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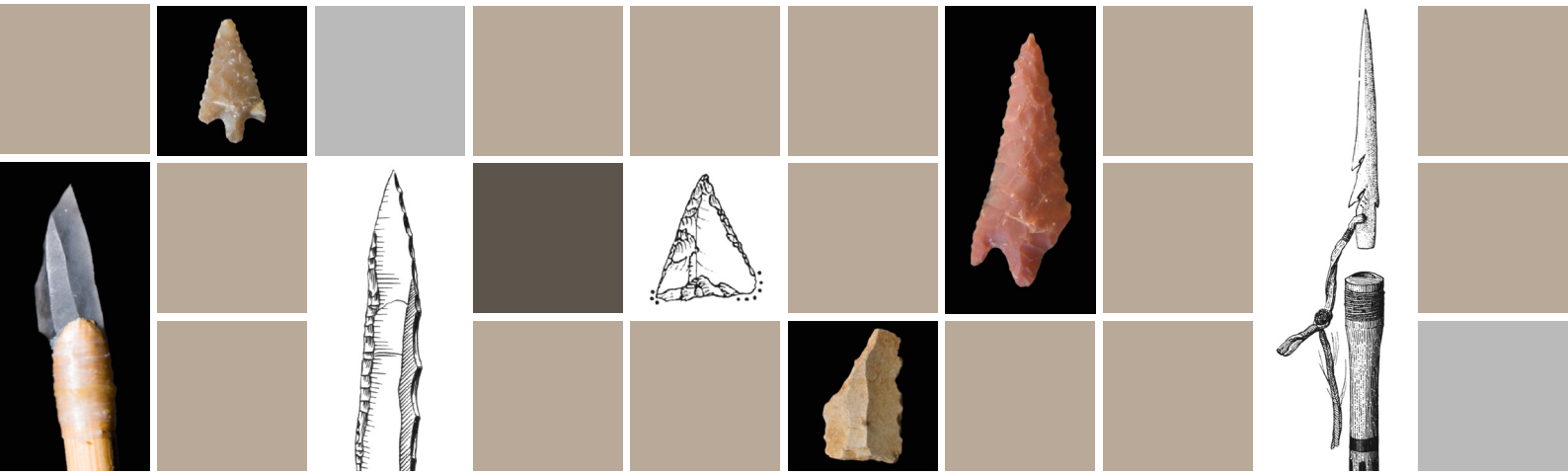
# PROJECTILE WEAPON ELEMENTS FROM THE UPPER PALAEOLITHIC TO THE NEOLITHIC

## Proceedings of session C83



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# THE FUNCTION(S) OF ARCHAIC AURIGNACIAN BLADELETS : DATA AND THOUGHTS BASED ON EXAMPLES FROM ISTURITZ CAVE (PYRÉNÉES-ATLANTIQUES, FRANCE)

Christian NORMAND, Magen O'FARRELL & Joseba RIOS GARAIZAR

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**Abstract**

Very early on, prehistoric groups in the western Pyrenees benefitted from the favorable geographic situation and vast dimensions of Isturitz Cave. The excavations conducted there in the beginning of the 20th century revealed evidence of frequent occupations during the Middle, and especially Upper Paleolithic. Starting in 1999, new research in the Saint-Martin gallery has focused on its Aurignacian stratigraphic sequence. The base of this sequence is composed of rich Archaic Aurignacian assemblages with a lithic industry largely dominated by bladelets. In this paper, we present the first results of usewear analyses of these bladelets, which reveal diverse functions. However, we also insist on the need to validate our hypotheses through experimentation.

**Key-words :** Projectile weapon element, Aurignacian, Isturitz, Pyrenees, bladelet production, bladelet function.

The abundance of bladelet debitage in the Aurignacian is now well demonstrated and numerous studies have emphasized the major role played by these productions throughout the duration of this techno-complex (e.g., Arrizabalaga, 1995; Chiotti, 1999; Bon, 2000; Bordes, 2002 ; Maíllo Fernández, 2003 ; Teyssandier, 2003, to cite only the most recent examples). This role must be considered from at least two perspectives: that of the Aurignacians themselves for whom the production and utilization of these tool blanks often constituted major activities, and that of the archaeologists for whom the typological and technological variations of these objects provide data that can contribute to the formulation of precise chronological phasings of Aurignacian assemblages. Recent research has indeed demonstrated the existence of significant morphological and dimensional differences among these "bladelets", as well as variations in the location, organization and intensity of retouch. Based on these criteria, a few principal morpho-types have been defined (e.g., "Font-Yves", "Dufour" and "Roc-de-Combe" bladelets; e.g., Demars & Laurent, 1992), each more or less exclusively associated with different phases of the Aurignacian (*ibid.*). In the Archaic Aurignacian[1], percentages of retouched bladelets regularly exceeding 25% of the total tool assemblage have been observed at all sites where excavation methods have insured their collection. This is particularly true in a group of assemblages from sites extending from the Cantabrian-Pyrenean zone (El Castillo – e.g., Cabrera Valdez *et al.*, 1997, 2001 and 2006; Maíllo Fernández, *op. cit.*, Cueva Morín – e.g., González Echegaray J. & Freeman L. G., 1971 and 1973; Maíllo Fernández, *op. cit.* and 2006. Labeko Koba - Arrizabalaga et Altuna, 2000. Gatzarria - Laplace, 1966 ; Saénz de Buruaga, 1991) to Italy (Riparo Mochi - e.g., Laplace, 1977 ; Kuhn et Steiner, 1998. Fumane – e.g. Bartolomei *et al.*, 1992; Broglio *et al.*, 1996, 2002 and 2003), without forgetting the Grotte du Renne at Arcy-sur-Cure (e.g., Schmider *et al.*, 2002 ), and of course the Mediterranean coast with sites such as Arbreda (e.g., Maroto Genover *et al.*, 1996; Soler Masferrer, 1999), La Laouza (e.g., Bazile, 1974; Bazile *et al.*, 1981; Sicard, 1995; Bazile & Sicard, 1999), Esquicho-Grapaou (e.g., Bazile, 1984; Sicard, 1994; Bazile & Sicard, *op. cit.*), Mandrin Cave (Slimak *et al.*, 2006) and many others. Such percentages have logically motivated several researchers to investigate the function of these objects. Their use as elements of composite projectile weapons has been proposed, for example at the Grotte du Renne (e.g., Schmider & Perpère, 1996) and for those attributed to the Early Aurignacian at Le Flageolet (Rigaud 1993). This function was regularly associated with the great rarity—and often total absence—of osseous projectile points in Archaic Aurignacian assemblages (Liolios, 1999). Nonetheless, very few detailed studies of these bladelets have been conducted and that of the assemblage from Fumane (Broglio *et al.*, 1996 and 2005) has remained exceptional for some time. This latter study was limited, however, to retouched blanks and macro-usewear traces (*ibid.*, p. 498) since surface alterations prevented further studies (*ibid.*, p. 498). It thus seemed pertinent to us to present the data resulting from analyses currently in progress of a large set of bladelets recovered during excavations from 2002 to 2005 of the Archaic Aurignacian levels at Isturitz. In contrast to the studies previously presented, ours concerns retouched and non retouched pieces and analyses of both macro and micro traces, the generally good preservation of these bladelets permitting the latter. Nonetheless, even if the samples analyzed are probably representative of the bladelet tool kits of the Archaic Aurignacian groups at Isturitz, our results must be considered as preliminary since the excavations are not yet finished and the quantity of bladelets in these assemblages will certainly increase significantly, and, most importantly, several complementary studies (especially experimentation) remain to be conducted.

[1] -Rather than "Protoaurignacian", we chose this designation following the recent arguments of F. Bon (Bon, 2006). As this author emphasizes, it is evident that this has no implications for the quality of the material productions and even less for their authors.

## Isturitz Cave

### *Geographic context*

Isturitz Cave is located a short distance from the current shoreline of the Atlantic Ocean and the first lateral foothills of the Pyrenees. It occupies a favorable position in the piedmont of the Western Pyrenees, which constitutes a zone of passage and contact between the Aquitaine plain, the Basque-Cantabrian ledge and the Ebre Valley, the latter accessible to the south by a series of mountain passes less than 30 km away (fig. 1).

This site, administratively situated in the districts of Isturitz and Saint-Martin-d'Arberoue (Pyrénées-Atlantiques), is closely linked to a valley with a general north-south orientation and traversed by the small Arberoue River (approximately 20 km long) and a few tributary streams (fig. 2). The ensemble is fed by several springs originating in relatively gentle reliefs forming two approximately parallel bands, punctuated by the indentations that separate the principal massifs and provide access to the neighboring valleys. Around 200 km to the north, the altitude increases progressively in a southward direction while remaining moderate, with a maximum of 571 m for the summit of Hocha Handia. These different factors contribute to the accessibility of the zone and its role as a route of communication between the Adour plains and the first Pyrenean foothills. This route could already have played a significant role in the movements of prehistoric human groups, as well as of herbivore herds during their seasonal migrations between these two biotopes.

The cave penetrates into a hill constituted of Urgonian limestone (altitude 209 m). The name of the hill, Gaztelu, refers to the presence of a royal Navarrian castle (Normand, 1997). It forms a sharp stone spur 500 m long and 300 wide, rising around 100 meters above the valley below, which it partially blocks. As it traversed this obstacle, the Aberoue River carved out several levels of cavities, three of which are currently known: the Erberua network, through which the stream of this name still runs, the Oxocelhaya network and the Isturitz network (fig. 3).

The Isturitz network, which has a general north-west/south-east orientation, probably originally formed a vast tunnel more than 120 m long and as much as 50 m wide in some places. It was open at its two extremities but successive collapses progressively filled in the south-east entrance and greatly reduced the size of the opposite one, which remained nonetheless accessible (fig. 4). Two zones have been distinguished in this cavity: the Saint-Martin Gallery (or South Gallery) and the Grand Gallery or Isturitz Gallery (or North Gallery). There are also two "annex" galleries, the Rhinolphes Gallery and the Phosphate Gallery, as well as some small adjacent ones. The Isturitz Gallery is astonishingly large with a surface of more than 1500 m$^2$, accentuated by the height of its ceiling, which attains 15 m in some locations. Its floor currently presents a double inclination, originating from its two extremities, which converge near the stairway dug into the floor in 1953 to provide access to the Oxocelhaya network. The maximum slope, located at the foot of the entrance on the Isturitz side, corresponds to a large talus formed by the back dirt of previous excavations, and whose gradient seems to be very close to that before the excavations. Nonetheless, fragments of floors still attached to the walls show that a large portion of the calcite covering was destroyed during these excavations. The physical configuration of the Saint-Martin Gallery, which was much less altered by previous excavations, is quite different. In addition to its smaller surface area, its roof is never more than 2 m high and numerous concretions link it to a locally thick floor (30 cm).

### *History of research*

Isturitz Cave has always been known and over many centuries it inspired erroneous legends and attributions (Normand, in press a). At the end of the 17$^{th}$ century, it already appeared in texts as a Roman gold mine. It is not until 1786 that the Baron of Dietrich finally described it as a natural cavity.

In 1895, numerous prehistoric remains were observed during an industrial exploitation of phosphates (to be used as fertilizers) in the Phosphate Gallery. The progressive destruction of the site was finally interrupted in 1898 following legal proceedings. Several prehistorians, such as E. Piette and H. Breuil then expressed ambitions to

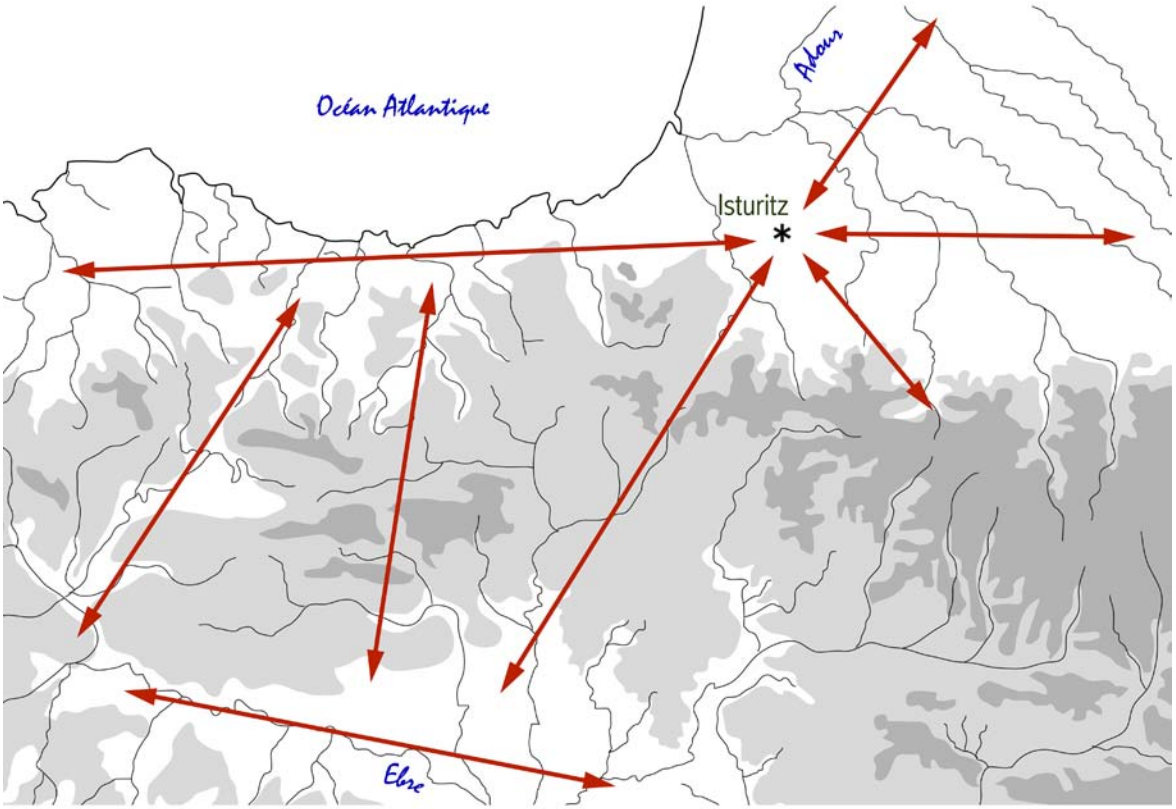


**fig. 1** : Location of Isturitz Cave and the main potential circulation routes.



**fig. 2** : Arberoue Valley from the southern entrance to the cave.


**fig. 3** : Gaztelu Hill and its main sites.

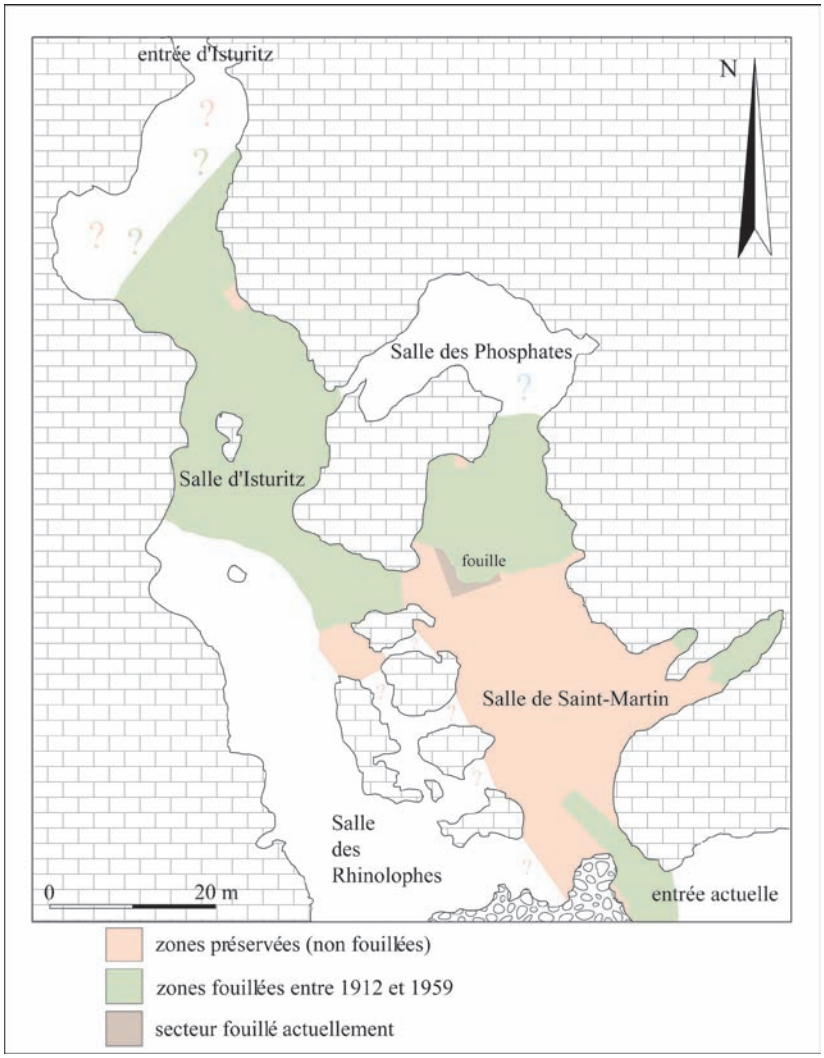


**fig. 4** : Plan of Isturitz Cave, extension of the Aurignacian levels and location of the zone currently under excavation.

excavate the site, but never took concrete action. F. Mascaraux made at least one test trench, but the first real research began in 1912 with the work of E. Passemard. He abandoned the cave in 1923 after excavating a test trench in the Saint-Martin gallery that reached 7.5 meters in depth without attaining bedrock (Passemard, 1944). R. and S. de Saint-Périer then obtained authorization to conduct excavations that would continue more or less intensively until the death of the Count in 1950 (Saint-Périer, 1930, 1936, 1952). This phase of research was terminated in 1959 with excavations under the south-east porch, with the participation of G. Laplace. Due to a lack of publications, it is impossible to precisely determine the degree to which this latter intervened in the cave. It is nonetheless certain that he collected numerous artifacts from the screening of the back dirt of a clandestine excavation made in 1985/1986 in the profile corresponding to the limit of the excavations of R. and S. de Saint-Périer. It is this destruction that incited the owner of the site to call upon the Regional Archaeology Service of the Aquitaine to evaluate the archaeological potential of the site.

This operation was conducted from 1996 to 1998 (Normand & Turq, 2007). The following year, an official excavation program was begun and is still in progress at the time of the writing of this paper.

### *The general archaeological context*

It is impossible to present here all of the abundant data that have resulted from the enormous human investment made in the excavation and research of this site, which is attested by an abundant bibliography (Normand *in*: Normand *et al.*, 2005).

We have already mentioned the principal characteristics of Isturitz Cave: a favorable location in the heart of the Aquitaine-Pyrenean-Cantabrian zone and a vast surface area accessible to large human groups. These factors could alone explain the attraction of this site to prehistoric hunter-gatherers very early on and over a long period of time. Various research projects have indeed revealed a remarkable succession of Paleolithic occupations (e.g. Passemard, 1922, 1924 and *op. cit.*; Saint-Périer, *op. cit.*), which has led the scientific community to consider Isturitz as the principal prehistoric site of the Western Pyrenees and one of the most important habitat sites for this period in Europe.

Though the archaeological remains and stratigraphies described by the principal excavators of this site present several problems—artifact selection, globalization of the stratigraphic levels, lack of consideration of the variations that forcibly existed in a site of this size, etc.—it is nonetheless possible to reconstruct the principal characteristics of its human occupations, which are summarized here and in table 1:

- in the Isturitz Gallery, above levels containing only fauna, a nearly complete Upper Paleolithic sequence was revealed, and above it an Azilian level followed by Bronze Age burials deposited on a large dripstone floor near the north entrance. While the Aurignacian and Solutrean occupations were considered to be relatively scarce, the Gravettian and Magdalenian occupations were judged to be particularly important due to the abundance of objects of all types that they have yielded;
- in the Saint-Martin Gallery, the first human occupations recognized are attributed to the Mousterian, with artifacts that are sometimes associated with abundant bear remains. Rich Aurignacian and Magdalenian assemblages have been identified in the levels above, while only a few objects attest to possible Gravettian and Solutrean passages in the site. As in the preceding gallery, deposits of Bronze Age human remains are found at the top of the archeological sequence.

## The Aurignacian

### *Early data on the Aurignacian stratigraphies*

E. Passemard and later R. and S. de Saint-Périer noted the presence of dense but unequally distributed Aurignacian artifacts over a surface of nearly 1700 m2 in the two galleries (e.g. Esparza San Juan, 1995; Normand, 2005-2006; Normand & Turq, *op. cit.*). In the Isturitz Gallery, only one level was observed: level A for E. Passemard (Passemard, 1944) and Ist V for R. and S. de Saint-Périer (Saint-Périer, 1952).

| Salle d' Isturitz | | Salle de Saint-Martin | | Entrée sud |
|---|---|---|---|---|
| ***Passemard*** | ***Saint-Périer*** | ***Passemard*** | ***Saint-Périer*** | ***idem et Laplace*** |
| surface | surface | surface | surface | Isturitz es |
| *A. du Bronze à contemp.* | *A. du Bronze à contemp.* | *?* | *A. du Bronze* | *Magdalénien ?* |
| stalagmite | stalagmite | stalagmite | stalagmite | *Aurignacien* |
| *stérile* | *stérile* | *?* | *A. du Bronze* | *"Protaurignacien"* |
| B | Ist. Ia | E | S I | *Moustérien* |
| *Azilien ?* | *Magdalénien et Azilien* | *Magdalénien moyen* | *Magdalénien moyen* | |
| F I | Ist. I | xy | sans dénom. | |
| *Magdalénien sup.* | *Magdalénien sup.* | *Solutréen ?* | *Solutréen* | |
| E | Ist. II | *Gravettien ?* | S II | |
| *Magdalénien moyen* | *Magdalénien moyen* | *Aurignacien* | *Aurignacien* | |
| *Solutréen (à la base)* | | A | S III | |
| F II | Ist. IIIa et b | *Aurignacien* | *Aurignacien* | |
| *Solutréen* | *Solutréen* | | S III base | |
| C | Ist. III | | *Préaurignacien* | |
| *Gravettien* | *Gravettien* | M | S IV | |
| F3 | Ist. IV | *Moustérien* | *Moustérien* | |
| *Gravettien* | *Gravettien* | repaire d'ours | | |
| A | Ist. V | *Moustérien* | | |
| *Aurignacien* | *Aurignacien* | P | S V | |
| Limons | sans dénom. | *Moust. à hachereaux* | *Moustérien* | |
| *faune (arrêt à -6,5 m)* | *faune* | sans dénom. | | |
| | | *faune (arrêt à -7,5 m)* | | |

**tab. 1** : Synthesis of the stratigraphies described according to authors and sectors.

This latter assemblage was attributed exclusively to the "Middle" Aurignacian (Saint-Périer, *op. cit.*). Meanwhile, considering published accounts and our own observations, it is legitimate to imagine that the Aurignacian archeostratigraphy was much more complex (Normand, *op. cit.*). At the entrance to the Saint-Martin Gallery, only one assemblage was also signaled, this time attributed to a "Protoaurignacian with marginally backed pieces" (Laplace, 1966), but two assemblages can be distinguished ("lower" and "upper" assemblages) in the Saint-Périer collection at the Musée d'Archéologie National (personal observation), which is coherent with our own data (Normand et Turq, *op. cit.*). Inside the gallery, E. Passemard described an assemblage (xy) with an uncertain attribution since he speaks of objects with Gravettian or Solutrean characteristics (Passemard, *op. cit.*). Lower in the sequence, he found a very rich Aurignacian level that he also named "A" or "*couche truffé*" ("stuffed level"). R. and S. de Saint-Périer recognized three Aurignacian levels, from top to bottom: S II, S III and S III base (Saint-Périer, *op. cit*.). Their precise chronological attributions are questionable due to their selection of objects that resulted in an over-representation of obvious "Aurignacian" characteristics and evident contaminations. Consequently, though A and S III have always been attributed to a "Typical" Aurignacian (Passemard, *op. cit.*, p. 22; Saint-Périer, 1952, p. 201 and 1965; Esparza San Juan, *op. cit*., p. 100), S II was qualified as Middle Aurignacian (Saint-Périer, *op. cit*, p. 188), as an evolved "Typical" Aurignacian (Saint-Périer, 1965), as an Aurignacian II or III Barthélémy de Saizieu, 1981, p. 84), as an Aurignacian I (Bicard-See & Moncel, 1984 and 1985), and finally as a "Typical" Aurignacian more recent than S III (Esparza San Juan, *op. cit*., p. 107). Level S III base, on the other hand, was first attributed to a "Pyrenean facies of the Lower Aurignacian or Chatelperronian" (Saint-Périer, 1952, p. 226) and then to a "Preaurignacian" (Saint-Périer, 1965), and finally to a "Protoaurignacian" (Esparza San Juan, *op. cit*., p. 91). We use these data as a base of reference in our current research.

### *Localization of the current excavations and representativity of the assemblages*

The test excavations conducted in 1996/1998 showed that inside the Saint-Martin Gallery and under the porch of its entrance, rich Aurignacian *sensu lato* levels must still occupy a surface of between 500 and 700 m$^2$, while approximately 350 m$^2$ were concerned by earlier research (Normand & Turq, *op. cit.*; fig. 4). Among other factors, the high discrepancy observed between the contents of these levels and those of the old collections, as well as the opportunity to conduct detailed analyses of the stratigraphies, which were apparently simplified in previous studies, incited us to undertake new research. We chose to concentrate on a zone corresponding to the stratigraphic profile left by R. and S. de Saint-Périer at the end of their work.

Three sectors, separated by two enormous stone blocks, were delimited (fig. 5):

- the "Principal excavation" sector, with a maximum surface of nearly 7 m$^2$, corresponding to bands 28 and 33 of the general grid system;
- the "Profile" sector, with a surface of approximately 4 m$^2$ , divided among bands 34 and 39 of this same grid;
- the "Extension" sector, covering approximately 8 m2, of which a large part is occupied by a third block.

In total, taking into account the space occupied by the stone blocks, only around 15 m2 of the 1500 originally occupied by the Aurignacian levels (or less than 1 %) are concerned by our current excavations. We must therefore question the representativity of the data resulting from this "sample". It is evident that we will never know precisely what was present in the areas affected by earlier research. Nonetheless, in addition to the assemblages collected from these zones, we have two other sources of information: the objects recovered through screening of the back dirt of early excavations (with an average of 400 tools per m$^3$) and the test excavations made in other parts of the cavity. These elements show that the assemblages collected during the early excavations present internal components that are generally similar to those observed in the zone

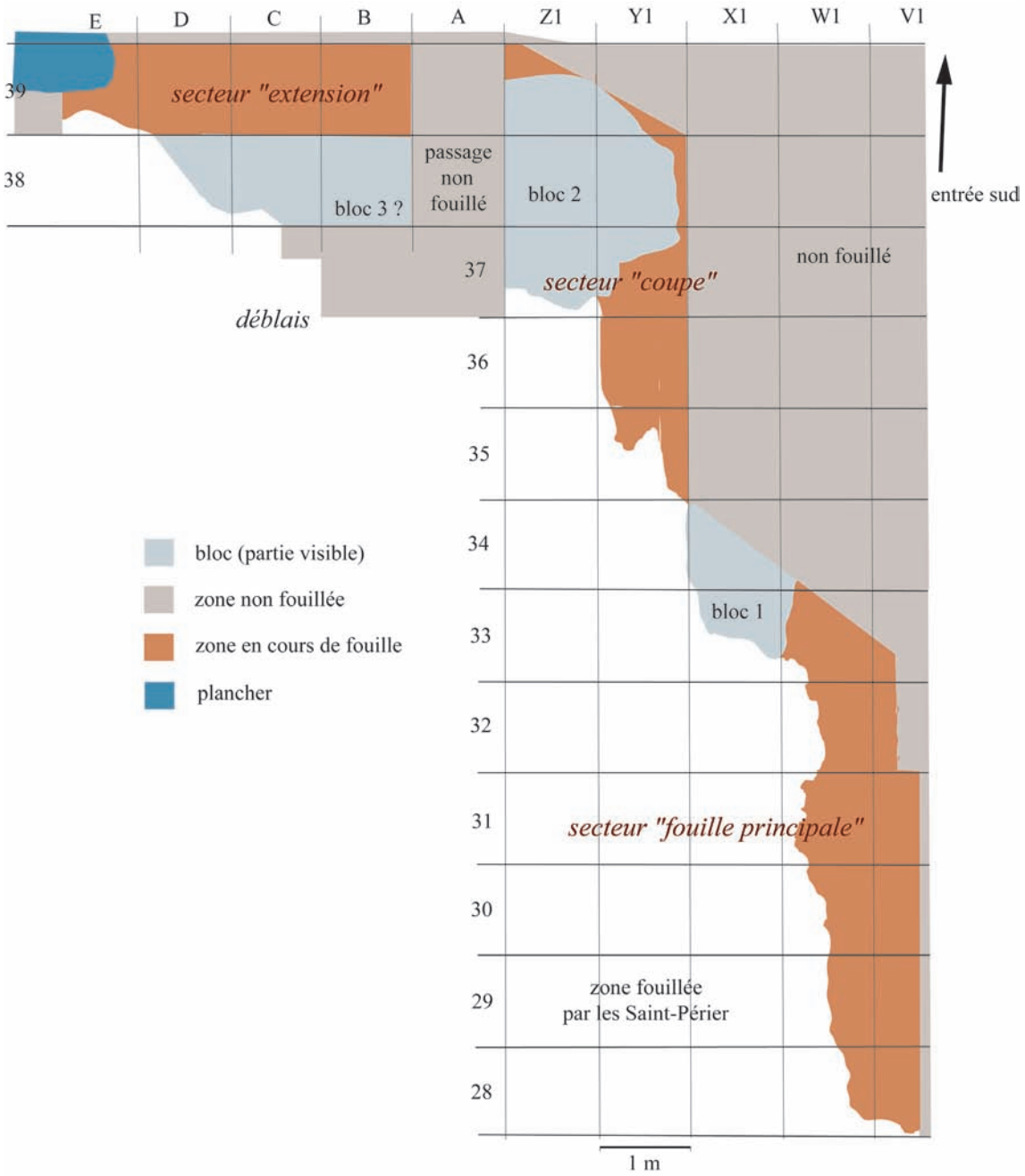


**fig. 5** : Plan of the zone currently under excavation.

currently under excavation. Variations do of course exist within the lithic tool assemblage, but they concern almost exclusively typological percentages and do not appear to be significant relative to the percentages of each tool type. Most importantly, we have not observed differences in the domains treated in this paper. Therefore, we consider the data furnished by this work in progress to be globally representative of that which exists in the Aurignacian of the entire Saint-Martin Gallery.

### *Geo-stratigraphy*

The sedimentological studies conducted since the beginning of the current excavations have revealed evidence of two principal site formation processes: rock fall and water flow (e.g., Texier, 1997; Texier & Lenoble, in press). Though only the "Principal excavation" sector was subject to detailed analyses, we know that these two agents played a comparable role in the other two sectors as well.

Rock fall and water flow determined the nature of the lithostratigraphy observed, with a double variability:

- a vertical variability created by alternating periods of accumulations of stone fragments originating from the cave ceiling and of water runoff that displaced sediments;

- a horizontal variability, deducted in the "Principal excavation" sector by the presence of a joint through which water flowed—and still flows—with varying intensity in different zones of the site. This process was particularly significant in bands 28 and 29, as well as in square W1 31.

In addition, repeated freezing and thawing episodes provoked cryoturbations at certain times during the formation of the deposits. These are locally represented by diverse alterations of the levels: undulations, sediment sorting, injections, etc. Solifluction also played a minor role. Five units (I, II, III, IV and V) were distinguished in the "Principal excavation" sector, and can be resumed as follows (Texier, *op. cit.*, Texier & Lenoble, *op. cit.*):

- Unit I. Laminated dripstone floor of variable thickness, interstratified with decanted brown to brown-black clays;

- Unit II. Angular limestone blocks and stones, very heterometric and non-oriented. On the top, stone debris filled in with a dark gray, sandy clay. In the middle, an open stone debris present only to the north of the witness section. At the base, a semi-open stone debris filled in with a yellow matrix. Its thickness varies from 0.1 to 1 m;

- Unit III. Stacked lenses covering bands 28 and 29. These levels yield two facies: sub-horizontal, layered to laminated loams and alternations of layers of sorted pseudo-sands or gravels filling in channels. Starting at band 30, there is a clastic based gravel with a dark gray, loam-clay based matrix, around 1 m thick;

- Unit IV. Yellow, clayey loams with a polyhedric form (thickness between 0.3 and 0.6 m);

- Unit V. Rock and gravel deposits with an open to semi-open texture (thickness unknown).

### *Archeo-stratigraphies*

The Aurignacian sequences, which vary somewhat in the different sectors, are contained in geological units II, III and perhaps IV, in which artifacts are rare and for the moment non diagnostic. This latter unit, with an average thickness of 50 centimeters, clearly separates the archaeological assemblages currently under excavation from the underlying Mousterian levels, which are very poor in this sector of the cave. In our opinion, thus assures the absence of contamination of the Aurignacian by material from the Mousterian levels.

The sedimentary processes had an evident impact on the archaeological assemblages making it possible to divide the assemblages into two groups according to their geological context:

- in one group, the assemblages are associated with levels in which water runoff played a significant role. These assemblages "*yield lenses of materials in secondary position*" and "*the result is a diffusion of the material of each occupation into the overlying levels*" (Texier & Lenoble, *op. cit.*). The integrity of these assemblages is thus questionable and they are not included in current analyses;

- in the second group, the assemblages are contained in stone debris deposits in which there is a risk of "*displacement of the smallest objects*", though "*the stratigraphic position of the objects does not seem to have been altered*" and in which "*the process of solifluction did not have a significant impact on the constitution of artifact accumulations*" (Texier & Lenoble, *op. cit.*). We thus consider these assemblages and the information they provide to be reliable.

Finally, out of the approximately thirty assemblages distinguished throughout all the sectors, only around twelve appear to be statistically reliable. These are indicated in bold type and italics in table 2 where we integrated a proposition of correlations with the descriptions of our predecessors.

### *Chronological attributions*

According to the typo-technological results now available for levels 4d1 and 4III, we can definitively attribute these assemblages to the Archaic Aurignacian (Normand, 2006). This attribution is compatible with the two dates thus far obtained, each from a fragment of burned bone: one from the top of level 4d (Gif 98237: 34630 ± 560 BP), and the other from its base (Gif 98238: 36550 ± 610 BP) (Turq *et al.,* 1999).

The main characteristics of the assemblages of levels 4b1 and 2, 4I and E 4I (limited presence of carenated pieces and Aurignacian retouch, antler split based points, etc.) indicate an early phase of the Aurignacian. Meanwhile, other elements (the coexistence of morphologically variable blanks, several bladelet production strategies, personal ornaments in the form of perforated Bovid teeth, etc.) show some differences from the "classic" Early Aurignacian currently described in the Aquitaine region (e.g., Chiotti, 1999; Bon, *op. cit.*; Bordes, *op. cit.*; Bordes & Tixier, 2006; White, in press), which could be explained by territorial and/or chronological variations (Normand, *op. cit.*).

Levels 4c4 and 4II could represent an evolution from the Archaic to Early phases of the Aurignacian.

The chronological attributions of levels 3b summit, 3I and E 3I are more difficult to determine. Though most of the objects from these levels still present similarities with Early Aurignacian objects, certain other elements contradict this attribution. One consists of the dates obtained for the upper part of level 3b summit (Beta 136048: 28290 ± 240 BP; Beta 136049: 29400 ± 370 BP; Barandiaran *et al.*, 2000), which indicate a more recent phase. Another consists of a few objects also found in the upper part of level 3b summit, including two mesial parts of small blades with direct, abrupt retouch on one edge. Also notable is the presence of four busked burins in level SII. Though no subdivision was observable during excavation, it is likely that these assemblages contain both Early Aurignacian objects, probably the most numerous, and at the top, other more recent objects to which the dates would correspond.

## Archaic Aurignacian bladelets

### *General data on the Archaic Aurignacian*

Though collected in different sectors of the site, in this study we regroup all assemblages from levels 4dI and 4III. The few divergences observed between these assemblages, mostly related to quantities and typological variations, do not appear to justify their separation in the present context. Nonetheless, certain aspects will be discussed when we judge them to be pertinent.

| *Passemard* | *Saint-Périer* | *secteur "fouille principale"* | *secteur "coupe"* | *secteur "extension"* |
|---|---|---|---|---|
| y | S II | C 3a | absent | absent |
| | | ***C 3b sommet*** | ***C 3I*** | ***E 3I*** |
| | | C 3b base | C 3II | E 3II |
| A | S III | ***C 4b1*** | ***C 4Ia*** | ***E 4Ia*** |
| | | ***C 4b2*** | ***C 4Ib (et c?)*** | ***E 4Ib*** |
| | | C 4c1, 2 et 3 | absent | non encore fouillé |
| | | ***C 4c4*** | ***C 4II*** | non encore fouillé |
| | | C 4c5 | absent ? | non encore fouillé |
| | | C 4c6 et 7 | ? | non encore fouillé |
| | | C 4c8 à 11 | absents | non encore fouillé |
| | | ***C 4d1 a, b, c et j*** | ***C 4IIIa, b, cet d*** | non encore fouillé |
| A ou ? | S III base | base de C 4d et/ou C 5 ? | base de C 4III et/ou C 5 ? | non encore fouillé |

**tab. 2 :** Proposition of correlations of Aurignacian sequences of old and recent excavations.

The objects attributable to the Archaic Aurignacian are generally very abundant and varied. They correspond to two occupations, which were probably frequent and dense, during the warm season (Rendu, 2005). Horse was the principal species hunted, followed by large bovids. Reindeer and red deer were hunted less frequently in almost equal numbers (Costamagno, 2005; Costamagno & Letourneux, 2006). A substantial use of bone as a combustive material is demonstrated by the presence of a high proportion of burned fragments.

The relatively abundant osseous tools consist mostly of bone smoothers and awls, along with rare retouchers and a small, mesial fragment of an antler point of an undetermined type (Goutas, 2005 and 2006).

Before the 2006 excavation season, the lithic tool assemblage consisted of 689 pieces (now around 1,000). Retouched bladelets are the dominant tool type, composing 60 to 70% of the assemblage depending on the sectors and sub-assemblages. Retouched blades represent between 11 and 14%, burins between 5 and 9%, and end scrapers between 3 and 8%. The accumulated percentage of splintered pieces, notched or denticulated pieces and side scrapers is lower than 10 %. The raw material used was almost exclusively flint, mostly from close sources (25 to 30 km from the site). Flints of more distant origins were also used, especially from the high Erbre Valley, attesting to movements of over 150 km through the Pyrenees, while flint from the northern Aquitaine is almost totally absent (Tarriño and Normand, 2006). A few objects made on cobbles complete this inventory, principally hammerstones and/or anvils, or more rarely grinding stones (A. de Beaune, 2006).

The personal ornaments include around fifty perforated gastropods (mostly littorines), as well as two pendants in amber and one in a tender stone with a zoomorphic or anthropomorphic form (White, 2005).

### *Bladelet debitage*

We have defined bladelets as all elongated blanks with a maximum width of 1.2 cm. Consequently, blades are defined as those blanks with a width greater than this (Normand & Turq, 2005). We made this distinction during the first years of our research based on the absence, in the assemblages then collected, of inverse retouch on blanks with a width greater than 1.2 cm. The analyses that we present in this paper lead us to reconsider the validity of this limit (now arbitrary) between these two categories of products and associated concepts.

Though not yet counted with precision, the total number of blades and bladelets, retouched or not, is over 6,000. If we consider the totality of objects susceptible to be used as a tool blank, meaning all flakes over 2 cm and all blades and bladelets, these latter represent respectively 15% and 70% of this total. We must meanwhile note that the fracturation rate is very high since less than 7% of bladelet blanks were found whole. This clearly amplifies the percentages and we will later present our hypotheses to explain this phenomenon. It is nonetheless clear that blade and bladelet production was the primary objective of flint knappers at Isturitz during the Archaic Aurignacian, and that a large part this production took place at the site (Normand, *op. cit.*).

Around 100 cores, 85 of which are bladelet cores, are associated with this production. The debitage process, always performed by percussion with an organic hammer, most often began after a simple abrasion of the striking platform lip. We will not describe the details of the strategies used, or their implications, as this information has already been published elsewhere (Normand, in press b). We can, however, recall the principal characteristic, which is the great variety of strategies employed.

Six principal core types were identified based largely on their morphology and the location of the exploited surface [2] :

- 4 cores with exploitation surfaces that were generally reused as new striking platforms after their abandon (fig. 6) ;

- 2 carinated and 5 atypical carinated cores. One specimen, which has the general morphology of carinated cores, could be transitional to the next type described as it

[2] - To this inventory we must add 5 pieces on which bladelet debitage was barely begun.

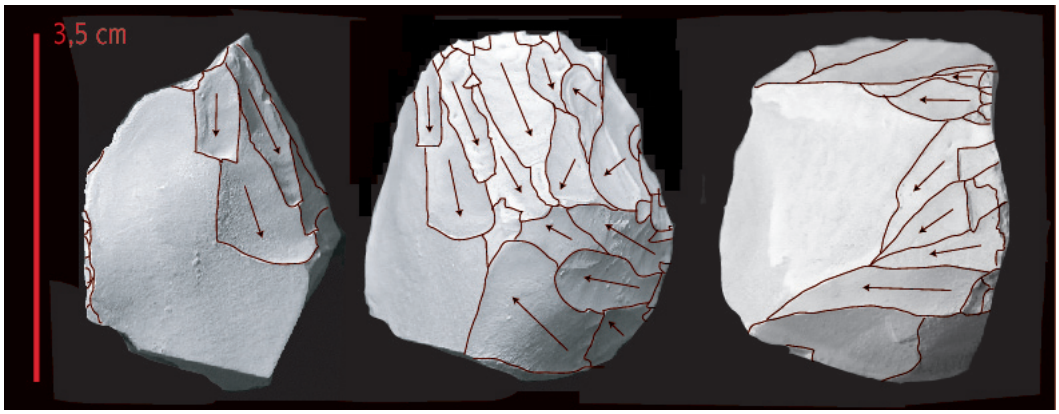


**fig. 6** : Core with multiple exploitation surfaces.

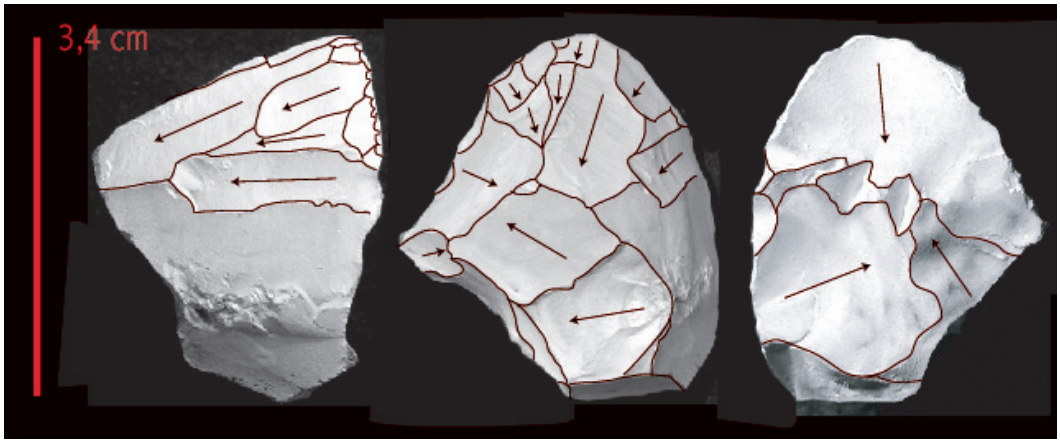


**fig. 7** : Core with a carinated morphology.

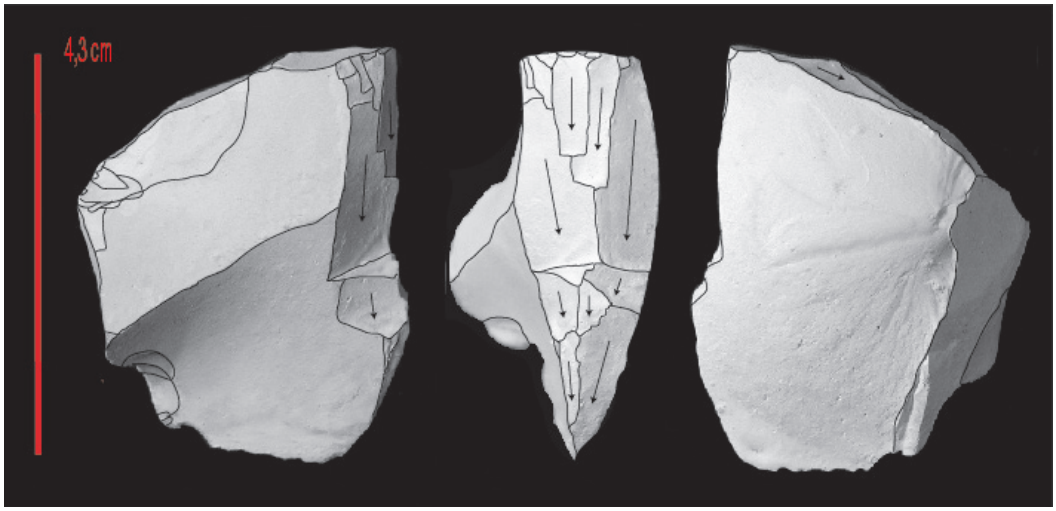


**fig. 8** : Core on flake exploited along its edge with unipolar debitage.

has a modified striking platform and was exploited along the edge of the flake (fig. 7) ;

- 29 cores on flakes exploited along the edge, including 2 on platform rejuvenation flakes. All debitage is unipolar (fig. 8), except for one piece with bipolar debitage (fig. 9);

- 14 conical (*pyramidal*) cores. These cores have a unipolar exploitation surface that is usually triangular due to maintenance by convergent, and sometimes overshot, removals from the sides of the core (fig. 10);

- 20 cylindrical (*prismatique*) cores. The exploitation surface of these cores is rectangular due to maintenance by removals from a secondary striking platform opposite the primary one. There is no clear limit between the exploitation surface and the sides of the core, from which bladelets are often removed. These cores are most often distinguished from the preceding ones by their non-convergent or only slightly convergent removals that are not overshot. A few specimens show a reorientation and/or reimplantation of this surface (fig. 11);

- 6 trapezoidal cores. This form could represent a continuity between the two preceding types. Two of these cores indeed combine the maintenance of the exploitation surface by removals of convergent flanks and removals from a secondary striking platform opposite the primary one.

Despite this variability, it is possible to distinguish two bladelet production types:

- the first, corresponding to the three first core types, is autonomous and almost always realized on flakes whose entire volume ("multiple exploitation") or thickest axis is exploited, thus favouring an axis parallel to the flake surfaces ("flake-edge core", exploited along the edge of a flake), or more rarely, perpendicular to the flake surfaces (carinated core). The bladelets produced are often rectilinear in profile, rather thin, and almost never twisted. They are relatively standardized within each category. However, those produced from cores with multiple exploitation surfaces and carinated cores are smaller (2 cm in length at the end of production) than those produced from "flake-edge cores" (approximately 4 cm in length):

- the second, corresponding to the cylindrical, conical and trapezoidal cores—mostly on nodules—furnishes blanks that are often produced in continuity with blades, generally beginning with a block of relatively small dimensions[3]. The blanks obtained are distinguished from the preceding ones by a high dimensional variability, as is shown by the length of the last products, between 1.7 and 4 cm. Their morphology is generally the same as that of the bladelets described above, though the distal extremities of bladelets produced from conical cores are slightly more curved in profile and more pointed than those produced from cylindrical cores. In addition, during the blade production phase, bladelets (usually very rectilinear) are sometimes produced through the exploitation of the ridges created during blade production.

### *The bladelets*

The analyses presented here were conducted on a collection of 451 retouched pieces (165 from level 4d1 and 286 from level 4III) and several hundreds of non retouched objects. We begin with our observations of the retouched pieces.

*Fragmentation:*

We have already mentioned the high degree of fracturation of blade and bladelet blanks; less than 7% of these blanks were found whole. This percentage is even higher for retouched bladelets since 97% of them are represented by fragments (fig. 12).

Mesial fragments are the most numerous (285 for 63.2%), with a slightly higher domination in level 4III (67.1%). Proximal fragments are much less numerous at 22.2%, followed by distal fragments at 12.4%.

Among numerous possible explanations for this fragmentation, we cite only the principal ones here, which all may apply to different degrees:

[3] - One of these blocks is slightly less than 5 cm long.

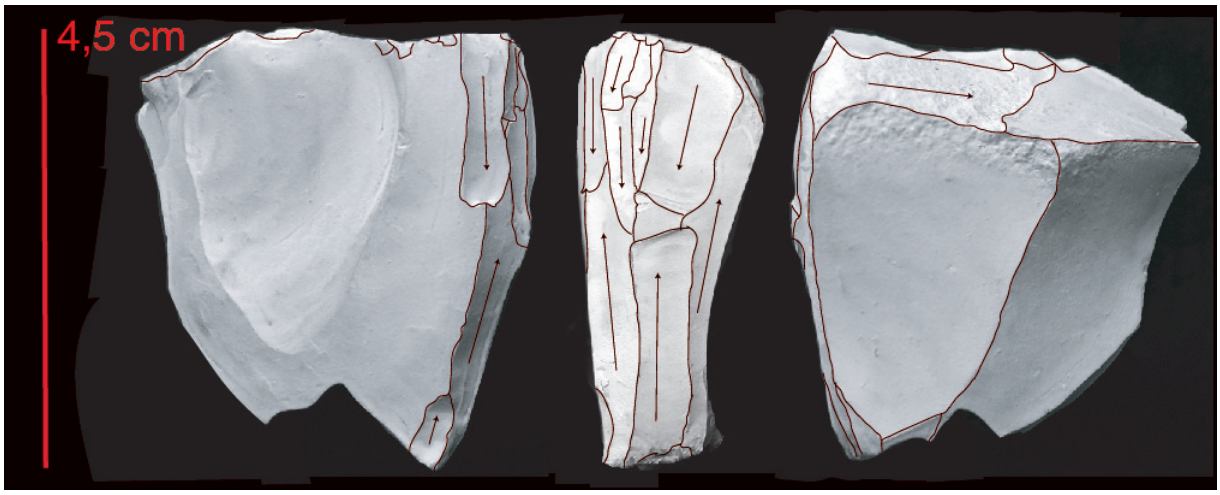


**fig. 9** : Core on flake exploited along its edge with bipolar debitage.

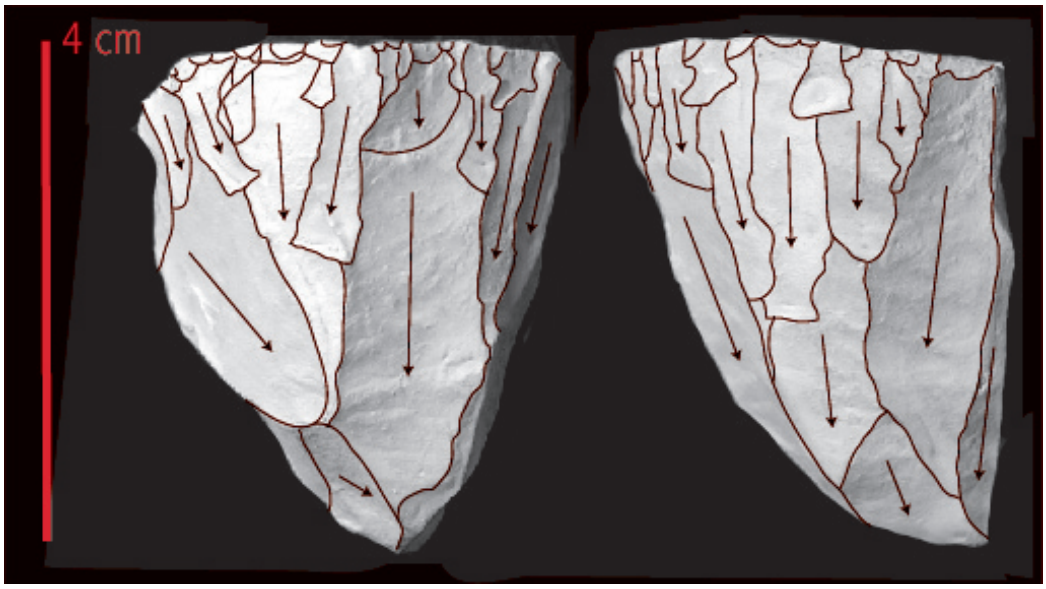


**fig. 10** : Conical core.

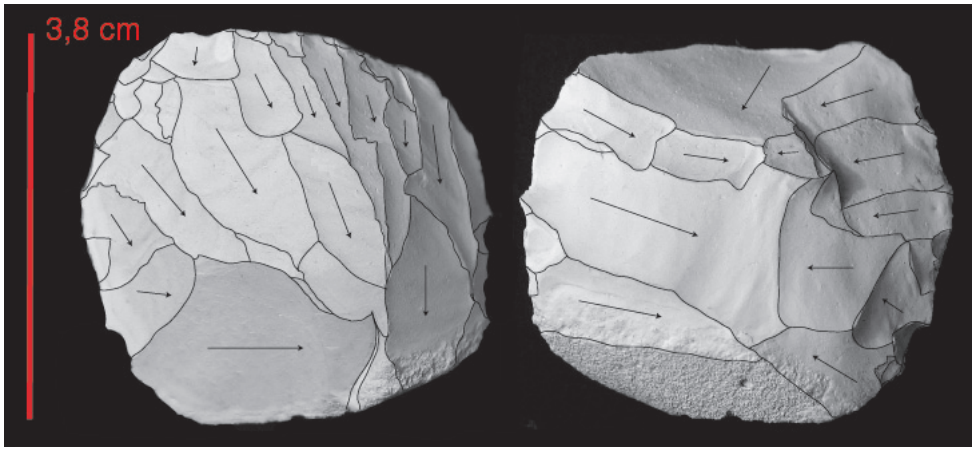


**fig. 11** : Core with a cylindrical morphology.

- the first is associated with the evident *in situ* production of bladelets, resulting in their fracturation during debitage or retouch;

- the second is related to trampling on a ground surface rich in limestone blocks. In this sense, it is probably significant that the average length of fragments found in the "Profile" sector, where the stone debris density is high, is much lower than in the "Principal excavation" sector, where there is less limestone debris. This hypothesis is supported by the higher percentage of refits of fragments found near each other in the former sector;

- the third corresponds to a voluntary action in order to obtain fragments with a specific morphology, in this case the rectangular pieces corresponding to mesial fragments;

- the last may be associated with a specific utilization during which the bladelets were broken.

We will further explore these two latter hypotheses in the section devoted to functional analyses.

Whatever the cause, our observations seem to indicate that this fracturation often resulted in the creation of 4 to 5 fragments from one bladelet. This would explain the high proportion of mesial fragments relative to distal and proximal ones, but it cannot explain the discrepancy between distal and proximal fragments, which may be related to the retouching of these objects.

*Retouch:*

Diverse localizations, intensities and degrees of regularity of the different retouch types were observed (fig. 13). Retouch serves to regularize and/or reinforce the edge of the piece, as well as to reproduce a specific model from blanks with heterogeneous morphologies and dimensions. The nature of the blank thus dictates more or less intensive modifications by the toolmaker.

The amplitude of bladelet retouch thus varies from a slight delineation, barely visible to the naked eye, to intensive modifications. The latter are often abrupt or semi-abrupt and can result the removal of several millimetres of material. In the case of slight modifications, it is sometimes difficult to distinguish voluntary retouch from unintentional use traces. The criteria used are the regularity of the edge and a continuous modification at least 5 mm in length. This variability occurs not only on different objects and in conjunction with the lateralization of the retouch, but also on the same object. For example, sometimes only one part of one or both edges of a piece is retouched. Furthermore, the intensity of retouch is rarely constant; the highest intensity is most often located on the mesial part of the edge and least often on the distal part. In fact, naturally pointed distal extremities were frequently not retouched at all. If we consider the distal parts retained, it seems that the desired form was a natural or modified point since 80% of those analyzed have this morphology (fig. 14). The fact that some of these distal extremities were left unretouched could at least partly explain the discrepancy noted above between the numbers of proximal and distal fragments: many of these latter may have been left among the tiny non retouched elements that have not been studied in detail. The proximal extremities of bladelets were also sometimes modified into a point, and both ends of one slightly asymmetric bladelet were pointed in this way. When there is retouch, it is most often alternate, or sometimes direct; in one case, the retouch is alternate on the entire piece, except for a few millimetres from the extremity where it becomes direct. This reorientation is also applied to mesial fragments, though it remains rare (6 pieces). On all of the bladelets, alternate or inverse retouch is much more frequent (more than 92%) than direct retouch on one or two edges. Alternate retouch, meanwhile, is clearly more frequent than inverse retouch at 62%, though there is a strong discrepancy between levels 4d1 and 4III (respectively 70% and 49.7%), for which we have not yet found an explanation.

On the pieces with alternate retouch, the inverse retouch is usually more intensive and constant than the direct retouch, whose variability applies particularly in this case. It is thus possible that the knapper gave priority to the inverse retouch, while the direct retouch was used only as a "method of adjustment".

Finally, this retouch, whatever its amplitude, does not always form a regular delineation, and in certain cases can created a denticulated edge. This could represent a deliberate intention or an unfinished state of this modification.

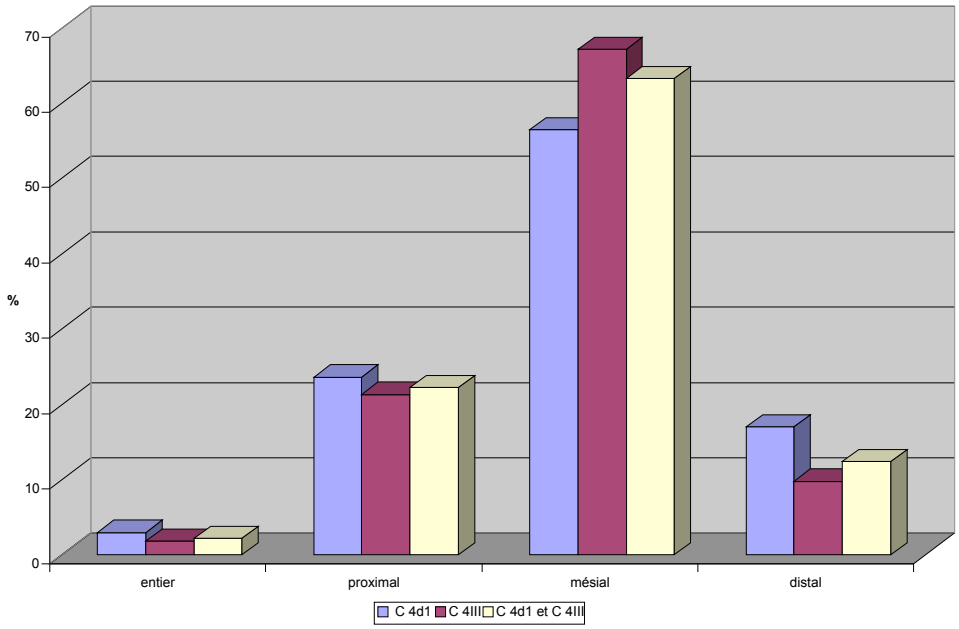


**fig. 12** : Distribution of bladelet fragment types in assemblages 4d1 and 4III.



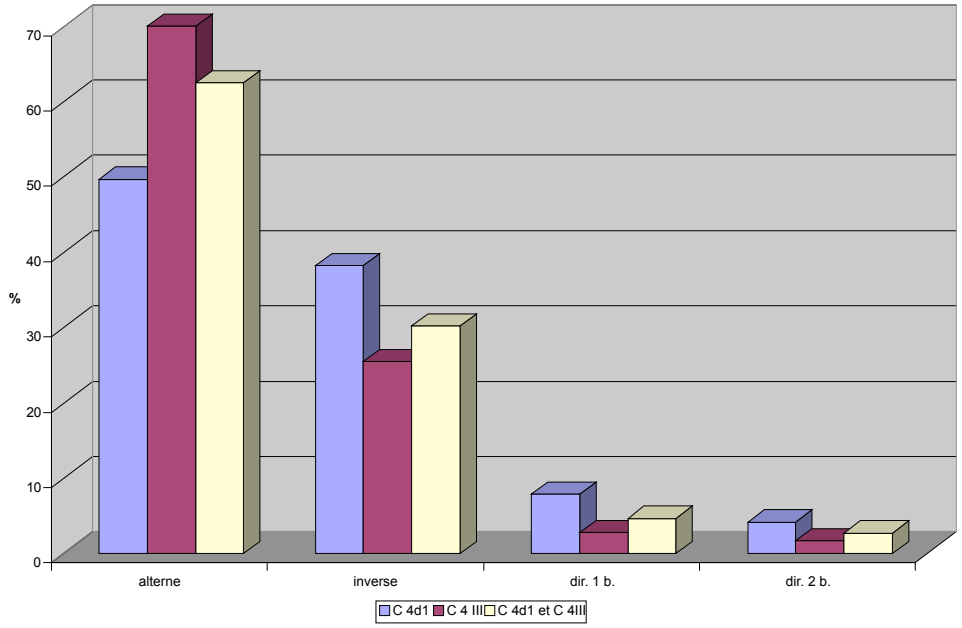


**fig. 13** : Distribution of retouch types on bladelets in assemblages 4d1 and 4III.

As has already been observed at many other Aurignacian sites (e.g., Bon, *op. cit.*; Bazile *et al*., 1981; Bordes, *op. cit.*; Broglio *et al.*, *op. cit.*; Chiotti, *op. cit.*; Lucas, 2000; Maíllo Fernández, *op. cit.*; O'Farrell, 2005; Pelegrin et O'Farrell, 2005; Schmider & Perpère, *op. cit.*; Teyssandier, *op. cit.*), the bladelet retouch at Isturitz is strongly lateralized, with inverse retouch almost always on the right edge (more than 95% of the time). On the other hand, when there is only direct retouch, no clear lateralization is observable.

*Morphology and dimensions:*

The highly fragmented state of almost all of the bladelets studied makes their morphological analysis very difficult. Nonetheless, in concordance with our observations of bladelet production strategies, the majority of retouched blanks show a high degree of investment (fig. 15) and a morphology that is generally very regular, with a straight to very straight profile (more than 80%). When the profile is curved, it is usually slight and located on the distal part of the bladelet. Only three pieces have both curved and twisted profiles, including one that is whole, but relatively irregular and with only partial inverse retouch (4.4 cm long).

Analysis of the metric characteristics of retouched bladelets is even more difficult since the length, width and thickness of the original blanks are greatly modified by the retouch. Once they are retouched, use, post-depositional processes and other factors lead to a high degree of fragmentation of these pieces. It is thus impossible to determine the exact length of bladelets before they were broken. Meanwhile, according to the few whole examples recovered, this length would have varied from 2.5 to 4 cm, with an average of around 3.6 cm, which corresponds well to the lengths determined based on the lengths of the negative bladelet scars on cores (and the dimensions of the cores in the case of flake cores). This data must be considered with caution, however, as the dimensions of several fragments attest to a higher length, which can perhaps be associated with production on block cores.

The width of the bladelets for all retouch types varies from 2.5 to 11.5 mm, with a high frequency between 3.5 and 6.5 mm (fig. 16). We obtained a bimodal curve separating the pieces with alternate retouch from those with inverse retouch, the peak width of the former at between 4 and 5 mm, and that of the latter, which is logically wider, at between 5.5 and 6.5 mm. The pieces with direct retouch on 1 or 2 edges show a much greater variability with no visible peak in width (fig. 17).

The majority of retouched bladelets are between 1 and 2 mm thick (fig. 18). In contrast to the width, there seems to be a difference in bladelet thickness between levels 4d1 and 4III, those of 4d1 being generally thicker (fig. 19). On the other hand, there is no significant difference in thickness between bladelets with alternate retouch and those with inverse retouch. As with the width, the thickness of pieces with direct retouch is more variable (figure 19).

### *Bladelet functions*

The two analyses presented in this paper were conducted according to different methods and procedures that we will present separately. Though the results are complementary, they also present a few divergences that we will attempt to explain in the conclusions of this paper.

#### Analysis 1: macro-fractures and edge damage

*Methods*

The methodology employed in this study has already been fully described elsewhere (O'Farrell, 2004 and 2005). The macro-fractures were analyzed with the naked eye and with low magnification (10x to 40x). Lacking an experimental database specific to Aurignacian bladelets, the fractures observed were divided into three categories—simple, complex and probable complex—based on criteria established in previous studies of other projectile types (O'Farrell *op cit*.) and adapted to this context:

- *complex fracture* (definite projectile function): all fractures with an extension (fracture lip length) greater than 1.5 mm long, on a face or edge, and all fractures with a step termination, whatever the length of the fracture extension;

- *probable complex fracture* (possible projectile function): fracture with a hinge or feather termination

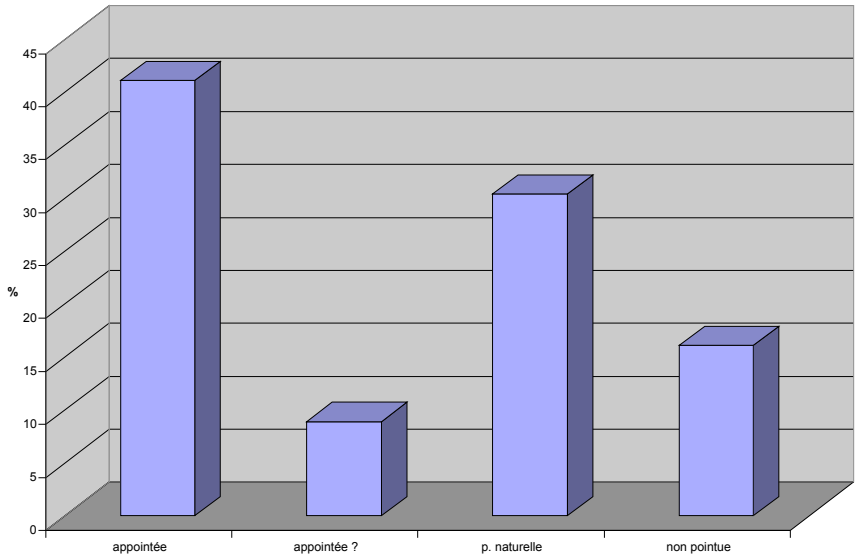


**fig. 14** : Morphology of the proximal fragments of the retouched bladelets.


**fig. 15** : Sample of retouched bladelets from 4d1 with a regular morphology.

and a fracture extension of at least 1.5 mm, if it is combined with a high amplitude of these characteristics and/or traces characteristic of projectile use on one or more edges;

- *simple fracture* (unknown function): « snap » fracture with no extension (lip) or a very short extension (< 1.5 mm).

Until they are experimentally verified, these criteria must not be considered as definitive, but rather as highly indicative of a distinction between tools fractured during use as a projectile weapon element and others broken and/or damaged through other processes. For the moment, we consider that:

- the complex fractures correspond to fractures produced by a violent axial impact, and thus to projectile accidents;

- the probable complex fractures correspond to probable projectile accidents;

- the simple fractures are produced by diverse processes such as fabrication, trampling, geological phenomena, or indeed, use as a projectile. These processes are either non identifiable or identifiable in relation to the context of the fracturation (e.g. separate criteria showing the tool was in the process of fabrication, refits, sedimentary context amenable to fracturation by trampling or geological processes, etc.).

*Results*

This study integrates two phases of analysis: 1) a complete techno-functional analysis and low power microscopic (10x to 40x) observations of 165 retouched bladelets from level 4d1, and; 2) low power microscopic observations of 286 retouched bladelets and a large sample (number not recorded) of nonretouched bladelets from level 4III in order to determine if unretouched bladelets also present complex fractures.

Among the 165 retouched bladelets of level 4d1, six pieces with one or more complex fractures were identified, for a percentage of 4% (fig. 20). In level 4III, one or more complex fractures were identified on eight pieces, equaling 2.5% of the sample studied (fig. 21). If we combine the two samples, the percentage of pieces with complex fractures equals 3%. No probable complex fracture was identified. On the other hand, other types of damage, mostly edge chippings, were observed.

This percentage of complex fractures is relatively low compared to the results of identical analyses conducted with Aurignacian bladelets from Brassempouy (O'Farrell, 2005), Castanet (Pelegrin & O'Farrell, 2005) and Roc de Combe (O'Farrell, in preparation). In addition to the fact that these assemblages are not attributed to the Archaic Aurignacian, several other, non exclusive hypotheses could explain this discrepancy, including:

- a statistical bias given that these other samples are much smaller than that of Isturitz;

- a more extensive utilization of bladelets at these sites in comparison with those of Isturitz, resulting in a greater amplitude of use traces;

- a greater in-situ fabrication of bladelets at Isturitz, accompanied by evidence for more systematic bladelet retouching, resulting in a greater number of simple fractures before their utilization;

- or, more diverse bladelet functions at Isturitz.

Among the unretouched bladelets of level 4III, eleven have characteristic complex fractures. Most of these are made on blanks that are morphometrically similar to those of the retouched bladelets with complex fractures. It is thus tempting to attribute the same function to them and identify them as projectile weapon elements. However, since none of them show the determinant criteria of retouch that has been "cut through" by the fracture (the retouch thus being anterior to the fracture), and lacking an experimental analysis of the fractures that can be produced during bladelet production, we must consider this as a hypothesis that remains to be tested.

Despite the small number of retouched bladelets with complex fracture(s) at Isturitz, it is possible to make a few observations comparable to those made with bladelets from Brassempouy and Castanet (O'Farrell, *op. cit.*; Pelegrin & O'Farrell, *op. cit.*):

- all of the complex fractures are on mesial bladelet fragments. This could argue in favor of a voluntary fracturation of some pieces in order to obtain

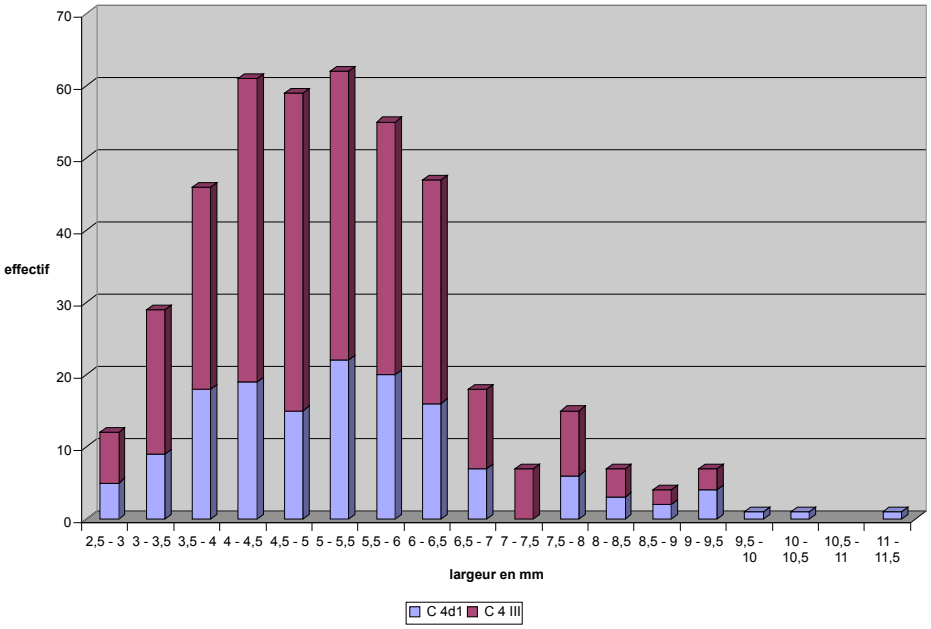


**fig. 16** : Width of retouched bladelets in assemblages 4d1 and 4III together.



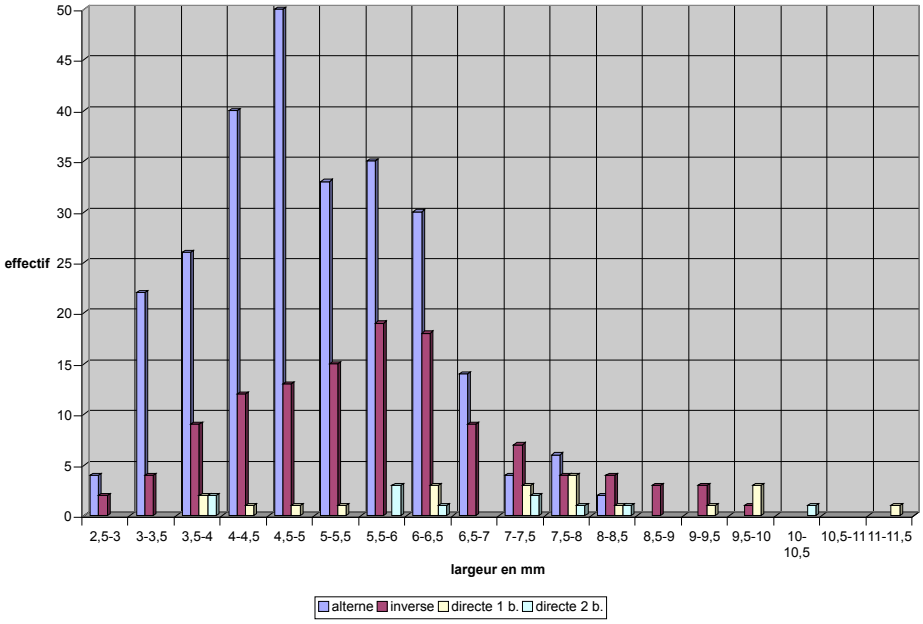


**fig. 17** : Width of retouched bladelets in assemblages 4d1 and 4III separated.

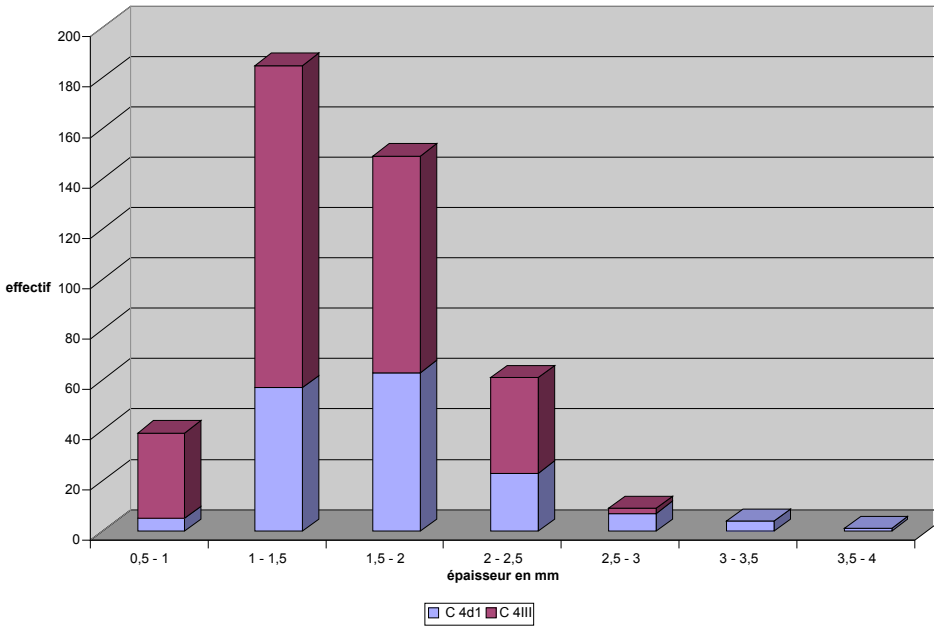


**fig. 18** : Thickness of retouched bladelets in assemblages 4d1 and 4III together.

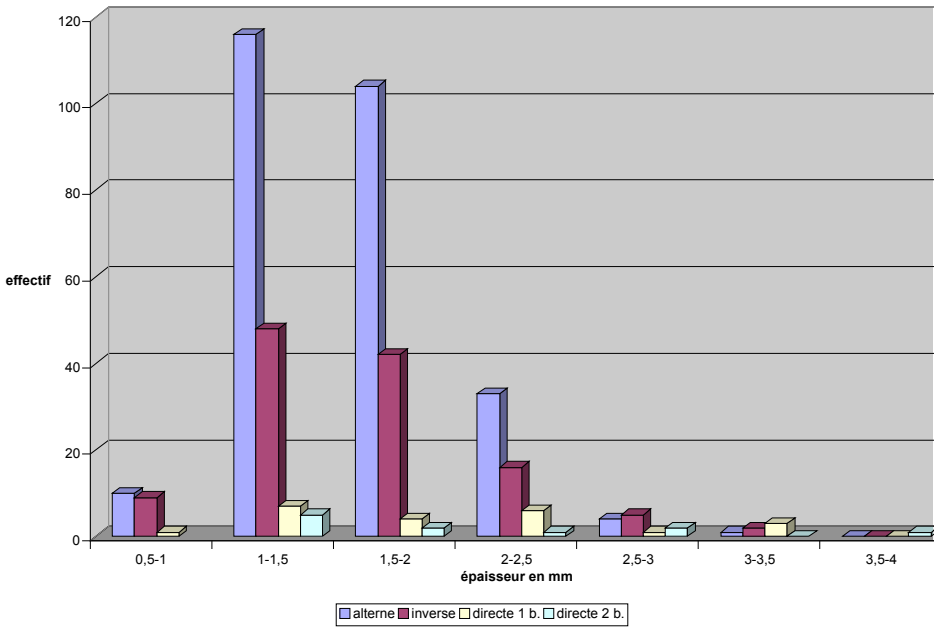


**fig. 19** : Thickness of retouched bladelets in assemblages 4d1 and 4III separated.

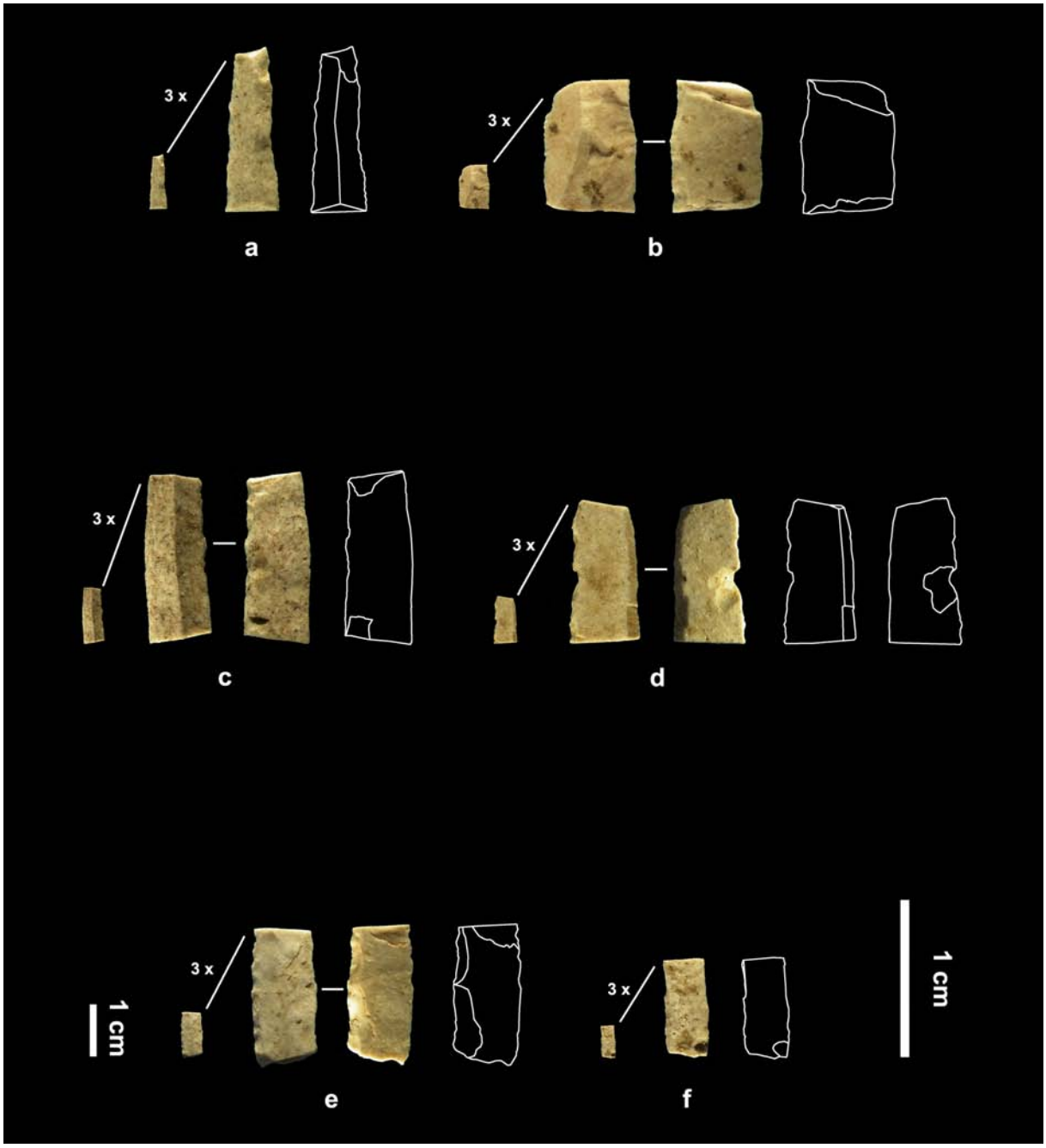


**fig. 20** : A few retouched bladelets of assemblage 4d1 with complex fractures (a and f) or complex fractures and other damage (b, c, d and e).


**fig. 21** : A few retouched bladelets of assemblage 4III with complex fractures (a, c, d and g) or complex fractures and other damage (b, e and f).

regular and rectilinear elements that would facilitate lateral hafting in a series, as has already been proposed for the bladelets of Brassempouy (Bon, *op. cit.*) ;

- their morphology is regular and their profile is rectilinear;

- the presence of inverse retouch, whether or not it is combined with direct retouch on the opposite edge, seems to be a determinant element since the complex fractures are always found on pieces with inverse or alternate retouch, and never on pieces with direct retouch only. In addition, there is a slight predominance of complex fractures on pieces with the most intensive inverse retouch;

- the majority of complex fractures are located on or near the edge with inverse retouch (fig. 22).

As for retouched bladelets in general, we can use only the width and thickness of bladelets with complex fractures as a measure of their dimensions. With the exception of one piece, all fall into the range already described above for bladelets in general. The majority of these pieces are between 4 and 4.5 mm wide and 1 and 1.5 mm thick (fig. 23). In contrast, none fall into the category of the larger bladelets, which were probably produced in a continuous reduction sequence with blades.

## Analysis 2: micro and macrowear analysis

*Methods*

In addition to around one hundred tools representative of the entire tool assemblage of level 4III, 95 bladelets (83 retouched and 12 non retouched), with morphological characteristics similar to those of the objects concerned by the preceding study, were analysed according to microwear analysis methods already applied to other sites (González et Ibañez, 1994). However, the particular nature of bladelet use, usually considered to be associated with projectile weapons or non intensive cutting actions, complicates the formation of micro traces. Therefore, in several cases, the determination of the activity realized had to rely on macro-traces, thus partially overlapping with the preceding study. This situation is complicated even further considering that, according to some analyses, the majority of bladelets (around 2/3) used as projectile barbs do not show identifiable traces (Caspar, 1988; Ibáñez, 1993).

*Results*

Forty retouched and five non retouched bladelets, comprising 47.4% of the sample, showed identifiable use traces with a total of 48 active zones, for an average of 1.1 per piece. Diverse activities were identified (table 3 and figs. 24 and 25).

Twenty-nine bladelets, including the five non retouched ones, show traces related to use in a cutting (16 active zones) or scraping (10 active zones) action on diverse materials: soft (skin, meat, etc.), hard (osseous), or semi-hard (antler and/or vegetal) (fig. 26). The working movement and material concerned were precisely determined in only seven cases, while in six cases, neither the movement nor the hardness of the material could be clearly determined.

For the pieces with alternate or inverse retouch, a clear correspondence between the active zone and the edge opposite the edge with inverse retouch was observed. This could indicate that when these tools were hafted, the inverse edge was fixed against the haft. Regardless of this factor, these activities correspond to cutting actions made with knives in which the bladelets were associated with a shaft made of another material (wood?). These knives were used in large part for butchery activities (disarticulation, meat cutting, etc.), or scraping, here also with composite tools, perhaps corresponding to precise activities with diverse materials such as the finishing and/or maintenance of hafts and projectile points. It is interesting to note that the analysis of other tool categories also revealed a high frequency of activities associated with hard and semi-hard organic materials, perhaps including the fabrication and maintenance of hunting weapons.

Within the totality of identified macroscopic traces, 16 retouched bladelets, most with alternate retouch and made from local flint, possess one or several, more or less intensive traces that we consider to be indicative of use as a projectile barb (fig. 27). Among these bladelets, nine (or 9.5% of all the pieces analyzed and

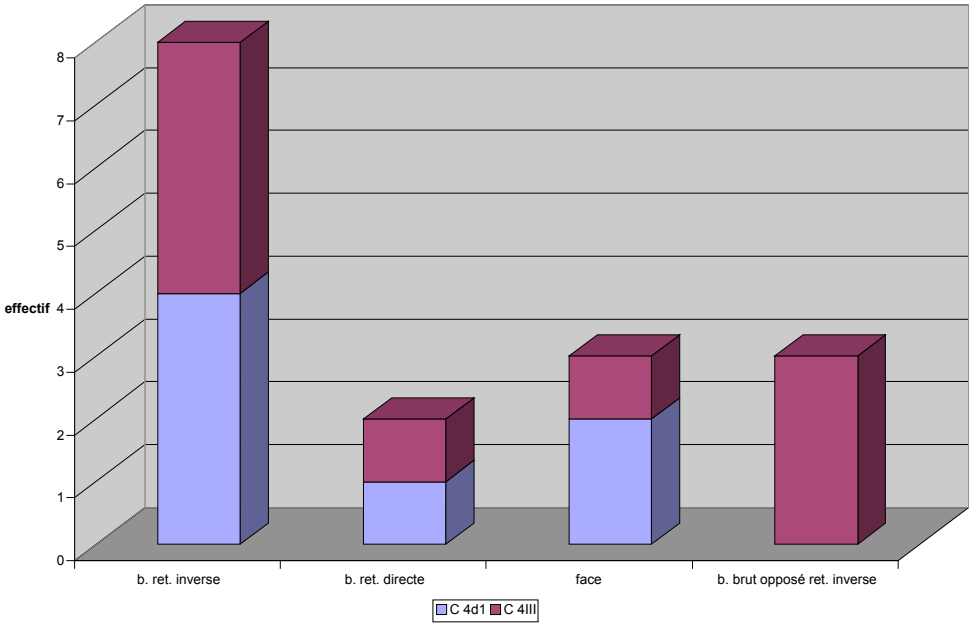


**fig. 22** : Position of the complex fracture relative to the edge of the bladelet.

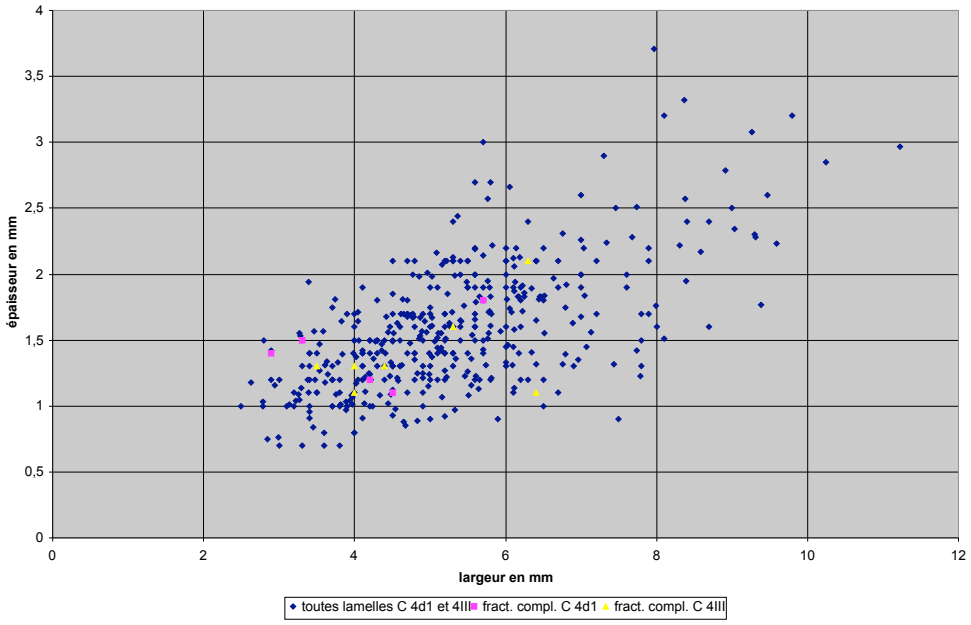


**fig. 23** : Distribution of retouched bladelets according to their widths and thicknesses.

| | nombre | sans traces | utilisées | % | zones act. | z. a./pièce |
|---|---|---|---|---|---|---|
| ***lamelles*** | 95 | 50 | 45 | 47,4 | 48 | 1,1 |

| activité | z. active | % |
|---|---|---|
| *projectile* | 16 | 33,3 |
| *boucherie* | 1 | 2,1 |
| *mat. tendre* | 9 | 18,7 |
| *mat. dure* | 5 | 10,4 |
| *m. semi-dure* | 4 | 8,3 |
| *indéterminé* | 13 | 27,1 |
| **TOTAL** | 48 | 100 |

| action | z. active | % |
|---|---|---|
| *coupage* | 16 | 33,3 |
| *raclage* | 1 | 20,1 |
| *projectile* | 9 | 33,3 |
| *indéterminé* | 6 | 12,5 |
| **TOTAL** | 48 | 100 |

**tab. 3** : Activities and actions of the bladelets analyzed.

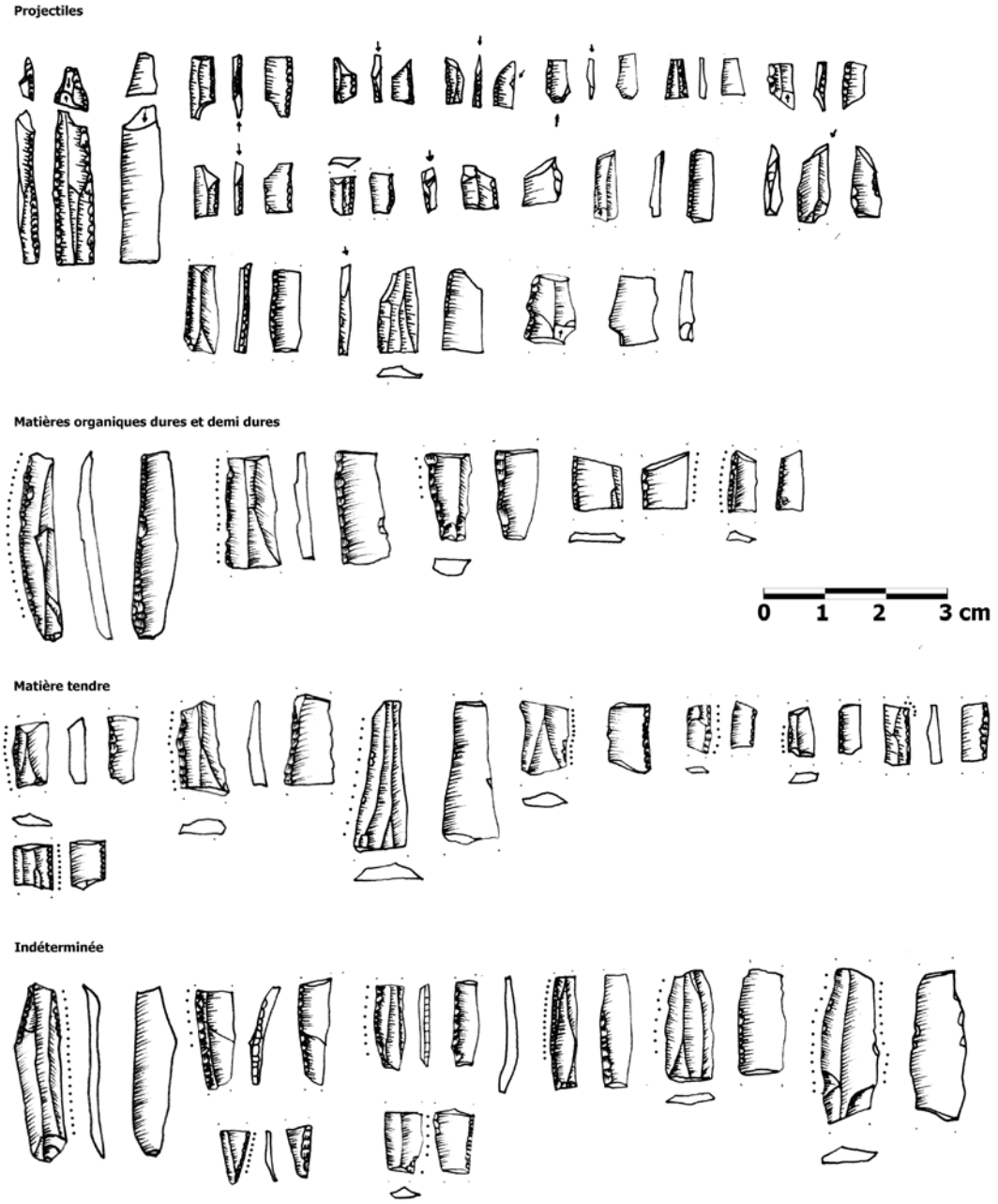


**fig. 24** : Bladelets of assemblage 4III with use traces and corresponding uses.

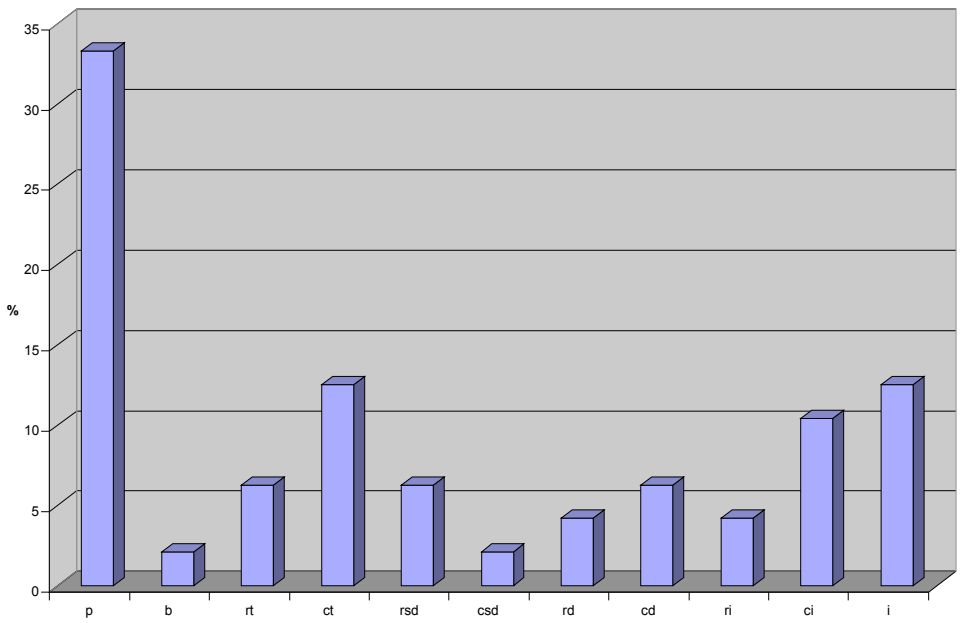


**fig. 25** : Distribution of uses relative to all the active zones. p: projectile; b: butchery; rt: scraping of soft material; ct: cutting of soft material; rsd: scraping of semi-hard material; csd: cutting of semi-hard material; rd: scraping of hard material; cd: cutting of hard material; ri: scraping of undetermined material; ci: cutting of undetermined material; i: undetermined use.

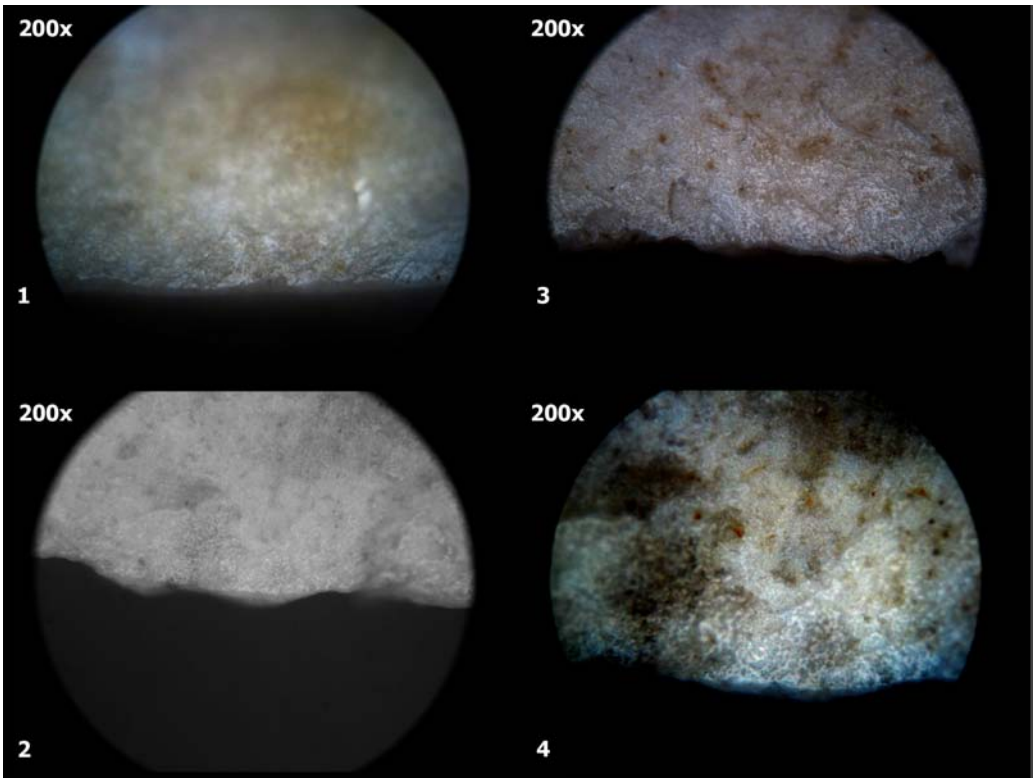


**fig. 26** : 1: cutting of hard organic material; 2: cutting of skin; 3: cutting of hard organic material; 4: scraping of soft material.

nearly 19% of those with use traces) are thus interpreted as possible projectile weapon elements, and seven as definite projectile weapon elements (7.4% of all pieces and 14.6% of those with use traces). These percentages are much higher than those indicated by the preceding analysis of macro fractures. There are several possible explanations for this discrepancy, such as the use of more restrictive criteria in one of the studies. We will further address this question at the end of this paper.

As with other use traces, those associated with an impact are generally located on the edge opposite the one with inverse retouch, once again indicating that this edge is the one that was fixed against the haft. The causes of this localization, apparently in contradiction with the conclusions of the preceding study, will be discussed below. Except for two pointed examples, these pieces have a rectangular and rectilinear morphology and relatively small dimensions (11.3 x 4.75 x 1.8 mm average). A morphometric comparison of bladelets used as projectile weapon elements and those employed for other activities shows significant differences: the former have a generally more regular morphology and are narrower than the latter, with some overlapping of the two ensembles at around 5 mm (fig. 28). This type of metric differentiation has also been observed for bladelets from several Basque sites of the Late Upper Paleolithic, with average widths of 6 mm or more for the bladelets used in butchery activities and less than 6 mm for the others (Ibáñez y González, 1996).

## Conclusions

The studies presented here of Archaic Aurignacian bladelets recently excavated in the Saint-Martin gallery of Isturitz Cave allow us to make several observations and formulate hypotheses to be further explored in future research. Some elements—such as the absolute priority accorded to blade and blade production—confirm that which has already been observed for other assemblages (for a general discussion, see Le Brun-Ricalens, ed., 2005; for a specific discussion of bladelets, see Bon, 2005), and it is not useful for us to elaborate further on this subject.

Other elements, however, merit further discussion. But we must first remind the reader that though they are probably reliable, some data must still be considered as preliminary until they can be confirmed by further research. It is now indispensible to complete our studies with others, including experimental analyses[4] of the entire life span of bladelets from their fabrication to their discovery. This need underlies all the ideas that we propose in the remainder this paper.

At least some of the retouched and nonretouched bladelets that we have analyzed appear to have served as composite projectile weapon elements. All or some of them appear to have been hafted along at least one side of a projectile point shaft in a manner that we have not identified (In a groove? In a groove with an adhesive? With an adhesive alone?). For bladelets with inverse retouch, the absence of microwear on the edge with this retouch strongly suggests that this is the edge that was fixed against the shaft. Meanwhile, the presence of several bladelets with at least one pointed extremity could suggest that some were attached in an apical position.

What is certain is that these bladelets had multiple functions, comparable to those of Fumane (Broglio *et al.*, *op. cit.*) or of level VII of Labeko Koba (Rios, study in progress). Several of the bladelets in our study revealed diverse activities, such as butchery and the maintenance of tools and/or weapons in hard or semi-hard materials (bone, antler, wood, etc.). These bladelets thus likely served as composite elements of knives or “scrapers”. The blanks of these bladelets are relatively variable even if their morphology is often regular and their profile rectilinear. When they were retouched, which is not always the case, this retouch was indiscriminately alternate, inverse or direct.

Our usewear analyses showing the presence of complex fractures and other traces show that some bladelets were used as composite projectile weapon elements, thus attesting to the use of such weapons in the Archaic Aurignacian of Isturitz. Meanwhile, we have not determined the nature of the projectiles that were armed

[4] - For example, the type of experimentation recently conducted with Magdalenian Forked Based Points (Pétillon, 2006).

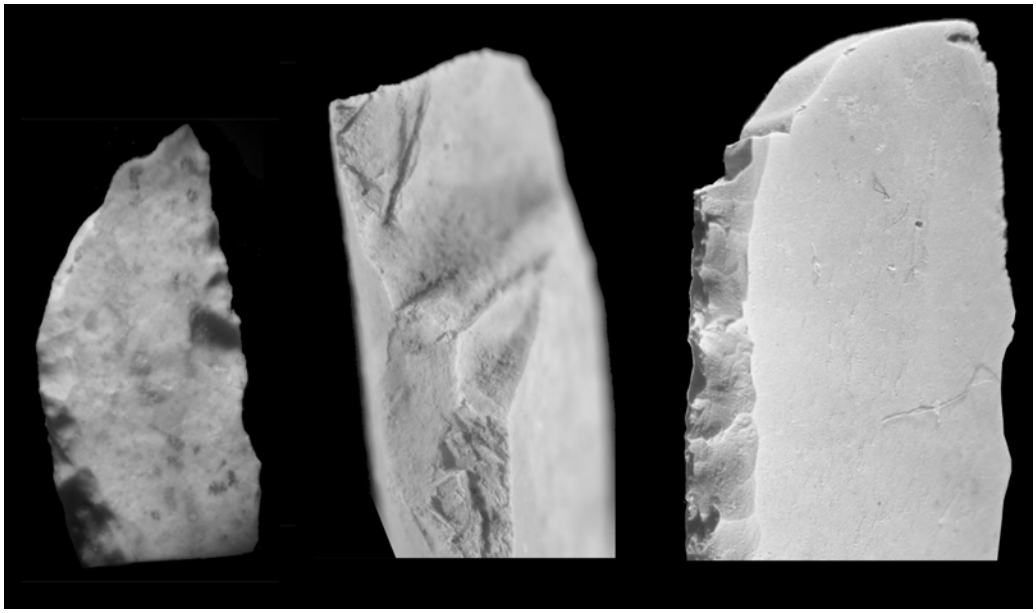

**fig. 27** : Examples of impact fractures and chipping.

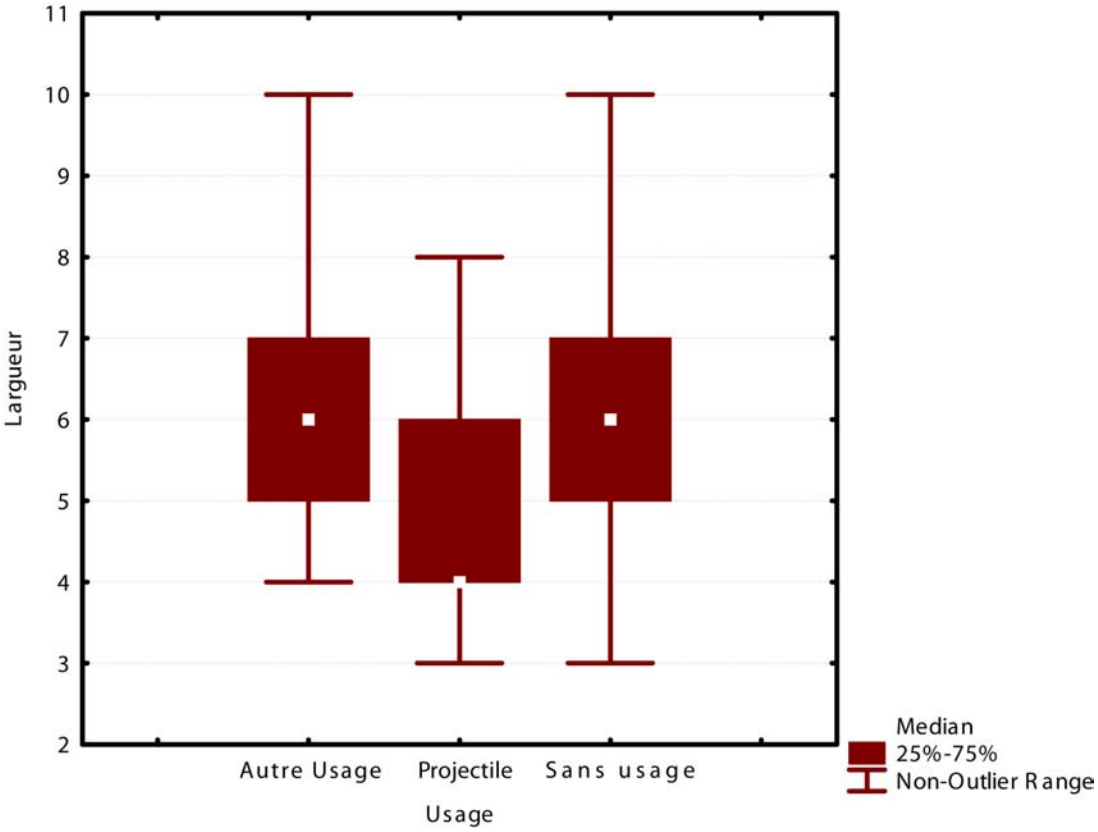


**fig. 28** : Box and whiskers graph of the width of analyzed bladelets.

with these bladelets. Were they spears or arrows, for example. Though the former are the most commonly recognized for this period, a recent article justifiably argued that the use of the bow and arrow during the Aurignacian cannot be excluded (Cattelain, 2006).

The presence of only one antler point fragment in the rich assemblages of levels 4d1 and 4III suggests that the shafts of these weapons were principally made from wood—which also correlates with presence of pointed bladelets mentioned above. Wood could have been used due to a lack of other materials or for more complex reasons (Liolios, *op. cit.*; Otte, 2001).

The bladelets used as composite weapon elements were more carefully selected than those used for other functions. It seems that morphometric characteristics allowing a significant degree of standardization were favored. This factor appears to correlate with the use of inverse retouch (often intensive) or alternate retouch, though it is possible that some nonretouched pieces may have had the same function. The dimensions of the bladelets used as weapon elements were also generally smaller than those of bladelets used for other functions. It follows that the largest blanks were not those selected for use as weapon elements. These larger blanks—in particular, the long bladelets with direct retouch that do not have characteristic impact traces—do not seem to be associated with projectiles, but more likely with the other functions discussed above.

Meanwhile, it is difficult to determine the relative importance of the different functions associated with bladelet tools, especially since each of the usewear approaches applied gave different percentages. This result, though it may seem curious, if not contradictory, illustrates a factor that we emphasized above: the necessity of integrating different, complementary, analyses in functional studies of lithic and osseous tools. The use of bladelets as projectile weapon elements undoubtedly results in a large range of stigmata, extending from an absence of visible traces to intensive chippings and complex fractures. The proportionally low frequency of typical impact traces and/or fractures on these tools might be explained by their fragility: simple fractures would be more frequent on bladelets used as weapon elements since these tiny pieces could be easily broken before being subject to forces sufficient to produce a complex fracture. Meanwhile, it is evident that the potential damage to composite weapon elements depends on many other factors as well. For example:

- the nature and intensity of the hafting "attachments"—of which we are completely ignorant—between the different components of a projectile weapon. A bladelet that could be easily detached surely suffered less damage than one that was strongly attached;
- a piece with a long use duration probably accumulated more damage than one abandoned after a short use duration;
- finally, even for a weapon shot only one time, the traces produced by contact with an animal, or any other element, likely differs according to the hardness of the material impacted, the type of projectile or the force of the person or tool projecting the weapon.

Another contradiction relates to the position of use traces relative to the edge with inverse retouch, which is probably the edge that was fixed against the shaft. The majority of complex fractures are located on or near this edge while most of the other traces are located on or near the opposite edge. It appears that some complex fractures could thus result from a shock between bladelets set in a series on the projectile shaft, or the between the bladelet and the projectile shaft itself, rather than from a contact with the target.

Returning to bladelets in general, it is interesting to ask what was the relationship between production strategies and the function(s) of the corresponding products? To us, these blanks appear to be multifunctional, but were they for the Archaic Aurignacian artisans, and what was their conception of what we call bladelets? Was the objective of their production to obtain blanks to be used for multiple functions through a random employment of all the production strategies known to them? Or was each strategy associated with products with a specific function?

We observe that:

- some bladelets were produced through a continual *chaîne opératoire* (reduction sequence) with blades, while others were obtained independently of blade production;

- some bladelets had functions comparable to those of blades (cutting, scraping, etc.), while others were used as projectile weapon elements, a function that blades apparently never had.

Can we thus draw a link between these two situations and deduce that the bladelets with a greater dimensional variability, produced in continuity with blades, were intended to be used in the same way as blades, while the bladelets produced through autonomous strategies, which allow the fabrication of more homogeneous blanks, were intended for use as projectile weapon elements? We do not yet have a definitive response, but it is perhaps not accidental that the largest blanks, produced from the same cores as blades, as well as those with direct retouch similar to that of blades, do not appear to have been used as weapon elements. In other words, among the range of blanks that we call "bladelets", there could exist two categories of objects that played different roles: those used to arm hunting tools and those employed in butchery and/or manufacturing activities, complementary to the activities realized with blades. In this case, the latter, including the "big bladelets" considered to be characteristic of the Archaic Aurignacian, could thus have been considered by their producers as small or very small "blades", and not as "bladelets".

As early as the Archaic Aurignacian, we would thus observe the association of an autonomous production of relatively small and morphologically standardized blanks for use as composite weapon elements with another production of blanks with a high dimensional variability for use in more "domestic" activities, though we remain cautious concerning the meaning of this term (Tartar *et al.*, 2006). From this perspective, without minimizing a number of other more or less clear distinctions, the roles of laminar and lamellar productions in the Archaic Aurignacian of Isturitz would not be fundamentally different from those identified in the Early Aurignacian. In both cases, « bladelets » would have been obtained in an autonomous manner from cores on flakes ("flake-edge cores"), while «blades » would have been obtained from other types of cores, mostly on larger flint nodules (Normand, in press b).

These ideas are still hypothetical, reflecting only part of a very complex whole that extends well beyond the scope of this paper. They venture well beyond simple interrogations concerning the function of a blank type at a given moment during the Aurignacian. They delve further into questions concerning the nature, articulation and evolution of the binomial relationship of weapons and tools during the Archaic Aurignacian, and thus allow us to make comparisons with the Early Aurignacian. In the end, these interrogations address the relationships in this domain between these two phases of the Aurignacian, and reveal the importance of such questions to our understanding of the origins of this techno-complex.

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