

*International Conference
on
Use-Wear Analysis*

USE-WEAR 2012

Edited by

*João Marreiros,
Nuno Bicho and
Juan F. Gibaja*



International
Conference
on Use-Wear
Analysis

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TABLE OF CONTENTS

Introduction	xiv
--------------------	-----

Part I: Methods

Chapter One.....	2
------------------	---

A Specialized Occupation Despite Appearances. Function of the Buhot
Late Glacial Site (Calleville, North-western France)

Jérémie Jacquier

Chapter Two.....	13
------------------	----

Use-Wear Characterization through Confocal Laser Microscopy:
The Case of Wild vs Domestic Cereal Harvesting Polish

J.J. Ibáñez, J.E. González-Urquijo and J. Gibaja

Chapter Three.....	24
--------------------	----

Glossy Tools: Innovations in the Method of Interpretation of Use-Wear
Produced by Plant Processing

Davide d'Errico

Chapter Four.....	35
-------------------	----

Turning the Wheel on Lithic Functionality

Telmo Pereira, Rui Martins and João Marreiros

Chapter Five.....	45
-------------------	----

Experimental Program for the Detection of Use Wear on Quartzite

Victoria Aranda, Antoni Canals and Andreu Ollé

Chapter Six.....	56
------------------	----

Micro-residues on Stone Tools: Morphological Analysis, Interpretation
and Challenges

H.J. Geeske Langejans and Marlize Lombard

Chapter Seven.....	66
--------------------	----

Management of Heated Bladelets in the Southern Chassey Culture:
Use-Wear Analysis and Efficiency Test

Loïc Torchy

Chapter Eight.....	80
Ornaments and Use-Wear Analysis, Methods of Study Applied to the Adaïma Necropolises Mathilde Minotti	
Chapter Nine.....	90
“Cereal polish”: Diagnosis, Challenge or Confusion Maria Gurova	
Chapter Ten	103
Ten Years of Use-Wear Analysis of Early Neolithic Macrolithic Tools from North-Western Europe: Limits and Contribution Caroline Hamon	
Chapter Eleven	116
The Effects of Cleaning on Surface Roughness: Evaluating Sample Preparation Using Use-Wear Quantification Danielle Macdonald and Adrian Evans	
Chapter Twelve	124
Use-Wear Analysis on Quartz and Quartzite Tools Methodology and Application: Coudoulous I (Midi-Pyrénées, France) Flavia Venitti	
Part II: Hunter-Gatherers	
Chapter Thirteen.....	140
New Functional Data concerning Middle Palaeolithic Bifaces from Southwestern and Northern France Emilie Claud	
Chapter Fourteen	152
Use of Middle Palaeolithic Tools in San Quirce (Alar del Rey, Palencia, Spain) Ignacio Clemente-Conte, J. Carlos Díez Fernández-Lomana and Marcos Terradillos Bernal	
Chapter Fifteen.....	162
Flint Workshop or Habitat? Technological and Functional Approaches towards the Interpretation of Site Function in Bergerac Region Early Aurignacian Joseba Rios-Garaizar and Iluminada Ortega Cordellat	

Chapter Sixteen	173
The Camp of Upper Palaeolithic Hunters in Targowisko 10 (S Poland)	
Bernadeta Kufel-Diakowska and Jarosław Wilczyński	
Chapter Seventeen	183
The Contribution of Traceology and Lithic Technology in the Study of the Socio-economic Capsian of SHM-1 (Hergla, Tunisia)	
Rym Khedhaier El Asmi, Simone Mulazzani and Lotfi Belhouchet	
Chapter Eighteen	198
Typology versus Function: Technological and Microwear Study of Points from a Federmesser Site at Lubrza (Western Poland)	
Jacek Kabaciński, Iwona Sobkowiak-Tabaka and Małgorzata Winiarska-Kabacińska	
Chapter Nineteen	213
Use-Wear Analysis of a Set of Geometric Projectils from the Mesolithic Context of Cocina Cave (Eastern Spain)	
Oreto García Puchol, Niccolò Mazzucco, Juan F. Gibaja Bao and Joaquim Juan Cabanilles	
Chapter Twenty	224
Late Mesolithic Notched Blades from Western Europe and North Africa: Technological and Functional Variability	
Bernard Gassin, Juan Francisco Gibaja, Pierre Allard, Toomai Boucherat, Émilie Claud, Ignacio Clemente, Colas Gueret, Jérémie Jacquier, Rym Khedhaier, Grégor Marchand, Niccolò Mazzucco, Antoni Palomo, Unai Perales, Thomas Perrin, Sylvie Philibert, Amelia Rodríguez and Loïc Torchy	
Chapter Twenty One	232
Experimentation and Functional Analysis of the Backed Point Tools from the Castello's Shelter at Termini Imerese (PA, Italy) Preserved from the Museo delle Origini (Rome)	
Stefano Drudi	
Chapter Twenty Two	241
Functional Analysis of a Magdalenian Site from the Spanish Northern Meseta: A Case Study of Endscrapers from La Peña de Estebanvela (Ayllón, Segovia)	
Ignacio Martín Lerma and Carmen Cacho Quesada	

Chapter Twenty Three	256
The Proto-Aurignacian “Knives” of the Riparo Mochi (Balzi Rossi, Italy)	
Stefano Grimaldi	
Chapter Twenty Four.....	270
A Microwear Analysis of Handaxes from Santa Ana Cave (Cáceres, Extremadura, Spain)	
Andreu Ollé, Josep Maria Vergès, Luna Peña, Victoria Aranda, Antoni Canal and Eudald Carbonell	
Chapter Twenty Five	279
Stone Tool Hafting in the Middle Palaeolithic as Viewed through the Microscope	
Veerle Rots	
Chapter Twenty Six.....	294
Lithic Technology and Tool Use in the North American Archaic: Bridging Technologies, Plants, and Animals	
April K. Sievert and Melody K. Pope	
Chapter Twenty Seven.....	302
Lithic Use-Wear Analysis from the Early Gravettian of Vale Boi (Southwestern Iberia)	
João Marreiros, Juan Gibaja and Nuno Bicho	
Chapter Twenty Eight.....	321
Integrated Functional Studies of Badegoulian Lithic Industry: Preliminary Results of Le Péhau (Coimères, France)	
Amaranta Pasquini, Gilles Monin and Paul Fernandes	
Chapter Twenty Nine	331
Human Occupation of the High-Mountain Environments: The Contribution of Microwear Analysis to the Study of the Cova del Sardo Site (Spanish Pyrenees)	
Niccolò Mazzucco, Ignacio Clemente and Ermengol Gassiot	
Chapter Thirty	342
Wood Technology of Patagonian Hunter-Gatherers: A Use-Wear Analysis Study from the Site of Cerro Casa de Piedra 7 (Patagonia, Argentina)	
Laura Caruso Fermé, Ignacio Clemente, Sylvie Beyries and Maria Teresa Civalero	

Chapter Thirty One.....	352
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 Noora Taipale, Kjell Knutsson and Helena Knutsson	
Chapter Thirty Two.....	362
A Consideration of Burin-Blow Function: Use-Wear Analysis of Kamiyama-Type Burin from the Sugikubo Blade Assemblage in North-Central Japan Akira Iwase	
Chapter Thirty Three.....	375
The Two Faces of Resharpener: Management and Use of Resharpener Flakes in the Middle Paleolithic at Cueva Morín Talía Lazuén	
Chapter Thirty Four.....	389
Looking for the Use and Function of Prismatic Tools in the Mesolithic of the Paris Basin (France): First Results and Interpretations Caroline Hamon and Sylvain Grisélin	
Chapter Thirty Five.....	398
Semi-product, Waste, Tool... Are We Sure? Functional Aspect of Stone Age Morphological Flint Tools Grzegorz Osipowicz	
Chapter Thirty Six.....	430
The History of One Arrowhead from a Peat Bog Site in Central Russia (Technological and Use-Wear Studies) Natalia Skakun Mikhail Zhilin Vera Terekhina	
Part III: Projectile Technology	
Chapter Thirty Seven.....	442
The Functionality of Palmela Points as Throwing Weapons and Projectiles: Use-Wear Marks Carmen Gutiérrez Sáez, Ignacio Martín Lerma and Alba López del Estal Charles Bashore Acero	

Chapter Thirty Eight.....	457
Arrowheads without Traces: Not Used, Perfect Hit or Excessive Hafting Material?	
Yvonne Lammers-Keijsers, Annemieke Verbaas, Annelou van Gijn and Diederik Pomstra	
Chapter Thirty Nine.....	466
Projectile Experimentation for Identifying Hunting Methods with Replicas of Upper Palaeolithic Weaponry from Japan	
Katsuhiko Sano and Masayoshi Oba	
Chapter Forty.....	479
Possibilities of Identifying Transportation and Use-Wear Traces of Mesolithic Microliths from the Polish Plain	
Katarzyna Pyżewicz and Witold Gruzdź	
Chapter Forty One.....	488
Use and Maintenance of Leaf-Shaped Points in the Late Upper Paleolithic in the Japanese Islands	
Takuya Yamaoka	
Chapter Forty Two.....	500
Projectiles from the Last Paleolithic Hunter-Gatherers in the Eastern Cantabrian Region: Azilian Backed Points at the Site of Santa Catalina	
Jesús González-Urquijo, Juan José Ibáñez and Eduardo Berganza	
Part IV: Bone Technology	
Chapter Forty Three.....	512
Two Experimental Programs to Study the Bone Tools from the Middle Paleolithic Hunter-Gatherers	
Millán Mozota	
Chapter Forty Four.....	521
All the Same, All Different! Mesolithic and Neolithic “45° Bevelled Bone Tools” from Zamostje 2 (Moscow, Russia)	
Yolaine Maigrot, Ignacio Clemente Conte, Evgeny Gyria, Olga Lozovskaya and Vladimir Lozovski	

Chapter Forty Five.....	531
Recovering the Oldest Bone Tool Assemblage from Low Paraná Wetland Natacha Buc	
Chapter Forty Six	539
Traces on Mesolithic Bone Spatulas: Signs of a Hidden Craft or Post-Excavation Damage? Sara Graziano	
Chapter Forty Seven.....	551
Bone Tools Use-Wear in an Early Formative Pastoralist Site of Northern Chile: Weaving and Piercing at the Dawn of Herds Boris Santander	
Chapter Forty Eight.....	561
Atypical Use of Bone Objects of Known Forms from Some East European Upper Paleolithic Sites Natalia B. Akhmetgaleeva	
Part V: From the Neolithic to the Iron Age	
Chapter Forty Nine.....	572
Investigating Neolithic Activities: The Contribution of Functional Analysis to the Reconstruction of Settlements' Economy in Central- Southern Italy Cristiana Petrinelli Pannocchia	
Chapter Fifty.....	584
The Use of Flint Artifacts from Early Neolithic Levels at Atxoste (Basque Country): An Interpretation of Site Function through Use-Wear Analyses Unai Perales Barrón, Juan José Ibáñez Estévez and Alfonso Alday Ruiz	
Chapter Fifty One	597
Use-Wear Analysis of Chipped Stone Assemblages from Neolithic Burial Caves in Portuguese Estremadura: The Case of Bom Santo (Lisbon) Juan Francisco Gibaja and António Faustino Carvalho	
Chapter Fifty Two	607
Comparative Analysis of Shell Tools from Two Neolithic Sites in NE Iberia: La Draga and Serra del Mas Bonet (Girona) I. Clemente-Conte, D. Cuenca-Solana, M. Oiva-Poveda, R. Rosillo-Turrá and A. Palomo-Pérez	

Chapter Fifty Three	619
Investigating Pottery Technological Patterns through Macrowear Analysis: The Chalcolithic Village of Maccarese-Fiumicino (Italy) Vanessa Forte	
Chapter Fifty Four	630
Experimental Approach to Use-Wear Damage on Limestone Tools Comparing with Flint Tools Laura Hortelano Piqueras and Paula Jardón Giner	
Chapter Fifty Five.....	642
Use-Wear Analysis of Early Neolithic Lithic Industry of Peiro Signado: A Pioneer Implantation in South of France Sylvie Philibert, François Briois and Claire Manen	
Chapter Fifty Six	652
A Neolithic Sickle Haft from Costamar (Castellón, Spain) Juan F. Gibaja, Juan José Ibáñez, Enric Flors and Oreto García	
Chapter Fifty Seven.....	660
The Perforation of Pottery using Seashells: An Experimental Approach Renaud Gosselin	
Chapter Fifty Eight.....	672
Beyond Chaves: Functional Analysis of Neolithic Blades from the Ebro Valley Rafael Domingo Martínez	
Chapter Fifty Nine.....	682
Lithic Functional Studies in Ireland: A Case Study from Early Neolithic Rectangular Timber Houses Sol. Mallía-Guest	
Chapter Sixty.....	693
The Materiality of Funnelbeaker Burial Practices: Evidence from the Microscope Annelou Van Gijn	
Chapter Sixty One	702
Funerary Adornments: Objects Belonging to the Living or to the Dead? A Few Examples from the Romanian Eneolithic Monica Margarit	

Chapter Sixty Two.....	714
Associating Residues and Wear Traces as Indicators of Hafting Methods: A View from the Chipped Stone Industries from the Island of Gavdos, Crete	
Eleni Chriazomenou, Christina Papoulia and Katerina Kopaka	
Chapter Sixty Three.....	727
Raw Material Selection for Pounding and Grain Processing in the Single Grave Culture of the Netherlands: The Site of Mienakker	
Virginia Garcia-Diaz	
Chapter Sixty Four	736
What are Prehistoric Tools with Very Rounded Edges Doing in Iron Age Storage Pits?	
Renaud Gosselin	
Chapter Sixty Five.....	745
Flint Blade Use-Wear in Late Neolithic/Chalcolithic Collective Burials: Data from Pastora Cave (Eastern Spain)	
Oreto García Puchol, Juan Francisco Gibaja Bao, Joaquim Juan Cabanilles and Sarah B. McClure	
Chapter Sixty Six.....	757
Technology and Function of the Chalcolithic Dagger from Cabezos Viejos (Archena, Murcia, Spain)	
C. Gutiérrez Sáez, I. Martín Lerma, J.A. Marín de Espinosa and J. Lomba Maurandi	
Chapter Sixty Seven	764
First Results on Use-Wear Analysis over Several Early Neolithic Contexts from Northwest Africa	
Amelia Rodríguez-Rodríguez, Jörg Linstädter, Juan F. Gibaja, Manuel Rojo, Ines Medved, Rafael Garrido, Antoni Palomo, Antonio F. Carvalho, Iñigo García and Cristina Tejedor	
Contributors.....	772

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 Kaaranekoski 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 \times) 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).

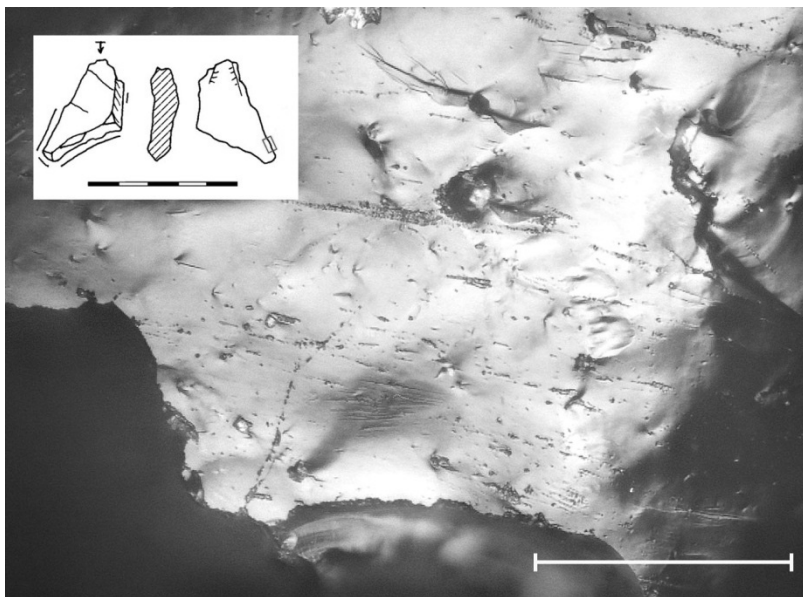


Fig. 1. Wear from sawing on tool NM 31377:642, a flake fragment, from Pello Kaaraneskoski. Discontinuous striations run parallel to the edge line. Magnification 400 \times , scale bar 100 μ m.

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.

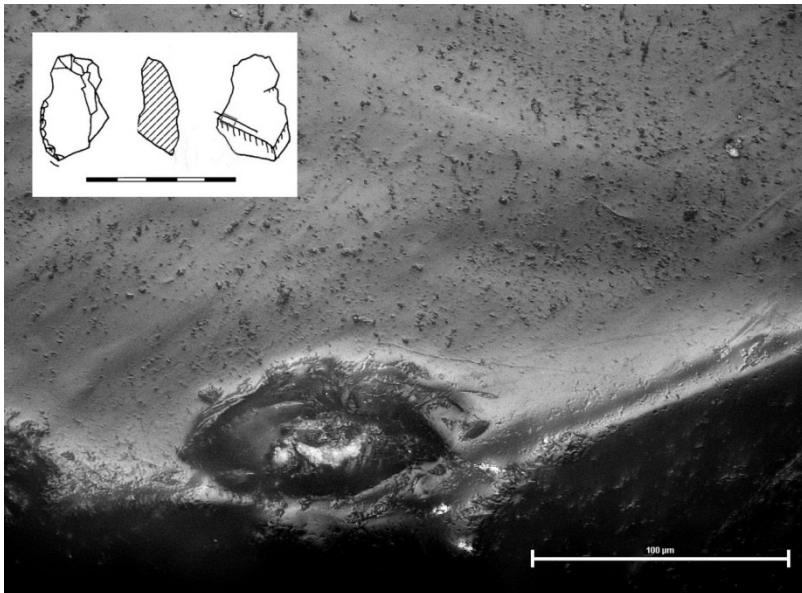


Fig. 2. Wear from planing/scraping on an unmodified, obtuse-angled edge of tool NM 31377:1043 from Kaaraneskoski. The polished surface is covered in numerous impact pits and discontinuous striations, running at slightly varying angles, generally perpendicular to the edge line. Magnification 400 \times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

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 & Tallavaara 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.

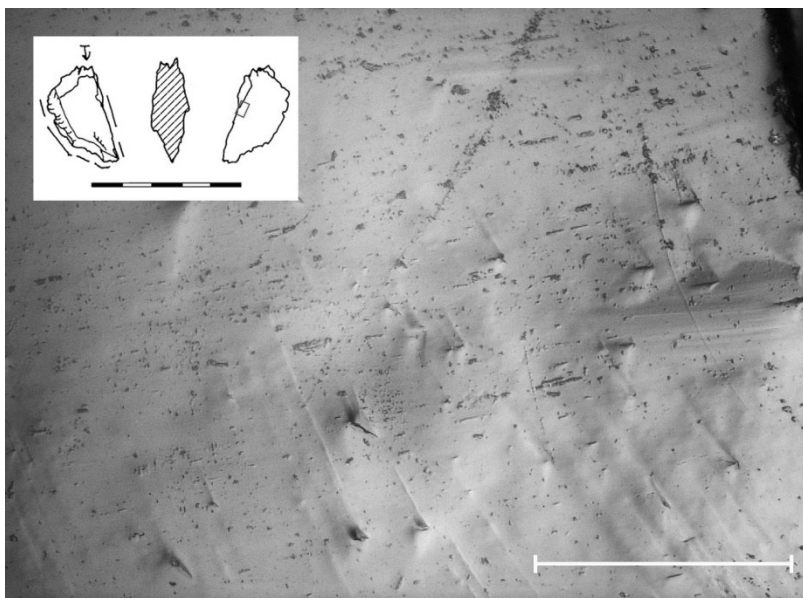


Fig. 3. Wear from sawing on an obtuse-angled edge of tool NM 34856:104, a flake fragment, from Lohja Hossanmäki. Very parallel discontinuous and straight-sided striations cover the surface. The edge rim is located below the picture and runs parallel to the striations. Magnification 400 \times , scale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

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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