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The cretaceous outcrops of the Lille-Tournai (FR/BE) area and their archaeological significance

Hans VANDENDRIESSCHE, Philippe CROMBÉ & Jean-Philippe COLLIN

1. Introduction

In recent years, new studies concerning the lithic raw materials exploited on the prehistoric sites of the Belgian Scheldt valley have been undertaken at Ghent University in the framework of several doctoral dissertations (Fiers, 2020; Messiaen, 2020; Vandendriessche, in press). Guidance for the traditional macroscopic analyses and determinations carried out, was provided by the expertise built over the past decades in the neighboring regions (*e.g.*, Allard *et al.*, 2005, 2010; De Grooth, 2011; Denis, 2017; Collin, 2019; Gehlen *et al.*, 2021), that was among others shared through international workshops (Collin *et al.*, in prep.) and made consultable via lithic reference collections. In addition to a macroscopic analysis of archaeological artefacts, fieldwalking surveys were organized from 2016 to 2018 to document the cretaceous outcrops of the Lille-Tournai area and geochemical characterizations were carried out on the collected samples in collaboration with the Geology and Analytical Chemistry departments of Ghent University (Fiers *et al.*, 2019; Laforce *et al.*, 2021).

The main goals of the present contribution are to report and illustrate the lithic raw materials collected during our prospections, as well as to briefly discuss their prehistoric exploitation. Other topics that will be addressed in a succinct manner are the lithostratigraphic origins of some of the flints found in secondary position, as well as the potential for sourcing of the geochemical methods employed in recent years. In the near future most of the information published in this paper will be made accessible, in a new open access reference collection 'Flepostore', launched by Ghent University earlier this year.

2. Prospections

From 2016 to 2018, several fieldwalking surveys were undertaken to gain a better understanding of the siliceous raw materials present in the cretaceous deposits of the faulted anticline of the Mélantois-Tournaisis massif, between Lille and Tournai. This was done in the hope to find outcrops of a flint type that is particularly abundant on prehistoric sites in the Upper Scheldt valley, colloquially referred to as 'Scheldt flint' or *Scheldevuursteen* (Fig. 1). It is an opaque and moderately grained dark-grey to black flint with many small, millimeter-scale, light-grey inclusions. Other distinctive features are the frequently occurring well-preserved sponge spicules among the allochems as well as the uneven contact between the cortex and the inner fabric of the flint (recurrent intrusions). Apart from this, some nodules can show a greater variability in terms of their color and the quantity of their inclusions, *i.e.*, they can sometimes contain brown colored zones and coarser-grained pluricentimetric inclusions. Finally, the state of the cortex can vary a lot from one nodule to the next, and ranges from fresh, chalky white cortex to dark-green and heavily rolled (cf. 'Thanetian flint'), or even scoriaceous cortex. Of course, the appearance of the cortex has evolved since the diagenesis and is highly influenced by the

nature of the substratum in which the nodules were contained. Nevertheless, the cortex of the Scheldt flints seems particularly sensitive to these post-depositional processes, as illustrated by the wide range of macrofacies of the cortex.

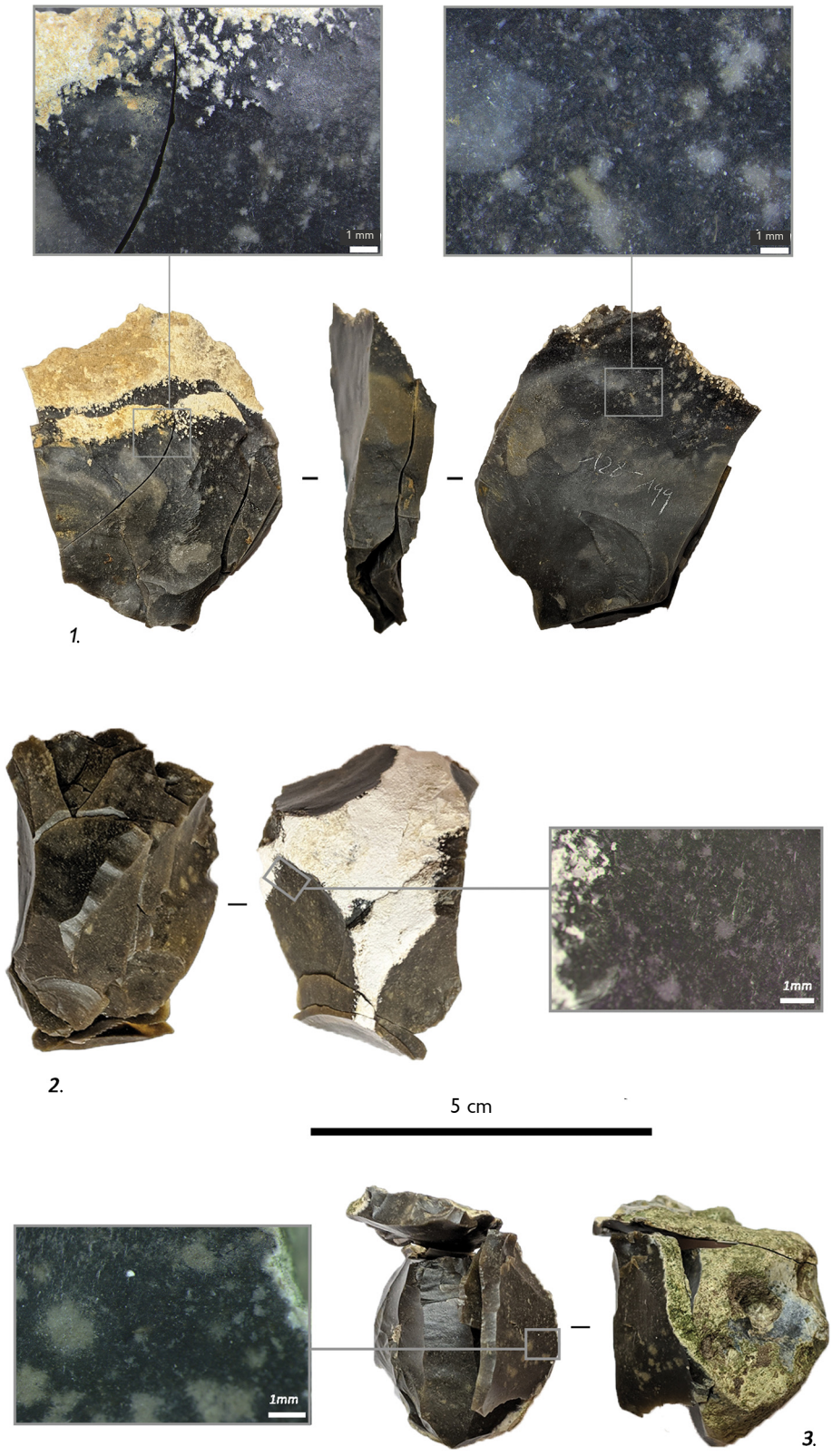

Fig. 1 – Scheldt flint or Schelde vuursteen from the Final Palaeolithic site of Ruien (1) and the Mesolithic site of Kerkhove (2-3). Photographs and CAD H. Vandendriessche, UGent

In total four survey locations were chosen (Tab. 1; Fig. 2). The first location, situated at Bouvines (FR) was explored because the flint outcrops had been described in a geological guide to the region (Delattre *et al.*, 1973) and had previously been cited by Vanmontfort (2004: 56) as a possible provenance for a part of the lithics exploited at the Middle Neolithic site of Spiere. The three other survey locations, Ère, Froyennes and Esplechin, near Tournai (BE), were selected based on the combined presence of superficially buried cretaceous layers and an admixture of stones in the subsoil, according to the geological map and the soil map of the Walloon region respectively. This selection strategy proved highly effective. All the potential outcrop locations ended up yielding flint nodules that matched the archaeological 'Scheldt flint' samples, confirming the presence of these raw materials at considerably closer distances of the archaeological sites studied than previously thought (cf. Crombé *et al.*, 2011, 2014).

Location	*Lithostratigraphy*	*Formation*	*Member*	*References*	*Coordinates*
Bouvines (FR)	upper Turonian	C3c	-	Delattre *et al.*, 1973	50°35'14.5" N 3°11'23.2" E
Esplechin (BE)	upper Turonian	Esplechin	-	Hennebert & Doremus, 1997	50°33'58.2" N 3°18'17.7" E
Froyennes (BE)	middle to upper Turonian	Vert Galand*	-	Hennebert & Doremus, 1997	50°37'02.1" N 3°21'19.9" E
Ère (BE)	middle to upper Turonian	Vert Galand*	Merlin	Hennebert & Doremus, 1997	50°34'44.3" N 3°22'20.3" E

Tab. 1 – Detailed information on the surveyed locations. *: Although the Vert Galand Formation was present in the subsoil at Ère and Froyennes, it is not certain that our prospection finds originated from these layers.

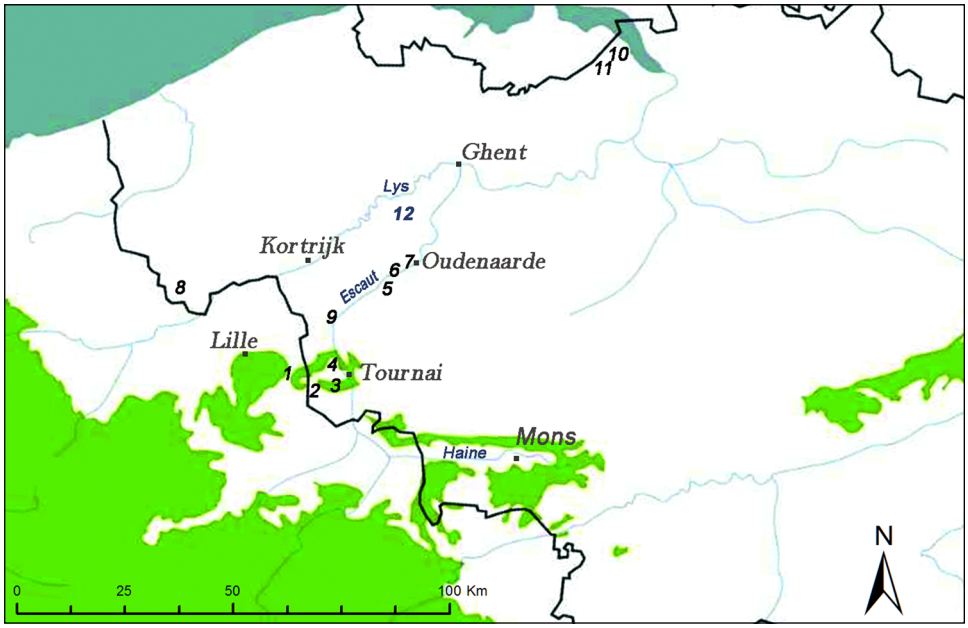

Fig. 2 – Map of the cretacrous outcrops in Belgium with position of the prospected terrains and sites mentioned in the text.
1. Bouvines; 2. Esplechin; 3. Ère; 4. Froyennes; 5. Ruien; 6. Kerkhove; 7. Oudenaarde 'Donk'; 8. Kemmelberg; 9. Spiere; 10. Verrebroek 'Aven Akkers'; 11. Sint-Gillis-Waas. 12. Kruishoutem 'Kerkakkers'.

3. Results

3.1. Bouvines (FR) and Esplechin (BE)

At Bouvines and Esplechin, nearly identical situations were encountered. The nodules were found in a near-primary position (or 'sub-autochtonous context' when adopting the terminology developed by Allard *et al.*, 2005), as evidenced by the multitude of

ploughed-up marl fragments found besides the flint nodules. At both locations, moreover, the Upper Turonian units yielded relatively large nodules (up to 18 cm) with a fresh appearance, judging by their chalky white to slightly rougher beige cortex (Fig. 3). The mesofacies presents a typical Turonian petrofabric rich in detrital elements containing numerous elements of sponges (Fig. 4:left).

3.2. Ère and Froyennes (BE)

By contrast, at Ère and Froyennes, all the nodules were recovered in secondary position. Although Scheldt flint nodules were present (Fig. 5:2,4), they occurred much less frequently, were generally smaller in size and more often (but not always) displayed traces of secondary alterations (Fig. 4), *i.e.*, several samples showed a heavily rolled, dark green, glauconitic cortex with an underlying orange-brown oxidation band. Such alterations are considered typical of so-called 'Thanetian flints' (Moreau *et al.*, 2013; Denis, 2017), which are cretaceous flints that have been remobilized by glauconite-rich sands during Early Palaeogene marine transgressions. Besides these, at both locations, a second flint microfacies was attested (Fig. 5:1,3,5): a dark-grey to black, uneven-quality flint comprised

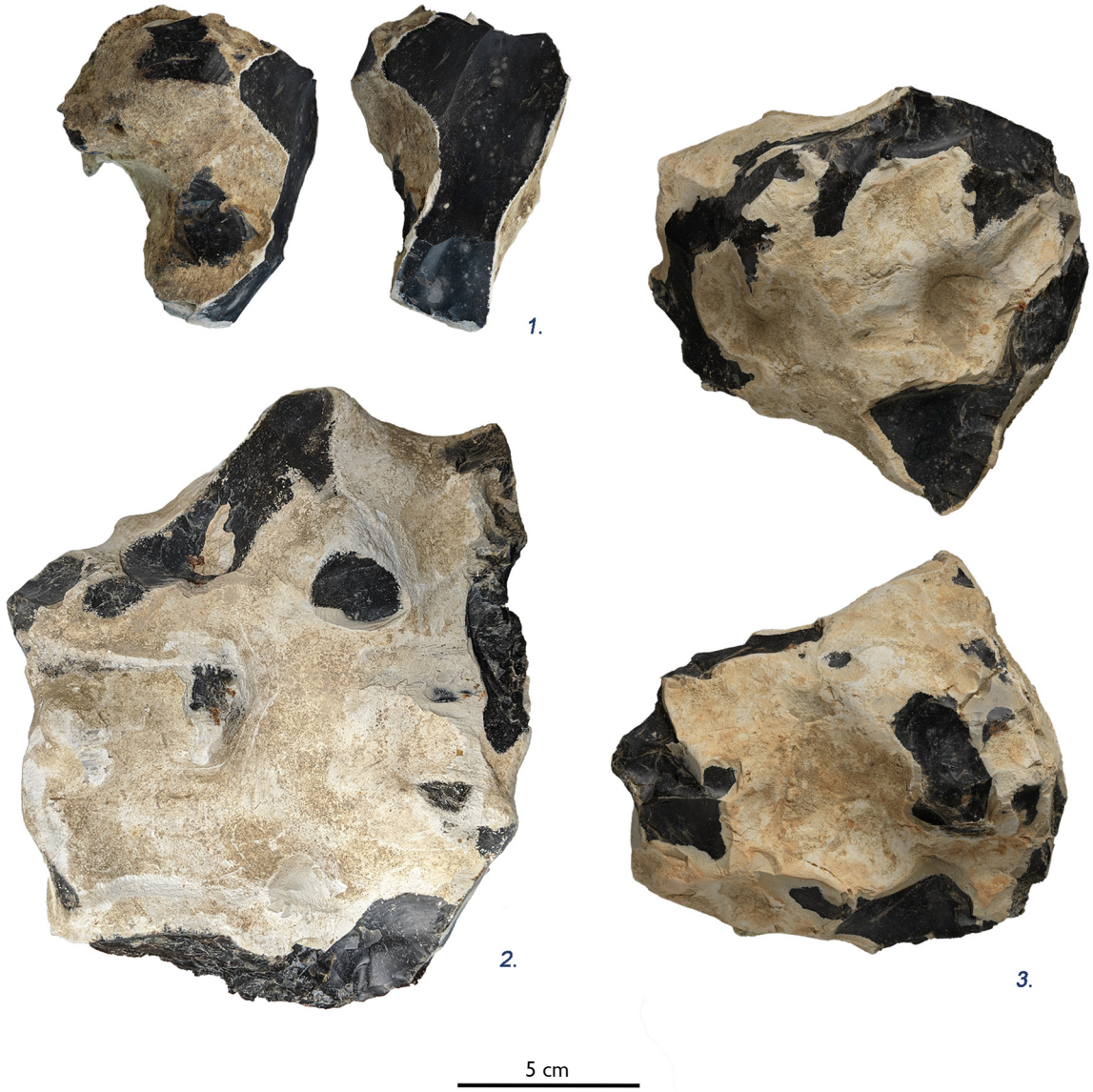

Fig. 3 – Nodules collected at Bouvines (1) and Esplechin (2-3). Photographs © C. Verhelst, Flepostore, UGent.

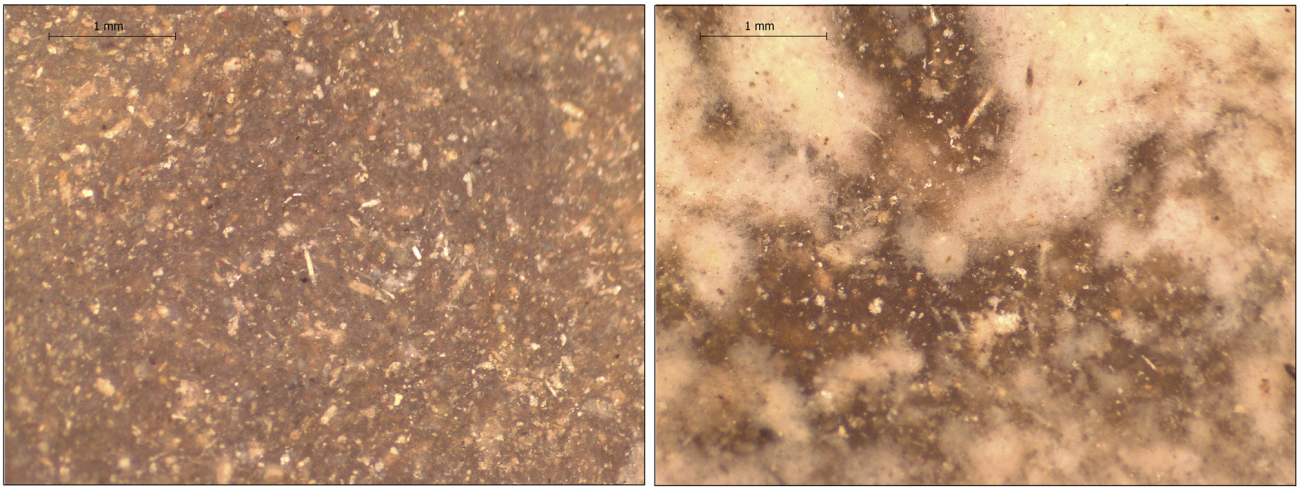

Fig. 4 – Left: Upper Turonian flint from Esplechin. Right: Second flint facies from Ère and Froyennes. Photographs J.-P. Collin.

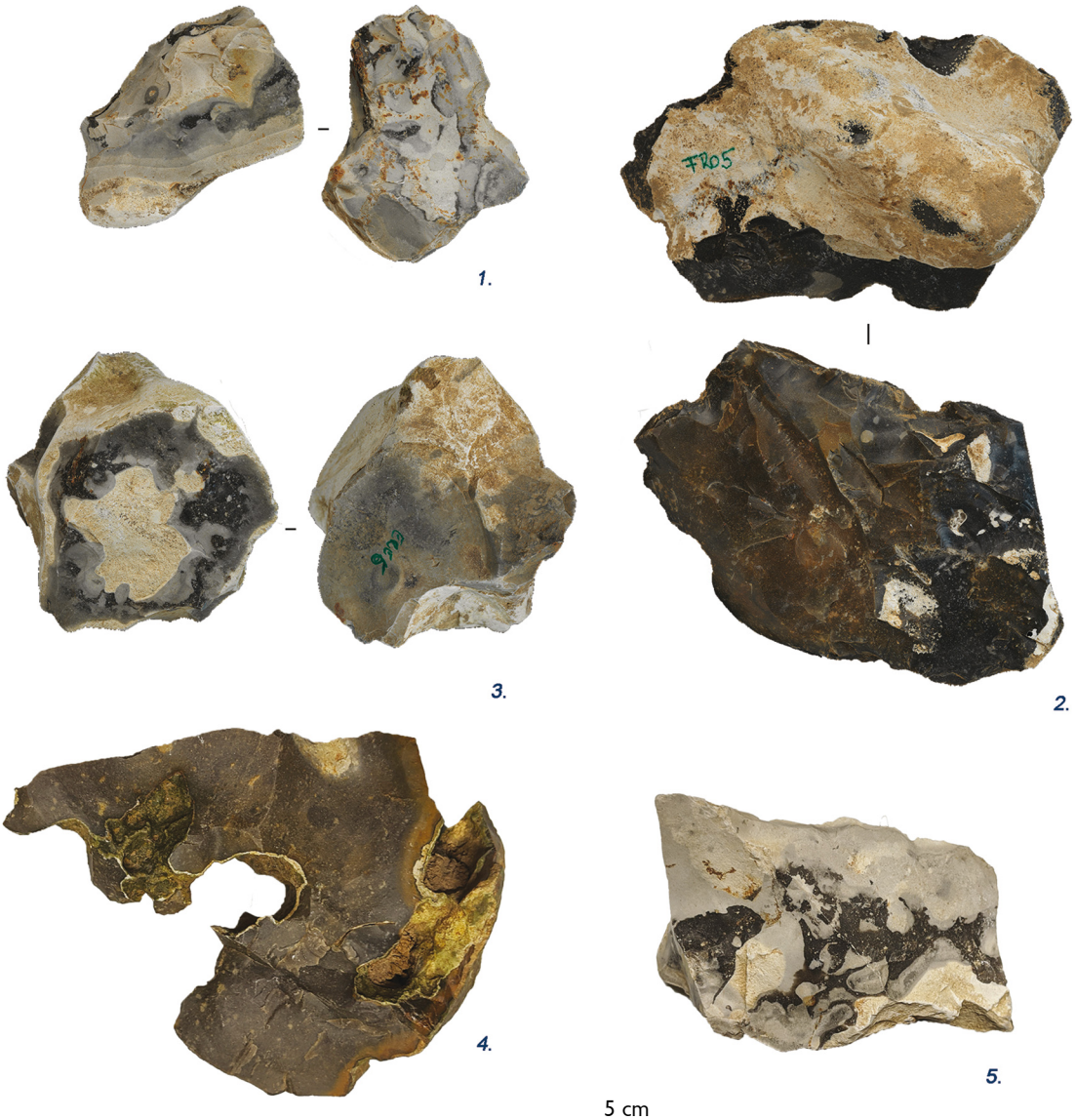

Fig. 5 – Samples collected at Froyennes (1-2) and at Ère (3-5). Photographs 1-3 © C. Verhelst, Flepostore/UGent.

of chalky zones presenting various degrees of silicification and containing rounded elements including sponge fragments and glauconitic grains (Fig. 4:right & Fig. 5).

Because of the secondary context in which the nodules were found, it is not certain if these flints could have originated in some way from the locally present Middle to Upper Turonian Merlin Member of the Vert Galand Formation. Instead, we need to take into account the possibility that they originate from younger deposits that were locally eroded or dissolved since.

In casu, it seems likely that the 'Scheldt flints' derive from the Esplechin Formation. Our hypothesis is that the second category of flint could have originated from dissolved Coniacian/Santonian deposits, based on the fact that closely resembling flint is known from the Coniacian/Santonian formations of Maisières and Saint Vaast in the Mons Basin. Flints from those formations present a similar heterogeneity. The first one is rich in glauconitic grains and the second one has a very comparable black and white pattern in primary position (Collin, 2019). However, the flints of the Saint-Vaast formation are distinguished by a petrofabric containing fewer figured elements than those sampled at Ère and Froyennes.

4. Discussion

Even though the *in situ* preserved flint-bearing units in the Lille-Tournai area appear limited to the Esplechin Formation and its equivalent, the C3c Formation in Northeastern France, for several reasons, the results of these explorations bear a lot of potential to increase our knowledge of raw material procurement strategies, prehistoric mobility networks and territoriality in the Belgian Scheldt valley. Indeed, the Upper-Turonian flints from the Lille-Tournai area seem to have been among the main lithic resources in the Upper-Scheldt valley, as exemplified by their ubiquity on prehistoric sites across different periods, *e.g.*, Ruien (Crombé *et al.*, 2014), Kerkhove (Vandendriessche *et al.*, 2019), Oudenaarde 'Donk' (Lombaert *et al.*, 2007), Kruishoutem 'Kerkakkers' (Crombé, 1998), Spiere 'De Hel' (Vanmontfort, 2004), the Kemmelberg (Collin *et al.*, 2019). Due to their relative homogeneity and their distinctive set of features, it seems moreover that, in some cases, they can be differentiated from the Upper-Turonian flints of the Haine Saint-Paul Formation from the Mons Basin (Collin, 2019). As opposed to the latter, that contain zones with higher translucency the samples collected by us are for example, entirely opaque and matte. They also do not display zones with white flecking ('*floculations laiteuses coalescentes*') and appear to be less charged in sponge spicules than their Mons Basin counterparts. These features must be observed at the scale of a whole corpus and not of a single artifact to be considered relevant. Consequently, this distinctive character facilitates to some extent mapping the distribution and exploitation of these Upper Turonian artefacts at greater distances from the outcrops. They have, for example, already been identified on several Late and Final Mesolithic sites in the Lower Scheldt valley (Crombé *et al.*, 2011: 469; Messiaen, 2020), at distances up to 90 km from the outcrops.

The same, perhaps unexpectedly, holds true for the hypothetical Coniacian/Santonian flints discovered at Ère and Froyennes. Until recently, Kerkhove was the only site on which this poorer-quality raw material had been identified in an archaeological context (Fig. 6). Although not suitable for the production of larger-sized blanks due to its many flaws and lesser silicified patches, its transport to Kerkhove, where it was found in Early Mesolithic contexts demonstrates that its substandard knapping qualities were not considered deterring for bladelet productions. It should be added that the white and black zonations of this flint also give it a very specific appearance.

Finds of an isolated bladelet fragment in a Late Mesolithic cluster at Verrebroek 'Aven Ackers' (Messiaen, 2020: 61) and of a small Mesolithic assemblage during prospections at Sint-Gillis-Waas (De Bock & De Meireleir, unpublished report) could have been knapped in this same raw material. If confirmed by further analysis, this would mean that these possible Coniacian/Santonian flints could have been transported over distances 80 to 90 km from their outcrops, whether the latter were situated in the Mons Basin (Maisières and Saint-Vaast Formation) or in the Tournaisis. Perhaps Mesolithic hunter-gatherers by consequence valued this flint for other reasons besides its knapping properties, such as its striking black and white color pattern?

For the moment, the above considerations are, however, entirely based on a naturalistic approach of the lithic raw materials. In recent years though, numerous outcrops have been studied geochemically, ultimately with the goal to develop geochemical sourcing protocols to support these interpretations. Bulk-XRF and µXRF analyses have been carried out on the Mélantois-Tournaisis outcrops and on some of the Mons Basin outcrops (Fiers *et al.*, 2019; Laforce *et al.*, 2021). The latter have additionally been subjected to Laser Induced Breakdown Spectroscopy (LIBS; Collin, 2019) and LA-ICPMS (Moreau *et al.*, 2016; Fernandes *et al.*, 2019). While the outcomes of these studies are unanimously positive, some obstacles remain to be cleared. There is a general need to expand sampling databases, as the flints from Northern France, the Hesbaye and from Limburg have not yet been included in the datasets. In addition, there is need to better comprehend lateral variations within the same lithostratigraphical units and between horizontal equivalents of the same units in adjacent regions (*e.g.*, Upper-Turonian of the Mons Basin, Lille-Tournai area and the French Upper Scheldt region around Cambrai). A last often cited problem concerns the need to better gauge the impact of post-depositional weathering processes on the geochemical signatures obtained by these methods.

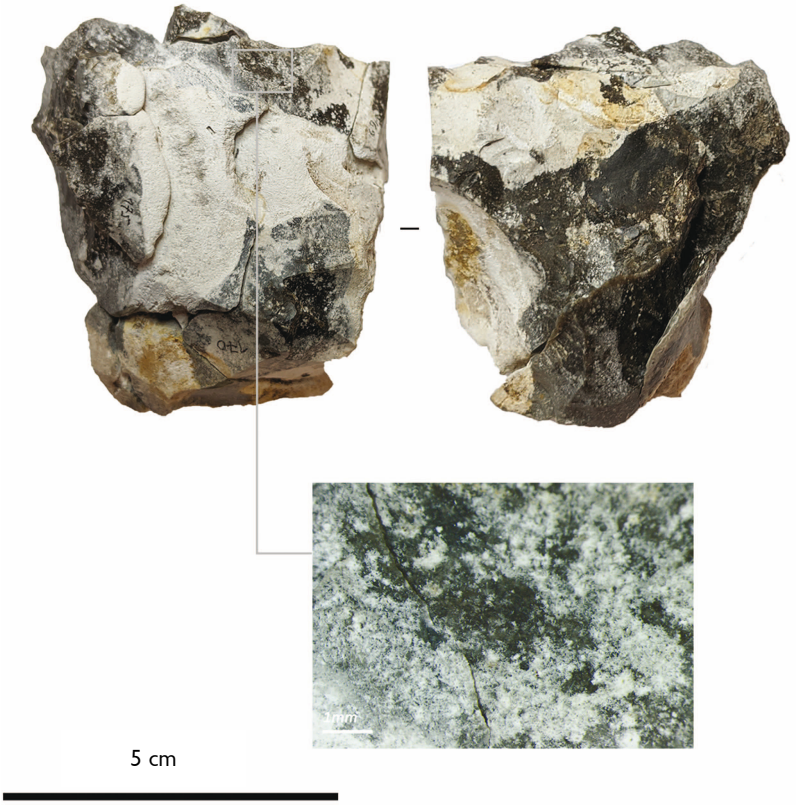

Fig. 6 – Early Mesolithic refitted sequence from Kerkhove made from possible Coniacian/Santonian flint. © UGent/H. Vandendriessche.

5. 'Flepostore'

In recent years, the GDR 'Silex' (dir. Céline Bressy-Léandri), mainly active in France, has been working to harmonize flint characterization practices and to make the data stored in the lithotheques curated by the GDR member accessible to all. In a similar way, the decision was made to include the results of our prospections, accompanied by

high-resolution photographs and microphotographs, in the new open access repository of Ghent University, 'Flepostore' (Flemish Pottery and Stone Reference collection; https://flepostore.ugent.be; dir. Wim De Clercq, Veerle Cnudde & Philippe Crombé). Alongside of the raw materials collected during our prospections, it is furthermore our intention to make all other lithic raw materials present at Ghent University consultable in this reference collection. Similar to the way we were substantially aided in our research by attending workshops and visiting reference collections, doing this will beyond any doubt contribute to answer some of the research questions outlined above and stimulate further research on these topics.

6. Conclusion

In comparison with the larger Belgian cretaceous outcrop areas, the Lille-Tournai outcrops remain poorly known from an archaeological point of view. The main goal of this admittedly short contribution was therefore to present and illustrate the lithic raw materials collected during our 2016-2018 surveys and to discuss the role they could play in elucidating raw material procurement strategies, mobility networks and territoriality. For the moment, interesting results are already being obtained for the Mesolithic of the Scheldt valley (cf. Messiaen, 2020; Vandendriessche *et al.*, 2019; Vandendriessche, in press), even if they require further elaboration. Finally, sharing this data through 'Flepostore' will undoubtedly promote a more widespread knowledge of these raw materials as well as encourage new research on the above mentioned topics.

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Abstract

Scheldt flint or *Scheldevuursteen* appears to be universally present on the prehistoric sites of the Belgian Upper Scheldt valley (between the French border and Ghent). In this paper, the results of field prospections carried out in 2016 and 2018 are presented. The four surveyed location all yielded Scheldt flint nodules, confirming its presence in the Upper Turonian deposits of the Mélantois-Tournaisis massif between Lille and Tournai. In addition, at two of the locations, Ère and Froyennes, a second flint facies was recognized. In spite of its seemingly poor suitability for knapping, this second flint type, that resembles nodules attested in the Maisières and Saint-Vaast formation of the Mons Basin, was also exploited by the Mesolithic hunter-gatherers of the Belgian Scheldt valley.

Keywords: Lille (Hauts-de-France, FR), Tournai (Hainaut, BE), Upper Turonian, Scheldt flint, Coniacian/Santonian, Lithic raw materials, Mesolithic.

Samenvatting

Scheldevuursteen is alomtegenwoordig op prehistorische sites uit de Belgische Bovenschelde (tussen de Franse grens en Gent). In deze paper worden de resultaten van veldprospecties uit 2016 en 2018 voorgesteld, waarbij op vier verschillende locaties in de regio tussen Rijsel en Doornik Scheldevuursteen knollen aangetroffen werden, zodoende bevestigend dat het Mélantois-Tournaisis massief als voornaamste herkomstgebied van deze vuursteensoort beschouwd kan worden. Op twee van de vier geprospecteerde locaties, te Ère en Froyennes, werd bovendien een tweede vuursteensoort ingezameld. Deze vertoont op basis van zijn opvallende uiterlijke kenmerken sterke gelijkenissen met het vuursteen uit de Maisières en Saint-Vaast formaties van het bekken van Mons. Hoewel ze duidelijk minder geschikt lijkt voor debitage, getuigen onder andere vondsten te Kerkhove van het feit dat deze tweede vuursteensoort ook door de mesolithische jagers-verzamelaars uit de Scheldevallei geëxploiteerd werd.

Trefwoorden: Rijsel (Hauts-de-France, FR), Doornik (Hainaut, BE), Boven-Turoniaan, Schelde vuursteen, Coniaciaan/Santoniaan, lithische grondstoffen, mesolithicum.

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