



Article

Alpine raw materials and the production and use of scrapers at the Swiss Late Mesolithic site of Arconciel/La Souche

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Key words

- Late Mesolithic
- Arconciel/La Souche
- Switzerland
- scrapers
- lithic technology
- use wear analysis

Parole chiave

- Mesolitico recente
- Arconciel/La Souche
- Svizzera
- grattatoi
- analisi tecnologica
- analisi delle tracce d'uso

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Summary

The well stratified rock shelter site of Arconciel/La Souche, Switzerland was repeatedly occupied between 7100 and 4900 cal BC. It lies in the Sarine river valley at the foot of the Prealps. This paper presents the first preliminary results of the study of the scrapers from this site. Of the chipped stone tool categories, scrapers are the most numerous found at Arconciel/La Souche. A combined technological and microscopic use wear study of the scrapers from three assemblages (*ensemble* 3, 4 and 5) has allowed us to examine the use and production of scrapers as well as how production and use relate to the various raw materials utilised at Arconciel/La Souche. We were able to show that although scraper morphology remained stable over time, there was a significant change in the relationship between raw materials and scraper production as well as the use of scrapers.

This research will be expanded to include other assemblages and chipped stone artefact categories from Arconciel/La Souche, but has already provided important new insights into artefact use-life in the still relatively poorly understood millennium leading up to the end of the Mesolithic on the Swiss Plateau and the nearby Prealps.

Riassunto

Il sito d'Arconciel/La Souche (Svizzera) è un riparo mesolitico scavatosi naturalmente nelle gole della valle della Sarine, ai piedi delle Prealpi. Un'importante stratigrafia attesta la presenza continua dell'uomo che, tra il 7100 e il 4900 a.C., ha soggiornato nel rifugio sotto roccia. Il presente lavoro illustra i risultati preliminari dello studio sui grattatoi, utensili dominanti nel panorama degli strumenti litici scoperti nel sito d'Arconciel/La Souche. Le ricerche portano su tre orizzonti stratigrafici (insiemi 3, 4 e 5). Il nostro approccio, che riunisce dei metodi di analisi tecnologica e di analisi delle tracce d'uso, s'interessa particolarmente a come le differenti materie prime presenti sul sito sono state utilizzate per i processi produttivi dei grattatoi, per la loro lavorazione e per il loro impiego. Abbiamo potuto constatare che, se da una parte le morfologie generali dei grattatoi restano stabili, dall'altra l'utilizzo delle materie prime evolve nel tempo.

Questa ricerca, ancora in corso, fornisce già sin d'ora alcune interessanti ipotesi che saranno da confermare o da invalidare con il proseguimento dello studio su altre categorie di reperti litici del sito d'Arconciel/La Souche. I risultati ci permetteranno di conoscere meglio la fine del Mesolitico a nord delle Alpi svizzere.

Redazione: Giampaolo Dalmeri

pdf: http://www.muse.it/it/Editoria-Muse/Preistoria-Alpina/Pagine/PA/PA_48-2016.aspx

Introduction

The lithic industry from the rock-shelter Arconciel/La Souche is analysed as part of an ongoing research project regarding the end of the Mesolithic in Switzerland. We present the first and preliminary results of a combined technological and micro wear study of scrapers from the site. At 48 %, scrapers are the most numerous tool category of the chipped stone artefact assemblage. Our main focus concerns how both local and imported raw materials relate to the production and use of scrapers and to the scrapers collectively as a tool category rather than as single artefacts. The well-stratified multi-phased site of Arconciel/La Souche provides a rare opportunity to gain insights into the economic, social and technological processes at the end of the Mesolithic on the Swiss Plateau and in the nearby Prealps.

Arconciel/La Souche and the Mesolithic of the Swiss northern Prealps and the Swiss Plateau

The Mesolithic-Neolithic transition of the perialpine areas of Switzerland and its immediate surroundings has - in comparison to other regions of Europe - seen very little attention during the past decades. This is mostly due to a relative lack of well-stratified and well-dated late Mesolithic sites and an apparent absence of identified archaeological sites in much of Switzerland during the 6th millennium BC.



Fig. 1 - Arconciel/La Souche, August 2012. M. Cornelissen / Arconciel/La Souche, Agosto 2012. M. Cornelissen.

Many Mesolithic sites on the Swiss Plateau were excavated earlier in the twentieth century and are often either not well stratified or not well dated. Other more recently excavated sites, such as Cha-teau d'Œx and Oberriet-Unterkobel (Schindler and Wegmüller 2013; Crotti and Pignat 1993) await full publication. Possible exceptions are a number of recently excavated alpine sites such as Bregaglia/Val Forno-Plan Canin, Hospental-Moos and Alterswil/Flue (Cornelissen *et al.* 2013, Auf der Maur and Cornelissen 2013, Mauvilly, Kramer and Arbogast 2011). Although they provide insights into the occupation and the nature of use of these alpine regions, their often small chipped stone assemblages and poor bone preservation seldom allow for significant advances in our understanding of the nature of the occupation of these sites or of the production and use of lithic artefacts during the Mesolithic.

The well-stratified Mesolithic site of Arconciel/La Souche (Fig. 1, 2), excavated between 2003 and 2012, is providing new data and has the potential to greatly increase our understanding of the Mesolithic on the Swiss-Plateau and the social, economic and technological processes taking place during the Late Mesolithic (Perrin *et al.* 2009).

Arconciel/La Souche is located 7 km south of the city of Fribourg at the foot of the Prealps (Fig. 3). The Sarine gorge in which it is situated is of postglacial origin. Between the Late Glacial Maximum and the first recorded occupation of the site at around 7100 cal BC most of the valley and the rock shelter were cut out of the Miocene Molasse by the Sarine river. The rock shelter is ca. 50 m long - of which 16 m were entirely or partly excavated - and 5 m deep (Brillard and Mauvilly 2008).

Up to three meters of stratigraphy dating from 7100 to 4900 cal BC was excavated by the Service Archéologique de l'Etat de Fribourg (SAEF). The site was excavated as a fieldschool in collaboration with the universities of Berne, Neuchâtel, Fribourg and Basel under supervision of Michel Mauvilly (SAEF). Initial analysis show the stratigraphical sequence to consist of six main occupational phases (*ensembles* 1-6, from young to old). These are, often, separated by roof collapse events or natural sedimentation. Some 20 radiocarbon dates enable the excavators to date most of the occupational sequence (Mauvilly *et al.* 2013).

This paper includes the chipped stone artefacts from the 2003 - 2011 campaigns. It consists of a total of 21,402 artefacts (Fig. 4 and 5). The cataloguing of the lithic industry from 2012 is still in progress. With a total number of 773 out of 1,197 tools (2003 - 2011) scrapers are exceptionally numerous at Arconciel/La Souche.

After the lithic industry, faunal remains are the second most abundant finds category at Arconciel/La Souche. They represent wild species and also include some fish remains. Antler and bone artefacts include deer teeth pendants, perforated *Columbella rustica*, a scraper fashioned from a wild boar canine, bone points and awls as well as two antler harpoons (Mauvilly *et al.* 2008a, Mauvilly *et al.* 2013). Three ceramic objects were found at Arconciel/La Souche. Two small pottery sherds were recovered from the bottom of structure 32a, stratigraphically part of *ensemble* 2 (5200 - 4900 cal BC) (Mauvilly *in press*) and a further burnt clay object was recovered from *ensemble* 4, dating to the end of the 7th millennium BC. The excavators have compared this to similar objects, so-called clay stamps or pintadera, known from southeast Europe (Mauvilly *et al.* 2008b).

Modern excavation methods, a well-dated stratigraphy, together with the wide spectrum of finds categories, including botanical and zoological material, make Arconciel/La Souche a site with great potential to increase our understanding of the social, economic and technical processes leading up to the Neolithisation in Perialpine Central Europe.

Methodology

This paper discusses scraper artefact biographies, including the technological processes of production and artefact use leading up to

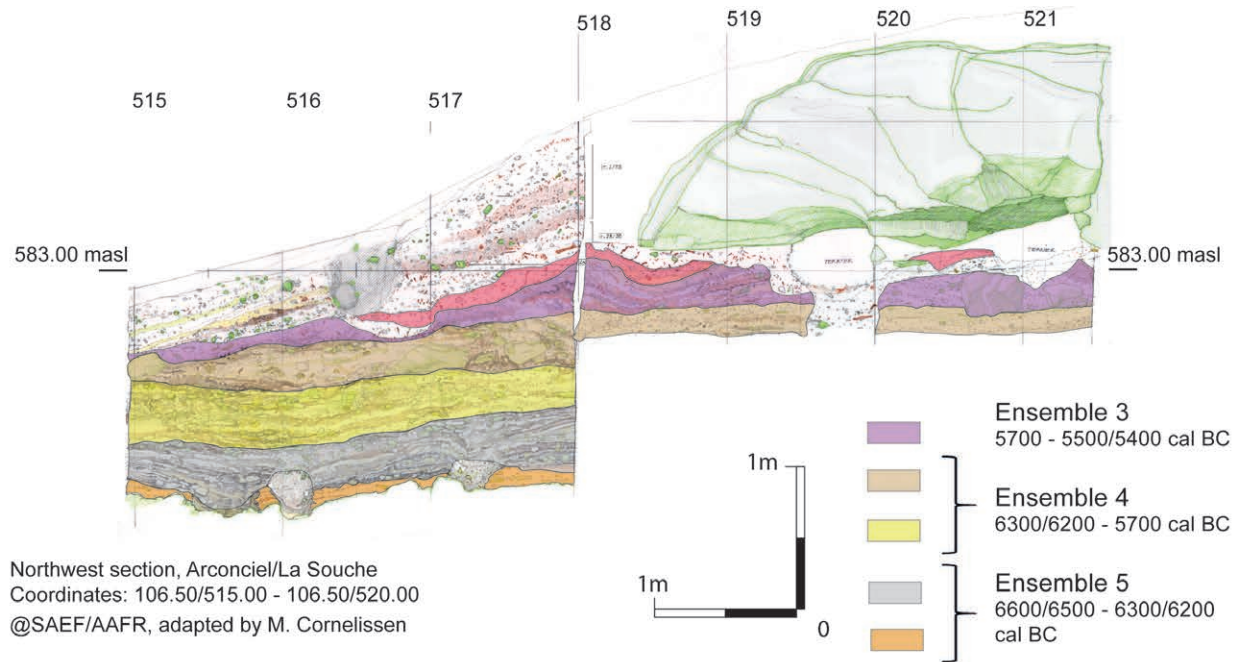


Fig. 2 - Section Arconciel/La Souche showing the stratigraphic location of ensemble 3, 4 and 5. SAEF/AEFR, adapted by M. Cornelissen / Profilo d'Arconciel/La Souche rappresentante la posizione stratigrafica degli insiemi 3, 4 e 5. SAEF/AEFR, adattato da M. Cornelissen.

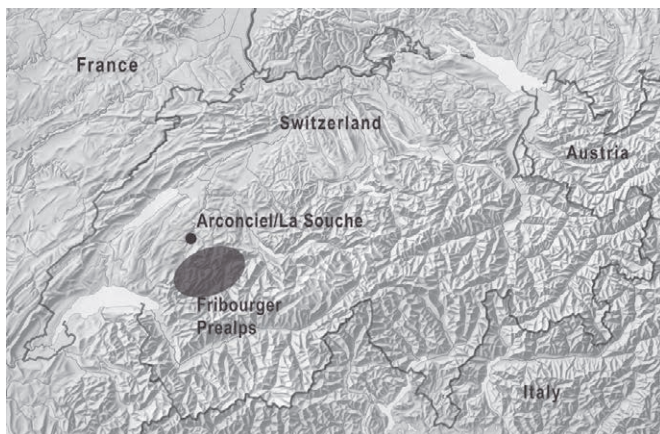


Fig. 3 - Arconciel/La Souche and the Fribourg Prealps. M. Cornelissen / Il riparo sotto roccia d'Arconciel/La Souche, ai piedi delle Prealpi svizzere. M. Cornelissen.

and during the process of Neolithisation. Combining technical and microscopic use wear analysis of the lithic artefacts from Arconciel/La Souche allows us to study the entire use-life of single artefacts as well as that of their assemblages; the complex and dynamic patterns of production, use and discard during the Mesolithic on the Swiss Plateau and in the Prealps.

3.1 Sampling

The unusually high proportion of scrapers at Arconciel/La Souche in comparison to other tool categories led us to concentrate on this tool category. We define scrapers as unilaterally retouched artefacts, often, but not exclusively, retouched at the frontal or basal ends. These ends often correspond with the distal or proximal end. The term scraper often carries use-related associations (Shott and Scott 1995). We use this term to maintain consistency, reject, however, such a-priori assumed functional associations. The present study concerns the scrapers of three assemblages - *ensembles* 3, 4 and 5 - from the middle of the stratigraphical sequence at Arconciel/La Souche. These *ensembles* represent the richest occupational phases, dating between 6600 and 5400 cal BC.

	Radiolarite		Local Flint		Fine-grained quartzite		Flint		Other raw materials		Total
Scrapers ensemble 3	72	37.5%	30	15.6%	22	11.5%	68	35.4%	0	0	192
Total 2003-2011 ens. 3	926	36.4%	494	19.4%	759	29.8%	198	7.8%	170	6.7%	2547
Scrapers ensemble 4	149	56.7%	53	20.2%	31	11.8%	29	11.0%	1	0.4%	263
Total 2003-2011 ens. 4	3217	41.1%	1653	21.1%	2144	27.4%	333	4.3%	482	6.2%	7829
Scrapers ensemble 5	174	54.7%	93	29.2%	7	2.2%	44	13.8%	0	0	318
Total 2003-2011 ens. 5	316	40.5%	258	33.1%	90	11.5%	85	10.9%	31	4.0%	780

Fig. 4 - Raw materials used for scrapers and the entire artefact collection at Arconciel/La Souche, ensemble ensembles 3, 4 and 5. L. Bassin (preliminary results) / Totale dei grattatoi e dei reperti litici d'Arconciel/La Souche suddivisi per materie prime e secondo gli orizzonti 3, 4 e 5 (risultati preliminari). L. Bassin.

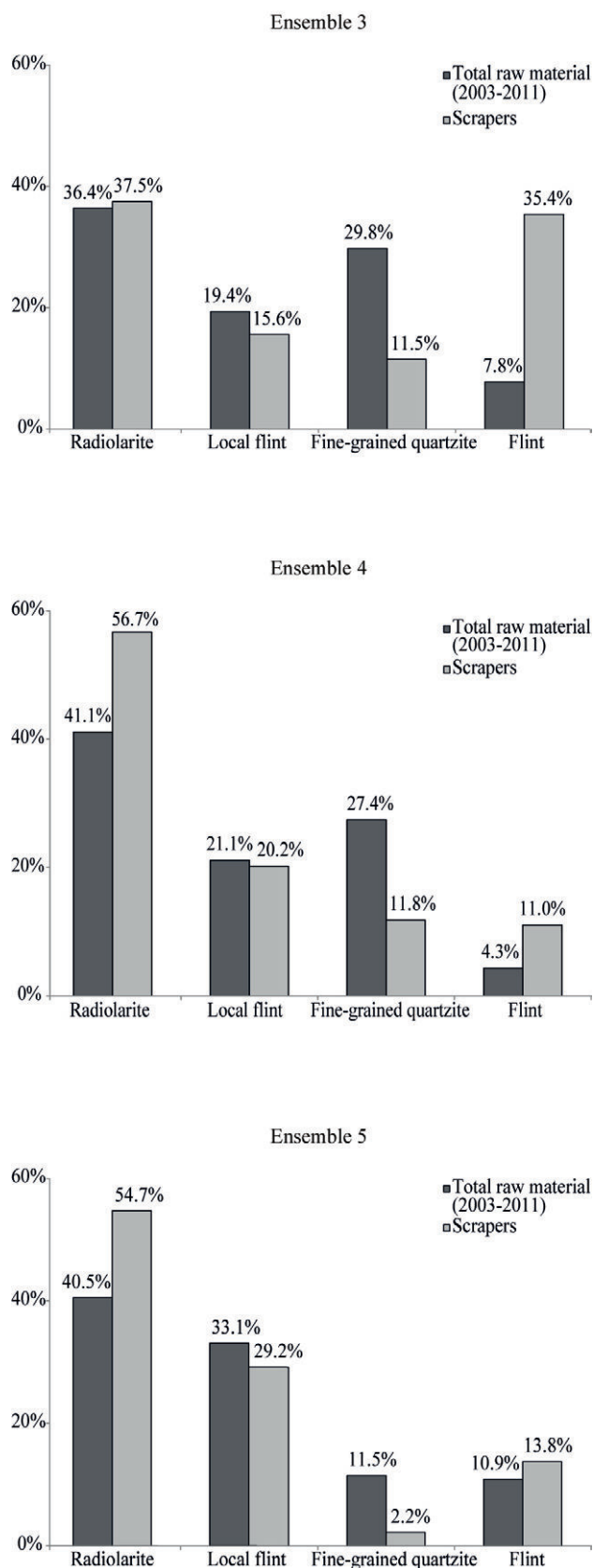


Fig. 5 - Proportion of raw material used at Arconciel/La Souche for the entire chipped stone collection and for the production of scrapers of ensembles 3, 4 and 5 (temporary results). L. Bassin / Proporzioe totale, per gli orizzonti 3, 4 e 5, delle materie prime ritrovate sul sito e delle materie prime ritoccate in grattatoi (risultati preliminari). L. Bassin.

The oldest of the three, *ensemble 5* (6600/6500-6300/6200 cal BC) represents the phase with the most frequent occupation. *Ensemble 4* (6300/6200-5700 cal BC) is a phase with a similarly regular occupation, while *ensemble 3* (5700-5500/5400 cal BC) is the result of a somewhat less frequent occupation. Of the 773 scrapers included in this study, 318 belong to *ensemble 5*, 263 to *ensemble 4* and 192 to *ensemble 3*.

For the use wear analysis a total of 38 artefacts were randomly selected from *ensembles 3* and *4*. Only artefacts that were found *in-situ*, i.e. not during sediment sieving, and only artefacts with secure stratigraphical provenance were considered for use wear analysis. No selection was made for morphology, raw material or other criteria. This limited the sample of scrapers that were available for inclusion in the analysis to 7.6 % and 9.4 % of *ensembles 3* and *4* respectively. For the same reasons only one scraper that was made from non-local flint could be analysed (small findnr. 13,967; *ensemble 3*).

3.2 Technological analysis and lithic raw materials

The high proportion of scrapers amongst the tools at Arconciel/La Souche is marked. In order to study the production and use of this predominant artefact category it was important to describe the morphology and technological characteristics of the scrapers. This included features such as raw-material, artefact blanks, aspects of retouch as well as other technological (e.g. basal fracturing, forms of lateral edge working, curving of the ventral surface) and recurring morphological artefact characteristics. These have been recorded and studied for all scrapers from Arconciel/La Souche, but only the 773 scrapers from the chipped stone artefact assemblages from *ensembles 3, 4* and *5* are presented here.

Raw material determination was done macroscopically only, although some microscopic raw material sourcing has been done in the past (Mauvilly *et al.* 2002). However, in general it was possible to make a distinction between local raw materials from the Prealps (distance 20 - 30 km) and imported flints (distance over 70 km). Of the artefacts 87 % are produced on three local raw materials: radiolarites (39 %), a type of local and predominantly grey flint (21 %) and a fine-grained quartzite (27 %; *quartzite à grains fins* or *Ôlquarzit*, a homogeneous, grainy metamorphosed sandstone). These all outcrop in the nearby Prealps and can be found in the Sarine riverbed in the immediate vicinity of the site as well. Radiolarite is very abundant in the region and, like the local flint, does not have good knapping qualities. The remainder of the artefacts are made from raw materials such as rock crystal, local sandstone and chalk (all < 1%) and flints (5 %) imported from e.g. the Jura mountains, the Geneva region and eastern France (Brillard *et al.* 2003). The imported flint often has notably superior knapping qualities compared to the local flint.

The results presented here are only preliminary and are still to be placed in the wider context of the entire chipped stone artefact assemblage and other data from Arconciel/La Souche. It is expected that future analysis of other sections of the chipped stone tool assemblage will allow further interpretation.

3.3 Microscopic use wear analysis

This study applies a so-called pragmatic approach to use-wear analysis. It combines low- and high-power analysis (10 - 400x) and focuses on establishing the presences or absence of traces, the used parts of the artefact, the type of use (movement) and to some extent the intensity of use (Grace 1989, Finlayson and Mithen 1997, Smith 2007). The entire artefact was scanned for macroscopic and microscopic use wear traces and (potential) microscopic traces were subsequently investigated in greater detail (Gijn 2014, Smith 2007). Use wear traces were recorded photographically, on drawings and in written form. All artefacts were washed with water and during analysis isoprophyl-alcohol and cotton pads were used to clean them. For the analysis, a Keyence VHX-600 Gen II digital microscope at the Department of Geosciences, University of Freiburg, Switzerland was used.

		Prealpine local raw materials (~ 20 km)			Longer distant (> 70 km - 100 km)
		Radiolarite	Local Flint	Fine-grained quartzite	Flint
Ensemble 3 (5700-5500/5400 cal BC)	Use of raw materials	used in proportion to the quantity of recovered raw material	used in proportion to the quantity of recovered raw material	minimal use	preferred raw material
	Blanks	scraper blanks : predominantly flakes, except for an increase in the use of bladelets in comparison to assemblages 4 and 5			
				notable use of bladelets	notable use of bladelets
			frequent use of core preparation flakes		frequent use of core preparation flakes
Ensemble 4 (6300/6200-5700 cal BC)	Use of raw materials	preferred raw material	used in proportion to the quantity of recovered raw material	minimal use	used more than the proportions of the total quantity of raw materials
	Blanks	scraper blanks : predominantly flakes, except for an increase in the use of bladelets in comparison to assemblage 5			
				notable use of bladelets	
			frequent use of core preparation flakes		frequent use of core preparation flakes
Ensemble 5 (6600/6500-6300/6200 cal BC)	Use of raw materials	preferred raw material	used in proportion to the quantity of recovered raw material	minimal use	used in proportion to the quantity of recovered raw material
	Blanks	scrapers blanks : predominantly flakes from all reduction stages			
					notable use of bladelets
			frequent use of core preparation flakes		

Fig. 6 - Raw materials and blanks used for the production of scrapers at Arconciel/La Souche, ensembles 3, 4 and 5. L. Bassin / Sintesi della gestione delle materie prime e delle scelte dei supporti per i grattatoi degli orizzonti 3, 4 e 5. L. Bassin.

The use wear study is accompanied by an experimental program. The aims of this was foremost the observation of the differing developments of traces on the main raw materials present within the Arconciel/La Souche chipped stone assemblage. To some extent it also provided comparative material for the analysis of the archaeological material. The experiments comprised of the experimental working of wood (*Corylus avellana* L.), bone (*Cervus elaphus*) and the working of sheep skin (*Ovis orientalis aries*; dry and wet curing) and goat skin (*Capra hircus*; wet curing). Experimental tools were made from radiolarite, local flint and fine grained quartzite. They were used prehensile or hafted. The hafts were usually hazel wood and other materials used in the hafts were birch-tar and either synthetic sinew or sisal string.

Previous work and blind tests have shown that the identification of the worked material is inefficient and inaccurate (Evans 2014, Grace 1989, Betts and Finlayson 1990). This study thus aims less at providing detailed, but uncertain data about worked materials for each individual artefact, but instead aims to provide secure information on the production and use of the artefacts, and especially of the scrapers as a tool category.

Allowing for artefact equifinality, and incorporating the results of the technological studies, use-wear analyses can, depending on the data, provide information on the whole use-life of the tool. This study not only aims to investigate the production and use of artefacts, but also to research artefact categories and even the assemblage as a whole. The combination of both technological and microscopic use-wear analysis to study artefact ontogeny will enable us to abandon

traditional typological nomenclature and study the artefact's actual functions and meanings (Finlay 2006, Riede 2006, Ingold 2000, Sternke and Costa 2006). It allows a biographical approach to the chipped stone artefacts and assemblages.

Results

The production system of the scrapers from *ensembles* 3, 4 and 5 was established. It appears that during the more than thousand years covered by these assemblages, scraper morphology and dimension remained virtually unchanged. Morphologically, a number of standard shapes could be recognised. These shapes remain present throughout *ensembles* 3, 4 and 5. Round to near-to-round shapes dominate. Many are unguiform, others we have classified as pear-shaped. These tools resemble unguiform scrapers, but have one narrower end. Others are classed as crescent shaped. Other forms, such as elongated and irregularly shaped scrapers are relatively rare. Our morphological descriptions largely follow Rozoy (1968) and G.E.E.M. (1975). The proportion of the entire scraper collection in relation to the number of tools in general also remains stable over more than a millennium. A number of specific technological attributes seem to occur consistently throughout the studied assemblages as well. These results raised a number of questions regarding the relationship between tool morphology, production, hafting practices and use and how these might have developed over time.

Scraper dimension varies widely from very small to large pieces

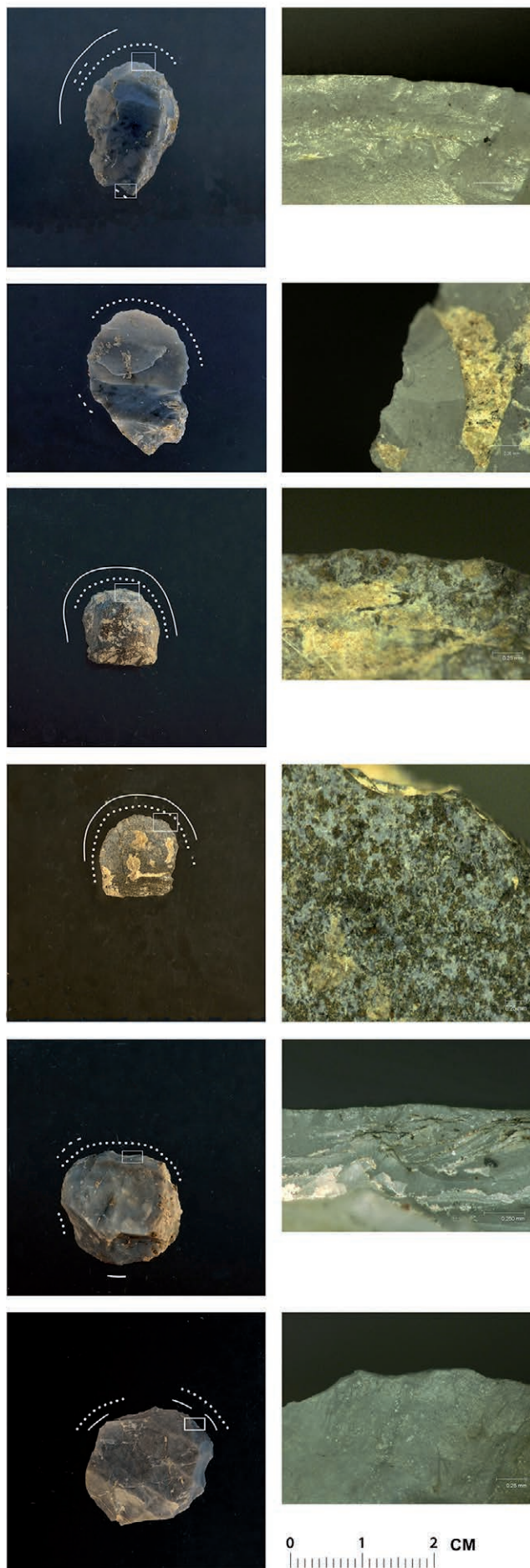


Fig. 7 - Microscopic use wear traces on scrapers at Arconciel/La Souche. Line: polish; dots: rounding; dashed line: micro-fracturing. 1a & b: Scraper Inv. Nr. 15528, ensemble 4, flint Prealps, pear-shaped, dorsal and ventral view; 1c: rounding and polish, 200x; 1d: micro fracture, 150x. 2a & b: Scraper Inv. Nr. 20571, ensemble 3, fine grained quartzite Prealps, unguiform, dorsal and ventral view; 2c: rounding, 150x; 2d: rounding and polish, micro fracture, 100x. 3a & b: Scraper Inv. Nr. 10965, ensemble 3, radiolarite Prealps, round, dorsal and ventral view; 3c: rounding, 200x; 3d: rounding and polish, 150x. M. Cornelissen / *Microtracce di utilizzazione sui grattatoi d'Arconciel/La Souche*. 1a & b: Grattatoio inv. Nr. 15528, Orizzonte 4, selce prealpina, tipo a ventaglio, faccia dorsale e ventrale; 1c: arrotondamento e micropoliture, 200x; 1d: microfratture, 150x. 2a & b: Grattatoio inv. Nr. 20571, Orizzonte 3, quarzite a grana fine prealpina, tipo ad unghia, faccia dorsale e ventrale; 2c: arrotondamento, 150x; 2d: arrotondamento e micropoliture, microfratture, 100x. 3a & b: Grattatoio inv. Nr. 10965, Orizzonte 3, radiolarite prealpina, tipo circolare, faccia dorsale e ventrale; 3c: arrotondamento, 200x; 3d: arrotondamento e micropoliture, 150x. M. Cornelissen

(width: 6.1-41.9 mm; length: 6.6-52.2 mm; thickness: 1.9-17.9 mm). Within this range, scrapers are distributed evenly without forming distinct groups according to size.

However, while scraper morphology and dimensions remain constant for the period represented by *ensembles* 3, 4 and 5, the raw materials chosen for their production varies (Fig. 6). There is a significant discrepancy between the proportion of the various raw materials used for the production of scrapers and that of the overall chipped stone assemblage.

This indicates raw material was purposefully selected for the production of scrapers and that this varied for each of the three assemblages. While fine-grained quartzite remains systematically under-used and local flint remains used in proportion with its general occurrence at Arconciel/La Souche, the use of radiolarite steadily decreases. In *ensembles* 4 and 5 it is the preferred raw material, but in *ensemble* 3 its use has decreased to resemble the proportion of radiolarite in the total chipped stone collection. The use of imported flint for scrapers visibly increases in *ensemble* 3.

Blank selection for production also changes between the three assemblages (Fig. 6). Flakes remain the main type of scraper blank throughout the whole period (73 % in *ensembles* 4 and 5, 68 % in *ensemble* 3). The use of bladelets, however, steadily increases from 9.1 % in *ensemble* 5 to 14 % in *ensemble* 4 and 19 % in *ensemble* 3. In addition, more core reduction flakes made on local and imported flint are employed as scraper blanks. This might be related to the generally small size of cores and their thick cortex.

At this point explanations of these developments remain tentative. However, as the proportions of the various raw materials remain stable in the total assemblage, a simple change in acquisition range can be excluded. A possible explanation might be found in a modification of scraper production responding to a changing use of scrapers over time (see below). This might have led to different demands made of the tools. Further research into the scrapers and the chipped stone assemblage in general is hoped to shed more light on this issue.

We have seen that raw material selection for the production of scrapers changes to some extent over time. The use wear traces, on the other hand, do not indicate differing use of scrapers depending on their different raw materials. Use wear traces do, however, show some change in use over time (see below), which could be related to this shift in raw material selection.

The experiments had already shown, that here is some variation in the development and readability of traces on scrapers made on different raw materials and this was confirmed by the analysis of the archaeological material (Fig. 7). The fine grained quartzite consists of multiple mineral components on which traces develop variedly. Rounding is rather pronounced but not always distinguishable from dense

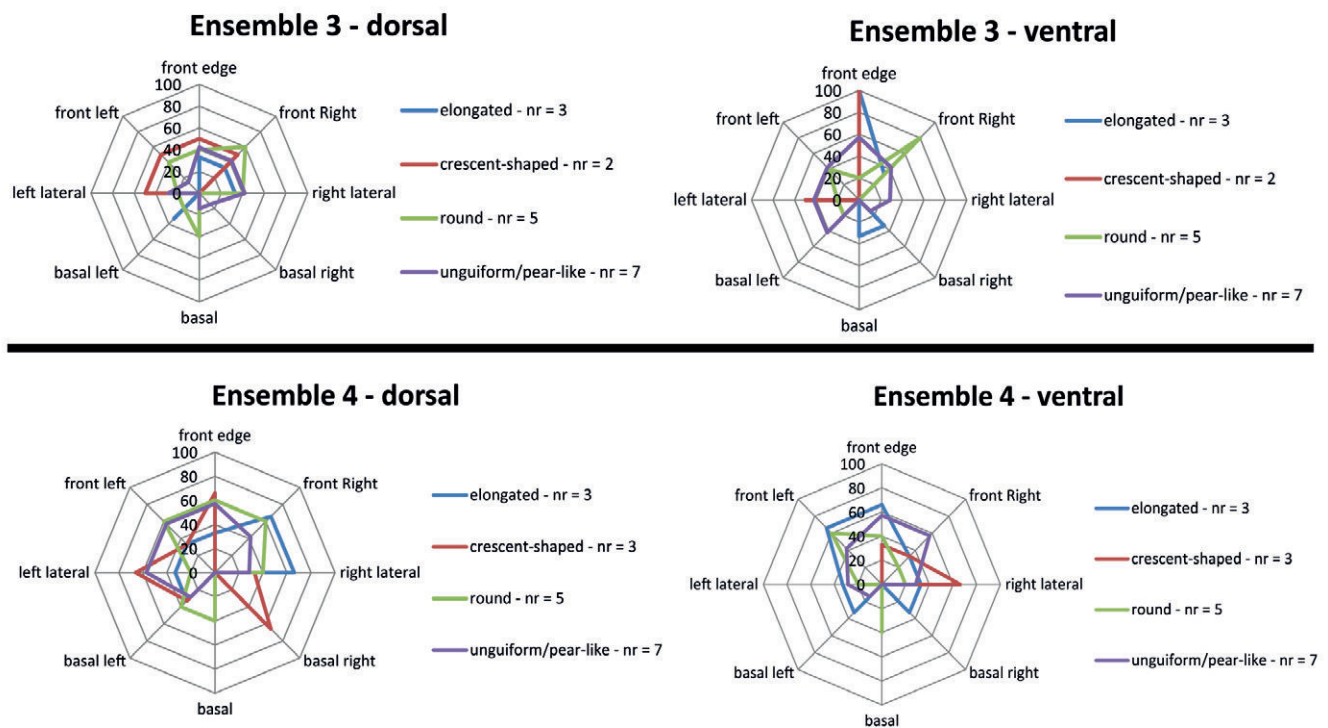


Fig. 8 - Micro wear trace distribution on scrapers from Arconciel/La Souche ensembles 3 and 4 in % according to morphology. M. Cornelissen / Ripartizione proporzionale delle microtracce sui grattatoi d'Arconciel/La Souche per gli orizzonti 3 e 4 secondo le morfologia. M. Cornelissen

micro fracturing on these artefacts and polish development depends on the presence of varying mineral components in each particular tool. Due to its material qualities, less polish is observed on scrapers made on fine grained quartzite. Rounding, however is relatively common on these artefacts. While rounding was only observed on relatively few flint scrapers from *ensemble 3*, more rounding was observed on flint scrapers from *ensemble 4* than on other scrapers from this sample. On the radiolarite and, to a lesser extent, on the local flint, polish is not always easily discernible due to the translucency of these materials. In contrast traces tend to be relatively clear on imported flints. At this point it is not yet possible to interpret this data any further, but the experimental evidence suggests these variations are caused by a difference in trace development and readability, not by use. The data to some extent lack clear patterns, and at least until the use wear analysis of the remaining assemblage is completed, more definitive conclusions remain difficult.

The various raw materials used at Arconciel/La Souche have thus been shown to influence the development of microscopic wear traces and to some extent their readability. It is possible that raw material has also influenced scraper use, but at present there is no direct evidence for it in the studied samples.

The working edge of the studied tools generally seem to have been the front edge and the adjacent corners (the front is morphologically determined, and does not necessarily equal the distal end) (Fig. 8). Interestingly there was a difference in the use between *ensembles 3* and *4*. Scrapers from *ensemble 4* were more often used in a pushing motion, while those of *ensemble 3* more in a pulling motion. This is indicated by the general distribution of use wear traces. This is supported by polish distribution as *ensemble 4* scrapers show significantly more polish on the dorsal distal edge than the *ensemble 3* tools. Polish and linear features on the dorsal and ventral surfaces confirm that the direction of use would have been along the longitudinal axes or diagonal to it.

Two radiolarite scrapers and possibly a further radiolarite and one flint scraper show signs of light resharpening after initial use. There is no indication that these were used in a particular fashion.

Both the intensity of use of the individual artefacts and the number of artefacts displaying evidence of use in each assemblage appear to remain constant over time. There does not seem to have been a significant difference in the intensity of use of the scrapers of different raw materials or morphology.

It is likely that traces on the basal edges of crescent-shaped scrapers (see below) and on the basal sections of other types of scrapers are related to hafting. It is notable that overall, polish and micro-fractures dominate the trace distribution patterns on the basal parts and polish the dorsal and ventral surfaces of the scrapers of both samples. Together with the use related evidence from the frontal parts of the artefacts, it can be concluded that these are largely hafting traces (Rots 2003). This is probably also true of the micro-fractures seen on the dorsal lateral edges of the longer tools and flint scrapers especially. Noteworthy in this light are also the relatively common instances of rounding on the flint scrapers of *ensemble 4*.

It was not possible to demonstrate significant variability in the way different morphological scraper types were used. In fact, the scraper's use seems to have been remarkably consistent, within the two assemblages as well as when comparing between them. However, while trace patterns on the ventral side of many of the *ensemble 4* artefacts were broadly similar one to another, the pattern on the ventral side of the *ensemble 3* artefacts appeared very variable, too random to allow any definite conclusions. This diversity also made comparison with the pattern on the *ensemble 4* artefacts very difficult. Apart from the aforementioned differences, the crescent-shaped scrapers show some traces - especially micro-fractures - on the basal parts of the artefacts of *ensemble 4*, but such fractures are very rare in *ensemble 3*. The small size of a large number of the scrapers recovered at Arconciel/La Souche are notable. Also, some of the crescent-shaped scrapers are very short. This raised the question whether these are complete artefacts or whether they are distally severed tools. The presence of the use wear traces shows that at least a substantial number of crescent-shaped and small scrapers are complete artefacts and were used as such.

Discussion and conclusions

Scrapers were an important tool category at Arconciel/La Souche between 6600 and 5400 cal BC. The tools were purposefully made to perform a scraping function. The raw materials they were made on varied, but seem to have been chosen with care. Many appear to have been hafted and a large majority was used and there is some indication of tool maintenance after initial use.

Between 6600 and 5400 cal BC, the way raw materials are used to produce scrapers changes. A development in the relationship of local and imported raw materials at Arconciel/La Souche is shown by a decreasing use of local materials and an increased preference for imported ones. This is accompanied by a change in scraper blank selection.

While the production sequence of scrapers made on local materials remains the same, there is a significant change in the reduction sequence of scrapers on imported flint. Also the choice of blanks changes, with an increased importance of bladelets. The end-forms, however, continue to be the same.

The use wear traces too, show limited change with time. 35 of 38 analysed artefacts were used and wear traces suggest that working edges comprise both distal edges and distal corners. In addition, traces on basal edges and especially their corners indicate many tools would have been hafted. Lastly, there are some indications of a change of use over time, with an overall change from a predominance of a pushing to a predominance of a pulling motion. It should be stressed that although it seems these movement patterns predominate in the two studied assemblages they are by no means exclusive, and, as already mentioned, use wear trace patterns observed, especially on the ventral side, in *ensemble* 3 were hard to interpret.

The combined changes seen in technological choices and use can be explained by a behavioural change and this resulted in a change in scraper requirements.

The research presented here is part of the ongoing "Gestures of Transition" project and is to be extended to other artefact categories and additional stratigraphical units. The biographical approach and the integration of the use wear and technological analysis have been shown to be able to provide an added value to the study of chipped stone assemblages and has already allowed new insights into behaviour and artefact use-life in the millennium leading up to the Mesolithic-Neolithic transition just north of the Alps.

Acknowledgements

We would like to thank the organisation committee of the Mesolife conference for enabling us to present and publish our research here. We would also like to thank the many Mesolife participants for the interesting discussions in Selva di Cadore. M.-I. Cattin, B. Finlayson, and R. Gubler read an earlier version of this text and we thank them for their valuable comments and insights. Any failings, of course, remain our own. We thank R. Tettamanti for the Italian translations. M. Cornelissen would like to thank the Department of Geosciences, University of Fribourg for allowing him to use their lab and microscope. Last but not least we thank M. Mauvilly, F. McCullough and the SAEF for their support and providing access to the finds from Arconciel/La Souche.

This research is part of the "Gestures of Transitions" project at the universities of Zürich and Neuchâtel, Switzerland and is funded by the Swiss National Science Foundation (140419).

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