International Conference on Use-Wear Analysis

USE-WEAR 2012

Edited by

João Marreiros, Nuno Bicho and Juan F. Gibaja

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CHAPTER THIRTY ONE

UNMODIFIED QUARTZ FLAKE FRAGMENTS AS COGNITIVE TOOL CATEGORIES: TESTING THE WEAR PRESERVATION, PREVIOUS LOW MAGNIFICATION USE-WEAR RESULTS AND CRITERIA FOR TOOL BLANK SELECTION IN TWO LATE MESOLITHIC QUARTZ ASSEMBLAGES FROM FINLAND

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Abstract

We present the results of the first microwear analysis made on quartz artefacts excavated in Finland. Fifty-nine pieces from two Late Mesolithic sites were analyzed, including both morphological tools and unmodified flakes and flake fragments. Both assemblages have been previously analyzed using a stereomicroscope (Pesonen & Tallavaara 2006, Rankama & Kankaanpää 2011). Our results show that unmodified quartz fragments have been utilized as tools and therefore new tool categories can be found among the material previously treated as production waste. The results also indicate that the reliability of low magnification analysis depends greatly on the level of wear preservation, as well as on tool edge morphology, as obtuse-angled working edges could only be identified as used with high magnifications. Preliminary observations about possible tool blank selection criteria, such as the preference of intact flakes over flake fragments, should be tested with larger and more varied samples.

Keywords: Microwear analysis, vein quartz, Late Mesolithic, Finland

1. Introduction

Due to the idiosyncratic fracturing patterns of vein quartz, the quartz industries of eastern Fennoscandia were long misunderstood (Knutsson 1998; Siiriäinen 1981). While the quartz assemblages are nowadays better comprehended in terms of technology (see Callahan et al. 1992; Driscoll 2011; Tallavaara et al. 2010), formal tools are typically rare in the assemblages (e.g. Manninen & Knutsson 2011), and the use of unmodified flakes and fragments has been demonstrated to be a common trait among quartz-using groups in Sweden. Because of this, microwear analysis is often needed to reconstruct and understand the logic of tool blank production, selection and use (see Knutsson 1988a, 1988b; Knutsson & Knutsson 2009).

In Finland, vein quartz was the most common raw material for tools throughout the Stone Age. Although some recent studies have utilized stereomicroscopy in the analysis of quartz in order to recognize small retouch and possible use-wear (Pesonen & Tallavaara 2006; Rankama 2002; Rankama & Kankaanpää 2011; Tallavaara 2007), high magnifications have not been used in Finland prior to our study. Here, we present the results of the microwear analysis of 38 pieces from Pello Kaaraneskoski and 21 pieces from Lohja Hossanmäki. The sites have been subject to rescue excavations, which covered parts of the settlement areas. At both sites, a number of finds concentrations have been observed and may reflect repeated short-term occupations and/or variability in the activities performed at the sites. The inner chronology of the sites remains somewhat open, but both quartz assemblages have been dated to the Late Mesolithic (Pesonen & Tallavaara 2006; Rankama & Kankaanpää 2011). The purpose of our study was 1) to examine the level of microwear preservation in the two assemblages; 2) to evaluate the relationship between the results of low magnification and high magnification analyses, carried out separately; and 3) to make observations about the possible patterns in tool blank selection at the two sites.

2. Materials and methods

A high power method for the analysis of use-wear on vein quartz artefacts has been developed in Sweden since the 1980s (Knutsson 1988a, 1988b; Knutsson & Knutsson 2009; Knutsson et al. in prep.). Experimental programs devoted to macroscopic wear on quartz tools, on the other hand, have to our knowledge been very rare. A study by Broadbent and Knutsson (1975), focussed on quartz scrapers, has been used as a reference in the stereomicroscope analysis of the Kaaraneskoski material (Rankama & Kankaanpää 2011), whereas the interpretation of the Hossanmäki material (Pesonen & Tallavaara 2006) relies on more general observations made in the context of experiments involving other lithic raw materials. Our interpretations of the wear observed under high (mainly 400×) magnifications are based on the experimental results published by K. Knutsson (1988a) and on the results of a small experimental series produced for the purposes of this study (see Taipale 2012).

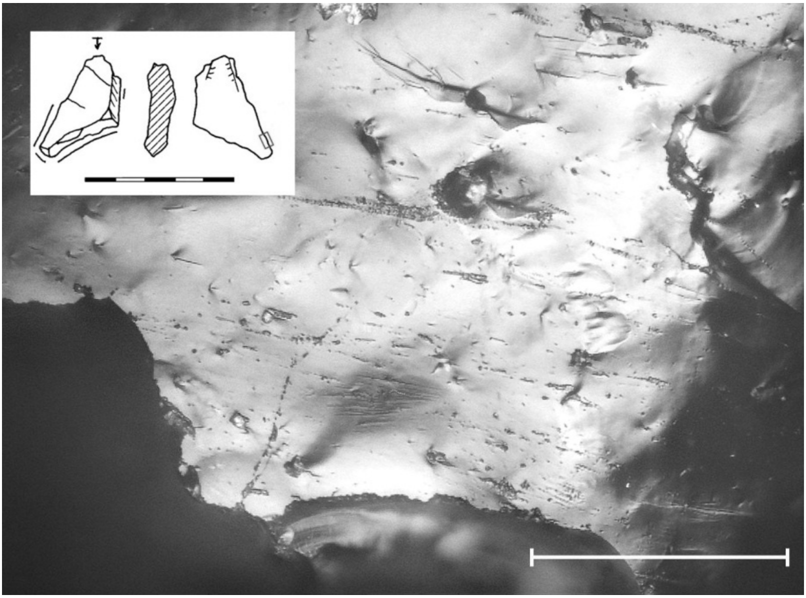

Fig. 1. Wear from sawing on tool NM 31377:642, a flake fragment, from Pello Kaaraneskoski. Discontiuous striations run parallel to the edge line. Magnification 400×, scale bar 100µm.

A clear difference was observed in the level of preservation between the two samples of archaeological tools. This might be partly due to the differences between the soil types at the sites. The silt moraine at Hossanmäki is generally more fine-grained than the sandy soil found at Kaaraneskoski (Pesonen & Tallavaara 2006; Rankama & Kankaanpää 2011), and it is possible that the difference in the grain size of the sediment affects the way the worn surfaces preserve. It seems likely, however, that other factors play a part here as well. Possible differences in the stability of the soil, for instance, cannot be ruled out. Some tool edges in the Kaaraneskoski sample have suffered damage that is visible as rather heavy rounding. Occasionally this rounding appears on edges without linear features that would clearly indicate use, and therefore its connection with prehistoric tool use is ambiguous. Despite these observations, the Kaaraneskoski assemblage also shows evidence of well-preserved microwear (see Figs. 1 and 2). Features like the rounding mentioned above pose challenges for low magnification use-wear analysis.

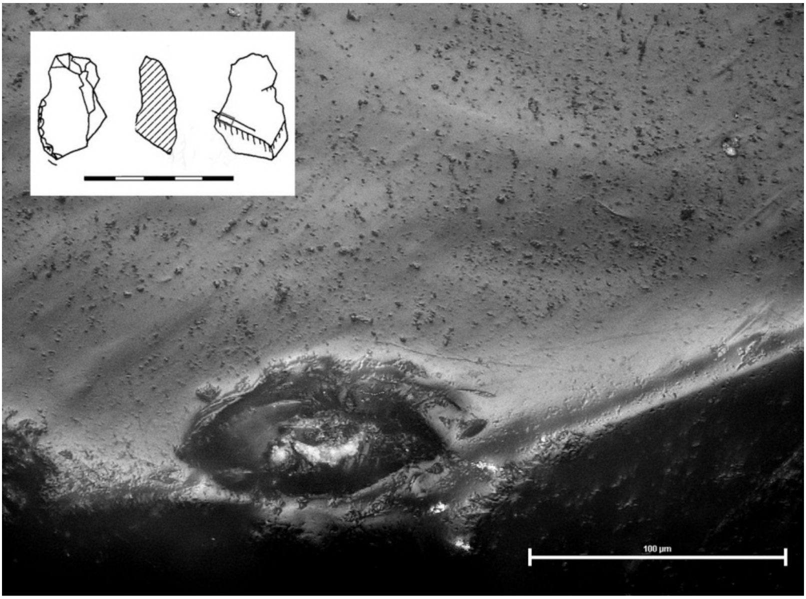

Fig. 2. Wear from planing/scraping on an unmodified, obtuse-angled edge of tool NM 31377:1043 from Kaaraneskoski. The polished surface is covered in numerous impact pits and discontinuous striations, running at slightly varying angles, generally perpendicular to the edge line. Magnification 400×, scale bar 100μm.

3. Results

The Hossanmäki assemblage showed an excellent level of preservation, which probably has an effect on the good agreement between the results of the two analyses in the case of our sample (see Table 2). Tables 1 and 2 show the frequencies of morphological tools and unmodified flakes identified as used during the microwear analysis. Our analysis showed that the correlation between the low magnification and high magnification results depends greatly on the level of postdepositional damage on tool edges. The amount and quality of this damage cannot be evaluated without examining the tools with magnifications of 200-400×. Low magnification analysis, though showing promising results especially in the case of the Hossanmäki sample, is further complicated by the fact that fractures occur frequently on quartz tool edges, and it is not easy to separate those originating from tool use from those caused by retouch or later damage.

PELLO KAARANESKOSKI	Number of used pieces	Number of analysed pieces
Tools with secondary modification	7	20
Tools with edge rounding or crushing	3	4
Flakes and flake fragments	3	14
Total	**13**	**38**

Table 1. The number of pieces with clearly identifiable use-wear observed under magnifications of 200–400×. Groups represent the categories from the earlier analysis (Rankama & Kankaanpää 2011) using magnifications of 24× or less. On several retouched pieces, wear in the form of edge rounding and crushing was registered during the initial stereomicroscope analysis, but it could not always be connected to tool use and is interpreted as being partly caused by postdepositional processes.

LOHJA HOSSANMÄKI	Number of used pieces	Number of analysed pieces
Tools with secondary modification	6	8
Tools with edge rounding or crushing	6	7
Flakes and flake fragments	3	6
Total	**15**	**21**

Table 2. The number of pieces with clearly identifiable use-wear observed under magnifications of 200–400×. Groups represent the categories from the earlier analysis (Pesonen & Tallavaaara 2006) using magnifications of 24× or less. The use-wear was well-preserved on these pieces, which is also reflected in the agreement between the two methods.

Also, a trait common to both samples was the evident utilization of right- or obtuse-angled edges for different tasks such as sawing, planing and scraping (Figs. 2 and 3). Typically, the edges identified as used under a stereomicroscope in the Hossanmäki sample are rather sharp and thin. In both assemblages, the low-power method failed to identify the obtuse-angled tool edges as used, probably due to their resistance to severe rounding and crushing. Therefore, it can be suspected that tools with thin edges are overrepresented in assemblages that have been analyzed with low magnifications, while obtuse-angled edges suitable for planing, scraping or sawing remain undetected. This observation further underlines the potential value of microwear analysis in future studies dedicated to observing cultural and behavioural patterns in the use of quartz in the area of present-day Finland.

When quartz is knapped, flakes fragment more easily than is the case with most lithic raw materials. Because of this, fragments with different shapes and edge qualities are found in assemblages together with intact flakes (Callahan et al. 1992). It has sometimes been suggested that certain fragment types might have been preferred for certain tool types (e.g. Rankama 2002). While no clear connection between fragment types and specific tasks was observed in our study, both the samples show a preference of intact flakes over flake fragments. These pieces often possess a sharp edge suitable for, e.g., cutting or whittling, and at least at Hossanmäki, they have also served as scraper blanks.

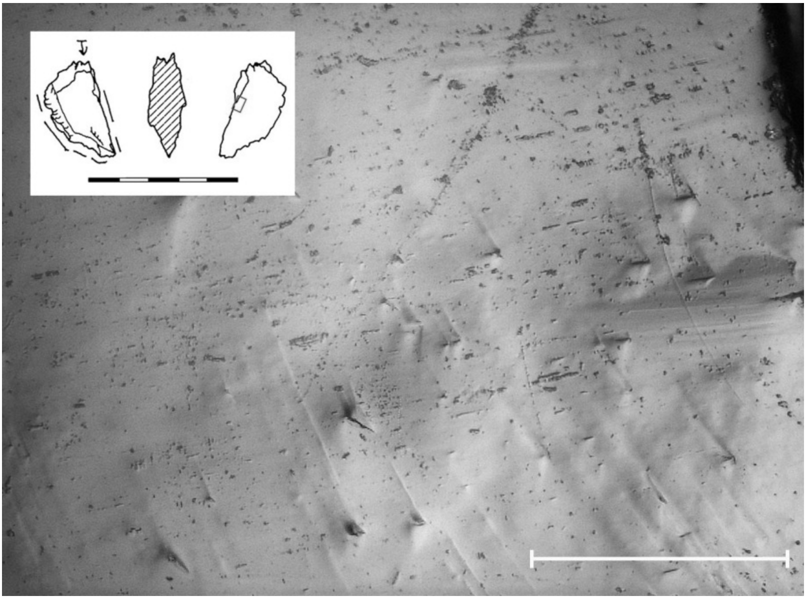

Fig. 3. Wear from sawing on an obtuse-angled edge of tool NM 34856:104, a flake fragment, from Lohja Hossanmäki. Very parallel discontinuous and straight-sided striations cover the surface. The edge rim is located below the picture and runs parallel to the striations. Magnification 400×, scale bar 100µm.

4. Discussion

The samples for this study were chosen primarily on the basis of the earlier macrowear results (Pesonen & Tallavaara 2006; Rankama & Kankaanpää 2011) in order to assess the feasibility of the method in the study of quartz tools. As said, this method may recognize certain tool categories such as sharp cutting edges more readily than others, and our samples do not therefore necessarily reflect the overall variation in tool blank morphology. Therefore, results presented here remain suggestive and should be tested against larger samples picked in a different manner. In the case of the Kaaraneskoski sample, the large portion of secondarily modified tools among the used pieces (five out of 13) further complicates the evaluation of the relationship between the fragment types and use, since retouch prevents the recognition of the types of fragments that have served as blanks for these five tools. When they are excluded, the second largest category (three pieces), are intact flakes. While the dominance of intact flakes seemed clearer among the used pieces from Hossanmäki, it was not found statistically significant in the small sample (see Taipale 2012) and should also be tested further.

Some differences were observed between the groups of used pieces from the two sites. For instance, the use of multiple edges was more common in the Hossanmäki sample than in the Kaaraneskoski sample. Among the Kaaraneskoski tools, the amount of retouch seems to correlate with the amount of wear, whereas no such connection was observed in the Hossanmäki sample. In the case of the latter, unmodified pieces also exhibited strong wear. These observations would be worth investigating further, especially with respect to the spatial distribution of the artefacts, since both the sites can be interpreted as the remains of several occupations that have occurred over a period of time (Pesonen & Tallavaara 2006; Rankama & Kankaanpää 2011).

Despite the observed differences, there are also similarities between the samples. Our study clearly demonstrates that the use of unmodified quartz flakes and fragments has been part of the strategies used by the groups visiting Kaaraneskoski and Hossanmäki. Another trait common to both the samples is the selection of sturdy, straight natural edges with angles close to 90° for different tasks such as sawing or planing. These are exactly the type of edges that commonly appear on quartz flake fragments and are not easily recognized as used in low magnification analysis. Both these observations have implications for future quartz studies in Finland, and underline the importance of integrating microwear analysis with other analytical methods.

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