated from the termination side of a precedent bending break (f) (pictures and CAD: J. Coppe).

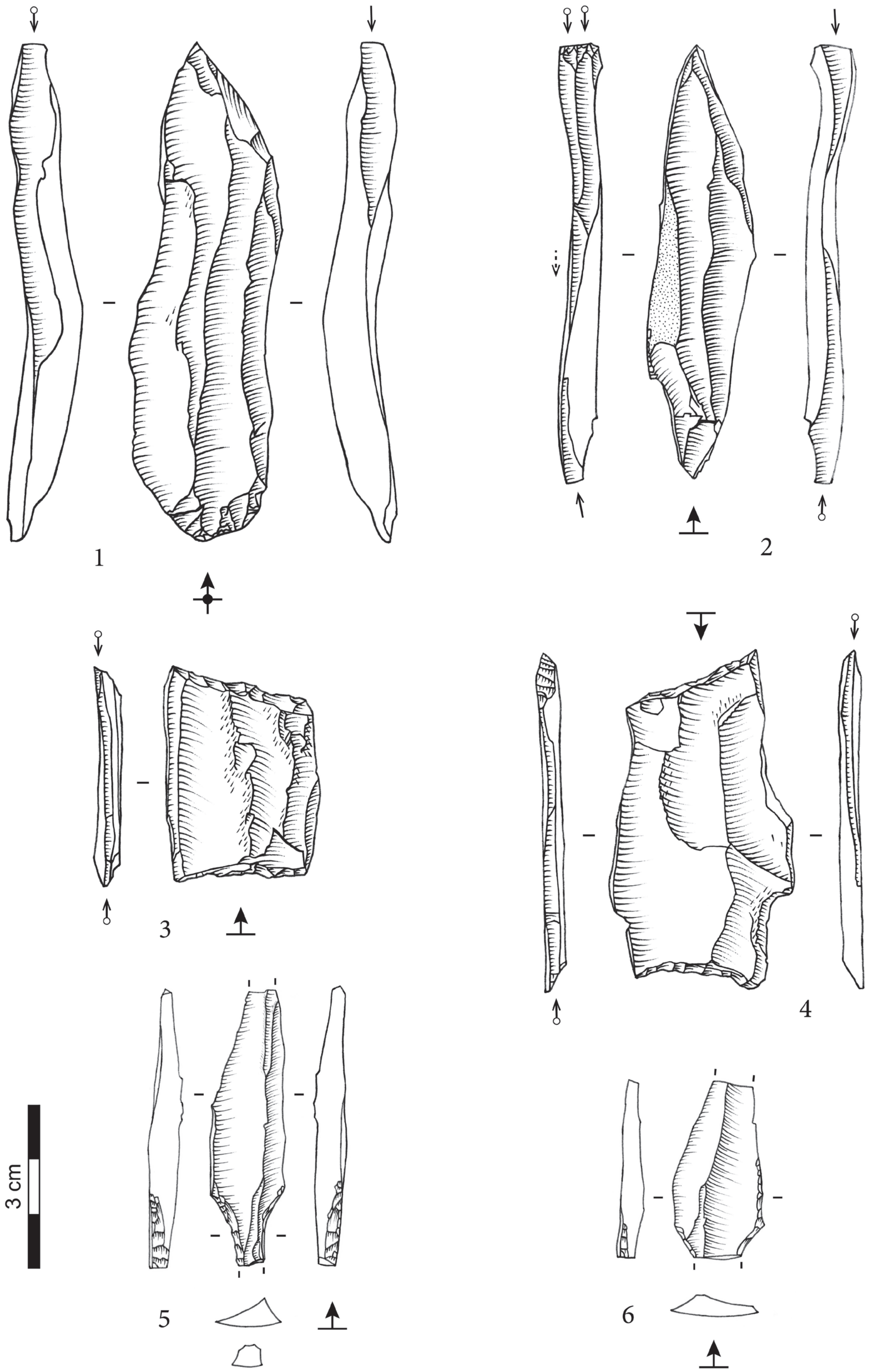

Fig. 6 – 1-2: dihedral burins; 3-4: burins on truncation with narrow bevels; 5-6: tanged points (drawings and CAD: O. Touzé).

Types of damages	N	%
Bending breaks initiated from a surface and terminating on a surface	18	23.7
Bending breaks initiated from a surface and terminating on an edge	6	7.9
Scars initiated from an earlier break surface and terminating on a surface or an edge	20	26.3
Lateral oblique oriented scars initiated from a surface	32	42.1
Total	**76**	**100**

Table 3 – Count of the types of damages observed on the backed pieces.

4.3.1. Blade production

a) Block selection and preparation
Blade production is carried out on more or less cylindrical volumes that can reach about 15cm in length, and possessing either a circular section defining surfaces of equal width, or a more oval section offering an association of narrow and wide surfaces. The only tested block in the material, as well as the cores with extended cortical surfaces, show that the selected blocks have fairly regular cortical surfaces.

The shaping of the blocks is variable and depends on their natural characteristics and their suitability with regards to the requirements of the knapper, and maybe also on the level of know-how of the latter. Two cores abandoned prematurely provide information on the earliest stages of the reduction process and display a preparation that uses two opposite two-sided crests. The invasiveness of these crests induces an almost complete configuration of the flanks of the future reduction surface. At least seven other cores abandoned at more advanced reduction stages attest to the preparation of at least one dorsal two-sided crest. Conversely, eleven cores whose back remained entirely cortical, as well as at least one flank for five of them, suggest a rather limited degree of preparation. However, the shaping phase involves usually the creation of at least one frontal crest. Among the crested blades, two-sided pieces are the most common by far. The preparation of the crest generally concerns the entire length of the future reduction surface, but this operation can occasionally be simplified as evidenced by a piece displaying a partial proximo-mesial crest, and by four other pieces testifying to a partial preparation of one of the two sides. The preparation of a single-sided crest is rare and depends closely on the natural regularity and convexities of the surface chosen for the initialization.

b) Core management
Blade production is in most cases managed using two opposite striking platforms. Of the 54 blade cores examined, 39 are in this case. Different situations exist however. While bidirectional management often involves strictly opposite striking platforms (n = 27), at an advanced stage of the *chaîne opératoire* these platforms frequently display different orientations, as shown by a group of 11 cores (see below). The fragmentary state of the last bidirectional core does not make it possible to determine the exact arrangement of the two striking platforms. Five other cores show a unidirectional management, while an overshot on a sixth individual does not allow excluding the presence of an opposite striking platform although the orientation and elongation of the laminar negatives testify to the strongly unipolar aspect of the reduction process. Three of these six cores are longer than 10cm, which place them among the longest cores of the assemblage. By comparison, only five of the 39 bidirectional cores are above this threshold. These data make it possible to consider that the unidirectional and bidirectional managements correspond to different phases of the *chaîne opératoire*, the opposite striking platform being often created during the reduction process, and not as soon as the preparation of the blocks. The last nine cores are too fragmentary to allow the determination of the direction of the removals. Furthermore, the unretouched blanks coming from the *plein débitage* show 64.2% of unidirectional removal sequences, and 23.9% of bidirectional sequences (11,9% of the cases are undetermined). In this latter case, the blanks are clearly related to a bidirectional reduction process, which directly refers to the data provided by the cores. On the other hand, the overrepresentation of unidirectional sequences seems contradictory from this point of view. The reasons of this contradiction are certainly multiple and could comprise a late implementation of the bidirectional management of the reduction process and/or a slow alternation between the two striking platforms.

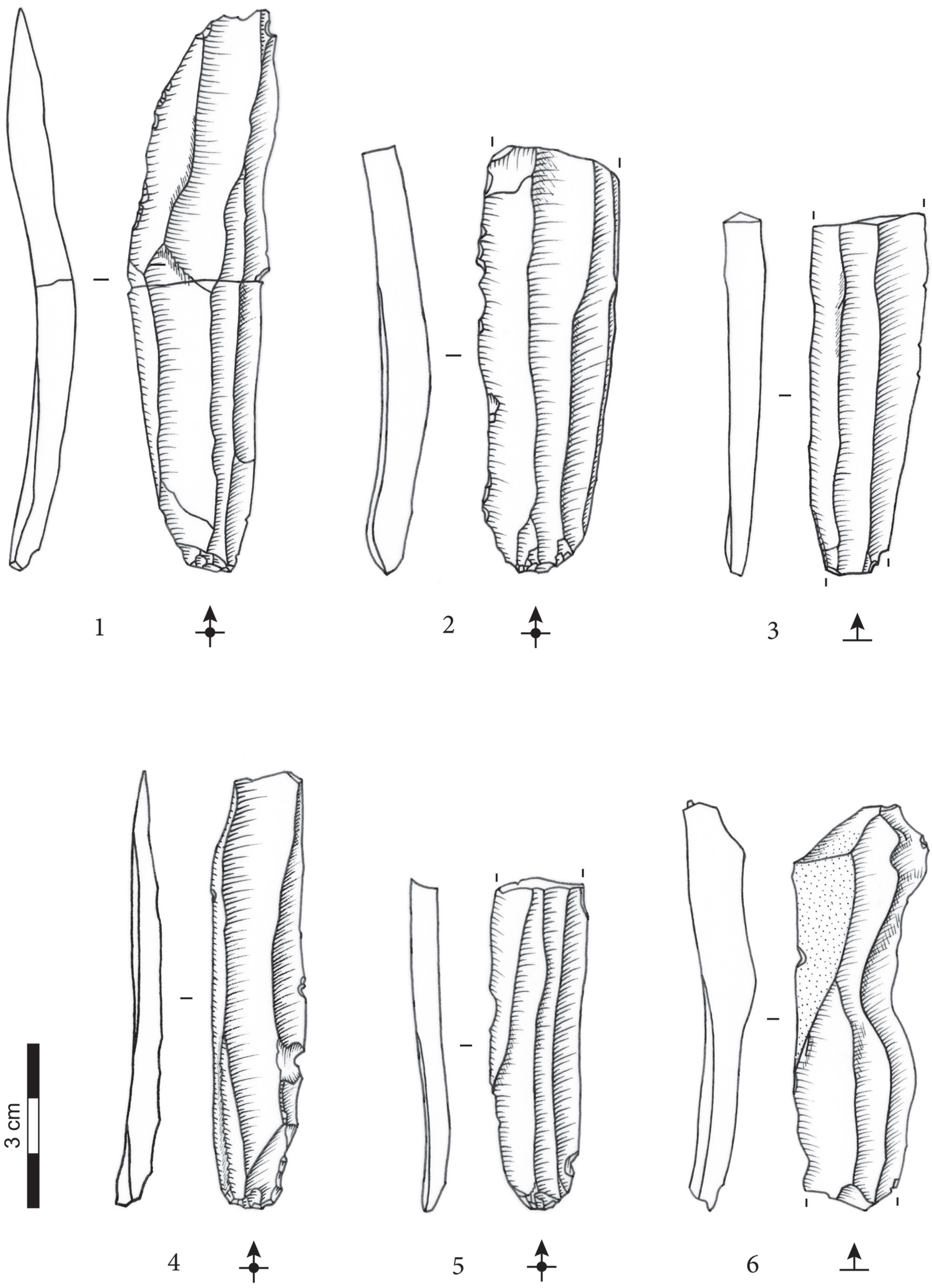

Fig. 7 – 1-5: *plein débitage* blades; 6: anterolateral blade (drawings and CAD: O. Touzé).

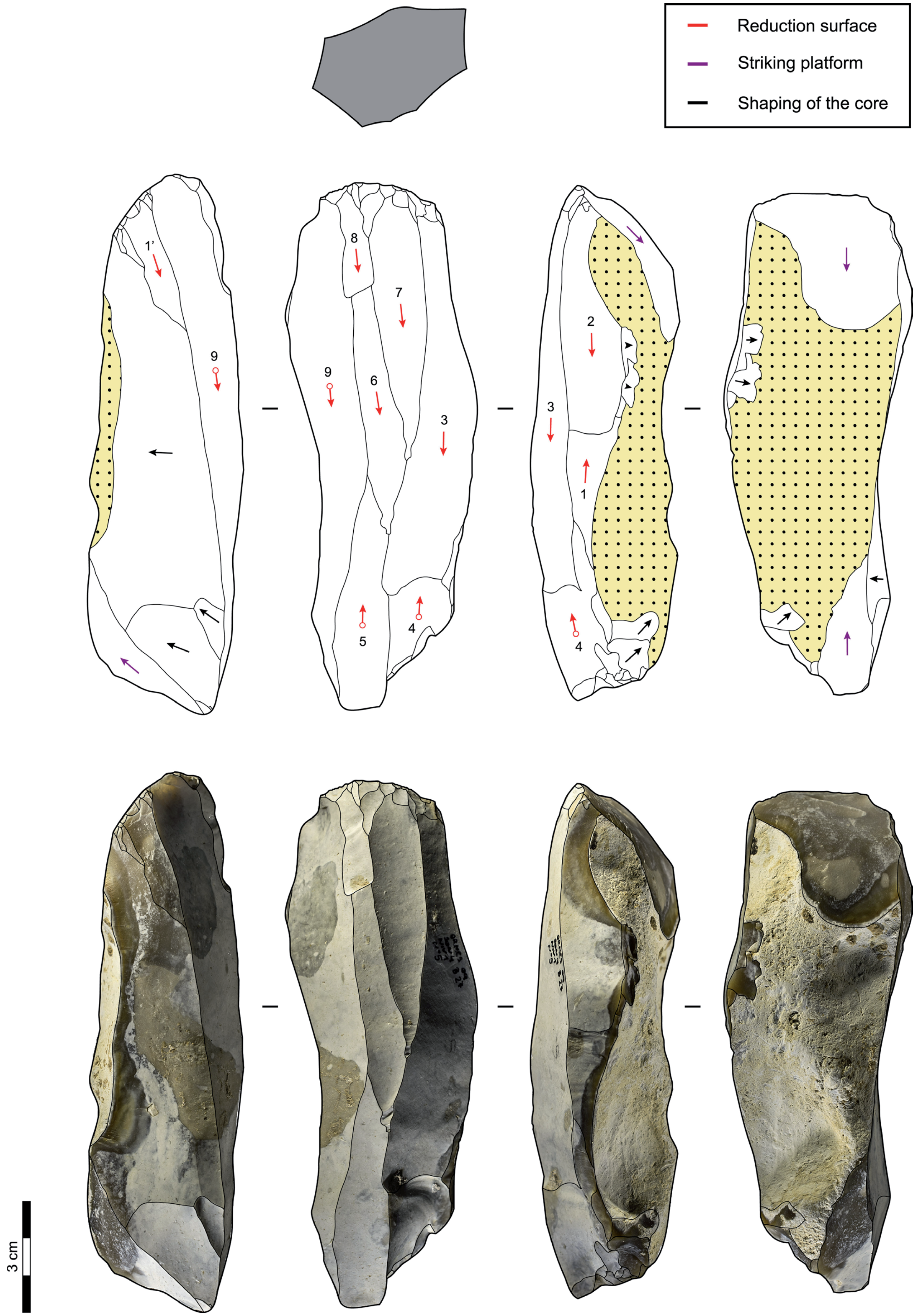

Fig. 8 – Blade core (pictures and CAD: O. Touzé).

The continuity of the reduction process is mostly ensured by the laminar removals themselves, which allows a permanent control of the convexities. The bending of the reduction surface is thus maintained by anterolateral blades whose detachment alternates with laminar extractions performed at the centre of this surface (fig. 7). The maintenance of the lateral convexity can also involve the preparation of a neo-crest, which is only partial in most cases and mainly aims to adjust the guide-ridge in order to optimize the success of the operation. Most of the time, the preparation of a neo-crest does not lead to a complete reshaping of the reduction surface/flank junction. The evolution of the longitudinal convexity is carefully controlled thanks to the bidirectional detachment of blades exceeding the middle of the reduction surface without exploiting its entire length. This process avoids the creation of a pronounced convexity by the effect of a progressive lowering of the ends of the reduction surface relative to its mesial part. In return, the blades produced are shorter than the length of the reduction surface. The alternate detachment of blades from the two striking platforms thus help to preserve the longitudinal convexity needed to the continuity of the reduction process, while ensuring that this convexity remains limited enough to allow the extraction of rectilinear blanks.

c) Progression of the reduction process

Of the 54 blade cores examined at least 35 have a reduction surface limited by two flanks equally invested by laminar removals and opposed to a back often formed by a two-sided crest or a cortical surface (fig. 8). This organization suggests that the reduction process follows mostly a symmetrical progression (Valentin *et al.*, 2014). These same cores were however abandoned at an advanced stage of exploitation, so that it is not possible to perceive potential evolutions in the progression of the *débitage* during the *chaîne opératoire*. The detailed characterization of this aspect will be done in the framework of a systematic refitting programme. Seven cores indicate nevertheless that a dissymmetrical progression is also possible, although this option seems frequently related to particular circumstances, such as the failure of the initialization of the reduction process, or a succession of unproductive strikes damaging the reduction surface.

If symmetrical progression thus seems to be one of the structuring principles of blade production, a discontinuity is nonetheless noticeable at an advanced stage of the *chaîne opératoire*. This discontinuity manifests itself through an extension of the perimeter of the reduction surface and concerns 14 blade cores displaying small dimensions with a length always situated below 9cm. Two options are implemented. The most common option is to extend the reduction surface by successively exploiting the different faces of the core. In this case, the *débitage* progresses between adjacent surfaces. Because each of these surfaces is managed independently with two, or most often with a single striking platform, the complete reduction surface is formed in reality by a juxtaposition of distinct, although partially secant laterally, reduction surfaces. The usually unidirectional character of the *débitage* can be explained by the desire to exploit the entire available length of the reduction surface in order to obtain blanks that are as elongated as possible, despite the fact that cores are already significantly reduced at this stage. The cores still possess two striking platforms, however, but they are systematically oriented differently ("*opposés-décalés*" striking platforms: see Klaric, 2003), and regularly reoriented in order to facilitate the exploitation of different surfaces. In the case of the second option, the reduction surface is directly transferred from the exploited face of the core to its opposite face by means of an inversion of the orientation of the striking platform. Consequently, in contrast to the first option, the *débitage* does not progress linearly around the core.

4.3.2. Bladelet production

Bladelet production also aims at obtaining regular blanks with a straight or slightly curved profile. These blanks can reach 60mm in length, although the majority of them do not exceed 45mm. The very high proportion of microgravettes among retouched tools demonstrates the fundamental role played by the production of bladelets in the lithic technical system. Regarding the *débitage*, the importance of this role is clearly strengthened by the diversity of solutions implemented by the knappers.

a) Productions associated with the laminar reduction process

Two of these solutions are directly associated with blade production. The first one is documented by four bladelet cores displaying a reduction surface that extends to almost their entire circumference. However, rather than forming a single surface, it can be separated into a juxtaposition of reduction surfaces successively exploited with the help of frequent reorientations of both striking platforms (fig. 9a). The latter furthermore show different orientations in order to favour an independent unidirectional management of each reduction surface, even if indications of bidirectional management also exist in some cases. When they are abandoned, the cores show an extremely reduced section and a more or less elongated "stick" morphology. The width and thickness of these cores are almost always situated between 15 and 20mm. Their organization is closely similar to that of most of the peripherally exploited blade cores described above. It is thus likely that these bladelet cores represent the last possible stage of reduction of blade cores, which attests to the possibility of a continuity between the production of laminar and lamellar blanks. Finally, it must be stressed that none of the four cores in discussion show traces of an accident, which is quite remarkable considering their very significant degree of reduction. Consequently, the end of the reduction process never appears to be premature and simply results from the exhaustion of the cores, which seems to indicate a relatively high degree of know-how.

Two cores suggest that blade production can sometimes include discontinuities during the reduction process (fig. 8). These discontinuities are associated with a change of goal which aims to insert the detachment of several bladelets, or short and narrow blades, into the reduction sequence thanks to a particular sequence of technical gestures. This sequence firstly involves the extraction of a long blade at the edge of the reduction surface. By lowering the reduction surface/flank junction, this removal makes it possible to accentuate the bending of the centre of the reduction surface, while simultaneously creating a new ridge in this same area. This ridge is used secondly to extract one or more tapered and very regular bladelets. These blanks can be obtained from one or two striking platforms and their detachment probably implies carefully controlled percussions. The morphology of the corresponding negatives and their extent on the reduction surface, as well as the fact that several bladelets can be extracted during the same sequence, further suggest that they are first intention products and not by-products adjusting a ridge to prepare the following laminar removal. Given the number of cores displaying this type of sequence, it seems however likely that this strategy only plays a secondary role with regard to bladelet production.

b) Autonomous productions

Among the autonomous bladelet productions, a production on narrow and elongated blocks is attested by three cores. Their width is situated between 21 and 27mm, while their length is comprised between 50 and 79mm. The preparation of the blocks seems rather limited, since both the back and the flanks are left cortical or prepared by means of a partial dorsal two-sided crest. The reduction process is managed using two opposite striking platforms. It also follows a symmetrical progression involving regular overflows towards the flanks in order to maintain sufficient bending, whereas the maintenance of a limited longitudinal convexity is ensured by bidirectional removals exceeding the middle of the reduction surface. Given its characteristics, this bladelet production appears to apply the general principles of blade production to smaller volumes that are suitable for obtaining bladelets.

The fourth and last solution applied by the knappers consists in the extraction of bladelets on the edge of a blank (fig. 9b). The studied material includes 25 "burin-cores" which directly result from this production. Their significant number suggests that they have probably provided most of the bladelets produced on the site. The blanks selected to support this production are mainly blades (n = 15) often associated with the first phases (initialization products, under-crested blades) or the maintenance of the reduction process (neo-crested blades). A few flakes were also used (n = 4) and six blanks are undetermined because of their fragmentary state. All these blanks were in particular selected for their pronounced thickness, as indicated by the blades used whose thicknesses are comprised between 12 and 26mm, which place them among the thickest blades of the assemblage (fig. 10). In total, the thickness of the burin-cores is situated between 10 and 28mm, with a mean of 17.6mm. The importance of the thickness of the blanks likely lies in the fact that this parameter defines the maximum width of the lamellar reduction surface. This aspect is therefore essential because it mechanically influences the width of the obtained bladelets which must be reduced afterwards by the preparation of the microgravettes' back. The selection of thick blanks seems therefore justified by the search for sufficiently wide bladelets so that the making of the microgravettes is not too constrained. The bladelets are detached from one or two striking platforms. Depending on whether they overflow towards a flank or are detached at the centre of the reduction surface, these products have somewhat different characteristics. In the first case, they carry a part of the dorsal or ventral face of the blank which defines a relatively steep facet with regards to their ventral face, because these removals are usually only slightly overflowed. This facet can either be slightly concave (*pan-avers*) or slightly convex (*pan-revers*), depending on whether the removal overflows towards the dorsal or the ventral face of the blank. Since a *pan-revers* has been identified on four microgravettes, it is clear that overflowing bladelets are not by-products. As the back of these four tools is always prepared on the *pan-revers*, it is possible that the presence of a steep facet on overflowing bladelets was sought, insofar as it prefigures the creation of the back. According to the morphology of the corresponding negatives, the bladelets obtained at the centre of the reduction surface are regular with subparallel edges converging in the distal part, and possess a rectilinear profile. They appear comparable, both in terms of morphology and dimensions, to the *plein débitage* bladelets coming from the other productions. If a difficulty occurs during the reduction process, a wide product can be extracted in order to erase previous negatives and create new ridges on both sides of the reduction surface that allow pursuing the production. The rejuvenation of the striking platforms is carried out by the detachment of tablets. The dorsal face of these by-products carry parts of both the dorsal and ventral faces of the blank, in addition to the possible negative of a previous tablet.

4.3.3. Percussion techniques

The percussion techniques used were characterized based on the diagnostic characters defined by J. Pelegrin (2000). Soft stone percussion appears clearly dominant, as was identified very early (Bodu *et al.*, 2011, p. 265-266), while cases of organic percussion are too rare for the use of this technique to be considered likely. It seems possible that these few cases were actually generated by a soft stone hammer, since this type of tool can create, under certain conditions (Biard and Prost, 2015), combinations of characters that are usually indicative of organic percussion. The thickness of the butts mostly shows values situated between less than 1mm and 2mm, which demonstrates that the percussions involved in the detachment of lamino-lamellar products were usually done at a very short distance from the edge of the striking platform. This aspect, together with the probable tangential character of the percussions relative to the longitudinal axis of the reduction surface, is certainly one of the factors that favoured the production of thin blanks.

In addition, the butts of the blades and bladelets are commonly flat. A preparation is sometimes noted which can result in a facetted, dihedral, or very exceptionally spur morphology. These preparations are independent of the technical status of the products, but they seem correlated to the thickness of the butts, and thus to the distance of the percussion relative to the edge of the striking platform. Indeed, the prepared butts usually have a thickness greater than or equal to 3mm that is uncommon in the assemblage. The dorsal edges of the butts further show that the removal of the overhang is mainly carried out with an abrasion directed towards the reduction surface. In some cases, this operation is done with an abrasion or with small percussions directed towards the striking platform, or with small percussions followed by an abrasion, but these different options are rarely used. In one case out of 10, no trace of overhang preparation is present. This absence can be associated either with a little prominent or non-existent overhang, or with a percussion performed at a good distance from the edge of the striking platform.

5. Discussion and conclusion

As previously mentioned, the Gravettian occupation of Les Bossats suffered from taphonomical problems. Its preservation is especially affected by an ancient talweg which cut the eastern part of the site and might have erased one (or more) area(s) of the archaeological layer. Because of this situation, it is important to bear in mind that our interpretations are certainly influenced in part by this bias. The reality of the latter will be evaluated more precisely by the excavation of the talweg. However, the data collected so far allow to make some preliminary observations and hypotheses regarding the characteristics and the nature of the Gravettian occupation.

The Gravettian lithic industry represented at Les Bossats comprises a significant amount of artefacts, including numerous cores, which show that blank and tool production at the site was an important and relatively time-consuming activity. This industry is mainly based on the exploitation of a good quality Campanian flint available near the site, along the Loing valley. The carriage of a limited complementary stock of tertiary flint blanks over several dozens of kilometres also suggests that the presence of good quality flint in the area was known so that lithic equipment did not need to be prepared in advance. It is clear in consequence that the configuration of the territory was known by the group.

The lithic technical system includes both the production of rather narrow and thin blades and a multimodal production of bladelets. This dual objective of the *débitage* is perfectly illustrated by the retouched tools which are dominated by far by burins and backed pieces. If the function of the former still remains unclear for the moment, the latter mostly include microgravettes, some of which at least were clearly used as weapon components. In consequence, the lamellar component of the industry appears to be closely related to the hunting activity. Integrating the technological and functional data, it appears that microgravettes were first produced on the site in order to prepare the equipment involved afterwards in hunting. Once this latter task was performed, the weapons used and at least part of their lithic components were brought back to the camp together with hunted animals. The damaged microgravettes were then discarded and probably replaced in view of the next hunt.

The laminar component of the lithic industry had several roles including a direct contribution to the production of microgravettes (burin-cores). Regarding blade tools, the fact that some osseous pieces wear traces indicating the possible use of burins suggests that these tools were partly involved in the treatment of the carcasses. Even though this remains to be empirically tested by future analysis, tool types such as end-scrapers (skin work?) and retouched blades that usually have one unretouched cutting edge (butchery?) may have also participated in this activity. However, as noted above, retouched tools are not highly diversified. In fact, we note that tool types other than burins and backed pieces represent less than 10% of all the retouched tools, and that types such as end-scrapers or drills are poorly represented or completely lacking. This situation suggests that several common "domestic" activities were performed only to a limited extent at Les Bossats, or not performed at all.

Apart from the lithic industry, Les Bossats yields other types of remains that provide significant data on the activities carried out at the site. Faunal remains are especially important here, given their number (n > 3,400 excluding chips; Lacarrière, this volume) and their relatively good state of preservation, and the fact that they are rarely found at other Gravettian sites of the region due to different taphonomical situations. The archaeozoological data indicate the kill of at least eight bison, two horses and two reindeer (Lacarrière, this volume). Given both the number of animals and the species represented, it is clear that hunting—especially bison hunting—was a central activity during the Gravettian occupation. This conclusion is furthermore supported by the lithic industry, considering the quantitative (number of bladelet cores, blanks and microgravettes) and qualitative (diversity of the *schémas opératoires* implemented) importance of the lamellar component and its relation to this activity. Animals were likely killed in the vicinity of Les Bossats (a few kilometres maximum), before being transported afterwards to the site for butchering activities. Skeletal element representation indicates that bison carcasses were entirely transported, although long bones from the limbs appear overrepresented. This observation could suggest that transport of these parts was favoured, or, conversely, that the other portions were mainly treated in view of a later consumption at another site. As opposed to long bones, dental remains are rare which could indicate that skulls were abandoned at the kill-site, or, if skulls were transported, their possible destruction at Les Bossats. However, the recent discovery of bison teeth in secondary position at the bottom of the talweg could also indicate—if they prove to be dated to the Gravettian—that skulls were abandoned in the eastern part of the site which was later eroded by a massive water flow. Moreover, several clues indicate a quite intensive on-site treatment of the carcasses including skinning, meat removal, breakage of fresh bone for marrow and/or grease recovery, and selection of spongy bones to supply the combustion areas (Lacarrière *et al.*, 2015; Lejay *et al.*, this volume).

Organisation of the living space is attested by several features including the presence of faintly structured combustion areas, the intentional installation of a living floor formed by a bed of gravel whose function was probably to protect the group against the soil's humidity, and the transport (over a short distance) and arrangement of several calcareous sandstone blocks (Lacarrière *et al.*, 2015; Lejay *et al.*, this volume). Other activities include the probable preparation of ornaments as suggested by the discovery of more than 160 fossil shells, some of which were intentionally perforated (Peschaux, this volume). The nearest source for these shells is located 80km away, in the northern part of the Paris Basin, which directly echoes the import of a stock of tertiary flint blanks attesting a movement of about thirty kilometres from a more northern area (Lacarrière *et al.*, 2015). Finally, some limited indications of bone and reindeer antler exploitation are present.

Given the features of the Gravettian occupation, some comments can be made on its functional status and probable duration. Firstly, although the function(s) of the burins still remain(s) unclear at this stage, the tool assemblage is clearly dominated by microgravettes and burins which creates the impression of a relatively specialised tool-kit that does not seem to fit well with the hypothesis of a site occupied during most part of the year. The scarcity of the osseous industry also tends to rule out this possibility, since this scarcity would appear rather curious in the case of a long term occupation, especially considering the material made available by the hunting activity and the role of the osseous industry in Gravettian technical systems (Goutas, 2004). However, as noted above, some bone remains related to this industry show traces suggesting the use of burins (Goutas *in* Bodu [dir.], 2018). Because burins are very numerous at the site, and assuming that at least part of them were used on osseous material, it is possible that bone working activities were actually more important than what the current state of the data leads to suggest, but that part of the evidence disappeared either due to taphonomical problems or due to the export of bone tools to other sites. Future traceological study of the burins will help to solve this issue. Similarly, features related to the organisation of the living space remain limited and consequently little suggests the installation of a permanent or semi-permanent habitat.

However, these latter features, as well as the amount of lithic remains, the intensive on-site treatment of bison carcasses and the preparation of fossil shell ornaments, do not argue either in favour of a simple hunting camp—at least if the notion of "hunting camp" is understood in its most strict definition, that is a highly specialised site occupied for a short period by a group of accomplished hunters (Bodu, Olive *et al.*, 2011)—, even if we take into account the fact that hunting camps can sometimes reveal a certain diversity of activities (Burke, 2011).

Besides, the recent discovery of a deciduous molar of a child aged 8 to 12 years provides an interesting hint with regard to the composition of the group (Bodu [dir.], 2016, p. 301). Data collected on contemporary hunter-gatherer societies shows that children can successfully perform subsistence activities like gathering plants or hunting small animals. However, big-game hunting requires skills that involve a very long learning process (Lew-Levy *et al.*, 2017). Because of the complexity of this latter activity, the learning usually begins at the end of childhood and continues far into adulthood, which implies that individuals often become highly proficient only at an advanced stage of their adult lives (Walker *et al.*, 2002; Gurven *et al.*, 2006; Lew-Levy *et al.*, 2017). Even though data collected on contemporary hunter-gatherers are obviously not directly related to Upper Palaeolithic bison hunting, they nevertheless indicate that it is unlikely that the Gravettian child of Les Bossats actively participated in bison hunting, although it is possible, given his/her age, that he/she was already engaged in learning how to hunt large animals through observation, the training to the use of hunting weapons, games with peers, teaching by adults, etc. The site of Les Bossats was thus likely occupied by a group that was heterogeneous from a socio-economic perspective, and not exclusively by trained adult hunters.

Taken together, all these elements suggest that the Gravettian occupation of Les Bossats would be best described as a "residential base" (Binford, 1980) that was probably occupied during several weeks or a few months maximum. The nature of the archaeozoological data allows to hypothesise that the possible acquirement of a considerable amount of animal resources contributed significantly to the choice of the site. One can even venture to assume that the presence of bison had been verified in advance, if not anticipated, or even that their acquisition and treatment were partially intended for deferred consumption.

Finally, it is important to emphasize the presence of several other Early Gravettian sites in the region (Klaric, 2013) which indicates its frequent occupation during this specific time period, especially since some of these can be correlated with Les Bossats on both technological and typological grounds (Touzé, 2019). Indeed, these sites always display lithic assemblages including microgravettes associated with few tanged points. Furthermore, recent technological studies of the material discovered at the surface site of Flagy – Belle-Fontaine (Seine-et-Marne; Klaric *et al.*, 2004; Touzé, 2019) showed strong similarities between blade and bladelet productions at this site and that of Les Bossats (Touzé, 2019). These elements indicate that the Paris Basin possesses a real potential of research for this period, although the nature and the quality of the documentation available today are highly unequal which prevents any attempt to address complex topics such as regional settlement systems—the scarcity of faunal assemblages is especially problematic in this regard. Based on the reference case of Les Bossats, future research could include the search of new sites in loess deposits along the Loing as well as in neighbouring areas. Such a project would hopefully help to overcome the very limited data available for most of the other regional Gravettian sites. It may also allow (on the long term) to reach a deeper palethnographic understanding of Gravettian societies, following the famous example of the Magdalenian in the same region (among others: Pigeot [dir.], 2004; Audouze, 2006; 2007; Bodu *et al.*, 2006; Valentin, 2008; Julien and Karlin [dir.], 2014), and to investigate the evolution of their socio-economical organisation during the second half of the Early Upper Palaeolithic.

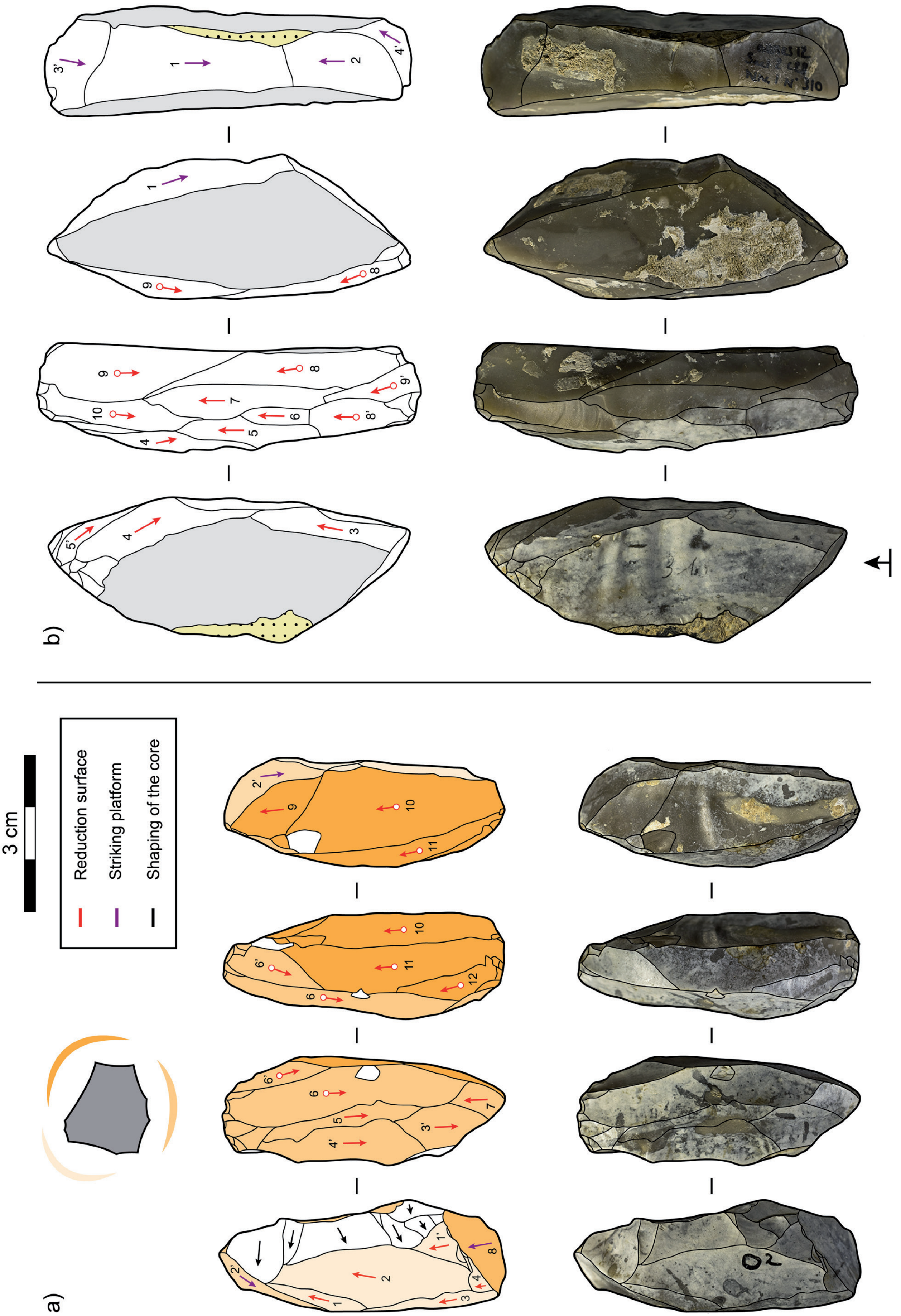

Fig. 9 – a: bladelet core with peripheral exploitation, b: burin-core (pictures and CAD: O. Touzé).

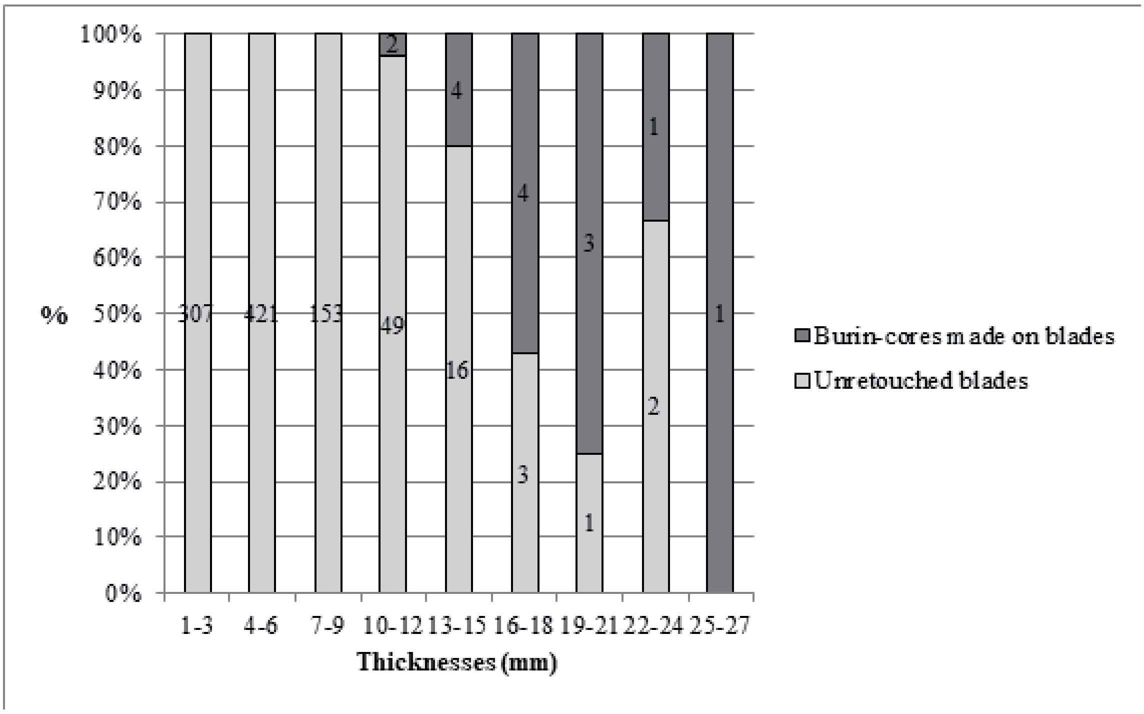

Fig. 10 – Distribution in percentages of the thicknesses of unretouched blades and burin-cores made on blades.

Acknowledgments

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Endnotes

1. Although we chose to illustrate both tanged points because of their chrono-cultural significance (fig. 6, nos. 5-6), only one of these artefacts was found before 2014 (fig. 6, no. 6) and is therefore integrated into the quantitative data presented in this article, as stated in section "*3. Material*" (see tabl. 2). The other tanged point (fig. 6, no. 5) was found in 2017 in secondary position. It is likely that it fell accidentally from a stratigraphic section directly adjoining the Gravettian occupation. The area where this artefact was discovered, as well as its typological characteristics and its surface state make it clear that it belongs to the Gravettian occupation and not to one of the other industries represented on the site (Solutrean, Chatelperronian, Mousterian).
2. The limit of 4mm established between microgravettes and nanogravettes is also used by other authors (Floss *et al.* 2013, p. 345).

Bibliography

Antoine P. (2002) – Les Lœss en France et dans le Nord-Ouest européen. *Revue française de géotechnique*, 99, p. 3-21.

Antoine P., Catt J., Lautridou J.-P., Sommé J. (2003) – The Lœss and Coversands of Northern France and Southern England. *Journal of Quaternary Science*, 18, p. 309-318.

Audouze F. (2006) – Essai de modélisation du cycle annuel de nomadisation des Magdaléniens du Bassin parisien. *Bulletin de la Société préhistorique française*, 103 (4), p. 683-694

— (2007) – Mobilité résidentielle et stratégie de subsistance dans le Magdalénien du Bassin Parisien. *In:* P. Rouillar,

C. Perlès, E. Grimaud, *Mobilités, immobilismes : l'emprunt et son refus*, Proceedings of the symposium of Maison René-Ginouvès, Nanterre (June 2006). Paris, de Boccard, p. 27-44.

Béraud H., Vacher G., Vignard E. (1965) – Le Périgordien Gravettien des Ronces dans les Gros Monts de Nemours (Seine-et-Marne). *Bulletin de la Société préhistorique française*, 62, p. 98-109.

Biard M., Prost D. (2015) – Le Débitage à la pierre tendre. Exemple de deux postes de taille de l'extrême fin du Paléolithique en Haute-Normandie. *Bulletin de la Société préhistorique française*, 112 (1), p. 59-73.

Binford L.R. (1980) – Willow Smoke and Dog's Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity*, 45 (1), p. 4-20.

Bodu P. (dir.) (2016) – *Le Gisement du Paléolithique moyen et du Paléolithique supérieur des Bossats, Ormesson (Seine-et-Marne) – 77348*, rapport de première année de triennale (autorisation triannuelle 2016-2018). Paris, Service régional de l'Archéologie d'Île-de-France, 527 p.

— (2018) – *Le Gisement du Paléolithique moyen et du Paléolithique supérieur des Bossats, Ormesson (Seine-et-Marne) – 77348*, document final de synthèse (autorisation triannuelle 2016-2018). Paris, Service régional de l'Archéologie d'Île-de-France, 670 p.

Bodu P., Baillet M., Ballinger M., Dumarçay G., Goutas N., Julien M.-A., Lacarrière J., Legrand-Pineau A., Lejay M., Leroyer M., Lucas C., Moine O., Naton H.-G., Peschaux C., Salomon H., Stoetzel E., Suire J., Théry-Parisot I., Touzé O., with the collaboration of Allièse F., Bocquentin F., Guéret C., Valentin F. (2019) – Le gisement paléolithique multistratifié "les Bossats" à Ormesson (Seine-et-Marne, France) : palethnographie ou pâle ethnographie ? Une synthèse des huit premières années de fouille (2009-2016). *In:* C. Montoya, J.-P. Fagnart, J.-L. Locht (ed.), *Préhistoire de l'Europe du Nord-Ouest : mobilité, climats et identités culturelles*, Proceedings of the 28th French prehistoric congress (Amiens, 30 May – 4 June 2016), Session 2 : Palethnologie du Paléolithique supérieur ancien : où en sommes-nous ? Paris, Société préhistorique française, p. 231-262.

Bodu P., Bignon O., Dumarçay G. (2011) – Le Gisement des Bossats à Ormesson, région de Nemours (Seine-et-Marne) : un site gravettien à faune dans le Bassin parisien. *In*: N. Goutas, L. Klaric, D. Pesesse, P. Guillermin (dir.), *À la recherche des identités gravettiennes : actualités, questionnements et perspectives*, Proceedings of the round table of Aix-en-Provence (6-8 October 2008). Paris, Société préhistorique française (Mémoires de la Société préhistorique française, 52), p. 259-272.

Bodu P., Dumarcay G., Naton H.-G., with the collaboration of Ballinger M. and Théry-Parisot I. (2014) – Un nouveau gisement solutréen en Île-de-France, le site des Bossats à Ormesson (Seine-et-Marne). *Bulletin de la Société préhistorique française*, 111 (2), p. 225-254.

Bodu P., Julien M., Valentin B., Debout G. (ed.) (2006) – *Un dernier hiver à Pincevent : les Magdaléniens du niveau IV0 (Pincevent, La Grande-Paroisse, Seine-et-Marne)*. Paris, CNRS (Gallia Préhistoire, 48), 180 p.

Bodu P., Olive M., Valentin B., Bignon-Lau O., Debout G. (2011) – Où sont les haltes de chasse ? Discussion à partir des sites tardiglaciaires du Bassin parisien. *In:* F. Bon, S. Costamagno, N. Valdeyron (dir.), *Haltes de chasse en Préhistoire. Quelles réalités archéologiques ?*, Proceedings of the international symposium of University Toulouse 2 (13-15 May 2009). Toulouse, Presses universitaires du Midi (P@lethnologie, 3), p. 231-252.

Bodu P., Salomon H., Lacarrière J., Baillet M., Ballinger M., Naton H.-G.,Théry-Parisot I. (2017) – Un gisement châtelperronien de plein air dans le Bassin parisien: les Bossats à Ormesson (Seine-et-Marne). *Gallia Préhistoire*, 57, p. 3-64.

Bodu P., Salomon H., Leroyer M., Naton H.-G., Lacarrière J., Dessoles M. (2014) – An Open-Air Site from the Recent Middle Palaeolithic in the Paris Basin (France): Les Bossats at Ormesson (Seine-et-Marne). *Quaternary International*, 331, p. 39-59.

Bosselin B., Djindjian F. (1994) – La Chronologie du Gravettien français. *Préhistoire européenne*, 6, p. 77-115.

Boyer-Klein A., David F., Jouve A., Laloy J. (1983) – Le Gisement magdalénien de la Pente-des-Brosses à Montigny-sur-Loing (Seine-et-Marne) : II. Le milieu. *Gallia Préhistoire*, 26, p. 129-138.

Burke A.L. (2011) – La *Halte de Chasse* pendant la Préhistoire du Canada oriental : variabilité, représentativité et signification. *In:* F. Bon, S. Costamagno, N. Valdeyron (dir.), *Haltes de chasse en Préhistoire. Quelles réalités archéologiques?*, Proceedings of the international symposium of University Toulouse 2 (13-15 May 2009). Toulouse, Presses universitaires du Midi (P@lethnologie, 3), p. 9-20.

Cheynier A. (dir.) (1963) – *Le Cirque de la Patrie à Nemours (Seine-et-Marne)*. Paris, Société préhistorique française (Mémoires de la Société préhistorique française, 6), 195 p.

Coppe J. (2020) – *Sur les traces de l'armement préhistorique. Mise au point d'une méthode pour reconstruire les modes d'emmanchement et de propulsion des armatures lithiques par une approche expérimentale, mécanique et balistique*. PhD thesis, University of Liège.

Coppe J., Rots V. (2017) – Focus on the Target. The Importance of a Transparent Fracture Terminology for Understanding Projectile Points and Projecting Modes. *Journal of Archaeological Science: Reports*, 12, p. 109-123.

Daniel M., Daniel R. (1953) – Les Gisements préhistoriques de la vallée du Loing. *L'Anthropologie*, 57 (3-4), p. 209-239.

De la Peña Alonso P. (2011) – *Sobre la unidad tecnológica del Gravetiense en la Península ibérica: implicationes para el conocimiento del Paleolítico superior initial*. PhD thesis, Universidad Complutense de Madrid, 822 p.

Delarue R., Vignard E. (1959) – L'Aurignaco-Périgordien des Gros-Monts Bis et Ter dans les Bois des Beauregards près de Nemours. *Bulletin de la Société préhistorique française*, 56 (7-8), p. 462-478.

— (1963) – Le Périgordien-Gravettien du Bois des Chênes dans les Gros Monts de Nemours (S.-et-M.). *Bulletin de la Société préhistorique française*, 60 (5-6), p. 340-351.

Demars P.-Y., Laurent P. (1989) – *Types d'outils lithiques du Paléolithique supérieur en Europe*. Paris, CNRS Éditions, 178 p.

De Sonneville-Bordes D., Perrot J. (1956) – Lexique typologique du Paléolithique supérieur. Outillage lithique (suite et fin) : V. Outillage à bord abattu, VI. Pièces tronquées, VII. Lames retouchées, VIII. Pièces variées, IX. Outillage lamellaire, Pointe azilienne. *Bulletin de la Société préhistorique française*, 53 (9), p. 547-559.

Doigneau E. (1873-1874) – La Caverne du Croc-Marin et le foyer du Long-Rocher (forêt de Fontainebleau). *Bulletin de la Société d'Archéologie, Sciences, Lettres et Arts de Seine-et-Marne*, 7, p. 283-295.

— (1884) – *Nemours : temps géologiques, temps préhistoriques, temps historiques*. Paris, Librairie P. Garcet et Nisius, 252 p.

Floss H., Dutkiewicz E., Frick J., Hoyer C. (2013) – Le Paléolithique supérieur ancien en Bourgogne du sud. *In:* P. Bodu, L. Chehmana, L. Klaric, L. Mevel, S. Soriano, N. Teyssandier (dir.), *Le Paléolithique supérieur ancien de l'Europe du Nord-Ouest : réflexions et synthèses à partir d'un projet collectif de recherche sur le centre et le sud du Bassin parisien*, Proceedings of the symposium of Sens (15-18 April 2009). Paris, Société préhistorique française (Mémoires de la Société préhistorique française, 56), p. 331-350.

Foucher P., San Juan-Foucher C., Sacchi D., Arrizabalaga A. (2008) – Le Gravettien des Pyrénées. *In: Le Gravettien : entités régionales d'une paléoculture européenne*, Proceedings of the round table of Les Eyzies (July 2004). Les Eyzies-de-Tayac, SAMRA (Paléo, 20), p. 331-356.

Goutas N. (2004) – *Caractérisation et évolution du Gravettien en France par l'approche techno-économique des industries en matières dures animales (étude de six gisements du sud-ouest)*. PhD thesis, University Paris 1 – Panthéon-Sorbonne, 2 vol., 675 p.

Goval É., Hérisson D. (dir.) (2018) – *Les Chasseurs des steppes durant le dernier glaciaire en France septentrionale. Paléoenvironnement, techno-économie, approche fonctionnelle et spatiale du gisement d'Havrincourt*. Liège, Université de Liège (ERAUL, 141), 210 p.

Gurven M., Kaplan H., Gutierrez M. (2006) – How Long Does it Take to Become a Proficient Hunter? Implications for the Evolution of Extended Development and Long Life Span. *Journal of Human Evolution*, 51, p. 454-470.

Haesaerts P., Damblon F., Gerasimenko N., Spagna P., Pirson S. (2016) – The Late Pleistocene Loess-palaeosol Sequence of Middle Belgium. *Quaternary International*, 411, p. 25-43.

Julien M., Karlin C. (dir.) (2014) – *Un automne à Pincevent : le campement magdalénien du niveau IV20*. Paris, Société préhistorique française (Mémoire de la Société préhistorique française, 57), 639 p.

Kildea F., Griselin S., Lang L., Souffi B., with the collaboration of Sellami F., Holzem N., Dumarçay G. (2013) – Le Paléolithique supérieur ancien aux marges méridionales du Bassin parisien : le site de la Croix-de Bagneux à Mareuil-sur-Cher (Loir-et-Cher). *In:* P. Bodu, L. Chehmana, L. Klaric, L. Mevel, S. Soriano, N. Teyssandier (dir.), *Le Paléolithique supérieur ancien de l'Europe du Nord-Ouest : réflexions et synthèses à partir d'un projet collectif de recherche sur le centre et le sud du Bassin parisien*, Proceedings of the symposium of Sens (15-18 April 2009). Paris, Société préhistorique française (Mémoires de la Société préhistorique française, 56), p. 317-329.

Klaric L. (2003) – *L'Unité technique des industries à burins du Raysse dans leur contexte diachronique. Réflexions sur la variabilité culturelle au Gravettien*. PhD thesis, University Paris 1 – Panthéon-Sorbonne, 426 p.

— (2010) – Le Gravettien. *In:* J. Clottes (dir.), *La France préhistorique : un essai d'histoire*. Gallimard, p. 142-169.

— (2013) – Faciès lithiques et chronologie du Gravettien du sud du Bassin parisien et de sa marge sud-occidentale. *In:* P. Bodu, L. Chehmana, L. Klaric, L. Mevel, S. Soriano, N. Teyssandier (dir.), *Le Paléolithique supérieur ancien de l'Europe du Nord-Ouest : réflexions et synthèses à partir d'un projet collectif de recherche sur le centre et le sud du Bassin parisien*, Proceedings of the symposium of Sens (15-18 April 2009). Paris, Société préhistorique française (Mémoires de la Société préhistorique française, 56), p. 61-87.

Klaric L., Bertran P., Dumarçay G., Liard M. (2018) – A Long and Winding Road: Towards a Palethnographic Interpretation of the Middle-Gravettian Site of la Picardie (Indre-et-Loire, France). *Quaternary International*, DOI: 10.1016/j.quaint.2018.09.035.

Klaric L., Senée A., Soriano S. (2004) – Note sur le site Paléolithique de surface de Belle-Fontaine à Flagy (Seine-et-Marne). *In:* P. Bodu, L. Chehmana, N. Teyssandier (dir.), *Le Paléolithique supérieur ancien du Bassin parisien: des systèmes techniques aux comportements*, rapport de Projet collectif de recherche. Saint-Denis, Service régional de l'Archéologie d'Île-de-France, p. 57-66.

Lacarrière J., Bodu P., Julien M.-A., Dumarçay G., Goutas N., Lejay M., Peschaux C., Naton H.-G., Théry-Parisot I., Vasiliu L. (2015) – Les Bossats (Ormesson, Paris Basin, France): a New Early Gravettian Bison Processing Camp. *Quaternary International*, 359-360, p. 520-534.

Lew-Levy S., Reckin R., Lavi N., Cristóbal-Azkarate J., Ellis-Davies K. (2017) – How Do Hunter-Gatherer Children Learn Subsistence Skills? A Meta-Ethnographic Review. *Human Nature*, 28, p. 367-394.

Moss E.H. (1983) – *The Functional Analysis of Flint Implements: Pincevent and Pont d'Ambon: Two Case Studies from the French Final Palaeolithic*. Oxford, British Archaeological Reports (BAR International Series, 177), 249 p.

Nouel A. (1936) – La Station paléolithique de Hault-le-Roc à Montigny-sur-Loing (Seine-et-Marne). *Bulletin de la Société préhistorique française*, 33 (10), p. 567-576.

Paris C., Deneuve É., Fagnart J.-P., Coudret P., Antoine P., Peschaux C., Lacarrière J., Coutard S., Moine O., Guérin G. (2017) – Premières observations sur le gisement gravettien à statuettes féminines d'Amiens-Renancourt 1 (Somme). *Bulletin de la Société préhistorique française*, 114 (3), p. 423-444.

Paris C., Antoine P., Auguste P., Claud É., Coutard S., Coudret P., Deneuve É., Fagnart J.-P., Font C., Goutas N., Lacarrière J., Moine O., Peschaux C., Goval É., Hérisson D. (2019) – Les Gisements gravettiens d'Amiens-Renancourt 1 et 2 (Somme, France) : premières données palethnologiques. *In:* C. Montoya, J.-P. Fagnart, J.-L. Locht (ed.), *Préhistoire de l'Europe du Nord-Ouest : mobilité, climats et identités culturelles*, Proceedings of the 28th French prehistoric congress (Amiens, 30 May – 4 June 2016), Session 2 : Palethnologie du Paléolithique supérieur ancien : où en sommes-nous ? Paris, Société préhistorique française, p. 97-116.

Pelegrin J. (2000) – Les Techniques de débitage laminaire au Tardiglaciaire : critères de diagnose et quelques réflexions. *In:* B. Valentin, P. Bodu, M. Christensen (ed.), *L'Europe centrale et septentrionale au Tardiglaciaire*, Proceedings of the international round table of Nemours (14-16 May 1997). Nemours, APRAIF (Mémoires du musée de Préhistoire d'Ile-de-France, 7), p. 73-86.

— (2004) – Sur les techniques de retouche des armatures de projectile. *In:* N. Pigeot (dir.), *Les Derniers Magdaléniens d'Etiolles : perspectives culturelles et paléohistoriques (l'unité d'habitation Q31)*. Paris, CNRS Éditions (Supplément à Gallia Préhistoire, 37), p. 161-166.

Pesesse D. (2008) – *Les Premières Sociétés gravettiennes : analyse comparée des systèmes lithiques de la fin de l'Aurignacien aux débuts du Gravettien*. PhD thesis, University of Provence, 2 vol., 455 p.

Pigeot N. (dir.) (2004) – *Les Derniers Magdaléniens d'Etiolles : perspectives culturelles et paléohistoriques (l'unité d'habitation Q31)*. Paris, CNRS Éditions (Supplément à Gallia Préhistoire, 37), 351 p.

Poulard C., Roy J.-B., Simonin D. (1984) – Un nouveau site du Paléolithique supérieur à Bourron-Marlotte (Seine-et-Marne). *Bulletin de la Société préhistorique française*, 81 (1), p. 20-24.

Rasmussen S.O., Bigler M., Blockley S.P., Blunier T., Buchardt S.L., Clausen H.B., Cvijanovic I., Dahl-Jensen D., Johnsen S.J., Fischer H., Gkinis V., Guillevic M., Hoek W.Z., Lowe J.J., Pedro J.B., Popp T., Seierstad I.K., Steffensen J.P., Svensson A.M., Vallelonga P., Vinther B.M., Walker M.J.C., Wheatley J.J., Winstrup M. (2014) – A Stratigraphic Framework for Abrupt Climatic Changes during the Last Glacial Period Based on Three Synchronized Greenland Ice-core Records: Refining and Extending the INTIMATE Event Stratigraphy. *Quaternary Science Reviews*, 106, p. 14-28.

Rinck D. (1997) – *Étude typo-technologique de la collection des Chalumelles (Seine-et-Marne)*. Master thesis, University Paris 1 – Panthéon-Sorbonne, 84 p.

Rots V. (2016) – Projectiles and Hafting Technology. *In:* R. Iovita, K. Sano (ed.), *Multidisciplinary Approaches to the Study of Stone Age Weaponry*. Dordrecht, Springer, p. 167-185.

Rots V., Plisson H. (2014) – Projectiles and the Abuse of the Use-Wear Method in a Search for Impact. *Journal of Archaeological Science*, 48, p. 154-165.

Schmider B. (1971) – *Les Industries du Paléolithique supérieur en Île-de-France*. Paris, CNRS Éditions (Supplément à Gallia Préhistoire, 6), 243 p.

— (1986) – À propos de la datation par le C14 du gisement de la Pente-des-Brosses, à Montigny-sur-Loing (S.-et-M.). *Bulletin de la Société préhistorique française*, 83 (6), p. 163-164.

Schmider B., Roblin-Jouve A. (2008) – *Le Massif de Fontainebleau au Paléolithique supérieur. Les grands sites d'habitat préhistoriques, évolution des cultures et des paysages*. Liège, University of Liège (ERAUL, 120), 65 p.

Schmider B., Senée A. (1983) – Le Gisement magdalénien de la Pente-des-Brosses à Montigny-sur-Loing (Seine-et-Marne) : I. Les fouilles et l'industrie lithique. *Gallia Préhistoire*, 26 (1), p. 109-128.

Simonet A. (2009) – *Les Gravettiens des Pyrénées : des armes aux sociétés*. PhD thesis, University Toulouse 2 – Le Mirail, 391 p.

Soriano S. (1998) – Microgravettes du Périgordien de Rabier à Lanquais (Dordogne) : analyse technologique fonctionnelle. *Gallia Préhistoire*, 40, p. 75-94.

Touzé O. (2019) – *D'une tradition à l'autre, les débuts de la période gravettienne : trajectoire technique des sociétés de chasseurs-cueilleurs d'Europe nord-occidentale*. PhD thesis, University Paris 1 – Panthéon-Sorbonne, University of Liège, 638 p.

Valentin B. (2008) – *Jalons pour une paléohistoire des derniers chasseurs : XIV^e^-VI^e^ millénaire avant J.-C.* Paris, Publications de la Sorbonne (Cahiers archéologiques de Paris 1, 1), 325 p.

Valentin B., Weber M.-J., Bodu P. (2014) – Initialisation and Progression of the Core Reduction Process at Donnemarie-Dontilly (Seine-et-Marne, France), Site of the Belloisian Tradition. *Bulletin de la Société préhistorique française*, 111 (4), p. 659-678.

Walker R., Hill K., Kaplan H., McMillan G. (2002) – Age-Dependency in Hunting Ability among the Ache of Eastern Paraguay. *Journal of Human Evolution*, 42, p. 639-657.