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OSSEOUS MATERIAL WORKING DURING THE FRENCH MESOLITHIC: FIRST ELEMENTS OF CHARACTERIZATION AND FOCUS ON THE DEBITAGE BY EXTRACTION¹

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In France, the Mesolithic populations have mainly been investigated from the perspective of their lithic industry and the work of osseous materials was believed to be a marginal activity. The results of my doctoral research show this idea is in fact the result of a lack of studies. I begin to fill this gap by proposing a characterization of the work of osseous materials and to assess to what extent it refines our perception of this period. In the South and East of France, the work of osseous materials was based on a differential exploitation of each raw material. My study shows this exploitation remained highly unified throughout the considered chronological and geographical frames. The particular case of the use of debitage by extraction is discussed here: it has not been really registered but because of the presence of ambiguous clues, the existence of rod production by extraction in Southern half of France during Mesolithic remains currently questionable.

Keywords: археология, Mesolithic, Western Europe, France, osseous material, technology, debitage by extraction.

Introduction

The debitage by extraction was one of the topic studied in the framework of CNRS European Research Group GDRE PREHISTOS. Objective is to precise the emergence, spread and perpetuation of rod production by extraction in prehistoric Europe. Concerning the Mesolithic, very few information were available concerning the use of this method and the work of osseous material industry in France in general. It was historically seen as at best a marginal activity, compare to what we know about previous period (Liolios, 1999; Christensen, 1999; Averbouh, 2000; Goutas, 2004; Pétilion, 2006; Braem, 2008, Tartar, 2009) or, during Mesolithic, about Northern Europe (David, 2005; Elliott, 2012). Some original, heavy or decorated artefacts has been found (Péquart *et al.*, 1937; Lacam *et al.*, 1944; Barrière, 1973) (fig. 1) but were considered as exceptions to the rule, which was Mesolithic osseous material industry is rare and unsophisticated, mainly composed of elementary finished objects, like bone awls.

I realized, thanks to my PhD research, that the problem was not a real decline of work of osseous material but, in fact, a lack of study of this material (Marquebielle,

2014). I propose a preliminary general characterization of work of osseous material during Mesolithic in South and East of France. These first results give a new image of this part of material culture, far from poor and opportunistic stereotypes. One of the results is the high scarcity of debitage by extraction and, in particular, of rod production by extraction, maybe linked with radical changes in projectile points production.

Methodology

Some authors spoke about the topic of work of osseous material during Mesolithic of western Europe, but general synthesis has never made (Rozoy, 1978; Plonka, 2003; David, 2005; Kozłowski, 2009). I focused my work on France and studied bone, antler and tooth artefacts coming from 25 sites, which are correspond to 36 stratigraphic units, coming from 4 geographic areas: Pyrenees mountains, Causses region, Alps mountains and Jura mountains (fig. 2). The selected stratigraphic units have been grouped into three chronological sets: early, middle and late/final Mesolithic. This sample allows a study of the whole Mesolithic sequence, from a large geographical point of view, based on

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well preserved artefacts, in majority because of limestone environment.

Goal is to reconstitute the technical and economical transformation scheme of osseous materials working, using technological approach developed and adapted by Averbouh to particular aspects of osseous material industries (Averbouh, 2000). My conclusions are based on the study of 464 artefacts: finished objects, blanks and wastes. Collections are often small and very different in terms of artefact numbers. Moreover, one third of collections has been studied only by bibliographic review. A number of cautious conclusions can nevertheless be drawn.

A characterization of Mesolithic work of osseous material en France

Mesolithic populations worked the same raw materials all period long and in all areas: mainly long bones of medium and big mammals, red deer antler of medium and big size-classes and lower canines of male wild boar. Bones and teeth could had been recovered from the game. Deer antlers have been gathered after their fall. The proportion of each raw material varies according to areas and periods. It is possible that these variations are the result of different cultural choices but it is also possible that they are caused by variable preservation state of the remains. For example, the high proportion of deer antler remains in Causses region is due to the presence of lot of debitage waste, from two sites identified as antler tools production sites (Le Cuzoul de Gramat and Le Sanglier).

The bone was worked mainly by direct percussion to produce flat blanks, mainly shaped to pointed objects like awls (fig. 3a). The blanks are splinters of bone and could be the result of a real debitage or a recovery of fragments of good size and shape, among kitchen waste. Shaping was made by scraping, often limited to the active part. The majority of bone finished objects evoke a fast production. Some objects, like decorated ones, are the result of a more complex work, but these kind of artefacts are rare.

The antler was worked by sectioning to produce segments, shaped to bevelled objects, with a distal and convex bevel, on tine and beam (fig. 3b). Sectioning was made in two

times: first, preparing of the split lines perpendicular to the longitudinal axis of the antler by “entailage” (with the use of the removal by direct percussion technique) or sometimes by sawing, and second, detaching of the blank, by diffuse percussion or bending. Concerning beam debitage, preparing of the split line was limited to the posterior side of antler and the final removal was made by bending. The result was an oblique transverse truncation, which is the preform of the active part of the future bevelled tool. Moreover, rare finished objects made from flat blanks had been identified, like harpoons or barbed points, but this blank production still unclear, as discussed below. There is very rare finishing work and no decoration on deer antler tools.

One precise type of teeth, the male wild boar lower canine, was worked by bipartitioning to produce flat blanks, shaped to bevelled objects, with lateral bevels (fig. 3c). Debitage of canine was made in two times: first, preparing of the split lines in parallel to the longitudinal axis of the tooth by grooving on posterior side and second, splitting of the tooth by indirect percussion thanks to a chisel or a wedge inserts in the groove, perpendicular to the longitudinal axis. The result is two fractures: one following the bottom of grooving, the other following the anterior edge of the canine. Shaping was made by unifacial scraping, localization of scraping is different depending to finished object type. Others teeth, in majority carnivore canines, was directly shaped to produce pendants, by a drilling of the root.

I proposed a new typology of osseous material equipment, because traditional one was base on functional assumption and a little bit confuse, sometimes with many names being used to identify the same type of tools. As far as possible, I choose neutral names, in term of use. I identified a “*fonds commun*” which represents 70% of the osseous material equipment of South and East French Mesolithic: bone awls and spindle-shape points, antler distal bevelled tools and wild boar canine lateral bevelled tools (fig. 4). This “*fonds commun*”, or tools of group 1, have been found in all areas, and are dated from the beginning to the end of Mesolithic time.

Tools of group 2 are less frequent (20% of the osseous material equipment): smoothers, handles and non functional decorated artefacts. Tools of group 3 are the rarest (10% of osseous material equipment): barbed points, punches, hammers, perforated tools.

Concerning economical data, bone working seems to have been rather opportunistic, that means acquisition and working of this raw material were made at the same time as butchering. Raw material was easily available and bone working seems to have been made quickly, maybe depending of immediate need. Surprisingly, bone is also the only raw material used to make decorated objects. Bone objects seems to be at a crossroad between domestic and symbolic spheres. Antler working seems to have been more planned. This is a seasonal raw material, Mesolithics used only shed antlers with a good preservation state and selected precise antler size-classes. Two sites, in Lot region, the Cuzoul de Gramat and Grotte du Sanglier, are identified as production sites of antler blanks or finished objects. Antler working seems so to have been doubly planned: in time and space, some sites are, for a moment in the year, dedicated to antler working. Economical data about wild boar canine working is unclear. It's is difficult to obtain the raw material: it is necessary to hunt a dangerous large game and to break carefully his mandible to extract the whole canine. Moreover, adults or old males wild boar are rare among faunal remains. There is an important way of research to understand if and how technical concern could influence hunting activities.

In conclusion, I highlighted two main points. Firstly, there were very different and standardized works of each raw material. Each one was worked following one (or sometimes two) main transformation scheme. Secondly, the works of raw materials are the same during all Mesolithic time, in all studied areas. There is a strong apparent stability of osseous materials working in term of typology and, mostly, in term of technology.

What about the debitage by extraction?

Concerning the topic studied in the framework of CNRS European Research Group GDRE PREHISTOS, the debitage by extraction has not been really registered

(Marquebielle, 2014). We have not identified finished object shaped from blank clearly recognized as obtained through this debitage nor either waste indicating this kind of debitage. Clark and Thompson early noted the possible disappearance of rod production by extraction (they spoke of “*groove and splinter technique*”) in French Mesolithic (Clark, Thompson, 1953). Later, and on the contrary, Rozoy considered that “*the majority of bone (and antler) tools with elongated shape, was prepared using groove and splinter technique*” (Rozoy, 1978, p. 987). But his conclusion was made without technical study. It seems to be a result of, on one hand, comparisons with context in which waste of rod production by extraction were known (Switzerland, North of Europe) and on the other hand, shortcut like “*elongated object = rod production by extraction*” whereas there are a lot of possibilities to obtain this kind of blank (by bipartition or even by fracturation).

Nevertheless, the possible use of rod debitage by extraction during Mesolithic in France cannot be totally ruled out. There are two kinds of problematic remains. The first kind is finished objects crafted from elongated blanks obtained by extraction in close geographical or chronological context, as it is for harpoons and barbed points (fig. 5). These types of objects are rare but some fragmentary remains are known mainly in Pyrenean context, dated from ancient to recent Mesolithic, on sites of Poeymaü rock shelter (Pyrénées-Atlantique, early Mesolithic), Troubat rock shelter (Hautes-Pyrénées, middle Mesolithic) and la Tourasse caves (Haute-Garonne, recent Mesolithic). Other specimens are known in Alp and Jura region, on sites of Gigot 1 (Doubs, middle and late Mesolithic) and Roseau cave (Ain, late Mesolithic). It may be tempting to compare these objects with crafting of Azilian Pyrenean harpoons in one case (Seddas, 2012) and with contemporary Mesolithic Swiss or German harpoons in other case (Wyss, 1966, 1976). But the technological study does not allow to determine how the blanks were produced. Generally, debitage traces were erased by an important shaping. Furthermore, wastes debitage are missing (Marquebielle, 2014).

The second kind of problematic remains which could illustrate the use of rod debitage by extraction is represented by fragments with lengthwise grooving associated with lengthwise fracture plane. Of course, the presence of this traces combination doesn't reflect the definite use of debitage by extraction, made for example, following the double grooving procedure. Therefore, concerning wild boar tusk exploitation, the debitage by bipartitioning was made using these lengthwise grooving associated with lengthwise fracture plane. But rare examples of bone or antler with lengthwise grooving are known (fig. 6): two bone fragments and an awl fragment at Balma Margineda (Andore, late Mesolithic), one bone fragment at Rouffignac cave (Dordogne, early Mesolithic), one awl fragment at Baume de Montandon (Doubs, late Mesolithic) and one antler fragment at Clos de Poujol (Aveyron, middle Mesolithic, Bridault *et al.*, 2009). In each case, there are insufficient elements to conclude in which procedures grooving was included and then if that grooving was clearly related to debitage by extraction (Marquebielle, 2014). The existence of rod production by extraction in Southern half of France during Mesolithic remains currently questionable. More studies are necessary to try to fill this gap of our knowledge. Mesolithic sites of South-East France could be an interesting way to follow to bring new elements (Marquebielle, work in progress).

Rod production by extraction didn't completely disappeared during Mesolithic in Western Europe. In Denmark and neighbouring countries, various methods of debitage had been used to produce elongated antler and bone rods, including extraction method. These blanks were shaped into different types of projectile points, barbed or not, which represent the majority of Maglemosian osseous material industry (David, 2004). In Great-Britain, Clark and Thompson had shown the use of rod production by extraction at Starr Carr (Clark, Thompson, 1953; Clark, 1954). New studies confirmed these results, highlighting rod production was linked to production of uniserial barbed point (Elliott, 2012). In Switzerland, rod production by extraction

is also linked to the production of antler barbed points. On the site of Birmatten, rod production consists of extraction of a unique wide rod on the deer antler beam (Bandi, 1963; Rozoy, 1978; David, 2000). In all of those examples, the debitage by extraction was made by double grooving procedure, in order to produce antler or bone rods. These elongated and flat blanks have been shape to projectile points, barbed or not. In the context of Mesolithic Western Europe, southern half of France had so to be distinguished in term of osseous material industry, in particular because of the very scarcity of these kind of weapon elements. With the exception of rare barbed points, no bone or antler arrowhead had been securely identified (Marquebielle, 2014). Microliths seems to have been the almost unique chosen solution to realise projectile points of highly standardized shape, in the case of composite projectile.

Discussion

The osseous material industry is composed, on one hand, of simply pointed object with no stereotypic shape (bone awls), and, on the other hand, of tools made by taking advantage of natural morphology of blocs (heavy distal bevelled tools on antler or lateral bevelled tools on wild boar tusk). Production of these domestic tools didn't required blanks with similar, artificial and standardized shape, like rods could be. The whole question revolved around this apparent abandon of rod production by extraction in half south France. Basically, two interpretation can be done. The first is that the method knowledge disappeared, and then populations had to found other way to produce their equipment. The second is that the equipment was produce using another and perfectly valuable methods, then the rod production by extraction becoming useless and superfluous. Both proposals are of course caricatural and a wide range of intermediate solutions had to be considered.

If from the very start of Mesolithic period, there is no convincing proof of debitage by extraction, some part of the answer could be found studying the evolution of osseous material industry between end of final Palaeolithic and beginning of

Mesolithic. In south of France, one of the characteristic of some cultures of the end of final Palaeolithic, Azilian in particular, is the presence of barbed points, made thanks to rod production by extraction (Mons, 1995; Seddas, 2012). If these projectile points are historically one of the “*fossile directeur*” of Azilian cultures (of the south France mainly), there is a lack of accurate and reliable information about their production and about the perpetuation of this hunting equipment. More technological studies of osseous material industry of end of final Palaeolithic are now necessary (Marquebielle, work in progress; Seddas, 2012). Some results are already available about Laborian, last culture of final Palaeolithic, but are, as for now, too partial and anecdotal to propose any conclusion (Langlais *et al.*, 2014).

In addition, this question of evolution of debitage by extraction is part of a more general issue, which concern the evolution of all osseous material working at the beginning of Holocene. At the present time, French Mesolithic osseous material industry, from the early stages of the period, appears very different than final Palaeolithic ones in term of raw material, transformation schemes or finished objects. But, due to the lacks of our knowledge, this situation could be only a false point break. This unclear situation has so to be solve, in the coming years, by further investigations.

Conclusion

The work of osseous material during French Mesolithic was historically seen

as at best a marginal activity, based on opportunistic exploitation. Actually, and thanks to a technological analysis, it had been based on a differential exploitation of various raw material (bone, antler and tooth), each one worked following a main transformation scheme. Debitage by extraction was not certainly registered. But the use of this method remains questionable, because of the presence of ambiguous clues. It is clear, at any rate, that debitage by extraction is a very marginal method employed in Mesolithic half south of France, whereas at the same time, in others areas, it was one of the most widely used methods. As of now, the reasons and rhythms of this apparent disaffection is unclear.

It is necessary now to continue the characterisation of work of osseous material of the last hunter-gatherer populations, in a wider chronological (and geographical) point of view. The long term objective is to participate to the general characterisation of osseous material working in Europe, at the end of the Pleistocene and beginning of the Holocene, crossing with Mesolithic transitions issues. And beyond these points, it will be of course necessary to think about relation between osseous material working and the other parts of culture. Osseous material industry has, in fact, a central role in human activities, since at least the beginning of Palaeolithic. Study of its industry is just a way to understand a little bit more life of women and men who crafted it.

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**ОБРАБОТКА КОСТИ В МЕЗОЛИТЕ ФРАНЦИИ:
ПРЕДВАРИТЕЛЬНАЯ ХАРАКТЕРИСТИКА И УГЛУБЛЕННОЕ
РАССМОТРЕНИЕ «DEBITAGE BY EXTRACTION»²**

Б. Маркюбелле

Во Франции мезолитические комплексы изучаются, главным образом, с точки зрения каменной индустрии, а работа с костным материалом считается маловажной. На самом деле, это мнение появилось в результате недостатка исследований в данном направлении. Работа с костными материалами юга и востока Франции базировалась на дифференциации способов обработки каждого вида костного сырья. Исследования автора показывают, что эти приемы обработки оставались весьма унифицированными на всем протяжении рассматриваемых хронологических и географических рамок. В статье обсуждается частный случай использования техники “debitage by extraction” в мезолите Южной Франции.

Ключевые слова: археология, мезолит, Западная Европа, Франция, костный материал, технология, «debitage by extraction».

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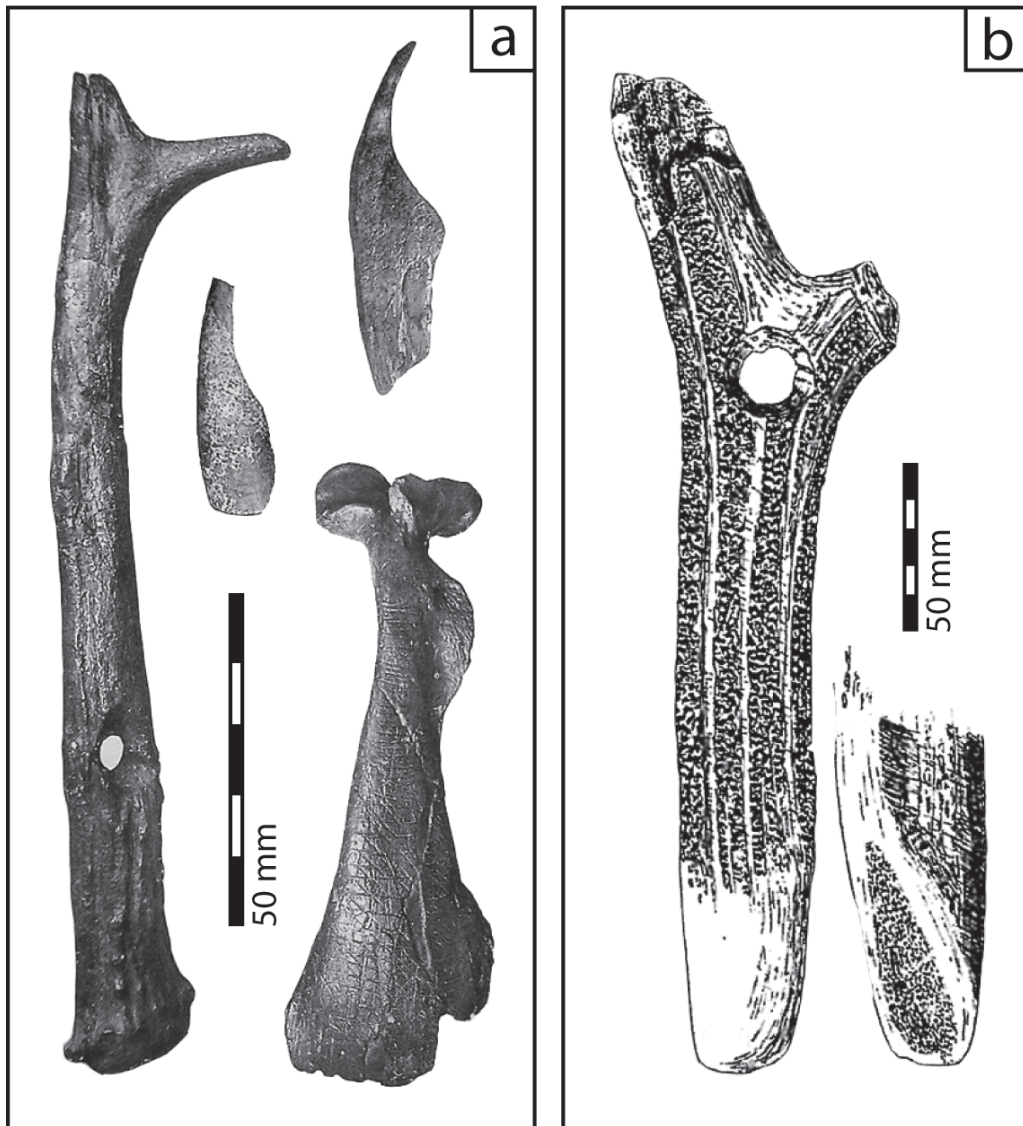


Fig. 1. Some examples of first discovered Mesolithic bone tools; a: from Tévéc (Péquart *et al.*, 1937); b: from Le Cuzoul de Gramat (Lacam *et al.*, 1944).

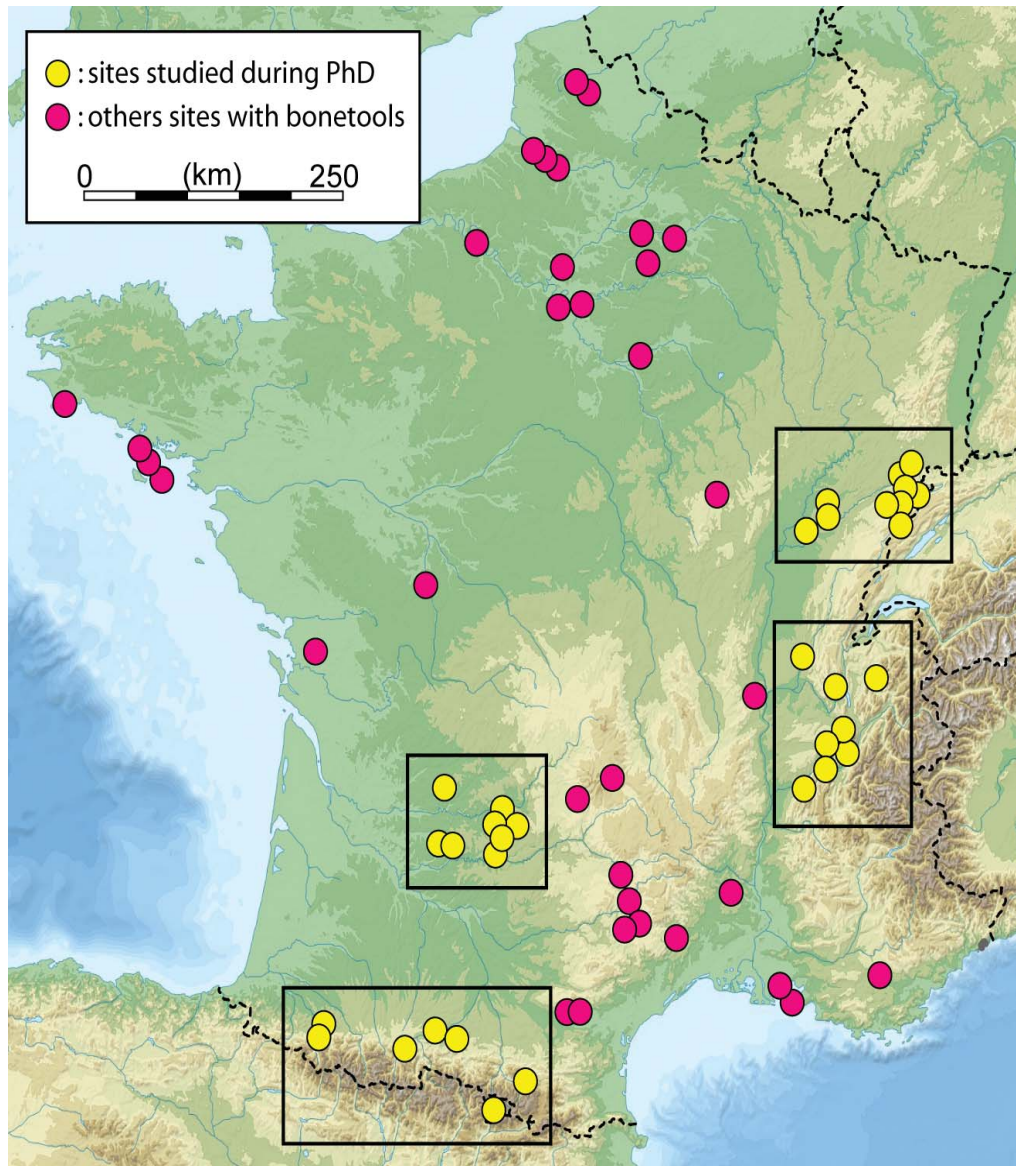


Fig. 2. Localisation of Mesolithic sites with bone tools (© B. Marquebielle).

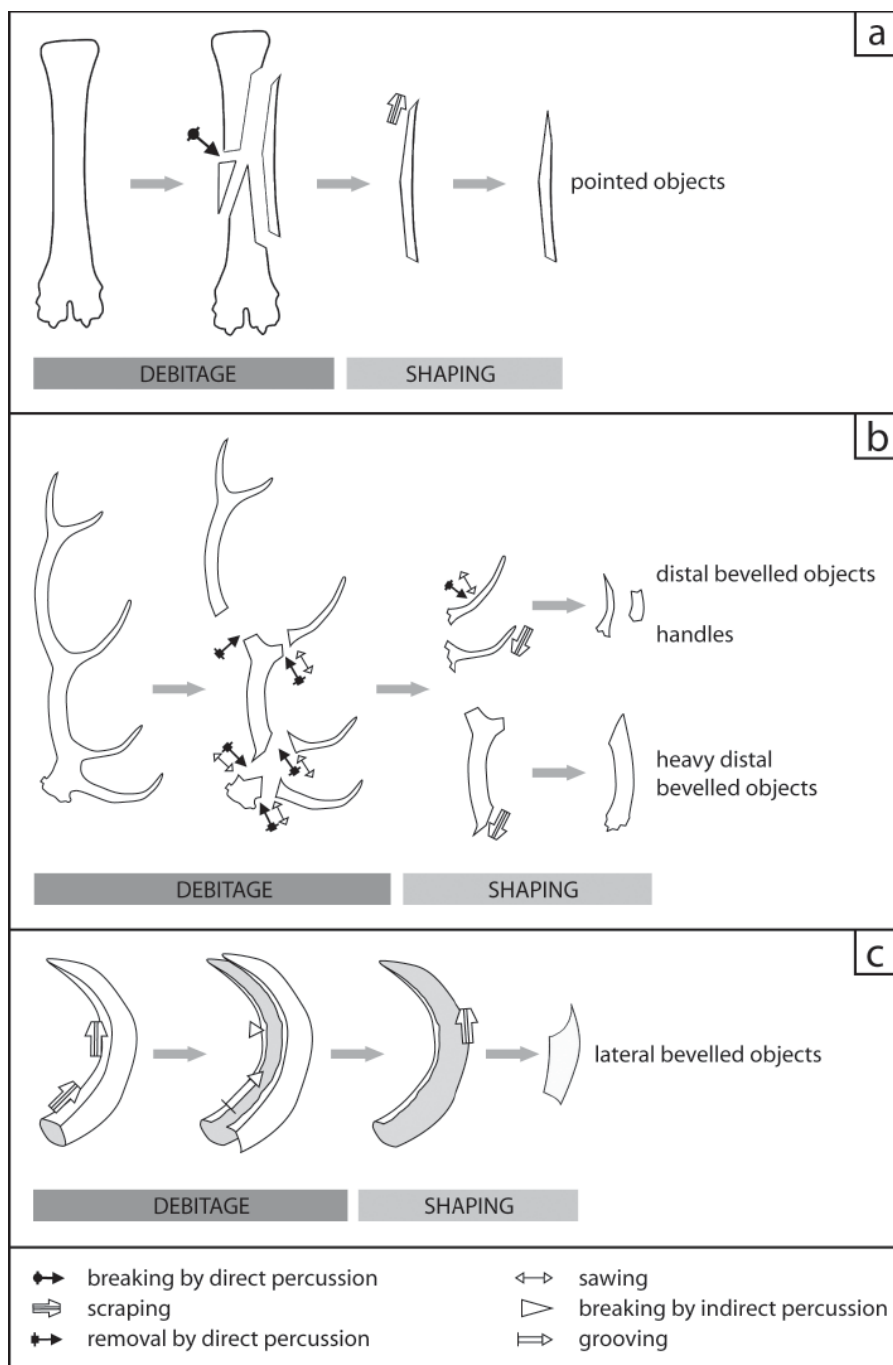


Fig. 3. Main transformation schemes of osseous material in the Mesolithic of half-south of France (a: bone transformation scheme; b: deer antler transformation scheme; c: wild boar tusk transformation scheme) (© B. Marquebielle).



Fig. 4. General overview of the finished object in osseous material in the Mesolithic of half-south of France; heavy distal bevelled tools (a1: Cuzoul de Gramat, Méso. récent/final; a2: les Balmettes, Méso. ancien; a3: le Poeymaü, Méso. moyen), spindle-shape points (a4: les Fieux, Méso. ancien; a6: Cuzoul de Gramat, Méso. récent/final), awls (a5: Cuzoul de Gramat, Méso. récent/final; a7: la Grande Rivoire, Méso. récent; a8: Gigot I, Méso. récent; a9: les Fieux, Méso. ancien; a10 et 11: le Poeymaü, Méso. moyen; a12: Cuzoul de Gramat, Méso. récent/final), lateral bevelled tools (a13: grotte-abri du Moulin, Méso. moyen; a14 et 16: Cuzoul de Gramat, Méso. récent/final; a15: abri inf. de Chataillon, Méso récent), smoothers (b1: la Grande Rivoire, Méso. récent), handles (b2: la Grande Rivoire, Méso. récent), non fonctionnal decorated artefacts (b3: Rouffignac, Méso. ancien; b4: les Fieux, Méso. ancien; b5 et 6: le Poeymaü, Méso. moyen), hammer (c1: Dourgne, Méso. final), barbed point (c2: Gigot I, Méso. récent), punch (c3: Cuzoul de Gramat, Méso. récent/final) (© B. Marquebielle except a7, b1 and b2: © R. Picavet; b3: © M. Boucharat; c1: © J. Guilaine).

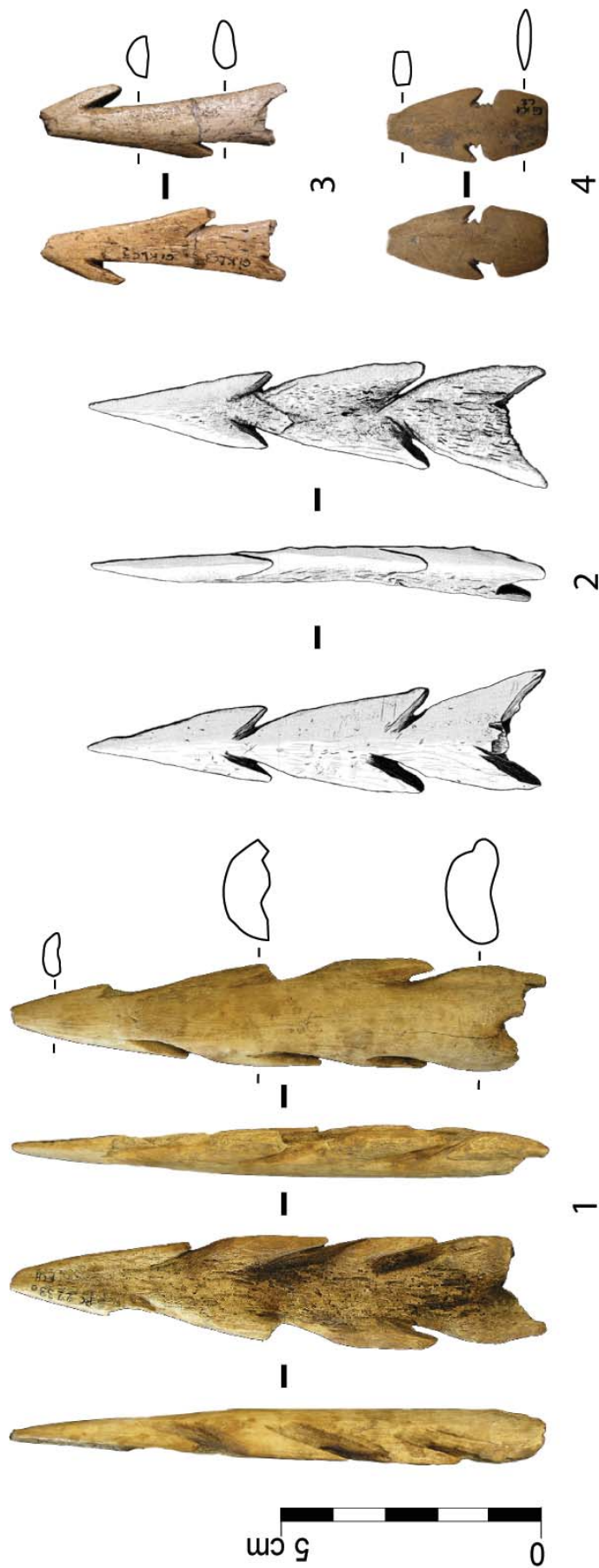


Fig. 5. Barbed points made from elongated blank; 1: Le Poeymaü (Pyrénées-Atlantique, France); 2: La Tourasse (Haute-Garonne, France); 3 and 4: Gigot 1 (Doubs, France) (1, 3 and 4: © B. Marquiebielle; 2: © M. Seddas)

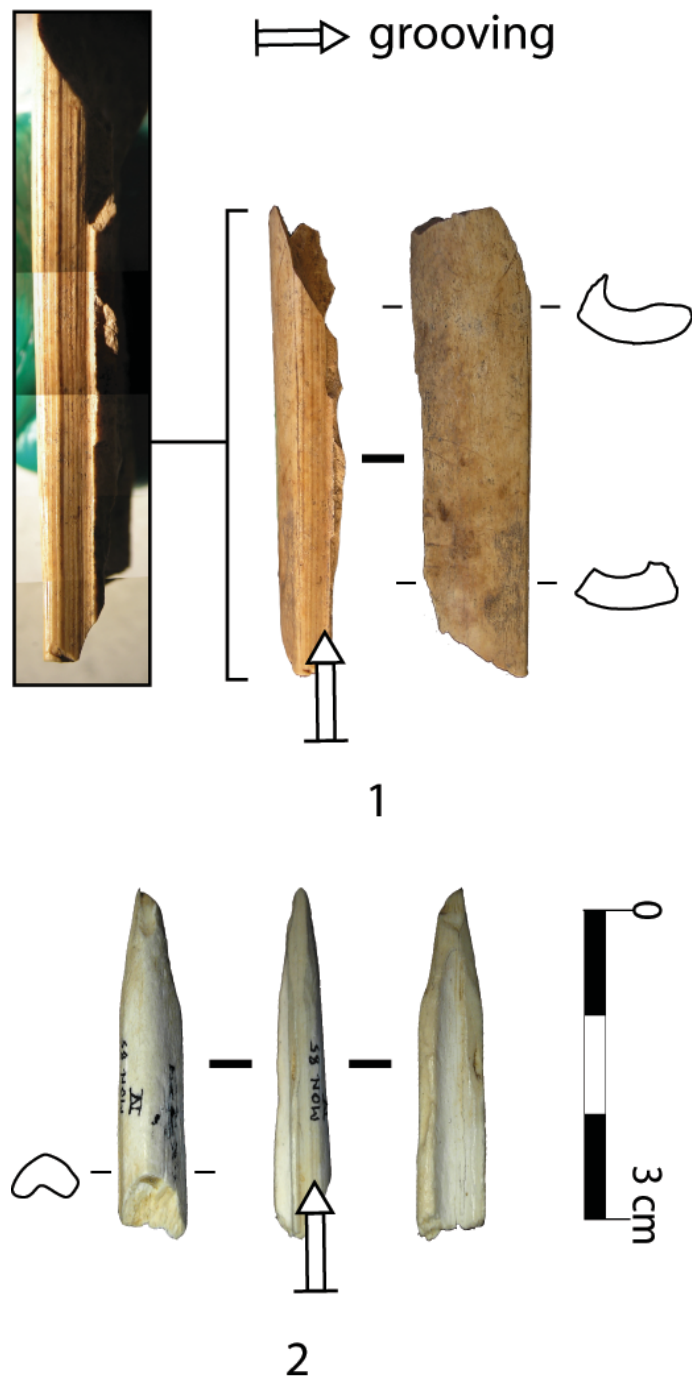


Fig. 6. Bone fragments with lengthwise grooving; 1: Rouffignac (Dordogne, France); 2: Baume de Montandon (Doubs, France) (© B. Marquebielle).