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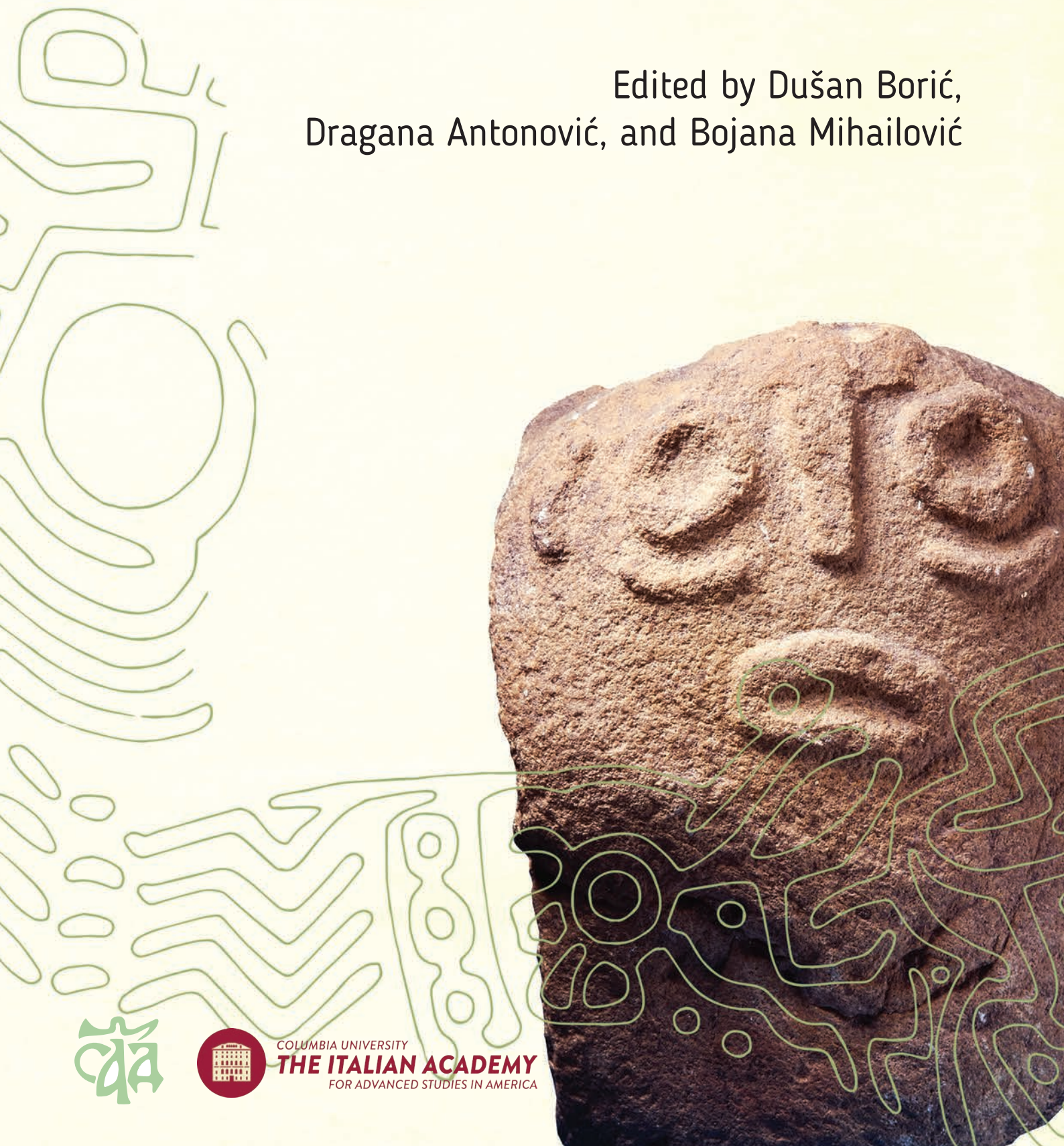
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# Foraging Assemblages

Volume **2**

Edited by Dušan Borić,  
Dragana Antonović, and Bojana Mihailović



COLUMBIA UNIVERSITY  
**THE ITALIAN ACADEMY**  
FOR ADVANCED STUDIES IN AMERICA

# Foraging Assemblages

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Serbian Archaeological Society  
The Italian Academy for Advanced Studies in America, Columbia University

Belgrade & New York

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# 80. Tools made from wild boar canines during the French Mesolithic: A technological and functional study of the collection from Le Cuzoul de Gramat (France)

Benjamin Marquebielle and Emmanuelle Fabre

Mesolithic tools made from wild boar canines were identified from a very early date at French sites. Despite this early discovery, these tools are still poorly known and are referred to by various names, often in accordance with underlying functional assumptions. This paper summarizes the results of two complementary studies on wild boar canine tools in order to propose the first systematized global approach (typological, technological, and functional) for understanding these enigmatic Mesolithic artefacts. Analyses were conducted on a collection from Le Cuzoul de Gramat, a Mesolithic site located in south-western France. Using this study, a general typology of these artefacts is proposed for the first time. The main results show that tools from Le Cuzoul were made following a transformational sequence that included longitudinal splitting of lower canines in order to produce scraping tools, which were subsequently used to work various raw materials.

**Keywords:** bone tool, wild boar canines, France, technological and functional study

## Introduction

In a short footnote, published in 1929, Marcelin Boule evoked the recovery of some very particular tools made from wild boar split lower canines at French Mesolithic sites (Boule in Péquart and Péquart 1929, 396), and went on to consider them as a kind of *fossile directeur* for this period. Subsequent works have provided no clear consensus as to the status of these objects, and their various names, reflecting more often than not functional assumptions, have impeded the development of a more systematic perspective. To date, these artefacts have been variously known as: leather knives (Lacam *et al.* 1944), split and polished cutting tools (Niederlender *et al.* 1966), stitching awls (Barbaza 1989; Barrière 1956), awls (Péquart *et al.* 1937; Rozoy 1978) (Fig. 80.1) or sharp awls (Barbaza 1989), burins (David 2000), and used teeth (Bandi 1963). In other instances, these tools are simply characterized as wild boar tusk artefacts (Patte 1971), wild boar canine tools (Curdy and Praz 2002), or pointed tusks (Coulonges 1935). Only a few studies explore the manufacturing process of these tools (David 2000), and more often than not their function is assumed from their morphology; no functional research has yet been conducted on this tool type. Proper use-wear analyses have been conducted on some Neolithic examples, yet

some of these objects were not split, and they have shown to have been used for wood or bone scraping (Maigrot 2003).

Tools manufactured using wild boar canines are in fact quite common at French Mesolithic sites (Marquebielle 2014), yet, as has already been underlined, these objects are quite poorly understood. This paper summarizes the results of two studies: the first is a technological study of southern French Mesolithic osseous industries (Marquebielle 2014), and the second is a use-wear analysis of wild boar canine tools from the site of Le Cuzoul de Gramat (Lot region, France) (Fabre 2015). The integration of these two studies will allow us to propose the first systematic approach (typological, technological, and functional) to these Mesolithic artefacts in France.

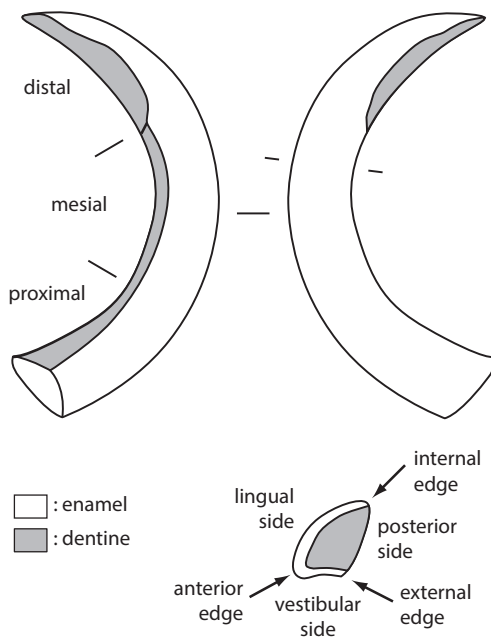
## Materials and methods

### *Wild boar canines as a raw material*

Male wild boar canines are very developed. The upper canines are large, with a rounded cross-section, and curve upwards and outwards from the maxilla. The lower canines are long, curve backwards and upwards, and have a tapered shape and triangular cross-section. For lower canines, thickness and width decrease gradually from the proximal to distal parts, which is not the case for the upper canines;



**Fig. 80.1.** Early identified tools made from wild boar canines. 1. Tévéc (Péquart *et al.* 1937); 2. Trou Violet (Rozoy 1978).



**Fig. 80.2.** Description of a right lower canine of male wild boar. CAD by Benjamin Marquebielle.

both upper and lower sets of canines grow continuously throughout the life of an individual. As the jaw opens and closes, the upper canines rub against the lower set and sharpen the teeth, giving them a wedge-like shape. Canines are used by wild boars as a natural weapon and a tool – to dig for and find food. These ethological uses leave various marks that become more pronounced as the animals age (Chiquet *et al.* 1997; Maigrot 2001). The biggest part of the canine, sitting at about two-thirds of its entire length, is deeply rooted in the mandible. This proximal part is hollow

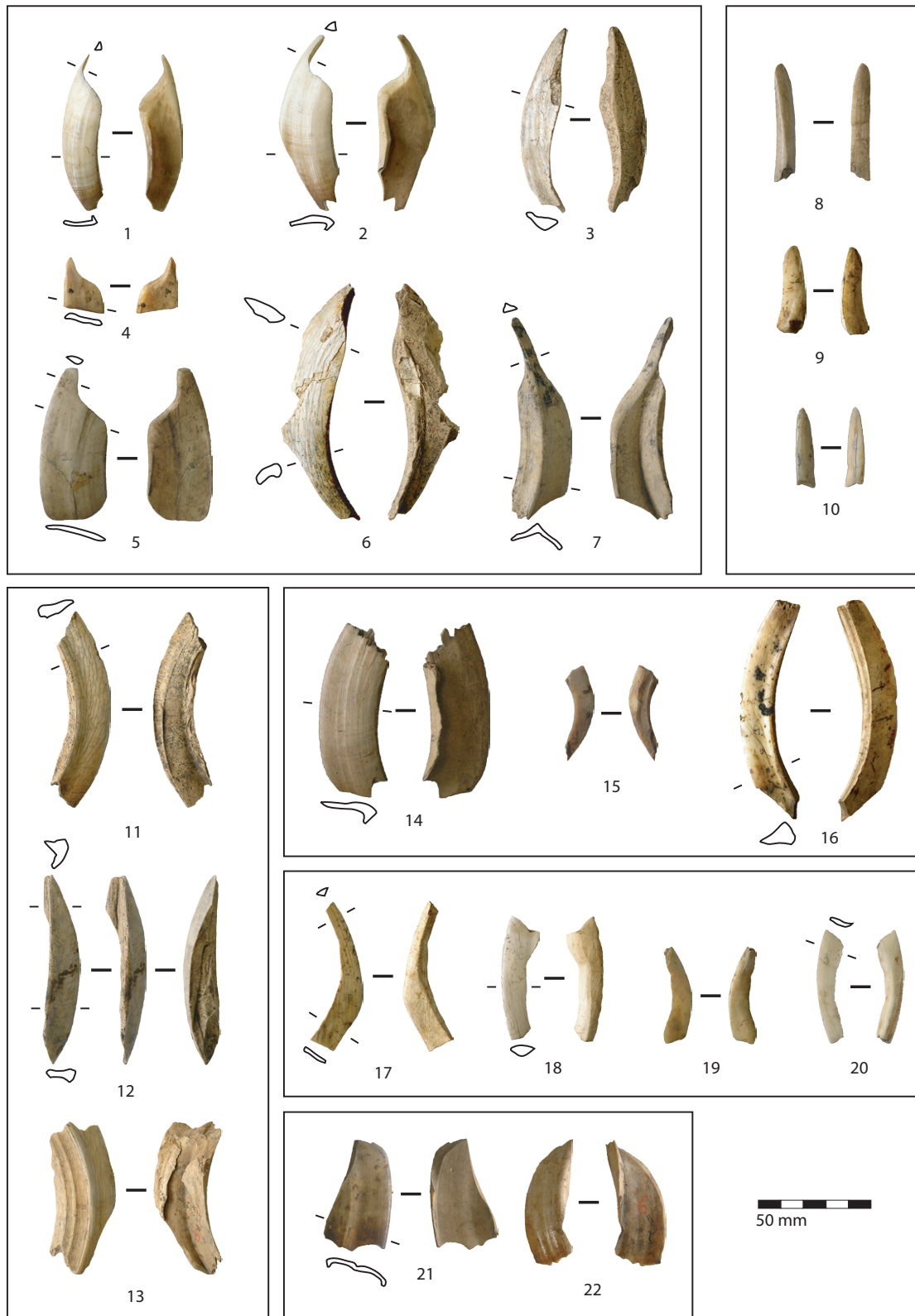
and comprises between 35 and 45 percent of the canine's total length (Chiquet *et al.* 1997). With the successive dentine deposits characteristic of canine growth, the three sides of the tooth become gradually thicker and more solid at the distal end; the part of the tooth that protrudes from the mandible is in fact a solid block of dentine. Dentine is the main constituent of these teeth, and only two sides of canines are coated with enamel (Fig. 80.2). To estimate the original size of canines used as initial blocks of raw material, and subsequently the age of the providing individuals (canine size is strongly correlated with age in wild boars), our archaeological specimens were compared with two modern canines from young males, and one whole archaeological example, whose individual age was estimated to have been seven years (Leduc 2005).

While canines are composed of very hard material, some morphological characteristics can weaken the tooth: its curvature, its heterogeneous structure (enamel/dentine), and its hollow base. Linear zones of weakness are often found on the edges of tusks having triangular cross-sections, which could have been exploited during canine debitage, as we will see below.

#### *The archaeological artefacts*

The artefacts studied here were found during R. Lacam and A. Niederlender's excavations at Le Cuzoul de Gramat, which took place between 1923 and 1933 (Lacam *et al.* 1944). The site consists of a rockshelter and a cave located in the Lot, a department of south-western France. The site is famous for its substantial stratigraphy, covering the entire Mesolithic period. The collection of tools made from wild boar canines is composed of 22 artefacts: 19 artefacts are finished objects (Fig. 80.3:1–10, 14–22), one is in an indeterminate technical state (Fig. 80.3:11), and two are waste products originating from the debitage process (Fig. 80.3:12–13).

Artefacts come from five different levels, formerly dated to the Tardenoisian period using lithic typology (Lacam *et al.* 1944). New excavations and studies of materials have led to the re-dating of these levels, placing them in the Second Mesolithic (Valdeyron *et al.* 2014; Constans *et al.* 2019). Given that the original five sub-levels are now obsolete, and precise stratigraphic origins within this obsolete sequence are unknown (Valdeyron *et al.* 2014; Constans *et al.* 2019), we have decided to study all artefacts as an ensemble as they all date to the greater part of the Second Mesolithic. Additionally, between early and more recent excavations, some specimens from the original collection of wild boar tusk tools have been lost. Therefore our study consists of a sample of 22 objects from the initial ensemble. While we are confident in our conclusions, it is possible that they do not represent all the prehistoric variability of the assemblage, which is unfortunately impossible to evaluate given the loss of some of the discovered objects.



**Fig. 80.3.** Archaeological artefacts. 1–7: objects with convex-concave bilateral bevels and spurs; 8–10: objects with straight bilateral bevels; 11: object in indeterminate technical state; 12–13: waste debitage; 14–16: objects with unilateral convex bevel; 17–20: objects with convex-concave bilateral bevels; 21–22: objects with indeterminate bevel. Photographs and CAD by Benjamin Marquebielle.

### Methods

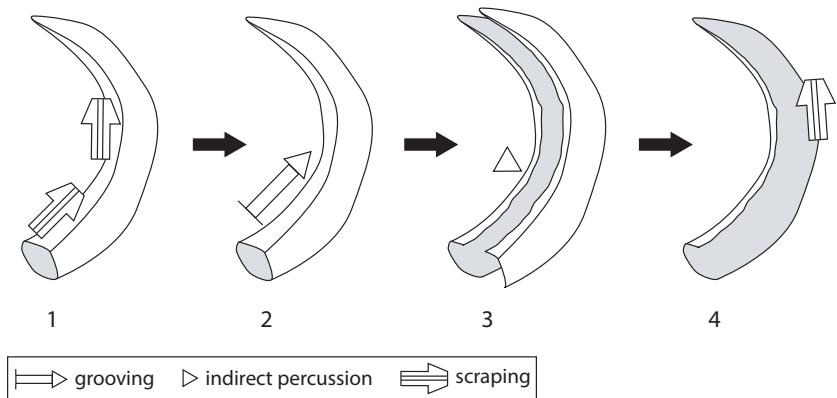
To reconstruct the technical and economic transformational sequence of wild boar canines (Marquebielle 2014), we adopted a methodological approach adapted to particular aspects of osseous industries, which was developed by Averbouh (2000). It is based on the principle that ‘tool manufacturing involves distinct know-how and the implementation of a series of actions and technical operations organised in sequences’ (Averbouh *et al.* 2016). In order to understand the function of the tools, we carried out eight different experiments: the stripping and grooving of green hazel branches; the stripping and scraping of green pine branches; the scraping of dry oak branches; the scraping of nettle stems; the scraping of brambles; the scraping of fresh bone; and the softening of dry hide. During each experiment, five or six tools were used. Half of them were used with a low inclined working angle, while the other half were used with a strongly inclined working angle. A ‘positive cut’ was always used, *i.e.* the scraping angle (the angle formed between the worked surface and the active part of the scraping tool) was larger than 90 degrees. Macroscopic (x10 to x60 binocular magnification using Nikon SMZ800) and microscopic (x100 to x200 magnification using Olympus BX41M-LED) observations were conducted twice: the first time was 10 minutes after the experiment and the second time, 50 minutes after the experiment (Fabre 2015).

### Results

#### Tool typology

On the basis of morphology and location of active parts, four types of lateral bevelled tools have been identified:

- Objects with a unilateral convex bevel: these have an arched rectangular shape, a straight profile, a triangular or S-shaped cross-section, smooth edges that are parallel or converge distally, and the bevel is located on the convex edge (Fig. 80.3:14–16).
- Objects with straight bilateral bevels: these have a rectangular shape, a slightly crescent shaped profile, a triangular cross-section, parallel smooth edges, a convex distal end, and bevels on both edges (Fig. 80.3:8–10).
- Objects with convex-concave bilateral bevels: these have an arched rectangular shape, a straight profile, a triangular or S-shaped section, parallel smooth edges, and bevels on both edges (Fig. 80.3:17–20).
- Objects with convex-concave bilateral bevels and spurs: these are diamond-shaped, have a crescent shaped profile, a crescent-shaped cross-section on the proximal part, and a triangular cross-section on the distal part. The first



**Fig. 80.4.** Transformational sequence showing the longitudinal splitting of a lower wild boar canine. CAD by Benjamin Marquebielle.

bevel is on the convex edge, while the second one is on the distal end of the opposite edge, and is shorter and more concave. The morphologies and locations of the two bevels create a spur at the distal end of tools, which are the largest examples in the collection (Fig. 80.3:1–7).

#### Tool manufacturing

Mesolithic populations seem to have used only lower canines of adult or older males, and in most cases the right canines were selected for transformation. These animals might have been hunted, but to date, only a limited study has been conducted of the faunal remains from Le Cuzoul. In a small-scale zooarchaeological study conducted only on the material from recent excavations, remains of wild boar have been identified, but the assemblage consisted of females and young individuals only (Chevallier and Garcia 2014).

The precise part of the canine used for tool manufacturing is identified for 19 artefacts. Anterior edges were used to produce four of the objects, buccal sides were used to produce six artefacts, and lingual sides were used to produce nine artefacts. The thinness of several artefacts is an indication that they were produced from the proximal part of teeth, revealing that the whole canine was extracted from the jaw before tool manufacturing. During our experiments, we successfully and quickly extracted canines by breaking the jaw in three steps using modern metal tools. The first step consisted of the breaking the complete mandible into its constituent left and right halves. The second step consisted of breaking the vertical ramus up to the canine base. Finally, the third step involved gradually breaking the horizontal ramus to free the canine. More experiments, and a comparison with archaeological assemblages with jaw fragments, will be necessary to determine the precise extraction process used in Mesolithic contexts.

Various manufacturing traces are often visible on the wild boar canine tools:



– *Long and thin striations* – These are typical traces of scraping made with a sharp lithic edge following the curvature of the worked objects. The position and extent of traces are different depending on the tool type used. For example, on objects with convex-concave bilateral bevels and spurs, the striations are mainly on mesial and distal parts, on both edges, and have a medium extent. Only the edges and/or the lower face of tools were scraped: these areas are not coated by enamel, and thus correspond to the inner sides of these teeth.

– *Removal scars with a stepped morphology* – These traces are located on mesial parts and, once again, on the lower face not coated by enamel. By splitting canines using indirect percussion with a bone wedge, placed at a right angle to the lengthwise axis of the tooth following the installation of a longitudinal groove, we were able to recreate these traces. By comparing experimental with archaeological specimens, we are able to conclude that indirect percussion after a preliminary grooving is a possible, and even likely, technique used to break canines.

– *A groove* – Located on the lower face of the concave edge of tools, this groove is parallel to the lengthwise axis of the tool. Deep striations are visible on groove surfaces, which are characteristic manufacturing traces resulting from the use of a burin in creating grooves. This grooving technique was used on the posterior sides of canines, which, as has already been underlined, are not coated by enamel.

– *Fracture surfaces* – These can be more or less visible depending on of the degree to which tools were shaped. When visible, they are located on one or two edges and are parallel to the lengthwise axis of the tool. They follow the anterior edge of a tooth and can additionally be associated with the grooving used to prepare the fracture on some tools. These fracture surfaces follow the deepest point of the groove and are generally covered by striations.

– On three objects (Fig. 80.3:6, 11–12), removal scars, grooves, and fracture surfaces appear to have been involved in the same splitting procedure. Initially, the canines were grooved on their posterior sides. Next, canines were split using a wedge, placed at the deepest point of the groove, and indirect percussion (as described above for the experimental assemblage) (Marquebielle 2018a). On the other objects in the assemblage, these three traces of manufacture (removal scars, grooves, and fracture surfaces) are not always present, but as highlighted above, the degree of shaping can influence the visibility of such traces. The similarity in morphology of these objects to those showing all three traces leads us to conclude that the same splitting procedure was likely used.

This splitting procedure is integral to the debitage stage of these objects, as it allowed for the production of usable blanks from the original piece of raw material, *i.e.* the entire canines. The morphology and size of the artefacts permit

us to conclude that the aim of this debitage process was to obtain two flat and elongated blanks from each tooth, one from the lingual side and the other from the buccal side. Subsequent blank shaping was conducted by scraping the non-enamelled surface. The objective of this step was to obtain a wedge-shaped active zone using a longitudinal scraping action. This scraping might have been achieved by using a short and abrupt gesture (to shape the short bevel of objects with convex-concave bilateral bevels and spur) or a longer one (to shape the bevel of objects with a unilateral convex bevel).

The manufacturing of objects with a unilateral convex bevel and objects with convex-concave bilateral bevels and spurs is conducted following a transformation sequence that entails the longitudinal splitting of canines to produce two equal blanks (Fig. 80.4). The manufacturing of objects with convex-concave bilateral bevels and objects with straight bilateral bevels is more difficult to characterize. On these objects, the shaping step erases the debitage and modifies the initial morphology of the blanks. The specific debitage process for these objects remains unclear, which inhibits us from defining the transformation steps responsible for these traces.

In theory, each canine can provide two flat blanks while producing relatively little waste. These waste products are the distal part of tooth, which are harder and therefore more difficult to split, or fragments of the non-enamelled posterior surface. Some waste products of the first type have been found at Le Cuzoul, indicating some *in situ* production, yet these types of remains are quite rare. Two hypotheses can therefore be proposed regarding the location of production: either the majority of these objects were produced elsewhere and imported into the site, or these typical waste products passed unnoticed during the early excavations and were therefore not collected.

### *Tool function*

The observation of macroscopic and microscopic use-wear traces, as part of a functional analysis, allowed us to highlight the way tools made from wild boar canines were used in prehistoric contexts. Among the 22 archaeological artefacts, 16 have use-wear traces. The active part is most often localized on the edges of the tools; the three objects with straight bilateral bevels are the only ones that have use-wear traces on their distal parts as well.

The lateral active parts have mainly a convex delineation (or a straight delineation on objects with straight bilateral bevels), and can extend either over the whole length of the tool or only over a half of the length (for mesial and distal parts). Concerning the objects with convex-concave bilateral bevels and spurs, interestingly enough, the concave bevelled part and the spur never show traces of use. It appears that only the convex bevel was the active part of the tool.



**Fig. 80.5.** Utilization of an experimental tool on a green pine branch. Photograph by Emmanuelle Fabre.

The orientation of striations allows us to conclude that all tools were used as lateral scrapers using a unidirectional gesture. The localization and extent of traces permit us to demonstrate that the tools were used in ‘positive cut’ (see above for a definition), with the lower non-enamelled surface in contact with the material being worked and creating an abrupt to oblique working angle (Fig. 80.5).

A diverse range of worked materials were identified:

- *Hide working* – Two archaeological objects with convex-concave bilateral bevels could have been used to work dry hide (Fig. 80.2:18–19). They have bifacial dissymmetric edge-rounding and a unifacial micro-polish with a blurry-edged and irregular contour. These traces are similar to those observed on experimental tools used for the softening of dry hide.

- *Bone working* – Two tools with straight bilateral bevels could have been used to work osseous materials (Fig. 80.2:8, 10). These objects have flattened and marginal edge-rounding and numerous short and deep macroscopic striations. The micro-polish is unifacial with a blurry delineation (Fig. 80.6). These traces evoke those obtained on experimental tools used for scraping fresh bone.

- *Wood working* – The use-wear traces on one object with a convex unilateral bevel could be consistent with woodworking (Fig. 80.2:15). The striations are numerous, discontinuous, short, and shallow, while the micro-polish is moderate, unifacial, and has a distinct and regular contour. On experimental tools, traces are more extended and intrusive when green wood is worked (hazel and pine) as opposed to dry wood (oak). On archaeological specimens, traces are more compatible with those obtained while working green wood.

- *Indeterminate function* – The precise function of 11 tools remains indeterminate as the traces observed

on archaeological materials do not correspond to any observed on experimental specimens. Certain traces exhibit some similarity with experimentally produced ones, suggesting that the tools’ functions could be similar, yet more experimental work is necessary to clarify the situation.

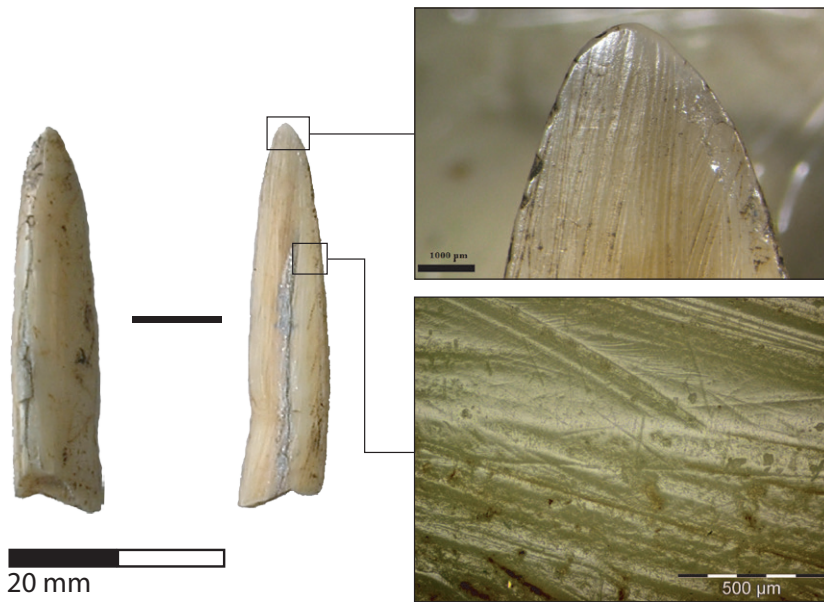
Six artefacts show no use-wear traces: one object with a unilateral convex bevel (Fig. 80.2:14), two fragments of indeterminate bevelled objects (Fig. 80.2:21–22), one object in an indeterminate technical state (Fig. 80.2:11), and two waste products (Fig. 80.2:12–13).

We have highlighted a variety of worked materials with varying degrees of hardness (hide, wood, and osseous materials). In the case of the three objects with bilateral straight bevels, two of them could have been used to scrape bone, while the third was used to scrape an indeterminate hard material. This direct association between the working of hard materials and the precise tool type is noteworthy, though we remain cautious about extrapolating this function to all tools of this type as our sample is quite small.

The canine tools found at Le Cuzoul seem to have been used in a relatively homogeneous manner, irrespective of their function. These objects were used as lateral scrapers, in ‘positive cut’ with an abrupt to oblique working angle and with a unidirectional gesture. Preliminary data regarding their actual function suggest that various materials were worked. This functional study raises a number of questions (for example, the link between tool-type and materials worked), which will be answered through the multiplication of the experimental reference dataset.

#### *Handling versus hafting*

The majority of the Le Cuzoul tools under study have an extensive covering polish with a grainy aspect on the mesio-distal part of the upper surface, resembling traces left by the direct manipulation of tools observed on our experimental material. This could imply that these tools were directly handled when used rather than indirectly by way of a haft. However, on some of the other artefacts, this polish is not visible or cannot be distinguished from taphonomic traces. Nevertheless, a few tools have traces that could correspond to hafting. The three objects with straight bilateral bevels have a tongued fracture surface on the proximal part of the upper surface. This kind of fracture results from strong and progressive pressure (flexion) and can be linked to use, and might perhaps have been caused by haft stress. Two tools (Fig. 80.2:1, 5) have edge-rounding and a micro-polish associated with thin and longitudinal striations on the proximal part of the lower surface as well as on their edges. The location and morphology of these traces are different than the ones on active parts and could be explained by the use of a haft, although such a hypothesis requires experimental verification.



**Fig. 80.6.** Archaeological tool no. 10 interpreted as having been used to work bone with its distal part (x10). Note the striations on the edge (x100). Photographs by Emmanuelle Fabre.

## Discussion

While our results are preliminary, especially those obtained via use-wear analysis, and concern only one archaeological collection, they nevertheless provide significant insights into the typological, technological, and functional nature of a poorly known artefact type characteristic of the French Mesolithic. Our morphologically based typology, which does not rely on presumed functional characteristics of the objects under study, could hopefully facilitate useful and meaningful comparison with other collections.

Our technological study of these objects should also allow for meaningful comparisons regarding the unity or variability of production traditions. We have highlighted the strong selection of quite specific raw materials (the lower canines of adult or older males) and the very specific knowledge and know-how required to produce these tools. The collection from Le Cuzoul, thanks to the good preservation and a relatively significant number of artefacts, can now be used as a point of reference. An inventory of wild boar canine tools at Mesolithic sites in France has already been conducted (Marquebielle 2014), and the technological study of archaeological elements from sites in the southern half of the country has shown that a similar tradition of wild boar canine tool production seems to have been shared across these sites, including, logically, Le Cuzoul (Marquebielle 2014). However, a zooarchaeological study of the Cuzoul faunal assemblage is necessary to confirm or reject the proposed strategy of raw material acquisition (Gardeur 2018; also work in progress by M. Gardeur as part of his PhD thesis). At Le Cuzoul, a potential contrast

between those wild boar hunted for meat (females and juveniles) and the origins of canines transformed into tools (adult and older males) has been noted. The same pattern has been observed at the nearby Mesolithic sites of Les Fieux (Thibeau 2008) and Les Escabasses (Rivière 2006). While this interesting choice regarding raw material selection for these tools has yet to be confirmed at Le Cuzoul, it is also possible that male wild boars were hunted for both their meat and their canines, as has been proposed for other French Mesolithic sites (Leduc *et al.* 2015).

Our functional analysis indicates that the wild boar canine tools from Le Cuzoul were scrapers, used on a wide range of materials. While the archaeological and experimental analyses must be multiplied to further clarify the situation, our study provides, for the first time, strong empirical evidence for the functional role of French

Mesolithic wild boar canine artefacts. In addition, we wish to note that while the specimens studied here seem to have been used in scraping, this does not preclude uses related to piercing, cutting, or grooving. Yet, these other ways of using wild boar canine tools still have to be confirmed via use-wear analysis.

The emergence and use of tools made from wild boar canines seems to have been strongly embedded within Mesolithic populations. The earliest known example of such bevelled tools made on wild boar canines was found in the Early Mesolithic layers of Les Fieux, in the Lot region (Marquebielle 2014), and this kind of tool seems to have been unknown before the Early Mesolithic, even when wild boar is present in the faunal assemblages of older Azilian or Laborian sites (Marquebielle 2018b). This same observation can be made for France as a whole, and even beyond national boundaries.

In the northern half of the country, Mesolithic populations also exploited wild boar canines, but some differences can be noted. Some tools were made using split canines, for example at Tévéc (Britain) (Péquart *et al.* 1937), whereas others are made using whole canines, for example at the 62 rue Farman site (Paris) (Leduc *et al.* 2013) and at Roche-dane (Jura) (Leduc *et al.* 2015).

In Switzerland, tools made on wild boar canines, and so-called 'burins', were found in the Boreal layers of the sites of Ogens and Birmatten (Bandi 1963; David 2000). The transformational sequence of production is quite similar to the sequence defined at Le Cuzoul, with the splitting of the teeth prepared by grooving on the posterior side, and



tool shaping performed via scraping (David 2000). At Arcanciel/la Souche, a bevelled tool made from the buccal side of a canine was found in Late Mesolithic layers. The specific debitage process of the blank remains undetermined, but the shaping of the tool was clearly conducted via scraping, and the authors advanced the hypothesis that the tool in question was indeed a scraper (Mauvilly *et al.* 2008). A similar functional proposition was suggested concerning tools from Chable-Croix, though this assemblage contains objects made on both split and whole canines (Curdy and Praz 2002). Finally, tools made from wild boar canines were also found at the Middle Mesolithic sites of Vionnaz and Cure; these were dubbed knives (David 2000).

Tools made on split wild boar canines have also been reported occasionally in some other European countries (David 2000, 2005; see also Cristiani and Borčić this volume):

- In Luxembourg, in the recent Mesolithic layer of the site of Reuland Loschbour.
- In Germany, in the Boreal layer of the site of Hohen Viecheln.
- In Denmark, in the Middle Mesolithic layer of the site of Holmegaard.
- In Sweden, in the Middle Mesolithic layer of the site of Ageröd.

Some parallels have been drawn between the production of the German and Danish artefacts and the Swiss ones from Ogens and Birmatten (David 2000), yet, and quite unfortunately, all of these cases lack associated use-wear studies.

## Conclusion

The objective of our integrated study was to propose the first global approach to Mesolithic tools made on wild boar canines and to attempt to systematize their study and understanding as coherent typological, technological, and functional elements within the greater Mesolithic phenomenon. The collection from Le Cuzoul de Gramat provided us with a significant opportunity to establish the first methodological and epistemological milestone for these objects, which can be used as a reference point for future studies and would also compensate for the small sample studied herein. Last, but not least, geographical and chronological exploration of these objects at the European scale will be necessary for understanding their emergence, diffusion, role within the domestic toolkit, relationship with lithic industries, and finally, whether they are efficient chrono-cultural markers characteristic of certain Mesolithic traditions.

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### Volume 1

- Transitions – Beginnings
- Colonization
- Landscapes
- Settlement
- Regional Identities

### Volume 2

- People in Their Environment
- Technology
- Social Relations, Communication, Mobility
- Rites and Symbols
- Transitions – Endings
- Representing and Narrating the Mesolithic

