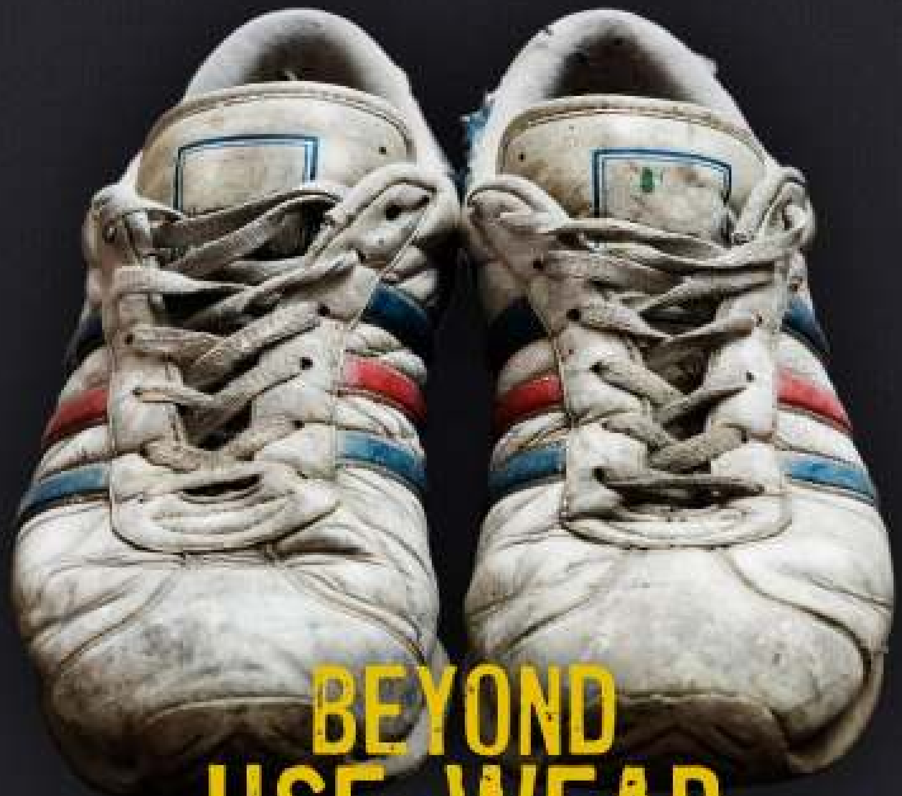

BEYOND USE-WEAR TRACES

GOING FROM TOOLS TO PEOPLE BY MEANS OF ARCHAEOLOGICAL WEAR AND RESIDUE ANALYSES

SYLVIE BEYRIES, CAROLINE HAMON
& YOLAINE MAIGROT (EDS)

BEYOND USE-WEAR TRACES

This book brings together 30 papers by leading scholars in the field of usewear and residue analysis. This publication aims to revive the debate on the role of traceology (use-wear and residues) in multidisciplinary approaches that address archaeological questions. Many studies on technological aspects of material culture deal with specific material categories (e.g. flint, ceramics, bone), often in separate or isolated ways, and this division does not really reflect the integrated nature of technical systems in which different material categories are in dynamic interaction.

Hence, exploring the interaction between different *chaînes opératoires* is crucial for a more global concept of the toolkit with all its components and it is a precondition for paleo-ethnographic reconstructions of technical systems and economies. Starting from a functional perspective, the papers in this book explore various topics such as apprenticeship, group dynamics, social status, economy, technological evolution, spatial organization, mobility patterns and territories, or adaptations to cultural and environmental changes.

This collection of papers, presented at the AWRANA conference in 2018, constitutes a major sign of the dynamism, popularity and scientific importance of our discipline in current archaeological research. AWRANA 2018 was dedicated to the memory of H. Keeley.

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Experimental archaeology for the interpretation of use-wear

The case study of the small tools of Fontana Ranuccio (late Lower Palaeolithic, Central Italy)

Flavia Marinelli, Daniela Zampetti and Cristina Lemorini

Abstract

Recent technological studies of Levantine and European lithic assemblages from the Late Lower Palaeolithic show that the small unretouched and retouched flakes (small tools) found in many sites of this period are relevant technological elements. Their presence in the lithic assemblages of the Late Lower Palaeolithic allows us to reconsider the role of bifacial tools as techno-cultural markers of this chronological phase. In this article we discuss the relevance of experimental archaeology for the interpretation of the use-wear observed on the small tools from the Acheulean site of Fontana Ranuccio located in Central Italy (Latium).

Keywords: Lower Palaeolithic, small tools, technology, use-wear analysis, experiments

Introduction

During the Middle Pleistocene, the appearance of lithic and osseous bifaces in many European sites is considered evidence for the introduction, in these geographical areas, of a new lithic technology. However, recent technological studies have shed light on the role of small unretouched and retouched artefacts (from now on called small tools in this paper), as further relevant elements of this period (Aureli *et al.* 2015; Chazan 2013; Bilbao *et al.* 2013).

Many Levantine and European sites are characterized by small tools that existed from previous periods, between 1.2 Ma and 600 kya. This production continues with different technical methods in the Middle Pleistocene sites that are characterized by the

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presence of bifaces and small tools or by the presence of small tools alone. With the aim of providing new data to define the role of the small tools in the Middle Pleistocene, this article presents the preliminary results obtained through use-wear analysis of a sample of flint small tools from the Fontana Ranuccio site located in Anagni (Central Italy), dated 408 kya (Pereira *et al.* 2018, 112-129). Through a series of experiments, we tested the efficiency of the small tools of Fontana Ranuccio. The macro-traces of use developed on the replicas of the small tools allowed us to validate analogous macro-traces observed on the archaeological items and to infer the activities carried out and the materials worked with the small tools at the Late Lower Palaeolithic site of Fontana Ranuccio.

The Anagni basin (Central Italy)

The Anagni basin is located within the valley of the Sacco river (also known as Valle Latina), which extends for 95 km. It consists of a sequence of basin-morphotectonic units, whose physical evidence is not always obvious because it is partly buried.

The tectonic pit that lies between the Lepini and Ernici mountains, along which the Sacco river flows, is made up of a series of depressions formed during the most

Figure 1: Geological map with an indication of the pyroclastic flow of the Lazio Volcano, 1- Colleferro-Segni sector, 2,3- Anagni sector; R, position of Fontana Ranuccio deposit (Segre, 2004).

ancient phase of Apennine orogenic activity at the end of the Miocene. The subsequent unblocking of corrugated and faulted clods divided the NW-SE pit into basins and transversal thresholds; these basins have hosted, in different times of the Pleistocene, lake and marsh extensions ever wider proceeding towards south-east (Segre 2004, 205-232). The Anagni basin, located between Sgurgola and Colleferro, is formed in its upper part for over 14 km by pyroclastic products coming from the Lazio Volcano, of considerable thickness in the western part, continuing in the easternmost part to the south and south-east of Anagni with large areas of travertine (fig.1).

To the east, the basin is bordered by faulty anticlinal outcrops of the upper Cretaceous limestone of Sgurgola which give rise to a threshold emerging from the palaeokarstic morphology; this is deeply engraved by the Sacco river, separating this basin from the Frosinone-Tecchiena unit.

The Anagni basin is separated by two depressions shaped by buried palaeomorphologies: Ranuccio, Acquacetosa towards Paliano and Anagni which appears to be wider and more complex, extending south-west towards Gavignano and towards Ferentino to the east. It appears that the greatest thickness of the Pleistocene deposit reaches approximately 140 m.

During the Middle and Lower-Middle Pleistocene, the basin had vast expanses of lakes. These palaeolacustric basins were then filled by limno-tuffites and subsequently by extensive layers of travertines, sometimes with the presence of caves (early Pleistocene palaeokarst) with Upper Palaeolithic industries (Segre 2004, 205-232).

The site of Fontana Ranuccio

Fontana Ranuccio is a fluvial-lacustrine site dated 408 kya (Pereira *et al.* 2018, 112-129). The site was discovered in 1977 during a pozzolana extraction activity that exposed a stratigraphic sequence of geological and anthropic layers that can be summarized as: 1) pyroclastic arenite with leucites; 2) medium volcanoclastic rock; 3) agglomeration of leucitic lapilli; 4) tuffite palaeosoil; 5) fluctuated tuff rocks; 6) ochre duricrust; 7) green clay (colluvial); 8) cineritic tephra of the Ernici volcanoes with flora in *Buxus* and *Zelkova* and terrestrial molluscs (*Cyclostoma*); 9) pedogenized cineritic tephra with crushed roots in situ; 10) Late Lower Palaeolithic layer embedding fauna and anthropic remains (chipped stone tools made of flint, lava and bones); 11) clay sands with ferromanganese duricrust, cryoturbation horizon; 12) clay loam with terrestrial malacofauna (Helix); 13) bank of cineritic tephra with leucites and lapilli; 14) upper “lithoid tuff”; 15) pedogenized “lithoid”; 16) red clay palaeosoil with Middle Palaeolithic industry, and overlying soil with Bronze Age pottery (Segre 2004, 205-232) (fig. 2).

At Fontana Ranuccio, the Middle Pleistocene fossil faunas pertain to the interstage of MIS 11 (Segre 2004). The most represented faunas are large herbivores such

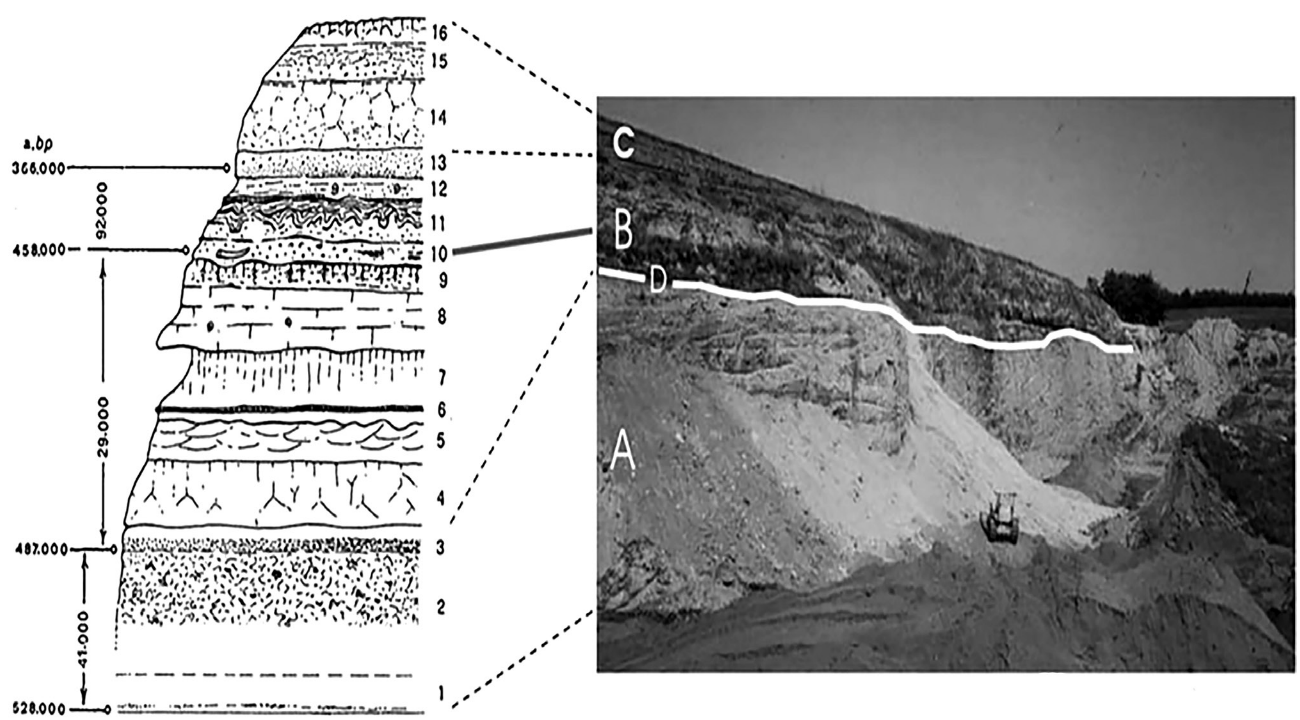

Figure 2: stratigraphy of the Fontana Ranuccio site (Segre Naldini *et al.* 2009).

as *Elephas* (*Paleoloxodon*) *antiquus*, *Equus ferus*, *Cervus elaphus*, *Cervus elaphus eostephanoceros*, *Bos primigenius*, and *Dama Clactonian*.

The archaeological record

The industry of Fontana Ranuccio is composed of bifaces made of flint, lava and bone. The other elements of the industry assemblage are made of flint and are characterized by scrapers, choppers, flakes and small unretouched and retouched flakes that are the object of this study. The small tools (items with dimensions ranging from 20 mm to 30 mm in length) taken into consideration for the study number 151 and they come from excavations of Fontana Ranuccio dating from 1978 to 2008.

This sample is composed by unretouched flakes (34%), unretouched flake fragments (52%), retouched flakes (8%) and retouched flake fragments (6%). The degree of preservation is not excellent, nevertheless the majority of the sample was successfully analysed through the low-power approach. In detail, the macroscopic observation of 35 items revealed a general rounding due to weathering. Because of this alteration they were not submitted to use-wear analysis.

The observation with a metallographic microscope of the remaining 116 items allowed us to distinguish alterations due to chemical processes or abrasion, the latter possibly due to the aeolian thin particles produced by the eruption of the Lazio Volcano and deposited on the anthropic remains. Despite the presence of these alterations, on 116 out of 151 items it was possible to carry out an analysis of the macro-traces of use (edge-removals), as the lithic tools maintain well-preserved edges.

Macro-traces of use were identified on 42 small tools with a stereomicroscope and a reflected light system (fig. 3).

The results obtained through the observation of the macro-traces allowed to recognize that cutting and scraping were the activities carried out with both the unretouched and retouched flakes. The active edges of

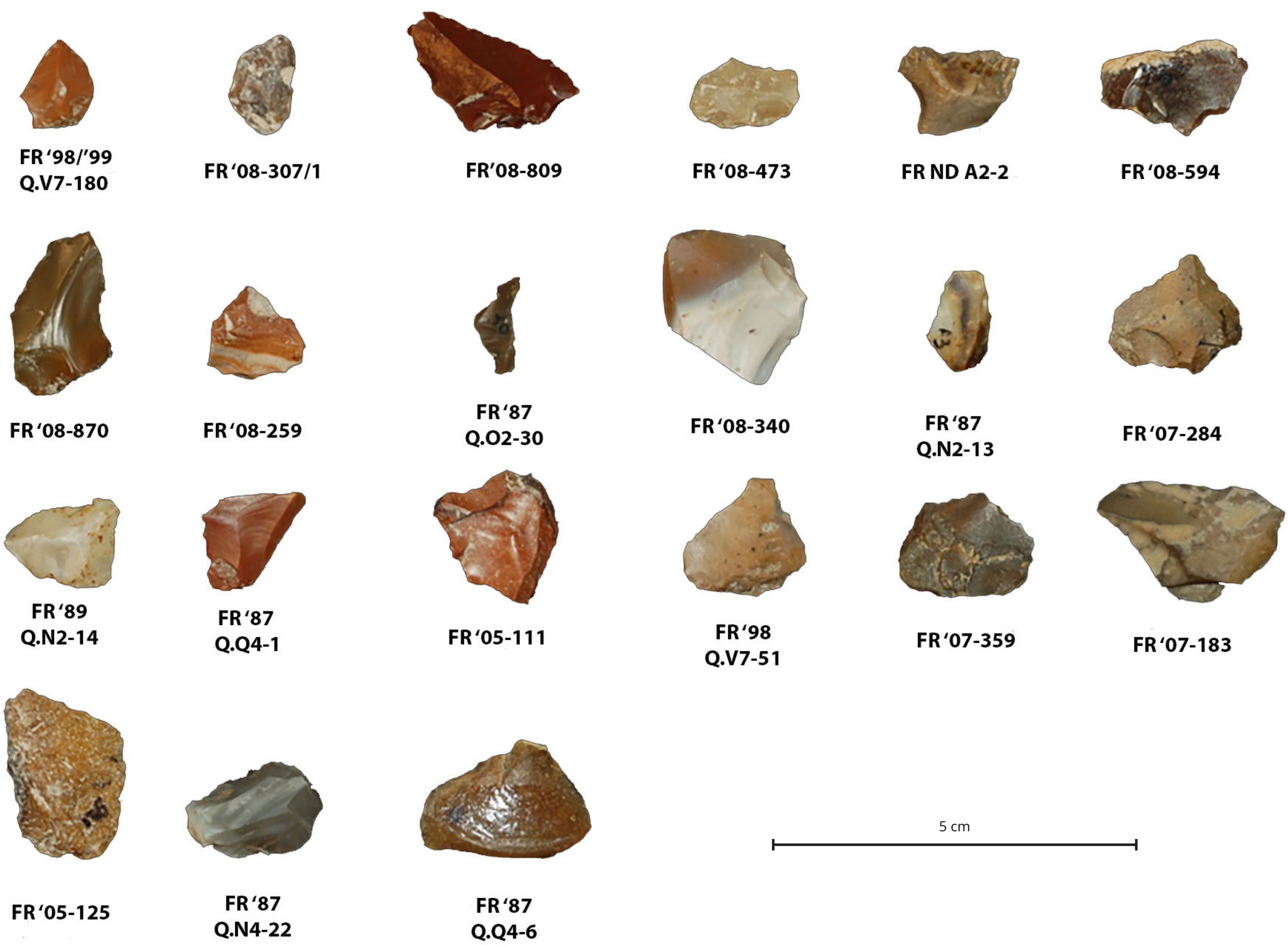

Figure 3: Small tools of Fontana Ranuccio (F. Marinelli).

these flakes have a *close regular* distribution, *feather* and *step* terminations, *transversal* and *oblique unidirectional* directions. These morphologies of the edge-removals suggest contact with soft and medium-soft materials.

Methodology

The experiments were carried out in the LTFAPA laboratory of Sapienza University of Rome. Nineteen replicas of small flakes were used, ten unretouched and nine retouched. The small tools, with a maximum size of 30 mm, were made by an expert technologist by direct percussion with a hard hammerstone. For the retouching of the flakes, a soft retoucher made of antler was used. Hide, wood (bay laurel, willow) and nettle are the materials processed with the replicas of small tools. The choice of materials to be processed was based on their hardness. We tested the efficiency of these tools for working a hard material such as bone. These tests highlighted that the small size of these tools and the thinness of their edges are barely effective since the pressure exerted does not affect the surface of the bone consistently and, although very sharp, the edge collapses quickly due to its fragility. Thus, these results suggested such tools were used to process medium and soft materials.

Cutting, sawing and scraping were carried out and each type of activity was repeated for each type of material. The replicas were utilized for over 30 minutes (see tab. 1 and 2)

For the analysis of the macro-traces the low magnification approach was applied with a Nikon SMZ-745 binocular stereomicroscope with x10 ocular and x1 objective lenses, with magnifications from x0.67 to x5 and optical fibre reflected light illumination. The photographic documentation was carried out with a Nikon DMX 1200 digital camera. This type of observation allows us to analyse edge-removals and rounding related to the use of the edges of the tools. The parameters used to identify the macro-traces are shown in the following table (tab. 3).

The experiments

The use of the unretouched flakes

Three replicas were used for sawing and scraping fresh wood (bay laurel, willow). The sawing action was performed to make a pointed tool, while the scraping action to remove the bark from the wood (fig. 4).

The first experiment of wood scraping (fig. 4A and B) was carried out with unidirectional transversal movements. Despite the small size of the object and the small area of prehension, the tool was effective and still usable at the end of the experimental session.

For the second experiment of scraping, oblique unidirectional movements were applied. The pressure exerted on the tool was constant throughout the activity

Experiment	Typology	Activity	Worked material	Time of use	Efficacy	Functional at the end of activity
2	Flake	Scraping	Fresh wood	35’	Excellent	Yes
8	Flake	Scraping	Fresh wood	60’	Excellent	Yes
9	Flake	Cutting	Fresh wood	25’	Excellent	No (broken
3	Flake	Cutting	Dry hide	1h	Excellent	Yes
5	Flake	Cutting	Dry hide	30’	Good	No
7	Flake	Cutting	Dry hide	40’	Excellent	Yes
10	Flake	Cutting	Willow	40’	Excellent	Yes
11	Flake	Cutting	Willow	1h	Excellent	Yes
12	Flake	Cutting	Nettle	1h	Excellent	Yes
13	Flake	Cutting	Nettle	20’	Excellent	Yes
16	Retouched flake	Scrapping	Fresh wood	50’	Excellent	No
17	Retouched flake	Cutting	Fresh wood	60’	Good	No
18	Retouched flake	Scrapping	Fresh wood	40’	Good	No
19	Retouched flake	Cutting	Dry hide	50’	Good	No
20	Retouched flake	Scrapping	Dry hide	60’	Excellent	No
21	Retouched flake	Scrapping	Willow	50’	Excellent	No
22	Retouched flake	Cutting	Willow	30’	Excellent	Yes
23	Retouched flake	Scrapping	Nettle	30’	Excellent	Yes
24	Retouched flake	Cutting	Nettle	30’	Excellent	Yes

Table 1: The characteristics of a single experiment. (F. Marinelli).

Experiment	Typology	Shape	Profile	Cross-section	Angle
2	Flake	Convex	Convex	s-s	26
8	Flake	Convex	Convex	cv-s	25
9	Flake	Straight	Straight	s-s	24
3	Flake	Straight	Straight	s-s	26
5	Flake	Convex	Convex	s-s	25
7	Flake	Straight	Straight	cv-cx	26
10	Flake	Convex	Convex	s-s	24
11	Flake	Straight	Straight	cv-s	24
12	Flake	Straight	Straight	cx-s	25
13	Flake	Straight	Straight	s-s	26
16	Retouched flake	Straight	Straight	cx-s	26
17	Retouched flake	Irregular	Irregular	cx-s	28
18	Retouched flake	Straight	Straight	s-s	25
19	Retouched flake	Straight	Straight	cv-s	25
20	Retouched flake	Convex	Convex	cv-s	28
21	Retouched flake	Straight	Straight	cx-s	28
22	Retouched flake	Concave	Concave	s-s	25
23	Retouched flake	Straight	Straight	cx-cv	26
24	Retouched flake	Straight	Straight	s-cx	26

Table 2: The characteristics of the experimental small tools.

Parameter	Characteristic
Localisation	Ventral/Dorsal/Ventral+Dorsal/Ventral More/Dorsal More
Distribution	Close regular/Close irregular/Wide regular/Wide irregular/Overlapping/Indeterminable
Termination	Step/Feather/Hinge/Snap/Snap-Half Mooon shape/Indeterminable
Orientation	Oblique unidirectional/Oblique bidirectional/Transversal/Mixed/Indeterminable
Dimension	Small/Large/Mixed
Edge rounding	Low/Medium/High
Typology of worked material	Hard/Medium/Medium-Soft/Soft

Table 3: Parameters for the identification of macro-traces (F. Marinelli) (see also Van Gijn 1989; Lemorini 2000).

and it was noticed that the small tool improved its performance during the experimental session.

The sawing activity, instead, (fig. 4C and D) was carried out for only 25 minutes due to the breakage of the active edge.

In this case, the pressure exerted to stabilize the active edge on the wooden surface and to prevent its sliding during the activity had negative effects on the integrity of the active edge itself. This result suggests that the very thin active edges of the small tools were not suitable to saw medium resistant materials. It is worth mentioning that this effect is consistent with the hardness of this specific wood. The hardness of wood may vary considerably depending on the species and the state of preservation (fresh, semi-dry, dry, soaked). Thus, a very soft wood can give different results (see below).

As in the previous experiments, cutting and scraping activities were performed with two replicas of small tools for processing dry hide (fig. 4E and F).

In this case the cutting activity was used to divide the hide into several parts, while the scraping activity was carried out to soften the hide.

For cutting, during the activity, the tool was tilted several times with an angle of 45° and 90° depending of the cutting needs, thus producing an oblique unidirectional followed by transversal bidirectional movement.

The necessity to change the movement during the experimentation is essentially linked to the size of the object and therefore to a question of comfort during its use. The tool suffered a fracture due to its use (after 30 minutes of work), but despite this, it continued to be functional. Also, in the case of the scraping activity, carried

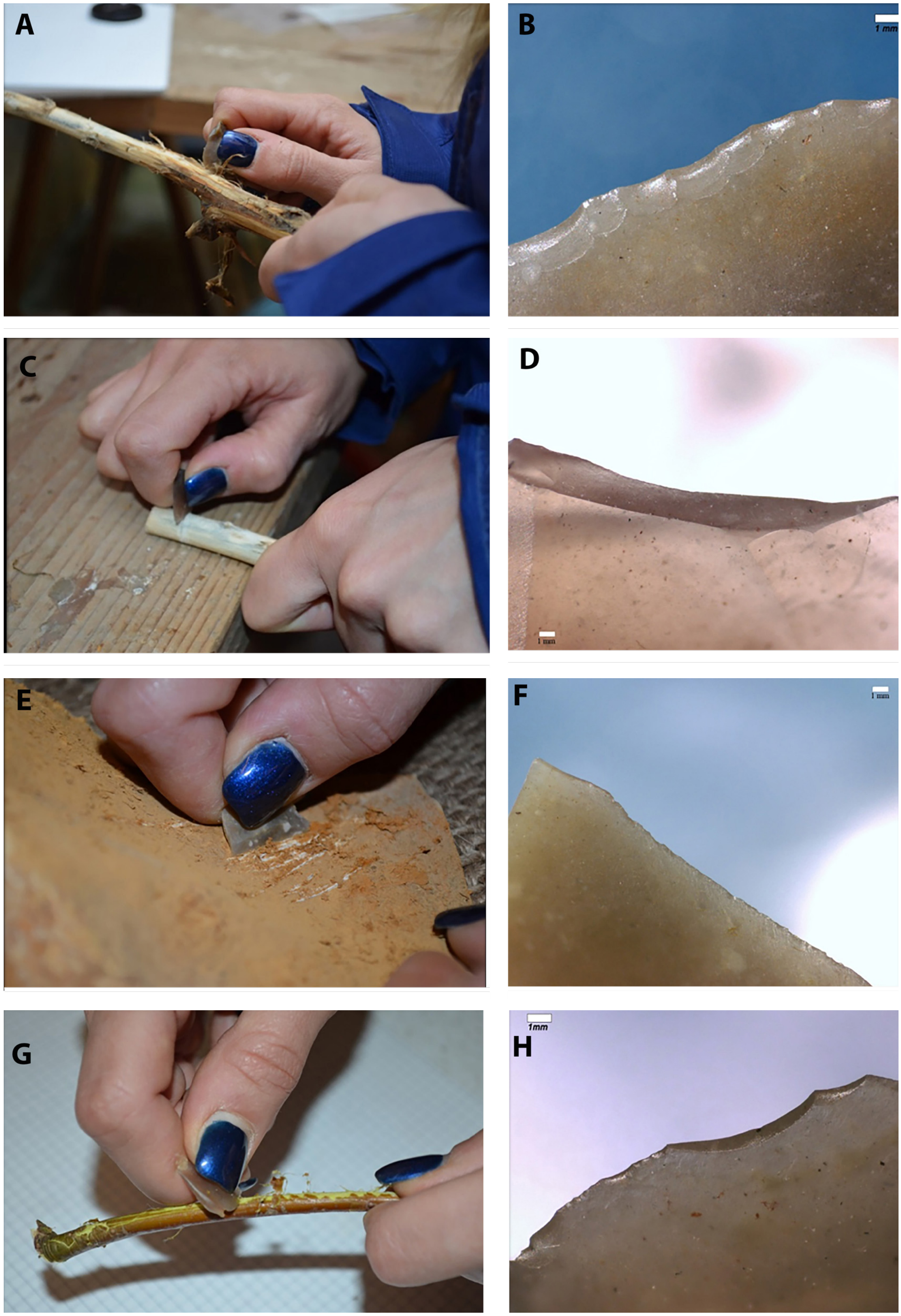

Figure 4: Experiments, A- scraping fresh wood, B- macro-traces formed after scraping fresh wood, C- sawing fresh wood, D- macro-traces formed after sawing fresh wood, E- cutting dry hide, F- macro-traces formed after cutting dry hide, G- scraping nettle, H- macro-traces formed after scraping nettle. (F. Marinelli).

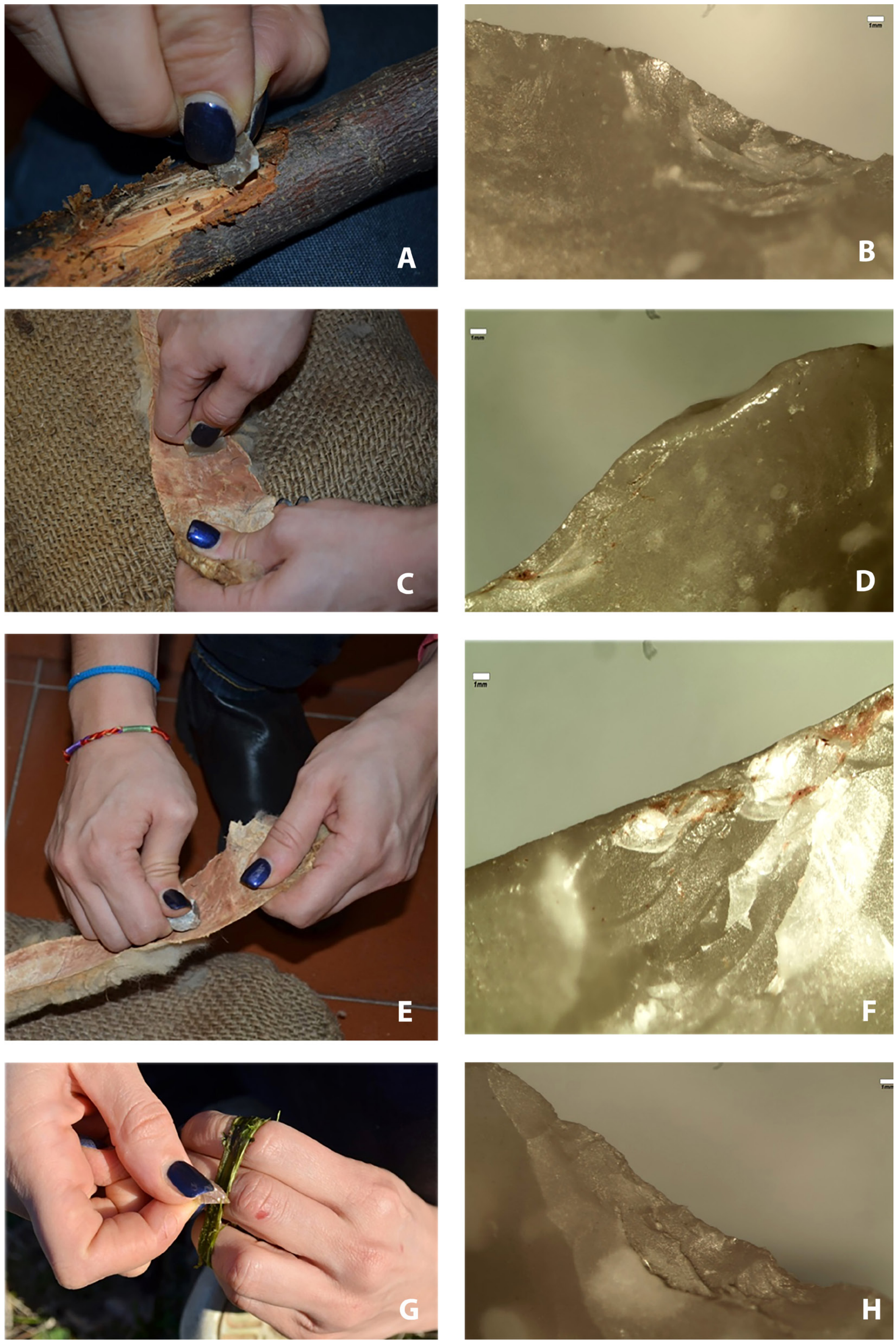

Figure 5: Experiments, A- scraping wood, B- macro-traces formed after scraping wood, C- cutting dry hide, D- macro-traces formed after cutting dry hide, E- scraping dry hide, F- macro-traces formed after scraping dry hide, G- cutting nettle, H- macro-traces formed after cutting nettle. In white the retouch; in red the macro-traces (F. Marinelli).

out with transversal unidirectional movements, the tool maintained its efficiency even after 40 minutes of activity.

The remaining four replicas of small tools were used to process willow and nettle. In this case the actions also consisted of cutting and scraping. The tools performed oblique unidirectional and transversal movements. In the case of the processing of willow, the tools used for cutting and scraping were very efficient and probably the pasty and soft aspect of this vegetable favoured these activities.

For the scraping action on nettle (fig. 4G and H) the choice of the movements was dictated by the performance of the tool with this specific type of material. We observed that the tool performed a better function trough oblique unidirectional movements, rather than transversal movements. Probably the tool adhered better to the stem of the nettle when orienting the active edge at 90° rather than at 45°.

For cutting, on the other hand, the processing was more difficult as the nettle has very hard stems. So, after the gathering from the ground, the stems were softened by beating and then easily cut in strips.

The use of the retouched flakes

As for the unretouched flakes, the same actions (cutting, sawing and scraping) were carried out with replicas of retouched small tools in order to find similarities or divergences between the two categories.

The retouches observed on the archaeological sample are very thin and with a scalar morphology. We found that a soft retoucher made of antler was the best choice to replicate this type of retouch.

As in the previous experiments, the materials worked were dry hide, wood and herbaceous plants.

In this case as well, sawing was carried out to produce a wooden object, while scraping was carried out to remove bark. Dry hide was softened by scraping, while strips of hide were obtained by cutting.

The last experiments aimed to process herbaceous plants by scraping and cutting nettles in order to produce fibres to make ropes.

All the matters were worked through oblique unidirectional and transversal movements (fig. 5).

Woodworking was problematic with this category of tools; in particular sawing because the material was too hard to work with and the retouches do not sufficiently strengthen the active edge; on the contrary, this scalar retouch produces or maintains a very sharp and thin active edge, too fragile to process a medium to medium-hard material.

The scraping of dry hide (fig. 5E and F) was more complicated than the similar activity performed with the unretouched flakes. Although the material was the same, for this type of action it was necessary to stretch the hide, blocking one end with one foot and stretching the other with the hand. This action was performed to try to increase the adherence of the active edge with the material worked. In fact, the tool tended to slip on the hide thus preventing the material from being processed. After the stretching of the hide, it was easier to work with and the tool adhered better to the surface.

The hide, stretched with the hand, was cut with an oblique bidirectional movement. The tool, despite having worked efficiently, was no longer usable at the end of the experiment. The edge was heavily damaged and, as a result, we observed some macro-traces of use only in a portion of the active edge (fig. 5C and D).

For the processing of the herbaceous plants, we noticed that the retouched small flakes hampered the working of the nettle with their indented active edge. In fact, the nettle has a very compact structure, and its fibres became stuck between the interstices of the retouches. Thus, to facilitate the activity, the stems were softened by beating and then cut in strips (fig. 5G and H). After softening, the tools become more effective, as the nettle lost its consistency, leaving its fibres flat and thin.

The processing of the willow consisted in removing bark from the branch by cutting and in reducing bark into fibres by scraping. The two retouched small tools used for this activity were very effective to process the bark that is a harder and thicker material compared to nettles.

During all the experiments, a great attention was paid to the way the small tools were gripped. Due to the small size, the area of gripping coincides with a great portion of the surface of the tool, active edge included (fig. 4 A and E; fig. 5A and C). Thus, to improve the size of the active area, a specific posture of the arm is needed that allows for the lifting of the wrist from the working surface. In this way, the visibility of the worked material is enhanced as well.

Comparison between experimental record and archaeological record

Each replica was analysed by means of a stereomicroscope and a reflected light system, in order to identify the macro-traces of use (tab. 4B and D).

There is a clear distinction between the terminations of the scars related to the processing of the medium/soft material, that are f*eather/step* and *feather/hinge*, and to the processing of soft material, that are *feather*. The direction of these scars, moreover, is due to the movement carried out. Thus, it is easy to distinguish different movements/activities from the orientation of the scars relative to the active edge (longitudinal unidirectional/cutting, longitudinal bi-directional/sawing, transversal unidirectional/scraping, transversal bi-directional/cutting/sawing).

The macro-traces developed on the replicas were compared with the macro-traces observed on the sample of small tools from the site of Fontana Ranuccio. The tables

A				ARCHAEOLOGICAL FLAKES			
ID	Localisation	Distribution	Termination	Orientation	Edge Rounding	Activity	Worked material
FR'87 Q.Q4-6	Dorsal more	Close regular	Step/Hinge	Obl.unidirectional	High	Cutting	Medium
FR'87 Q.N4-22	Dorsal more	Close regular	Feather/Hinge	Obl.unidirectional	Medium	Cutting	Medium/Soft
FR'07-183	Ventral more	Close regular	Feather/Hinge	Transversal/obl.unidir.	High	Cutting	Medium/Soft
FR'07-359	Dorsal	Wide regular	Feather/Hinge	Obl.unidirectional	Medium	Cutting	Medium/Soft
FR98 Q.V7-51	Ventral more	Close regular	Feather	Transversal	High	Scraping	Medium/Soft
FR'05-111	Ventral	Wide regular	Feather	Obl.unidirectional	High	Cutting	Soft
FR'05-125	Ventral	Close regular	Feather/Step	Obl.unidirectional	Medium	Cutting	Medium/Soft
FR'87 Q.Q4-1	Ventral more	Close regular	Feather/Step	Obl.unidirectional	Medium	Cutting	Medium/Soft
FR'89 Q.N2-14	Ventral/Dorsal	Close regular	Feather/Step	Obl.unidirectional	Low	Cutting	Medium/Soft
FR'07-284	Dorsal	Close regular	Feather/Step	Obl.unidirectional	Medium	Cutting	Medium/Soft
FR'89 Q.N2-13	Dorsal	Close regular	Feather	Obl.unidirectional	High	Cutting	Soft
FR'08-340	Dorsal more	Close regular	Feather/Step	Obl.unidirectional	High	Cutting	Medium/Soft
FR'87-Q.O2-30	Ventral	Close regular	Feather	Obl.unidirectional	Low	Cutting	Soft
FR'08-259	Dorsal more	Close regular	Feather/Step	Transversal	Medium	Scraping	Medium/Soft
FR'08-594	Ventral	Close regular	Feather	Obl.unidirectional	Medium	Cutting	Soft
FR'08-870	Dorsal	Close regular	Feather	Obl.unidirectional	Low	Cutting	Soft
FR'ND-A2-2	Dorsal	Close regular	Step	Obl.unidirectional	Low	Cutting	Medium
FR'08-473	Dorsal	Close regular	Feather	Transversal	Low	Scraping	Soft
FR'08-809	Dorsal	Close regular	Feather	Obl.unidirectional	Medium	Cutting	Soft
FR'08-307/1	Dorsal	Close regular	Feather	Transversal	Medium	Scraping	Soft
FR'98/99-Q. V7-180	Dorsal	Close regular	Feather	Obl.unidirectional	Small	Cutting	Soft

B				EXPERIMENTAL FLAKES				
EXP.	Localisation	Distribution	Termination	Orientation	Edge Rounding	Activity	Worked material	Hardness Material
2	Dorsal more	Close regular	Feather/Step	Transversal	Medium	Scraping	Wood	Medium
9	Ventral and Dorsal	Wide regular	Hinge	Oblique Transversal	Low	Cutting	Wood	Medium
8	Dorsal more	Close regular	Feather/Step	Transversal	Medium	Make a point	Wood	Medium
3	Ventral More	Close regular	Feather	Transversal	High	Cutting	Dry hide	Medium/Soft
5	Ventral and Dorsal	Close regular	Feather	Indeterminable	Medium	Piercing	Dry hide	Medium/Soft
7	Dorsal	Close regular	Feather/Step	Transversal	Medium	Scraping	Dry hide	Medium/Soft
10	Ventral More	Close regular	Feather/Step	Transversal	Low	Scraping	Fresh wood	Soft
11	Dorsal more	Close regular	Feather	Oblique bidirectional	High	Cutting	Fresh wood	Soft
12	Ventral More	Close regular	Feather	Transversal	Low	Scraping	Vegetable	Soft
13	Dorsal more	Close regular	Feather	Oblique unidirectional	Low	Cutting	Vegetable	Soft

C				ARCHAEOLOGICAL RETOUCHED FLAKES			
ID	Localisation	Distribution	Termination	Orientation	Edge Rounding	Activity	Worked material
FR'07-122	Dorsal	Close regular	Feather	Transversal	Low	Scraping	Medium/Soft
FR'08-345	Dorsal	Close regular	Feather	Transversal	Low	Scraping	Soft
FR'89 Q.N1-17	Dorsal	Indeterminable	Feather	Obl.unidirectional	Medium	Cutting	Soft

Table 4 (continued on the next page): Characteristics of archaeological macro-traces and experimental macro-traces (F. Marinelli).

D				EXPERIMENTAL RETOUCHED FLAKES				
EXP.	Localisation	Distribution	Termination	Orientation	Edge Rounding	Activity	Worked material	Hardness Material
16	Dorsal	Close regular	Feather/Step	Transversal	Medium	Scraping	Dry wood	Medium
17	Dorsal	Close regular	Feather/Step	Obl.bidirectional	Medium	Cutting	Dry wood	Medium
18	Dorsal	Wide regular	Feather/Hinge	Transversal	High	Make a point	Dry wood	Medium
19	Dorsal	Indeterminable	Indeterminable	Indeterminable	High	Cutting	Dry hide	Medium/Soft
20	Dorsal	Indeterminable	Feather	Transversal	High	Scraping	Dry hide	Medium/Soft
21	Dorsal	Close regular	Feather	Transversal	Medium	Scraping	Fresh wood	Soft
22	Dorsal	Close regular	Feather	Indeterminable	Medium	Cutting	Fresh wood	Soft
23	Dorsal	Close regular	Feather	Transversal	Medium	Scraping	Vegetable	Soft
24	Dorsal	Close regular	Feather	Obl.bidirectional	Low	Cutting	Vegetable	Soft

in tab. 4A, B, C and D show the macro-traces observed on the experimental replicas correspond to those found on 42 out of 151 small tools that form the sample of Fontana Ranuccio. The morphology of the scars of these tools match with the morphologies developed on the replicas, proving that these artefacts were used for processing soft (22 out of 42 items) or medium-soft materials (20 out of 42 items). Moreover, the direction of the scars matches with those reproduced during the experiments, corroborating that a variety of activities were carried out with these small tools (26 out of 42 items, cutting; 16 out of 42 items, scraping).

Conclusion

The experimental approach applied to the functional study of the small tools of Fontana Ranuccio allowed us to achieve an initial evaluation of the degree of efficiency of these tools in relation to the materials worked. As a result, these artefacts have edges that are sharp but too thin to be successfully used to process hard or medium-hard materials. Moreover, the experiments demonstrated that with these small tools it is possible to carry out different types of activities. The macro-traces that provide evidence of these activities are clearly present on the archaeological small tools, and thus show that these artefacts were not only used for cutting. Following the results of the experiments, the retouched small tools do not seem to maintain all the functional potential of the unretouched ones. Their efficiency seems more limited in terms of activities and material worked; only the processing of bark and the production of fibres were easily carried out with these tools.

All the experiments were carried out free hand. The small size of the tools did not prevent a solid grip. However, it seems that to maintain this grip and to have, at the same time, a good visibility and, thus, a good control of the activity, a specific posture of the arm is needed. These very preliminary data on the manipulation of the small tools suggest that the use of these artefacts was related to body postures that deserve to be investigated with dedicated research that takes into account the anthropological parameters that characterize the body and the hands of *Homo heidelbergensis.*

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