Notae Praehistoricae, 39 / 2019 : 15-44

On the spatial distribution of archaeological sites with Wommersom quartzite in the Rhine-Meuse-Scheldt area

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1. Introduction

Flint artefacts, although ubiquitous, are by no means the only lithic material objects encountered in the archaeological record from the river basins of the Rhine, Meuse and Scheldt (RMS) in Belgium, the southern Netherlands, western Germany, Luxemburg and northern France. In the group of non-flint rocks used by prehistoric people in this area, Wommersom quartzite (WSQ), named after the eponymous Belgian village, has received by far the most attention from prehistorians and geologists. In an early review of archaeological sciences in Belgium, published well over a century ago, Fraipont & de Loë (1908: 159; also de Loë, 1928: 30-31) wrote: *En 1901, de Loë et Raeymaekers ont fait connaître le gisement de Wommersom, élucidant ainsi la question de l'origine d'une roche qui avait intrigué depuis longtemps tous ceux qui s'occupent du préhistorique de Belgique*. The site referred to in the quote is commonly known as the *Steenberg* ('stone mountain'). While WSQ-artefacts had without a doubt been discovered at archaeological sites prior to the 20th century, as this quote seems to suggest, the notes on WSQ published by de Loë & Raeymaeckers (1902a, 1902b) as part of the proceedings of two meetings of the *Société d'Anthropologie de Bruxelles* during the spring of 1901 arguably mark the beginning of an important line of research on the prehistoric use and geographical distribution of WSQ.

Viewed by Destexhe-Jamotte (1947: 142-143) as a rock *qui ne laisse pas d'intriguer les préhistoriens* or by Rozoy (1978: 174) as a lithic raw material *[qui] a frappé dès le début l'imagination des chercheurs*, WSQ not only has been labelled as 'quartzite', but also often been referred to as quartzitic sandstone ('grès-quartzite'), flint ('silex'), 'microquartzite', 'quartzarenite' or even 'psammite'. Following one of the first archaeological papers devoted to this raw material (Rutot, 1902), some odd misspellings have entered into the literature as well, even until very recent times. These include the frequently quoted term of 'Wommerson', but also 'Wormerson', 'Wormersom', 'Wommersomme', 'Wommersonm', 'Wommersomse', 'Womersom' or even 'Wommerrum' (e. g. Barrière, 1956; Coutil, 1912; Creemers, 2015; Dijkstra & Verbeek, 1991; Dursin, 1932; Ducrocq, 2001; Francotte, 1912; Gendel, *et al.* 1985; Henrard, 2003; Kozłowksi, 2009; Mercenier & Mercenier, 1974; Meyers, 1986; NN, 1979; Ophoven, 1945; Ophoven & Hamal-Nandrin, 1947; Oppenheim, 1935, 1940; Peeters *et al.*, 2017; Vandebosch, 1953; Vanmontfort, 2008; Votquenne, 1994; Wouters, 1953).

Since its first appearance in the archaeological literature around the turn of the 20th century, data and hypotheses about the prehistoric production, use and distribution of WSQ-artefacts have formed the subject of numerous (> 960) publications. While most of these accounts are only brief mentions in site-reports, there are also several more elaborate inventories and in-depth studies. Compared to other raw materials, the attractiveness of WSQ as an archaeological research subject over a time span of more than 115 years owes much to its frequently assumed unique geological outcrop-source. This assertion, hardly investigated in any detail, makes it an ideal candidate for tackling a broad range of questions about past human behaviour in this part of North-western Europe. While accounts and discussions on the existence of pre- and post-Mesolithic WSQ-artefacts are legion, this raw material is most often associated with the last hunter-gatherers-fishers (*ca.* 11.000-6000 BP) in the southern part of the North Sea basin, even to the extent that it is considered by many prehistorians to be a Mesolithic 'guide fossil' for this area. The most frequently tackled research questions relate to sourcing, variation in chronology, distribution, typology and/or technology of WSQ-artefacts in relation to its presumed geological outcrop source at the *Steenberg*, and the potential meaning of this variability in terms of past hominin social structures, intergroup contacts and trade networks.

Intrigued by repetitive references to the same few key studies, but also by the often far-reaching assertions on social dynamics of past hominin populations based on limited and selective supporting evidence, the present study attempts to collect as much data on WSQ as possible and provides a new, updated inventory of all currently known archaeological sites that have yielded this raw material. This paper focuses on the spatial distribution of these sites and some microlith types. Apart from a historical assessment of all previous distribution maps, it also presents new point maps, four decades after the last of such maps was published by Rozoy (1978: fig. 256).

2. Materials and methods

Our inventory relies on journal articles, monographs and book chapters, as well as 'grey' field reports and (unpublished) Master, and PhD-dissertations. In addition to these written accounts, two site-inventories managed by the Flemish and Dutch heritage agencies, were also consulted (*e. g. CAI* for Flanders and ARCHIS3 for the Netherlands). Whereas primary sources were consulted for at least two-thirds of the records in the present database, this type of source was not available for another 19 % of all sites. Although representing a considerable share, it should be noted that for many of the latter locations a reliable inventory for the recorded attributes could be compiled based on information from secondary sources: for 75 % of these sites the total number of WSQ-artefacts is known and in 42 % of the cases a detailed typological inventory of these WSQ-artefacts is available as well. For 17 % of the records it could not be established whether or not the consulted publication was a primary source. This latter group contains many of the locations only mentioned in one of the two regional archaeological inventories and for which no additional references were found. Several older sources predating the recognition of WSQ as a raw material have not yet been consulted. However, given that WSQ was only recognized in archaeological literature from the early 20th century onwards and that these early sources often remain vague in their data presentation, the amount of information loss by not (yet) consulting these 19th century sources probably remain very limited. For locations mentioned in the literature from the 20th century onwards, most information is based on primary sources. While the present WSQ-dataset can be viewed as a very extensive one compared to most previous (published) inventories, it by no means is exhaustive and has to be viewed and evaluated as a work in progress, prone to improvement, corrections and additions in the future. While serious efforts have been made to check the dataset for redundant records, by means of cross-checking the different attributes across the records, their presence cannot be entirely excluded. This results from the fact that some sources use different site names and/or do not provide (enough) details on some of the other recorded attributes hampering the cross-checking process. Yet, we believe that the presence of multiple records referring to the same location, and their influence on subsequent analyses, is minimal.

Our inventory contains variables related to site identification, research history, (other) lithic raw materials, artefact typology and chronology. Attributes from the first group include country, province, town, toponym, collection(-s), spatial coordinates, calculated distance and direction from the presumed outcrop area in the village of Wommersom. Attributes related to research history include the date of site discovery, the nature of fieldwork that led to the discovery of the WSQ-artefacts, in case of excavations also the date of excavation campaigns, primary sources, consulted sources, and the date when the location was first reported in the literature. Besides counts of the (minimum) number of WSQ-artefacts and the entire lithic inventory, raw material variables also include counts of artefacts from other 'exotic' lithic raw materials. Both the WSQ subset and the total lithic inventory also include an artefact-typology. Given the large diversity in typologies used in the literature over time, the use of a simplified version encompassing as much variability as possible was preferred. When present, artefact drawings were used as an additional source of information to verify typological attributions. This simplified typology consists of three large groups of artefacts: cores, blanks and secondarily modified artefacts. The group of blanks include flakes, blade(let)s, rejuvenation products, and a rest group. Secondarily modified artefacts include scrapers, burins, retouched flakes, retouched blades, microliths and a rest group. Among the microliths we further distinguished between points with unretouched base, points with retouched base, crescents, triangles, small backed bladelets, surface-retouched microliths, trapezes and a rest group. Unlike some previous WSQ-studies, no further subdivision of the different microlith-types was made (yet), nor was any data on lateralization of retouched edges recorded so far. Finally, the number of microburins was included.

Apart from the chronological designations provided by the original authors of the consulted sources, always used with caution, recorded chronological attributes include radiocarbon dates (for excavated sites) and a tentative chronological evaluation based on the presence of particular artefact types, with a specific focus on Mesolithic types. In concordance with current knowledge, microliths are commonly regarded as indicative for a Mesolithic component in a lithic inventory. Surface-retouched microliths, and to a lesser extent small backed bladelets, are considered by most to be indicative for a Middle Mesolithic component, although the number of securely dated Middle Mesolithic records from the study area remains extremely small (Robinson *et al*., 2013) and surface-retouched microliths have occasionally also been attributed to earlier or later phases of the Mesolithic (e. g. Vermeersch, 1976). Given the large and often confusing variability in nomenclature, their often very fragmented nature, and the frequent lack of clear drawings, the group of (small) backed bladelets often posed difficulties and as a consequence their numbers need to be treated with caution. The occurrence of trapezes is taken as evidence for the presence of a more recent Late(r) Mesolithic component in the assemblage. When an inventory lacks microliths but contains microburins, chronology was marked provisionally as Mesolithic. Regularity of blade(let)s, a criterion often used as chronological indicator, was not recorded as it was not considered useful for chronological designation. To avoid circular reasoning, the presence of WSQ is not used as a chronological (Mesolithic) indicator. An in-depth analysis of each of these recorded variables is beyond the scope of the present paper and will be discussed at a later time.

Not all of the variables could be determined for each record in our dataset. While in some cases this is because we were not (yet) able to consult primary sources, it mainly reflects the variable quality in reporting these attributes in the consulted (primary) resources. We therefore somehow have to assess the quality standard of the publications in presenting these attributes to allow for an evaluation of the data quality in our inventory. Obviously, this quality of publication does not have to be a direct reflection of the quality of data-collection in the field, which is another -even more complex- issue to deal with. In other words, our evaluation is first and foremost directed to the accuracy of reporting of what has been collected from the field, regardless of how accurate the material remains were recorded and collected during fieldwork. We acknowledge that these activities by archaeologists and how they proceed with data recording and collecting in the field is crucial to evaluate the usefulness of data for any scientific inquiry. As far as can be inferred from the consulted sources, WSQ-artefacts in our inventory were collected by means of archaeological survey in at least 71 % of the cases, while an excavation (but not necessarily directed towards the recovery of prehistoric find distributions) accounts for 14 % and a combination of both approaches for 4 %. While often true that excavations are more accurate than survey with regard to the exhaustiveness of artefact recovery by applying sieving procedures, the recording of contextual information by applying invasive procedures and the spatial resolution by using smaller units of observation and recovery, this by no means can considered to be a given fact as several of the survey-data will certainly be more accurate than those from excavations. Thus, quality assessment and analysis have to go beyond the simple dichotomy of surface collected data (perceived of as worse because biased against smaller material remains, a lower spatial resolution and a lack of contextual data) *versus* excavated data (perceived of as better because 'everything' is collected in small recovery units and contextual information is recorded), as many more (often unrecorded) factors intervene in these collecting processes.

The remainder of this paper will focus on the spatial distribution of WSQ, as documented in previous distribution maps and in some new maps based on our new inventory.

3. A historical sketch on WSQ-distribution maps

The first map of WSQ-artefacts was published under the title *Carte de la Belgique avec indication de localités où ont été recueillies des pièces en silex (dit quartzite) de Wommersom dressée par le Baron A. de Loë, J. Hamal-Nandrin* et *Jean Servais*. It appeared more than a decade after the first explicit appearance of WSQ in the archaeological literature, as part of an early hallmark paper written by the Liège scholars Hamal-Nandrin & Servais (1913). It was composed of individually labelled point locations and heavily relied on information that Hamal-Nandrin and Servais acquired from Alfred de Loë, Georges Cumont and Marcel De Puydt (see also Ophoven, 1943: 14-15; Ophoven *et al*., 1948: 6). Apart from the Dutch locations of 'Bergeyck' and 'Luyksgestel' situated near the frontier with Belgium -the first two WSQ-references from the Netherlands to be mentioned in the literature- this first map already included 83 locations -representing at least 195 WSQ-artefacts- distributed over an area of *ca.* 14.000 km^2, corresponding to *ca.* 1/5th of the currently known distribution area. This first demarcated distribution area included all the Belgian provinces, except for Luxembourg. Apart from isolated and/or low density occurrences mainly in the provinces of West-Vlaanderen, Oost-Vlaanderen, Antwerpen and Namur, the distribution pattern showed three clusters in an area of *ca.* 35 km around the village of Wommersom: (1) a first one to the (south-)west of Wommersom, in the provinces of Vlaams-Brabant, Brabant Wallon and the northern part of Hainaut, (2) a second one to the south-east of Wommersom, in the western part of the province of Liège, and (3) a third one to the north-east of Wommersom, in the province of Limburg. The explanation of the map reveals a chronological distinction between *stations quaternaires* (*i.* e. Palaeolithic sites including Spy, Engis et Huccorgne-l'Hermitage), *fonds de cabanes de la Hesbaye* (*i.* e. Neolithic sites, including Tourinne, Kiva, Framaset and Liège) and *stations néolithiques* (including what are now considered to be Mesolithic sites). Based on the wide spatial distribution of WSQ-artefacts on archaeological sites in Belgium, Hamal-Nandrin & Servais (1913: 24) hypothesized on the possible existence of additional WSQ-outcrop areas, besides the *Steenberg* in Wommersom.

Near the end of the second and the onset of the third decade of the 20th century two new distribution maps were created, the first of which was only briefly mentioned in the museum catalogue of the prehistoric department of the Curtius museum of Liège (Servais & Hamal-Nandrin, 1929: 44) and was said to be exhibited in the second room of the museum building. As part of his presentation of a number of newly discovered Mesolithic sites in the Netherlands, Dursin (1932: fig. 1) provided another updated, but only partial distribution map. These new discoveries of archaeological WSQ-sites near Drunen and Loon-op-Zand made by Dursin and his companion Engels at the onset of the 1930s were summarized in a number of papers that appeared in the next few years (Dursin, 1931, 1932, 1934). As made clear by Dursin, and later also in historiographic studies by van der Lee (1972: 69, 1987: 41-43), these new discoveries were a direct result of some explicit quests aimed at gaining a better understanding of the northern distribution of WSQ in the Netherlands: *nous avions* [...] *le désir d'examiner si le quartzite de Wommersom, dont la présence caractérise si bien les stations tardenoisiennes belges, n'avait pas été utilisé jusqu'en Hollande.* [...] *Par les découvertes de quartzite de Wommerson* [sic] *à Drunen et Loon-op-Zand nous avons porté le point de dispersion septentrional de cette roche de 70 km (Weelde) à 100 km et faisons ainsi entrer dans l'orbe de civilisation tardenoisienne belge les stations tardenoisiennes hollandaises situées au Sud de la Meuse* (Dursin, 1932: 345, 349). Van der Lee (1972: 69) later noted that in order to achieve their goal both Belgian amateur-archaeologists carefully selected their search locations and particularly focussed their efforts on a number of sand dune areas, including areas previously also visited by some of their Dutch colleagues (*e. g.* Ossewaarde, Van der Vlugt). As addressed by Dursin (1932: 345), this careful selection of search areas was apparently based on a detailed study of the geological map. Dursin and Engels' search not only involved their own fieldwork activities in these areas, variously described as study travels (*voyages d'études et de recherches*) or wanderings (*pérégrinations*), but also relied on their personal contacts with some of their Dutch colleague amateur-archaeologists (*e. g.* Popping, Bezaen, Butter, van der Moer) who possessed their own artefact collections of Dutch stone age sites. These, however, did not turn out to include any WSQ-artefacts (Dursin, 1932: 345). The map Dursin integrated in his 1932 paper was not intended to be exhaustive but focused specifically on the Campine area in the Belgian provinces of Antwerpen and Limburg and the Dutch province of Noord-Brabant. Dursin was, however, very aware of the vast spatial distribution of WSQ, as is illustrated by his references to earlier finds from Dentergem, Mendonk, Feschaux and Weelde (Dursin, 1932: 347, 1934: 65). Dursin's distribution map contained 38 locations, representing at least 409 WSQ-artefacts. As was the case with the map previously produced by Hamal-Nandrin & Servais, each of these locations were labelled individually. Whereas twenty-six of Dursin's locations already appeared on this previous map, it also included twelve new locations: Brasschaat, Brecht and Kalmthout in the province of Antwerpen, Balen, De Maay, Eksel, Hechtel and Neerpelt in the province of Limburg, and Budel, Drunen, Tilburg and Loon-op-Zand in the province of Noord-Brabant. The new finds from Drunen and Loon-op-Zand pushed the northernmost limit of the WSQ-distribution range 30 km further into the Netherlands relative to the map created by Hamal-Nandrin & Servais, but still *ca.* 80 km south of the currently known northern boundary, and slightly enlarged its distribution range from 14.000 km^2 to *ca.* 15.000 km^2.

The third quarter of the 20th century saw the appearance of new WSQ-maps by Barrière (1956) and Narr (1968). For his major *status quaestionis* and synthesis of the 'Tardenoisian' in Western Europe, Barrière (1956: fig. 95) redrew the original map by Hamal-Nandrin & Servais. While his study appeared nearly a quarter of a century after Dursin's map, it completely ignored the locations added by Dursin, as well as many other WSQ-locations discovered and published before 1956, including no less than 125 locations from Belgium, the Netherlands and Germany, corresponding to at least 7.900 WSQ-artefacts. Barrière's copy of the first point map by Hamal-Nandrin & Servais also contains several inaccuracies: not only does it omit the site of Loonbeek, at least 17 of the sites listed in the legend are also misspelt. In addition to this map, Barrière also provides a second partial distribution map in support of his argument of contemporaneity and contact between Mesolithic and Neolithic populations in the Hesbaye region, depicting unlabelled Mesolithic locations with WSQ-artefacts alongside Neolithic sites (Barrière, 1956: 243-247, fig. 104).

Twelve years after Barrière's rather sloppy copy of the original WSQ-distribution map, Narr's book "*Studien zur älteren und Mittleren Steinzeit der Niederen Lande*" was published (Narr, 1968), although it was finished already a decade before but delayed in its publication (Narr, 1968: 2). In his discussion of the distribution of WSQ, Narr added new information from a number of German sites located in a region where the archaeological record had been severely disturbed due to the second World War (Narr, 1968: 260). It includes a map of the "*Maas-Gruppe des Tardenoisiums*" depicting the distribution of WSQ-artefacts (Narr, 1968: Karte 10) which heavily relies on the map published by Barrière (Narr, 1968: 260). Narr furthermore compares the WSQ-distribution range with that of surface retouched microliths, a practise repeated in some of the more recent maps (*cfr infra*). Another interesting feature of Narr's map, in contrast to all previous maps, is the use of boundary-lines instead of individual point locations to indicate the northern and eastern limits of the distribution range. This practice, too, would become increasingly popular from the 1980s onward, rendering it often more difficult to obtain information on the raw data (including site names and number of locations) on which these boundary-maps are based. Narr located the northern limit of the WSQ distribution range near Ermelo in the Dutch province of Gelderland, 80 km further north relative to Dursin's 1932 map and corresponding well with the currently known northern edge of the WSQ-distribution range. In his text, Narr (1968: 109, 261) cites Harskamp, *ca.* 20 km south of Ermelo, as the northernmost location with WSQ, referring to an older publication by Butter (1941) that does, however, not contain any reference to Harskamp nor WSQ. The eastern limit on his map was set along the Dutch-German border at the line Venlo-Geilenkirch, *ca.* 40 km more to the east compared to Dursin's earlier map. This corresponds to Venlo-Velden in the Netherlands (based on Wouters, 1953) and Grambusch-Eisen Kämp and the Teverener Heide in Germany (Narr, 1968: 89, 261). In his site inventory and discussions, Narr (1968: 41-118, 261) lists only 33 sites with WSQ-artefacts, including 17 from Belgium, 14 from the Netherlands and two from Germany, representing at least 277 WSQ-artefacts.

A decade after Narr's partial map, Rozoy (1978: fig. 256) produced a slightly updated version of the original map from 1913, an identical copy of which re-appeared again much later (Rozoy, 1991: fig. 10). It contains 93 sites spread over an area of *ca.* 18.200 km^2, representing at least 450 WSQ-artefacts. Yet, at the time of its first publication this map was already outdated as many of the published data available at that time was not incorporated. Being fully aware of the non-exhaustive nature of his map, Rozoy included the following lines in the original legend: *Dispersion du G.Q.W. d'après de Loë, Hamal Nandrin et Servais, complété (non exhaustif, et de loin)*. This is confirmed by our inventory which indicates that around the time of Rozoy's first publication of the map (at least) 680 locations containing a total of 32.000 WSQ-artefacts were known, distributed over an area of *ca.* 38.850 km^2. It is not always easy to relate his map to the earlier ones as Rozoy did not add site labels to his points, but it is clear that the northernmost locations of Loon-op-Zand, Drunen and Tilburg from Dursin's map and the locations of Harskamp and Venlo mentioned by Narr were not included in Rozoy's map. In addition to the sites on the map by Hamal-Nandrin & Servais on which Rozoy had based his WSQ-distribution range, he also included 11 new locations: eight in Belgium, two in the Netherlands and one in France. Only the Belgian location of Bonheiden from the original 1913-map, was not copied by Rozoy. Apart from a single site located in Hainaut, all the new locations were situated in the Belgian province of Limburg. Based on (unpublished) investigations by Marolle at Givonne in Northern France, Rozoy's map is the first to include finds from across the Belgian-French Border, extending the WSQ-distribution range with more than 40 km to the south. Rozoy (1978: 165, 936-937) noted the occurrence of WSQ-artefacts at up to 100 km away from the town of Wommersom, with a considerable number of sites located within a 60-80 km radius around the presumed outcrop area. Furthermore, he stressed the off-centre position of the *Steenberg* outcrop within the distribution range and the irregular and asymmetric distribution pattern, evidenced by a (near and peculiar) absence of WSQ-finds in the Hesbaye region close to the outcrop area and the presence of a large number of WSQ-sites in the Belgian province of Limburg and the adjoining Dutch province of Noord-Brabant. Finally, the Meuse is considered by Rozoy to have acted as a barrier in the distribution of this raw material.

Around the time Rozoy pushed the southern boundary of the WSQ-distribution beyond the southern Belgian border and stressed the asymmetric distribution pattern around the presumed outcrop area, Arora (1971, 1973, 1975, 1976, 1978a, 1978b, 1979, 1980, 1981, 1983) studied the eastern distribution of WSQ -in the western part of Germany- and produced two versions of a regional map with the distribution of Mesolithic sites with WSQ-artefacts in this area (Arora, 1979: Abb. 11, 1980: Abb. 226). In addition to extending the eastern limit *ca.* 50 km beyond the line previously drawn by Narr (1968), he also pointed to the low numbers of WSQ artefacts, the dominance of 'finished' products and the near absence of 'production waste' at the sites along the eastern course of the Rhine. Both maps depicted the same 27 locations distributed in an area of *ca.* 2.000 km^2 around the cities of Düsseldorf, Monchengladbach, Köln and Aachen, representing at least 145 WSQ-artefacts, but only the first of both maps was supplied with labels.

The point map by van de Konijnenburg (1980: plan 4) as part of his master thesis on the Mesolithic in the Belgian provinces of Hainaut and Brabant Whallon contains 90 unlabelled sites distributed over an area of *ca.* 18.000 km^2. Despite a number of differences, Van de Konijnenburg's map is very similar to that of Rozoy and is probably indebted to it.

By far the most influential study on WSQ from the past 35 years was done by Gendel during the 1980s (Gendel, 1982a, 1982b, 1983, 1984, 1989). As part of his PhD research focusing on the socio-stylistic variation throughout the Mesolithic of North-western Europe, Gendel also investigated the spatial distribution of WSQ, emphasising the social and chronological implications of the observed patterns. As part of this study, Gendel discussed the WSQ-distribution range, comprising an approximate surface of *ca.* 40.000 km^2, and also referred to the asymmetric nature of the distribution pattern around the presumed outcrop area in Wommersom, a pattern previously noted by Rozoy (1978). Gendel argued that the western boundary of this distribution was still poorly defined despite the presence of a few isolated finds in the western part of Flanders, an aspect that would be picked up and investigated in more detail a couple of years later, first by Vanmoerkerke & Van Vlaenderen (1985) and later more extensively by Crombé (1996) as part of his PhD research (see also Noens *et al.*, 2019). The southern limit of the distribution area was situated in the southern part of Belgium, omitting the French data from Rozoy (*cfr supra*), its northern limit in the central part of the Netherlands and its eastern limit in the lower Rhine area of western Germany. Gendel published slightly different versions of his WSQ-maps (Gendel, 1982a: fig. 1; 1983: fig. 7; 1984). Contrary to most maps available at that time, he did not produce point maps but instead only depicted the outer limits of the WSQ-distribution. Only the 41 inventories he studied in more detail were depicted individually. In his 1982 map Gendel still combined individually labelled point locations (*i. e.* the collections he studied himself) with a hatched area indicating the approximate WSQ-distribution range which measured only *ca.* 37.150 km^2. In his second map produced a year later individual sites are no longer depicted, and the approximate WSQ-distribution range has changed in shape and size, covering a slightly smaller area of *ca.* 35.000 km^2. Taking into account the approximate nature of the maps, WSQ-artefacts were known from an area of *ca.* 35-40.000 km^2, ranging from the central part of the Netherlands in the north, to the Lower Rhine area in the east, the Belgian-French border in the south, and (provisionally) just across the Scheldt river in the west. Both maps produced by Gendel, one of which later also appears in the published version of his PhD (Gendel, 1984), have been reproduced several times in subsequent years -often despite advances in knowledge- by other scholars including Caspar

(1984: fig. 37), Bassleer (1985: fig. 1), Price (1987: fig. 15) and much more recently Verhart & Groenendijk (2005: fig. 8.4). Other scholars, discussed below, used Gendel's maps as a starting point to create their own similar but more elaborate maps.

In their study on the western limits of the WSQ distribution range, Vanmoerkerke & Van Vlaenderen (1985) also emphasised the asymmetrical distribution pattern of WSQ throughout the Mesolithic: WSQ was found 140 km to the north and the east, 100 km to the west and only 50 km to the south(east) of Wommersom, including a limited number of sites just across the Meuse and Rhine. More original, however, was their focus on the western boundary of the WSQ-distribution area, nearly 8 decades after Raeymaeckers (1907) had noted a complete absence of WSQ artefacts in the area around the city of Ghent. Referring to Gendel's earlier observation regarding the lack of useful data from this part of Belgium, they briefly presented 16 locations with WSQ artefacts from the area west of the Scheldt, resulting from intensive field surveys, excavations and the study of old collections. They added a regional distribution map (Vanmoerkerke & Van Vlaenderen, 1985: fig. 3), the first of three regional point maps for the Belgian territory that appeared during the second part of the 1980s. WSQ-sites depicted by Vanmoerkerke & Van Vlaenderen (1985: fig. 3) were dispersed over an area of *ca.* 600 km^2 in the provinces of Oost- and West-Vlaanderen. Despite the limited reliable dating evidence, these inventories were attributed to the Final-Palaeolithic (Klein-Sinaai, Wachtebeke – 't Mat, Wachtebeke – Kalve), the Early or Middle Mesolithic (Mendonk – site 1, Lovendegem, Oedelem) or the Late Mesolithic (Sint-Kruis-Winkel – Spanjeveer, Wachtebeke – Langelede, Wachtebeke – Warande, Wachtebeke – 't Mat, Wachtebeke – Oudenburgse Sluis, Wachtebeke – Ramonshoek, Huise, Zaffelare – Rosegoed, Drongen, Lembeke, Oudenaarde – Donk). Vanmoerkerke & Van Vlaenderen (1985: 6) argued that the spatial and temporal distribution of WSQ-artefacts in this area west of the Scheldt deviates from Gendel's data: in contrast to the area east of the Scheldt, locations west of this river contain only low numbers and percentages of WSQ-artefacts (<1 %) throughout the Mesolithic, a view that is now somewhat outdated given subsequent discoveries of reasonable amounts of WSQ-artefacts (*e. g.* Melsele – Hof ten Damme, Eksaarde – Fondatie, Verrebroek – Dok 1, Stekene – Molenberg, Bazel – Sluis, Verrebroek – Waaslandpark Fase West and Kerkhove – Stuw). They interpreted this pattern as the result of seasonal migrations of populations and the possible existence of a cultural border between different population groups (Vanmoerkerke & Van Vlaenderen, 1985: 6).

The regional maps by Arts (1987: fig. 20) and Huyge (1987: fig. 10) appeared around the same time and covered more or less the same area. For his thesis at Amsterdam University, Arts (1986) inventoried more than 2.000 (mostly unpublished) Palaeolithic and Mesolithic sites from the Southern Netherlands, representing over 791.000 studied (lithic) artefacts. Unfortunately, only the excavated sites are discussed in some detail (Arts, 1986: bijlage 1). His extensive inventory is said to include over 44.000 WSQ-artefacts (Arts, 1986: tab. 13) from an unknown number of these sites. Arts (1987) published an article on the Mesolithic in north-east Belgium and in the south-eastern part of the Netherlands and the north-eastern part of Belgium (Arts, 1987), referring to the distribution studies by Arora (1979), Gendel (1982a, 1982b) and Vanmoerkerke & Van Vlaenderen (1985). Based on the limited knowledge of the presence of WSQ in the central part of the Netherlands and in the area between the cities of Liège and Namur, he considered its distribution area to be bounded by the Scheldt and Meuse, as well as by the uplands of the Ardennes and the loamy areas. His accompanying partial distribution map included 23 locations spread over an area of 4.400 km^2 (Arts, 1987: fig. 20).

From the end of the 1970s onwards, but mainly throughout the 1980s, Huyge regularly published on the use and distribution of WSQ during the Mesolithic, mainly as part of individual site reports (De Bie & Huyge, 1989; De Bie *et al.*, 1992; Huyge, 1978a, 1978b, 1980, 1983, 1985a, 1985b, 1986a, 1986b, 1986c, 1986d, 1987; Huyge & Menten, 1985; Huyge & Vermeersch, 1982; also Huyge, 2009a, 2009b). Particularly as part of his study of the inventories from Zonhoven – Daalheide and Bolderdal, both showing high percentages of WSQ, he shared his wider reflections on the distribution pattern of WSQ, and its interpretation in terms of past human behaviour. In his report on the Daalheide inventory he not only summarised Gendel's (1982a, 1982b, 1984) views on the relationship between WSQ-percentages in Mesolithic inventories and the distance of these locations from the presumed outcrop area, but also included new data to this debate (Huyge, 1986b: 99-101), from the recently excavated locations of Helchteren – Sonnisse Heide 2 and Brecht – Moordenaarsven 1. In his subsequent paper on Bolderdal Huyge (1987: 67-69) further added the Early Mesolithic inventories of Donk and Stevoort to this list. It also included a regional distribution map (Huyge, 1987: fig. 10), depicting only 10 Belgian and Dutch locations from an area of 3.100 km², each of which yielded more than 40 % of artefacts made from WSQ.

Löhr (1990: fig. 45) provided an update of the German situation, more than a decade after Arora had mapped the first German WSQ-locations. For his map, Löhr not only combined Gendel's 1984 hatched data with Arora's 1978 point data, but also added new point locations from the Eifel area. As a result, the border of the WSQ distribution range was extended to the south-east and the WSQ-distribution area increased from Gendel's 35.000-37.000 km² to *ca.* 44.500 km². It is interesting to note that the additions made by Löhr are often neglected in more recent maps.

No WSQ-maps were published during the first half of the 1990s with the exception of Löhr (1990: fig. 45) and Rozoy (1991: fig. 10), the latter being a reproduction of the original but by then already obsolete map from 1978. New and updated maps were published in the second half of this decade by Crombé (1996, 1998). More than a decade after Vanmoerkerke & Van Vlaenderen (1985) used the archaeological surface record to analyse the prehistoric use and distribution of WSQ in the area west of the Scheldt, and Van Acker (1985) briefly discussed WSQ in her inventory of prehistoric sites east of Bruges, Crombé (1996) paid considerable attention to the past use of 'exotic' quartzites in NW-Belgium, mainly -but not exclusively- focusing on the Early Mesolithic period. As part of his PhD research on the Mesolithic in the sandy areas of NW-Belgium, his study of WSQ constituted an important part of the analyses of the lithic inventories from Verrebroek – Dok 1. In addition to placing this area west of the Scheldt more firmly on the Mesolithic map, it also marked the start of a long-standing research tradition at Ghent University focusing on the use and distribution of 'exotic' quartzite varieties during the Mesolithic. Crombé's first map was based on Gendel (1982a, 1984) and showed a hatched area of *ca.* 38.300 km², together with a limited number of point locations (Crombé, 1996: fig. 39), and Gendel's map was supplemented with additional data from the north-western part of the Belgian province of Oost-Vlaanderen and -for the first time- also data from the eastern half of the province of West-Vlaanderen, extending the boundary of the WSQ-distribution range *ca.* 35 km to the west (*ca.* 1.500 km²). Crombé's second map compared the WSQ-distribution range with that of surface-retouched microliths (Crombé, 1996: fig. 41), as had previously also been done by Narr (1968: karte 10) and Price (1987: fig. 15). The distribution range on this second map is slightly different from that of the first map: it covers an area of *ca.* 35.700 km² (*i. e.* 7 % smaller than the distribution range of the first map) and apart from the previously mentioned westward extension, corresponds better to the distribution range depicted on Gendel's 1983 map. The new German data published by Löhr a few years earlier was not included in either of the two maps. On a third map, Crombé (1996: fig. 40) added individual points and labels to depict six Middle Mesolithic and four Late Mesolithic sites for which the percentage of WSQ artefacts amounted to more than 20 % of the total lithic inventory, similar to the map previously published by Huyge (1987) who used 40 % as a cut-off. A similar point map re-appeared in the published version of his PhD (Crombé, 1998: fig. 90), in addition to a labelled point map showing Early Mesolithic sites with WSQ-artefacts in Belgium (N = 17), Luxembourg (N = 1) and Germany (N = 3). This latter is the first to include the Grand Duchy of Luxembourg into the WSQ distribution range, an extension that was based on WSQ data from the site of Berdorf - Kalekapp 2 (Spier, 1982). Although prior to the publication of this map a number of scholars had already vaguely referred to the presence of WSQ in the Grand Duchy of Luxembourg (*i. e.* Gendel, 1984; Van Oorsouw, 1993), the evidence on which these claims had been based had never before been included in any WSQ distribution map. Yet, the exact nature and origin of the raw material used at Berdorf – Kalekapp 2 has been debated: Spier (1997: 310-312) refers to a macroscopic identification by Crombé confirming the presence of WSQ artefacts, but this identification has recently been questioned by Leesch (2011: 115, 2017: 67-68), who pointed to the existence of more local raw material sources similar to WSQ (e. g. Hunsrück-Eifel, Mersch-Mierscherbierg). In his 2002 article on the meaning of Early Mesolithic microlith variability in Belgium, Crombé discussed the presence of WSQ and TQ in the different early Mesolithic assemblage types he defined. Arguing that during the Preboreal both quartzite varieties were simultaneously distributed over an area of *ca.* 45.000 km², albeit mostly in different directions, an adjoining map delimited an area of 43.000 km². The western edge of this area was depicted for the first time on any map and nearly touched the current North-sea coastline, including not only a large part of the Belgian province of West-Vlaanderen but also the current river mouths of the Scheldt, Meuse and Rhine in the Netherlands. The same map is reproduced by Robinson (2010: fig. 2.8).

As part of his Master thesis on the distribution of WSQ and TQ in the sandy area of lower Belgium, Gobbin (2004) has the most comprehensive inventory available for this area, listing 110 locations corresponding to *ca.* 21.700 WSQ-artefacts. He also provided a regional point distribution map for this area comprising all records of his inventory (Gobbin, 2004: kaart 4).

In the past decade, several maps of Middle Palaeolithic sites with WSQ-artefacts were produced. The first of these was published by Amkreutz & Verpoorte (2009a, 2009b) as part of their announcement of a WSQ find from the quarry of Stein – L'Ortye, located close to the Dutch/Belgian border. Discovered during 2008 in a secondary context on a gravel heap in the quarry, the artefact was classified as a convergent convex scraper. Apart from a detailed description of the artefact and its context (see also Niekus *et al.*, 2017; Amkreutz & Niekus, 2019), Amkreutz & Verpoorte also provided a wider Middle Palaeolithic context consisting of nine other Belgian sites (Amkreutz & Verpoorte, 2009a: fig. 3).

In order to better understand the potential role of two varieties of quartzite as chrono-cultural markers for the Mesolithic of the Low Countries, and in particular the north-western part of lowland Belgium, Perdaen *et al.* (2009: fig. 2) compiled a map of both quartzite varieties. Referring to previous studies by Arora, Gendel, Gobbin (*cfr supra*) and also by van Oorsouw (1993), they argued that during the Mesolithic WSQ was present in an area of *ca.* 40.000 km² and pointed to the importance of rivers as both transport routes and barriers (Perdaen *et al.*, 2009: 219). They furthermore differentiated between a core area of only 32.100 km² and a maximum distribution area (including TQ) of more than 56.000 km². It is noteworthy that for the first time since the early 1990s the WSQ-distribution range also included the Eifel region from Löhr's 1990-map, although Löhr is not explicitly referred to. The western edge of the distribution range, including nearly the entire province of West-Vlaanderen and the estuaries of the Scheldt, Meuse and Rhine, closely resembles that of the map drawn by Crombé in 2002.

Recently re-used as part of *a status quaestionis* on the early prehistory of the Dutch province of Limburg (Verhart, 2016: afb. 04.03), Van Ginkel & Verhart's (2009: fig. 3.9) original

WSQ map in a popular book on Dutch archaeology consisted of concentric contour lines with a dark red coloured centre near the town of Wommersom and fading outer edges. This way of visualising suggests to the viewer that the highest number of WSQ-sites (and/or artefacts?) are to be found near the presumed raw material outcrop, whereas the number of sites and/or artefacts significantly drops when the distance from Wommersom increases. It probably finds its roots in the prevailing idea of a rapidly decreasing number of WSQ-artefacts further away from the presumed source-area. However, the uniform nature of the contour lines and colour changes in all wind directions suggests that it merely serves as an idealized representation of this hypothesis, probably mainly for aesthetic reasons for a laymen audience, rather than a faithful presentation based on data at hand.

Apart from his reproduction of Crombé's 2002-map for the distribution of WSQ and TQ during the Early Mesolithic, Robinson (2010: fig. 2.13) included an additional map in his PhD-thesis depicting the distribution of a number of specific artefact types in the Scheldt basin thought to reflect social territories. Besides the distribution of bone and antler points and trapezes with a right lateralization, he also gave a schematic representation of the distribution of WSQ, based on Gendel (1984). Displaying a number of differences compared to the original map by Gendel, the rectangular distribution range delimited by Robinson encompasses an area of only *ca.* 29.000 km^2.

Recent finds of WSQ-artefacts from Rotterdam led to a number of new, albeit often largely obsolete, distribution maps by Dutch scholars. The first of these was published in 2011 as part of the excavation report of Rotterdam – Beverwaard Tramremise (Zijl *et al.*, 2011: afb. 24) and find its roots in a map that Verhart & Groenendijk published in 2005, which in turn was a reproduction of one of Gendel's maps published more than two decades before. Three years after Zijl *et al.* published their map, another one appeared in the report of a geo-archaeological research from Rotterdam – Yangtzehaven (Moree & Sier, 2014: afb. 7). As was the case with the map by Zijl *et al.* this second map was also inspired from Verhart & Groenendijk's earlier map, but unlike the former it was partly updated with a number of recent finds from Almere – Hoge Vaart/A27 (published in 2001 by Hogestijn & Peeters) and Rotterdam (*e. g.* Tramremise, 't-Hart and Yangtzehaven). Although ignoring important data from the western part of Belgium, France, Luxemburg and western Germany, the delineated area on this map measured *ca.* 46.700 km^2. Remarkably, it also includes an area of *ca.* 2.800 km^2 corresponding with the current North Sea for which at present no factual data seems to exist (but see further). Similar maps were later reproduced by Peeters *et al.* (2017: fig. 4.3) and Niekus & Van Koeveringe (2018: 93).

Compared to the earlier map by Amkreutz & Verpoorte (2009a: fig. 3), the distribution of Middle Palaeolithic sites with WSQ artefacts drawn by Di Modica (2011: fig. 78) contains only nine locations. A comparison of the legends of both maps reveals that eight of the sites are the same (yet not depicted at the same locations), but whereas the finds from Stein published by Amkreutz & Verpoorte (2009a, 2009b) and from Veldwezelt-Hezerwater WFL-locus published by Bringmans (2006) are not included by Di Modica, those from Holsbeek – Meesberg published already in the 1976 by Vermeersch are not incorporated by Amkreutz & Verpoorte. In addition, neither of both maps depicted a number of other locations which also had yielded (presumed) Middle Palaeolithic WSQ-artefacts.

More than a decade after Gobbin presented his study on the distribution of WSQ and TQ in the sandy area of lower Belgium, another Master thesis at Ghent University investigated the use of both quartzite variants during the Mesolithic (Coppens, 2015). This new study differed in several respects from Gobbin's earlier one, although both are based on a literature review and not on first-hand analyses of lithic artefacts. Coppens' aim was not so much to investigate the geographical and temporal variation of the number and relative frequency of both quartzites during the Mesolithic, as Gobbin had done, but to focus more on the typological variability across time and space related to the use of both lithic raw materials, compared to flint. While she explicitly strived to provide a typological overview of the total area of WSQ- and TQ-distribution (Coppens, 2015: 20), the dataset upon which she relied was far from exhaustive (Coppens, 2015: 19-20). Referring to an (as yet) unpublished paper by Robinson *et al.*, Coppens (2015: 14) mentions a total of 300 sites with artefacts in WSQ and/or TQ, one third of which she used for her typological analyses and part of which are shown on an accompanying point map (Coppens, 2015: fig. 6).

More recently, Crombé (2017; Herremans & Crombé, 2017) published two new WSQ-maps. The first appeared as part of a discussion of the potential impact of the 9.3k cal BP cooling event on the natural environment and human occupation in the RMS-area (Crombé, 2017: fig. 8). Again comparing the distribution of WSQ (*ca.* 50.000 km^2 from the text *versus ca.* 56.600 km^2 from the map) with the partly overlapping but wider distribution of surface-retouched microliths, Crombé made use of a boundary map to support his hypothesis of the existence of two dialectic tribes forming part of a bigger language family within the RMS area during the later Mesolithic. A more recent map appeared in a popular book released as part of the excavations at the Mesolithic site of Kerkhove – Stuw (Herremans & Crombé, 2017: 61). As in the JQS-paper, this latter map compared the distribution of WSQ with that of surface-retouched microliths, by combining a boundary line for the WSQ data with point locations for the surface retouched microliths. Upon close scrutiny, however, the latter differs markedly from a similar map published by Gehlen *et al.* (2014: abb. 9). This map by Herremans & Crombé was produced according to an oblique projection, prohibiting an accurate geo-rectification and therefore also a comparison with other WSQ maps. Despite this difficulty, one important element is clearly different from all other maps published so far: a northward extension from the city of Amsterdam of *ca.* 1.200 km^2 (?) into the province of Noord-Holland, between the Marker Meer in the east and the North Sea coast in the west. However, the raw data underlying this extension remains elusive to us.

The map by Niekus *et al.* (2017: afb. 5; see also Amkreutz & Niekus, 2019: 49), is the most recent one depicting Middle Palaeolithic WSQ-occurrences. It includes 12 sites, *i. e.* respectively two and three locations more than similar maps by Amkreutz & Verpoorte (2009a: fig. 3) and by Di Modica (2011: fig. 78). Both new maps were published as part of a new find report of a bifacial artefact recovered without contextual information from North Sea deposits near the harbour of Rotterdam (hence the North Sea-extension on the map of Moree & Sier, 2014?). Apart from this new find location, these maps also include the site of Meldert which is not previously referred to in the literature or on maps. According to Niekus *et al.* (2017: 167, 168) it refers to a bifacial artefact from the collection of the *Gallo Romeins Museum* in Tongeren.

WSQ received considerable attention in a recent evaluation report on the contribution during the past 15 years of developer-led, commercial archaeology to our understanding of the prehistory in the Netherlands (Peeters *et al.*, 2017). The attention for WSQ in this report heavily focuses on the existence of a specific distribution pattern, emphasising a gradual decrease of the number of sites and of WSQ artefacts with increasing distance from the source area (Peeters *et al.*, 2017: 118). Including the new Mesolithic finds from in and around Rotterdam (*e. g.* Beverwaard, Groenenhagen and Yangtzehaven), Peeters and colleagues pointed to the importance of river valleys and in particular the Scheldt river system, for the dispersion of this raw material during the Early and Middle Mesolithic. The report contains a slightly modified version of the contour map drawn previously by Moree & Sier (2014, see also Niekus & Van Koeveringe, 2018: 93), which was already outdated around the time of its construction as it did not include the most up-to-date information on the western, eastern and southern boundaries of the distribution range and furthermore also omitted data from NW-Belgium, France, Luxembourg and W-Germany. Peeters *et al.* referred to WSQ-data from *ca.* 15 Dutch locations, mostly stray finds but also more extensive assemblages, discovered and investigated in the context of development-led archaeology since 2005 (Peeters *et al.*, 2017: 64, 86, 117-119). Apart from the previously mentioned sites from Rotterdam, these new sites include Borgharen – Site 8, Casteren, Deurne – Groot Bottelsche Akker, Ede – Kernhem, Ekkersrijt, Holtum – Noord II, Keersop – Deelgebied II, Middegaal, Sevenum – Gelderdijk, Susteren – Aardenweg and Tungelroyse Beek. While Peeters *et al.* (2017: 118) argued that the results of these Dutch development-led excavations on prehistoric sites with WSQ did not produce a radically new picture but instead confirm the general distribution of WSQ, on a more general level they also noted that these development-led studies on raw materials, including WSQ for the Mesolithic, permit us to gain insight into long distance transport of raw materials, provide us with new insights into the geographical sphere of interaction in various time periods and draw attention to the degree of mobility of groups and to the social interaction between groups, despite the scanty data and incidental observations that these reports have produced (Peeters *et al.*, 2017: 8, 118). On this latter aspect they further noted that reports resulting from development-led work make little mention of Wommersom quartzite, possibly related to the lack of expertise in correctly identifying lithic raw materials (Peeters *et al.*, 2017: 118).

Finally, as part of a regional study on the Mesolithic in the extreme north-western part of Belgium, around the city of Bruges, Noens *et al.* (2019: fig. 6) also included a point and contour map of the western distribution of WSQ. This map is based on an earlier version of our current inventory.

This historical sketch presented above shows that the spatial distribution of prehistoric artefacts made from WSQ received considerable attention, resulting in no less than 47 maps published between 1913 and 2019. Other publications without such maps have also discussed spatial aspects of WSQ but often simply repeated the findings from the publications referred to above. Prior to the late 1970s only five maps were produced in a period of 65 years. From the end of the 1970s onwards both the number and frequency of the published maps increased dramatically with no less than 41 maps (re-)produced over the past 40 years. A detailed comparison of these maps reveals many differences, not only relating to the type of map and the area depicted, but also to the number of sites and the delimitation of the distribution range.

While over 60 % of all maps created since 1913 refer to the total WSQ-distribution range, other maps zoom in on selected areas, periods and/or themes. For instance, the maps by Dursin (1932), Barrière (1956), Arora (1979, 1980), Vanmoerkerke & Van Vlaenderen (1985) and Gobbin (2004) focus on Mesolithic sites containing WSQ artefacts in the Campine area, the Belgian Hesbaye region, the Lower Rhine area, the Belgian provinces of Oost- and West-Vlaanderen, and the sandy lowlands of Belgium, respectively. And whereas Arts (1987), Huyge (1987) and Crombé (1996, 1998) depict the spatial distribution of sites with WSQ artefacts during different phases of the Mesolithic in northern Belgium and the south-eastern Netherlands, Amkreutz & Verpoorte (2009a, 2009b), Di Modica (2011), Niekus *et al.* (2017) and Amkreutz & Niekus (2019) focus on Middle Palaeolithic WSQ-sites.

Different depiction types can be distinguished. A first group, encompassing all but one of the maps produced between 1913 and the early 1980s, shows individual points to depict sites with WSQ-artefacts. Some of these also provide individual site labels and/or use different symbols (or sometimes different maps) according to chronology. A second group of maps does not contain point locations but only depict the outer limits or the overall WSQ-distribution range by means of boundary lines or hatching. Apart from the early example by Narr (1968), this type of map became increasingly popular from the early 1980s onwards, after it was first used by Gendel (1982a). In fact, two-thirds of all

WSQ- maps published since belong to this type. During the last four decades, a dozen of maps with individual point locations has been published, often depicting only a selection of WSQ-sites set against the overall WSQ-distribution range. These are often partial maps, showing a thematic (*e. g.* Bassleer, 1985; Huyge, 1987; Crombé, 1996, 1998), chronological (*e. g.* Crombé, 1998; Amkreutz & Verpoorte, 2009; Di Modica, 2011; Niekus *et al.*, 2017; Amkreutz & Niekus, 2019) or regional (*e. g.* Vanmoerkerke & Van Vlaenderen, 1985; Arts, 1987; Gobbin, 2004) selection of sites. Only the point maps by Rozoy (1991) -a copy of his 1978 version- and Coppens (2015) focus on the entire WSQ-distribution range, yet failed to include all known locations at that time. As a result of this shift in data presentation from the early 1980s onwards, it is often difficult to gain a reliable insight into the raw data underlying this second type of WSQ-distribution maps. Van Ginkel & Verhart's (2009, fig. 3.9) map, recently reproduced by Verhart (2016: fig. 04.03), deviates from both previous map types as it uses different shades to suggest a (pseudo?) density distribution.

Many maps aim to depict the total WSQ-distribution range and an overall growth of this range can be noted upon comparing these maps according to publication date. Yet, at several points in time this trend is interrupted, reflecting the incompleteness of some of the datasets on which the maps rely. An important interruption between the early 1990s and 2005 can be explained by the omission of Löhr's (1990) German data from these datasets. Whereas Perdaen *et al.* (2009) and Crombé (2017) did incorporated this data into their maps, many other maps fail to do so, even until very recently (*e. g.* Robinson, 2010; Zijl *et al.*, 2011, Moree & Sier, 2014; Peeters *et al.*, 2017; Coppens, 2015). Many of these maps are often (explicitly) based on Gendel's older maps dating back to the first half of the 1980's and neglect much of the additions on more recent maps.

A four-year research project between 2010 and 2014 on the prehistoric uses of 'exotic' quartzites at Ghent University (Robinson *et al.*, 2013; in press; Cnudde *et al.*, 2013) used field surveys at the presumed outcrop areas around the city of Tienen to improve our understanding of prehistoric procurement activities and exchange systems in relation to landscape evolution. Extensive refitting analyses, lithic experiments and micro-wear analyses to better comprehend quartzite knapping technology, the workability of WSQ and TQ and their usage were announced as part of this project. No results have been published on these aspects so far. It also aimed at better identifying diachronic changes in the distribution and utilization of these different quartzite varieties based on a GIS-analysis of 267 sites with WSQ and/or TQ artefacts, covering an area of around 80.000 km^2. While being one of the most extensive inventories so far, our present study shows that these 267 sites represent a small fraction of all known sites with WSQ-artefacts, corresponding to only *ca.* 13 % of our inventory. The distribution range depicted by Robinson *et al.* (in press) is considerably larger than in other published accounts. It is for instance *ca.* 30 % larger compared to the (more) recent and most comprehensive map drawn by Crombé (2017). Unlike any previous inventories or maps, Robinson *et al.*'s is also the first to include the two WSQ-microliths from Fère-en-Tardenois - l'Allée Tortue (sites Xa and Xb) situated at *ca.* 207 km (not 350!) from the village of Wommersom, originally published by Rozoy & Rozoy (2000). In this respect, it is interesting to note that already in the 1950s Barrière (1956: 232-234) mentioned the presence of WSQ-artefacts in the Paris Basin, although he did not incorporate these in his own distribution map and no-one since then has referred to these sites.

Throughout the published accounts on the WSQ-distribution range, the Mesolithic has received most attention, often with an emphasis on the number of locations and/or the number, percentages and types of WSQ-artefacts in lithic inventories, as well as their relative distance to the presumed primary outcrop in Wommersom. From the 1980s onwards, scholars from the Universities of Leuven (*i. e.* Gendel, 1983; Maes, 1983; Huyge, 1987), Ghent (*i. e.* Crombé, 1996, 1998, 2017; Gobbin, 2004; Coppens, 2015; Robinson,

2016) and Leiden (*i. e.* Amkreutz, 2013) investigated such relationships quantitatively using different datasets, which led to multiple hypotheses on the dispersion mechanisms leading to the observed geographic and diachronic distribution patterns of this raw material. In many of these hypotheses the connecting or barrier role formed by the rivers Scheldt, Meuse and Rhine play an important role.

Since the earliest investigations, a reference to the *Steenberg* as the primary geological outcrop and extraction source of WSQ is an often-recurring element in publications. Most studies consider this location to be *the only* source of this raw material type, but others are more cautious in attributing artefacts to a single outcrop and instead stress the limited state of our knowledge. Recent geological sourcing studies (Blomme, 2011; Blomme *et al.*, 2012; Veldeman *et al.*, 2012) as well as a limited number of archaeological studies (Nelissen, 1962; Narr, 1968; Rozoy, 1971; van Oorsouw, 1993; Di Modica, 2005; Ryssaert *et al.*, 2007) suggested that other, yet unknown outcrop areas might exist as well – a point already made by Hamal-Nandrin and Servais in 1913 – and stressed that more sourcing studies are required before we can fully evaluate hypotheses on the provenance, use and distribution of WSQ in the past. The existence of WSQ-nodules in secondary contexts, such as the gravel beds of the river Meuse, is debated by Dutch scholars: denied by some (Wouters, 1954; Peeters, 1971; Peeters *et al.*, 2001; Moree & Sier, 2014), others (provisionally) do recognize the occurrence of reworked WSQ (van Oorsouw, 1993; Amkreutz & Verpoorte, 2009a, 2009b). Based on oral communication with Deeben & Wouters, van Oorsouw (1993) argued that if correct, the occurrence of WSQ nodules in these Meuse gravel beds can only be explained by the existence of a direct link between the rivers Meuse and Gete at some point in the past. According to Amkreutz & Verpoorte (2009a, 2009b), who in addition also cite some geological publications (*i. e.* Nijs & De Geyter, 1984; Dreesen & Dusar, 2004), the existence of such a direct link between the area of the *Steenberg* and the Meuse is unlikely. They do not consider the presence of WSQ in the Meuse gravel beds as the result of natural processes, but instead explain it by pointing to its use in recent historical times as building material.

While most scholars claim to have no problems with identifying WSQ based on a quick and simple macroscopic observation, the artefacts from the Mesolithic site of Berdorf – Kalekapp 2 referred to above are a good reminder that macroscopic identification is not always straightforward nor reliable. Similar difficulties with macroscopic identifications were also reported by Ryssaert *et al.* (2007) and Di Modica (2011). Relying on geological information, Ryssaert *et al.* (2007: 32-33) argue for the potential existence of variants macroscopically similar to WSQ coming from different outcrops in the region of Mons. In his evaluation of distribution studies of WSQ-artefacts from Middle Palaeolithic contexts, Di Modica (2011: 168) emphasised on the need for a more critical attitude by prehistorians. Already 70 years ago Danthine (1949: 282-285) referred to similar problems in relation to an artefact from the Middle Palaeolithic site of Fond-de-Forêt. These problems surrounding raw material identification, with consequences for distribution maps, confirm the urgent need for more in-depth comparative sourcing studies, both in the area around the village of Wommersom and in other areas (*i. e.* Di Modica, 2011; Blomme, 2011; Blomme *et al.*, 2012; Veldeman *et al.*, 2012; Cnudde *et al.*, 2013).

4. Some updated point-distribution maps on WSQ

Our inventory currently lists 2.040 archaeological WSQ-sites, counting for over 84.200 WSQ-artefacts.

We draw attention to Arts' (1986) inventory of over 2.000 prehistoric sites from the Dutch provinces of Noord-Brabant and Limburg, most of them unpublished, containing over 44.000 WSQ-artefacts from an unknown number of these (mainly surface) sites. For these provinces from the southern Netherlands our inventory has 592 WSQ-sites representing at least (only) 16.270 WSQ-artefacts, being an underestimation given that for 32 % of these sites no reliable data on the number of WSQ-artefacts are available. Considering Arts' information, it is thus possible that our inventory lacks a substantial amount of data from this area, although this remains difficult to assess in absence of further details on Arts' dataset. It therefore should be kept in mind when reading our maps that the observed patterns for the southern part of the Netherlands based on the known data can be biased to some degree.

Interestingly, less than half of our records contain direct indication(s) for a Mesolithic component in the lithic inventory, either in the form of one or more microlith(s) (45 %) or in the form of at least one microburin but in absence of any microliths (3 %). In only around 1/3th of the records with microliths (35 %), at least one of these was made from WSQ. In nearly 2/3th (64 %) of the cases with microburins but without microliths at least one of the microburins was made from WSQ. Around 60 % of the records with microliths have types that are commonly attributed to the Middle Mesolithic (15 %), the Late(r) Mesolithic (25 %) or both (21 %). Given that the (pre-Holocene) deposits from which most of these inventories were recovered, both at or below the present-day surface, may contain lithic remains from different archaeological periods intermixed in an unstratified position, and that we are often unable to distinguish the lithic inventories from these different periods (based on chronometric, typological and/or technological criteria), this surprisingly restricted amount of records with univocal Mesolithic WSQ-remains is insufficient to ascertain a unique -or even predominant- link between WSQ and the Mesolithic.

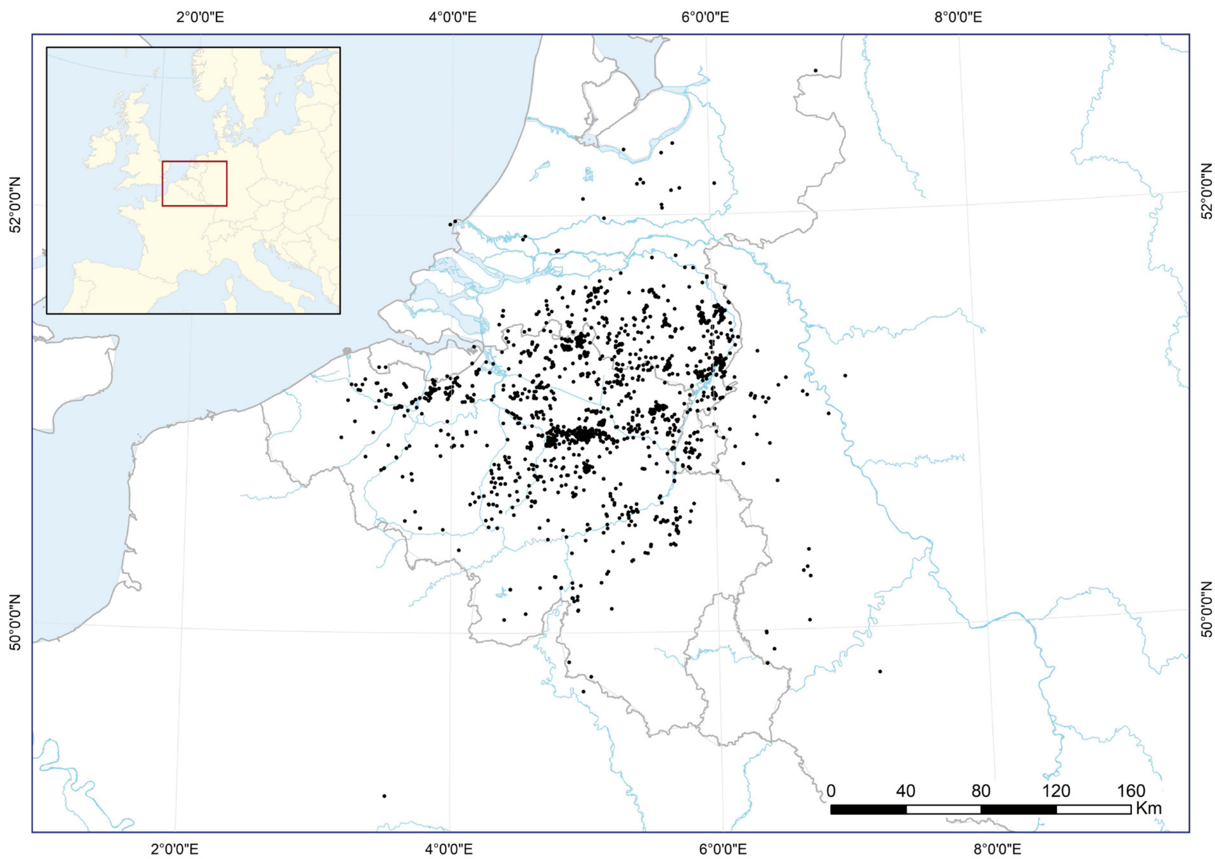

Fig. 1 – Distribution of WSQ-sites.

Site-location is known for over 80 % of our records, while for another 8 % it could be established more or less accurately give or take maximum a few hundreds of meters. For the remaining 12 % no further information except for the name of a town or city or some other vague topographical reference is available. Given the huge variation in artefact-recovery procedures this spatial attribute can have different meanings. For highly accurate excavations or surveys it can refer to exact point provenience data or be attributed to individual artefact clusters, for less accurate recovery procedures, on the other hand, it can refer to the boundaries of modern parcels from which all collected artefacts have been lumped together. This difference in spatial resolution should be kept in mind when reading the maps, yet is very difficult to adequately deal with in the analyses; in any case, we always used the most detailed spatial information available to us. Despite such difficulties, site location could be determined with a sufficient degree of confidence -either exactly or approximately- to put them on a distribution map covering the whole distribution area as individual point locations for nearly 90 % of our records -representing 96 % of all WSQ-artefacts. The result is shown in Fig. 1. To this we added several maps showing the distribution of WSQ-sites with Mesolithic indicators, and the distribution of several WSQ-microliths types (Fig. 2-7).

To our knowledge these are the most extensive maps of archaeological WSQ-sites produced to date, containing over 17 times the number of sites depicted on previous similar attempts (Rozoy, 1978; Coppens, 2015). Using a convex hull boundary box, the WSQ-distribution range on our maps covers an area of *ca.* 79.300 km^2, however including a lot of empty zones.

WSQ-artefacts are known from all Belgian provinces and regions and from all but three of the Dutch provinces, as to our knowledge no WSQ was yet recovered from Groningen,

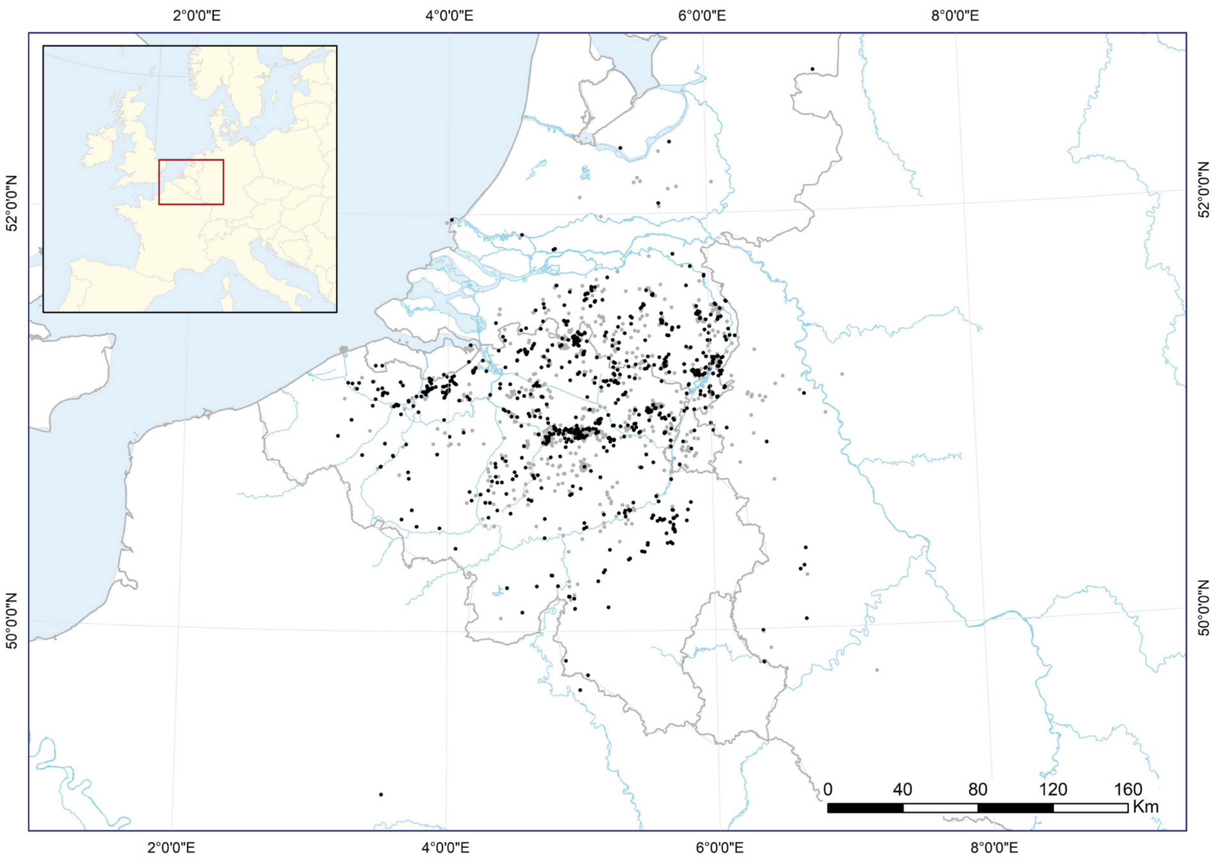

Fig. 2 – Distribution of WSQ-sites with Mesolithic indications (black dots).

Friesland and Noord-Holland. In Germany WSQ was found in two western states bordering Belgium, the Netherlands and Luxemburg. *Ca.* 72 % of the WSQ-artefacts from our dataset are from Belgium and 22 % from the Netherlands. The highest numbers and densities of locations are from the Belgian province of Vlaams-Brabant (*e. g.* 16 % of the locations with a density of 0,16 sites per km²) and the Dutch province of Limburg (*e. g.* 16 % with a density of 0,15). Belgian Limburg has also the same number of locations (16 %) but a slightly lower density (0,13), while both numbers and densities slightly drop for Antwerpen (15 % with a density of 0,10). More than two hundred locations have been recorded for Noord-Brabant (12 % with a density of 0,05). The relatively large numbers for Oost-Vlaanderen (10 % with a density of 0,06), particularly in its northern part, can surely be related to a higher research intensity -both excavations and surveys- in this area. Most WSQ-artefacts come from Antwerpen which has more than one third of all Belgian WSQ-artefacts although it accounts for only 22 % of all Belgian WSQ-locations and has fewer locations than Vlaams-Brabant and both Dutch and Belgian Limburg. Slightly less artefact numbers are from Belgian Limburg and Vlaams-Brabant which together with the data from Antwerpen reflect 94 % of all WSQ-artefacts from Belgium, but only 71 % of all Belgian locations. Most of the other provinces and regions show a reverse pattern where the number of WSQ-locations is overrepresented compared to the number of artefacts. This is especially apparent for Oost-Vlaanderen and Dutch Limburg. While the locations from Oost-Vlaanderen represent 14 % of all Belgian sites, these only account for 4 % of all artefacts found in Belgium. This effect is similar for Dutch Limburg representing 55 % of all Dutch locations but only 14 % of all Dutch WSQ-artefacts. While for Oost-Vlaanderen this might be a reflection of an archaeological reality (*e. g.* locations overall characterised by low amounts of WSQ-artefacts), for the Limburgian sites the data from Arts' (1986) inventory should be included to allow for a meaningful explanation in terms of archaeological reality and/or research bias.

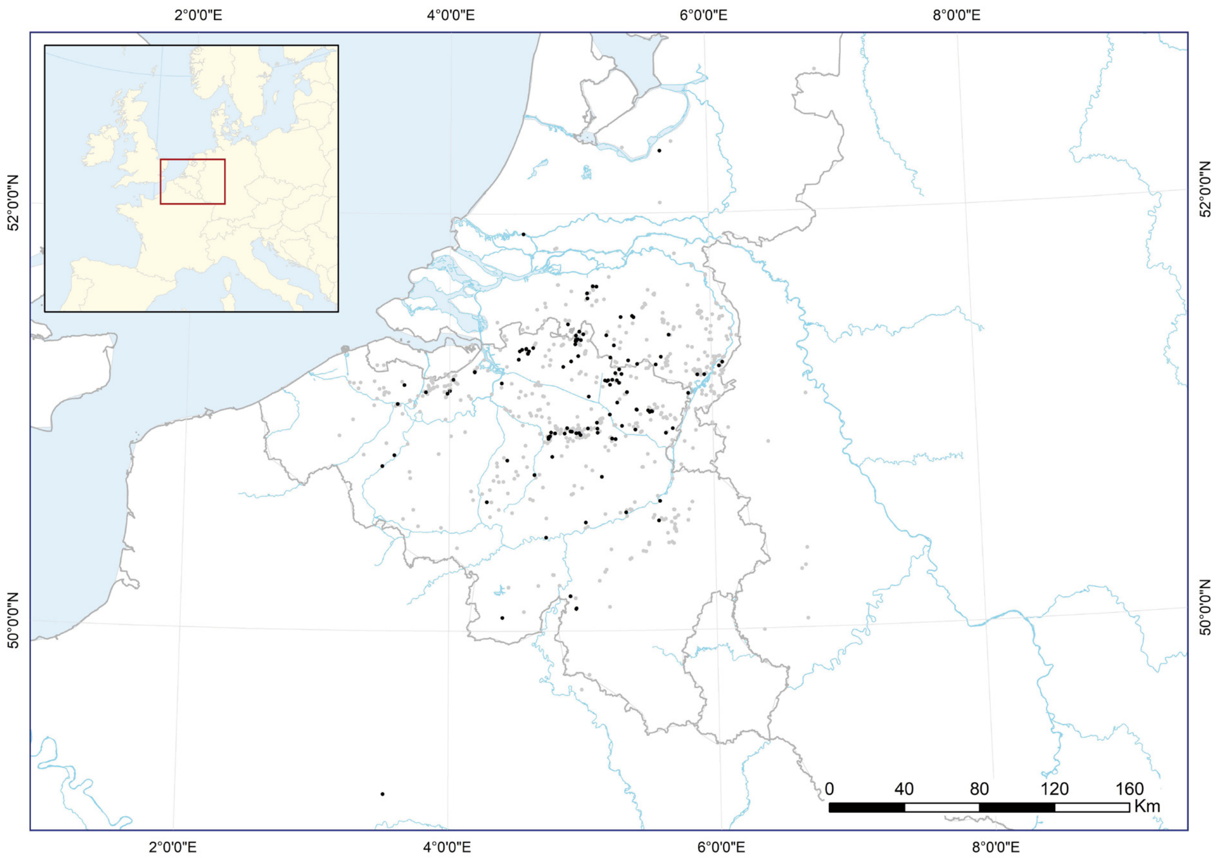

Fig. 3 – Distribution of Mesolithic WSQ-sites with WSQ-surface retouched microliths (black dots).

Discrepancies can be noted when comparing our map with previous ones. While WSQ-distributions on most of the old maps fall within the boundaries of our distribution range, several of the more recent maps partly extend beyond the boundaries of our range. This means either omissions from our part (despite the extensive nature of our enquiry) or inclusion of areas for which no factual data exists on these previous maps. This first applies to the western boundary where parts of the Belgian province of West-Vlaanderen up to the North-Sea coastline have been incorporated into the distribution area since the mid-1990s by scholars from Ghent University (Crombé, 1996, 2002, 2017; Perdaen *et al*., 2009; Robinson, 2010), up to *ca*. 45 km to the west of our western-most point (see also Noens *et al*., 2019: 183-184). It also applies to the north-western boundary where the area between the lower course of the Rhine and the North-Sea coastline, including large empty parts of the Dutch province of Noord-Holland, have been incorporated into the distribution area by Dutch and Belgian scholars, up to 45 km (Moree & Sier, 2014; Peeters *et al*., 2017) or even 80 km (Herremans & Crombé, 2017) beyond the most north-western point on our map. Finally, it also applies to the north-eastern boundary where the same scholars (Moree & Sier, 2014; Crombé, 2017; Peeters *et al*., 2017) pushed the limits up to 15 km along the right riverbank of the Lower Rhine in the north-western part of the German state of Nordrhein-Westphalen, more than 45 km beyond our most north-eastern point, whereas even the 30-35 km wide area between the Meuse and Rhine directly to the southwest of that area currently seems to be nearly devoid of any finds at all.

Our maps partly confirm previous findings with regard to the extent, irregularity and 'asymmetry' of distribution and the eccentric position of the presumed outcrop of the *Steenberg*, but also provides additional information on density variation within the distribution area. In line with previous views, it shows that WSQ-locations are unevenly dispersed within

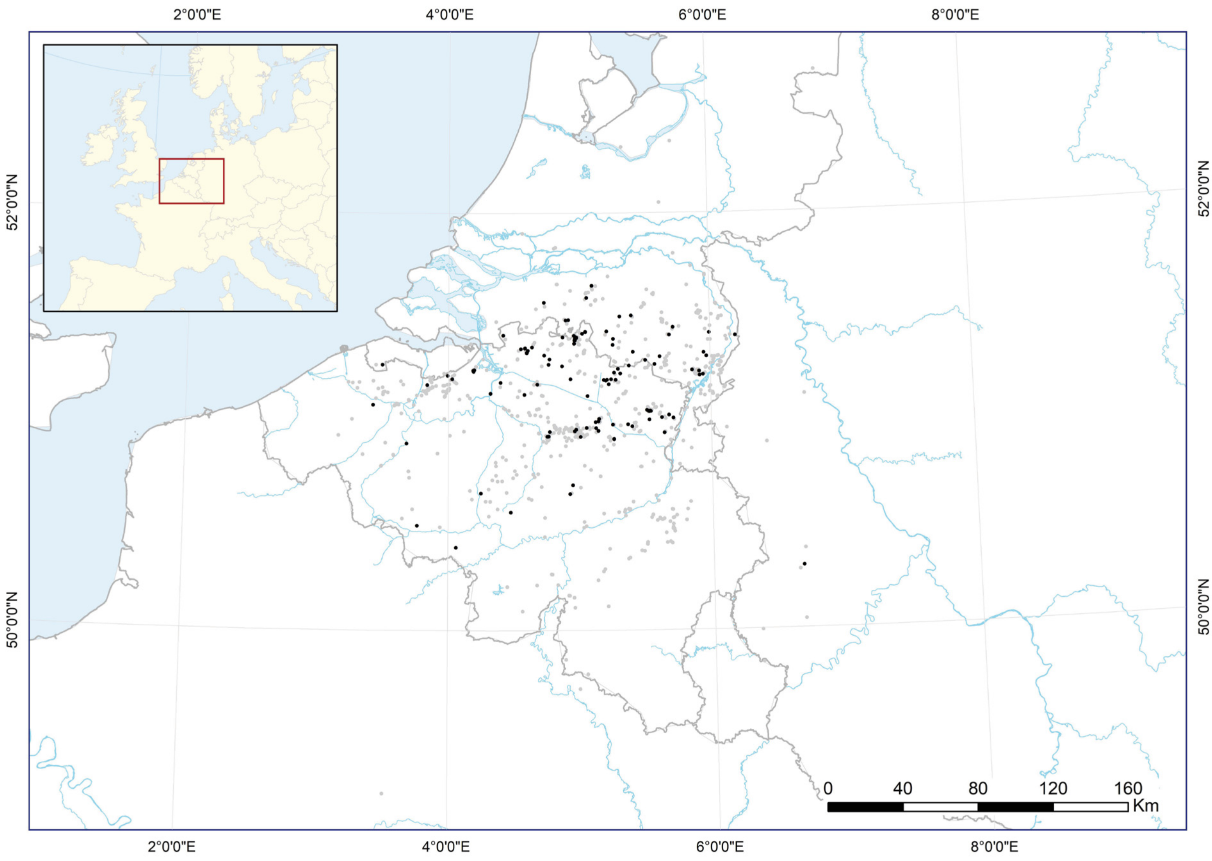

Fig. 4 – Distribution of Mesolithic WSQ-sites with WSQ-trapezes (black dots).

the distribution area, showing some obvious clusters interspersed with a large number of (nearly) empty zones. Most of the known locations are situated between a latitude of 50°00'N and 51°40'N and a longitude of 3°20'E and 6°40'E, with a particularly strong clustering to the northwest, north and northeast of the village of Wommersom (above the 50°50'N-line), up to a distance of *ca.* 100 km around the *Steenberg*. In contrast, the southern part of the distribution area has a much lower density with many regions actually being devoid of any WSQ-artefacts. Following a low-density zone of *ca.* 15 km, the high-density band between the cities of Leuven and Hasselt is striking and mainly reflects the detailed inventory of prehistoric (surface)-data compiled over four decades ago by Vermeersch (1976). Another cluster, situated within a distance of *ca.* 5 km directly to the southeast of Wommersom, reflects a similar intensive inventory-project by Lodewijckx (1988). The clusters in the northern parts of Sandy Flanders, beyond 70 km to the northwest of Wommersom, can be linked to the increasing research intensity from both amateur and professional archaeologists since the early 1980s onward.

Despite the occurrence of many high(er)-density zones, particularly in the northern part of the distribution area, several empty or low-density zones can also be noted. One of the most striking is the near empty band of *ca.* 15 km in the sandy-loamy area between Wommersom and the cluster reflecting Vermeersch' inventory. Except for the area up until the Zenne river -at a distance of *ca.* 50-60 km to the (south-)west of Wommersom-, this very low density distribution is characteristic for the entire sandy-loamy and loamy areas of Belgium, stretching over more than 225 km form the eastern boundary of West-Vlaanderen to the Meuse river in the east, and characterized by much lower research-intensities when compared to the northern sand areas. As such, the loamy and sandy-loamy areas -and the southern part of the sandy area- in the 50 km wide zone between the rivers Zenne and Scheldt, as well as the 15 km wide zone further to the west between

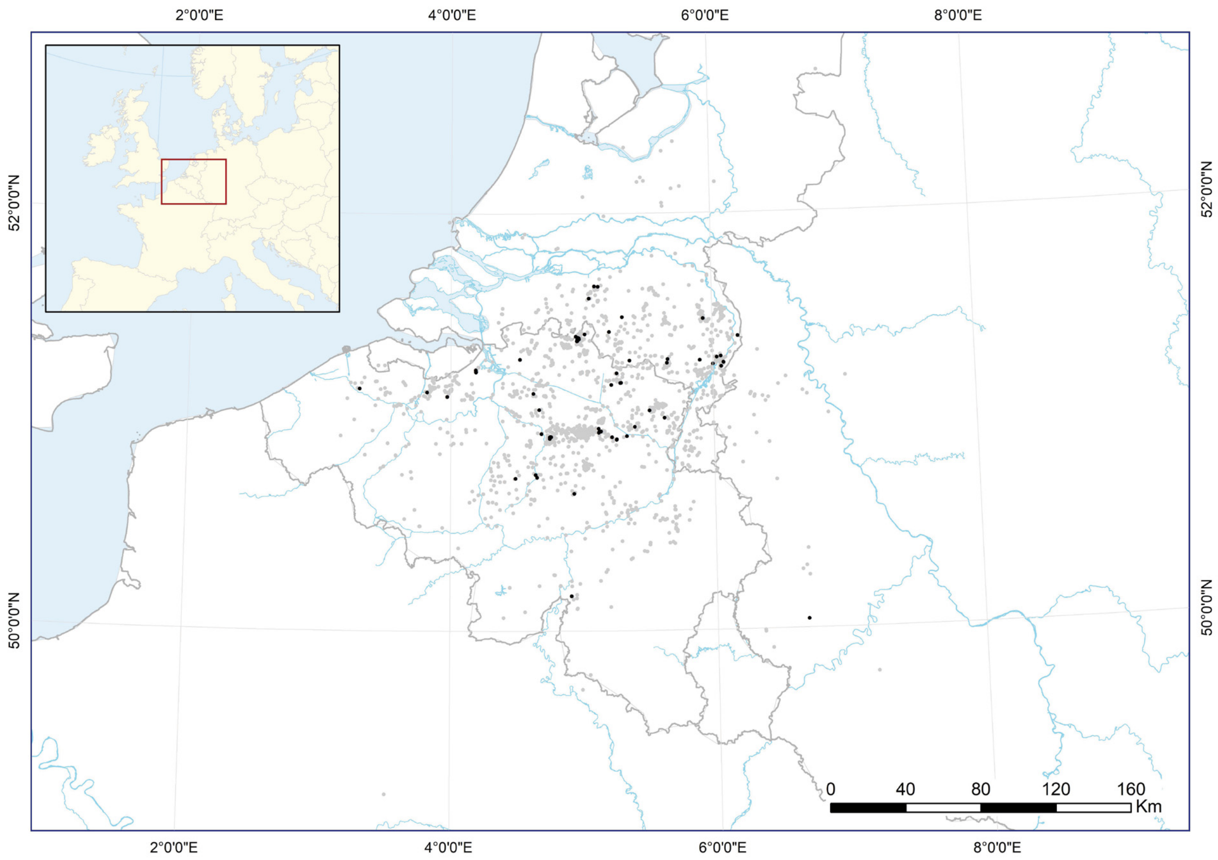

Fig. 5 – Distribution of Mesolithic WSQ-sites with WSQ-points with unretouched base (black dots).

the left bank of the Scheldt and the right bank of the Leie and the area to the west of the Leie hardly contain any known locations at all. Another remarkable area nearly devoid of WSQ-artefacts within *ca.* 60 km around Wommersom can be observed in the Campine-area between Aarschot, Heist-Op-Den-Berg, Turnhout and Geel. While a number of WSQ-locations are known from the area to the north of the Rhine, corresponding to the northern outer fringes of the known distribution area, very few finds were recovered from the zone between the rivers Rhine, Waal and Meuse in the middle part of the Netherlands. Equally striking is the near absence of known locations in a band of *ca.* 10 km to the south of the lower course of the Meuse. The area southeast of Wommersom has hardly any finds in the first 20 km -except for the cluster reflecting Lodewijckx' inventory- but shows some clear clusters between 20 and 60 km, on both sides of the Meuse, again followed by a zone completely devoid of any known location -corresponding to the Belgian Ardennes. It is only further southeast in Luxemburg and the German state of Rheinland-Pfalz that a number of sites are present. This remarkably large empty zone and the reappearance of locations further to the southeast might support the hypothesis of different outcrop areas of (macroscopically) similarly looking raw material variants. To the south and southwest of Wommersom densities are always low with a number of small clusters within a radius of 20 km, between 30-35 km and around 60-70 km. Some sporadic southern occurrences are known from the Ardennes near the French-Belgian border at 100-110 km. The isolated case of the two WSQ-microliths from Fère-en-Tardenois - l'Allée Tortue in the Aisne-region in France, situated at a distance of over 200 km and marking the southern limit of the known distribution, is remarkable as it is located in total isolation at nearly 120 km from its their nearest neighbour in northern France, the rest of northern France being totally devoid of any WSQ-artefacts. Many of the polder and delta-areas from Flanders and the Netherlands, where archaeological remains are buried below Holocene deposits, also lack WSQ-finds. As can be argued for most parts of the sandy-loamy and loamy areas, as well

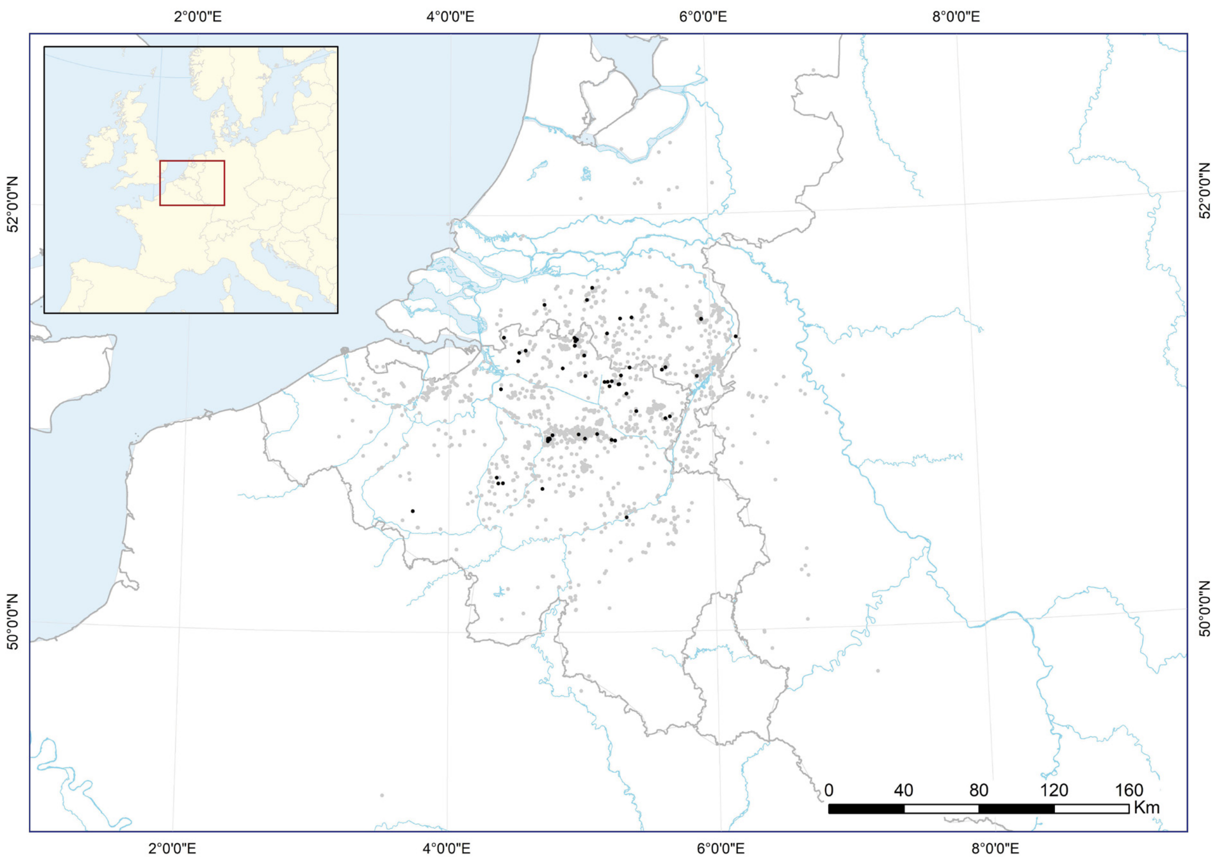

Fig. 6 – Distribution of Mesolithic WSQ-sites with WSQ-points with retouched bases (black dots).

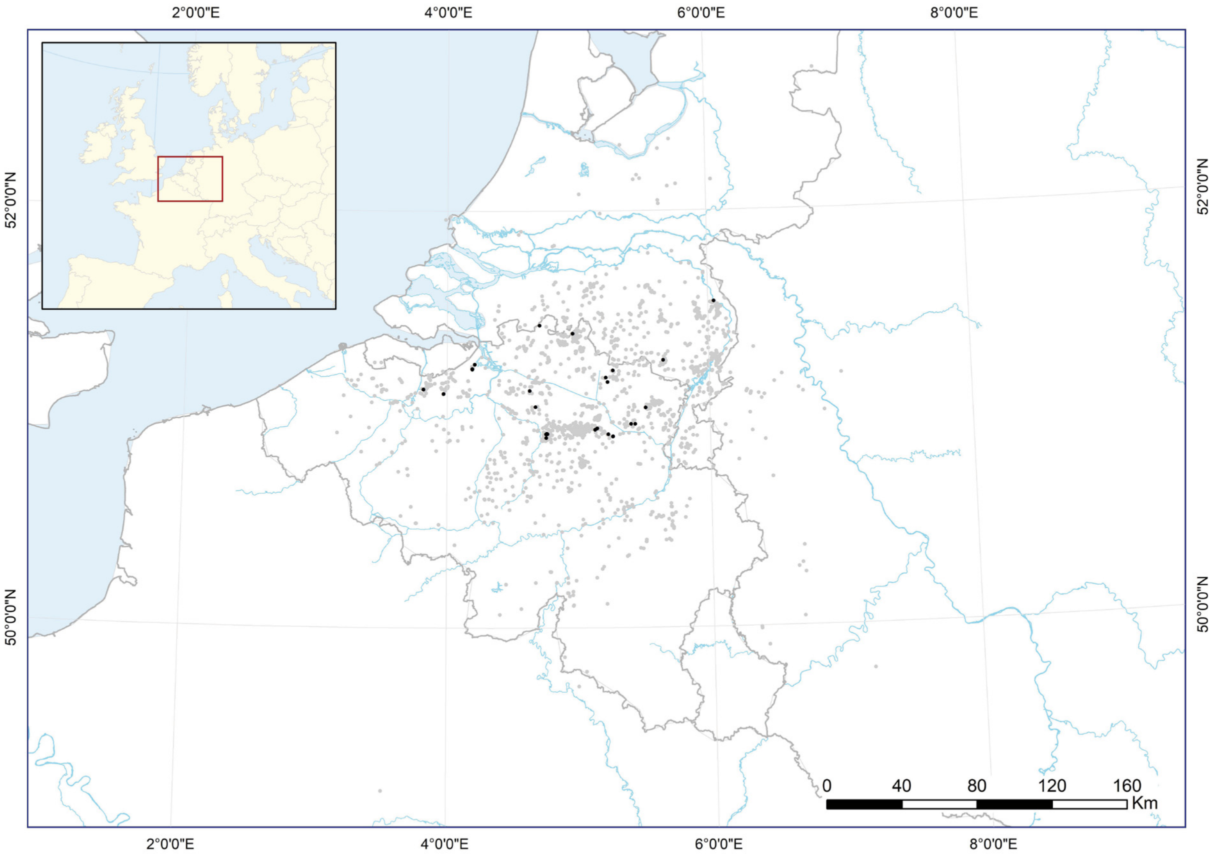

Fig. 7 – Distribution of Mesolithic WSQ-sites with WSQ-crescents (black dots).

as many other empty or low-density zones within the distribution range regional differences in research intensity might be important explanations for this pattern. Given the intensive efforts required to systematically discover prehistoric find distributions in areas of low surface-visibility and given the fact that such survey-efforts only started around 25 years ago in Flanders and the Netherlands through the introduction of auger-surveys in regular grid configurations the many blank spots on the WSQ-distribution map should not come entirely as a surprise. Therefore, a further comparison between the WSQ-sites and the known prehistoric record -and how it relates to the unknown parts of it- is needed to interpret the distribution of WSQ in terms of past human behaviour.

A preliminary analysis of the direction and distance of sites relative to the *Steenberg* in Wommersom confirms the dominant northwest, north and northeast distribution and further reveals that at shorter distances (< 80 km) from the presumed outcrop source more sites occur to the northwest and north, but that from a distance of *ca.* 60-80 km onwards a shift towards the northeast becomes apparent mainly reflecting the Dutch find-clusters on both sides of the Meuse near the border with Germany. Whether or not this shift reflects an archaeological reality, and has any chronological significance, or merely relates to the possible bias induced by the absence of the data collected by Arts (1986) in our inventory requires further study.

5. Conclusion

The spatial distribution of archaeological artefacts made from WSQ and its interpretation in terms of past hominin behaviour in a diachronic perspective has received considerable attention, particularly with regard to the Mesolithic, resulting in almost 50 maps between 1913 and 2019. Relying on different units of analysis (including numbers, percentages or types of sites or artefacts) such studies used the *Steenberg* in Wommersom as a fixed reference point to investigate the relationship between each of these units and their distance from this location, based on a commonly-held but largely untested assumption that this outcrop was the only available source for procurement of this lithic raw material. However, an in-depth study of such spatial aspects, and their interpretation in terms of past human behaviour, is hampered by the absence of an inventory of the known part of the archaeological lithic record in any part of this large area where WSQ-artefacts have been attested. Equally important, the impact of different research intensities, agendas and strategies of survey, excavation and post-excavation analysis on all of the observed spatial patterns within this region remains unknown and is difficult to evaluate in any detail. Furthermore, we always have to keep in mind the difficulties of the dataset, which are not only related to limitations in recovery and/or publication strategies, but also to the inherent palimpsest nature of the archaeological record, in this area largely dominated by non-stratified (sandy) contexts, and the dominance of surface-collected inventories in the datasets, both of which usually hinder a clear understanding of internal site chronologies.

Four decades after the previous point map of archaeological WSQ-sites was published by Rozoy (1978), before being replaced by a tradition of boundary maps, this paper presented up-to-date versions based on an inventory of over 2.000 sites representing over 84.200 artefacts made from WSQ. These new maps partly confirm insights gained from previous maps and discussions with regard to the extent and asymmetry of WSQ-distribution, but also provides additional information on density variation within the distribution area. It, however, does not pretend to be exhaustive and is to be considered as a work in progress, prone to improvement, corrections and additions in the future. Yet, it will serve its purpose within the discussions of spatial patterns of WSQ and their interpretation of past hominin behaviour. As such, our compiled dataset forms a solid base for more elaborate detailed enquiries on the archaeological use and spatial distribution of this raw material. To what extent the spatial distribution of currently known locations reflects archaeological realities or results from research biases is unknown yet and requires more in-depth studies.

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Abstract

Wommersom quartzite (WSQ) is a lithic raw material used during prehistoric times in the Rhine-Meuse-Scheldt (RMS) area. Its attractiveness as an archaeological research subject over a time span of more than 115 years owes much to its assumed unique geological outcrop-source in the eponymous Belgian village. This assertion makes it an ideal candidate for tackling a broad range of questions about past human behaviour in this part of North-western Europe, resulting in many hypotheses relating to its chronology, distribution, typology and/or technology and the potential meaning of this variability in terms of past (mainly Mesolithic) hominin social structures, intergroup contacts and trade networks. Distribution maps are an important element in these studies with no less than 47 of such maps being (re-)created since the first one appeared in 1913. In addition to providing a critical review of these earlier distribution maps, this paper presents up-to-date point-maps based on a dataset of more than 2.000 sites with WSQ, representing at least 84.200 WSQ-artefacts.

Keywords: Wommersom quartzite, Wommersom (Linter, Flemish Brabant, BE), spatial distribution, Mesolithic, Palaeolithic, Rhine-Meuse- Scheldt area.

Samenvatting

Wommersomkwartsiet (WSQ) is een steensoort die tijdens de prehistorie in het Rijn-Maas-Schelde (RMS) gebied van Noordwest-Europa werd gebruikt voor de vervaardiging van lithische artefacten. Het archeologisch onderzoek ervan kent een lange traditie die tenminste teruggaat tot het begin van de 20e eeuw. De grondstof dankt haar populariteit als studieobject aan haar veronderstelde unieke extractielocatie. Hypotheses omtrent het prehistorisch gebruik, de verspreiding van deze grondstof en de betekenis ervan in termen van sociale structuren, contacten en handelsnetwerken, voornamelijk doorheen het Mesolithicum, komen veelvuldig voor in de literatuur. Als onderdeel van deze studies werden sinds 1913 ook tal van archeologische verspreidingskaarten vervaardigd die we in deze bijdrage toelichten. Een grootschalige inventarisatie op basis van de beschikbare literatuur leverde meer dan 2.000 vindplaatsen op waar deze grondstof werd aangetroffen, samen goed voor tenminste 84.200 WSQ-artefacten. Op basis van deze recente inventaris presenteren we een aantal geüpdatete verspreidingskaarten.

Trefwoorden: Wommersomkwartsiet, Wommersom (Gemeente van Linter, Vlaams-Brabant, BE), ruimtelijke spreiding, Mesolithicum, Paleolithicum, Rijn-Maas-Schelde gebied.

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Informationsheft herausgegeben von
-
Informatieblad uitgegeven door
-
Bulletin d'information édité par

Studia Praehistorica Belgica
Liège - Brussels - Leuven

39

Tervuren 2019

NOTAE PRAEHISTORICAE

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Printed in 2019

ISSN 0774-3327