



## Articolo

# Site functional variability and settlement systems in the Sauveterrian (Southern France and Northern Italy)

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## Parole chiave

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- sistemi tecnici
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- Italia nord-orientale

## Keywords

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- technological systems
- territorial organisation
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## Riassunto

La tecnologia del Mesolitico antico è in genere percepita come il risultato di un basso investimento tecnico nella produzione e uso degli strumenti litici. In questo articolo viene proposto che tale percezione sia da imputarsi primariamente ad un problema di visibilità archeologica. Tramite l'applicazione di un approccio tecno-funzionale combinato allo studio di due insiemi litici del Mesolitico antico (Sauveterriano) provenienti dalla Francia meridionale e dall'Italia nord-orientale, è stato possibile comprendere in maniera più approfondita i sistemi tecnici degli ultimi gruppi di cacciatori-raccoglitori preistorici. Contestualizzando e confrontando questi siti con il record archeologico regionale è stato possibile percepire la grande variabilità funzionale dei siti noti e la complessità del sistema insediativo Sauveterriano. In questo scenario, è possibile affermare che l'insieme di siti noti riferibile a questa fase cronologica, seppur particolarmente abbondante rispetto a periodi preistorici più antichi e a territori limitrofi, sia comunque influenzato dallo sviluppo delle attività di ricerca. Gli scavi svolti in passato, infatti, hanno permesso di indagare un gran numero di siti specializzati nelle attività di caccia. Questi sono sicuramente molto importanti per la ricostruzione dei modi di vita dei gruppi mesolitici ma allo stesso tempo costituiscono solo una parte del più articolato sistema insediativo logistico sauveterriano.

## Summary

Early Mesolithic technology is generally perceived as the result of a small technical investment in lithic tool manufacture and use. In this paper, it is argued that such perception is primarily the result of low archaeological visibility. By using a combined techno-functional approach to study two Early Mesolithic (Sauveterrian) flaked assemblages from Southern France and North-eastern Italy, it was possible to gain a deeper insight into the technological systems of the last European prehistoric hunter-gatherer groups. By contextualising and comparing these two sites with available regional evidence, it was possible to get a glimpse of the high functional variability of the known sites and the complexity of the Sauveterrian settlement system. In this scenario, it seems that the current Early Mesolithic evidence of the region, although relatively abundant with respect to earlier prehistoric periods and neighbouring territories, is still partially biased by research activities. Past excavations, in fact, mostly allowed exploring hunting-specialised sites that are undoubtedly significant for the reconstruction of Mesolithic lifeways but, at the same time, only represent a part of the complex Sauveterrian logistical settlement system.

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## Introduction

As regards the Early Mesolithic, the large area encompassing Southern France and Northern Italy is believed to be characterised by the presence of a single vast cultural entity known as Sauveterrian. This complex was identified and defined at the end of the 1920's by L. Coulonges (1928) thanks to his field research in the Sauveterre-la-Lemance Municipality (Nouvelle Aquitaine, France). In the Early Holocene layers of two rock-sheltered sites, he brought to light lithic assemblages characterised by the presence of small backed bladelets and triangular microliths. Based on such lithic artefacts, the *Sauveterrien* culture was defined. In the following years, similar assemblages were identified at numerous other sites such as Cuzoul de Gramat (Lacam et al. 1944), Rouffignac cave (Barrière 1973) and the Baume de Montclus (Escalon de Fonton 1966). At the end of the 1960's, assemblages characterised by similar compositions were also identified in the Adige valley (Northern Italy) and attributed to the same complex (Broglia 1971; 2016). Since the 1970's, most authors have been persuaded that the large territory between the southern part of the French Atlantic coast and the Trieste karst are to be ascribed to the same cultural complex (Kozłowski 1976; Barbaza & Valdeyron 1991; Thévenin 1999). It must be said that this assumption was not supported by any dedicated comparisons of the lithic assemblages. The only attempt to do this, although only on typological grounds, tentatively concluded that the French and Italian Sauveterrian were not as close as expected (Valdeyron 2008). A later work that directly compared French and Italian lithic assemblages confirmed this hypothesis and highlighted the existence of much smaller regions of influence that are still difficult to be delineated with the current archaeological record (Visentin 2018).

Since the first Sauveterrian sites were discovered, known evidence in these regions has exponentially increased. A fair share of the hundreds of known sites is represented by lithic scatters, which have not been thoroughly studied from a technological point of view. In particular, both the French and Italian Alpine and pre-Alpine massifs have been the object of intense survey activities that led to the discovery of a considerable number of high-altitude settlements (Angelin 2017; Bagolini & Dalmeri 1987; Bintz & Pelletier 1999; Crotti & Bullinger 2013; Dalmeri & Pedrotti 1994; Fontana et al. 2009b; 2021; Fontana & Visentin 2016; Raiteri 2017; Visentin et al. 2016c). Similarly, the karstic plateaus surrounding the Central Massif have

yielded significant evidence, represented mainly by rock shelters. On the other hand, evidence concerning plain sites is not as rich and is primarily related to surface collections. Nonetheless, a few well-excavated sites are attested in both countries (Amiel & Lelouvier 2003; Fontana et al. 2009a; Fontana & Visentin 2016; Guilbert 2003, Visentin et al. 2016a).

As regards lithic technology, Sauveterrian technical systems are generally perceived as the result of low technical investment with respect to earlier and later prehistoric periods. Nonetheless, some studies carried out in the last two decades highlighted the existence of a complex and variable behaviour suggesting that such assumption should be partially reconsidered (Fontana et al. 2009a; Fontana & Visentin 2016; Wierer et al. 2016; Angelin 2017, Visentin 2018) or, at least, bent to the different products and stages of Sauveterrian reduction sequences. The most striking example is the dichotomy between "common" tools and armatures. While artefacts belonging to the former category have been described as "*outils expédients*" (Guilbert et al. 2006) to highlight the low investment in their transformation phase (retouch), an opposite behaviour has been remarked for microlithic armatures. In this latter case, it has been stressed that the technical investment was shifted from the blank production phase to the transformation one (Fontana & Guerreschi 2009).

Up until recently, functional data seemed to support these notions. The studied sites are mainly characterised by a large number of microliths, in some cases featuring numerous impact traces (Philibert 2002; Chesnaux 2014). Cynegetic activities are well attested also as regards tools. A relatively high number of these yielded use-wear consistent with butchering and first animal carcasses processing (Philibert 2002; Fontana et al. 2009b; Visentin et al. 2016b). On the other hand, other transformation activities are not as frequent and generally testify to brief tasks. Nonetheless, some works indicate the existence of sites with varied functional vocations (Philibert 2002, Valdeyron et al. 2011; Chesnaux et al. 2018; Visentin et al. 2016; 2021), such as transformation activities related to hide and vegetal materials processing.

A research project that compared French and Italian Sauveterrian evidence allowed the development of this topic (Visentin, 2018). This paper aims to summarise part of the obtained results and, in doing so, to propose a reassessment of the functional role of Sauveterrian (*sensu lato*) sites within the regional settlement systems.

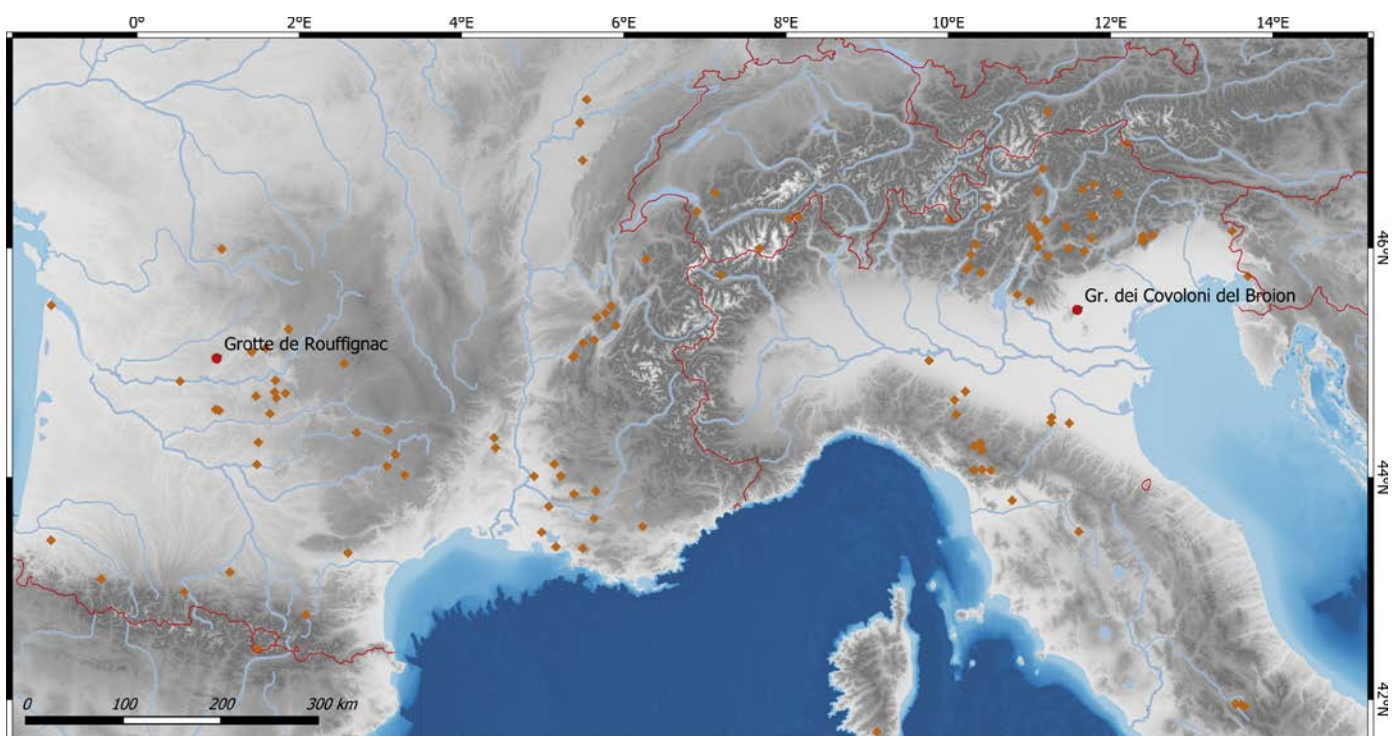


Fig. 1: Location of the two sites included in this work and of the main other Early Mesolithic sites of the region.

**Material and methods**

Within the above-mentioned research project, a series of key sites were analysed following a technological approach in its broader sense, that is to say, encompassing the entire *chaîne opératoire*, from raw material procurement to the manufacture, use and discard of tools (Visentin, 2018). The sites were selected trying to cover as best as possible the period in which the Sauveterrian is attested in the region (i.e. 11,500 - ca. 8500 cal BP) and to account for the sites variability both in terms of location (highlands vs lowlands; open-air vs rock shelter) and presumed functionality (according to published data, if available). Ten sites were selected, totalling more than 55,000 artefacts and wastes.

The results obtained by applying an integrated techno-traceological approach to two of these assemblages are reported in the present work: Grotta dei Covoloni del Broion (Italy) and Rouffignac cave (France) (Fig. 1). Traceological analysis (Semenov 1964) followed the combined low- and high-power approach (cf. González-Urquijo & Ibáñez 1994; Van Gijn 2014), which is the commonly accepted protocol for this type of analysis.

**Results**

The comparison of a significant number of sites allowed perceiving a high technological variability within what was referred to as Sauveterrian (Visentin 2018). This variability is partially to be ascribed to cultural factors and the existence of different areas of influence within this territory. The numerous differences in the size, shape and manufacturing modality of microliths (in particular as regards Preboreal assemblages) are the most striking example of this. On the other hand, part of this variability is related to the specific functional vocation of some of these sites. Cynegetic activities are always represented, although with different intensities. At the same time, the presence of tools dedicated to specific transformation activities cannot be neglected. These could either represent part of a wide set of tasks and activities that took place at the sites or even indicate their primary functional vocation. Two significant examples of this are reported in the following sections.

**Abrasive material working**

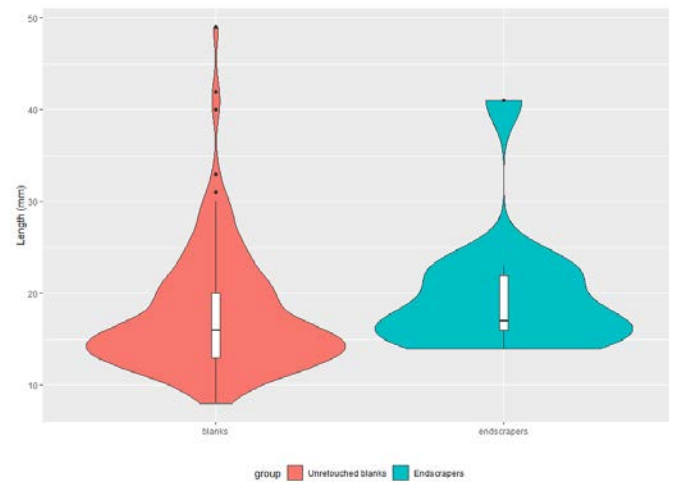
Grotta dei Covoloni del Broion (Veneto, Italy) is a small and narrow horizontal cave located on the southern slope of Mount Broion in the Berici Hills, a hilly group located in the Venetian plain, not far from the Venetian pre-Alps. In the 1970'ies, the site was the object of a stratigraphic investigation that yielded a late Pleistocene-to-mid Holocene sequence, including a Sauveterrian layer (Ligabue 1974).

Although not particularly abundant, the lithic assemblage belonging to this layer (L. 7) presents an utmost peculiar structure in the framework of the Early Mesolithic regional evidence. It consists of 1786 artefacts and chips. Half are undetermined fragments (51.2%), and 26.9% are flakes smaller than 1 centimetre. At a macroscopic level, the assemblage is in a good preservation state, as the share of pieces altered by fire exposure is relatively low: 20.9%. On the other hand, minor fractures and edge scarring are frequently attested (23.8%) (Visentin 2018).

The lithic assemblage was produced following a single *chaîne opératoire* aimed at exploiting small irregular cobbles and slabs. Presumably, the size of imported raw materials was no larger than 50 mm, and the flaking process was destined to produce flakes and bladelets shorter than 40 mm (Fig. 2). Nonetheless, the largest (longer than 30 mm) products and by-products are rare in the preserved assemblage. Half of the bladelets are around 20 to 24 mm in length and 7 to 12 in width. Flakes and flake by-products are even smaller. This means that these primary products were almost systematically transformed into retouched tools (a total of 38 artefacts). Endscrepers are by far the most abundant type totalling 25 pieces (Fig. 3). All the entire endscrepers are short types. The only exception is a thick, plunging, naturally backed bladelet whose natural morphology was only slightly modified with a marginal retouch. Fourteen short ones present a wide retouched front, and 8 of them also feature

lateral retouches on at least one of the two sides. Furthermore, one circular, one nosed and two double endscrepers are attested. One of these latter associates a wide frontal type with a nosed one, while the other two are nosed types. Undeterminable fragments represent the remaining six endscrepers. As regards dimensional values, except for the long type (41 mm), the length spans between 14 and 23 mm, with an average value of 18 mm. Width is between 12 and 24 mm and thickness between 2 and 9 with average values of 18 and 6 mm, respectively.

The other tools are represented by three burins, three truncations, one small backed knife, one splintered piece and a few other artefacts featuring abrupt and simple retouches. On the other hand,



**Fig. 2:** Grotta dei Covoloni del Broion, layer 7. Comparison of length values of complete unretouched blanks (n. 137) and endscrepers (n. 13).



**Fig. 3:** Grotta dei Covoloni del Broion, layer 7. The endscreper assemblage identified in the Sauveterrian level. The dotted line indicates edge rounding; the dash-and-dotted line indicates the presence of bending removals; "X" indicates hafting traces.

microlithic armatures are not abundant (12 elements). Among them are one Sauveterre-like backed point, two crescents, one backed bladelet and one backed-and-truncated bladelet. The presence of 4 microburins attests to the on-site production of microliths.

The traceological analysis involved all retouched artefacts and debitage blanks larger than 1 cm. At a general level, the preservation state of the assemblage is not excellent as surface alterations (dehydration) and mechanical abrasions are widespread. On the other hand, taphonomic microchipping is not as intense as the former and is mainly localised, rarely affecting the entire edges. These alterations erased all eventual micro-polishes. Therefore, the identification of use-wear traces primarily relied on the analysis of edge rounding and micro-scarring.

Among retouched tools, 11 endscrapers yielded use-wear traces (Fig. 4). These are represented by a marginal, asymmetric rounding developed towards the dorsal aspect of the blank (retouched front). In most of them, rounding is not homogeneous and does not affect the entire front being particularly developed laterally. Moreover, two endscrapers present some fine bending removals in correspondence of the front that could be related to the tool use (Fig. 4D). At a general level, the evidence is consistent with the scraping of a mid-hardness abrasive material. The low degree of rounding is comparable to that obtained with experimental artefacts and can be related to the significant hardness of the chert lithology. Additionally, two endscrapers yielded hafting traces represented by short and wide, trapezoidal or rectangular, hinge-terminating bending removals on one or both lateral edges. On-site resharpening of endscrapers is attested by two pieces in which successive retouches partially removed the edge rounding (Fig. 4C). The systematic application of this procedure could also partially explain the high percentage of flakes smaller than 1 cm with respect to the entire lithic assemblage (26.9% of the entire assemblage). It seems that endscrapers were abandoned only after their overexploitation or following major fractu-

res. Except for the partially retouched long endscrapper (cf. *infra*), the only pieces longer than 2 cm that yielded use-wear traces are the two abandoned during resharpening and two others featuring major proximal fractures. The other six present length values comprised between 14 and 18 mm. Three endscrapers also attest to the presence of irregular and patchy red ochre residues. Anyways, these are distributed in the ventral and dorsal faces of the blanks and cannot be directly related to any functional edge. Overall, the distribution of use-wear (decentred and with a limited distribution on the upper face), the poor rounding, the frequent resharpening and the small dimensions of endscrapers are consistent with hide-working (e.g. see the Konso fleshing modality in Beyries and Rots 2008). However, the absence of determinable polishes does not allow for fully confirming this hypothesis.

As regards the other tools, ochre residues are associated with the transversal retouched edge of a thick truncated bladelet. Residues, in particular, are located in correspondence with the ridges formed by retouch removals that appear particularly rounded. Unfortunately, this piece was heavily affected by post-depositional damages. A large abrasion zone in correspondence with the ventral face does not allow to appreciate the distribution of use-wear along the presumed contact surface. Nonetheless, the disposition of the rounding and the distribution of ochre residues suggest a transversal motion with a high working angle.

A truncated blade manufactured in a Maiolica lithotype outcropping in the Lessini area and not attested at the site by other elements presents a well-developed rounding in correspondence of all of its edges and ridges but for the ones formed by the proximal fracture. Additionally, invasive, bifacial and irregular removals are present on both edges. Such features confirm that this tool was manufactured elsewhere, being the wear pattern consistent with accidental travel-induced damage. Both the raw material subtype and its presumed original dimensions allow excluding that it was flaked on-site.



**Fig. 4:** Grotтина dei Covoloni del Broion, layer 7. Use-wear attested on some of the Sauveterrian endscrapers. The white arrow on image C indicates a retouch flake posterior to the use-wear development.

As regards microlithic armatures, a single backed fragment yielded a diagnostic impact fracture consisting of a composite bending fracture with a spin-off located in the artefact distal (apical) end.

Similarly, a single unmodified flake yielded use-wear traces. In this perspective, the generally small dimensions of debitage should be considered. Most blanks are too small to be directly used, and their functional potential is limited. On the right side of the flake, the presence of small, alternating, oblique semicircular or trapezoidal, feather terminating removals attests to a longitudinal action on soft material.

### Vegetal material working

Grotte de Rouffignac is a large cave located at around 200 m asl in Nouvelle-Aquitaine, Southwestern France. At the entrance of the cave, an Early-to-Mid Holocene sequence was brought to light by Barrière (1973). In this work, layer 5b - totalling 1981 artefacts - has been taken into consideration (Visentin 2018). It represents the most ancient one and roughly corresponds to the late Preboreal (10,560-10,185 cal BP).

One of the most peculiar aspects of Rouffignac cave is the presence of rich outcrops of chert. This strictly local raw material was exploited quite intensively during prehistoric times, as testified by the numerous clusters of knapping wastes - mainly composed of cortical and semi-cortical flakes - lying together with charcoal remains on the cave floor and at the bottom of the numerous bear wallows (Dachary et al. 2016). The on-site availability of lithic raw materials influenced the flaking activities and is reflected by the larger-than-average dimensions of the products and wastes. The analysis of the lithic assemblages revealed that two reduction schemes were put in place. The first exploited large blocks (around 15-20 cm) to obtain initially laminar products and then smaller bladelets and flakes. These latter products also represent the aim of the second reduction scheme that started with smaller blocks and cobbles (around 7-10 cm).

The number of microlithic armatures is relatively low (18), although this could be ascribed to the excavation methods that did not include water sieving of the sediment with fine meshes. Nonetheless, they present the typical features of the French Preboreal Sauveterrian and include Sauveterre-like backed points, triangles and crescents.

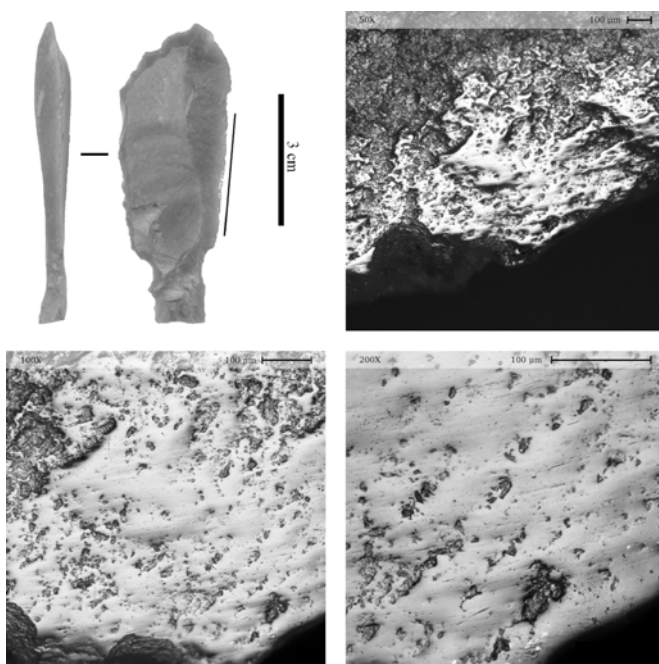
Laminar blanks, along with flakes and, less frequently, different by-products and wastes were preferentially selected to produce re-

touched tools. From a typological point of view, the assemblage is relatively rich (86 elements) and composed of a wide set of tools. Particularly numerous are burins, truncations and backed knives.

From a taphonomic point of view, the assemblage is in a poor preservation state as a result of concurring factors: chemical and mechanical processes originated from the depositional environment and the excavation and post-excavation procedures. Artefacts are characterised by an intense, although not invasive, micro-scarring that, in numerous cases, completely destroyed the edges of the blanks. Moreover, numerous abraded areas and bright spots can be noticed at high magnifications, while ridges do not appear to be rounded. These features likely result from small-scale movements and frictions the archaeological material underwent during and after the excavation.

Nonetheless, 20 retouched and unretouched tools yielded use-wear traces. Among them, a set of 4 cutting tools stands out (Visentin et al. 2021). This is composed of modified and unmodified blanks, among which are a Rouffignac backed knife, a regular backed knife, a truncated blade, and a cortical naturally backed blade. They all present long, straight and thin (35-40°) cutting edges. Three of them had already been identified by C. Barrière (1973) because of the presence of a bright polish along one of the edges. A single active zone corresponding to the lateral cutting edge was identified on the four artefacts. A well-developed and defined bright polish is associated with scalar, semicircular, oblique, hinge-terminating removals that are irregularly spaced and present on both aspects (Visentin et al. 2021). The edge is well-rounded and symmetric, although the almost continuous taphonomic edge damage does not allow to fully appreciate it. The polish is characterised by a highly reflective aspect and appears matt and smooth in texture, with a domed topography (Fig. 5). Striations are frequent and parallel to the edge. The polish is more invasive than the edge scarring, reaching 2 mm. Its limits are well defined towards the inner parts of the tools and more degressive in the two extremities. The partial covering of the removals by polish testifies its association with the edge scarring. These characteristics are consistent with the working of resistant, siliceous-rich plants such as reeds. The distribution and directionality of polish, striations and removals indicate a longitudinal activity. Moreover, the asymmetric distribution of the polish on the scars suggests a unidirectional preferential movement. The inferred motion is thus a cutting activity that could be interpreted as the harvesting of reeds. The comparison with experimental references at different degrees of polish development indicates that such activity had been performed over several hours, in particular for the Rouffignac backed knife and the cortical backed blade.

As to the other artefacts that yielded use-wear traces, it was impossible to determine the exact worked material because of their preservation state. Nonetheless, the record indicates a wide variety of activities that span from cutting soft materials to boring and scraping harder ones (Table 1).



**Fig. 5:** Rouffignac, layer 5b. One of the four tools interpreted as harvesting reeds and detail of the attested use-wear.

**Tab. 1:** Table 1: Rouffignac, layer 5b. Use-wear traces identified in the studied assemblage.

Motion	Worked material	n.	%
Longitudinal	reeds	4	20.0%
	soft-medium	3	15.0%
	undetermined	3	15.0%
Transversal	hard	1	5.0%
	mid-hard	5	25.0%
	undetermined	3	15.0%
Rotational	mid-hard	1	5.0%

## Discussion and conclusion

The analysis of the two sites of Grottna dei Covoloni del Broion and Grotte de Rouffignac suggests that the current perception of Sauveterrian technical systems has been heavily influenced by an archaeologically biased record. In fact, most reference sites in the region – such as Fontfaurès (Barbaza et al. 1991) and Mondeval de Sora (Fontana et al. 2009a; b) – present a robust functional vocation for cynegetic activities and have yielded lithic assemblages dominated by microlithic armatures. Conversely, the traceological analysis of other essential reference assemblages which yielded a more balanced or varied typological structure – such as Galgenbühel/Dos de la Forca (Wierer 2008) and Romagnano Loc III (Flor et al. 2011) – has either not been published or is still ongoing (Visentin et al. 2022). The absence of evidence concerning the activities carried out in sites like these latter, has led to a distorted picture of the Sauveterrian groups' technical investment in lithic productions with respect to the variety of performed activities. Applying a combined techno-traceological analysis to the two above-presented case studies made it possible to perceive such a bias and the higher behavioural complexity of Sauveterrian hunter-gatherers than the one usually described.

In the first one, Grottna dei Covoloni del Broion, it seems that the narrow environment offered by the small horizontal cave was exploited as a specialised site for processing abrasive materials (possibly hide). This seems to be the most significant task carried out in the cave, and it probably proceeded over quite a long time. The very high number of small flakes, most of which can be interpreted as retouch flakes, suggests that multiple cycles of use and sharpening were carried out. The lithic assemblage indicates that other activities could also have been carried out at the site, most likely of ephemeral nature. The fact that the great majority of usable blanks were transformed into endscraper supports the interpretation of this context as a specialised site, and it allows us to safely discard the possibility that such specialisation results from a bias related to the poor preservation state of the assemblage.

At Rouffignac, on the other hand, there is evidence of a prolonged specialised activity in the framework of what is believed to be a multifunctional settlement. The harvesting of reeds was carried out over several hours (according to the experimental references) with different tool types featuring similar cutting edges, among which was a typical "Rouffignac backed knife". Most likely, the latter was not designed for this activity but recycled to carry out this task (Visentin et al. 2021).

The processing of vegetal materials (mostly wood) over a long period is also documented at other sites such as Collecchio (Visentin et al. 2016), Le Mose (Visentin 2018), Le Sansonnet (Khedhaier 2003, cited in Guéret 2013), Saint-Lizier à Creysse (Chesnaux et al. 2018) and Lago delle Buse 2 (Lemorini 1994). In light of these considerations, only part of the Sauveterrian toolkits can be described as "expedient" (Guilbert et al. 2006). In this regard, it should be pointed out that, in some cases, there seems to be a shift in the technical investment from the retouch (which dominates in the case of microliths) to the *débitage* phase (research of specific working edges). This trend has already been noticed in other European Early Mesolithic contexts (Guéret 2013). In other cases different tool types (backed knives and burins, among others) attest to complex and prolonged utilisation and a careful manufacturing and transformation process.

To conclude, while microliths seem omnipresent in the Sauveterrian assemblages, although with varying percentages, the evidence of different specialised activities that were carried out at various sites suggests the existence of a complex structuration of the settlement system with a significant logistic component. In this framework, the versatility of Sauveterrian technology, which allowed the exploitation of a wide variety of knappable rocks and included a comprehensive set of solutions for their processing, was fundamental in allowing capillary exploitation of the varied landscapes that compose the vast region included between the south-western Atlantic coast of France and north-eastern Italy, comprising mountainous, alluvial and coastal areas (Fontana and Visentin 2016; Fontana et al. 2021).

## Authors' contributions

D. Visentin: conceptualisation, methodology, formal analysis, writing – original draft, review & editing; F. Fontana: writing – original draft, review & editing; S. Philibert: formal analysis, writing – original draft, review & editing; N. Valdeyron: writing – original draft, review & editing.

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