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On Quina and demi-Quina scraper handling: Preliminary results from the late Lower Paleolithic site of Qesem Cave, Israel

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ABSTRACT

Most of the studies related to the function of Paleolithic stone tools carried out so far focused mainly on the analysis of the worked materials and the activities performed. On the other hand, only few works included an analysis of the tool griping area/s, and the wear derived by object manipulation. Here we present the results of an experimental framework dedicated to the interpretation of the griping modes of two types of flint scrapers, Quina and demi-Quina scrapers, which represent a very meaningful component of the lithic assemblages unearthed at the late Lower Paleolithic site of Qesem Cave (Israel).

Our study includes the analysis of both a selected sample of archeological scrapers and of experimental replicas. We were able to underline the efficiency of different types of prehension modes while isolating diagnostic wears related to each of the adopted solutions. The experiments allowed defining wears related to several handling solutions, creating a traces collection to be compared to the ones identified on the archeological sample. The results obtained so far suggest a preference towards a free hand manipulation of the scrapers, even though wear related to wrapping and also to a probable insertion of the objects in a haft have been identified as well. This work allows providing preliminary insights related to the handling solutions adopted by the human groups at Qesem Cave, underlining the overall high level of technological knowledge characterizing the Middle Pleistocene inhabitants of the site.

1. Introduction

The analysis of the wear derived from tool manipulation has not been the focus of many studies related to the function of prehistoric stone tools. Indeed, apart specific works (e.g. Stordeur, 1987), more relevance was given to the hypothesized working edge or edges, through the analysis of edge damage and micro wear (polishes, striations and abrasion). In general, the interpretative potentials of traces derived from prehension or hafting, were surrounded by a certain amount of skepticism. Even when such traces were identified, only little attention was given to this aspect. Most of the critics were directed towards the wear derived by prehension, which was considered to be extremely light or too poorly developed in order to enable any kind of interpretation (see an overview on the matter in Rots, 2010, pp. 935). However, at least the wear generated by hafting received some attention, in particular in relation to microliths (e.g., Odell, 1978; Lombard and Pargeter, 2008) and in the rare cases where adhesive residues were preserved over the archeological tool/s (e.g, Boëda et al., 2002; Mazza et al., 2006; Zipkin et al., 2014 and reference therein). Only in the last few years, and thanks to the extensive work carried out by V. Rots (2006, 2010), Rots et al. (2011, 2001), the investigation of hafting and prehension wear is becoming an integral part of the interpretation of ancient stone tool function and use.

With this integrated perspective in mind, the study presented here focuses on data related to the interpretation of flint scraper handling, and is accompanied by a dedicated experimental framework followed by the analysis of an archaeological sample of flint Quina and demi-Quina scrapers from the late Lower Paleolithic site of Qesem Cave (Israel).

2. Regional setting

Qesem Cave is located 90 m a.s.l. in the western foothills of the Samaria Hills, ~12 km East of Tel Aviv, Israel (Gopher et al., 2005). The sediments are some 10 m deep and all the stratigraphic

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sequence is assigned to the Acheuleo-Yabrudian Cultural Complex (AYCC). The dominant industry in the sequence is the Amudian, while the Yabrudian was found in three distinct parts within the stratigraphy of the cave (Barkai et al., 2009; Parush et al., 2016, 2015). The speleothems from the cave were dated by U/Th to ca. 420–200 ka (Barkai et al., 2003; Gopher et al., 2010) and a similar range as obtained by TE and ESR (Mercier et al., 2013, Falguères et al., 2016).

The stratigraphic sequence is generally divided into two parts:

- Lower part (~5.5 m thick) deposited when the cave was closed, consisting of sediments with clastic content gravel and clays
- Upper part (~4.5 m thick) deposited when the cave was more open and is characterized by cemented sediment with a large ashy component (Karkanas et al., 2007).

Many burnt bones and flint items were found at Qesem Cave. In addition, ash was found in the cave's sediments. It appears that the use of fire was common throughout the sequence and possibly more intensive in its upper part indicating a controlled and habitual use of fire (Karkanas et al., 2007).

The faunal assemblage includes *Dama mesopotamica* (dominates the assemblage), *Bos, Equus, Sus, Testudo, Cervus;* the absence of all body parts indicate that carcasses were first processed outside of the site and only selected parts were brought to the cave. Furthermore, cut marks were abundant, found on 9–12% of bones (Blasco et al., 2014).

Concerning the lithic assemblage, Quina and demi-Quina scrapers are found in several areas of the cave, related to both Yabrudian and Amudian horizons. These peculiar tools are characterized by a scalar retouch affecting their working edges (Bordes, 1961; Verjux and Rousseau, 1986; Bourguignon, 1996) for details see Lemorini et al. (2016).

The majority of the scrapers at Qesem Cave are related to Yabrudian levels, which are characterized by two main features. First, the very conspicuous presence of scrapers made on thick flakes including transversal and *dejete* flakes and some scrapers made on flat flint nodules. Second is the evident re-sharpening, retooling and recycling of scrapers. It is worth mentioning that the *chaine operatoire* related to the production of these tools at Qesem Cave cannot be followed as opposed to the case of Amudian blades. Indeed, It seems that the flakes or the ready-to-use scrapers were imported to the site from a different locality, possibly after early stages of reduction at the raw material source.

3. Materials and methods

Both Low and High-power approaches were adopted in the analysis of the materials (Keeley, 1980; Rots, 2010; Van Gijn, 2010). The former was carried out with a stereomicroscope Nikon SMZ in reflected light with 10× oculars, 0.5× objective and range of magnification from 0.75× to 7.5×, while the latter with a metallographic microscope Nikon Elite in reflected light with oculars 10× and objectives 10×, 20× and 50×.

The identification and description of the wear generated by prehension and wrapping is based on the combination of the dedicated experimental framework performed, and the criteria defined by Rots (2010). The choice leading to the adopted experimental tool handling modes is based on the preliminary observation on the archaeological sample presented in this paper, characterized by traces associable to wrapping and prehension, following Rots (2010) definitions.

Experimental Quina and demi-Quina scrapers, made of local Israeli flint, produced by L. Bourguignon, a leading expert dealing with the morpho-technological analysis of Quina scrapers (see Lemorini et al., 2016), were used in different activities both free hand and wrapped in hide and plants (*Ampelodesmos mauritanicus*). The reasons leading to the choice of this specific plant are its wide distribution in the Mediterranean basin and its exploitation in the production of ropes and twines in traditional contexts (Anderson, 2006). In this way, it was possible to evaluate the prehension efficiency and the traces left by each of the adopted handling modes, in order to perform a comparison with the wear identified on the archeological objects.

The archeological specimens were washed with fresh water in order to remove the soil deposit. Subsequently, the objects were washed with de-ionized water inside an ultrasonic tank for 10 min. The experimental objects were washed with fresh water and soap, then subjected to a chemical bath starting with a dilute 3% acetic acid (CH_3COOH) lasting 15 min followed by a dilute 3% sodium hydroxide (NaOH) again for 15 min. Finally, the objects were washed with de-ionized water in an ultrasonic tank for 10 min.

4. Results

4.1. Experiments

The adopted experimental framework was designed on the observation made on an archaeological Quina and demi-Quina scraper sample from Qesem Cave. These peculiar tools are generally characterized by a long life cycle testified by the several stages of retouch and edge modification (Bourguignon, 2001). These tools are along with their exploitation in different types of activities, reflecting the overall high versatility of Quina and demi-Quina scrapers that has been highlighted by numerous scholars (Baena Preysler and Carrion Santafè, 2010; Claud et al., 2012; Lemorini et al., 2016; Romagnoli et al., 2015). The experimental Quina and demi-Quina scrapers were used to process fresh hide, dry and fresh wood through scraping and cutting activities, for a total of six experiments (for details see Table 1). The motivation leading to the selection of the worked materials is given by the fact that these are two of the most exploited substances at Qesem Cave (see

Table 1
Detailed information about the performed experimental framework.

Exp#	Tool type	Worked material	Action	Contact angle	Working time (min)	Tool efficiency	Tool handling mode	Handling mode efficiency
3	demi-Quina Scraper	Fresh Hide	Scraping	55°	60	High	Vegetal Wrapping (Amphelodesmos mauritanicus)	High
4	Quina Scraper	Fresh Hide	Scraping	55°	60	Very High	Free Hand	Medium
5	demi-Quina Scraper	Dry Wood (Quercus robur)	Scraping	60°	30	Medium	Leather Wrapping	Medium
6	demi-Quina Scraper	Dry Wood (Quercus robur)	Cutting	90°	30	Medium	Leather Wrapping	Medium
7	demi-Quina Scraper	Fresh Wood (Eriobotrya japonica)	Scraping	60°	30	Very High	Free Hand	High
8	demi-Quina Scraper	Fresh Wood (Eriobotrya japonica)	Cutting	90°	30	Very High	Free Hand	High