

*Magdalenian chrono-stratigraphic correlations and cultural connections
between Cantabrian Spain and Southwest France...and beyond.
Corrélations chrono-stratigraphiques et interactions culturelles au cours du Magdalénien
entre l'Espagne cantabrique et le Sud-Ouest de la France... et au-delà.
Correlaciones y Conexiones Crono-Culturales del Magdaleniense
entre la Región Cantábrica Española y el Sur-Oeste de Francia...y más allá*
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The bone industry collections from the Middle and Upper Magdalenian levels in La Viña rock shelter and Llonin cave (Asturias, Northern Spain)

Les collections d'industrie osseuse des niveaux du Magdalénien moyen et supérieur de l'Abri de La Viña et la Grotte de Llonin (Asturies, Nord de l'Espagne)

Domestic, hunting and symbolic spheres *Sphères domestique, cynégétique et symbolique*

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To Javier Fortea Pérez (1946-2009)
To Manuel Hoyos Gómez (1944-1999)

Abstract: In the long narrow Cantabrian region, numerous Magdalenian sites have contributed abundantly generic elements but also more specific ones. The internal temporary development, population flows, technological innovations and symbolic transformations have alternated over time offering a series of changing periodization's and cultural models largely subdued to the information from old excavations. This imbroglio, added to the data of the recent excavations, makes difficult to define these big questions that have already become paradigms because a degree of precision that we lack at the moment would be necessary. The Middle Magdalenian (MM) is well represented in La Viña and Llonin, and at the latter site its presence has been now detected in all the cave's excavation areas. Conversely, the Upper Magdalenian (UM) is better documented in Llonin. Here, however, stratigraphic contamination affecting the characterization of the MM and the UM has been recognized. In this case, such contamination is due to anthropogenic disturbances directly linked to the construction of hearths in the Galería area. The Cantabrian MM/UM transition is also marked by other kinds of post-depositional processes: a short cold episode presumably associated with the MM, also manifested in La Viña III, followed by a humid phase linked to the UM that caused karst reactivation and sediment transport. If those processes occurred (anthropogenic and/or natural), with the consequent mixing of the archaeological record, they were masked in the old excavations. La Viña and Llonin have clearly shown these processes and their consequences.

The quantity of the studied collections is diverse in terms of the sites and levels and so the domestic, hunting and symbolic spheres. Structural differences stress the importance of the type of site (rock shelter/cave), topographic location and internal spatial distribution. In La Viña the techno-economic investment was greater than in Llonin. Symbolism experienced a series of change during MM/UM that is not tracked through the general analysis. According to the toolkit and the correlations of the studied levels altogether with other sites, we have differentiated two phases in the MM. One (MM1) is present in La Viña-Level IV and the other (MM2) is documented in Llonin (Galería II, Vestíbulo III-IIB, Cono Anterior X) and La Viña-Level III. Bone-discs and fork-based points are common in both phases,

but there are differences such as, respectively, bone cut-outs and multi-barbed points ('proto-harpoons') *versus* half-round rods with dorsal protuberances and the diversification of double-bevelled and point-based points. They also differ in terms of abundant portable art with figurative representations *versus* scarcity thereof. Nevertheless, the available record of the MM2 phase is fragmentary, because levels are thin and in La Viña it is spatially very restricted. On the other hand, the UM has a varied multi-barbed point ('harpoon') typology in detriment of other projectile points, tools are rarefied and there occurred an artistic renovation, previously interpreted as a regional process.

In this context, the MM/UM shift reveals important and rapid changes that need to be better documented within the regional framework, because the archaeological resolution is insufficient to assess the internal evolution, and therefore comparisons with the Pyrenean-Aquitaine area remain tenuous and problematic, as are evidences of the interrelationships and their directionality. Finally, if we can foresee a finer and oscillating evolution linked to the small-scale ecosystem changes, the specific features arise. It is necessary to determine what elements that define these episodes are not contaminations that simulate a progression with respect to inventions and rejections.

Keywords: Tardiglacial, hard animal material points/tools, ornaments, portable art, decorative motifs, Franco-Cantabrian relationships.

Résumé: Dans de nombreux sites magdaléniens de la longue et étroite région cantabrique, les caractéristiques générales se confondent avec d'autres, plus spécifiques, où le temps, la population, les innovations et le symbolisme se sont dilués dans un abondant registre archéologique, mais ont été soumis aux informations des anciennes fouilles et des périodes changeantes proposées à ce jour. Le Magdalénien moyen (MM) est bien représenté à La Viña et à Llonin. Sur ce dernier site, sa présence a été détectée dans toutes les zones de fouille de la grotte. Inversement, le Magdalénien supérieur (MS) est mieux documenté à Llonin. Ici, cependant, une contamination stratigraphique affectant la caractérisation du MM et de l'UM a été repérée. Dans ce cas, il s'agit des perturbations anthropiques directement liées à la construction de foyers dans le secteur de la Galerie. La transition MM / MS dans la région Cantabrique est également marquée par d'autres types de processus post-dépositionnels : un court épisode de froid vraisemblablement associé au MM, également manifesté dans La Viña III, suivi d'une phase humide liée au MS qui a provoqué la réactivation karstique et le transport de sédiments. Si ces processus (anthropiques et/ou naturels) se sont produits dans les sites, avec le mélange consécutif des niveaux archéologiques, ils étaient masqués dans les fouilles anciennes. La Viña et Llonin ont clairement montré ces processus et leurs conséquences.

La quantité des collections étudiées est diverse en ce qui concerne les sites et les niveaux et ainsi les sphères. Les différences structurelles soulignent l'importance du type de site (abri rocheux / grotte), de la localisation topographique du même et de la distribution spatiale interne. À La Viña, l'investissement techno-économique est plus intense qu'à Llonin. Le symbolisme expérimente une série de changements tout au long du MM / MS qui ne sont pas cependant suivis dans l'analyse générale. Selon l'équipement osseux et la corrélation des niveaux étudiés et d'autres sites, nous avons différencié deux phases dans le MM. L'un (MM1) est présent dans le niveau IV de La Viña et l'autre (MM2) à Llonin (Galería II, Vestíbulo III-IIB, Cono Anterior X) mais aussi à La Viña, niveau III. Les rondelles et les pointes à base fourchue sont communs dans les deux phases, mais il existe des différences telles que, respectivement, les contours découpés et les 'proto-harpons' (MM1) *versus* baguettes demi-rondes avec des protubérances dorsales et la diversification des pointes à double biseau et à base appointée. De même, l'art mobilier figuratif *versus* la rareté du même. Néanmoins, les données disponibles sur la seconde phase du MM sont fragmentaires car les niveaux sont très minces et à La Viña ils sont très restreints spatialement. De sa part, le MS dispose d'une typologie variée des pointes multi-barbelées au détriment d'autres types de projectiles. En plus, les outils se sont raréfiés et une rénovation artistique, interprétée auparavant comme un processus régional, apparaît.

Dans ce contexte, le passage MM / MS révèle des changements importants et rapides qu'il s'avère nécessaire de mieux documenter dans le cadre régional, car la résolution archéologique est insuffisante pour évaluer l'évolution interne. Par conséquent, les comparaisons avec la zone Pyrénées-Aquitaine restent faibles et problématiques, ainsi que les interrelations et leurs directions. Enfin, si nous pouvons prévoir une évolution plus fine et oscillante liée aux modifications de l'écosystème à petite échelle, il est nécessaire de déterminer quels éléments qui ont dehors et déjà défini ces épisodes ne sont pas des contaminations simulant une progression par rapport aux inventions et aux rejets.

Mots-clés: Tardiglaciaire, projectiles/outillage en matières dures animales, parure, art mobilier, motifs décoratifs, relations franco-cantabriques.

INTRODUCTION

Magdalenian sites in the Cantabrian region are numerous and usually yield bone industries in a good state of preservation. The Magdalenian assemblages from Altamira, El Castillo, Cueto de la Mina, La Riera and La Paloma were considered to be the most representative ones during the first half of the 20th century and lead to a singular evolutionary cultural model for this north-western part of Iberia where multi-barbed points (*i.e.*, harpoons) attained a predominant status and possessed a regional difference vis à vis SW France (*i.e.*, the perforated base). With this artefact type, the Upper Magdalenian (UM) was clearly identified in excavations, but the definition of a Middle Magdalenian (MM) was not so clear, given that fork-based points were elusive (Vega del Sella, 1917; Hernández Pacheco, 1923; Obermaier, 1925). Thereafter, very few sites were excavated or studied until the 1960s (Barandiarán, 1972; Utrilla, 1981; Corchón, 1986; González Sainz, 1989).

Late 20th century excavations finally consolidated the existence of the MM and in this context La Viña provided the first perforated bone disc and animal head cut-outs at the western-end of the Cantabrian Magdalenian territory, while Las Caldas yielded singular decorated pieces (an anthropomorphic sculpture, a spearthrower, pendants), all in significant levels (Fortea *et al.*, 1990a). The excavations in Llonin, conducted partially simultaneously with those at La Viña, added another perforated bone disc and singular portable art to the current inventory of MM and UM assemblages (Fortea *et al.*, 1990b). La Garma contributed a high-quality MM sequence with an extraordinary living-floor and portable art (Arias *et al.*, 1999). In addition, other finds and re-excavations have enlarged the sequence and exceptional pieces have been added to the regional collections (e.g., Cueva Oscura de Ania, Coimbre, El Linar, Las Aguas, Santimamiñe, Praile Aitz, Ezkuzta and Abauntz in the Ebro-Pyrenean frontier).

However, the internal developments and the Lower Magdalenian-Middle Magdalenian and Middle Magdalenian-Upper Magdalenian transitions are still poorly documented. There is no clear in situ evolution at these sites, except in Las Caldas, but post-sedimentological processes here were important and liable to have caused inter-stratigraphic mixing (Hoyos, 1995). In other cases, because the excavations are old, there is information bias (artificial and “in bulk” archaeological and stratigraphical divisions and artefact selection) that cannot be undone (e.g., Altamira, El Castillo, Aitzbitarte IV). Finally, in some sites it would be important to extend the excavation areas in order to recognize the whole stratigraphy and/or to understand the site’s depositional dynamics (e.g., El Buxu, El Cierro, Colubil, Coimbre, El Linar, Las Aguas, Cualventi, El Pendo, La Garma, Santimamiñe). At present, even the sedimentological information is not completely analyzed in detail within the regional chronoclimatic framework (Rasilla and Duarte, 2017). Here, but apparently unlike other Magdalenian areas (Straus, 1990-91; Pétilion *et al.*, 2016), the

geological setting, fluvial/karst drainage systems, precipitation ranges, retreat of the perpetual snows, coastal location, natural soles/sediments and diverse biotopes, involve profound and changing characteristics where post-depositional processes (mainly focused on humidity) have frequently been rejected or unnoticed when analyzing and comparing archaeological assemblages. All this entails nuances among environmental changes as registered in pollen (Hoyos, 1995), which go unnoticed by the prevailing climatic models made from the long-time scale ice and marine cores.

In addition, not all the sites have been studied exhaustively and in the case of the Tardiglacial assemblages of La Viña and Llonin had not began to be systematically studied or published until recently (Rasilla *et al.*, i. p; Duarte *et al.*, 2012, 2014). Therefore, apart from the most noteworthy portable art and bone artefacts, the techno-complexes of these sites were little known.

Here we describe these assemblages focusing on the main typological, decorative and technological trends within each site, as well as their relative stratigraphical positions and cultural assignments. The aim is to expand the knowledge of each site, the cultural evolution and the relationships between them and the broader Magdalenian culture. The starting point for this study was the paradox that the manufactured bone assemblage at La Viña was larger for the MM while at Llonin it was larger for the UM, so the comparison between the two sites seemed quite weak. However, systematic refitting and stratigraphic re-evaluations have led us to identify the MM in all the excavation areas at Llonin cave, thus forming an overall assemblage that is little different (tentatively designated by us as MM2) from La Viña (now designated as MM1). In contrast, a diagnostic UM assemblage is absent in La Viña (but MM2).

THE SITES

La Viña rock Shelter (La Manzaneda, Oviedo, Asturias; fig. 1)

The site is located in the middle basin of the Nalón River. It is 292 m above sea level, ~100 m above the closest drainage (Nalón River), ~29 km away the Cantabrian Sea in a straight line and faces SSE. It formed in Visean-Namurian limestone in a mid-mountainous relief, with a surface area of ~225 m² and ~30 m long. It preserves a long stratigraphic and cultural sequence and a singular rock art partially covered by the stratigraphy (Fortea, 1994; González-Pumariega *et al.*, 2017).

Stratigraphy

The excavation was conducted in two sectors, Sector Central (SC) and Sector Occidental (SO), located in the areas where engravings appeared just above the ground surface and where in 1981 the geophysical study identified the deepest area (Fortea, 1990, p. 55). In both sectors there

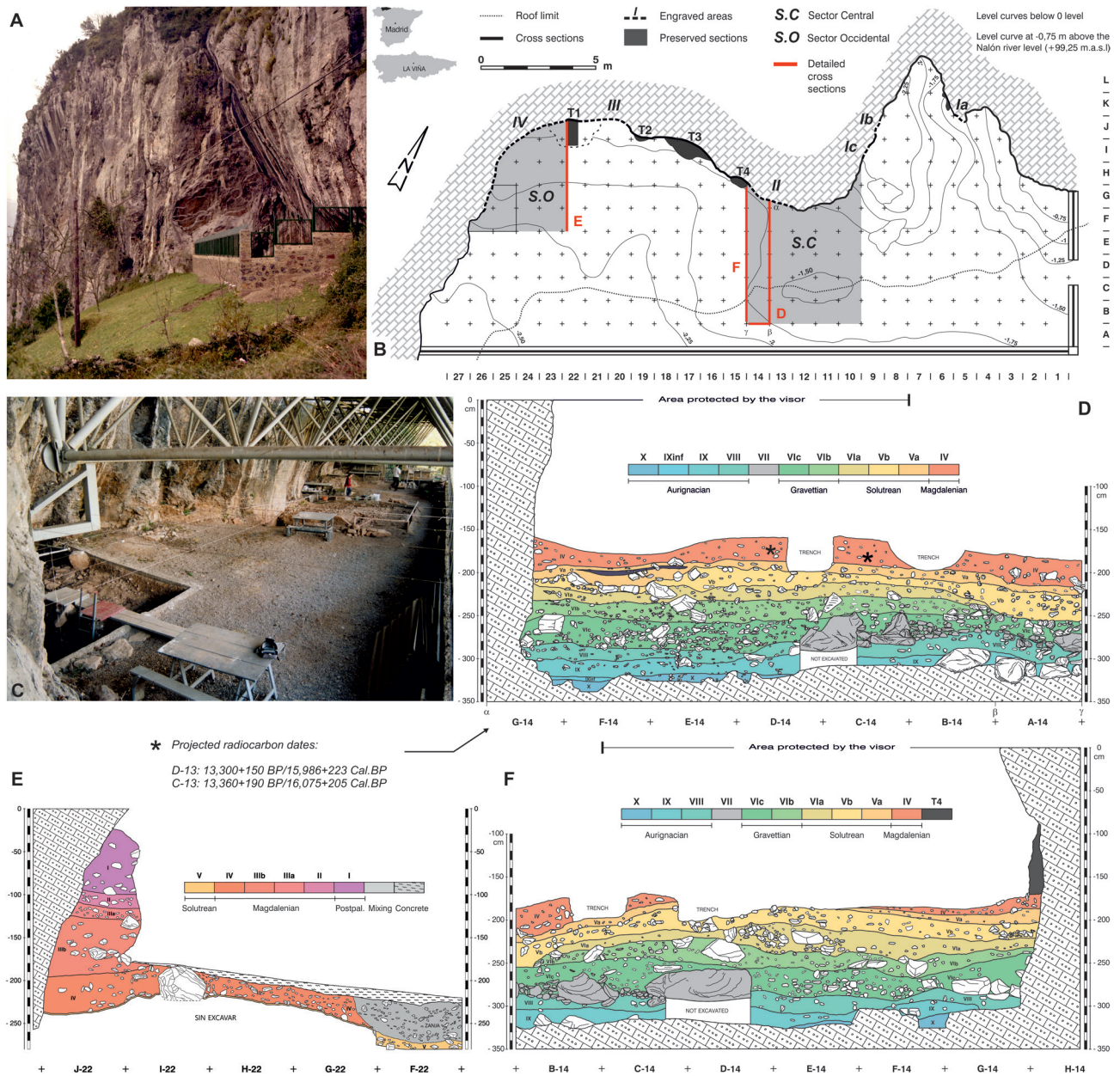


Fig.1 – La Viña rock shelter. A. General view; B. Plan; C. General view of the excavation areas; D-F. Stratigraphic sections: D and F. Sector Central; E. Sector Occidental (photos J. Fortea).
Fig. 1 – Abri de La Viña. A. Vue générale du site ; B. Plan ; C. Vue générale des zones fouillées ; D-F. Coupes stratigraphiques : D and F. Sector Central, E ; Sector Occidental (clichés J. Fortea).

are calcareous masses covering the wall (T4 and T1), so the whole stratigraphy of La Viña is identified here.

The cultural sequence is: Mousterian, polymorphic Protoaurignacian, Early Aurignacian, Recent Aurignacian, Gravettian, Middle and Upper Solutrean, Middle and Upper Magdalenian and Post-Paleolithic remains (Fortea, 1981, 1990, 1992, 1995, 1999, 2001; Fortea *et al.*, 1990a; Duarte *et al.*, 2012, 2016; Santamaría *et al.*, 2014; Santamaría, 2012; Marín-Arroyo *et al.*, 2018; Rasilla *et al.*, 2018).

The information from Level II is scarce due to its mere presence in the calcareous masses T1-T4. Level III, present also in T1-T4, spreads a little more through the surroundings of the masses. Both levels were excavated across a

small area. Level IV is preserved across the whole site and is almost the first level in the sequence. ~25 m² were excavated and an important archaeological collection was recovered.

Although sedimentological studies are still in progress the level characteristics of in both sectors are as follow (fig. 1D-F):

- Level IV: Deposited over a paleo-relief filling and equalizing the soil irregularities. Its components are products of frost weathering and runoff waters and are friable. The cryoclasts decrease in size and frequency from the middle part of the level to the top and evidence of humidity is quite important at the bottom, decreases in the middle and increases in the upper part. In some

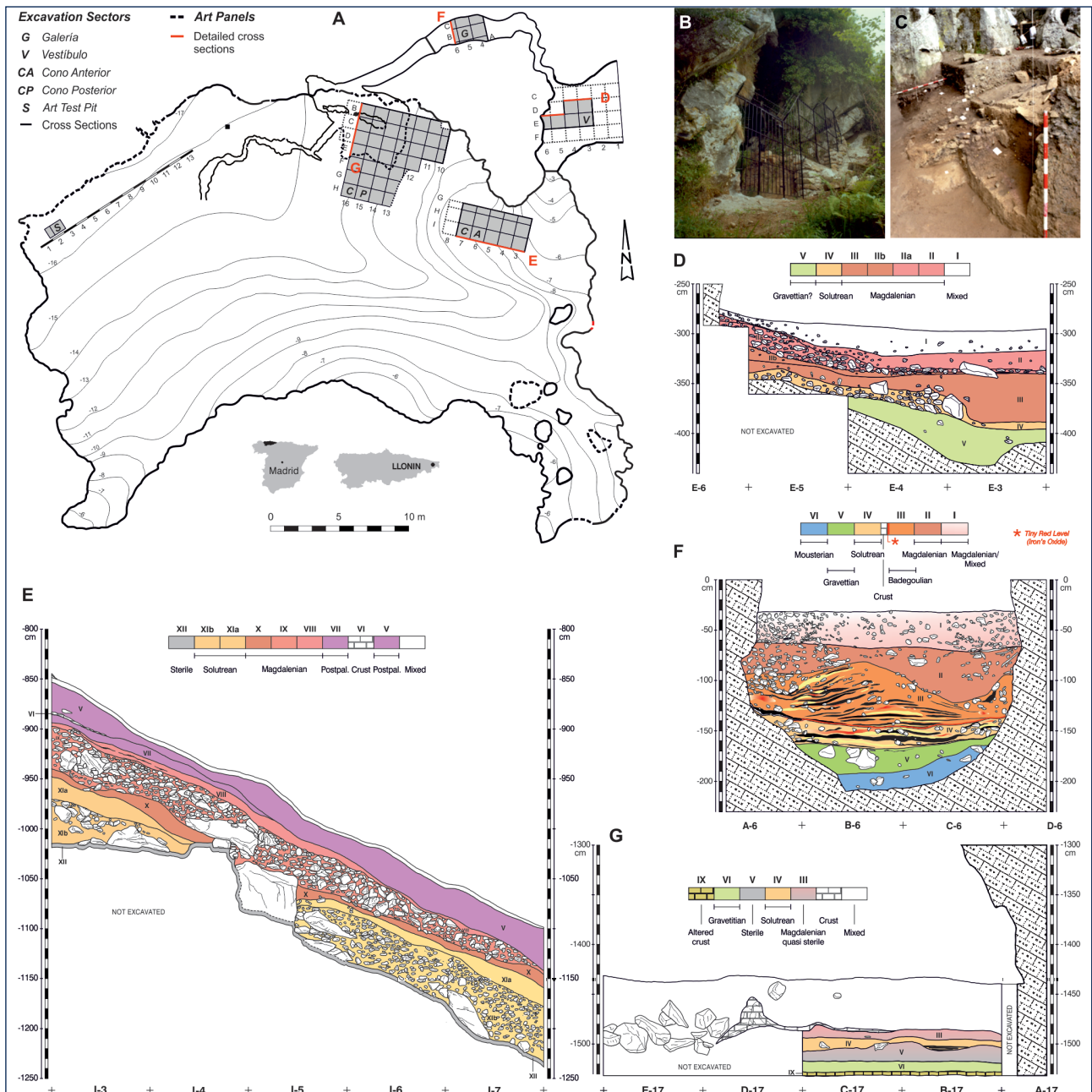


Fig. 2 – Llonin cave. A. Plan; B. General view; C. Vestibulo area during the excavation works; D-G. Stratigraphic sections: D. Vestibulo, E. Cono, F. Galería, G. Cono Posterior (photos J. Fortea).

Fig. 2 – Grotte de Llonin. A. Plan ; B. Vue générale du site ; C. Vue de la zone du Vestibulo pendant la fouille ; D-G. Coupes stratigraphiques: D. Vestibulo; E. Cono Anterior; F. Galería; G. Cono Posterior (clichés J. Fortea).

places, it is strongly colored with red iron oxide (Fortea, 1990; Hoyos, 1995).

- Level III: Breccia with few diagnostic artefacts. The main level components are the products of frost weathering, with scarce deposition of elements from runoff water.

The paleoclimatic assignation for Level IV is Dryas I/Bølling and for Level III is Dryas II (Hoyos, 1995, p. 50-63, 69).

Two radiocarbon dates are considered to be appropriate for Level IV: they were obtained in the year 1983 for which ~2 kg of bones were used in each case (Fortea, 1990, p. 65; Santamaría *et al.*, 2014, p. 98, Cal: OxCal program based on the 2013 IntCal curve):

- Ref.: VI 7. Square: C-13 (bones from the bottom to the midpoint of the level). Lab. No.: Ly-3316 = 13,360±190 BP; 16,075±205 cal. BP.

- Ref.: VI 8. Square: D-13 (bones come from the entire level). Lab. No.: Ly-3317 = 13,300±150 BP; 15,986±223 cal. BP.

Llonin Cave (Peñamellera Alta, Asturias; fig. 2)

Llonin cave is located in the Cares-Deva basin at 112 m above sea level, ~23 m above the closest drainage (La Molinuca stream) and ~18 linear km from

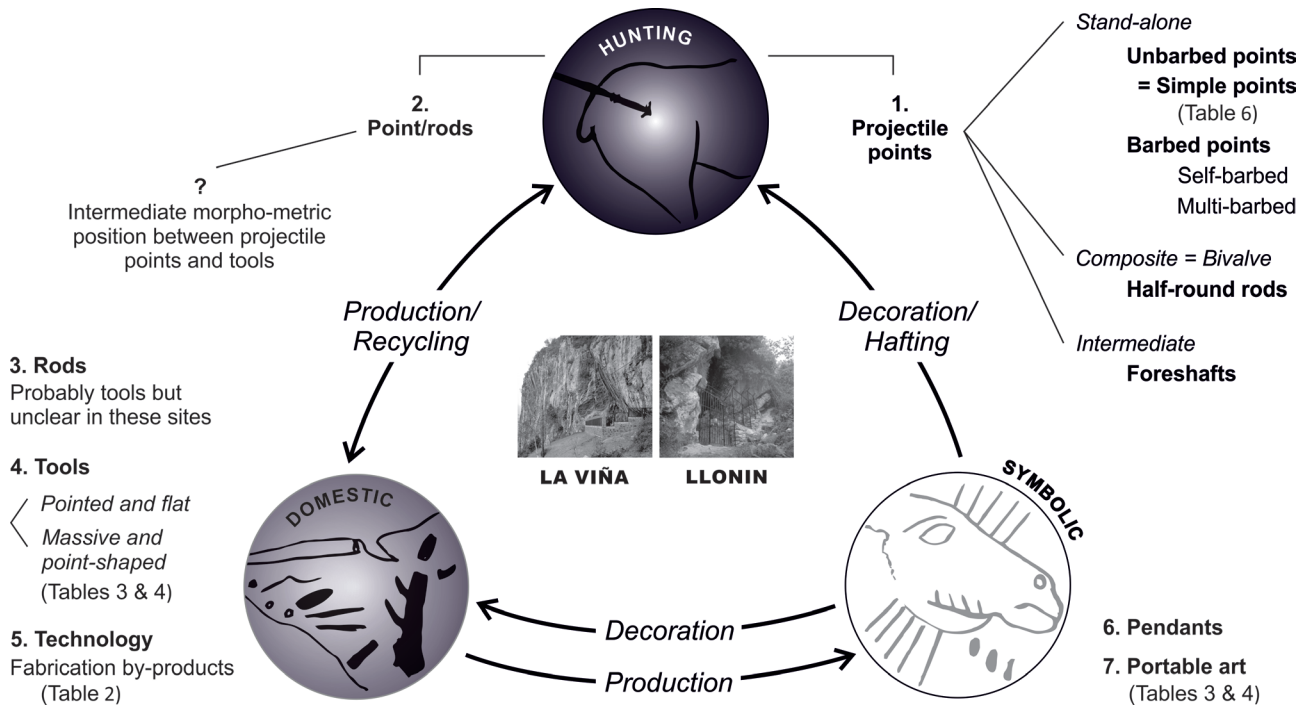


Fig. 3 – Spheres and typological organisation used in the present study.
Fig. 3 – Sphères et organisation typologique utilisées dans cet étude.

the present shore of the Cantabrian Sea. It faces ENE and is formed in Namurian limestone. The Cares-Deva valley is surrounded by a steep mountainous relief with several mineral outcrops while the landscape around Llonin is enclosed by mid-altitude mountains and the Peñamellera peak which constitutes a prominent landmark. Llonin preserves an important Middle and Upper Palaeolithic stratigraphic and cultural sequence, along with remarkable rock art with a long chronology (Fortea *et al.*, 2004).

Stratigraphy

The excavation was conducted in four sectors based on the cave's morphology and the cultural sequence is: Mousterian, Gravettian, Upper Solutrean, Badegoulian, Middle and Upper Magdalenian and presence of Azilian and Bronze Age (Fortea *et al.*, 1992, 1995, 1999, 2004, 2007, 2010; Fortea, 2001; Aura *et al.*, 2012; Duarte *et al.*, 2012, 2014, 2016; Sanchis *et al.*, 2019; Rasilla *et al.*, 2014, 2019).

While sedimentological studies are still in progress, the stratigraphy in the sectors included in this study is as follows (fig. 2D-G):

Galería:

- Level II: More or less compact dark brown clayey-sandy level (see *infra*, section Llonin cave, Level II, Galería)

- Level I: The upper part was disturbed by animals and clandestine human activities. The remainder was a loose black anthropogenic level (see *infra*, section Llonin cave, Level I, Galería).

Vestíbulo:

- Level III: Yellowish clay level with few pebbles and archaeological material. The effects of karst reactivation removed the material eventually deposited there and only a few artefacts were found some in a restricted area near the wall (see *infra*, section Llonin cave, Level III, Vestíbulo).

- Level II: Black anthropogenic level that was sub-divided during excavation into IIB (the first angular pebbles/cobbles that penetrate in Level III) and IIA (a bed of pebbles/cobbles over the clayey Level III).

Cono Anterior:

- Level X: Light brown sandy-clayey bed with minor coarse-grained fraction.

- Level IX: Very washed-out bed, with a scarce fine-grain fraction but plentiful pebbles/cobbles.

- Level VIII: Black anthropic level.

MATERIALS AND METHODS

The general content of the assemblages has been studied through a quantitative morpho-metric perspective, based on typological, technological and ornamental/art pieces. They have been associated to clusters and spheres (hunting, domestic or symbolic) with the aim of assessing the general articulation of the assemblages, comparing the two sites and the internal Magdalenian phases (fig. 3).

We have revised the complete faunal assemblage (~200,000 remains) from the MM and UM levels of La Viña (IV, III and II) and Llonin (X, IX and VIII from Cono

Anterior, III and II/IIB/IIA from Vestíbulo and II and I from Galería) to identify the existence of these pieces. We have also revised all the material from the initial surface and mixed sediments, surface and stratigraphic cleaning and fall of stratigraphic-sections. We have only incorporated the artefacts that fit morphologically with the periods under study. The latter are classified under the heading 'unclear stratigraphical correspondences'.

The artefacts obtained in this revision, as well as those separated during excavation and laboratory work, have all been analysed together. So the studied artefacts are 1,295 in total (table 1).

For raw materials, general categories have been used: antler (deer), bone, tooth, shell and indeterminate antler/bone. The bone's anatomical origins and species have

been identified where the epiphysis or determinant features are preserved. Regarding the shells, we have counted the undoubtedly anthropogenically perforated ones (n = 99, table 1); a detailed analysis including species, technology, typology, etc., is under study by I. Gutiérrez Zugasti (University of Cantabria).

The clear technological evidences for bone and antler technological processes total 392 artefacts (table 1). They have been identified and classified following different authors (Averbouh, 2001; Ramseyer, 2004; Pétillon and Ducasse, 2012; Baumann and Maury, 2013; Tejero *et al.*, 2014), but they are assembled in big morphologically descriptive groups (table 2).

The state of preservation has been evaluated in terms of alterations and fragmentation, and we have tried to

Raw material	Object	La Viña				Llonin									Total
		SO, SC	SO-T1, T4	T1, T3	USC	CONO ANT			VEST			GAL		USC	
		IV	III	II		X	IX	VIII	III	IIB	IIA-II	II	I		
Bone, Antler, Teeth	Technological	204	5	1		58	56	36	3**	7	11	6	5		392
	Typological	458	29*	7	22	68	43	4	8**	12	20	52	56	25	804
Shell	Perforated	4	1			75	2	5				1		11	99
	Total	666	35	8	22	201	101	45	11	19	31	59	61	36	1295

Table 1 – La Viña and Llonin. Technological and typological objects (Typological objects: points, tools, pendants and portable art; *1 Point from Sweeping previous to excavation; **1 technological piece and 1 hammer/retoucher from the intersection between levels III and IV; SO: Sector Occidental; SC: Sector Central; USC: Unclear stratigraphical correspondences).

Tableau 1 – La Viña et Llonin. Objets technologiques et typologiques (Objets typologiques : pointes, outils, pendentifs et art mobilier ; *1 pointe est issu du Balayage avant la fouille, **1 objet technologique et 1 perceur/retouchoir du niveau III-IV, SO: Sector Occidental, SC: Sector Central, USC: Correspondance stratigraphique pas claire).

Raw material	Object	La Viña			Llonin								Total		
		SO, SC	SO-T1, T4	T1, T3	CONO ANT			VEST			GAL				
		IV	III	II	X	IX	VIII	III	IIB	IIA-II	II	I			
Antler	Splinter	75		1											76
	Splinter with GST	56	1						1*		1				59
	Tine	36			17	30	18			2	4			3	110
	Basal shed/u	5	1 burr												6
	IF with GST				7	3			2						12
	Flake/IF	17	3		32	23	18			5	6	5	2		111
Bone	Splinter with GST	11			1								1		13
	DCL	4													4
	Flake/IF				1										1
	Total	204	5	1	58	56	36	3	7	11	6	5	5	392	

Table 2 – La Viña and Llonin. Technological objects

(SO: Sector Occidental; SC: Sector Central; USC: Unclear stratigraphical correspondences; *Intersection between levels III and IV; GST: Groove-and-splinter technique; IF: Indeterminate fragment; DCL: Double convergent lines).

Tableau 2 – La Viña et Llonin. Objets technologiques

(SO: Sector Occidental ; SC: Sector Central ; USC: Correspondance stratigraphique pas claire ; *Niveau III-IV ; Flake/IF : Éclat/ Fragment indéterminé ; DCL: Lignes doubles convergentes).

	Area	Level	Square, subsquare	Depth (cm)	Vd (cm)	Hd (cm)	Object	Refitted fragments	Fracture	Refit	Fig. here
La Viña	SO, SC, T1-T4	III	I-23, 6	-46/-55	<9	<10	Point, mesial fragment	2: TM-TM	ST +C	This study	9.2
		III	J-24, 4	-43/-56	<13	<10	Conic-based point	2: TP-TD	T, long +C	Excavation	9.13
		IV	C-13, 9	-37/-42	<5	<47	Needle without hole	2: TM-TM	ST +C	This study	
		IV	D-14, 2	-120/-130	<10	<47	Fork-based point	2: Left FT-TP	R/Exc	This study	3.3
		IV	E-14, 1/5	-50/-85	<35	47-94	Wedge/chisel	2: TP-TD	ST	This study	3.10
		IV	G-23, 1/2	-91/-100	<9	47-74	Subrectangular rod	2: TM-TM	R/Exc	This study	4.14
		IV	H-24, 5/8	-86/-96	<10	47-74	Fork-based point	2: Right FT-TP	T	This study	
		IV	I-24, 8/9	-70/-86	<17	47-74	Subrectangular rod	2: TM-TM	P/Exc?	This study	
		IV	H-24, 2/9	-70/-80	<10	74-121	Half-round rod	2: LLM-RLM	R/Exc	This study	
		IV	H-26	-66/-114	<48	<47	Needle	4: TP-TM-TM-TD	R/Exc	This study	3.16
Llonin	CA	IX	H-3/H-4	-850/-940	<90	<47	Rod	2: TM-TM	R/Exc +F	This study	10.13
		X	H-3	-900/-935	<35	30	Bull-roarer	2: TP-TD indirect	Irr	Excavation	
		X	H-4	-940/-970	<30	<10	Rod	2: TP-TD	ST	Excavation	5.11
		X	H-6/H-7	-1120	0	~40	Point/rod	2: TD-TM	R/Exc +F	This study	5.10
	VEST	II	D-3, 8	-329/-333	<4	5	Multi-barbed point, 1	3: TP-TM-TD	ST	Excavation	11.11
		II	D-4, 8	-330/-331	<1	<47	Point-based point	2: TP-TD	T, long	This study	10.11
		II B	F-5,9/E-5,1	-347/-397	<50	<39	Point-based point	2: TD-TP	ST +C	This study	6.25
	GAL	I	C-5*/C-4, 6	-38/-79	~40	<148	Point-based point	2: TD-TP	P +FA	This study	6.24
		I	C-4, 9	-49/-82	<33	<47	Point, mesial fragment	2: TM-TM	P +FA	This study	
		I	C-4, 7	-66/-71	<5	<47	Multi-barbed point, 2	2: TM-TM indirect	Irr +FA	Excavation	11.4
		I	C-5, 1/4/7	-49/-64	<15	<106	Point/rod	2: TM-TM	ST	This study	
		II	B-6, 1	-70/-76	<6	<47	Point, distal fragment	2: TM-TD	P +FA	This study	
		II	C-5,6/C-4,5	-74/-94	20	125	Conic-based point	2: TP-TD	P +FA	This study	6.30

Table 3 – Refits from La Viña and Llonin (In cursive: inter-stratigraphic refit; Hd: Distance horizontale; V: Distance verticale; Refitted fragments, FT: Fork-tine; LLM: Left-longitudinal-mesial; RLM: Right-longitudinal-mesial; TD: Transversal-distal; TM: Transversal-mesial; TP: Transversal-proximal; Fracture, +C: Highly concretioned; +F: Highly fissured; +FA: High fire-alteration; Exc: Excavation works; Irr: Irregular; P: Plane; R: Recent; ST: Saw teeth; T: Tongue).

Tableau 3 – Raccords effectués à La Viña et Llonin. En cursive : remontage inter-stratigraphique, (Hd : Horizontal distance ; Vd : Vertical distance ; Fragments remontés, FT : fourchon ; LLM : Longitudinal-gauche-mesial ; RLM : Longitudinal-droite-mesial ; TD : Transversal-distal ; TM : Transversal-mesial ; TP : Transversal-proximal ; Fracture, +C : Très concrétionné ; +F : Très fissuré ; +FA : Très altéré par le feu ; Exc : Fouille ; Irr : Irrégulier ; P : Plat ; R : Récent ; ST : Dents de scie ; T : Languette).

make physical refits for all the typological broken pieces. Refits total 23 (table 3) and the cultural assignation of the refitted artefacts has been assessed through stratigraphy, state of preservation and typology.

Typological pieces total 804 artefacts. They have morphological features that make them subject to be classified within typological systems (tables 4 and 5). We have focused on bone and antler typological objects.

Fine and multiple engravings, small marks, pits and notches (trampling, carnivores, butchery, use-wear, etc.) have been excluded to their large numbers at both sites and the need for them to be studied jointly with the analysis of the fauna currently being carried out by Alfred Sanchis (Museo de Prehistoria de Valencia) in the case of

Llonin and by Ana Belén Marín-Arroyo (Universidad de Cantabria) for La Viña. Therefore, some categories proposed by M. S. Corchón (1981, 2017)¹, e.g., knife, notch/denticulate, burin/rough, trowel, used bone, compressor or ‘tensor’, are excluded since they are doubtful in terms of taphonomy, faunal processing, etc.

The measurements given here are maximum length, width and thickness for each piece, along with width and thickness at the mid-point for typological pieces (complete and/or fragments) and -10 mm in proximal/distal fragments and complete pieces (measured with protected stainless digital calliper, 150 mm/0.01 mm). They have been observed with magnifying glasses 8x, 15x, 20x and with a Dino-Lite Edge Digital Microscope (10-200x).

They have been oriented according to their typological axis (Camps-Fabrer, 1977 and *Fiches de la Commission de nomenclature sur l'industrie de l'os préhistorique*) or their maximum axis when the typological one is lacking (e.g., engravings on fragmented bones). Fragments have been grouped into proximal, proximal-mesial, mesial, meso-distal, distal and multiple (≥ 3 broken sides).

As this study consists of an overview of both La Viña and Llonin assemblages, we do not go into depth in the reconstruction of technological or use-wear processes, but we rather focus on the final morphology of the pieces, so that the artificial types are assigned according to these characters. Further analyses will go into other studied variables not included here.

Classification has been analysed following the typology of the *Fiches de la Commission de nomenclature sur l'industrie de l'os préhistorique* (Cahiers I-X) and Barandiarán (1967), as well as the works of other authors for detailed cases such as fork-based points, multi-barbed points, etc. (Barandiarán, 1972; Corchón, 1986; González Sainz, 1989; Bertrand and Pinçon, 2004; Pétilion, 2006, 2016; Langley, 2014). Sections have been grouped into categories of (sub-)circular, (sub-)oval, (sub-)quadrangular, (sub-)rectangular and others (sub-triangular, polygonal or biconvex). The width/thickness ratio (*i.e.* flattening index: FI, Delporte *et al.*, 1988) between 0.80 and 1.20 covers circular-quadrangular sections and lower or higher FIs correspond to oval-rectangular sections.

Taking into account these typologies, the Cantabrian context and current Magdalenian models based on projectile points, some criteria have been introduced.

1. As sometimes an artefact involves more than one type, we use “+” for the attachment, *i.e.* Type1+Type2 and successively; ≥ 3 types will be named as multiple tools.

2. In other cases, this final morphology does not fit well into one particular type, but it is just in the “passage” between one and another. Only further techno-metric and use-wear analyses are likely to clarify these “inconsistencies”, if possible. We use the slash symbol, *i.e.* Type1/Type 2 and successively, in these cases. The first named type will always be the one that fits the best, e.g., ‘Spatula/rod’ is a thick spatula, made from a rod-like support. In this sense, ‘Point/rod’ is a group of pieces with intermediate morpho-metric features. They have poorly flattened sections (1.30-1.80 FI) that change along the piece. They have in addition decorations and morphologies typical of half-round rods (HRRs from now on), in the context of these assemblages.

3. ‘Rods’ have ≥ 1.80 FI (except for some irregular, in process rods) and ‘simple points’ have < 1.80 FI. The metric FI cut-off between rods and simple points is based on the piece that illustrates the best intermediate position between HRR/rod (plane-convex/sub-rectangular plane-convex/sub-rectangular cross-section, 1.80 FI, see *infra* fig. 13.2). On the other hand, HRRs have a ~ 1.3 -3 FI but are determined by their cross-section; in the studied assemblages, they consist on a plane ventral-face associated to a convex dorsal-face (therefore plane-convex

cross-section) or convex with a flattened central band (therefore polygonal cross-section). Bases for both HRRs and rods have been identified when they have lateral transversal marks or they are bevelled. Conversely, we have identified as distal ends or tips those sharpened, multiply and slightly faceted or spatulate.

4. Points have been classified by different variables (base, cross-section, metrics, outline, profile). They have been crossed and in this study we have focused on base, width module and FI because they are the most determining variables for characterizing the typological groups. We have avoided the use of the term ‘massive points’, because ‘massive’ is already used by us for referring to flaking-based tools. Moreover, for us it does not describe terminologically well the characteristics of these bases and there are inconsistencies regarding points from French sites (see *infra*, section Llonin cave, Level X, Cono Anterior). In consequence, we have referred to ‘large points’, regarding module and the morphology of the base, e.g., large conical-based point. We have also avoided the term ‘bipoints’; although from a terminological point of view they should include equally pointed bases (as synonyms: e.g., I.9. ‘Punta doble’: Barandiarán, 1967, and following other Cantabrian classifications, e.g., González Sainz, 1989 and Corchón, 2017), this category currently implies a slippery morpho-metric category as can be observed in some papers (e.g., Langley *et al.*, 2016). Instead, we have used ‘pointed base’ and ‘point-based point’, although it sounds redundant. These bases are faceted (not bevelled although there are some intermediate bases; see *infra*, section Llonin cave, Level X, Cono Anterior) or they are plain (*i.e.*, blunt). As some of them are complete or marginal (see *infra* fig. 6.1; 7.24-28; 11.1), we have dismissed them as distal ends. In other cases, they have transversal/oblique/longitudinal deep marks (see *infra* fig. 11.5-7 and 15-17). We have classified all of them as bases in contrary to some examples by Barandiarán, 1973 (e.g., PE4, PE, RI6, V11) or González Sainz, 1989 (La Paloma, fig. 3.9 and 5.15; La Riera, fig. 18.13; La Pila, fig. 20.4; Urtiaga, fig. 50.8) as a way of comparing the bulk of pointed ends because the distinction between the base and the tip is impossible in the cases where complete points are not preserved and they are plentiful in the Cantabrian collections. On the contrary, pointed fragments lacking faceted panels or deep marks, independently of module, are classified as distal.

5. Elongated and bevelled wedges or chisels are classified as ‘wedge, point-shaped’ and are compared with ‘simple points’ (see *infra*, section Spheres and internal articulation).

6. Irregular and unfinished points or rods, as well as multiple points or tool fragments, are classified following the more complete (lateral) part preserved.

7. Trimmed or ‘raccourci’ ends have been documented as technological features (Rigaud, 2004) so we have classified them in this sense and not as typological ones, as recorded in some Cantabrian assemblages (Barandiarán, 1967; González Sainz, 1989; Adán, 1997; Corchón, 2017).

Area Level	La Viña									Total
	MM		USC			MM		UM		
	SO	SC	SO	SC	Cov	SO-T1	T4	T1	T3	
	IV		Trench	IV-V		III		II		
Points, stand-alone and bivalve										
Simple point	70	63	5			14	1	4	3	160
Fork-based/Foreshaft		1								1
Preform/Foreshaft	1									1
Multi-barbed point, 'proto-harpoon'	1	2								3
Half-round rod	27	12		1		2				42
Points or rods, intermediate										
Point/rod	3	1								4
Rods										
Rod	17	6	1	1						25
Tools, pointed and flat										
Needle	9	1				1				11
Needle without hole	30	16	2	2						50
Needle/Awl		4	1							5
Awl	15	6	1	1		2				25
Bipointed awl	2		1							3
Natural-based awl		2								2
Spatula	12	7								19
Spatula, edges	7									7
Spatula/Rod	5	1								6
Smoother	9	6								15
Smoother, multiple-tool	1									1
Tools, massive and point-shaped										
Hammer/Retoucher	43	13								56
Wedge/Chisel		3				1				4
Wedge, point-shaped						1				1
Bevelled object	3		1							4
Pendants										
Perforated red deer canine	5	1				3				9
Perforated, others	3	2								5
Teeth with marks/notches		3	1			1				5
Perforated bone disc	1									1
Bead, perforated	1									1
Ellipse	1									1
Portable art										
Bone cut-out		3								3
Carving		1								1
Sculpture					1					1
Figurative engraving	4	1		1						6
Non-figurative engraving	9	4		1		3				17
Others										
Pointed, undetermined	3	4		1						8
Lateral notches	5	6								11
Indeterminate	2									2
Total	289	169	13	8	1	28	1	4	3	516
Total/Level	458		22			29		7		

Table 4 – La Viña. Typological objects

(SO: Sector Occidental; SC: Sector Central; USC: Unclear stratigraphical correspondences; Cov: Covacha).

Tableau 4 – La Viña. Objets typologiques

(SO: Sector Occidental ; SC: Sector Central ; USC: Correspondance stratigraphique pas claire ; Cov: Covacha).

Area	Llonin																Total
	MM		UM		USC						MM		UM		Mx(UM)		
	CONO ANT		CONO ANT						IC	CP	VEST			GAL			
	X	IX	VIII	X-XI	IX-X	IX-XI	VIII-IX	VII-VIII	S/Surf.	IV top	III	IIB	IIA-II	II	I	I/II	
Points, stand-alone and bivalve																	
Simple point	25	20		1	5	1	1	1	3		2	10	8	23	35		135
Self-barbed point	1										1						2
Self-barbed point, possible	1																1
Multi-barbed point, 1 row		3	1										3	4	1	2	14
Multi-barbed point, 2 rows																3	3
Multi-barbed point, base																1	1
Multi-barbed point, possible 'proto-harpoon'														1			1
Half-round rod	1								1	1				7	3		13
Points or rods, intermediate																	
Point/rod	2	1									1					2	6
Rod	4	2	1										1	2	1		11
Point/Awl											1					1	2
Tools, pointed and flat																	
Needle	3	2												2			7
Needle without hole	4												1	4	1		10
Awl	2	1				1			1								5
Natural-based awl	3	1	1								1	1		2			9
Spatula																2	2
Bull-roarer	2																2
Smoother	2	2									1		3				8
Smoother/Spatula/Point														1	1		2
Tools, massive and point-shaped																	
Hammer/Retoucher	2										1						3
Wedge/Chisel	2	1											1				4
Wedge, point-shaped		2														1	
Wedge, point-shaped, possible		1															
Pendants																	
Perforated red deer canine	3		1		2	1							2	2	2		13
Perforated, others	2											1	1	1			5
Perforated bone disc	1																1
Bead, unperforated														1			1
Ellipse																	
Portable art																	
Figurative engraving		2															2
Non-figurative engraving	7	5					2								1	1	16
Others																	
Tube	1																1
Lateral notches														1			1
Indeterminate				1					1							1	3
Total	68	43	4	2	7	2	4	1	5	2	8	12	20	52	56	2	288
Total/Area	115			23							40			110			

Table 5 – Llonin. Typological objects (USC: Unclear stratigraphical correspondences; Mx(UM): Mixed Upper Magdalenian; IC: Inner Cave; CP: Cono Posterior; S/Surf.: Sweeping/Surface).

Tableau 5 – Llonin. Objets typologiques (USC: Correspondance stratigraphique pas claire ; Mx(UM): Magdalénien supérieur mélangé ; IC : Intérieur de la grotte ; CP : Cono Posterior ; S/Surf. : Balayage/Surface).

Finally, decorative motifs have been classified according to Barandiarán (1967), with some additions from Corchón (1986) and Lucas (2014).

MIDDLE MAGDALENIAN BONE COLLECTIONS

Projectile points, tools and ornaments are more abundant (~70%) than the preliminary numbers of technological pieces (30%: table 1). Points and rods stand out in both assemblages in different proportions compared with the rest of typological groups and portable art (tables 4 and 5; see *infra* fig. 9). Refits done during previous excavation/laboratory work and this study have no taphonomic implications for level integrity because they come from the next layers and/or sub-squares (table 3).

La Viña rock shelter. Level IV and unclear stratigraphical correspondences

Level IV (table 4; fig. 4 and 5)

The bone industry is distributed into 63% for the SO and 37% for the SC. Typological bone objects also follow a similar pattern (table 4). Moreover, they are randomly distributed vertically, e.g., fork-based points and needles are in Band H (where the upper-most part of the level is not eroded) from the bottom to the top of the level. In other squares HRRs and spatulas are distributed throughout the level and only scarce 'proto-harpoons' are in the middle part. Surprisingly, the more singular portable art works (bone cut-outs ['contours découpés'], fish-tail-like spatula and an owl sculpture) are located in SC, near to the hearth and the heating next to the wall (Fortea, 1990). In comparison, the bone disc was located in SO (H-24), next to the large 'proto-harpoon', the tubercled HRR and several fork-based points, among others (fig. 4 and 5). The three bevelled objects are exclusively concentrated in the next square (H-23).

The typological group is dominated by simple points, notably fork-based points, while other bases are scarce (table 6). A pyramidal-based, slender, point has straight parallel edges with a minimal curvature so it does not fit with self-barbed points (fig. 4.24). The single-bevelled point has dorsal grooving (Fortea *et al.*, 1990a) and the distal end is laterally narrowed, as also documented in other points with the same medium module (fig. 4.23 and 25). HRRs are larger than the rods (sub-rectangular and sub-oval, table 4), they do not refit facially and some are distally and bifacially spatulate or decorated (fig. 4.4). However, sub-rectangular rods (FI ~2) are sometimes used as fork-based points (fig. 4.2-3). Some rods, HRRs and large points preserve a fine cortical area, laterally framed by more or less incurved longitudinal lines or scraping (fig. 5.2 and 11, similar to some Pyrenean HRRs, e.g., Chollot-Varagnac, 1980, Mas-d'Azil,

p. 156, 47.573C; Isturitz, p. 174, 77.159 B.11). The most complex decorations are documented in HRRs, e.g., a particular tuberculation, made by an asymmetrical deep engraving similar to Pyrenean 'croissants' [crescents] or spirals (Chollot-Varagnac, 1980), also known in Hornos de la Peña (Barandiarán, 1972, H2) or angular 'entailles' (La Madeleine: Chollot-Varagnac, 1980, p. 401, 60.340, here: fig. 5.6). In addition, a multi-tool (half-round rod+wedge/chisel+smoother2, has a blurred frontal carving, wavy zigzag or double bell-like series (fig. 4.29), similar to a HRR from Laugerie-Basse (Varagnac, 1980, p. 120: 54.228).

Multi-barbed points have tight, short and uni-lateral protruding teeth. Distal ends are rounded and polished. Their general outline and sizes coincide with 'proto-harpoons' from Las Caldas-Level VII (Corchón, 2017, fig. 200.3101, here: fig. 5.1, 10 and 17).

A smoother made from metapod has a notched natural base on the distal epiphysis (fig. 3.31). If it is a singular piece and the notched base remembers remotely to a 'pasador' [barrette] from Las Caldas-Level IIIc (Corchón, 2017, fig. 323.165).

One of the indeterminate objects is an antler rod with removed back, rounded end and a lateral protuberance (fig. 5.16), possibly comparable with a handle or an object from Morín, 'machacador' [pounder] from Tito Bustillo-Level 1a or an engraved bone from La Paloma 'Magdaleniense superior' (respectively, Corchón, 1986, fig. 137.4; González Sainz, 1989, fig. 12.20 and 4.12).

Until now, seven extraordinary objects have been published: three bone cut-outs, one fish-form spatula/pendant, one perforated bone disc, one ellipse, one owl sculpture and one scapula fragment with engraved reindeer and horse (Fortea *et al.*, 1990a), alongside decorated tools and pendants (Duarte *et al.*, 2012). Other engraved bone fragments had also been revised by J. Fortea, but remained unpublished. They consist of profiles, such as one horse (fig. 5.19), one possible chamois and one possible carnivore, apart from bell-like motives (fig. 5.21) and a bird-bone fragment with transversal marks (fig. 5.28), both similar to Las Caldas-Levels XII and IX respectively (Corchón, 2017, fig. 147.1039 and 62.1643).

Oblique lines and transversal marks are the most common functional/decorative marks (mainly located on the bases and shafts of the points and tools). Within points, grooves are documented in three fork-based points; two are internally striated (Chollot-Varagnac, 1980, p. 292-298, here: fig. 4.1) and the other is deeply grooved (fig. 3.2). In addition, a mesial fragment displays two oblique and irregular opposed/open V-series, associated with a longitudinal line (fig. 4.18). This feature is usually associated with other fine points (La Paloma, Lumentxa, Urriaga: González Sainz, 1989; Las Caldas: Corchón, 2017; Gourdan: Chollot-Varagnac, 1980, p. 133, 48.406). Another point has dorsal series of short and parallel longitudinal lines (Ermittia: González Sainz, 1989, fig. 42.12) and oblique lines on the edges (fig. 4.21).

Unclear stratigraphical correspondences. Sector Central, Covacha and Sector Occidental

Level IV-V. Sector Central (table 4)

The top of Level V presents an irregular surface marked by eroded drip basins ['cubetas']. Some pieces were recovered in the areas where Levels V and IV intersected and they potentially belong to MM: 1. Half-round rod, distal fragment, with encoched edges, similar to another one from Level IV (see *infra*, section Assemblage characterization of the Cantabrian Middle and Upper Magdalenian; fig. 5.3), 2. Long-bone multiple fragment with a finely-engraved horse profile (fig. 5.20), see another from Las Caldas-Level VIII (Corchón, 2017, fig. 170; Rivero, 2010, fig. 31), 3. Oval rod, mesial fragment, with longitudinal zigzag. This object was found in the second layer of Level V but in the bottom of a "cubeta" in G-14 (Fortea, 1990, Duarte *et al.*, 2012, here: fig. 5.23).

Covacha. Area Ib-Ic, art panels (table 4; fig. 1)

A horse-head sculpture that was recovered near the SC a few days after the discovery of the site has recently been published. Both the object itself and its proposed chronology are credible, as well as its origin from La Viña and the circumstances of the find (Juaneda, 2011).

Trench: squares F-22/23. Sector Occidental (table 4; fig. 1)

There are some diagnostic pieces that could belong to Level IV as it was tentatively classified by J. Fortea (excavation logbook), namely two broken fork-tines. A polygonal/half-round rod (fig. 5.5) and a single-bevelled point (2/3 flat-shaped, fig. 4.28) require further discussion (see *infra*, section Assemblage characterization of the Cantabrian Middle and Upper Magdalenian).

Llonin cave. Level X (Cono Anterior) and unclear stratigraphical correspondences (Cono Anterior)

Level X. Cono Anterior (table 5; fig. 6)

Shell pendants (basically made from *Littorina obtusata*, fig. 6.20) are more numerous than points and other artefacts. Typological objects were preferentially accumulated in Band H (70%). On the other hand, Bands 4/7 are poorly represented in terms of finds (26%). The only striking association is located in I-3 where a needle was found within a tube next to another needle and five bone tubes; furthermore, two needles were found in the next square (H-3). In addition, a perforated bone disc and a possible bull-roarer appeared in the same square.

Fork-based points³ and broken fork-tines are scarce (table 6); broken fork-tines are somewhat bifacially scraped (fig. 7.1-2). Two double-bevelled points are short (~60-70 mm long), with long, curve-based, bevels (~25 mm) and both lack decoration/hafting marks (fig. 7.21 and 23). Conversely, one double-bevelled point has cross-hatched (i.e., reticule-like design) bevels and a ven-

tral longitudinal groove (fig. 6.14). One self-barbed point is slender, with an arched profile (1.10 mm spire) and a sub-rectangular cross-section; the mesial part is covered by concretion so no dorsal marks/engravings are documented but they are included in the definition of the type (Pétillon, 2016, here: fig. 6.6). On the other hand, a point-based point (fig. 6.2) has dorsal longitudinal grooving, oblique oriented lines on the base and sinuous profile that makes it look like a Gazel self-barbed point (Pétillon, 2016, fig. 10.2), but width and thickness are higher (and closer to 'massive points' sensu Pétillon, 2016).

One pointed and spatulate HRR has lateral protuberances (fig. 6.27). Its outline is similar to those from Las Caldas-Level VIII (Corchón, 2017, fig. 165, mainly 6027) and Coimbre-Level 2 (Álvarez-Alonso and Yravedra, 2017, p. 437), but width and thickness are reduced by the half in the case of Llonin. It is also similar to the distal end of a multi-barbed point from Laugerie-Basse (Rousot, 1977, fig. 2 right). A refitted point/rod (fig. 6.10 and table 3) has a polygonal cross-section and dorsal oblique lines, similarly to one point from the same level in Llonin and another from Mas d'Azil or Gourdan (Chollot-Varagnac, 1980, p. 300, 47.732c and 315, 48.408, here: fig. 6.4).

A complete and tiny needle was found inside a bird-bone tube (fig. 5.14). An awl made from a rib is a kind of dagger (fig. 6.15), somewhat similar to one from Brasempouy (Chollot-Varagnac, 1980, p. 257, 56.425.A).

Figurative engravings are lacking and the more important bone artefact markers are one bone disc and one highly engraved point-based point (Fortea *et al.*, 1990b, Duarte *et al.*, 2012). The recent two-piece refit of a point/rod (fig. 6.11 and table 3) has led us to complete a small lateral zigzag (Duarte, 2010). It is a tight design, made up of irregular angles and associated with lateral grooves (fig. 6.11). It resembles a double zigzag with internal strokes (Chollot-Varagnac, 1980, p. 81, 77.163.F.1) and even clover-like designs associated with inverted parentheses (Utrilla, 1995; Corchón, 2017). A pendant is decorated with sets of transversal marks similarly to a Gourdan pointed tooth or Le Placard perforated teeth (Chollot-Varagnac, 1980, p. 152, 48.626, p. 60, 54.949, here: fig. 6.16).

Unclear stratigraphical correspondences (Cono Anterior)

They come from the intersection of several levels and we cannot assign them with certainty to one or another (see *infra* fig. 13).

Level X-XI. Cono Anterior (table 5)

The first artefact is an enigmatic antler piece with three isolated and relatively long, angular teeth on one edge and an opposite convex edge which is rounded and smoothed (fig. 13.6). This latter edge is similar to the smoother/awl from Altamira (Barandiarán, 1972, AL29) and the opposing teeth have a slight parallel with an antler-carving from Las Caldas-Level VIII (Corchón, 2017, fig. 216.991). The



Fig. 4 – La Viña MM, Level IV. 1-5: Fork-based points ; 6: Preform/foreshaft; 7: Fork-based point/foreshaft; 8-9: Double-bevelled points (bases); 10: Wedge/chisel; 11/22/30: Spatulas; 12-13/16: Needles; 14-15: Awls; 17: Bipointed awl; 18-19/21/23: Simple points; 20/31: Smoothers; 24: Pyramidal-based point; 25: Single-bevelled point with frontal groove; 26: Point-based point (base); 27: Quadruple-bevelled point; 28: Point-based point with 2/3 flattening; 29: Multi-tool; 32: Bevelled object; R: Refit (drawing 25: A. F. Rey; photos/drawings: E. Duarte).

Fig. 4 – La Viña MM, niveau IV. 1-5 : Pointes à base fourchue; 6 : Ébauche/pré-hampe; 7 : Pointes à base fourchue/ pré-hampe; 8-9 : Pointes à biseau double (base) ; 10 : Coin/ciseau; 11/22/30 : Spatules; 12-13/16 : Aiguilles; 14-15 : Poinçons; 17 : Poinçon bi-appointé; 18-19/21/23 : Pointes simples/sagaies; 20/31 : Lissoirs; 24 : Pointe à base pyramidale; 25 : Pointe à biseau simple avec rainure frontale; 26 : Pointe à base appointée (base) ; 27 : Pointe à biseau quadruple; 28 : Pointe à base appointée avec aplatissage de 2/3; 29 : Multi-outil; 32 : Objet biseauté; R : Raccord (dessin 25 : A. F. Rey ; clichés/dessins : E. Duarte).

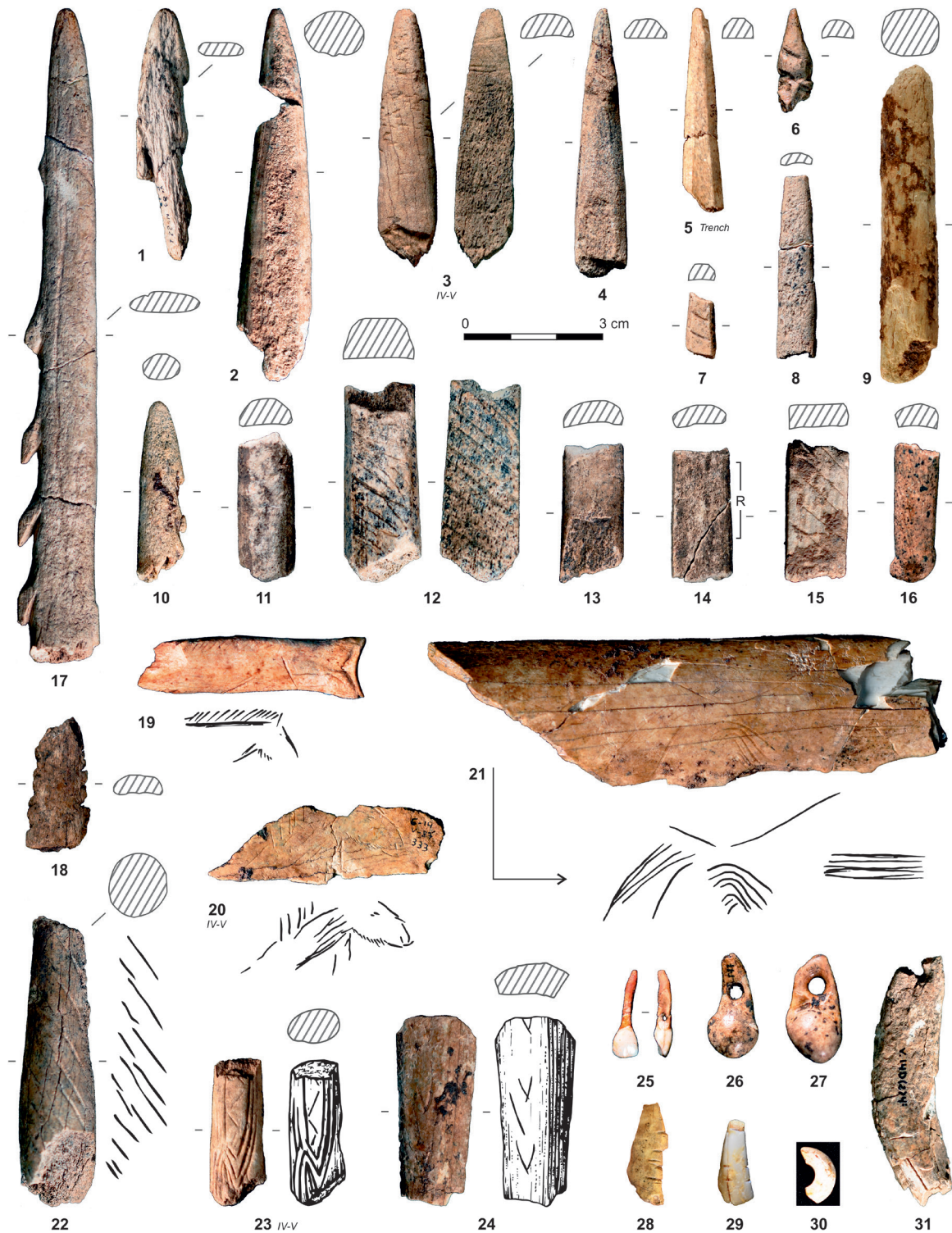


Fig. 5 – La Viña MM, Level IV. 1/10/17: Multi-barbed points ('proto-harpoons'); 3/6/13: HRRs; 2/11: Rod and HRR with sub-cortical front; 4-5/7/12: HRRs with polygonal cross-section; 8: HRR with removed back; 9: Large-module simple point; 14: Sub-rectangular rod; 15: Double-bevelled rod (base); 16: Indeterminate (rod with lateral protuberances); 18: Object with lateral notches; 19-21: Engraved bone fragments; 22: Engraved tine fragment; 23: Sub-oval rod; 24: Wedge/chisel; 25: Ungulate incise pendant; 26-27: Red-deer canine pendants; 28: Engraved bird-bone fragment; 29: Engraved ungulate incise; 30: Perforated bead (raw material is under study); 31: Horse incise pendant (photos/drawings: E. Duarte).

Fig. 5 – La Viña MM, niveau IV. 1/10/17: Pointes multi-barbelées ('proto-harpons'); 3/6/13 : Baguettes demi-rondes ; 2/11 : Baguette et baguette demi-ronde avec front sub-cortical ; 4/5/7/12 : Baguettes demi-rondes avec partie supérieure enlevée ou à section polygonale ; 8 : Baguette avec face inférieure enlevée ; 9 : Pointe simple à grand module ; 14 : Baguette sub-rectangulaire ; 15 : Baguette à biseau double (base) ; 16 : Objet indéterminé (baguette à protuberance latérale) ; 18 : Objet à encoches latérales ; 19-21 : Fragment d'os gravé ; 22 : Fragment d'andouiller gravé ; 24 : Coin/ciseau ; 25 : Pendentif en incisive d'ongulé ; 26-27 : Pendentifs en canine de cerf ; 28 : Fragment d'os d'oiseau gravé ; 29 : Incisive d'ongulé gravé ; 30 : Perle perforée (la matière première est en cours étude) ; 31 : Pendentif en incisive de cheval (clichés/dessins : E. Duarte).



Fig. 6 – Llonin MM, Cono Anterior: Level X; Vestíbulo: Levels III and IIB; Galería: Level II. 1-2/9: Point-based points; 3-4: Simple points; 5: Engraved bone fragment; 6/8: Self-barbed points; 7/10-11: Point-rods; 12: Smoother; 13: Single-bevelled point (base); 14: Quadruple-bevelled point (irregular base cross-section); 15: Needle in tube; 16: Indeterminate tooth pendant; 17-18: Red-deer canine pendants; 19: Rib pendant; 20: *Littorina obtusata* pendant; 21: Bone bead; 22: Awl (dagger); 23: Needle; 24: Natural-based awl; 25/27-29: HRRs; 26: HRR with removed upper-most area or polygonal cross-section; R: Refit (photo 10: J. Fortea; photos/drawings: E. Duarte).

Fig. 6 – Llonin MM, Cono Anterior: niveau X; Vestíbulo: niveaux III et IIB; Galería: niveau II. 1-2/9: Pointes à base appointée; 3-4: Pointes simples; 5: Fragment d'os gravé; 6/8: Pointes uni-barbelées; 7/10-11: Pointe/baguettes; 12: Lissoir; 13: Pointe à biseau simple (base); 14: Pointe à biseau quadruple (section irrégulière); 15: Aiguille à l'intérieur d'un os d'oiseau; 16: Pendentif en dent indéterminé; 17-18: Pendentifs en canine de cerf; 19: Pendentif en côte; 20: Pendentif en *Littorina obtusata*; 21: Perle en os; 22: Poinçon (poignard); 23: Aiguille; 24: Poinçon à base naturelle; 25/27-29: Baguettes demi-rondes; 26: Baguette demi-ronde avec partie supérieure enlevée ou à section polygonale; R: Raccord (cliché 10: J. Fortea; clichés/dessins: E. Duarte).

second item is a single-bevelled point, with long bevel and sub-quadrangular section (thicker than wide). There is no similar point in Cono Anterior X (see *infra* fig. 13.1; see *infra*, section Assemblage characterization of the Cantabrian Middle and Upper Magdalenian).

Level IX-X. Cono Anterior (table 5)

Outstanding objects are a broken fork-tine with fine oblique lines on the inner side, a striated quadruple-bevelled point (fig. 13.3) and two long double-bevelled points; one with engraved bevels (fig. 13.9) and another with V series or spike-like motif, very similar to one from Le Placard (Chollot-Varagnac, 1980, p. 98, 55.096, Fortea *et al.*, 1995, fig. 11). They fit well with other artefacts recovered from Cono Anterior X.

Level IX-X-XI. Cono Anterior (table 5)

They come from the fall of the stratigraphic-section that has affected to these three levels. They were recovered during the excavation of Level XI. A slender distal point fragment has a fine lateral groove and oblique lines in irregular angle and compartmentalized by transversal short lines, similar to Cueto de la Mina B (Corchón, 1986, fig. 130.4, here: see *infra* fig. 13.4).

MIDDLE/UPPER MAGDALENIAN MODIFICATIONS IN THE CULTURAL SEQUENCE OF LLONIN AND LA VIÑA ACCORDING TO THE BONE COLLECTIONS

An inter-stratigraphic refit between Galería-Levels II and I, accompanied by the study of the bone industry and its comparison with the assemblages of the other site areas, has led us to conclude that MM is also present in Galería and Vestíbulo (table 3; fig. 7).

Llonin cave. Levels II and I (Galería), unclear stratigraphical correspondences (Galería), Levels III and IIB (Vestíbulo)

Level II. Galería (table 5; fig. 6 and 7)

We have analysed the assemblage as it was organised during the excavation works and we have noticed several indistinguishable elements between levels II and I, with other striking or contradictory aspects also present.

1. Objects from both Level II and I are highly altered by fire.

2. Fragmentation is high in both levels II and I (~85%) and similar to that of La Viña IV regarding general length concentrations (~2-5 mm), but contrasting with the long and extremely long pieces as in the case of Cono Anterior or Vestíbulo levels (fig. 8). Given that Galería has been isolated from the karst network (Rasilla *et al.*, 2019) the fragmentation pattern is due to high-intensity anthropogenic activity (sin/post-depositional).

3. Regarding typological groups, we have compared those from Galería with the other assemblages under study for assessing their general composition (fig. 9). Simple points, rods and half-round rods (rods/HRRs from now on in this subsection), are abundant in Galería II and La Viña IV. Other groups usually amount to <10% or in one case 10-15%, *e.g.*, Cono Anterior IX and Vestíbulo II (fig. 9). In Galería II and La Viña IV there is more than one group >10%: rods/HRRs, needles and another formed by hammers and retouchers in the case of La Viña IV; rods/HRRs and needles in Galería II. Points and rods/HRRs display similar changes in frequencies, so rods/HRRs seem to increase at the expense of points. The presence of several needles qualifies the character of both levels; domestic sphere is enlarged and hunting activities are diminished (see *infra*, section Spheres and internal articulation). It is noteworthy that spatulas and smoothers disappear in Galería II but we think that the antler smoother/spatula/point (fig. 7.6) from Galería I (disturbed level) could fit in the assemblage of Galería II (see *infra*, section Assemblage characterization of the Cantabrian Middle and Upper Magdalenian). Massive tools are very scarce in Galería II and the rest of Llonin levels, which is probably related to the existence of hammers made from lutite (elongated pebbles) that are relatively light and effective in blade/bladelet knapping (Duarte, PhD in progress).

4. Typologically singular objects and correlations within Galería. Multi-barbed points are absent in the lower part of Level II but they are abundant in Level I and in the uppermost layer of Level II, more specifically in the intersection between Levels II and I. Those in the intersection are concentrated on B-4, B-5 and C-6 (fig. 7 and 12).

5. Other typological correlations between Galería and Cono Anterior. There are two short double-bevelled points from the top of Level II. They are typometrically equal to another two from Cono Anterior X (fig. 7.20-23). This correlation is also observed with the medium point-based points: one from Level II and another from Cono Anterior X (fig. 7.27 and 26 respectively), which also lack decoration. The fork-based point is long and therefore metrically different from those from Cono Anterior X-IX but it fits well morphologically, see the base and the hollow (fig. 7.16-18). It also comes from top Level II and there was a broken fork-tine near it.

6. Refits (Galería). The inter-stratigraphic two-piece refit is a dorsally grooved big point (ancient plain fracture) whose short fragment (R1) was recovered in C-4, in the middle part of Level II and near the bottom of a hearth (marginal area), while the longer fragment (R2) was recovered in C-5, towards the bottom of the Level I (table 3; fig. 7). Because of its stratigraphical position and the typological features, we have privileged the deepest position as the original one (see *infra*, section Assemblage characterization of the Cantabrian Middle and Upper Magdalenian). A medium point-based point, two-piece refit (fig. 7.24), in C-4/5 quite clearly denotes other contaminations of the Level I (table 3; fig. 7). This point could belong to Level II because there is another like it

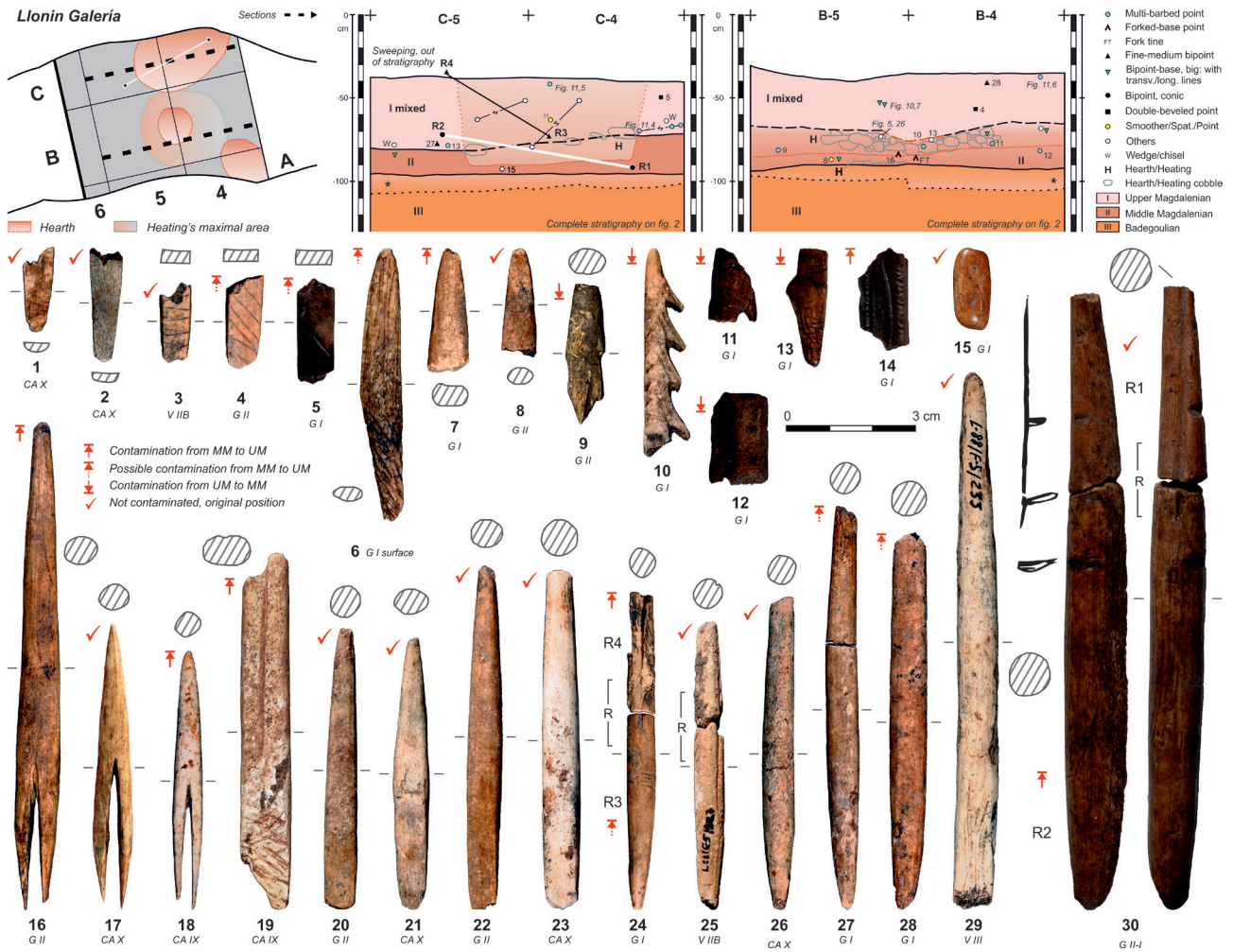


Fig. 7 – Llonin MM/UM, contamination. Plan and sections: Galería, Levels II-I (anthropogenic contamination).

Objects from C-4/5 are projected in C band section, as they are in B band (lithics of this layer are not studied but the bone industry is and it is assigned to Badegoulian; Rasilla *et al.*, 2019). 1-2: Engraved/scraped fork tines; 3-5: Double-bevelled points (bases); 6: Antler spatula; 7-8: Antler smoother/spatula/point; 9: Possible 'proto-harpoon'; 10-13: Multi-barbed points; 14: HRR; 15: Bone bead; 16-18: Forked-base points; 19: Double-bevelled point with frontal groove (cross-hatched bevels); 20-23: Short double-bevelled points; 24-28: Fine-medium point-based points; 29: Long double-bevelled point; 30: Conical-based point; R: Refit, ↔

Refit's direction and depth are interchangeable, see table 3 (photos: E. Duarte).

Fig. 7 – Llonin, contaminations du Magdalénien Moyen/Supérieur. Plan et coupes stratigraphiques : Galería, niveaux II-I avec des contaminations anthropiques. Des objets récupérés dans les carrés C-4/5 sont projetés dans la coupe stratigraphique de la bande C et ceux des carrés B-4/5 dans la bande B (l'industrie lithique de cette couche n'est pas étudiée mais l'industrie osseuse est attribuée au Badegoulien ; Rasilla *et al.*, 2019). 1-2 : Fourchons gravés/racés ; 3-5 : Pointes à double biseau (base) ; 6 : Spatule en bois ; 7-8 : Lissoir/spatule/point ; 9 : Pointe multi-barbelée, possible proto-harpon ; 10-13 : Pointes multi-barbelées ; 14 : Baguette demi-ronde ; 15 : Perle en os ; 16-18 : Pointes à base fourchue ; 19 : Pointe à double biseau avec rainure frontale (biseaux réticulés) ; 20-23 : Pointes courtes à double biseau ; 24-28 : Pointes à base appointée fines-moyennes ; 29 : Pointe longue à double biseau ; 30 : Pointe à base conique ; R : Raccord ; ↔

La direction et la profondeur de ces raccords sont interchangeables, voir tableau 3 (clichés E. Duarte).

from the bottom of Level II, very similar to the one from Cono Anterior X and Vestíbulo IIB (fig. 7.24-26). Those from Level I (fig. 7.27-28) could also belong to the MM (see *infra*, section The contribution of La Viña and Llonin to the Cantabrian Middle and Upper Magdalenian).

7. Hearths (Galería). Spatially, bone objects are concentrated in Band 4 (mainly Square B-4) and in the upper half of the level. 65% of the pieces were recovered in this area, including barbed and fork-based points, and most rods/HRRs. This level is ~30 cm thick and hear-

ths are spread all over the excavated surface (fig. 7). The main hearth is ~1 m in diameter and situated next to the wall in squares C-4/5 and other small hearth/"heating" sensu excavation logbook, but connected to the previous one by different clay layers and block concentrations in B-4/5 and A-4. In fact, during the excavation, the top surface of Level II was irregular, with several pits, and the large hearth was already documented from the first layer of Level I and beneath the surface mixings in C-4/5. However, in C-4 (right hearth limit), levels were

separated by a crust, so at least in this area Level II remains intact. In conclusion, the large hearth was built in Level I, it crossed the crust and it altered and mixed both Levels I and II. Nonetheless, the last two layers of Level II remain intact in C-4/5 as they may be in B-4/5 but there the altered extent regarding blocks is less clearly demarcated (fig. 7). Lower half of the level is usually poor in bone industry but the blocks and clay lenses were numerous. In conclusion, there are some square areas (fig. 7, plan and sections) where the distinction between Levels I and II was correctly identified during excavation; there are in addition some layers (fig. 7, lower-most part of the level or beneath the red-dotted line) where alterations are minimal because bone points and tools, although few, show internal coherence⁴. In this sense, the fork-based point and the broken fork-tines, the bone bead, several decorated HRRs, the smoother/spatula/point, short and medium-module double-bevelled points, medium-module point-based points and the large-module conical-based point characterize this level, somewhat similarly to the Cono Anterior X and Vestíbulo III-IIB. Multi-barbed points should be excluded from this assemblage since they were not recovered in Cono Anterior X. Moreover, in Galería they are concentrated in the areas where levels have been modified during, at least, the UM and top Level II is altered irregularly as it can be observed from the distribution of the fork-based points. B-4/5 and C-4/5 reflect fairly well the magnitude of anthropogenic alterations and the way in which objects can randomly go down and up randomly within a given “manipulated” volume of sediment (i.e., trampling, digging; fig. 7). The large representation of rods/HRRs in Level II would be therefore associated with the MM. Large-module point-based points involve a cultural (MM-UM) continuity because they are documented both in Cono Anterior X and IX or Vestíbulo III, IIB and IIA-II, but they have diverse decorations. Given that the bone industry assemblage from Galería III fits fairly well with the Badegoulian and no LM typological marker has yet been detected, the existence of a LM is discarded.

Level I. Galería (table 5; fig. 7 and 11)

This level is multiply contaminated: modern holes, mixings and rare recent remains (e.g., ceramics). So it is not clear how many of these artefacts can be assigned to Level I as “Palaeolithic” and which cannot. As this is a disturbed level, we have added some pieces from the surface, mixtures, etc.: four points and one spatula. We have ascribed to modern contamination a bone rectangular-plaque with four perforations (~3 mm diameter) on one edge (fig. 13.5) because it was recovered in B-6, near the wall, where the fall of the stratigraphic section is recurrent. It is very well preserved (no dissolution, orange patina or other alterations common in the other palaeolithic artefacts, but it has ochre remains) so it seems to belong to a different deposition, possibly coeval with some ceramic remains also recovered in Galería and Cono Anterior (Fortea *et al.*, 2004).

Spatially, typological objects are concentrated in C-4/5 (31%), coinciding with the aforementioned large hearth (fig. 7) and the rest (<13%) are dispersed among the other squares.

A part of this level could be assigned to the UM because of the existence of multi-barbed points and points with deep lateral engravings, correlated to Cono Anterior IX-VIII and Vestíbulo IIA-II. This multiplicity of levels indicates a probable correspondence between Cono Anterior VIII and Vestíbulo I (mixed). Even Galería I was originally formed by more levels given its altered character, so multi-barbed points may have originally been distributed in the stratigraphy in a very different way from how they are observed today. Nevertheless, no internal division has been made because of the mixed character, the absence of other bone markers and the above mentioned undefined significance of point-based points (fig. 7).

Unclear stratigraphical correspondences. Level I/II. Galería (table 5)

Two pointed and shouldered bases (multi-barbed points) were recovered during the excavation of top Level II as a consequence of a fall of the stratigraphic-section involving Level I and the excavated part of Level II, therefore it is more likely that they belong to Level I (see *infra* fig. 12.7-8).

Level III. Vestíbulo (table 5)

Since this level is under the stony Level IIA and thins out toward the cave entrance, it is possible that it could correspond to Cono Anterior X. The assemblage is small and diagnostic pieces are lacking but for a double-bevelled point (bevels with strong longitudinal scraping lines) and a self-barbed point that could equally fit with Cono Anterior X. The typological objects are all broken; they come from Band 5 except for one point recovered in E-3. There is also a bone hammer/retoucher from the intersection between Levels III and IV. A rod/point, mesial fragment, partially flattens towards the proximal fracture. Here the section tends to sub-polygonal, with a two-eave-roof ventral face similar to a piece from Ermitia (González Sainz 1989, fig. 42.17) and associated oblique lines; the dorsal face has fine oblique lines and a slightly arched long line (fig. 6.7), similar to a piece from Las Caldas-Level III (Corchón, 2017, fig. 319.443).

Level IIB. Vestíbulo (table 5)

It is a thin, intermediate and wedged level. It is quite similar to the base of Cono Anterior IX. Contaminations are likely since cobbles and blocks resulted into an irregular surface during the deposition of several levels (fig. 2B).

Typological pieces tally with the MM (fig. 5), except for a pointed fragment with deep lateral engravings, similar to ones from Cono Anterior IX, so it probably

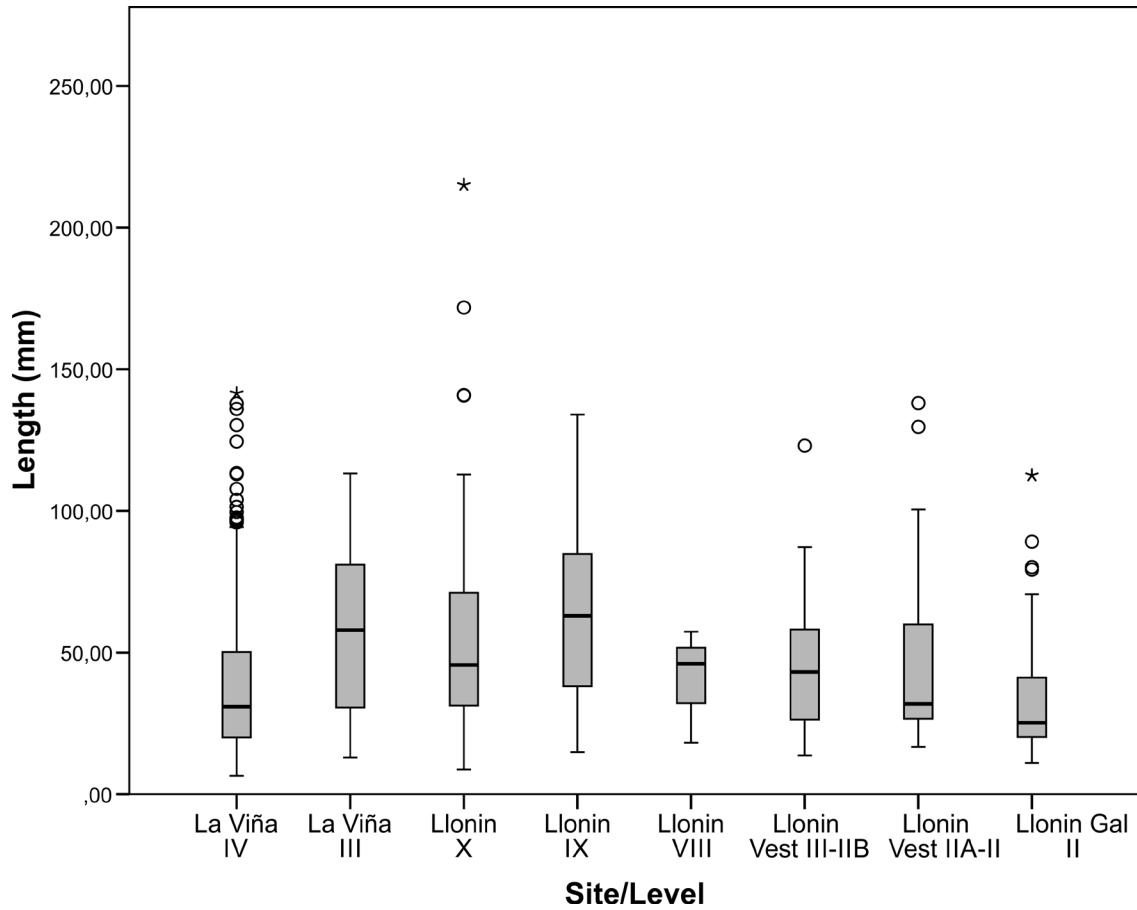


Fig. 8 – La Viña and Llonin. Length measures (complete/fragment) from typological objects for each level or linked/assimilated levels, >30 objects/level. Tooth and shell pendants are excluded.

Fig. 8 – La Viña et Llonin. Longueur maximale des objets typologiques (complets/fragmentés) provenant de chaque niveau étudié ou des niveaux groupés/assimilés, >30 pièces par niveau. Les pendentifs fabriqués en dent et coquille sont exclus.

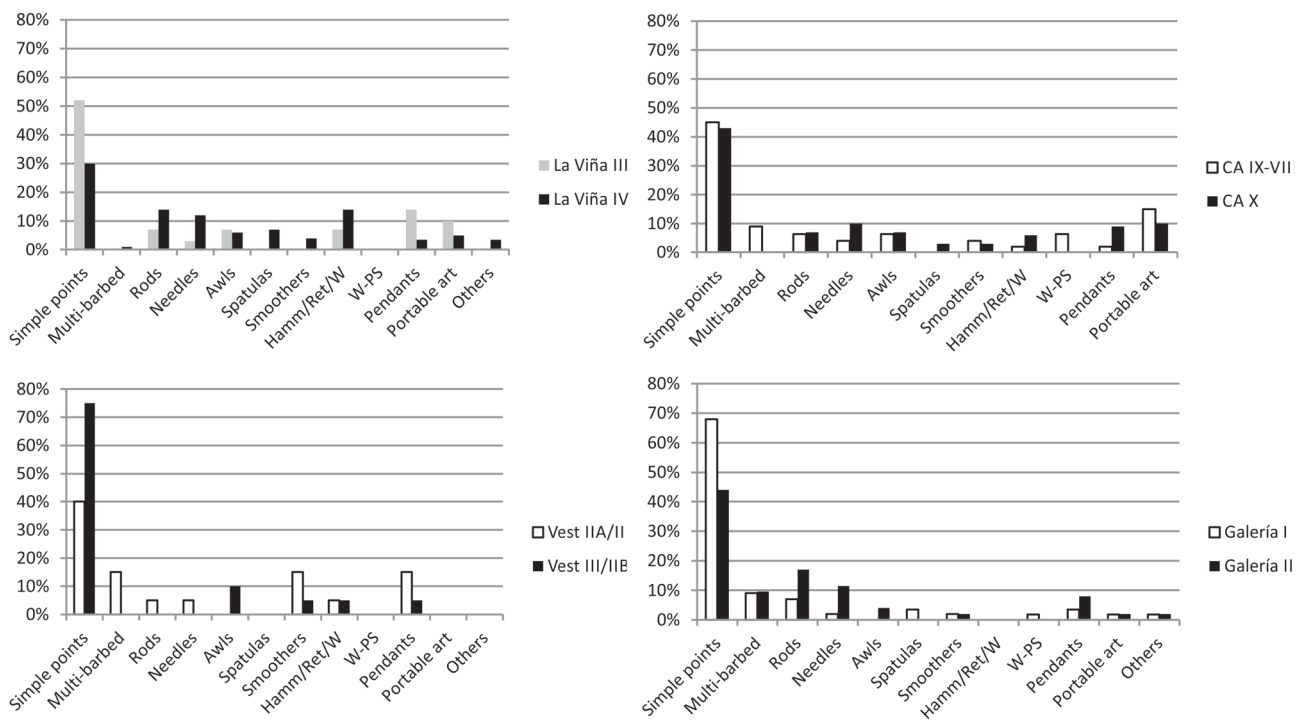


Fig. 9 – La Viña and Llonin. Frequencies of typological groups.

Fig. 9 – La Viña et Llonin. Fréquences des groupes typologiques.

belongs to the UM. There is no portable art and the most outstanding objects are a rib-pendant, highly decorated by series of oblique lines (Duarte, 2010, here: fig. 6.19) and a pointed fragment (rectangular cross-section) with series of short transversal marks in pairs as well as oblique lines (fig. 6.9), somewhat similar to the ventral design of a HRR from La Viña IV (fig. 5.3).

*Unclear stratigraphical correspondences:
Level IV. Cono Posterior (table 5)*

A mesial fragment of a HRR (rectangular/plane-convex, fig. 13.2) was recovered at the top of Level IV (D-16, sub-square 2), just immediately under the crust of almost sterile Level III. This sub-square is near the area where there was sinking of the stratigraphy and associated with blocks (fig. 2G), so it seems to have been intruded from Level III, transported by water and filled a void interstice within the blocks, dripping, etc. Level III seems to correspond to the prolongation of Cono Anterior X slope down, given that Cono Anterior IX stops in Band 7 and Level IV is Solutrean (Fortea *et al.*, 2004). It fits well with the MM assemblage, e.g., Galería II.

La Viña rock shelter

*Level III. Sector Occidental,
T1 and T4 (table 4; fig. 10)*

This is a small assemblage that comes mainly from T1 (fig. 1B and E). T4 is a residual area (<1m², fig. 1B and F) and only one point has been recovered.

Points and HRRs constitute the main typological group (61%). A conical-based point is decorated with crosses, cross-hatched designs and a partial lateral groove (Duarte, 2010, here: fig. 10.17). A mesial point refit has a sub-triangular cross-section, with ventral salient spongy tissue (fig. 10.2). It coincides typometrically with another point that comes from I-25, top Level III (sweeping previous to excavation). Distal large-module fragments lack the base, one (fig. 10.13) has lateral grooves associated with protuberances in checkerboard form on the two faces. Two HRRs have ventral oblique lines and dorsal decorations consisting of two longitudinal series of tubercles (fig. 10.14) and central groove with incipient scaled protuberances on each side (fig. 10.10). A wedge/chisel, large point/rod, has an irregular and spongy back, flattened proximal end and crosses on both edges that extend a little over the upper face (Duarte, 2010, here: fig. 10.1). One bone fragment has three longitudinal lines next to a longitudinal row of ellipses filled with oblique fine lines, near a cross-hatched design (fig. 10.15). Ellipses are documented in some Pyrenean HRRs (e.g., Lourdes or Mas d'Azil associated with 'croissants': Chollot-Varagnac, 1980) or bone pendants (e.g., Marsoulas). There are some parallels in La Paloma and Ermitia (González Sainz, 1989, fig. 3.1 and 42.3) or Altamira and El Pendo (Corchón, 1986, fig. 54 and 162).

**UPPER MAGDALENIAN
BONE COLLECTIONS**

The UM is well represented in Llonin, both Cono Anterior and Vestíbulo. In Cono Anterior IX the typological and technological pieces are balanced (~50%, table 1). Typological pieces are higher in Vestíbulo II but in Cono Anterior VIII the technological pieces are overrepresented (table 1). The assemblage from La Viña II is so scarce that it is difficult to characterize it, but we maintain the preliminary UM assignment by J. Fortea (1990).

**La Viña rock shelter.
Sector Occidental, T1 and T3**

Level II (table 4; fig. 10)

This is a tiny level in a residual and highly cemented area with few objects, T1 (n = 4) and T3 (n = 4, table 1; fig. 1B and E). One double-bevelled point has oblique lines on the bevel and matches others from Level III (fig. 10.7).

**Llonin cave. Levels IX and VIII
(Cono Anterior), II (Vestíbulo) and unclear stratigraphical correspondences
(Cono Anterior and Inner Cave)**

Level IX. Cono Anterior (table 5; fig. 11)

Regarding typological pieces analysed here, points, points/rods, rods and point-shaped wedges dominate over the rest (67%) and there are no pendants (table 5; fig. 9). Spatially, 60% is concentrated in Band H and G is very poorly represented (only 3 pieces, <10%). A refitted rod has no consequences regarding the level's integrity (table 3; fig. 11.13) but two points come from the base of the level, just under the stony layer (fig. 2E, squares H-3 and I-7 respectively) and we think that they belong to Level X: 1. Short fork-based point, similar to another from Level X, 2. Double-bevelled point with cross-hatched bevels. There are no more fork-based points or broken fork-tines in middle-top Level IX in the same way as there are no more cross-hatched bevels in Level IX but there is one in Level X (see section Llonin cave, Level X, Cono Anterior). On the other hand, multi-barbed points are well-preserved since they are long and are among the longest pieces from the level >120 mm (fig. 12.1-3 and 7), contrary to those from Vestíbulo II and Galería I, which are extremely fragmented (fig. 8, <60 mm). Regarding wedges, two are point-shaped, with longitudinally convex double bevels and splintered/crushed opposite ends, similar to those described in Morin (Gironde; Defarge *et al.*, 1977, here: fig. 11.2-3). They fit both with the metrics and decoration of other points of the Level X (see *infra*, section Spheres and internal articulation). Point-based points are different from those of Level X because they are not faceted, but rather are almost dou-

bly flattened, with no clear bevels, based on plain and polished oval cross-sections; two with deep lateral engravings (fig. 11.15), one of which is partially splintered (fig. 11.4), and three with transversal marks (fig. 11.17). A thick awl coincides metrically, i.e., maximum width and thickness, with the self-barbed point from Level X but it lacks morphological features (fig. 11.18).

Some artworks have already been published, such as a rib fragment with frontal-view ibex head images (Fortea *et al.*, 2004, Duarte *et al.*, 2012, Rasilla *et al.*, 2019), a metapodial with a figure noted as being caprine-like (Fortea *et al.*, 2004, fig. 5), a long-bone fragment with a longitudinal zigzag and superposed on interwoven oblique fine lines (Duarte *et al.*, 2012, here: fig. 11.8) or

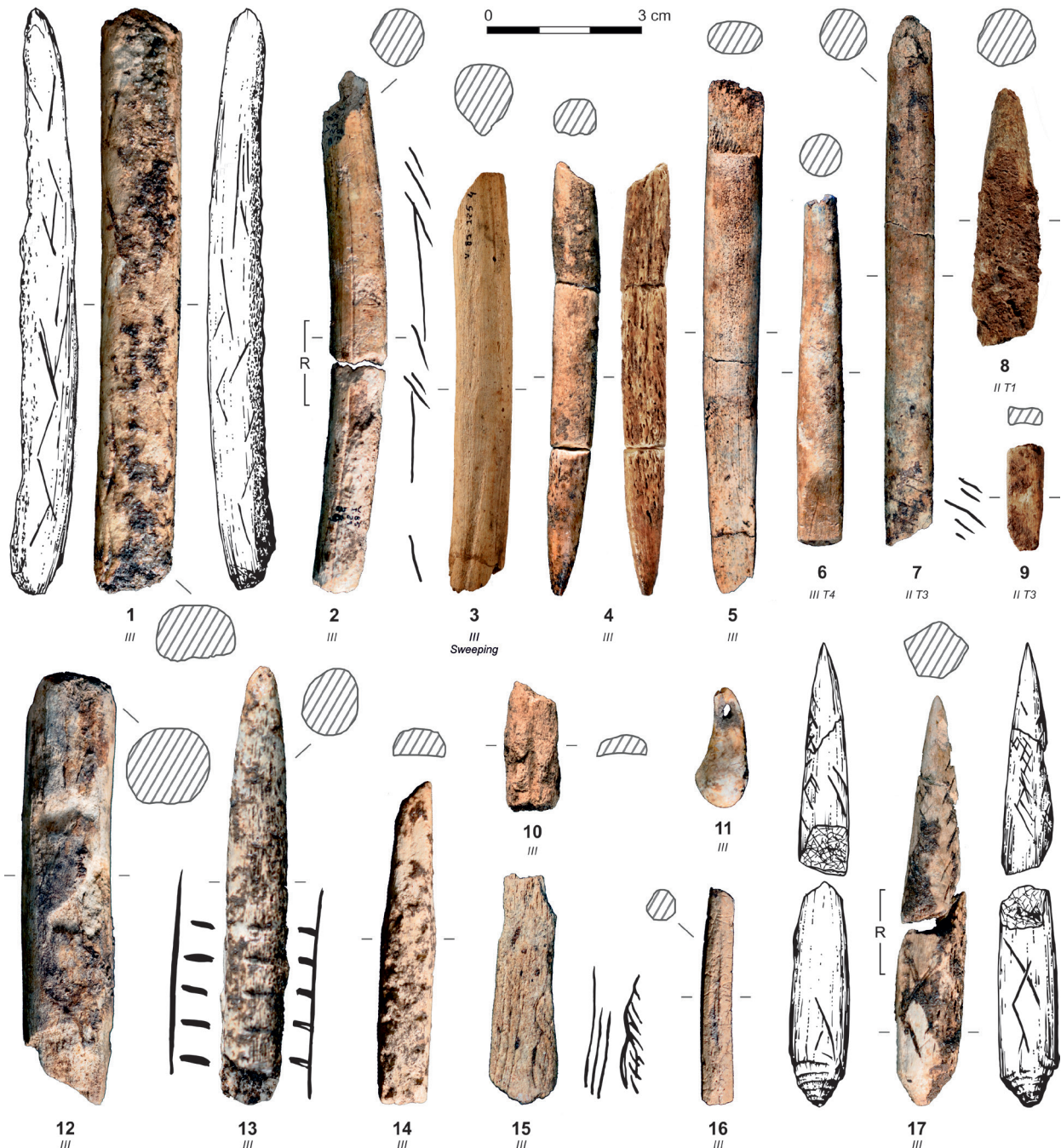


Fig. 10 – La Viña MM and UM, Levels III and II. 1: Wedge (possible, point-shaped); 2-3: Simple points; 4: Point-based point; 5-7/9: Double-bevelled points; 8: Large-module simple point; 11: Red-deer canine pendant; 12: Wedge/chisel; 13: Tuberculated large point; 10/14: Tuberculated HRRs; 15: Engraved bone fragment; 16: Fine point (polygonal cross-section); 17: Conical-based point; R: Refit (photos/drawings: E. Duarte).

Fig. 10 – La Viña MM et MS, niveaux III et II. 1 : Coin/ciseau possible (forme appointée) ; 2-3 : Pointes simples ; 4 : Pointes à base appointée ; 5-7/9 : Pointes à biseau double ; 8 : Pointe simple de module grand ; 11 : Pendentif en canine de cerf ; 12 : Coin/ciseau ; 13 : Pointe grande tuberculée ; 10/14 : Baguettes demi-rondes tuberculées ; 15 : Fragment d'os gravé ; 16 : Pointe fine à section polygonale ; 17 : Pointe à base conique ; R : Raccord (clichés/dessins : E. Duarte).



Fig. 11 – Llonin UM, Cono Anterior: Level IX, Vestíbulo: Level II and Galería: Level I (although contaminated). 1: Simple point; 2-3: Wedge point-shaped; 4: Wedge point-shaped possible; 5-7/11/15-17: Point-based point; 8: Engraved bone fragment; 9-10: Red-deer canine pendants; 12-13: Sub-oval rods; 14: Smoother; 18: Awl; 19-20: Needles; 21: Natural-based awl; R: Refit (photos/drawings: E. Duarte).

Fig. 11 – Llonin MS, Cono Anterior : niveau IX ; Vestíbulo : niveau II et Galería : niveau I (avec des contaminations). 1 : Pointe simple ; 2-3 : Ciseau à forme appointée ; 4 : Possible ciseau à forme appointée ; 5-7/11/15-17 : Pointes à base appointée ; 8 : Fragment d'os gravé ; 9-10 : Pendentifs en canine de cerf ; 12-13 : Baguettes sub-ovales ; 14 : Lisseur ; 18 : Poinçon ; 19-20 : Aiguilles ; 21 : Poinçon à base naturelle ; R : Raccord (clichés/dessins : E. Duarte).

three engraved rib-fragments with tight V-series/rhombus (Duarte, 2010). With regard to the engraved metapodial, for us, it corresponds better to a marmot because of the rounded snout, the presence and character of the claw and nails and the flattened tail. Deep engravings are notable in several wedges and points (e.g., fig. 11. 2-5, 15-16).

Llonin Level VIII. Cono Anterior (table 5)

Technological pieces are overrepresented (table 1; see *infra* fig. 14). The four typological objects were located randomly in two H-band squares and two I-band squares. This level thins out from Band 5 as the slope increases and blocks interrupt its general dip (fig. 2E), so it went almost unnoticed during the excavation. A multi-barbed point (fig. 12.15) was found at the top of Level VIII (I-6) where this level thins down significantly.

Unclear stratigraphical correspondences: Level VIII/IX. Cono Anterior (table 5)

They come from the fall of stratigraphic cross-section concerning several squares: H-5 (bone awl), I-6 (distal fragment of projectile point, circular cross-section with finely engraved central band made of transversal and superposed oblique lines) and H-6 (two engraved bone fragments).

Unclear stratigraphical correspondences: Level VII/VIII. Cono Anterior (table 5)

Also in Band 6, where Level VIII is very thin, there is a patch of travertine crust and an archaeologically mixed patch where a pointed fragment with transversal-oblique lines (similarly to point-based points from Cono Anterior IX, Vestíbulo IIA-II or Galería) was recovered⁵.

Unclear stratigraphical correspondences: Scramble/Sweeping. Inner Cave (table 5)

These pieces were picked up during surface cleaning previous to the excavation, so they lack stratigraphical assignation. They are scarce and we have selected three, presumably Magdalenian, singular objects:

1. Decorated, single-bevelled, large point/rod. The upper face has an irregular cortical-band surface, framed by two parallel arched lines. The decorative motif is not clear because the surface is weathered and the engraving is filled with sediment but a slight zigzag laterally framed by longitudinal lines can be discerned in the central part (fig. 13.7).

2. Decorated tine, mesial fragment, with parallel straight longitudinal grooves, similar to some other fragments from the Pyrenean and Aquitanian caves (Chollot-Varagnac, 1980, p. 281) and perforated batons from Isturitz and Arudy (Chollot-Varagnac, 1980, p. 269) or Las Caldas-Level VI (Corchón, 2017, here: fig. 13.8).

3. Long complete decorated (faceted) point-based point, carinated profile, circular cross-section with pro-



Fig. 12 – Llonin UM. 1-3/9-15: Unilateral multi-barbed points; 4: Bilateral multi-barbed point; 5: Engraved rod, possible shaft of multi-barbed point; 6-8: Multi-barbed points (bases); R: Refit (drawings 1-3: A. F. Rey; photos: E. Duarte).

Fig. 12 – Llonin MS. 1-3/9-15: Pointes multi-barbelées à une rangée; 4: Pointe multi-barbelée à deux rangées; 5: Baguette décorée, fût possible de pointe multi-barbelée; 6-8: Pointes multi-barbelées (bases); R: Raccord (dessins 1-3: A. F. Rey; clichés: E. Duarte).

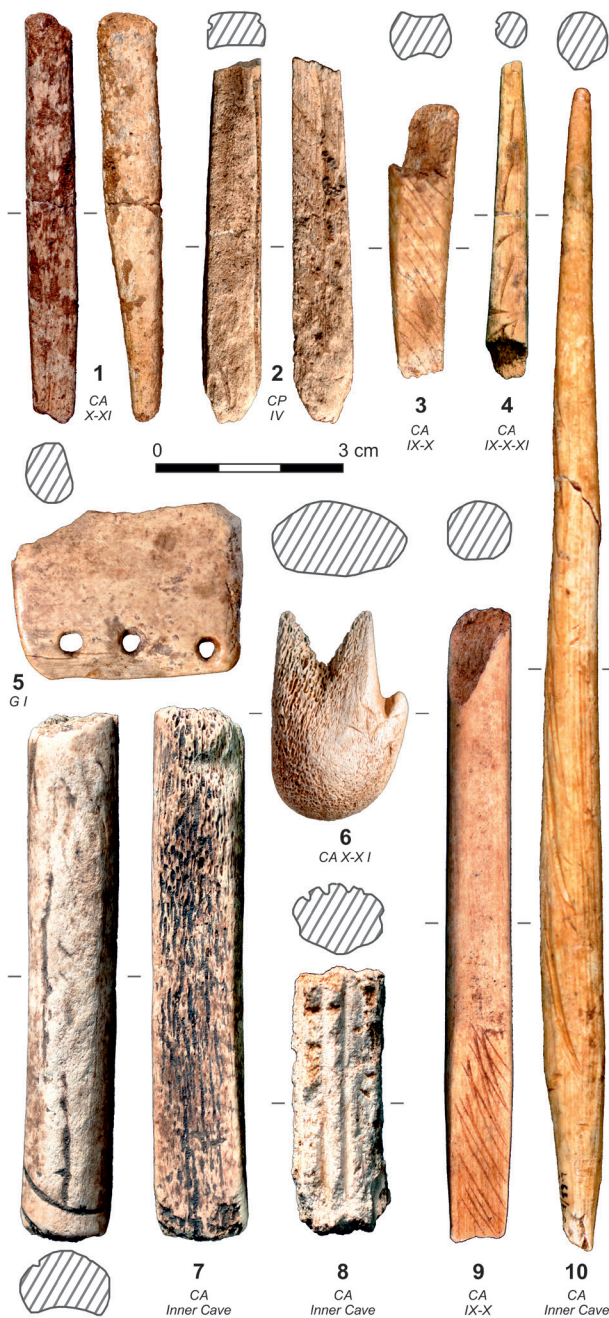


Fig. 13 – Llonin. Unclear stratigraphical correspondences. 1: Single-bevelled point; 2: HRR/sub-rectangular rod; 3: Quadruple-bevelled point (base); 4: Simple point; 5: Perforated bone plaque; 6: Indeterminate (smoother with teeth); 7: Single-bevelled point/rod; 8: Multi-grooved tine fragment; 9: Long double-bevelled point; 10: Point-based point (photos: E. Duarte).
Fig. 13 – Llonin. Objets issus des Correspondances stratigraphiques pas claires. 1 : Pointe à biseau simple ; 2 : Baguette demi-ronde/sub-rectangulaire ; 3 : Pointe à biseau quadruple ; 4 : Pointe simple/sagaie ; 5 : Plaque osseuse perforée ; 6 : Objet indéterminé (lisseur dentelé) ; 8. Fragment d'andouiller multi-rainuré ; 9 : Pointe longue à double biseau ; 10 : Pointe à base appointée (clichés: E. Duarte).

minent ventral spongy tissue (so it tends towards a sub-triangular section). It displays a fine longitudinal groove, laterally framed by oblique lines and two open V-series on the dorsal face (fig. 13.10). It could correspond to the MM/UM because of the ventral groove framing spongy tissue, similarly to some points from Galería I or La Viña III. It is metrically and formally analogous to artefacts from Coimbra-Level 1 (Álvarez-Alonso and Yravedra, 2017). In addition, there are two broken fork-tines; one is the longest at the site (47.26 mm) and it is bifacially scraped.

Levels II and IIA. Vestíbulo (table 5; fig. 11)

The assemblage is formed by 11 technological pieces and 20 tools and ornaments (table 1). Points and rods/HRRs dominate over the rest (60%, table 5 and fig. 9). Spatially, 50% is concentrated in Band 3 unlike Levels III-IIB which are concentrated in Band 5. A refitted point-based point is ~130 mm, with an estimated complete length of 205 mm (table 3 and fig. 11.11) and it has a zigzag-like motif (Duarte *et al.*, 2012). Conversely, the three-piece-refitted multi-barbed point (table 3; fig. 12.11) is the finest and shortest complete one at the site.

THE CONTRIBUTION OF LA VIÑA AND LLONIN TO THE CANTABRIAN MIDDLE AND UPPER MAGDALENIAN

Spheres and internal articulation

Spheres differ greatly depending on the level, culture and site (fig. 14). MM and UM are not clearly differentiated among the studied collections. We have subdivided MM (MM1 and MM2) in order to delve into the internal variability of the assemblages (see next section). Thus, the symbolic sphere increases during MM2 but it is deceptive, since La Viña III is a small assemblage and in Llonin a high percentage of the artefacts is constituted of shell pendants from Cono Anterior, maybe from a single complete necklace. Conversely, portable art is qualitatively richer during MM1, but domestic sphere rises up. Here, a unique balance between the two domestic sub-spheres (technology and the rest, i.e., rods and tools, fig. 3) and the hunting sphere is reached (fig. 14). In those levels where the mentioned sub-spheres are equilibrated with a tendency to the decrease of the technological one, is La Viña III and Galería both MM2 and UM. In this case, Vestíbulo and Cono Anterior share a similar pattern, implying an important spatial distribution: manufacture in the cave entrance (Cono Anterior is displaced from Vestíbulo) and household activities in the sheltered Galería, including point retrieval and recycling because of the importance of the hunting sphere. Cono Anterior VIII is a small but extreme case because of the large quantity of technological pieces.

We have combined tools and technological pieces in the domestic sphere. This sphere is very high in La

Viña IV, with an important frequency of needles and awls (fig. 9 and 14). It is not clear for us if HRRs belong among the category of projectile points and, conversely, if rods belong to the domestic sphere, since we have attested intensive use both in projectile points and tools (resharpening and recycling) and the almost absence of bases distort classification (i.e., intermediate typologies, notably rods and HRRs). Matrix lack and splinters and by-products are not plentiful (but for Cono Anterior IX and VIII)6, so it seems that production is also intensive and partly made off-site (fig. 14 and table 2). However, it is biased by the high rate of fragmentation (~80% for the whole studied series) and the low number of refits (table 3). On the other hand, since decorations and portable art are varied, importation is not to be rejected.

The internal distribution of the three spheres suggest a constant interchange attested through production, recycling and hafting/decoration (30-40% and ~60% in Llonin) but the relations between the hunting and symbolic spheres are different since recycling has not been assessed between them, i.e., there are no perforated points (fig. 3).

Regarding typology, the most frequent cluster in each level is the one formed by mostly antler projectile points, point/rods and rods (~60% for the whole studied series). Partly because of the mentioned fragmentation rate, complete projectile points, point/rods and rods are few (<2% out of the typological pieces, excluding refits: 12 simple points, 1 self-barbed point and 2 multi-barbed points). Together with the scarcity of matrix and splinters, it is difficult to evaluate the initial metrics of antler blocks and the reduction thereof. The preserved maximum length modules are ~150 mm (fig. 7). There is an extreme outlier ~215 mm, almost complete point-based point, from Cono Anterior X (fig. 6.1). In addition, there is a ~205 mm (estimated) refitted and then almost complete, point-based point from Vestíbulo II-IIA (fig. 10.1) and ~181 mm complete point-based point from the Cono Posterior (fig. 12.10). All these long pieces (>150 mm) have medium-large width module. We can therefore estimate a >200 mm length for the making of 9-12 mm width points, either point-based or barbed.

Modules are determined from the shaft's maximum width and divided as large, medium, fine and very fine (table 6, 68% of the total of table 6). Thickness is a less significant factor since its metric range is more reduced as it is standard deviation (i.e., width 9.29 mm mean, 3.04 st deviation; thickness 6.82 mm mean, 2.39 st deviation; considering maximum width and thickness of simple points in the grey columns of table 6).

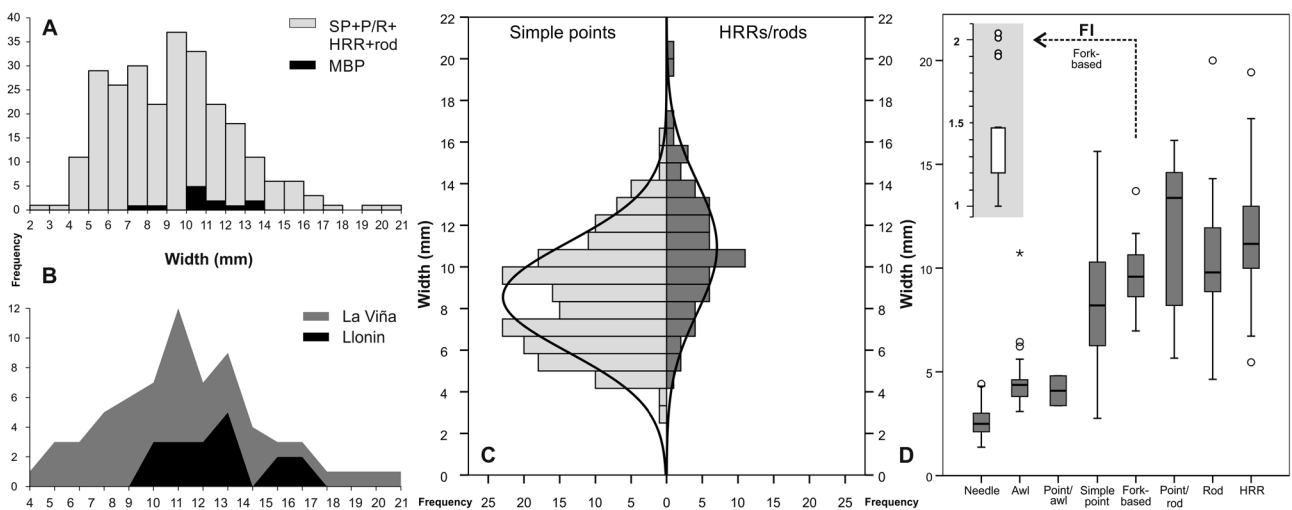
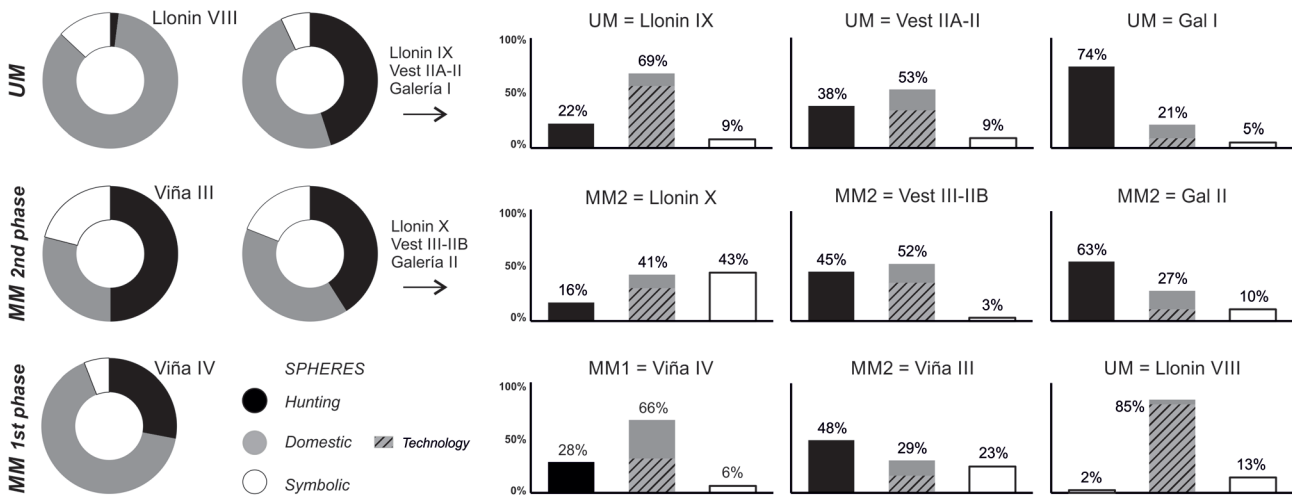
There are also in both sites and phases wider and thicker (large module and always incomplete) points, rods or point/rods, which are more numerous in the assemblages where technological pieces are large, i. e., La Viña IV and Cono Anterior IX (fig. 14 and table 6). The characteristics of these pieces point to almost complete preservation of the initial metrics regarding width and thickness. Thus some have spongy tissue and changing section (e.g., fig. 11.13 and 13.7), others have several uses/recycling (e.g., wedges from La Viña III and Cono Anterior IX,

fig. 9.1 and 10.2-3) and others are in course of fabrication with irregular edges (basically rods, table 6). Moreover, multi-barbed points' maximum width is ~12.5-14 mm, similarly to that of the in-process multi-barbed point (fig. 12.13: ~14 mm width). In conclusion, these large modules seem to 'ramify' both into points, rods/HRRs and re-ramify or recycle in some cases into smaller modules, e.g., HRRs with cleavage-like faces (fig. 5.8 and 6.26).

Comparing simple points with HRRs/rods, the last group has a higher width range (fig. 15), it overlaps with simple points but distribution is focused on medium-large modules (fig. 15 and table 6). Width modules of HRR/rods vary between La Viña and Llonin, being more restricted in the case of Llonin (fig. 15). Metric (width) overlapping is extensive to all the typological groups, e.g., the very fine module is composed of tiny rods and HRRs and these overlap with points such as self-barbed or pyramidal point, as well as antler point/awls and bone awls (fig. 15). The use of awls as projectile points is feasible from a metric analysis and further studies will clarify the cut-out from one to another. Moreover, awls overlap with needles (fig. 15).

Bases are poorly preserved in the case of points, ~30-50% regarding simple and multi-barbed points, <10% regarding both HRRs and rods (table 6), and it is higher concerning preserved shaft and bases (simple points: ~10% in La Viña IV, Galería II and I but ~20-30% in the rest). Simple points are best represented in MM, so fork-based and double-bevelled points predominate in the overall studied series, preferably fine and medium modules. The very fine module increases if we count the mesial and meso-distal fragments; this is a metric effect (distal ends <40 mm long are usually very fine) which may suggest an in-situ point retrieval, resharpening, or even recycling.

Resharpening has been recorded by superposed scraping series or faceted panels (e.g., fig. 6.11) in projectile points, rods, awls, needles and spatula (40-50% of the tips). Fork-based points from La Viña and Llonin have similar metrics (forking-hollow and FI, table 6), outline and cross-sections (fig. 4 and 7, table 6), except for the case of four points made from rectangular rods (fig. 15 and 4.1-3: recycling (?); when including these pieces, the mean st deviation of the FI increases up to .35 that is the highest of the simple points). In the case of Llonin, resharpening from one long fork-based point with a finished aspect (the longest of the MM assemblages) is clear (fig. 7.16-18, 46% of reduction). Regarding HRRs, they do not have the potential to configure bivalve points since no facial refits have been documented, their morphology and metrics are diverse (high mean st deviation of the FI), ventral hafting lines are scarce (e.g., La Viña IV: 8%). In addition, tips are few, some have a spatulate form with flattened-polygonal or biconvex cross-section (e.g., La Viña, fig. 6.27 and 10.14), that creates a sharp tip (Langley, 2015). These tips are also recorded in rods, fork-based points (fig. 4.5), multi-barbed point (fig. 12.14), awl/dagger (fig. 6.22), needle (fig. 4.13), tiny rods/broken fork-tines (fig. 7.2) and in the smoother/spatula/point from Galería I/II (fig. 7.6), so they are not restricted to



projectile points. The mentioned smoother/spatula/point is the one that best indicates that strong scraping and spatulate forms fit best with the tip than with the base or 'basal striations' (as classified by Langley, 2015, IST II 1930), since base is clearly worked and morphologically separated from the shaft.

Recycling has been noted when evidence of a previous morphology is preserved, e.g., smoother (multi-tool, fig. 4.29). 'Point-shaped wedges' are inserted in the points' metrics (fig. 15), so they are probably recycled (Deffarge *et al.*, 1977). Tiny rods are recovered in levels

with fork-based points (La Viña IV, Llonin X, Galería II), they are narrower and thinner than those preserved in the complete fork-based points. They have cross-hatching or multiple scrapings that alter the initial morphology (instead of one-way technological-scraping preserved in complete fork-based points) and there are pieces with an intermediate form, i.e., fork-tine outline and bifacial scraping (table 6; fig. 7.1; see *infra*, section The contribution of La Viña and Llonin to the Cantabrian Middle and Upper Magdalenian), so recycling from broken fork-tines, which are frequent in the assemblages with fork-

based points, is conceivable. A possible rejuvenation-recycling is a refitted rod from Llonin X that coincides with a point, distal fragment, in decoration (fig. 6.4 and 10). La Viña IV foreshaft is the smallest fork-based point recovered (>49% of reduction taking Llonin complete one as reference, fig. 4.7). Given that the base does not diverge from others (fig. 4) the bevelled tip may consist evidence of recycling. Concerning the possible perform/foreshaft (fig. 4.6), a question comes around because it could be a flattened rod-like support bound for fork-based point or others. It would configure another point length module, going deeper into the question of diversification not exactly determined by maintenance.

Diversification consists of a series of points and tools that have a different morphology and starting dimensions undetermined directly by the reduction itself but rather by a specific design that consists of the selection of different supports as a starting point of fabrication. It is clear in needles because the one from Cono Anterior X, found within the tube (fig. 6.15), is complete, it has a finished aspect but it is smaller size than the rest. Double-bevelled points show a clear distinction regarding morphology and length. If resharpening is feasible from those of Llonin (fig. 7.22 to 6.21, 26% of reduction, estimated complete), it is not so clear with fig. 7.29 because of morphological divergences (58% of reduction, estimated complete, see section Llonin cave, Level X, Cono Anterior and section Llonin cave, Level II, Galería). Regarding multi-barbed points, those from Galería I and Cono Anterior X share similar morpho-metrics that differ from the one of Vestíbulo II, reduced by ~66% of the estimated initial length (fig. 12.1), a bit higher than those from the Pyrenees and Dordogne (Langley, 2015). Although the base is rejuvenated, the different width metrics and teeth morphology, and the morphological and decoration diversity recovered in Llonin, the lack of intermediate or in process points in the assemblages, conversely to the above-mentioned fork-based points from Llonin, it points to diverse and sophisticated designs as result of a different initial length concept and not a simple reduction.

Assemblage characterization of the Cantabrian Middle and Upper Magdalenian

In the Cantabrian region there are currently few sites with recent excavations that can ensure an appropriate record for establishing techno-typological attributes and, in turn, suitable for defining the chrono-cultural and regional framework and that could be compared with the recently proposed models for the Pyrenean-Aquitaine area (Langlais *et al.*, 2016; Pétilion, 2016).

MM has been historically poorly documented because it is diluted with LM (Utrilla, 1981, 2004). It was influenced by old excavations where multi-barbed points ('harpoons') had eclipsed the stratigraphic series leading to the stratigraphical mixing of the sites/assemblages or their neglect in the case of small assemblages, namely brief occupations (*e.g.*, El Castillo, Cueto de la Mina, La Loja: Utrilla, 1981). In addition, similar or other stratigra-

phical problems and chronological overlapping are documented in the so-called Evolved Lower Magdalenian (*e.g.*, Las Caldas, La Güelga, Tito Bustillo), which has introduced more confusion than clarity.

The main sites suitable for analysing and defining the MM are Las Caldas, Cueva Oscura de Ania, Coimbre, El Linar, Las Aguas and Santimamiñe; apart from those currently under excavation or study (*e.g.*, El Cierro, Cova Rosa, La Garma, Ezkuzta). However, old excavated sites are useful, *e.g.*, Cueto de la Mina, but they should be revised from the current framework because they do not fulfil the needed stratigraphical precision.

Of them, only Las Caldas has a long-term MM stratigraphy, but stratigraphic problems are important (solifluctions, erosions, *etc.*: Hoyos, 1995) and they have not been systematically taken into account when addressing the stratigraphic integrity of each level and its cultural assignment (see Corchón, 2017 for a synthesis). In Corchón's monograph (2017), the use of the alterations and systematic refits to assess these problems is not clear, particularly in the bone industry analysis. According to the sedimentological processes detected, the results offered in Corchón *et al.* (2016) must be taken cautiously because solifluction events always imply movement, some processes that occur afterwards could affect previous levels and the spatial area analysed is small (~3 m long/~2 m wide). These issues cannot be addressed here.

UM sites were numerous at the beginning of Palaeolithic research (González Sainz, 1989), but with various stratigraphic snags that have probably led to an idea of continuity (MM/UM/late UM), nuanced in recent studies (Chauvin, 2012, González-Morales and Straus, 2012). Some sites are useful (*e.g.*, Los Azules, La Pila, El Perro, La Fragua, Santa Catalina, Berroberria), but others have little development or are under excavation or study, so they cannot yet contribute to a better approach to this question (*e.g.*, El Olivo, Cueva Oscura de Ania, Cova Rosa, La Riera, Los Canes, Rascaño, El Pendo, El Valle, Sovilla, La Garma, El Horno, Antoliña, Santimamiñe, Laminak II, Arlanpe, Ekain).

If we focus on MM-UM and the transition between them, there are some sites with typological markers of both moments where the cultural and stratigraphical differentiation is not so clear (*e.g.*, 'facies País Vasco' sites: Utrilla, 1981, 2004). Thus, some objects from La Viña and Llonin entail stratigraphical doubts, so the cultural assignment is subject to debate. In our case, attribution is made on the basis of the assemblage's unity, inter-assemblage convergences and relative stratigraphical position and it calls into question the traditional or current framework (Barandiarán, 1972; Utrilla, 1981, 2004; Corchón, 1986, 2017; Adán, 1997; González Sainz, 1989; Pétilion, 2007, 2016).

1. Single/Double-bevelled points with cross-hatched (*i.e.*, reticule-like design) engraved bevels are documented in La Viña IV, Cono Anterior X (and IX although intruded from X) and Vestíbulo IIB. Traditionally, these medium-size cross-hatched-bases are associated with the LM (Utrilla, 1981; Corchón, 1986) but the sites where

they had been documented include MM and/or UM overlying levels, so contaminations are probable (Corchón, 1986, Altamira: fig. 42.3, El Castillo: fig. 59.1 and 68.5, Balmori: fig. 20.6, El Río: fig. 54.2, La Paloma: fig. 44.4, Barandiarán, 1972, El Pendo PE6, Urtiaga U4). Cross-hatched designs are also documented on broken fork-tines (fig. 6.1), which are in our opinion partly or completely recycled into tiny-rods (La Viña IV, Llonin X, Galería II or Laa 2 as seen in fig. 2.3., Pétilon *et al.*, 2015).

2. Fork-based points are not registered in the studied UM levels but for one in Llonin, Cono Anterior IX. As we have already explained, it comes from the bottom of Level IX, under the clastic bulk of the level so it should be assigned to Level X and to the MM. Moreover, fork-tines are absent in this level, whereas they are present in Cono Anterior X and Galería II.

3. The conical-based and refitted point from Galería II and I entails a problem of assignation because there are no direct parallels in the Cantabrian region. Its large module fits well with other MM or UM points from the studied sites but the conical-based point is only documented in MM assemblages like Las Caldas-Levels VIII and VII (Corchón, 2017) and La Viña III and although a sub-triangular section is associated with the LM and País Vasco Facies (Utrilla, 1981) we have documented this kind of section in both sites and both periods. The grooved E design is similar to that of Gourdan (Chollot-Vargnac, 1980, p. 259, 48.570.R) and this motif is associated by Lucas (2014) to the 'Ancient' Upper Magdalenian. In the absence of more arguments, we assign this point to the MM so we consider the deepest fragment (R1) in its original place (see section Llonin cave, Level II, Galería).

4. Medium-size point-based points and short double-bevelled points from Llonin, Galería II and I, are attributed to the MM, because the stratigraphic position of some of them is at the bottom of Level II and they are assimilated/correlated to other points from Cono Anterior X and Vestíbulo III/IIB. In contrast, multi-barbed points ('harpoons') are assigned to the UM since they were recovered inside a hearth in the intersection layer between Levels I and II; they are correlated to Cono Anterior IX and Vestíbulo IIA/II.

On the other hand, some objects come from the intersection between two levels. In some cases, stylistic/topological features cast no doubt (*e.g.*, engraved horse and oval rod with zigzag from La Viña, see section La Viña rock shelter, Level IV-V, Sector Central) but in others, arguments for their assignment are scarce.

1. Single-bevelled point (2/3 flat-shaped) from La Viña IV-V is the largest complete point in comparison with Level IV. One is decorated in La Paloma 'Upper Magdalenian' level, with a similar outline and estimated size (~90 mm long, González Sainz, 1989, fig. 3.5). This is not conclusive because the stratigraphical series of La Paloma includes LM-MM-UM (Hoyos *et al.*, 1980, Hoyos 1995). It could correspond to the MM but the Solutrean levels in La Viña need to be studied to rule out contamination.

2. Half-round rod from La Viña IV. It has a wide pointed tip with short transversal lines on the upper face/edges and oblique/superposed transversal lines on the lower face. It comes from SC and from the lowermost part of Level IV. In addition, it is similar to one recovered in the next square but belonging to the first layer of Level V. They do not refit and there are two other similar pieces in Las Caldas, designated as 'Isturitz-type'. In this site, they were recovered in Levels XI and IXc (Corchón, 2017, fig. 79 and 127), therefore assigned to LM and MM respectively, but the one from Level XI was recovered inside a hearth and the dates of overlying Levels IX and VIII are overlapped, so it is a clear example of anthropogenic contamination and a MM origin is appropriate.

3. Plane-convex/sub-polygonal HRR from La Viña, bottom Level IV. It is narrow (~6 mm) and it has two deep transversal lines on the upper, flat, face. It comes from the lower part of Level IV in SC and another, with comparable width, was found in the Trench. One similar fragment is documented in Las Caldas-Level XI and attributed to LM (Corchón, 2017, fig. 57.720), but this level is contaminated as said before.

For these two last cases, a MM assignment is feasible given that in La Viña there are no more intermediate levels between MM and Solutrean, while in Las Caldas the presumed LM is followed, from top to bottom, by Badegoulian and Solutrean (Rasilla and Duarte, 2017).

4. Thick single-bevelled point from Llonin, Cono Anterior X-IX (intersection of Levels X and IX). It is the only one currently known at the site but it is similar to those from El Castillo and Cueto de la Mina-Level D (Corchón, 1986, fig. 48.3 and 17.3 respectively), so it is necessary to study the Upper Solutrean level in Llonin to verify its assignment.

Leaving apart the mentioned problems, we think that 'Cantabrian-Pyrenean Middle Magdalenian' (Forkea, 1989) or 'Ancient Middle Magdalenian' (Corchón, 2017) is well defined in La Viña and Las Caldas, although it is necessary to consider the mentioned contaminations and others that are plausible given the sedimentological study of Las Caldas (Hoyos, 1995). Chronologically they are coeval ~13,500/13,000 BP or ~16,500/16,000 cal. BP and despite the eventual contamination, general trends stand out.

In any case, we think that La Viña's osseous assemblage is biased by fragmentation and site's functionality is somewhat different from that of Las Caldas. Thus, La Viña IV has a predominance of fork-based points within few point-based points, double-bevelled points, one quadruple-based point and one pyramidal-based point. Rods are diverse, some are very formalised and decorated; others are unfinished; some are highly elaborated and recycled. Bases are almost absent but by comparing with some from Las Caldas (*e.g.*, Level XI, very similar metrically) they could be single-bevelled, like the only preserved base in La Viña IV. Tips are usually spatulate or smoothed. Ventral engravings are scarce in La Viña and dorsal decorations are diversified in both La Viña and

Las Caldas. 'Proto-harpoons' are scarce but very singular in La Viña: one with protruding teeth is in addition the largest piece at the site, although broken (estimated min. length ~150 mm). Needles are abundant; some are long, others very short and width is also variable. Few awls have a pointed base, others are unfinished or trimmed; natural-based awls are scarce. Spatulas are large, diverse and made from ribs, some are finely worked and decorated but they are usually fragmented. Smoothers, wedges/chisels and hammers/retouchers are poorly worked and they are scarce, except for the last group which are abundant (fig. 8). Pendants are also diverse and some are exceptional, decorated, with links to art-works, which are not large but determinant in considerations of symbolic matters and networks. Horse dominates the graphic ensemble and other animals are scarcely represented, such as owl and other problematic, possibly composite, animals. Point and tool decorations are common, especially on HRRs, and one single tuberculate-like carving is possibly an adaptation of Pyrenean 'croissants' or spirals while open-V series in central band suggest a regional link with Las Caldas, Abautz and other Cantabrian and Pyrenean sites (Duarte *et al.*, 2012), but lithic or hard animal exotic raw materials are scarce.

Llonin fits fairly well with La Viña IV assemblage, and so generic MM, when we take into account all the series from the cave where we have identified this period: Cono Anterior X, Cono Posterior IV^{top}, Vestíbulo III-IIB and Galería II (tables 1 and 5). However, Galería II has a non-quantified mixed anthropogenic assemblage that we have isolated in terms of typology, so it is not as accurate as desired. In fact, all the areas of Llonin may potentially have suffered mixings: Cono Anterior and Posterior = dejection cone, Vestíbulo = cobble falls/anthropogenic placing, Galería = anthropogenic contaminations. Nonetheless, verifications of the stratigraphical provenance and typological features isolate the MM from the UM and allow us to track some levels with these formal convergences.

Anyway, if we consider MM and UM levels from Llonin together, the results evoke sites with complex stratigraphies and probable contamination, *i.e.*, 1. Contamination has already been detected during excavation (Tito Bustillo), 2. Contamination is inferred from the sedimentological analysis (Las Caldas, Berroberria), 3. Contamination is inferred from the stratigraphical sections because they involve wedgings, block falls, *etc.* (Cueva Oscura de Ania), 4. Techno-complexes represent a 'transition', 'beginning', *etc.* from the typological studies (Urriaga). These assemblages are made up of double-bevelled points, point-based points, very few fork-based points, decorated HRRs (some with tuberculate decoration and/or clovers and parentheses), multi-barbed points/'harpoons' either 'proto', 'classic' or both, needles/awls and some extraordinary pendants, including bone discs.

Unlike to La Viña IV, the assemblage of Llonin, generically MM (Cono Anterior X, Vestíbulo III-IIB, Galería II and those pieces from Level I assigned to the underlying Level II and Cono Posterior IV^{top}), is less

focused on fork-based points. Instead, there are diversified double-bevelled points (bevels with longitudinal lines, long points, and without them, short points), medium-fine point-based points, fine double-bevels, fine point with polygonal cross-section, self-barbed points, cross-hatched bevels, HRRs, point/rod with zigzag/clovers, large conical-based point, large and small needles, awls, antler smoother/spatula/point with engraved handle, bone bead, bull-roarer, bone disc and a large number of shell pendants, although portable art is almost absent. Some points have a sub-triangular section, few of them with protruding spongy tissue. Point/tool engravings are notably zigzag and oblique lines but not as deep as they will be during UM (Lucas, 2014).

Strikingly, it is basically similar to Las Caldas-Levels III-I, which are ascribed to the end of MM/beginning of UM and dated ~13,400-12,500 BP (~16,500-15,000 cal BP: Corchón, 2017). And also to Abautz-Level E dated ~13,500 BP (16,413±423 cal BP: Utrilla *et al.*, 2015). In Las Caldas-Levels III-I, portable art decreases in quantity and quality, bone cut-outs and multi-barbed points are absent but there are bone discs, fork-based points (some long and others very short), short double-bevelled points (with no hafting-marks or lines), long double-bevelled point (longitudinal hafting-lines), medium-fine point-based points, bone discs, bone bead, antler smoother/spatula/point with engraved handle, HRR with clover and parentheses designs, large conical-based point, bone plaque (possible bull-roarer), metrically-diverse needles, quadruple-based points, fine polygonal-section point, flattened point/rod with ventral curve-line and cross-hatched bevels.

Some of these features are also documented in other sites, such as fine-medium point-based points (Urriaga-Level D, Santimamiñe-Level VI, Tito Bustillo-Level 1a or La Paloma 'Magdaleniense superior': González Sainz, 1989), possible slender self-barbed point (Ermittia-Levels III-II, Urriaga-Level F: González Sainz, 1989, fig. 42.97), fork-based points (Corchón, 1983) and short double-bevelled points (La Paloma, Santimamiñe, Urriaga, Aitzbitarte IV: González Sainz, 1989). Abautz-Level E could also form part of this group because of clovers, lateral crosses and zigzags among other motifs (Utrilla, 1995). If the separation between short and long double-bevelled points is subject to use/resharpening/recycling/*etc.*, it is noteworthy that we observe a clear cut-out (130 versus 90 mm long) in several sites (for example from the published of Las Caldas-Level III: Corchón 2017, Isturitz EUM: Pétilon 2016). It matches the so-called projectile diversification and the miniaturization of several projectiles (González Sainz, 1989). Regarding the short group, the complete points share a similar morphology (*i.e.*, round-based bevels without hafting marks and rhomboidal outline, altogether with a lack of resharpening features) and longer double-bevelled points are different because they are wider and bevels are square-based with hafting marks.

We therefore believe that another phase, tentatively designated by us as MM2, could be masked within these transitional levels, best represented in Llonin and Las

Caldas, although we cannot delve further at the moment in the degree of contamination. In Las Caldas, it corresponds to the sedimentological sequence of Levels III to I established by Hoyos (1995), assigned to ‘Cantábrico VII/Dryas II’ and also documented in La Viña III. It is described as a cold phase, similar to inter Laugerie-Lascaux and longer-lived than in Dordogne (Hoyos, 1995).

La Viña III is a small assemblage with three tuberculate objects and some similar features shared with Llonin, MM2, such as short and long double-bevelled points, point-based point and fine polygonal-section point. Two tuberculate HRRs are very different from each other and from another one recovered in Level IV. One has two parallel bands of protruding sub-circles similar to one from Gourdan (Chollot-Varagnac, 1980, p. 168, 47.324.C). There is also a large distal point with a draughtboard design, parallel to Urtiaga-Level D (González Sainz, 1989, fig. 50.5) and Cueva Oscura de Ania-Level 3 (HRRs in this case: Adán *et al.*, 2002). Both examples from Urtiaga and Cueva Oscura de Ania belong to levels placed in the MM/UM transition. Thus at Urtiaga, possible mixings between Levels D and E have been highlighted (González Sainz, 1989) and Cueva Oscura de Ania is subjected to inter-layer contaminations (the named Evolved Magdalenian or Initial Upper Magdalenian: Álvarez-Alonso and Yravedra, 2017) as already commented. Another feature observed in the mentioned transitional sites (i.e. Cueva Oscura de Ania, Las Caldas and Urtiaga) and La Viña III is the large oval wedge (point/rod) with lateral crosses, frontal lines and/or zigzag (Corchón, 2017, fig. 319.671), as at Cueva Oscura de Ania (Adán *et al.*, 2002, fig. 7.6) and El Pendo (Santamaría *et al.*, 2001, fig. 2) and points with grooves or ‘frames’ (Las Caldas: Corchón, 2017 and here fig. 10.4).

At the time of recognition, this period of time was poorly documented both sedimentologically and chronometrically in the Cantabrian sites (Hoyos, 1995). Recent chronometric and sedimentological data are not abundant or clear enough (e.g., González Sainz and Utrilla, 2005; Farrand, 2012) to qualify this phase. As regards generic MM radiocarbon dates, they overlap with the LM and the UM so if we superimpose/join the cumulative diagrams from the three periods, namely LM, MM and UM (González Sainz and Utrilla, 2005, fig. 1), the outline of the frequencies does not narrow so much towards the limits, contrary to what happens with the diagrams of LM and UM individually, suggesting then a significant chronological continuity and not a rupture, which is partly related to wide deviations in old dates. So they do not clarify much the issue.

The UM is represented in several levels of Llonin, that is to say Cono Anterior IX and VIII, Vestíbulo II/IIA and Galería I. The assemblage is formed by point-based points and Cono Anterior IX has a singular series of point-based/double-bevelled points with deep lateral engravings, apart from wedges/chisels. The latter are large module, projectile-point shaped and correspond morpho-metrically with one from Tito Bustillo that has engraved ibex heads (Duarte *et al.*, 2012), as well as those

from La Chora and El Valle (González Sainz, 1989). These ibexes are also depicted on the edge of one multi-barbed point and on one rib from the already named Cono Anterior IX. In Vestíbulo IIA there is a small multi-barbed point and in Galería I, together with those from the mentioned contaminations, there are several multi-barbed points. Rods, needles, awls, spatulas and pendants are no longer as important as in the MM and multi-barbed points do not entail a direct replacement of any tool type (fig. 12). No internal division has been made regarding UM levels (see section Llonin cave, Level I, Galería). No dates are available, not even one from a black painted ibex coming from an ibex group in frontal view, comparable to the above mentioned rib of Cono Anterior IX. This date was contaminated by an insect and the rest of art dating, directly obtained from the paintings of the wall, were not very precise either (Fortea, 2002).

Regional and interregional links: stand-by, absences, problems and singularities

As noted in some papers, MM sees the emergence of portable art and this also comes true at the Cantabrian area (Utrilla, 2004; Sauvet *et al.*, 2008; Straus, 2013; Corchón, 2017; Sauvet, 2019; Fuentes *et al.*, 2019). Inter-regional links have been pointed out since the beginning of excavations at both sites (notably cut-outs and bone discs: Fortea, 1990, Fortea, *et al.*, 1990a, 1990b) and these cultural markers have been included in the sub-subsequent regional and general formal comparisons or circulation/interrelations analysis (Sauvet *et al.*, 2008). We added others when we compared the two opposite ends of the Cantabrian region: Abauntz (in northern Navarra) with La Viña and Llonin (Duarte *et al.*, 2012). The present study has not added more high-entity markers, so their contribution to this matter can be rightly assessed through the different existing maps and theoretical formulations (Álvarez and Rivero, 2009; Rivero, 2010; Pétilion, 2013; Utrilla *et al.*, 2013; Duarte, 2015; Pétilion *et al.*, 2015; Sauvet, 2019; Gravel-Miguel, 2017; Straus, 2018; Fuentes *et al.*, 2019, among others).

For hard animal raw materials, we have documented general groups: bone, deer antler, teeth and shell but they need to be studied in greater depth. Reindeer are documented in other Magdalenian Cantabrian sites (e.g., sites <50 km from Las Caldas, Tito Bustillo, Cueto de la Mina, La Riera, El Castillo, Altamira or El Ruso; Gómez-Olivencia *et al.*, 2013) and are probably present in La Viña and Llonin given that this animal is engraved/painted in both sites (mobile and parietal art respectively) during the MM. In La Viña there is also a perforated deer incisor similar to ones from the ‘necklace’ of Las Caldas (Corchón, 2017, here: fig. 4.25). Whale bone (Pétilion, 2013) has not (yet) been documented, but a study is ongoing by A. Lefebvre (Université de Bordeaux). In Las Caldas cave there are points made from cetacean, as well as cetacean teeth and representations of these animals (Corchón, 2017). In addition, cetaceans are represented in other Cantabrian caves (Candamo, Tito Bustillo, etc.)

where historical hunting has been documented, so, similarly to reindeer, cetacean bone was surely more used than is currently documented. Also, marine resources were employed, notably in Llonin-Cono Anterior X where there is a large number of perforated *Littorina obtusata*, which are also present in such other MM sites as Urtiaga F and G and La Garma (Utrilla, 2004).

Other absences have been detected, such as decorated deer canines, common in other Cantabrian sites (Vanhaeren and d'Errico, 2003), doubly perforated pendants or perforated/decorated hyoid bones (e.g., Las Caldas, La Garma). Conversely, some pendants are quiet exceptional (e.g., decorated and perforated rib from Llonin-Vestíbulo IIB) or reveal inter-regional links (e.g., a decorated and pointed horse incisor, Sauvet *et al.*, 2008, Álvarez and Rivero, 2009). In the case of bone discs, they have appeared in both sites and their decoration is different, as it is in other Cantabrian sites (Schwendler, 2005; Corchón and Rivero, 2008). Bone cut-outs are more significant in La Viña than in the rest of Cantabrian caves because three have been found and one is recycled (from horse to red deer: Fortea, 1983) and there is a sculpture with the same stylistic canon (Juaneda, 2011). In this case, no strong intra-regional links can be assured because the bone cut-outs are formally different from Las Caldas and Tito Bustillo, as well as at other sites (in terms of eye shape, jaw, *etc.*). If we take into account engraved bones, horse is the main graphic subject at La Viña and there is however a strong intra-regional link regarding the depiction of a horse both there and at Las Caldas. In addition, a bell-like motif is documented on a bone fragment from La Viña and a pointed horse incisor from Las Caldas (see section La Viña rock shelter, Level IV).

Absences may be understood if we bear in mind that La Viña is a relatively elevated rock shelter that must have been used for somewhat different purposes than lower-lying caves in the context of the Nalón valley (Corchón *et al.*, 2014). When we compare it with Llonin, the comparison is not so sharp and if we take into account all the Cantabrian MM sites, both in La Viña and Llonin there are some absences: no anthropomorphic spearthrower/sculptures, no decorated phalanges, no bison images, no sculptures with incrustated eye, no long spatulas with bison/ibex images. Nor is there any matrix for making bone disc/cut-outs or waste products either. As other non-figurative decorations are missing (Duarte *et al.*, 2012), it seems that these sites lay outside some circulation networks (Straus, 2013), which makes more sense when they are compared with Las Caldas' symbolic wealth and possible 'ritual ceremonies' celebrated on-site (Corchón, 1994).

We believe that the major symbolic component at Las Caldas is also due to the proximity of thermal springs, although it lacks long-lasting chronology parietal art (Rasilla and Duarte, 2018). In the case of Llonin-Cono Anterior X, the site is surprising because it also lacks, for the moment, exotic raw materials (e.g., non-Cantabrian flints or "exceptional" pendants). However, the site's characteristics allow us to classify it as an aggregation

site (Rasilla and Duarte, 2018), as its osseous industry is characterized by the great thematic diversity, including oblique lines, cross-hatched designs, grooves and transversal marks, combined zigzag, series of short parallel strokes points (see Conkey, 1990) during the MM, and this thematic diversity is even greater when linked to parietal art. It contrasts with the sole existence of local marine-shell pendants. We therefore hypothesize that it could be an "in-process" aggregation-site (that is, decorated for a social reunion that did not occur and thus "exceptional" pendants, portable art, raw materials, *etc.*, are missing). And we could add, because the site was abandoned during cold 'Cantábrico VII' period, in coincidence with particular cultural changes and/or population movements.

Concerning other markers, we have documented both broad-spectrum and regional features. We have mentioned several objects whose chronology is imprecise (e.g., La Paloma, Ermitia, Mas-d'Azil) but they form part of the Magdalenian culture, as far as the Aquitaine area (note that we have focused on M. Chollot-Varagnac compendium). In other cases, they are restricted to the Cantabrian-Pyrenean area but we lack precision for some of the outstanding sites (e.g., Gourdan, Mas-d'Azil). They are usually confusing because we have documented low resolution analogies, e.g., La Viña MM/El Pendo Final Magdalenian, but the problem falls frequently on the archaeostratigraphic context of a given object and not on the formal features themselves that eventually aim at synchronicity.

The typical art proliferation of the MM runs parallel to a major diversification of the toolkit regarding bone industries (González Sainz, 1989; Adán, 1997; Pétilion, 2016). As we have already explained, MM bone industry is diversified and it is related to the techno-typological change observed in lithics and tools from the LM to MM (Cazals and Bracco, 2007) but in both sites technological blanks are not so determinant since rods and points have common splinter measures and they are interchanged within resharpening/rehafting (e.g., point → wedge; broken fork-tine → tiny rod, *etc.*) until exhaustion or recycling in some cases. Regarding typology, 'proto-harpoons' from La Viña and Las Caldas MM are morphologically different from those of Cantabrian UP: barb outline shape (tightly shaped), flattened section (FI ~2 vs. <2-1.5), non-pointed and long ends (smoothed or spatulate) and lack of engravings in the tooth area. That is why we maintain the names of 'proto-harpoon' (Fortea, 1989, Corchón, 2017) and 'harpoon'.

However, this diversity is reduced during the UM in a way coeval with a regionalisation process based on techno-economical and symbolic patterns (González Sainz and González Urquijo, 2004; Sauvet *et al.*, 2008; Barandiarán *et al.*, 2013). The assemblage of Llonin multi-barbed points, according to González Sainz's code (2011, p. 147), is 1-6-7 (we count as 1 the three-piece refitted points). So it is the fourth site in terms of the quantity of points in the region. The increase of the numbers in comparison to those given in Fano *et al.* (2013) is due to the present revision. We observe a variety of morphologies

and decorations: bases are roughly equal in number to distal fragments; there is only one perforated base; there is one concave-barb-point and only one has two rows. Such complex assemblages have only been recorded in El Pendo, Ermitia and Urtiaga (González Sainz, 1989) possibly linked to major sites in the regional organization.

Deep lateral engravings are assigned to the EUM (Lucas, 2014) and in Llonin point-based points and point/rod/wedges from the UM have these kinds of engravings. They are basically long lines alternated with oblique short lines or short oblique lines superposed on long lines but not zigzag. These motifs are not only present in Isturitz and other Pyrenean sites (Chollot-Varagnac, 1980; Lucas, 2014), but also in La Paloma, Cueto de la Mina, La Pila, El Valle and Urtiaga (González Sainz, 1989). Conversely, lateral zigzags have been documented both in La Viña and Llonin MM and/or UM but in both cases they are shallow engravings and associated with other kind of lines and compositions. We think that it is important to take into account these series because it is necessary to track them in order to determine if they are coeval with deeply-engraved lateral zigzags (Fuentes *et al.*, 2019) and to assess the evolution of other small and tight zigzags that proliferate during the MM/UM.

The reduction in the symbolic sphere during the UM is seen in the absence of detailed engravings of horses, bison, etc., as well as of extraordinary pendants such as bone-discs and cut-outs. In contrast, frontal and schematic views of ibex and red deer are the common at Cantabrian sites and in some of them, such as Llonin, this regional character is highly emphasized by formal and thematically complex representation of the mentioned ibexes and deer (Barandiarán, 1993; Utrilla *et al.*, 2009; Fortea *et al.*, 2004; Duarte *et al.*, 2012; Barandiarán *et al.*, 2013). According to the compilation undertaken by Rivero *et al.* (2014: 593, fig 2), the rib from Llonin currently contains the most images of ibex both in frontal view and the largest number of animal representations on a single bone in the region (Duarte *et al.*, 2014; Rasilla *et al.*, 2019); only exceeded by the engraved stone from Abauntz (Utrilla *et al.*, 2009). In addition, the depiction of the sole line (Sauvet *et al.*, 2008) also exists in a group of ibex on the Panel Principal of Llonin (Berenguer, 1979, fig. 1; Fortea, 2002). The perfect integration of the “scenography” between the wall rock forms emulating the external landscape and ibex behaviour in the nearby El Bosque Cave must be noted (Fortea, 1995). Finally, the notable presence of ibex persisted until the recent times, since the administrative area is called ‘Cabres’ (cabra in Spanish = goat/ibex), so this is a regional phenomenon, but in “contact” a feature that mixes symbolism and economy and places Llonin in a major position near the nuclear western origin of ibex representations (Sauvet *et al.*, 2008; Barandiarán *et al.*, 2013). If we can infer creation and innovation, we suspect that this is not the only one because this is not a case of passive reception (Fortea, 1990). We do not yet know the complete Cantabrian UM toolkit and its internal evolution, so profound chrono-cultural correlations will be useful for tracking

these issues, during the MM as well, and the implementation in proximate areas, namely Galicia (e.g., Valdavara: Vaquero *et al.*, 2009).

DISCUSSION

The Cantabrian MM as documented in La Viña and Las Caldas (and possibly La Garma) seems to be coeval with the French EUM (Pétillon, 2016) because there are fork-based points, multi-barbed points (‘proto-harpoons’) and decorated HRRs; being designated here as MM1. However, in these assemblages there are also point-based points and their presence is interpreted in France as evidence of stratigraphic mixing (Pétillon, 2016, p. 120). The radiocarbon date from La Viña IV is ~16,000 cal. BP, parallel to the ~16,600-16,000 cal. BP period covered by the levels VIIIa-II with fork-based points (despite chronological overlaps and archaeological mixings already mentioned) from Las Caldas (Corchón, 2017). In this last case, chronological dates are similar to the first Pyrenean fork-based points (Pétillon *et al.*, 2015), so these sites would be coeval with the French transition between LMM/EUM (Pétillon *et al.*, 2016) and the hypothesis of a diachronic lapse between the Pyrenean and Cantabrian assemblages with fork-based points (Pétillon, 2007) is to be nuanced. So far, although inventions seem to reach the west later, the time lapses are tending to get reduced as new sites are discovered, new chronometric dating methods are applied, and systematic revisions made.

On the other hand, our ‘cold’ (namely ‘Cantábrico VII’) MM phase or MM2 has point-based points, self-barbed points, doubled-bevelled points, few fork-based points, decorated HRRs, but almost certainly lacks ‘proto-harpoons’; so there is no direct correlation with the French model. However, this proposed phase coincides with the suggested northern Aquitaine depopulation (Barshay-Szmidt *et al.*, 2016), so it would probably be evidence of French withdrawal to an Iberian refugium (Straus, 1992, 2018; Gravel-Miguel, 2017).

The keys are: 1. Do multi-barbed points (‘proto-harpoons’/‘harpoons’) exist or not in this cold phase and to what extent is our MM/UM division made in Llonin Galería “realistic”? 2. Are the tuberculation and the clover and parentheses motifs key markers of the human culture during the mentioned cold phase in the Cantabrian region? Do they exclude ‘harpoons’? 3. Do fork-based points really coexist with ‘harpoons’? 4. Was the aforementioned phase a brief occupation and does it involve a lesser investment in art or is everything altered by karst dynamics? The question is if we are adding more “contamination” or “noise” to the already contaminated series (e.g., Urtiaga, La Paloma, *etc.*).

On the other hand, the Cantabrian UM would be coeval with the French LUM, but slightly chronologically delayed in comparison with France (e.g., El Horno: ~12-13,500 cal. BP: Fano *et al.*, 2016), although other sites’ dates are coeval with EUM/LUM (El Mirón, Coimbre, La

Riera: Straus and González Morales, 2010, 2018; Álvarez-Alonso and Yravedra, 2017). In any case, this should be taken with caution because Coimbre-Levels 1 and 2 involve mixings in the sense that, for example, the bone disc and a bilaterally barbed point come from the same square (K-27) and they very close in the dipping stratigraphy (Álvarez-Alonso and Yravedra, 2017, table 3; note that there is no correlation between the depth registered in the table and that of the stratigraphic profile). Moreover, the point with complex geometric decoration (tectiform-like) comes from Level 1 and it is assigned to the UM (Álvarez-Alonso and Yravedra, 2017), but it was found next to the mentioned transitional levels. The short-bevelled points, tuberculated HRR and fine-medium point-based points from Level 1 are assigned to the UM, but recall Llonin (MM2).

Thus, there are features that we need to track more precisely and it is also necessary to acquire a more detailed knowledge of the stratigraphic sequences, depositional processes, materials, palaeoenvironment and radiocarbon dating within the regional framework, because changes from the Pyrenean to the Cantabrian region are relevant within sites, ecosystems, sediments, *etc.* The MM/UM transition reveals important and rapid changes that need also to be tracked when inferring population movements and interregional links. So stratigraphy, demography and culture turn more complex than all the current, 'driven' long-range wave of fashion models can infer.

Finally, it is increasingly important for the cultural interpretation to exclude contaminations, certify the stratigraphic integrity of the levels by combining different studies and, if possible, obtain direct dating. We may have to take another look at the main archaeological collections just to define precisely all these objections and doubts.

CONCLUSIONS

La Viña and Llonin assemblages augment the Middle and Upper Magdalenian bone industry corpus with, respectively, 731 and 564 artefacts. The ~100 km distance between them involves slight topographic, geophysical and biotope differences that are more appreciable at first sight in the lithic assemblage, because of differences in raw materials, than in bone industry.

While La Viña IV contributes an excellent MM level (here designated as MM1), the generic MM is also present in Llonin, basically in Cono Anterior X as it was known so far. But in Galería, the assemblage was spatially reduced and biased by contaminations. An inter-stratigraphic point-refit between levels II and I has revealed that several hearths were excavated from Level I into Level II, so different objects were mixed. Several multi-barbed points were located precisely in the intersection of both excavation levels and typo-metrical correlations of simple points and rods/HRRs, together with their relative position in the stratigraphical sequence at the site, have allowed us

to extent the MM occupation to the entire cave: Galería, Vestíbulo, Cono Anterior and Cono Posterior (scant in the last case) and associate this assemblage with another tentatively phase, designated for the moment as MM2.

The generic MM, as it is recognised in both sites, employed a diversified toolkit characterized by fork-based points, point-based points, few multi-barbed points ('proto-harpoons'), decorated rods and spatulas. Portable art changes greatly within both sites as well as technological frequencies. The hunting sphere is equally represented, but in La Viña the domestic one is significant and in Llonin the symbolic sphere acquires a greater relevance.

Nevertheless, some MM markers are missing in Llonin, such as bone cut-outs or other figurative portable art, whereas some kinds of projectiles are absent in La Viña IV. Moreover, La Viña III has tuberculate rods and points that could fit better with the MM than the UM although they are traditionally ascribed to the MM/UM transition. But the question is how contamination and mixtures condition the general scenario and which sites have a broader MM occupation inoculated by multi-barbed points and so attached to the UM. The palaeoclimatic episode of La Viña III is consonant with a sedimentological cold phase that could equally correspond to the MM, conforming a later, MM second phase (MM2). It should be stressed that in some old excavations the MM went unnoticed because postdepositional processes (related to Dryas II and Alleröd) disturbed and mixed the archaeological record with the UM and it was typology, namely 'harpoons', that determined the major stratigraphical/cultural divisions. La Viña III and Llonin MM conform an assemblage assimilated to Las Caldas III-I, involving a later and short MM phase where portable art investment was left aside and hunting and domestic spheres were subtly transformed.

Conversely, the UM toolkit is less diversified and characterized by multi-barbed points, decorated point-based points and point-shaped wedges. Ibex representations stand out in a so-called 'regional process' of artistic evolution. UM is a more homogeneous assemblage because it is basically restricted to Llonin (Cono Anterior IX and Vestíbulo IIA-II) given that the contamination registered in Galería I must be considered. Paradoxically, 'harpoons' have been a key element for inferring contamination, while other points are waiting for a deeper chrono-cultural track.

Therefore, the MM/UM transition is documented in the studied assemblages as a complex puzzle altered by karst dynamics and post-depositional processes. These features need to be better documented within the regional framework because archaeo-stratigraphic resolution is insufficient when considering the cultural development. We stress now that inter-stratigraphic contaminations are documented and we think that they exist to a greater extent of what has been recognized until now. In consequence, comparisons with the Pyrenean-Aquitaine area, interrelations and the direction of movements and exchanges, remain weak, so it is better not to set or stick to models, deepen in the data and prove hypothesis.

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NOTES

(1) The following numbers of the typological list (Corchón, 2017) are excluded: 1, 3, 4, 9, 10, 22, 30 and Others, if they are not combined with portable art.

- (2) Rounded and smoother-like extremity lacking hafting marks, so are classified as distal end and not “base pleine” as proposed for a similar tool from Reverdit (Bourdier *et al.*, 2014).
- (3) One (fig. 6.17) was published, erroneously, as coming from La Viña (Santamaría *et al.* 2014, fig. 2.4).
- (4) This will be obviously implemented nonetheless with techno-typological analysis and lithic refits (Duarte, PhD in progress).
- (5) In the other squares, Level VIII is equally thin becoming mixed with Level VII in some areas (Rasilla *et al.*, 2012).
- (6) In these last cases the proportion is correlated with the characteristics of the deposit and it needs to be analysed with other data, as for example cores are also highly abundant in Cono Anterior IX (Duarte, PhD in progress).
- (7) Regarding Ermitia, we suppose that this is the one documented by Pétillon (2016, fig. 5).

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