# 11 FIRST TRACEOLOGICAL STUDY OF THE LITHIC ASSEMBLAGE FROM MARATHOUSA 1 AND CONTEXTUALIZATION OF THE RESULTS WITHIN THE EUROPEAN LOWER PALAEOLITHIC

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## 11.1 INTRODUCTION

The European Lower Palaeolithic demonstrates a wide range of human settlements and various lithic production techniques. This variability is still poorly understood, hindering the assessment of hominin techno-economical choices. Recent studies on lithic variability of the Middle Pleistocene investigated whether differences in assemblage composition is related to cultural or temporal trends, site function, or availability of raw materials.

Here we focus on small flakes which constitute important blanks in many lithic assemblages of the Lower Palaeolithic (Rocca et al., 2016). They are present both in Africa and Eurasia from ≥1 Ma to 300 ka (Burdukiewicz and Ronen, 2003; Derevianko, 2006; Lemorini, 2018). Although the origin of such assemblage diversity is still debated, it is proposed to be related to the age of assemblages, to the unique preservation of sites, or to specialized activities or durations. In order to better understand how small lithics were utilized, we conduct techno-morpho-functional and traceological analyses. The combined approach provides the opportunity to further assess the *chaîne opératoire* from the production of tools to their use and curation through the analysis of their final morphology before discard.

We report the preliminary results from a traceological study of lithics from Marathousa 1 (Megalopolis, Greece). The site is located in the Megalopolis Basin which periodically hosted an



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ancient lake (Panagopoulou et al., 2018; Bludau et al. 2021). The archaeological layer is attributed to Marine Isotope Stage 12 (Tourloukis et al., 2018a). The archaeological remains are at the contact of sedimentary units UA3-UA4 and UB4-UB5 (Karkanas et al., 2018). The excavation took place in two sections, approximately 60 m apart, areas A and B. Area A exhibits numerous elephant bones from a largely complete single individual with anthropogenic cut-marks and a low density of lithic finds (Konidaris et al., 2018). Area B has yielded a higher density of lithics, but also additional elephant remains and other bones with cut-marks and anthropogenic modifications. The lithic assemblage is composed of 2058 artifacts. The raw materials of local origin are radiolarite, flint, limestone and quartz, collected in close proximity to the site (Tourloukis et al., 2018b). The lithic assemblage is composed of exhausted cores, flakes, and tools and belongs to a flake-based industry. Blank types are varied. The aim of the debitage is to produce blanks with sharp and durable edges. Technological studies provide numerous data on technological behaviors but questions remain about tool use and site function.

## 11.2 METHODS

The objective of this pilot study is to assess the potential for use-wear analysis on a sample of 250 lithic artifacts from Areas A and B. The sample is representative of the whole assemblage (Table 1). The analysis was carried out in two stages: a taphonomic analysis of the flint and radiolarite artifacts to determine the nature of post-depositional processes; and then a functional analysis of the 250 artefacts in the sample. This last part of the work is in progress: 13 pieces have been analyzed so far and are presented here.

The taphonomical study was founded on the methodological approach developed by petroarchaeologists (Fernandes, 2012; Fernandes and Raynal, 2005). The aim of this methodology is to identify the post-depositional processes within the archaeological site.

| **Lithic type** | **Radiolarite** | **Flint** | **Limestone** | **Quartz** | **Sandstone** | **Total** |
|---|---|---|---|---|---|---|
| Unretouched blanks | 148 | 21 | 15 | 10 | 1 | 195 |
| Cores/Core fragments | 7 | 0 | 5 | 2 | 0 | 14 |
| Flakes >15 mm | 96 | 12 | 8 | 4 | 1 | 121 |
| Chips <15 mm | 38 | 7 | 0 | 3 | 0 | 48 |
| Debris | 7 | 2 | 2 | 1 | 0 | 12 |
| Retouched blanks | 47 | 7 | 1 | 0 | 0 | 55 |
| Backed pieces | 9 | 2 | 1 | 0 | 0 | 12 |
| Notched pieces | 10 | 2 | 0 | 0 | 0 | 12 |
| Denticulates | 7 | 0 | 0 | 0 | 0 | 7 |
| Scrapers | 6 | 1 | 0 | 0 | 0 | 7 |
| Core tools | 7 | 0 | 0 | 0 | 0 | 7 |
| Retouched pieces | 4 | 1 | 0 | 0 | 0 | 5 |
| Composite tools | 3 | 1 | 0 | 0 | 0 | 4 |
| Pointed pieces | 1 | 0 | 0 | 0 | 0 | 1 |
| **Total** | **195** | **28** | **16** | **10** | **1** | **250** |

**Table 1:** Sample details.

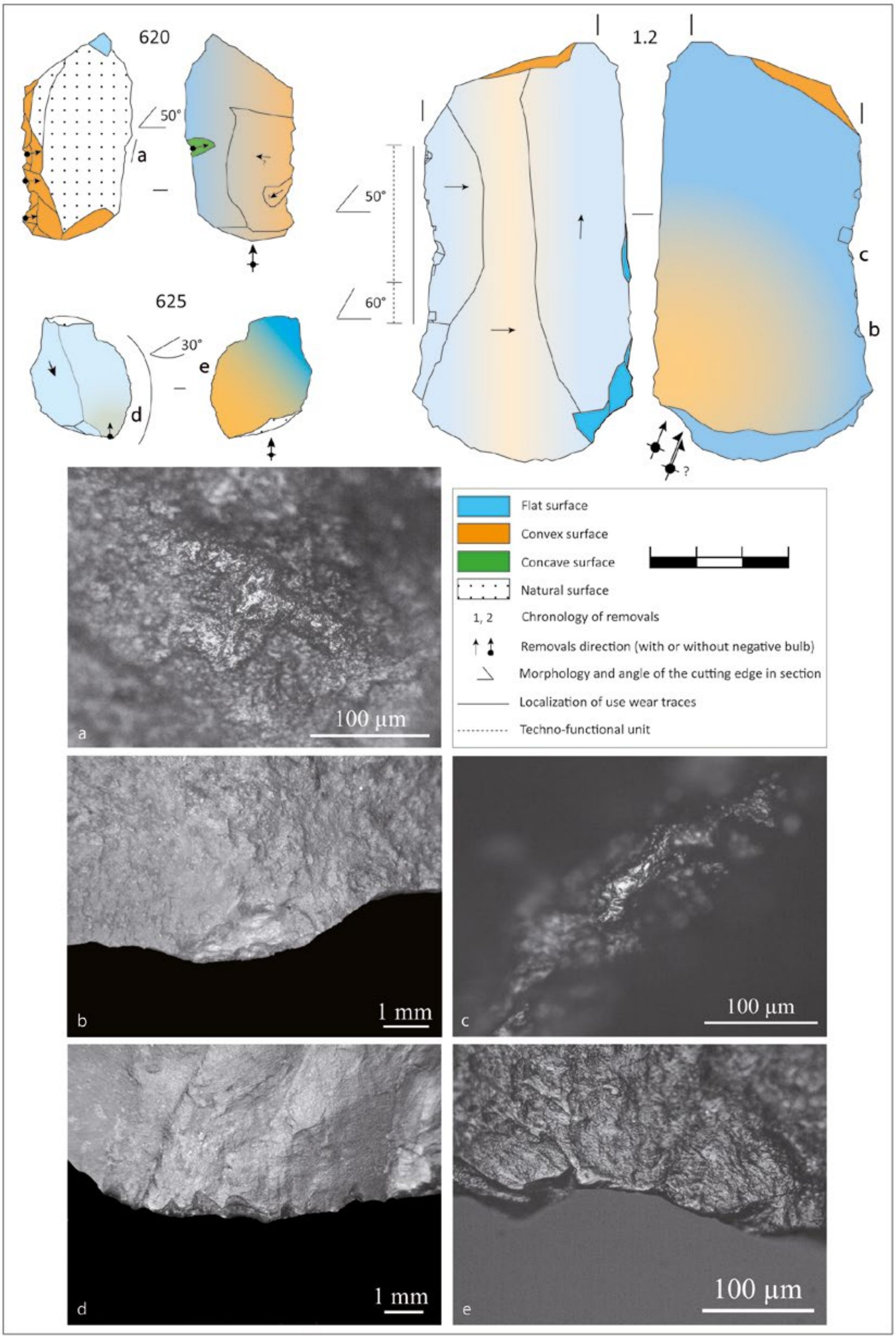


**Figure 1:** Diacritical sketches of lithics with use-wear traces and photos of traces. a. functional spot polish from flake 620 (used in a longitudinal motion possibly for butchering activities); b. and c. crushing and smooth spot polish visible on the cutting edge of flake 1.2 (used to process hard material in a longitudinal motion); d. and e. angular scars oblique to the edge, smooth spot polish and striations oblique to the edge of flake 625 (used in a longitudinal motion for butchering activities).

The techno-morpho-functional approach, conceived by M. Lepot (1993) and E. Boëda (1997) is occasionally combined with use-wear analysis to better characterize lithic assemblages from the Lower and Middle Paleolithic (Bonilauri, 2010; Claud, 2008; Guibert-Cardin et al., 2021). First, the functional analysis of lithics was conducted at both low and high magnifications to identify active parts and modes of tool use. Lastly, an analysis of the dorsal-scar pattern and the succession of each removal in the manufacturing of tools with use-wear traces was conducted. We seek to understand the existing relationships between the production of blanks for tools, morphology, retouch and use.

## 11.3 RESULTS

The pieces analyzed for the taphonomical study are exceptionally well preserved: the overwhelming majority of the pieces examined exhibit slight alterations, providing the opportunity to conduct use-wear analysis at both low and high magnifications. Post-depositional surface modifications are mainly of chemical origin; however, some mechanical alterations attest to slight movement of the lithics after deposition. This observation reinforces the interpretation of minor reworking of the find layers according to Giusti et al. (2018).

Currently, 13 lithics were analyzed for use-wear with a stereomicroscope and a metallographic microscope. Five in total show use wear traces and one exhibits technological traces (for the detailed results and comparisons with the experimental use-wear traces see Guibert-Cardin et al., 2022). The remaining seven lithics do not exhibit use-wear traces. However, this does not necessarily imply that the latter were not utilized.

MAR1 1.2 (Fig. 1) is a flint flake with a backing. The opposite edge is unretouched and bears bifacial and oblique scars and striations parallel to the working edge indicating a longitudinal motion. The processed material is hard because crushing and smooth polish are present and scars are large and overlap. The active edge is unretouched and is opposite to a back.

MAR1 620 (Fig. 1) is a radiolarite backed knife. The back is created by abrupt retouch and is opposite an unretouched edge bearing spots of smooth polish and short and isolated striations. These use-wear traces are similar to those produced during butchering activities. Striations are oblique to the edge indicating a longitudinal motion.

MAR1 625 (Fig. 1) is an unretouched radiolarite tool. One edge exhibits bifacial scars, striations oblique to the edge and a symmetrical rounding resulting from a longitudinal motion. The scar characteristics are the same as those one would expect from butchering activities, namely with a triangular shape and bending and cone initiations. MAR1 605 (Fig. 2) is an unretouched radiolarite flake with a short back. The secant cutting edge exhibits dissymmetric use-wear traces indicating a transversal motion. The scars have circular and elongated forms, and the polish is domed and smooth. These characteristics are indicative of plant processing.

MAR1 637 (Fig. 2) is a thick radiolarite chunk with a convergent spine created by retouching. Use-wear traces are located on this spine. The scars are bifacial and the striations are perpendicular to the edge, implying a transversal bidirectional motion. The material processed is semi-hard because polish and striations are on high areas and the scars are infrequent. Rounding and numerous striations are indicative of an abrasive material. These traces are possibly related to the hammerstone, although they could also indicate the processing of a semi-hard and abrasive material.

MAR1 1132 (Fig. 2) is a thick flake with a cortical back opposite a retouched edge. On the face opposite to the retouch, the edge exhibits a band of polish and associated striations strictly parallel to each other indicating that they come from the

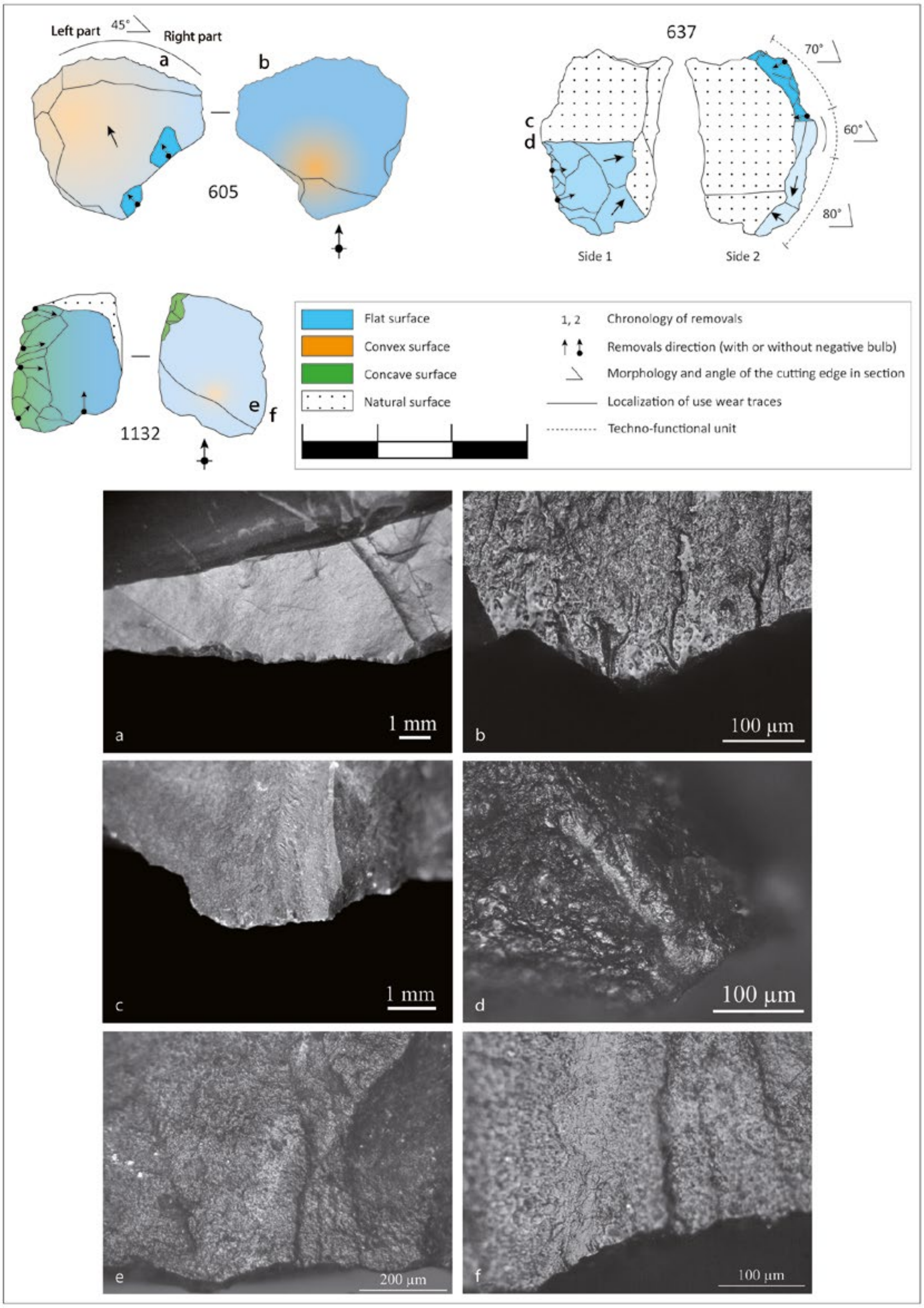


**Figure 2:** Diacritical sketches of lithics with functional and technological traces and photos of traces. a. and b. circular and elongated small scars opposite to a smooth domed polish on the cutting edge of flake 605 (used to process plant in a transversal unidirectional motion); c. and d. small irregular scars opposite to a rough to smooth polish on a slightly rounded arris with long striations perpendicular to the edge of flake 637 (related to technological traces or utilized on a semi hard material in a transversal bidirectional motion); e. and f. large band of polish in the center of a crescent-shaped crack and numerous organized striations on the ventral surface opposite the retouch scars of flake 1132 (technological traces).

same event. These traces are associated with an impact mark and this combination of traces probably has a technological origin.

In summary, motions and material processed are varied. Tools exhibiting use-wear traces include unretouched and retouched flakes that frequently display a back opposite to the active edge, maybe to facilitate gripping.

| | | | | Motion | | | | Material processed | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Isotopic stage | Nr. subjected to functional analysis | Nr. with use wear traces | Long. | Transv. | Both | Und. | Animal | Vegetal | Hard | Semi hard | Soft | Und. | Residues | Prehension/ hafting | Other | |
| Evron Quarry, Israel | 19 | ? | ? | | | | | | | | | | | | | Impact traces | Chazan, 2013 |
| Isernia la Pineta, Italy | 15 | c. 1230 | >261 | x | x | | x | x | 1? | | | | x | | | Short activity | Longo et al., 1997 Minelli et al., 2004 |
| Ficoncella, Italy | 13 | 129 | 13 | x | x | | | | | | x | x | | | | Short activity | Lemorini, 2018 |
| Revadim, Israel | 13-12 | 283 | 109 | 80 | 16 | 8 | 5 | 5 | | 21<br>53<br>....22....<br>......3...... | | | 5 | Animal | Prehension | Short activity. One flake = one activity | Venditti et al., 2019a Venditti et al., 2019b |
| Marathousa 1, Greece | 12-11 | 14 | 5 | 3 | 2 | | | 1 | 1 | 2 | 1 | | | | | | Guibert--Cardin et al., in press, 2022 |
| Fontana Ranuccio, Italy | 11 | ? | ? | x | x | | | | | | x | | | | | | Marinelli et al., 2019 |
| Aridos 1 and 2, Spain | 11 or 9 | 77 | 33 | 31 | 2 | 5 | 2 | 38 | 2 | | | | | | | | Ollé, 2003 |
| Qesem cave, Israel | 11-8 | 743 | 231 | 155 | 31 | 42 | 3 | 83 | 19 | 1 | 12 25<br>.....91.... | | | Various | Wrapping? | Short activity | Venditti, 2019 Lemorini, 2015 |
| Schöningen, Germany | 9 | 13 | 3 | 2 | | | 1 | 1 | 2 | | | 1 | | Animal, vegetal | Prehension | | Rots et al., 2015 |
| La Polledrara di Cecanibbio, Italy | 9 | 155 | 20 | x | x | | | x | x | | | | | | Prehension | | Lemorini, 2018 |

**Table 2:** Use-wear data on small flakes from Lower Palaeolithic sites in Europe and the Levant.

## 11.4 DISCUSSION

This study confirms the exceptional state of preservation of the site. Moreover, it confirms that butchering activities took place at both excavation areas and demonstrates that plants were exploited. The activities carried out at Marathousa 1 involved a broader range of activities than originally hypothesized. Tools with use-wear traces do not show any significant standardization in terms of blank shape or form, except for the recurrent presence of an active edge opposite a natural or retouched back (Guibert-Cardin et al., 2022). These first functional results from Marathousa 1 are part of the current discussions on the function of small flakes in the Lower Palaeolithic.

Use-wear analyses on small blanks and tools have been performed on assemblages from fewer than ten sites in total (Table 2). Small tools are mainly used to process soft and semi-hard materials and when worked materials can be identified, they primarily involve butchering activities and to a lesser extent, vegetal materials (Lemorini, 2018; Venditti, 2019; Guibert-Cardin et al., 2022). It is frequently suggested that small tools are used in the final stages of the butchering process (Longo et al., 1997; Venditti et al., 2019b). Our preliminary results suggest that small tools were used for different tasks as also seen in the Italian sites of La Ficoncella and La Polledrara di Cecanibbio (Aureli et al., 2016; Lemorini, 2018). One of the most recurring questions about small tools is the mode of prehension. Small flakes from Revadim, La Polledrara di Cecanibbio and Schöningen exhibit prehension traces, whereas at Qesem Cave, they were possibly wrapped (Lemorini, 2018; Rots et al., 2015; Venditti, 2019; Venditti et al., 2019a). With the current functional data on tools from Marathousa 1, there is no evidence to determine the mode of prehension. However, the presence of a back or an unsharpened edge opposite or adjacent to the active part, as well as the lack of standardization of the tools, suggests hand use rather than hafting. Experimental reproductions of small tools demonstrate that backing opposite to a sharp edge provides a superior grip and promotes the application of force and precision (Chazan, 2013; Jones, 1980; Starkovich et al., 2021).

This preliminary study enriches the sparse functional data available on small tools and more generally on Lower Palaeolithic tools. Use-wear analyses are rare on Lower Palaeolithic assemblages because of taphonomic problems. However, by coupling techno-morpho-functional and use-wear analysis, it is possible to access the techno-economic choices of human groups. The pursuit of the functional analysis of lithics from Marathousa 1 will contribute to better qualify, quantify and understand tool structure, function and activities carried out.

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