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# Ist vs. IInd Mesolithic in southern France. Functional approach of techno-economic behavior through the Castelnovian of Montclus rock shelter (Gard): First results

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## ABSTRACT

In southern France, the spread of blade and trapeze industries brought to an end the high stability of the technical and economic system of the Epipalaeolithic (Azilian) and Early Mesolithic (Sauveterrian) groups. The Late Mesolithic is, in fact, characterized by substantial modifications of technological standards and conceptual schemes as testified by the appearance of new tools (i.e. notched blades) and the renewal of the microlithic toolkits. A preliminary use-wear analysis carried out on a Castelnovian lithic assemblage of the Montclus rock-shelter (Gard, Southern France) enabled to investigate how the functional behavior was affected by these innovations. In this paper the results concerning the two most emblematic tools are going to be presented: notched blades and trapezes. The former appeared to be an extremely dedicated tool type while the latter have been correlated to a new functioning and hafting mode.

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## 1. Introduction

The Late Mesolithic represented an abrupt technological break. During the 7th and 6th millennia cal BC most of Western Europe and Northern Africa underwent a major transformation process that affected the production of lithic industries at different levels: from toolkits to knapping techniques and reduction sequences (Clark, 1958; Kozłowski, 1976, 2009; Perrin et al., 2009; Marchand, 2014a). As regards the latter they were aimed at the production of large blades obtained by pressure or indirect percussion. The microlithic assemblage was implemented by a new trapezoidal type, manufactured on regular blades using the microburin technique. Finally, new tools appeared, in particular notched blades (Allard et al., in press).

By means of a critical re-examination of sites and radiocarbon dates, recent researches demonstrated that the rapid spread of the new technical package probably started in Northern Africa and gradually developed from South to North (Perrin et al., 2009). This expansion appeared to be the result of complex processes that potentially involved people migrations, especially in the Mediterranean Basin, along with the diffusion of the new technical concept

(Perrin et al., 2009; Binder, 2013; Perrin and Binder, 2014; Marchand and Perrin, 2015; Perrin et al., in press).

The first phase of this process is attested by the appearance of blades and trapezes industries around 6700–6600 cal. BC at Uzzo Cave in Sicily (Collina, 2009) and at Latronico 3 in the Southern Italian peninsula (Dini et al., 2008). In these earliest Late Mesolithic industries, arrowheads are mainly represented by small symmetrical trapezes. The second stage, around 6400–6200 cal. BC, is marked by a rapid expansion in the entire Mediterranean Basin: Italy, southern France and the Mediterranean coast of Spain (Perrin et al., 2009; Marchand and Perrin, 2015). At a general level, in south-eastern France as well as in the Italian peninsula and Sicily, this stage corresponded to the development of the Castelnovian.

The Late Mesolithic brought to an end the high stability of the technical and economic system of the Epipalaeolithic (Azilian) and Early Mesolithic (Sauveterrian) groups. This phenomenon is not homogeneous. In the Pyrenean context, for example, the continuity between the Early Mesolithic and the large arrowhead industries is a question still in debate (Binder, 1987; Valdeyron, 2000; Marchand, 2014b; Perrin and Defranould, 2016). In any case the major technical break with the Sauveterrian complex is not negligible as this latter *facies* is characterized by the simplification of knapping modalities and the production of small

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bladelets obtained by percussion. These were intended as blanks to be shaped into microliths by abrupt retouch.

Although biases connected to specific site functions have to be accounted for, use-wear analysis of Sauveterrian lithic industries indicates a low techno-functional investment. Expedient and polyvalent domestic toolkits, with short cycles of use, probably reflect the flexibility of their economy (Philibert, 2002, 2004; Guilbert et al., 2006).

Functional data for the Late Mesolithic of Southern France are very few. Use-wear analyses of lithic assemblages were carried out on rather poor contexts and led to limited results difficult to interpret, both regarding tool management and activities. Some examples are Roc de Dourgne, level C9 (Vaughan, 1993), Buholoup rock-shelter, level C3c and, in the Andorran Pyrenees, Balma Margineda, level C4 (Philibert, 2002). Other analyses were focused on specific tools, such as the arrowheads of Cuzoul-Gazel groups (Albarello, 1986, 1988) and, more recently, notched blades (Gassin et al., 2013).

Which is the functional meaning of these innovations, beyond the technical sphere? How were transformations of the technical system translated in term of functional behaviour, management of economic activities and use of tools? To what extent does the spread of new tools reflect the appearance of new functions and the modification of the economic organization of the groups? In order to tackle these issues a functional analysis of the Montclus lithic industry was undertaken.

## 2. Materials and methods

### 2.1. The site

The Montclus rock-shelter is located in south-eastern France, in the Gard district at about 80–100 km from the present Mediterranean shores (Fig. 1). It opens at the feet of a cliff, at an altitude of 80 m a.s.l., along the banks of the river Cèze, a tributary of the Rhône.

Excavated by Max Escalon de Fonton during 1956–1971, the Montclus rock-shelter is one of the most important reference sites

for the Mesolithic of Southern France. It offers an important stratigraphic sequence spanning from the Early Mesolithic (Montclusian) to the Late Neolithic. While layers 32–17 undoubtedly belong to the Early Mesolithic and layers 14–6 to the Late Mesolithic (Castelnovian), layers 15 and 16, in which triangles are associated to symmetrical trapezes, were attributed to a later Montclusian phase (*Montclusien à trapèzes*) (Escalon de Fonton, 1968; Rozoy, 1978; Darmedru and Onoratini, 2003). Latest researches, including technological analyses and new AMS radiocarbon dates, started to question the existence of this transitional level. It could be the result of a stratigraphic mix with an hypothetical early phase of the Late Mesolithic featuring symmetrical trapezes (Perrin et al., 2009; Perrin and Defranould, 2016). Besides the lithic industries, the levels yielded particularly rich evidence and the site was interpreted as a specialised fishing camp due to the presence of numerous fish vertebrae and hearths that were presumed to be structures for smoking fish (Escalon de Fonton, 1968; Rozoy, 1978).

### 2.2. The use-wear analysis: layer 14 and 16

Layer 14 can be attributed to the Early Castelnovian on a typological base and is dated between 6350 and 6060 years cal. BC. The lithic assemblage is mainly produced on local raw materials that outcrop between 5 and 10 km far from the site, similarly to what is attested for the Sauveterrian (Montclusian) layers. Additionally a few artefacts made on chert of regional origin are also attested, in particular on a blond chert probably outcropping in the riverside of the Rhône. Knapping activities are oriented towards the production of large blades by pressure and indirect percussion. The lithic assemblage is composed of 2491 lithic artefacts, including 64 cores, 1371 produced blanks (761 flakes and 610 blades) and 172 microburins. Among the 1371 blanks only 8.48% (131 artefacts) have been retouched. These are mainly shaped out of blades (94%) and include trapezes, notched blades, end-scrapers and retouched blades.

As part of a project aimed at the analysis of the entire lithic industry of layer 14, a preliminary use-wear analysis was attempted on 103 retouched tools. It will be important to integrate this study

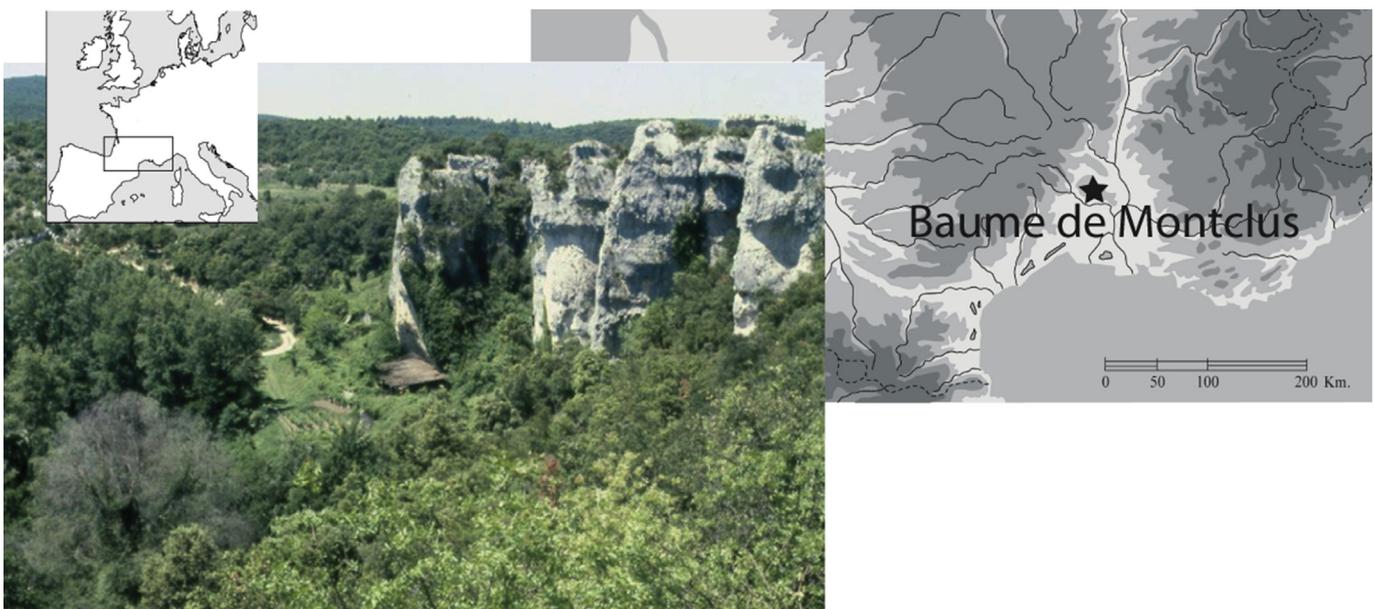


Fig. 1. Baume de Montclus (Gard), location and view of the rock-shelter (photo C. Meiklejohn). The site is located on the right bank of the Cèze gorges, a tributary of the river Rhône, around 80–100 km from the current shore of the Mediterranean sea.

with analyses on unretouched blanks that represent the largest part of the industry. In this paper the results of the notched blades and trapezes analysis will be presented.

A traceological test has been carried out on the trapezes of layer 16 that is dated to 6590–6460 years cal. BC. These trapezes are very different from a morphological point of view with respect to the large asymmetric ones of layer 14. The assemblage is composed exclusively by symmetric trapezes, either long or short, with rectilinear truncations.

The use-wear analysis was carried out according to the generally accepted protocol that combines the low and high magnification approaches (Semenov, 1964; Keeley, 1980; Plisson, 1985). For this study, a Nikon Z800 stereoscopic microscope (6×–50×) and a Nikon LV150 metallographic microscope (50×–200×) were used. A preliminary test indicated a good preservation state of the artefacts with the exception of extensive nail polish covered surfaces (especially on the ventral aspect) and the presence of pencil marks along the edges. After a first observation, these substances were removed respectively with acetone and eraser.

The functional interpretation was based on the comparison with dedicated experimental references (both notched blades and projectiles). A recent collective project allowed study from a technological and functional perspective of a wide assemblage of notched blades coming from Western Europe and Northern Africa. In particular the reduction sequences for their manufacturing and modalities in which they could be used were reconstructed through extensive experimental programmes. A traceological blind test clarified the interpretation criteria (Gassin et al., 2013, 2014, in press).

Within the framework of this preliminary analysis, the characterization of impact traces was based on the comparison with generic experimental references. Authors tend to agree on some diagnostic criteria specific to each type of arrowheads (for example Fischer et al., 1984; Odell and Cowan, 1986; Albarello, 1988; Gassin, 1991; Philibert, 2002; Martinez, 2003; Yaroshevich et al., 2010; Chesnaux, 2014). However, generally projectile experiments rarely concern trapezes and are only partially transposable to this specific tool. A dedicated experimental programme is being planned with the aim of testing the hafting mode of Montclus asymmetric and symmetric trapezes, taking into account some of the numerous factors influencing the formation of diagnostic impact wears such as their morphology, size and raw material.

### 3. Results and discussion

#### 3.1. Notched blades: a new way for plant processing?

At Montclus, notched blades dominate among retouched tools (38%) and represent 19% of the retouched artefacts ( $n = 25/131$ ).

Blanks selected for the manufacture of notched blades attest to morphometric variability and belong to different stages of the reduction sequence including regular full production blades and irregular technical blades. Numerous blanks ( $n = 9/25$ ) are semi-cortical blades that feature more or less extensive residual cortical surfaces (Figs. 2–4). Cortical blades, in particular, are extremely rare at European level and its adoption seems to be a peculiarity of the site. This is probably related to the morphology of the local raw material, a tertiary chert that is available as thin slabs. The limited degree of blade selection suggests that all the debitage products were likely to have been exploited and integrated in the toolkit. It could also be argued that most regular blades were selected for the manufacturing of trapezes.

Notches are made by pressure, creating an active edge featuring an obtuse angle, mainly on the dorsal aspect. In 4 cases notches are shaped out also on the ventral aspect, with an

alternating distribution. In 7 cases the notches are bilateral. The analysis of 12 out of 25 notched blades allowed the identification of 8 used tools and 15 used zones (9 on notches and 6 on unretouched edges).

Notches appear to be a specific active edge, with a single way of use. Each notch is an independent active zone. Polishes are focused on the concave part of the notches, are always asymmetric with a convex fluted bevel and a compact shining marginal polish on the contact (generally ventral) aspect. On the leading aspect, which is the retouched one, the polish is not well developed, is more diffuse, and features a low degree of linkage. Striations are rare (Figs. 2 and 3). The wear distribution suggests a negative rake-cutting motion (planing) allowing the removal of fine shavings, without penetrating deeply into the worked material. This cinematic was systematically identified on 186 notched blades from 24 sites of Western Europe and Northern Africa (France, Belgium, Spain, Morocco and Tunisia) which were analysed as part of an international project (Gassin et al., 2013, 2014).

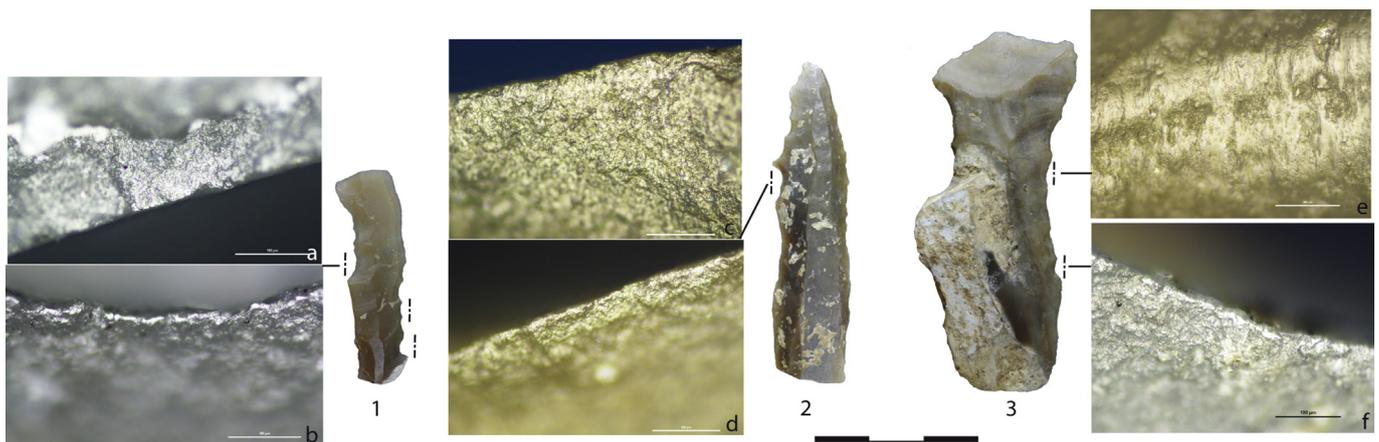
At Montclus, notches are probably connected to the processing of different plants, including rigid and siliceous ones and wood. Two notches, that yielded a flatter marginal bevel and some perpendicular cracks, could have been used to scrape bone or wood.

The morphology of the active zone and functional traces suggest that notched blades were involved in light working activities or at the finishing stage of the implements manufacture process. In general notched blades were used in plant and wood processing, for scraping stems or soft plant fibres, stalks of rigid vegetal, wooden splints or small branches, as part of various *chaînes opératoires*, for example the manufacture of arrows or foreshafts, basketry or plaiting. Considering the functional interpretation of the site, it is possible that some of these tools were used for scraping vegetal materials for the manufacture of nets or fish-traps.

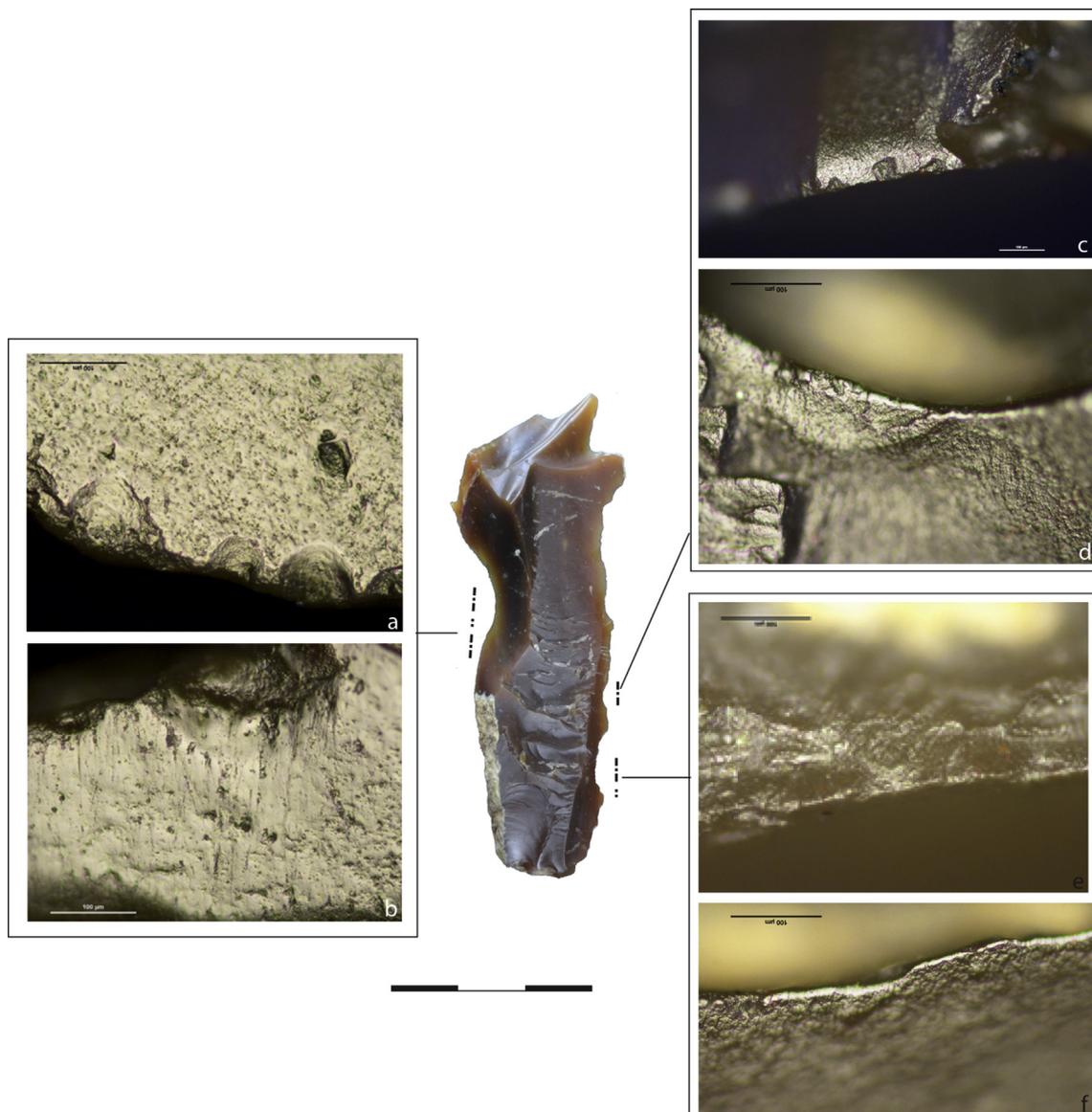
Occasionally also the unretouched edges of these tools were used for cutting and scraping multiple materials (Figs. 3a, b and 4). In particular 6 unretouched active edges on 5 blanks have been identified. Three of them correspond to the scraping a rigid, soft and lightly abrasive material. An edge was used for cutting hide, one for splitting woody plants and the last one for scraping siliceous plants with a positive rake-cutting motion. On 2 blades, these active zones are separated from the notches or lie on the opposite edge. In one case, on the other hand, it was possible to establish that notches are posterior than the use of the natural edge, thus indicating a recycling process.

The cinematic and the worked materials of the notched blades of Montclus support pre-existing data and suggest the increasing importance of the vegetal material processing during the Late Mesolithic or/and a change in the working methods. In the area of Sauveterrian (and Montclusian) influence and at its margins the main activities that were carried out seem to be focused on the procurement and processing of soft animal tissues: hunting, hide working and butchery. The processing of vegetal materials, in particular plant and soft vegetal materials, is attested, but it never reaches consistent values in the functional spectrum of the sites, as documented in dedicated synthetic studies (Philibert, 2002, 2004; Khedhaier, 2003; Guéret, 2013a).

This image of the Mesolithic vegetal economy depicted by knapped lithic industries is, anyways, possibly biased by taphonomic issues, sampling strategies (underestimation of unretouched blanks and macro-tools) and by the status and function of the sites. As regards the Early Mesolithic in Southern France, most of use-wear analysis concerns rock-shelter or cave sites that can be considered as seasonally occupied logistic and/or hunting camps. In some sites soft plants and wood working played a more important role and, by widening the range of activities, contributed to their



**Fig. 2.** Montclus, Layer 14, Castelnovian. Notched blades with use-wear on notches from scraping vegetal materials. a, c) tiny polish on the leading surface; b, d, f) convex fluted bevel on the contact surface, both characteristic of a negative rake cutting; e) scraping plant polish on unretouched edge. All photographs taken at 200 $\times$ .



**Fig. 3.** Montclus, Layer 14, Castelnovian. Notched blade involved in plant processing. An unretouched edge on the left side was used to scraping with a positive rake-cutting motion on siliceous plants (a: dorsal face, b: ventral face). Two notches on the right edge were used for plant scraping (c, e: dorsal face, d, f: ventral face). All photographs taken at 200 $\times$ .

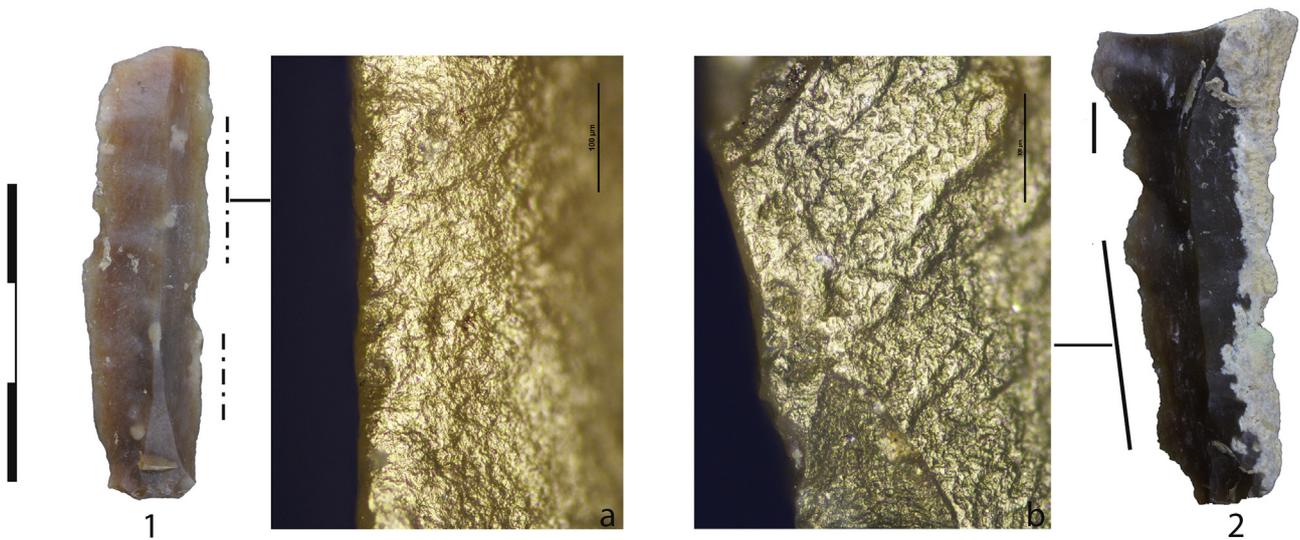


Fig. 4. Montclus, Layer 14, Castelnovian. Notched blades attesting use-wears on the unretouched edges: a) scraping mildly abrasive rigid soft material; b) plant cutting. All photographs taken at 200 $\times$ .

interpretation as longer and more complex occupations. This is the case, for example, of the Grippons rock-shelter in the Swiss Jura. In the early Mesolithic layer, 27.5% of used domestic tools (corresponding to 16 active zones) yielded traces of vegetal material working (Martinet, 1991).

Vegetal working activities during Early Mesolithic are possibly underestimated in Southern France, as only a partial view of the activity spectrum of the yearly cycle and of economic territories is available. Recent work seems to indicate that plant processing could be more frequent in open-air sites. This hypothesis has been formulated especially for the site of Saint Lizier (Creysse, Dordogne), in which 7 unretouched edges used for soft vegetal processing, probably for plant splitting, were identified (Chesnaux, 2013a). In any case the rarity of Early Mesolithic open-air sites in the region does not currently allow to clarify this question.

These data contrast with respect to the evidence from Northern France and Northern Europe where plant working is one of the central activities, mainly attested on sites dated to the Late Mesolithic such as Vaenget Nord (Juel Jensen and Brinch Petersen, 1985), Swifterbant (Bienenfeld, 1985), Star Carr and Mount Sandel (Dumont, 1988), Hardinxveld (Van Gijn et al., 2001) but also to the Early Mesolithic such as Noyen sur Seine (Seine-et-Marne, France), Doel and Verrebroek (Belgium). In these sites, use-wear analyses highlighted the presence of scraping, splitting and boring activities corresponding to manufacturing and maintenance of soft vegetal objects and to the plant fibres working (Beugnier and Cromb , 2005; Beugnier, 2007; Gu ret, 2013a,b). In Early Mesolithic sites, these activities were not realized with dedicated tools but with unretouched tools, possibly selected according to the morphology of the edges.

The rare wooden or non-ligneous plant objects found in wetland contexts – dugout canoes, fish-traps, nets, bows, arrows, basketworks – give an idea of the technical traditions and the high level of know-how the Early Mesolithic people were in possess of. With the Late Mesolithic, the appearance of specific, if not specialized, tools could reveal a reorganization of technical systems or new technical processes for plant working.

### 3.2. Trapezoidal arrowheads: changing form, changing function

#### 3.2.1. Asymmetrical trapezes as “point-barb”

Layer 14 delivered 64 microliths including 7 undetermined fragments and 1 scalene triangle that were not considered in this paper. The study, thus, focused on 56 geometric bi-truncations which almost exclusively correspond to asymmetric trapezes. The exceptions are represented by 3 very small symmetric trapezes (type BG 22 from Perrin, 2009). The asymmetric trapezes, obtained by means of the microburin technique, feature a certain morphological variability. Trapezes with a concave small truncation and straight or concave long truncation (*trap zes de Montclus*) are the most frequent type ( $n = 43$ , type BG11) (Fig. 5, 1). Eight trapezes are characterized by an inverse retouch on the small truncation (type BG13) (Fig. 5, 3a) and 2 others by bipolar retouch on the long truncation (type BG 12). Among the 53 asymmetric trapezes, a great majority attest an offset short base (*trap zes   base d cal e*) ( $n = 21$ ) (Fig. 5, 2).

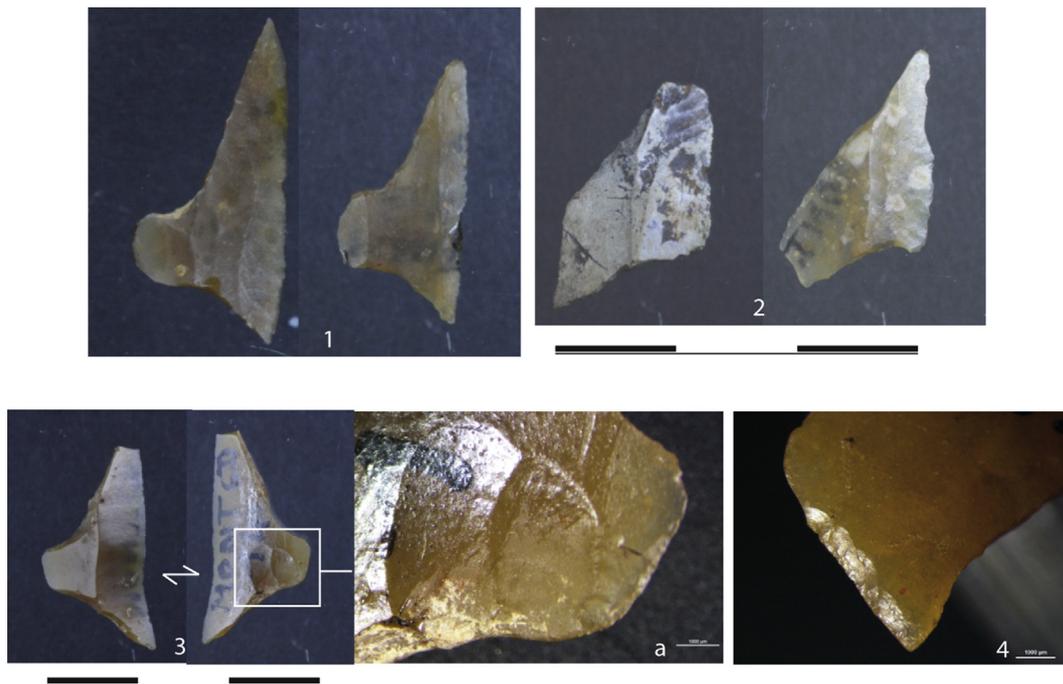
A low magnification observation allowed diagnostic projectile impact traces to be identified on 19 trapezes out of 56 (34%) (Table 1). The remaining artefacts are either intact (5) or show strong thermal alterations (7) or non-symptomatic damages such as snap fractures.

Diagnostic impact damages are preferentially located on the main point of the trapezes (13/19) that in 14 cases display multiple edge-damaged zones (2–4 areas).

Table 1

Localisation of the diagnostic impact fractures according to trapezes typology (Perrin, 2009). d cal : offset short base, MP: main point, SP: small point, LB: long base, SB: short base.

Type	nb	diag	MP	SP	LB	SB
BG11	25	10	10	6	6	3
BG11 d�cal�	18	5	1	2	3	2
BG13	6	2	2	1	1	1
BG13 d�cal�	2	1			1	
BG12	1	1		1	1	
BG12 d�cal�	1	0				
BG22	3	0				
Total	56	19	13	10	12	6



**Fig. 5.** Montclus, Layer 14, Castelnovian. Asymmetrical trapezes: 1) trapezes with concave truncations (*trapezes de Montclus*); 2) trapezes with offset short base (*trapezes à base décalée*). 3) *trapeze de Montclus* and detail of the small truncation (a) showing the inverse retouch; 4) micro-retouch on the short base of a trapeze.

The most common damage of the main point is represented by long step or hinge terminating bending fractures (9/13) (Fig. 6). These fractures are relatively lightly invasive and generally affect the very tip of the point. In 2 cases the bending fractures removed half of the trapezes (Fig. 6, 4g). A second type of damage is represented by tiny impact burinations (4/13). These small burin-like fractures are either located on the main point of the trapezes or on the small one in association with diagnostic step terminating bending fractures (3 cases). Spin-off fractures, which are considered to be highly diagnostic of impacts, are observed in association with step terminating bending fractures on the main point of 3 trapezes (Fig. 6, 1b, 3e). All these fractures show the same orientation, slightly oblique with respect to the longitudinal axis of the trapezes.

On the long base, impact damages consist in edge scarring and crushing, often continuous and bifacial with step terminating, sometimes stepped, removals with oblique orientation (12/19) (Fig. 7, 1, 2). Impact scarring is combined to diagnostic traces on the main point or on the small point in 10 cases out of 12.

With the exception of snap fractures, macroscopic damage on the small points (10), is represented by small step terminating bending fractures (Fig. 7, 4) or more important damages such as bifacial burin-like fractures (3) and long step terminating bending fractures developing along the small truncation (2). The orientation of the removals is perpendicular to the long base of the microliths.

Damages are less frequent on the small base (7) (Fig. 7, 3). They are represented by step terminating scars or small transverse bending fractures that are likely to result from the impact against the shaft.

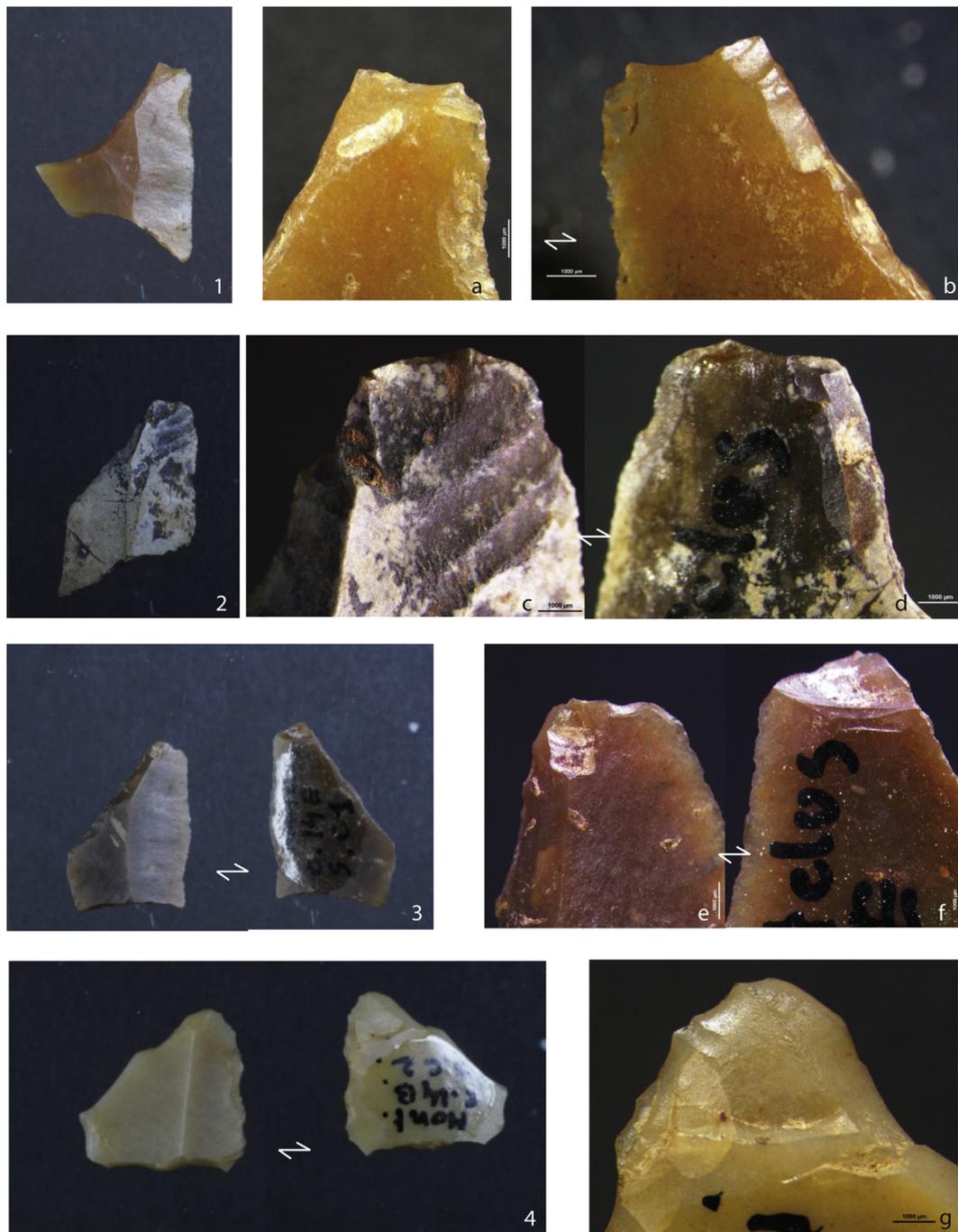
The recurring orientation of impact traces, as well as their distribution and combination, allows to propose the hypothesis that asymmetric trapezes were hafted as “point-barbs” implements combining a piercing tip (main point) and a lateral barb (small point) (Fig. 8). It cannot be excluded that some trapezes were hafted as lateral elements or barbs, in particular in the cases in which damages are located only on the long base and the small

point (4 cases). Among offset short base trapezes only 1 out of 21 attests damage on the main point (Fig. 6, 2) and thus the reconstruction of hafting modalities is more difficult.

The issue of the hafting system – composition of the glue, presence of bindings, etc. – has not yet been approached through microscopic observation and experimental references. As working hypothesis a modality similar to the one proposed for the Castelnovian asymmetric trapezes of the Gaban rock-shelter can be advanced. The analysis of archaeological residues suggest that these trapezes could have been fixed with glue produced by mixing beeswax, bitumen and red ochre (Cristiani et al., 2009). The insertion of the short base in the arrow shaft seems to be confirmed at Montclus by the above mentioned impact traces and its intentional modification. On the one hand, 8 trapezes, in fact, feature a flat indirect retouch that starts on the small truncation and develops on the short base (on one offset short base trapeze the retouch starts from the main truncation) (Fig. 5, 3a). Such retouch reduces the thickness of the blanks of about 1 mm, from an average of 2.6 mm to 1.62 mm. On the other hand, on the short base of 13 trapezes (out of 56) a direct or indirect semi-abrupt retouch is observed (Fig. 5, 4). Both modalities were probably intended to calibrate and thin the hafting zone.

Currently, functional and hafting modalities of the asymmetric trapezes of layer 14 seem to be quite standardized. By combining a perforating point, a lacerating edge and a retention barb on a single microlith it is possible that trapezes were the only lithic implement on the Castelnovian arrows, hafted on the tip of the shafts perhaps with the addition of a supplementary lateral element.

The design of Sauveterrian arrows is radically different, as they are composed of several microliths, but the desired ballistic properties seem to be the same at a general level. Sauveterrian microliths are characterized by a variety of morphologies, each with a different function related to their hafting mode and position on the shaft: schematically micro-backed points and triangles were used as perforating tips, scalene triangles or crescents as lateral barbs with a lacerating edge and possibly a retention point (Philibert,



**Fig. 6.** Montclus, Layer 14, Castelnovian. Impact fractures on the main point of the trapezes: 1) complex fracture composed of a feather terminating bending fracture on the dorsal face (a) and a burin-like spin off on the ventral one (b); 2) long hinge terminating bifacial fracture (c, d); 3) bifacial fracture with spin off (e) on the dorsal face and step terminating bending fracture (f) on the ventral one 4) long step terminating bending fracture on the ventral face (g).

2002; Chesnaux, 2013b, 2014). The concept of “point-barb” is not an innovation of the Castelnovian trapezes as it has already been proposed for some Sauveterrian long scalene triangles (Philibert, 2002).

Sauveterrian microliths differ from trapezes in particular for their extremely reduced size. The microlithisation of lithic arrow implements as well as the simplification of their production processes, presumably constitute one of the strategies adopted in order to minimize the risks (Elston and Kuhn, 2002). Additionally this solution allows the customization of arrowheads according to the hunted game, the status of the archer or the purpose of the

arrow, i.e. its social or symbolic function (Wiessner, 1983; Petrequin and Petrequin, 1990). Ethno-archaeological researches (Bosc-Zanardo et al., 2008) as well as experimental and techno-functional ones (Chesnaux, 2014; Gaillard et al., 2015) suggest that this technical choice is balanced by a greater investment in the fixing system and an important know-how in the manufacture of glues.

With the Early Castelnovian trapezes, the conception of a single arrowhead combining multiple ballistic properties is correlated with a return to a high investment in the production of regular blanks and to new modalities for their exploitation.

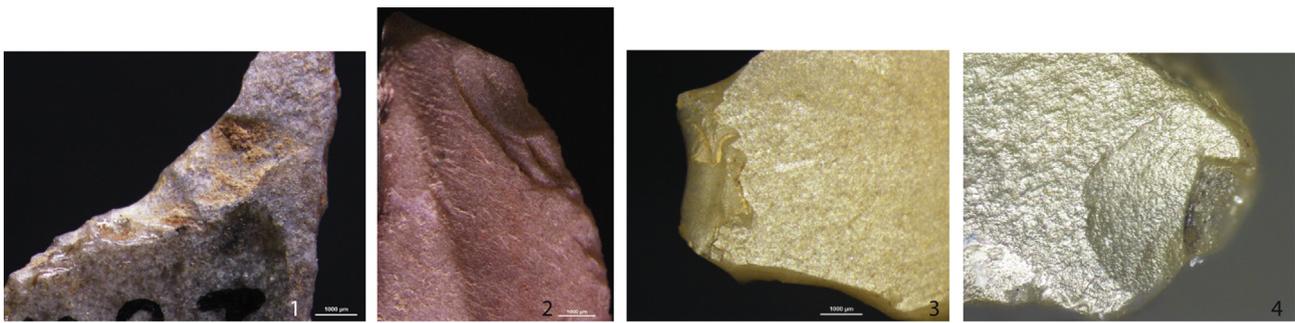


Fig. 7. Montclus, Layer 14, Castelnovian. Impact damages on the trapezes: edge scarring and crushing on the long base (1 and 2) and removals on the short base (3) and on the small point (4).

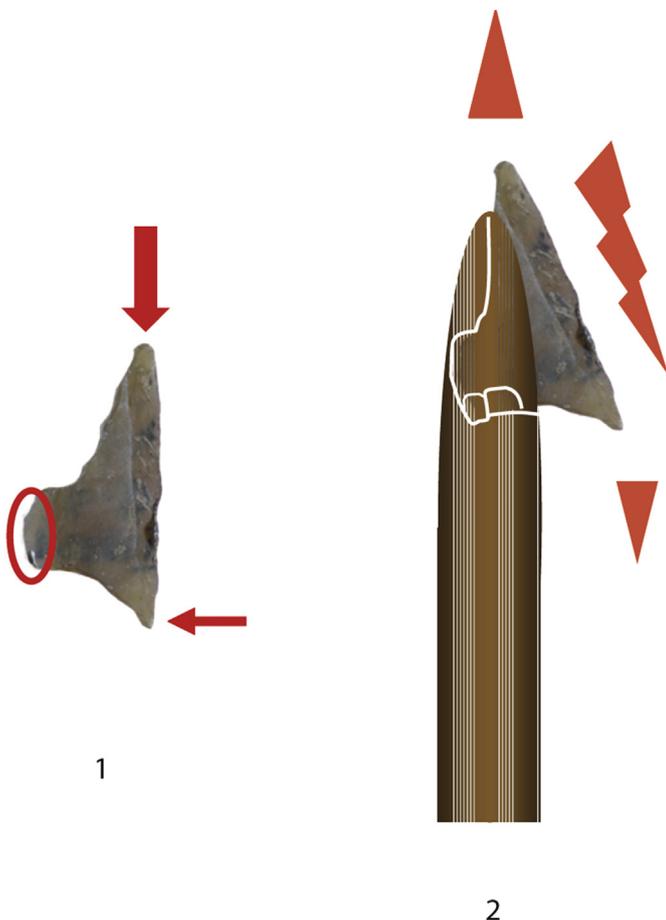


Fig. 8. Recurrent orientation and position of impact traces observed on the Montclus trapezes (1) and hypothetical reconstruction of their hafting and use as "point-barb", combining a piercing tip and a lateral barb (2).

### 3.2.2. Symmetrical trapezes of layer 16: transverse arrowheads?

A sample of 20 symmetrical trapezes (out of 34) has been analysed with the low magnification approach. Six of them revealed the presence of damages connected with their use as projectile implements (Fig. 9). The impact traces identified on this artefacts is represented by step terminating bending micro-fractures and micro-burinations located on the two points formed by the long base and the truncations. The orientation is slightly oblique and the fracture develops along the retouch forming the truncation. In one case, the direction of a burin-like fracture is parallel to the long

base. These fractures, of particularly small size, are difficult to interpret in term of functioning and hafting modalities.

Nevertheless, 4 elements show more intense damage such as edge crushing and step terminating perpendicular removals on the long base (n. 3) and one complex fracture featuring a bifacial step terminating bending removal on one of the two points, perpendicular to the long base (Fig. 9, 3). These fractures are consistent with the use of these trapezes as transversal points, although this interpretation needs to be confronted by the micro-wear observation and the detailed analysis of all the symmetric trapezes, including 9 specimens recovered in layer 15.

The symmetric trapezes of the Montclus rock-shelter could represent an actual functional rupture by marking the appearance of transversal arrowheads, around 6500 years cal. BC. This hafting modality constitutes a real break with Early Mesolithic projectiles, both in term of technical conception and ballistic properties. Therefore, in the hypothesis of an attribution of these symmetric trapezes to the later Montclusian (Early Mesolithic), their functional coexistence with the « triangles de Montclus » is a key issue.

## 4. Conclusion

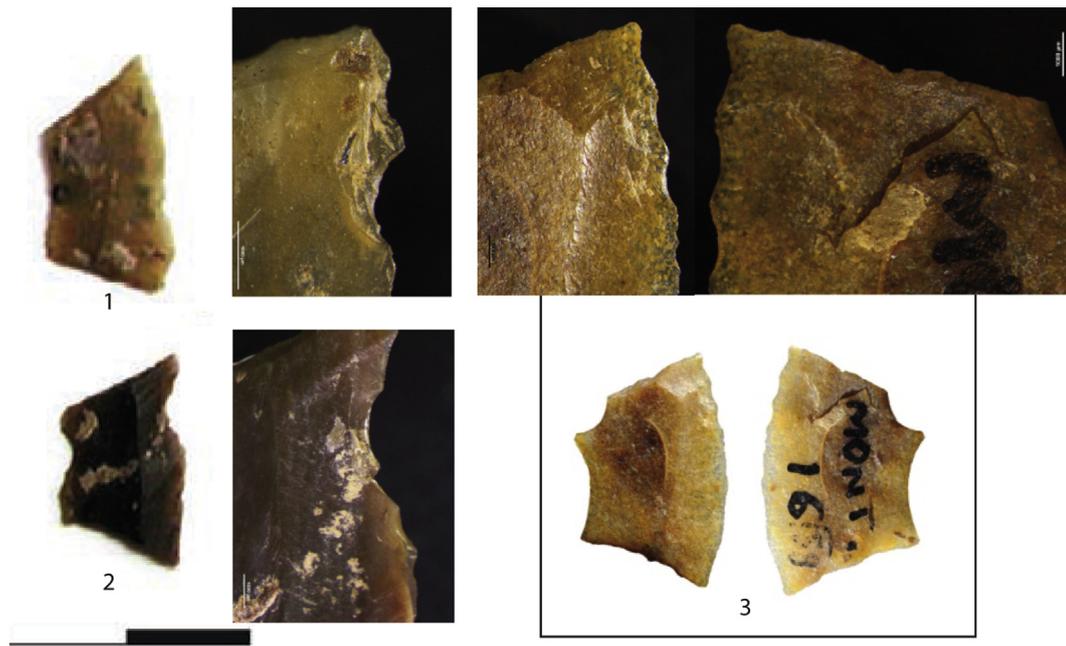
Tackling the functional logic assessments, on which the renewal of the toolkits during the 7th millennium cal BC is based, represents one of the major issues for understanding the spread and the constitution of the Late Mesolithic.

This preliminary use-wear analysis of the Castelnovian industries of the Montclus rock-shelter contributes to supply a functional perspective on the two most emblematic tools.

The appearance of notched blades, which seem to have been used according to a recurrent modality on a large area, can be interpreted as a dedicated tool, whose specific active edge – the notch – was aimed at processing activities and the manufacturing of material goods. This new tool is possibly a sign of changes happening in the technical processes, in particular as regards plant processing.

Trapezes, as projectile implements, indicate a change in the conception of the arrow and in the hafting modalities. Asymmetric trapezes can be interpreted as "point-barb" arrow implements that combine in a single microlith multiple ballistic properties: perforation, laceration and retention. Symmetrical trapezes of layer 15–16, on the other hand, attest a functional rupture represented by their supposed transversal hafting. The preliminary consideration here highlighted will have to be verified by complementary analysis of Montclus artefacts and through comparisons with the other Castelnovian sites.

In the western Mediterranean area, functional analyses on Mesolithic contexts are still few although an increasing trend is



**Fig. 9.** Montclus, Layer 16. Impact fractures on symmetrical trapezes: 1–2) edge crushing on the long base; 3) complex fracture with bifacial step terminating bending removals.

perceptible. Some examples that are worth mentioning are the sites of Cocina Cave (Garcia Puchol et al., 2014) and El Embarcadero (Clemente-Conte and Pijoan Lopez, 2005) in Spain, Laghetti del Crestoso (Lemorini, 1997) and Gaban rock-shelter (Cristiani et al. 2009) in northern Italy and the Capsian site of SHM-1 Hergla (Khedhaier El Asmi et al., 2014) in Tunisia. Available data are still too few to discuss the functional homogeneity of the Late Mesolithic industries, as well as their functional continuity or rupture with the Early Mesolithic ones. In some contexts, this question is undoubtedly more complex than in others, as for example at the Mourre de Sève rock-shelter (Vaucluse, France) where use-wear analysis revealed a gradual economic transition between Sauveterrian, Montclusian and Castelnovian occupation phases (De Stefanis et al., 2016). It is likely that within this multi-form phenomenon the new technical solutions and know-hows coexist with some traditions that are preserved.

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