Lithic Technology

ISSN: 0197-7261 (Print) 2051-6185 (Online) Journal homepage: https://www.tandfonline.com/loi/ylit20

Formalized Reduction Sequences from the Site of Kerkhove, Belgium – New Perspectives on Early Mesolithic Flint Knapping

Hans Vandendriessche & Philippe Crombé

To cite this article: Hans Vandendriessche & Philippe Crombé (2020): Formalized Reduction Sequences from the Site of Kerkhove, Belgium – New Perspectives on Early Mesolithic Flint Knapping, Lithic Technology, DOI: 10.1080/01977261.2020.1721162

To link to this article: https://doi.org/10.1080/01977261.2020.1721162

Published online: 03 Feb 2020.

LITHIC TECHNOLOGY
https://doi.org/10.1080/01977261.2020.1721162

Formalized Reduction Sequences from the Site of Kerkhove, Belgium – New Perspectives on Early Mesolithic Flint Knapping

Hans Vandendriessche and Philippe Crombé

Department of Archaeology, Ghent University (BE), Ghent, Belgium

ABSTRACT
The refitting of eight Early Mesolithic artefact clusters yielded a detailed image of the flint knapping methods applied at the site of Kerkhove (BE). Apart from apparent intra-site variability, the analysis revealed a greater investment in core-shaping than is traditionally present in Early Mesolithic assemblages, combined with a clear preference for bladelet production organized from alternatingly used, opposed striking platforms. Both elements, unprecedented to some extent in Northwestern Europe, indicate continuity between Early Mesolithic technological traditions and those of the preceding, Final-Palaeolithic period.

KEYWORDS
Refits; Early Mesolithic; crested bladelets; formalized debitage; Final Palaeolithic

Introduction

Ever since Rozoy's (1968) seminal work on the Mesolithic of northern France and Belgium, it is well established that bladelet knapping in northwestern Europe evolved from a production of irregular bladelets with highly variable morphological features (i.e. "Coincy style debitage") in the Early and Middle Mesolithic (circa 11 000–9000 cal. BP), to a standardized production of regular bladelets (i.e. "Montbani style debitage") during the Late Mesolithic (circa 9000–6000 cal. BP).

While at first, the research emphasis was clearly on the bladelets themselves (Rozoy, 1968), detailed technological inquiry over the last 25 years has resulted in a more comprehensive view on the matter. Regarding the Early Mesolithic, aggregate analyses dealing with representative samples of lithic assemblages have confirmed the existence of a generalized irregular bladelet production in most parts of northwestern Europe (e.g. Conneller, Little, Garcia-Diaz, & Croft, 2018; Dumont, 1997; Holst, 2014; Ketterer, 1997; Kind, 2003; Michel, 2009; Perdaen, Crombé, & Sergant, 2008; Reynier, 2005; Souffi, 2004; Sørensen, 2006). Often, the production processes described in these studies are rather simplistic and invariably qualitatively described in terms of their *ad-hoc*, *expedient* or *opportunistic* nature. This interpretation is primarily based on the limited amount of preparation/core-shaping prior to bladelet production, the flexible character of the bladelet knapping, and also, as we will discuss below, on the sometimes misguided technological reading of the crested bladelets and flakes observable in these assemblages.

This perception of irregularity and lack of complexity has in the meantime somewhat been revised by refit studies performed on the eastern French sites of Choisey, Ruffey, Dammartin-Marpain and Pont-sur-Yonne (Séara, 2013; Séara & Roncin, 2013; Séara, Rotillon, & Cupillard, 2002) and on the Belgian site of Doel-Deurganckdok (Noens, 2013). All of these clearly contain decortication sequences, removing substantial parts of the original nodules (e.g. Pont-sur-Yonne) prior to bladelet knapping. Moreover, F. Séara's (2014) refitting results paved the way for a more accurate understanding of the variability in Early Mesolithic knapping methods. By integrating data from multiple sites (each containing several series of spatially distinct clusters), he demonstrated the existence of at least four different production strategies in eastern France during this period (Séara, 2014).

In this contribution, we would like to add to the observed variability by arguing that, based on new refit data from Kerkhove, firstly, preparation and core-shaping was in some cases more elaborate and more systematically applied than has been acknowledged so far; and secondly, that this elaborate preparation was often paired with the alternating use of two opposed striking platforms throughout the reduction sequence. Next, we will adopt a wider, interregional perspective to discuss these results and simultaneously raise some general methodological concerns. Finally, the significance of

CONTACT Hans Vandendriessche Hans.Vandendriessche@UGent.be Sint-Pietersnieuwstraat 35, 9000 Ghent, Belgium

these new data for the position held by Early Mesolithic technological traditions in comparison with the previous Final Palaeolithic (circa 15 000–11 000 cal BP) and the subsequent Late Mesolithic periods will be addressed briefly.

Site description

The Mesolithic wetland site of Kerkhove (Figure 1) is situated in the "Flemish Ardennes", a part of northwestern Belgium characterized by its undulating landscape, dominated by Palaeogene hills (max. height 156 m TAW = Belgian ordnance level, corresponding to −2.3 MSL) and covered by Weichselian sandy-loam sediments. Within this region, the site is located in the floodplain of the river Scheldt, on a NE-SW oriented alluvial levee (length N 550 m; mean width c. 80 m; mean height 3 m) formed during the Lateglacial and covered by peat formation and alluvial clays during the Holocene. Hence, the 17 Mesolithic artefact clusters discovered on the top and on the slopes of this levee during large-scale preventive excavations in 2015–2016 were relatively well-preserved. After mechanical removal of the overlying sediments, the Mesolithic levels were excavated in a 0.25 m^2 grid and systematically wet-sieved (2 mm meshes). Two areas measuring 1475 and 238 m^2 respectively were continuously excavated this way, including 816 m^2 of low-density areas in between the clusters. The latter were judged to be vital, in conjunction with refitting and microwear analysis, to understand what conditioned artefact movement and the organization of space on the site. Moreover, the site appeared to be particularly well-suited for refitting thanks to the diverse raw materials employed and the overall low density of lithic artefacts, even within the clusters, with a mean of 16 artefacts/m^2.

The Early Mesolithic occupation (see Vandendriessche et al., 2019)

The most important occupation of the site, represented by 9 clusters, occurred during the Early Mesolithic period. It is more precisely situated in the first half of the Boreal period and dated to the middle of the 11th to the 10th millennium cal. BP, based on Bayesian modeling of a series of 19 ^{14}C-dates obtained on single entity samples of charred hazelnut shells. From a typological point of view, most of these assemblages belong to the regionally defined Chinru group (Crombé, 2019; Crombé, Van Strydonck, & Boudin, 2009), characterized by a dominance of (scalene) triangles and points with retouched base among the armature types (previously described as Beuronien A/C by A. Gob, 1984). Microwear-analysis performed by C. Guéret (Vandendriessche et al., 2019) on the two largest clusters (C5 and C6) showed that besides short endscrapers and burins, common tools mostly consisted of unretouched flakes and bladelets that were used to perform a wide array of tasks. The lithic raw materials found within these contexts mainly consist of middle to upper Turonian flint varieties from the regions of Tournai (Belgium) and Lille (northern France), supplemented with Turonian flints possibly coming from the adjacent Mons basin. The closest outcrops are situated at only 20 km from the site, as was recently confirmed by field surveys. Besides flint artefacts, faunal remains and vegetal macroremains were also documented. The most common faunal remains in the assemblage belong to medium-sized prey species such as wild boar (*Sus scrofa*) and roe deer (*Capreolus capreolus*), followed by red deer (*Cervus elaphus*) and fur-animals such as pine marten (*Martes martes*) and fox (*Vulpes vulpes*). All contexts contained carbonized hazelnut shells.

Finally, these clusters seem to be functionally and spatially organized in homogeneous ways. They are centered around non-structured surface hearths, identified by the spatial overlap of combustion proxies (i.e. heavily burned flints, carbonized hazelnut shells and burned bones, cf. Sergant, Perdaen, & Crombé, 2006). Microwear analysis furthermore indicates that a large range of activities was carried out in the vicinity of these hearths, comprising among others hide working with small scrapers (<3 cm), plant working with *curved knives* (cf. Juel Jensen, 1994), butchering prey and working bone and/or antler.

Methodology

To characterize the technological features of the Early Mesolithic occupation, we adopted a twofold methodology, combining a detailed attribute analysis (see Vandendriessche et al., 2019 for preliminary results) with an extensive refit study. While the attribute analysis provides quantitative aggregate level information (i.e. at the level of an artefact cluster), the refitting in contrast, offers highly precise, complementary observations at the level of the individual reduction sequences present within these clusters. An additional goal of our research, to be further elaborated in the near future, is to compare and contrast the data from both these approaches and, to a certain degree, test their interpretational limits. The following paragraphs are however entirely dedicated to the refitting results and their implications for our understanding of Early Mesolithic knapping methods. More

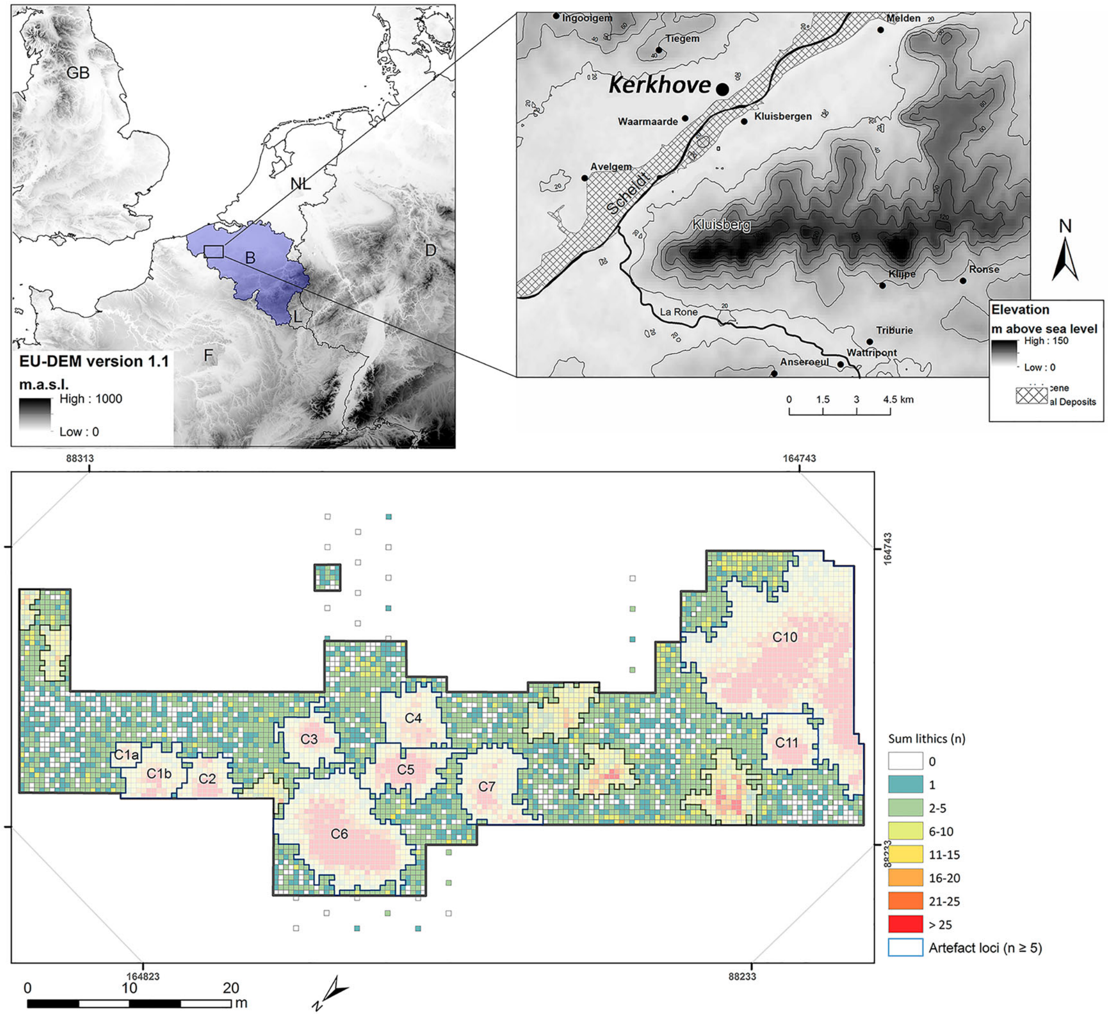

Figure 1. Site location (above) and distribution map of the artefact clusters (below).

precisely, based on refits from eight of the nine clusters dating to the Early Mesolithic (Table 1), the different *chaînes opératoires* represented at the site and the range of choices made within each step of the reduction process will be discussed. The last cluster (C10) is not included in this paper because it is a vast spatial palimpsest extending over 200 m^2 (see Bailey, 2007), that incorporates Middle Mesolithic flint scatters as well as Early Mesolithic ones. So far, 271 refit sets (Figures 2 and 3) have been identified, involving 1052 artefacts. The vast majority of these contain only two or three artefacts. The bigger refit sets, e.g. counting ten or more artefacts (n = 18), yielded the largest "portions of *chaines opératoires*" and by consequence most of the technological information described hereafter. It should be noted that even taking into account these larger sets, complete sequences are rare, indicating a large degree of spatial fragmentation (e.g. Bleed, 2002) of the flint knapping within these assemblages.

Results

Nodule selection and the initial stages of the knapping sequence

The Early Mesolithic hunter-gatherers of Kerkhove seemingly displayed a sense of pragmatism regarding the selection of their raw materials. They generally exploited nodules of small, but nevertheless, widely varying dimensions (4–18 cm). This is illustrated by the size of the complete and briefly tested nodules recovered at the site; and by the dimensions of the refitted sequences, with the smallest reconstructed nodules being about 4 cm in size, and the largest (though far from complete) 13 cm. These dimensions are more or less in agreement with those of the nodules observed in the nearest surveyed outcrops (on average 9,5 ± 3 cm).

Nothwithstanding the fact that bladelet knapping started almost immediately on the smallest volumes, taking advantage of suitable natural ridges already present, the majority of the nodules were knapped

Table 1. General characteristics of the studied Early Mesolithic clusters.

	Cluster size (m^2)	Density (n/0,25 m^2)	^{14}C-date Uncal. BP	^{14}C-date cal. BC (95,4 %)	Lab N°	Lithics (n=)	Artefacts <1 cm (%)	Refit rate* (%)
C1	31	13	8859 ± 35	8210–7831	RICH-23847	1787	67	11.5
C2	20	18	8916 ± 35	8237–7966	RICH-23846	1437	70	11.8
C3	28	14	9136 ± 40	8461–8276	RICH-24385	1624	55	17
C4	33	13	–	–	–	1665	61	6.9
C5	35	23	–	8571–8317	–	3146	65	7
C6	106	25	8803 ± 38	8184–7728	RICH-23841	10673	66	9.7
			8796 ± 40	8181–7685	RICH-23838			
C7	44	13	–	–	–	2297	65	7.3
C11	28	20	8860 ± 37	8211–7830	RICH-23839	2202	66	7.6

*Refit rates are calculated as a percentage of the amount of artefacts >1 cm.

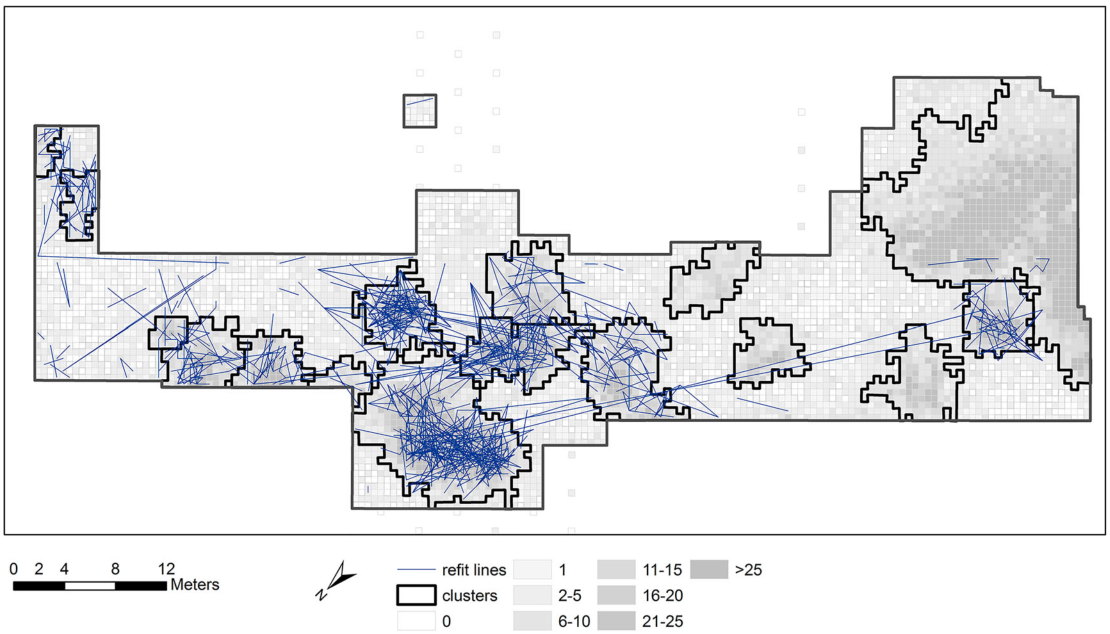

Figure 2. Current view of the refit lines connecting the artefacts within and beyond the boundaries of the different clusters.

following more elaborate production schemes. One of the first knapping objectives was to subdivide the selected raw materials into smaller, more convenient volumes for bladelet production, by detaching large flakes that were subsequently turned into cores (Figure 4, R62) as is shown by refit sequences containing multiple cores or core 'ghosts' (cf. Morrow, 1996). When poorer quality raw materials were exploited, this initial segmentation was sometimes achieved by fragmenting the nodules along pre-existing frost fissures (Figure 4, R85).

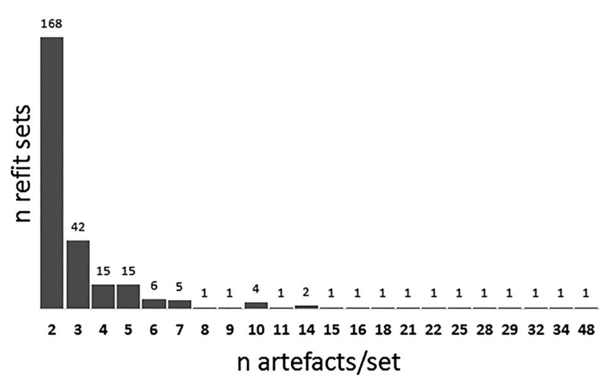

Figure 3. Distribution of the amount of lithic artefacts per refit set.

Preparation

Secondly, in several cases, an extensive roughing out phase occurred, which was attested either by large cortical refits or by sequences that lacked cortex altogether, implying decortication had been carried out somewhere else. As mentioned above, similar sequences have been recorded at Doel-Deurganckdok by G. Noens (2013) and at Pont-sur-Yonne by F. Séara (2013). Simultaneously, the general shape of the core and the positions of the striking platform(s) and exploitation table were determined. Once established, these positions rarely changed during the knapping sequence.

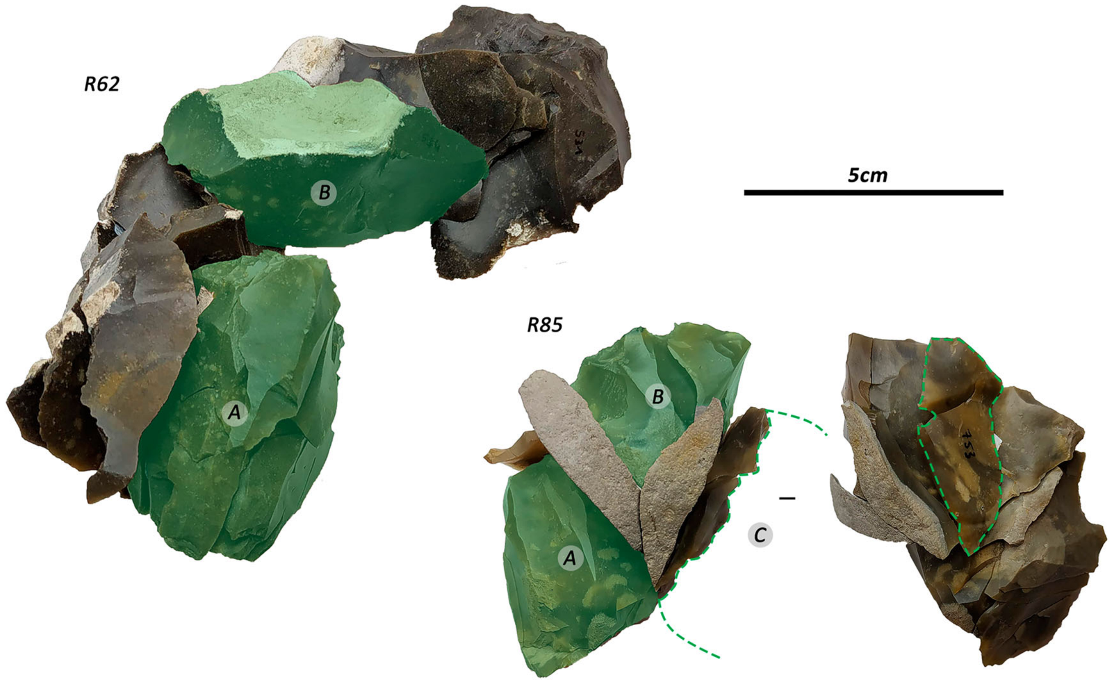

Figure 4. Refit sequences showing the segmentation of the initial volumes into different cores for further exploitation. R85 was split along frost fractures into at least 3 cores, two that could be refitted and a third 'ghost' core, revealed by the dorsal to dorsal refit of a bladelet (green dotted line) on the rest of the sequence.

Following decortication, and this is perhaps the most striking feature of the Kerkhove refits, the longitudinal and transversal shape of the table was frequently optimized by cresting (Figure 5). Although slight adjustments often sufficed to achieve this, resulting in only partially and unilaterally crested bladelets (Figure 5, R62), other examples were clearly the result of more meticulous preparation. Two refit sequences found at roughly the same position in C6 illustrate this perfectly: upon partial removal of a first unilateral crest, a second preparation of *néo-crête* type, with bilateral negatives followed immediately, to realign the crest and to further thin out the core flanks (Figure 5, R60). Furthermore, the crests occupied diverse positions on the refitted cores, indicating that the knappers of Kerkhove mastered the full range of technical possibilities this procedure had to offer. Indeed, in addition to being located at the center of the exploitation table, the flanks of the core could also be thinned out by making use of lateral crests or centrally located crests on the back of the core. These configurations combining several crests respectively gave rise to prepared cores with a triangular (Figure 5, R94) or biconvex shape, when seen in section, reminiscent of some of the more elaborate late Upper Palaeolithic and Final Palaeolithic types of preparation (such as the Magdalenian prepared cores, e.g. Audouze et al., 1988; Cahen, Karlin, Keeley, & Van Noten, 1980; Olive, 1988; Pigeot, 1987).

Bladelet production

The refits provide abundant data on the manner in which bladelet knapping was organized. Although sequences knapped from a single striking platform were present, most of the knapping was carried out from two opposed striking platforms. Within both knapping modalities, the exploitation table was either situated on the frontal part of the core or could expand, albeit to a limited extent, onto the sides during reduction. The back was either prepared or cortical. In addition, the opposed platform cores were always conceptualized as such before the start of the bladelet production, i.e. the positions of both striking platforms were already fixed. Moreover, as a rule, no new exploitation tables were opened during the debitage, nor did we document instances where cores evolved from single striking platform into opposed platform cores during, or near the end of the production sequence. Only two exceptions to this rule were noted. On two cores from C3 the table was at some point moved to the back of the core, where it was again exploited from two opposed striking platforms, this time perpendicularly oriented on the ones used to exploit the front.

An unprecedented feature of the opposed platform cores of Kerkhove resides in the fact that most of them were worked in a genuinely alternating way (Figure 6), in which both platforms were almost simultaneously

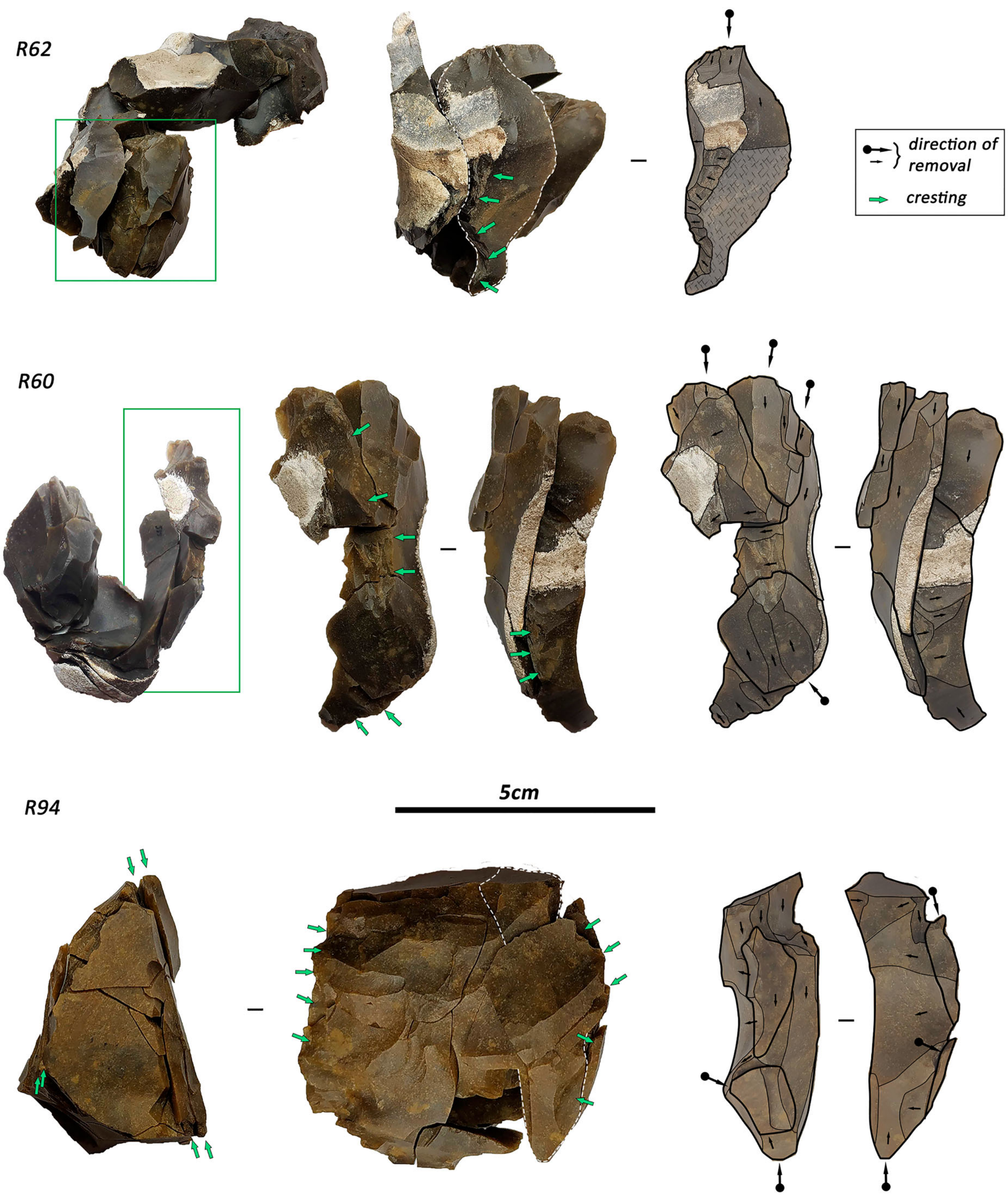

Figure 5. Different degrees of preparation through cresting. R62: Unilateral cresting; R60: unilateral cresting followed by the removal of a bilateral néo-crête; R94: Core with three crests and a triangular section after preparation.

employed in swift succession, after yielding only 1–4 bladelets each turn. Although this constant turning of the core might seem impractical at first, in theory it allows to automatically maintain a suitable longitudinal convexity (cf. Bodu, Hantaï, & Valentin, 1997; Marchand & Michel, 2009, p. 103; Valentin, 1995, p. 730) and hence reduce the risk of creating repeated hinge terminations that might damage the table beyond repair. In reality however, we noticed that the platform changes were often governed by the need to actively adjust these convexities, instead of occurring in anticipation of future problems. This being said, there does not seem to be any hierarchy between the platforms. Aside from the fast pace of the platform changes, the products of the platforms are impossible to distinguish (e.g. in terms of size, morphology or core-edge preparation) and both

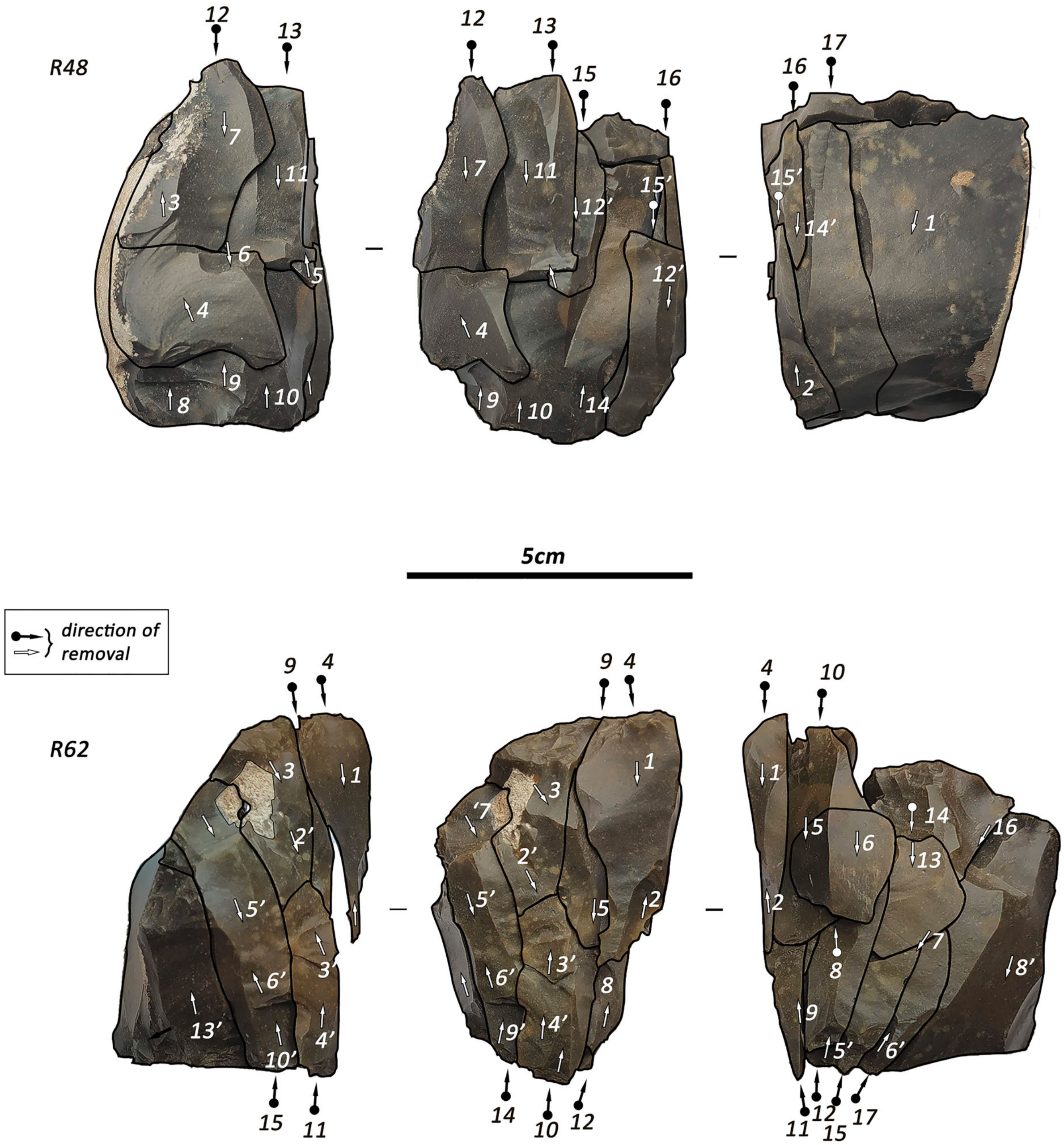

Figure 6. Two alternatingly knapped, opposed platform cores. Platform changes occurred rapidly until one or more plunging bladelets destroyed the second platform, de facto creating the impression on the exhausted cores that they were primarily worked from one striking platform.

Table 2. Summarizing table (exclusively based on the larger refit sequences) evoking the variability in knapping procedures applied in the different clusters.

	Multiple cores/refit	Extensive preparation	Cresting	Single platform	Opposed successive	Opposed alternating
C1		R22		R27		
C2			R26	R29,R27		
C3	R42	R39, R42, R45	R42	R45	R42	R39
C4						
C5	R84, R85	R89, R94	R84, R94, R95,R98	R84, R85, R98	R94	R85, R93, R95
C6	R50, R62, R75	R60, R62, R74	R52, R53, R60, R62, R63, R72	R75, R78		R48, R50, R53, R60, R62, R64, R67, R76
C7		R89	R107			
C11	R53		R53			R53

Note: This variability is however relative. Clusters 3, 5 and 7 are for example linked by refit lines, as well as clusters 6 and 11, indicating their potential contemporaneity.

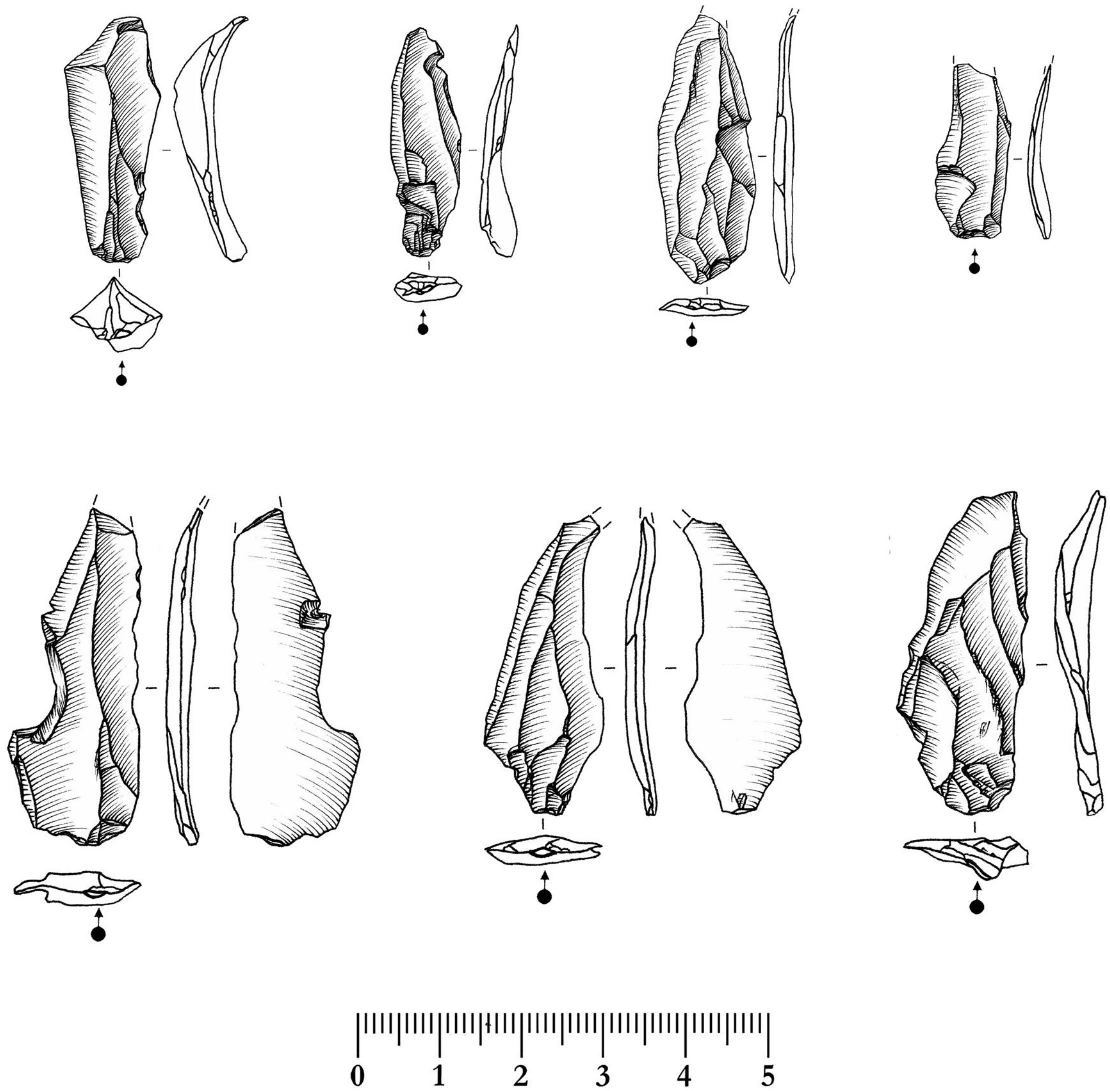

Figure 7. Typical 'Coincy style' bladelets from clusters 6 and 10.

platforms were indiscriminately used to correct mistakes. A single refit sequence (R39, see Table 2) displays some hierarchy, expressed by the fact that the products from the secondary platform are systematically smaller, shorter and less prepared than those from the primary platform.

Finally, two sequences with opposed platforms have been qualified as knapped in a successive way, meaning platform changes only occurred after longer series of removals (12 bladelets in the case of R42!) and/or could be at the same time limited to just one change. Sometimes this happened out of necessity, e.g. when an opposite platform had to be abandoned because of a plunging bladelet.

The bladelets produced following these methods are typical 'Coincy style' bladelets (Rozoy, 1968), characterized by their limited dimensions (on average 24 × 10 × 3 mm) and their overall irregular morphology (with regards to edge outline, dorsal facets and curvature; Figure 7). The majority of their platforms are linear or pointed, and about half of the bladelets show traces of thorough core-edge preparation. Impact points and pronounced bulbs were only rarely observed. These elements, combined with the regular presence of a lip (ca 25%) and proximal scars or *esquillements du bulbe* (ca 10%, as defined by Tsirk, 2010, p. 152; and Pelegrin, 2000; respectively), finally suggest the systematic use of direct percussion with a soft stone hammer during bladelet production (Pelegrin, 2000).

Rejuvenation

Rejuvenation was in a sense limited to the striking platform and was carried out by removing either entire core tablets or just partial rejuvenation flakes. Both methods were applied interchangeably and even

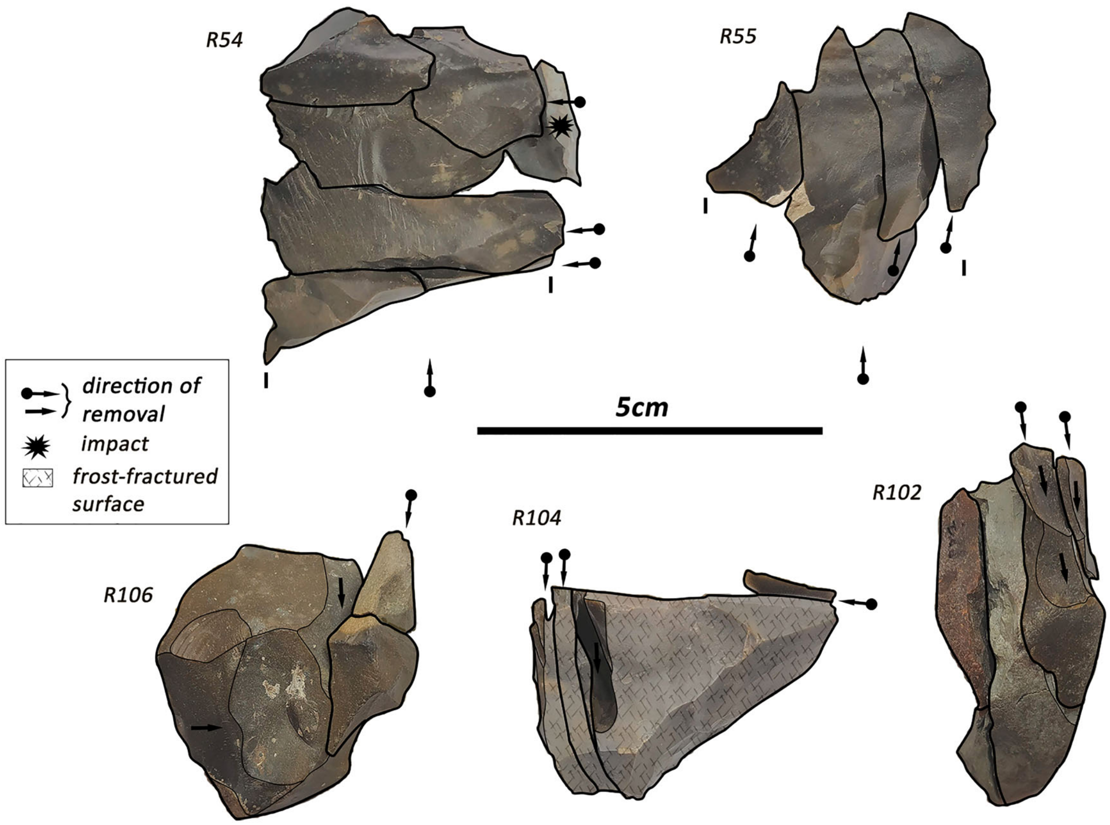

Figure 8. R54 & R55: Ventral face of flakes recycled as cores; R106, R104 & R102: simplistic debitage of small pebbles and frost-fractured debris.

co-occur from time to time on the same opposed platform cores. Their frequency reflects the need to keep the exterior angle sharp enough at all times, mostly between 70° and 85°. As explained above, rejuvenation of the table was as in fact integrated in the knapping process and did not yield distinctive products; troublesome hinge negatives or less than ideal convexities were simply removed or adjusted from the opposite platform. Lateral removals rejuvenating the transversal convexity of the table were not observed.

A single-minded focus on bladelets?

Even though bladelets undoubtedly were the main knapping objectives: they formed the basis for microlith production and were employed as unretouched blanks for a myriad of activities (Vandendriessche et al., 2019). They were not the only objectives actively pursued at the site. Formal tools were explicitly produced on the larger flake blanks available in the assemblages for example, (i.e. those derived from core shaping and preparation). Surprisingly, none of the sequences containing scrapers or burins could be refitted onto bladelet production sequences. Although this could be due to the considerable degree of spatial fragmentation of the studied *chaînes opératoires*, it also means that at this point, it is impossible to specify whether the other tools should be seen as by-products from bladelet/microlith production or whether we ought to consider them as knapping objectives in their own right, resulting from separate *chaînes opératoires*. Perhaps the possibility of a combination of integrated and separate productions should also be considered.

Further, two rather complete knapping sequences (from C3 and C6) yielded neither common tools, nor bladelets. Instead, they were from start to finish geared towards the production of blades and blade-like implements. C3 has not been subjected to microwear analysis yet and the sequence of C6 only yielded one result: a striking platform tablet used to cut soft animal tissue. Therefore, for the time being, we do not have enough data to verify if these implements served a different purpose than the other knapping products.

Recycling?

In artefact clusters C4, C6 and C11, larger flakes and tools were secondarily recycled as cores (Figure 8, R54 and R55). They were either reduced along the same axis of the original flake, or perpendicularly to it, producing narrow bladelets with a quadrangular or trapezoidal section. As such, these bladelets can closely resemble burin spalls, but they are in general larger and thicker. It is unclear at present if this occurred as a classic form of re-use or recycling or if it should be considered as secondary recycling/scavenging (Jacquier & Naudinot, 2014; Schiffer, 1972). A third option would be that this approach was integrated in the primary reduction process and served as a technical shortcut to obtain the required bladelets, in the same line of thought as the initial fragmentation of the nodules carried out at the very start of the knapping process.

Simplified knapping schemes

Finally, to end this overview of the knapping methods and procedures, we need to mention the presence of some very rudimentary debitage sequences in C4 and C7 (Figure 8, R102, R104 and R106), in which heavily rolled pebbles with irregular shapes and maximum dimensions of only 5 cm were worked. Taking advantage of the natural convexities of the nodule, a couple of excessively small flakes/bladelets were knapped off, after which the potential of these pebbles (that was very low to start with) was immediately exhausted. The meaning of these sequences is difficult to assess. Could they reflect an attempt to meet ad hoc tool needs when raw materials were unavailable? It seems more likely that they represent the work of beginning flint knappers, practicing on small pebbles rather than on more valuable raw materials, as shown by the frequent impact points on the core platforms and the stacked hinge negatives. They could even be the result of unguided children's play (e.g. Olive, 1988, p. 98; Ploux, 1991; Stapert, 2007).

Discussion

The refit data presented above offers a detailed account on how flint knapping was conducted at Kerkhove (Table 2) and at the same time provides some new elements and research perspectives regarding the global way flint knapping was organized during the Early Mesolithic in Northwestern Europe. Indeed, on the one hand, the results confirm the importance of some specific knapping procedures and show their implementation was widespread, e.g. the deliberate fragmentation of nodules into several cores in the initial stages of reduction (Ducrocq, 2013; Guilbert, 2010; Noens, 2013; Pirnay, 1981; Séara, 2014; Souffi, 2004) or the recycling of large flakes as cores (Conneller et al., 2018; Ducrocq, Bridault, Cayol, & Coutard, 2014; Ketterer, 1997; Marchand & Michel, 2009; Michel, 2009; Souffi, 2004). On the other hand, the information gained by the refits helps to clarify some aspects of Early Mesolithic flint knapping that have not always been fully understood or that remained hypothetical until now and allows to address them on a more objective basis.

The most obvious example concerns the role of (unilateral) crested bladelets in Early Mesolithic assemblages. Current interpretations of the latter based on analyses without refits can be very diverging. For some, they are the result of the rather opportunistic use of the core-edge as a guide for the first removal, when relocating the striking platform to the side of the core (e.g. Conneller et al., 2018 and Holst, 2014). Others are less hesitant to equate them with their Upper and Final Palaeolithic counterparts (Ducrocq, Bridault, & Coutard, 2008; Heinen, 2012; Ketterer, 1997; Perdaen et al., 2008; Souffi, 2004). Although, even then, some confusion persists regarding the positions of these crests and whether they derive from preparation or from rejuvenation. The refits from Kerkhove for their part, objectively illustrate the wide range of preparation types these crests could be involved in. In addition, this observation proved to hold true even for the more unorthodox partially and unilaterally crested bladelets. They showed that crests could be installed at the front and/or at the back of the core, respectively in a central position or located on one or both of the flanks. Crests used to rejuvenate the cores were however not recognized. Perhaps such an intervention would simply be too wasteful in most cases considering the small size of the cores involved? Interestingly, this absence of rejuvenation by cresting was also noticed by Ducrocq et al. (2014) based on the refits of the Warluis I site in the North of France.

Another important aspect of Early Mesolithic bladelet knapping that could not have been appreciated without refits, involves the way it was organized. In Kerkhove, bladelet production occurred predominantly from alternatingly used opposed platforms. Yet, on a northwest-European scale, this observation is unprecedented. When dealing with opposed platform cores, most researchers interpret them as being knapped either in a successive way or showing a clear hierarchy between the platforms. Given these new results, we would however recommend more caution when making such detailed inferences based on a static technological reading of the exhausted cores only. Without (longer) refit sequences, such distinctions are nearly impossible to make, and an alternating use of the striking platforms should by consequence not be rejected *a priori*.

The few refit studies carried out until now show quite some variability regarding this matter. In Eastern France, bladelet knapping on cores with a single platform prevails. When opposed platforms occur, they are mostly installed at the end of the knapping process (Séara, 2013; Séara et al., 2002). On the northern French sites of Hangest – Gravière II Nord (Ketterer, 1997) and Warluis I (Ducrocq et al., 2014), similar to Kerkhove, opposed platform cores are the most frequent, but they are nearly always worked in a successive way. At Star Carr (UK), opposed platform cores are said to show a clear hierarchy between the platforms (Conneller et al., 2018). The case of Kerkhove thus adds to the observed variability. Important to note is that sequences in which cores were opportunistically and repeatedly turned on their sides during bladelet production (Conneller et al., 2018; Hahn, 1998; Heinen, 2012; Holst, 2014; Perdaen et al., 2008), linked to the above-mentioned hypothesis about cresting, have not been convincingly documented by refit studies so far. Perhaps cores with perpendicularly oriented striking platforms therefore simply reflect the extraction of a last set of flakes at the very end of the debitage, instead of being a truly representative Early Mesolithic flint knapping method?

Which leads to a last interesting fact to discuss. In Kerkhove, the striking platforms were consistently fixed prior to the start of the actual bladelet knapping and were generally not relocated/reoriented throughout the debitage. Taken together with the elaborate preparation, this demonstrates that the knapping process was logically structured and to a certain extent formalized, instead of being driven by *ad hoc*/opportunistic decision making within an overall flexible knapping scheme. While contrasting with some of the currently circulating ideas about Early Mesolithic flint knapping, the picture painted by the refits of Kerkhove is hence one of an Early Mesolithic that shows much greater affinities with the preceding Final Palaeolithic. The types of core preparation observed (sometimes making use of 2 or even 3 crests), but also the simultaneous/alternating use of two opposed platforms are for example common features in the lithic industries of the (Epi-)Ahrensburgian (Crombé, Deeben, & Van Strydonck, 2014; Hartz, 2012; Johansen & Stapert, 2000; Vermeersch, 2013) and the Long-Blade/Belloisian (Barton, 1998; Biard & Hinguant, 2011; Bodu, 2000; Fagnart, 1997; Valentin, 2008). Taken together with the prevalence of direct percussion with a soft stone hammer that is widely accepted to have been the preferred knapping technique for bladelet production during both periods, the results from Kerkhove therefore suggest a level of continuity between the technological traditions of the Final Palaeolithic and the Early Mesolithic that has not been recognized until now. Even if this continuity was previously suspected based on similarities in armature typology (Crombé & Verbruggen, 2002; Gob, 1988; Perdaen et al., 2008) and was also alluded to by the existence of "Initial Mesolithic" industries in the North of France dated to circa 9800 uncal. BP (Coudret & Fagnart, 2012; Ducrocq et al., 2008; Naudinot, Fagnart, Langlais, Mevel, & Valentin, 2019). At Kerkhove, this fact is even more striking because the refitted assemblages do not predate 9300 uncal. BP and by consequence advocate a longer term or a more generalized continuity between both periods.

Furthermore, this continuity agrees rather well with the available data for Northern and Central Europe. There, a recently published overview reported a similar long-standing continuity between the lithic traditions of the Lateglacial Ahrensburgian/Swiderian technocomplexes and the Early Maglemosian/Early Mesolithic (Berg-Hansen, 2018, pp. 80–81). Either way, these results suggest that further systematic refitting analyses of Early Mesolithic and Final Palaeolithic assemblages could prove instrumental to increase our understanding of the lithic traditions occurring throughout this transitional period. For the Scheldt valley, the neighboring site of Ruien shows a lot of potential in this regard. Despite dating to the very start of the Younger Dryas, its lithic assemblage has a very 'Mesolithic' character, due to its almost exclusive focus on bladelet production and the use of direct percussion with a soft hammerstone (Crombé, Sergant, et al., 2014).

Finally, with these new data and hypotheses in mind, it seems important to turn our attention once more to the dichotomy between *Coincy* and *Montbani style* knapping (Rozoy, 1968). Despite the more formalized way of working attested at Kerkhove, this dichotomy is on the one hand still very relevant when comparing Early and Middle Mesolithic assemblages with Late Mesolithic ones. The major differences between both "styles" seem to be related to changes in knapping technique, with the introduction of indirect percussion and pressure flaking in the course of the 7th millennium BC (Allard, 2017; Marchand & Perrin, 2017), ultimately leading to more regular bladelets with straight profiles and parallel edges. On the other hand, considering the clear similarities in knapping technique and methods between the Early Mesolithic and the Final Palaeolithic, we would discourage a broad interpretation of the term 'Coincy debitage' and would advise to use it only to characterize the typical irregularly shaped bladelets of the Early Mesolithic. Indeed, despite the numerous changes occurring at the transition from the Younger Dryas to the (Pre)boreal (e.g. with regards to hunting strategies, toolkit composition and raw material acquisition (Crombé, Deeben, et al., 2014; Ducrocq, 2001, pp. 214–215; Naudinot et al., 2019), technological traditions seemingly evolved in a continuous manner instead of representing a rupture with the preceding period. The most important technological differences remaining involve the larger proportion of blades in Final Palaeolithic industries and the greater standardization of the blanks produced. Although even this is not necessarily always the case, as shown by the lithic industry of Ruien (Crombé, Sergant, et al., 2014).

Conclusion

The data from Kerkhove offers a more nuanced view on the northwest-European Early Mesolithic technological traditions and emphasizes the diversity in knapping methods that occurred, both at an intra-site level and on a broader regional scale. *Chaînes opératoires* could be as condensed as they are sometimes assumed to be for this period, but they could also be complex and diversified, displaying different degrees and types of preparation, different knapping objectives and different ways of organizing bladelet production. As such, the more elaborate sequences from Kerkhove show affinities with the lithic technological traditions of the preceding Final Palaeolithic period and point to a greater level of continuity between both periods. New extensive refit studies on the Earliest Mesolithic assemblages (Preboreal and Early Boreal) will be needed to further explore this proposition and to create an unbiased interpretative framework allowing to test the representativeness of the findings described in this paper.

Acknowledgements

We would like to thank all our fellow archaeologists and field technicians involved in the preventive excavations held at Kerkhove and more specifically Gunther Noens for his drawings of the lithic artefacts. Finally, we are grateful to two anonymous reviewers, whose valuable comments on an earlier draft substantially improved the paper. The preventive archaeological excavations at the site of Kerkhove-Stuw were financed by De Vlaamse Waterweg nv and the European Union, Trans-European Transport Network (Ten-T). Further, no specific funding was used for the analyses presented in this article.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributors

Hans Vandendriessche, has been a research assistant and phd candidate at Ghent University since 2015 and is currently working on a phd about the lithic technological traditions of the Lateglacial and Early Holocene in Belgium, supervised by Philippe Crombé. After having obtained his MA degree in 2009 and prior to this research project, he worked as a field-archaeologist on several large-scale preventive excavations in the Scheldt basin.

Philippe Crombé, is head of the Archaeology Department and professor of Prehistoric Archaeology at Ghent University. He is currently promoter of several multidisciplinary research projects focusing on the Lateglacial and Early Holocene transition and the Neolithization process in the Scheldt basin of NW Belgium. Prior to the Kerkhove project, he directed several large-scale excavation projects in the Antwerp-Harbour, which yielded the sites of Verrebroek-Dok and Doel-Deurganckdok and led an interdisciplinary research on the Lateglacial Moervaart palaeolake.

References

Allard, P. (2017). Variabilité des débitages laminaires au Second Mésolithique et au Néolithique ancien dans le nord de la France (VIIè et VIè millénaire BCE). *Journal of Lithic Studies*, *4*(2), 75–103.

Audouze, F., Karlin, C., Cahen, D., Croisset de, E., Coudret, P., Larrière, M., … Taborin, Y. (1988). Taille du silex et finalité du débitage dans le Bassin parisien. In M. Otte (Ed.), *De la Loire à l'Oder, les civilisations du Paléolithique final dans le Nord-Ouest européen. Actes du Colloque de Liège, décembre 1985* (pp. 55–84). Oxford: Archaeopress (ERAUL 25/BAR International Series, 444).

Bailey, G. (2007). Time perspectives, palimpsests and the archaeology of time. *Journal of Anthropological Archaeology*, *26*, 198–223.

Barton, R. N. E. (1998). Long blade technology and the question of British Late Pleistocene/Early Holocene lithic assemblages. In N. Ashton, F. Healy, & P. Pettitt (Eds.), *Stone age archaeology. Essays in honour of John Wymer* (pp. 158–164). Oxford: Oxbow (Monograph 102; Lithic Studies Society Occasional Paper 6).

Berg-Hansen, I.-M. (2018). Continuity and change in Late- and Post-Glacial social networks: Knowledge transmission and blade production methods in Ahrensburgian and Early Mesolithic North-West Europe. In K. Knutsson, H. Knutsson, J. Apel, & H. Glorstadt (Eds.), *Technology of early settlement in Northern Europe: Transmission of knowledge and culture* (pp. 63–98). Sheffield: Equinox (The early settlement of northern Europe, 2).

Biard, M., & Hinguant, S. (2011). *Le bivouac préhistorique du Buhot à Calleville (Eure)*. Paris: CNRS éditions/INRAP (Recherches archéologiques, 2).

Bleed, P. (2002). Obviously sequential, but continuous or staged? Refits and cognition in three late palaeolithic assemblages from Japan. *Journal of Anthropological Archaeology*, *21*, 329–343.

Bodu, P. (2000). Les facies tardiglaciaires à grandes lames rectilignes et les ensembles à pointes de Malaurie dans le sud du Bassin parisien: quelques réflexions à partir de l'exemple du Closeau (Hauts-de-Seine). In P. Crotti (Ed.), *Méso 97* (pp. 9–28). Lausanne, 21–23 Novembre 1997, Cahiers d'Archéologie Romande, Lausanne.

Bodu, P., Hantaï, A., & Valentin, B. (1997). La Long Blade Technology au suddu Bassin Parisien: nouvelles découvertes. In J.-P. Fagnart & A. Thévenin (Eds.), *Le Tardiglaciaire en Europe du Nord-Ouest. Chronostratigraphie* *et environnement des occupations humaines du Tardiglaciaire et du début de l'Holocène en Europe du Nord-Ouest Actes du 119ème congrès national des sociétés historiques et scientifiques, Pré-et Protohistoire, Amiens, 1994* (pp. 123–137). Paris: CTHS.

Cahen, D., Karlin, C., Keeley, L. H., & Van Noten, F. (1980). Méthode d'analyse technique, spatiale et fonctionnelle d'ensembles lithiques. *Helinium*, *20*(2), 209–259.

Conneller, C., Little, A., Garcia-Diaz, V., & Croft, S. (2018). The worked flint. In N. Milner, B. Taylor, & C. Conneller (Eds.), *Star Carr volume 2: Studies in technology, subsistence and environment* (pp. 493–534). York: White Rose University.

Coudret, P., & Fagnart, J.-P. (2012). Les occupations préhistoriques du 'Marais de Conty' (Somme). In P. Antoine, J.-P. Fagnart, P. Auguste, P. Coudret, N. Limondin-Lozouet, P. Ponel, A.-V. Munaut, A. Defgnée, A. Gauthier, & C. Fritz (Eds.), *Conty, vallée de la Selle (Somme, France) : séquence tardiglaciaire de référence et occupations préhistoriques* (pp. 63–90). Paris: Quaternaire (hors-série 5).

Crombé, P. (2019). Mesolithic projectile variability along the southern North Sea basin (NW Europe): hunter-gatherer responses to repeated climate change at the beginning of the Holocene. *PloS one*, *14*(7), 1–19.

Crombé, P., Deeben, J., & Van Strydonck, M. (2014). Hunting in a changing environment: The transition from the Younger Dryas to the (Pre)boreal in Belgium and the Southern Netherlands. In S. Michel, & N. Naudinot (Eds.), *Transitions, ruptures et continuité durant la Préhistoire. Actes du XXVIIéme Congrès Préhistorique de France, 31 mai - 5 juin, Bordeaux-Les Eyzies* (pp. 583–604). Paris: Société Préhistorique française.

Crombé, P., Sergant, J., Verbrugge, A., De Graeve, A., Cherretté, B., Mikkelsen, J., … Boudin, M. (2014). A sealed flint knapping site from the Younger Dryas in the Scheldt valley (Belgium): Bridging the gap in human occupation at the Pleistocene-Holocene transition in W-Europe. *Journal of Archaeological Science*, *50*, 420–439.

Crombé, P., Van Strydonck, M., & Boudin, M. (2009). Towards a refinement of the absolute (Typo)chronology for the Early Mesolithic in the Coversand area of Northern Belgium and the Southern Netherlands. In P. Crombé, M. Van Strydonck, J. Sergant, M. Boudin, & M. Bats (Eds.), *Chronology and evolution within the Mesolithic of North-West Europe: Proceedings of the international congress chronology and evolution in the Mesolithic of Northwest Europe, May 30th till June 1st 2007, Brussels* (pp. 95–112). Cambridge: Cambridge scholar publishing.

Crombé, P., & Verbruggen, C. (2002). The Lateglacial and early Postglacial occupation of northern Belgium: The evidence from Sandy Flanders. In B. V. Eriksen, & B. Bratlund (Eds.), *Recent studies in the Final Palaeolithic of the European plain, proceedings of the UISPP symposium (Stockholm, 1999), Højbjerg, Jutland Archaeological Society – Moesgaard Museum* (pp. 165–180). Aarhus: Aarhus University Press (Jutland Archaeological Society Publications 39).

Ducrocq, T. (2001). *Le Mésolithique du bassin de la Somme*. Lille: Université des Sciences et Technologies Lille. (Publications du CERP 7)

Ducrocq, Thierry. (2013). The 'Beuronian with crescents' in Northern France: beginnings of a palethnological approach. In Boris Valentin, Bénédicte Souffi, Thierry Ducrocq, Jean-Pierre Fagnart, Frédéric Séara, & Christian Verjux (Eds.), *Palethnographie du Mésolithique. Recherchessur les habitats de plein air entre Loire et Neckar, Actes de latable-ronde internationale de Paris, 26 et 27 novembre2010. Séances de la Société Préhistorique française* (Vol. 2(1), pp. 217–234). Paris: Société Préhistorique française.

Ducrocq, T., Bridault, A., Cayol, N., & Coutard, S. (2014). Une concentration caractéristique du Beuronien à segments: Le gisement de Warluis I (Oise). *Revue Archeologique de Picardie*, *2014*(1–2), 5–42.

Ducrocq, T., Bridault, A., & Coutard, S. (2008). Le gisement de Warluis (Oise): approche préliminaire. In J.-P. Fagnart, A. Thévenin, T. Ducrocq, B. Souffi, & P. Coudret (Eds.), *Le début du Mésolithique en Europe du Nord-Ouest*. Actes de la table ronde d'Amiens, 9–10 octobre 2004 (pp. 85–106). Paris: Société préhistorique française (Mémoires 45).

Dumont, S. (1997). Nouvelles recherches sur la transition Tardiglaciaire-Préboréal dans le Sud et l'Est de l'Angleterre. In J.-P. Fagnart, & A. Thévenin (Eds.), *Le Tardiglaciaire en Europe du Nord-Ouest. Chronostratigraphie et environnement des occupations humaines du Tardiglaciaire et du début de l'Holocène en Europe du Nord-Ouest Actes du 119ème congrès national des sociétés historiques et scientifiques, Pré-et Protohistoire, Amiens, 1994* (pp. 517–528). Paris: CTHS.

Fagnart, J.-P. (1997). *La fin des temps glaciaires dans le Nord de la France. Approches archéologiques et environnementales des occupations humaines du Tardiglaciaire*. Paris: Société Préhistorique française (Mémoires de la Société préhistorique française, 24).

Gob, A. (1984). Les industries mésolithiques dans la partie sud de la Belgique. In D. Cahen, & P. Haesaerts (Eds.), *Peuples chasseurs de la Belgique préhistorique* (pp. 195–210). Bruxelles: Patrimoine de l'Institut Royal des sciences naturelles de Belgique.

Gob, A. (1988). L'Ahrensbourgien de Fonds-de-Forêt et sa place dans le processus de mésolithisation dans le Nord-Ouest de l'Europe. In M. Otte (Ed.), *De la Loire à l'Oder. Les Civilisations du Paléolithique final dans le Nord-Ouest européen, Actes du colloque international, Liège, 1985* (pp. 259–285). Oxford: Archaeopress (BAR International Series 444).

Guilbert, R. (2010). "Le Sansonnet" et "Les Agnels" (Vaucluse), un exemple de fragmentation thermique intentionnelle du silex au Sauveterrien. *Paléo*, *13*, 245–250.

Hahn, J. (1998). Opportunistic patterns of lithic reduction at the Mesolithic site of Rottenburg-Siebenlinden 1. In N. J. Conard, & C.-J. Kind (Eds.), *Aktuelle Forschungen zum Mesolithikum-Current Mesolithic research* (pp. 251–255). Tübingen: Verlag Marie Leidorf (Urgeschichtliche Materialhefte, 12).

Hartz, S. (2012). Grundformerzeugung im Nordischen Endpaläolithikum. In H. Floss (Ed.), *Steinartefakte, vom Altpaläolithikum bis in die Neuzeit* (pp. 389–398). Tübingen: Kerns Verlag (Tübingen Publications in Prehistory).

Heinen, M. (2012). Grundformproduktion und -verwendung im frühen Mesolithikum Mitteleuropas. In H. Floss (Ed.), *Steinartefakte, vom Altpaläolithikum bis in die Neuzeit* (pp. 535–548). Tübingen: Kerns Verlag (Tübingen Publications in Prehistory).

Holst, D. (2014). *Subsistenz und Landschaftsnutzung im Frühmesolithikum: Nussröstplätze am Duvensee*. Mainz: Verlag des Römisch-Germanischen Zentralmuseums (Monographien des Römisch-Germanischen Zentralmuseums, 120).

Jacquier, J., & Naudinot, N. (2014). Socio economic significance of stone tools recycling, reuse and maintenance at the end of

the Lateglacial in Northwestern France. *Quaternary International*, *361*, 269–287.
Johansen, L., & Stapert, D. (2000). Two 'Epi-Ahrensburgian' sites in the northern Netherlands: Oudehaske (Friesland) en Gramsbergen (Overijssel). *Palaeohistoria*, *39/40*, 1–87.
Juel Jensen, H. (1994). *Flint tools and plant working, Hidden traces of stone Age technology. A use wear study of some Danish Mesolithic and TRB implements*. Aarhus: University press.
Ketterer, I. (1997). Les techniques et l'économie du débitage Mésolithique d'Hangest « Gravière II Nord » (Somme). In J.-P. Fagnart, & A. Thévenin (Eds.), *Le Tardiglaciaire en Europe du Nord-Ouest. Chronostratigraphie et environnement des occupations humaines du Tardiglaciaire et du début de l'Holocène en Europe du Nord-Ouest Actes du 119ème congrès national des sociétés historiques et scientifiques, Pré- et Protohistoire, Amiens, 1994* (pp. 123–137). Paris: CTHS.
Kind, C.-J. (2003). *Das Mesolithikum in der Talaue des Neckars. Die Fundstellen von Rottenburg-Siebenlinden 1 und 3*. Stuttgart: Konrad Theiss Verlag (Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Würtemberg, 88).
Marchand, G., & Michel, S. (2009). Les industries lithiques, matériaux, chaînes opératoires et outillages. In G. Marchand (Ed.), *Des feux dans la vallée, les habitats du Mésolithique et du Néolithique récent de l'Essart à Poitiers (Vienne)* (pp. 87–142). Rennes: Presses universitaires de Rennes.
Marchand, G., & Perrin, T. (2017). Why this revolution? Explaining the major technical shift in Southwestern Europe during the 7th millennium cal. BC. *Quaternary International*, *428*, 73–85.
Michel, S. (2009). Le Premier Mésolithique du Centre-Ouest: modalités techniques de l'industrie lithique. *Bulletin de la Société préhistorique française*, *106*(4), 715–734.
Morrow, T. M. (1996). Lithic refitting and archaeological site formation processes. A case study from the Twin Ditch site, Greene County, Illinois. In G. H. Odell (Ed.), *Stone tools. Theoretical insights into Human Prehistory* (pp. 345–377). Boston: Springer (Interdisciplinary Contributions to Archaeology).
Naudinot, N., Fagnart, J.-P., Langlais, M., Mevel, L., & Valentin, B. (2019). Les dernières sociétés du Tardiglaciaire et des tout débuts de l'Holocène en France. Bilan d'une trentaine d'années de recherches. *Gallia Préhistoire*, *59*, 5–45.
Noens, G. (2013). Intra-site analysis of Early Mesolithic sites in Sandy Flanders: The case of Doel-'Deurganckdok J/L', C3. In B. Valentin, B. Souffi, T. Ducrocq, J.-P. Fagnart, F. Séara, & C. Verjux (Eds.), *Palethnographie du Mésolithique. Recherches sur les habitats de plein air entre Loire et Neckar*, Actes de la table-ronde internationale de Paris, 26 et 27 novembre 2010 (pp. 217–234). Paris: Société Préhistorique française (Séances de la Société Préhistorique française, 2 (1)).
Olive, M. (1988). *Une habitation magdalénienne d'Etiolles. L'unité P15*. Paris: Editions CNRS (Mémoires de la Société Préhistorique française 20).
Pelegrin, J. (2000). Les techniques de débitage laminaire au Tardiglaciaire: critères de diagnose et quelques réflexion. In B. Valentin, P. Bodu, & M. Christensen (Eds.), *L'europe centrale et septentrionale au Tardiglaciaire, actes de la table ronde internationale, Nemours, 1997* (pp. 73–86). Nemours: APRAIF (Mémoires du musée de Préhistoire d'Île-de-France, 7).
Perdaen, Y., Crombé, P., & Sergant, J. (2008). Lithic technology and the cultural identity of Early Mesolithic Groups. *Current Anthropology*, *49*, 317–327.
Pigeot, N. (1987). *Magdaléniens d'Etiolles: économie de débitage et organisation sociale (l'unité d'habitation U5)*. Paris: Editions CNRS (Gallia Préhistoire, Supplément, 25).
Pirnay, L. (1981). Préhistoire expérimentale – technologies mésolithiques. *Bulletin de la Société Préhistorique Luxembourgeoise*, *3*, 11–46.
Ploux, S. (1991). Technologie, technicité, techniciens: méthode de détermination d'auteurs et comportements techniques individuels. In Collectif (Ed.), *25 ans d'études technologiques en Préhistoire : bilan et perspectives, actes des XIes Rencontres internationales d'archéologie et d'histoire (Antibes, 18–20 octobre 1990)* (pp. 201–214). Juan-les-Pins: APDCA.
Reynier, M. (2005). *Early Mesolithic Britain. Origins, development and directions*. Oxford: Archaeopress (British Archaeological Reports British Series, 393).
Rozoy, J. G. (1968). L'étude du matériel brut et des microburins dans l'Epipaléolithique (mésolithique) franco-belge. *Bulletin de la Société Préhistorique Française*, *65*(1), 365–390.
Schiffer, M. B. (1972). Archaeological context and systemic context. *American Antiquity*, *37*(2), 156–165.
Séara, F. (2013). *Les occupations du premier Mésolithique des Basses Veuves (Pont-sur-Yonne)*. Paris: CNRS éditions/INRAP (Recherches archéologiques, 8).
Séara, F. (2014). Variabilité des schémas de production lithique: facteurs et signification. In A. Henry, B. Marquebielle, L. Chesnaux, & S. Michel (Eds.), *Des techniques aux territoires : nouveaux regards sur les cultures mésolithiques. Actes de la table-ronde, 22–23 novembre 2012, Maison de la recherche, Toulouse, France* (pp. 23–53). Toulouse: Presse Universitaire du Midi (Palethnologie, 6).
Séara, F., & Roncin, O. (2013). Fonds de vallée et fréquentation mésolithique. L'exemple de Dammartin-Marpain dans le Jura. In B. Valentin, B. Souffi, T. Ducrocq, J.-P. Fagnart, F. Séara, & C. Verjux (Eds.), *Palethnographie du Mésolithique. Recherches sur les habitats de plein air entre Loire et Neckar*, Actes de la table-ronde internationale de Paris, 26 et 27 novembre 2010 (pp. 93–118). Paris: Société Préhistorique française (Séances de la Société Préhistorique française, 2 (1)).
Séara, F., Rotillon, S., & Cupillard, C. (2002). *Campements mésolithiques en Bresse jurassienne. Choisey et Ruffey-sur-Seille*. Paris: Editions de la Maison des Sciences de l'Homme (Documents d'Archéologie Française, 92).
Sergant, J., Perdaen, Y., & Crombé, P. (2006). The 'invisible hearths : A contribution to the discernment of Mesolithic non-structured surface hearths. *Journal of Archaeological Science*, *33*, 999–1007.
Sørensen, M. (2006). Teknologiske traditioner i Maglemosekulturen. En diakron analyse af Maglemosekulturen flakkeindustri. In B. V. Eriksen (Ed.), *Stenalderstudier Tidligt mesolitiske jaeger og samlere i Sydskandinavien* (pp. 19–75). Aarhus: Jysk Arkaeologisk Selskab (Jysk Arkæologisk Selskabs Skrifter, 55).
Souffi, B. (2004). *Le Mésolithique en Haute-Normandie (France). L'exemple du site d'Acquigny " l'Onglais" (Eure) et sa contribution à l'étude des gisements mésolithique de plein air*. Oxford: Archaeopress (British Archaeological Reports International Series, 1307).

Stapert, D. (2007). Neanderthal children and their flints. *PalArch's Journal of Archaeology of Northwest Europe*, *1*(2), 16–39.

Tsirk, A. (2010). Popouts and related fractures. *Lithic Technology*, *35*(2), 149–170.

Valentin, B. (1995). *Les groupes humains et leurs traditions au Tardiglaciaire dans le Bassin parisien. Apports de la technologie lithique comparée* (Unpublished doctoral dissertation, Universite Paris I).

Valentin, B. (2008). *Jalons pour une Paléohistoire des derniers chasseurs (XIVe-VIe millénaire avant J.-C.)*. Paris: Publications de la Sorbonne (Cahiers archéologiques de Paris 1 (1)).

Vandendriessche, H., Guéret, C., Aluwé, K., Messiaen, L., Cruz, F., Storme, A., … Crombé, P. (2019). Deux millénaires d'occupations mésolithiques aux bords de l'Escaut à Kerkhove (Belgique). Première approche palethnographique. *Bulletin de la Société préhistorique française*, *116*(2), 283–316.

Vermeersch, P. M. (2013). *An Ahrensburgian site at Zonhoven-Molenheide (Belgium)*. Oxford: Archaeopress (BAR International Series 2471).