Adaptations of the lithic production in the Sauveterroid level of Coveta de la Foia site (Vilafranca, Castelló)

Joan Fullola-Isern [1], Inés Domingo [2], Dídac Roman [1]

1. PRE-EINA, Universitat Jaume I, Av. Vicent Sos Baynat, s/n 12071 Castelló de la Plana, Spain. Email: Fullola-Isern: fullola@uji.es; Roman: romand@uji.es
2. ICREA, Universitat de Barcelona, Facultat de Geografia i Història, c/Montalegre, 6, 08001, Barcelona, Spain. Email: ines.domingo@ub.edu

Abstract:

In this paper, we analyse two different lithic adaptations of the Sauveterroid Mediterranean culture in the Valencian Country. On one hand, we have a standardized serial production of projectiles such as backed bladelets and backed micropoints. On the other hand, there is a non-predetermined and less standardized production of a large number of domestic lithic tools such as end-scrapers and retouched blades. The lithic production of this Sauveterroid group shows a double adaptation in relation with the environment: although these groups have enough sources of lithic raw material nearby, and thus they had no restrictions as to the size of the lithic tools, they decided to make a cultural and technical choice producing a large amount of little backed armatures. In addition, the production of domestic tools demonstrates a less technical investment. Technical schemes are mainly unipolar and semi-enveloping, with bipolar and orthogonal technical resources used to prevent knapping accidents caused by soft stone percussion. For non-standard and poorly standardized production, unipolar exploitation is preferred, while in standardized serial production bipolarity and semi-enveloping openings are used as a recurring technical resource. The site of Coveta de la Foia offers the opportunity to explore the relationship between two different lithic productions in one single occupation. Even with relatively close sources of raw materials, cultural pressure is more evident in the production of hunting weaponry as it tends to a process of microlitization tipical of the Mediterranean Epipalaeolithic (Roman 2015; Soto 2015). This type of technical adaptation shows how important cultural influence is in a community's technical and social system, as it completely constraints the production of hunting weaponry. The Sauveterroid occupation of Coveta de la Foia is one of the oldest in the Iberian Peninsula with a dating of 12740-12680 cal. BP, offering one of the first examples of geometric microlithism in this geographical area.

Keywords: Sauveterroid; lithic technology; lithic armatures; Valencian Country; *chaîne opératoire*; technical scheme

Journal of Lithic Studies (2024) vol. 11, nr. 2, 21 p. DOI: https://doi.org/10.2218/jls.7304

Published by the School of History, Classics and Archaeology, University of Edinburgh
ISSN: 2055-0472. URL: http://journals.ed.ac.uk/lithicstudies/

1. Introduction and background

1.1. Cultural context

The research carried out in the northern Valencian region over the last few years has demonstrated the need for the deep contextualisation of the end of the Upper Palaeolithic on the Mediterranean side of the Iberian Peninsula. The reassessment of the Mediterranean Epipalaeolithic period (Alday et al. 2020; Aura 2001; Roman 2012; 2015; Casabó 2012; Roman & Domingo 2020a, 2020b; Soto et al. 2019a; 2019b) offered an opportunity to restructure and redefine the lithic assemblages and the naming of cultures following the Magdalenian and preceding the Neolithic, covering the Pleistocene-Holocene transition, approximately between 14,000 and 7,500 cal. BP.

The current proposed cultural sequence states that, at the end of the Magdalenian, there was a drastic fall, almost to the point of disappearance, in hunting items made of bone and antler (spears and harpoons) (Aura 2001; Roman 2012), which were replaced by backed points. This change means we can now talk of an Epimagdalenian period (approx. 14,300-12,400 cal. BP). Within the same industrial dynamic, after 12,800-12,500 cal. BP, some small geometric microliths made with the micro-burin technique appeared. At this point, we enter the Sauveterroid period (Roman 2012; Roman & Domingo 2020a; 2020b). This new industrial complex continued until approximately 10,000-9,500 cal. BP, when it was finally replaced by Mesolithic industries (approx. 10,500-7,300 cal. BP) (Roman & Domingo 2021).

The materials analysed in this study fit precisely into this transition between the Epimagdalenian and Sauveterroid periods. Our aim is to set out the technological processes from the Sauveterroid level at Coveta de la Foia.

1.2. The Coveta de la Foia site

Coveta de la Foia (Vilafranca, Castelló, northern Valencian Country) is a rock shelter discovered in 2013 and under excavation since 2015 (Roman & Domingo 2020a) (Figure 1). Coveta de la Foia is in the western part of the Maestrat plateau, just where the Iberian System ends. At this point of the Iberian System, there exist some folds generated by the confluence between the faults in the Iberian direction (NW-SE) and those in the Catalan direction (NNE-SSW). The rock shelter is in the southern part of an anticline in the Iberian direction which shows outcrops from the Lower Cretaceous (Albian, Aptian, Barremian and Hauterivian) in the northern part, and outcrops from the Upper Albian and Cenomanian in the southern part. The origin of this ravine is probably caused by differential erosion. This erosion found rocks that were less hard to wear away than those of the Upper Albian and Cenomanian (bioclastic limestone) and it eroded part of the anticline laterally, generating the rock overhang morphology.

Seven fieldwork seasons allowed opening up an excavation area of a 12 m², including a 2 m² test pit. The test pit yielded a sequence of human occupations with the main prehistoric level assigned between the Sauveterroid and the early Epimagdalenian periods. This main level is mainly composed by lithic industry, dominated by backed laminar microlithic pieces and end-scrapers.

In the upper spits or artificial excavation layers of this main level, the presence of microburins and geometric microliths was detected, together with backed elements and end-scrapers, suggesting the ascription to the Sauveterroid. These are the layers analysed in this paper to understand and characterise these Sauveterroid industries. The analysis of layers 1-6 is the first in-depth techno-typological approach to Coveta de la Foia lithic industry, allowing us to chronologically place the more recent occupations of the site.

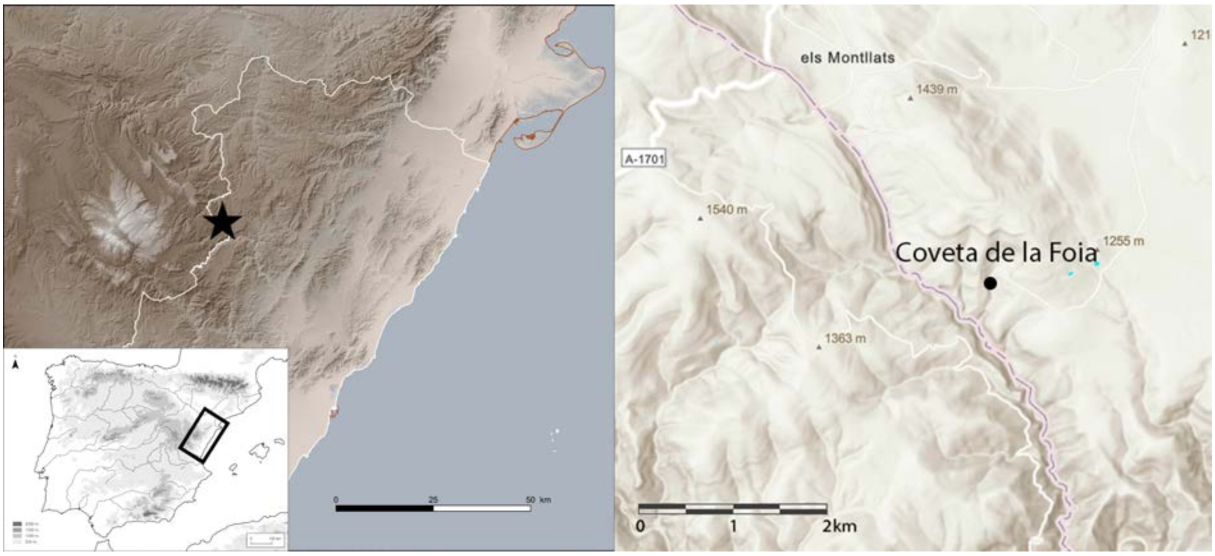

Figure 1. Location of Coveta de la Foia.

The micro-sedimentological analysis of the stratigraphy is still in progress, so the stratigraphic data included below are preliminary. The excavation was conducted using 5 cm spits within each natural layer. The initial pit (Square C5) shows 6 archaeological levels. The first three levels include mix materials dating from the Middle Ages to the Neolithic, the fourth level has the Sauveterrian occupations, and the fifth and sixth belong to the Epimagdalenian. As mentioned above, this is a preliminary division, to be revised according to the detailed geoarchaeological survey.

Our study is based on the materials recovered in the open area excavation (9 m2) at artificial layers 1 to 6 (depth approximately between 185 and 215 cm from the reference point). These layers were numbered once a superficial layer with mixed materials belonging to more recent times had been excavated. Ascription of these layers to Sauveterrian was based on the typology of the materials recovered, as no sedimentary differences were observed during the excavation.

2. Methods

This study is based on the technological analysis of the lithic materials belonging to spits 1 to 6 of Coveta de la Foia, dating to 10700 ± 30 BP (12740-12680 cal. BP) (Beta-616379) and ascribed to the Sauveterroid period. Our technological approach takes into account the production processes, the knapping processes and the *chaînes opératoires* undertaken on the site (Geneste, 2010; Pelegrin, 1990; Pelegrin *et al.* 1988; Inizan *et al.* 1995: 15). This perspective serves to analyse the types of technological systems used to produce the different tools. In this study, we have chosen to classify the retouched material typologically using together the Sonneville-Bordes & Perrot (1954; 1955; 1956a; 1956b) and Laplace (1966; 1968; 1972; 1974) lists, as both perspectives provide a complementary view.

3. Materials

3.1. General features

All lithic evidence analysed, both tools and knapping debris, are made of chert, showing an absolute preference for this raw material. A total of 3,177 pieces have been analysed. Though provenance studies to identify the sources of the lithic raw materials used by the occupants of Coveta de la Foia are still in progress, those conducted in the neighbouring site of La Roureda, of similar chronology (Rey-Solé et al. 2015), suggest a local or regional origin (5-80 km).

3.2. Blanks and retouched pieces

If we consider complete and fragmented flakes, laminar flakes, blades and bladelets, all the unretouched blanks total 1,444 pieces. Such a high proportion of flakes, chunks and debris (Table 1) is due to a high rate of thermal fragmentation, which causes an over-representation of this type of blanks. The degree of thermal alteration in these blanks exceeds 50%, while in the other blanks it does not exceed 20%. In each type of blank we include the pieces that have thermal fractures but can be identified as such (flakes, laminar flakes, blades and bladelets).

Table 1. Inventory of the material studied from Coveta de la Foia.

Blank	N	%	N retouched	% retouched
Flake	756	23.80%	29	4.40%
Blade	428	13.50%	68	15.90%
Bladelet	452	14.20%	126	27.90%
Laminar flake	37	1.20%	6	16.20%
Core	33	1.00%	-	-
Trimming elements	78	2.50%	8	10.30%
Debris	694	21.80%	-	-
Burin spall	2	0.10%	-	-
Chunk	696	21.90%	3	0.40%
Total	**3177**	**100.00%**	**240**	

Focusing on the level of transformation into tools, we observe a preferential selection of microblade and blade and a use of trimming elements as tools. Bladelets represent the highest degree of transformation into tools of the site (27.9%). They are the most common type of blank after the flakes.

Laminar flakes are the second most transformed blank proportionally, although the low frequency of this blank must be taken into account, while blades are well represented, with a high transformation rate.

The use of trimming elements as tools (10.3%) is quite relevant. This selection of trimming elements may indicate that this is a real economy of *debitage* (Perlès, 1980; 1991).

The three retouched chunks are splintered pieces. It has been impossible to identify the original blanks, so they have been classified in this category.

The entire collection of the blade and microblade has an average size of 23.2 x 8.6 x 2.8 mm and an average lengthening index of 2.9 (including only unbroken blanks). This assemblage is subdivided into two main groups that do not match the classical division between blades or bladelets (Brézillon 1968: 100). Therefore, all these blanks have been analysed as belonging to the same general group. At the beginning of this study, the traditional separation between blades and bladelets was carried out. Later on, though, the separation made by Mixture Analysis and scatter plot was deemed more relevant. Broadly speaking, there is a group of large and rather irregular blades and another set of small, thinner and more regular blades and bladelets. These two morphometric groups correspond to two distinct dimensional trends, and have different numerical proportions (Figures 2 and 3).

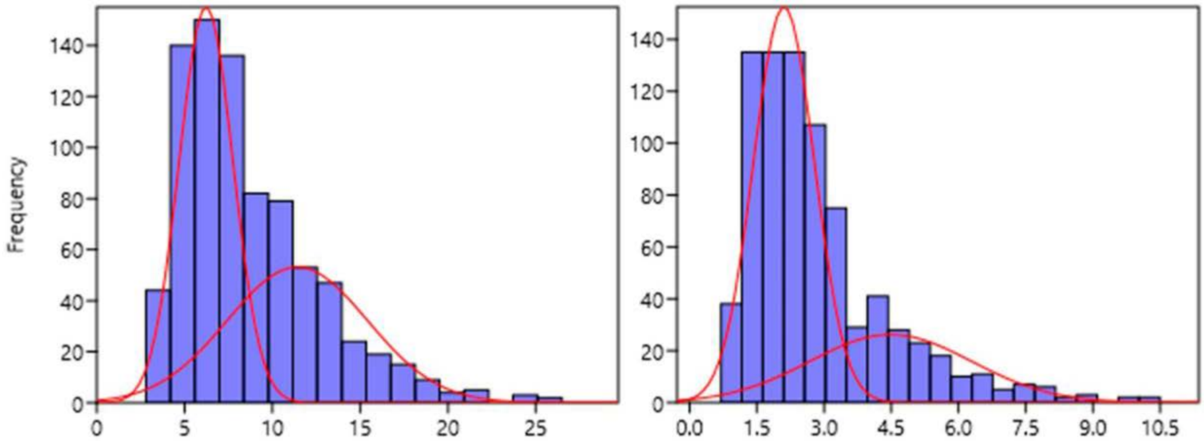

Figure 2. Mixture Analysis of the width (left) and thickness (right) of the laminar and microlaminar assemblage. The curves represent the clusters in two normally distributed populations.

Figure 3. Unretouched blades and bladelets from Coveta de la Foia.

The group of large blades is the smallest and is rather heterogeneous and more widely dispersed. The average width and thickness of this first group is 12.5 x 5.1 mm. The second group of smaller pieces is the largest, with average values of 6.1 x 2.1 mm. This group includes smaller blades and, especially, bladelets, whose level of homogeneity and regularity is very high.

Around 92% of the assemblage has no cortex, while the remaining 8% preserve the cortical parts on the sides. Only in two cases the cortex completely covers the piece. Main preservation of the cortex on the sides of the blades shows a dynamic of extraction towards the flanks of the core, where the unexploited surfaces are usually preserved.

A number of features specific to soft mineral percussion (diffuse bulbs, incomplete impact cone cracking, inconspicuous point of impact) provide clear evidence of the predominant use of this technique (Gameiro 2017; Pelegrin 2000). The use of overhang abrasion is also the most common method used in the assemblage associated mainly with small butts (linear, punctiform, smooth). As for the dihedral and faceted butts, they tend to be made by preparing the striking platform, with no abrasion applied. The group of small blades and bladelets uses abrasion to extract and prepare the blanks, as smooth, linear and punctiform butts are the most common in this group.

As for types, it should be noted that 51.7% of the tools are backed elements, including backed points, backed truncations and backed blades and bladelets. There are also many end-scrapers and retouched blades, together with some truncations. It is worth mentioning the presence of six geometric microliths and nine microburins, indicating a Sauveterroid ascription (Table 2, Figures 4 and 5).

Table 2 Typological list of Coveta de la Foia.

Type	**N**	**%**
Retouched blade	27	11.30%
Simple point	3	1.30%
End-scraper	36	15.00%
Notched piece	6	2.50%
Denticulate	2	0.80%
Simple abrupt	4	1.70%
Truncation	19	7.90%
Backed point	34	14.20%
Backed blade or bladelet	84	35.00%
Truncated backed blade	6	2.50%
Geometric microliths	6	2.50%
Microburin	9	3.80%
Splintered piece	3	1.30%
Burin	1	0.40%
Total	**240**	**100.00%**

Figure 4. 1-4: end-scrapers, 5-7: truncations.

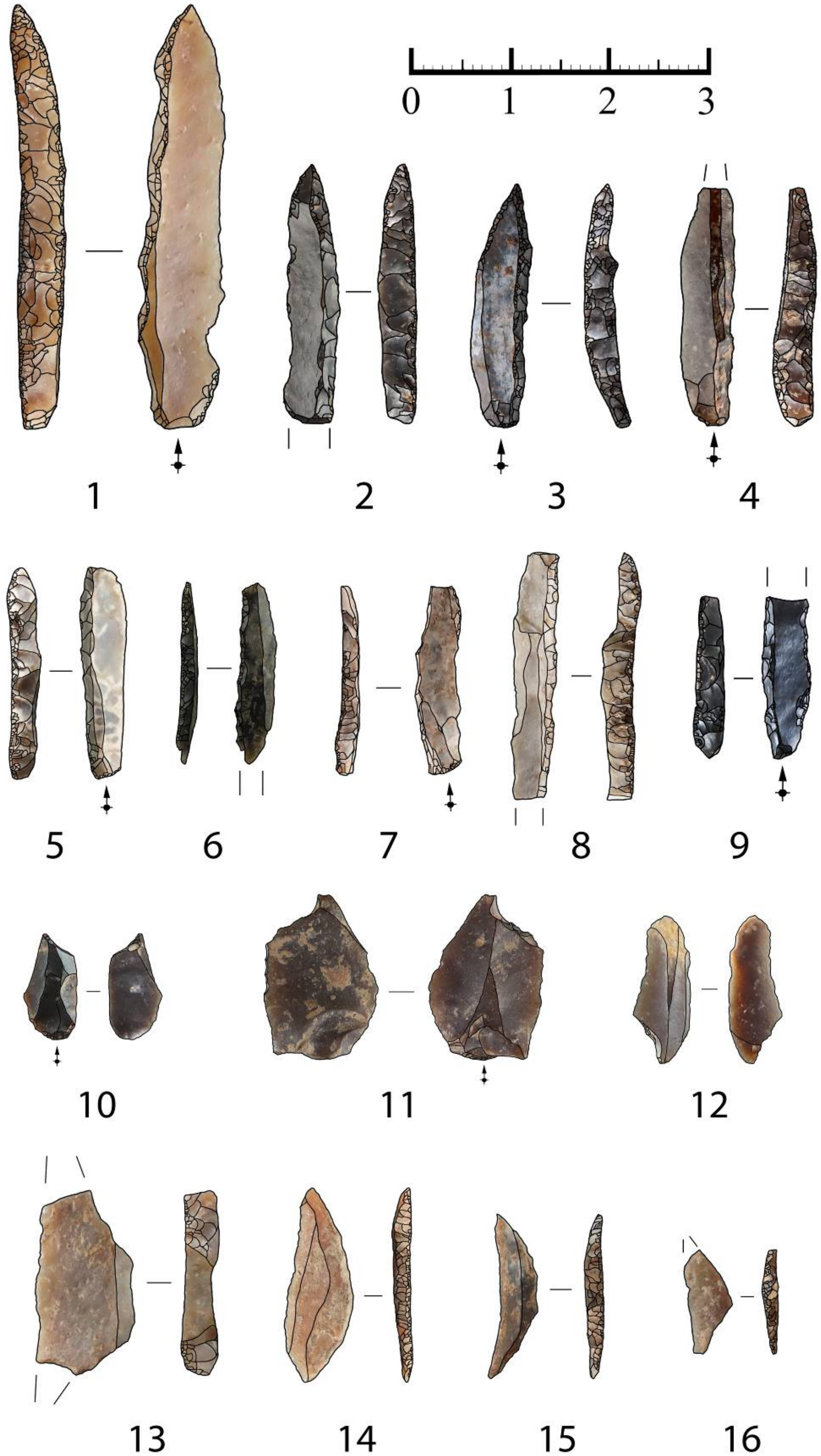

Figure 5. 1-4: backed points, 5-9: backed bladelets, 10-12: microburins, 13-16: geometric microliths.

Figure 6 shows how the smaller retouched pieces, from which most of the backed pieces come, are notably less wide than the unretouched ones, placing them more to the left on the graph. This evidence the effect of retouching on the small blades, which mostly become bladelets. As the original width of these smaller blades is on average 9 mm, it is quite likely that abrupt retouching would reduce them to less than 8 mm, when they are considered bladelets. Many of the backed bladelets and microblade backed points were therefore initially small blades of standard shape.

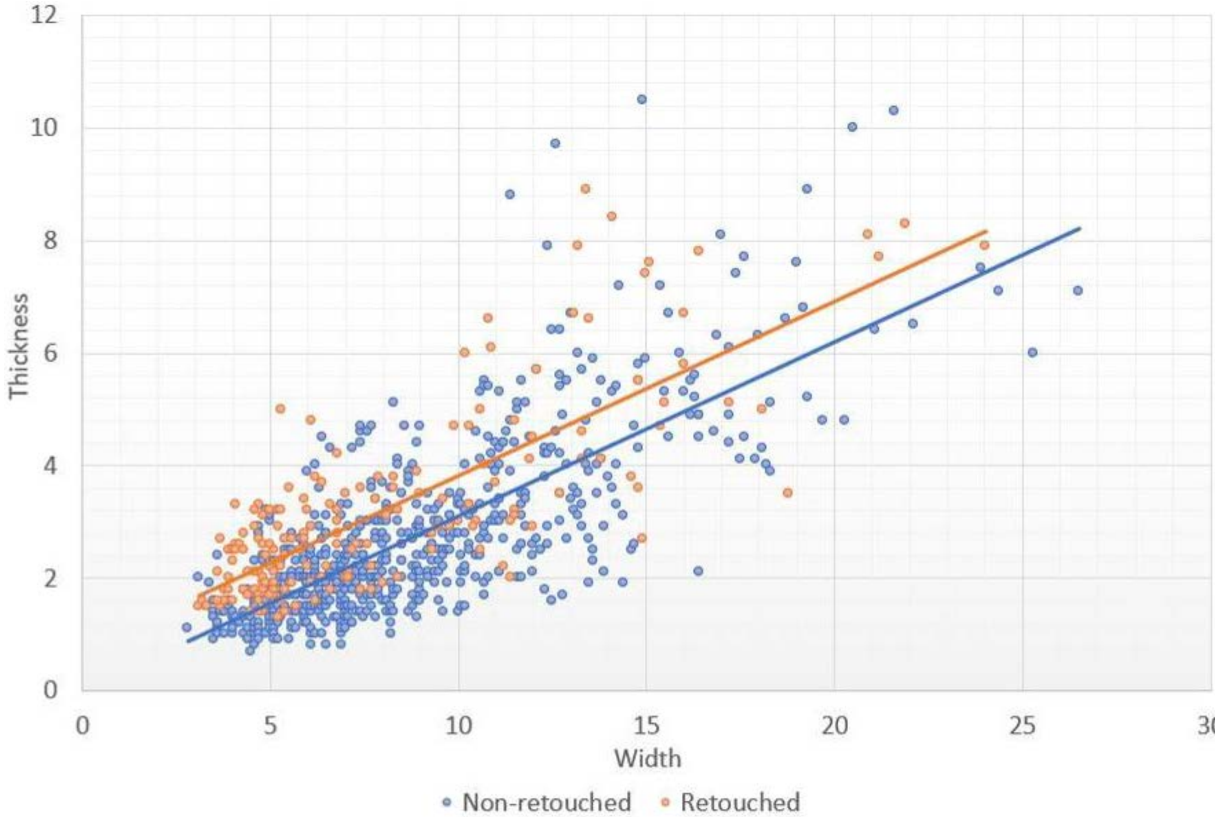

Figure 6. Scatter plot of retouched and unretouched blades and bladelets.

The thickness of the retouched blanks is no less than 1.3 mm, while the thickness of the non-retouched ones falls as low as 0.7 mm. This shows that Blanks of a certain thickness have been selected to be transformed into tools, particularly backed elements, which are the thinnest of the retouched assemblage. For this reason, the trend for retouched pieces is greater than unretouched pieces on the graph, generally representing a thicker type of blank.

On the graph, there is a considerable accumulation of unretouched pieces between 5 and 10 mm wide, including small blades and a large set of bladelets. In contrast, in the retouched pieces, this accumulation is displaced to the left, at between 3 and 8 mm wide. The effect of abrupt retouching on the backed elements therefore reduces the width of the piece by an average of 2 mm.

3.3. Knapping schemes

From the analysis of the cores and blanks (Figure 7, Table 3), different knapping schemes corresponding to different intentions could be stablished, based on the irregularities of the raw material, and knapping sequence. The original blanks from the cores are mainly diaclasic fragments in which the natural surfaces have been used as striking platforms. Some flakes have also been used as cores to produce microblades. Here we show the main differences between the various knapping schemes:

- **Edge exploitation**. Debitage starts either directly using a natural edge or with a minimal preparation of the edge via semicrest. Initial exploitation of small blades quickly turns into a lamellar debitage. Through flank blades, the debitage is opened laterally, achieving a semi-enveloping rhythm. Occasionally an opposed striking platform can be opened to try to clear some hinged scars. If it does not work the core is abandoned. The main original core blank of this scheme is a flake or a fragment of a core. The relative frequency of this scheme is 17%.
- **Unipolar on a wide surface**. This scheme has two phases: a first one to extract large blanks and a second of *plein debitage*, following different schemes. Initially, starting from a semicrest, non-standardised large blades are extracted. These blanks will be mainly transformed into domestic tools: end-scrapers, truncations, notches, some denticulates and a few burins. Exploitation is carried out from a single striking platform. After this first phase, production turns to a phase of *plein debitage*, with two options: opening an opposite striking platform, or opening the debitage laterally via laminar flanks or neocrests. In this case, the exploitation takes on a semi-enveloping rhythm. Some flank removals help to open the debitage laterally and in some cases, a part of the cortex is also removed. The use of neocrests helps to maintain the regularity of the distal convexity. The use of a soft stone hammer in a flat unipolar exploitation easily produces many accidents and this is corrected through neocrests. There are several longitudinal and transverse core flank removals that also demonstrate the need to clear the debitage surface of hinged removals in a unipolar exploitation. The striking platform is also subject to continuous conditioning with the frontal extraction of flakes or semi-tablets. The aim of this second phase of exploitation is to obtain small blades and bladelets to be transformed into backed elements, end-scrapers, geometric microliths and some other tools. The relative frequency of the unipolar scheme is 45%, while the relative frequency of the semi-enveloping scheme is 17%.
- **Bipolar on a wide surface**. We prefer to separate this scheme because of its technological importance. Bipolarity is an adaptation to the use of a soft mineral hammer on a wide striking surface. The use of this type of hammer results in non-very elongated and easily hinged blanks. When this occurs, the core's *carenage* must be corrected with a few extractions from the opposite surface. Bipolar re-intervention happens at advanced stages of *plein debitage* with the aim of regularising the *debitage* surface with small series of opposing unipolar interventions. The extractive dynamic develops alternately between the two striking platforms: first there is a series of parallel extractions from one striking platform and then the same action is repeated from the opposite one. To a certain degree, the systematic use of the two striking platforms makes it easy to control the *debitage* surface conditions. Despite this, because the *debitage* surface becomes flat as the exploitation progresses, deep hinged removals form, which can lead to the core being abandoned. Maintenance actions are similar to those indicated in unipolar exploitation, with flank extractions and some neocrests. The relative frequency of this scheme is 14%.
- **Orthogonal**. This is not a pattern in itself, but rather a technical shortcut. When the raw material has irregularities or accidents of difficult solution, alternative striking surfaces are opened to continue a new unipolar exploitation. No prior configuration actions have been identified beyond the preparation of the striking platform and natural striking platforms are also used. The exploitations are carried out perpendicular to one another, depending on the characteristics of the previous accidents or irregularities in the raw

material. The blanks extracted tend to be laminar flakes with a notably irregular morphology. The relative frequency of this scheme is 7%.

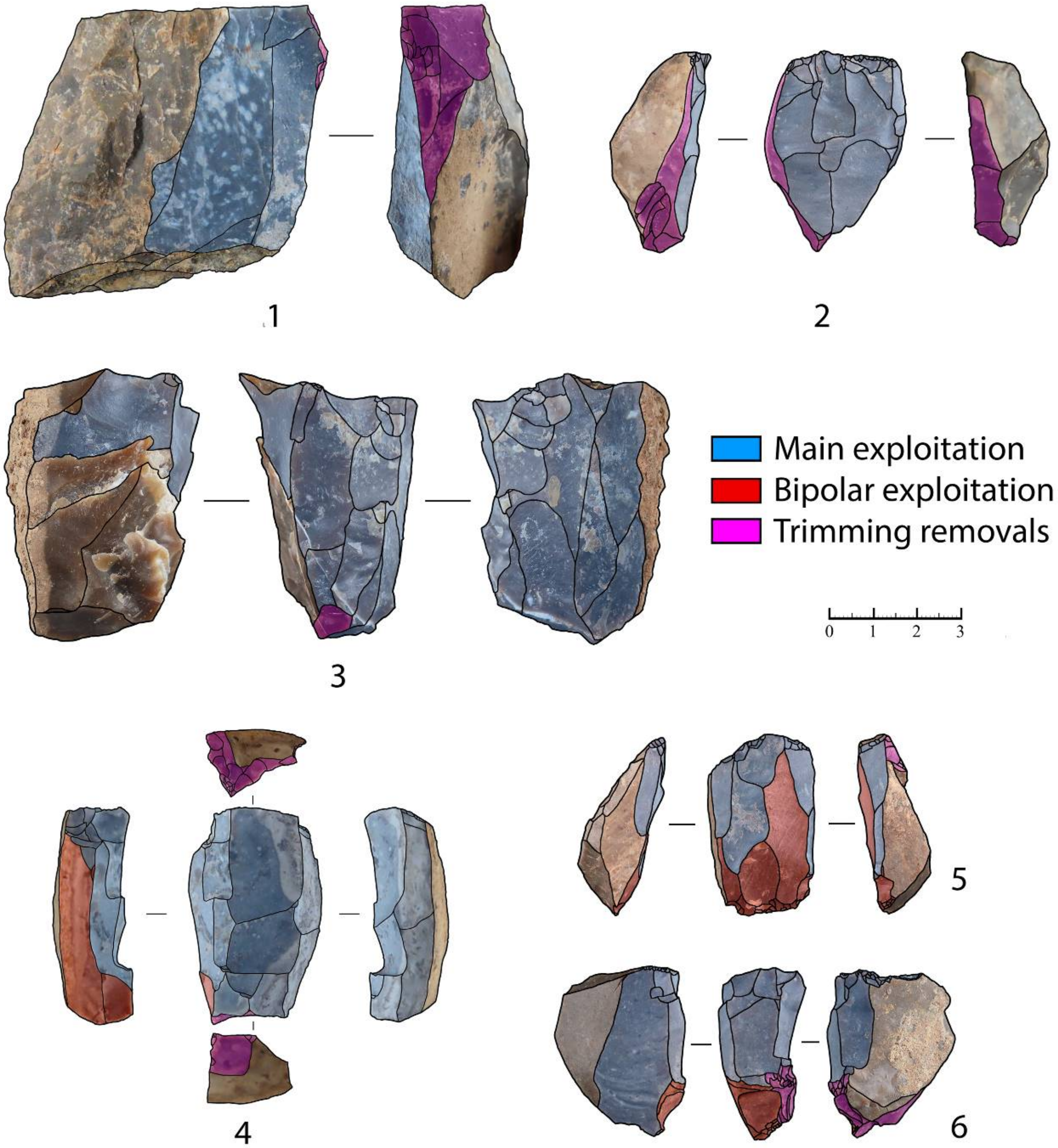

Figure 7 Cores of Coveta de la Foia. 1-3: unipolar exploitations. 4-5: bipolar exploitations. 6: edge exploitation. Trimming removals are related with preparation and core management.

Table 3 Representation of the different knapping schemes and the different blank types.

Core blank type		Knapping schemes	
Flake	4%	Unipolar	45%
Diaclasic fragment	21%	Semi-enveloping	17%
Nodule	7%	Orthogonal	7%
Platelet	4%	Bipolar	14%
Undetermined	64%	Edge	17%
Total	**100%**	**Total**	**100%**

Of the 78 trimming elements, eight are retouched (a few end-scrapers, a notch, a point and a truncation). This shows an economy of debitage within the first phase of the knapping sequence, even though is a simple production line. The use of these trimming elements as tools shows a preferential selection of blanks depending on their shape, within not very standardised production.

The abandonment of cores mostly happens because of hinged removals and other accidents. In some cases, flakes are extracted simply due to excess force, and blade or microblade exploitation becomes impossible. The smallest complete cores (25.1 x 24.8 x 13.7 mm) show that, below these dimensions, it is useless to proceed with *debitage*, as the blanks extracted are too small and the technical investment would not bring any reward.

4. Interpretations of the data

From the analysis of the lithic materials, it can be inferred that the knapping strategies at Coveta de la Foia were focused on obtaining blades and microblades with two significantly different behaviours.

On one hand, there is a production of flakes, large blades and laminar flakes with non-standard and rather irregular morphologies. This unipolar knapping production happens in the early stages of the exploitation. At early stages, the *debitage* surface is usually prepared based on a semicrest or using a natural edge of the original blank. The existing fracture platform and diaclasic fractures of the raw material are used as striking platforms for the core, although in some cases the striking platform can be conditioned via frontal extraction. The rhythm of *debitage* is mainly frontal, maintaining the corticality on the flanks and back of the core. The *debitage* surface is rarely maintained, as the blanks extracted do not require very accurate morphometric calibration. Instead, a greater intervention of the retouching in the tools is used to calibrate the desired morphology.

On the other hand, there is a standardised mass production of highly regular small blades and bladelets. The blanks extracted are smaller and homogeneous. The morphometric calibration of the blanks is more accentuated, as less tools are extracted. Greater precision is therefore required in the original morphology of the blank. In this case, the main aim is to make backed elements from blades and bladelets. Although the retouching will change the original width of the blank, the calibration of the final tool will come more from the original blank than the retouching. This is the same for end-scrapers and geometric microliths that come from this standardised production.

As already mentioned, at this stage of *plein debitage*, the rhythm of *debitage* can be either unipolar or bipolar. Even if, in some cases, the raw material or accidents do not allow knapping to continue, a perpendicular striking platform can be opened up. In many cases a tendency towards semi-enveloping progression can be observed, either through neocrests or flank blades (Figure 8). Bipolarity and the application of neocrests are technical resources used to maintain a *debitage* surface flat enough to extract straight and regular blanks of a controlled length. The striking platform is continually maintained by means of semi-tablets.

The purpose of this conditioning is to revive the angle of the striking platform, especially in cases of semi-enveloping *debitage*. The technical investment required in *plein debitage* is therefore greater than in the first phase of exploitation, and a large number of interventions are required to keep the extracted blanks homogeneous.

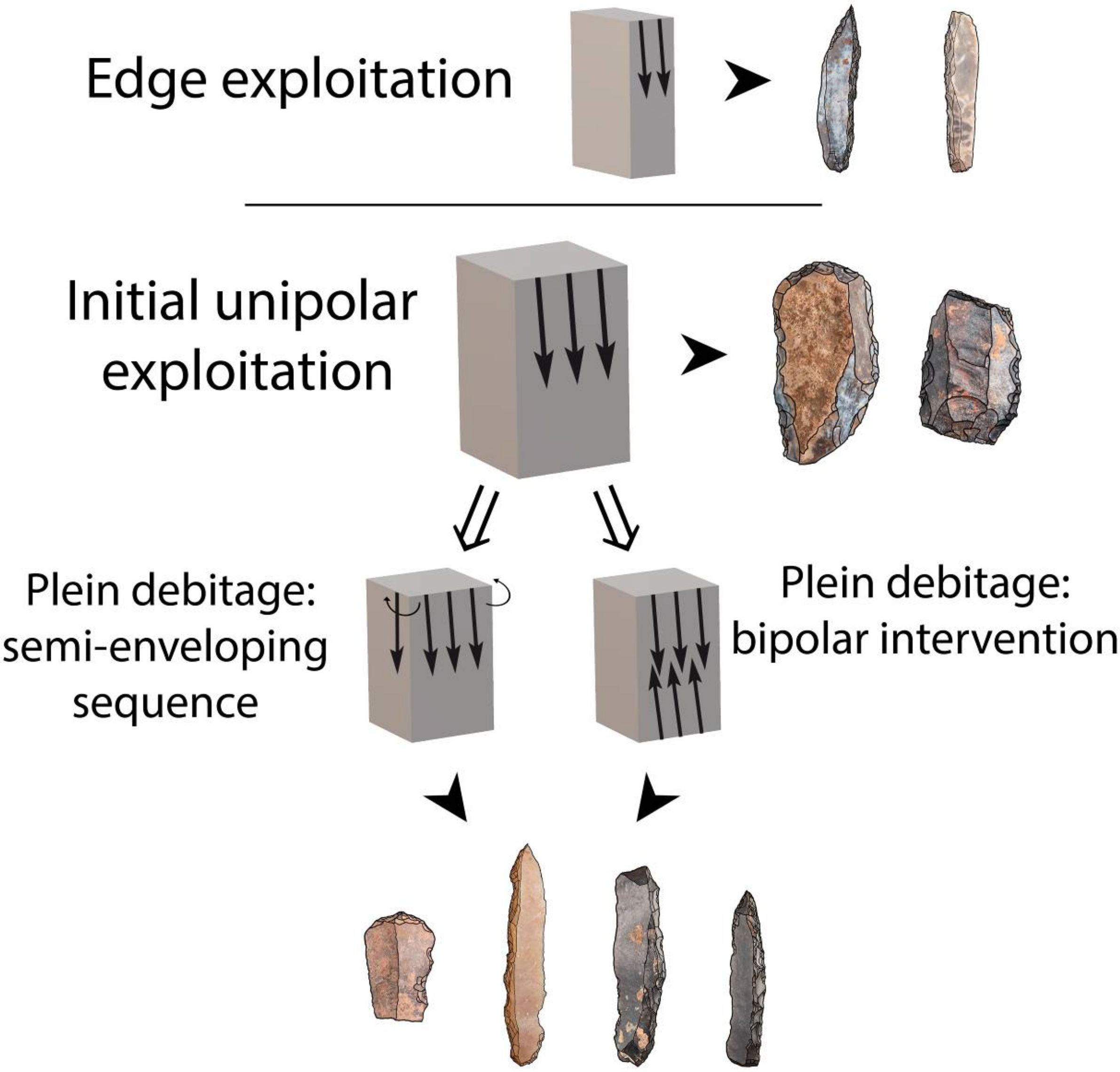

Figure 8. Schematization of the chaîne opératoire.

Meanwhile, there exist an edge exploitation to produce small blades and bladelets. This type of technical scheme does not require much prior preparation as it uses the natural edge of a flake or fragment as a guide to begin the knapping sequence. Sometimes a semicrest is used as a preparation in this scheme. Although it is an opportunistic behaviour, the progress of the knapping demands good *debitage* surface maintenance. This is because the frontal progress of *debitage* using soft mineral percussion causes hinged removals. As a solution, neocrests or bipolar openings can be applied to try to clean the *debitage* surface. The lateral openings are also used as a technical solution, as in the unipolar pattern mentioned above. It is therefore a simple technical scheme, with little technical investment in the preparation, as *plein debitage* can take place after one or two extractions. The fact that accidents are frequent, and cores are small causes a non-persevering maintenance in this type of exploitation.

Ultimately, blades and bladelets are produced in an integrated way; in other words, through intensive, maintained exploitation of cores between 45 and 50 mm long on average, gradually reducing until they are abandoned. This happens at around 24 mm. These small sizes are a result of the maintenance processes through trimming elements, but they are also a product of knapping systems. *Plein debitage* means more conditioning and maintenance, making it easier to continue down to small sizes.

Meanwhile, the direct production of bladelets and small blades as edge exploitations is carried out based on shorter dynamics. After relatively fast progress, the cores are abandoned at around 27 mm, showing an existing interest in obtaining small blade products.

5. Conclusions

The knapping patterns present at Coveta de la Foia show a double behaviour in the lithic assemblage, corresponding to different needs. The first behaviour is in the early stages of knapping and takes the form of general exploitation with scarcely standardised production and little or rather careless technical maintenance. This behaviour would be designated as an expedient strategy (Parry & Kelly 1987; Nelson 1991). The second behaviour tends towards general standardisation in the production of blanks and greater technical investment in knapping processes and it would be designated as a curation strategy (Binford 1979; Nelson 1991).

A very specific type of armature production can be observed, amongst which a series of little blades and bladelets produced in a normalized and recurrent way stand out. These lithic blanks have the particularity of having a straight profile and a morphometric similarity between them. Therefore, the retouch will only modify the width of the blanks to turn them into projectile armatures. The reduction of the cores shows a clear trend towards unidirectional and bifacial exploitation and some occasional orthogonal schemes. As for the domestic lithic production there is a range of elongated blanks (laminar flakes, blades, quite irregular in trend) and it is the retouching that entirely modifies the piece.

Studies of raw material procurement strategies are still in progress. Nonetheless, following Rey-Solé et al. (2015) studies, we can assume a local and regional procurement radius. In some sites with Sauveterroid occupation, the procurement areas are smaller and local materials are used (Mangado 2005; Tarriño 2006; Lacombe 2005), while in others the strategy remains the same as in previous periods (Epimagdalenian), such as the Atxose site (Álava, Basque Country) (Soto 2015). From the type of materials observed at the site, it seems that Coveta de la Foia would fall into the second category, as no change in the raw materials is detected, from the lower to the upper layers.

The technical characteristics observed are similar to those of the Epimagdalenian and Sauveterrian at other sites in the same territorial context, such as Cingle de l'Aigua (Xert, Baix Maestrat, Castelló) (Roman 2012) and Atxose (Soto 2015). These are characterised by few preconfiguration and conditioning actions in the early stages of debitage, together with the almost systematic use of the natural morphologies of the matrices in the early phases of knapping. Microliths are also a characteristic shared by all three sites. At these sites, there are edge exploitations intended exclusively to produce bladelets, very similar to those at Coveta de la Foia. There are also unipolar and bipolar exploitations on wide surfaces with the same technical resources.

Even though these sites have nearby sources of raw materials, and therefore no material restrictions, tool makers have deliberately chosen to produce small blanks. This is driven by two different factors:

- The need to obtain projectiles of certain sizes through more or less standardised production, in which retouching calibration has a relatively small effect. The width of the piece will be more or less the same in backed elements, as it will be marked by the width of the arrow shaft (Roman & Villaverde 2006).

- The microlithic cultural tradition that began at the end of the Epimagdalenian and beginning of the Sauveterroid period. The intensive production of backed elements and the appearance of the first geometric microliths are part of a cultural signature in which the size of unused blanks and tools tends to be reduced.

Finally, we can conclude that standardisation and mass production at Coveta de la Foia corresponds to cultural (microlithism) and technical conditioning factors. In this case of study, the dimensions of the materials are constrained by the technical processes and not by the availability of the raw materials, since the proximity of raw material sources alone does not determine the size of the materials (McCall 2012). We are facing a preferential production of backed elements (more than half of tools), which requires most of the technical cost in regularising *plein debitage* blanks. Knapping patterns are simpler than in earlier periods (Roman 2015), although it must be stressed that this simplification is not as marked as could be, especially when compared to the Sauveterroid finds from the Filador rock shelter (Domènech 1998; García-Argüelles et al. 2013). Coveta de la Foia therefore offers one of the oldest Sauveterroid levels in the Iberian Peninsula and demonstrates that, in the late glacial period, the process of simplification of technical systems is not entirely linear or progressive.

Acknowledgements

This research has been developed within the framework of several research projects, such as PID2021-128349NB-funded by the Ministerio de Ciencia e Innovación; of the ERC CoG LArcHer project, funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (grant agreement No. 819404) and of the CIDEGENT / 2018/043 project of the GenT Plan of the Generalitat Valenciana. Fieldwork campaigns at Coveta de la Foia were directed by D. Román and I. Domingo and were authorised by the regional administration: Direcció General de Patrimoni, Generalitat Valenciana.

Data accessibility statement

The authors confirm that the data supporting the findings of this study are available within the article.

References

Alday, A., Soto, A., Montes, L., Domingo, R. & Utrilla. P. 2020, Del Pleistoceno al Holoceno en el valle del Ebro. Industrias, cronología y territorio. In: *Las Facies microlaminares del final del Paleolítico en el Mediterráneo ibérico y el valle del Ebro*, (Roman, D., García-Argüelles, P. & Fullola, J. M., Eds.), Monografies del SERP, 17, Societat Catalana d'Arqueologia, Barcelona: p. 61-107. (in Spanish) ("From the Pleistocene to the Holocene in the Ebro Valley. Industries, chronology and territory") URL: https://www.researchgate.net/publication/349339032

Aura, J. E. 2001, Caçadors emboscats. L'Epipaleolític al País Valencià. In: *De neandertals a cromanyons. L'inici del poblament humà a les terres valencianes* (Villaverde, V., Ed.), Universitat de València, València: p. 219-238. (in Catalan) ("Ambushed hunters. The Epipalaeolithic in the Valencian Country")

Binford, L. R. 1979, Organization and Formation Processes: Looking at Curated Technologies. *Journal of Anthropological Research*, 35(3): 255-273. DOI : https://doi.org/10.1086/jar.35.3.3629902

Brézillon, M. 1968, *La dénomination des objets de pierre taillée*. Suplément à Gallia Préhistorie Vol. 4. Centre National de la Recherche Scientifique, Paris, 423 p. (in French) ("The naming of knapped stone objects")

Casabó, J. 2012, Las industrias de la Cova dels Blaus (La Vall d'Uixó, Castelló). Aportación a la transición paleolítico-epipaleolítico en las comarcas septentrionales del País Valenciano. *MARQ, Arqueología y Museos*, 5: 19-51. (in Spanish) ("The industries of the Cova dels Blaus (La Vall d'Uixó, Castelló). Contribution to the Palaeolithic-Epipalaeolithic transition in the northern regions of the Valencian Country")

Domènech, E. M. 1998, Los sistemas de producción lítica del Paleolítico Superior Final y Epipaleolítico en la vertiente mediterránea occidental. Tres ejemplos claves: la Grotte Gazel (Salleles-Cabardès, Aude), Cova Matutano (Vilafamés, Castelló) y Abric del Filador (Margalef del Montsant, Tarragona). *Pyrenae*, 29: 9-45. (in Spanish) ("The lithic production systems of the Final Upper Palaeolithic and Epipalaeolithic in the western Mediterranean basin. Three key examples: the Grotte Gazel (Salleles-Cabardès, Aude), Cova Matutano (Vilafamés, Castelló) and Abric del Filador (Margalef del Montsant, Tarragona)")

Gameiro, C. 2017, A utilização do percutor em pedra branda na debitagem lamelar durante o Magdalenense na Estremadura portuguesa. *Journal of Lithic Studies*, 4(3): 57-77. (in Portuguese) ("Soft hammerstone percussion use in bladelet debitage during the Magdalenian at Portuguese Estremadura") DOI: https://doi.org/10.2218/jls.v4i3.2532

García-Argüelles, P., Fullola, J. M., Román, D., Nadal, J. & Bergadà, Mª M. 2013, El modelo epipaleolítico geométrico tipo Filador cuarenta años después: vigencia y nuevas propuestas. In: *Homenaje a Javier Fortea Pérez*, (de la Rasilla, M., Ed.), Ménsula Ediciones, Universidad de Oviedo, 151-165 p. (in Spanish) ("The Filador-type geometric epipalaeolithic model forty years later: validity and new proposals")

Geneste, J.M. 2010, Systèmes techniques de production lithique: Variations techno-économiques dans les processus de réalisation des outillages paléolithiques. *Techniques & Culture*, 54-55: 419-449. (in French) ("Technical systems of lithic production: Techno-economic variations in the processes of making Palaeolithic tools") DOI: https://doi.org/10.4000/tc.683

Inizan, M.L., Reduron, M., Roche, H. & Tixier, J. 1995, *Technologie de la Pierre taillée. Vol. 4*. Cercle de Recherches et d'Études Préhistoriques, Meudon, 199 p. (in French) ("Knapping stone technology")

Lacombe, S. 2005, Territoires d'approvisionnement en matières premières lithiques au Tardiglaciaire. Remarques à propos de quelques ensembles pyrénéens. In: *Territoires, déplacements, mobilité, échanges durant la Préhistoire, Congrès du CTHS, Toulouse, 2001*, (Barbaza, M. & Jaubert, J. Eds.), Éditions du CTHS, France: p. 329-353. (in French) ("Supply territories for lithic raw materials in the Late Glacial. Remarks about some Pyrenean groups")

Laplace, G. 1966, Recherches sur l'origine et l'évolution des complexes leptolithiques. *École Française de Rome, Mélanges d'Archéologie et d'Histoire*, 4: 333-354. (in French) ("Research on the origin and evolution of leptolithic complexes")

Laplace, G. 1968, Recherches de typologie analytique. *Origini*, 2: 7-64. (in French) ("Research on analytical typology")

Laplace, G. 1972, Liste typologique 1972. *Cahiers de typologie analytique*, 1: 9-27. (in French) ("Typological list 1972")

Laplace, G. 1974, La typologie analytique et structurale: base rationnelle d'étude des industries lithiques et osseuses. *Banques de Donées Archéologiques*, 932: 91-143. (in French) ("Analytical and structural typology: rational basis for the study of lithic and bone industries")

Mangado, X. 2005, *La caracterización y el aprovisionamiento de los recursos líticos en la Prehistoria de Cataluña. Las materias primes silíceas del Paleolítico Superior final y el Epipaleolítico*. BAR International Series, 1420, Oxford, 207 p. (in Spanish) ("The characterization and supply of lithic resources in the Prehistory of Catalonia: The siliceous raw materials of the Final Upper Palaeolithic and the Epipalaeolithic") DOI: https://doi.org/10.30861/9781841718590

Nelson, M. C. 1991, The Study of Technological Organization. *Archaeological Method and Theory*, 3: 57-100 URL: https://www.jstor.org/stable/20170213

Parry, W. J. & Kelly, R. L. 1987, Expedient Core Technology and Sedentism. In: *The Organization of Core Technology*, (Johnson J. K. & Morrow, C. A. Eds.), Westview Press, Boulder and London: p. 285-304.

Pelegrin, J. 1990, Prehistoric lithic technology: some aspects of research. *Archaeological Review from Cambridge*, 9(1): 116-125,

Pelegrin, J. 2000, Les techniques de débitage laminaire au Tardiglaciaire: critères de diagnose et quelques réflexions. In: *L'Europe Centrale et Septentrionale au Tardiglaciaire. Actes de la table-ronde internationale* (Christensen, M., Valentin, B., & Bodu, P., Eds.), Mémoires du Musée de Préhistoire d'Ile-de-France, Association pour la promotion de la recherche archéologique en Île-de-France (APRAIF), Nemours: p. 73-86. (in French) ("Laminar debitage techniques in the Late Glacial: diagnostic criteria and some reflections")

Pelegrin, J., Karlin, C. & Bodu, P. 1988, Chaînes opératoires: un outil pour le préhistorien. In: *Technologie préhistorique. Notes et Monographies Techniques*, Vol. 25, (Tixier, J. Ed.) Editions du CNRS, Paris: p. 55-62 (in French) ("Operational chains: a tool for prehistorians")

Perlès, C. 1980, Économie du débitage et économie des matières premières: deux exemples grecs. In: *Préhistoire et technologie lithique* (Tixier, J., Dir.), Cahiers de l'URA Vol. 28, 1, CNRS (), France: p. 37-41. (in French) ("Economy of debitage and economy of raw materials: two Greek examples")

Perlès, C. 1991. Économie des matières premières et économie du débitage: Deux conceptions opposées. In: *25 ans d'études technologiques en Préhistoire: Bilan et perspectives*, Editions APDCA, C.R.A., Antibes. p. 35-45. (in French) ("Economics of raw materials and economics of debitage: Two opposing conceptions")

Rey-Solé, M., Roman, D. & Mangado, X. 2015, Aproximación al estudio arqueopetrológico de la industria lítica procedente del abrigo de La Roureda (Villafranca, Els Ports, Castelló, País Valencià). *Journal of Lithic Studies*, 2(2): 24. (in Spanish) ("Archaeopetrological study of the lithic industry from "La Roureda" rockshelter (Vilafranca, Els Ports, Castelló, Valencian Country)") DOI: https://doi.org/10.2218/jls.v2i2.1434

Roman, D. 2012. Nouveautés sur la séquence du Pléistocène final et l'Holocène initial dans le versant méditerranéen de la péninsule Ibérique à travers l'industrie lithique. *L'Anthropologie*, 116(5): 665–679. (in French) ("New insights into the Late Pleistocene and Early Holocene sequence in the Mediterranean side of the Iberian Peninsula through the analysis of the lithic industry") DOI: https://doi.org/10.1016/j.anthro.2012.09.002

Roman, D. 2015, La tecnología lítica durante el Magdaleniense en la vertiente Mediterránea de la península Ibérica. *Journal of Lithic Studies*, 2(2): 20. (in Spanish) ("Lithic technology during the Magdalenian in the Mediterranean side of the Iberian Peninsula") DOI: https://doi.org/10.2218/jls.v2i2.1422

Roman, D. & Domingo, I. 2020a, Exploring the end of the upper magdalenian in northern Valencian region (Mediterranean Iberia). *Quaternary International*, 564: 75-82. DOI: https://doi.org/10.1016/j.quaint.2019.09.049

Roman, D. & Domingo, I. 2020b, Las Facies Microlaminares del final del Paleolítico en el norte del País Valenciano. In: *Las Facies microlaminares del final del Paleolítico en el Mediterráneo ibérico y el valle del Ebro* (Roman, D., García-Argüelles, P. & Fullola, J. M., Eds.), Monografies del SERP, 17, Societat Catalana d'Arqueologia, Barcelona: p. 175-197. (in Spanish) ("The Microlaminar Facies of the end of the Palaeolithic in the north of the Valencian Country") URL: https://www.researchgate.net/publication/348742000

Roman, D. & Domingo, I. 2021, Aportaciones al conocimiento del Mesolítico antiguo en la vertiente mediterránea de la península ibérica: la Balma del Barranc de La Fontanella (Vilafranca, Castelló). *Trabajos de Prehistoria,* 78(2): 344-355. (in Spanish) ("Contributions to the knowledge of the Ancient Mesolithic in the Mediterranean basin of the Iberian Peninsula: the Balma del Barranc de La Fontanella (Vilafranca, Castelló)") DOI: https://doi.org/10.3989/tp.2021.12280

Roman, D. & Villaverde, V. 2006, Las puntas de la Gravette y las microgravettes de los yacimientos gravetienses del País Valenciano: caracterización morfológica y tipométrica y análisis de sus fracturas. *Zona Arqueológica*, 7(1): 440-451 (in Spanish) ("The Gravette points and the microgravettes of the Gravettian deposits of the Valencian Country: morphological and typometric characterization and analysis of their fractures")

Sonneville-Bordes, D. & Perrot, J. 1954, Lexique typologique du Paléolithique supérieur outillage lithique I, grattoirs, II, outils solutréens. *Bulletin de la Société Préhistorique Française*, 51(7-8): 327-335. (in French) ("Typological lexicon of the Upper Palaeolithic lithic tools I, end-scrapers, II, Solutrean tools") DOI: https://doi.org/10.3406/bspf.1954.3106

Sonneville-Bordes, D. & Perrot, J. 1955, Lexique typologique du Paléolithique supérieur outillage lithique III, outils composites-perçoirs. *Bulletin de la Société Préhistorique Française*, 52(1-2): 76-80. (in French) ("Typological lexicon of the Upper Palaeolithic lithic tools III, composite tools perçoirs") DOI: https://doi.org/10.3406/bspf.1955.3156

Sonneville-Bordes, D. & Perrot, J. 1956a, Lexique typologique du Paléolithique supérieur outillage lithique IV, burins. *Bulletin de la Société Préhistorique Française*, 53(7-8): 408-413. (in French) ("Typological lexicon of the Upper Palaeolithic lithic tools IV, burins") DOI: https://doi.org/10.3406/bspf.1956.3357

Sonneville-Bordes, D. & Perrot, J. 1956b, Lexique typologique du Paléolithique supérieur outillage lithique (suite et fin). *Bulletin de la Société Préhistorique Française*, 53(7-8): 547-559 (in French) ("Typological lexicon of the Upper Palaeolithic lithic tools (continuation and end)") DOI: https://doi.org/10.3406/bspf.1956.3374

Soto, A. 2015, Los sistemas de producción lítica en el Epimagdaleniense y el Sauveterroide del Alto Ebro: El caso del abrigo de Atxoste (Vírgala, Álava, País Vasco). *Munibe*, 66: 93-118 (in Spanish) ("Lithic production systems in Epimagdalenian and Sauveterrian industries from the Upper Ebro valley: The case of Atxoste site (Virgala, Alava, Basque Country)") DOI: https://doi.org/10.21630/maa.2015.66.05

Soto, A., Montes, L., Domingo, R. & García-Simón, L. M. 2019a, Nuevos datos sobre la transición Pleistoceno/Holoceno en el noreste de la península ibérica: el Sauveterriense de Peña-14 (Biel, Zaragoza). *Trabajos de Prehistoria*, 76(1): 29-47 (in Spanish) ("New data on the Pleistocene/Holocene transition in the northeast of the Iberian Peninsula: the Sauveterrian of Peña-14 (Biel, Zaragoza)") DOI: https://doi.org/10.3989/tp.2019.12224

Soto, A., Domingo, R., García-Simón, L. M., Alday, A. & Montes, L. 2019b, For a fistful of geometric microliths: Reflections on the Sauveterrian industries from the upper and middle Ebro Basin (Spain). *Quaternary International*, 564: 61-74 DOI: https://doi.org/10.1016/j.quaint.2019.09.044

Tarriño, A. 2006, *El sílex de la Cuenca vasco-Cantábrica y Pirineo Navarro. Caracterización y su aprovechamiento en la Prehistoria*. Monografías del Museo Nacional y Centro de Investigación de Altamira Vol. 21. Ministerio de Cultura, Madrid, 264 p. (in Spanish) ("Flint from the Basque-Cantabrian Basin and the Navarrese Pyrenees. Characterization and its use in Prehistory")

Adaptaciones de la producción lítica en el nivel Sauveterroide del yacimiento de Coveta de la Foia (Vilafranca, Castelló)

Joan Fullola-Isern [1], Inés Domingo [2], Dídac Roman [1]

1. PRE-EINA, Universitat Jaume I, Av. Vicent Sos Baynat, s/n 12071 Castelló de la Plana, Spain.
Email: Fullola-Isern: fullola@uji.es; Roman: romand@uji.es
2. ICREA, Universitat de Barcelona, Facultat de Geografia i Història, c/Montalegre, 6, 08001, Barcelona, Spain.
Email: ines.domingo@ub.edu

Abstract:

En este artículo se analizan dos adaptaciones líticas diferentes de la cultura mediterránea sauveterroide en el País Valenciano. Por un lado, contamos con una producción en serie estandarizada de proyectiles, dentro de las cuales hay puntas de dorso, láminas de dorso y laminitas de dorso. Por otro lado, existe una producción no predeterminada y menos estandarizada de un gran número de herramientas líticas domésticas como raspadores y láminas retocadas. La producción lítica de este grupo Sauveterroide muestra una doble adaptación en relación a su entorno: si bien estos grupos cuentan con suficientes fuentes de materia prima lítica cercanas, por lo que no tenían restricciones en cuanto al tamaño de las herramientas líticas, decidieron realizar una producción lítica basada en la producción de una gran cantidad de armaduras de pequeñas dimensiones. Por otro lado, la producción de herramientas domésticas demuestra una menor inversión técnica. Los esquemas técnicos son principalmente unipolares y semienvolventes, utilizándose recursos técnicos bipolares y ortogonales para evitar accidentes de talla provocados por la talla con percutor blando. Para la producción poco estandarizada de útiles domésticos se prefiere la explotación unipolar, mientras que en la producción en serie estandarizada también se utilizan los esquemas unipolares pero se usan los esquemas bipolares y las aberturas semienvolventes como recurso técnico recurrente.

El yacimiento de la Coveta de la Foia ofrece la oportunidad de explorar la relación entre dos producciones líticas diferentes en una única ocupación. Incluso con fuentes de materias primas relativamente cercanas, la presión cultural es más evidente en la producción de armamento de caza ya que tiende a un proceso de microlitización típico del Epipaleolítico mediterráneo (Roman 2015; Soto 2015). Este tipo de adaptación técnica muestra cuán importante es la influencia cultural en el sistema técnico y social de una comunidad, ya que condiciona por completo la producción de armas de caza en un nivel tipológico. Finalmente, podemos concluir que la estandarización y producción en serie en la Coveta de la Foia responde a condicionantes culturales (microlitismo) y técnicos. En este caso de estudio, las dimensiones de los materiales están limitadas por los procesos técnicos y no por la disponibilidad de las materias primas, ya que la proximidad de las fuentes de materias primas por sí sola no determina el tamaño de los materiales.

A nivel cronológico, la ocupación sauveterroide de la Coveta de la Foia es una de las más antiguas de la Península Ibérica con una datación de 12740-12680 cal. BP, ofreciendo uno de los primeros ejemplos de microlitismo geométrico en esta zona geográfica. Las características técnicas observadas en este yacimiento son similares a las del Epimagdaleniense y Sauveterriense en otros yacimientos del mismo contexto territorial, como Cingle de l’Aigua (Xert, Baix Maestrat, Castelló) (Roman 2012) y Atxose (Soto 2015). La presencia de microlitos geométricos también es una característica compartida por los tres sitios ibéricos. En estos yacimientos también se realizan explotaciones sobre arista destinadas exclusivamente a la producción de láminas y laminitas, muy similares a las de la Coveta de la Foia. También existen explotaciones unipolares y bipolares en amplias superficies con los mismos recursos técnicos.

Palabras clave: Sauveterroide; tecnología lítica; armaduras líticas; País Valenciano; *chaîne opératoire*; esquema técnico