PROBLEMS IN DATING STONE-AGE SETTLEMENTS ON SANDY SOILS: THE HOF TEN DAMME SITE NEAR MELSELE, BELGIUM

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ABSTRACT. Archaeological sites on sandy soils often suffer from dislocation of artifacts and datable materials. Because stratigraphy and context lose their meaning in such cases, all ^{14}C dates in this study were put in a dispersion diagram regardless of the sample origin. We drew conclusions about the chronology of the site by comparing this diagram with archaeological analysis of the artifacts and the evolution of the landscape. The dating series, as well as the archaeological analysis, suggest several occupation phases. In general, the archaeological chronology agrees with the ^{14}C dates, although the two can be equated only with caution.

INTRODUCTION

It is well known that archaeological sites on sandy soils are difficult to date because of the dislocation of the artifacts and datable organic material. We were first confronted with this problem in 1983 when dating the Donk site at Herk-de-Stad, Belgium (Dauchot-Dehon, Heylen and Van Strydonck 1984). Initially, we rejected some dates because they did not agree with the archaeological context. However, when we noticed that the dates agreed with the different occupational phases of the site proposed by archaeologists, we re-evaluated them (Van Strydonck 1992). In our present study, we anticipated the possibility of dislocation and started the dating project assuming that most, if not all, of the samples were no longer in their original context. We sought to avoid a circular argument by initially separating the dating project and the study of the archaeological context. Only after this initial investigation did we compare the two chronological models.

SITE DESCRIPTION

The site of Hof ten Damme (Fig. 1) at Melsele, O Vlaanderen, Belgium (51°15′01″N, 4°17′40″E) lies on the east side of a Pleistocene cover sand mound (Fig. 2: B) underlying peaty (Fig. 2: D) and clayey (Fig. 2: E) sediments of the river Schelde. The topography of the site is strongly conditioned by the Tertiary substratum (Fig. 2: A). Against the strongly eroded north side of the mound is a complex deposit of peaty, sandy and clayey sediments (Fig. 2: C). The top of the deposits is weathered, and we noticed a hiatus in the sedimentation, indicating that this surface was exposed for a considerable time. This complex as well as the higher-positioned cover sands is covered with a peat layer (Fig. 2: D) and alluvial sediments (Fig. 2: E). Archaeological material (van Berg, Van Roeyen and Keeley 1991) from the Late Mesolithic and Neolithic was found in the homogenized topsoil of the mound. Bioturbation had caused vertical displacement of the artifacts and datable materials, except for the bark lining of a probable storage pit. Artifacts and charcoal were also found in large bowl-shaped pits, probably windblows. Some material was redeposited by erosion in the sediments against the north flank of the mound. Little material was found at the base of the peat layer or of the mound. The artifacts include lithic objects (14,000 fragments), ceramics (1500 fragments), bone fragments (from wild and domesticated animals), charcoal and hazelnuts.

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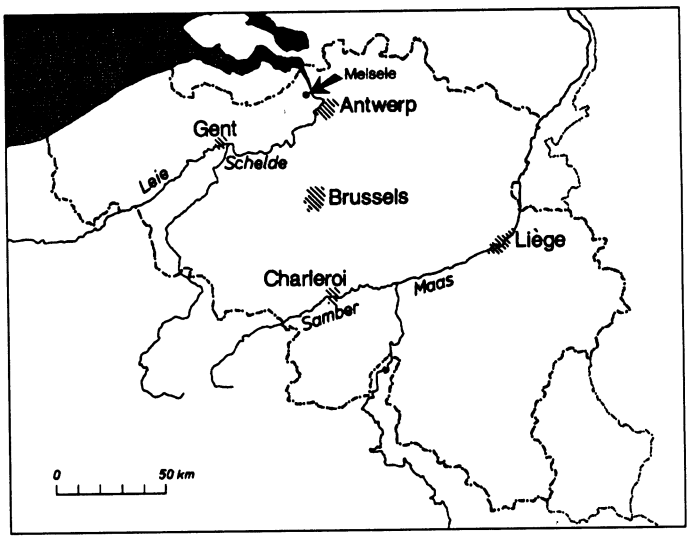

Fig. 1. Map of site location near Melsele

RESULTS

Geological Samples

Table 1 lists the dates from three profiles. The top and base of the peat layers and sublayers were dated, as well as some organic deposits. However, the dates of these organic deposits may have been affected by contamination and oxidation, resulting in migration of organic matter. One younger sample (IRPA-958) comes from a gully and is probably taken from a renewed peat growth.

TABLE 1. Geological Samples

Sample*	Lab no.	Sample location	T.A.W.† (cm)	Age BP	$\delta^{13}C$(‰)
		Profile I			
a	IRPA-958‡	Peat from gully	221–223	1450 ± 80	−27.8
		Profile II			
b	IRPA-957	End peat formation	228–230	1770 ± 40	−29.0
c	IRPA-956	Peat sublayer	212–214	2310 ± 40	−28.4
d	IRPA-955	Peat sublayer	206–208	2800 ± 45	−28.7
e	IRPA-954	Peat sublayer	194–196	3300 ± 40	−28.9
f	IRPA-953	Peat sublayer	186–188	3500 ± 45	−28.2
g	IRPA-952	Peat sublayer	175–177	3540 ± 50	−27.2
h	IRPA-951	Basal peat formation	165–166	4080 ± 60	−27.5
		Profile III			
i	IRPA-950	Top peat layer	182–184	1915 ± 40	−28.5
j	IRPA-949	Sublayer	108–112	2900 ± 50	−28.3
k	IRPA-947	Basal peat layer	50–52	4300 ± 60	−28.5
l	IRPA-946	Top peat layer	20–24	5000 ± 40	−25§
m	IRPA-944	Basal peat layer	−15 to −19	5350 ± 50	−27.0
n	IRPA-943	Organic layer	−21 to −26	5160 ± 60	−27.2
o	IRPA-942	Organic layer	−48 to −56	5300 ± 70	−27§

*See Fig. 2

†T.A.W.: Tweede Algemene Waterpassing = Belgian ordnance datum

‡IRPA = Royal Institute for Cultural Heritage, Brussels

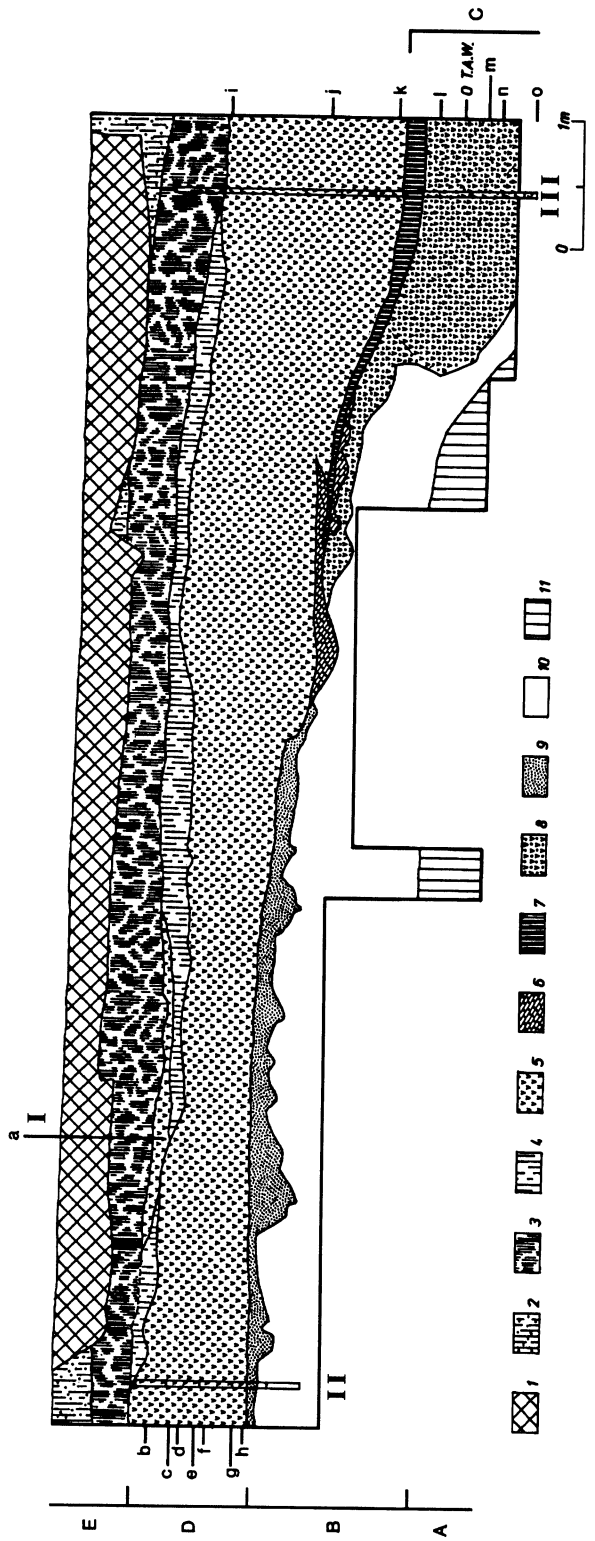

Fig. 2. Site stratigraphy and location of the geological samples. 1. Anthropogenic disturbed clay; 2. sandy clay; 3. slightly organic and sandy clay; 4. organic clay; 5. complex peat layer; 6. sandy colluvium; 7. heavy compact clay; 8. complex peaty, sandy and clayey strata; 9. bioturbated top of cover sand; 10. Pleistocene cover sand; 11. Tertiary marine substratum. A. Tertiary substratum; B. Pleistocene cover sand mound; C. complex deposit of peaty, sandy and clayey sediments; D. stratified peat; E. alluvial sediments. a–o: geological samples from Profiles I–III (see Table 1 for identifications).

Archaeological Samples

Table 2 lists the dates of 15 archaeological samples. Figure 3 shows the dispersion diagram (Ottaway 1973) of the conventional (A) and the calibrated (B) dates. The diagram of the conventional dates is the sum of the Gaussian distributions of each single date. The calibrated diagram is obtained by the *sum-probabilities* option in the Stuiver and Reimer (1993) calibration program. The diagrams show single results at *ca.* 9000, 7700 and 3200 BP. Two almost identical dates, but on different material, are at 5700 BP. Ten dates form a cluster, incorporating almost the entire 5th millennium BP. The two dates obtained on the bark from the pit mark the beginning of this cluster (average of the two = 5040 ± 60 BP). The youngest sample (IRPA-938) dates to *ca.* 3200 BP and was found in the same context (windblow α) as the oldest sample (IRPA-933). UtC-1351 and IRPA-937 were also found in the same context (windblow β). IRPA-1040 is part of the cluster although the sample comes from a stratigraphically much younger context. We noted evidence of migration not only of small or single lumps of charcoal, but conglomerates (>10 g) were also displaced.

TABLE 2. Archaeological Samples

No.	Lab no.	Material dated	T.A.W. (cm)	Age BP	$\delta^{13}C$(‰)
1	IRPA-938	Charcoal from windblow α	100–105	3210 ± 60	–25.2
2	UtC-1445*	Wood from gully	95–100	4180 ± 50	–27.4
3	IRPA-1040	Charcoal from peat base	130–135	4370 ± 65	–26.0
4	IRPA-988	Charcoal from transition peat/ cover sand	150–155	4460 ± 35	–26.5
5	UtC-1430	Charcoal from gully	95–100	4520 ± 100	–25.9
6	IRPA-934	Charcoal from cover sand	150–155	4610 ± 60	–25.4
7	UtC-1444	Charcoal from cover sand	135–140	4660 ± 60	–25.1
8	IRPA-937	Charcoal from windblow ß	120–130	4850 ± 50	–26.2
9	OxA-3092*	Bark from storage pit	--	4950 ± 80	–26.0
10	UtC-1352	Charcoal from cover sand	135–140	5090 ± 80	–24.4
11	OxA-3087	Bark from storage pit	--	5130 ± 80	–26.0
12	IRPA-945	Wet wood from cover sand	135–140	5690 ± 55	–25.3
13	UtC-3191	Carbonized hazel nut from cover sand	150–155	5700 ± 60	–27.2
14	UtC-1351	Charcoal from windblow ß	130–135	7730 ± 110	–24.6
15	IRPA-933	Charcoal from windblow α	125–130	9030 ± 70	–27.3

*UtC = samples prepared in Brussels and measured at the Van der Graaff Laboratory, University of Utrecht; OxA = Oxford Radiocarbon Accelerator Unit

DISCUSSION

>5690 BP

In spite of the mixing of the artifacts, at least two distinct phases could be recognized based on the typology of the lithic material. Most of the lithics belong to the Late Mesolithic tradition, which thus postdate 8 ka BP. Only a few tools can clearly be attributed to the Neolithic. The pottery shows distinct technical groups and does not seem to belong to one of the known Early or Middle Neolithic groups. A more-or-less similar situation occurs at the site of Weelde-Paardsdrank (Huyge and Vermeersch 1982). One ^{14}C date at Hof ten Damme (UtC-1351: 7730 ± 110 BP) corresponds with the Late Mesolithic. Two dates (UtC-3191: 5700 ± 60 BP, IRPA-945: 5690 ± 55 BP) might correspond with a Late Mesolithic survival of "ceramized" hunters (Van Roeyen and van Berg 1989). The site

of Weelde-Paardsdrank yielded a similar date (Lv-934: 5710 ± 80 BP), whose close agreement with our dates is unlikely to be coincidental.

Lithic typology is inconclusive concerning possible human occupation of the site *ca.* 9 ka BP. However, two similar sites at the neighboring village of Verrebroek (Van Hove and Van Roeyen 1988; Crombé 1994) yield three nutshell dates of the same period (UtC-2743: 9000 ± 190 BP; UtC-2744: 8920 ± 130 BP; IRPA-633: 8890 ±100 BP). The anthropogenic origin of the charred nutshell is beyond doubt. Sporadic use of the Hof ten Damme site dated by a charcoal deposit (IRPA-933: 9030 ± 70 BP) can be neither ruled out nor fully proven.

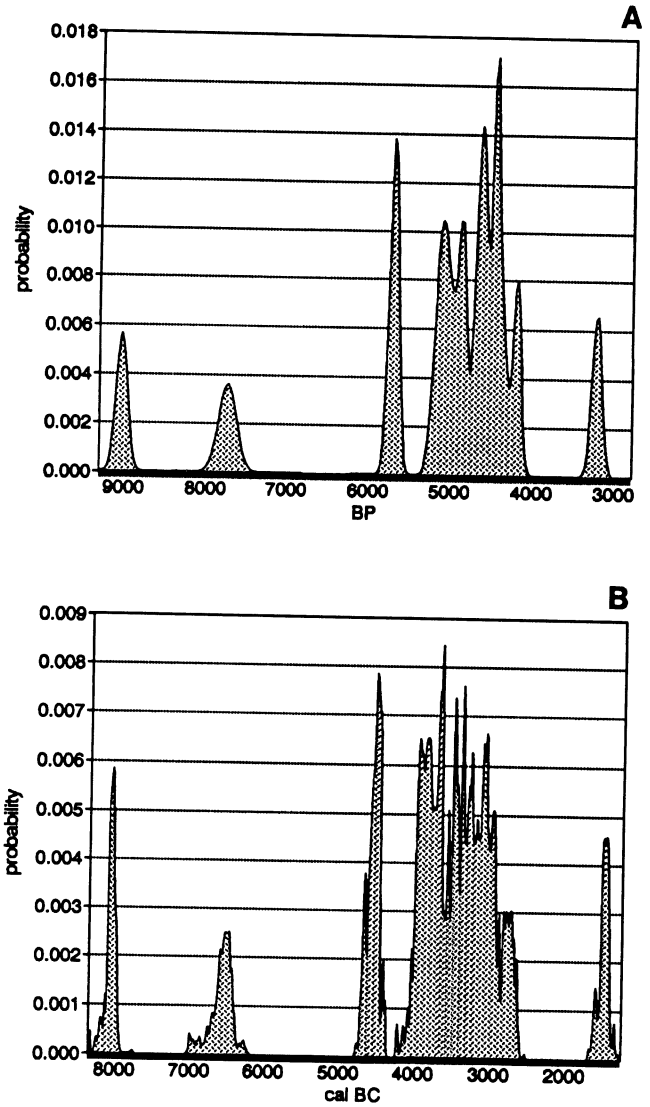

Fig. 3. Dispersion diagram of 15 archaeological samples. A. Conventional dates; B. Calibrated dates.

5300–5000 BP

Diatom and pollen analyses (Denys and Verbruggen 1989) of the sediments at the north flank of the mound (Fig. 2: C) revealed a deposition in a brackish environment, demonstrating an important downstream supply of sediments by tidal activity. This sedimentation begins *ca.* 5300 BP (IRPA-942) and ends *ca.* 5000 BP (IRPA-946). A similar deposit from the same period is also dated in a peat sequence at the nearby village of Doel (Minnaert and Verbruggen 1986) (base, IRPA-457: 5350 ± 70 BP; top, IRPA-454: 4900 ± 60 BP). During this active sedimentation period no clear evidence of human activity on the site could be found in the pollen analyses. The top of this complex is a weathered compact clay and was probably a surface for more than a century.

5000–4300 BP

After 5 ka BP, tidal activity disappeared. The age of one charcoal sample (UtC-1352) and the average of the bark dates (OxA-3092 and -3087) correspond with the end of this active sedimentation and the beginning of a period of stagnation in the Holocene floodplain expansion of the river Schelde. A cluster containing 10 ^{14}C dates covers a period of *ca.* 800 ^{14}C yr (5000–4200 BP). It is important to emphasize that the bark lining of the pit was the only sample that was undoubtedly still *in situ*. The few Neolithic stone tools, some ceramics and probably most of the bones from domesticated fauna can be related to this phase. Although the dates reveal human activity for almost 800 ^{14}C yr, within the excavated area, no evidence was found for permanent occupation.

<4300 BP

At the lower portion of the mound (50–52 cm T.A.W.), peat (Fig. 2: D) started growing *ca.* 4300 BP (IRPA-947). At the higher parts (165–166 cm), the peat growth started at *ca.* 4000 BP (IRPA-951). These dates correspond to the youngest dates of the cluster, namely the sample from the peat base (130–135 cm T.A.W.) (IRPA-1040: 4370 ± 65 BP) and the one (95–100 cm T.A.W.) (UtC-1445: 4180 ± 50 BP) found in a younger deposit. From that time on, the landscape is characterized by a peat bog dominated by alder. The top of this peat layer is covered by a clastic alluvium (Fig. 2: E), according to pollen analysis, caused by the Dunkerk-II transgression, as confirmed by a ^{14}C date of 1770 ± 60 BP (IRPA-957). No trace of human activity could be demonstrated either archaeologically or palynologically between 4 ka BP and the Middle Ages. This implies that the youngest charcoal date (IRPA-938: 3210 ± 60 BP) cannot be anthropogenic. The Medieval moated site Hof ten Damme was dated to 1000–1200 cal AD (Van Hove 1988).

Conclusion

Dislocated samples can give chronological information about the archaeological phases of a site. The classical relations between dates, stratigraphy and artifacts must be abandoned, however. We initially put all dates from the site in a dispersion diagram, regardless of their origin. Then the dates were related to: 1) the artifacts; 2) similar dates from related sites; and 3) information obtained from pollen analysis and environmental studies. This made it possible to identify the cluster of dates in the 5th millennium BP and to conclude that this occupation phase was determined by the tidal activity of the river Schelde. This cluster would not have been noticed if the dates had been ranked according to stratigraphic position or artifactual assemblage. The ^{14}C dates also indicate an occupation *ca.* 5700 BP. The relation between this phase and a Late Mesolithic survival remains to be established. The oldest charcoal date may be anthropogenic, but the youngest probably is not. Our inability to distinguish anthropogenic from natural charcoal is a major limitation of this method. It must also be emphasized that random sampling is essential, since there are no longer any real selection criteria.

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REFERENCES

Crombé, P. 1994 Recherche poursuivie sur le mésolithique en Flandre Orientale. *Notae Praehistoricae* 13: 71–78.

Dauchot-Dehon, M., Heylen, J. and Van Strydonck, M. 1984 Institut Royal du Patrimoine Artistique radiocarbon dates X. *Radiocarbon* 26(3): 384–391.

Denys, L. and Verbruggen C. 1989 A case of drowning—the end of Subatlantic peat growth and related palaeoenvironmental changes in the lower Scheldt basin (Belgium) based on diatom and pollen analysis. *Review of Palaeobotany and Palynology* 59:7–36.

Huyge, D. and Vermeersch, P.M. 1982 Late Mesolithic settlement at Weelde-Paardsdrank. *In* Vermeersch, P. M. ed., Contributions to the study of the Mesolithic of the Belgian Lowland. *Studia Praehistorica Belgica* 1: 115–209.

Minnaert, G. and Verbruggen C. 1986 Palynologisch onderzoek van een veenprofiel uit het Doeldok te Doel. *Bijdragen van de Archeologische Dienst Waasland* 1: 201–208.

Ottaway, B. 1973 Dispersion diagrams: A new approach to the display of ^{14}C dates. *Archaeometry* 15(1): 5–12.

Stuiver, M. and Reimer, P. 1993 Extended ^{14}C data base and revised CALIB 3.0 ^{14}C age calibration program. *In* Stuiver, M., Long, A. and Kra, R. S., eds., Calibration 1993. *Radiocarbon* 35(1): 215–230.

van Berg, P. L., Van Roeyen, J. P. and Keeley, L. H. 1991 Le site mésolithique acéramique de Melsele (Flandre Orientale), campagne de 1990. *Notae Praehistoricae* 10: 37–47.

Van Hove, R. 1988 Melsele (Beveren, O.-Vl.): Hof ten Damme. *Archeologie* 2: 174–175.

Van Hove, R. and Van Roeyen, J. P. 1988 Verrebroek (Beveren, O.-Vl.): Vroeg-mesolitisch site. *Archeologie* 2: 150–151.

Van Roeyen, J. P., van Berg, P. L. 1989 Les Chasseurs "ceramisés" du pays de Waas. *Notae Praehistoricae* 9: 31–32.

Van Strydonck, M. 1992 *Radiokoolstof: Een Maat voor het Verleden*. Koninklijk Instituut voor het Kunstpatrimonium, Brussels: 80 p.