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SÉANCES DE LA SOCIÉTÉ PRÉHISTORIQUE FRANÇAISE
2-2

MESOLITHIC PALETHNOGRAPHY

RESEARCH ON OPEN-AIR SITES BETWEEN LOIRE AND NECKAR

PROCEEDINGS FROM THE INTERNATIONAL ROUND-TABLE MEETING IN PARIS (NOVEMBER 26–27, 2010)

as part of sessions organised by the Société préhistorique française

Published under the direction of

Boris Valentin, Bénédicte Souffi, Thierry Ducrocq,
Jean-Pierre Fagnart, Frédéric Séara, and Christian Verjux

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CONTENTS

Mesolithic Palethnography
Research on open-air sites between Loire and Neckar
Proceedings from the international round-table meeting, Paris, November 26–27, 2010
Boris Valentin, Bénédicte Souffi, Thierry Ducrocq, Jean-Pierre Fagnart,
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The use of radiocarbon dates in unraveling Mesolithic palimpsests:

Examples from the coversand area of North-West Belgium

Philippe Crombé, Joris Sergant and Jeroen De Reu

Abstract: Extensive radiocarbon dating at several sealed sites in North-West Belgium has enabled investigation of the formation processes of spatial and cumulative palimpsests dating to different stages of the Mesolithic. A clear spatio-temporal difference could be observed in the occupation of large *versus* small sand dunes. The former are characterized by continuous occupation on a seasonal basis over many hundreds of years, mainly during the Early and Final Mesolithic, leading to either extensive spatial palimpsests (Early Mesolithic) or dense cumulative palimpsests (Final Mesolithic). The occupation of smaller sand dunes on the other hand seems more discontinuous but covering the entire Mesolithic and even the Early Neolithic. Furthermore a difference in the relative duration of each occupation stay is likely, with relatively longer stays on larger dunes and more ephemeral visits on smaller dunes.

Mesolithic sites in North-West Europe often consist of several spatially delimited scatters of lithic artifacts of various sizes and densities, situated unstratified in the top of coversand deposits. In absence of any interstratification, the exact formation process of these 'multiple scatter' sites generally poses major difficulties. Yet, most archaeologists interpret these sites as palimpsests, resulting from repeated visits to the same location. Depending on the mode of re-use, a distinction is made between spatial palimpsests and cumulative palimpsests, as defined by Bailey (2007). The latter result from repeated occupation of exactly the same location within a site, leading to an often irrevocable mixture of settlement remains from different occupation events. Spatial palimpsests on the other hand are formed when re-occupation occurs within separate areas of a site, so that there is no or only minor overlap between the remains of different occupation events, i.e. the artifact clusters.

Refitting is usually considered the best tool to improve understanding of the formation process(es) of palimpsests. Indeed, refits between different artifact loci are often used to demonstrate real contemporaneity. However, refitting is a very time-consuming and hence expensive analysis. As a consequence in Flanders refit analyses are, in particular in salvage, developer-led excavation projects, seldom or only limitedly financed.

In the present paper we would like to demonstrate that ^{14}C-dating can offer a good alternative to get a general grip on the intrasite chronology and hence the formation of Mesolithic open-air sites in particular in cases where refitting is difficult or cannot be done. Even if refitting is financed, a preliminary dating program is useful as it may facilitate organization of subsequent refitting in a more adequate way certainly if one is dealing with sites with numerous artifact loci.

THE STUDY-AREA

The paper will focus on the wetland area of the lower Scheldt river in North-West Belgium. Expansion of the Antwerp harbor during the last 20 years has allowed Ghent University to excavate almost 2 hectares of sealed Mesolithic settlement surface (tabl. 1; Crombé, 1998 and 2005). The Pleistocene landscape in the study area

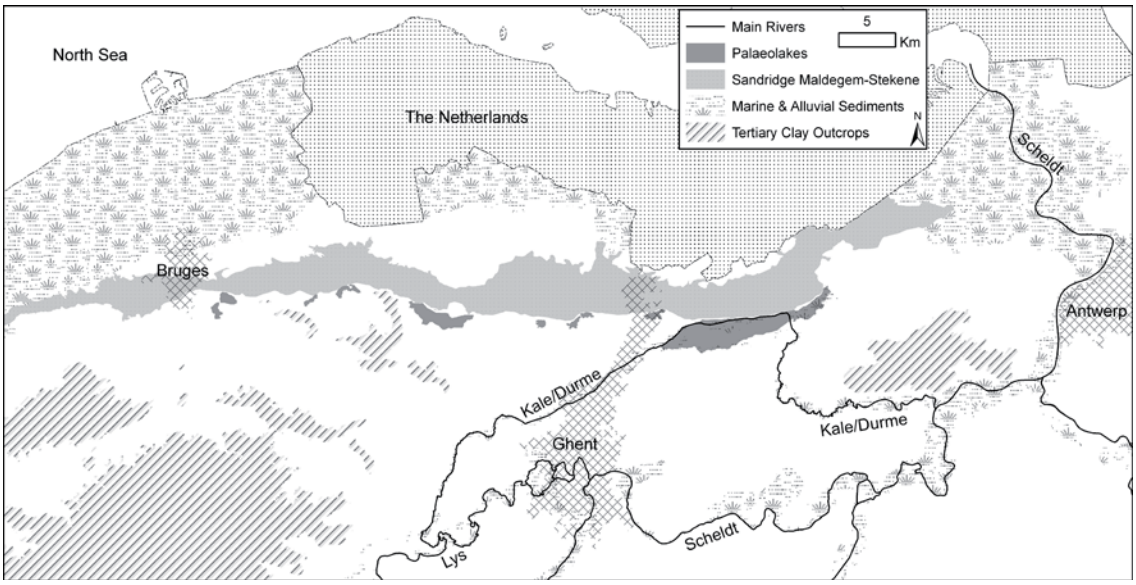


Fig. 1 – Map showing the extent of the Great Ridge 'Maldegem-Stekene', which is the largest sand dune within North-West Belgium. To the west and east this massive dune 'disappears' underneath Holocene sediments of respectively the coastal polders and Scheldt polders.

consists of numerous sand ridges formed during the end of the Pleniglacial and the Late Glacial (Heyse, 1979). Due to subsequent rising of the sea-level, these ridges got gradually buried below Holocene peat and (peri)marine clay. Geo-morphologically two types of sand ridges can be discerned:

– large and extensive sand dunes running over several hundred of meters or even several kilometers. The largest sand ridge, called the Great Ridge 'Maldegem-Stekene' (Crombé and Verbruggen, 2002), runs from east to west over ca. 80 km, is locally 1.5 to 3 km wide, and is built up of a series of parallel partly overlapping and intersecting ridges separated by low lying depressions (fig. 1);

– small and low sandy outcrops with a limited occupation surface of ± 2,000 to 3,000 m² (fig. 2).

Numerous palimpsest sites have been excavated on both types of sand dunes. However, the present paper will just focus on the most extensively dated sites, i.e. Verrebroek 'Dok 1', Doel 'Deurganckdok' sector B and sector M, all situated on large sand dunes, and the sites of Verrebroek 'Aven Ackers', lying on small sandy outcrops (table 1).

Site		Excavated surface (m²)	Chronology	References
Verrebroek 'Dok 1'	1992-2000	6 210	Early Mesolithic	Crombé, 1998 and 2005; Crombé et al., 2003 and 2006
Verrebroek 'Dok 2'	1999	1 034	Final Palaeolithic	Crombé 2005; Crombé et al., 1999; Perdaen et al., 2004
Doel 'Deurganckdok' sector B	2000	3 500	Final Palaeolithic Early Mesolithic Final Mesolithic	Crombé, 2005; Crombé et al., 2000
Doel 'Deurganckdok' sector J/L	2003	3 300	Early Mesolithic Final Mesolithic	Bats et al., 2003; Noens, this volume
Doel 'Deurganckdok' sector M	2003	800	Early Mesolithic Final Mesolithic	Crombé et al., 2004
Verrebroek 'Aven Ackers'	2006-2007	3 000	Early Mesolithic Middle Mesolithic Late Mesolithic Neolithic	Sergant and Wuyts, 2006; Sergant et al., 2007
TOTAL		17 844		

Table 1 – Overview of excavated Mesolithic sites and surfaces in the lower Scheldt polder area.

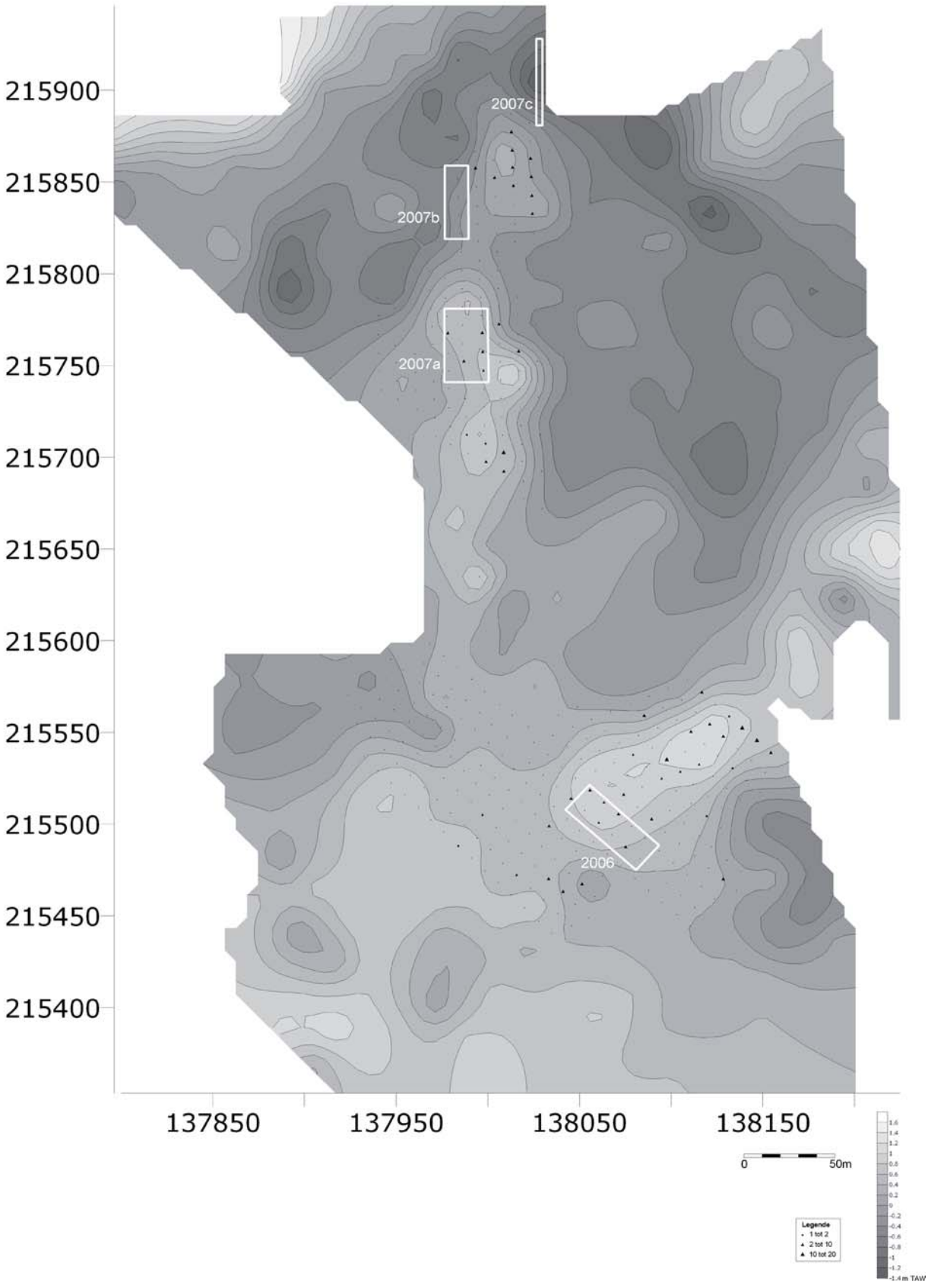


Fig. 2 – Verrebroek 'Aven Ackers'. Palaeotopographical map of the sealed coversand relief. The palaeolandscape consists of several small sandy outcrops, all yielding remains of Mesolithic occupation. Indicated are the location of the borings which yielded lithic artifacts (black triangles) and the excavations trenches from 2006 and 2007.

DATING STRATEGY AND RESULTS

All four sites have been dated extensively following the same sampling strategy. Dating was done exclusively on single entity samples with a clear connection to human activity. Dating focused on carbonized food residues, mainly burnt hazelnut shells and, to a lesser extent, carbonized seeds and pips, collected from humanly made features such as latent surface-hearths (Sergant et al., 2006). Charcoal dates, although available for these sites, have been omitted from the analysis because of supposed contamination problems (Crombé et al., 2009a and 2012).

Comparison of the dating results reveals a different pattern between the sites situated on large and small sand dunes. The sum probability curves of the dates obtained for the sites situated on large sand dunes show a clustered pattern (fig. 3). More than 80% to 90% of all dates concentrate within a specific time period of the Mesolithic. The large-scale excavated site of Verrebroek "Dok 1"(fig. 3a), which has been dated on 57 hazelnut dates, was almost exclusively occupied during the Boreal, between ca. 8740 and 7560 cal BC — 95% probability range — or 8405 to 7890 cal BC — interquartile range — (Van Strydonck and Crombé, 2005). Judging by the presence of only three younger ^{14}C dates, prehistoric man only incidentally visited the site afterwards. This occupation pattern obtained by ^{14}C is in full agreement with the settlement remains found on the site, which typologically mainly refer to the Early Mesolithic (Crombé et al., 2009a).[1] Besides a handful of trapezes, no artefacts belonging to the Late Mesolithic or Neolithic have been attested, indicating that in later times activities were very restricted and ephemeral, even though the sand ridge was still dry enough for occupation. Radiocarbon dating of the peat base, which covered the sand dune, indicates that the wettening of the dune slopes did not start before the middle of the 4th millennium cal BC (Van Strydonck, 2005).

Although less dated (10 to 11 dates), a similar pattern is observed at both Doel sites, also situated on large sand dunes (fig. 3b and 3c; Van Strydonck and Crombé, 2005; Boudin et al., 2009). Clearly both sites were occupied during specific stages of the Mesolithic. A first occupation phase dates back to the late 9th and early 8th millennium and is partly contemporaneous with the main occupation of Verrebroek 'Dok 1' (Early Mesolithic).[2] However, the main occupation took place during the second half of the 5th millennium cal BC, when hunter-gatherers belonging

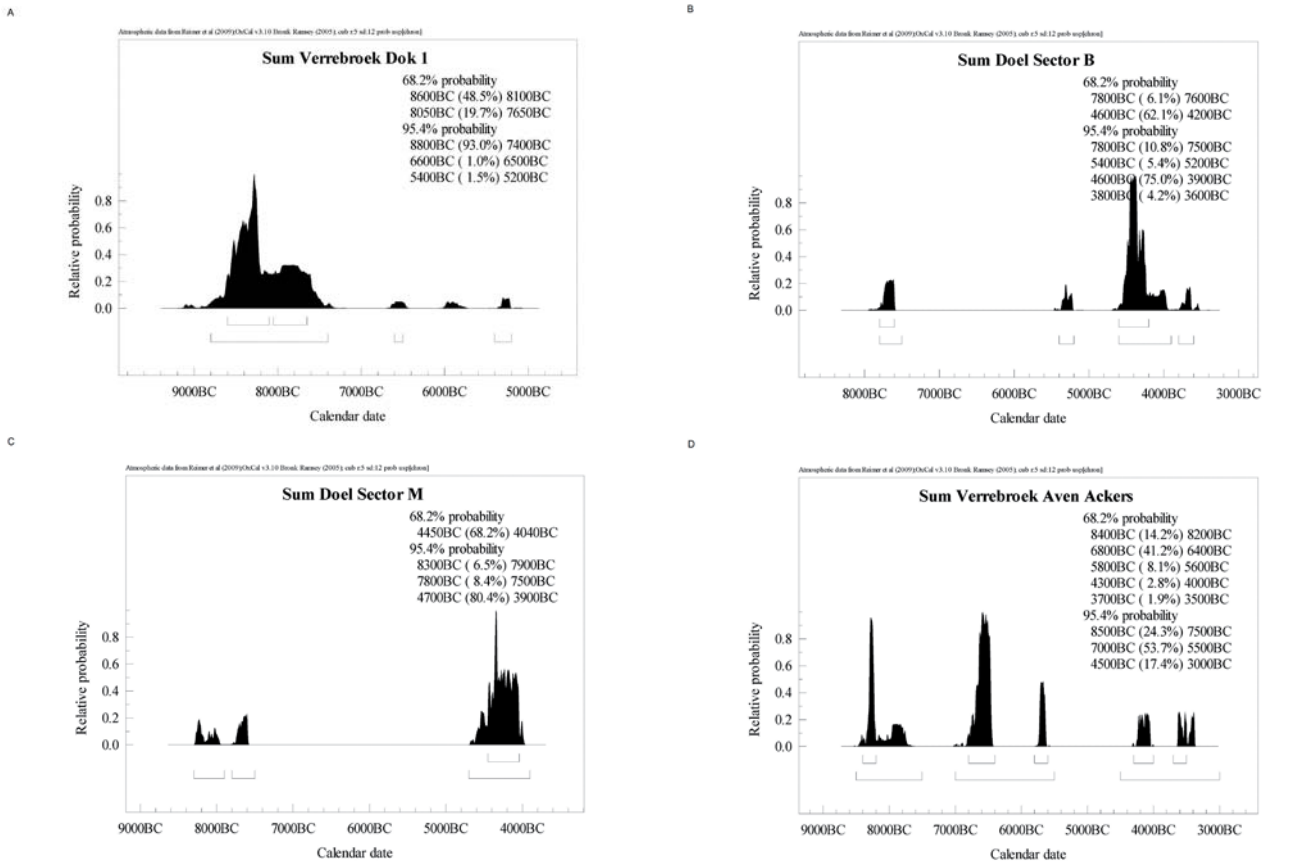


Fig. 3 – A: Verrebroek 'Dok 1', Sum probability of 57 hazelnut dates from different artifact loci (Reimer et al. 2009; Bronk Ramsey, 2005); B: Doel 'Deurganckdok' sector B, sum probability of 10 hazelnut dates from different artifact loci; C: Doel 'Deurganckdok' sector M, sum probability of 11 hazelnut dates from different artifact loci; D: Verrebroek 'Aven Ackers', sum probability of 11 hazelnut dates from different artifact loci.

to the Swifterbant Culture settled on these sand dunes (Boudin et al., 2009). The total lack of radiocarbon dates in between these two events, except for one single date around 5300 cal BC at Doel B, strongly suggests that both sand ridges remained largely unoccupied during almost three millennia, which is also confirmed by the total absence of material remains belonging to the Middle and Late Mesolithic.

The dating results from the site of Verrebroek 'Aven Ackers' (fig. 3d), situated on a few small sandy outcrops, is totally different from these three sites. The dates from the most extensively excavated and dated sandy outcrop (trench 2007a; fig. 2) shows no clear clustering at all (Crombé et al., 2009b). Rather, there is a spread of isolated dates over a time-period of more than five millennia, starting from the middle of the 9th till the 4th millennium cal BC. Apparently this small outcrop of hardly 1,500 m² has been used repeatedly during the Early, Middle and Late Mesolithic as well as during the Early Neolithic, as also testified by the presence of a broad variety of microlith types and pottery fragments.

DISCUSSION

Clearly the observed intersite difference in the distribution of radiocarbon dates reflects differences in occupation dynamics throughout the Mesolithic.

The clustered pattern on the large sand dunes most likely matches with what we could call a continuous reoccupation on a seasonal basis over a relatively extended period of several centuries to possibly even a millennium. These massive sand dunes clearly functioned as persistent places (Barton et al., 1995; Crombé et al., 2011) during specific stages of the Mesolithic, in particular during the Early (Boreal) Mesolithic and the Final Mesolithic (Swifterbant Culture). Apparently people kept using these locations on a seasonal basis probably yearly over many generations. In situations where the available occupation surface was large enough, Mesolithic populations could avoid settling on the remains of a former visit by choosing an area a little further on for each new camp. This process ultimately led to the formation of extensive

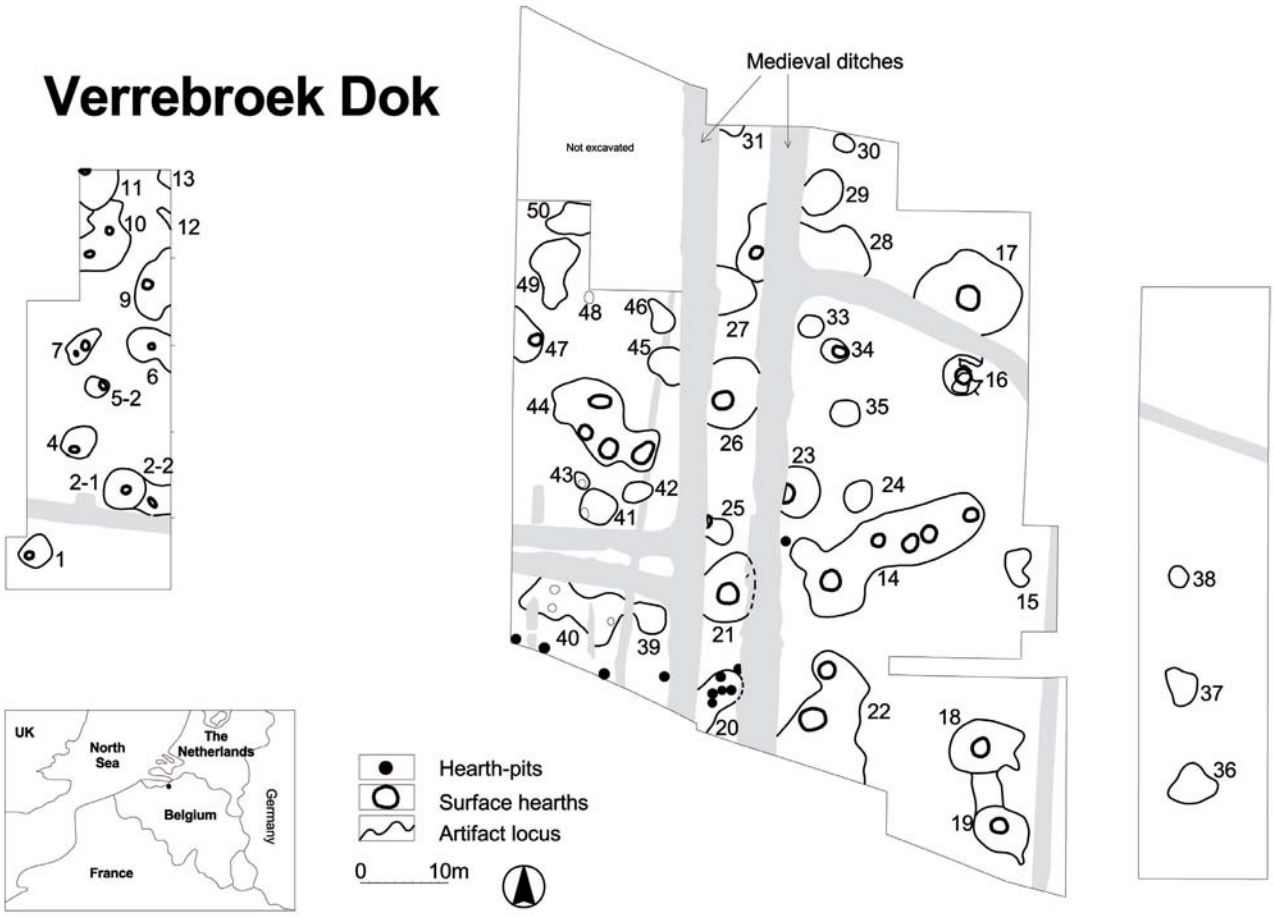


Fig. 4 – Verrebroek 'Dok 1'. Schematic distribution map of the artifact loci excavated.

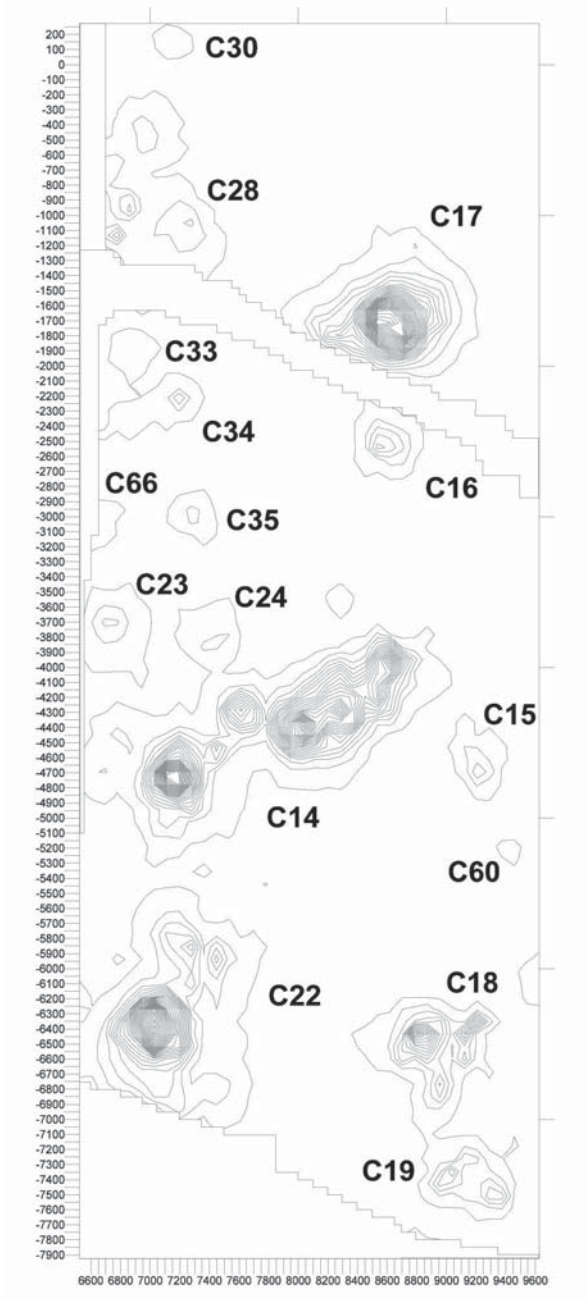


Fig. 5 – Verrebroek 'Dok 1'. Detailed distribution map of the artifact loci excavated in the eastern section.

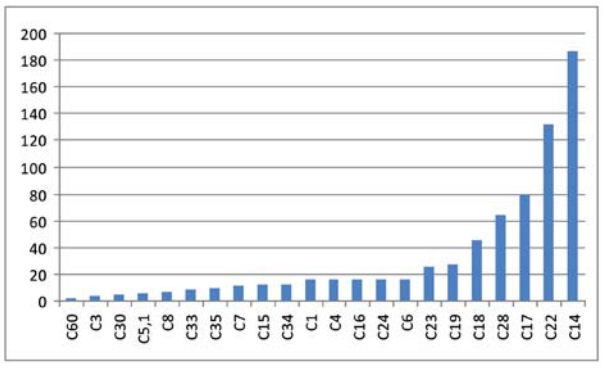


Fig. 6– Verrebroek 'Dok 1'. Diagram showing the difference in size (m²) of different artifact loci.

spatial palimpsests, comprising numerous artifact units which in most cases are spatially separated or slightly overlapping.

A good example of this process is found at the Early Mesolithic site of Verrebroek 'Dok 1', situated on the easternmost end of the massive Great Ridge. Excavations over a surface of ca. 6,200 m² revealed a very dense pattern of artifact loci of various sizes and densities (figs. 4, 5 and 6), each dated by means of ^{14}C. Spatial modeling of all these dates demonstrates clearly how these loci were used diachronically while the occupation of the sand dune gradually shifted from the south to the north (fig. 7 a-g). The radiocarbon dates (fig. 8) furthermore indicate that the smallest units (< 25-30 m²), which are most prevalent on the site, are chronologically homogeneous and might thus represent single occupation events, while the formation of the larger units (40-186 m²) is much more difficult to explain (Sergant, 2004; Crombé et al., 2006). The available ^{14}C dates (fig. 9a, c) at first sight suggest that the latter are cumulative palimpsests resulting from at least two to three occupation events. However, by combining different types of analyses (typology, raw materials, spatial analysis) and series of radiocarbon dates it could be argued that most of these larger loci (e.g. C14, C22, C28,) can be split up into smaller subclusters (with mostly one or two surface-hearths). Each subcluster possibly represents a separate occupation event, the remains of which spatially only slightly overlap or border with remains of former occupations (Crombé et al., 2006). Most subclusters (table 2; figs. 10 and 11) are of the same size as the smallest individual loci (< 25-30 m²), but larger subclusters of ca. 46 m² to 87 m² (C67, C14, C70 and C22) do also occur. Yet most of these larger subclusters yielded compatible radiocarbon dates (fig. 9a, 9c), suggesting that these too might reflect single occupation events, although diachronic use within a limited timespan cannot be fully ruled out (Crombé et al., 2006). Real cumulative palimpsests, showing an irreversible mixture of remains from different occupation events and no internal sub-clusters, are rather exceptional on the site (e.g. unit 17; figs. 9b and 12).

On a larger scale the site of Verrebroek 'Dok 1', or what has been excavated of it, represents just a small portion of a larger site-complex. Systematic augering (Bats and Cordemans, 2005) revealed that the Early Mesolithic site extends over a surface of at least 12 hectares and is connected to a series of surface sites running along the southern edge of the same massive sand dune over approximatively 8 km distance (Crombé et al., 2011; fig. 13). What we observe here is a large 'lithic landscape' probably resulting from an intense, seasonal occupation of an extensive dune side specifically during the Boreal.

Contrary to the Early Mesolithic repeated seasonal re-occupation of large dunes during the Final Mesolithic did not result in extensive spatial palimpsests. Due to a gradual wettening of the environment as an indirect result of rising sea level the coversand dunes, even the largest and highest ones, got gradually covered by peat and brackish water sediments (Crombé, 2005).

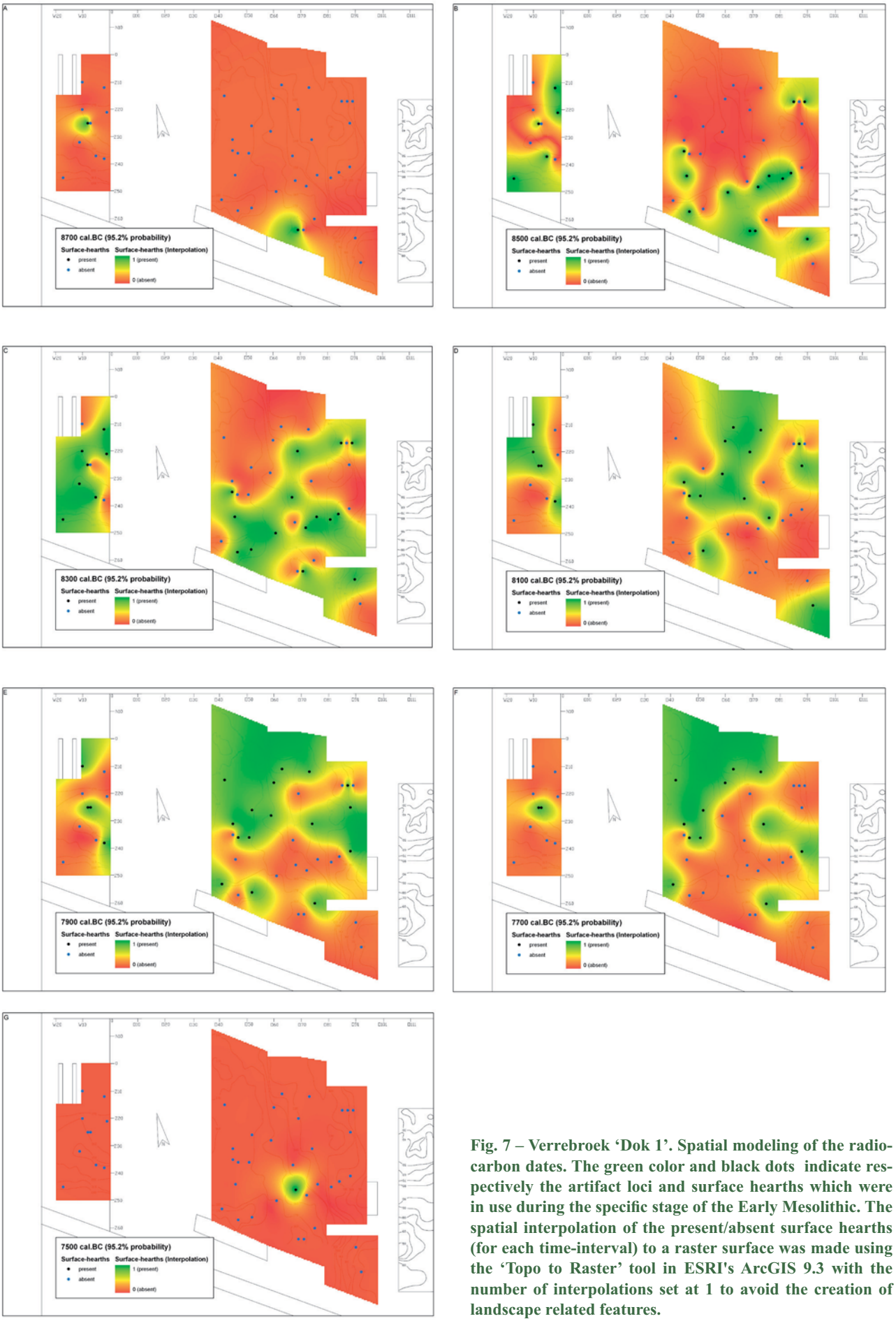


Fig. 7 – Verrebroek 'Dok 1'. Spatial modeling of the radiocarbon dates. The green color and black dots indicate respectively the artifact loci and surface hearths which were in use during the specific stage of the Early Mesolithic. The spatial interpolation of the present/absent surface hearths (for each time-interval) to a raster surface was made using the 'Topo to Raster' tool in ESRI's ArcGIS 9.3 with the number of interpolations set at 1 to avoid the creation of landscape related features.

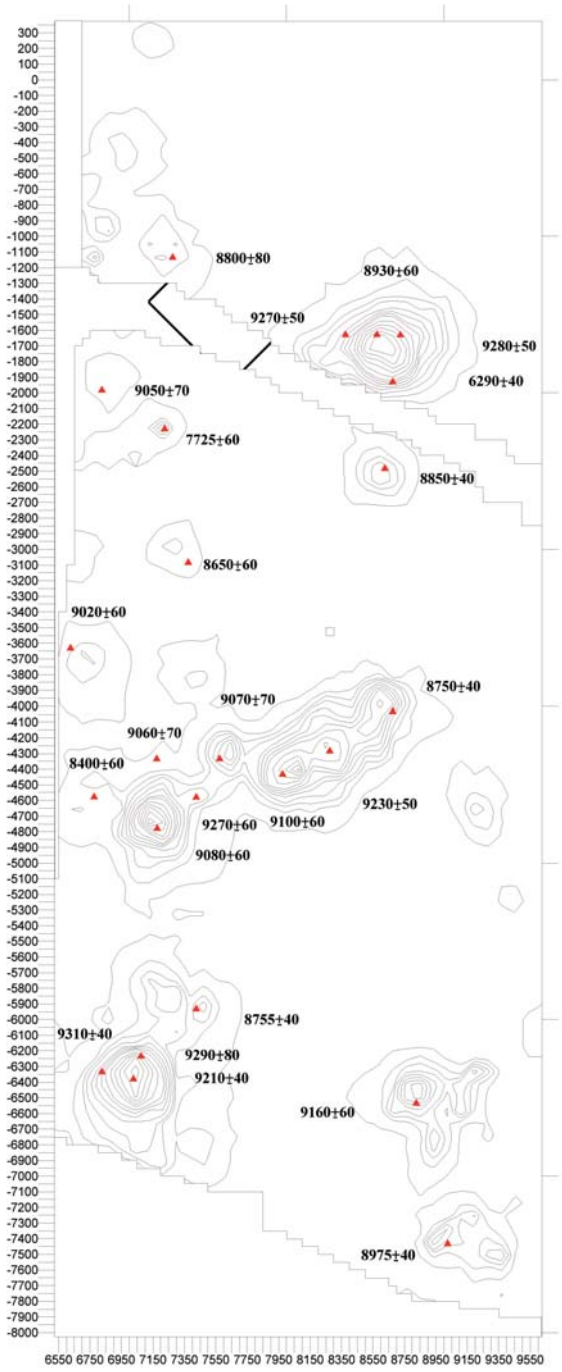


Fig. 8 – Verrebroek 'Dok 1'. Distribution of the radiocarbon dates related to different artifact loci.

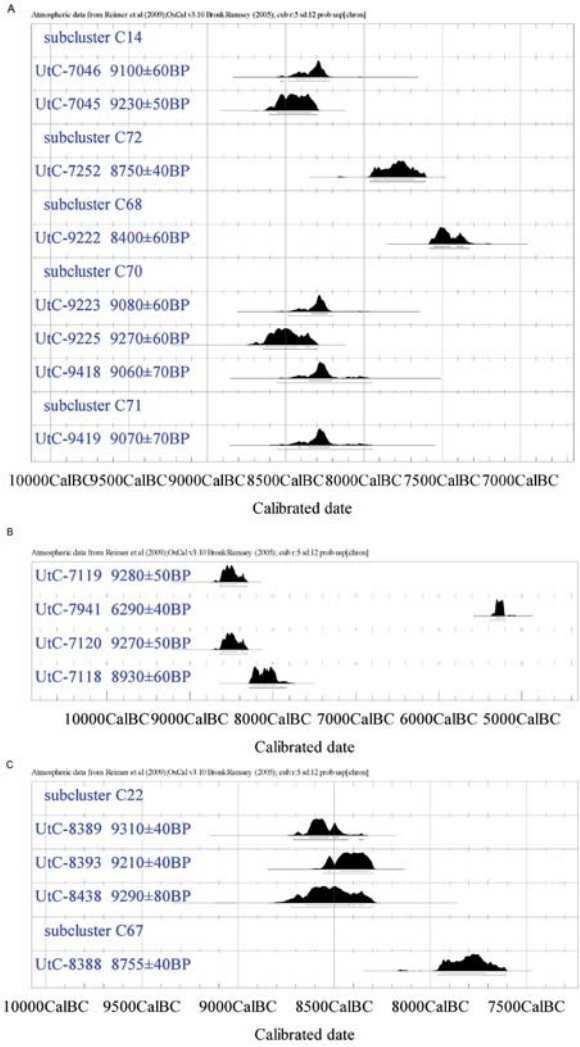


Fig. 9– Verrebroek 'Dok 1'. Calibrated radiocarbon dates from the largest artifact loci. A: locus 14; B: locus 17; C: locus 22.

Main clusters	Subclusters	surface (m²)
C14	C14	57
	C68	14
	C69	6/25
	C70	62.5
	C71	18
	C72	28.75
	Total	**186.5**
C22	C22	86.5
	C67	45.5
	Total	**132**
C28	C28	27.75
	C29	19.25
	C61	5
	C62	8.25
	C63	3.75
	Total	64

Table 2 – Verrebroek 'Dok 1'. List of subclusters within the largest artifact loci.

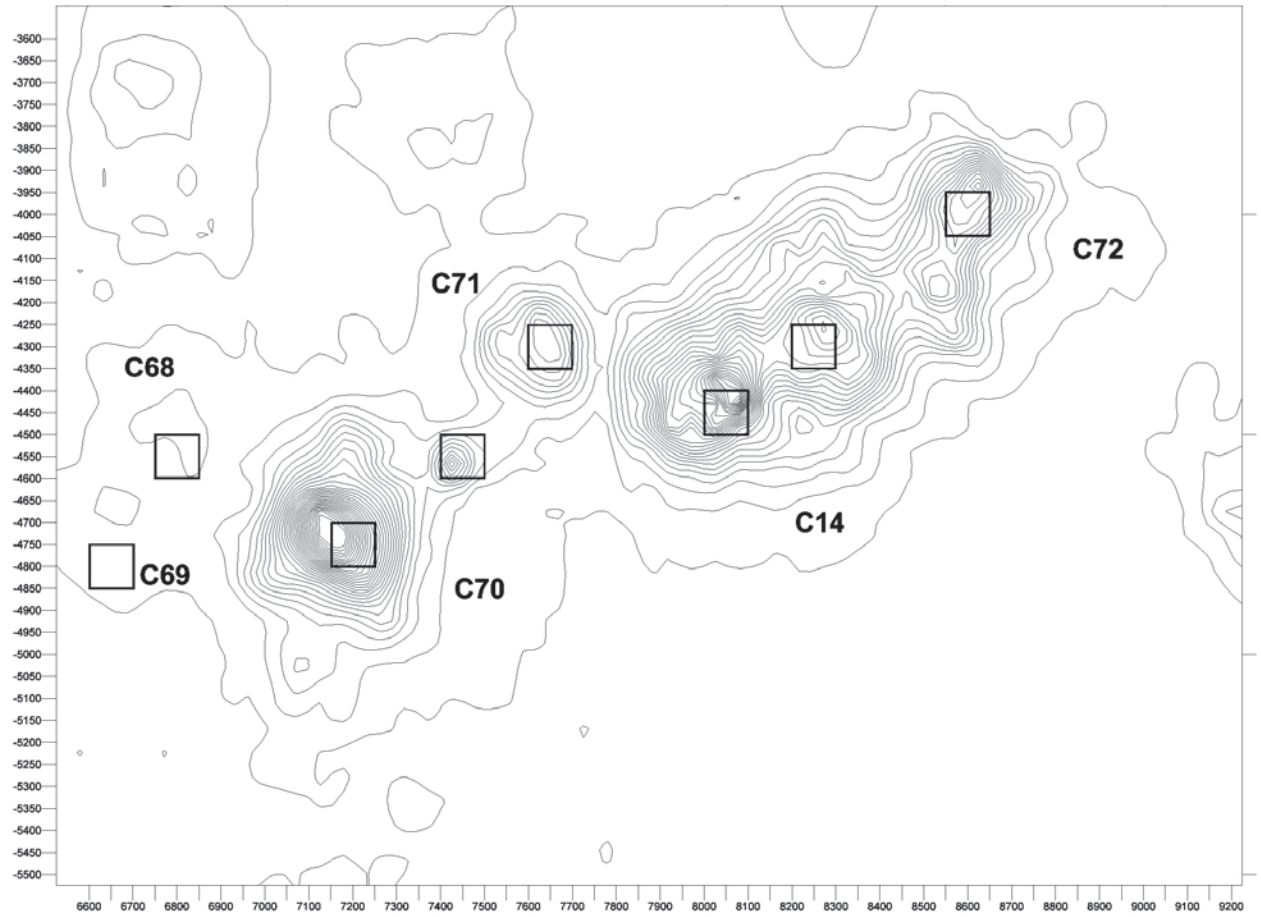


Fig. 10 – Verrebroek 'Dok 1'. Detailed density map of the main artifact locus C14, which can be split up into different subclusters. Indicated is the presumed position of latent surface-hearths (boxes).

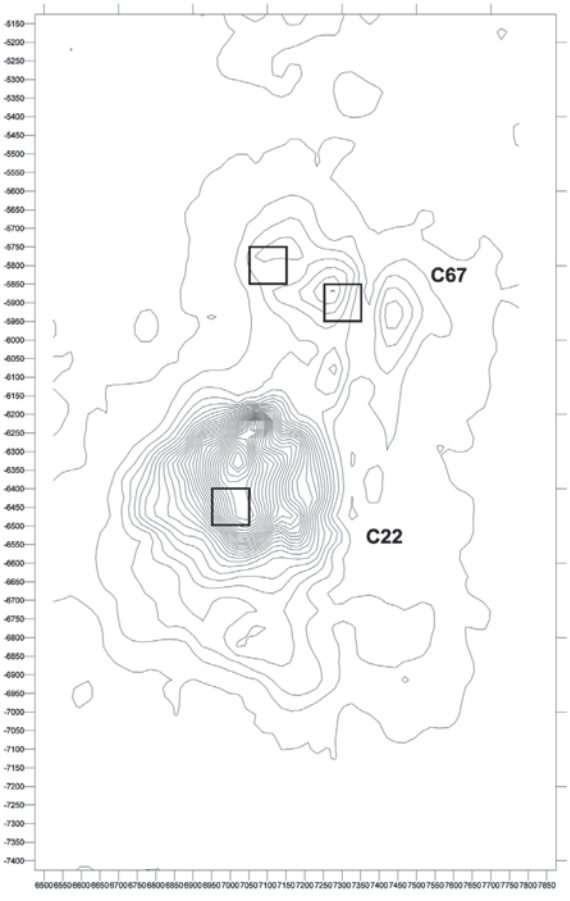


Fig. 11 – Verrebroek 'Dok 1'. Detailed density map of the main artifact locus C22, which can be split up into different subclusters. Indicated is the presumed position of latent surface-hearths (boxes).

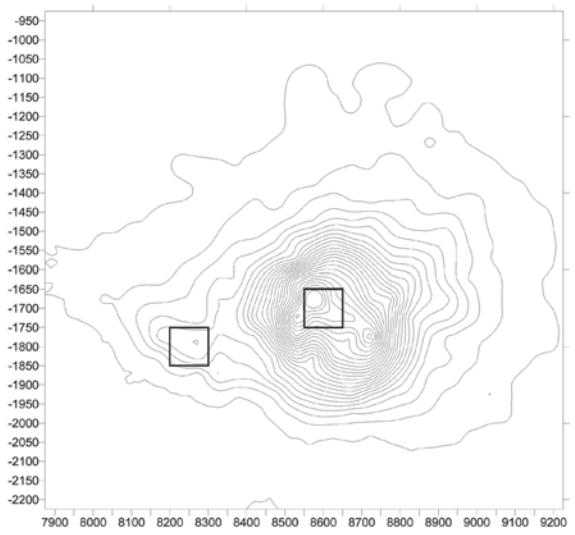


Fig. 12 – Verrebroek 'Dok 1'. Detailed density map of the main artifact locus C17. Indicated is the presumed position of latent surface-hearths (boxes).

As a consequence in the 5th millennium only the top part of the dunes were dry enough to be suited for human occupation. This reduction of the available occupation surface forced man to re-use the same locations, leading to the formation of cumulative palimpsests.

Compared to the large dunes, occupation of small sandy outcrops, e.g. at Verrebroek 'Aven Ackers' situated immediately south of the extensive site-complex mentioned above, clearly is more discontinuous and incidental. Due to the much more restricted available land surface, re-use more rapidly led to the formation of large 'multiperiod' cumulative palimpsests. On the top of one of the outcrops at Verrebroek 'Aven Ackers' (trench 2007a) a cluster of ca. 225 m² (C1) was excavated (fig. 14). Eight hazelnut samples were radiocarbon dated, yielding evidence of at least three different episodes of occupation over a period of four millennia (Crombé et al., 2009b; fig. 14). This is also corroborated by the presence of typically Early (e.g. crescents) and Middle Mesolithic microliths (e.g. points with surface retouch) and pottery fragments.

This difference in the spatio-temporal use of these two types of sand dunes within the study-area is also reflected in other aspects of these sites. For instance there is a marked difference in the mean find-density between

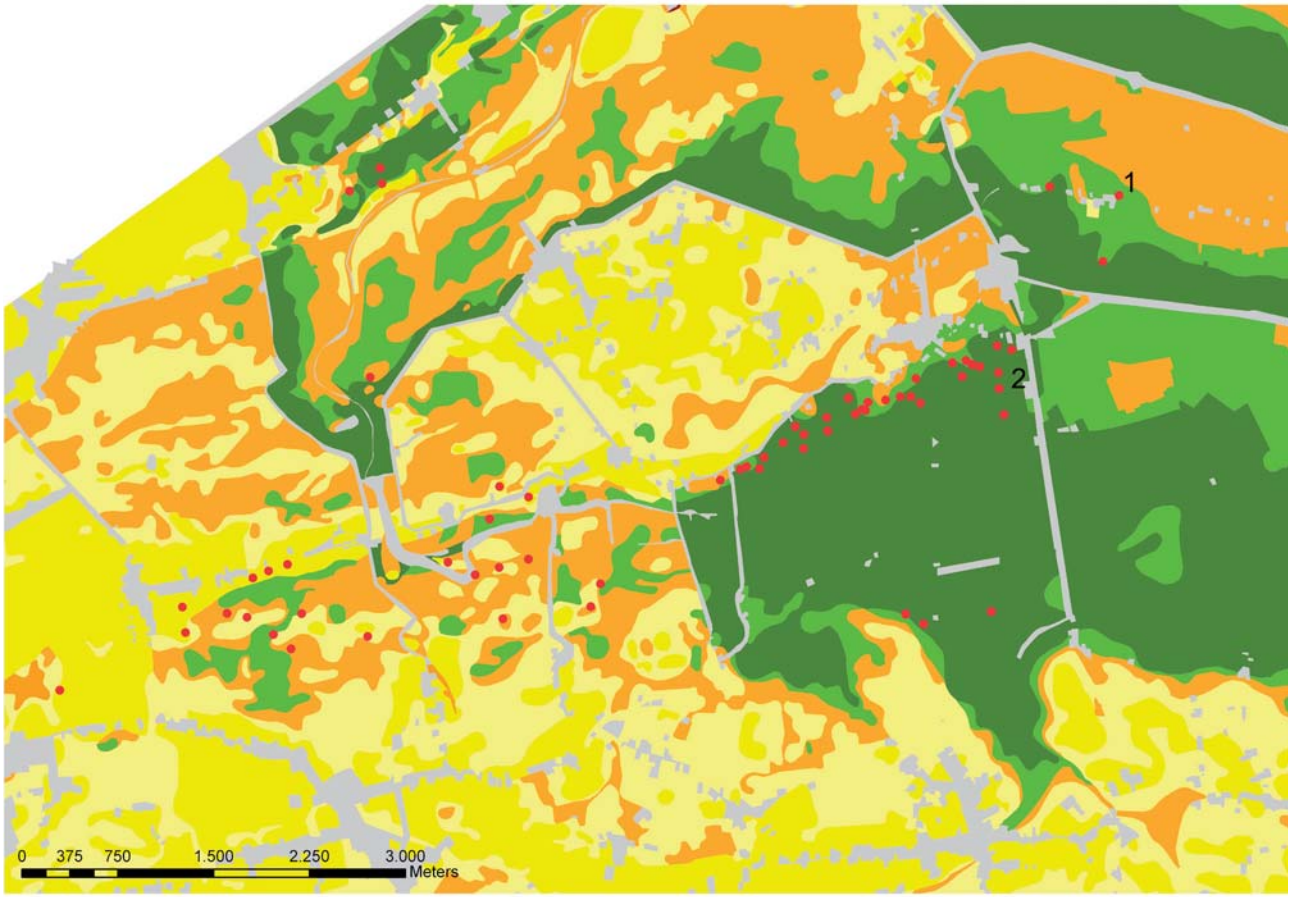
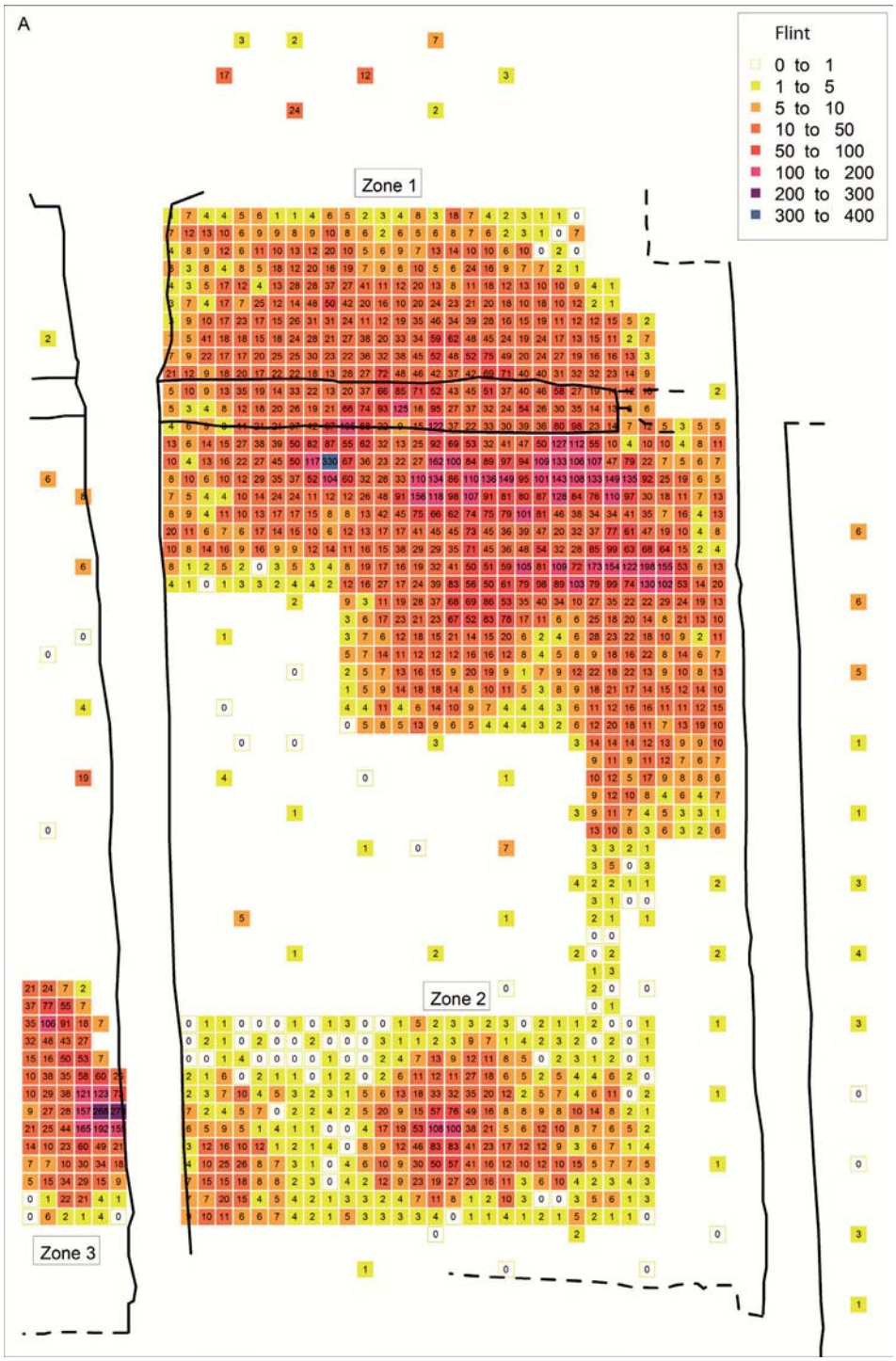


Fig. 13 – Distribution map of Mesolithic sites along the southern edge of the Great Ridge. 1: Verrebroek 'Dok 1'; 2: Verrebroek 'Aven Ackers'.



B

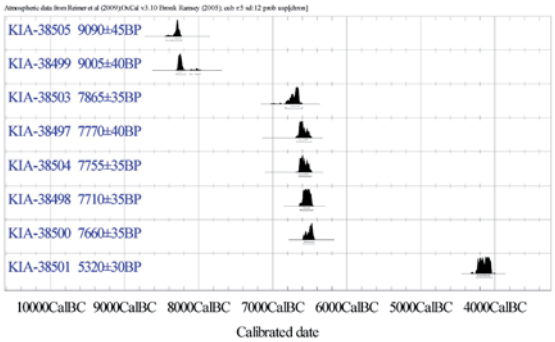


Fig. 14 – Verrebroek 'Aven Ackers'. A: Distribution of the excavated artifact loci; B: the list of calibrated radiocarbon dates relates to the largest locus, C1.

both (figs. 15 and 16). On large dunes the complete range from low-density (sub)clusters (< 20 artifacts per ¼ m²) over medium (20-60 artifacts) to really high density (sub) clusters, the latter yielding between 70 an 160 artifacts per ¼ m², is present (fig. 15a). Apparently there is no linear relationship between the size of the unit and its find density (fig. 15b). Although all larger (sub)clusters have a high to very high densities, some smaller units also yielded substantial numbers of artifacts per ¼ m². On the smaller dunes high density (sub)clusters are completely lacking (fig. 16a); density is nearly always below 20-25 artifacts per ¼ m² even within the big cumulative palimpsest C1. This intersite difference might indicate that occupation generally lasted shorter and were more ephemeral on small sand dune.

Another intersite difference is related to the frequency of burnt artifacts, as a possible indication of fire places (Sergant et al., 2006). On large dunes their frequency ranges between ca. 10% and 60-75% (fig. 15c); apparently there is no direct relationship with the size of the units, nor with the find-density, although all larger units are characterized by a very high frequency of overheated artifacts. On small dunes (fig. 16b) the data are still restricted, but nevertheless tend to point to generally low percentages (10-30%) of burnt artifacts. This might reflect shorter burning episodes compared to most loci on the large dunes, and combined with the generally lower find density, suggest shorter duration of occupation.

CONCLUSION

There is obviously an important spatio-temporal difference in the use of large *versus* small sand dunes in the coversand area of North-West Belgium. Camp sites situated on large sand dunes are on average seasonally occupied in a continuous way while the use of smaller sand dunes is more discontinuous and ephemeral. Possibly these differences reflect functional (e.g. base camps *versus* temporary special activity camps) and/or seasonal variations in the use of both types of sand ridges. For the Early Mesolithic, nevertheless, no obvious differences in the tool-composition can be seen between both types, which might suggest no or only limited functional differences. However, detailed microwear analyses are needed in order to get a clearer view on the activities which were really performed on these sites. Unfortunately, microwear analyses thus far have been limited to sites situated

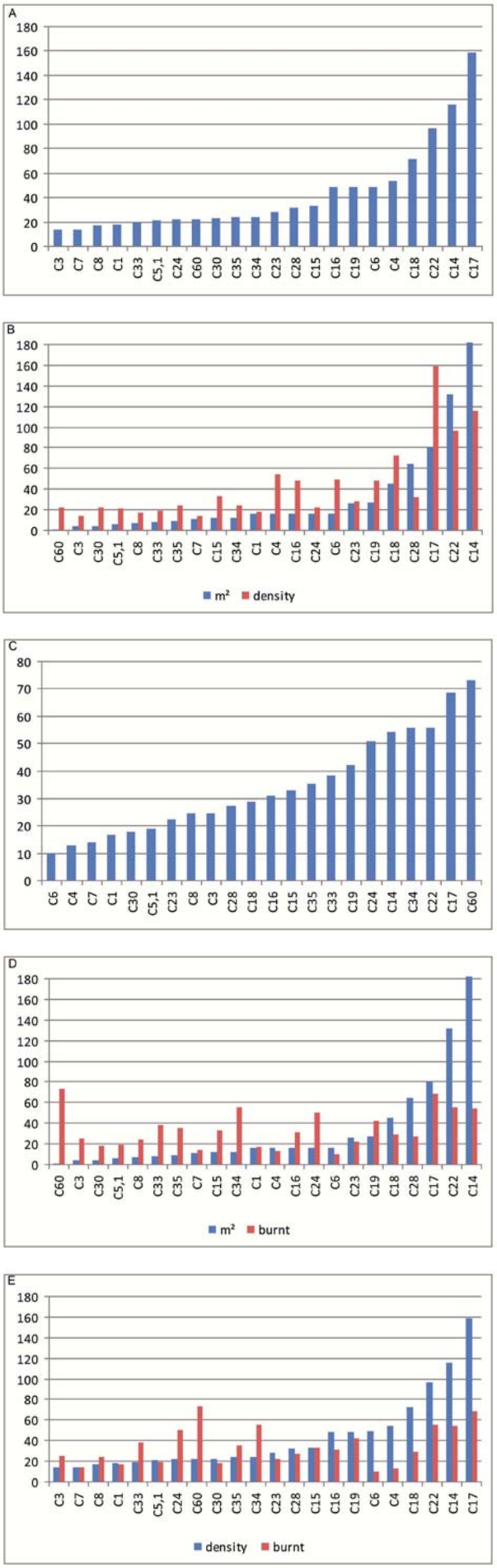


Fig. 15– Verrebroek 'Dok 1'. A: artifact density per ¼ m² within several loci; B: relation between artifact density and size within several loci; C: frequency of burnt artifacts within several loci; D: comparison between the surface and frequency of burnt artifact in several loci; E: comparison between the artifact density and frequency of burnt artifact in several loci.

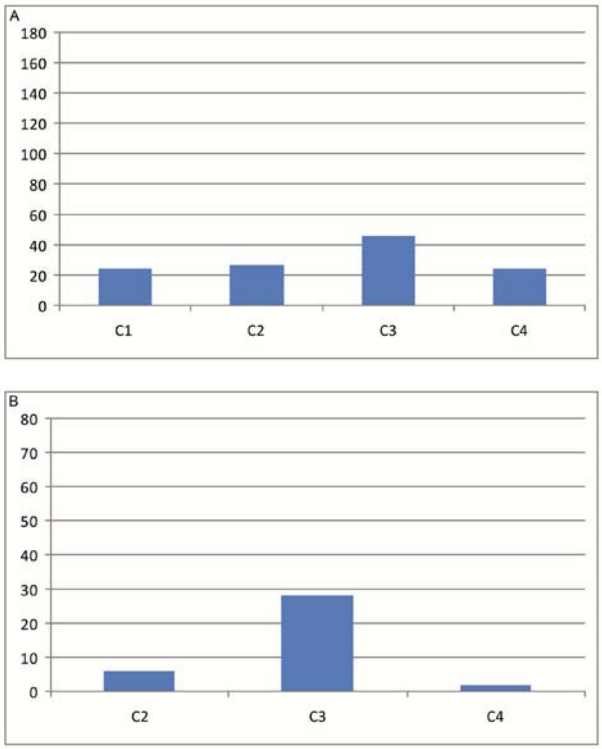


Fig. 16– A: Verrebroek 'Aven Ackers', artifact density per ¼ m² within several loci; B: Verrebroek 'Aven Ackers', frequency of burnt artifacts within several loci.

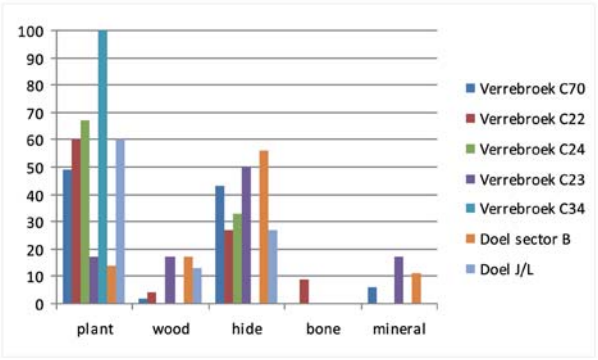


Fig. 17– Doel and Verrebroek 'Dok 1', results from microwear analyses on different artifact.

on larger sand dunes, e.g. Verrebroek 'Dok 1' (Crombé et al., 2001; Beugnier and Crombé, 2005; C. Guéret, this volume) and Doel (Beugnier, 2007; C. Guéret, rthis volume). The results point to a very limited activity range on these sites, comprised of two main activities: (dry) hide working and the processing (mainly scraping) of non-siliceous plants probably for making small craftwork (fig. 17). Future microwear analyses are planned to investigate also some low-density clusters from small dunes. Furthermore the complete lack of faunal remains on all sites, does not allow us to test whether there are differences in the seasonal occupation of sites on large versus small sand ridges.

Another important conclusion of the above analysis is that continuous re-occupation of large ridges, leading to the formation of extensive spatial palimpsests (e.g. Verrebroek-region), seems to occur only during specific stages of the Mesolithic, especially during the Early Mesolithic.[3] Apparently these large site-complexes are bound to important open-water systems, such as the Kale-Durme river and a fossil river gully south of the Great Ridge nearby Verrebroek (Crombé et al., 2008 and 2011). For the Middle, Late and Final Mesolithic these large site-complexes so far seem to be missing from the study-area (Crombé et al., 2008 and 2011), albeit large dunes continue to be used intensively on a seasonal basis, certainly during the Final Mesolithic. This change in settlement system might be related to an increased focus on wetland (peat marshes) exploitation which seems to characterize the later stages of the Mesolithic (Crombé et al., 2011). As illustrated by the excavations at Doel 'Deurganckdok' the available land surface in these wetlands was limited due to a gradual rising of the water table and inundations. Prehistoric man was forced to install his camp-sites on the highest parts of the dunes, which in the long run led to the formation of large cumulative palimpsests.

FOOTNOTES

(1) Based on series of radiocarbon dates, the chronological boundaries of the Mesolithic stages for the Belgian coversand region are: Early Mesolithic (ca. 8750-7400 cal BC), Middle Mesolithic (ca. 7400-6500 cal BC), Late Mesolithic (ca. 6500-4500 cal BC) and Final Mesolithic (ca. 4500-4000 cal BC): Crombé et al., 2009a and 2009b.

(2) At Doel-sector B remains of a *Federmesser* occupation were also found, which is not revealed by ^{14}C dating as no hazelnuts were available for dating.

(3) A similar pattern has been observed for the *Federmesser* Culture (Crombé and Verbruggen, 2002; Crombé et al., 2011).

REFERENCES

Bailey G. (2007) – Time Perspectives, Palimpsests and the Archaeology of Time, *Journal of Anthropological Archaeology*, 26, p. 198-223.

Barton R. N. E., Berridge P. J., Walker M. J. C., Bevins R. E. (1995) – Persistent Places in the Mesolithic Landscape: An example from the Black Mountain Uplands of South Wales, *Proceedings of the Prehistoric Society*, 61, p. 81-116.

Bats M., Cordemans K. (2005) – Appendix A: Auger Survey at the Mesolithic Sites of Verrebroek 'Dok 1' and 'Dok 3', in P. Crombé (ed.), *The Last Hunter-gatherer-fishermen in Sandy Flanders (NW Belgium): the Verrebroek and Doel excavation projects*, 1. *Palaeo-environment, Chronology and Features*, Ghent, Academia Press (Archaeological Reports Ghent University, 3), p. 335-339.

Bats M., Crombé P., Perdaen Y., Sergant J., Van Roeyen J.-P., Van Strydonck M. (2003) – Nieuwe ontdekkingen in het Deurganckdok te Doel (Beveren, Oost-Vlaanderen): Vroeg- en Finaal-Mesolithicum, *Notae Praehistoricae*, 23, p. 55-59.

Beugnier V., Crombé P. (2005) – Étude fonctionnelle du matériel en silex du site Mésolithique ancien de Verrebroek (Flandres, Belgique) : premiers résultats, *Bulletin de la Société préhistorique française*, 102, 3, p. 527-538.

Beugnier V. (2007) – Préhistoire du travail des plantes dans le Nord de la Belgique. Le cas du Mésolithique et du Néolithique final en Flandre, in V. Beugnier and P. Crombé (eds.), *Plant Processing from a Prehistoric and Ethnographic Perspective. Proceedings of a Workshop at Ghent University (Belgium) November 28. 2006*, Oxford, Archaeopress (BAR, International Series 1718), p. 23-40.

Boudin M., Van Strydonck M., Crombé P. (2009) – Radiocarbon Dating of Pottery Food Crusts: Reservoir Effect or not? The case of the Swifterbant Pottery from Doel 'Deurganckdok', in P. Crombé, M. Van Strydonck, J. Sergant, M. Bats and M. Boudin (eds.), *Proceedings of an International Meeting, Brussels, May 30th-June 1st 2007 "Chronology and Evolution within the Mesolithic of North-West Europe"*, Newcastle-upon-Tyne, Cambridge Scholars Publishing, p. 727-745.

Crombé P. (1998) – *The Mesolithic in Northwestern Belgium. Recent Excavations and Surveys*, Oxford, Archaeopress (BAR, International Series 716), 222 p.

Crombé P., éd. (2005) – *The last Hunter-gatherer-fishermen in Sandy Flanders (NW Belgium): the Verrebroek and Doel Excavation projects*, 1. *Palaeo-environment, Chronology and Features*, Ghent, Academia Press (Archaeological Reports Ghent University, 3), 334 p.

Crombé P., Verbruggen C. (2002) – The Lateglacial and Early Postglacial Occupation of Northern Belgium: the Evidence from Sandy Flanders, in B. V. Eriksen and B. Bratlund (eds.), *Recent Studies in the Final Palaeolithic of the European Plain, Proceedings of a UISPP Symposium, Stockholm, 14.-17. October 1999*, Højberg, Jutland Archaeological Society Publications, p. 165-180.

Crombé P., Perdaen Y., Sergant J. (2003) – The Site of Verrebroek 'Dok' (Flanders, Belgium): Spatial Organisation of an Extensive Early Mesolithic Settlement, in L. Larsson, H. Kindgren, K. Knutsson, D. Loeffler and A. Akerlund (eds.), *Mesolithic on the Move: Papers Presented at the Sixth International Conference on the Mesolithic in Europe, Stockholm 2000,* Oxford, Oxbow Books, p. 205-215.

Crombé P., Perdaen Y., Sergant J. (2006) – Extensive Artefact Concentrations: Single Occupations or Palimpsests? The evidence from the Early Mesolithic site of Verrebroek 'Dok' (Belgium), in C. J. Kind (ed.), *After the Ice Age. Settlements, Subsistence, and Social Development in the Mesolithic of Central Europe*, proceedings of the international meeting (Rottenburg/Neckar, Baden-Württemberg, Germany, 9-12 September 2003), Stuttgart, Theiss (Materialhefte zur Archäologie in Baden-Württemberg, 78), p. 237-243.

Crombé P., Perdaen Y., Sergant J. (2008) – Le Mésolithique ancien dans l'Ouest de la Belgique : quelques réflexions concernant l'occupation du territoire, in J.-P. Fagnart, A. Thévenin, T. Ducrocq, B. Souffi and P. Coudret (eds.), *Le début du Mésolithique en Europe du Nord-Ouest*, proceedings of the round-table (Amiens, 9-10 October 2004), Paris, Société préhistorique française (Mémoire, 45), p. 193-204.

Crombé P., Sergant J., Robinson E., De Reu J. (2011) – Hunter-gatherer Responses to Environmental Change during the Pleistocene-Holocene Transition in the Southern North Sea Basin: Final Palaeolithic-Final Mesolithic Land Use in Northwest Belgium, *Journal of Anthropological Archaeology*, 30, p. 454-471.

Crombé P., Van Strydonck M., Boudin M. (2009a) – Towards a Refinement of the Absolute (Typo)Chronology for the Early Mesolithic in the Coversand Area of Northern Belgium and The Southern Netherlands, in P. Crombé, M. Van Strydonck, J. Sergant, M. Boudin and M. Bats (eds.), *Chronology and Evolution within the Mesolithic of North-West Europe. Proceedings of an international meeting, Brussels, May 30th-June 1st 2007,* Newcastle-upon-Tyne, Cambridge Scholars Publishing, p. 95-112.

Crombé P., Bats M., Wuyts F., Van Roeyen J.-P. (2004) – Een derde vindplaats van de Swifterbantcultuur in het Deurganckdok te Doel (Beveren, Oost-Vlaanderen, België), *Notae Praehistoricae*, 24, p. 105-107.

Crombé P., Perdaen Y., Sergant J., Caspar J.-P. (2001) – Wear Analysis on Early Mesolithic Microlithis from the Verrebroek Site, East Flanders, Belgium, *Journal of Field Archaeology*, 28, 3-4, p. 253-269.

Crombé P., Robinson E., Boudin M., Van Strydonck M. (2012) – Radiocarbon dating of Mesolithic Open-air Sites in the Coversand Area of the Northwest European Plain: Problems and Prospects, *Archaeometry* (on-line the 30 May 2012: doi: 10.1111/j.1475-4754.2012.00693.x).

Crombé P., Sergant J., Lombaert L., Van Strydonck M., Boudin M. (2009b) – The Mesolithic and Neolithic site of Verrebroek - Aven Ackers (East Flanders, Belgium): the Radiocarbon Evidence, *Notae Praehistoricae*, 29, p. 15-21.

Crombé P., Van Roeyen J.-P., Sergant J., Perdaen Y., Cordemans K., Van Strydonck M. (2000) – Doel 'Deurganckdok' (Flanders, Belgium): Settlement Traces from the

Final Palaeolithic and the Early to Middle Neolithic, *Notae Praehistoricae*, 20, p. 111-119.

Crombé P., Deforce K., Langohr R., Louwagie G., Perdaen Y., Sergant J., Verbruggen C. (1999) – A small Final Palaeolithic knapping site at Verrebroek 'Dok 2' (Flanders, Belgium), *Notae Praehistoricae*, 19, p. 63-68.

Heyse I. (1979) – *Bijdrage tot de geomorfologische kennis van het noordwesten van Oost-Vlaanderen (België)*, Bruxelles, Paleis der Academiën (Verhandelingen van de Koninklijke Academie voor Wetenschappen, Letteren en Schone Kunsten van België, Klasse der Wetenschappen, 41, 155), 257 p.

Perdaen Y., Crombé P., Sergant J. (2004) – Federmessergroepen in de Scheldepolders (Oost-Vlaanderen, België): technologische variabiliteit binnen een vast schema, *Notae Praehistoricae*, 24, p. 81-88.

Reimer P. J., Baillie M. G. L., Bard E., Bayliss A., Beck J. W., Blackwell P. G., Bronk Ramsey C., Buck C. E., Burr G. S., Edwards R. L., Friedrich M., Grootes P. M., Guilderson T. P., Hajdas I., Heaton T. J., Hogg A. G., Hughen K. A., Kaiser K. F., Kromer B., McCormac F. G., Manning S. W., Reimer R. W., Richards D. A., Southon J. R., Talamo S., Turney C. S. M., Van der Plicht J., Weyhenmeyer C. E. (2009) – INTCAL 09 and MARINE09 Radiocarbon Age Calibration Curves, 0-50,000 Years Cal BP*, Radiocarbon*, 51, 4, p. 1111-1150.

Sergant J. (2004) – *De aantrekkingskracht van een zandrug. Ruimtelijke analyse van een vroeg-mesolithische site te Verrebroek-Dok*, PhD thesis, Ghent University, Ghent, 409 p.

Sergant J., Wuyts F. (2006) – De mesolithische vindplaats van Verrebroek Aven Ackers: voorlopige resultaten van de campagne 2006, *Notae Praehistoricae*, 26, p. 167-169.

Sergant J., Crombé P., Perdaen Y. (2006) – The 'Invisible' Hearths. A Contribution to the Discernment of Mesolithic Non-structured Surface Hearths, *Journal of Archaeological Science*, 33, p. 999-1007.

Sergant J., Bats M., Noens G., Lombaert L., D'Hollander D. (2007) – Voorlopige resultaten van noodopgravingen in het afgedekte dekzandlandschap van Verrebroek "Aven Ackers" (Mesolithicum, Neolithicum), *Notae Praehistoricae*, 27, p. 101-107.

Van Strydonck M. (2005) – Palaeo-environment: Radiocarbon Dating, in P. Crombé (ed.), *The Last Hunter-gatherer-fishermen in Sandy Flanders (NW Belgium): the Verrebroek and Doel Excavation Projects*, 1. *Palaeo-environment, Chronology and Features*, Ghent, Academia Press (Archaeological Reports Ghent University, 3), p. 127-137.

Van Strydonck M., Crombé P. (2005) – Features: Radiocarbon Dating, in P. Crombé (ed.), *The Last Hunter-gatherer-fishermen in Sandy Flanders (NW Belgium): the Verrebroek and Doel Excavation Projects*, 1. *Palaeo-environment, Chronology and Features*, Ghent, Academia Press (Archaeological Reports Ghent University, 3), p. 180-212.

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MESOLITHIC PALETHNOGRAPHY

RESEARCH ON OPEN-AIR SITES BETWEEN LOIRE AND NECKAR

Proceedings from the international round-table meeting in Paris (November 26–27, 2010)

as part of sessions organised by the Société préhistorique française

Published under the direction of
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'Mesolithic Palethnography…': part of this volume's title represents a sort of methodological and theoretical mission statement designed to convey the idea that research concerning the last hunter-collectors is today in desperate need of this type of insight. Since the beginning of the 1990s, a spectacular crop of occasionally vast open-air sites has emerged, one of the notable contributions of preventive archaeology. Several long-term excavations have also added to this exponentially increasing body of information that has now come to include a growing number of well-preserved sites that have allowed us to address palethnographic questions. This volume represents a first step towards revitalising Mesolithic research. Here we have focused on occupations from the 8th millennium cal BC, currently the best documented periods, and limited the scope to Northern France and certain neighbouring regions. The first part contains several preludes to monographs highlighting potential future studies as well as various patterns in the structuring of space and the location of camps. These, as well as other complementary discoveries, provide material for the second part of the volume dedicated to new data concerning the functional dynamics of Mesolithic camps.

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