The functional significance of Sauveterrian microlithic assemblages: broadening the focus of investigation

Hugues Plisson, a Laure Dubreuil, b Raphaëlle Guilbert c

a UMR 6130 du CNRS – Sophia Antipolis, Valbonne, France
b Université McGill– Montréal, Canada
c UMR 6636 du CNRS – Aix en Provence, France

Summary. Microlithization is one of the most intriguing trends in the evolution of lithic industries. In Europe, studies of this phenomenon have particularly focused on the Sauveterrian, a major facies of the Mesolithic. In a recent synthesis of use-wear data, it has been suggested that the Sauveterrian flint industries reflect a minimal technical system produced by groups with simple social structures.

This view is in sharp contrast with the general perception of the Natufian, a period marking the transition to agriculture in the Near East characterized by increased sedentarization and extensive production and utilization of microlithic tools. Yet, Natufian and Sauveterrian flint tools are very similar and appear to have been involved in a similar range of tasks.

A reduction in tool size and assemblage diversity seems to have been initiated at the end of the Upper Palaeolithic. Functional studies suggest that during this period some categories of flint tools were replaced by less elaborated macro-tools, as seems to have been the case in the Natufian. The Natufian illustrates the dichotomy between micro and macro-tools, each category involving distinct raw materials and concepts. These observations stress the necessity to reassess the functional significance of Sauveterrian assemblages.

Résumé. La microlithisation est l’une des tendances évolutives les plus étonnantes des industries lithiques. En Europe occidentale, le Mésolithique de type Sauveterrien constitue un exemple particulièrement typique de ce phénomène. Les outillages de silex sauveterriens ont récemment été interprétés comme les produits de systèmes techniques simples, reflétant une organisation sociale relativement peu complexe.

Cette hypothèse contraste avec la perception que nous avons du Natoufien, une période durant laquelle s’amorce au Proche-Orient un processus de sédentarisation des populations. L’industrie de silex associée à ces groupes est essentiellement de nature microlithique. Elle comprend des types d’outils fortement semblables à ceux attribués au Sauveterrien, objets qui semblent en outre avoir été utilisés dans les mêmes registres techniques.

On observe à la fin du Paléolithique une diminution de la taille des outils de silex et une moindre diversité de types. Un macro-outillage semble s’y substituer, comme l’indiquent certaines analyses sténochimiques. Le Natoufien constitue un exemple particulièrement frappant de cette dichotomie entre formes micro- et macro-lithiques, chaque catégorie impliquant des matériaux et des concepts distincts. Les nombreuses similarités fonctionnelles documentées entre les assemblages Natoufiens et Sauveterriens soulignent la nécessité de reconsidérer la signification fonctionnelle de ces derniers assemblages.

Key words: macro-tools, Mesolithic, microliths, Natufian, Sauveterrian, tool function, site function, use-wear analysis.

Introduction

One of the strengths of Semenov’s functional and technological approach to past material culture is that he considered the entire technical system without limiting his analysis to a narrow range of tool types or raw materials.

In Western archaeology, use-wear analysis initially developed as a ramification of typological studies. For a long time, the focus was on flint industries and beautiful artefacts (Maigrot and Plisson in press). It seems fair to say that in these developments, little interest was paid to the theoretical implications of the use-wear method. As a result, the potential of the approach originally developed by Semenov was rarely fully exploited. In this paper, an effort is made to consider use-wear data in a broader perspective, while discussing some aspects of human adaptation during the late Pleistocene and early Holocene. More particularly, we explore the significance of the increase of microlithic tools in the assemblages made by the last hunters-gatherers of south-western Europe.

Microlithization has raised much attention in archaeology, as it represents one of the most important and interesting patterns in the evolution of material culture. However, because microliths developed in a great variety of ecological, geographical, cultural, and chronological contexts, it has proven difficult to explain this multifaceted phenomenon using a single explanatory model (Elston and Kuhn 2002). In Western Europe, microlithization has generally been approached focusing on the Sauveterrian, a Mesolithic facies.

Based on use-wear analyses, it has recently been suggested that the Sauveterrian flint industries reflect groups with minimal technical systems and simple social structures (Philibert 2002). The aim of the present paper is to reassess functional interpretations of the Sauveterrian by comparing this industry with Palaeolithic and Epi-Palaeolithic assemblages from Northern Europe and the Near East. Moreover, we would like to broaden the scope of the discussion by considering all categories of lithic tools, including microliths and ad hoc implements.
The onset of post-glacial climatic conditions during the Epi-Paleolithic induced important changes in the landscapes. The current consensus view is that the human diet during the late glacial period consisted of a low diversity of resources. Consequently, a broader range of resources became available to prehistoric populations. As pointed out by Semenov (1961, 2005), developments of abrading and grinding technology might have been especially critical in these new environments. Therefore, examining abrading and grinding implements may be particularly informative for determining subsistence strategies during the Epi-Paleolithic.

Abrading and grinding tools include, among others, abraders, polishers, shaft straighteners, mortars, pestles, grinding slabs, handstones, as well as used pebbles and blocks. Most commonly, these implements were made of limestone, sandstone, basalt, and granite, raw materials that are quite distinct from those used for cutting tools. Because most grinding and abrading implements tend to be larger and heavier than flint tools, the term “macro-tool” is generally used to refer to them. In the Near East, a significant increase in the proportion of macro-tools and a florescence of microliths are observed during the Epi-Paleolithic.

Studies of the emergence of macro-tool technology are still few. To the contrary, the microlithization of flint tools has been for long a major focus of archaeological research. Yet, despite the accumulated knowledge on this last issue, the significance of the trend towards tool size reduction remains a tricky question to address.

Why microliths? Two insightful case-studies

With the warming conditions of the post-glacial, a general trend towards tool size reduction, accompanied by an apparent decline in knapping abilities, is observed in European and Near Eastern sites. The nature of the relationship between these cultural patterns and climatic change remains obscure. Schild’s (1976, 1979, 1984) study of the Final Paleolithic in the Polish plains provided insightful observations regarding this problem. Climatic fluctuations seem to have been more pronounced in this area than in Western Europe. According to Schild, late glacial periods, characterized by reindeer hunting in open landscapes, were associated with Upper Paleolithic-like industries. During the more forested interstadial phases, territories were smaller and the industry Azilian-like, as indicated by the presence of short scrapers and backed points. Subsistence was probably based on the exploitation of more sedentary species. This case study suggests rapid reorganization of group mobility, hunting strategies, and material culture in response to changes in resource availability. Such cultural flexibility might have permitted adaptation to small-scale environmental changes and fostered the colonization of new territories.

Since the general trend towards microlithization began at the end of the Paleolithic, examining assemblages from this period may improve our grasp of this phenomenon. In this perspective, a comparison of Magdalenian and Azilian assemblages in regions differing markedly in raw material abundance has yielded interesting results. Technological and use-wear analyses demonstrated that the scarcity of raw materials affected considerably flint tool management, use, and discard during the Magdalenian, but not during the Azilian (Plisson 1985). These results suggest that this new concept of the flint toolkit, based on the production of fewer tool types, tools of smaller size, and on a simplification of the manufacturing techniques, contributed to reduce dependency on raw material availability. This proposition is in agreement with the hypothesis of changes in mobility patterns at the end of the Paleolithic, as argued for Poland (Schild 1976, 1979, 1984), and, more recently, Northern France (Valentin 2005b).

It has been suggested that in a few Azilian sites faunal and/or chronological data demonstrate that the technical changes observed in the Epi-Paleolithic preceded environmental changes. However, none of the assemblages associated with reindeer used to support this claim are derived from secure stratigraphic contexts. Moreover, the oldest reliable dates obtained for the Azilian come from regions in which reforestation occurred particularly early, for instance the Swiss piedmont (Leesch et al. 2004). Because they are in continuity with regional traditions and observed over a wide geographic scale, the modifications in lithic toolkits at the Pleistocene-Holocene boundary cannot be reduced to local phenomena. This supports the hypothesis that these modifications were mediated by global environmental changes affecting subsistence and mobility strategies.

It seems to us that the available data sustain the view that microlithism was one of the many strategies used by prehistoric groups for managing risk (Elston and Kuhn 2002). In the particular context of the end of the Upper Paleolithic, microlithism appears to be a response to dramatic changes in mobility patterns induced by the replacement of Pleistocene fauna by less gregarious and non-migrant species, and to the development of more forested landscapes.

This assumption is examined further in the remainder of this paper while investigating Sauveterrian adaptation. An emphasis is placed here on the use-wear approach. However, departing from a strictly materialist standpoint, we will consider the evolution of the symbolic dimensions of stone implements, along with transformations of the production and subsistence systems.
Fig. 1: Azilian micro-tools and macro-tools from La Tourasse cave, France. Objects drawn at the same scale. Drawings: M. Orliac.
Fig. 2: Sauveterrian flint and hyaline quartz tools showing use-wear, from Vionnaz, rockshelter, Switzerland (Pignat and Plisson, 2000). Drawings: H. Lienhard.
A use-wear perspective on the Sauveterrian flint industry

The Sauveterrian emerged around 10,000 BP in southeastern France and Northern Italy, and then progressively spread to other regions of Western Europe where it replaced the Azilian tradition. This industry is characterized by highly standardized geometrical microliths, produced using different knapping and retouch methods (Guilbert, 2003), and a gradual simplification of the methods of microlith blank production. The Sauveterrian toolkit also includes small irregular flakes and few retouched artefacts (Fig. 2), mostly scrapers.

Even though functional studies of Sauveterrian flint assemblages are fewer than those for the Upper Palaeolithic, use-wear data (approximately 5000 artefacts) are now available for a dozen sites (Lemorini 1990, 1994; Martinet 1991; Rodriguez Rodriguez 1993; Philibert, 1999, 2002; Pigat and Plisson 2000; Khedhaier 2003; Juan Gibaja in press). Despite variation in artefact surface preservation and sampling methods, these studies yielded similar results. In the Sauveterrian, patterns in the use and discard of flint tools can be characterized as follow:

- a very low proportion of artefacts were used;
- a limited range of activities is documented. These activities are mostly related to the procurement and processing of soft animal matters, such as meat and hide, and involved microliths, flakes, blades, and scrapers;
- woodworking is poorly represented in the use-wear sample, and is mostly associated with unretouched flakes;
- a relative scarcity of traces associated with bone working is noted.

In the following section, these patterns are compared with earlier, contemporaneous, and succeeding industries in Europe and the Near East.

The Sauveterrian in a wider perspective

On one hand, there are striking contrasts in the use and discard of Sauveterrian flint tools compared with the Upper Palaeolithic and Neolithic. In general, Upper Palaeolithic assemblages differ from Sauveterrian ones in showing more diverse toolkits and higher percentages of utilized and recycled implements. In addition, tools were probably involved in a wider range of activities. Neolithic toolkits contrast with those of the Sauveterrian in presenting evidence for new activities, processed material, and tool categories (some of which had a very long use-life).

On the other hand, several similarities are observed in flint tool management between the Sauveterrian and several industries from the end of the Palaeolithic and the Epi-Palaeolithic:

- Very similar patterns in tool use and discard are found between the Final Palaeolithic industries (Azilian and Federmesser) and the Sauveterrian. Indeed, all these industries present evidence of a narrow range of processed materials and low proportions of utilized artefacts (Célérier and Moss 1983; Moss 1983; Plisson 1985; Ibañez Estévez and González Urquijo 1996; Caspar and De Bie 1996; De Bie and Caspar 2000). These similarities are noted despite differences in methods of blade production (more elaborated in the Azilian and Federmesser), and projectile point size and morphology.
- The Sauveterrian also shows many typological and functional similarities with the Natufian, an industry associated with the emergence of sedentary societies in the Near East. With respect to assemblage composition and production techniques, these contemporaneous industries present the same basic structure: an expedient toolkit manufactured on irregular flakes and rough blades, some of which were retouched, and the presence of notches and denticulates (Fig. 3). In addition, assemblages from both periods contain very similar proportions of elaborated geometric microliths. However, contrary to what is observed in the Sauveterrian, burins appear to be more common than scrapers in the Natufian. A use-wear study of 500 flint implements from Hayonim Terrace (Israel) shows patterns of artefact use and discard similar to those described for the Sauveterrian (Valla et al. 1989; Valla et al. 1991): the edges are mostly unretouched and use-wear indicates light work and short use-life for the most abundant tools; in general, geometric microliths and retouched bladelets were hafted projectiles. Two distinctions can be made between the Natufian and the Sauveterrian, based on use-wear and typological data: the scarcity of hideworking flint tools in the Natufian; the use, at least in some Natufian assemblages, of burin sides and small notches for light boneworking and woodshaping, possibly for making points or shafts. Tiny bone points that could have been produced with these burins and notches were also found at Hayonim.

Overall, in spite of the few differences mentioned above, Natufian and Sauveterrian toolkits show a common core set of features in tool management. These similarities are particularly striking, as these industries were produced by groups with very different social organizations: semi-sedentary groups occupying permanent houses in the Levant and mobile hunters-gatherers living in forests and mountains in Europe. In this case, dramatic differences in adaptations are not reflected in the flint toolkits.

Broadening the focus: A look at the macro-tools

Two important cultural changes have been attributed to the end of the Natufian: the emergence of plant domestication (e.g., Moore et al. 2000; Belfer-Cohen and
Fig. 3: Natufian micro-tools and macro-tools from Hayonim Terrace (1–15) and Mallaha (a–g). Flint artifacts enlarged with respect to macro-tools. 1–3: cortical flakes used for cutting flesh; 4, 5 and 6: notches used in plant, wood, and bone scraping; 7: denticulate used to scrape wood; 8–9: burins used to scrape and groove bone; 10 & 15: microliths used to cut plants; 14: microlith used to cut meat; 11-13: microliths used as projectile barbs (from Valla, et al., 1991). a: pestles; b–d: handstones; e: grinding-slab; f: mortar; g: shaft straighteners (drawings from D. Ladiray).
While flint toolkits were apparently relatively stable during the Natufian, other classes of objects seem to document changes in the technical system. More particularly, a significant increase in the abundance of grinding implements is observed (Bar-Yosef 1980, 1981; Wright 1992, 1994). This increase is striking when compared with previous periods. A functional study of these tools showed that some specimens were used to process plants, more specifically, legumes and cereals (Dubreuil 2002, 2004). The use-wear study also suggested that changes in grinding implement morphology during the Natufian are probably related to intensification of plant processing. This conclusion appears in line with other changes observed in subsistence and settlement patterns during the end of the Natufian.

An additional finding of the use-wear analysis of Natufian macro-tools is that some of the artefacts commonly classified as grinding implements were actually used in activities unrelated to plant-food processing (Dubreuil 2002, 2004). For instance, hide-carrying implements, rare in the flint assemblages of Hayonim Terrace, are documented in the macro-tool sample. Furthermore, some macro-tools may have been used for woodworking. Also, stone implements seem to have been involved in bone abrasion activities, as suggested by bone tool studies (Stordeur 1991), and residue analysis of shaft straighteners (Christensen and Valla 1999). Based on these data, it can be suggested that non-flint implements replaced flint tools, at least in certain activities, in Natufian assemblages. It is suspected that this shift also occurred in Mesolithic industries of Europe, as mentioned by Rozoy (1978).

In sum, along with the development of a flint industry based on small flakes and bladelets, and a trend toward microlith size reduction, flourished a macro-tool technology differing in raw materials and concepts (Fig. 3). Use-wear data indicate that at least some of the Epipaleolithic macro-tools were associated with the exploitation of vegetal resources. In contrast, flint tools appear to be designed specifically for the procurement and processing of game. The transformation of plants by grinding and pounding constitutes a mean for maximizing caloric returns (O’Dea et al., 1980; Stahl 1989; Wright 1992). Therefore, the emergence of macro-tool technology may have been particularly important in a context of increased sedentarity and faunal resource overexploitation (Stiner et al. 1999, 2000; Monroe 1999).

While the emergence of macro-tools during the Epipaleolithic may stemmed from resource intensification, the trend toward microlithization seems to be linked to the optimization of resource procurement through mobile strategies. Flannery (1986) proposed that mobility, a strategy long used for coping with resource variation, was no longer possible in the context of the Late Pleistocene to Holocene transition in the Near East, due to increased demographic pressure. It is suggested that the role of the flint technology became less central in the subsistence system during that episode.

Social representations: The symbolic dimensions of microliths

The study of the Sauveterrian raises the issue of the evolution of the role and symbolic dimension of flint industries during the early Holocene. At the beginning of the Epi-Paleolithic, microlithism can be explained as a strategy used to cope with variation in raw material availability in relation with new patterns of mobility resulting from smaller territories and more diverse resources. However, the study of the Natufian suggests that, just prior to the decline of microliths, flint technology was not a vector of major innovations. This may be related to the specialization of flint implements for game procurement and processing, in continuity with the Kebarian. The similarities noted between the Natufian and Sauveterrian toolkits leave us with the impression that the flint tool repertoire was strongly associated with high residential mobility, and possibly, an egalitarian ideology. The technological changes observed during the neolithization process are most conspicuous in non-flint implements. Macro-tools, which represent a significant proportion of non-portable implements, are, at least for some of them, partly related to the exploitation of vegetal resources. This macro-tool versus micro-tool dichotomy was possibly reinforced by a sexual division of production activities, as suggested by ethnography (Testart 1986) and the study of Natufian human remains (e.g. Peterson 2002; Bocquentin 2003). It has been proposed that the sexual division of labour played a significant role during the rise of plant domestication (Rohrlicht-Leavitt 1975; Forest 1993, in preparation). Despite the probably growing significance of macro-tools in subsistence activities, the efforts devoted to the production of microliths during the Natufian seems to indicate that these tools were in response symbolically overinvested (Valla and Plisson 2005).

Back to the Sauveterrian

The development of macro-tools in many microlithic industries is not surprising, given that these often lack—or show a very low proportion—of heavy-duty tools. Because microliths, bladelets, and most flakes have thin, small, and fragile edges, these implements were not designed for the transformation of large volumes of raw material. The Mesolithic dugout canoes of Noyen-sur-Seine and Nandy (Bonnin 2000), for instance, were
certainly not manufactured with these tools! Therefore, it is almost tautological to argue that the Sauveterrian microliths were involved in a narrow range of activities. As a result, it is difficult to accept the proposition that the limited range of activities seen in the Sauveterrian reflects a concomitantly simple technical system (Philibert 2002). Moreover, models that attempt to establish a direct link between the complexity of a technical system and the complexity of the social network that produced this technical system are likely to run into many difficulties (Maigrot and Plisson in press).

To better understand the Sauveterrian, it is critical to broaden the scope of analysis by including macro-tools. In the Natufian, these implements are characterized by high archaeological visibility, possibly because sites of this period were occupied intensively. Although poorly documented, similar tools exist in more expedient forms in Palaeolithic (de Beaune 2000) and Mesolithic (Rozoy 1978) contexts. For instance, J.E. González Urquijo and J.J. Ibáñez (2002) showed that in the late Magdalenian contexts. For instance, J.E. González Urquijo and J.J. Ibáñez (2002) showed that in the late Magdalenian and Azilian sites of the Spanish Basque country, pebbles were not only used as flintknapping hammers and mineral crushers, but also for hide rubbing and for pounding organic matters. Evidence of hide rubbing with ad-hoc implement has been found in south-western France as well (Lenôtre et al. 2003). Used pebbles were also reported for the Azilian levels of the La Tourse cave in France (Orliac and Orliac 1972) (Fig 1). The Federmesser site of Rekem (Belgium) contains a number of imported macro-tools showing evidence of use, ranging from hammerstones and other heavy-duty tools, to spokeshaves and grinders (De Bie and Caspar 2000).

Macro-tools have been largely overlooked in the study of the Sauveterrian. This is possibly the result of the low visibility of these tools in sites produced by highly mobile groups. However, the scarcity of macro-tools in Sauveterrian assemblages may also be due to biases in recovery methods. Indeed, these implements were generally ignored by archaeologists in past excavations. Another important source of bias comes from our incomplete knowledge of Sauveterrian settlement patterns. For instance, certain types of sites, such as those found in specific biotopes or those peripheral to zones of high occupation density, are probably overrepresented in the archaeological record (Guilbert 2001) and particularly in the functional studies. In addition, the sexual division of labour may have mediated spatial distribution of tool types, as suggested by the specialization of flint implements for game procurement and processing activities. Comparing contemporaneous assemblages and sampling all types of habitats may allow us to overcome biases induced by the differential spatial distribution of tool types and to detect patterns in flint versus non-flint tools.

For Semenov, use-wear analysis was not limited to the study of a selected range of artefacts or raw materials. Rather, it was for him a method aimed at unravelling the structure of a coherent system. In this framework, use-wear analyses may yield very valuable information on early Holocene adaptations.

Bibliography


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