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## WHAT'S UP WITH THE EARLY MIDDLE MAGDALENIAN IN SOUTH-WEST OF FRANCE (19.5–17.5 CAL KY BP). NEW DATA FROM LITHIC TECHNOLOGY AND PALEOGEOGRAPHIC STUDIES

*ABSTRACT:* Succeeding the Lower Magdalenian, the Early Middle Magdalenian (EMM) extends between 19,000 and 17,500 cal. BP, during the second half of Greenland Stadial 2-1 b. It seems to end with the climatic cooling associated with the Heinrich 1 event.

Known from northern Spain to Maszycka cave in Poland, it is divided into three facies based on aspects of either the lithic industry (facies with scalene bladelets) or the bone industry (facies with 'navettes' and facies with Lussac-Angles points). The last two are historically considered to be exclusive and only very partially contemporaneous. These different facies now form the backbone of the EMM structure. The three facies therefore overlap geographically in Gironde-Périgord-Poitou.

After examining the criteria for attribution to any one of the facies, this article proposes to answer the following questions. Are the three facies contemporaneous? Are they totally exclusive from each other? To do this, it is necessary better to integrate all deposits and extend the list of markers to be taken into account in order to conduct a broader analysis of EMM structuring.

The use of Bayesian analysis has led to the demonstration of a broad contemporaneity among the three facies. However, it is important to note the existence of a timelag between the signal given by the lithic industry (from 19,500 cal. BP) and, later, that of facies based on the bone industry (around 19,000 cal. BP). This asymmetry raises the question of the (gradual?) restructuring of equipment as an adaptive response to a change in the ecosystem (environmental and/or social).

In parallel, recent dates of deposits such as Saint-Germain-la-Rivière or Combe-Cullier lead to the proposal to move the start of the EMM, for South-West France, up to around 19,500 cal. BP.

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**RÉSUMÉ :** Le Magdalénien moyen ancien (MMA) s'étend entre 19000 et 17500 cal. BP. Reconnu du nord de l'Espagne jusqu'à la grotte de Maszycka en Pologne, il se divise en trois faciès originaux basés sur l'industrie lithique (faciès à lamelles scalènes) et l'industrie osseuse (faciès à navettes et faciès à pointes de Lussac-Angles). Ces deux derniers sont historiquement considérés comme étant exclusifs et peu contemporains. Pourtant, ils se recoupent géographiquement dans l'ensemble Gironde-Périgord-Poitou. Dans la dynamique des recherches récentes, cet article vise à tester si ces trois faciès sont contemporains et exclusifs et à rechercher des marqueurs archéologiques qui leur seraient communs.

Le recours à des analyses bayésiennes a permis de démontrer une large contemporanéité des trois faciès. Toutefois, il est important de noter l'existence d'un temps de latence entre le signal donné par l'industrie lithique (dès 19500 cal. BP) et celui, plus tardif, des faciès basés sur l'industrie osseuse (vers 19000 cal. BP). Cette asymétrie pose la question de la restructuration (graduelle ?) de l'équipement comme réponse adaptative à un changement d'écosystème (environnemental ou social).

Une classification ascendante hiérarchique couplée à l'analyse paléogéographique d'une vingtaine de marqueurs a permis de mettre en évidence des éléments fédérateurs notamment entre le faciès à navettes et le celui à pointes de Lussac-Angles (propulseur de type 2A, os hyoïdes perforés) témoignant d'interactions entre ces entités. Bien qu'il y ait une opposition dans les conventions artistiques et les codes identitaires plaident en faveur de deux traditions culturelles distinctes, celles-ci ne sont pour autant pas totalement isolées les unes des autres ni du reste des groupes magdaléniens ne produisant pas de marqueurs spécifiques.

Enfin, les datations récentes de gisements tels que Saint-Germain-la-Rivière ou Combe-Cullier amènent à proposer un début du MMA, pour le Sud-Ouest de la France, vers 19500 cal. BP.

**MOTS-CLES :** Paléolithique supérieur - Magdalénien moyen ancien - Techno-économie lithique - Navettes - Pointes de Lussac-Angles - Lamelles scalènes - Paléogéographie - SIG - Faciès culturels

## 1. INTRODUCTION

The work carried out within the framework of the MAGDATIS project (*Agence nationale de la Recherche*; Pétillon and Laroulandie, coord.), in south-western France, has helped clarify the chronological and paleoenvironmental framework of the Magdalenian region. The cross-referencing of chronological and cultural data has led to the proposal of new subdivisions of this technocomplex (Barshay-Szmidt *et al.* 2016, Pétillon 2016, Langlais *et al.* 2016). Succeeding the Lower Magdalenian, the Early Middle Magdalenian (hereinafter EMM) extends between 19,000 and 17,500 cal. BP, during the second half of Greenland Stadial 2-1 b (Rasmussen *et al.* 2014). It seems to end with the climatic cooling associated with the Heinrich 1 event, according to new calibrations of the reservoir ages (Naughton *et al.* 2016, Langlais *et al.* 2016).

EMM is mainly recognized in France and northern Spain; only Maszycka cave in Poland is an exception.

This chronocultural entity would also correspond to an increase in the available animal biomass (saiga antelope, reindeer, bison), particularly in Aquitaine (Delpech 1999). These environmental conditions (increased biomass, extension of inhabitable areas) have been able to encourage a demographic increase in human groups (Demars 1996, Delpech 1999) and play a role as levers to stimulate cultural changes. In addition, the development of original symbolic practices, burials (e.g. Gambier *et al.* 2000, Vanhaeren, d'Errico 2003, Straus *et al.* 2015), parietal sculptures (e.g. Bourdier 2010), human depictions (e.g. Fuentes 2013)... reflect social and cultural changes from the Lower Magdalenian.

EMM is divided into three historical facies: the facies with 'navettes' (Allain *et al.* 1985), the facies with Lussac-Angles points (Pinçon 1988) and the facies with scalene bladelets (Langlais 2007a). The first two are considered *a priori* exclusive. The 'navettes' are distributed discontinuously between Gironde and Poland; the points of Lussac-Angles are documented

from the eponymous sites of Vienne to Cantabria. Finally, the distribution range of scalene bladelets extends over the southwestern quarter of France, excluding the Pyrenees. These different facies now form the backbone of the EMM structure.

The Magdalenian with '*navettes*' and the Magdalenian with Lussac-Angles points (LAP) have each been the subject of numerous research projects and programs by several teams since the late 1980's. They have gradually taken over and revised the reference deposits: for La Garenne sites, the project "Préhistoire de la vallée moyenne de la Creuse" (Paillet et Tymula, coord.; Despriée *et al.* 2009b); for Grappin cave in Arlay, the project "Le Tardiglaciaire et le début de l'Holocène dans le massif du Jura et ses marges: 20 000–5 000 av. J. C." (Cupillard, coord.). Other projects to be mentioned are MAGDATIS (Pétillon *et al.* 2016, Laroulandie *et al.* 2017) and MAGDAQUI (funding from the New Aquitaine region; Langlais coord.) for, among others, the Roc-de-Marcamps (Magdalenian with '*navettes*') or Saint-Germain-la-Rivière and Combe-Cullier sites (facies with scalene bladelets). AMS radiocarbon dates are also associated with deposit revisions. These facies based on various elements of the bone industry (weapons and tools) were also the subject of a round table from which several syntheses of historiographic, technological and symbolic data were produced (Bourdier *et al.* dir., 2017). More generally, the EMM has also been the subject of academic work on various themes (e.g. Jacquot 2002, Mélard 2006, Langlais 2007a, Bourdier 2010, Fuentes 2013, Malgarini 2014, Gaussein 2017, Peschaux 2017, Sécher 2017, Gauvrit Roux 2019) or recent field operations (e.g. Taillis des Coteaux, Bouyssonie cave or Solutré-Route de la Roche; Primault *et al.* 2007, Lajoux *et al.* 2016).

Despite this research dynamic, the structuring of the EMM in facies suffers from some weaknesses. After a brief summary of the techno-economic system of the EMM in southwestern France, I propose to discuss the following points. How to integrate into the discussion the many sites that are not attributable to one of the facies? These variations, which are the basis for the differentiation of several EMM facies, deserve to be discussed in order to evaluate their chronology, variability and divergences, but also to highlight unifying features. After reviewing the criteria for attribution to one of the facies, this article proposes to answer the following questions. Are the three facies contemporaneous? Are they totally exclusive of each other? To do this, it is necessary to better integrate all

deposits and extend the list of markers to be taken into account in order to conduct a broader reflection on the structuring of the EMM.

## 2. ANALYTICAL METHODS

This study is the result of a doctoral dissertation (Sécher 2017) conducted at the PACEA laboratory of the University of Bordeaux, as part of the MAGDAQUI project (Langlais, coord.). This thesis was structured in two axes: the study of the lithic technical systems of the EMM and the paleogeographic analysis of different archaeological markers in France and Spain. This article will mainly focus on the results of the paleogeographic analysis.

The lithic material analysed was taken from four sites in Gironde (Moulin-Neuf, Roc-de-Marcamps 1 and 2) and Lot (Combe-Cullier; *Figure 1*). Particular care was taken to reassess the archaeostratigraphy of the corpus sequences (digitization of notebooks, projection of remains, controlled radiocarbon dates, etc.). Once they had been assessed from a taphonomic perspective, the lithic assemblages were compared according to several parameters according a techno-economic approach: interconnection between the domestic tools and hunting armatures, typo-technology of the microliths, and origin and distribution of the siliceous raw materials.

The spatial analyses were carried out using a GIS (geographic information system; QGIS software). They focused on the Franco-Cantabrian area, from the Jura to the Ebro Valley, because it concentrates the almost exclusive distribution of the EMM deposits. All the maps presented in this article were generated by the author using QGIS software.

In addition, the use of hierarchical ascending classifications allows different individuals (here stratigraphic units or SU) to be ordered into different classes according to their degree of similarity. Classification operates by successive groupings of individuals, starting with those closest to each other. The position of a node between two branches is proportional to the dissimilarity of the individuals composing these branches. These groupings are highly dependent on the aggregation algorithm chosen. Here, the choice was made for the Ward algorithm which allows to obtain a more aggregated partition (e.g. Kopp 1978). The similarity coefficient between two SU was calculated from the asymmetric Sørensen-Dice index (S), sometimes referred to as the Czekanowski index

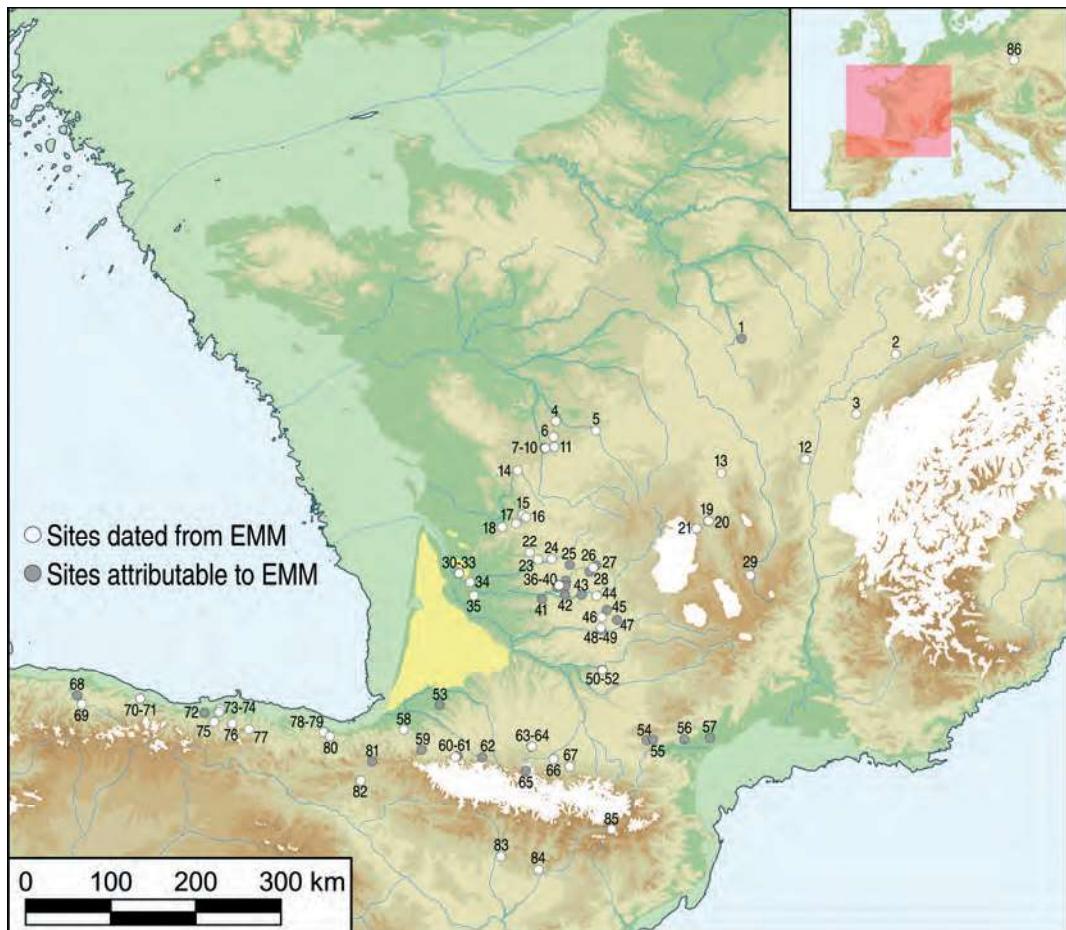


FIGURE 1: Geographic distribution of the deposits selected for this study (for numbers, refer to Table 1; map A. Sécher).

(Dice 1945, Sørensen 1948). Well adapted to presence/absence type source data, this index gives equal weight to each variable. It is called asymmetric because it does not consider the simultaneous absence of a trait in two individuals as evidence of similarity. Its formula is  $S=2h/(2h+a+b)$  where  $a$  is the number of object type present in the first sample,  $b$  is the number of object type present in the second sample and  $h$  is the number of common type between the 2 samples. It varies from 0 (disjoined samples) to 1 (similar samples). For reasons inherent to the nature of the algorithm, SU that did not deliver any of the selected markers (see list below) had to be excluded. Similarly, in order to ensure better reliability of the rendering, the SU filled in for a single variable (the state of the other variables being unknown) were excluded. This type of modelling is highly dependent on source data, sometimes partial, but also on the similarity index used

and the aggregation algorithm (or even the software). Therefore, it is important to remain cautious about the interpretations that can be drawn from the results, especially qualitative results, of this tree. The details provided by future studies, collection revisions or discoveries will certainly enrich or contradict these initial results, but the new classifications will only be more reliable.

A bibliographical review lead to identify as many sites as possible whose dates definitely refer to the EMM and whose standard deviation was less than or equal to 200 years. Then, we selected the sites that had delivered remains reminiscent of the EMM ('navettes', LAP...). The chronology of these deposits, although probable, remains to be validated by radiocarbon dating. Finally, it seemed important to maintain in the mapping the sites that did not deliver any of the classic EMM markers. The objective here goes beyond simply

mapping the presence of characteristic objects, it is also necessary to map their absence. To date, the database contains 162 stratigraphic units from 86 sites

(Figure 1, Table 1): 101 of these US are clearly attributable to the EMM; for 61 of them the attribution is likely but remains to be verified.

TABLE 1: List of sites used in the study.

Nº	ID	Name		Nº	ID	Name
1	Trilob	Trilobite		44	CoCu	Combe-Cullier
2	Rign	Rigney - La Cotte Pouçot		45	Rouss	Grotte Roussignol
3	Grap	Grotte Grappin		46	Peg	Pegourié
4	RocS	Roc-aux-Sorciers		47	StEu	Sainte Eulalie
5	Gare	La Garenne		48	PCBa	Petit Cloup Barrat
6	Tail	Taillis des Coteaux		49	Camb	Les Cambous
7	Marc	La Marche		50	Gand	Gandil
8	RGM	Réseau Guy Martin		51	Lafa	Lafaye
9	Fade	Les Fadets		52	Plan	Plantade
10	Terr	Grotte des Terriers		53	Bras	Brassemouy
11	Pisc	La Piscine		54	Cane	Canecaude
12	SoluRteR	Solutré-Route de la Roche		55	Gaze	Gazel
13	PetG	Petits-Guinards		56	Bize	Bize
14	Chaf	Puit du Chaffaud		57	Cres	Crès
15	Plac	Le Placard		58	Istu	Isturitz
16	MonG	Montgaudier		59	Harr	Harregi
17	RdS	Roc-de-Sers		60	Espa	Espalungue
18	Chai	Chaire à Calvin		61	Tast	Grotte Tastet
19	Chab	Lépétade-Chabasse		62	Espe	Les Espélugues
20	Env1	Enval 1		63	Scil	Les Scilles
21	Thon	Thones-le-Vieux		64	Harp	Les Harpons
22	Peyz	Peyzie		65	Trob	Le Moulin de Troubat
23	Raym	Raymonden		66	MarO	Marsoulas
24	Csaun	Combe-Saunière		67	Enle	Enlène
25	Peyr	Le Peyrat		68	Palo	Paloma
26	Bouy	Grotte Bouyssonie		69	Cald	Las Caldas
27	PuyL	Puy de Lacan		70	TiBu	Tito Bustillo
28	Escl	Esclauzure		71	ElCie	El Cierro
29	RDB	Rond du Barry		72	Altam	Altamira
30	Fee	Grotte des Fées		73	Juyo	El Juyo
31	RocM	Roc-de-Marcamps		74	Pend	El Pendo
32	RocM1	Roc-de-Marcamps 1		75	ElCast	El Castillo
33	RocM2	Roc-de-Marcamps 2		76	Rasc	Rascaño
34	StGR	Saint-Germain-la-Rivière		77	ElMir	El Mirón
35	MouN	Moulin Neuf		78	Erm	Ermittia
36	Reve	Réverdit		79	PrAit	Praile Aitz
37	LaugH	Laugerie Haute		80	Ekai	Ekain
38	LaugB	Laugerie Basse		81	Abau	Abauntz
39	CapB	Cap Blanc		82	Leg	Legintxiki
40	StCi	Roc-Saint-Cirq		83	Alon	Cova Alonsé
41	Jamb	Les Jamblanes		84	Gran	Cova Gran
42	Flag	Flageolet II		85	Mleo	Montlleó
43	Couc	Coucoulu (Cocalas)		86	Masz	Maszycka

The integration of quantitative data has not always been done because:

- the data are not always available in the literature.
- the division of sites into stratigraphic units is not systematic, in which case the sites are considered as a whole. This would have generated an aggregation effect that would have distorted the archaeological reality. This is often the case with ornamental objects.
- the methods of gathering the material are not equal. These are mainly biases related to the conditions

under which old excavations were sampled, which were not exhaustive with regard to the smallest elements, in particular the microliths.

The different archaeological markers (Figure 2) were selected because of their recurrences in the different deposits. They have been grouped by archaeological registers (details in Sécher 2017: 46–49):

- lithic industries: scalene bladelets;
- bone industries: '*navettes*', double-beveled point (Magdalenian with '*navettes*' type) and phallic

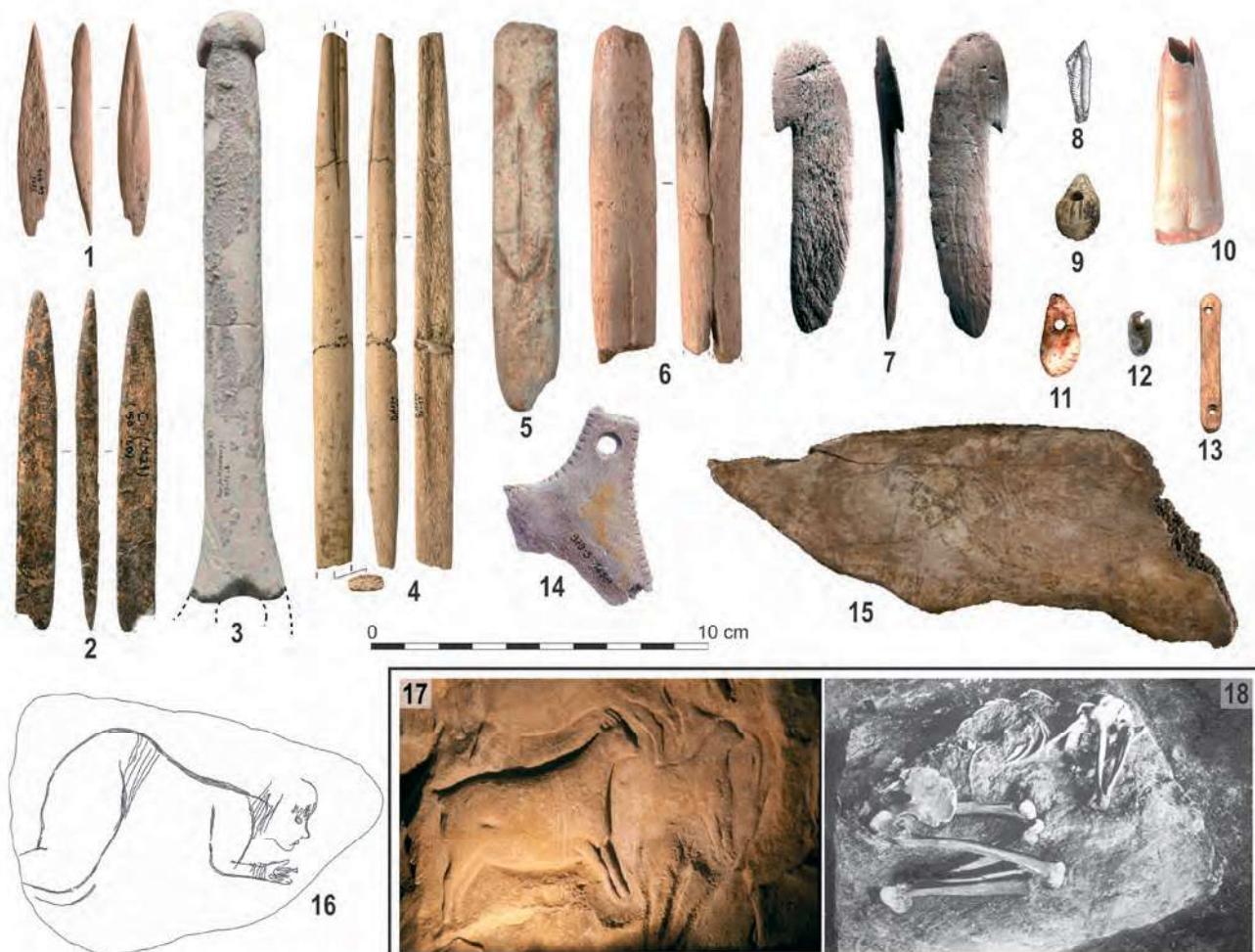


FIGURE 2: Illustrations of the objects and features selected for analysis. 1, Lussac-Angles point; 2, points with tongued base; 3, fragment of phallic pierced baton; 4, double-beveled point; 5, schematic human representation; 6, '*navette*'; 7, type 2A spearthrower; 8, scalene bladelet; 9, stomach bead; 10, engraved horse's incisor; 11, decorated red deer vestigial canine; 12, soapstone bead; 13, applique with two perforations; 14, perforated hyoid bone; 15, decorated scapula; 16, realistic human representation; 17, parietal sculpture; 18, burial. References: 1–2, 4, 6: Langlais *et al.* 2017; 3, 5: Fuentes *et al.* 2017; 7: González Morales, Straus 2009; 8: Langlais 2007a; 9: photo T. Ollivier RMN; 10, 14: Airvaux 2011; 11–12: Vanhaeren, d'Errico 2003; 13: Peschaux *et al.* 2017; 15: photo V. Schulmeister Guillén, Museo Arqueológico Nacional de Madrid; 16: Pales, Tassin de Saint-Péreuse 1976; 17: photo G. Pinçon et DRAC Poitou-Charentes; 18: Blanchard *et al.* 1972.

- pierced baton (Allain *et al.* 1985); Lussac-Angles points (Allain, Descouts 1957, Pinçon 1988); points with tongued base (Pétillon in Langlais *et al.* 2015); type 2A spearthrowers (Cattelain 1988, 2005);
- iconography, funeral practices and ornaments: schematic human representation (Magdalenian with '*navettes*' type; Allain *et al.* 1985, Fuentes 2009); realistic human representations (la Marche type; Pales, Tassin de Saint-Péreuse 1976, Fuentes 2010); worked hyoid bones (Péricard et Lwoff, 1940); parietal sculptures (Bourdier 2010); engraved horse's incisor (Airvaux 2011); primary burial (Gambier *et al.* 2000); *applique* with two perforations (Peschaux *et al.* 2017); stomach beads (Dujardin, Pinçon 2000); decorated red deer vestigial canine (Vanhaeren, d'Errico 2003); soapstone bead (Peschaux *et al.* 2017) and finally the decorated scapulae of Asturias and Cantabria (e.g. Almagro Basch 1976).

Many sites have several levels attributed to EMM (e.g. La Garenne, el Mirón, Combe-Cullier, etc.). It is then advisable to place the focus on a fine resolution, in order not to put objects belonging to different layers on the same (synchronous) plane. The basic unit of geomantic analysis is therefore the stratigraphic unit.

As with any geographical study, the main limitation is the availability and quality of bibliographic data. The chronological resolution of stratigraphy is heterogeneous (opposition between ancient and modern excavations) and these inaccuracies can only be overcome by the revaluation of ancient collections or the critical revision of stratigraphy, where this is still possible. For the oldest excavations, markers with no explicit stratigraphic origin (or association) were isolated. This is the case, for example, for the type 2A spearthrowers in le Placard, which could not be assigned either to the '*navettes*' levels or to those in LAP. They were therefore treated separately.

Finally, Bayesian models were carried out in order to better circumscribe the different facies chronologically. The ChronoModel software (Lanos *et al.* 2016), calibrating dates according to the IntCal13 curve (Reimer *et al.* 2013), was used. In ChronoModel, a phase brings together several facts on the basis of one or more criteria (here, belonging to one or the other of the facies). Dates are used as independent raw material. No a priori hypothesis is made about the position/distribution of them within the phase (no stratigraphic or duration constraints) hence the potential for overlap.

### **3. TECHNO-ECONOMIC SYNTHESIS FOR THE EMM OF SOUTH-WEST FRANCE**

The lithic technical subsystem of the Middle Magdalenian (EMM and Late Middle Magdalenian or LMM) was redefined between the Rhône and Ebro about ten years ago (Langlais 2007a: 310) and then specified later (Langlais *et al.* 2016, Sécher 2017). It is organized into two independent production processes. One, laminar, aims to produce blades for the manufacture of tools. The other, lamellar, tends to produce, in various ways, bladelets for the supply of standardized microliths. The widespread use of organic soft percussion and the care taken in debitage shows a desire to optimize raw materials in order to ensure high productivity.

#### **3.1 Blades for tooling purposes**

Blades production is composed of two schemas. The first, called simplified, led to the punctual debitage of a few blanks from materials of variable quality, generally on pebbles. The shaping is reduced to a minimum. This scheme seems to meet immediate needs. On the contrary, the second, more careful, optimized the volumes of good quality materials, allowing a high productivity in blanks. Particular care is devoted to the shaping and maintenance of convexities. This scheme, segmented in space and time, ensures the production of wide and long-life blanks. Occasionally, some laminar cores, which have reached exhaustion, have been reoriented for lamellar debitage.

Unfortunately, blade cores are rare in our sites. This under-representation of abandoned laminar cores can be explained by a takeaway of the still usable cores and a reorientation of nodules that have reached laminar exhaustion. Indeed, each of the sites in our corpus has delivered a few bladelet cores still bearing traces of laminar removals. These were carried out before the volume was resumed and redirected for the production of bladelets following a block fracture, an accident or an exhaustion state. By extrapolation, we can consider that some blade cores whose production has been stopped have subsequently been recovered, reshaped and transformed into bladelet cores. This is all the more important when it comes to optimizing the use of distant or good quality materials. Similarly, we have highlighted (particularly at Moulin-Neuf) the use of laminar blanks made of extra-local materials on the sites. This segmentation of the *chaîne opératoire* aimed at building up a reserve of blades plays a substantial part in the under-representation of blade cores.

### 3.2 Backed bladelets for hunting weaponry

Unlike blade cores, lamellar cores have reached us in large numbers, which has allowed us to better document the diversity of the operating schemes used and the behaviours implemented. However, remote material nodules remain under-represented and are often lacking. Lamellar debitage is based on two models: the first on blocks (prismatic or pyramidal) and the second on flakes (knapped on the edge; *Figure 3*).

The advantage of debitage on flake's edge is that it requires only minimal shaping out. As a corollary, the exploitation of this type of core leaves relatively little waste. After recovery of a flake (shaping/production waste of laminar or lamellar material), there is the

preparation of a neocrest generally in the longitudinal axis of the flake. The system of tabular crest can be completed by shaping a posterior neocrested bladelet. The extraction of this product will then create the necessary guide arris for further debitage. This will be unipolar and progress head-on. The natural morphology of the flake, with the upper and lower faces acting as perpendicular flanks, allows a narrow table to be well bent and to progress in a frontal way. However, it can sometimes slightly overflow on the lower face without becoming semi-turning. The striking platforms are rejuvenated (*Figure 3, n° 3.8'*) by the extraction of often partial core tablets. Partial (distal) neocrested bladelet can be performed during the debitage process to correct the careenage. The bladelets of the center of the knapping surface seem to be preferentially sought after rather than the *pan-revers* bladelets. When the table is no longer usable, a second one can be set up on the back of the core (second edge of the flake).

As in blade production, prismatic and pyramidal cores are mainly managed by a main striking platform with possibly one or two secondary striking platform for convexity maintenance (cleaning of the table or rejuvenation of the sides). These cores are preferably operated in a unipolar manner on their narrow face, which is generally well bent. Shaping out the sides seems to be a necessary prerequisite to properly position the knapping surface, keep it narrow and create dihedrons that will serve as guide arrises for the progression of the debitage. The maintenance of the tables is marked by different arrangements either directly from the striking platform or an opposite striking platform (longitudinal maintenance products) or from the sides (transverse maintenance products). The striking platforms are regularly rejuvenated either by partial core tablets or by core tablets *stricto sensu*. When a knapping surface is no longer usable, the core is reoriented and a new table is created in an offset or opposite-shifted manner (*Figure 3, n° 4*). This second table can cancel the first one. The block is therefore optimized to maximize the production of blanks.

Although the production methods are different, the backed bladelets have relatively homogeneous templates and morphologies, around 4 to 5 mm in width and 2 to 3 mm in thickness. Several of these microliths (5% to 9%) have diagnostic impact breaks when used as jet weapons.

### 3.3 A wide supply of raw materials

We were able to highlight a diversity in the supply of raw materials, particularly in Moulin-Neuf site

**FIGURE 3:** Diversity of bladelet cores during Early Middle Magdalenian (CAD A. Sécher). 1, pyramidal core; 2, prismatic core; 3, core on flake's edge; 4, pyramidal core with semi-turning debitage. 1-2, Roc-de-Marcamps 2; 3, Combe-Cullier level 11; 4, Combe-Cullier level 13c.

(Sécher, Caux 2017), Roc-de-Marcamps 2 (Kuntz *et al.* 2015, Sécher 2015) or Combe-Cullier (Sécher *et al.* 2018). In Moulin-Neuf, in addition to the exploitation of local senonian flint, we noted a contribution of blocks and blanks from the Bergerac's region (60 km), Saintonge (80 km) and Chalosse (150 km). Some tools also come from the Grand-Pressigny or Touraine region (> 250 km). Thus the Gironde appears at the heart of a circulation network not only east-west (with Périgord) but especially north-south.

The cross-referencing of petro-archaeological and techno-economic data has led to the identification of

segmentation, in space and time, of the *chaîne opératoire* (Figure 4). It is no longer only the tools that are transported but also nodules and cores already productive in materials sometimes distant, such as the flints of Chalosse. The management of many sources of raw materials in the economic system consolidates the idea of a complex planning of needs, in blocks and/or blanks of good quality, integrated into mobility cycles. At the scale of the EMM in southwestern France, a dense network of raw materials circulation, over distances of up to 200 km, highlights large-scale socio-economic interactions (Figure 5).

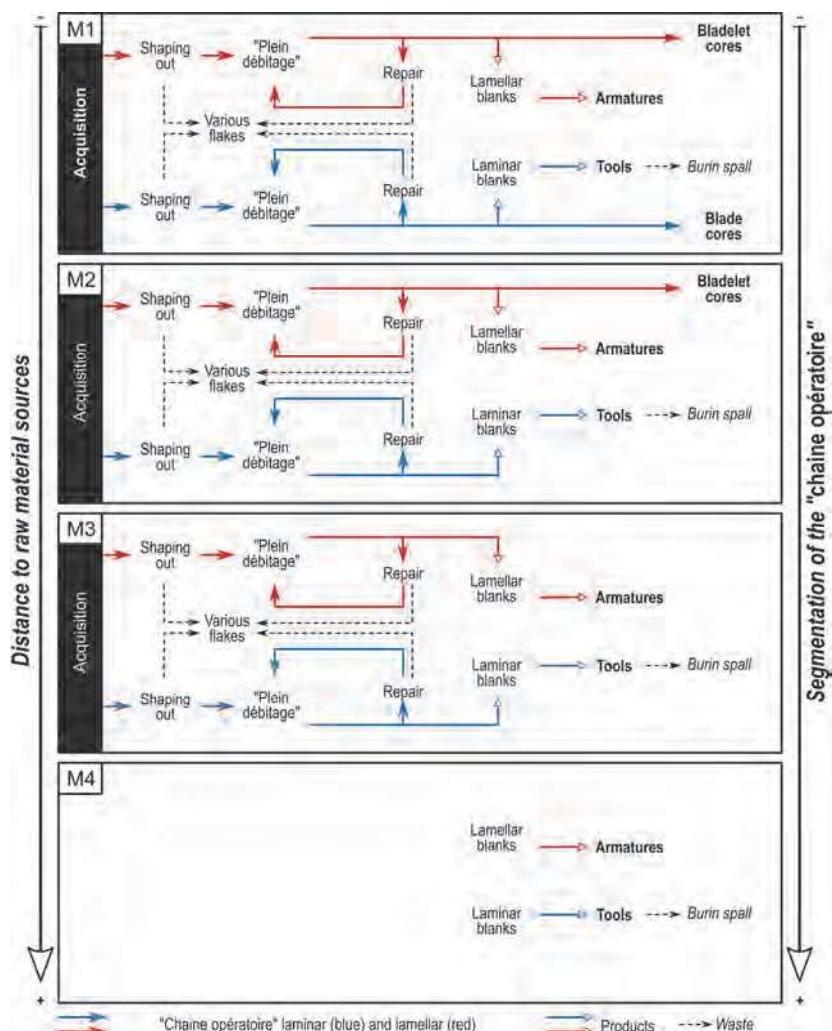


FIGURE 4: Moulin-Neuf: variation in representation of the *chaîne opératoire* according to the mode of acquisition and circulation of lithic raw materials (CAD A. Sécher). M1, senonian flint, tertiary and Aurillac tertiary flint; M2, Bergerac flint; M3, Grain de mil and Chalosse flint; M4, Écoyeux Turonian, Infralias, Berry Lower Turonian and Grand Pressigny flint.

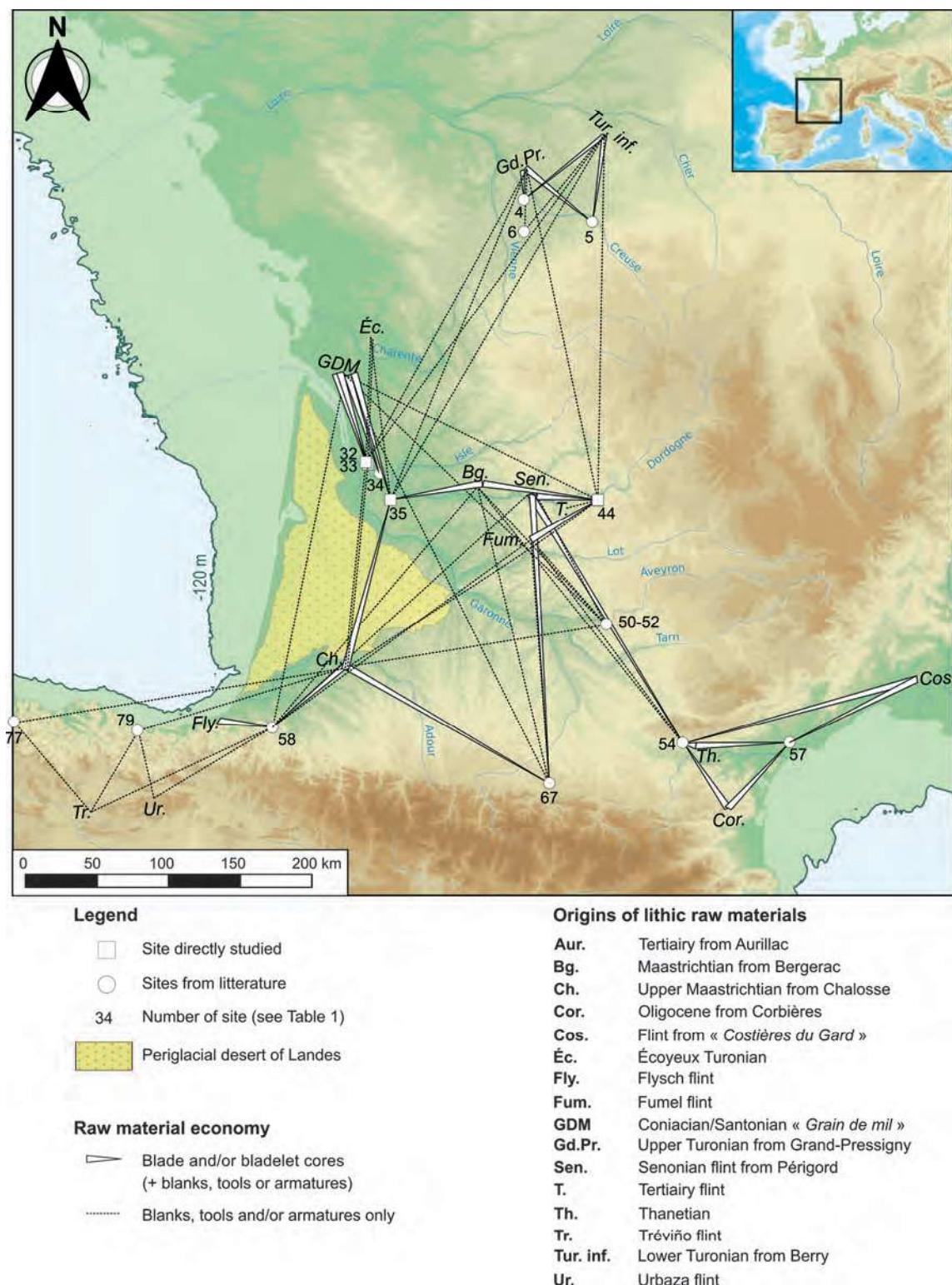


FIGURE 5: Raw materials diffusion during Early Middle Magdalenian in south-western France (after Jacquot 2002, Langlais 2007a, Primault *et al.* 2007, 2008, Langlais *et al.* 2015, 2016, 2017, Sécher 2017; map A. Sécher).

#### 4. THE DIFFERENT FACIES STRUCTURING THE EARLY MIDDLE MAGDALENIAN

##### 4.1 The facies with 'navettes'

It has a wide geographical distribution (*Figure 6*) from the northern part of the Aquitaine Basin (e.g. Roc-de-Marcamps, Laugerie, le Placard), Poitou and central France (Chaffaud, La Garenne), then the Jura (Grappin cave) and finally Poland (Maszycka). Based on La Garenne site (Indre), the work of J. Allain and his collaborators (1985: 94–99) provides a comparative synthesis to identify characteristic elements of this facies. These criteria, forming a coherent set, are:

- double-beveled point: long point on a large rods which have a quadrangular section that can exceed

one cm<sup>2</sup>. The ventral surface can be dug out of a deep groove.

- 'navette': it is a drum of subcircular cross-section made of reindeer antler whose carefully curved, convex ends, both transversely and longitudinally, have a narrow slit with subparallel edges. Each slit identifies two generally symmetrical tongues with a plano-convex inner face and an unguided outer face at its end (Allain, Rigaud 1993: 5).
- original artistic concepts: naturalist animal art is rare, sexual figurations (especially phallic pierced sticks) are common; the figuration of the human face is represented schematically and on organic material (see also Fuentes 2009, 2013, Bourdier *et al.* 2017a).
- decorations in variously ordered cups.

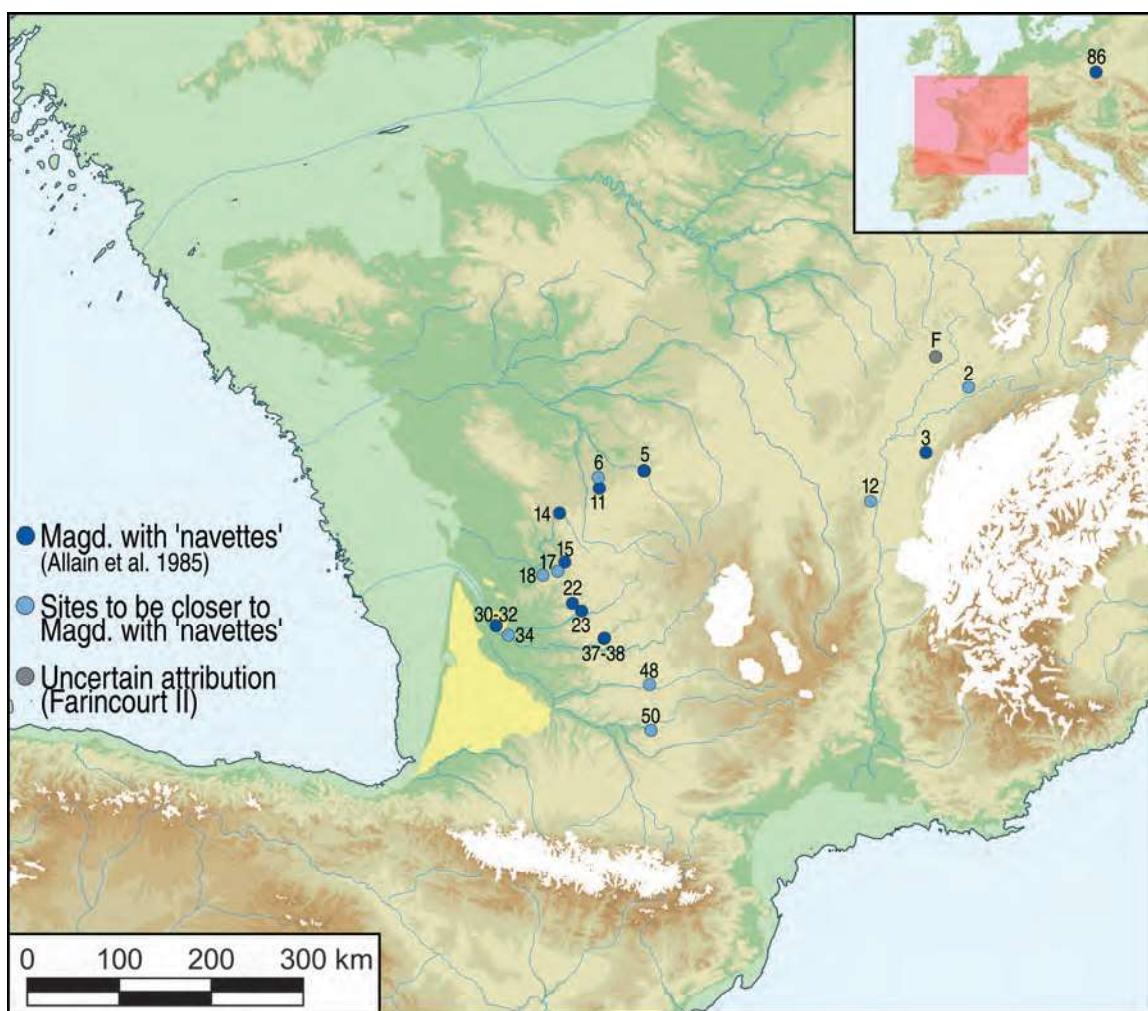


FIGURE 6: Geographical distribution of the deposits attached to the Magdalenian with 'navettes' (map A. Sécher). F: Farincourt II cave (uncertain attribution).

Nevertheless, some sites that did not include all of these markers could be brought closer to the Magdalenian with 'navettes'. Phallic pierced batons from Middle Magdalenian levels have been exhumed at Rigney Cave (Glory 1961) and Solutré - Route de la Roche (Lajoux *et al.* 2016). Schematic human figures are present on the sites of La Peyzie (Allain *et al.* 1985), Le Roc-de-Sers (Tymula 1999), La Chaire-à-Calvin (Bourdier 2010), La Grotte des Fées (Breuil 1912) and Saint-Germain-la-Rivière (Blanchard *et al.* 1972, Fuentes *et al.* 2017). It should be noted that at the Trilobite cave, Ficatier (1886) discovered a piece that could correspond to a 'navette' or foreshaft fragment (Pétillon, Averbouh 2013, Malgarini 2014). Unfortunately, this part is now lost, making it impossible to verify typology. Finally, let

us mention, with a great deal of reserve, the Farincourt II cave in which a phallic pierced baton was discovered in a wall cache (Joffroy, Mouton 1952) as well as a hypothetical schematic human representation (Allain *et al.* 1985, Pétillon, Averbouh 2013). The relative poverty of the collections, the complex archaeostratigraphic context and the absence of chronological data call for great caution. Technotypological analyses of the osseous industry only allow us to attribute it to the Middle Magdalenian *sensu lato* (Malgarini 2014, Malgarini *et al.* 2017).

#### 4.2 The facies with Lussac-Angles points

Described as "very cute" by Breuil (1912), the first definition of the Lussac-Angles point (LAP) dates from

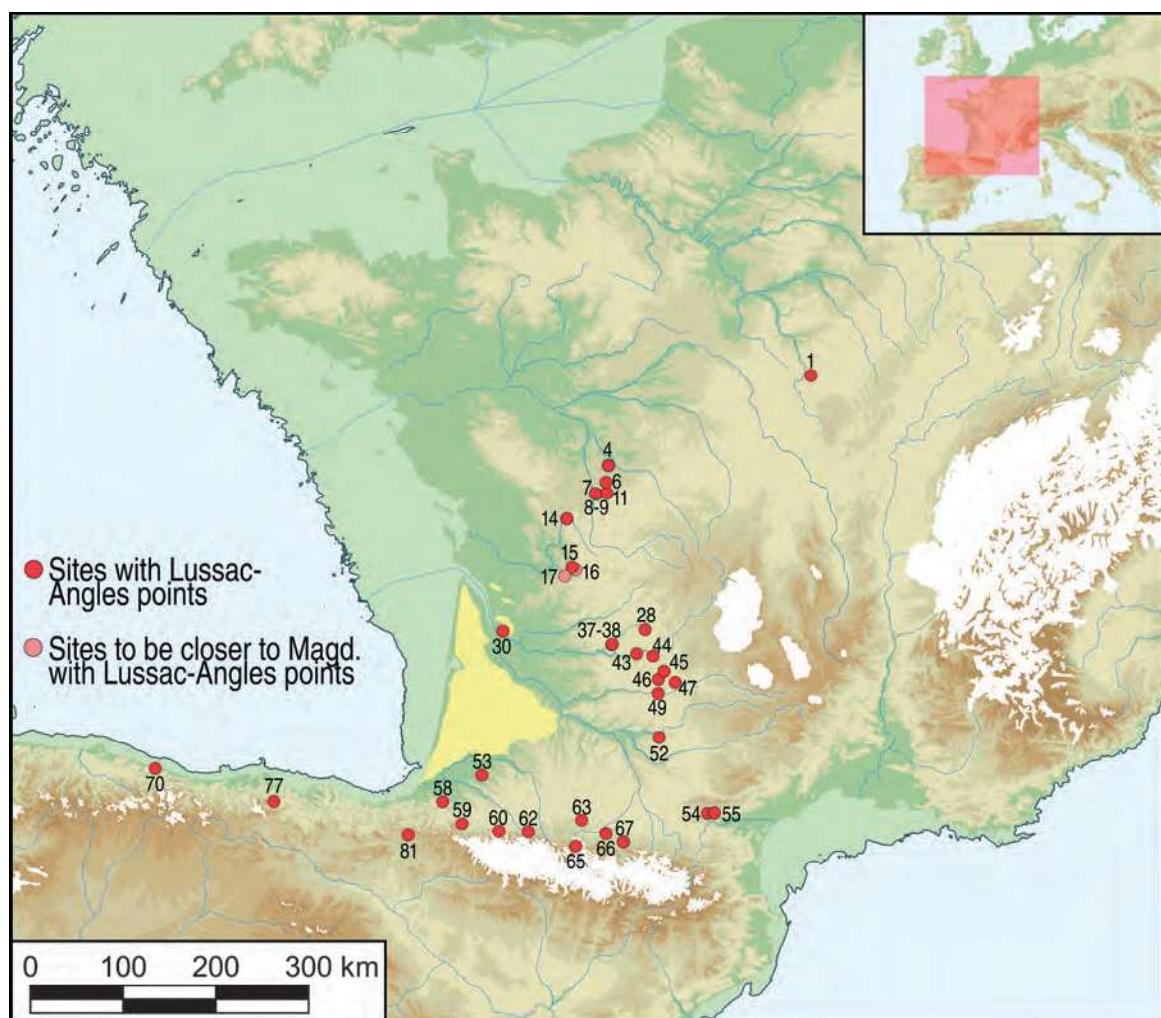


FIGURE 7: Geographical distribution of the deposits attached to the Magdalenian with points of Lussac-Angles (after Cazals, Langlais 2005, Langlais 2007a, Langlais *et al.* 2015, Sécher 2017 ; map A. Sécher).

the late 1950s and describes "short spear with a long single bevel, even striated, and double dorsal and ventral groove" (Allain, Descouts 1957: 511). It will then be specified and fixed by G. Pinçon: "The Lussac-Angles spear is a simple beveled spear that is individualized by its dimensions and morphology: it is on average shorter and wider, its shape is lanceolate, its distal end is sharp, its bevel is long and not striated, it always has a groove on its upper face and another frequently on its lower face" (Pinçon, 1984, 1988).

Historically, the interdisciplinary characterization of LAP facies has only recently been the subject of work at eponymous sites (e.g. Paillet *et al.* 2017, Chauvière *et al.* 2017, Peschaux *et al.* 2017), and there is no list of criteria as for the Magdalenian with '*navettes*'. However, some objects seem to be recurrent, such as engraved horse's incisor (Airvaux 2011), stomach beads (Gobillot 1919, Rousseau 1933, Lwoff 1942) or La Marche-type realistic human figures (e.g. Pales, Tassin de Saint-Péreuse 1976, Fuentes 2013). Thus, by extension, sites that have delivered one of these particular markers will be considered to have affinities with the Magdalenian with LAP. Finally, work such as that carried out at the Grotte des Fées (Langlais *et al.* 2017), Isturitz (Pétillon 2004) or Marsoulas (Pétillon, Averbouh 2013) has revealed a significant presence of LAP outside Poitou, some of which have been directly dated (see below). The Magdalenian with LAP therefore seems to extend from Vienna to Cantabria (*Figure 7*).

#### **4.3 The facies with scalene bladelets: towards a new definition**

The scalene bladelet (see history in Langlais 2007a, appendix 1) is considered as a real morphotype within the frameworks of the Middle Magdalenian (Langlais 2007a: 420). It is defined as a "small piece on an elongated bladelet with an angular back whose two edges of unequal length are formed by a small oblique truncation, sometimes a little convex and a straight or slightly concave back, slightly oblique with regard to the axis of the piece" (Demars, Laurent 1989: 108). The manufacture of these microliths seems to be governed by stable technical standards with "preferential lateralization of oblique truncation and back whose junction forms an angle of 120° to 140°" (Langlais 2007b: 762).

These elements are still poorly contextualized for various reasons. First, they mostly come from old excavations where the absence of sieving only allowed partial collection. Their search in the literature is not

easy because of the confusion of terminology between "scalene bladelets" and "scalene triangles" until the 1960s (e.g. Couchard 1960, Tixier 1963, Cheynier 1965). Similarly, these types of microliths remain under the name "triangle" in the typological lists (n°79) until the symposium organized in 1972 in Bordeaux by F. Bordes, and the distinction between the scalene bladelets (n°78) and the scalene triangles (n°77). All these historical reasons, inherent in the structuring of research, are therefore an undeniable obstacle to their identification in older series and will require a return to the collections. Finally, their stratigraphic and consequently chronological origin remains largely to be specified. Currently, scalene bladelets appear to be limited to the Middle Magdalenian. The use of the microburin technique has not been highlighted in the EMM and tends to become systematic during the LMM (e.g. la Coma d'Infern; Langlais 2007a).

The attribution of an archaeological level to the facies with scalene bladelets is delicate without a return to the material. As it stands, it is appropriate to focus on the series that have been the subject of a recent documentary review. Within backed bladelets, there appears to be variability in the proportion of scalene bladelets and non-scalene truncated backed bladelets, as in Saint-Germain-la-Rivière (scalene: 33,9% versus truncated backed bladelets: 4,8%; Langlais *et al.* 2015) or in La Coma d'Infern (scalene: 73,2%; truncated backed bladelets: 1,0%; Langlais 2007a). However, sites delivering scalene bladelets, which are sometimes numerous, do not reach such proportions (for example 4% scalene in Le Flageolet: Rigaud 1970, 14% in Les Peyrugues: Langlais 2007a, 11% in Combe-Cullier 13b/13c: Sécher *et al.* 2018). Should we exclude them? In addition, these scalene bladelets often coexist with backed bladelets with more or less oblique truncation.

How to distinguish between scalene intention and the simple variability of truncated backed bladelets, whose deviating obliquity of truncation can lead to morphological (and therefore typological) convergence with scalene bladelets? However, a reliable criterion seems to be emerging: the preferential lateralization of the scalene bladelets. Already identified by Cheynier (1965: 318), it seems to be confirmed on all the sites that delivered the most scalene bladelets (e.g. Langlais 2007a). For lateralization, we look not only at the position of the back (sinister or dexter), which reflects more of an archaeologists' reading grid, but rather the position of the back/truncation pair defining a morphotype (*Figure 8*). Moreover, it is systematically the same morphotype ("alpha") that seems to be

dominant or even exclusive in all numerically defined deposits, both for EMM and LMM. It has a dexterous back and a proximal truncation or a senestral back and distal truncation. Its chiral morphotype (sinister back and proximal truncation or dexter back and distal truncation) will be called "beta morphotype". On the other hand, within corpuses of truncated backed bladelets (Roc-de-Marcamps 1, Moulin-Neuf, etc.; Langlais *et al.* 2017, Sécher 2017), no preferential lateralisation is to be noted and no particular morphotype seems to emerge.

Faced with this observation, I propose two criteria that seem to constitute the standard for the manufacture of scalene bladelets:

- the morphological criterion, which consists of a back/truncation angle between  $120^\circ$  and  $130^\circ$  originally defined (Cheynier 1965: 317–18, Demars, Laurent 1989: 108), remains the basis for the decision.
- preferential back/truncation lateralisation, according to alpha morphotype, must be demonstrated (at least 66%, for corpus of at least 10 scalene bladelets), to validate the "scalene choice".

Thus, the application of these new criteria leads to three types of results (*Figure 9*):

- the site delivers more than 10 scalene bladelets preferably lateralised according to the morphotype  $\alpha$ . It is then fully part of the "scalene facies".
- the site delivers more than 10 scalene bladelets but the lateralisation could not be validated due to a lack of information. As it stands, these sites cannot be reliably linked to the "scalene facies". A return to the series is necessary.
- the site delivers less than 10 scalene bladelets, so it is not recommended to decide on a statistically reliable preferential lateralisation. As a precaution, these sites are excluded. Two hypotheses can then be put forward. Firstly, the occupants were culturally part of the "scalene facies" but any bias deprives us of solid evidence to demonstrate it. Secondly, the occupants had no link with the "scalene facies", in which case part of their production of backed bladelets with more or less oblique truncation converges with the scalene morphotype.

## 5. SIMULTANEOUS FACIES?

Historically, the facies with '*navettes*' and facies with LAP were successive and exclusive in stratigraphy, such

as at the Grotte du Placard or Le Chaffaud (e.g. Allain *et al.* 1985), pleading for a non-contemporaneity of these two entities. New dates have been obtained, some directly on '*navettes*', double-beveled points or LAP (e.g. Despriée *et al.* 2009a, Kozłowski *et al.* 2012, Barshay-Szmidt *et al.* 2016). In order to test their contemporaneity, Bayesian models were carried out for each of the different facies (*Figure 10, Table 2*).

The facies with '*navettes*' seems to be the oldest, according to, for instance, the dates of Roc-de-Marcamps (Barshay-Szmidt *et al.* 2016) and Taillis des Coteaux (Brou *et al.* 2013). The dates do not seem to show any discontinuity throughout the EMM. Maszycka's different dates (Kozłowski *et al.* 2012) seem to be contemporary with certain levels of La Garenne (Despriée *et al.* 2009a).

In stratigraphy, the facies with LAP is generally later than the facies with '*navettes*' (e.g. Chaffaud). The oldest date comes from a point of Lussac-Angles in the Grotte des Fées dated around 18,800 cal. BP. Surprisingly, the eponymous sites of the Marche and Roc-aux-Sorciers have delivered some of the most recent ages. In addition, two dates raise questions. These are Trilobite (on Lussac-Angles point, level 4, Er118003:  $13,812 \pm 89$  BP; Malgarini 2014, Malgarini *et al.* 2017) and Abauntz level E (on decorated spatula; OxA5983:  $13,500 \pm 160$  BP; Utrilla, Mazo 1996). The latter seem to be discordant because they are too late. The question of the late presence of LAP in the LMM remains open and calls for further direct dating on these objects, particularly in the Pyrenees and Northern Spain. This would make it possible to assess whether these elements relate only to the EMM, in which case the dates of Trilobite and Abauntz could be rejected with certainty. Otherwise, it would demonstrate that these objects lasted until the end of the LMM, which would lead to a thorough review of the time structure of the Magdalenian with LAP. As it stands, a certain caution leads to the exclusion of these two inconsistent dates from Bayesian analyses.

For the Magdalenian with '*navettes*', Bayesian modelling estimates an early phase with an interquartile interval between 19,154 and 18,909 cal. BP (mean  $19,088 \pm 291$  cal. BP; 95% confidence interval 19,753–18,769 cal. BP) for an end of phase between 17,709 and 17,469 (mean:  $17,552 \pm 252$  cal. BP; 95% confidence interval: 17,930–16,968 cal. BP). For the Magdalenian with LAP, despite a more limited corpus of dates, the beginning of the phase has an interquartile interval between 18,989 and 18,734 cal. BP (mean:  $18,821 \pm 307$  cal. BP; 95% confidence

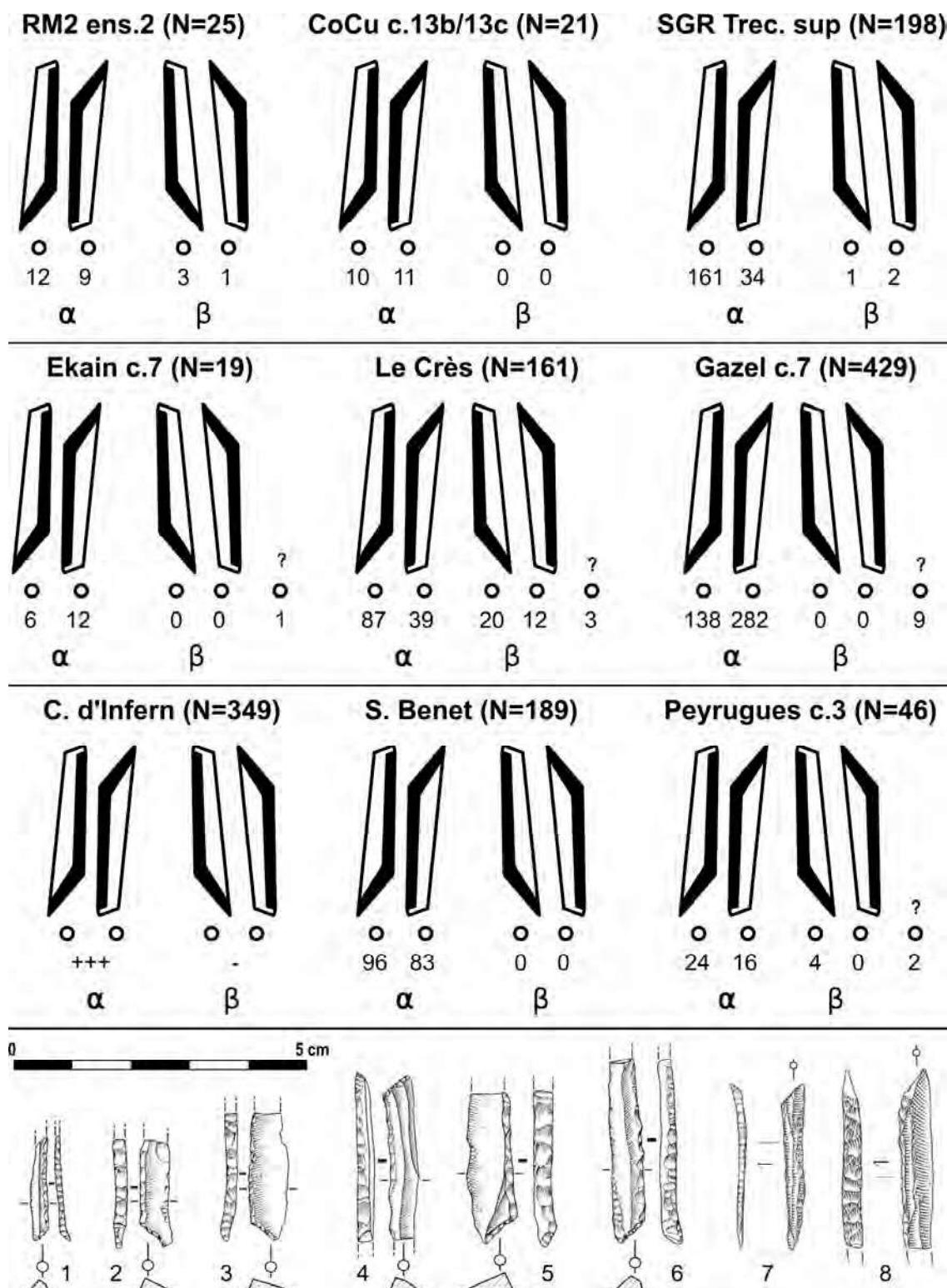


FIGURE 8: Morphotype and examples of scalene bladelets. 1–6, Roc-de-Marcamps 2; 7–8, Saint-Germain-la-Rivière. (1–6, drawings A. Sécher, inking G. Devilder in Sécher 2017; 7–8, drawings S. Ducasse in Langlais *et al.* 2015).

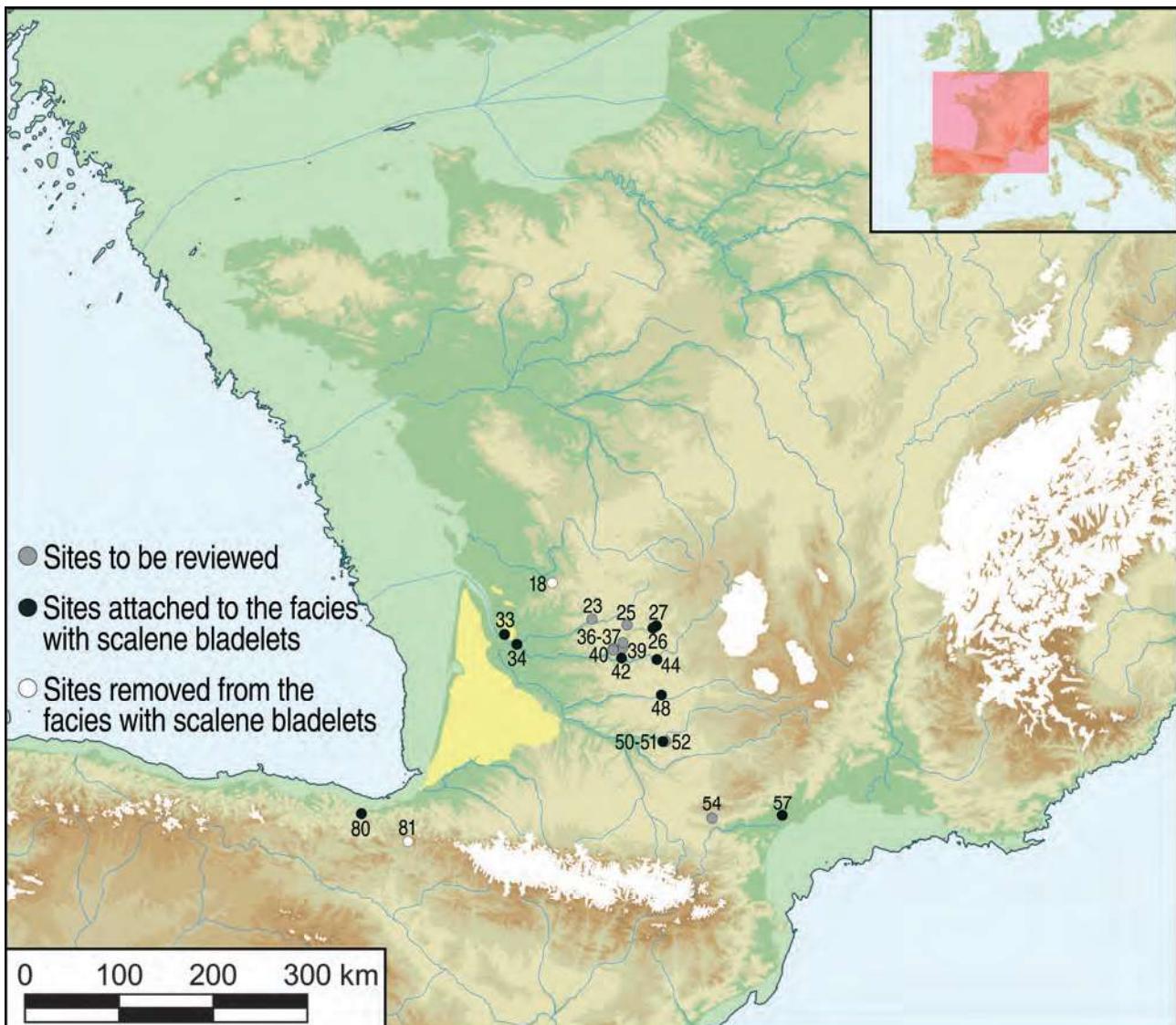


FIGURE 9: Geographical distribution of the deposits attached to the Magdalenian with scalene bladelets (after Langlais, 2007a, map A. Sécher).

interval: 19,602–18,558 cal. BP) therefore slightly later than for the facies with '*navettes*'. In contrast, the end of phase begins at the end of the EMM/beginning of the LMM with an interquartile interval ranging from 17,579 to 17280 (mean:  $17,401 \pm 252$  cal. BP; 95% confidence interval: 17,781–16,848 cal. BP), close to that of the Magdalenian with '*navettes*'.

For the facies with scalene bladelets (*Figure 11, Table 3*), the work is more difficult since these markers will persist during the LMM and these objects are poorly contextualized stratigraphically and chronologically.

The oldest scalene bladelets levels dated are those of Combe-Cullier (levels 13b/13c) and Saint-Germain-la-Rivière (Trécolle excavations), between 19,500 and 19,000 cal. BP. The dates of Roc-de-Marcamps 2 are between 19,000 and 18,500 cal. A Bayesian analysis of available dates returns an interquartile interval for the appearance of facies between 19,502 and 19,254 cal. BP (mean of  $19,406 \pm 239$  cal. BP; 95% confidence interval: 19,934–18,996 cal. BP).

The dates of Saint-Germain-la-Rivière (upper part of the Trécolle excavations), Combe-Cullier (levels

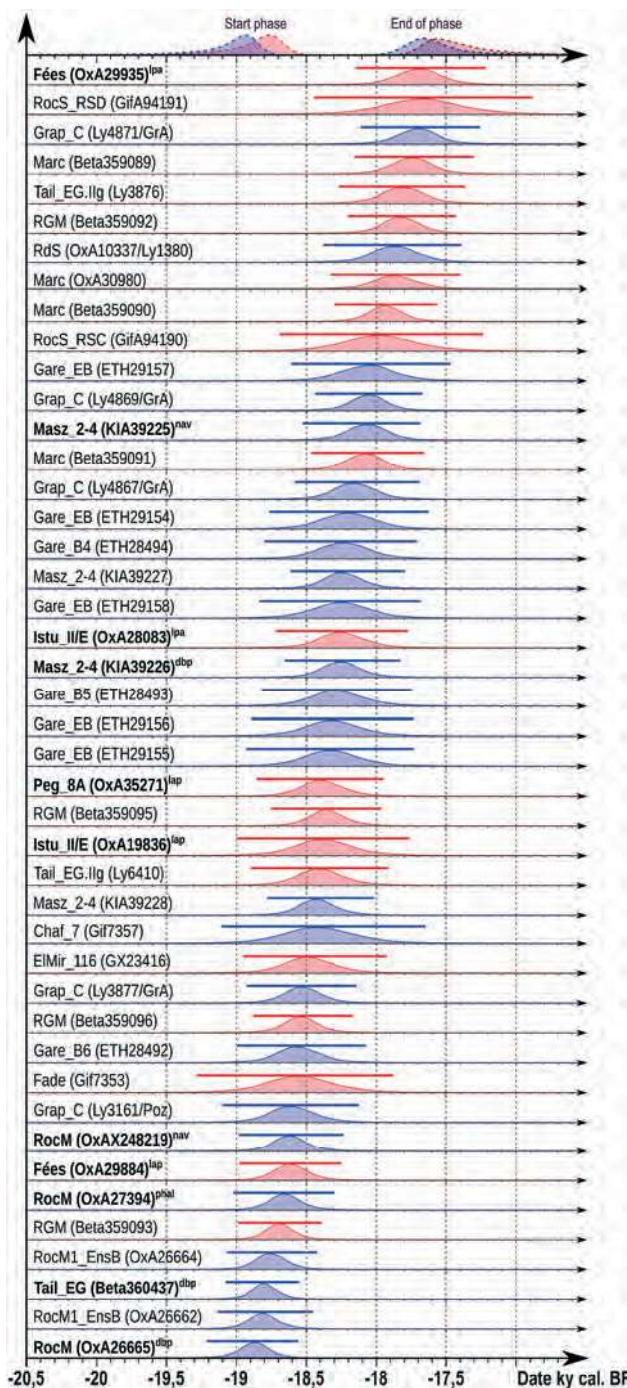


FIGURE 10: Bayesian models for 'navettes' (blue) and Lussac-Angles facies (generated by ChronoModel software using IntCal13 curve calibration). In bold, the dates on specific objects. lap: Lussac-Angles point; nav.: 'navette'; dbp: double-beveled point; phal.: phallic pierced baton.

12/13a and 13b/c), Gandil (level 2), or Plantade (black level), lead to propose to delay, for the South-West of France, the start of the EMM around 19,500 cal. BP.

The results of Bayesian modelling are rather consistent with the current EMM partitioning (Langlais *et al.* 2016). They demonstrate a broad contemporaneity of the three facies during almost all of the EMM. However, it is important to note the existence of a latency time between the signal given by the lithic industry (as early as 19,500 cal. BP) and the later one of the facies based on the osseous industry (around 19,000 cal. BP). This asymmetry raises the question of the (gradual?) restructuring of the equipment as an adaptive response to a change in ecosystem (environmental or social) compared to the Lower Magdalenian. It should be recalled that these results remain highly dependent on the available dates and do not claim to be exhaustive. They reflect a basis for reflection on the state of research. Consequently, this framework can still be improved and will benefit from being clarified by a better technotypological characterization of microliths in old collections, and by new dating, particularly of scalene bladelets sites but also of Pyrenean and Spanish sites, which are not well represented here.

## 6. EXCLUSIVE FACIES?

The three facies overlap geographically and are largely contemporaneous. It remains to test their exclusivity, particularly between the Magdalenian with 'navettes' and the one with LAP, by looking for stratigraphically common markers for them.

The distribution of all the selected markers (see above) by stratigraphic unit (SU) can therefore be used as a basis for developing a first hierarchical ascending classification according to their presence/absence (Figure 12). The tree generated from the selected SU corpus (see chapter methods) shows four main clusters. Cluster 1 groups almost all the SU attributed to the facies with 'navettes' and is clearly individualized from the other three. Cluster 2, which is small in size due to the imprecision of archaeostratigraphic contexts, is organized around the presence of scalene bladelets. Cluster 4 brings together the vast majority of the SU of the Magdalenian with LAP, with the exception of Combe Saunière level 2. Finally, cluster 3 seems to be organized around a mosaic of features: decorated scapulae (El Mirón level 17; El Castillo level 8), type 2A spearthrowers (e.g. Isturitz level II/E), decorated deer

TABLE 2: Dates and references used for Figure 10 (except Abauntz and Trilobite).

Site	Layer	Code	Object	Date	$\sigma$	Source
Abauntz	E	OxA5983	Decorated spatula	13500	160	Utrilla, Mazo 1996
Trilobite	4	Er118003	Lussac-Angles point	13812	89	Malgarini 2014
Roc-aux-Sorciers	RSD	GifA94191	-	14510	160	Airvaux <i>et al.</i> 2012
Fees	-	OxA29935	Lussac-Angles point	14510	70	Barshay-Szmidt <i>et al.</i> 2016
Grappin	C	Ly4871 (GrA)	Rangifer	14520	50	Drucker <i>et al.</i> 2012
Marche	-	Beta359089	Equus	14560	60	Brou <i>et al.</i> 2013
Taillis des Coteaux	EG.IIg	Ly3876	Rangifer	14630	75	Primault <i>et al.</i> 2007
RGM	-	Beta359092	Equus	14640	50	Brou <i>et al.</i> 2013
Roc-de-Sers	-	OxA10337 (Lyon-1380)	Saiga	14680	80	Dujardin <i>et al.</i> 2001, Dujardin, Tymula 2005
Marche	-	OxA30980	Human	14685	75	Barshay-Szmidt <i>et al.</i> 2016
Marche	-	Beta359090	Equus	14740	50	Brou <i>et al.</i> 2013
Roc-aux-Sorciers	RSC	GifA94190	-	14770	140	Airvaux <i>et al.</i> 2012
Garenne	B-B1-B2	ETH29157	Equus	14840	100	Despriée <i>et al.</i> 2009
Grappin	C	Ly4869 (GrA)	Rangifer	14850	50	Drucker <i>et al.</i> 2012
Maszycka	2-4	KIA39225	'Navette'	14855	60	Kozłowski <i>et al.</i> 2012
Marche	-	Beta359091	Equus	14870	50	Brou <i>et al.</i> 2013
Grappin	C	Ly4867 (GrA)	Rangifer	14940	60	Drucker <i>et al.</i> 2012
Garenne	B-B1-B2	ETH29154	Equus	14980	100	Despriée <i>et al.</i> 2009
Garenne	B4	ETH28494	Equus	15010	90	Despriée <i>et al.</i> 2009
Maszycka	2-4	KIA39227	Human	15015	50	Kozłowski <i>et al.</i> 2012
Garenne	B-B1-B2	ETH29158	Equus	15020	100	Despriée <i>et al.</i> 2009
Isturitz	II/E	OxA28083	Lussac-Angles point	15020	70	Barshay-Szmidt <i>et al.</i> 2016
Maszycka	2-4	KIA39226	Double-beveled point	15025	50	Kozłowski <i>et al.</i> 2012
Garenne	B5	ETH28493	Bos-Bison	15050	90	Despriée <i>et al.</i> 2009
Garenne	B-B1-B2	ETH29156	Equus	15070	100	Despriée <i>et al.</i> 2009
Garenne	B-B1-B2	ETH29155	Equus	15080	100	Despriée <i>et al.</i> 2009
RGM	-	Beta359095	Equus	15100	50	Brou <i>et al.</i> 2013
Isturitz	II/E	OxA19836	Lussac-Angles point	15130	110	Szmidt <i>et al.</i> 2009
Pégourié	8A	OxA35271	Lussac-Angles point	15130	70	Ducasse <i>et al.</i> 2019
Taillis des Coteaux	EG.IIg	Ly6410	-	15140	80	Airvaux <i>et al.</i> 2012
Maszycka	2-4	KIA39228	Human	15155	60	Kozłowski <i>et al.</i> 2012
Chaffaud	7	Gif7357	-	15160	150	Airvaux <i>et al.</i> 2012
Grappin	C	Ly3877 (GrA)	Rangifer	15260	70	Drucker <i>et al.</i> 2012
RGM	-	Beta359096	Equus	15270	60	Brou <i>et al.</i> 2013
Garenne	B6	ETH28492	Rangifer	15290	90	Despriée <i>et al.</i> 2009
Fadets	-	Gif7353	-	15300	150	Airvaux 2001
Grappin	C	Ly3161 (Poz)	Equus	15335	100	Cupillard, Welté 2006
Fees	-	OxA29884	Lussac-Angles point	15340	70	Barshay-Szmidt <i>et al.</i> 2016
Roc-de-Marcamps	-	OxAX248219	Navette	15340	70	Barshay-Szmidt <i>et al.</i> 2016
Roc-de-Marcamps	-	OxA27394	Phalliform object	15380	70	Barshay-Szmidt <i>et al.</i> 2016
RGM	-	Beta359093	Equus	15420	60	Brou <i>et al.</i> 2013
Roc-de-Marcamps 1	Ens. B	OxA26664	Cervus	15495	70	Barshay-Szmidt <i>et al.</i> 2016
Taillis des Coteaux	EG.I (rem)	Beta360437	Double-beveled point	15540	50	Brou <i>et al.</i> 2013
Roc-de-Marcamps 1	Ens. B	OxA26662	Saiga	15555	70	Barshay-Szmidt <i>et al.</i> 2016
Roc-de-Marcamps	-	OxA26665	Double-beveled point	15630	70	Barshay-Szmidt <i>et al.</i> 2016

canines (e.g. Lafaye; Saint-Germain-la-Rivière, upper terrace and Mirande collection; Solutré – Route de la Roche) or burials (e.g. El Mirón level 504). This cluster has the particularity of bringing together both SU belonging to the Magdalenian with LAP and SU with strong affinities with the Magdalenian with 'navettes'.

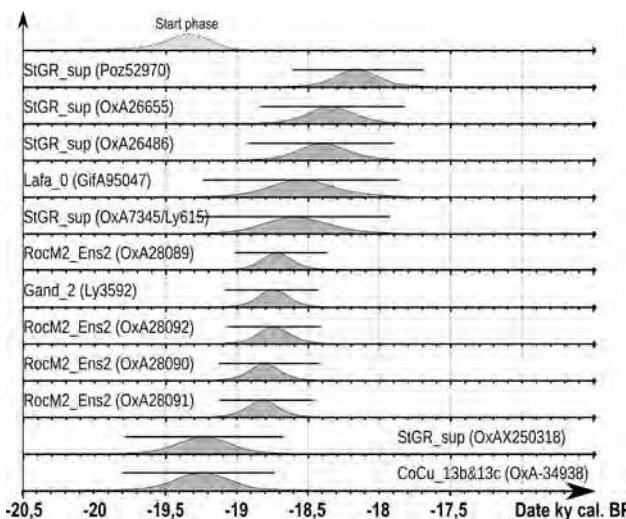


FIGURE 11: Bayesian models for scalene bladelets facies (generated by ChronoModel software using IntCal13 curve calibration).

TABLE 3: Dates and references for Figure 11.

Site	Layer	Code	Object	Date	$\sigma$	Source
Combe-Cullier	13c	OxA-34938	Equus	15950	80	Sécher 2017
Saint-Germain-la-Riviere	coll. Trécolle (C-C1-C2)	OxA250318	Bubo scandiacus	15940	80	Barshay-Szmidt <i>et al.</i> 2016
Roc-de-Marcamps 2	Ens. 2	OxA28091	Saiga	15570	75	Barshay-Szmidt <i>et al.</i> 2016
Roc-de-Marcamps 2	Ens. 2	OxA28090	Rangifer	15550	75	Barshay-Szmidt <i>et al.</i> 2016
Roc-de-Marcamps 2	Ens. 2	OxA28092	Rangifer	15480	75	Barshay-Szmidt <i>et al.</i> 2016
Gandil	2	Ly3592	-	15480	70	Banadara online database
Roc-de-Marcamps 2	Ens. 2	OxA28089	Saiga	15460	70	Barshay-Szmidt <i>et al.</i> 2016
Saint-Germain-la-Riviere	coll. Trécolle (C-C1-C2)	OxA7345/ Ly615	-	15330	150	Drucker, Henry-Gambier 2005
Lafaye	-	GifA95047	Human	15290	150	Gambier <i>et al.</i> 2000
Saint-Germain-la-Riviere	coll. Trécolle (C-C1-C2)	OxA26486	Bone industry	15140	90	Barshay-Szmidt <i>et al.</i> 2016
Saint-Germain-la-Riviere	coll. Trécolle (C-C1-C2)	OxA26655	Bos-Bison	15090	75	Barshay-Szmidt <i>et al.</i> 2016
Saint-Germain-la-Riviere	coll. Trécolle (C-C1-C2)	Poz52970	Rangifer	14940	70	Barshay-Szmidt <i>et al.</i> 2016

This first classification highlights certain coherence in the grouping of the levels of the Magdalenian with 'navettes' and the Magdalenian with LAP. However, the composition of cluster 3 invites us to nuance the strict exclusivity of these facies and to look for the factors that led to their closeness. As for the facies with scalene bladelets, it appears to be becoming more individualized within cluster 2, but will nevertheless require a strengthening of primary contextual data.

The qualitative results raised by cluster 3 lead to the search for unifying elements in the two osseous facies.

LAPs are originally associated with engraved horse incisors, stomach beads and realistic human representations found, among others, in eponymous sites. Some morphological scalene bladelets are known in the "Lussac-Angles" context but their number is too small for a definite attribution to the facies with scalene bladelets according to the criteria defined above (Abauntz: Cazals 2000, Canecaude: Langlais 2007a). It is also in the Magdalenian with LAP that the most perforated hyoid bones are known (e.g. Péricard, Lwoff 1940, Dujardin, Pinçon 2000). In Abauntz (level E), the co-presence of LAP, perforated hyoid bones (Utrilla, Mazo 1996) and a decorated deer canine can be compared to those of Saint-Germain-la-Rivière or Plantade (Tejero Cáceres

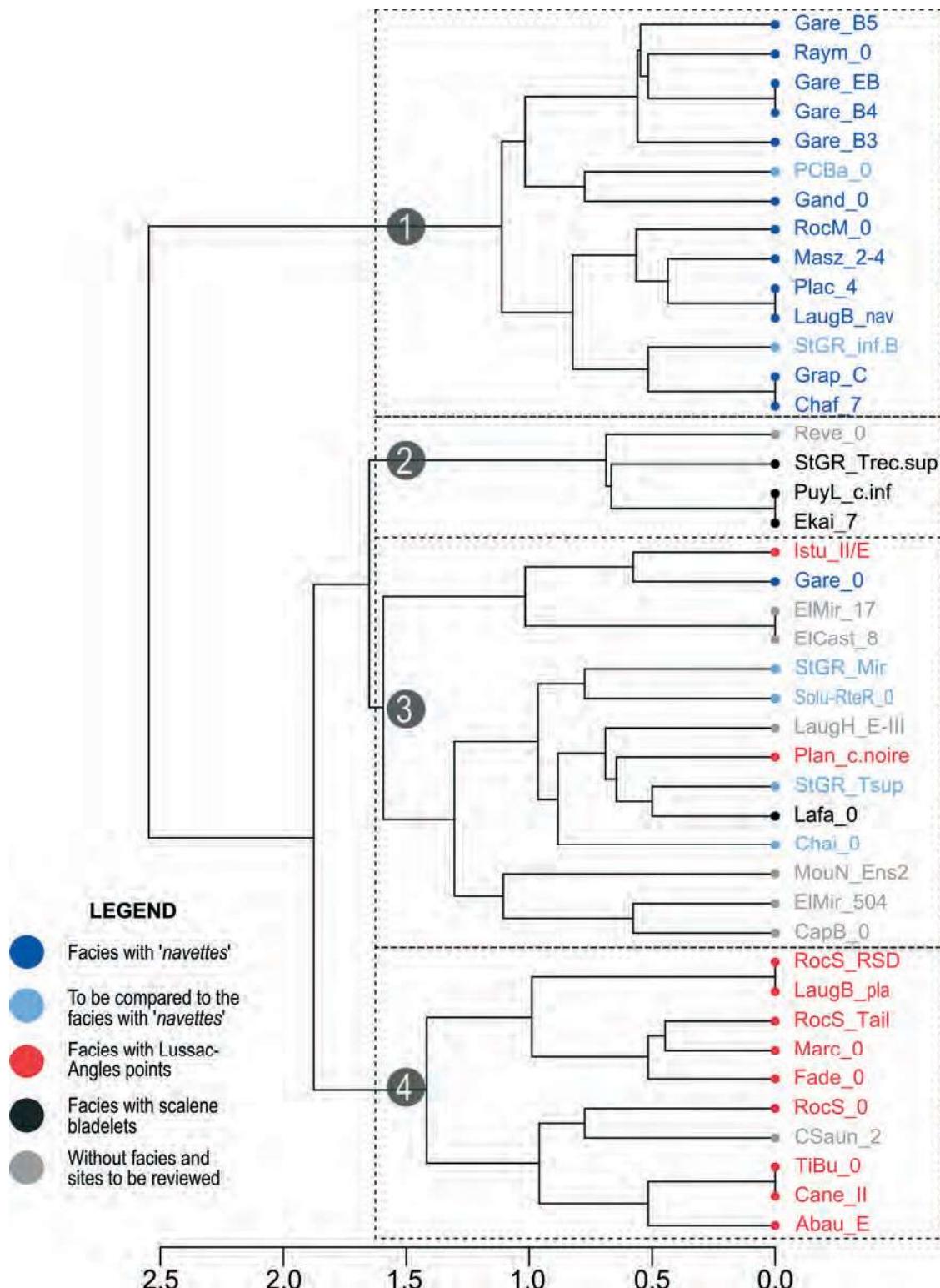


FIGURE 12: Hierarchical ascending classification of different stratigraphic units of EMM according to the features selected in Figure 2 (CAD A. Sécher).

2004). Finally, two markers are probably associated with the Magdalenian of Lussac-Angles, but the ancient excavation context calls for a certain caution. These are the soapstone pearls found in Plantade (Peschaux *et al.* 2017) and the 2A type spearthrower from Isturitz (Cattelain, Pétillon 2015). Ivory pearls called stomach beads are specific to the Magdalenian with LAP of the Vienne (Fadets: Gobillot 1919, Roc-aux-Sorciers: Rousseau 1933, la Marche: Lwoff 1942), we can also link the parietal complex of Roc-aux-Sorciers to them (Bourdier 2010).

In addition to the markers involved in its definition, the facies with '*navettes*' is stratigraphically associated with type 2A spearthrowers (La Garenne level B5 and Roc-de-Marcamps; Cattelain, Pétillon 2015) or perforated hyoid bones (Roc-de-Marcamps) as well as multi-perforated *appliques* (La Garenne level B3 Peschaux *et al.* 2017). The presence of a phallic pierced baton and three perforated hyoid bones in Solutré – Route de la Roche (Lajoux *et al.* 2016) recalls the Roc-de-Marcamps collections. The upper terrace of Saint-Germain-la-Rivière can also be compared to the facies with '*navettes*' thanks to the presence of schematic human representations (Blanchard *et al.* 1972). In addition, the burial and its ornaments (deer canines and soapstone beads) found at the same locus may potentially be associated with the facies with '*navettes*'. Finally, the Mirande collection of the same deposit includes decorated deer canines and two spears with schematic human figures (Vanhaeren 2002, Vanhaeren, d'Errico 2003, Lenoir, Welté 2013, Fuentes *et al.* 2017) and the level B of the lower terrace is provided with double-beveled points and a fragment of a phallic object (Blanchard *et al.* 1972, Langlais *et al.* 2015).

Associations for the facies with scalene bladelets are more difficult to implement due to heterogeneous documentation of the few known sites. The most informative is Saint-Germain-Rivière. The Trécolle excavations in the slope make it possible to link with certainty the scalene bladelets to points with tongued base (Langlais *et al.* 2015). However, the link with the burial (and its ornamental objects) of the upper terrace (Blanchard excavations) remains possible but not proven. The same is true in Lafaye where scalene bladelets coexist (Pajot 1969) with deer canines (Ladier, Welté 1993) and primary burial (Brun 1867, Gambier *et al.* 2000) but synchrony remains to be demonstrated. This site is very close to that of Saint-Germain-la-Rivière. As an indication, the various Raymonden locus (without stratigraphic continuity) yielded a few scalene bladelets (Cheynier 1955), one '*navette*' and a fragment of

phalliform object (Bouyssonie excavations; Allain *et al.* 1985) and a primary burial (Hardy 1891, Barshay-Szmidt *et al.* 2016).

This bibliographical review being established, it remains to reconstitute the links between these different facies. Hyoid bones make it possible to establish a fairly solid first link between the Magdalenian with '*navettes*' and with LAP. Then, the type 2A spearthrower allows to make a probable link which would be complementary to the one already made from hyoid bones. However, uncertainty remains as to the strict association of LAP/type 2A spearthrower at Isturitz. In addition, in Combe-Saunière level 2, there is an association between perforated hyoid bone and type 2A spearthrower independently of '*navettes*' and LAP. These two markers therefore constitute a research avenue to be supported, in particular, by a better contextualisation of these objects (dating, characterisation of the associated archaeological material, etc.).

Finally, possible connections between the three main facies remain to be validated. As seen above, the burial of Saint-Germain-la-Rivière could be near the facies with '*navettes*'. Lafaye's burial can be compared to the scalene bladelets facies present in the deposit. The two burial sites also have a similar set of ornaments (soapstone bead, decorated deer canines). From one close to the other, it is therefore possible to propose relationships between the Magdalenian with '*navettes*' and the Magdalenian with scalene bladelets based on the ornamental register. Similarly, a horse-incisor engraved in Roc-de-Marcamps 2 (facies with scalene bladelets) and one in Roc-de-Marcamps (ancient coll.; facies with '*navettes*') may evoke the incisors decorated from Vienne (Peschaux in Kuntz *et al.* 2015: 494, 510).

For markers that do not participate in the definition of classical facies, there are associations between burials, decorated deer canines and soapstone beads (Saint-Germain-la-Rivière and potentially Lafaye). They can also coexist with clues of Magdalenian with '*navettes*', without a strictly established association, such as the different locus of Saint-Germain-la-Rivière or Raymonden. Similarly, in Cap Blanc, the contemporaneity of the burial and the parietal sculptures has not been demonstrated.

Type 2A spearthrowers are present in both '*navettes*' and Lussac-Angles contexts and can be associated with perforated hyoid bones (Combe Saunière and Roc-de-Marcamps) or decorated scapulae (El Castillo level 8: Almagro Basch 1976, El Mirón level 17: González Morales, Straus 2009). Conversely, hyoid bones are

more present in the Lussac-Angles context than in the '*navette*' facies. They are also associated with the decorated deer canines (Abauntz E; Solutré – Route de la Roche) and most probably with the parietal sculptures of Roc-aux-Sorciers.

Soapstone beads are four out of six cases associated or potentially associated with decorated deer canines, and are present in the burials of Saint-Germain and Lafaye. Possible, but not proven, affiliations can be made with the parietal sculptures and schematic human representations at the Chaire à Calvin, the multi-perforated *appliques* of Laugerie-Haute Est or the facies with scalene bladelets (e.g. Lafaye, Petit-Cloup-Barrat).

Despite the obvious bias represented by some of these deposits that lack reliable archaeostratigraphic data, the recurrence in the sharing of markers (perforated hyoid bones, type 2A spearthrowers, types of ornaments) leads us to consider the existence of interactions between the different EMM entities and relativizes their exclusive status. This shows a certain permeability between the different facies (but also the sites attached to none of the current facies) and repeated contacts between these human groups materialized by exchanges of ideas or objects.

## 7. DISCUSSION

The typological diversity of the EMM archaeological markers allows us to propose connections between the different stratigraphic units. For many, these links remain fragile due to stratigraphic uncertainties in deposits such as Laugerie, Isturitz, le Placard, etc.

Between La Garenne and the ancient excavations of Roc-de-Marcamps, typological ('*navettes*', double-beveled points, phallic pierced batons, schematic human figures, type 2A spearthrowers, fossils shells of Aquitaine) and chronological (between 19,000 and 18,500 cal. BP) rapprochements can be performed. Strong links therefore seem to unite these two deposits, both material (double beveled points, type 2A spearthrower...), but also symbolic (origin of shells for the ornament: Taborin 1993, styles of human representations: Fuentes 2013). These sites have thus been occupied by groups linked together by similar symbolic practices and by a well-structured system of alliance, exchange or contacts (social and economic).

Within the facies with LAP, the eponymous sites are obviously very close and can be particularly close to Laugerie-Basse (decorated incisor, worked hyoid bone) and the Isturitz site, which is the third site with the most

LPA (49 for level II/E). These sites of Vienna and Isturitz are therefore probably very closely linked within a socio-economic network. The LAP of La Marche and Taillis des Coteaux are unfortunately too altered to be directly dated (Brou *et al.* 2013). Tests at Roc-aux-Sorciers would be welcome in order to clarify the chronological framework of the Vienne and to better model the diffusion of these objects, particularly along the Pyrenees and to verify the recent dates (LMM?) of Abauntz or Trilobite. It is therefore surprising that the eponymous sites are the most recent. In addition, the presence of LAP, type 2A spearthrower or perforated hyoid bones in Cantabria is an additional indication of the relationship between EMM and *Magdalenien inferior cantábrico* on both sides of the Pyrenees. A more specific investigation will have to be carried out in order to better compare the different archaeological registers, both technical (lithic and osseous industries) and symbolic (ornaments, arts).

Finally, the facies with scalene bladelets is the one that will benefit most from being specified from a chronological point of view (in particular the Spanish sites of Sant Benet and Coma d'Infern) since it will persist during the LMM. Saint-Germain-la-Rivière remains a central site for EMM with a high proportion of scalene bladelets compared to truncated backed bladelets. This proportion is lower at Roc-de-Marcamps 2 and Combe-Cullier (c.13b/13c). On the contrary, scalene bladelets almost exclude truncated backed bladelets in Le Crès.

Within each facies, links can be drawn with more or less strength. Until now, both '*navettes*' and LAP facies were considered exclusive and asynchronous. Chronologically, thanks to Bayesian models, a wide contemporaneity between these facies has been established. This overlap is not only chronological but also geographical since the different facies of the Magdalenian overlap in a Gironde-Périgord-Poitou triangle. In addition, it has been shown that some markers can link the different facies (hyoid bones, type 2A spearthrowers, etc.). The sharing of objects, whether technical (raw materials, microlith morphotypes, spearthrowers) or symbolic (ornaments), testifies at least to a contact with exchanges of objects or the circulation of individuals between the different groups. For example, the Roc-de-Marcamps and Grotte des Fées sites concentrate the three main facies in very narrow chronological intervals, around 19,000–18,500 BP cal.

There is still no solid data on microlithic elements, which nevertheless seem to constitute the best discriminating factor for lithic industry and an

"important identity vector [...] at the heart of livelihood strategies" (Ducasse, Langlais 2008: 75). The designation "facies with scalene bladelets" can be maintained but only by conditioning the attribution rules previously defined. This seems to be a good prerequisite for normalizing the attachment to this facies, thus excluding numerically poor series, containing few scalene bladelets (potential morphological convergences of truncated backed bladelets) and potentially biasing interpretations.

The relevance of these facies of lithic and osseous industries, created above all by archaeologists to order sites, had to be discussed. Should we therefore consider these facies as "boxes" for classifying sites containing "guiding fossils" or as a reflection of cultural traditions in their own right with a unity of values, symbols and techniques?

The use of hierarchical ascending classifications, based on the crossing of a set of archaeological markers, has demonstrated the consistency of the well grouped '*navettes*' and LAP facies (clusters 1 and 4) even if cluster 3 has a mosaic of features. It should be recalled that this classification still suffers from some gaps in the source data that will have to be filled by a revision of the various collections in question.

It seems appropriate to consider the Magdalenian with '*navettes*' and the Magdalenian with LAP as two well individualized cultural traditions, codified and with well-defined symbolic conventions. Indeed, beyond the technical register, the modes of representation of humans seem to be the perfect identity criterion to distinguish these two entities. On the one hand, the realism of the typical figures of La Marche highlights the individual "*as a social claim of the individual existing within the community*" and "*this view of oneself has not developed, or at least has not been widely disseminated*" (Fuentes 2013: 611). On the other hand, the schematic and fairly standardized representations of the Magdalenian with '*navettes*' advocate for the erasure of individuals "*in favour of a stereotyped figure*" (Fuentes 2013: 547). The same formal dichotomy seems to be expressed through the stylistic conventions of horse representations in movable and parietal art (Bourdier *et al.* 2017a). On the one hand, animal figures from the Magdalenian with '*navettes*' are rare and schematic (rectilinear silhouettes with no dynamism, few internal details). On the other hand, those of the Magdalenian with LAP, in Poitou, seem more abundant and generally adopt a more realistic style (dynamism of subjects, internal details, modelling of muzzles and hooves). Finally, the ornamental traditions are also distinguished and in

particular for the Magdalenian in LAP (stomach beads, decorated horses incisors...). This opposition in artistic conventions and identity codes argues in favour of two distinct cultural traditions and allows us to exclude the hypothesis, sometimes advanced, that '*navettes*' and LAP facies are only variations in the function of the sites or in the seasons of occupation.

However, these two cultural traditions are not totally isolated from each other or from the rest of the Magdalenian populations that have not produced markers. Indeed, the permeability of certain features (type 2A spearthrowers, decorated hyoid bone...) testifies to these interactions. EMM is therefore marked by arrhythmias in the diffusion of certain concepts (chronological gap between the lithic industry and the osseous industry). On the one hand, the EMM is characterized by a rapid globalization of the laminar phenomenon and backed bladelets (Langlais *et al.* 2016, Sécher 2017) and, on the other hand, it is marked by a regionalization of certain objects (scalene bladelets, LAP...) or symbolic manifestations (sculptures, human representations...) defining a series of traditions.

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