



Universiteit  
Leiden  
The Netherlands

**Persistent traditions: a long-term perspective on communities in the process of Neolithisation in the Lower Rhine Area (5500-2500 cal BC)**

Amkreutz, L.W.S.W.

**Citation**

Amkreutz, L. W. S. W. (2013, December 19). *Persistent traditions: a long-term perspective on communities in the process of Neolithisation in the Lower Rhine Area (5500-2500 cal BC)*. Sidestone Press, Leiden. Retrieved from <https://hdl.handle.net/1887/22968>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/22968>

**Note:** To cite this publication please use the final published version (if applicable).

Cover Page



## Universiteit Leiden

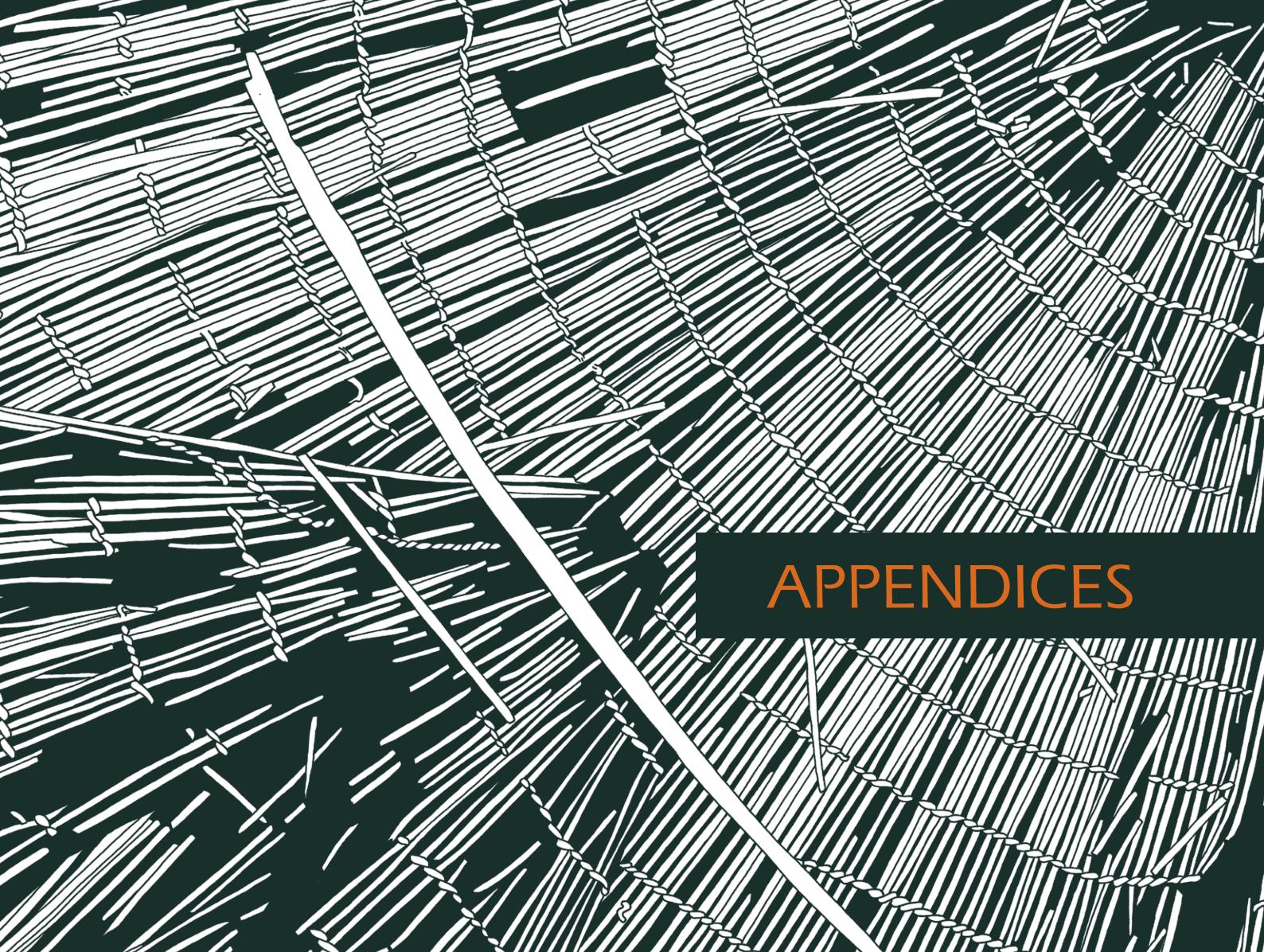


The handle <http://hdl.handle.net/1887/22968> holds various files of this Leiden University dissertation.

**Author:** Amkreutz, Luc Winand Sophia Wilhelm

**Title:** Persistent traditions : a long-term perspective on communities in the process of Neolithisation in the Lower Rhine Area (5500-2500 cal BC)

**Issue Date:** 2013-12-19



## APPENDICES

L.W.S.W. Amkreutz

# PERSISTENT TRADITIONS

A long-term perspective on communities in the process of  
Neolithisation in the Lower Rhine Area (5500-2500 cal BC)





# PERSISTENT TRADITIONS

## APPENDICES





L.W.S.W. Amkreutz

# PERSISTENT TRADITIONS

A long-term perspective on communities in the process of  
Neolithisation in the Lower Rhine Area (5500-2500 cal BC)

## APPENDICES

© 2013 L.W.S.W. Amkreutz

Published by Sidestone Press, Leiden  
[www.sidestone.com](http://www.sidestone.com)

ISBN 978-90-8890-211-6

Drawing cover: Bergschenhoek fish trap (Rijkmuseum van Oudheden/drawing Leo Verhart)  
and decoration bone awl Hardinxveld-Giessendam-De Bruin  
Lay-out & Cover design: Sidestone Press

This book was sponsored by funding from:  
Stichting Nederlands Museum voor Anthropologie en Praehistorie (SNMAP)  
Stichting Rijksmuseum van Oudheden (RMO)

This research project was funded by the Dutch Organisation for  
Scientific Research (NWO)

## *Contents*

<b>Appendix I: Site catalogue</b>	<b>11</b>
Introduction	11
Structure and scope	11
Glossary and abbreviations	12
List of sites in catalogue ('+' = including site plan)	17
1. Bergschenhoek	19
2. Bergumermeer S64-B	23
3. Brandwijk-Het Kerkhof	27
4. Brecht-Moordenaarsven 2	33
5. Bronneger	36
6. Dilsen-Dilserheide III	38
7. Doel-Deurganckdok	41
8. Echt-Annendaal (HVR-183)	47
9. Ede-Frankeneng	50
10. Ewijk-Ewijkse Velden	52
11. Gassel-Over de Voort	57
12. Gassel-De Zittert	59
13. Grave-Pater Berthierstraat	62
14. Haamstede-Brabers	65
15. Hardinxveld-Giessendam De Bruin	69
16. Hardinxveld-Giessendam Polderweg	74
17. Hazendonk	78
18. Hekelingen-I	85
19. Hekelingen-III	88
20. Helden-Panningen-industrieterrein	95
21. Helmond-Stiphouts Broek	100
22. Hoge Vaart-A27	102
23. Hüde-I	108
24. Jardinga-Johannahoeve	117
25. Kessel-Eik-Keuperheide	123
26. Koningsbosch	126
27. Leidschendam	130
28. Liège-Place St.-Lambert (LPS)	135
29. Linden-De Geest	141
30. Linden-Kraaijenberg	145
31. Lommel-Molse Nete	150
32. Lommel-Vosvijvers 3	151
33. Mariënberg	153
34. Meeuwen-Donderslagheide 1	161
35. Meeuwen-In den Damp I	166
36. Melsele-Hof ten Damme	169

37. Merselo-Haag	173
38. Nijmegen-‘t Klumke	176
39. Opglabbeek-Ruiterskuil	180
40. Oudenaarde-Donk	183
41. Schipluiden-Noordhoorn	187
42. Schokland-P14	201
43. St.-Odiliënberg-Neliske (HVR-22)	209
44. Slootdorp-Bouwlust	213
45. Sweikhuizen-de Hei	216
46. Swifterbant-S2	219
47. Swifterbant-S3/5/6	227
48. Swifterbant S11/12/13	233
49. Swifterbant-S21	237
50. Swifterbant S22/23/24	241
51. Urk-E4	245
52. Vlaardingen	250
53. Voorschoten-Boschgeest	256
54. Wateringen-4	262
55. Weelde-Paardsdrank	267
56. Wijchen-Het Vormer	271
57. Ypenburg	275
58. Zandwerven	282
<b>Additional sites:</b>	<b>287</b>
59. AHR-32-Rijswijk-Schaapweg	290
60. AHR-42-Sion	291
61. Alblasserdam-Plan Nieuw Kinderdijk	292
62. Albrandswaard-Rhoon Essendaal (19-12)	292
63. Albrandswaard-Rhoon Koedood (19-16)	293
64. Albrandswaard-Rhoon Portland 4 (20-134)	293
65. Almere-Poort	293
66. Antwerpen-Lombardenstraat	294
67. Barendrecht-Gaatkensplas-Zuidpolder (20-126)	294
68. Barendrecht-Zuidpolder (20-58)	295
69. Barendrecht-Hordijk West (13-74)	296
70. Barendrecht-Vrijenburg (20-125)	296
71. Bazel-Sluis	296
72. Beuningen-Ooigraaf-het Woerdje	299
73. Bracht-Brüggen 8-West	300
74. Brecht-Moordenaarsven 1	300
75. Brecht-Moordenaarsven 3	301
76. Brecht-Overbroek I/II/III	301
77. Brecht-Thomas Heyveld	302
78. Buinerveen/Donkerbroek/Westerbork	303

79. Coesfeld-Harle	303
80. Den Haag-Wateringse Binnentuinen	304
81. Denekamp-Klokkenberg	305
82. Dodewaard-Peyenkampse veldweg	305
83. Donkenproject	306
84. Ede-Rietkamp (forgery)	307
85. Emmeloord-J97	308
86. Ename-Stuw	309
87. Gieten-Gietsenveentje	310
88. Gouda-Westergouwe-Deelgebied 3	310
89. Havelte-De Doeze	312
90. Hazerswoude-Rijndijk-Spookverlaat	313
91. Heemse-Hardenberg	314
92. Hekelingen II	314
93. Hellevoetsluis-Ossenhoek	315
94. Hoornaar-Lage Giessen	317
95. Hulst-Nieuw-Namen	317
96. Leidschendam-Frekeweg	318
97. Linderbeek-1944	318
98. Linne (St.-Odiliënberg)-Mortelshof-HVR 16	319
99. Lommel-Kattebos	320
100. Meppel-de Gaste	320
101. Menstede-Coldinne	320
102. Nagele-J112	321
103. Nagele-J125	322
104. Namur-Grognon	323
105. Nieuw-Schoonebeek	324
106. Nijlen-Varenheuvel	325
107. Noordoostpolder	326
108. Nottuln	326
109. Osterwick-Höve (Ldkr. Coesfeld)	327
110. Posterholt-Vinke-HVR 39	328
111. Remouchamps-Station Leduc	328
112. Rijswijk-A4	329
113. Rommertsdonk	331
114. Rotterdam-Bergse Bos (06-39)	332
115. Rotterdam-Beverwaard (13-17)	332
116. Rotterdam-Beverwaard-Tramremise (13-83)	332
117. Rotterdam-De Donk I (14-08)	334
118. Rotterdam-De Donk II (14-09)	334
119. Rotterdam-'t Hart (13-66)	335
120. Rotterdam-Hordijkerveld (13-69)	335
121. Rotterdam-Hordijkerveld (13-85)	335
122. Rotterdam-Kievitsdonk (14-22)	336

123. Rotterdam-RandstadRail-Centraal Station (05-42)	336
124. Rotterdam-Groenenhagen-Tuinenvelden De Zwanen-Rietpark (13-78)	337
125. Rotterdam-Van Ghentkazerne (13-82)	338
126. Schiedam	339
127. Schokkerhaven-E170/171	339
128. Soest-Burgtheaterparkplatz	340
129. Staphorst-Olde-Meppelerdiep	340
130. Swifterbant-S4	341
131. Swifterbant S31/32/33	342
132. Swifterbant-S41	342
133. Swifterbant-S42/43	343
134. Swifterbant-S51	343
135. Swifterbant-S61	344
136. Swifterbant-S71	345
137. Swifterbant-S81/82/83/84 (Klingenweg)	345
138. Swifterbant-Dronten-Bisonweg	346
139. 's-Hertogenbosch-Maaspoort	346
140. Tilburg-Kraaiven	348
141. Toterfout-Halve Mijl	349
142. Tietjerk-Lytse Geast I	349
143. Turnhout-Zwarte Heide	350
144. Veen-Kaninenberg	351
145. Veldhoven-Habraken	351
146. Ven-Zelderheide	352
147. Voorschoten-De Donk	352
148. Wateringse Veld	354
149. Weelde-Voorheide	354
150. Well-Aaijen	355
151. Westbroek-Velzerbroekpolder	356
152. Wieringermeer-Dijkgatsweide	356
153. Wijgaarden-De Wingerdse Donk	357
154. Willemstad-Volkerak	358
155. Winsum-Wetsingermaar	359
156. Winterswijk	360
157. Ypenburg-Gavikavel	360
158. Zoelen-Buren (de Boldert/Beldert)	361
159. Zwijndrecht-Vlaams Hoofd (Antwerpen-Vlaams Hoofd)	362

<b>Appendix II: Lithic data</b>	<b>363</b>
IIA Technology	367
IIB Typology	368
IIC Point typology	369
IID Kolmogorov-Smirnov two-sample test	370
IIE Evenness index	371
IIF Raw material	373
IIG GQW and Phtanite distance	374
IIH GQW debitage and tools	375
<b>Appendix III: Ethnography</b>	<b>377</b>
South America and the Caribbean	377
Asia and Oceania	379
Africa and the Middle East	382
Nomads, Middle East and Central Asia	385
Middle and North America	385
Europe: potential archaeological parallels.	387
<b>References</b>	<b>391</b>



## *Appendix I*

# Site catalogue

### **Introduction**

The site catalogue presented below contains information on the majority of sites figuring in the thesis. The catalogue is meant to provide more detail concerning various aspects of the sites discussed, while at the same time compiling an overview of most of the informative sites available. In line with the scope of this thesis, the emphasis in the catalogue has been on sites of relevance for the Late Mesolithic in the Lower Rhine Area and the process of Neolithisation in the wetlands and wetland margins between 5500 and 2500 cal BC (Swifterbant, Hazendonk and Vlaardingen sites), as well as additional sites forming an important source for a contemporary Neolithic perspective.

The rationale behind the selection of sites in both catalogue and thesis has predominantly been based on the level and context of information they yielded (also see Groenewoudt 1994). The level of information may pertain to actual excavated data, as well as the degree to which a site forms a unique source of information with respect to the topics and problems discussed in the thesis. Other motivations have been the selection of a geographically balanced set of sites, both with respect to upland and wetland locations, and the desire to include different zones in the landscape such as the loess-soils, the coversand area, the diversity in wetlands and the succession of coastal landscapes. It should be added that although the direct focus of both thesis and catalogue is on sites as qualitatively high and point-specific sources of information, this is based on the premise that these can only be understood in the light of their geographical and environmental contexts (see ch. 4; Binford 1992; Peeters 2007).

### **Structure and scope**

This appendix consists of two sections; the first section reviews the information of 58 sites from the Lower Rhine Area (LRA). The sites are important primary and secondary sources of information on the Late Mesolithic or the process of Neolithisation in the area. A second section contains a selection of information of 101 additional sites that form a subsidiary source of information. The sites in the first section are discussed following a set template in order to facilitate inter-site comparison. The information of the sites is synthesised and quantitative information is only included to a limited extent. Radiocarbon dates, unless indicated otherwise, are presented in years cal BC and have been calibrated with Oxcal 2.8 (Bronk and Ramsey/Stuiver). References are listed per site and include the most important primary sources of information.

Interpretatively most of the data that is presented has been selected and compiled from the available publications per site. The aim was to form an elaborate introduction to most of the important sites and a brief summary for the other subsidiary sites. The reader is however urged to also consult to original sources. Apart from this reflection of the available information in the literature, the final section of the template of the sites in the first section is formed by the author's interpretation. Most of the sites in the first section include newly drawn site plans, based upon the plans available in the literature, which were produced by Medy Oberendorff and Joanne Porck (Faculty of Archaeology, Leiden University) and finalized by Archol BV. Their aim is to provide a basis for comparison. Uniform scales and legends have been used as much as possible, although the diversity in site plans, sizes and symbols formed a limiting factor. The sites have been listed alphabetically since many witnessed occupation during more than one period. Finally, during the writing of this thesis a number of sites were published in full, or saw more up to date publication (see also the (recently) established archaeological EDNA e-depot facility of the data archiving system DANS/EASY). As far as possible the newest publications have been included. Being a synoptic site-based compilation of information, the catalogue should be used as an exhaustive summary of, or elaborate introduction to the original sources.

## **Glossary and abbreviations**

### *Glossary geology:*

**Coversand:** *coversand is eolic sediment originating from the North Sea basin. During the glacial periods it was deposited over vast stretches of Northwest-Europe. Outside of the Holocene sedimentation area it is still largely at the surface often in the shape of extensive, low and undulating dune complexes.*

**Donk:** *Donken are Late Glacial of Early Holocene river dunes consisting of a body of sand that has been 'trapped' in Holocene sediments such as peat and clay. Most of these dunes are currently completely covered up. During a large part of the Holocene these locations provided rather stable though slowly drowning settlement locations within an often vast wetland area.*

**Esdek:** *An esdek is a plaggan soil. An artificially deposited layer partly consisting of manure and other farm refuse. These layers usually date to the Middle-Ages.*

**Ironpan:** *an ironpan is an impenetrable layer situated above the C-horizon originating from the influx, through leaching, of iron compounds from a higher level.*

**Ven/Fen:** *A shallow lake of modest extent, generally in a coversand landscape and resulting from an impermeable layer or soil horizon (iron pan) in the subsoil. While the use of English terminology for these landscape features is elaborate (including fen, mire, bog, marsh), the term peat fen is most to the point.*

### **Soil horizons:**

**Ap:** This is the ploughzone

**A1:** The A1-horizon is the top layer of the soil profile containing most organic material. Within the A1-horizon organic material is transformed into soil. On top of the A1-horizon there may be another layer, the Ao-horizon, containing humic material.

**E:** The E-horizon or A2-horizon is marked by lateral or vertical eluviation or leaching of minerals and nutrients. This results in general poor nutritional conditions of this horizon. The E-horizon is often recognisable by its bleached colour (in sand).

**B:** Several soil processes mark the B-horizon. There is influx from minerals and nutrients from the layers above as well as soil activity through bioturbation. In this layer the soil formation takes place. Apart from the A1-horizon, the B-horizon can be considered the most nutritious layer in the soil. The B-horizon sometimes is subdivided in more specific layers. Bh indicates the presence of humic material. Bir the influx of iron-oxide. Bt the presence of texture within the B-horizon. B/C indicates the gradual change from B to C: The C-horizon contains the original soil material on top of which soil formation has taken place.

### Glossary fauna:

Allis – *Alosa alosa*  
 Aurochs – *Bos primigenius*  
 Badger – *Meles meles*  
 Bass – *Dicentrarchus labrax*  
 Beaver – *Castor fiber*  
 Bewick's swan – *Cygnus bewickii*  
 Bittern – *Botaurus stellaris*  
 Bottle-nosed Dolphin – *Tursops truncates*  
 Bream – *Abramis brama*  
 Brent – *Branta bernicla*  
 Brown bear – *Ursus arctos*  
 Carp family – Cyprinidae  
 Carrion crow – *Corvus corone*  
 Catfish – *Silurus glanis*  
 Cattle – *Bos taurus*  
 Chub – *Leuciscus cephalus*  
 Common Pochard – *Aythya ferina*  
 Common seal – *Phoca vitulina*  
 Cormorant – Phalacrocoracidae  
 Crane – *Grus grus*  
 Crow – *Corvus corvus*  
 Dace – *Leuciscus leuciscus*  
 Dalmatian pelican – *Pelecanus crispus*  
 Dog – *Canis familiaris*  
 Duck (wild) – *Anas platyrhynchos*  
 Eel – *Anguilla anguilla*  
 Eider – *Somateria mollissima*  
 Fox – *Vulpes vulpes*  
 Flounder – *Pleuronectes flesus*  
 Garganey – *Anas querquedula*  
 Geese – *Anser* sp.  
 Goat – *Capra hircus*  
 Golden eye – *Bucephala islandica*  
 Goosander – *Mergus merganser*  
 Grey mullet – Mugilidae, *Mugil cephalus*  
 Grey seal – *Halichoerus grypus*  
 Horse – *Equus* spec.  
 Mallard – *Anas platyrhynchos*  
 Mute swan – *Cygnus olor*  
 Otter – *Lutra lutra*  
 Peppery furrow shell – *Scrobilaria plana*  
 Perch – *Perca fluviatilis*  
 Polecat – *Putorius putorius*  
 Pig – *Sus domesticus*  
 Pike – *Esox lucius*  
 Red deer – *Cervus elaphus*  
 Red-throated Loon – *Gavia stellata*

Roach – *Rutilus rutilus*  
 Roe deer – *Capreolus capreolus*  
 Roker – *Raja clavata*  
 Rudd – *Scardinius erythrophthalmus*  
 Ruff – *Philomachus pugnax*  
 Ruffe – *Gymnocephalus cernuus*  
 Salmon – *Salmo salar*  
 Sheep – *Ovis aries*  
 Shelduck – *Tadorna tadorna*  
 Smew – *Mergus albellus*  
 Spined loach – *Cobitis taenia*  
 Stingray – *Dasyatis pastinaca*  
 Sturgeon – *Acipenser sturio*  
 Swans – *Cygnus* sp.  
 Teal – *Anas crecca*  
 Tench – *Tinca tinca*  
 Tufted duck – *Aythya fuligula*  
 Turtle – *Emys orbicularis*  
 Whale (general) – Cetacea  
 White-tailed eagle – *Haliaeetus albicilla*  
 Widgeon – *Anas penelope*  
 Wild boar – *Sus scrofa*  
 Wild cat – *Felis sylvestris*

### Glossary botany:

Alder – *Alnus*  
 Apple (wild) – *Malus sylvestris*  
 Ash – *Fraxinus*  
 Aster family - Asteraceae  
 Barley – *Hordeum*  
 Beech – *Fagus*  
 Blackberry – *Rubus fruticosus*  
 Black Nightshade – *Solanum nigrum*  
 Blackthorn – *Prunus spinosa*  
 Blue elderberry – *Sambucus nigra*  
 Birch – *Betula*  
 Bracken – *Pteridium aquilinum*  
 Bread wheat – *Triticum aestivum*  
 Bread wheat (small variant) – *Triticum aestivum* *aestivo-compactum*  
 Celandine – *Ranunculus ficaria*  
 Cereals – Cerealia  
 Cherry (wild) – *Prunus*  
 Dock – *Rumex* L.  
 Dogwood – *Cornus sanguinea*  
 Einkorn wheat – *Triticum monococcum*  
 Elder – *Sambucus nigra*

Elm – *Ulmus*  
 Emmer wheat – *Triticum dicoccum*  
 Fat hen – *Chenopodium album*  
 Ferns – *Pteridophyta (Polypodium)*  
 Flax – *Linum usitatissimum*  
 Garden sorrel – *Rumex acetosa*  
 Glossy Buckthorn – *Rhamnus frangula*  
 Goosefoot – *Chenopodium album*  
 Goosefoot family – Chenopodiaceae  
 Grasses – Poaceae  
 Ground ivy – *Glechoma hederacea*  
 Hawthorn – *Crataegus monogyna*  
 Hazel – *Corylus avellana*  
 Hornbeam – *Carpinus*  
 Ivy – *Hedera helix*  
 Juniper – *Juniperus communis*  
 Knotgrass – *Polygonum aviculare*  
 Lambsquarter – *Chenopodium album*  
 Lesser celandine – *Ranunculus ficaria*  
 Lime – *Tilia*  
 Maple – *Acer*  
 Mountain-ash – *Sorbus aucuparia*  
 Mugwort and associated species – *Artemisia*  
 Naked barley – *Hordeum vulgare* var. *nudum*  
 Nettle – *Urtica dioica*

Oak – *Quercus*  
 Oats – *Avena* spec.  
 Onion and leek – *Allium* sp.  
 Pale Persicaria – *Persicaria lapathifolia*  
 Pear (wild) – *Pyrus communis*  
 Pine – *Pinus*  
 Plantain – *Plantago*  
 Raspberry – *Rubus idaeus*  
 Reed – *Phragmites*, *Phragmites australis*  
 Ribwort plantain – *Plantago lanceolata*  
 Rose – *Rosa canina/rubiginosa*  
 Rose hip – *Rosa rugosa*  
 Sea beet – *Beta vulgaris maritima*  
 Sedges - Cyperaceae  
 Sloe – *Prunus spinosa*  
 Spruce – *Picea*  
 Smartweed or pinkweed – *Persicaria* spec.  
 Taxus – Taxaceae  
 Three-nerved Sandwood – *Moehringia trinervia*  
 Waternut – *Trapa natans*  
 Wild apple – *Malus sylvestris*  
 Wild cherry – *Prunus*  
 Willow – *Salix*  
 Yellow iris – *Iris pseudacorus*  
 Yew – *Taxus baccata*

### *Abbreviations general:*

**Archis:** Archeologisch informatie systeem.  
 Digital archaeological database for the  
 Netherlands.

**Archol:** Archeologisch onderzoek Leiden.

**ADC:** Archeologisch Diensten Centrum.

**AWN:** Archeologische Werkgemeenschap  
 Nederland, Dutch amateur archaeologist  
 community.

**BAI:** Biologisch-Archeologisch Instituut,  
 the former archaeological department of  
 Groningen University.

**BIAx:** Commercial company specialised in  
 archaeobotanical research.

**BOOR:** Bureau Oudheidkundig Onderzoek  
 Rotterdam.

**GIA:** Groninger Instituut voor Archeologie,  
 current archaeological department of  
 Groningen University.

**Haz.:** Hazendonk group or period at the  
 Hazendonk site.

**HVR:** Heemkundevereniging Roerstreek: well-  
 organised amateur archaeology group focusing  
 on the Roerstreek in Middle Limburg.

**IAP:** Instituut voor het Archeologisch  
 Patrimonium, Belgian institute for the  
 management of the archaeological heritage,  
 currently VIOE, Vlaams Instituut voor  
 Onroerend Erfgoed.

**IPL:** Instituut Prehistorie Leiden. Leiden  
 University institute of Prehistory, academic  
 predecessor of the Faculty of Archaeology.

**IPP:** Instituut voor Prae- en Protohistorie;  
 Amsterdam University pre- and protohistoric  
 institute.

**LRA:** Lower Rhine Area.

**MK:** Michelsberg culture.

**NAP:** Nieuw Amsterdams Peil, Dutch Ordnance Datum.

**PFB:** Protruding Foot Beaker culture.

**RAAP:** Regionaal Archeologisch Archiverings Project; Foundation specialized in preliminary field research by means of augering, survey techniques and small-scale excavations.

**RMO:** Rijksmuseum van Oudheden; National Museum of Antiquities.

**ROB:** Rijksdienst voor Oudheidkundig Bodemonderzoek, Dutch State Service of Archaeology, subsequently changed into

**RACM:** Rijksdienst voor Archeologie, Cultuurlandschap en Monumenten, and currently

**RCE:** Rijksdienst voor het Cultureel Erfgoed, State Service for Cultural Heritage.

**SGC:** Single Grave Culture.

**SOM:** Seine-Oise-Marne culture.

**SWB:** Swifterbant.

**taq:** terminus ante quem.

**tpq:** terminus post quem.

**TRB:** Trichterbecher Kultur, Funnel Beaker culture.

**VL:** Vlaardingen culture.

**WSV:** Wartberg-Stein-Vlaardingen complex (north-western component of the SOM culture).

**RMS:** Rhine-Meuse-Scheldt area. Also: RMS group. Mesolithic geographical and cultural unit.

*Abbreviations dated materials (see Oxcal. graphs):*

a.: antler, at.: antler tool, c.: charcoal, b.: bone, bc.: charred remains of bone, bt.: bone tool, hc.: charred remains of hazelnut, cr.: incrustations (aankoeksel), m.: macroremains, mc.: charred macroremains, o.: organic remains, w.: wood, wc.: charred wood.

## List of sites in catalogue ('+' = including site plan)

1. Bergschenhoek +	30. Linden-Kraaijenberg +
2. Bergumermeer S64B +	31. Lommel-Molse Nete
3. Brandwijk-Het Kerkhof +	32. Lommel-Vosvijvers 3 +
4. Brecht-Moordenaarsven 2 +	33. Mariënberg +
5. Bronneger	34. Meeuwen-Donderslagheide 1 +
6. Dilsen-Dilserheide III +	35. Meeuwen-In den Damp I +
7. Doel-Deurganckdok +	36. Melsele-Hof ten Damme +
8. Echt-Annendaal (HVR 183) +	37. Merselo-Haag +
9. Ede-Frankeneng	38. Nijmegen-'t Klumke +
10. Ewijk-Ewijkse Velden +	39. Opglabbeek-Ruiterskuil +
11. Gassel-Over de Voort	40. Oudenaarde-Donk +
12. Gassel-De Zittert +	41. Schokland-P14 +
13. Grave-Pater Berthierstraat +	42. Schipluiden-Noordhoorn +
14. Haamstede-Brabers +	43. St.-Odiliënberg-Neliske (HVR-22) +
15. Hardinxveld-Giessendam De Bruin +	44. Slootdorp-Bouwlust +
16. Hardinxveld-Giessendam Polderweg +	45. Sweikhuizen-de Hei +
17. Hazendonk +	46. Swifterbant-S2 +
18. Hekelingen I +	47. Swifterbant-S3/5/6 +
19. Hekelingen III +	48. Swifterbant-S11/12/13 +
20. Helden-Panningen industrieterrein	49. Swifterbant-S21 +
21. Helmond-Stiphoutsbroek +	50. Swifterbant-S22/23/24 +
22. Hoge Vaart A27 +	51. Urk-E4 +
23. Hüde I +	52. Vlaardingen +
24. Jardinga +	53. Voorschoten-Boschgeest +
25. Kessel-Eik-Keuperheide +	54. Wateringen-4 +
26. Koningsbosch +	55. Weelde-Paardsdrank +
27. Leidschendam +	56. Wijchen-Het Vormer +
28. Liège-Place St.-Lambert +	57. Ypenburg +
29. Linden-De Geest +	58. Zandwerven +



Bergschenhoek	17	Lommel-Molse Nete	37
Bergumermeer S64B	1	Lommel-Vosvijvers 3	37
Brandwijk-Het Kerkhof	20	Mariënberg	9
Brecht-Mordenaarsven 2	35	Meeuwen-Donderslagheide 1	42
Bronneger	3	Meeuwen-In den Damp 1	42
Dilsen-Dilsreide III	45	Melsele-Hoften Damme	34
Doel-Deurgancxdok	33	Merselo-Haag	32
Echt-Annendaal (HVR 183)	41	Nijmegen-'t Klumke	26
Ede-Frankeneng	23	Opglabbeek-Ruiterskuil	43
Ewijk-Ewijkse Velden	24	Oudenaarde-Donk	47
Gassel-Over de Voort	28	Schokland -P14	7
Gassel-De Zittert	28	Schipluiden-Noordhoorn	16
Grave-Pater Berthierstraat	27	St.-Odilienberg-Neliske (HVR-22)	40
Haamstede-Brabers	30	Slootdorp-Bouwlust	4
Hardinxveld-Giessendam De Bruin	22	Sweikhuizen-de Hei	46
Hardinxveld-Giessendam Polderweg	22	Swifterbant-S2	8
Hazendonk	21	Swifterbant-S3/5/6	8
Hekelingen I	19	Swifterbant-S11/12/13	8
Hekelingen III	19	Swifterbant-S21	8
Helden-Panningen industrieterrein	38	Swifterbant-S22/23/24	8
Helmond-Stiphoutsbroek	31	Urk-E4	6
Hoge Vaart A27	11	Vlaardingen	18
Hûde I	10	Voorschoten-Boschgeest	12
Jardinga	2	Wateringen 4	15
Kessel-Eik-Keuperheide	39	Weelde-Paardsdrank	36
Koningsbosch	44	Wijchen-Het Vormer	25
Leidschendam	13	Ypenburg	14
Liège-Place St.-Lambert	48	Zandwerven	5
Linden-De Geest	29		
Linden-Kraaijenberg	29		

Fig. 1 Topographical map with the main sites listed in Appendix I.

## 1. Bergschenhoek

### *Location:*

Bergschenhoek was located on the peaty shores of a lake in the coastal area north of the Rhine-Meuse estuary. After occupation part of the shore broke loose and became re-embedded close by (Louwe Kooijmans 1986; Raemaekers 1999).

### *Site characteristics:*

The site, situated at a depth of –8 m NAP (Dutch ordnance datum), was discovered in 1976 while digging a recreational pond and was subsequently excavated in 1978. The extent of the excavation measures some 100 m<sup>2</sup> (Raemaekers 1999, 97). At its centre is a small, 3 by 4 m living platform (Louwe Kooijmans 1987, 238). Several corings in the vicinity yielded charcoal, indicating the total use-area at the lake-margin may have been larger (pers. comm. L. Verhart 2004).

### *Geology/Pedology:*

The site was situated on a body of peat originating from the lake margin. After occupation the peat body broke loose and became re-embedded in the clay, as is for instance displayed by peat body's frayed edges. The microstratigraphy of the clay matrix suggests flooding and clay deposition during spring and winter, and sedimentation of plant remains during winter (Louwe Kooijmans 1985, 92; 1987, 238). Eventually the site became completely embedded in the clay. On a regional level the site was situated within a saline mudflat area. The freshwater tending to slightly brackish environment of the lake forms a localized break with the salt and brackish conditions of the Calais-II transgressive phase within the coastal area (*ibid.*; Raemaekers 1999).

### *Taphonomy:*

Due to the quick cover up of the site during as well as after its use, Bergschenhoek may be considered one of the best preserved sites of this period. This resulted not only in a refined microstratigraphy, but also (owing to the waterlogged conditions) in an excellent preservation of organic remains. Initially the site was interpreted as a small island that later became embedded in the surrounding clay (e.g. Louwe Kooijmans 1986). Currently however the site is interpreted as part of a shore that broke loose after occupation and subsequently became re-embedded close by (pers. comm. Louwe Kooijmans 2007). This interpretation is less problematic with respect to re-occupation and stability of the location. Furthermore it may explain why some of the finds were found underneath the 'peat-island'.

### *Ecology:*

The site was located in a freshwater lake environment within a saline mudflat area close to the coast. Reed belts bordered the lakes and small groves of hazel, wild apple and sloe might have grown in the vicinity (although the fruits of these trees found on the site, may also have been transported there). Yellow iris and dogwood also grew nearby. The site ecology was influenced by both the proximity of the coast and the rivers (this was for example identified in the clay). The foreign woodland species are thought to have their origins in the westernmost river dunes

and the coastal area (see Out 2008<sup>b</sup>). Furthermore the site yielded a pollen grain of Cerealia, although this should not necessarily be interpreted as an indication for agriculture.

### Dating:

In total four <sup>14</sup>C dates were obtained. GrN-9896 was obtained on wood from an erosional layer underneath the peat and might therefore have yielded an older date (cf. Lanting/Van der Plicht 1999/2000, 57).

Since the site was used during a short span of time (cf. *infra*) it is justified to combine the three youngest dates.

The radiocarbon dates indicate that the site was used between 4340 and 4050 cal BC. The presence of several superimposed hearths provides evidence for a repeated use of the location over a period of three to six years (Louwe Kooijmans 1978, 297). The microstratigraphy of the surrounding clay (cf. *supra*) indicates a maximum use of *c.* ten years (Louwe Kooijmans 1986, 10). There is a 76.3% chance this took place between 4340 and 4220 cal BC.

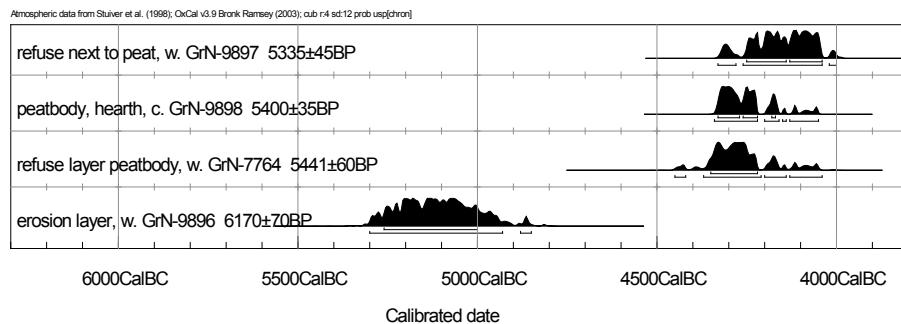


Fig. 2 Radiocarbon dates for Bergschenhoek.

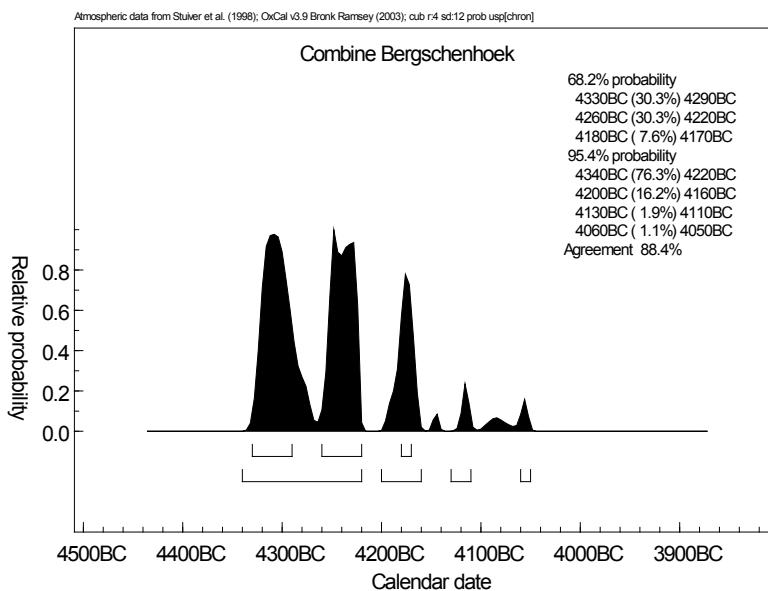


Fig. 3 Combined date for Bergschenhoek.

### *Features/Spatial layout:*

The site was located on a body of peat that was part of a lake-margin and became embedded in clay after its use. Bundles of reeds were deposited on top of the peatbody to make it inhabitable. Wooden boards and small trees were also used for the same purpose (Louwe Kooijmans 1978; 1986; 1987). It is possible that a small hut or construction was erected on the site, although there is no solid evidence for this, apart from wooden stakes driven into the peat (Louwe Kooijmans 1985, 94). A spectacular find were the several superimposed hearths. Within the 32 cm thick microstratigraphy of this feature a succession of 38 different layers was recorded. These usually consisted of layers of reeds and peat on top of which a hearth had been built. In total ten to eleven phases of hearth-use could be reconstructed, probably covering a period of three to six years (Louwe Kooijmans 1987, 297). The remains of at least four fish traps were recovered on top and around the peatbody (also see Out 2008<sup>b</sup>). These may also be interpreted as structural elements of the site (*ibid.* 298).

### *Finds:*

A few dozen sherds tempered with organic material were collected. Some have spatula impressions on the top of the rim (*Randkerbung*) and one rim is reminiscent of a *Tüpfenleist*. A number of sherds had repair holes underneath the rim (Louwe Kooijmans 1985; Raemaekers 1999). Only three flint artefacts were recovered amongst which a small retouched blade. A fragment of a quartzite adze-shaped *Walzenbeil* with oval cross-section was also found (Louwe Kooijmans 2005, 266; Raemaekers 1999, 97). Ten Anscher (in prep. 71) mentions these may be indicative of southern contacts (possibly Rössen).

Most spectacular however are the wooden and bone artefacts that were preserved. They comprise at least four locally made fish traps of dogwood, several pointed arrows of ash (*Fraxinus*), pointed sticks, elements of a leister prong, part of an antler axe, an antler axe blade, a bird bone awl, pieces of rope, baked clay net weights and several irregular boards of a canoe (Louwe Kooijmans 1985, 78, 98; 1987, 240).

Among the faunal remains the dog (*Canis familiaris*) is the best represented of the domestic animals. Remarkably this included the find of several skeletons of young puppies adjacent to the body of peat. Apart from domestic animals, many remains of wild fauna and fish were found. The mammals comprise wild cat, grey seal and otter. The remains of hunted fowl were however the most informative on seasonality and site-use. The remains comprise both resident species, such as mallard, tufted duck, bittern, and eider as well as winter guests such as Bewick's swan, goosander, golden eye and widgeon. The specific winter spectrum of the birds is further supported by the fish remains, typically lacking anadromous summer species such as sturgeon or thin-lipped mullet (Louwe Kooijmans 1987, 240; Raemaekers 1999, 97). In general the spectrum of fish indicates fresh or slightly brackish conditions (Louwe Kooijmans 1985).

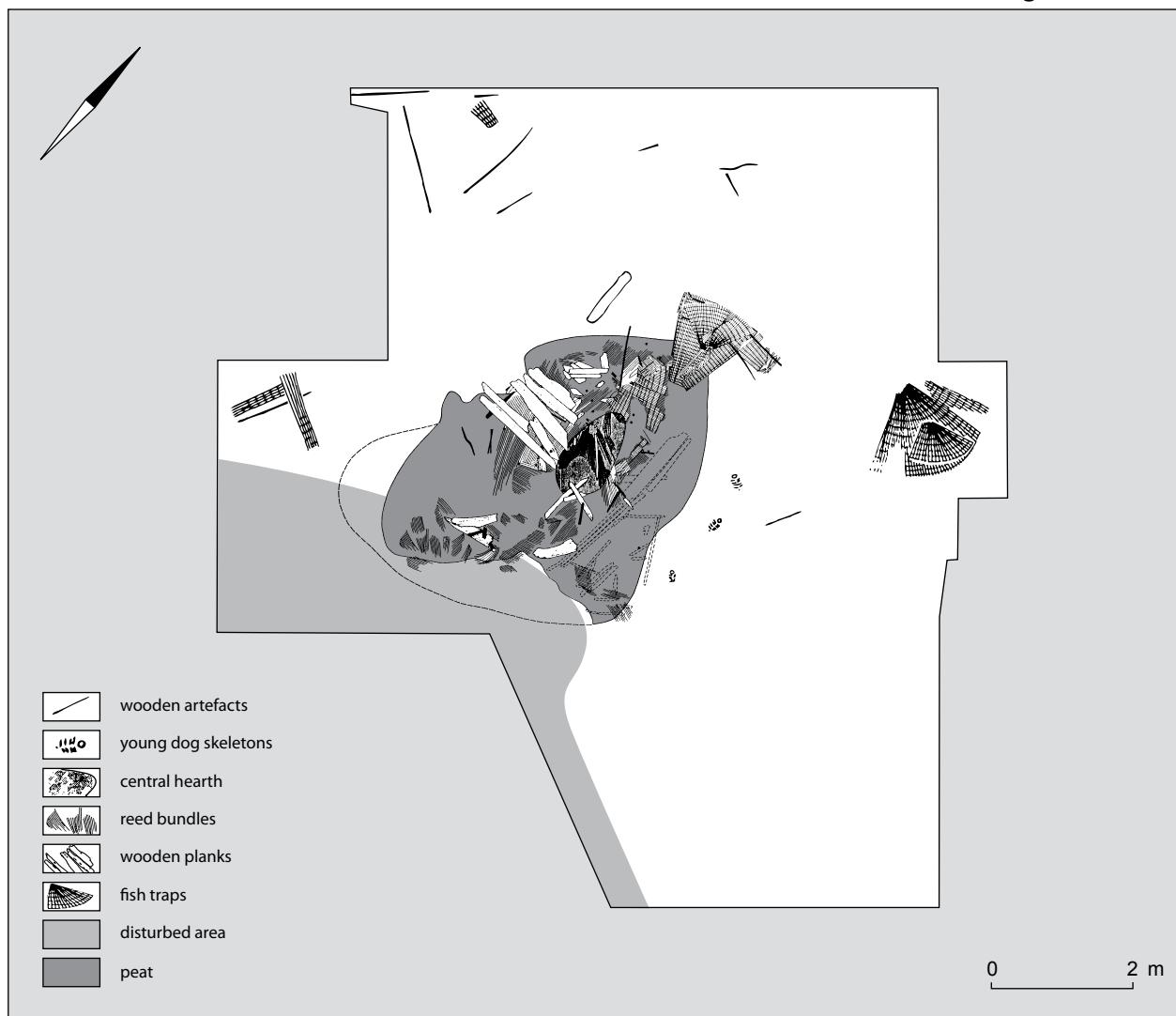
The botanical remains of wild apple, hazelnut and sloe are indicative of autumn, yet may just as well have been dried and brought to the site (*cf.* Bakels/Zeiler 2005, 319).

### Interpretation:

Bergschenhoek is a unique site with respect to preservation of organic remains and internal chronostratigraphy. This enables a rather high-resolute interpretation. The site should be considered a small special activity site or camp on the margin of a lake that was revisited on an annual basis during a period of approximately ten years. Within this period three to six main occupations of the site took place as was witnessed in the stratigraphy of the hearth. Activities at the camp comprised hunting, fishing and fowling with a dominance of fishing and especially fowling. The bird remains quite clearly indicate a presence in the winter. For some species this may vary between October and May (Bakels/Zeiler 2005, 319) yet the abundance and specific constellation of different species as well as the fact that the site was probably used for a limited duration at one time argues for a presence in winter and perhaps autumn. After use the piece of lake-margin peat became re-embedded in the clay. Charcoal in corings in the vicinity may indicate the presence of more camps. Furthermore it should be realised that the specific function of Bergschenhoek should be interpreted in its wider setting. An important aspect of

*Fig. 4 Bergschenhoek. Overview of the camp-site (phase 3 out of 4). Clearly visible are the fish traps and the wooden planks that supported the activity area. In the direct vicinity of the site a number of wooden artefacts as well as the skeletons of several young dogs can be seen. Notice the small extent of the location. Adapted from Louwe Kooijmans 1993<sup>b</sup>, fig. 8, Louwe Kooijmans 1978, fig. 22 and Bloemers et al. 1981, 43.*

Bergschenhoek



this is the vicinity of several donken (*e.g.* Hillegersberg and several of the recently discovered sites around Rotterdam) at a distance of *c.* 15 km to the east. It is very plausible that Bergschenhoek may have had an auxiliary function in relation to these sites.

*References:*

Bakels/Zeiler 2005  
Clason/Brinkhuizen 1993  
Lanting/Van der Plicht 1999/2000  
Louwe Kooijmans 1978  
Louwe Kooijmans 1985  
Louwe Kooijmans 1986  
Louwe Kooijmans 1987  
Louwe Kooijmans 2005  
Out 2008<sup>b</sup>  
Raemaekers 1999

## **2. Bergumermeer S64-B**

*Location:*

The site is located on a Late Glacial coversand ridge bordering Lake Bergumermeer in the province of Friesland in the northern Netherlands. The site was surrounded by a wetland landscape with open water on three sides (100-150 m, Casparie/Bosch 1995). To the north of the location there is another elevation with habitation (chronologically separated by *c.* 500 yrs, Odell 1980).

*Site characteristics:*

In 1971 and 1972, the University of Groningen excavated 1200 m<sup>2</sup> of the site covering almost the entire dune. Virtually all the finds were recorded three-dimensionally.

*Geology/Pedology:*

In the dune sand a podzol exists post-dating the Mesolithic settlement (Newell 1980, 256). On the dune sand re-deposited peat was found at the lower elevations, superimposed with a marine clay and 'terp ground' layer on top. According to Casparie and Bosch the entire ridge was covered by a thin peat layer that did not predate the Subatlantic (1995, 235).

*Taphonomy/Site-formation:*

The site has been on or at the surface until the Subatlantic (*c.* 800 cal BC) implying that older as well as younger material may have been mixed. Bioturbation and especially treefalls (at least 19, *cf.* Newell 1980, table 13) have further disturbed the site. Huiskes (1988, 39) also mentions subsidence and water erosion.

### *Ecology:*

Palynological evidence indicates the presence of open water, which is confirmed by finds of waternut within the excavation. Hazelnuts, wild cherry and acorns were identified as well (Casparie/Bosch 1995; Odell 1980).

### *Dating:*

Twenty-four (24) radiocarbon dates were analysed. Two dates relate to S64-A. Four dates are rejected on the basis of no or insufficient sample treatment (*cf.* Casparie/Bosch 1995; Lanting/Van der Plicht 1997/1998, 136-137). Five dates concerning the Subatlantic have not been plotted. Furthermore Niekus (2005/2006) corrected the provenience of dates GrN-6843 and GrN-14884 as well as the range of GrN-14889.

Apart from GrN-14889 indicating the start of the occupation around 6500 cal BC, a first distinct phase of site-use can be placed around 6340-5920 cal BC (GrN-14886/7927). A next phase of use is indicated between 5890-5250 cal BC (GrN-12000/GrN-14885/GrN-14884/GrN-14891). Due to overlap and the broad ranges of most dates and especially GrN-14890 and GrN-11998, the above periodisation is speculative. GrN-11999 and GrN-14887 represent two distinct Neolithic moments of activity. The radiocarbon dates underscore the Late Mesolithic occupation of the site, but their association to the artefacts is an assumption. The latter indicate occupation during multiple periods, including the Late Palaeolithic, Neolithic and Bronze Ages (Niekus 2012, 81).

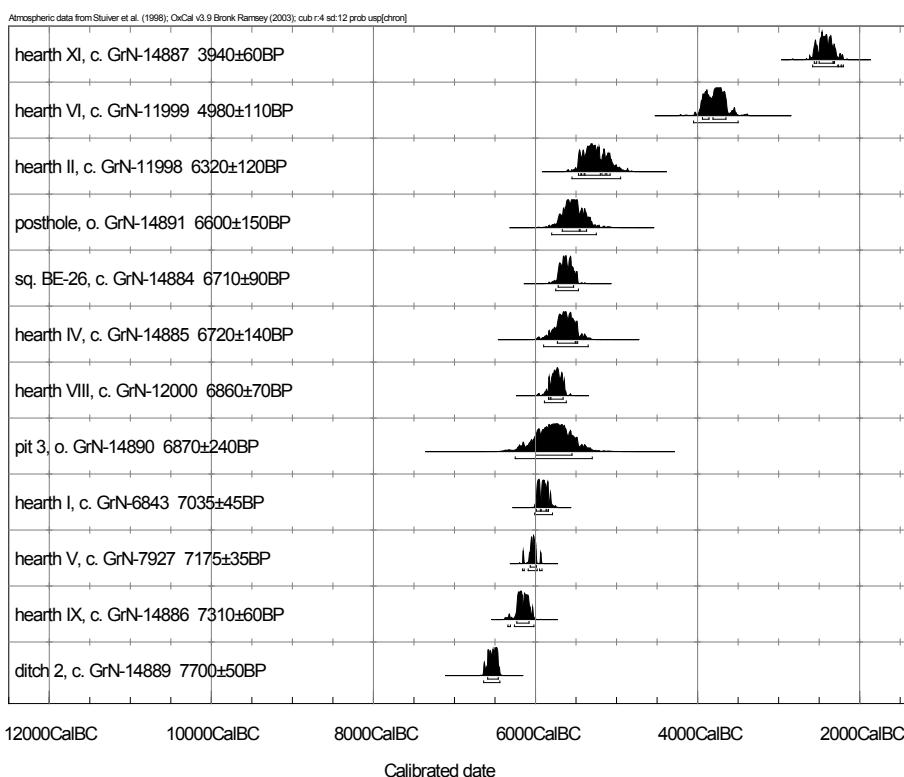


Fig. 5 Radiocarbon dates for Bergumermeer.

### *Features and spatial layout:*

Apart from 19 tree-fall features the site yielded 15 hearths with a depth of up to 30 cm, 13 of which are assigned to the Mesolithic. This is partially confirmed by  $^{14}\text{C}$  dates (*cf.* Newell 1980, 257 and fig. 3). In total some 28 Mesolithic 'pits' were identified. The more neutral term features might however be more appropriate (*ibid.*). Six elliptical configurations of 17-22 manuports coinciding with a compacted yellow to orange elliptical band as well as with a locally raised B2 horizon were uncovered. These features (measuring 7.2-8 m in length and 4-5.2 m in width) have been identified as hut dwellings on the basis of dimensions and statistical analysis (*ibid.* 260). All hearths and pits are claimed to be either inside or within 3 m of the structures and are spaced evenly over the site.

Newell (1980, 265, fig.4) suggests there is a fixed relationship between the floor and surface area of the structures and their associated primary activity areas. Odell (1980, 409) further indicates that most utilized tools were found in units close to or associated with hearths. A recent re-analysis of the site by Niekus (2012) indicates that both older and younger Mesolithic features are present over the entire ridge. Moreover, no distinct association between features and finds could be established (*ibid.*, 83). This lack of distinct association thus questions the interpretation of a number of the Bergumermeer features as Late Mesolithic huts. The association of these horseshoe-shaped features to the concentrations of finds is interpreted as questionable (*ibid.*, 84).

### *Finds:*

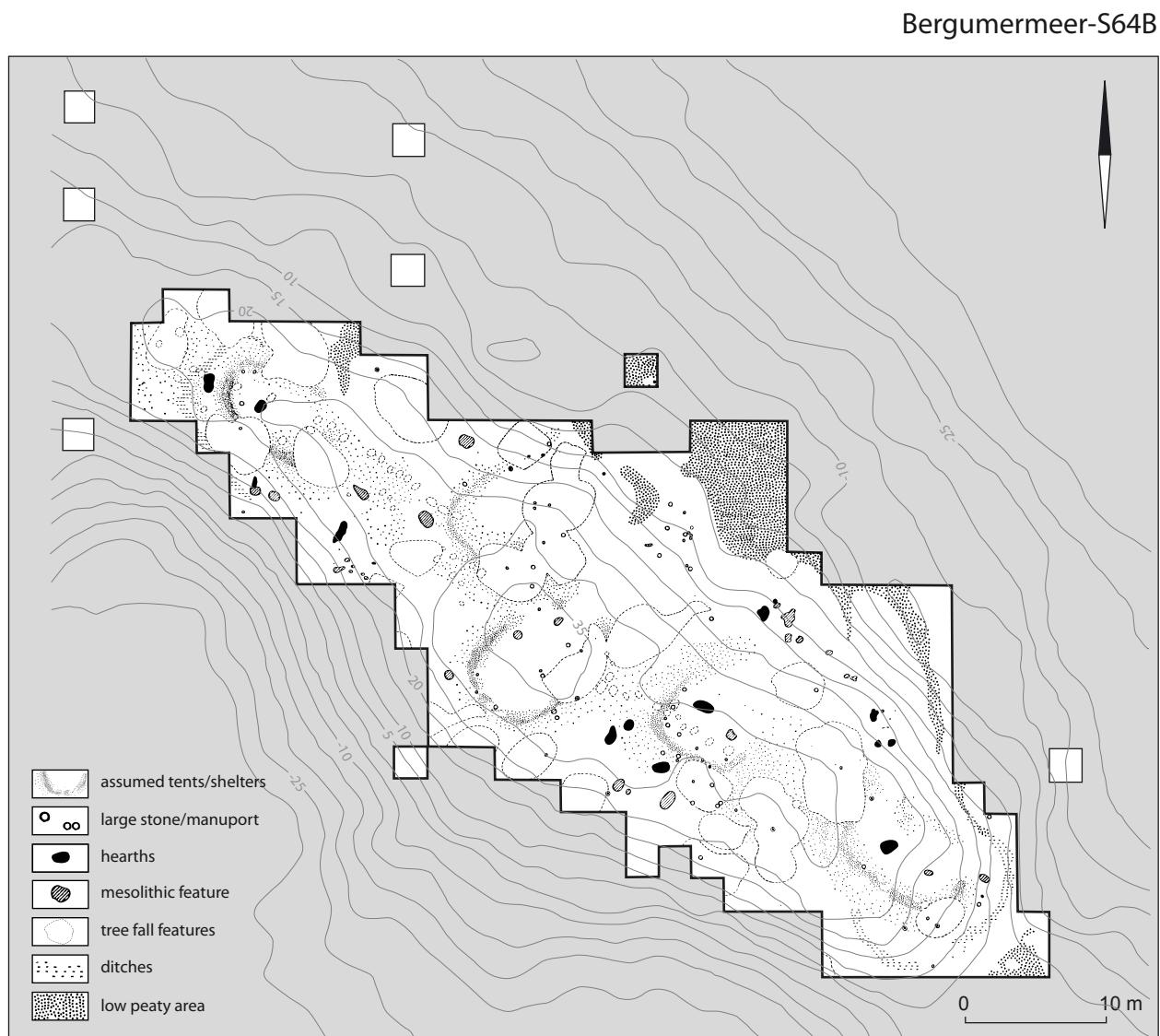
In total some 123,746 artefacts were found (Bloemers *et al.* 1981). Detailed analysis of the relation between the functional and spatial aspects of the finds has yet to be undertaken. Use-wear analysis by Odell (1980) indicates a wide range of activities (*e.g.* contact with wood, bone and antler as well as projectile usage). He further speaks of 3635 retouched pieces (*ibid.* 408). Charred remains of waternut, hazelnuts, wild cherry and acorns were identified (Casparie/Bosch 1995; Odell 1980). In a preliminary report Newell and Vroomans give a first typological assessment (1972, 90). Points dominate the spectrum, followed by scrapers, knives, backed blades, burins and borers, axes and diverse other tools. At Bergumermeer S-64B trapezes are followed by B-points and A-points (*ibid.* 91). Although the Late Mesolithic assemblage is significant, Niekus (2012, 81-83) emphasizes the palimpsest character of the assemblage, which includes both earlier Late Palaeolithic and Early Mesolithic artefacts as well as later Neolithic and Bronze age finds.

### *Interpretation:*

On the basis of statistical analysis both Odell (1980) and Huiskes (1988) have tried to interpret the intrasite characteristics of Bergumermeer. Odell argues that the same group seasonally occupied the site during a minimum period of up to 35 yrs (1980, 423). Huiskes (1988, 57, 58, 60) suggests that the  $^{14}\text{C}$  dates indicate a continuous occupation. He opts for occupation of all six dwellings once a year as a maintenance camp and occupation of one or three dwellings twice a year as extraction camp (although almost all 'hut dwellings' have been dated indirectly and the date for dwelling V,  $6745 \pm 85$  is not to be found in either Lanting/Van

der Plicht 1997/1998 or Casparie/Bosch 1995). The interpretation of both the hut dwellings of Bergumermeer and their spatial context is seriously hampered by the lack of published data. Although the supposed hut features statistically might differ from tree-falls this does not yet make them anthropogenic. However while not denying the possibility of dwelling structures, and accepting that the site may have seen episodes of more intense activity, its palimpsest character (both relating to the prolonged use as well as the stable surface), in combination with the disturbance by bioturbation, especially treefalls, forms a serious problem in its interpretation. This was recently further confirmed and underlined by a re-analysis of the find material by Niekus (2012). According to that study, the site should be interpreted as a multi-period palimpsest. Furthermore it stresses that there is no unambiguous relationship between the supposed hut features and the concentrations of finds, and it questions the interpretation of the former as hut dwellings (*ibid.*, 81-84).

Fig. 6 Bergumermeer-S64 B. Location of the assumed tents or shelters. Visible are the hearths situated on the crest of the ridge. Notice the intense post-depositional disturbance by tree falls. Adapted from Newell 1980, fig. 3 and Bloemers et al. 1981, 33.



### *References:*

Bloemers *et al.* 1981  
Casparie/Bosch 1995  
Huiskes 1988  
Lanting/Van der Plicht 1997/1998  
Newell 1980  
Newell/Vroomans 1972  
Niekus 2005/2006  
Niekus 2012  
Odell 1980  
Peeters/Niekus 2005

## **3. Brandwijk-Het Kerkhof**

### *Location:*

The donk of Brandwijk-Het Kerkhof is located in the region of the Alblasserwaard in the western downstream part of the Dutch Rhine-Meuse delta. It is situated 250 m south of the donk of Brandwijk and 4.5 km to the NW of the Hazendonk (Van Gijn/Verbruggen 1992, 349).

### *Site characteristics:*

The site was discovered by an augering campaign within the *donkenproject* of M. Verbruggen (Verbruggen 1992<sup>a</sup>; Verbruggen in prep.) in 1990. In order to correlate and interpret the augering data from several *donken* (plural), a small part of Brandwijk-Het Kerkhof was excavated in 1991. The *donk* itself is rather small and round (currently Ø 75 m). In the deposits covering the southern slope, four refuse layers were found with a combined surface area of 1,100 m<sup>2</sup>. The stepped excavation trench was located where three of the four layers could be recorded (Van Gijn/Verbruggen 1992, 350-351). The trench was 3 m wide and covered 29 m<sup>2</sup>. It was located perpendicular to the slope of the river dune. Finds from three refuse layers (L30 (base), L50 and L60 (top)) were recorded (*ibid.* 351). The site was excavated in squares and a large section across the trench was documented. Micromorphological (in the eastern section) and palynological samples (in the western section as well as at some distance from the dune) were retrieved (Van Poecke 1991, 4-6). Finds were recorded three-dimensionally.

### *Geology/Pedology:*

The site is situated on a Late Glacial dune, located in the so-called peri-marine zone. This led to a succession and stratigraphy of clastic and organic (peat) sediments (Van Poecke 1991). Dependent on the specific local circumstances (presence of channels etc.) both depositional and erosional environments can exist side by side (Rikkers 1985, 117). According to De Ridder and Thanos (1993, 26), most of the occupation phases at Brandwijk could be correlated with quiet episodes in the geological history of the area, characterized by a large extent of open water. Through continuous deposition, the actual surface of the dune slowly shrank. Within the sedimentary stratigraphy some 13 layers could be identified. In total three important refuse levels could be identified: L30, L50 and L60 (Van

Poecke 1991, 9-10). These developed within an alder carr environment (Van Gijn/Verbruggen 1992, 351). L30 contained a small number of artefacts and charcoal. On the basis of micromorphology, L50 could be subdivided in L50 base and L50 top, separated by a relatively clean layer in between. L60's position high up on the dune explains why it is less rich in finds than L50. L70, forming the peat cover of L60, contained one potsherd and can be used as a *terminus ante quem* (Raemaekers 1999, 44). L15 finally is associated with the top of the river dune and cannot be dated (L15 included a fragment of a grinding stone and a cattle bone). Other, less substantial layers are layer L345 including bone and charcoal, yet no artefacts; layer 20 and layer 80. L45 (between L30 and L50) yielded botanical evidence for restricted human impact (Out 2009(2010), 61). Combined, the layers indicate the presence of more intensive phases of occupation interspersed by phases of limited human activity.

#### *Taphonomy:*

As is the case with other *donken*, most information is derived from the refuse layers. The top is disturbed by post-depositional processes, and subsequent occupations have contributed to the existing palimpsest. This disturbance is demonstrated by the contrast in finds and information between layers L50 and L60. Aside from occupational intensity, taphonomic history also forms a factor. Furthermore some of the layers excavated show influence of trampling and reworking of material (Van Poecke 1991, 9).

#### *Ecology:*

Around Brandwijk a variety of wetland environments was present. The general trend however indicates a development from a dense alder carr towards an open alder carr with open water (Out 2009; Out 2009(2010); Van der Woude 1983). Vegetation on top of the dune itself consists of a mixed deciduous forest with lime, oak, elm and ash (Out 2007). Several times anthropogenic activity is attested by evidence of a more open vegetation, although indications are weak and may also be induced by fluctuating water levels. L50 has a more distinct anthropogenic signal, correlating with an increase of upland shrubs, pollen of *Artemisia*, *Plantago lanceolata*, *Persicaria* spec. and *Cerealia* (no distinction could be made between base and top for the archaeobotanical investigations of pollen and macroremains, pers. comm. W. Out 2005). This corresponds with most indicators for open water, which may relate to increased accessibility of the dune (*ibid.*). Apart from this there was also evidence of anthropogenic influence on the wetland vegetation, especially alder (*Alnus*). Marine influence on the vegetation seems to have been very small or absent (*ibid.*). Alder carr and eutrophic freshwater vegetation could be found on the slopes and in the surrounding wetland area (Out 2008<sup>a</sup>). With regard to L50 top and L60 anthropogenic impact on the vegetation could be recorded.

#### *Dating:*

In total 11 archaeological samples were dated (Lanting/Van der Plicht 1999/2000, 57; Raemaekers 1999, appendix 3, 201; Verbruggen in prep.). One of these (GrN-19076) could be discarded since it was too young and probably intrusive (*cf.* Lanting/Van der Plicht 1999/2000, 57). Within the remaining dates a clear subdivision per layer is visible, indicating the site was inhabited during several

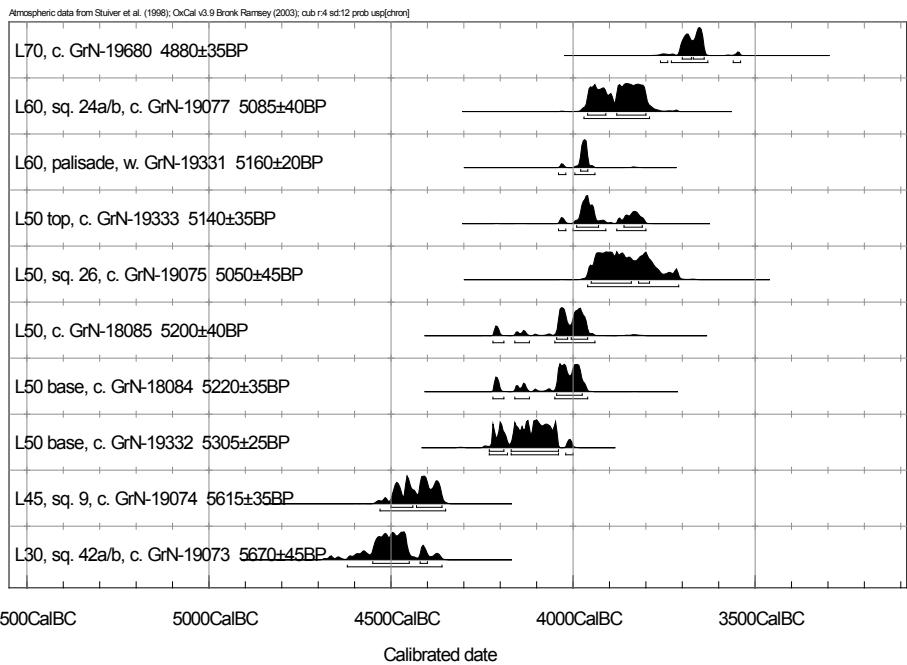


Fig. 7 Radiocarbon dates for Brandwijk-Het Kerkhof.

Table 1. Main phases of occupation with reduced calendar ranges.

Phase	Date cal BC	Reduced	2 $\sigma$ range	References
L70	3700-3660	yes	3762-3546 (GrN 19680)	Raemaekers 1999, app.3, 201-202
L60	3940-3820	yes	3987-3952 (GrN 19331)	Raemaekers 1999, app.3, 201-202
L50 top	4030-3940	no	4030-3808 (GrN 19333)	Raemaekers 1999, 44, app. 3 201
L50 base	4220-4100	yes	4228-4008 (GrN 19332)	Raemaekers 1999, app.3, 201-202
L30	4610-4550	yes	4668-4364 (GrN 19073)	Raemaekers 1999, app.3, 201-202

phases. Apparently the hiatus between L50 and L60 is substantially less extensive than the hiatus between L30 and L50. Noteworthy is the fact that both L50 and L60 have the same internal morphological composition (Van Poecke 1991, 9).

For the main occupation phases reduced calendar ages were calculated. This was produced on the basis of conventional  $^{14}\text{C}$  dating the interpolation of groundwater levels of other sites in the region (see Out 2009(2010), 55; Raemaekers 1999, 202; Verbruggen 1992<sup>b</sup>; in prep.). The 2 $\sigma$  range is presented as well.

While the site was first visited during the transition from the early SWB to middle SWB culture, the main occupation phase (L50) can be dated to the middle phase of the SWB culture.

#### Features/Spatial Layout:

The spatial layout of Brandwijk differs per phase. Remarkable is the substantial increase in extent between L30 and L50.

Around 4000 cal BC the surface of Brandwijk measured approximately 1 ha. At that time the donk rose 4 m above its surroundings. Open water could be found 15 m south of the dune (Van Gijn/Verbruggen 1992, 351). Within the find horizons of the separate phases not many features were recovered. Most features probably were located on top of the dune. One structure forming a palisade or series of pointed stakes (mostly oak) was found in L60. Interpretations range from

Phase	Extent	Thickness	Location slope	Reference
L60	Top + 1600 m <sup>2</sup>		SE	Raemaekers 1999/Verbruggen in prep.
L50	Top + 1500 m <sup>2</sup>	40 cm	S, E and N	Raemaekers 1999/Verbruggen in prep.
L30	Top + 200 m <sup>2</sup>		southern slope	Raemaekers 1999/Verbruggen in prep.

Table 2. Site extent at Brandwijk per layer.

an enclosure to fence in animals (De Ridder/Thanos 1993, 27) to a camp-shed bordering open water (Van Gijn/Verbruggen 1992, 352).

### Finds:

In total some 4000 finds were recorded for Brandwijk. The pottery and flint assemblage of Brandwijk L30, L50 base, L50 top, L60 and L70 were studied by Raemaekers (1999, 44-59).

Within the pottery assemblage all sherds can be attributed to the SWB tradition. One sherd from L30 however might indicate southern influence by Bischheim or Blicquy, since it was decorated with a three-pointed spatula. The pottery assemblages from L50 base, L50 top and L60 are very similar. An increase in grit as tempering agent (next to mainly organic temper) is recorded for L50 top. Furthermore fewer sherds within the L60 assemblage are decorated. Most pots must have had a distinct S-shaped profile. L70 is dated to around 3600 cal BC contemporaneous with the Hazendonk group, yet the single sherd found is clearly of SWB origin (Raemaekers 1999, 54-55).

Within the flint assemblage L30, L50 base, L50 top and L60 consist of several types of raw material (terrace flint, pebble 'Meuse eggs', Rijckholt type and Lightgrey Belgian type). From L50 top onwards Rijckholt flint becomes predominant. From L50 base onward the amount of cortex on the artefacts decreases. Flake technology is technologically the most common in all phases. The tool assemblage of L30 comprises a trapeze and three retouched flakes. L50 base comprises a drop-shaped and a leaf-shaped point, a borer and a scraper, and L50 top a leaf-shaped point of Rijckholt-flint and some scrapers. In L60 only one drop-shaped point was documented (Raemaekers 1999, 55-59).

Organic remains were also recovered at Brandwijk. Ten bone and antler artefacts were found comprising chisels, awls and points, mainly fabricated on the bones of wild animals (Robeerst 1994, 10, 53). Cereal remains of emmer wheat and naked barley and a small number of chaff remains of the latter species were found in L50 and L60. Their absence in L30 may not be significant (see Raemaekers 1999, 59; Out 2007; 2009(2010)). Apart from this the site also yielded cereal pollen (Out 2008<sup>a</sup>). Out (2008<sup>a</sup>) however argues against local crop cultivation of a more than limited scale, because of the wet circumstances, the absence of sickle blades and the small size of the dune. The faunal evidence points to a dominance of pig or wild boar, otter and red deer in all phases. Furthermore a minority of domestic species was attested, comprising cattle, dog, pig and ovicaprids (Raemaekers 1999;

Phase	Npottery	Wpottery	Nflint	Wflint
L70	1	-	-	-
L60	203	4429	53	105.9
L50 top	268	6085	29	110.5
L50 base	765	15983	80	319.4
L30	9	45	31	48.7

Table 3. Npottery is number of pottery, Wpottery is weight in grams (g), etc.

Robeerst 1995). Cattle was documented in layer 50, but could only be quantified for layer 60. Some evidence exists for sheep/goat and pig in L30 (see Out 2009). At least some of these bones may however factually originate from layer 50 (pers. comm. D. Raemaekers 2007). Bird remains both comprise resident species as well

### Brandwijk-Het Kerkhof

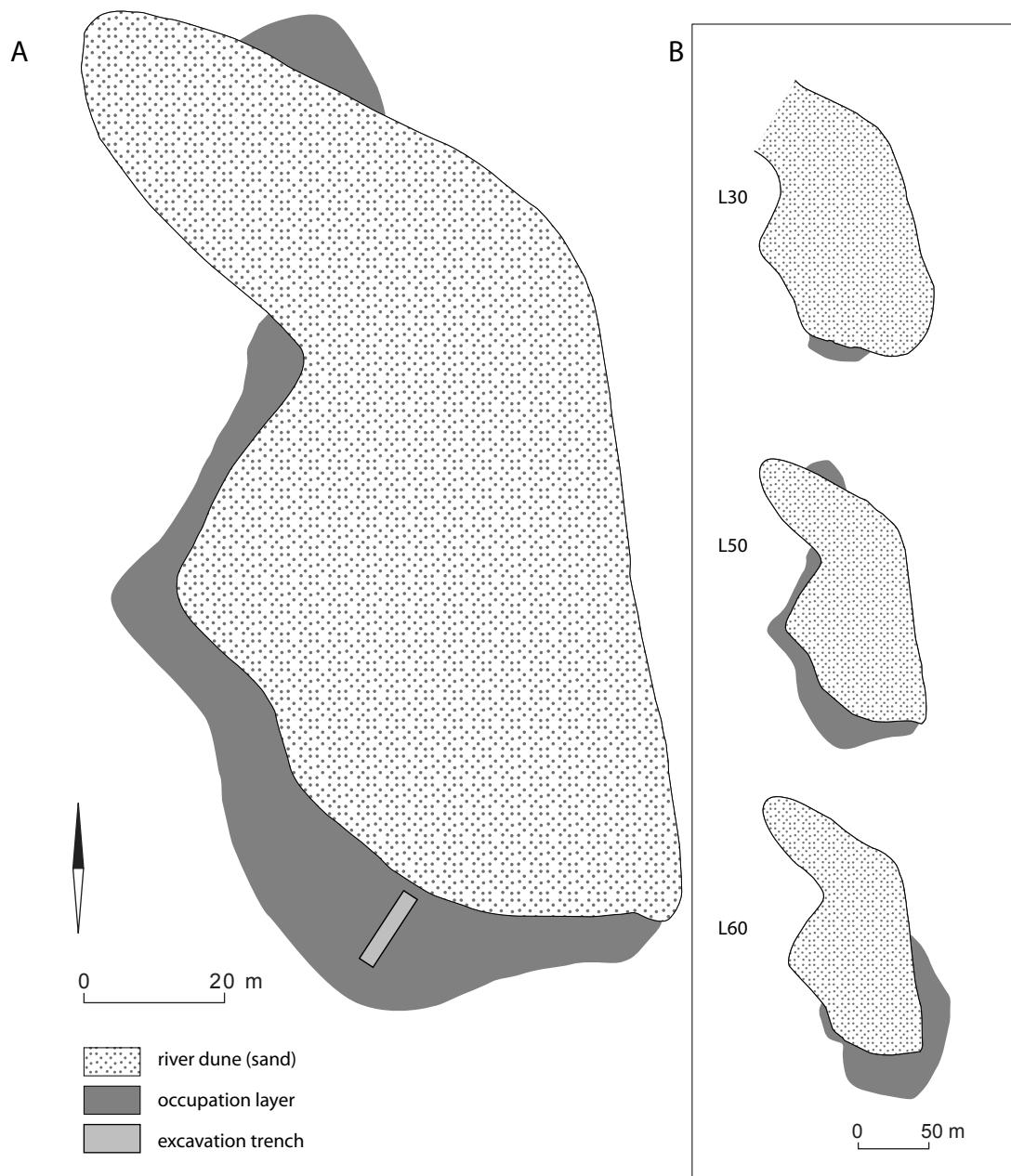


Fig. 8 Brandwijk-Het Kerkhof. (A) location of the excavation trench in relation to the main body of the river dune and the extent of the layer with archaeological material on the slope. Notice the small extent of the trench. (B) extent of the layer with occupation remains and refuse during three consecutive periods, L30 (4610-4550 cal BC), L50 (4220-3940 cal BC) and L60 (3940-3820 cal BC). Adapted from Raemaekers 1999, fig. 3.6 and Out 2009, fig. X.X. For a section see Out 2009, appendices (2010) fig. II.2, pp. 55.

as winter visitors. Among the fish remains, freshwater, anadromous and marine species (of the mullet family and capable of entering fresh water) are present. Sturgeon and salmon indicate a human presence in winter (Ball 1997; Raemaekers 1999).

#### *Interpretation:*

As with the Hazendonk, Brandwijk is especially important for understanding the process of Neolithisation because of its long-term diachronic perspective. Changes in site-use, contacts and subsistence may be recorded at these locations. The material evidence of Brandwijk mostly indicates a strong continuity. This is demonstrated by the similarities in the pottery and flint assemblage (Raemaekers 1999, 54, 59), as well as the faunal remains (Raemaekers 1999; Robeerst 1995). Although the time-depth of the various layers indicates that we are dealing with recurrent visits to the site, the continuity within the material remains enables a coherent interpretation of site use. In this respect Brandwijk may be considered a base camp that was used in several distinct phases, separated by apparent hiatuses during a period of approximately 1000 years. The seasonal indicators point to activities in both the summer and the winter (Raemaekers 1999; Robeerst 1995). According to Out (2009 (2010), 85-86) an occupation in autumn and possibly summer is possible for L30, while summer and autumn is most likely for L50 and L60. Year round occupation cannot be refuted (Raemaekers 1999, 61), although in the light of the specific activities (dominance of pig/wild boar, otter and red deer), the absence of permanent structures and the unsuitability of the environment for growing crops (Bakels 1981; Out 2008<sup>a</sup>; Out 2009), seasonally related occupation seems more likely. However, pinpointing the character of the occupation suffers from the small extent of the excavation. It is likely that if any crop cultivation took place this would have been on a small-scale level, or would have been situated elsewhere (also see Out 2009(2010), 85).

#### *References:*

- Bakels 1981
- Ball 1997
- Lanting/Van der Plicht 1999/2000
- Out 2008<sup>a</sup>
- Out 2009
- Out 2009(2010)
- Van Poecke 1991
- Raemaekers 1999
- De Ridder/Thanos 1993
- Rikkers 1985
- Robeerst 1994
- Robeerst 1995
- Van Gijn/Verbruggen 1992
- Verbruggen 1992<sup>a</sup>
- Verbruggen in prep.
- Van der Woude 1983

## 4. Brecht-Moordenaarsven 2

### *Location:*

The site is located on a parabolic Late Glacial dune on the eastern limit of an extensive dune landscape in the north-western part of the Belgian Kempen. Numerous depressions (*vennen*) characterize the area. One of these (Moordenaarsven) is located between the arms of the dune.

### *Site characteristics:*

The site consists of three locations (BM 1, 2 and 3). Two of these (BM 1 and 2) have been excavated (Vermeersch/Lauwers/Gendel, 1992). Since BM-2 (172 m<sup>2</sup>), excavated by Leuven University in 1981 and 1982, has the most informative sample it shall be discussed here.

### *Geology/Pedology:*

The dune rests upon Late Glacial coversands on top of marine Pleistocene deposits (to the south and east) (Bubel 2002/2003, 398). In the dune sand a wet forest soil developed. Artefacts have been deposited on a stable surface. Most finds were located in the A2 and B2 horizon. The development of a podzol was a later phenomenon. Vertical dispersion due to soil turbation probably took place late in the Atlantic/Sub-Boreal, contradicting the opinion of a later cover of 25 cm of dune sand (Vermeersch/Lauwers/Gendel, 1992, 67).

### *Taphonomy/Site-formation:*

Apart from ditches for a pine plantation, the location of the site has not been cultivated. Part of the northern margin of BM-2 was disturbed by motorway construction activities, part of the southern margin by wind erosion. The vertical distribution of artefacts extends over 35 cm but clusters around 15 cm. It is unknown whether the current vertical distribution is the result of trampling and bioturbation prior to the post-depositional cover (*ibid.* 10), or that it might have moved down from the layer underneath the topsoil. The artefact distribution can probably be placed before the development of the podzol (*ibid.* 42). Although there is only one artefact horizon, there is no positive indication of a single occupation (*ibid.* 40). It should be expected the site knew extended periods of surface-stability.

### *Ecology:*

Palynological research of the fen and the podzol could not pinpoint or clarify the Mesolithic habitation, since important parts of the Boreal and Atlantic sequence were missing (*ibid.* 13).

### *Dating:*

In total 6 conventional radiocarbon dates could be obtained. Five dates stem from charcoal fragments within features located either within the A2 or B2ir. One date (Lv-1295D) comes from dispersed charcoal fragments within the concentration, but is not in contradiction.

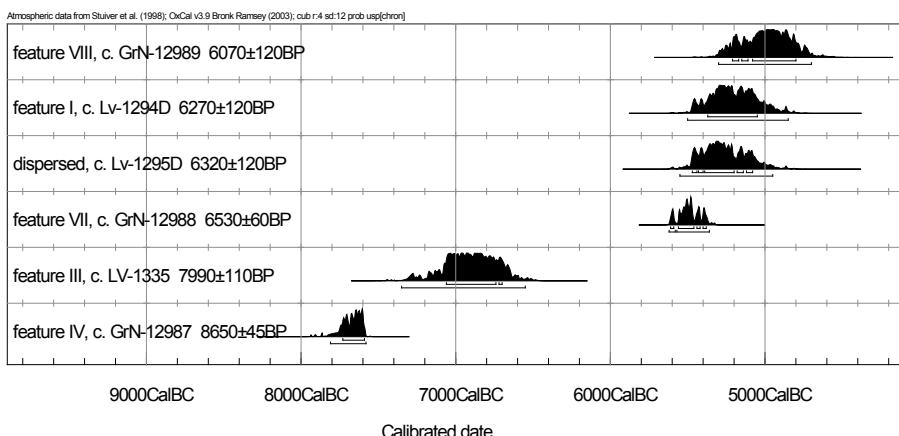


Fig. 9 Radiocarbon dates for Brecht-Moordenaarsven.

The dates clearly indicate an earlier occupation phase dating to either the Early or Middle Mesolithic and a later occupation in the Late Mesolithic (*c.* 5400-4800 cal BC).

#### *Features and spatial layout:*

In total 9 features could be identified. Four of these (I, III, VII, VIII) can be characterized as basin-shaped pits containing charcoal concentrations as well as some artefacts. Feature III yielded an older date. The other features are charcoal concentrations with a shallow depth. The pit- and surface hearths correlate to some extent with a higher concentration of phosphate (*ibid.* 42-46, 55). The site yielded an oval cluster measuring 12 x 7.5 m, comprising lithic artefacts and charcoal (*ibid.* 6). Within the concentration some denser patches can be identified.

#### *Finds:*

Apart from some fragments of burnt sandstone, ochre nodules and three intrusive Neolithic artefacts, BM-2 yielded 24,000 flints (9854 of which were three-dimensionally recorded). Tools as well as debitage and cores were present. Most of the raw material came from local fluviatile terraces. Wommersom quartzite makes up 11% of the flint assemblage. Very small quantities of phtanite and micaceous sandstone artefacts were also found (*ibid.* 16). Typology and radiocarbon dates indicate two separate occupations. By quantitative comparison of BM-2 with the nearby pure Late Mesolithic assemblage of Brecht-Thomas Heyveld (BTH) (Lauwers/Vermeersch, 1982) the authors have tentatively tried to single out the Early and Late Mesolithic assemblages. Typical of the late assemblage is the high number (44%) of tools of Wommersom quartzite. On the basis of this analysis the Early Mesolithic assemblage consists of 552 tools and the Late Mesolithic assemblage of 294 tools (*ibid.* 58-64). Three points of Neolithic affinity were also found. One of these was associated with the Mesolithic material (*ibid.* 38).

#### *Interpretation:*

If the artificial division between the Early and Late Mesolithic assemblages is accepted, than the Late Mesolithic and especially Wommersom quartzite clusters in the northern part around features I-VII and VIII (so between hearths V, VI



Fig. 10 Brecht-Moordenaarsven 2. Lithic distribution with concentrations bordering on the Moordenaarsven to the south. Notice the recent ditches, eroded area and disturbance by tree falls. Adapted from Vermeersch et al. 1992, fig. 22 and 23.

and VII) as well as in the south around feature IV. The central concentration of artefacts measuring about 5 m, east of feature III, mainly comprises tools belonging to the earlier occupation. The Late Mesolithic areas also remarkably coincide with a higher phosphorus concentration in the soil (*ibid.* 66).

The artificial division in an Earlier and a Later Mesolithic occupation is a legitimate attempt yet based on a large number of assumptions. Late Mesolithic artefacts are in fact found all over the site (*ibid.* 63) and most features were dated late. Furthermore the division is based on the assumption that BTH and BM-2 are inter-comparable regarding site function and permanency. However the assemblage of BTH is for an important part formed by the surface collection of this highly disturbed site. No separation between clusters was possible. BM-2 therefore results from one or multiple occupations in the Early and Late Mesolithic. The artificial separation is slightly supported vertically (Bubel 2002/2003, 395-438). The latter occupation(s) averagely date between 5320 and 4950 cal BC (cf. Vermeersch/Lauwers/Gendel 1992, 67). Probably most of the hearths and features also date to this period. An alternative subdivision would be to define a southern,

middle and northern Mesolithic zone. The middle zone would then be delimited by the distribution of trapezes, Montbani blades, backed blades and microburins and may have had a different function compared to the northern and southern concentration. Features and finds indicate use as a basecamp.

#### *References:*

Bubel 2002/2003  
Vermeersch *et al.* 1992  
Lauwers/Vermeersch 1982

## **5. Bronneger**

#### *Location:*

The site is located in the Dutch province of Drenthe and was discovered during dredging of the Buinen-Schoonoord canal (100 m south of dam 1) in 1990. The canal is located at the site of the former stream of the Voorste diep (Kroezenge *et al.* 1991) The site is situated in a riverine setting.

#### *Site characteristics:*

The artefacts were found in the sludge deposited on the canal bank. The finds, consisting of two, more or less complete, antler and sherd, were all located within an area of 6.25 m<sup>2</sup> (2.5 by 2.5 m). A subsequent investigation by the BAI yielded more sherds, antler and skull fragments and flint artefacts. Later dredging activities in the vicinity (Bronneger-Bronnegermaden) again yielded fragments of antler as well as flint artefacts (Archis number 137277).

#### *Geology/Pedology:*

The dredged up sludge consisted of sand and peat (Kroezenge *et al.* 1991). There was much gravel in the sand (Archis number 23089). Since both antler fragments and sherds were covered with fine sand and ferrous concretions, it is most likely they were located in the sandy riverdeposits of the Voorste Diep.

#### *Taphonomy:*

All of the finds were recovered in secondary context. However, the limited area within which they were recovered suggests a spatial coherence within primary context (Kroezenge *et al.* 1991). Furthermore conditions within the sediments of the Voorste Diep are favourable with respect to preservation of organic remains.

#### *Ecology:*

No ecological information was obtained. The presence of antler and skull fragments of red deer (*Cervus elaphus*) might, but need not, indicate a wooded environment.

#### *Dating:*

Three AMS dates were obtained on the antlers and on charred organic remains adhering to the pottery.

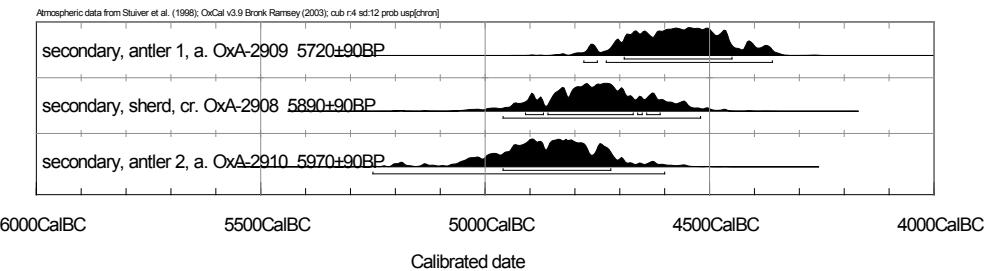


Fig. 11 Radiocarbon dates for Bronneger.

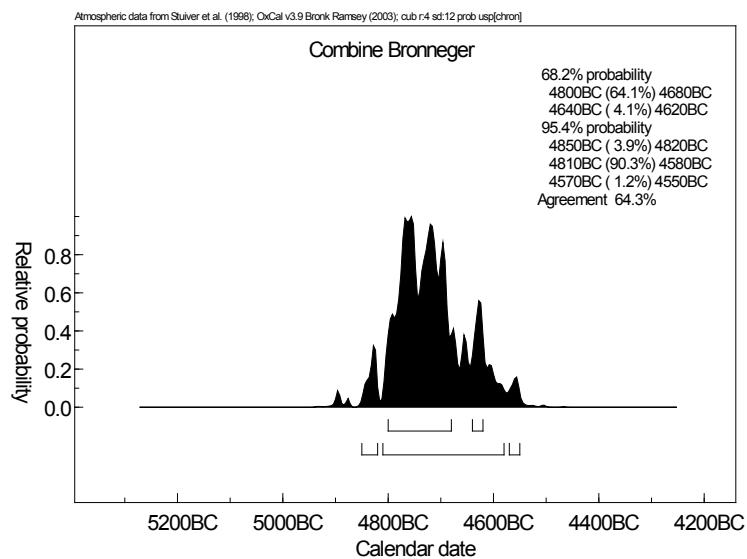


Fig. 12 Combined date for Bronneger.

Since it is likely the finds were contemporaneous (*cf. supra*) it is justified to calculate a combined date.

The AMS analysis of the site dates it to between 4850 and 4550 cal BC, during the early SWB culture (*cf. Raemaekers 1999, 108-110*). It should however be noted that it is not certain to what extent the dated sherd might be contaminated due to the reservoir effect. This for example led Niekus (2005/2006, 48) to exclude it from his analysis.

#### Features/Spatial layout:

No features were documented. It is most likely the site was located on or in the vicinity of the banks of the Voorste Diep.

#### Finds:

At the location of the Voorste Diep four almost complete antler beams of red deer, each with a piece of skull attached, were found. These could be refitted to two more or less complete antlers. Pieces of a third, partially burnt, antler and other skull pieces were also found. No other skeletal parts of the deer were found. The antlers belonged to mature animals. Most of the sherds could be refitted and formed part of an S-shaped pot. The vessel was tempered with grit, coil-built with H-joins and had a smooth surface. The rim was decorated with spatula impressions

and had a repair hole. Encrustations were found on both the inside and outside of the pot. Several flint artefacts were also recovered. At nearby Bronnegermaden (Archis 137277) several antler beams and flint artefacts were found.

#### *Interpretation:*

The site of Bronneger is usually interpreted as a ritual deposition of pottery and antlers in a wet context (e.g. Lanting/Van der Plicht 1999/2000, 55; Louwe Kooijmans 2005, 263; Raemaekers 1999, 125). The ritual context may be deduced from the nature of the finds (a combination of complete antlers of hunted animals and a more or less complete vessel), as well as their context (in a wet location making them probably irretrievable). For some this ritual interpretation is 'beyond doubt' (Raemaekers 1999, 125), there is however no reason why a more secular interpretation could not be equally valid. First of all there is little contextual information, making any interpretation speculative. Second, the location, on the banks of a river may also be interpreted as a favourable location for a settlement or special purpose camp. Apart from this the finds of flint tools, charred residue on the pottery and a fragment of a burnt antler might also be indicative of more domestic activities. This point of view is substantiated by finds of flint and antler in other locations along the Voorste Diep (Archis 137277). Nevertheless the location and nature of the finds are comparable to other Neolithic depositions and deposition practices (e.g. Koch 1999).

#### *References:*

Kroezenge *et al.* 1991  
Lanting/Van der Plicht 1999/2000  
Niekus 2005/2006  
Raemaekers 1999

## **6. Dilsen-Dilserheide III**

#### *Location:*

Dilsen-DIII is located on a Late Glacial coversand ridge on the eastern side of the Campine plateau. The site is situated between a local elevation (the 'Platte Lindenbergs') and a valley with an ancient spring (Luypaert *et al.* 1993, 8). The dune is situated in an undulating coversand landscape (pers. comm. P. Vermeersch, August 2006).

#### *Site characteristics:*

In 1991, 146 m<sup>2</sup> of an approximately 240 m<sup>2</sup> Late Mesolithic site was excavated by Leuven University. The excavation consisted of 4 trenches placed perpendicular to the slope of the dune.

#### *Geology/Pedology:*

The location is characterised by a thin layer of loamy sand on top of Pleistocene Meuse-gravels. Three different soil types can be found near the site. All are characterised by a thin humic top layer. These soils are considered the most fertile soils in the Campine area (*ibid.* 10).

### *Taphonomy/Site-formation:*

After the Late Glacial aeolic sedimentation no new sediments were deposited on the site. Almost 2/3 of the lithic material was retrieved from the ploughzone. The other material was vertically spread over 60 cm due to taphonomic processes. The more solid B-horizon acted as bedrock. Horizontally some of the lithic material and the pottery clusters in zone 250-254S, 178-188W and 252S, 180W (pottery) (*ibid.* 11-13, fig. 5 and 6).

### *Ecology:*

Palynological information only related to the Subatlantic. The location of the site however indicates the probable exploitation of several profitable ecotones (Meuse valley, slopes, plateau). Another favourable circumstance is the fertile soil (*ibid.* 28), although this is not necessarily of importance to the Late Mesolithic occupation.

### *Dating:*

Due to the absence of organic material no  $^{14}\text{C}$  dates were obtained. Typologically the lithic assemblage can be dated to the Late Mesolithic, more specifically the 'Opglabbeek-Ruiterskuil-group'. Apart from Late Mesolithic flint some anachronistic pottery sherds were found within the same context. These date to the Middle Neolithic, more specifically the Michelsberg culture.

### *Features and spatial layout:*

No specific features were found. There is a thin scatter of flint over the entire site with some clustering. The lithic material clusters most apparently in 250-254S of sector III. The cluster has a roughly ovaloid shape measuring approximately 7 x 3 m. The pottery clusters in the same area around 252S-180W (*ibid.* 13, fig. 6). Both lithic material and sherds suffered from vertical displacement. No spatial division could be discerned.

### *Finds:*

In total 5513 lithics were found, 65% of which stems from the ploughzone. Most lithic artefacts (*c.* 95%) were made on local Maas gravels (S1). A small percentage (<1%) was made on imported silex of probable Maastrichtien origin (S2). About 4% of the artefacts were of Wommersom quartzite (*ibid.* 14-15). Tools make up 5% of the assemblage. Trapezoids dominate the microlith assemblage. Some 206 sherds of MK-pottery were found, 160 (77.67% of the total) of which were located underneath the ploughsoil. The sherds were tempered with quartz and chamotte and belonged to a bottle-shaped MK-beaker (*ibid.* 28). Outside of the concentration other Neolithic elements were found made from imported flint (tools and flakes of Middle Neolithic origin; polished axe-flakes and two Late Neolithic points).

### *Interpretation:*

The Late Mesolithic site of Dilsen is geographically ideally located within the landscape. On the basis of the vertical and horizontal distribution it is currently impossible to indicate whether the MK-elements are intrusive (and may originate

### Dilsen-Dilserheide III

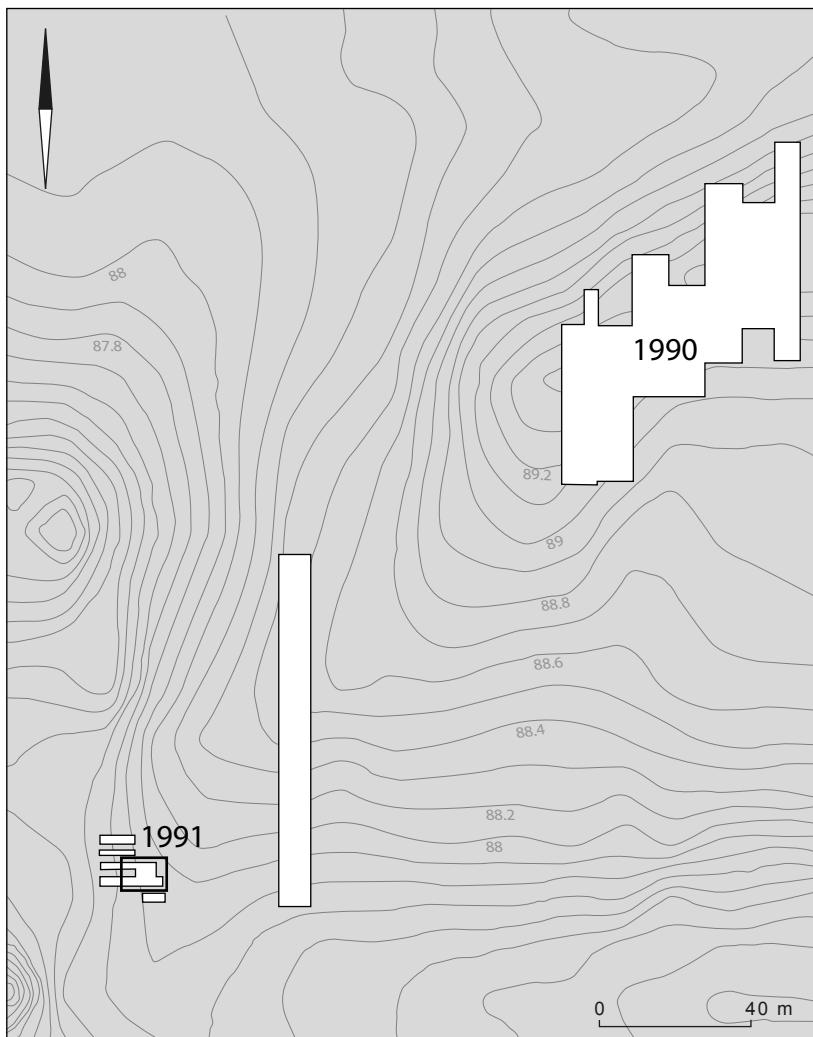
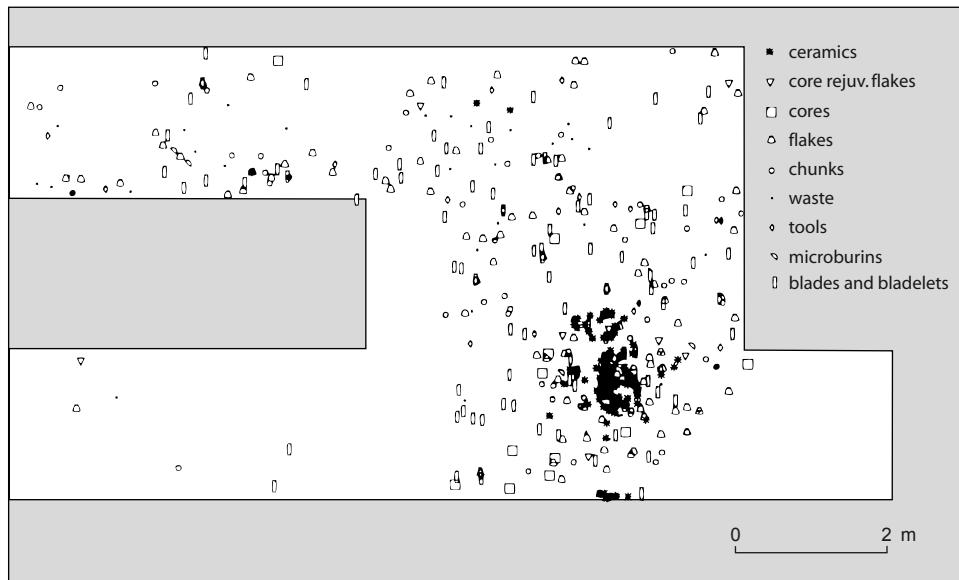


Fig. 13 Dilsen-Dilserheide III. Distribution of finds in the 1991 trenches situated between the valley and the 'Platte Lindenbergs' elevation. Note the concentration of sherds belonging to the Michelsberg vessel. Adapted from De Bie et al. 1991, fig. 1 and Luypaert et al. 1993, fig. 6.



from the favourable location of the ‘Platte Lindenberg’) or whether they are the material relics of Mesolithic hunter-gatherers, in contact with Middle Neolithic farmers (*ibid.* 32). Recently Vermeersch (2006) has argued that due to the palimpsest nature of Dilsen, as well as several other locations, it is improbable the Neolithic material can be associated with the Late Mesolithic occupation.

#### *References:*

De Bie *et al.* 1991  
Luypaert *et al.* 1993  
Vermeersch 2006

## **7. Doel-Deurganckdok**

#### *Location:*

The site is located on a 30-40 m wide N-S sand ridge on the left bank of the Scheldt River in the flat coversand area of northwest Belgium. The area (Waasland Scheldtpolders) currently is covered with peat and (peri)-marine clayey deposits (Crombé 2005<sup>b</sup>, 16).

#### *Site characteristics:*

In total three sites were distinguished. Doel-Deurganckdok-sector B is situated in the northern part of the dune and yielded remains of Federmesser and Swifterbant occupations (3,500 m<sup>2</sup> excavated with different methods in four consecutive subzones). Sector C (570 m<sup>2</sup> excavated) was located on the south of the ridge and could be correlated with a Middle Neolithic (Michelsberg) occupation. Sector A is a Holocene soil section with palynological information. The sites were excavated between 1998 and 2002 by the University of Ghent and often suffered from severe time restrictions and unfavourable excavation conditions (Crombé 2005<sup>a,b</sup>). During 2003 a third zone with amongst others?SWB pottery was discovered (sector J/L) on a parallel N-S sandridge, 200 m wide. Some 3,400 m<sup>2</sup> were investigated here, again under extremely severe circumstances (Bats *et al.* 2003). Crombé (2005<sup>d</sup>) mentions slightly different sectors all including Final Mesolithic finds; B/C: 2,500 m<sup>2</sup>, I/J: 3,300 m<sup>2</sup>, M: 800 m<sup>2</sup>). In 2003 another site was excavated in the vicinity of the first (sector M) again yielding Mesolithic and SWB finds. In total c. 1,000 m<sup>2</sup> was documented in this area (Crombé *et al.* 2004; Sergant *et al.* 2006).

#### *Geology/Pedology:*

The Waasland area is characterised by (re)deposited coversands of local Pleniglacial fluvial origin. During the Subatlantic the area was regularly inundated resulting in deposition of calcareous flood clay and sand. The relief of the area is very flat (Louwagie/Langohr 2005, 27-28). The pedo-lithostratigraphy of sector B starts with a base of Upper Pleniglacial coversands. On top of this a brunified soil developed comprising respectively of a Bt-horizon (fragmented clay accumulation bands) and a bioturbated Bw-horizon. The E-horizon is lacking and the A-horizon is up to 20 cm thick. The Swifterbant occupation, present in the upper 5-10 cm of the soil, was probably synchronous with the development of this soil and was covered with peat (*ibid.* 93). Sector A yielded the following sequence. Until

approximately 4900 cal BC the area was characterised by a coversand landscape with Late Glacial dunes in the vicinity of the Scheldt. From that time onward the area bordering the river turned into a peat fen due to the rising sea level. Between 4500 and 3700 cal BC increased marine influence inundated the fen and deposited clay and clayey peat. Only the highest parts, such as the top of the sand ridge in sector B, remained dry. From that time onward the site was covered with peat and clay (Louwagie/Langohr 2005, 99). In total Doel has now yielded remains of Mesolithic and Middle Neolithic (including SWB) occupation on three different coversand ridges (J/L; B/C and M) (Cromb   et al. 2004).

#### *Taphonomy:*

Major parts of both sector B and C were destroyed by the harbour works (Cromb   2005<sup>b</sup>, 23) yet on the other hand the waterlogged conditions after the peat formation preserved the archaeological site (Louwagie/Langohr 2005, 106). Most artefacts were recovered from the 10-15 cm thick humiferous and heavily bioturbated upper horizon of the profile (Cromb   et al. 2000, 112).

#### *Ecology:*

Palynological information from sector B, retrieved from the contact zone of the sand and the peat, indicated an increasing dominance of Alder (*Alnus*) and sedge vegetation (*Cyperaceae*). There are also high values for *Pinus*, which is exceptional in the Late Atlantic forest. Chenopodiaceae either indicate the presence of human activity or marine influence. The Late Atlantic profile from sector A (dating to the Swifterbant/Middle Neolithic occupation of sector B/C) indicates an alder dominated fen carr with eutrophic peat. On the drier sandy soils a dense mixed oak forest grew with oak (*Quercus*), lime (*Tilia*), elm (*Ulmus*), hazel (*Fraxinus*) and pine (*Pinus*). The high values of pine and hazel might be due to their resistance to decay. Despite the presence of the light-demanding Ericaceae and Poaceae no evidence for clearances, cultivation or cattle breeding has been found. The presence of the anthropogenic indicator-species of Chenopodiaceae may also be related to the influence of brackish water in the Late Atlantic. After inundation another alder dominated fen carr developed (DeForce et al. 2005, 121, 124-126).

#### *Dating:*

In total 5 geological <sup>14</sup>C dates were obtained as well as 22 archaeological dates (sector B/C/J). The latter will be presented here. All samples received careful treatment in order to prevent contamination and only small samples of homogeneous material were dated (Van Strydonck/Cromb   2005, 180-181). All dates are AMS dates.

The <sup>14</sup>C dates point to several distinct occupations of the site. The codes refer to the sector and the feature reference. The oldest evidence at Doel points back to the Late Palaeolithic in the form of Federmesser artefacts. The oldest <sup>14</sup>C dates indicate an Early Mesolithic presence at the site but are probably of an intrusive nature for various taphonomic reasons (e.g. the two dates of B/S22) (Van Strydonck/Cromb   2005, 205). A next set of dates indicates a presence at the transition from the Middle to the Late Mesolithic. Apparently all the hearth-pits date to this period. The same pattern is witnessed at the Hoge Vaart-A27 (Peeters/Hogestijn 2001; Van Strydonck/Cromb   2005, 208). Because of previous

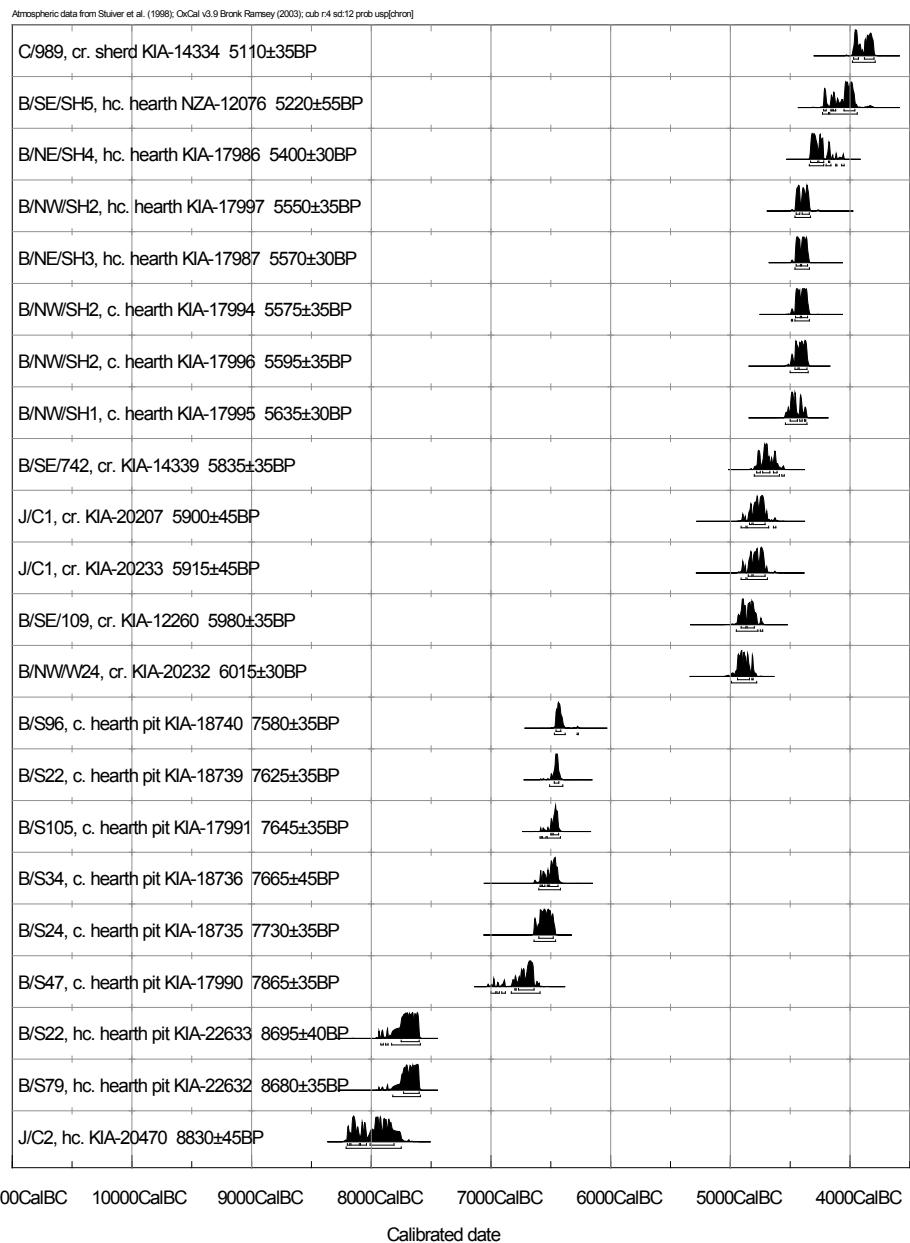


Fig. 14 Radiocarbon dates for Doel-Deurganckdok.

destruction and taphonomic factors, the Early and Middle/Late Mesolithic occupations only yielded a scarce quantity of finds (*ibid.* 208).

The SWB occupation of Doel is dated both by the surface hearths as well as foodcrusts on pottery. The latter dates appear to deviate a bit, but this may be due to a freshwater reservoir effect. If correlated they would coincide with the dates from the surface-hearths (*ibid.* 209; Cromb   et al. 2011). The SWB dates from sectors B and J are roughly contemporaneous. The youngest date was obtained on a foodcrust on MK-pottery from site C to the south. Although this sherd was not sampled for a reservoir effect, other samples from the same site show  $\delta^{13}\text{C}$  and  $\delta^{15}\text{C}$  values that are typical for plants suggesting the reservoir effect may not have been of influence (*ibid.* 211). On the basis of the  $^{14}\text{C}$  dates and leaving out the earlier dates on foodcrusts, the SWB occupation at Doel may be dated between 4550 and 3960 cal BC, based on the dates from sector B.

The MK occupation, based on the date from sector C, dates between 3980 and 3790 cal BC. This indicates the existence of no or only a limited hiatus in occupation. This is further substantiated by the fact that there are clearly sherds with SWB affinity in the MK assemblage (*cf.* Vanmontfort 2004, 209). It should, however, be noted that both obtained ranges were derived from different sectors (B and C). Furthermore sector M also yielded SWB sherds as well as earlier Mesolithic artefacts, including a new <sup>14</sup>C date (KIA-24455: 8660±40BP).

#### *Features/Spatial layout:*

Apart from remnant shallow deepenings of the A-horizon containing SWB settlement waste, three different types of features have been excavated. These are typical hearthpits (lots of charcoal) with either one or two layers (the latter are somewhat larger and deeper), atypical hearth-pits (fewer charcoal) and surface hearths. In total 79 hearth-pits were found. These seem to concentrate in the NE subzone but this is partly an artefact of taphonomic conditions. What is important is that they seem to cluster in the northern sector of the site and that none overlap (Cromb   et al. 2005, 160). Some 23 atypical hearthpits were found. Most of the hearth-pits only yielded a few artefacts. Some of the artefacts were burnt. Several clusters of burnt bone and fish remains have been interpreted as surface hearths or hearth-dumps (*ibid.* 175). Sector C yielded 10-12 hearth-pits. The general morphology of the hearthpits at Doel is in perfect accordance with Dutch equivalents for example at HogeVaart A-27 (Hamburg et al. 2001) or Urk-E4 (Peters/Peeters, 2001) (Cromb   et al. 2005, 175). Concentration C1 in zone J/L yielded no features but appeared to be the periphery of an SWB site (Bats et al. 2003, 57). In sector M the SWB material clusters in *c.* 5 concentrations of less than 1 m<sup>2</sup> in association with clayey patches. These may tentatively be interpreted as hearths (Cromb   et al. 2004, 106).

#### *Finds:*

Sector B yielded pottery sherds (often in clusters of 5-10 m<sup>2</sup>) mainly tempered with grog and organic material. Pottery morphology and decoration (*e.g.* *Randkerbung*) point to a date in the early and middle phase of the SWB culture and has strong affinities with the pottery from Melsele. Cromb   et al. (2002, 704) further argue the Early SWB pottery points to contacts with Grossgartach/R  ssen groups, because of the S-shaped profiles, rim decoration and knobs. According to Craig (2005) most of the food residue consisted of meat and milk from herbivores as well as freshwater fish. Apart from the pottery rectangular and symmetrical trapezes, Montbani-blades and artefacts (scrapers) of Wommersom quartzite were found which probably date to the same period (Cromb   et al. 2000). The pottery in sector C technologically and morphologically differs from sector B (*e.g.* grit temper). It may be attributed to the MK yet some sherds are in SWB tradition (Vanmontfort 2004, 271). The flint assemblage comprises artefacts on local as well as exogenous flint. Among the latter category are two leaf-shaped and two transverse arrowheads, a robust blade fragment and the base of a polished axe (Cromb   et al. 2000). Sector J/L yielded undiagnostic flint artefacts and early SWB pottery (Bats et al. 2003, 57).

The botanical information from sector B indicates almost all the species were gathered locally in hardwood riverside woodland, which was located on the highest parts of the floodplain, river dunes, levees etc. (Bastiaens *et al.* 2005, 277-278). Apart from seeds and fruits such as hazel (*Corylus avellana*), wild apple (*Malus sylvestris*), sloe plums from blackthorn (*Prunus spinosa*), acorns (*Quercus*), hawthornberries (*Crataegus monogyna*), stones from dogwood (*Cornus sanguinea*) one charred grain of bread wheat (*Triticum aestivum*) was recovered, probably dating before c. 4000 cal BC (Bastiaens *et al.* 2005, 271). This type of wheat seems to be the principal crop in contemporaneous Neolithic cultures such as Rössen and MK (Bakels 1997). Due to the nature of the find it is unknown whether breadwheat was grown locally (Crombé 2005<sup>d</sup>). Remarkable is also the presence of ivy (*Hedera helix*), which also seems to have been collected (Bastiaens *et al.* 2005, 275).

Sector B also yielded faunal remains recovered from the A-horizon. All bone is fragmented and severely burnt (possibly because of use as fuel). Apart from unidentifiable remains of mostly large species some species could be identified. These include polecat (*Putorius putorius*), red deer (*Cervus elaphus*), wild boar (*Sus scrofa*) (although *Sus domesticus* is unlikely it cannot be ruled out). Next to remains of amphibians (frogs and toads) a rich assemblage of fish remains (N>2000) was recovered. It mostly concerned fresh water species of the carp family (*Cyprinidae*), but stingray (*Dasyatis pastinaca*) and sturgeon (*Acipenser sturio*) are also present (Van Neer *et al.* 2005, 281-288). No archaeozoological remains from sector C or J/L were recovered. Sector M finally yielded evidence for Early Mesolithic occupation as well as pottery, flint and burnt bone (including fish remains) attributed to the SWB culture (Crombé *et al.* 2004, 106). The pottery is comparable to the pottery from the other sectors.

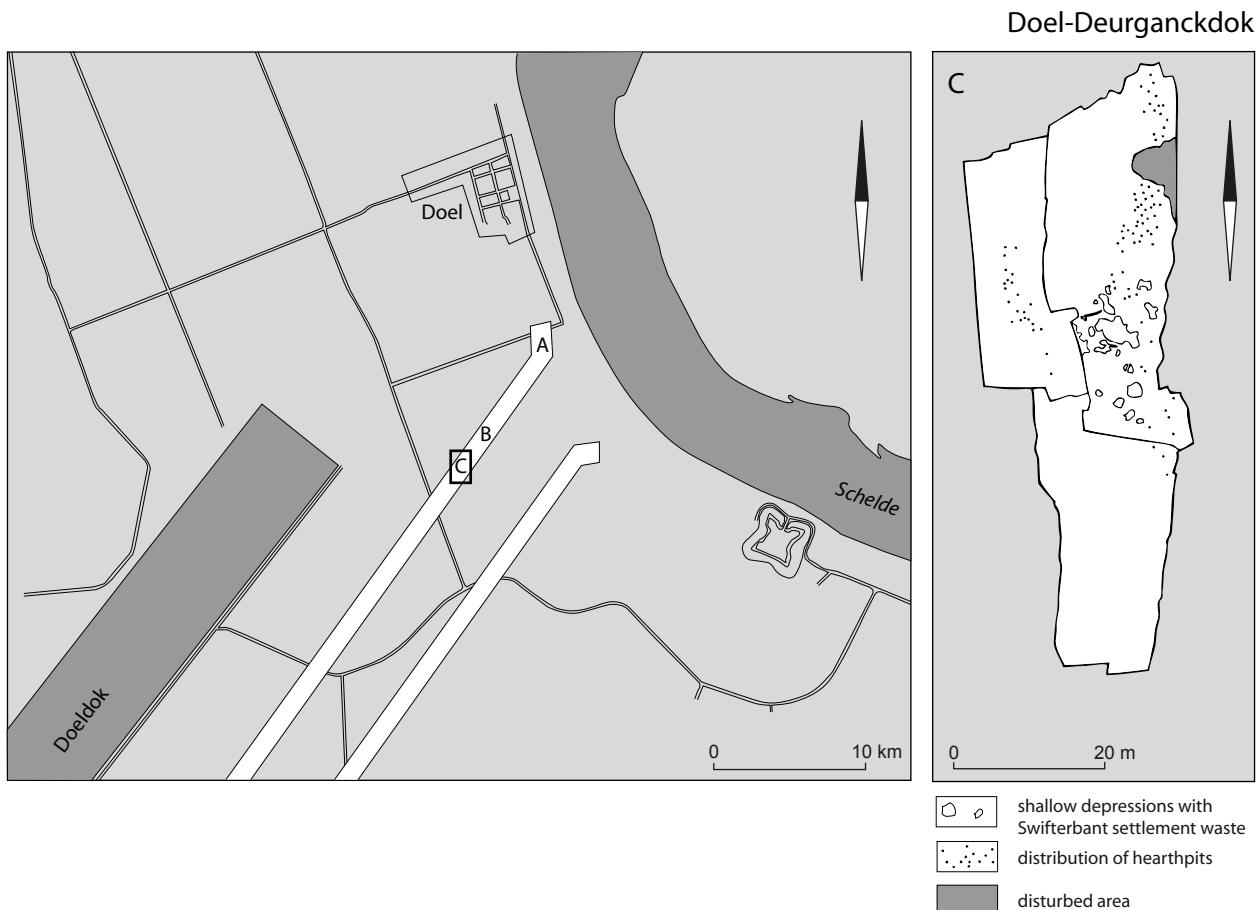
#### *Interpretation:*

Despite its turbulent taphonomic history the site of Doel-Deurgancksdok provides valuable information for the Middle Neolithic habitation of the area between c. 4500 and 3700 cal BC. The botanical and faunal remains recovered from the A-horizon, in combination with both lithic artefacts, pottery and hearths indicate the site was probably occupied during one or several parts of the year. Activities include hunting, gathering and fishing. Although a clear seasonal attribution of the site is impossible, the botanical data of gathered fruits and seeds indicates a presence between late summer and the start of winter (Bastiaens *et al.* 2005). On the other hand the abundance of fish remains might tentatively be related to a presence in spring, since this would be the most rewarding period for fishing (Van Neer *et al.* 2005). This may indicate a presence on the site at least twice a year. Remarkable is the presence of one grain of *Triticum aestivum* while on the other hand no remains of domesticated animals could be identified. This last aspect is especially interesting with respect to the incorporation of Neolithic elements in the SWB culture (*ibid.* 289). Another interesting quality of the site is the co-occurrence of both SWB pottery as well as MK-pottery. Within the MK-complex, which was found in sector C, there are clearly sherds of SWB affinity (Crombé *et al.* 2000; Vanmontfort 2004). A more detailed analysis of both the pottery and its spatial association may shed more light on the relationship between the SWB and MK pottery on the site as well as their association to, for example, the Hazendonk group.

*References:*

Bastiaens *et al.* 2005  
 Bats *et al.* 2003  
 Craig 2005  
 Cromb   2005<sup>a</sup>  
 Cromb   2005<sup>b</sup>  
 Cromb   2005<sup>c</sup>  
 Cromb   2005<sup>d</sup>  
 Cromb   *et al.* 2000  
 Cromb   *et al.* 2004  
 Cromb   *et al.* 2005  
 Cromb   *et al.* 2011  
 DeForce *et al.* 2005  
 Louwagie/Langoehr 2005  
 Sergant *et al.* 2006  
 Van Neer *et al.* 2005  
 Van Strydonck/Cromb   2005  
 Vanmontfort 2004

*Fig. 15 Doel-Deurganckdok.*  
*Distribution of depressions and*  
*hearthpits at sector C. Adapted*  
*from Cromb   2005<sup>b</sup>, fig. 6 and*  
*Cromb   *et al.* 2005, fig. 83 and 84.*



## 8. Echt-Annendaal (HVR-183)

### *Site location:*

The site is located in the vicinity of Echt and Posterholt and situated on a north facing slope on the edge of the upper terrace. The site overlooks the valley of the Vlootbeek. A stream is located at a distance of 1 km.

### *Site characteristics:*

The site was discovered in 1983 by H. Schmitz. Initial finds comprised LBK, Rössen and MK pottery. In 1984 Leiden University excavated at HVR-183. The excavation consisted of a trench of approximately 40 x 10 m (400 m<sup>2</sup>) and several (c. 16) test pits (Brounen 1986).

### *Geology/Pedology:*

The site was on a slope at the edge of the upper terrace. The transition between the upper terrace and the middle terrace was covered with coversand. The subsoil therefore consists of sand (Brounen 1985, 66). On the lower extents of the slope a sudden ridge marks the transition to the middle terrace. At this location the subsoil consists of sandy loess and loamy coversand, subsequently covered by coversand again (Brounen 1986, 1).

### *Taphonomy:*

The site was discovered at the surface, thus some artefactual information will have been lost due to land-use and insufficient cover. Furthermore the prehistoric features that were found were rather vague and may have been affected by post-depositional processes (treecfalls and subrecent activities). The acidity of the sandy subsoil further prevented preservation of organic remains.

### *Ecology:*

The local environment of the site may have been ecologically variable. The vegetation was less dense than on the loess soils and may have been of a patchy nature. Open places in the form of pastures might also have been present.

### *Dating:*

The site yielded evidence for use and occupation during the Early Neolithic, the Middle Neolithic and the Late Neolithic. No <sup>14</sup>C dates are available.

### *Features/Spatial layout:*

Features comprise of:

- a shallow ditch containing MK-pottery.
- an undated ditch.
- natural features interpreted as treefalls, some containing finds and subrecent features.
- a dark-grey discolouration in the soil with a depth of only 3 cm and a thin spread of charcoal particles.

### *Finds:*

The site yielded four clusters of sherds, each attributable to a LBK vessel (*c.* 30 decorated sherds and several undecorated sherds). One pot was decorated with decoration-scheme DII (Modderman 1970), dating to phase IIb–d. One was identified as a polished pot with lugs and one was a small vessel, decorated with rim-type AI, dating to phase Ib–IIC. The fourth pot was coarse ware with lugs and chamotte-tempered. In the vicinity of the LBK pottery sherds of Limburg pottery (some decorated) were found. The sherds were found in three different localities (Brounen 1985).

Apart from Limburg and LBK finds the site also yielded Rössen-pottery (8 decorated and 5 undecorated). The decoration scheme on these sherds, consisting of *Einzelstich-Stichrauhung* of the upper *Zwickel*, as well as multiple-banded *Winkelband* decoration in Furchenstrich-style and ‘hanging’ *Striche* below the *Winkelband*, is typical of so-called *Schüssel*, bowls with round bottoms, sometimes with a ring. These can be dated to the *Ältere Rössen Kultur*. The Middle Neolithic pottery (N = *c.* 63) found at HVR-183 is mainly tempered with broken quartz and has a smooth outer surface. These sherds can be classified as MK and might, on the basis of two rims, possibly part of *Tulpenbecher* I, belong to MK I. The other sherds were tempered with even more quartz and less well finished on the outside. These may belong to another Middle or Late Neolithic group (Stein group?). Furthermore two Beaker sherds were found, as well as some Iron Age pottery. The flint spectrum consisted of an LBK point, a possible LBK borer as well as 3 laterally retouched blades, scrapers made from Meuse-eggs (especially in the vicinity of the LBK and Limburg pottery as well as an MK scraper on blade and pointed blade. Furthermore fragments of axes and flakes were found (Brounen 1985).

### *Interpretation:*

The site yielded evidence for occupation in various periods. For the Early Neolithic (the LBK/Limburg component) an interpretation and a transhumance camp might be appropriate. The Rössen pottery may both indicate a special activity site, or the exploitation of the sandy soils by Rössen farmers (Brounen 1985). Another option is exchange. The Middle Neolithic component is possibly related to domestic habitation. The long-term use of the site characterises it as a *persistent place*.

### *References:*

- Brounen 1985
- Brounen 1986
- Modderman 1970

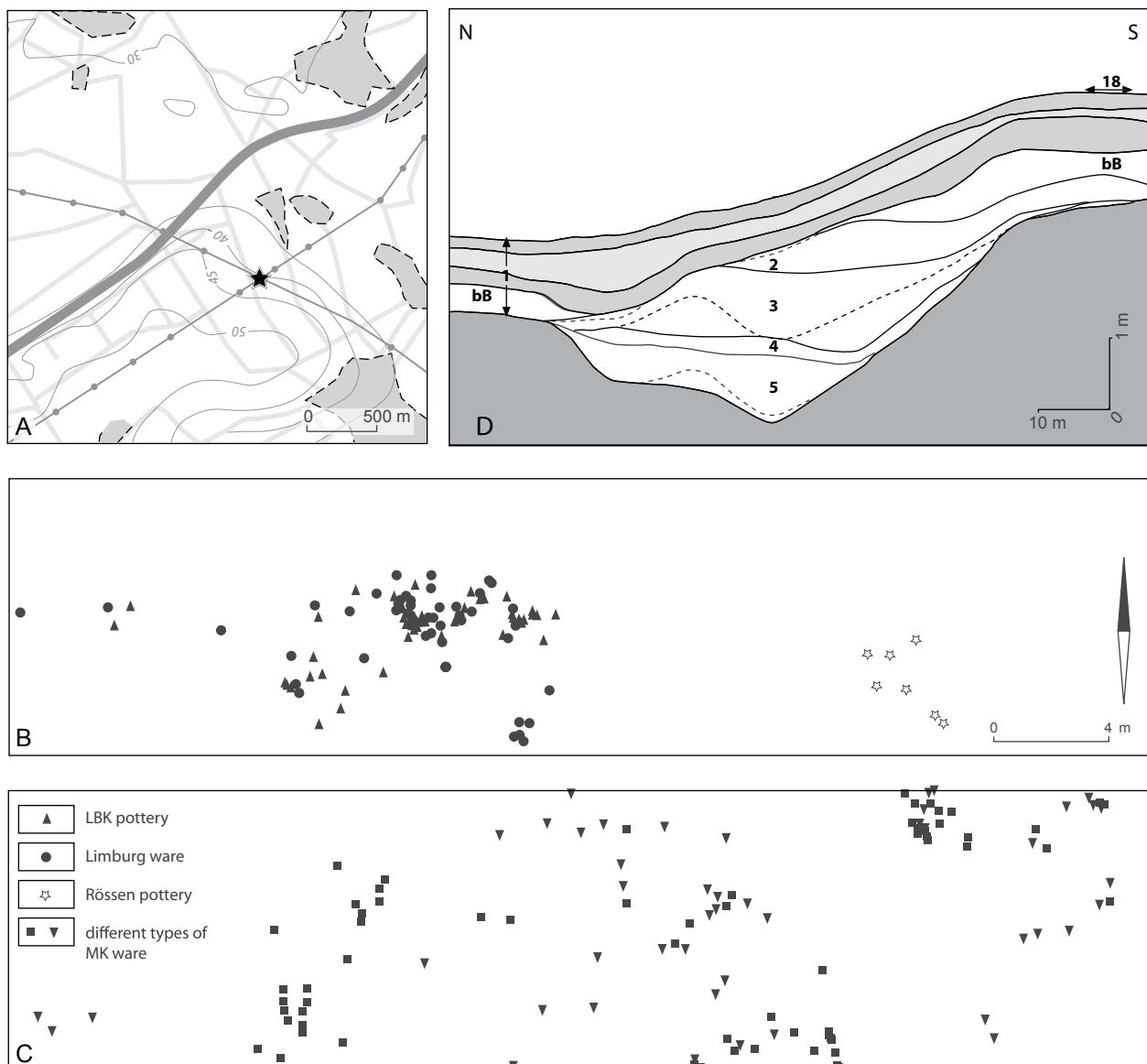


Fig. 16 Echt-Annendaal-HVR 183. (A) Situation map of HVR 183 situated on the slope of the upper terrace. (B) distribution of Early Neolithic LBK pottery, Limburg ware and Rössen sherds. (C) distribution of different types of Middle Neolithic MK pottery. (D) blown-up section based on augering data of the transition of the upper terrace to the middle terrace. (Ap, B, C) current soil horizons. (bB) buried B-horizon. (1) loamy fine sand; (2) loess; (3) sandy loess and loamy coversand; (4) moderately fine to coarse sand; (5) coarse sand and clay; (6) coarse sand and gravel; (18) location and width of trench. Adapted from Brounen 1986, fig. 1, 16 and 19 and Topografische dienst/Compact Provincie Atlas 1995, map, pp. 42-43.

## 9. Ede-Frankeneng

### *Location:*

The site was located on an EW oriented, Pleistocene coversand dune on the western limit of an ice pushed ridge (approximately 100 km north of the loess boundary). The dune formed part of a complex of dunes located in the humid valley of the Gelder (Schut 1988). The site was situated on one of the highest dunes (currently 12.25 m above Dutch ordnance datum [NAP]).

### *Site characteristics:*

The site was documented between 1967 and 1974 during earth-moving activities on behalf of an industrial zone south of Ede (province of Gelderland, in the east of the Netherlands). Due to amateur activity finds relating to the Mesolithic, the Neolithic, The Bronze Age and the Iron Age were recovered. Spectacular was the find of Early Neolithic pottery.

### *Geology/Pedology:*

The Pleistocene subsoil of the dune was covered with a Medieval anthropogenic layer of 50-100 cm. Underneath this layer a depression 3 m wide was uncovered in which the remains of a podzol profile had been preserved. The finds were located in the depression underneath the eluvial horizon. South of the depression the sloping Pleistocene sand came into contact with a peaty layer, which unfortunately was removed before it could be investigated (Schut 1988, 223).

### *Taphonomy:*

The site was severely disturbed by the earth-moving activities and could only be documented to a limited extent. Furthermore the location on top of the dune suggests the site has been at the surface for a considerable span of time. This means soil development and bioturbation may have disturbed the spatial integrity as well as subsequent occupation phases. No organic remains were preserved.

### *Ecology:*

The site was located on a high Pleistocene dune in a river valley. The presence of periglacial morene sediments, Pleistocene sand, Holocene valley sediments (clay and peat) indicate there was a considerable geomorphological and therefore ecological variety present in the river valley. This would have yielded good conditions for hunting and gathering.

### *Dating:*

No  $^{14}\text{C}$  dates were available. The site however has yielded Mesolithic, Neolithic, Bronze Age and Iron Age artefacts.

### *Features/Spatial layout:*

Within the 3 m wide depression containing the Early Neolithic finds no further spatial information was available. The site must have been located on the top and slope of the ridge.

### *Finds:*

The pottery consists of 77 sherds. Two sherds date to the Early Bronze Age. They were found in one of the upper layers, but intrusion of later sherds cannot be excluded (although it is possible, based on the atypical decoration, that they may also date to an earlier period, perhaps even the Early Neolithic). Approximately twelve sherds belonged to a vessel with a slightly elevated rim. Two sherds showed repair holes. Decoration is formed by plastic elements and impressions (cordons flanked by big single stabs on one side and rows of smaller and multiple stabs on the other). The latter motif is created with a flexible dented spatula with two or three points. The design consists of blocks of four impressed lines bordered on top by single or double impressions (Schut 1988, 225). This is a characteristic element of La Hoguette as can also be found in pottery from the Rhineland. Remarkable is the appearance of a solar motif, formed by a plastic interior surrounded by two rings of impressions and approximately 8-10 rays, also formed by impressions. The blocks and the solar motifs seem to alternate. The side of the pottery is accentuated with plastic ridges. A small fragment may be classified as a perforated ear, but is not necessarily part of the afore-mentioned group. The pottery is of a black to brown colour, thinwalled and tempered with sand and some chamotte.

The second group consists of 64 sherds. These may originate from one vessel or session of fabrication since temper, finish and colour are identical. A rim sherd indicated a diameter of 30 ( $\pm 10$ ) cm. Morphologically the vessel has a pointed bottom and ovoid shape. The top is slightly rounded. Decoration consists of triple or double alignments of a weak V-shaped (plastic) relief. These V-shaped cordons combined to a 'loosely woven' *Winkelband*. One of the sherds had a lug within the V-shape. The temper consists of quartz fragment up to 0.2-0.3 cm with exceptions up to 5 cm. Some of the temper protrudes out of the polished surface. The pottery is of brown to reddish colour with a grey to black interior (Schut 1988, 226). The flint artefacts found hitherto consist of one flint blade and a single flake, found in the depression (Schut 1988, 223).

Recently additional finds have been documented within the same collection. These appear to be sherds of genuine La Hoguette affinity as well as a typical LBK scraper and mediolithic blade of Rijckholt flint (Brounen *et al.* 2010<sup>b</sup>).

### *Interpretation:*

The site is special because of the combination of Early Neolithic pottery that is also associated with the LBK in a rather northern context. The decoration with the exception of the solar images strongly resembles decoration on La Hoguette vessels. On the other hand both groups of sherds lack the characteristic bone temper. The plastic V-shaped motif of the second group of sherds is not directly interpretable as La Hoguette and currently is classified within the group of Begleitkeramik of La Hoguette (*cf.* Brounen 1999).

Currently these vessels are the northernmost occurrences of the La Hoguette/Begleitkeramik of La Hoguette complex. Their presence on a river dune in the valley of the Gelder might have important repercussions for the interpretation of the process of Neolithisation in this area. Unfortunately there is hardly any contextual information.

#### *References:*

Brounen 1999  
Brounen *et al.* 2010<sup>b</sup>  
Schut 1988

## **10. Ewijk-Ewijkse Velden**

#### *Location:*

Ewijk is located in the east of the central river district, bordering on the sandy upland hills of the Wijchen area. The site was located on a levee bordering on a 60 m wide river. No specific information on the location of the settlement is available since only the refuse layers have been found. The levee was located at a distance of some 3 km from the sandy uplands around Wijchen and Bergharen, but could probably be reached without too much trouble, from levees within the 'Rijk van Nijmegen' area (Louwe Kooijmans 1985, 146).

#### *Site characteristics:*

Since the location was to be quarried for sand, rescue excavations of the ROB took place in 1973 and 1974. Remains of the Vlaardingen group were documented unsystematically in 15 x 30 m trenches. A narrow strip of some 165 m in length yielded most finds. In 1978 the AWN discovered the refuse layers of a Vlaardingen site located on a levee. Several sites were excavated (in cooperation with the RMO) (amongst which locations A, A<sup>1</sup>, B, B<sup>1</sup>, C, E, EB). These were located in eight remnant channelfills left in the sand quarry. Finds were recovered and a large section was documented. Some sieving took place as well as palynological and radiocarbon sampling (Asmussen/Moree 1987; Clason 1990). Finally in 1983 some further Vlaardingen finds were documented in a freshly dug ditch (Asmussen/Moree 1987, 4).

#### *Geology/Pedology:*

The site was located on the levee along a 60 m wide stream that came into existence during the Atlantic and cut into the lower lying Pleistocene sand deposits. After a period of peat growth in the Late Atlantic, the stream was reactivated in the beginning of the Subboreal, clearing part of the peat. During this time people of the Vlaardingen group settled on the levee, however, since the finds were found in the residual gully fill, which consisted of humic clay to clayey peat (Clason 1990), it is improbable the gully was still active (see Berendsen/Stouthamer 2001, 245; also see Arnoldussen 2008, 368). In the Early Subatlantic the Waal-system came into existence, eventually covering the location with clay (Asmussen/Moree 1987, 8-16). During occupation it is estimated the levee rose some 1 m above its

surroundings. The channel was 1-1.5 m deep (Louwe Kooijmans 1985, 146). The levee and the channelfill only yielded one find layer, which varied between 10-20 cm in the channelfill (Asmussen/Moree 1987, 27).

#### *Taphonomy:*

Due to the location of the trenches and the less than ideal circumstances for excavation, only a limited number of Vlaardingen features were documented on the levee. It is not known where the Vlaardingen settlement may have been located on the levee, nor is there information on its extents. Preservation conditions for organic remains were rather good in the remnant channel fills, although this of course is a rather limited find location. No stratification of the Vlaardingen material could be established. Furthermore erosion of sherds was clearly present on top of the levee (Asmussen/Moree 1987, 55).

#### *Ecology:*

The peat from the Late Atlantic, prior to occupation, has been sampled. Low NAP-numbers (*c.* 10%) indicate a rather substantial forest in the area. This forest is dominated by 'wet' components such as alder (*Alnus*) (47-63%) and willow (*Salix*). These, as well as reed (*Phragmites*), probably grew in wetter locations in the overbank deposits and along the channel. On the drier levees oak (*Quercus*) dominated, followed by elm (*Ulmus*), as well as ash (*Fraxinus*) and lime (*Tilia*). Hazel (*Corylus*) as well as some beeches (*Betula*) have been documented, the latter growing in lighter areas. Human presence is indicated by very low (<1%) counts of *Cerealia*, more specifically barley (*Hordeum*) as well as species of plantain (*Plantago*) and dock (*Rumex*). It is likely this activity predated the Vlaardingen occupation of the dune. This was confirmed by the  $^{14}\text{C}$  date from the peat (GrN-11290 5105±40 BP) (Asmussen/Moree 1987, 16-17).

#### *Dating:*

In total two  $^{14}\text{C}$  dates were obtained from a clayey layer in the peat within the findhorizon.

The dates do not date to the Vlaardingen occupation. According to Louwe Kooijmans (1985, 146) they indicate older human occupation. This would be in accordance with the Atlantic signal in the pollen diagram (*cf.* Asmussen/Moree 1987, 17). Lanting and Van der Plicht (1999/2000, 72) also indicate that, reckoning with the old wood effect, the peatlayer may be dated to 4000 cal BC. Without further reasoning they however think that the charcoal is not related to the pre-Vlaardingen occupation of the levee. The pottery could typologically be dated within VL1b, suggesting a date around 3000 cal BC.

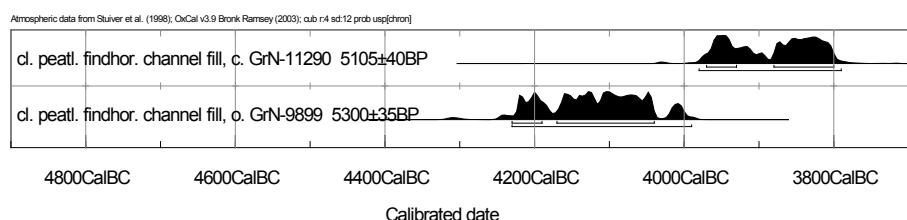


Fig. 17 Radiocarbon dates for Ewijk-Ewijkse velden.

### *Features/Spatial layout:*

During the 1973/1974 campaign Vlaardingen postholes were documented. Most of the finds of this campaign were derived from the top and the slopes of the levee (northern slope of the Woerdjes area), where there was evidence for some concentrations, especially in trenches 8, 22 and 28. Since most of the pottery was collected from these trenches and was also very fragmented, this location might be indicative of trampling and maybe a house site (Asmussen/Moree 1987; Hulst/Noordam 1974). During the 1978 campaign the channel fills were excavated and no features were found (e.g. trench 13). It is probable that the Vlaardingen habitation took place on the top and slopes of the levee. Refuse may have been dumped in the channel. Asmussen and Moree (1987, 21) divided the finds in four groups. Find group A comprises the finds from the 1978 (RMO-AWN) campaign, found in the channelfill. Sherds recovered during the 1973-1974 ROB campaign, collected in the excavation trenches north of the 'Woerdjes'-levee are grouped in Find group B. Finds recovered from the 1973-1974 excavation spill have been grouped in C. Find group D consists of regional Vlaardingen finds and assemblages. The levee groups (B and C) may have been the site of the former settlement. The channel group (A), may have been the former refuse area or waste dump (Asmussen/Moree, 1987, 91).

### *Finds:*

Most of the sherds in the pottery assemblage (80%) derive from the 1973-1974 campaign and are without further stratigraphical or locational information. The sherds from the channel are better contextualized and were partly excavated in  $m^2$  squares. The Ewijkse Velden yielded 1466 sherds (25 kg). Remarkably there is a slight indication for more storage vessels and less beakers on the levee, compared to the channel (Asmussen/Moree 1987, 32). Some 99% of the pottery was tempered with quartz. Although chamotte and some sand temper was present too. On 5.5 % of the sherds evidence for coil-building was present. Most of the sherds had N-joints, followed by Z- and H-joints. The pottery was smooth-walled and except for some perforations underneath the rim and lumped ears not decorated. Typologically VL1b as documented on the Hazendonk would be the best comparison, although the number of beaker elements at Ewijk is suggestive of some later influence. Morphologically forms are bag-shaped with a short everted rim, or with a more slender S-profile. Three slightly carinated profiles were also found. Some baking plates or discs were found, but no flasks, bowls or dishes. None of the sherds showed evidence for repair. Finally there is no reason for a chronological subdivision of the pottery from the 1973-1974 and the 1978 campaign (Asmussen/Moree 1987, 20-91).

In total 1227 pieces of flint were collected (7,084 g), including a former axe used as hammering stone. The sample however might be biased with respect to the number of tools (these were often preferentially collected). No further separation than between channel and levee could be established. Within a sample (N=442) 62% of the flint had a fresh or eluvial cortex, indicating import. The exact origins of the flint remain clear. Because of absence of indicators pointing to Southern Limburg, a Belgian origin is preferred by Asmussen and Moree, possibly near Dommartin (1987, 101). This would indicate flint of Lightgrey Belgian type. Some 17.7% of the assemblage was fabricated on discarded polished flint axes (some of

which were made on Valkenburg-flint). The rest of the artefacts were probably made on rolled terrace gravels or flint derived from glacial deposits near Nijmegen. Furthermore all long blades and two scrapers on blade were made on Rijckholt-type flint (Asmussen/Moree 1987, 102). Technologically the assemblage consists of hammering stones (N=24), cores (N=31, often not exhausted), flakes (N=472), blades (N=99) and blocs (N=111). These finds are indicative of a rather expedient and unsystematic technology based on flake production, similar to Hekelingen III (Asmussen/Moree 1987, 103-111). Typologically the assemblage consists of scrapers (N=295) (mostly a wide diversity flake scrapers, several racloirs and some blade scrapers), points (N=55, 46 transverse, 8 leaf-shaped points, indicative of MK- or Hazendonk influence, and 3 stemmed points with rudimentary wings), borers (N=15, 4 on blade), a burin, *Ausgesplitterte Stücke* (N=12), retouched blocs (N=22), flakes (N=71) and blades (N=20), flint axe-fragments (N=79) and one piece of a *Fels-Ovalbeil*. In total 135 unmodified flakes and 56 unmodified blades showed traces of use. The Ewijk-assemblage has some evident MK-components (leaf-shaped points, racloirs, long Rijckholt-type blades, one *Fels-Ovalbeil*, one blade with troncature), indicative of pre-Vlaardingen occupation, possibly substantiated by the <sup>14</sup>C and palynological samples, or 'scavenging'-behaviour of people of the Vlaardingen group (Asmussen/Moree 1987, 151).

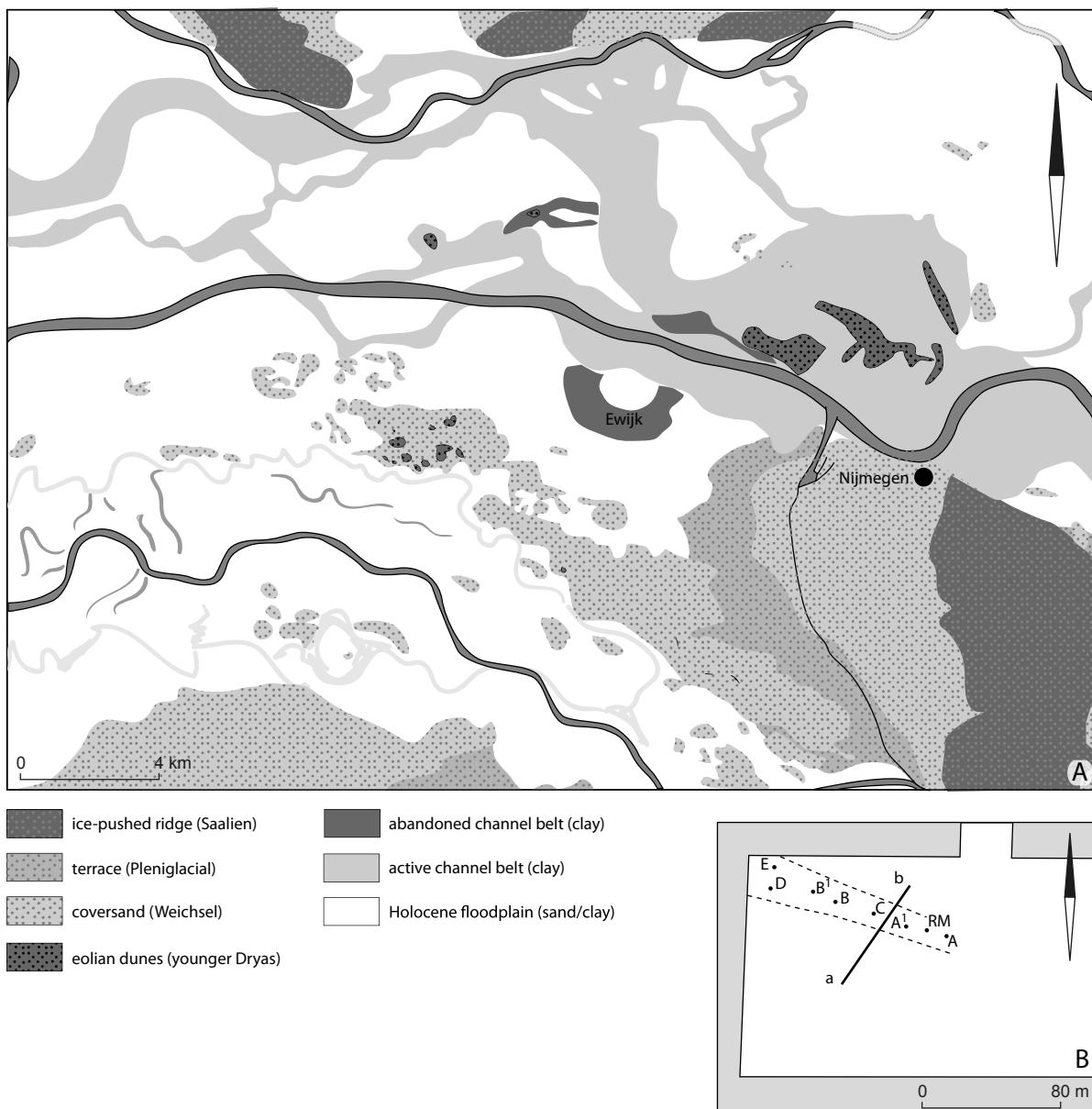
The stone assemblage comprises many quartzites and sandstones as well as a variety of locally available stones. Some 20% showed traces of use. Typologically the assemblage consisted of grinding and polishing stones as well as hammering stones. Furthermore pieces of jet and some possible cooking stones were found (Asmussen/Moree 1987, 156-163).

The substantial assemblage of faunal remains was recovered during the 1978 campaign and carefully hand collected (Clason 1990, 3). It is however remarkable that bird (N=2) and fish remains are largely absent. Clason (1990, 3) opts they may have been left in the settlement, Asmussen and Moree (1987, 165) rather think of a biased preservation with respect to taphonomical circumstances. This seems more likely. The mammal bone spectrum is dominated by domestic animals. Apart from dog (*Canis familiaris*), pig (*Sus domesticus*) dominates numerically and cattle (*Bos taurus*) concerning bone weight. Sheep (*Ovis aries*) and goat (*Capra hircus*) are also present in high numbers. The wild mammals only formed a small part of the assemblage (2.4% of the total number and 5.9% in weight) and comprised of beaver (*Castor fiber*), wild pig (*Sus scrofa*), roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*) and possibly one fragment of aurochs (*Bos primigenius*). Clason (1990, 4) suggests that the absence of large predators and the presence of sheep and goat might indicate large-scale clearance of woodlands and a reliance on stock breeding for meat supply. Concerning the age of death of the different species there are no indications for seasonal habitation (Clason 1990, 6). Artefacts of bone and antler comprised a chisel and a pointed bone and an antler axe-sleeve (Asmussen/Moree 1989, 166-167).

#### *Interpretation:*

Ewijk is a palimpsest site lacking essential spatial, stratigraphical and chronological information. On the other hand the material assemblage recovered over several campaigns is rather interesting for its homogeneity. Apart from evidence for earlier and MK and/or Hazendonk group activity at the site, the pottery and flint assemblage point to a rather strong presence of the Vlaardingen group, more

## Ewijk-Ewijkse velden



specifically phase VL1b. The flint spectrum is not remarkable for Vlaardingen sites, but shows a conspicuous contradictory balance between expedient technology and a strong import component. Furthermore the faunal assemblage seems to indicate a very strong domestic component (although the taphonomic influence should not be underestimated). With respect to the (early) indications for agriculture, it is not unlikely Ewijk should be envisaged mainly as an agrarian site belonging to the Vlaardingen group. Unfortunately the limited information available concerning fish, bird and plantremains, as well as features and the lack of stratigraphy, prevent statements on degree of sedentism and seasonality.

Fig. 18 Ewijk-Ewijkse velden. (A) overview of the geological situation and (B) excavation plan. The capital letters in the plan indicate the locations where finds were documented by the RMO and the AWN campaigns. The letters *a* and *b* indicate the location of the section. Adapted from Berendsen and Stouthamer 2001 (map 4500 BP) and Clason 1990, fig. 3.

### *References:*

Arnoldussen 2008  
Asmussen/Moree 1987  
Berendsen/Stouthamer 2001  
Clason 1990  
Hulst/Noordam 1974  
Janssen 1989  
Louwe Kooijmans 1985

## **11. Gassel-Over de Voort**

### *Location:*

The site was located on a river dune in the eastern part of the central Dutch river district.

### *Site characteristics:*

The site was discovered during sand mining activities in 1983 after which a short investigation by amateur archaeologists took place. Due to further commercial exploitation, a large part of the site (100 x 10-20 m), could only be documented by large-scale wet sieving (within an area of *c.* 100 x 10-20 m). Archaeological remains from the Late Mesolithic until the Early Neolithic were found.

### *Geology/Pedology:*

The dune consists of medium to coarse grained sand with a gravel admixture. Within this layer a disturbed find horizon with older and younger material was located. At approximately 2 m below the surface an intact layer with a Late Mesolithic concentration and hearth was discovered. The gravel layer was covered by a meter of clay (Brounen/De Jong 1985, 186).

### *Taphonomy:*

Post-depositional processes have seriously disturbed the site. Apart from the layer with Late Mesolithic finds the site is a palimpsest of different periods. This disturbance may be due to bioturbation or fluvial activity. These specific circumstances have also affected the pottery by weathering. Apart from this there is evidence for finds eroded from the top.

### *Ecology:*

The site was located on a high and dry river dune in an area that may be characterized as a wetland. No specific information was available on the extents of the river dune, although agriculture may have been possible there. The distance to the Meuse and the large variation in vegetation that must have existed, make for a rich and diverse environment.

### *Dating:*

No  $^{14}\text{C}$  dates were available. The archaeological remains span the period between the Late Mesolithic and the Late Neolithic (a.o. Bell Beaker period). Most remarkable are several Early Neolithic finds that might be contemporaneous with the LBK culture in Southern Limburg.

### *Features/Spatial layout:*

Apart from the Late Mesolithic concentrations and the hearth, no features or further spatial information was documented.

### *Finds:*

Finds from the Late Mesolithic period consisted of flint. The Late Neolithic period was represented by several Bell Beaker sherds. The Early Neolithic assemblage consisted of sherds of two to three pots. The sherds are of very hard nature, have a reddish brown colour on the outside and a black core. They have been tempered with chamotte and sand (there is also a fraction of gravel). There seems to be some evidence for coil building. Sherds of pot 1 are characterized by cannelures (half-round crosssection, 6-16 mm wide, 2 mm deep). One side of the intervening ridges has been decorated with diagonal incisions. The overall pattern may be described as superimposed V's. Sherds from the 2<sup>nd</sup> and 3<sup>rd</sup> pots are decorated with respectively a fish-bone or pine motif and juxtapositioned elements with a hatched interior (Brounen/De Jong 1985, 186-187). The lithic material that was collected contained several trapezes (these are usually regarded as a Late Mesolithic indicator). Furthermore an LBK adze of amphibolite was found. The overall lithic artefacts comprised more than 50,000 pieces (pers. comm. L. Verhart).

### *Interpretation:*

At the time the Early Neolithic assemblage of Gassel has been identified as Limburg ware. Currently part of this assemblage has been re-identified as *Begleitkeramik* of La Hoguette (Brounen 1999), although several decoration motifs remains characteristic for Limburg ware (pers. comm. F. Brounen 2007). Due to the absence of spatial and chronological information it is not clear whether part of the flint assemblage or perhaps the LBK adze might be associated with the pottery. The presence of pottery contemporaneous with the LBK at Gassel might be indicative of the level of contact and interaction that existed between hunter gatherers, Early Neolithic farmers and less well known groups such as La Hoguette.

### *References:*

Brounen 1999  
Brounen/De Jong 1988

## 12. Gassel-De Zittert

### *Location:*

The site is located on the northern side of a slightly sloping Late Glacial dune on the lower terrace of the Meuse in the eastern part of the Dutch central river district. This location is close to Holocene sedimentation plain of the Meuse (Verhart/Louwe Kooijmans 1989, 76-78).

### *Site characteristics:*

The site was discovered by surveying in a sand extraction area in 1983. Excavation time was limited and the area which could be excavated was bordered on three sides by disturbances caused by sand dredging. In total 445 m<sup>2</sup> was excavated by shovel in squares of 1x1 m, after mechanical removal of the clayey topsoil. Two test trenches were dug in order to estimate the spread of finds. Furthermore features were documented at two separate levels (one located directly underneath the find horizon, the other 15 cm below that) (Verhart/Louwe Kooijmans 1989, 76).

### *Geology/Pedology:*

The Late Glacial dune is located on top of the Pleistocene river loam forming the lower terrace of the Meuse. The lower parts of the dune sand show distinct patches and fibres of iron ore. Within depressions of the coversand as well as within some features relicts of Brown Podzolic soil were still present. After occupation of the dune, the habitation level was covered by 30-50 cm of sand either deposited by wind or washed in. This coverup led to the preservation of the pottery and the internal spatial structuring. On top of this layer 50 cm of clay was deposited. This took place after the Iron Age, but most probably in the Middle Ages (Verhart/Louwe Kooijmans 1989, 77-78, 107).

### *Taphonomy:*

Due to the coverup with sand after the site was inhabited, both pottery and internal spatial patterning were preserved to a certain degree. On the other hand the site suffered from the encroaching sand dredging activities. Furthermore bioturbation, tree-falls and illuviation have obscured the stratigraphical differentiation. Hardly any organic remains were preserved due to acidic soil conditions except for two fragment of carbonised hazelnut shell out of feature F4 (Verhart/Louwe Kooijmans 1989, 78, 79, 103).

### *Ecology:*

No specific ecological research was conducted. The site however is situated at the boundary of two ecotones. On the one hand there is the old Pleistocene river terrace with coversand ridges, on the other hand the wet Holocene floodplain of the Meuse. The floodplain could be used for hunting, fishing and gathering as well as for pastureland. The coversand ridges may have been suitable for agriculture and the lower lying parts of that area also as pastureland. In combination with the changing seasons the area must have been able to support sedentary or long-term permanent communities (Verhart/Louwe Kooijmans 1989, 107).

### *Dating:*

No  $^{14}\text{C}$  samples could be collected. The site therefore has been dated on the basis of the typological characteristics of the pottery assemblage. Apart from admixture of sherds dating to the Iron Age and the Roman period this meant a cultural attribution to the Hazendonk group (Verhart/Louwe Kooijmans 1989, 108). This roughly indicates a date between 3900 and 3400 cal BC (Raemaekers 2005<sup>a</sup>, 269-270). Anachronistic elements on the site comprise Iron Age and Roman pottery (Verhart/Louwe Kooijmans 1989). At a distance of less than 1 km a small site with an LBK adze and sherds of *Begleitkeramik* was found (Brounen 1999; Brounen/De Jong 1988).

### *Features/Spatial layout:*

The site is located on the northern side of the Pleistocene dune on top of the slope. No anthropogenic features could be discovered, although they may have disappeared due to taphonomic processes. The features that have been documented (e.g. F1, F4, F5), might be classified as natural depressions. In the eastern part of the excavation a substantial light grey discolouration is also interpreted as a shallow depression. This depression coincides with the majority of the artefact distribution (Verhart/Louwe Kooijmans 1989, 78-79). The major concentration of pottery thus coincides with the large natural depression, however, on the basis of empty areas and the distribution of other artefact categories, it is unlikely this concentration should be regarded as an ecofact. The pottery concentration measures approximately 13 x 9 m and is surrounded by a zone with considerably less sherds, although some concentrations are visible. Apart from the major zone located in the middle of the excavation, smaller concentrations are visible to the west and northwest (Verhart/Louwe Kooijmans 1989, 98-99). Furthermore there is clustering on a smaller scale of sherds with similar types of decoration. These might be attributed to locations or dumps of former vessels. The lithic assemblage showed no distinct clustering except for a small concentration in the south-western extension of the excavation (*ibid.* 100). With the aid of use-wear analysis it was possible to define clustering of several activity areas. Wood working (the main activity within the assemblage) was concentrated in the eastern part of the main concentration (of pottery) and in the western part of the excavation. The processing of hides mainly took place in the south-western part of the main concentration. Bone and antler working was predominantly located in the western part of the excavation. Apparently there was a concentration of activities within the main concentration as well as in the western part of the excavation (*ibid.* 101, 102).

### *Finds:*

In total 2225 Neolithic sherds were found (35,321 g). Unfortunately a considerable number of these were difficult to interpret due to adherence of sand and iron-oxide. Within the assemblage grit (broken quartz) dominates as a tempering agent, apart from sand and organic material. H- and N-joins are most common. Both polished and roughened surfaces are present. Some sherds were roughened with clay smeared on the surface or impressions of fingertips and nails, or spatulas. Furthermore there are sherds with lines, impressions or applications of clay. On one sherd there was a plastic band with fingertip impressions. Morphologically

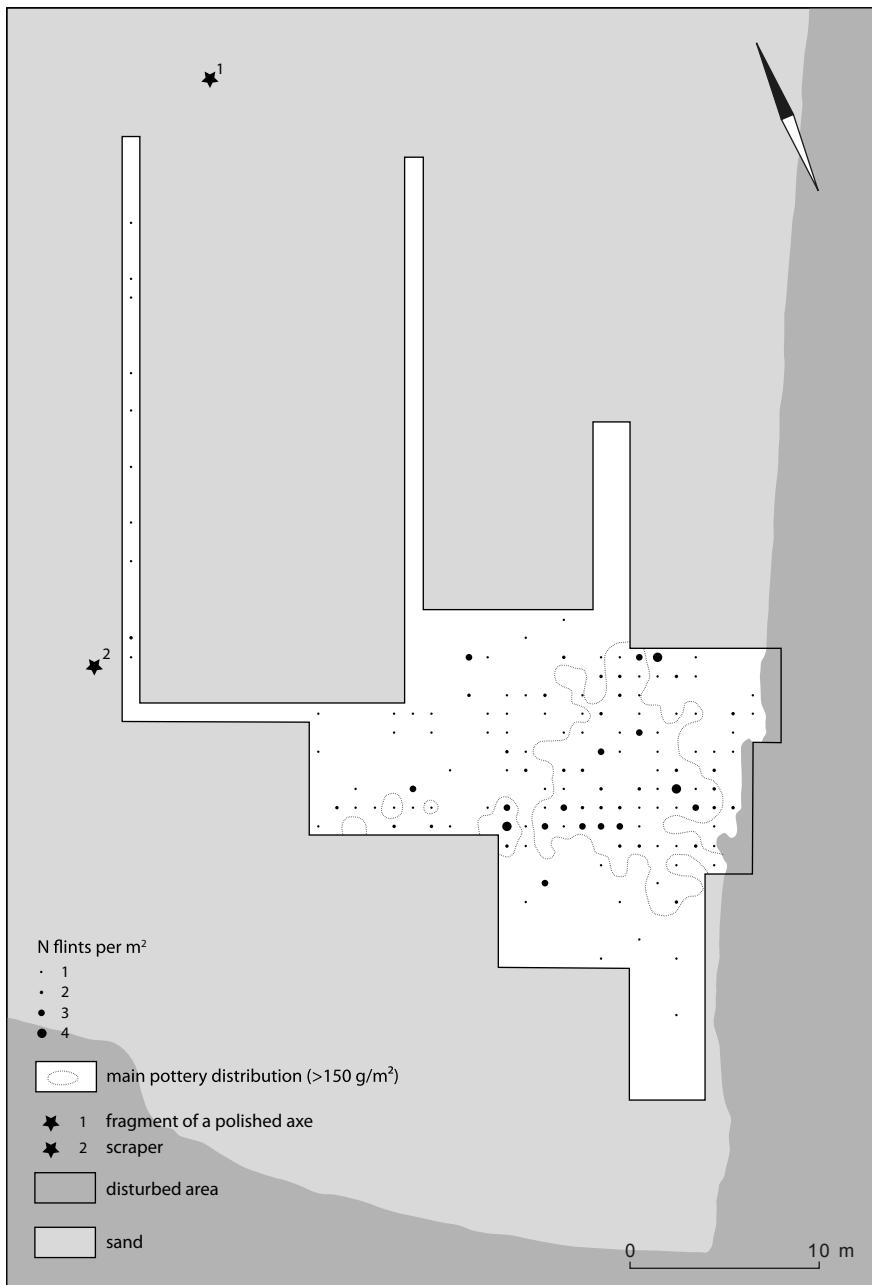


Fig. 19 Gassel-De Zittert. Overview of the main distribution of sherds (outline) and the distribution of flint (points). The main distribution coincides with the depression that was documented and several treefall features. Adapted from Louwe Kooijmans and Verhart 1989, fig. 6 and 31. For the geological and geomorphological location of the site in the wider region see map at Linden Kraaienberg.

the assemblage consists of carinated dishes, beakers, and mostly barrel and bucket-shaped storage vessels. Some of the rims have been flipped back. Lugs and knobs are omnipresent (Verhart/Louwe Kooijmans 1989, 79-88).

The flint assemblage comprised 214 artefacts (1954 g) as well as a scraper and axe-fragment found after the excavation. Part of the flint originated from the local terrace deposits of the Meuse. The other part comprises imports of primary or eluvial Rijckholt flint as well as imports of Lightgrey Belgian-, Vetschau-, and Valkenburg-type flint (there are indications for the import of Rijckholt blades). All tools were made on good quality imported flint, lacking any debitage remains. Soft percussion and flakes dominate and 28.5% of the assemblage was burnt.

Typologically the assemblage comprises points (N=5), scrapers (N=6), borers (N=2), retouched flakes and blades, some *Spitzklingen*, flakes from polished axes, an axe-fragment used as hammering stone and the middle-part of an axe of Lousberg-flint found after the excavation. The other stone material (37,572 g) comprises grinding and polishing stones as well as hammering stones and two pieces of Wommersom quartzite (Verhart/Louwe Kooijmans 1989, 88-97). Use-wear analysis on 95 tools indicated activities such as wood working (N=18), hide working (N=5), soft plant working and bone- and antler working (Bienenfeld 1986; Verhart/Louwe Kooijmans 1988, 111-116).

#### *Interpretation:*

The site of Gassel-De Zittert can be considered important for understanding the Middle Neolithic occupation of the Lower Rhine Basin. Despite clear evidence of post-depositional disturbance of the site a distinct patterning could be observed. The different concentrations of archaeological remains and the spatially separated evidence of different activities in the use-wear analyses indicate a partial in situ situation. On the basis of this Verhart and Louwe Kooijmans (1989, 105-106) assume the main concentration may be interpreted as the site of a hut (round to ovaloid, d=7 m). It may however be argued that the true impact of the correlating depression is not known, although artefact distribution indicates an anthropogenic patterning. An unambiguous hut site can thus not be convincingly attested. However the distribution and qualitative character of the artefact assemblage indicate a short-term occupation with a rather general domestic character (no special activity site). The afore-mentioned patterning as well as the presence of still useful artefacts indicates the occupants may have had the intention to return. Since no organic remains were preserved it is hard to estimate the composition of the subsistence of the occupants of Gassel. Due to the specific location of the site at the boundary of two ecotones a combination of hunting, gathering and fishing with animal husbandry and perhaps agriculture could be suggested (Verhart/Louwe Kooijmans 1989, 106-107). Gassel may thus be interpreted as the material reflection of a short-term occupation of a community which might have both been semi-agrarian and mobile.

#### *References:*

- Bienenfeld 1986
- Brounen 1999
- Brounen/De Jong 1988
- Raemaekers 2005<sup>a</sup>
- Verhart/Louwe Kooijmans 1989

### **13. Grave-Pater Berthierstraat**

#### *Location:*

The site is located on the northern edge of a large coversand dune (or island). To the west the site was bordered by the small river the Raam, currently in-filled with peat, and to the northwest by younger clastic deposits of the Meuse (Verhart 1989, 190; 2000, 159). The site is situated within the small municipality of Grave.

#### *Site characteristics:*

The finds were uncovered during the construction of a road in 1988. Finds and features were found over the entire width of the road (8 m) for a length of 15 m. Subsequently a small excavation took place. A trench (20 x 4 m) was dug east of and adjoining the road. The topsoil (30 cm) was removed mechanically, after which the find layer (15 cm) was excavated by shovel in 1 x 1 m squares. Subsequently the level underneath the find layer was cleaned, drawn and deepened 15 cm (Verhart 1989, 190-191).

#### *Geology/Pedology:*

A section in the excavation trench yielded the following sequence. At the base of the section there was a light yellow to yellow-brown layer of coversand with ferronous fibers. Above this layer a 20 cm thick brown-grey heterogeneous layer of sand, that contained most of the finds. On top of this was the topsoil (Verhart 1989, 190).

#### *Taphonomy:*

Much information was lost before the excavation took place because of the road works. Furthermore most of the features were difficult to recognize indicating processes of soil formation and/or erosion might have been present. No organic material was preserved in the acidic soil.

#### *Ecology:*

No specific ecological data was retrieved, but the site is situated at an ecotone in the landscape that combines the drier elements of the Pleistocene dunes with the wetter (remnant) parts of the former Meuse channels and hinterlands. The area was suitable for hunting, fishing and gathering. Agriculture might have been possible on the flatter and higher elements within the landscape.

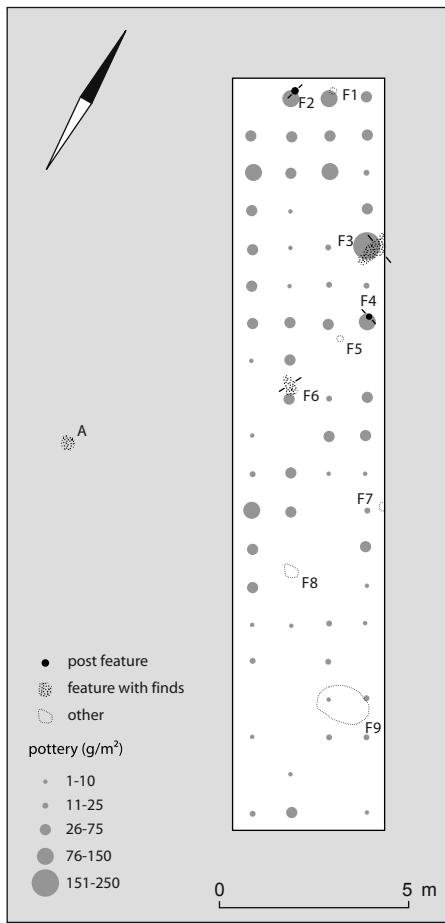
#### *Dating:*

Since no <sup>14</sup>C dates were available the site has been dated on the typological aspects of the pottery assemblage. Both elements of the Hazendonk 2 assemblage as identified on the Hazendonk (carinated profiles) as well as pottery belonging to the Hazendonk group (decorated with spatula, nail, fingertip impressions, flat bottoms) were found at the Pater Berthierstraat (Verhart 1989, 195). It is therefore most probable the site was in use during the Hazendonk-3 phase as well as slightly anterior to that and related to the northwest MK tradition.

#### *Features/Spatial layout:*

Some nine features were documented, seven of which appeared to be natural (Verhart 1989, 191). Only two features (F3 and F4) were identified as remnant postholes (30 cm deep). Furthermore a pit containing Middle Neolithic refuse was documented by amateurs previous to the excavation, but was not recovered afterwards. Overall the distribution of pottery over the excavation is continuous increasing in the north of the trench. Clustering of both pottery and flint is mainly related to the features. This is partly explainable by the fact that part of the features may have been present in the find layer (Verhart 1989, 195).

### Grave-Pater Berthierstraat



*Fig. 20 Grave-Pater Berthierstraat. Distribution of features and finds. Adapted from Verhart 1989, fig. 2. For the geological and geomorphological location of the site in the wider region see map at Linden-Kraaijenberg.*

#### Finds:

Apart from medieval pottery 192 Middle Neolithic sherds (2579 g) were collected during the excavation. Two amateur archaeologists also found 189 Middle Neolithic sherds (1771 g). The sherds varied in colour between yellow, brown and black, and suffered from iron ore adherence. The assemblage was coil-built and tempered with quartz and chamotte. In total 35 sherds were decorated (8.8 %) with impressions of nails, spatulas, lines and plastic elements. The zone underneath the rim was not decorated. Two sherds had lugged ears, one of which was perforated. Morphologically the assemblage comprises carinated profiles, dish-like vessels and bucket-shapes. Furthermore 88 g of clay was found with impressions of branches. Large parts of these were found in the features. They may be interpreted as elements of wattle and daub. In total 107 flint artefacts were found, mainly consisting of Rijckholt-type flint, with a local terrace element. A large number of tools were found (18.7 %). The tool assemblage comprised of one point and two point fragments, a blade and flake scrapers and retouched blades and flakes. One artefact with retouch was fabricated on a large flake from an axe. Furthermore two hammer stones and a fragment of a grinding stone were found (Verhart 1989, 191-194).

### *Interpretation:*

The site of Grave-Pater Berthierstraat is largely comparable to the Kraaienberg (*cf.* Verhart 1989, 196). Both sites indicate the presence of domestic settlements on the edge of coversand dunes next to the Meuse. The site of Pater Berthierstraat may be interpreted as a domestic settlement because of the presence of both pottery and a rather domestic flint assemblage, but especially because of the find of several features containing elements of wattle and daub. On the other hand only a small part of the site could be excavated, making it difficult to come to conclusions on the specific nature and intensity of habitation. Agriculture and husbandry are however plausible options within this type of landscape that is also very suitable to the exploitation of natural resources (*i.e.* hunting, gathering, fishing, fowling).

### *References:*

Verhart 1989  
Verhart 2000

## **14. Haamstede-Brabers**

### *Location:*

The site of Haamstede-Brabers was located on a 500 m long sand-ridge (Brabers) south of the village of Haamstede on the island of Schouwen in the province of Zeeland. The Neolithic settlement of Brabers was located at the southern tip of this rather short and narrow coastal barrier. This is also the exact spot where the Scheldt runs into the North Sea (Verhart 1992, 73-75).

### *Site characteristics:*

The site was discovered during a geological survey and excavated in 1957 by the ROB since the area was subject to rural land redistribution; time was limited and destruction imminent. Due these circumstances only a part of the Neolithic settlement could be excavated. Much information is lacking from the northern part. The topsoil was removed mechanically, but time restrictions only allowed for a clearing of the immediate surroundings of the features found. Therefore many small, outlying or vague soil traces must have been lost. All finds from the find layer were collected without consideration of their spatial placement (Verhart 1992, 74-75). In total the ROB excavated approximately 1,612 m<sup>2</sup>.

### *Geology/Pedology:*

The site was located on a coastal barrier that was probably formed during the Calais III transgression. Behind the coastal barrier there was an extensive area of tidal flats and mudflats crosscut by drainage channels. Between the tidal flats and the Pleistocene upland there was a zone with peat formation. The tidal and mud flats were drained by a wide channel which was not yet connected to the river Scheldt. The Scheldt river-mouth at that time was located north of the island of Walcheren and south of the coastal barrier of Schouwen. The pedological situation on the dune consisted of a base of sea sand on top which lay layers of decomposed cardium shells. A 10-30 cm thick humic layer on top of the cardium shells contained the Neolithic artefacts. At some places the find layer consisted

of two separate layers separated by 10 cm of probably wind-blown, sterile sand. The site was covered by another layer of wind-blown sand (20 cm), a thin layer of peat and a 10-40 cm thick humic soil containing Iron Age and Roman period finds. On top of this a medieval clay layer of 50-100 cm was deposited (Verhart 1992, 75).

#### *Taphonomy:*

Much information on the site has been lost due to the hectic circumstances surrounding the excavation (Verhart 1992, 73 and 75). This is even more regrettable since the area had a high potential for finding a rather intact site, especially because of its thick cover. Barely any organic material was preserved because of the existing soil conditions. This might be indicative of the fact the site was not covered up immediately and/or a low groundwater table.

#### *Ecology:*

No specific ecological data was collected, yet the site evidently was on an ecotone in the landscape. The coastal barrier provided for a high and dry settlement location, with some possibilities for agriculture. To the west and south the sea and the Scheldt-mouth formed ideal locations for fishing and transport. The tidal flats and mudflats to the east were suitable as grazing grounds for cattle and also formed ideal locations for hunting and gathering.

#### *Dating:*

According to the typological aspects of the pottery assemblage Brabers should be attributed to Vlaardingen phase 2a. This phase (on the Hazendonk) dates roughly from 2900 cal BC onwards (Lanting/Van der Plicht 1999/2000; Verbruggen 1992). One <sup>14</sup>C date was available, sampled on charcoal from the culture layer.

According to Lanting and Van der Plicht (1999/2000, 70) the sample must have suffered from a considerable old-wood effect. It might however also be possible that the internal division, (either the old one or the one devised by Lanting and Van der Plicht (1999/2000, 33-34) is not totally adequate.

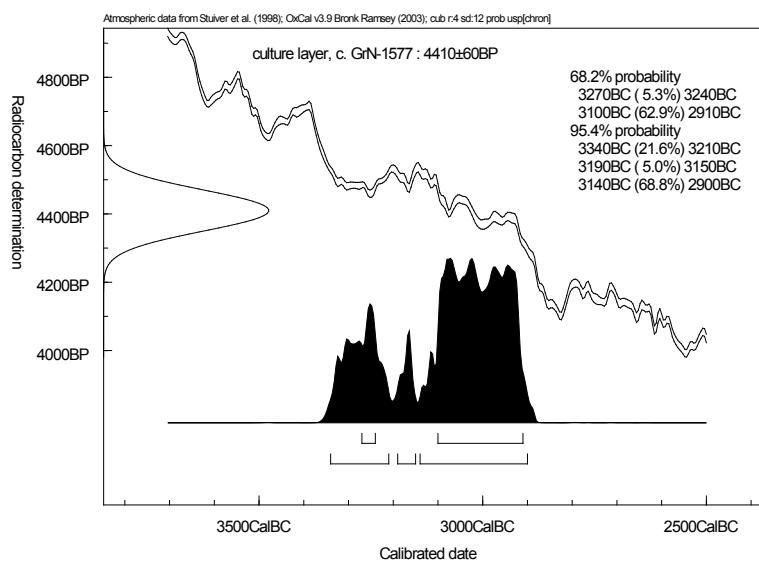


Fig. 21 Radiocarbon date for Haamstede-Brabers.

### *Features/Spatial layout:*

The numerous features were found mainly concentrated in four separate clusters. Cluster 1 is situated in the northern part of the excavation and comprises an ENE-WSW oriented oblong rectangular ground plan measuring 9.10 x 3.80 m and consisting of inner posts, a double row of posts along both walls and a concentration of smaller posts and stakes in the centre. One large discolouration was found inside the house (5.70 x 2 m), consisting of two parts and another oval one as well as five postholes at the eastern short side. The small house consisted of a roof construction with inner posts, rafters, in combination with purlines and a ridge pole. The outer wall posts probably supported a wall plate. The depression might have been indicative of artificial lowering of the living area (Verhart 1992, 83-85, *cf.* also Hogestijn/Drenth 2000/2001). The four posts on the eastern side of the house have been interpreted as a granary (Louwe Kooijmans 1985).

Cluster 2 is a NW-SE oriented rounded rectangular groundplan measuring 7.50 x 4.25 m. The building is small and two-aisled. A large number of irregular smaller posts appear inside and outside the groundplan. Their association is unknown. Several discolourations were found, with two ditch-like features near the walls and an oval soil trace near the south. A smaller discolouration in the house is probably a posthole, rather than a hearth. A saddle-roof is the most plausible option for structure 2.

Cluster 3 is located southwest of cluster 2 and consists of some 40 round to rectangular features. A 6 m long row consisting of 10 irregular spaced postholes was documented, to the south of which lay a pit containing 9 transverse arrowheads. No structure could be discerned out of the few features.

Cluster 4 is formed by a NW-SE oriented groundplan of 6 x 3.75 m and, in the western part nine separate postholes and three discolourations. Due to the failing documentation the exact position of this cluster is unclear. The structure is strongly divergent in that it has a rather irregular setting of posts with a double row with heavy outer posts in the north and a row with lighter posts in the south. The overall spacing is also irregular (Verhart 1992, 87-89). It is unlikely this cluster is the groundplan of a house (Hogestijn/Drenth 2000/2001; Verhart 1992). Remarkably none of the four structures are similar. It is therefore difficult to render hypotheses concerning contemporaneity and function of the buildings.

### *Finds:*

Only 192 sherds (4696 g) could be recovered. They only comprise rim, wall or base fragments, no clay discs or collared flasks. The pottery, with well-finished (smooth) to uneven surface, was tempered with chamotte and to a small extent (4%) with chamotte and quartz. Furthermore a weak S-profile, coil-joints at the base and rounded rims characterise the assemblage. Only one base fragment had a protruding profile. Typologically the characteristics of the assemblage (absence of quartz-temper, perforations applied before firing and protruding bases) indicate phase 2a of the Vlaardingen culture, rather than 1b or 2b (Verhart 1992, 79). Flint points to a predominantly local production in flake technology on rounded nodules (N=45) collected in the coastal region. Tools comprise transverse arrowheads (N=17), scrapers (N=48), borers (N=4), retouched flakes (N=34) (amongst which two typical bifacially retouched flakes) and retouched blades (N=1). Furthermore imported flint with a primary source in West or Middle

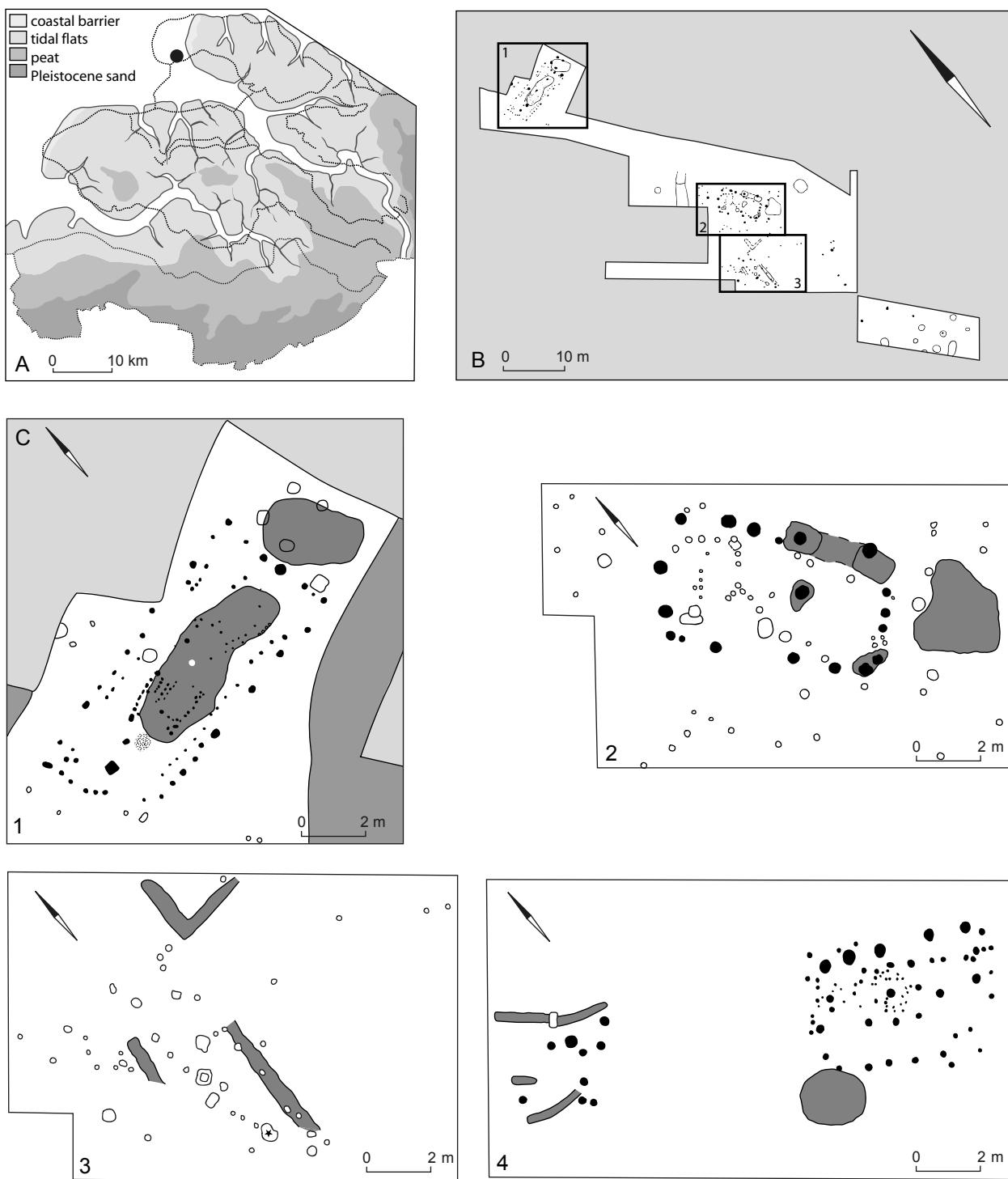


Fig. 22 Haamstede-Brabers. (A) Overview of the geological situation and (B)excavation plan. (C) details of the four clusters of posts that were identified. The star in cluster 3 represents the location of a pit containing 9 transverse arrowheads. The location of cluster 4 remains unknown. Adapted from Verhart 1992, fig. 3, 9, 10, 12, 14, 15.

Belgium was found as well numerous fragments of broken or damaged polished flint axes. Some 17% of the flint was burnt. The ten pieces of stone recovered comprised mainly fragments of granite of quartzitic sandstone, amongst which a remnant of a polishing stone. Furthermore the molar of a domesticated cow was found as well as pieces of charcoal (Verhart 1992, 80-81). There was also evidence of wattle-work (*ibid.* 85).

#### *Interpretation:*

On the basis of the variation in structures found at Brabers and in combination with the heterogeneous nature of Vlaardingen-settlements as a whole, it may be hypothesized that permanent habitation at Haamstede-Brabers need not have taken place (Verhart 1992, 93-95). The location of the settlement (on the southern tip of the coastal barrier) and the large percentage (16.2%) of arrowheads in the tool assemblage are thought indicative of the importance of hunting and fishing (*ibid.* 93-94). However, it should be taken into account that much data was lost during the excavation and virtually no information on subsistence is available. Furthermore out of the clusters of features some solid structures could be distilled, indicating that a reasonable investment in the location was made. Therefore a substantial degree of permanence might be assumed. This may have involved a year-round occupation of Haamstede.

#### *References:*

- Hogestijn/Drenth 2000/2001
- Lanting/Van der Plicht 1999/2000
- Louwe Kooijmans 1985
- Verhart 1992

## **15. Hardinxveld-Giessendam De Bruin**

#### *Location:*

De Bruin is located on a Late Glacial dune (donk) in the region of the Alblasserwaard in the western downstream part of the Dutch Rhine-Meuse delta. During occupation the site was surrounded by a succession of open water (peat)marsh and crevasse channels (Mol 2001<sup>b</sup>; 2003).

#### *Site characteristics:*

The site was dug by Leiden University in 1998 during the project of the 'Betuweroute', which entailed the construction of a railway. Since the site was at a depth of more than 5 m below groundwater level, steel bulkheads had to be inserted into the ground creating a bathtub-shaped excavation pit. The extent of the excavation was 345 m<sup>2</sup> (Nokkert/Louwe Kooijmans 2001, 23) and comprises of part of the top of the dune, the slope and the foot. De Bruin was the largest donk in the area covering 44,200 m<sup>2</sup> in phase 1. The maximum extent of the site also dates to Phases 1 and 2 and covers *c.* 1200 m<sup>2</sup>.

### *Geology/Pedology:*

The dune consists of Late Glacial coversand on top of fluvial and eolic sediments (Fm Kreftenheije). During Phase 1 (5500-5100 cal BC), the Middelkoop system deposited clay. At a height of 4 m, De Bruin was the highest dune in the vicinity surrounded by marshes, open water and three crevasse channels (Mol 2001<sup>b</sup>; 2003). During Phase 2 river activity ceased and peat growth occurred in the surrounding marshes. De Bruin surfaced only 1.5 m above the marshes. In Phase 3 (4700-4450 cal BC) the height of De Bruin decreased a further 70 cm and the site was surrounded by peat. Three crevasse channels of the Schaik system were active and deposited clay (Mol 2001<sup>b</sup>, 53). The dune slowly became covered with younger sediments.

At De Bruin three zones were identified within the excavation pit comprising of the top of the dune, the slope and the marsh area. Contrary to Polderweg, colluviation took place during the entire occupation resulting in a rather complex interspersement with all Holocene layers (Mol/Louwe Kooijmans 2001, 59).

### *Taphonomy/Site-formation:*

The cover of the entire site with waterlogged sediments resulted in good preservation of organic material and a strong level of spatial and chronological control. The top of the dune however has a 'decapitated' soil horizon because of slope processes. Apart from bioturbation especially these slope processes, such as colluviation, soil creep and soil wash are a substantial disturbing factor (Mol/ Louwe Kooijmans 2001, 66). The slope of the dune must have been a former activity area. The marsh zone bordering the dune is interpreted as a toss and drop zone (Louwe Kooijmans/Nokkert 2001).

### *Ecology:*

Palynological and macrobotanical data indicate a changing landscape of open water and swamps. Reed marshes grew at the edges of the lakes. On De Bruin, trees such as oak (*Quercus*), elm (*Ulmus*), ash (*Fraxinus*) and lime (*Tilia*) as well as varied shrubs such as hazel (*Corylus avellana*) grew. The wood that was used was obtained locally. The increase in alder over time indicates the increasingly wet circumstances (Bakels *et al.* 2001).

### *Dating:*

In total 20 dates were obtained. Two of these, dating the graves, have to be discarded on the basis of the reservoir effect (Mol/Louwe Kooijmans 2001, 71).

GrA-12304 dates the beginning of Phase 2, GrA-13277 the end of Phase 1. There is an overlap in the <sup>14</sup>C dates while archaeologically a hiatus is observed. GrA-13313 dates the end of Phase 2 (the outliers of GrA-13278/14864 are believed to date the find layer after habitation had stopped). Both archaeologically as well as with respect to the <sup>14</sup>C dates the hiatus between Phases 2 and 3 (GrA-13313/13315 and GrA-13317) is clearly visible. The combination of <sup>14</sup>C dates and stratigraphy has led to the following phasing: Phase 1: 5475-5100 cal BC, Phase 2: 5100-4800 cal BC, a hiatus between 4800 and 4700 and Phase 3: 4685-4459 cal BC (Mol/Louwe Kooijmans 2001, 68-71).

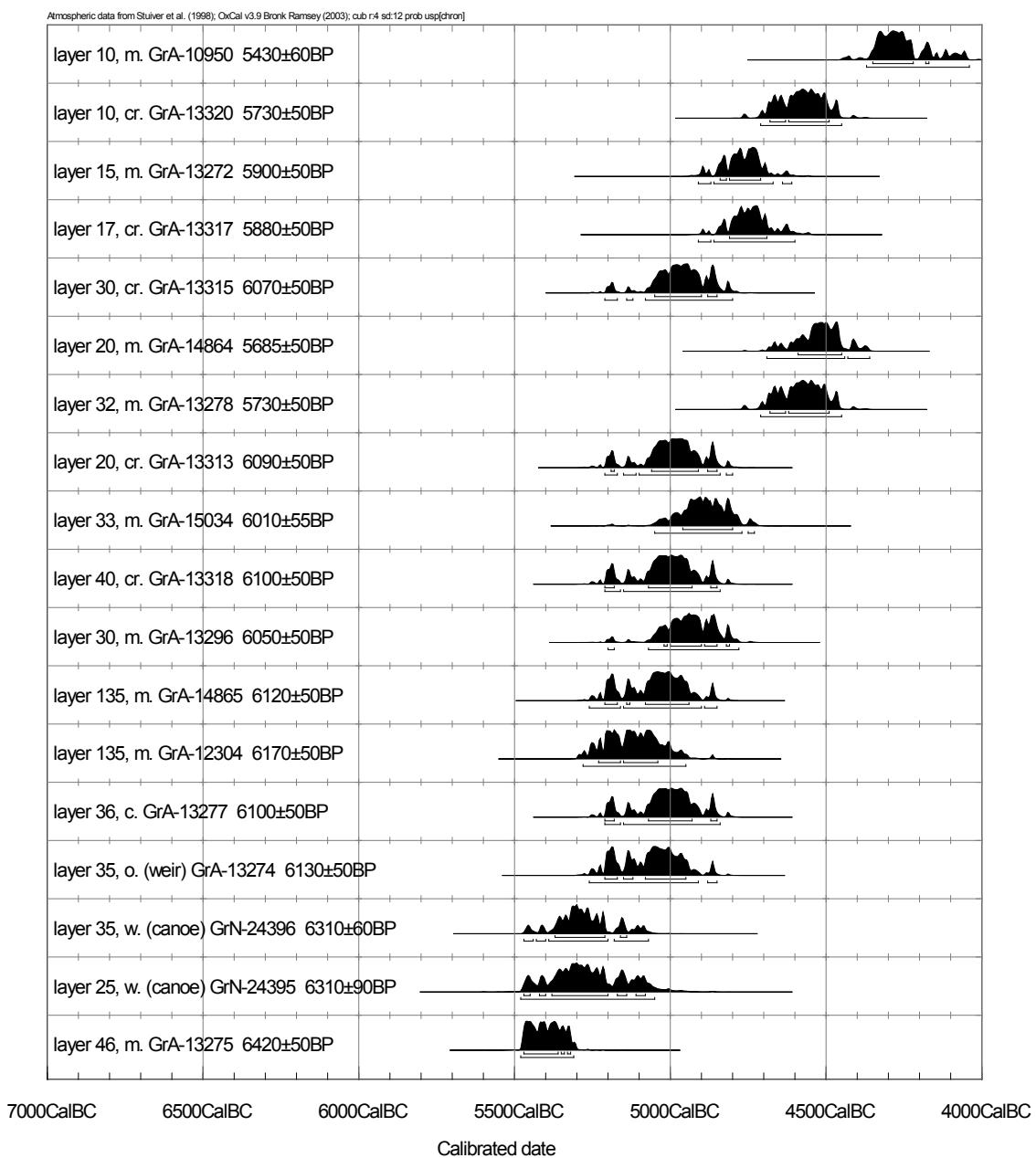


Fig. 23 Radiocarbon dates for Hardinxveld-Giessendam-De Bruin.

A recent reinterpretation of the available dates confirmed the existence of hiatuses and established the time ranges for Phase 1 at 5230±150 to 5110±90 cal BC, Phase 2 at 5040±80 cal BC to 4850±170 cal BC and Phase 3 at 4560±100 cal BC to 4480±160 cal BC (Mol/Van Zijverden 2007, 95). The error margin on these dates is, however, large, which is why the traditional phasing is used here.

#### Features and spatial layout:

At De Bruin several types of features were uncovered comprising of concentrations of artefacts, (deposition) pits, postholes, two human burials (G1 and 2) and one animal burial (G3) as well as a possible landing stage for canoes (Louwe Kooijmans/Nokkert 2001, 79). All three distinguished phases show a different

## Hardinxveld-Giessendam-De Bruin

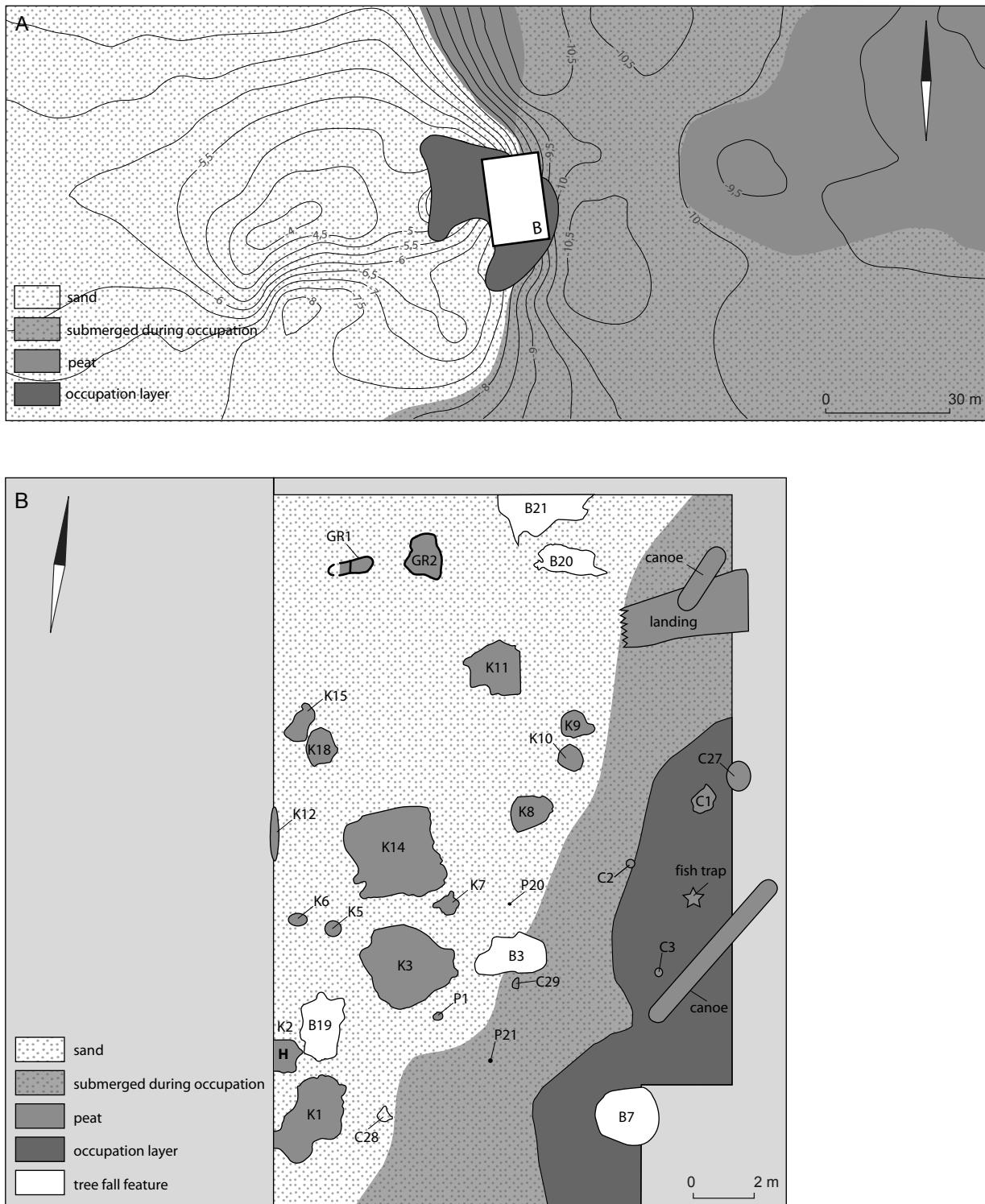


Fig. 24 Hardinxveld-Giessendam-De Bruin. (A) geological situation of the site and distribution of archaeological debris during phase 1, in combination with location of the excavation trench. (B) detail of the excavation trench on the river dune. All features belong to phase 1. Feature explanation: Feature explanation: B=treefall feature; C=concentration; G=grave; K=pit; S=wood; Adapted from Mol 2001<sup>b</sup>, fig. 2.6 and Louwe Kooijmans/Nokkert 2001, fig. 4.27.

spectrum of features. This is partly due to the 'movement' of the top, slope and marsh zones within the excavation pit. In Phase 1 many different pits were dug. On top of the dune not much activity is registered except for two burials. The marsh area seems to have been a landing stage for canoes. In Phase 2 several large pits were dug and hearth places attest to the use of the marsh margin as activity area. Some of the larger pits might represent hut features. Phase 3 is remarkable for several features with structural depositions (Louwe Kooijmans/Nokkert 2001, 106). In general human impact on the environment at De Bruin appears to have been restricted (Out/Verhoeven 2013).

#### *Finds:*

The flint (N=12,263) industry is characterised by both southern (Rijckholt/ Belgian lightgrey/ Wommersom) types as well as evident northern elements. Most flint artefacts were produced on local material. In contrast to Polderweg, De Bruin does have a substantial number of trapezes as well as LBK points dating to Phase 2 (Van Gijn *et al.* 2001<sup>b</sup>, 153).

The Swifterbant pottery, which was found in the layers belonging to Phases 2 and 3, typologically can be identified as belonging to the Early and Middle SWB phase (*cf.* Raemaekers 1999). Another type of pottery seems to be produced within *Groupe de Blicquy* tradition, indicative for southern contacts (Raemaekers 2001<sup>b</sup>, 149).

The good preservational conditions ensured an array of bone, wooden and antler artefacts as well as the remarkable find of an entire canoe and part of a fishweir (Louwe Kooijmans *et al.* 2001<sup>c</sup>; Louwe Kooijmans *et al.* 2001<sup>d</sup>). Botanical remains attest to gathering of a.o. waternuts (*Trapa natans*) (Bakels *et al.* 2001). Faunal and fish remains indicate a variation of species and a focus on beaver (*Castor fiber*), otter (*Lutra lutra*) and wild boar (*Sus scrofa*) (Oversteegen *et al.* 2001; Beerenhout 2001<sup>b</sup>). Some bones of domesticated cattle, pig, sheep and goat were found dating to the last phase. They are interpreted as having been brought to the site as quarters.

#### *Interpretation:*

The excavation of De Bruin can be considered a representative sample of the extent of occupation on the dune, although data from the dunetop is underrepresented for the later phases. The amount of activity indicates an alternating relationship with the twin site of Polderweg (phase 2 of De Bruin may be successive to phase 1 of Polderweg). Artefact spectrum and features indicate the function of a probable base camp in phase 2. Faunal, fish and botanical remains indicate a presence in all seasons. There are several possible scenarios. The most plausible option is a winter base camp with a logistical function during the summer (Louwe Kooijmans 2001<sup>b</sup>, 518). Furthermore there is clear material evidence of both southern and northern contacts.

#### *References:*

- Bakels *et al.* 2001
- Beerenhout 2001<sup>b</sup>
- Louwe Kooijmans 2001<sup>b</sup>
- Louwe Kooijmans *et al.* 2001<sup>c</sup>

Louwe Kooijmans *et al.* 2001<sup>d</sup>  
Louwe Kooijmans/Nokkert 2001  
Mol 2001<sup>b</sup>  
Mol 2003  
Mol/Van Zijverden 2007  
Nokkert/Louwe Kooijmans 2001  
Out/Verhoeven 2013  
Oversteegen *et al.* 2001  
Raemaekers 2001<sup>b</sup>  
Van Gijn *et al.* 2001<sup>b</sup>

## 16. Hardinxveld-Giessendam Polderweg

### *Location:*

Polderweg is located on a Late Glacial dune (donk) in the Alblasserwaard region in the western downstream part of the Dutch Rhine-Meuse delta. During occupation the site was surrounded by vast wetlands. Over time the dry habitation area slowly decreased while being covered by marsh-deposits (Mol 2001; 2003).

### *Site characteristics:*

The site was excavated by Leiden University in 1997, during the project of the 'Betuweroute', which entailed the construction of a railway. Since the site was at a depth of more than 5 m below groundwater level, steel bulkheads had to be inserted into the ground creating a bathtub-shaped excavation trench. The excavation measured 448 m<sup>2</sup>, both the extents of the dune and the partially overlapping site extents measure c. 4000 m<sup>2</sup>. Within the excavation trench part of the top, slope and foot of the dune were represented. The site was excavated in a 50 x 50 cm grid.

### *Geology/Pedology:*

The dune consists of Late Glacial coversand on top of fluvial and aeolic sediments (Fm Kreftenheije). Before 5500 cal BC (and before occupation) peat growth covered the lower extent of the dunes. During the main occupation phase (phase 1, 5500-5300 cal BC), the meandering Middelkoop river system deposited clay. Polderweg lay in between the open water and peat-marsh area. A crevasse channel probably formed a communication route. During occupation Phases 1/2 (5100±50 cal BC) and 2 (5000±50 cal BC) the inhabitable area of the dune further decreased. The site became surrounded by peat-marsh. Within the excavation trench three distinct zones were identified. As the dune 'drowned' these zones gradually shifted up slope. The first zone concerns the top of the dune and is characterised by a remnant of previous soilformation underneath a thin colluvial layer. The second zone is on the slope of the dune. It is a thick colluvial layer interspersing with marshy deposits on the distal end. The final zone defined is the marsh area at the foot of the dune characterised by peat and clay deposits (Louwe Kooijmans/Mol 2001; Mol 2001<sup>a</sup>; 2003).

### Taphonomy/Site-formation:

The quick covering of the entire site with waterlogged sediments resulted in an excellent preservation of organic material and enabled a strong level of spatial and chronological control. The top of the dune however suffered most from trampling and the weathering of organic remains. Bioturbation and colluviation further explain the low density and fragmentation of finds there. The slope of the dune must have been a former activity area yet colluviation and reworking of material complicate a spatial interpretation. The marsh zone bordering the dune can be interpreted as a toss and drop zone. Material is preserved in situ (Louwe Kooijmans/Mol 2001, 66-67).

### Ecology:

Palynological and macrobotanical data indicate a landscape of open water and swamps. Reed marshes grew at the edges of the lakes and other areas were characterised by alder carr. On the dunes, trees such as oak (*Quercus*), elm (*Ulmus*), ash (*Fraxinus*) and lime (*Tilia*) as well varied shrubs, grew. As the dune became smaller, trees fell because of the rise in the water table and the oak and lime vegetation was gradually replaced by a typical marsh-forest (Bakels/Van Beurden 2001).

### Dating:

Apart from a dendrochronological date of 4972 cal BC, in total 17 radiocarbon dates were obtained. Three of these date the pollen sample and one comes from the prospection. Of the 13 AMS-dates out of the excavation, four should be discarded on behalf of the reservoir-effect (Louwe Kooijmans/Mol 2001). The other dates are presented below:

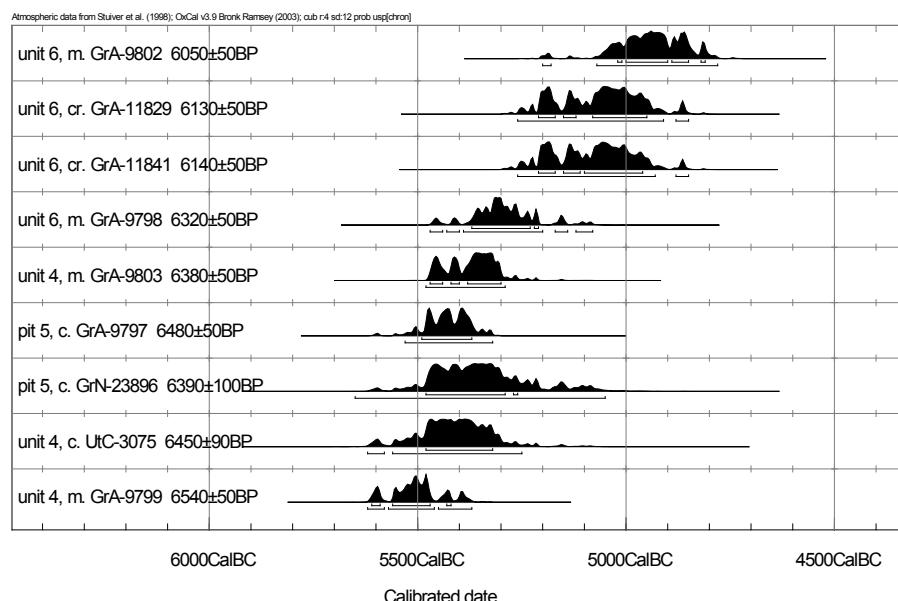


Fig. 25 Radiocarbon dates for Hardinxveld-Giessendam-Polderweg.

The combination of these dates with the site stratigraphy enables a rough division in two phases. Phase 1 dates between 5500 and 5300 cal BC and Phase 2 between 5100 and 4900 cal BC. The dating of a Phase 1/2 (5100±100 cal BC) is based on correlation with the groundwater table as well as on the basis of stratigraphic and spatial autonomy relative to Phase 2 (Louwe Kooijmans/Mol 2001, 66, 70). Phase 0 is separated off for all material formally predating Phase 1 and can be considered the very start of the occupation. A recent reinterpretation of the available dates confirmed the existence of hiatuses and established the time ranges for Phase 1 at 5430±90 to 5330±100 cal BC and Phase 2 at 5200±140 cal BC to 5069±140 cal BC (Mol/Van Zijverden 2007, 95). The error margin on these dates is, however, large, which is why the traditional phasing is used here.

#### *Features and spatial layout:*

At Polderweg a substantial variety of pits and features as well as find concentrations were uncovered. Several smaller and larger pits were found amongst which hearth pits as well as post and stakeholes. Remarkable are two large ovaloid (8.5 x 3 / 6.5 x 2 m) pits with a compact humic layer dating to Phase 1 (K5 and K8). They were interpreted as small huts with sunken floors (Hamburg/Louwe Kooijmans 2001; Louwe Kooijmans 2003). In total 5 graves were uncovered (G1-5). Two of these (G1 and 2) are human burials, the other three dogs, of which only one was articulated (G3), another incomplete (G2) and one was formed by a concentration of bones belonging to one individual. Except for burial G1 (skeleton of an old woman) all date to Phase 1. Phase 1 is the most informative and is characterised by extensive digging activity. This indicates an intensive use as habitation, activity and burial area.

#### *Finds:*

Because of the good preservational conditions Polderweg can be considered an extremely rich site. Flint (N=18,938) and stone material point to a somewhat deviant Late Mesolithic industry with a strong southern connection. Indicative of this are a.o. a large pre-core of Rijckholt flint as well as at least one LBK arrowhead dating to Phase 1 (Van Gijn *et al.* 2001<sup>a</sup>, 159). In Phase 2 the earliest Swifterbant pottery is documented (Raemaekers 2001<sup>a</sup>). The bone and antler industry consists of tools like axes, adzes, awls and chisels (Louwe Kooijmans *et al.* 2001<sup>b</sup>, 285). Wooden artefacts comprise fish traps, bows, paddle blades and axe handles (Louwe Kooijmans *et al.* 2001<sup>a</sup>).

The many faunal and fish remains indicate a focus on aquatic sources next to terrestrial species (esp. wild boar (*Sus scrofa*)) (Van Wijngaarden-Bakker *et al.* 2001; Beerenhout 2001<sup>a</sup>; Louwe Kooijmans 2003). Botanical remains of a.o. hazelnut (*Corylus avellana*), waternut (*Trapa natans*) and apple (*Malus sylvestris*) attest to gathering (Bakels/Van Beurden 2001, 358).

#### *Interpretation:*

The site is a sample of more or less 20% of the total occupation area. The sample can be considered representative although the information on the actual top of the dune is less well represented. Features, burials and artefacts indicate the status of a base camp at least for Phase 1. Faunal and botanical remains indicate either a presence from September to March or only in midwinter with occasional visits

in early autumn (Louwe Kooijmans 2001<sup>a</sup>, 543-563; 2003, 619-620). Subsistence activities indicate a focus on beaver (*Castor fiber*), otter (*Lutra lutra*) and pike (*Esox lucius*). There is ample evidence for direct or indirect contact with southern farming communities, making Polderweg one of the first stepping-stones in the process of Neolithisation.

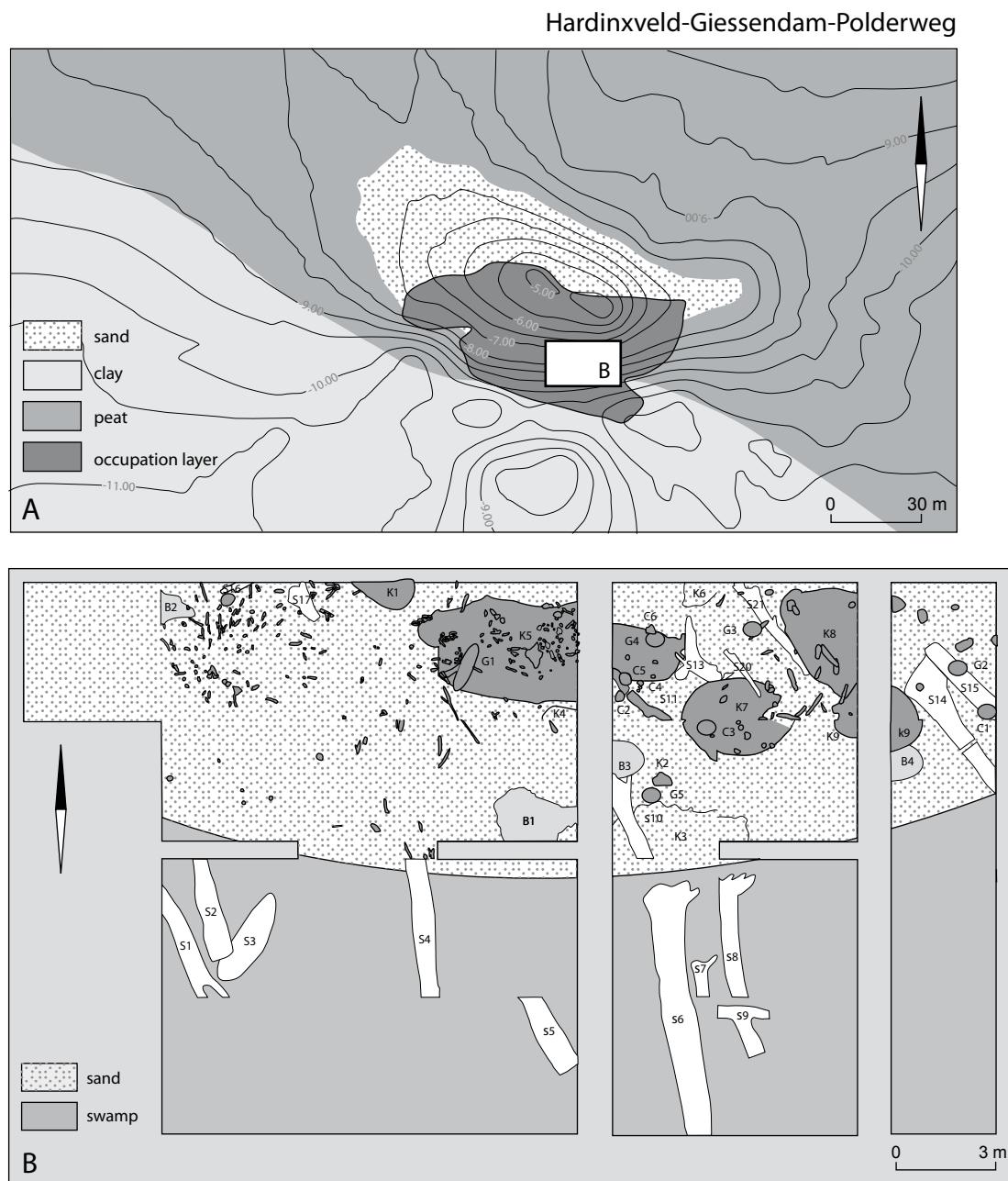


Fig. 26 Hardinxveld-Giessendam-Polderweg. (A) geological situation of the site and distribution of archaeological debris during phase 1, in combination with location of the excavation trench. (B) detail of the excavation trench on the river dune. Features belong to different phases. Phase 0: S3,6,7; B1; K3; G1. Phase 1: S1,5,8; K1,4,5,6,7,8; G2,3,4,5; P8. Phase 1/2: B2,4; C1,2,3,4,5. Phase 2: S1,2,4,9,10,12,13,14,15,16,17,18,19,20,21; C6. Adapted from Mol 2001<sup>a</sup>, fig. 2.5 and Hamburg/Louwe Kooijmans 2001, fig. 4.20-4.23.

### *References:*

Bakels/Van Beurden 2001  
Beerenhout 2001<sup>a</sup>  
Hamburg/Louwe Kooijmans 2001  
Louwe Kooijmans 2001<sup>a</sup>  
Louwe Kooijmans 2003  
Louwe Kooijmans/Mol 2001  
Louwe Kooijmans *et al.* 2001<sup>a</sup>  
Louwe Kooijmans *et al.* 2001<sup>b</sup>  
Mol 2003  
Mol/Van Zijverden 2007  
Van Gijn *et al.* 2001a  
Van Wijngaarden-Bakker *et al.* 2001  
Raemaekers 2001<sup>a</sup>

## **17. Hazendonk**

### *Location:*

The site of the Hazendonk is located on a SW-NE oriented donk in the region of the Alblisserwaard in the western downstream part of the Dutch Rhine-Meuse delta. The north-eastern slope is rather steep as opposed to the gradually dipping south-western 'tail' (Louwe Kooijmans 1974, 86). The donk is part of a larger complex of 25 donken. Twenty of these showed traces of occupation (Louwe Kooijmans 2005, 261; Verbruggen 1992).

### *Site characteristics:*

The site was discovered in 1963, test excavations took place in 1967, followed by a large-scale campaign between 1974 and 1976. The total excavated area measures c. 868-1,000 m<sup>2</sup>, if one includes the test excavations. In total 57 trenches with a standard size of 2 x 3 m were opened. They were located in a grid oriented on the dune and the finds were measured three-dimensionally. The eastern end of the dune was excavated in ten adjoining trenches labelled Unit C. Unit C is important since it holds the most complete section enabling a distinction in several phases of occupation. Interpretation is however hampered by the discrepancy between the slope of the dune and the orientation of the excavation grid. This was partly solved by a specific program to allocate the separate finds (Jonkers 1992). In total seven main periods of varying extent, location and duration could be identified (Louwe Kooijmans 1987, 231). There are some indications for Mesolithic activity in the form of dated charcoal and a minor signal in one of the pollencores (Hazendonk 0) (Out 2009; Van der Woude 1983, 79). The Hazendonk was occupied during the Middle Swifterbant period (Hazendonk 1 and 2), the Hazendonk 3 group (Hazendonk 3), the Vlaardingen group (Vlaardingen 1<sup>a</sup>, 1<sup>b</sup> and 2<sup>b</sup>) and the Bell Beaker period (Veluwe Bell Beaker). Apart from the excavation trenches extensive geological and palynological fieldwork and analyses took place (e.g. Van der Wiel 1982; Van der Woude 1983).

### *Geology/Pedology:*

The Hazendonk is located in a freshwater tidal area (at the edge of the zone with perimarine influence), however salt influx and tidal fluctuations are at a minimum (pers. comm. W. Out 2005; Van der Woude 1983). The dunebody consists of sand that was re-deposited before the Atlantic and may be of Pleistocene or Early Holocene date (Van der Woude 1983, 61). This sand was deposited on top of an undulating loam-surface (Fm Kreftenheije) (*ibid.* 72-73). Due to the rising water table peatgrowth started in this area from about 6340 cal BC (7400BP). This was followed by a succession of clay and peat deposits. During this time there is the first evidence for a Mesolithic occupation of the Hazendonk in the form of dated charcoal (5840 cal BC / 6900BP) found at the foot of the dune (*ibid.* 76-79).

At about 5055 cal BC (6100BP) the environment changed from a fluvio-lagunal situation into an extensive swamp forest with numerous expanding lakes. Sedimentation during this period, which lasted some 2000 years, was very limited. This may have been a stimulans for habitation since this correlates with the main phases of occupation on the Hazendonk (*ibid.* 85-86; Louwe Kooijmans 1976, 229). From the Middle Atlantic period (*c.* 5900 cal BC) stream ridges appeared as dryer places next to the river dunes (Van der Woude 1983, 87). Increasing clay deposition covered the stream ridges from 4230 cal BC onwards (5300BP). The environment during the Hazendonk 3 occupation might be described as a fluvio-lacustrine environment with influence from both lakes and small rivers. At about 3530 cal BC (4700BP) the lakes had filled up and gave way to renewed swamp expansion. Some channels related to the Schoonrewoerd stream may have been flowing close to the donk (*ibid.* 91). A period of renewed peat formation can be correlated with the Vlaardingen use of the site. During VL-1b this led to somewhat drier conditions (Zeiler 1997, 34-35). Around 2840 cal BC (4100 BP) fluvial activity increased and created a landscape dominated by a branching river pattern with wooded levees and open-water surfaces in the basins. A tributary of this riversystem ran next to the donk (Louwe Kooijmans 1985, 125). After the Neolithic occupation, clastic sedimentation took place by the Schoonrewoerd stream forming a final cover of clay ('Alblasserwaard cover') (Louwe Kooijmans 1974, 129-130; 1976, 229; Van der Woude 1983, 60). Only very small parts of the dunes still emerged above the surrounding wet area. By that time the Schoonrewoerd levee was the focus of habitation during the Middle Bronze Age. The Hazendonk would only slightly resurface due to later compaction of the peat (Van der Woude 1983, 97). The distinct occupation phases of the Hazendonk are separated from one and other by 'clean' layers without occupation debris (Louwe Kooijmans 1985, 125).

### *Taphonomy:*

Due to the fact the Hazendonk is rather small it was spared severe modern anthropogenic disturbance such as sand digging. (Louwe Kooijmans 1974, 87; Louwe Kooijmans 1982). As with most donken the top of the Hazendonk has been on the surface for a long time. Therefore disturbance and post-depositional processes affected this area. The interpretation of the finds from the slope deposits is further complicated by the differential compaction of the peat. Within the existing excavation grid it proved difficult to assign all the finds to their consecutive

layers (*cf.* Raemaekers 1999, 61). This was partly solved by a software package developed by Jonkers (1992). Recent research however indicated that up to 20% of the finds may have shifted between the layers (Amkreutz *et al.* 2008).

#### *Ecology:*

During the Hazendonk 1 period lakes surrounded by alder carr vegetation and many other marsh plants dominated the natural environment, which by that time was still relatively dry (Out 2009; 2010). The levees, which came into existence from the Middle-Atlantic period onward, were probably populated by elm (*Ulmus*) and ash (*Fraxinus*). On the dryer and firmer mineral soil around the donk alder (*Alnus*), ash and hazel (*Corylus*) could be found, as well as grasses. On top of the donk there was a deciduous forest dominated by oak (*Quercus*) and lime (*Tilia*). During the Hazendonk 2 occupation the lakes expanded and became more open. Alder and oak dominated the vegetation to a lesser extent. The increasing swamp conditions would eventually lead to alder carr in the entire area except on the stream ridges on which oak and hazel remained (Van der Woude 1983, 87-97; Louwe Kooijmans 1974, 137). By that time most of the river dunes had submerged. Palynological information from several corings indicates that periods of deforestation coincide with periods of occupation of the Hazendonk, after which regeneration of the forest takes place (Van der Wiel 1982; Van der Woude 1983). Furthermore Cerealia pollen is present in the diagrams during all occupation phases (Bakels 1981; Louwe Kooijmans 1987, 232).

#### *Dating:*

In total 37 <sup>14</sup>C dates were obtained for the Hazendonk in (Lanting/Van der Plicht 1999/2000; Verbruggen 1992<sup>b</sup>). Thirteen of these were obtained on peat in relation with the palynological investigations. Four additional dates could be discarded on the basis of the reservoir effect (GrN-9232), or intrusiveness (GrN-8232, GrN-9194, GrN-8238; *cf.* Lanting/Van der Plicht 1999/2000). One sample on charcoal (GrN-9189, 6900±100 BP) dates to the Mesolithic (Van der Woude 1983, 56). Lanting/Van der Plicht (1997/1998, 146) indicated it might be somewhat older due to peat overgrowth and insufficient pre-treatment.

Within the remaining dates a clear subdivision in several phases can be witnessed. After reducing the age ranges of most of the samples (*cf.* Verbruggen 1992, 124-126) the following dates can be given.

Phase	Date	Reduced	References
VL-2b	2580-2480 cal BC	yes	
VL-1b	3260-2960 cal BC	yes	Verbruggen 1992 <sup>b</sup>
VL-1a	3270-3090 cal BC	no	Calibration RC-date
Haz-3	3670-3610 cal BC	yes	Verbruggen 1992 <sup>b</sup>
SWB-Haz-2	3910-3790 cal BC	yes	Verbruggen 1992 <sup>b</sup>
SWB-Haz-1	4020-3969 cal BC	yes	Verbruggen 1992 <sup>b</sup>
Mesolithic	older than 5990-5620 cal BC	no	

*Table 4. Hazendonk occupation phases with reduced age ranges.*

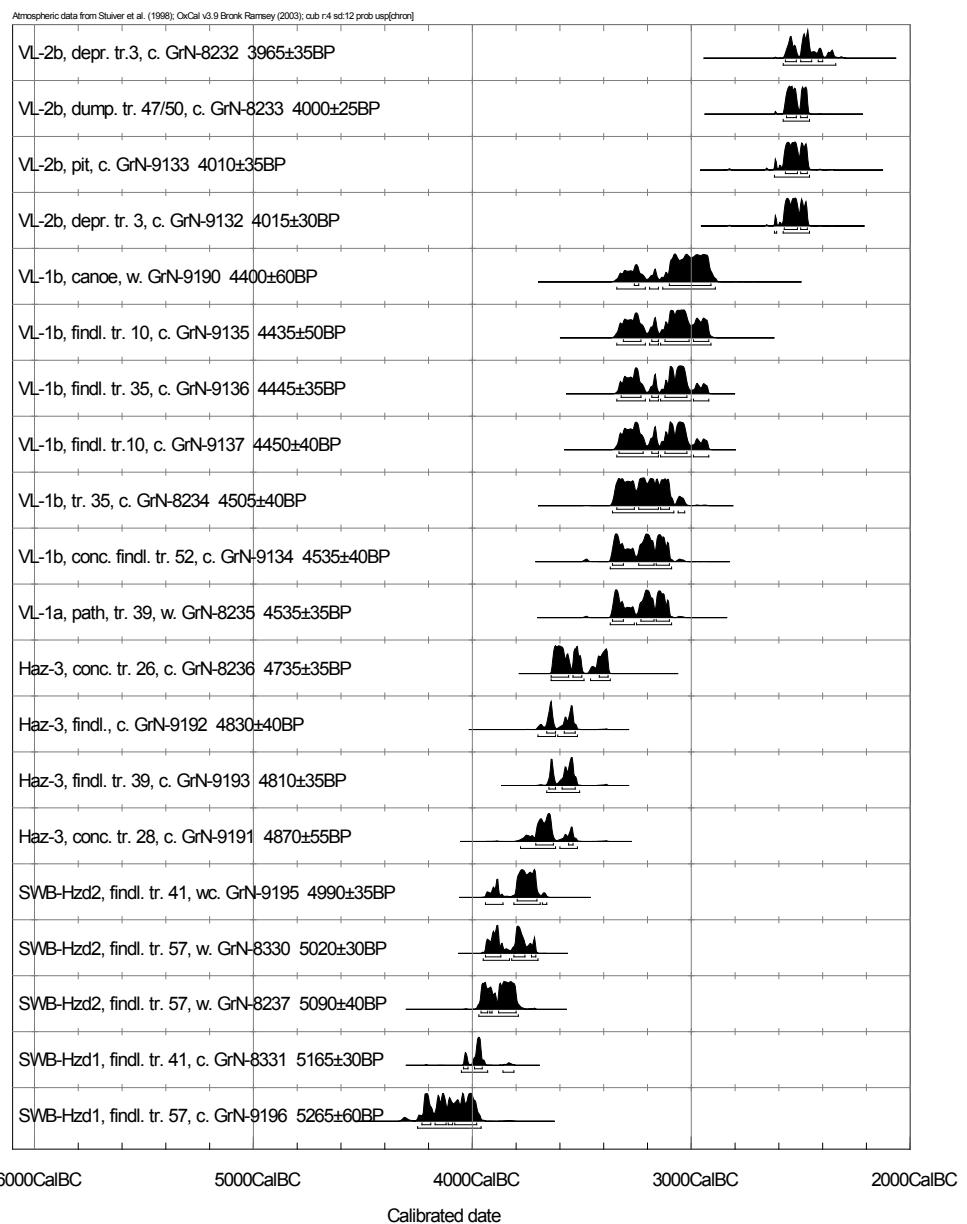


Fig. 27 Radiocarbon dates for the Hazendonk.

The overlap between VL-1a and VL-1b may be related to the lack of sufficient  $^{14}\text{C}$  dates. What is remarkable about the entire sequence is the fact that the site was used during a prolonged period of time separated by several hiatuses.

#### Features/Spatial Layout:

Since the sides and top of the donk are too much eroded and disturbed, most information stems from the slopes (Louwe Kooijmans 1974, 143). During occupation the actual dune surface slowly drowned due to the advancing peat. The total inhabitable area decreased from 12,500 m<sup>2</sup> to 4000 m<sup>2</sup> (Louwe Kooijmans 1985, 124). Remarkable is the fluctuation in extent of the waste deposits on the slope.

Phase	Extent	Thickness	Location slope	Reference
VL-2b	unknown			Raemaekers 1999/Verbruggen 1992 <sup>b</sup>
VL-1b	Top + 760 m <sup>2</sup>	8 cm	NE	Raemaekers 1999/Verbruggen 1992 <sup>b</sup>
VL-1a	Small scatter			Raemaekers 1999/Verbruggen 1992 <sup>b</sup>
Haz-3	Top + 730 m <sup>2</sup>	6 cm		Raemaekers 1999/Verbruggen 1992 <sup>b</sup>
SWB-Haz-2	Top + 300 m <sup>2</sup>		2W + 3 SE/E	Raemaekers 1999/Verbruggen 1992 <sup>b</sup>
SWB-Haz-1	Top + 800 m <sup>2</sup>		1SW/1SE	Raemaekers 1999/Verbruggen 1992 <sup>b</sup>
Mesolithic	unknown		1W + 1E	Raemaekers 1999/Verbruggen 1992 <sup>b</sup>

Table 5. Hazendonk site extent.

Apart from the palimpsest deposits on top of the dune and the slope deposits on the sides not many features were documented. The Hazendonk 3 and Vlaardingen occupations consist of several concentrations. A wooden walk way of branches (*Ulmus*) (Unit C) dates back to VL-1a. A fragment of a canoe (*Quercus*) and a wooden palisade (*Alnus*) surrounding an area of some 40 m in diameter (Louwe Kooijmans 1982, 63), also uncovered in unit C could be dated to VL-1b (Louwe Kooijmans 1985, 126).

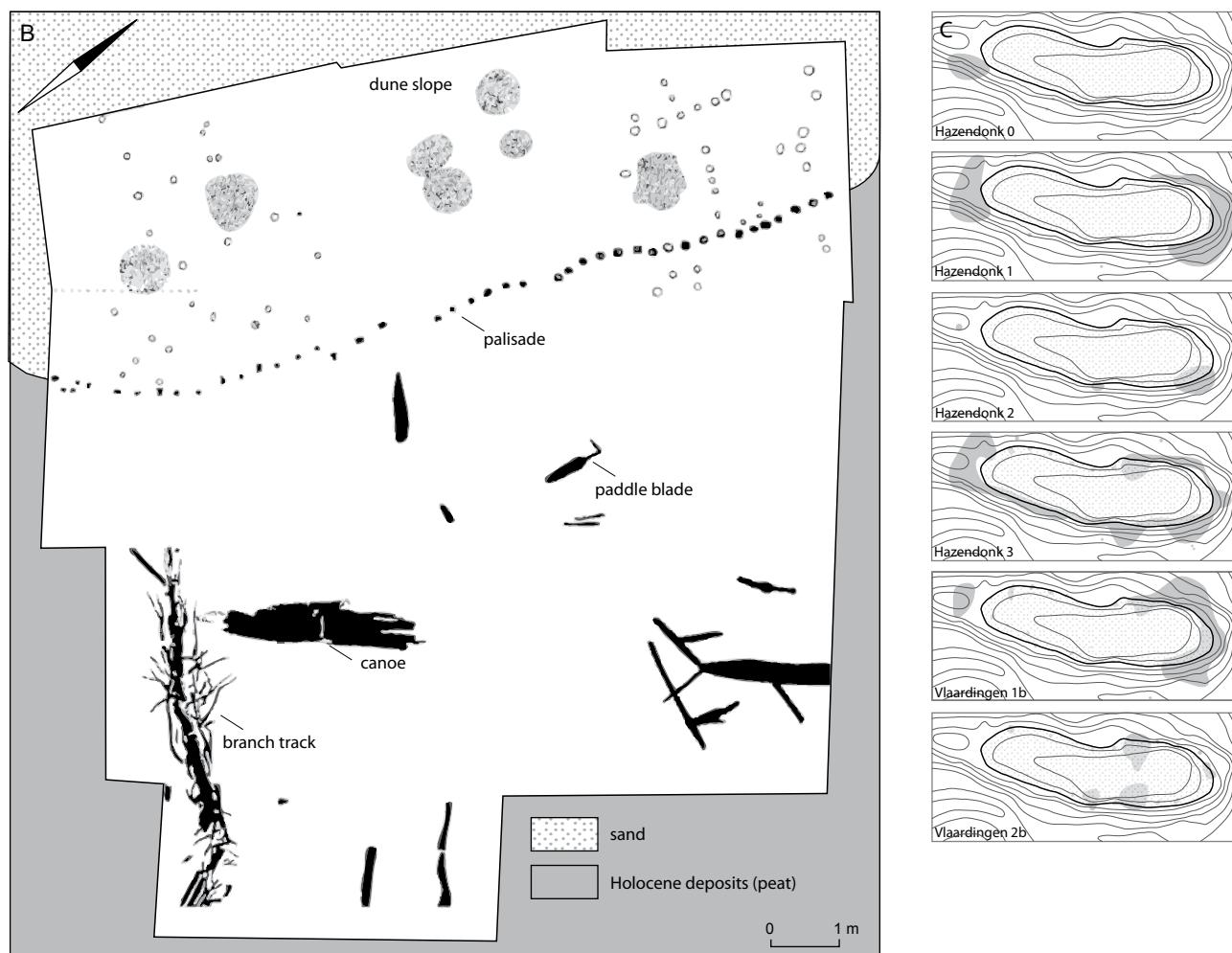
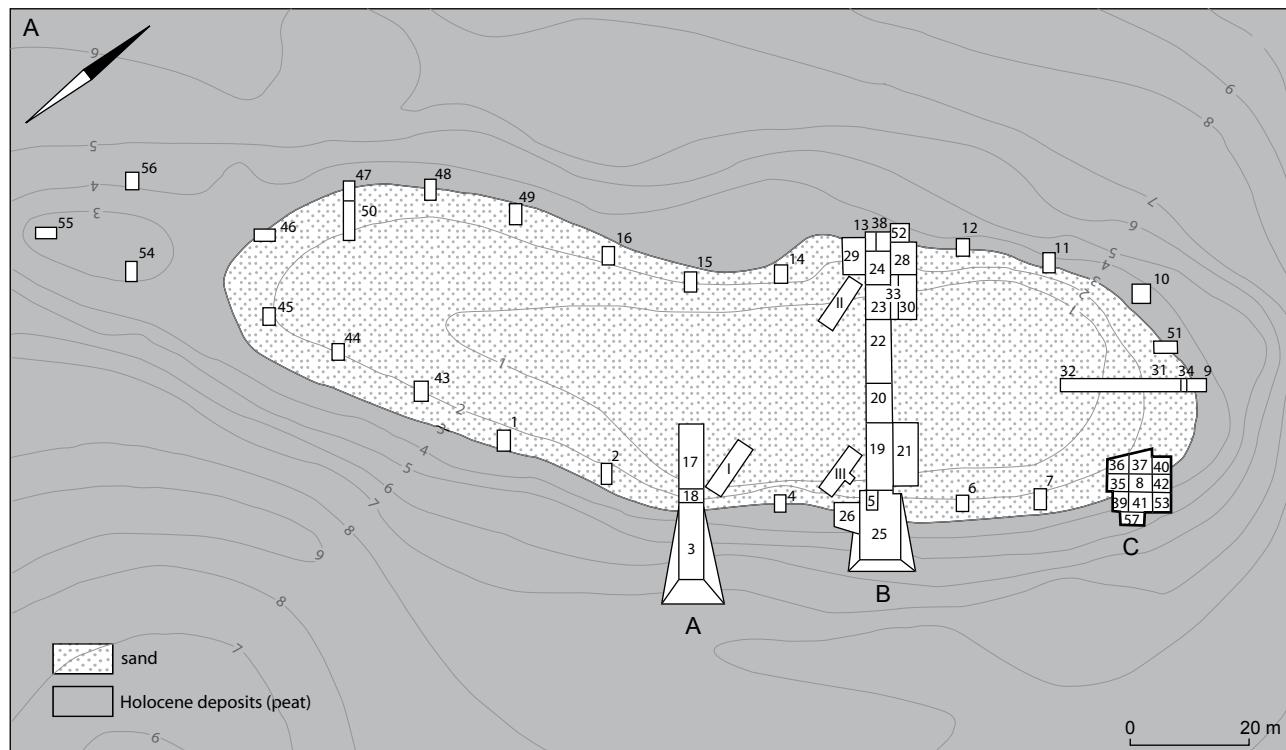
#### Finds:

All Swifterbant, Hazendonk 3 and Vlaardingen phases yielded pottery and flint artefacts. The pottery from both the Hazendonk 1 and 2 are currently interpreted as belonging to the Middle SWB period (Raemaekers 1999, 61-70; 2005) whereas before they were interpreted as belonging to a separate cultural tradition (Louwe Kooijmans 1976; 1985). Within the SWB- Haz-2 assemblage some pottery with Michelsberg elements is present (Raemaekers 1999, 69, 156). The Hazendonk 3 pottery falls within the Hazendonk group (*cf.* Raemaekers 1999, 156-158). The Vlaardingen pottery mostly dates to the VL-1b phase and includes pots with rim perforation (Raemaekers). Remarkably a small group of later sherds, including several types of Beaker pottery points to a continued limited use of the location, long after the Vlaardingen phase.

The flint spectrum (sample selected by Raemaekers 1999) of Haz-1 and Haz-2 consists both of flakes and blades (blocks, boulders and a scraper were also recognised Raemaekers 1999, 70). Two fragments of polished flint axes dating to the Haz 2 occupation were also found (*ibid.* 70). The flint assemblage of the Hazendonk 3 occupation consists mostly of flakes of both local and 'long-distance' origin (*e.g.* Belgian lightgrey type and Rijckholt type). Among the tools two points, two burins and a borer were identified. Forty fragments belonging to some six polished axes were also recovered (*ibid.* 151). VL-1a consists of flakes and two polished flint axe fragments. VL-1b is comparable with VL-1a. Local flint and flake production dominate (*ibid.* 1999, 175). Bienenfeld (1986, 277) found use-wear evidence for soft plant working, hide processing, bone or antler working and wood working. She remarks though that the absence of sizeable numbers of tools with evidence for soft plant working during the Vlaardingen occupation of the site is remarkable in the light of the pollen spectrum. It is however known that pollen need not be related to harvesting of the plants (*e.g.* Bakels 1986).

Several organic artefacts were preserved, among them an axe handle (*Fraxinus*, Hzd 1), part of a canoe (*Quercus*, V1-1b), a paddle blade (*Fraxinus*, VL-1b), a bow (*Taxus*, VL-1b), an axe head/hammer (*Pyrus/Crateaegus*, Haz-1) and the bottom of a wooden bowl (VL-1b; Louwe Kooijmans 1976; 1985; 1987). Apart from this,

Fig. 28 Hazendonk. (A) geological situation of the site and position of the excavation trenches on the river dune. (B) detail of the excavation trench C. (C) Refuse distribution over time. Adapted from Louwe Kooijmans 1985, pp. 125 and Out 2009, appendix III 2009 (2010), fig. III.2-III.3.c, pp. 101-104.



many faunal and botanical remains were found. Carbonised remains of cereals of emmer (*Triticum dicoccum*) and naked barley (*Hordeum vulgare* var. *nudum*) were found in all phases (from the SWB occupation onward) except VL-1a, while barley seems to have been absent in Haz 2. A substantial concentration or dump of charred cereals, chaff and internodes (a mix of emmer and barley) was found in Haz-1 (Louwe Kooijmans 1987, 232; see also Out 2009; 2009 (2010); 2010).

Faunal remains indicate the presence of domestic animals (cattle, pig and dog) as well as wild fauna, fowl and fish. Noteworthy is that the proportion of domestic animals becomes smaller in the successive phases. Furthermore there is a distinct focus on hunting and trapping beaver (*Castor fiber*) and otter (*Lutra lutra*) (Zeiler 1997, 34). An incidental observation concerns the find of an isolated skull in the Early Vlaardingen level of the Hazendonk (Louwe Kooijmans 2007; 2008).

#### *Interpretation:*

The Hazendonk remains a pivotal site for understanding the process of Neolithisation in the Lower Rhine Basin, both because of the evidence for contact and interaction (cereals, domesticated animals, long-distance contact) as well as the long-term perspective the site generates on the transition to agriculture.

During the SWB phases the Hazendonk may be interpreted as a base camp with both faunal and botanical indications (chess) for presence in summer and autumn although winter occupation cannot be excluded (e.g. Out 2009; 2010; Raemaekers 1999, 120; Zeiler 1997, 86, 99). It is also plausible to suggest that the site may have been used several times during the year (e.g. Louwe Kooijmans 1993; Raemaekers 1999, 120-123) or alternating or variably per year (Zeiler 1991, 109). The presence of cereals, chaff and internodes in almost all phases suggests that agriculture was practiced on the site. This is however in contradiction with the suitability of the wetland environment for this, neither are there any indications for large-scale clearance of fields. Bakels (1981; 1986) suggests either import of unthreshed cereals or small-scale local production. Although the second option may be less likely because of the environmental conditions and space available (Bakels/Zeiler 2005, 319-320), crop cultivation may have taken place as an additional activity. The substantial proportion of domesticated fauna (14% during Haz-1 and Haz-2) sharply drops during the Haz-3 and subsequent VL-1b phase. This may partly be related to the increasingly wet conditions although one would than expect an increase during the drier VL-1b period (Zeiler 1997, 34-35). A constant factor on the site is however the substantial proportion of wild fauna. The spectrum of wild fauna fluctuates in time, yet overall there remains a distinct focus on the hunting and trapping of fur animals (Zeiler 1997, 35-37). This last aspect might have been a major reason for visiting the Hazendonk (Louwe Kooijmans 1993<sup>a</sup>, 131).

A further important aspect of the Hazendonk is its clear evidence for continuity. The site was intermittently used for over two millennia, but what is truly remarkable is the fact that despite severe ecological fluctuations and a substantial decrease of the inhabitable or useable surface, the economical evidence clearly indicates continuity from the SWB phase to the VL phase.

*References:*

Amkreutz *et al.* 2008  
Bakels 1981  
Bakels 1986  
Bakels/Zeiler 2005  
Bienenfeld 1986  
Louwe Kooijmans 1974  
Louwe Kooijmans 1976  
Louwe Kooijmans 1982 (Excursion guide)  
Louwe Kooijmans 1985  
Louwe Kooijmans 1987  
Louwe Kooijmans 1993  
Louwe Kooijmans 2005  
Louwe Kooijmans 2007  
Louwe Kooijmans 2008  
Out 2009  
Out 2009(2010)  
Out 2010  
Raemaekers 1999  
Verbruggen 1992<sup>b</sup>  
Van der Wiel 1982  
Van der Woude 1983  
Zeiler 1991  
Zeiler 1997

## **18. Hekelingen-I**

*Location:*

Hekelingen I was located on the northern sandy levee of a 50 m wide tidal creek. The 3 km long remnant section of this creek is located in the Vriesland polder south of the Rhine-Meuse estuary, in the western part of the peat area, south of Rotterdam. The levee itself was *c.* 30-40 m wide (Louwe Kooijmans 1987, 244) and barely higher than its surroundings (Modderman 1953, 18). Hekelingen I is located approximately 200 m northwest of Hekelingen III, separated by two side creeks.

*Site characteristics:*

The site was discovered during a geological survey in 1949. Excavation took place by the ROB in 1950 after an initial augering campaign. Trench A (3 x 9 m) was located on the transition of the levee and the channel. Trench B was dug north of A in order to provide for a complete section. Trench C (5 x 9.7 m) was located west of these on the levee. Furthermore palynological samples were taken at 25 and 120 m from the site (Modderman 1953, 2).

### *Geology/Pedology:*

The subsoil of the site is formed by a marine clay cross-cut by several channels. At the same time the levees must have come into existence (Van Regteren Altena *et al.* 1962/1963). These may be dated to the Early Subboreal. On top of this deposit, the habitation layer was found, consisting of an upper layer of sandy clay (25 cm) and a lower layer of sandy clay becoming increasingly peaty further from the river. There is a rather steep drop in height towards the river. In the upper layer no features were found, the lower layer however yielded many small features. The find layer spread further west beyond the excavation. The site was covered by a sandy layer of clay and a clayey layer of peat. During the formation of these layers peat growth continued behind the levee and a dark layer formed on top of the levee. The final clay layer (37 cm) can be dated to the Subatlantic.

### *Taphonomy:*

Preservation of the site is reasonably good since it was covered with clay and peat. There is however also evidence for taphonomic disturbance. A ditch cutting through the site forms one factor in this. During the cleaning of the ditch sherds became re-deposited in higher levels (Modderman 1953). Furthermore bioturbation affected the spatial integrity of the site up to 60 cm. The upper find layer did not yield any features, these were only visible in the lower layer. This might point to a certain level of homogenisation. Finally it is plausible that the fluvial activity responsible for covering the site might also have disrupted it to a certain extent.

### *Ecology:*

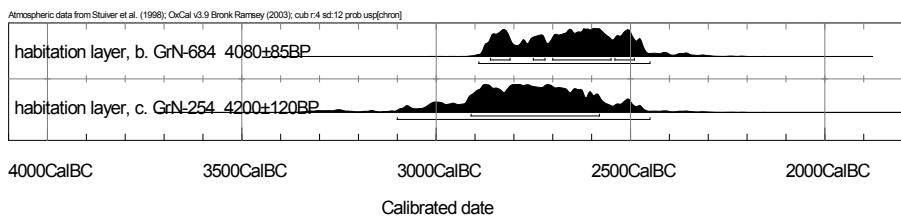
Before and during the habitation the local environmental setting consisted of peatlands with reed, sedge (*Carex*) and trees. On the basis of new evidence (*cf.* Van Regteren-Altena *et al.* 1962/1963), the occupation layer is found between the old marine clay and the wood-*Carex* peat. The development of wood peat thus not predates occupation of the site but is younger and/or contemporaneous. Behind the levees there were extensive back-swamps with soft clay soils. Shortly after occupation the channel became filled with clay, also covering the levee. The levees probably were covered with shrubs and trees while the back-swamp consisted of shrubs, sedges and other bog-plants of a eutrophic environment. Faunal remains also point to a wooded environment while sturgeon (*Acipenser sturio*), otter (*Lutra lutra*) and beaver (*Castor fiber*) indicate the presence of flowing water. During occupation extensive peatgrowth started and eventually the bogginess, cessation of flow through the creeks and the beginning of their silting up, all caused by diminishing ebb and flood, forced the inhabitants to abandon the site (Van Regteren Altena *et al.* 1962/1963, 16).

### *Dating:*

Two samples recovered from the habitation layer were available for  $^{14}\text{C}$  dating. According to Lanting and Van der Plicht (1999/2000, 70) the bone sample may have been contaminated with humic acids.

Due to their large range both dates are not very informative, yet seem to confirm a partial contemporaneity with elements from Hekelingen III as well as date the site within the timeframe of the Vlaardingen culture.

Fig. 29 Radiocarbon dates for Hekelingen-I.



### Features/Spatial layout:

It is evident Hekelingen I is part of the same complex of Vlaardingen settlements as Hekelingen II and III (also see description Hekelingen III below). Furthermore the extent of Hekelingen I have not been uncovered. The site continues further to the west (Modderman 1953). Several wooden stakes were found in the covering layer of sandy clay (*ibid.*) these may date to the Bronze Age (*cf.* Van Regteren Altena *et al.* 1962/1963). In the lower find layer a considerable number of features was found. Some of these seem aligned and possibly might be interpreted as a rectangular structure. A corner may be visible (also see Van Regteren Alten *et al.* 1962/1963, 18). On average these features have a diameter of approximately 20 cm, although there are also larger examples. Modderman however indicates that it was not always possible to accurately distinguish between postholes and black discolourations of peat. This makes it somewhat troublesome to attest and interpret the supposed structure. Apart from postholes a pit was discovered in trench B at a distance of 14.5 m from trench A and with an original depth of 1.6 m below the original surface. The bottom of the pit was covered with wood (branches?) and also contained sherds and bones.

### Finds:

The site yielded pottery predominantly tempered with grit apart from some chamotte. The pots have a smooth to burnished surface, everted rims, slightly convex sides and flat bottoms. Under the rim some fragments have cone-shaped pits or perforations. A sherd with a knob was also found as well as a spoon with solid handle. Three sherds were decorated of which one may be interpreted as 'barbed-wire' decoration. This kind of decoration dates to the Early Bronze Age (Modderman 1953; Van Regteren Altena *et al.* 1962/1963). It is not unlikely the decorated sherds are intrusive and possibly associated with the stakes in the covering layer.

The lithic assemblage consists either of a glossy grey-black variant, or a dull grey variant. Both seem to have a southern origin. Some fragments were clearly burnt. Several flakes clearly were derived from broken and pounded polished axes. Typologically some 50 scrapers were found as well as three borers, a trapezoidal arrowhead with transverse edge and a strike-a-light. Several irregular pieces as well as the extensive use of broken axes demonstrate the scarcity of flint (Modderman 1953; Van Regteren Altena *et al.* 1962/1963). Furthermore several pieces of natural stone were found, mostly of southern origin. Amongst these was a grinding stone, several hammering stones as well as pounded up material for tempering. Finally Hekelingen I also yielded bone and antler objects such as a perforated right canine tooth of a brown bear (*Ursus arctos*), a worked tusk of a boar (*Sus scrofa*), some bone awls, a small bone axe and a worked antler fragment.

The site also yielded faunal remains of which 85 samples have been determined. Most bones showed traces of butchering as well as gnawing by animals. Most of the 300 fragments that could be determined either belong to red deer (*Cervus elaphus*) or cattle (*Bos taurus*). One bone has been ascribed to aurochs (*Bos primigenius*) and several bones to roe deer (*Capreolus capreolus*). Next to these bones were found of wild pig, beaver, otter, polecat (*Putorius putorius*) and marten (*Martes* sp.). Several bones of a small horse were also found. Bird bones were also found amongst which some of the Red-throated Loon (*Gavia stellatus*). Fishing is attested by several remains of sturgeon (Clason 1967; Modderman 1953, 24-25).

#### *Interpretation:*

Hekelingen I may be interpreted as a domestic site of the Vlaardingen culture. In this respect it should be interpreted in relation with the information available on Hekelingen II and II. It is however not possible with the current chronological resolution to assess more than a general contemporaneity. Since Hekelingen III clearly is the focus of recurrent occupation, the same model might hold true for Hekelingen I. On the other hand whereas Hekelingen III consists of several isolated clusters of occupation debris and clusters of small postholes, Hekelingen I has a more substantial find distribution and possibly a more solid structure. Apart from this it is hard to establish whether Hekelingen I was occupied in a specific season since only the Red-throated Loon is a typical winter-guest. In accordance with Hekelingen III however it is evident wild resources formed a major contribution to the diet and hunting and fishing must have played an important role in subsistence.

Although an exact interpretation of Hekelingen I is not possible, its site function may be seen in the light of the information available from Hekelingen III. Therefore it is here suggested that occupation probably was not year round although it need not have been exactly similar to (the internally also variable) occupation at Hekelingen I. Both sites throw a 'Mesolithic' light on the Vlaardingen culture, which as often been interpreted as fully Neolithic.

#### *References:*

- Clason 1967
- Lanting/Van der Plicht 1999/2000
- Modderman 1953
- Van Rgeren Altena *et al.* 1962/1963

NB. See Hekelingen-III for site plan.

## **19. Hekelingen-III**

#### *Location:*

Hekelingen III is located on the northern sandy levee of a 50 m wide tidal creek. The 3 km long remnant section of this creek is located in the Vriesland polder south of the Rhine-Meuse estuary, in the western part of the peat area, south of Rotterdam. The levee itself was c. 30-40 m wide (Louwe Kooijmans 1987, 244; Louwe Kooijmans/Van de Velde 1980, 8).

### *Site characteristics:*

The first traces of Vlaardingen occupation at Hekelingen were discovered in 1949. Subsequent excavation by Modderman (1953) in 1950 led to the discovery of features and finds on the northern levee of the tidal creek. The site (Hekelingen III) is part of the same site complex as Hekelingen I, further west on the same bank. In 1967 and 1970 a second site (Hekelingen II) was discovered, east of Hekelingen I, along a side creek of the main system (Boomert 1974). Hekelingen III (virtually forming a continuation of Hekelingen I), finally was excavated as a consequence of the urban development project of Spijkenisse in 1980. In total a number of 99 testpits measuring 3 x 6 m and lying 10 m apart were excavated on both the northern and the southern levee. During this campaign a small fourth site (Hekelingen IV) was discovered and excavated along a side creek north of Hekelingen III. The results of the prospecting campaign indicated that the protected site of Hekelingen I continued for some 50 m to the east and some 80 m to the northwest and was separated from Hekelingen III by an area with relatively few features. Furthermore the southern levee seemed to have been uninhabited (Louwe Kooijmans/Van de Velde 1980, 1-6). Hekelingen I and III extend over a distance of 600 m of which 200 m had to be excavated (Van Gijn 1989, 99). Excavation focused on the site of Hekelingen III. Trenches of 4 m wide and of variable length were located alongside or perpendicular to the creek and excavated in spits of 1 x 1 m. No sieving took place (Louwe Kooijmans/Van de Velde 1980, 7). In total c. 1,800 m<sup>2</sup> was excavated. After the excavation palaeobotanic research as well as use-wear analysis took place.

### *Geology/Pedology:*

The Vriesland polder is an undisturbed estuarine landscape formed during the Calais IV transgression phase. At the base of the occupation level salt marsh deposits of the Calais III transgressive phase can be found, cut by a Calais IV in origin creek and levee system. Two different levee deposits were identified (IVa1 and IVa2). The first unit consists of sandy clay and comprises the archaeological units of phase I (A1, B1, C1, M1). The good preservation of remains from this phase (compared to subsequent phases) indicates sedimentation of the active creek system might have continued during occupation. This was followed by an erosive phase affecting parts of the levee and the sites (hence the archaeological material in the creek deposits). Subsequently sedimentation of a large part of the channel fill and the second levee deposit took place. This deposit is more clayey and comprises archaeological units attributed to Phase 3 (B3, C3, D3, E3, F3, M3). Phases 1 and 3 can clearly be separated stratigraphically. The intermediate phase II was documented in units H2 and I2 and is located somewhat higher than the units from Phase 1 (H2 is however synchronous with B3). Due to the small stratigraphical margins and overlap a continuous but shifting occupation is assumed. A third and final levee sediment could be correlated with BB-occupation. Finally a thick peat deposit, of which only a small band remained, sealed the lower levels, on top of which a clay cover was deposited (Van Gijn 1989, 101-102; Louwe Kooijmans/Van de Velde 1980, 8-10).

### *Taphonomy:*

There is a distinct difference in preservation between the remains of phase 1 and finds from later phases. This might be related to the fact sedimentation continued during the first occupation phase (Louwe Kooijmans, quoted in Van Gijn 1989, 101). Furthermore the erosive phase between both levee deposits destroyed part of the site (for example subsite A) (Van Gijn 1989; Louwe Kooijmans/Van de Velde 1980).

### *Ecology:*

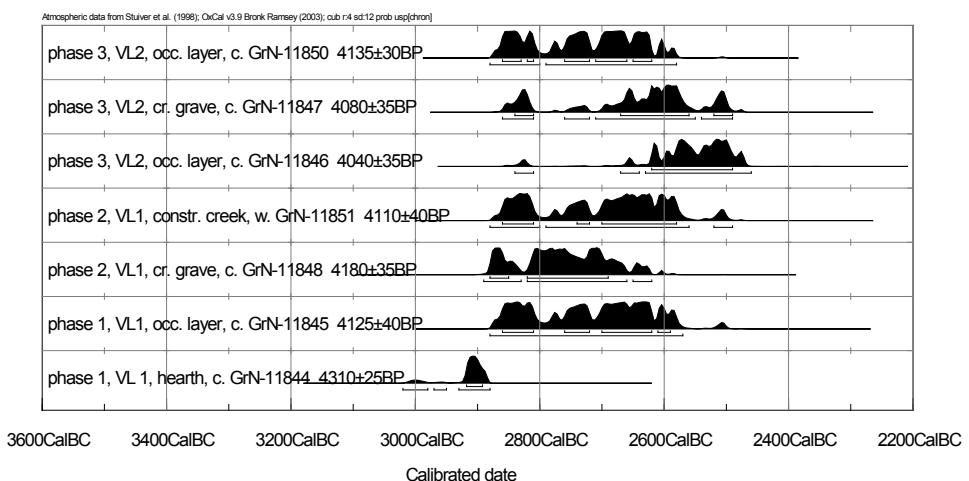
The estuarine Calais IV landscape consisted of a large freshwater stream of some 50 m wide as well as several small tributary creeks, lined by levees. The system was part of the Meuse delta. Behind the levees a backswamp zone with peat growth as well as open marsh was present. To the south there were salt marshes. Oak (*Quercus*) and hazel (*Corylus*) dominate the pollen spectrum, yet the macroremains indicate that the prevalence of oak and elm (*Ulmus*) was rather restricted. The vegetation on the levee consisted of maple (*Acer*), hazel, sloe (*Prunus*), and hawthorn (*Crataegus*), as well as ash (*Fraxinus*) and alder (*Alnus*) on the lower areas (Bakels 1988, 156; Louwe Kooijmans 1987, 244). Since oak was used in construction and acorns have been found at the site this type of wood may have been imported. Furthermore there are clear indicator species for the presence of man (e.g. *Urtica dioica*, *Chenopodium ficifolium*, *Ranunculus sceleratus* and *Conium maculatum*). Except for *Urtica* (Stinging Nettle) these plants indicate an open area vegetation for the site. Furthermore there is evidence of recurrent flooding of the site. The tidal fluctuation must have been at least one metre (Louwe Kooijmans 1987, 245). Local crop cultivation may have been possible but is unlikely (see section finds). Furthermore the abundance of fish, bird and mammal remains indicates a freshwater environment with a marshy vegetation of herbs, shrubs and (occasionally taller) trees (Prummel 1987, 234).

### *Dating:*

In total 12  $^{14}\text{C}$  dates are known for Hekelingen III. However four of these (GrN-9999; GrN-10001; GrN-10002; GrN-10003) have an unknown association and will not be included in the analysis. A Bell Beaker culture date of  $3865 \pm 30$  BP is also excluded.

According to Lanting and Van der Plicht (1999/2000, 70), GrN-11844 might be too old, however, no argument for this is given. Material dating to Phases 1 and 2 is attributed to VL-1b (Bakels 1988; Louwe Kooijmans 1981) or VL-1c according to the division by Lanting and Van der Plicht (1999/2000, 70). Phase 3 is attributed to VL-2a (Bakels 1988, 70; Louwe Kooijmans 1981). The youngest date is attributed to Phase 3, yet was sampled on top of sediments belonging to Phase 2. Therefore an attribution to Phase 2 is not unlikely. The  $^{14}\text{C}$  dates show no evident hiatuses and overlap even within 1 sigma probability, confirming the hypothesis of continuous but shifting occupation. In total use of the site lasted two to three centuries (Louwe Kooijmans 1983).

Fig. 30 Radiocarbon dates for Hekelingen-III.



#### Features/Spatial layout:

In total twelve different artefact concentrations have been located on the levee along the creek (site A-H and J-M). These are interpreted as hut sites of dwelling places. They were located on the highest points of the levee and overlap with clusters of small posts. These are considered to be the remains of round to oval huts, the oldest and better preserved of which also contained lenticular fire places (Louwe Kooijmans 1987). The different sites vary slightly in size. This may be related to the number of huts. Site A measures 25 x 8 m and is comprised of several concentrations with hearths. The pottery can be dated to VL-1(b). Site B has a diameter of 10 m and may be the follow-up of site A. It was occupied over a long span of time, since two phases of occupation, dating to VL-1(b) and VL-2(a) could be discerned. Continuity in the find distribution suggests continuity in use.

The other sites are smaller with a diameter of 6-8 m. Sites D-G date after the first levee deposit and were situated on the erratically shaped bank post-dating the erosional phase. Apart from hearths a distribution of pottery, flint and bones is associated with the concentrations. Posts and postholes vary in diameter between 5 and 15 cm. Site F yielded the most evident remains of one or several huts with a maximum diameter of 5 m. Apart from the clusters several other features were found. A shallow pit with a human cremation was found next to site D. The cremation dating to the VL-occupation probably was not related to site D, which only yielded BB-sherds. The dispersal of the burnt bones suggests the individual was seated when cremated. Furthermore the bottom of the small side-creek next to site F yielded the remains of a wooden structure probably related to fishing activities and possibly contemporaneous with site A. Finally a peculiar structure with heavy wooden posts was found near site M1, underneath which the remains of a disarticulated human skeleton (an adult male) were found. The structure is interpreted as an excarnation platform (Louwe Kooijmans 1985; Louwe Kooijmans/Van de Velde 1980, 10-12).

### *Finds:*

In total 250 kg of pottery indicating a minimum of 560 pots was found. Site A and the lower layers of site B yielded sherds with quartz temper, rim perforations and fragments of baking plates. The younger concentrations yielded less smooth, chamotte tempered pottery, with high rims and a less pronounced S-profile. Furthermore some spindle-whorls were found.

Flint was scarce (except in site E) and had to be imported, but was used in an expedient manner. Hardly any local rolled flint was used (Van Gijn 1989, 103). Three main groups of raw material were discerned (Verhart 1983). The first variant of fine-grained mottled grey flint is probably from Spiennes in Hainault, Belgium. It was transported as nodules or finished tools since no prefabs or blanks for axes were found (Van Gijn 1989, 103, contra Verhart 1987). A second type of flint of a brownish black colour with white specks, according to Verhart (1983) also originated in Hainault and was brought to the site in the form of nodules. A third variant could be predominantly attributed to units dating to phase 3. It has a black colour and is fine grained. A likely source is Cap-Blanc-Nez at Boulognes-Sur-Mer in France (Van Gijn 1989, 103; Verhart 1987, 578). It is remarkable that instead of a more common focus on southeastern sources, the southwest is preferred. Furthermore there is clear shift in provenience of the flint in phase 3. Cores (N=49) were mostly made on nodules or broken axes and since cortex was largely lacking cores were probably pretreated before. There was a predominance of non-standardised flake-production, which often led to premature abandonment of cores, either indicating a lack of skill or unproblematic supply. Tools were also often of an ad-hoc nature, except for axes and axe-fragments, several scrapers and a stemmed arrowhead (Van Gijn 1989; Louwe Kooijmans/Van de Velde 1980). Use-wear analysis indicated bone-working as a major activity. Furthermore soft plant-working (splitting of plants/twigs, binding/hafting and cutting of wild grasses) and hide-working (possibly dry), wood- and antler-working, and stone- and shell-working were attested. Conspicuously lacking is use-wear indicating cereal harvesting and fish-processing (Van Gijn 1989, 112-119). In time a trend is observable. In phase 1 bone antler and hide predominate and slowly make way in phases two and three for plant- and wood working. This however is based on a very small number of observations (cf. Van Gijn 1989, 123). Some natural stone (large Meuse gravels) was also found (Louwe Kooijmans/Van de Velde 1980, 13).

The elaborate faunal assemblage comprised twelve wild species of which red deer (*Cervus elaphus*) was the most important, followed by roe deer (*Capreolus capreolus*), beaver (*Castor fiber*), wild boar (*Sus scrofa*), bottle-nosed dolphin (*Tursiops truncates*) and otter (*Lutra lutra*). Domestic species comprised cattle (*Bos taurus*), pig (*Sus domesticus*), sheep/goat (*Ovis aries/Capra hircus*) and dog (*Canis familiaris*). Hunting may be considered most important (60-70% of all meat), although rearing of especially cattle and pig, also was a substantial activity. In phases 1 and 2 cattle provided most of the meat from domestic animals (cf. Prummel 1987, 220, contra Van Gijn 1989, 102). Next to mammals, bird remains of at least eight species were found. They are probably underrepresented but seem to have formed a minor addition to the diet. Bones of swan (*Cygnus*) are the most numerous, white-tailed eagle (*Haliaeetus albicilla*) might have been hunted for its feathers. Fish formed a rather substantial component of the diet with a predominance of sturgeon (in all three phases) (*Acipenser sturio*) and pike

(*Esox lucius*). In total the assemblage comprised seven freshwater species, one anadromous and one katadromous species (Prummel 1987, 211 and table 1). Furthermore the site yielded bone and antler tools, both finished products, such as awls and chisels as well as numerous waste pieces and rejects (Van Gijn 1989; Maarleveld 1985).

Of the botanical remains, local species such as hazelnut (*Corylus avellana*), sloe (*Prunus spinosa*), crab apple (*Malus sylvestris*), acorn (*Quercus* sp.) and waternut (*Trapa natans*) were found. Furthermore the site yielded charred remains of naked barley (*Hordeum vulgare* var. *nudum*), emmer (*Triticum dicoccum*), cultivated flax (*Linum usitatissimum*) and lesser celandine (*Ranunculus ficaria*). The presence of spikelet forks and rachis indicates grain was processed on the site. Furthermore the remains of a wooden structure (possibly a fish weir), a fragment of a bow a paddle-blade and an axe-handle were found (Louwe Kooijmans 1985, 99).

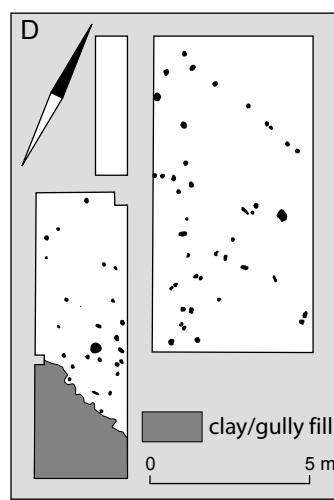
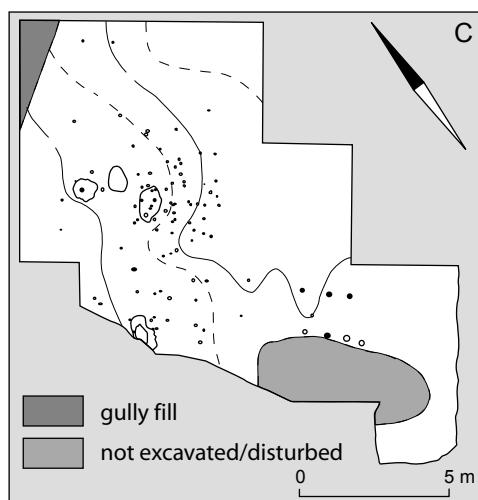
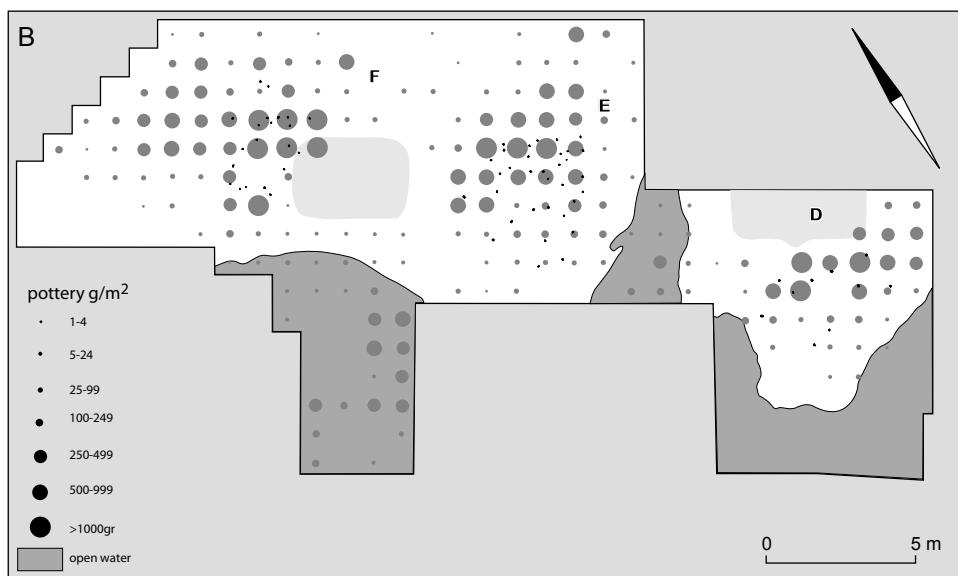
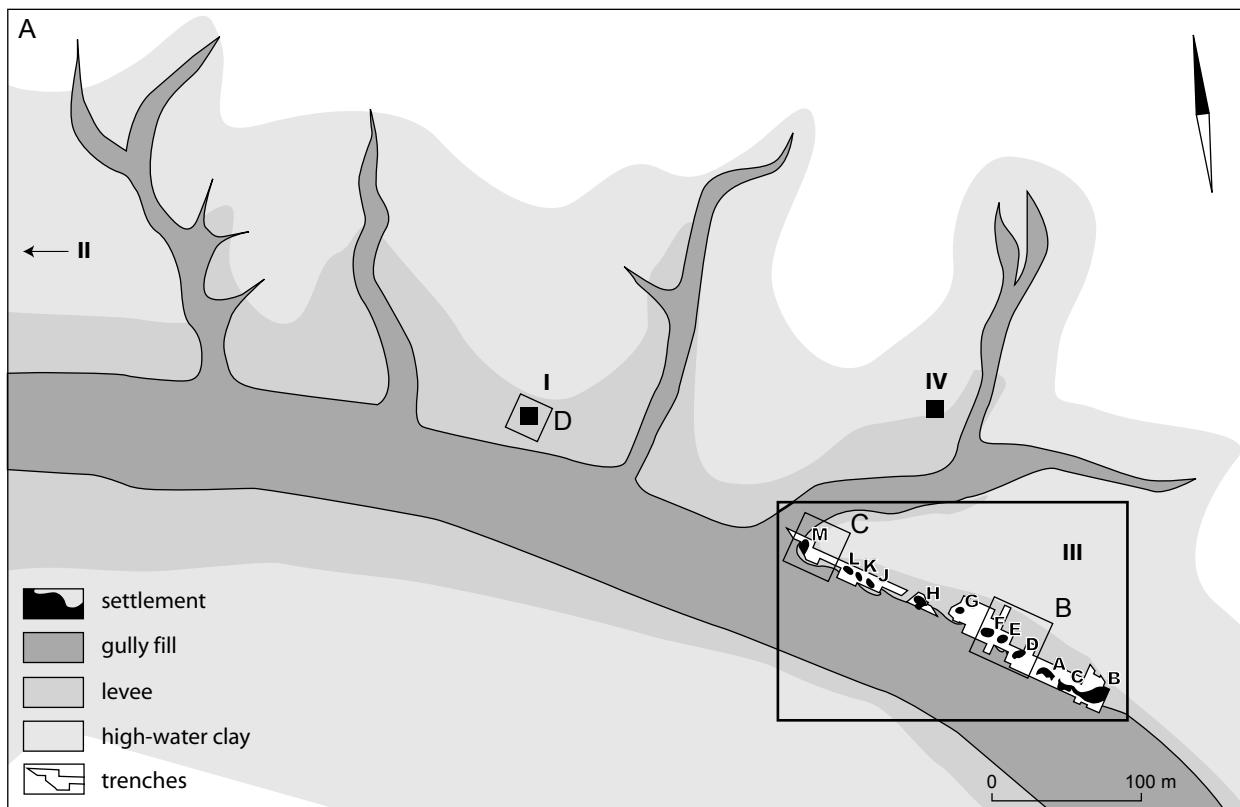
#### *Interpretation:*

Hekelingen III forms a valuable addition to the existent site spectrum of the VL-group. The site consists of a number of sub-sites of dwelling places on top of a levee in back-swamp or open marsh area. The  $^{14}\text{C}$  dates and pottery morphology indicate the site has been used for more than a century. On the other hand, apart from minor changes, the overall material repertoire, site-layout and proportions within the subsistence largely remained constant. An interesting question in this respect is the contemporaneity of the various dwelling places. In general the clusters date to the following phases: Concentrations A, B, J and M date to Phase 1, B and H to Phase 2 and D, G, K and L to Phase 3 (also see Louwe Kooijmans 1981). Even within one phase some clusters are therefore stratigraphically older than others (Louwe Kooijmans/Van de Velde 1980, 10). On the other hand there is also evidence for contemporaneity of some dwelling places. Refit analysis indicated contemporaneity of use between concentration D and F and to a lesser extent E. This way a picture emerges of several contemporaneous dwelling places.

Main subsistence activity was hunting and fishing, although cattle and pigs were also reared. A main question is whether cereals were grown locally. The presence of charred kernels of naked barley, rachis and spikelets as well as Cerealia in the pollen record, would seem to substantiate the hypothesis of summer crops on the levee, yet Bakels (1988, 160-161) argues that there might not have been enough space. Both pollen and macroremains could also have been indicative of transport and threshing of husked grains. If agriculture took place it must have been on a very small scale and of minor importance (cf. Bakels 1988, 161). Finally no sickle-gloss has been observed (Van Gijn 1989, 131). Agriculture therefore may be considered unlikely (Louwe Kooijmans 1983). A difficult problem is establishing at what time during the year the site was inhabited. If summer crops were grown this would mean a presence at the site for at least during the summer season. If not, faunal remains give a further indication.

Most of the freshwater fish could be caught from spring to autumn, but the abundance and importance of sturgeon points to May-July. Most birds could have been caught year round, although there are some typical winter guests such as the red-throated loon (*Gavia stellata*), whooper swan (*Cygnus cygnus*) and widgeon (*Anas Penelope*). These species indicate some human presence on the levees during winter (Prummel 1987, 234-237). Of the mammals the fur bearing species may have been hunted especially in the winter, since the fur in winter is at its maximum

### Hekelingen-III



*Fig. 31 Hekelingen I and III. (A) geological situation of the site and position of the excavation trenches of Hekelingen-III and the locations of Hekelingen I, II and IV on the river dune. (B) detail of the excavation trench with feature distribution and pottery density per m<sup>2</sup> of concentrations F, E and D at Hekelingen-III. (C) detail of Hekelingen-III concentration M1 with feature distribution. Note the heavy posts in the southern part of the excavation trench. These are attributed to an excarnation platform. (D) Feature distribution at Hekelingen I.*

*Adapted from Louwe Kooijmans 1983, fig. 2; Verhart 1987, fig. 3; Modderman 1953, fig. 2 and unpublished plans of the concentrations at Hekelingen III in the archive of the National Museum of Antiquities.*

density. The faunal remains thus indicate a presence in winter and spring/early summer, but are no proof for absence in other seasons.

In effect none of the artefact categories, nor the use-wear analysis is able to answer when and how intensive the site was inhabited (cf. also Van Gijn 1989, 131-132). If we however would place Hekelingen III on the extensive continuum between short-term extraction camps and sedentary occupation, then an intermediate position would give the best fit. There is evidence for recurrent visits and abandonments, but the presence of hut structures, the varied subsistence, the cremation graves and the elaborate set of activities and artefacts (including spindle-whorls) would suggest a stay from several weeks up to a few months, probably related to a seasonal activity. At last, a better understanding of Hekelingen III might depend on the character of Hekelingen I. There, more elaborate find layers have been uncovered, but unfortunately no further investigations took place.

#### *References:*

Bakels 1988  
 Boomert 1974  
 Lanting/Van der Plicht 1999/2000  
 Louwe Kooijmans 1981  
 Louwe Kooijmans 1983  
 Louwe Kooijmans 1985  
 Louwe Kooijmans 1987  
 Louwe Kooijmans/Van de Velde 1980  
 Maarleveld 1985  
 Modderman 1953  
 Prummel 1987  
 Van Gijn 1989  
 Verhart 1983  
 Verhart 1987

## **20. Helden-Panningen-industrieterrein**

#### *Location:*

The site is located on a coversand ridge near Panningen in Middle Limburg and is situated in the south-eastern extension of the southern coversand landscape at a distance of 20 km from the geological phenomenon of the 'Peelhorst' and at 5 km west of the current valley of the Meuse. The extensive high moors of the 'Peel' can be found 4 km east of the site. The area is dominated by several coversand ridges around the valley of the Everlose beek. The ridge itself is currently some 70 cm high. North of the ridge the toponyms of 'Laagheide' and 'Vlakbroek' indicate wet and moor-ish areas (Rensink *et al.* 2006).

#### *Site characteristics:*

The site was discovered by amateur archaeologists during the development program of the industrial complex of Panningen. Subsequent phases of this program led to an augering campaign by RAAP (154 corings), in 2001 (Van Dijk 2001). The discovery of Site 1 on top of the ridge, indicated the need for a follow-up campaign. In 2002 the ADC dug six test trenches (1-6), parallel and perpendicular

to each other, covering a total of 2400 m<sup>2</sup>. Apart from a recent brick kiln, the highest part of the ridge yielded many features, indicating a presence on the ridge in the Middle Neolithic, the Bronze Age, the Iron Age (e.g. cremation graves), the Middle Ages and subrecent times. Due to the good preservation conditions underneath the Medieval layer with sods and because it was not possible to protect the area, it was decided to excavate. In 2003 the ADC excavated Site 1, covering an area of 5200 m<sup>2</sup> (Kenemans/Lohof 2005).

Apart from many features dating to the Middle Ages and a complete cemetery with cremation burials dating to the Late Iron Age, the site also yielded artefacts and possibly features dating to the Middle Neolithic. In trench 13 a possible Middle Neolithic house plan was uncovered, associated with MK artefacts from a bioturbated layer on top. Although the house site currently is interpreted in Late Bronze Age-Early Iron Age context (Kenemans/Lohof 2005), its discovery at the time formed the incentive for another excavation by the ROB (trenches 14 and 15, covering 2,030 m<sup>2</sup>), north of ADC trenches 1 and 13. The objective was to establish whether the area with prehistoric features would extent further north and to investigate whether the features could be chronologically correlated with artefacts from the bioturbated layer (Rensink *et al.* 2006, 21). In order to do this finds were collected within the bioturbated layer in 1 x 1 m or 50 x 50 cm spits. Furthermore an area of approximately 10 x 25 m was wet sieved over 3 mm (*ibid.* 13).

#### *Geology/Pedology:*

Geologically Helden-Panningen-industrieterrein is located in the tectonically lifted 'Peelblok'-area. Stratigraphically the subsoil consists of 8-12 m of Pleistocene gravel deposits of the Meuse. A 0-10 m periglacial and aeolic deposit from the Saale Glacial and a 2-10 m thick layers of coversands, loamy layers and periglacial sands dating to the Weichsel Glacial. The coversand ridges in the area are oriented on the ENE system of tributary brooks of the Meuse (Rensink *et al.* 2006, 26-31). The coversand located on top of the aforementioned sediments was deposited in the Late Glacial. During the Early Holocene a brown weathered forest soil developed in these sands (Moderpodzol). This soil developed underneath the rich forest that came into existence during the Atlantic (much bioturbation). It probably was a very rich soil existing during the MK occupation. Above the weathered soil a limited podzolic soil (haarpodzol) could be discerned with a typical eluviation and illuviation horizon. Since the latter soiltype usually develops after a period of soil degradation, often the result of open terrain, but was not well established here, it is suggested this period of degradation lasted only short and probably can be placed in the Iron Age. Before that the coversand ridge must have been mainly covered with forest. After the area was brought under cultivation sod-manuring took place, creating a cover up to 70 cm. Between 20-40 cm underneath the base of the sod-cover, a disturbed bioturbated layer, containing most of the finds was located. Most MK finds were located in this layer. It was subdivided in layers 1 and 2. Layer two contained more (60%) MK sherds than layer 1 as well as more flint artefacts (Rensink *et al.* 2006).

### *Taphonomy:*

The finds from the bioturbated layer underneath the sod-cover form a mix of different periods of occupation. Although concentrations of finds dating to a single period could be located in the sieved fraction, the main body of material in this layer may be considered a palimpsest. On the other hand there is evidence for absence of postdepositional replacement of artefacts (absence of depressions), which indicates the bioturbated layer might represent the Middle Neolithic habitation level. The level with features was located 40-60 cm underneath the base of the sod-cover and 95-115 cm underneath the current surface. This depth corresponds with the weathered layer as well as with the bioturbated level, however most features seemed to be only marginally affected by this. A reason for this may be found in low levels of loam within the sand, since weathering and bioturbation are more intense in loam-rich environments (Rensink *et al.* 2006). Furthermore the prehistoric features were spared from destruction by the thick sod-cover. No organic remains were preserved due to acidic soil conditions.

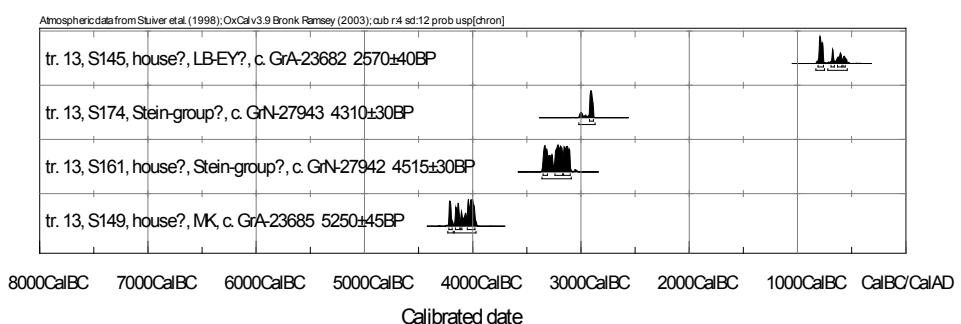
### *Ecology:*

The area may be considered an ecologically rich environment. The coversand ridge provided for a high and dry vantage point and wetter areas were located to the north. Water was present in the tributaries of the 'Everlose beek' and the 'Kwistbeek'. Ecological diversity was further provided by the valley of the Meuse and the peatbogs of the 'Peel'. If agriculture took place on top of the ridge during the MK period, this might seem somewhat of an illogical choice, since the soil is poor in loam and of a relatively light structure. On the other hand the less dense forest cover on top of the ridge might have been easier to cultivate and the sandy soils would not have been fully degraded at the time. Apart from this the soil on top of the ridge might have been easier to work with digging sticks or primitive ards (Rensink *et al.* 2006).

### *Dating:*

Apart from evidence for the Bronze Age, the Iron Age, the Middle Ages and subrecent times, there is evidence for a Middle Neolithic occupation at Panningen industrieterrein. Artefactual evidence of both pottery and flint indicate a MK occupation of the site. Furthermore four <sup>14</sup>C dates were obtained for this period. Three of these dated features to the Middle Neolithic (Rensink *et al.* 2006). Unfortunately none of the dated posts of the possible house structures fall within the same range. The Middle Neolithic dates are furthermore also all different

Fig. 32 Radiocarbon dates for Helden-Panningen-industrieterrein.



and only one dates to the MK. It may be concluded the dates reflect several periods of occupation of the site, but are not helpful in determining the age of the houseplan.

#### *Features/Spatial layout:*

The ADC uncovered 287 prehistoric features (excluding the Iron Age cremation graves). Several vague features in trench 1 might date to the Middle Neolithic on the basis of MK finds in the same area. They were located in the north of the excavation. During the second campaign of the ADC more Neolithic features were discovered, especially in trench 13, associated with Middle Neolithic finds in the bioturbated layers above. A configuration of features was interpreted as a Middle Neolithic houseplan, but later this structure was dated to the Late Bronze Age or Early Iron Age (although 80% of the sherds near the house are Middle Neolithic, this house variant was chosen since it corresponds with part of the pottery assemblage and most of the postholes) (Kenemans/Lohof 2005, 319). Several other configurations comprised later prehistoric barns or granaries (Kenemans/Lohof 2005). During the ROB excavation north of the ADC excavation 31 prehistoric features could be documented in trenches 14 and 15. These features are part of the cluster discovered by the ADC in trenches 1 (especially feature 36) and 13. Finds from the same area point to activity during the Middle Neolithic, extending to later periods on the northern slope of the ridge. Most of these features are postholes and some small clustering appears. Several of these features were found underneath the area that was sieved, although no direct correlation could be demonstrated between features and finds above them. Most features hardly contained any finds and only three may be attributed to the MK on the basis of their contents (feature 8, trench 14, features 2 and 12, trench 15). Otherwise attribution also exists on the basis of the morphological characteristics of possible Middle Neolithic traces (light brown-grey colour, heterogeneous, vague contours etc.)

#### *Finds:*

Most of the prehistoric sherds ( $N=600$ ,  $w=5700$  g) were found on top of the ridge (predominantly trenches 1, 10, 7 and 13). Thirteen sherds were identified as MK, while many other less diagnostic sherds were also probably part of this spectrum (up to half of all prehistoric sherds). Apart from Bronze Age or later periods there are possibly also sherds of the Stein group within the spectrum (Kenemans/Lohof 2005, 319).

Pottery from the ROB excavation also was found fragmented. The assemblage defined as MK consists of hard sherds of 5-10 mm with a temper of small quartz particles. The largest part of the sieved fraction ( $N=271$ ,  $w=1069$  g) could be attributed to the MK, although Iron Age pottery also formed an important part of this assemblage. Several sherds with *Tupfenleiste* were also found. Only eleven MK sherds were found in features or on the level. Furthermore wattle fragments were found ( $N=1,006$ ). A part of these may also be attributed to the MK (Rensink *et al.* 2005).

Both the ADC campaigns yielded 36 flint artefacts (Kenemans/Goossens 2003; Kenemans/Lohof 2005). Most flint was found in trenches 7 and 13. Apart from flakes (one axe flake), some blades and points with surface retouch and concave base, trench 10 yielded a typical pointed blade. Furthermore a Mesolithic blade

and Bronze Age artefacts were found. Most flint originated in Southern Limburg, although a rolled component was also present. Furthermore trench 3 yielded a prehistoric grinding stone (Kenemans/Lohof 2005, 28-30).

In total 49 flint artefacts were found in the sieved material (two tools, 45 [fragments of] flakes and two [fragments of] blades). Furthermore one large flake was found in feature 8, trench 14 and three smaller pieces in a Medieval ditch. Trench 15 yielded a Mesolithic core axe of Wommersom quartzite. The flint spectrum comprised of Rijckholt type, Lightgrey Belgian type, rolled terrace flint and a general category of South Limburg-type flint. Both tools are classic MK scrapers, fabricated on Rijckholt type flint. The natural stone component from the sieved fraction (N=157 / 787 g) and from the level and features (N=42 / 419 g) mainly consists of quartzitic sandstone and small fragments of quartz, respectively used as cooking stones and tempering agent (Rensink *et al.* 2006).

#### *Interpretation:*

Both the ADC and the ROB campaign yielded evidence for Middle Neolithic occupation on the northern slope of the coversand ridge. This evidence consisted of pottery and flint and most finds were located in the bioturbated level above the features. Out of the cluster of documented features (mainly trench 14) several hypothetical houseplans might be reconstructed (Kenemans/Lohof 2005). One objective of the subsequent ROB occupation was to establish whether artefacts from the bioturbated layer could be associated with underlying features. This was partly done by intensive sieving of the bioturbated layer. No absolute correlation could be attested between the concentrations of Middle Neolithic finds and underlying features. The concentrations were located 4 m north of the suggested houseplan as well as in its eastern part. These might indicate activity areas, yet the absence of sieving in trenches 1 and 13 prevent any conclusion on dimensions. Furthermore the scarcity of finds within the features does not shed any more light on the problem. With respect to the features excavated by the ADC that form part of the houseplan the diverse  $^{14}\text{C}$  dates indicate the existence of a palimpsest situation (see section dating). On the other hand the (unusually) limited taphonomical disturbance in the form of bioturbation and discolouration indicates part of the features might be of a Middle Neolithic date and thus have not necessarily been lost to disturbing effects. The most evident example in this case is formed by feature 36 in trench 1 containing thirteen MK sherds, probably belonging to the same vessel. The feature was located directly adjacent to a concentration of MK artefacts found in the sieved squares (Rensink *et al.* 2006).

In conclusion the rather limited finds indicate a certain level of MK activity on the ridge. The presence of pottery and scrapers suggest a domestic function of this activity. No evident MK houseplans were found, although some of the features can be attributed to this period. The site was located in a diverse and rich environment where agriculture as well as hunting and gathering would have been possible.

#### *References:*

- Kenemans/Goossens 2003
- Kenemans/Lohof 2005
- Rensink *et al.* 2006
- Van Dijk 2001

## 21. Helmond-Stiphouts Broek

### *Location:*

The site is located in the east of the Dutch Brabant coversand area and is situated on the south-eastern slope of a coversand ridge (Eenselaar). The ridge borders the Stiphoutse Broek and the Holocene sediments of two brooks (Stiphoutse Loop and Goorloop) enclose the ridge (Arts 1994, 79-81).

### *Site characteristics:*

The site was discovered during survey activities in 1988 upon which some augerings in the area took place. The main concentration stretched over 150 x 300 m, although part of it has been redeposited. In 1989 an excavation took place immediately south of the main concentration. In total approximately 2,115 m<sup>2</sup> was excavated in five (*a-e*) long trenches. Trenches *c*, *d* and *e* yielded finds. Three concentrations were found, and two of these were further investigated by shovel and random sieving (Arts 1994, 84).

### *Geology/Pedology:*

The absence of a podzol soil in combination with a relatively thin (30 cm) *esdek*, indicates the site has suffered from fairly recent reclamations. In the brook valleys Holocene peat can be found underneath the *esdek*.

### *Taphonomy/Site-formation:*

The site has been severely disturbed by the above-mentioned land reclamations. There is also evidence that part of the area was levelled off and that this soil was deposited in the brook valley. On the other hand bone material (e.g. aurochs [*Bos primigenius*] and red deer [*Cervus elaphus*]) from the brook valley has been collected in the past, indicating possibly good preservational conditions.

### *Dating:*

Two radiocarbon dates were obtained on hazelnut shells from a Late Mesolithic hearth. Although there seemed to be a clear association between the macroremains and the Late Mesolithic lithic material, both dates were far too young. GrN-18065 dated to  $190 \pm 30$  BP and UtC-1357 dated to  $360 \pm 50$  BP. Although largely unexplained this is a common feature of Mesolithic dates on the sand (e.g. Gillespie 1985; Verhart 2000). Both dates have to be rejected. The artefacts however undisputedly date the site to the Late Mesolithic with some anachronistic Neolithic elements (Arts 1994, 91).

### *Ecology:*

Charred remains of hazelnut were found as well as two pieces of unidentified wood.

### *Features/Spatial layout:*

The site consists of a major concentration (partly redeposited), measuring 150 x 300 m. This cannot be considered representative with respect to past exploitation of the terrain, yet survey has attested that a major part of the slope of the dune

## Helmond-Stiphoutsbroek

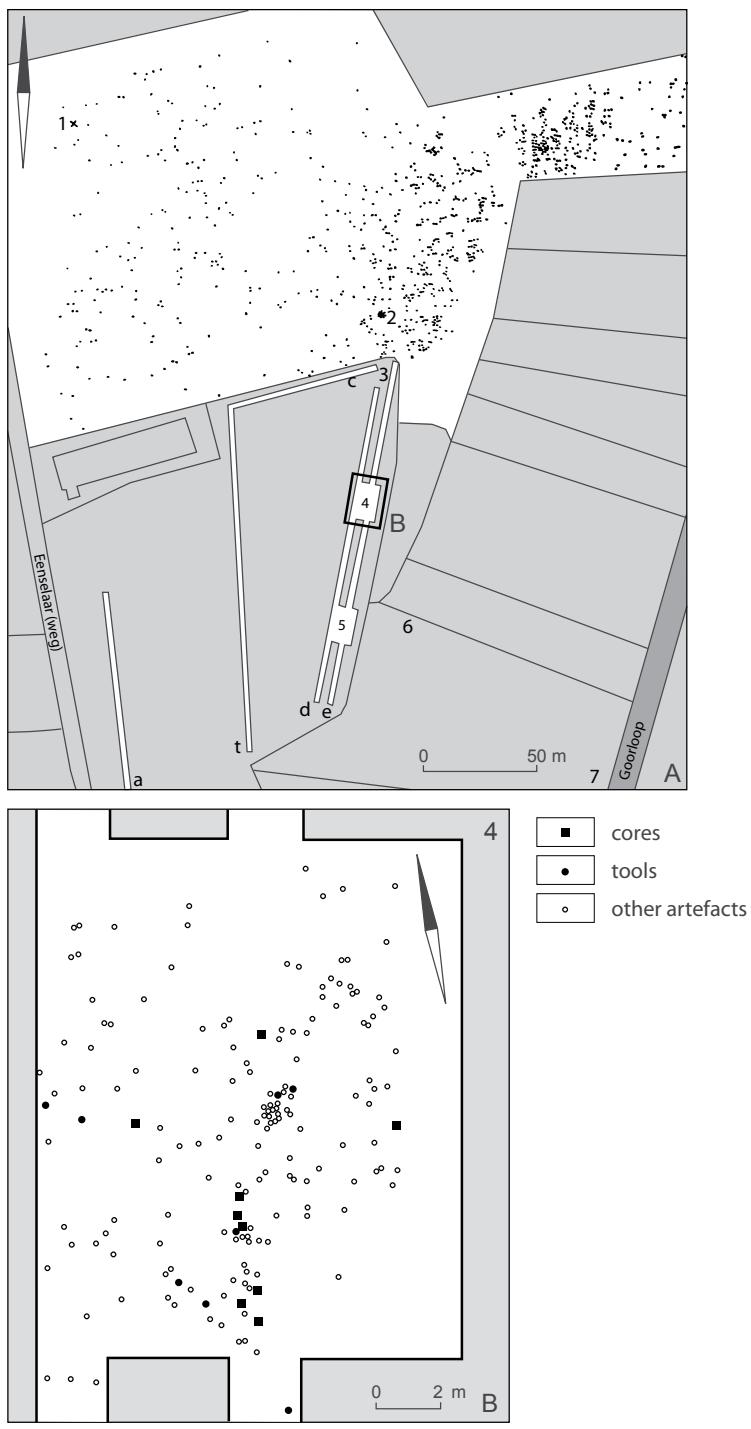


Fig. 33 Helmond-Stiphoutsbroek. (A) topographical situation of the excavation trenches and local finds. 1: location of a Late Neolithic point, 2: location of Rössen Breitkeil, 3: location of hearth, 4: non-excavated concentration, 5: excavated concentration, 6: fossil run of the Goorloop, 7: location of fossil finds potential aurochs, a-e: trenches, points indicate the surface collected material. (B) detail of the excavated concentration with distribution of cores, tools and other artefacts. Adapted from Arts 1994, fig. 2 and 3.

was used. The 1989 excavation took place south of this area and yielded three concentrations of Late Mesolithic material (trenches *e* and *d*). The smallest of these also contained a hearth (trench *e*). Trench *c* yielded only one artefact. Two of the three concentrations in trenches *e* and *d* were excavated. The southern concentration consisted of a thin scatter of finds.

#### *Finds:*

In total 1048 Mesolithic artefacts were collected. Of these 674 were collected on the surface and 219 in the excavation. Most of the flint was collected locally. Wommersom quartzite makes up 12.5% of the assemblage. Some Phtanite, sandstone, quartz and haematite was also found. The artefact spectrum consists of 155 tools (most were collected on the surface). Most of the points are trapezes (N=5), although b- and c-type points were also found. The site also yielded many notched blades, scrapers and cores and a grinding stone of lydite was found. In the hearth hazelnut shells, haematite and two pointed pieces of wood were found (Ø respectively 3 and 5 mm). Furthermore a Rössen *Breitkeil* with two drilled holes was found on the site in 1950 as well as a Late Neolithic point (Arts 1994, 85-91).

#### *Interpretation:*

The site is severely disturbed by natural and anthropogenic post-depositional processes. The overall density of the site is rather low but this probably partly relates to the same disturbing processes. The find spectrum is skewed because of the fact that most material stems from the surface. On the other hand several Mesolithic concentrations were uncovered, one yielding a hearth. The Early Neolithic Breitkeil found on the site as well as the presence of waterlogged sediments in the vicinity still make this a very promising site, also in respect to the process of Neolithisation. The site can be interpreted as part of a larger complex of scatters and patches on the Pleistocene ridge indicating recurrent visits to the site in the Late Mesolithic.

#### *References:*

Arts 1994

## **22. Hoge Vaart-A27**

#### *Location:*

The site is located on a N-S oriented coversand ridge. The ridge is a foothill of higher positioned sandgrounds connected with the Gooi and Veluwe area. To the west the ridge slopes into a flat landscape. To the east an old channel of, most likely, the Eem forms a low lying area. Over time the site became covered with Holocene sediments. After 4500 cal BC habitation was impossible (Peeters/ Hogestijn 2001; Spek *et al.* 2001<sup>b</sup>). Some 50 m south of Hoge Vaart another concentration of bone and charcoal was uncovered.

### *Site-characteristics:*

The site was excavated between 1994 and 1996 since it would be disturbed by the construction of the A27 motorway nearby. The site comprises the top of a Late Glacial dune, where a 20 x 50 m concentration was entirely excavated, as well as a northern and western periphery and a low lying area in the east coinciding with a channel of the Eem (Peeters/Hogestijn 2001, 11-15). In total 1684.5 m<sup>2</sup> was excavated (1166 m<sup>2</sup> of the top, 333 m<sup>2</sup> of the periphery and 185.5 m<sup>2</sup> of the low area). The site was excavated in spits of 50 x 50 cm and various levels were documented.

### *Geology/Pedology:*

The dune consists of Pleistocene coversand. Early in the Holocene peat formation took place in the eastern low lying area, but was probably halted by a sinking groundwater table. On top of the peat a colluvial layer of sand, originating from the dune, was deposited in the Boreal or early Atlantic. Clastic, organic and sandy deposits from 5400 cal BC subsequently covered this layer. This indicates the area became increasingly wet because of the rise in sealevel and thus groundwater table. The overall stratigraphy of the low area is a complex succession of erosive events and sedimentation. Between 5100 and 4900 cal BC aquatic sediments were deposited. After this event the area stabilised again leading to peat growth. Around 4400 cal BC the entire dune was covered by peat. This was followed by sedimentation of clay and later on organic material and peat dating up to 3400 cal BC (start of Calais III transgression) (Peeters/Hogestijn 2001, 17-25; Spek *et al.* 2001<sup>a</sup>). The increasing wet conditions led to the breakdown of a brown forest soil that had formed in the dune body (Peeters/Hogestijn 2001, 26).

### *Taphonomy/Site-formation:*

Due to the rising groundwater table the site was located in a dynamic wetland environment. On the one hand this led to preservation of organic remains, spatial and chronological data, especially in the low lying area. On the other hand the site has suffered from erosional events (mainly during the Atlantic) and redeposition of material. Erosion of the eastern slope of the dune also may have been caused by anthropogenic activity (Peeters/Hogestijn 2001, 130). A phase of erosion between 5055 and 4780 cal BC led to the serious disturbance of the original Mesolithic surface (*ibid.* 133, 169, 171). The top of the dune probably lacked conditions for the preservation of organic material and can be considered a palimpsest.

### *Ecology:*

In the Early Holocene the influence of the sea was negligible. The vegetation at the dune of the Hoge Vaart consisted of a forest of beech (*Betula*) and pine (*Pinus*). The low lying area was characterised by a vegetation of sedge (Cyperaceae) and willow (*Salix*). The vegetation on the dune changed to a lime (*Tilia*) and hazel (*Corylus*) forest during the Boreal and the Early Atlantic (3BC-horizon). Later on oak (*Quercus*) and alder (*Alnus*) increased. Unfortunately information on the vegetation of the low lying area is missing for the Boreal and the Early Atlantic, but alder probably grew in the wetter parts. During the Atlantic, oak increased and the vegetation on the dune opened up, consisting of species such as alder, ash (*Fraxinus*) willow, garden sorrel (*Rumex*) and ferns (*Polypodium*; *Pteridium*

*aquelinum*) (3E-horizon). In the low lying wet area there was marsh and reed vegetation. By 4400 the dune was covered by peat which developed into carr vegetation (Peeters/Hogestijn 2001, 27-28; Spek *et al.* 2001<sup>a,b</sup>).

#### Dating:

Hoge Vaart was dated both by dendrochronology (N=28) and <sup>14</sup>C (N=68). Both the dendrochronological dates and 36 <sup>14</sup>C samples mainly served to date the geological and palaeo-ecological development of the site. Only the dates relating to archaeological/anthropological phenomena are presented here. Unfortunately due to the loss of collagen the unburnt bone from the channel could not be dated. It is not clear whether all the bones suffered from this.

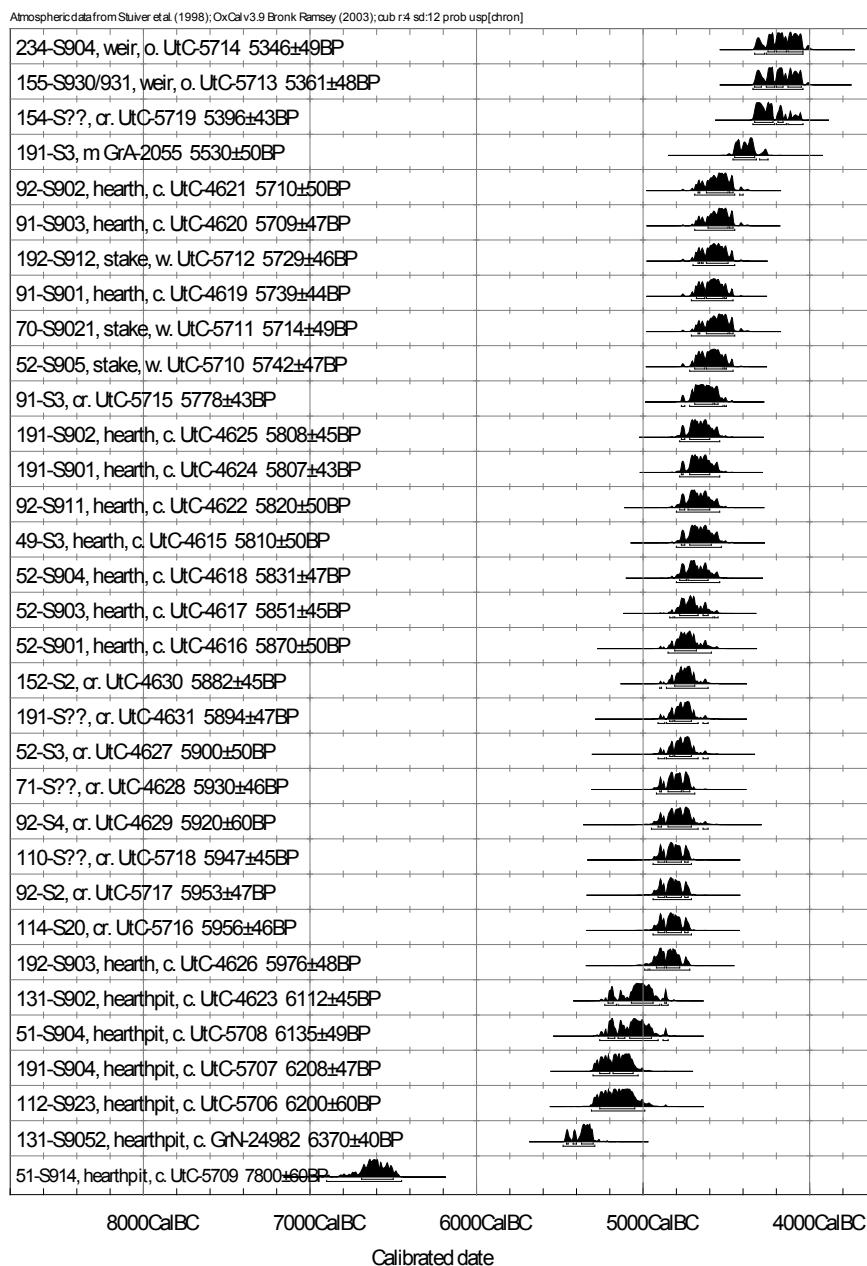


Fig. 34 Radiocarbon dates for Hoge-Vaart-A27.

In total the site was used during a period of 2500 years. Two phases of Mesolithic activity could be discerned using the dates from the hearthpits. One phase can be dated to approximately 6600 cal BC, the second between 5500-4850 cal BC. There seems to be a hiatus between the latter phase with deep hearthpits and a later phase dated by shallow hearths, food crusts on pottery and wood from posts. Both periods cannot be separated with respect to the calibrated  $^{14}\text{C}$  dates yet may attest to a different use of the site (Peeters 2004; Peeters *et al.* 2001<sup>a</sup>, 15). One of the main arguments for this division is the fact that the deep hearthpits were all truncated indicating that after occupation the top of the sand ridge suffered from erosion (visible in a perturbed layer) (Peeters 2004, 29). The site must have been in use continually between 4850 and 4500 cal BC. The clustering of younger dates on top of the dune might relate to increasingly wet circumstances. The fish weirs and traps date between 4350 and 4100 cal BC, postdating the cover-up of the site with peat. They indicate the last phase of use of the site. The intermittent date of GrA-2055 is interpreted as an incidental return to the site (*ibid.*).

#### *Features/Spatial layout:*

The site can be divided in a low lying area in the east (the former channel of the Eem or a separate transgression channel (Hamburg *et al.* 1997, 71), the actual body of the ridge and a rather flat area to the west. On top of the dune deep hearthpits (N=111) with a generally older date (*cf. supra*), surface (shallow) hearths (N=120) and deep pits (N<40) were found. A possible water pit and a clay-mixing pit were also identified. Some 175 features were identified as postholes, 250 features as possible postholes. The diameter of these features measures 3-10 cm. No convincing structures could be identified. To the east of the ridge three fish weirs were located in the Calais II-clay, thus postdating the main occupation of the site. West and north of the ridge three flint depots were found. Near the northern depot evidence for a possible platform was found in the alignment of four trunks of oak located perpendicular to the Calais-channel. (*ibid.* 36-42; Hamburg *et al.* 2001).

#### *Finds:*

A substantial number of flints (N=250,000) was found, both of northern and southern origin and collected in secondary context (rolled). One blade of Wommersom quartzite was found. The broad tool spectrum was dominated by points (30%, mainly trapezes) and scraping implements (30%). Only two artefacts could be identified as parts of axes. About 20% of the flint was burnt (Peeters/ Hogestijn 2001; Peeters *et al.* 2001<sup>b</sup>).

Other tools such as axes and awls were made of antler and bone (Laarman 2001). Furthermore wooden artefacts are represented by the fish weirs, fish traps and a paddle blade, dating to the last phase of use of the site (Hamburg *et al.* 1997; Peeters/Hogestijn 2001, 48). Artefacts of natural stone comprise of quartz and granite temper, haematite, cooking stones, hammer stones and an arrow shaft straightener (*ibid.* 45-46).

In total 2666 pottery sherds were preserved as well as grit. Most of the pottery dated between 4850 and 4500 cal BC and was located on top of the dune. Morphologically this type of pottery can be dated to the phase of the Early SWB culture (Haanen/Hogestijn 2001).



- deciduous woodland
- shrub
- alder woodland
- spaghnum/reed
- open water/reed



	deep hearth pits		flint deposits
	shallow hearth pits		wooden platform
	post/stakeholes		fish weirs
	location clay mixing pit		main distribution lithics

Bone was preserved in calcined and fragmented condition on the top and reasonably intact in the eastern low area. Fish, fowl and a varied spectrum of mammals including horse (*Equus sp.*) could be identified. Most indications point to the absence of domesticated animals (Laarman 2001, 23; Peeters/Hogestijn 2001, 31-33), albeit that identification is notoriously difficult for wild and domesticated pig (*Sus scrofa/domesticus*) (compare Hogestijn/Peeters 1996, 95 and Peeters/Hogestijn 2001, 31-32). Some severely calcined elements of the human skeleton, including the jaw of a juvenile child were also found on top of the dune. There seems to be differentiation in deposition patterns between the dune and the low area (*ibid.* 34). Due to the morphological conditions of the bone spectrum the authors refrain from statements on seasonality, butchering and hunting strategies. No botanical remains of cultigens were found.

*Interpretation:*

The Hoge Vaart is one of the few sites dating to the Late Mesolithic and Early SWB period that has been completely excavated. The interpretation of the site is however hampered by complex site-formative processes, especially the erosion of the Late Mesolithic surface. Although the abundance of  $^{14}\text{C}$  and dendrochronological dates has enabled a division in four phases (Peeters/Hogestijn 2001, 127-138; Peeters 2007) they lack resolution for a further internal division within and between Late Mesolithic and Early Neolithic times. The focus of the excavation was on the main cluster of finds on the top. This has led to a partial disentanglement of the existing palimpsest situation. It is however not unthinkable that a more intensive investigation of the low-lying eastern area with both unburnt bone as well as a more comprehensible stratigraphy could have been more informative (see *e.g.* the Hardinxveld sites).

On the basis of an intensive analysis of the isolated northern cluster, the Early SWB phase of the site has been interpreted as a palimpsest amalgamation of short-term hunting camps, since the overall patterning in the main cluster looks similar (Peeters 2004; 2007). These short-term hunting camps were then occasionally replaced by more substantial habitation as an explanation for more domestic features. Although the overall hunting character of the site seems evident, this interpretation can only be one of several hypotheses. There are several arguments. First of all it is unclear what part of the toolkit is undeniably of SWB affinity. Trapezoids also are an essential Late Mesolithic guide fossil and the stratigraphy of the 2C and 3E layers does not allow an internal division. Use-wear analysis has also indicated several other activities, such as the scraping of fresh and dry hides and plant working that are not directly indicative for a hunting camp. The presence of pottery, antler tools, postholes, a clay-mixing pit, a possible water pit and indications for heavy trampling, may indicate a more substantial domestic role for the site. This is further substantiated by the presence of children at the site as well as the broad spectrum in the fauna indicating many different activities. Since it is impossible to assert contemporaneity, the overall character of the site might have been more of a base camp than the excavators suggest. On the other hand and with respect to pottery, the limited number of sherds and the sole 'fabrication pit' suggest that pottery production may have been rather ad hoc, also befitting shorter occupations (see Peeters 2007). The question is to what extent the SWB occupation would have differed from the previous Late Mesolithic occupation.

*Fig. 35 Hoge Vaart A-27. (A) geomorphological overview of different regional landscape types at 5800 BP. (B) excavation plan depicting features of the Mesolithic and Swifterbant occupation in combination with the main lithic distribution. Adapted from Hamburg *et al.* 2001, Peeters 2007, fig. 3.12, fig. 4.7, 4.8, 4.9, 4.23 and Peeters *et al.* 2001, fig. 44a.*

### *References:*

Hamburg *et al.* 1997  
Hamburg *et al.* 2001  
Hogestijn/Peeters 1996  
Laarman 2001  
Peeters 2004  
Peeters 2007  
Peeters/Hogestijn 2001  
Peeters *et al.* 2001<sup>a,b</sup>  
Spek *et al.* 2001<sup>a,b</sup>

## **23. Hüde-I**

### *Location:*

Hüde I is located on a low elevation (10-30 cm) on the southern margins of Lake Dümmer (Niedersachsen, NW Germany). The direct surroundings of the site consisted of marshland dissected by creeks, one of which connected the north-western edge of the elevation with the lake. At approximately 5 km from the site there was hilly country (e.g. *Dammer Berge*, *Stemweder Berge*) (e.g. Deichmüller 1969; Kampffmeyer 1991; Raemaekers 1999; Stapel 1991, fig 1. ).

### *Site characteristics:*

The site was discovered in 1953 during drainage activities south of Lake Dümmer. Since the site was threatened test-excavations started in 1956 (Genrich, 1958, 168; Stapel 1991, 3). In 1961 evidence for the presence of possibly five sites with a total extent of 2,000 m<sup>2</sup> was found during an extensive augering campaign (Deichmüller 1963<sup>b</sup>, 84). From 1961 to 1967 some 1,100 m<sup>2</sup> were excavated. Since the extent of the excavation covered both the top and slope, almost the entire site was excavated. According to Hüster (1983, 406), the site measures 30 x 30 m (900 m<sup>2</sup>). Most of the site was excavated in 1m<sup>2</sup> squares in trenches of 5 x 10 m. Two long trenches (E-W and N-S), *Suchgraben* I and II, extend across the entire site. During the excavation there was an extensive sampling program for palynological data, radiocarbon dates, botanical, faunal and geomorphological data (Stapel 1991, 3, 7-8). Unfortunately not all of this information has been fully published.

### *Geology/Pedology:*

Lake Dümmer and its surroundings are located in a basin shaped by moraine activity during the Saalien Glacial (Deichmüller 1963<sup>a,b</sup>). The current extent of the lake dates to the Neolithic. At the start of that era the size of the lake sharply decreased. Sediments at the base of the existing stratigraphy therefore are of lacustrine origin. The elevation was surrounded by several infilled palaeochannels of the local stream the Hunte (Stapel 1991, 5). This indicates that aside from the lake there was a lot of open water. The base of the stratigraphic sequence is formed by the former lake bottom of sand covered by approximately 1 m of chalk-gyttja. The geological survey carried out by U. Staesche mentions the elevation consisted of Pleistocene sand covered first by brownish chalk-free gyttja followed by chalk

gyttja. The origin of this hill cannot be explained sufficiently (pers. comm. B. Stapel 2006). On top of these sediments marsh deposits and subsequently alder carr developed (Deichmüller 1965, 1-4). The find horizons were located within these sediments. Deichmüller (1965, 4) distinguishes between two find horizons. The lower find horizon (*Unteren Schicht*) consists of concentrations of finds and may both stratigraphically and typologically be considered older. It is mainly located in the northern and north-western extent of the excavation. Its extents have not been reached. In the middle of the elevation (consisting of a local thickening or step within the gyttja, *Gyttjaschwelle*) it sometimes merges with the upper find layer or *Oberen Schicht*. The *Unteren Schicht* had also compacted the subsoil. The reddish *Oberen Schicht* is about 65 cm thick and consists of compacted peat with charcoal, wood and finds (Deichmüller 1965, 4; 1969, 28-30). Artefacts with the stratigraphic indication ME (*Moorerde*) are however only to be found up to a depth of 30-40 cm.

On the basis of the more detailed stratigraphy in the channel as well as the location of several supposed structures, Stapel (1991, 9-15) and Kampffmeyer (1991, 74-77) propose a more precise subdivision. In general however approximately three phases of occupation may be discerned within only two stratigraphically separable layers (Stapel 1991, 10). Raemaekers (1999, 75-76) suggests an alternative approach on the basis of artificially defined units. Lanting and Van der Plicht argue that this subdivision also suffers from admixture with other phases. Stapel also abandoned the use of artificially defined units because of dissatisfaction results (pers. comm. B. Stapel 1991).

#### *Taphonomy:*

A basic subdivision may be proposed for Hüde I consisting of the top of the elevation and the slope and creek deposits. The top of the elevation is severely disturbed by repeated occupation and postdepositional processes such as trampling and bioturbation. The slopes enable a better subdivision between older and younger elements. Nevertheless many artefacts became re-deposited, resulting in horizons with differential degrees of admixture of chronologically foreign elements (Stapel 1991, 10). Furthermore remains of various structures dating to the Middle Phase (*cf. infra*) were uncovered (Deichmüller 1969, 34-35). Stapel assumes spatial and chronological coherence between these structural elements and lithic finds in the same area (1991, 14). Raemaekers (1999, 75) however questions this association since Deichmüller (1969, 35) indicated the palimpsest of structural remains belonged to various periods. Furthermore the contact zone between the find layers, the alder carr and the wet saturated *Schwemmtorf* suffered from the dynamic aquatic surroundings. This enabled younger material to end up in stratigraphically older strata. It might be concluded that the promising preservation conditions of Hüde I and the rich artefact assemblage suffer from the specific taphonomic history of the location, complicating allocation to different periods.

#### *Ecology:*

The environment around Hüde I consisted mainly of alder (*Alnus*), pine (*Pinus*) and hazel (*Corylus*). Since the site was located in the estuary of the Hunte river it was surrounded by open water in the form of creeks and channels. Presumably

the site was frequently flooded in winter and spring (Stapel 1991, 6). Since water and marsh dominated the surroundings of the site, the area might be considered largely unsuitable for agriculture (*ibid.*). This correlates with the absence of specific indicators for anthropogenic influence, especially agriculture, in the pollen diagrams before TRB occupation of the site (Schütrumpf 1988, 21).

### *Dating:*

The internal stratification and subsequent phasing of Hüde I have led to widely diverging opinions (e.g. Deichmüller 1969, 30-31; Geyh 1971, 199-208; Hüster 437; Kampffmeyer 1991, 236-330; Lanting/Van der Plicht 1999/2000, 23-25; Raemaekers 1999, 75-81; Schirnig 1979; Schütrumpf 1988, 30; Stapel 1991, 152-153). The difficulties mainly arise from the fact that the phases are based upon a cultural attribution of the different pottery assemblages in combination with palynological data and a large number of qualitatively variable  $^{14}\text{C}$  dates. Since the different layers seriously suffer from admixture with pottery from other phases, a detailed subdivision is impossible. Apart from some evidence for Boreal and Early Atlantic Mesolithic activity (Kampffmeyer 1991, 27; Schütrumpf 1988, 30) a basic tripartite division was established by Deichmüller (1969, 30-31) and subsequently refined by Stapel (1991, 10-15) and Kampffmeyer (1991, 226-230). Kampffmeyer (1991, fig. 250) arrives at the following subdivision.

Phase	Date uncal. BC	Cultural attribution
IV	3000-2800	Drouwen D1
III	3500-3200	TRB Drouwen type A-C <b>hiatus</b>
II	3600-3500	Rössen-Bischheim horizon followed by Early Neolithic TRB A-C <b>hiatus</b>
I	4100-3900	Hüde-SWB horizon (Ertebølle-Ellerbek culture) with Rössen imports <b>hiatus</b>

Table 6 Subdivision in phases for at Hüde-I.

Stapel (1991, 159) and Raemaekers (1999) both criticize the supposed affiliation with Ertebølle/Ellerbek and argue for parallels with the Swifterbant and Rössen culture. According to Gleser (1995) Kampffmeyer also wrongly attributed Bischheim pottery to Rössen. Lanting and Van der Plicht (1999/2000, 24) indicate that most of the Early TRB pottery identified by Kampffmeyer might also be attributed to Bischheim. Raemaekers (1999, 75-89) proposed a new division in phases taking into account the severe post-depositional processes that have affected the site. For this approach Raemaekers only used the qualitatively better data from the fill of the creek. Raemaekers devised ten artificial 'Pottery Units' (I-X). Unit VI-X contained TRB pottery and were not analysed further. The remaining units culturally and technologically form a rather homogenous assemblage consisting of both Swifterbant and Bischheim elements. And can be dated between 4700/4450 and 3500 cal BC. Raemaekers (1999, 78, 87-88) also recognises several MK elements, although these are rejected by Lanting and Van der Plicht (1999/2000, 24). Lanting and Van der Plicht (1999/2000, 24) furthermore recognize several TRB sherds within Units I-V, indicating the material might be mixed to a serious degree.

Unfortunately the profuse number of  $^{14}\text{C}$  dates does not further a more detailed phasing of the site. In total 81  $^{14}\text{C}$  dates are available (Kampffmeyer 1991, fig. 249). Both Raemaekers (1999, 73) and Lanting and Van der Plicht (1999/2000, 25) criticize the quality of these dates. Lanting and Van der Plicht (1999, 25)

critically selected the best dates available (rejecting dates with a large SD, or dates on bone and unworked wood). These dates are presented below.

In total three groups of dates may be discerned, although the large deviations prevent attribution to separate phases (Lanting/Van der Plicht 1999/2000, 58). The first group is formed by both of the oldest dates. According to Lanting and Van der Plicht (1999/2000, 58) both of these dates may be attributed to a very early SWB occupation. The second group is formed by 14 dates dating to both the Middle and Late phase of the SWB culture (*cf.* Raemaekers 1999). The third group is formed by the four youngest dates. Of these four, the two youngest dates may be attributed to the TRB Westgroup if the 'old-wood-effect' is present (*ibid.*). The dates represented here point to a rather continuous and recurrent occupation during all phases of the SWB culture. No large hiatuses can be detected in the

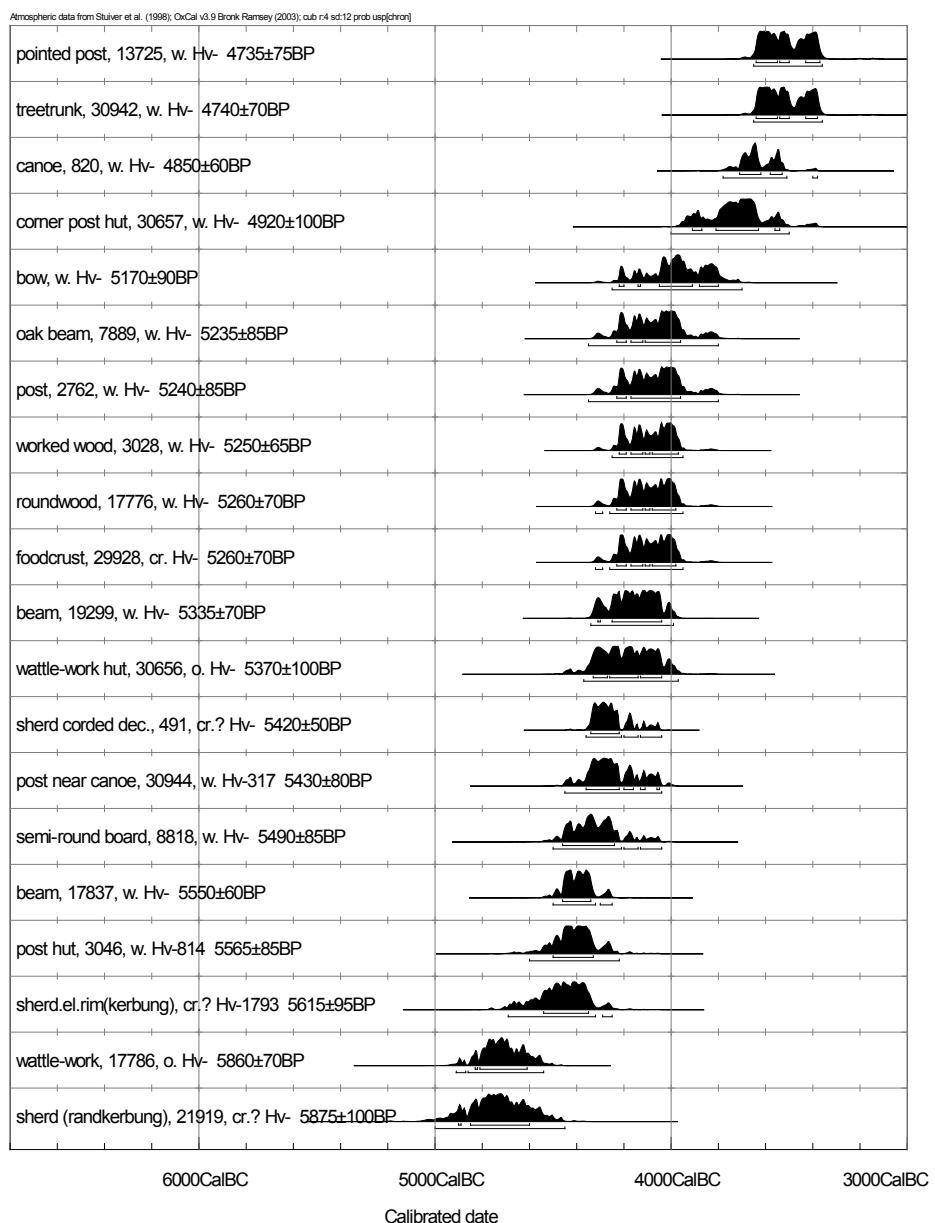


Fig. 36 Radiocarbon dates for Hüde I.

radiocarbon record (contra Kampffmeyer 1991). During the middle phase of the SWB culture (*cf.* Raemaekers 1999), there is a substantial import of Bischheim pottery. Whether or not there is an internal development towards the TRB culture, as proposed by Kampffmeyer (1991) and Stapel (1991), is still up for discussion. According to Lanting and Van der Plicht the TRB culture appears rather abruptly on the site with pottery of the TRB Westgroup (1999, 25). Stapel (pers. comm. 2006) however, does see several connections between Hüde I-ceramics and pottery of early TRB sites (especially of the Baalberg variety). This seems to be substantiated by polished axes (Wiehengebirgsgeoden), which may be connected geographically to axes in the north and northeast, some of which were produced locally (Stapel 1991, 161). Furthermore several lithic tools from middle occupation phase 1 were comparable to early TRB artefacts (transversal arrowheads). On the basis of these data, Stapel still is in favour of an early TRB development. The debate thus focuses on either the local development or intrusive character of the TRB culture, and whether the former should be considered independently as TRB, or evidence of contact.

#### *Features/Spatial layout:*

Interpretation of the spatial layout of Hüde I is greatly hampered by post-depositional and taphonomic processes (*cf. supra*) at the site. Nevertheless some trends could be observed. The extent of the lower find layer located within the alder carr/peat deposits (*Bruchtorf*) could only be located in the east of the excavation. Within this phase the site however seems to have been partially or completely surrounded by water from (seasonally or perennially) active channels of the Hunte river. One important channel (*Rinne*) delimited the site in the northwest, although refuse was also dumped on the other side. The lower find layer is disturbed by depressions as well as pits dug into the soil at different times. Furthermore contact with water might have disturbed part of the spatial layout (Kampffmeyer 1991, 66-74). Most artefacts and dates of the lower find layer seem to point to pre-TRB occupation of the site. The upper find layer however contains finds from all periods, indicating it has been subject to serious trampling, compression and soil-formation (Kampffmeyer 1991, 74). The extent of this layer, consisting of many separate horizons, has been found in the SE and SW of the excavation. Overall this layer seems to extend over the lower find horizon, indicating the surface of the site increased in time (Stapel 1991, fig. 226, 228 and 230). The site also extended over the former channel which was now filled in with peat (Kampffmeyer 1991, 74). Little spatial information was available for the upper find layer.

Several hearths (*Fläche*/trench XIII, XIX, XI, IV, XXXIX, XLIV) were however found as well as trampling indicative of paths (*Fläche* XXXIX, XLIV) and work-places (*Fläche* IV). Furthermore concentrations of stone and flint were documented (*Fläche* XXXIX, XLIV) as well as a small platform of cobbles (*Fläche* II) (Kampffmeyer 1991, 65-66). On the western site of the settlement a camp-shed or sheet-pile of posts with bark cover and wood was documented next to the channel (*Fläche* V) (Kampffmeyer 1991, 60/61). Since not many posts are found in the upper layer this might indicate a different building tradition on the site (Kampffmeyer 1991, 66-70), contrasting with the lower find layer. The absence of posts might however also be explained taphonomically.

The lower find layer mainly suffers from a lack of information in the centre of the excavation since this is where the upper find layer comes into direct contact with the gyttja base. No *Bruchwaldtorg* has been preserved here. In contrast, towards the edges of the settlement where the peat layer grows in thickness and is separated from the upper find layer many structural elements and organic finds were found.

Most spectacular were the remains of several huts (at least six) (Kampffmeyer 1991, Fig. 37, *Befunde* 2, 4, 6, 7, 8, 9; Stapel 1991, Fig. 228, 230). The remains of these huts were mostly located in *Fläche*, I, XX, XIX, XIV, XXXIX, XLIV. Most of them border on the channel delimiting the site to the northeast (Stapel 1991, Fig. 228). This indicates they probably suffered from flooding occasionally (Kampffmeyer 1991, 66-71). As the <sup>14</sup>C dates indicate most of the huts date to the second part of the 5<sup>th</sup> millennium cal BC, although some are later. It is not clear whether any of the huts were contemporaneous. The huts were constructed with posts and horizontal beams. The walls most probably consisted of segments of weaved branches or reed. The floor of the huts frequently comprised a lower layer of wood and a cover of bark, reed and branches of willow (*Salix*) and alder (*Alnus*). Within the material of the floor sherds and flint was found (Kampffmeyer 1991, 57, 69). No complete structure has been preserved although it is most likely they measured 3 x 4 m up to 5 x 8 m (Kampffmeyer 1991, 70).

Next to the huts there are often multiple rows of posts (e.g. *Fläche* I, III/IIIz, V, VI/VIz, XXI, XV, XXXIX), sometimes in combination with bark cover (Kampffmeyer 1991, fig. 37). They have been interpreted as a palisade or fence, but because of their close proximity to the former channels it is more likely they might be interpreted as camp-sheds or sheet-piles. Furthermore a canoe was found (*Fläche* VI/VIz) within the former channel. Several posts next to it may be interpreted as a landing stage (Kampffmeyer 1991, 63). There is also evidence for the existence of wooden walkways or tracks on the site consisting of branches and pegs (*Fläche* XX), although other interpretations are possible (Kampffmeyer 1991, 51). There is however positive evidence for the existence of wooden walkways or tracks in the area from 4700 cal BC onwards (Bauerochse/Metzler 2001, 105).

#### *Finds:*

Interpretation of the many finds from Hüde I also suffers from the taphonomic history of the site which itself was in use for over 1500 years. In total more than 100,000 stone and flint artefacts were found, among which 10,000 tools or fragments of production waste. Furthermore 40,000 sherds and approximately 30,000 faunal remains, both bone and antler, were found (Hüster, 1988, 36; Kampffmeyer 1991, 79; Stapel 1991, 1).

Within the pottery assemblage there is evidence for a continuous production of SWB pottery or Dümmerkeramik. The presence of Rössen pottery and local Early TRB style pottery has been suggested by both Deichmüller (1969) and Kampffmeyer (1991), which is however refuted by Lanting and Van der Plicht (1999/2000, 24-25). Neither do they acknowledge the presence of MK elements as proposed by Raemaekers (1999, 88). On the other hand there is clear evidence for the import of Bischheim vessels and for the rather abrupt occurrence of TRB West Group pottery in a later phase.

Stapel subdivided the flint assemblage in three different inventories (1991, 152-157) and correlated these with the three main phases of occupation. This subdivision however also suffers from intense admixture of artefacts from other layers in combination with the intrinsic longevity of certain tool types. Both Stapel (1991, 159) and Raemaekers (1999, 89) however acknowledge that there are strong similarities between the spectrum of Hüde and the flint assemblage of the Swifterbant sites. Most of the raw material can be typified as Baltic flint. There is also import of Belgian flint (1991, 188). The tool spectrum comprises points and borers (both 9-14%) as well as scrapers and retouched blades (up to 30%). One blade with typical sickle-gloss was found. It was made of Belgian flint and converted into a borer, probably before it reached Hüde (pers. comm. B. Stapel 2006). Apart from the flint tools there are imports of Rössen perforated broad wedges (*Breitkeile*) and a *Flachhache*. Grinding stones are also present. More spectacular however is the probable local production of axes: from *Wiehengebirgslydit* or *geode* (one *Walzenbeil* and two to three dozen *Flachbeilen* were made of this type of stone as well as of flint). Apparently some roughouts were brought to the site to be finished there (Stapel 1991, 191), although the total number of finished objects outmatches the roughouts (pers. comm. B. Stapel 2006). This activity might however be related to the TRB culture. Remarkable finally is the presence of a number of *Spitznackige Beile* some of which might have been made on Wiedaer Schiefer, a raw material also found in early TRB context (pers. comm. B. Stapel 2006).

Organic artefacts comprise antler axes, bone tools and pendants and spectacular wooden artefacts, such as a canoe, a paddle blade, a domestic bow for drilling and evidence of a technologically sophisticated wood working and construction technique (Deichmüller 1969; Kampffmeyer 1991; Werning 1983).

Of the faunal remains 35% could be identified. Within the wild faunal assemblage there is a specific focus on larger game, such as aurochs (*Bos primigenius*), horse, (*Equus caballus*) and wild boar (*Sus scrofa*). Noteworthy is the preponderance of remains of the beaver (*Castor fiber*). Domestic animals comprise dog (*Canis familiaris*), cattle (*Bos Taurus*), pig (*Sus domesticus*) and ovicaprids. Remarkable is the high percentage of wild animals within the bone assemblage amounting to 90-95%. Even when taking into account the difficulties that arise when determining remains of cattle (*Bos* spec.) and pigs (*Sus* spec.) (Hübner *et al.* 1988, 75; Kampffmeyer 1991, 291, 298). Some domestic animals may however have already been present in the phase yielding concentrations of pointbottomed vessels (pers. comm. B. Stapel 2006). Fowling mainly focused on mallard (*Anas platyrhynchos*) although a broad range of birds was hunted (Boessneck 1978, table 1). Remarkable is the high number of bones from the white-tailed eagle (*Haliaeetus albicilla*) (Boessneck 1978; Kampffmeyer 1991). Fish remains (N=1075) were only limited to some six species (Hüster 1983, fig. 5 and 6) and showed a predominance of pike (*Esox lucius*) and perch (*Perca fluviatilis*). Apart from this several isolated human bones were found (Deichmüller 1969, 36).

No substantial data on the macrobotanical remains of Hüde I have been published up to date. Kampffmeyer (1991, 310-318) summarizes the information available in 1991. No positive evidence for the presence of cereals was found at Hüde. Several impressions of cereals in sherds of pottery remain doubtful (Deichmüller 1969, note 28), although Kampffmeyer (1991, note 970) mentions

naked barley (*Hordeum vulgare*, var. *nudum*) or einkorn (*Triticum monococcum*). Two of these sherds originated in the *Lower Bruchtorf* horizon. Other macrofossils, more specifically certain (ruderal) herbs, point to the presence of open spaces and are often indicative of settlements (Kampffmeyer 1991, 312-313). Some species of wood clearly preferred a dry location and might have been brought in from some distance (e.g. oak (*Quercus*), glossy buckthorn (*Rhamnus frangula*), hazel (*Corylus*), Guelder rose (*Viburnum opulus*)), although not all of these are absent in wetter locations (pers. comm. W. Out 2007). The distinct dominance of alder around Hüde points to a presence of alder carr.

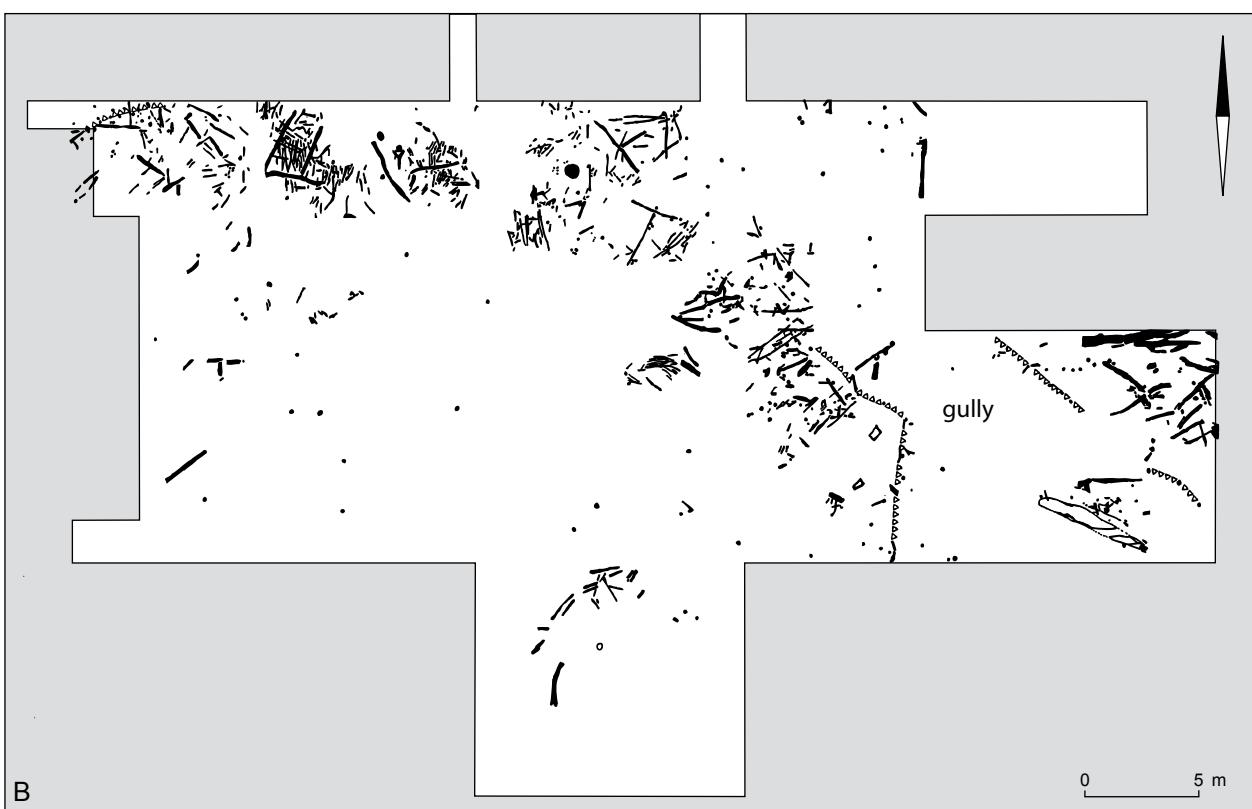
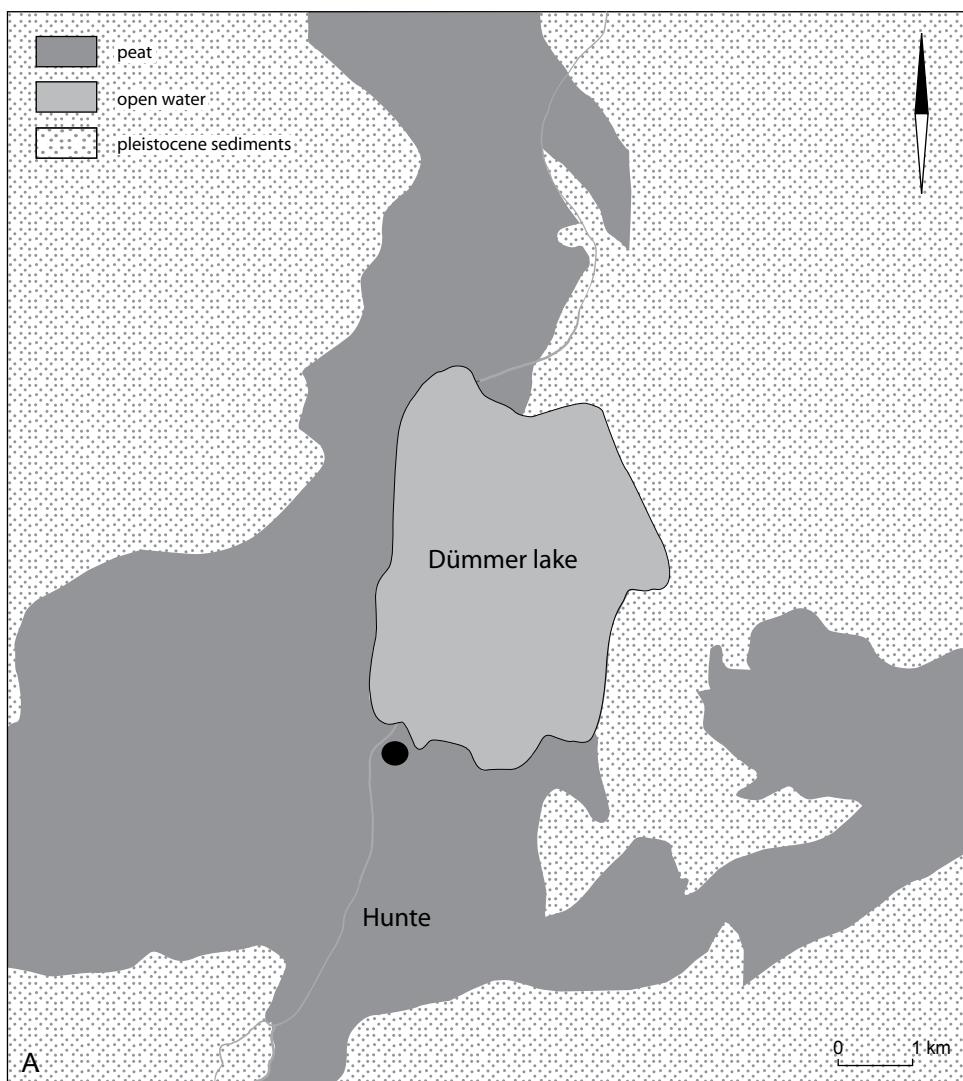
#### *Interpretation:*

As has been mentioned before, Hüde I is plagued by its internal stratigraphical situation, making it impossible to distinguish between 'clean' phases of occupation. On the other hand a basic subdivision between an older find layer with many structural remains dating to the earlier phases of occupation and a compressed upper find layer can be established for the site. Another argument in favour of regarding Hüde I as more than a mere palimpsest is the fact that most of the data indicates a very continuous and homogeneous use of the site. In this way interpretation of the site as a whole might be seen as representative for the many different moments of occupation during the SWB culture and TRB culture.

In this respect it is clear the site should be interpreted as a hunting, fowling and fishing station. Domesticated animals are only present in low numbers (possibly increasing a bit in later phases (Kampffmeyer 1991, 320) and cereals are entirely absent. Although it is not clear whether the earliest occupation phase saw the erection of structures, these were already present from very early on. The presence of huts, fences and camp-sheds indicate a substantial amount of time was spent at the location. This is further substantiated by the elaborate tool spectrum, the pottery assemblage and other finds. According to Schüttrumpf the site must have been inhabited throughout the entire year. His main arguments are built up around the quality and quantity of finds in the entire area (Schüttrumpf 1988, 26-30). Most evidence however points to occupation during part of the year (light construction of the huts, possible seasonal flooding, intensively repaired pottery, complete pots that were left behind etc.) (e.g. Kampffmeyer 1991; Raemaekers 1999; Stapel 1991).

The most concrete arguments for seasonal occupation are given by the faunal assemblage of the bird bones. The smew (*Mergus albellus*) of which three bones were found points to a sporadic presence in winter, the rest of the assemblage comprises resident species or typical summer birds (Boessneck 1978, 157-158). Raemaekers (1999, table 3.50) however argues for a minimal occupation in late summer and autumn. Although Hüde I must be considered a temporarily occupied seasonal site, this hardly means it was isolated. Southern influence is documented in foreign types of pottery; both imported but perhaps also imitated, as well as finds of Belgian flint, Rössen perforated broad wedges and amber. Clearly the inhabitants of Hüde were in contact with fully Neolithic farmers from very early on. Unfortunately this does not shed any light on the fact whether the domesticated animals were obtained through contacts or already formed an intrinsic part of SWB existence in NW-Germany. Summing up, Hüde lacks chronostratigraphic resolution yet still forms an important source of information for the process of

Hüde-I



Neolithisation in NW-Germany, especially with respect to its site-structuring and pottery sequence.

#### *References:*

Bauerochse/Metzler 2001  
Boessneck 1978  
Deichmüller 1963<sup>a,b</sup>; 1965; 1969  
Genrich 1958  
Geyh 1971  
Hübner *et al.* 1988  
Hüster 1983  
Kampffmeyer 1991  
Lanting/Van der Plicht 1999/2000  
Raemaekers 1999  
Schütrumpf 1988  
Stapel 1991  
Werning 1983

### **24. Jardinga-Johannahoeve**

#### *Location:*

Jardinga is located near Oosterwolde in SE Friesland in the northern Netherlands. The site is situated in a boulder clay area, in the peat-filled basin of the Tjonger river. The site is sitting at the narrowest point of this basin (Prummel *et al.* 2002).

#### *Site characteristics:*

The site was discovered by the finds of bovine bones and flint in 1981. This led to a small-scale excavation in the same year by the University of Groningen (BAI) in cooperation with the Fries museum in Leeuwarden. A trench of 2.4 x 7 m (trench 1) was opened. It ran perpendicular to the Tjonger. Sediment was not sieved, but most finds were recorded three-dimensionally (Prummel *et al.* 2002). Additional finds were also found such as a red deer (*Cervus elaphus*) rib, flint, stone, wood, hazelnuts and a potsherd; but the site and finds were forgotten for some 15 years. The material resurfaced in 1997 and was studied in detail as well as AMS-dated (see Prummel *et al.* 1999). In 2002 and 2003 two further campaigns took place. In 2002 two trenches were excavated. Trench 2 (4 x 50 m) was also situated perpendicular to the current Tjonger, immediately south of trench 1. Trench 3 (6 x 8 m) enclosed trench 1 and formed a connection with trench 2. The plough soil was removed mechanically and the level was partitioned in smaller units (near the Tjonger in 2 x 2 m spits). The excavation units were shovelled per layer and finds recorded with infrared theodolite. In trench 2, 224 50x50 cm spits were excavated (although the first four meters were excavated in 2 x 2 m squares), of these 92 were excavated by trowel. Soil from these spits was excavated in two to three layers and sieved over a mesh of 5 and 2 mm. Some 30 m of trench 2 were mechanically excavated to establish a section. In 2003 a fourth trench was excavated (5 x 6 m), directly east of trench 3 and joining trench 2. It was shovelled and excavated

Fig. 37 Hüde-I. (A) geomorphological overview of the site location in the vicinity of lake Hüde. (B) excavation plan depicting a number of potential structures and wooden construction on the gully banks. Adapted from Kampffmeyer 1991 (see e.g. Kampffmeyer 1991, fig. 37).

by trowel in 1 x 1 m spits and sieved over 5 mm. Furthermore 284 corings and terrain measurements were taken as well as samples for archaeobotanical research (Prummel/Niekus 2002/2003).

#### *Geology/Pedology:*

The site is located in a boulder clay area formed during the Saale glacial and subsequently covered with aeolian sand during the Weichsel Glacial. During that period the river basins, amongst which the NE-SW oriented Tjønner-basin, were filled with fluvio-periglacial sediments and aeolian sands. In deeper parts peat developed. During the Holocene eutrophic wood peat developed in the basin.

Stratigraphically trench 1 consisted of a topsoil, peat with sand lenses, wood peat, sand with peat and fluvial sands of the river bed. The finds were all embedded in the sand with peat layer. This layer was c. 1 m in thickness, located next to the Tjønner and only 10 cm thick higher up in the excavation trench. Two general areas were discerned in the excavation, the horizontal 'fluvial sand' and the 'river-bed', where the sand sloped towards the river. An erosion gully was located in the SE corner of trench 1. This may have connected the fluvial sand and sand-with-peat layer. It is assumed the erosion phase dates before and to the period of deposition of the finds. The gully may have been a tributary of the Tjønner running off the elevation on top of which Jardinga is situated (the layer developed between 7500 and 5000 BP). The sandy layer appeared to surface some 45 m south of the site (Prummel *et al.* 1999). Trenches 2 and 3 comprised a palaeochannel of the Tjønner filled with gyttja and peat as well as a steep embankment formed by a tongue of 5 x 5 m. Samples for archaeobotanical and radiocarbon research were taken for analysis.

#### *Taphonomy:*

Conservation of organic remains is excellent at Jardinga, although remains of bone and wood are more weathered further up on the slope (Prummel/Niekus 2002/2003). The good condition of most bones might indicate they became embedded within the sediment soon after deposition. This and the fact the skeleton of at least aurochs 1 (*Bos primigenius*) was reasonably articulated (also fragments of a loose scapula were found within 0.5 m), led the excavators to believe post-depositional disturbance of the site was limited (Prummel *et al.* 1999; Prummel/Niekus 2002/2003). On the other hand it is suggested that the bones of aurochs 2-4 and the red deer rib could have drifted to the site in the water. This is affirmed by fragments of hazelnut shell that clearly have been transported by water (Prummel *et al.* 2002, 421). It may thus be concluded that part of the assemblage could have been displaced by water, although there is no clear evidence for this on the bones themselves (*e.g.* rolling). Furthermore all of the animals might have been butchered at some distance of the site, after which parts were transported to the site (Prummel *et al.* 2002, 422). Either way, the interpretation of the site is hampered by difficulties in both. This need not be a problem in the interpretation of the site, yet may shed a different light on the assumption selected parts of the skeleton were moved to the settlement.

### *Ecology:*

Jardinga is located in an ecologically diverse area since it comprises upland boulder clay and aeolian sand deposits as well as a Holocene river peat basin. In this basin riverine wetland vegetation led to the formation of eutrophic wood peat, while the Pleistocene sands were covered with dense forests (Prummel *et al.* 2002). Archaeobotanical data (both pollen and macrobotanical remains) gathered from the SW section in the 2002/2003 campaign yielded further information. The macrobotanical remains are mainly dominated by aquatic wet species. During the Boreal, hazel (*Corylus avellana*), alder (*Alnus*) and oak (*Quercus*) appear, while at the end of the boreal wetland species such as sedge (*Carex* sp.) increase. This might be related to a flooding event or change of watercourse (Baak *et al.* 2002-2003). During the Atlantic (in which the occupation of the site might be placed), alder increases over beech (*Betula*), accompanied by for example nettle (*Urtica dioica*). Lime (*Tilia*) is present in small numbers. During the occupation of the site the vegetation consisted of an alder carr with peat growth on the banks of the river. On the higher sand ridges hazel and oak as well as some pine (*Pinus*) could be found (Baak *et al.* 2002/2003).

### *Dating:*

In total 11 AMS dates were obtained on the skeletal remains of the aurochs, red deer and beaver. Three additional conventional  $^{14}\text{C}$  dates dated stakes of a wooden construction to roughly the same period. Two older dates point specifically to Boreal activity. Remarkably the wooden stakes were hammered into a Preboreal pine trunk. Furthermore a bundle of willow (*Salix*) wicker also dated to the Boreal (the anthropogenic character of these branches is not confirmed by the excavators, personal communication Niekus/Prummel 2006). Other pointed posts dated to the SWB culture and Bronze age (not depicted) (Bottema-MacGillavry 2002/2003; Prummel/Niekus 2002/2003; see also Niekus 2005/2006).

On the basis of the dates of the bones two separate episodes are suggested in which animals were hunted, killed and butchered at Jardinga. The first episode may be dated between 5600-5300 cal BC and involved two aurochs, a beaver and a red deer. The second episode can be dated between 5300 and 4900 cal BC. During this period two aurochs and two red deer were hunted (Prummel/Niekus 2002/2003). It is however not clear to what extent the animals within the aforementioned time frames were hunted at the same time, or how many animals were actually involved (since at least the number of aurochs was based on an MNI count).

### *Features/Spatial layout:*

The site is located on the banks of the Tjoner. At this specific spot the bank forms a 5 x 5 m large peninsula jutting into the river. It is possible the animals were butchered in this area after which the remains were left on the bank and in the channel (Prummel/Niekus 2002/2003). Several bones of aurochs 1 were more or less found in articulation (Prummel *et al.* 2002); although it cannot be attested for all bones they suffered no or little transport. No further spatial information is available.

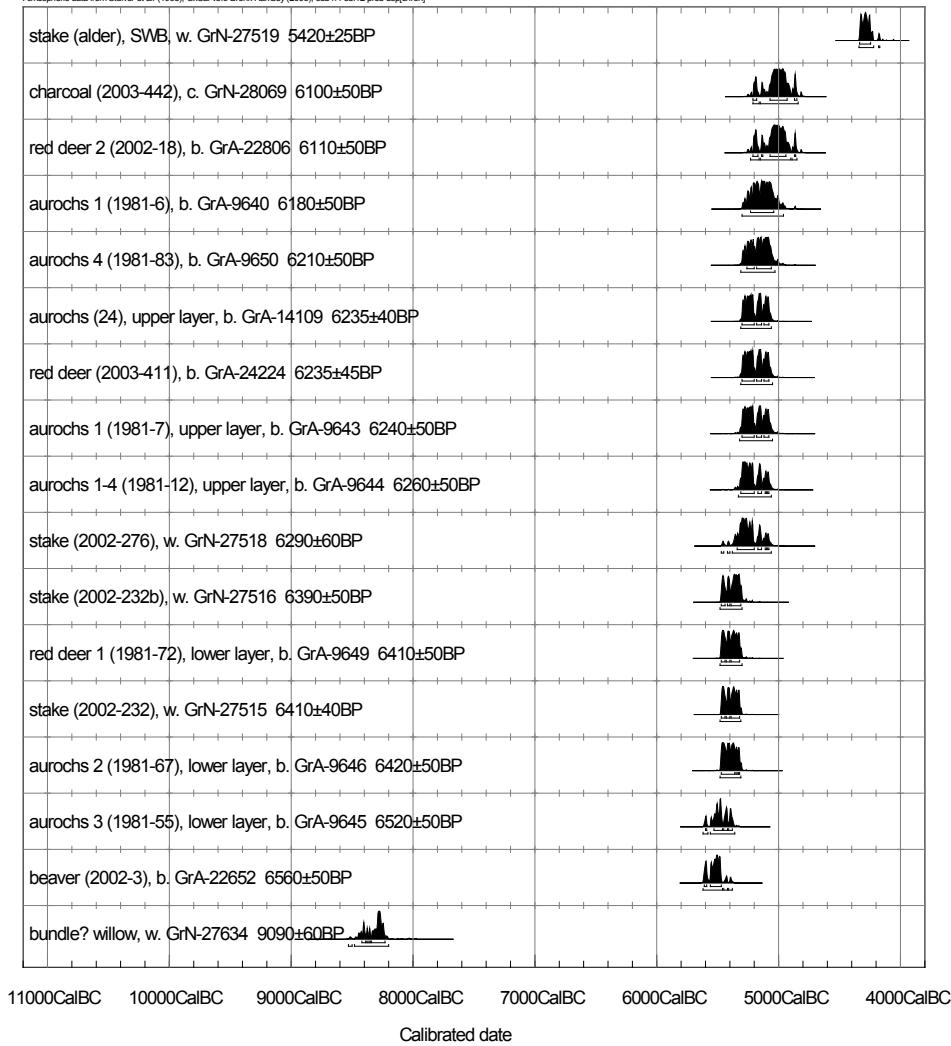


Fig. 38 Radiocarbon dates for Jardinga-Johannahoede.

### Finds:

The 1981 campaign yielded 64 fragments of 54 aurochs bones, one red deer rib fragment, six flints, eight pieces of wood, several uncarbonized hazelnut shells, stones and a late prehistoric or medieval sherd. With the previous finds from the river bank, a total of 62 aurochs bones were found, representing at least 4 individuals. Best represented is aurochs 1 (almost four complete lower legs). Some of the bones had been deliberately broken and flint cut-marks were visible. The animal was older than three years and was probably a bull. Aurochs 2 and 3 were represented by phalanges, of which the bones of individual 2 again showed cut-marks. The skull and several bones found in the river represent animal 4. This animal was smaller and younger (20-24 months) and might have been a cow. A phalanx and a rib show cut-marks. Other aurochs bones (some with cut-marks) might belong to the four animals mentioned above.

The red deer rib was deliberately broken at the proximal end (as were three aurochs ribs) and also showed cut-marks. During the 2002/2003 campaign, trenches 2, 3 and 4 yielded another 17 (fragments of) bones of aurochs, of which six showed cut-marks. One bone of an aurochs from trench 4 dated to the Late

Neolithic and was found in a higher level than the Mesolithic bones. Furthermore six fragments of bone of red deer were found, none showed cut-marks. Two of these fragments were dated to the Late Mesolithic. Three red deer molars might be older. Furthermore one bone of beaver (including cut-marks) was found and dated. Finally trench two yielded remains of the shell of at least two European pond turtles (*Emys orbicularis*). These may have been used, but no cut-marks were found. A  $^{14}\text{C}$  date yielded a Boreal age, but this probably was due to the reservoir effect. The site also yielded four fish remains of pike (*Esox lucius*) and perch (*Perca fluviatilis*) (Prummel *et al.* 2002; Prummel/Niekus 2002/2003).

During the 1981 campaign, six pieces of flint were found (five blades and one piece with traces of hammering). The flint is of northern origin. One blade showed traces of use, indicative of cutting of fresh meat or skin. During the 2002/2003 campaign 28 further flint artefacts were found. The total now amounts to ten chips, five flakes, three blades, eleven blade fragments, one possible core, three blocks and one flake with retouch. The scraper found adhering to the skull which initially led to the discovery of the site has been lost. The morphometric aspects of the blades (regular and small) point to a date in the Late Mesolithic. Most of the flint was found on the sandy peninsula and bordering streambed area (the three blocks were found at a distance of 45 m and might not be associated). No concentrations were found. The same campaign also yielded 2 natural stones, of which one was a quartzite sandstone with possible traces of hammering.

During the 1981 campaign twenty hazelnuts of which nine were still complete were found without further contextual information. Some of these may have been transported by water (Prummel *et al.* 2002; Prummel/Niekus 2002/2003). During the 2002/2003 campaign a wooden structure was discovered within the streambed sediments of trench two. It consisted of a Boreal trunk of pine in which three Late Mesolithic stakes were hammered. The construction may have been part of a fish trap (*cf.* Bottema-MacGillavry 2002/2003).

The site also yielded evidence for later activity, such as a stake dating to the SWB culture as well as stakes and three sherds dating to the Middle Bronze Age (Prummel/Niekus 2002/2003).

#### *Interpretation:*

Jardinga has been interpreted as a Late Mesolithic kill site of aurochs, largely preserved *in situ* (Prummel *et al.* 1999; Prummel/Niekus 2002/2003). Most evidence points in this direction (disarticulated skeletons of mainly aurochs as well as flint artefacts). There are however some remarks to be made. It is not known to what extent the site can be characterised as *in situ*. Some of the bones were clearly found in more or less articulated context, others might have been fluvially displaced. Especially the occurrence of flooding or inundations during the second Late Mesolithic phase of activity on the site (Prummel/Niekus 2002/2003, 36), indicates a less than stable environment. Furthermore it is not known with what intensity the site was used. In general two main phases of use may be discerned as well as at least 4 individual aurochs. Since the resolution of the  $^{14}\text{C}$  dates is not high enough and most of the bones are not articulated, there is no way of establishing how many aurochs were killed at a certain moment, or how many kill- and butchering events took place (although many lower limb bones can be traced to one individual, pers. comm. Prummel 2006).

Both of the aforementioned problems also relate to the function of the site. It is thus not known how many aurochs may be reconstructed from the bone assemblage. This, in combination with the fluvial action on the site, might have skewed the data on the parts that are missing and supposedly have been transported to a base camp. In this respect it is also remarkable that the most complete example, aurochs 1, is mainly represented by its lower legs, since these are regularly transported to base camps. Although especially aurochs are no mobile kill it is also strange that so much of the breaking, cutting and skinning of the bones should have taken place in that spot. Some of these activities may rather

Jardinga-Johannahoeve

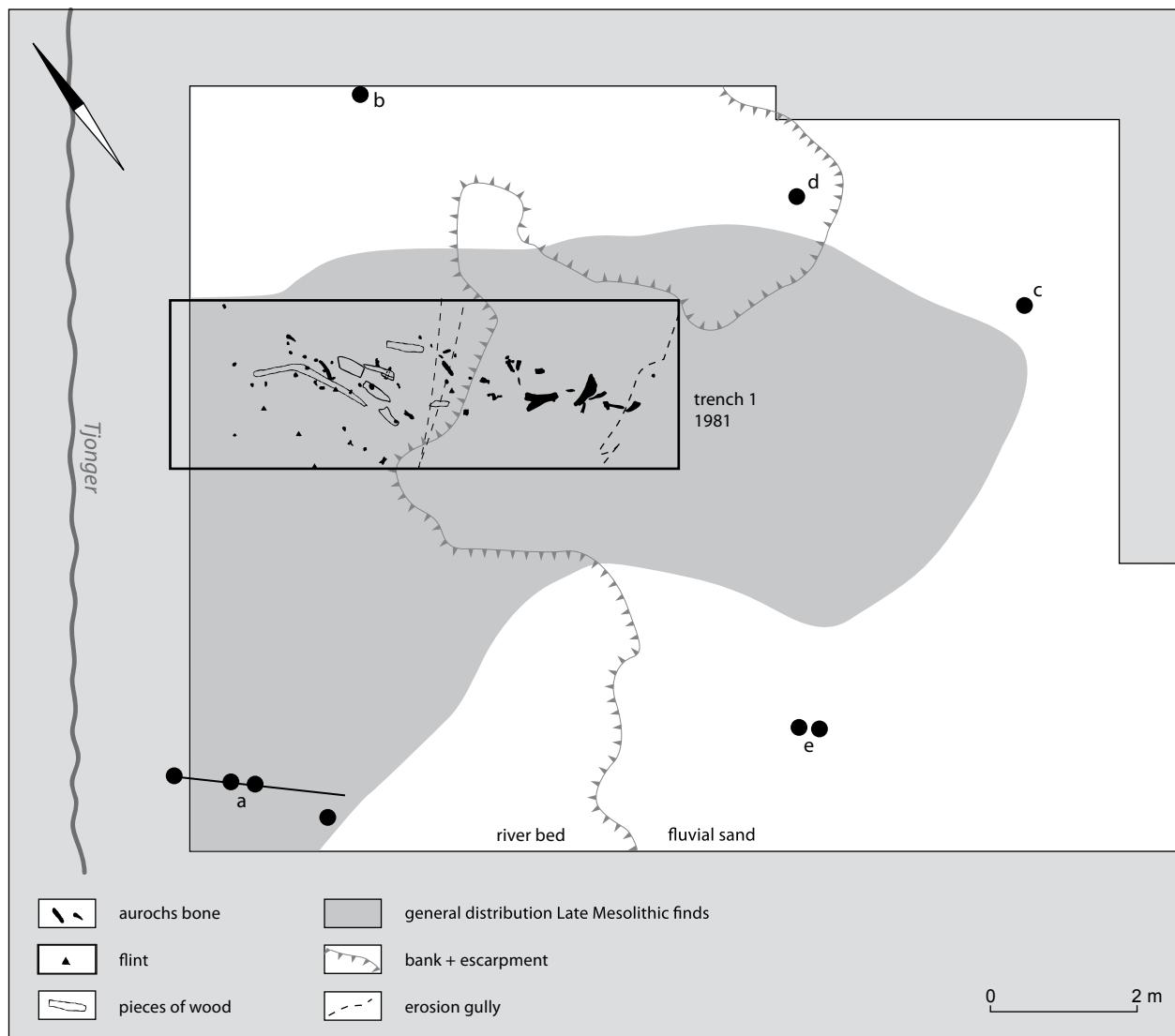


Fig. 39 Jardinga-Johannahoeve. Excavation plan of the original (1981) excavation and part of the later trenches (2002/2003) in relation to the geological situation (bank) and current Tjonger stream. Also depicted are several finds. a: four posts and pine trunk associated with potential Late Mesolithic fish trap, b: pointed post, Swifterbant period, c: Late Neolithic aurochs bone, d: Early Bronze Age Barbed Wire sherds, e: pointed posts Middle Bronze Age. Adapted from Prummel/Niekus 2002/2003, fig. 1 and Prummel et al. 2002, fig. 3.

befit a base camp. The option of base camp might even become more plausible in the light of the presence of the remains of other animals (red deer, beaver, pond turtle, fish), provided they were consumed, as well as a wooden structure that may be interpreted as a fish trap. Given that nothing is known about the southern and western extents of the excavation (*cf.* Prummel/Niekus 2002/2003), the site may have been less isolated than assumed. Since Jardinga is located near the Tjonger, on a sandy elevation, surfacing 45 m further south, it may also be interpreted as the working and/or dump area of a larger site, located further south. The current augering campaign however yielded no indications for this.

#### *References:*

Baak *et al.* 2002/2003  
Bottema 2002/2003  
Bottema-MacGillavry 2002/2003  
Lanting/Van der Plicht 1999/2000  
Niekus 2005/2006  
Prummel *et al.* 1999  
Prummel *et al.* 2002  
Prummel/Niekus 2002/2003

## **25. Kessel-Eik-Keuperheide**

#### *Location:*

The site is located on the present-day moorland between Helden and Kessel in Middle Limburg and situated on an elevated flat area with fine sand, locally interspersed by coversand dunes (Modderman 1974, 5).

#### *Site characteristics:*

The site was discovered and partially excavated in 1963 by amateur archaeologists, when they found flint artefacts in a firebreak. A total area of 6 x 4 m was excavated. This was followed by a campaign of the IPL in 1968 and 1969. An area of 78 m<sup>2</sup> was opened up as well as six smaller trenches (Modderman 1965; 1967; 1970; 1974; Modderman/Deckers 1984). Modderman and Deckers refer to a total excavated area of 674 m<sup>2</sup>. The site was excavated with trowel and shovel in 2 x 2 m squares.

#### *Geology/Pedology:*

The site was located in a flat elevated sandy area, poor in loam. Relief was formed by coversand dunes. Towards Kessel-Eik the subsoil becomes more humid, containing sandy and loamy sediments. The subsoil of the site may be classified as a podzol, although there is variation in soil development (Modderman/Deckers 1974, 32).

### *Taphonomy:*

It is not known to what extent the site has been disturbed. Remnants of a pit were visible in the 1968 campaign (Modderman 1968). This indicates erosion and weathering of the soil might have been limited. Furthermore the area has not been ploughed in historic times (Deckers/Modderman 1984, 29). No organic remains were preserved in the decalcined sand.

### *Ecology:*

The site was located in a relatively dry sandy area with some relief (currently of to 3 m). Diversification was provided by wetter parts in the direction of Kesseleyk, at a distance of only 85 m from the site (Deckers/Modderman 1974, 31). The wet conditions close to the site will have attracted wild animals. The site was located in the vicinity of the Meuse and tributary streams.

### *Dating:*

The pottery assemblage could be identified as Limburg ware and therefore points to contemporaneity with the LBK. Furthermore there is evidence of occupation during the Mesolithic, the Early, Middle and Late Neolithic and the Bronze Age. The sole  $^{14}\text{C}$  date available dated a pit (J 37) with charred remains of acorns dated this pit to the Bronze Age.

### *Features/Spatial layout:*

Apart from medieval defence structures and a Mesolithic hearth, only the remnants of one shallow pit (containing some sherds) could be discerned that was attributable to the Early Neolithic (located in the area excavated in 1963) (Modderman 1968). Furthermore several of the concentrations of charcoal (N=9) might point to Mesolithic hearths, or even hearthpits (since they were associated with Mesolithic artefacts). Furthermore a pit with a depth of 65 cm, comprising charcoal, possible cooking stones, quartz, flint as well as lumps of tempered clay was found. This pit may be associated with the Bronze Age occupation according to Modderman and Decker (1984, 32-33). Finally a pit with charred remains of acorns was discovered, yielding a  $^{14}\text{C}$  date of  $2980 \pm 35$  BP (GrN-6316).

### *Finds:*

The flint assemblage comprised 421 artefacts without clear spatial context from the 1963 campaign and approximately 200 artefacts from 1968/1969. Within the latter group eleven concentrations have been discerned. None of the concentrations (with a maximum of 80 artefacts per concentration) have been entirely excavated. One of the concentrations is clearly Mesolithic (I). Several others might date to the same period (VI, VII, IX, XI). Concentrations III, V and VIII are probably Middle or Late Neolithic. Several pieces of Lousberg flint as well as two other flakes might have been imported. The rest of the assemblage could have been made on locally available rolled flint. Typologically the assemblage (amongst others) consists of Mesolithic points (A, C, and a trapeze), Middle and Late Neolithic points (amongst which triangular points), flake and blade scrapers (including small round scrapers), retouched flakes and blades, blades with gloss (probably Late Neolithic in concentrations V, VII and VIII), several encoches and borers,

as well as axe-flakes. The array of tools indicates a presence in the Mesolithic, the Early, Middle- and Late Neolithic and the Early Bronze Age. The natural stone assemblage comprises several hammeringstones and grinding stones as well as shattered sandstone and quartz fragments, probably indicative of cooking stones. Fragments of white quartz may be interpreted as tempering material. Within the natural stone assemblage several concentrations could be identified.

Since the complete assemblage excavated in 1963 comprised both Mesolithic artefacts as well as more recent prehistoric remains, it is not unthinkable, the flint and the Limburg pottery may have been associated (cf. Modderman 1974, 5).

The pottery assemblage consists of approximately 40 Limburg sherds (12 were discovered in the 1968-1969 campaign), comprising several rim-fragments. Morphologically characteristic elements are formed by thick rims (flipped back, *Randverdickung*), absence of coil building, a light reddish brown colour with a black core, and a rather robust style. The pottery was partially tempered with organic (plant) remains, yet the porous texture might also indicate other organic temper (bone?) was lost due to post-depositional processes. Most of the sherds are decorated with 1-1.5 mm wide incised lines (short and long) as well as pinpricks. Several large sherds were decorated with a motif of V-shaped bands, filled with short oblique strokes, as well as horizontal zones in the same pattern. Another motif features triangles filled with pinpricks above V-shaped bands. According to Modderman the Limburg pottery stemmed from at least three different vessels. Particularly well known is a fragment of a bowl-shaped vessel with a diameter of 45 cm (Modderman 1974, 6). Apart from the Limburg assemblage, pottery has been found that could be dated to the MK (1274 g, including a rimsherd with *Tupfenleisten*, possibly associated with flint concentration XI), Hazendonk 3 group (120 g, several sherds probably belonging to 1 vessel), Late Neolithic AOO and other beakers (716 g) as well as the Bronze Age (2556 g). It is not unlikely that sherds from the Stein group might also have been present in the assemblage, although most lithic indications for this may also be attributable to the MK (cf. discussion Modderman/Deckers 1984, 52). Most of the pottery was found in concentrations.

#### *Interpretation:*

Kessel-Eik-Keuperheide clearly is a classic palimpsest of different occupations and activities comprising a long time-span of several millennia. The scarcity of features (apart from several Mesolithic hearths), structures and clearly associated finds prevents a more intensive functional analysis. It is probable the wetter conditions at a short distance from the slightly elevated location of the site, provided a welcome and durable reason for settlement. In time the character of occupation may have shifted from more temporal use of the area towards a more classic domestic function during the Bronze Age (potters clay, tempering agents). Most spectacular was the find of several dozens of sherds of Limburg pottery. This type is also found in LBK settlements approximately 50 km further south. The appearance of this type of pottery on the southern sandy uplands might be further indication for its unique function and/or association with a non-LBK group. It is not clear to what extent some artefacts within the rolled flint assemblage might be associated with this pottery.

## Kessel-Eik-Keuperheide

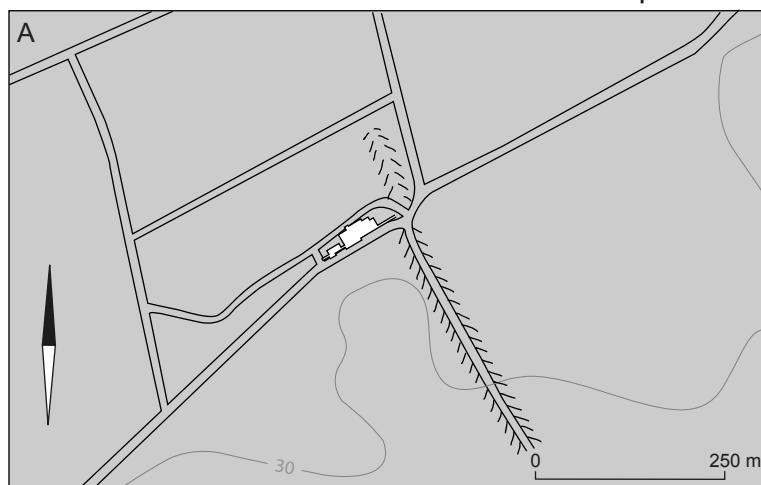
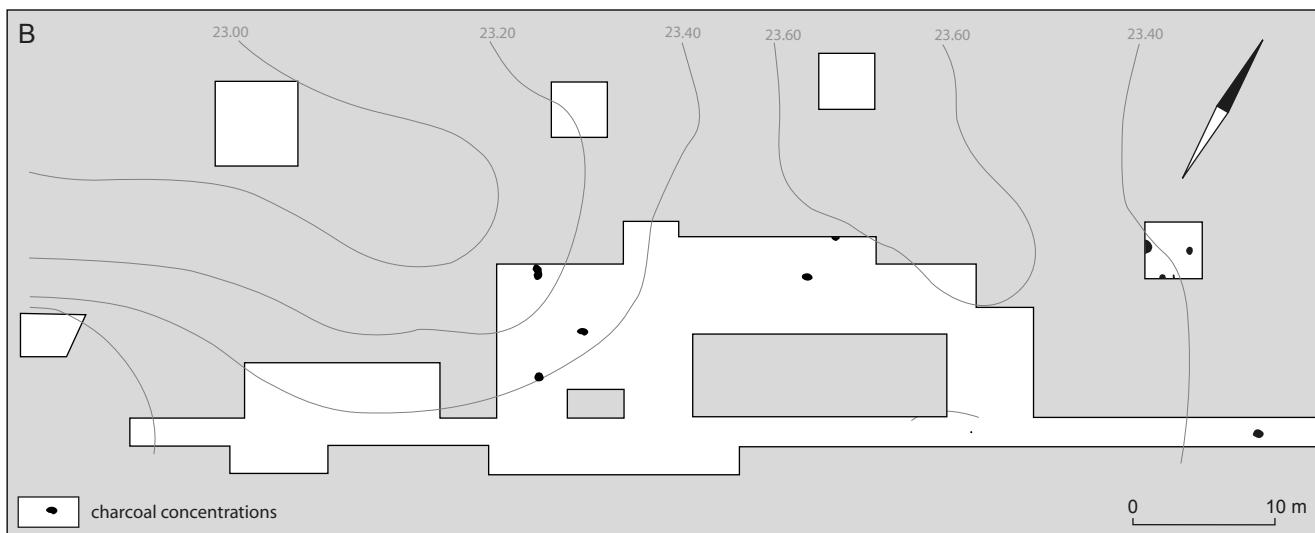


Fig. 40 Kessel-Eik-Keuperheide. (A) topographical situation and location of trenches I, II, III at location 27 and the trenches at location 24. Adapted from Modderman/Deckers 1984, fig. 2 and 3.



### References:

- Modderman 1965
- Modderman 1968
- Modderman 1970
- Modderman 1974
- Modderman/Deckers 1984

## 26. Koningsbosch

### Location:

Koningsbosch is located in the eastern part of central Limburg. The site is divided between two localities. Site 27 is located on the upper terrace bordering on a channel for surface water runoff. The channel had already come into existence

during the Boreal. Site 24 is located some 125 m further to the south along the same channel on top of a slight elevation (Van Haaren/Modderman 1973, 3). The entire location is situated on the upper part of a long slope.

#### *Site characteristics:*

The find of a polished flint axe in 1961 led to further investigation and eventually to an excavation of the site by the IPL in 1967. Some 240 m<sup>2</sup> was excavated at location 27 and 320 m<sup>2</sup> at location 24. Since location 24 was less informative than 27, the publication (Van Haaren/Modderman 1973) mainly focused on location 27. This site was excavated in three trenches of 4 x 20 m. Trench I and II were thus situated parallel to the extension of the ridge (NNW-SSE), trench III was located parallel to trench II at a distance of 40 m from trench I. All trenches were excavated in 1 x 1 m spits. Because of the lack of features and additional information, the finds from the excavation and the preliminary surveys were eventually treated as one complex (Van Haaren/Modderman 1973).

#### *Geology/Pedology:*

The site is located on the Pleistocene sandy soils, north of the loess extension in Limburg. The area shows considerable relief caused by the different Meuse terraces, the presence of channels and elevations in the coversand. No internal stratigraphy of the site could be established.

#### *Taphonomy:*

The site suffered from the stable surface of the coversand leading to a palimpsest of material, which for a large part was on or at the surface. This effect was stronger in location 24 compared to location 27. Apart from this hardly any features were visible. This may have been caused by erosion due to the slope of the location. Finally no organic remains were preserved in the acidic soil conditions.

#### *Ecology:*

The channel for surface water runoff, probably already came into existence during the Boreal. This was concluded from the analysis of a peat sample taken from the channelfill on the lower terrace. There is no specific ecological or palynological information available, but it is evident the site was located in a diverse environment focussing on the channel. There were likely also differences in vegetation and wildlife between the upper and the lower terrace, making for a rich diversity. Furthermore there was an extensive area with open water not far from Koningsbosch probably providing for a rich variety of waterfowl (cf. Van Haaren/Modderman 1973, 23).

#### *Dating:*

The material assemblage of the site yielded artefacts dating to the Mesolithic (probably the Middle and Late Mesolithic, the Early Neolithic, the Middle Neolithic and some artefacts dating to the Iron Age). Site 24 yielded artefacts from the Late Palaeolithic, the Mesolithic, the Early Bronze Age and the Iron Age (Van Haaren/Modderman 1973, 3). No <sup>14</sup>C data was available.

### *Features/Spatial layout:*

Except for vague disturbances no evident features or postholes were found, although conditions seemed ideal. This means features were very shallow and if present might have been lost due to erosion or slope-wash (Van Haaren/Modderman 1973, 4).

### *Finds:*

Apart from some Roman and Iron Age pottery, most sherds date to the Middle Neolithic (some could only be characterised as prehistoric). Some 13 thick-walled sherds with coarse quartz temper, a thick bottom and slightly everted rims can be classified within the Stein group (sherds probably belong to one vessel). In trench II some 40 sherds with smaller quartz temper and some chamotte-temper and smoothed outer walls were discovered. Rims are inverted and have small knobs (1.5 cm below rim) as well as small holes or lines. Van Haaren and Modderman (1973, 40-41) look for comparisons within the Vlaardingen and Wartberg group, yet opt for a *Mischcomplex*. Knobs and perforations are also known from Hazendonk 3 complexes (e.g. Raemaekers 1999). Smoothed surfaces, and a somewhat smaller grit temper might also be indicative of this complex, yet they too are common in Wartberg pottery. In the same trench a fragment of a collared flask (quartz and chamotte tempered) was found, which may be indicative of the SWV-complex. Some 37 less informative sherds may also be placed in the same time frame. Divergent is one sherd found after the excavation with a horizontally perforated lug reminiscent of MK pottery (*Ösenkranzflaschen*, MK II or III).

The lithic spectrum is quite substantial. The Mesolithic assemblage comprised 153 artefacts amongst which some 37 microliths (fragments and complete ones). The presence of Wommersom quartzite as well as morphological characteristics of the assemblage is indicative of a date in the Middle and Late Mesolithic. Other Mesolithic tools such as borers, burins, reamers etc. are also present. The Early Neolithic is represented by a LBK arrowhead as well as some 'mediolithic' tools in the scraper assemblage. Most of the flint however can be dated to the Middle Neolithic. This assemblage consists of 27 polished, mostly flint, axes as well as some 108 smaller fragments. Typologically *spitznackige* (N=3), *dünnnackige* (N=6) and *dünnblattige* (N=14) *Flint-Ovalbeile*, *Fels-Rechteckbeilen* (according to the classification by Brandt 1967) as well as axes out of Lousberg flint were found. Furthermore approximately 40 tools were made on fragments of polished axes (Van Haaren/Modderman 1973, 6-18).

The Middle Neolithic points consisted of four stemmed points, indicative for the SOM-culture and thus for the Stein group. Furthermore fourteen leaf-shaped points as well as five fragments and 41 transverse arrowheads (as well as ten less evident examples) were found, of which 34 were of Neolithic, more specifically SOM, affinity. Apart from blades, the tool assemblage yielded 48 borers and pointed artefacts either on long flakes or blades (Van Haaren/Modderman 1973, 23). Especially the pointed blades may be indicative for MK presence. Five blades showed distal retouch. The largest component in the assemblage is formed by a wide variety of scrapers (N=330) on flake or blade, most of which are of Middle Neolithic affinity (especially small circular scrapers). Finally 71 cores were found of both Mesolithic and Neolithic affinity. Other lithic material comprised of

quartz and sandstone hammeringstones (N=12), polishing stones (N=19), two grinding stones and several miscellaneous pieces (Van Haaren/Modderman 1973, 35-37).

*Interpretation:*

Koningsbosch is typical example of the nature of Neolithic sites in the coversand area. Lacking features it is a palimpsest of Middle- and Late Mesolithic, Early Neolithic and, several phases of Middle Neolithic occupation as can be witnessed in the flint and pottery assemblage. At the time Van Haaren and Modderman (1973, 48) defined a component of the Middle Neolithic complex as 'Middle Neolithic of Limburg'. Currently this assemblage would be part of the SWV-complex (cf. Louwe Kooijmans 1976), whereby the Stein group would be the most appropriate candidate for the finds from Koningsbosch. The absence of features and organic remains hinders a functional interpretation of the site. The Middle- and Late Mesolithic assemblage are dominated by a large number of points indicating hunting or curation of hunting equipment may have been important activities. The Middle Neolithic assemblage, apart from the less informative

Fig. 41 Koningsbosch.  
Topographical situation and  
location of trenches I, II, III at  
location 27 and the trenches  
at location 24. Adapted from  
Haaren/Modderman 1973, fig. 1.



MK-component, rather points to a domestic use. This is indicated not only by the pottery, but also by the many scrapers that were found. Unfortunately no information on degree of sedentism, seasonality of subsistence is available.

#### *References:*

- Brandt 1967
- Louwe Kooijmans 1976
- Raemaekers 1999
- Van Haaren/Modderman 1973

## **27. Leidschendam**

#### *Location:*

The Leidschendam settlement was located on a narrow sand ridge to the west of the Wateringen-Voorschoten sand ridge, northeast of The Hague. The site is located on the watershed between the Rhine and Meuse estuaries, although there would have been less influence of the Rhine compared to Voorschoten (Glasbergen *et al.* 1967, 98).

#### *Site characteristics:*

The site was excavated during a rescue campaign in 1963 and 1964. With interruptions, a total of five trenches were established. Trenches 1 and 2 both measured 3 x 10 m, trench 3 measured 14 x 18 m and trenches 4 and 5, 14 x 20 and 20 x 26 m respectively. Finds were collected in 1 x 1 m squares (Van Beek 1990; Glasbergen *et al.* 1967). Furthermore pollen and use-wear analysis took place (Van Gijn 1989; Groenman-van Waateringe *et al.* 1968). Recently (2005) Archol excavated an area of approximately 1354 m<sup>2</sup> north of the old trenches at the location of Leidschendam-Prinsenhof. The finds as well as a number of postholes indicated a limited extension of the site in this direction (Hamburg 2005).

#### *Geology/Pedology:*

The sand ridge was formed around 4800 cal BC (Van Gijn 1989, 133) and the further surroundings would have been under some influence of the Rhine. It was a period of coastal aggradation as the coastline shifted 2-3 km further west and the inland was protected by newly formed coastal barriers. The subsurface consists of old dune sand on top of a coastal barrier. The 20 cm thick dark grey occupation layer rested on top of this. After occupation the settlement was covered with a 15 cm thick layer of peat on top of which 15 cm of topsoil formed. Within the occupation layer no further stratigraphic distinction could be made. Most faunal remains were found in the wood peat of the eastern slope in the NE corner of trench 5.

#### *Taphonomy:*

The presence of distinguishable house plans on top of the dune argues in favour of limited taphonomic disturbance. On the other hand most of the faunal remains were retrieved from the eastern slope in trench 5. In reference to this aspect the excavation as a whole might have suffered from the location of the excavation

units. Especially since the occupation layer on top of the dune lacks internal stratification, this might have been found to some extent on certain parts of the slope. Furthermore the topsoil and occupation layer of trench 3 had already been removed mechanically, sparing only the level with features in that trench. Apart from this the excavation was plagued by bad weather sometimes preventing intensive documentation (Van Beek 1990, 33; Glasbergen 1967, 97-99).

#### *Ecology:*

The ecological situation is comparable to Voorschoten although less influence from the Rhine estuary is expected. The site must have been attractive because of the presence of grazing land available to the west of the ridge and in between the smaller and larger ridges. The beach flats with occasional lakes and alder brushwood formed natural grazing areas (Van Gijn 1989, 133). Palynological research indicated peat-growth started around 4000 cal BC. This started with a sedge (*Carex*) carr and alder (*Alnus*) carr and was followed by birch (*Betula*) carr higher up on the slopes. On top of the sand ridge there grew an oak (*Quercus*) and hazel (*Corylus*) vegetation, producing a lot of the pollen rain in the surroundings. Alder grew mainly on the slopes of the ridges. Saline vegetation such as Chenopodiaceae and Marine Plantain (*Plantago maritima*) are attributable to a short increase of salinity in the milieu (Groenman-van Waateringe *et al.* 1968, 109). Two occupation phases were discernible in profile L3 consisting of synchronous peaks in Cerealia and *Quercus*. The first of these phases was of limited impact. There was only a small increase in Chenopodiaceae and *Asteraceae tubuliflorae* alongside Cerealia and Urticeae (nettle family). It is concluded some agriculture took place as well as some animal husbandry, but probably not on the ridge itself. The second phase is more pronounced with peaks for *Plantago lanceolata* (Ribwort Plantain), *Rumex* (sorrel/dock), Asteraceae and Chenopodiaceae. This is indicative of cultivation and animal husbandry on a larger scale (Groenman-van Waateringe *et al.* 1968, 109). Contrary to Voorschoten there was no extensive cutting of the oak forest, although the general vegetation is disturbed as is witnessed by the local formation of alder carr.

Unfortunately profile L2 which was closer to the dune did not provide more information. It did however yield clear indications of human interference (*ibid.* 109). The above-mentioned phases are probably best correlated with a VL-1 occupation with some cultivation and a VL-2 occupation also bearing some PFB (SGC) elements (*ibid.* 120).

#### *Dating:*

Unfortunately all three <sup>14</sup>C samples yielded dates that were far too young, most probably due to humic contamination (Glasbergen *et al.* 1967, 115; Lanting/Van der Plicht 1999/2000, 71). On the basis of the pottery assemblage both VL1, but predominantly VL2 pottery is present. The latter assemblage also shows PFB (SGC)-elements. These might have been present after an interval or already at the beginning of VL2 (*cf.* Groenman-van Waateringe *et al.* 1968, 120).

### *Features and spatial layout:*

In trenches 3, 4 and 5 remains of house plans were found. In trench 4 a rectangular alignment of 16.75 x 4.75 m, oriented in SSW-NNE direction was found. The rectangular house plan with double posts seems to have been restored more than once. The plan largely overlapped with the extension of the finds in the trench. Whether the house had a gable construction (as in Vlaardingen) could not be established since the depth of the central posts could not be established. Trench 5 yielded a large (9 x 12 m) area covered by postholes (on average 30 cm below occupation level), some of which were oriented in SSW-NNE rows, one of which extended over a length of 9.25 m. No distinctive house plan was recovered. There may have been a succession of houses, probably even an eastern and a western one. Again definite gable posts could not be identified. Remarkably there was only a light spread of finds coinciding with the post structure. In trench 3 a vague constellation of postholes suggests a WSW-ENE oriented house plan. This would however differ from the orientation in trenches 4 and 5. Furthermore a small pit was located containing VL sherds, flint and other stones and another pit between trenches 1 and 2 contained the complete skeleton of a five month old pig (Glasbergen *et al.* 1967, 100; Groenman-van Waateringe *et al.* 1968, 114).

During the 2005 campaign a further 89 features were uncovered, including 75 postholes of *c.* 15 cm in diameter and 14 pits. The latter should most probably be interpreted as wells. The campaign also yielded a rectangular structure measuring 2.23 x 3.34 m, interpreted as a granary. Within the cluster of postholes some rows of three to four poles could further be identified without forming complete structures (Hamburg 2005, 14-19).

### *Finds:*

In total 1796 sherds were collected (as well as some fragments of wattle-work). Of these, 1691 were VL sherds and some 105 could be identified as PFB(SGC)-pottery. Most of the VL pottery is assigned to VL1-2, but on the basis of the grit content in the temper most pottery can be dated to VL2 (*cf.* Glasbergen *et al.* 1967; Lanting/Van der Plicht 1999/2000). It is however questionable to what extent the temper is useable as an appropriate measure to define between VL1 and 2 (*cf.* Raemaekers 2005<sup>a</sup>). Decoration is rare and mostly occurs on quartz-tempered sherds. The temper (mostly chamotte), and shapes of the additional pottery (*c.* 239 fragments) found during the 2005 campaign further confirm a date in Vlaardingen 2 is most likely (Hamburg 2005).

The flint assemblage is comprised of 1,773 pieces excluding splinters, and largely consists of flakes. It included 131 cores, 51 flakes from polished stone axes (11 of which were reworked into scrapers), 116 other scrapers, 6 borers, 4 blades and 7 transverse arrowheads. Remarkable is the contrast between the careless manufacture of the scrapers and transverse arrowheads, contrasting with a few well-worked objects such as some scrapers, blades and points. Furthermore there were a relatively large number of cores in trench 5 and a large number of flakes of polished axes (including scrapers) in trench 4. Compared to each other this may indicate that flint including axes was worked *in situ* in trench 4 and not in trench 5 on the slope of the ridge (Glasbergen *et al.* 1967, 110). The raw material mainly consisted of local flint in the form of rolled pebbles chipped with a bipolar technique (Van Gijn 1989, 134). Use-wear analysis (on artefacts from

trench 4) pointed to activities such as dry hide-working, (the main task), some wood- and bone-working (mainly in the northern part of trench 4) as well as two sickle-blades. Tools were used and curated intensively, indicating that the quantity of raw material available was restricted. The raw material further indicates some possible contacts to the north, but no orientation towards southern imported flint (Van 1989, 139). The other stone material (680 pieces) principally consists of pottery grit material as well as 8 pieces of shale and 100 flattish beach pebbles. Furthermore burnishers, querns and hammerstones were identified as well as a chip of a stone axe. Furthermore there were (roughouts of) jet beads (mainly in trench 5) as well as a small fragment of amber. A PFB-type axe was found outside of the trenches (Glasbergen *et al.* 1967, 111-112).

The 2005 campaign yielded several pieces of flint (including a core, 2 flakes and an axe flake), as well as two partially polished flint axes, both fabricated on southern flint (probably of Lousberg and Spiennes or Rijcholt type). This indicates that the inhabitants also had southern contacts to substantiate their limited local lithic production (Hamburg 2005, 25-29). The largest axe is of the Buren type common to the Stein-Vlaardingen complex. The smaller axe may belong to the SGC-culture. Both axes therefore indicate a date in Vlaardingen 2 is most likely.

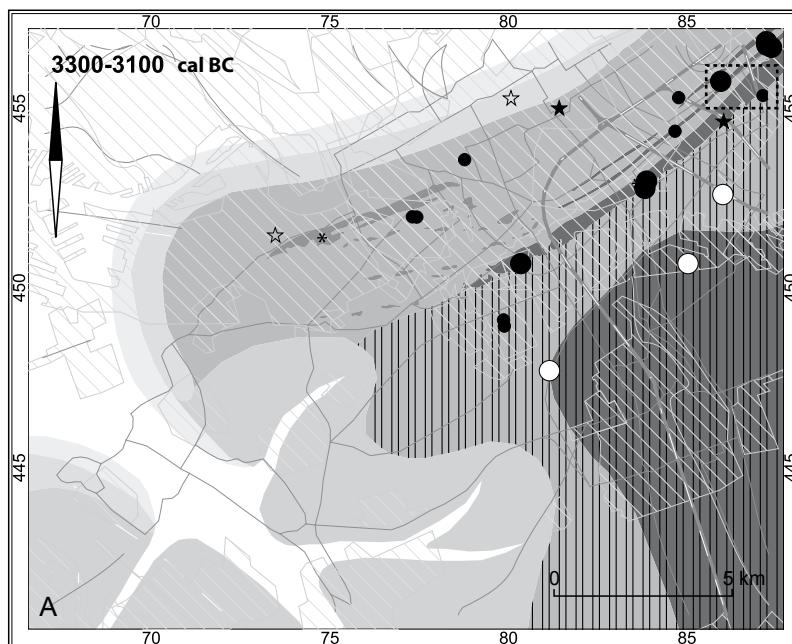
The faunal assemblage was mainly collected in the NE part of trench 5 and consists of 512 bone and teeth, 40 fragments of which were calcined, two fragments of bone plates of sturgeon (*Acipenser sturio*), three bone artefacts (a perforated rib and jaw and an awl) and some unidentifiable pieces. Two calcined thin-walled skull fragments collected in trenches 1 and 2 may be human. Hunted animals (N=54) nominally form 12 % of the assemblage and comprise red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), grey seal (*Halichoerus grypus*), beaver (*Castor fiber*) and pine marten (*Martes martes*). Domestic animals (N=409) comprise cattle (*Bos taurus*), pigs (*Sus domesticus*) and sheep or goat (*Ovis aries*/*Capra hircus*). Aurochs, wild pig and dog were not found, although some pig bones from young specimens may belong to wild animals (Groenman-van Waateringe 1968, 114). Domesticated cattle and pigs were clearly most important, followed by red deer and roe deer in the wild spectrum of the faunal assemblage. The 2005 campaign yielded 121 fragments of bone, including cattle, pig and sheep/goat (Hamburg 2005).

Macrobotanical and malacological remains comprise charcoal, mainly of alder, and shells of hazelnut (*Corylus avellana*).

#### *Interpretation:*

The settlement of Leidschendam was occupied during both (VL-1 and 2) phases of the VL group. The find concentration in trench 5 (faunal remains, VL1 pottery and a profuse number of cores and stones) is suggested to correlate with layers 2-5 in trench 17 at Voorschoten. The house, which may be comparable to the house of trench 15 in Vlaardingen, also is suggested to date to the early phase (Glasbergen *et al.* 1967, 112, contra Hogestijn/Drenth 2000/2001, 65). In contrast with the post construction in trench 4, this house-site may have been occupied only short due to the lack of many finds. VL-2 pottery (also termed devolved Vlaardingen) is mainly present in trenches 1, 2 and 4 and may correspond to layers 8 or 10-11 at Voorschoten (Glasbergen *et al.* 1967, 112). The presence of PFB(SGC)-elements indicated a partial attribution to VL-2a.

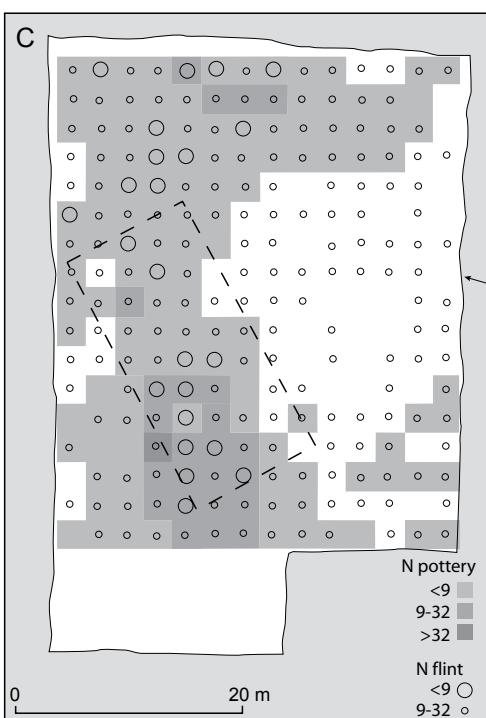
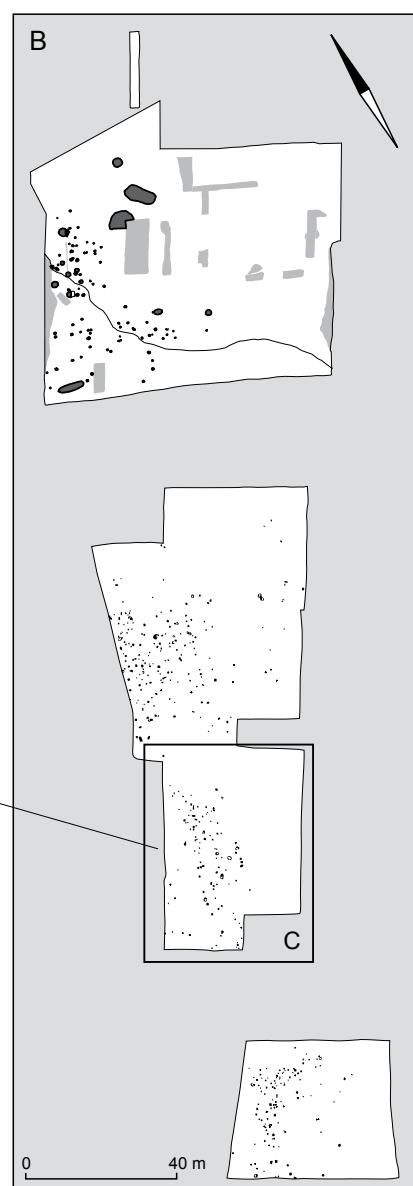
## Leidschendam



Legenda

water	● ○	settlement black: Vlaardingen culture white: Hazendonk group
beach	*	settlement finds
dune	●	activity area
salt marsh	★	flint artefact
wet grassland	☆	Buren-type axe
reed swamp	●	axe find
dune shrub		
alder carr		
deciduous woodland		
		Leidschendam

Fig. 42 Leidschendam. (A) palaeogeographical overview of the site location around 3300-3100 cal BC. (B) excavation plan depicting the feature distribution, including the 2005 Archol campaign. (C) density map of the distribution of pottery and flint around the southern structure. Adapted from Van Beek 1990, WP4, fig. 7 and 23; Hamburg 2005, fig. 5, 6, 9; Louwe Kooijmans 2009, fig. 2.



There are multiple phases of occupation discernible in the pollen diagram and as at Voorschoten the first peak indicates limited agriculture and husbandry, probably off the dune, followed by a more intensive phase. The location of Leidschendam was probably sought after for the ideal pastureland available in its surroundings. Furthermore both the woods on the sand ridge, as well as the beaches and creeks in the vicinity were used for hunting, gathering and fishing (Groenman-van Waateringe 1978, 116). Although sedentism cannot be attested, for example due to lack of seasonal indicators, the presence of (rebuilt) structures, domesticated cattle and indications for agriculture confirm the site must have been used during a large part of the year or year round. The agricultural and sedentary character of the site is further confirmed by evidence from the use-wear analysis and the possible granary found in 2005. Finally Van Beek (1990, 29-58) published an intensive intrasite study of trench 4. In this study there is some ambiguous evidence for a difference in activities within the house and outside, yet there is no absolute distinction.

#### *References:*

Van Beek 1990  
Van Gijn 1989  
Glasbergen *et al.* 1967  
Groenman-van Waateringe *et al.* 1968  
Hamburg 2005  
Hogestijn/Drenth 2000/2001  
Raemaekers 2005<sup>a</sup>

## **28. Liège-Place St.-Lambert (LPS)**

#### *Location:*

The site of LPS is located on the left bank of the Meuse in the alluvial plain. It is situated at the foot of the northern hillside where the Légia (a tributary river of the Meuse) passes the small Pierreuse river valley and splits into two separate branches. The site lies underneath the city centre of Liège (Van der Sloot *et al.* 2000; 2003).

#### *Site characteristics:*

The site LPS has been subject to several archaeological campaigns yielding evidence for prehistoric occupation during the Mesolithic, the Early, Middle and Late Neolithic and the Bronze Age (Van der Sloot, *et al.* 2003). Between 1977 and 1984 the first excavations took place focusing mainly on the LBK site (Otte 1984; 1988). Between 1990 and 1995 and 1999-2000 parts of several Late Mesolithic sites were excavated in rescue campaigns of the Archaeological service of the city of Liège and the bureau *In Situ* (Van der Sloot *et al.* 2003). In the 1990-1995 campaign some 10,000 m<sup>2</sup> were investigated leading to excavation in two sectors. In the northern zone some 200 m<sup>2</sup> were investigated comprising of the sondage S160 and the sector SDT. Some 50 m to the south the sector DDD (100 m<sup>2</sup>) was excavated yielding the remains of a stone platform and several structured hearths. The campaign of 1999-2000 was aimed at gaining better stratigraphic control through establishing a profile measuring 50 m (*Grande Coupe Nord*). In 2000 the

remains of possibly a Late Mesolithic butchering site were discovered in the north-western part of the Tivoli sector along an old arm of the Légia (*ibid.* Remacle *et al.* 2000). Some 30 m<sup>2</sup> were excavated here.

#### *Geology/Pedology:*

The geological situation at LPS is complex and comprises of several cycles of erosion, sedimentation, stabilisation and occasional development of soils throughout the Holocene. Different sequences were established for the northern and the southern zone (respectively cycle I-VIII and phase I-IX). In the northern zone the Mesolithic habitation is linked to cycle III, which consists of the geological units 3.1, 3.2 and 3.3. The Early Neolithic habitation dates predominantly to cycle IV (units 4.1 and 4.2). The sequence starts with the incision of a new channel of the Légia, which is subsequently sealed up by multiple layers of river loam (3.1, 3.2, 3.3). Layer 3.1 contains fragments of travertine and layer 3.3 is severely bioturbated, indicative of soil development in the Early Atlantic (Van der Sloot *et al.* 2003, 83). A new cycle (IV) starts with the incision of a new, smaller, channel of the Légia (unit 4.1), which is subsequently filled up by layers of gravel and sandy loam. This is indicative of an energetic environment relating to the small Pierreuse river valley. The cycle ends with the development of a humic horizon indicative of a phase of stabilisation. At the end of cycle VI a stabilisation sets in lasting over two millennia and dating to the Subboreal (*ibid.*). Evidence for Mesolithic and Early Neolithic occupation in the southern zone is found in the clayey deposits of phase VIIIB and the underlying deposit of phase VIC containing the stone floor.

#### *Taphonomy/Site-formation:*

The rather complex geological history of the site consisting of several cycles of erosion, deposition and stabilisation (*cf. supra*) has seriously affected its horizontal and vertical integrity (Van der Sloot *et al.* 2003, 88). Apart from the dynamic fluvial environment there is also evidence for bioturbation. Furthermore the location of the site underneath the city centre of Liège has led to intensive disturbance by later building and digging activities. On the other hand the specific conditions existing at the site have also partly led to good preservation. This is attested by some of the refitting sequences and the spatial integrity of some of the structured hearths and the platform (*ibid.*). The presence of travertine in the loamy deposits also led to the preservation of organic remains.

#### *Ecology:*

Since Boreal times the presence of the Meuse, the Légia and the Ourthe in the vicinity of the site has led to the development of open pastureland with marshy elements rich in grasses etc. (Asteraceae and Poaceae). The Boreal vegetation mainly consisted of hazel (*Corylus*), pine (*Pinus*) and beech (*Betula*). Elm (*Ulmus*), oak (*Quercus*) and lime (*Tilia*) were also present. Along the watercourses of the Meuse and the Légia dispersed instances of alder (*Alnus*) were present as well as an abundance of fern (*Filicales*). At the onset of the Atlantic species such as elm, oak, lime and ash (*Fraxinus*) increase. The surroundings of the site become more heavily forested. The presence of pollen and macroremains of cereals in LBK pits

on the site attest to the presence of fields, though probably very localised and small (Van der Sloot *et al.* 2003, 100). Pollen of Plantago and heather (*Plantago Lanceolata* and *Calluna vulgaris*) indicate open pastureland.

Geographically the Atlantic climax vegetation of lime, oak and elm is present on the plateau and the hillsides, whereas communities of ash, elm and oak form the transition towards concentrations of ash and willow (*Salix*) on the banks of the Meuse and its tributaries. Human impact on the environment may already be seen during the Mesolithic in the presence of *Plantago* as indicator for open spaces. The impact increased with local cultivation practiced by the LBK (Heim 1994; Van der Sloot *et al.* 2003)

#### *Dating:*

During the recent campaigns the site was both dated by  $^{14}\text{C}$  (AMS) and TL. The latter method however proved to be insecure because of environmental factors influencing the results (*ibid.* 93). Most dates have been established on organic material (mostly bone) from stratigraphically associated contexts. Two dates were discarded (OxA-8942 and OxA-8941). OxA-8942 dated the bone of a horse to the end of the Boreal, i.e. in a forested environment. On the other hand this might not have been an unnatural habitat because of the presence of pasture land (horse was also attested at Swifterbant and Hüde I). Because the date does not distinctly diverge from other dates in unit 3.3, it will not be used here. OxA-8941 is situated on a plateau of the calibration curve and cannot be used. In all 11  $^{14}\text{C}$  dates could be used to date the Mesolithic and Neolithic of LPS. These have been combined below with the dates available from LBK pits excavated in the 1970's and 80's (Gilot 1984), although these do not entirely correspond to the periodisation indicated by the decorated pottery (Amkreutz 2004). All Leuven dates (Lv) are conventional  $^{14}\text{C}$  dates and belong to this campaign. Dates Lv-1108, Lv-1211 and Lv-1307D have been rejected because of aberrant dates and/or association.

Two distinct phases of Late Mesolithic occupation at LPS can be distinguished. The first phase (Mésolithique récent) is represented by three dates dating to the first half of the 7<sup>th</sup> millennium. Two stem from sector DDD, where the stone floor was uncovered and 1 from sector SDT. The second Mesolithic occupation dates to the 3<sup>rd</sup> quarter of the 6<sup>th</sup> millennium and is represented by two dates from sector SDT and one from Tivoli. Van der Sloot *et al.* (2003, 95) argue this second occupation can be distinguished from the LBK occupation. One LBK date (Lv-1340) from the 1977-1984 campaign however also seems to fall into this range. The other LBK dates might indicate two separate occupations but the presence of calibration-plateau obscures this aspect. The LBK pottery mainly dates to a presence in the late LBK culture. The last two dates point to Neolithic activity in the second half of the 5<sup>th</sup> millennium. Unfortunately the  $^{14}\text{C}$  dates do not necessarily entirely correspond with the typological attribution of the Mesolithic assemblages, since the latter suffer to some extent from admixture.

#### *Features and spatial layout:*

During the 1977-1984 campaign part of an LBK settlement was excavated in the eastern zone of the Place St.-Lambert yielding some 12 features. The site was located next to a fossil channel of the Légia (Otte 1984, 85). The later campaigns yielded features probably relating to both Mesolithic occupations. In total 6

Atmospheric data from Stuiver et al. (1998); OxCal v3.9 Bronk Ramsey (2003); cub r4 sd12 prob usg[chron]

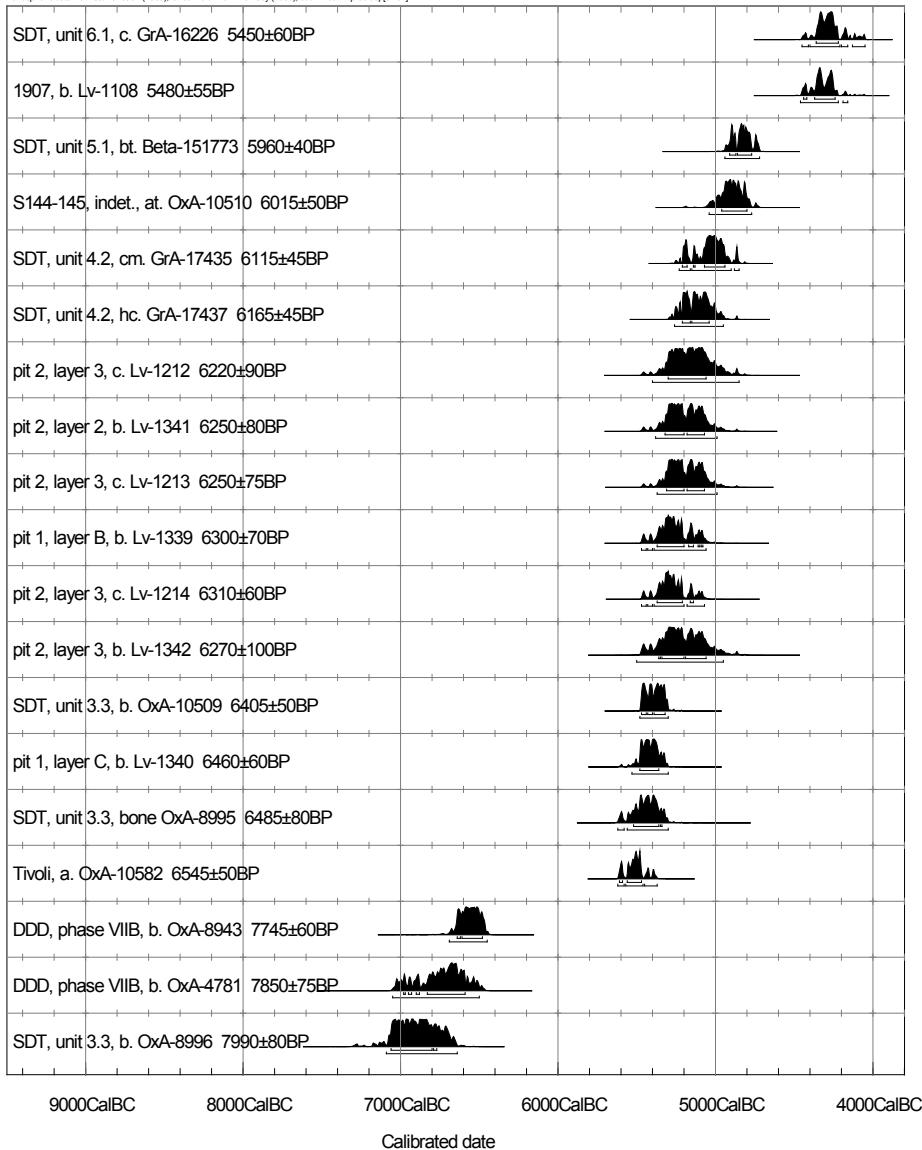


Fig. 43 Radiocarbon dates for Liège-Place St.-Lambert.

anthropogenic structures were found in the form of stone pavements made up of blocks of sandstones and river gravel. Five structures (L287, L288, L289, L290, 09-0263) were found in sector SDT, one (L500) in sector DDD. Three categories can be defined. The first category (L287, L290, 09-0263) consists of dispersed concentrations of stones bearing traces of fire and measuring approximately 1 x 0.70 m. They might be naturally or anthropogenically displaced hearths. The second category (L288, L289) of structures has the same dimensions but lacks traces of fire. This category consists of two layers of sandstone and is well structured. Their interpretation is not clear. The last category is represented by L500 in sector DDD (Gustin *et al.* 1994). This structure measures about 4 m<sup>2</sup> and consists of river gravels. It is located next to an old channel of the Légia. The interpretation of this stone floor/pavement is not clear. There are some traces of fire, but the dimensions rather indicate a function as drainage for a tent or hut (Van der Sloot *et al.* 2003, 97). Dating the structures is problematic especially since the

TL dates proved to be unreliable. Most evidence points to a Mesolithic date of the first two categories of structures. L500 seems to be related to the first Mesolithic occupation (Van der Sloot *et al.* 2003, 97-98). In 1999-2000 a Mesolithic activity zone was discovered in the eastern section 'Tivoli'. It consists of both faunal and lithic material deposited next to a meander of the Légia (Remacle *et al.* 2000). This was probably a Late Mesolithic butchering site.

#### *Finds:*

The oldest Mesolithic finds are 350 unpatinated pieces found in unit 3.2 and probably of a Boreal age. The first of the two Late Mesolithic phases (unit 3.3) (*cf. supra*) is represented by an industry affiliated with the Rhine-Meuse-Scheldt group (Gob 1985). The later Late Mesolithic industry also comprises of trapezes and LBK-like points. Parts of these concentrations are *in situ* (Van der Sloot *et al.* 2003, 87-88). Unfortunately the bulk of the Mesolithic material in the northern (SDT/S160) sector (N = 10542), cannot be securely related to one of both Late Mesolithic occupations (Van der Sloot, *in prep.* 159). In the southern zone the artefacts (N = 1222) seem to be related to the older of both Late Mesolithic occupations. All campaigns also yielded lithic artefacts and pottery of the LBK culture. Apart from that sherds of La Hoguette pottery were found in unit 3.3 (SDT). It is not clear whether these are associated with the Late Mesolithic material. Furthermore some bone-tempered sherds were found of unidentified origin (unit 5.1) as well as pottery dating to the Middle Neolithic (*ibid.* 2003, 88-90). Due to the presence of travertine in the subsoil many organic remains dating to both the Late Mesolithic and LBK occupation were found (López Bayón 1994, Otte 1984). For the latter phase these indicated an unusual high amount of hunting and gathering (Otte 1984). For the Mesolithic occupation some data regarding hunting strategies, and environment were gathered as well as some seasonal information. Evidence from both sector SDT and DDD indicated a focus on wild boar (*Sus scrofa*) and deer (López Bayón 1994, 132).

#### *Interpretation:*

The site of LPS is one of the most important sites with respect to specific riverine adaptation, in both Late Mesolithic and Early Neolithic times. There is a wealth of data, including organic remains, with the ability to shed new light on subsistence and settlement location choices for both periods. The presence of pottery sherds of La Hoguette makes this an even more interesting site. The Late Mesolithic structures, both the hearths and stone pavements attest to a more substantial occupation of the site. For the northern zone (SDT, S16) there is evidence for an intensive episode of flint debitage. The southern zone can be interpreted as a base camp (Léotard 1995; Van der Sloot *in prep.*). Unfortunately the distance between the zones (SDT, DDD and Tivoli) that were investigated as well as the unreliable TL-dates, the complex geology and the layer of urban disturbance seriously hamper our understanding, especially on the interrelatedness. Nevertheless all three localities (SDT/S160, DDD and Tivoli) yield a considerable amount of data attributable to either the very start as well as the developed part of the Late Mesolithic (Mésolithique recent, Mésolithique final).

## Liège-Place St.-Lambert

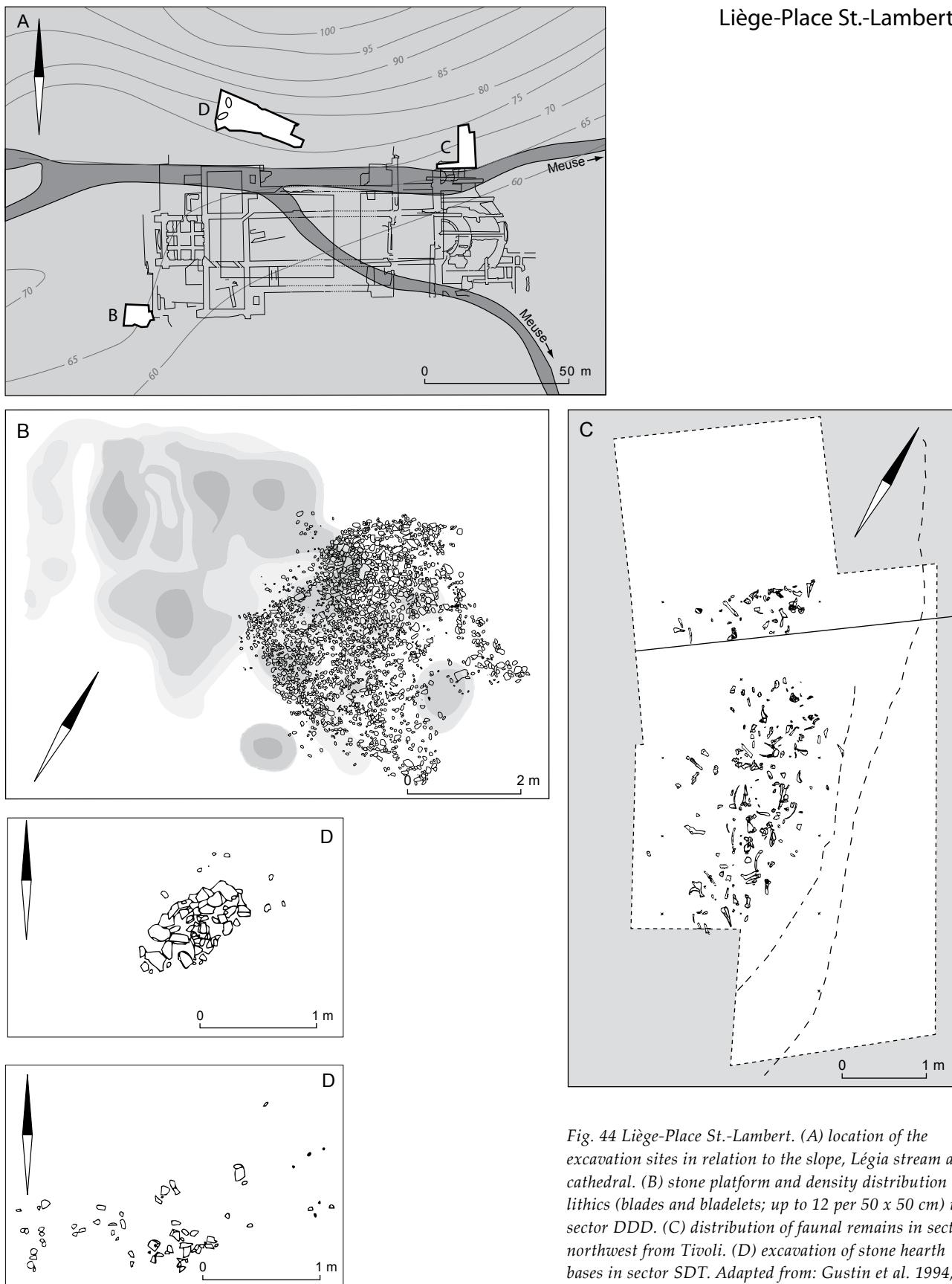


Fig. 44 Liège-Place St.-Lambert. (A) location of the excavation sites in relation to the slope, Légia stream and cathedral. (B) stone platform and density distribution of lithics (blades and bladelets; up to 12 per 50 x 50 cm) in sector DDD. (C) distribution of faunal remains in sector northwest from Tivoli. (D) excavation of stone hearth bases in sector SDT. Adapted from: Gustin et al. 1994, fig. 2; Léotard et al. 1995, fig. 3; Van der Sloot in prep. Fig. 21; Van der Sloot et al. 2000, fig. 1, 3; 2003, fig. 1; Remacle et al. 2000, fig. 3.

### *References:*

Gilot 1984  
Gob 1985  
Gustin *et al.* 1994  
Heim 1994  
Léotard *et al.* 1995  
López Bayón 1994  
Otte 1984  
Otte 1988  
Remacle *et al.* 2000  
Van der Sloot *et al.* 2000  
Van der Sloot *et al.* 2003  
Van der Sloot in prep.

## **29. Linden-De Geest**

### *Location:*

Linden-De Geest was located on the southern slope of a small Late Glacial river dune south of the settlement of Linden in the eastern part of the Dutch central river district. The dune was originally of parabolic shape and its current top is 11.3 m above Dutch ordnance level. The northern slope of the dune was eroded due to the former activity of a complex of residual Meuse channels surrounding the location (Verhart 2000, 172, 187).

### *Site characteristics:*

The site, which was threatened by dredging activities, was excavated in 1991. The investigations were part of the stepped procedure characteristic of the 'Maasdalproject' (Verhart 2000; Verhart/Wansleeben 1990) yielding information on different scales (*i.e.* the direct surroundings of the site were surveyed and subsequently an augering campaign took place. After this the most promising concentrations were partly excavated by test pits. Eventually 'site 9' was selected for excavation, mainly because this location was not severely disturbed. The area surrounding the site was augered in a 10 m grid. Some 3600 m<sup>2</sup> was investigated by augering yielding a concentration (mainly of flint 20 x 20 m) in the high western area. The topsoil was removed mechanically and a 96 x 4 m trench was dug in order to find the eastern (non-disturbed) extent of the excavation. Subsequently an area of 1150 m<sup>2</sup> was investigated by 25 x 25 cm test pits to a depth of 30 cm. The soil was sieved. The areas with the greatest find densities (some 450 m<sup>2</sup>) were excavated manually (by shovel). These levels were documented and photographed and features were sectioned. Following this a second level was excavated. In total 2200 m<sup>2</sup> were excavated for features (Verhart 2000, 187-189).

### *Geology/Pedology:*

The site is located in a river dune landscape north of the coversand. Infilled channels of the Meuse and backlands form the lower parts (Verhart 2000, 175). Information on the local geological situation was provided by a soil profile (30 m wide and 85 cm deep). The base of the profile is formed by yellow loamy

ferriferous sand. On top of this was some 25 cm of brownish yellow sand. Both layers increase in clastic level to the north. On top of this level lies sand with increased clay content. The sand was initially deposited by wind and constitutes the original top of the river dune. On the top and sides of the dune is a layer of fluvially deposited clay (up to 30 cm). The top of the dune might have been slightly eroded. Most of the finds were located in the upper brownish sand layer (some finds were in the ploughzone, or in the lower yellow sand layer) (Verhart 2000, 190).

#### *Taphonomy:*

Although disturbance by subsequent occupation was limited, certain parts of the site were less informative. The western part of the site was lost due to sand quarrying (Verhart 2000, 187). The northern slope of the dune was eroded due to the former activity of Meuse channels. Part of the top of the dune might also have been slightly eroded. Furthermore there was bioturbation and no preservation of organic material due to the acidity of the soil. Some of the Middle Neolithic sherds showed traces of weathering (Verhart 2000, 192), indicating the site may have been exposed to the elements for a substantial time span.

#### *Ecology:*

No specific ecological data could be retrieved. Information from the direct surroundings of the site point to a landscape of dunes and low-lying areas (infilled channels and backlands of the Meuse). From pollen diagrams within the same region it may be inferred that the higher grounds of the area were heavily forested during the Neolithic. Oak (*Quercus*), elm (*Ulmus*) and lime (*Tilia*) would have grown there with hazel (*Corylus*) and ash (*Fraxinus*) in the open parts. The low lying areas were populated with an open mixed deciduous riverine forest, consisting of ash, elm, oak and hazel. In the wetter parts alder carr existed consisting of alder (*Alnus*) and willow (*Salix*) and fern (*Dryopteris*). There may also have been a more open reed-sedge vegetation. This diverse terrain would have accommodated a lot of wild fauna and provided ample opportunities for fishing, fowling, hunting and collecting. The flatter river dunes may have been used for agriculture. Although indications of Middle Neolithic agriculture were present in pollen diagrams several kilometres away, this is no convincing evidence. Cattle might have been important too. The increase of *Plantago lanceolata* might have been related to this (Verhart 2000, 175-178).

#### *Dating:*

No organic material was available for  $^{14}\text{C}$  dating. On the basis of the pottery and flint an occupation in the Middle Neolithic A and the Middle Neolithic B is suggested (Verhart 2000, 195). The Middle Neolithic A occupation might be of Northwest MK origin, with pottery resembling the Hazendonk-2 assemblage. A date during the Hazendonk-3 phase is also possible. The Middle Neolithic B occupation is related to the WSV complex. Furthermore there is evidence of some Late Bronze to Iron Age activity.

### *Features/Spatial layout:*

In total 57 features were discovered, of which 16 were of prehistoric origin. Most of the features could be identified as vague pits or postholes containing but few finds. Only one pit (testpit 1990-trace 5) yielded a Middle Neolithic sherd. The features seem not interconnected but mainly cluster in the north-eastern part of the excavation (Verhart 2000, 190-191). The flint is evenly distributed with a slight concentration in the south and some discontinuous clustering in the western part of the shovelled area. Most of the burnt flint is present in the southern crescent-shaped cluster. Contrasting with most other evenly distributed categories, Rijckholt-type flint is found mainly in the western part of the southern concentration. Both find groups reveal a rather empty zone north of the main flint distribution. When the area was shovelled there appeared to be small clusters within the southern crescent-shaped concentration. The crescent-shape also is visible in the pattern of the pottery (Verhart 2000, 196). Apparently the empty zone north of that coincides with the highest parts of the dune, which may indicate erosion. Since the clusters coincided with dark patches visible in the levels, which are interpreted as natural depressions, they are of a natural instead of anthropogenic origin (*ibid.*).

### *Finds:*

Only 101 Middle Neolithic sherds were recovered, few of which display culturally significant features. All sherds were undecorated, coil-built (H- and N) and tempered with quartz, chamotte and sand. The exterior of the sherds mostly has a smooth finish. Bowls and plates with outward bending rims were recognized as well as some which were clearly carinated. (The latter are similar to the assemblage found in the Hazendonk-2 layer on the Hazendonk). Some thick sherds with coarse quartz tempering indicate there may be a WSV element in the assemblage (Verhart 2000, 191-192).

Flint comprised 917 artefacts of either Middle- or Late Neolithic date. Unfortunately a clear cultural attribution could often only be achieved for the points. Raw material consists of imported Rijckholt-type flint and Lightgrey Belgian (Hesbaye) as well as locally procured terrace flint. Old and broken axes served as cores (5 flakes with polish), but the general absence of cores (N=3) and debitage produce indicates flint processing hardly occurred in the excavated area (Verhart 2000, 192). The spectrum of 24 tools consisted of points (N=8), scrapers (N=9), retouched flakes and blades (N=7). Waste comprised 882 pieces and eleven artefacts showed traces of use. The leaf-shaped points with semi-surface retouch indicate a cultural affiliation with Northwest MK and Hazendonk-3 complexes, the transverse points with the WSV complex. Furthermore the central part of a grinding stone was found (Verhart 2000, 192-195).

### *Interpretation:*

Due to the low number of finds and features, the site is interpreted as an area of off-site specialized activities, not comparable to Grave, Gassel or the Kraaijenberg where evidence points more towards settlement activities. The presence of arrowheads indicates hunting must have been part of these activities. A presumed settlement may have been located nearby in the area of Hoge Renning (Verhart 2000, 198).

## Linden-De Geest

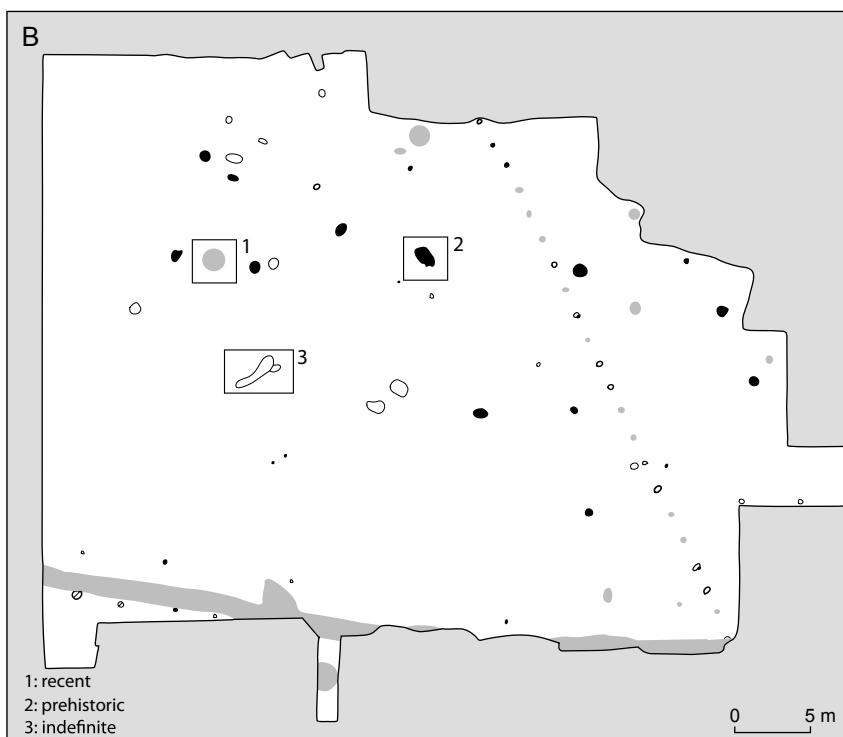
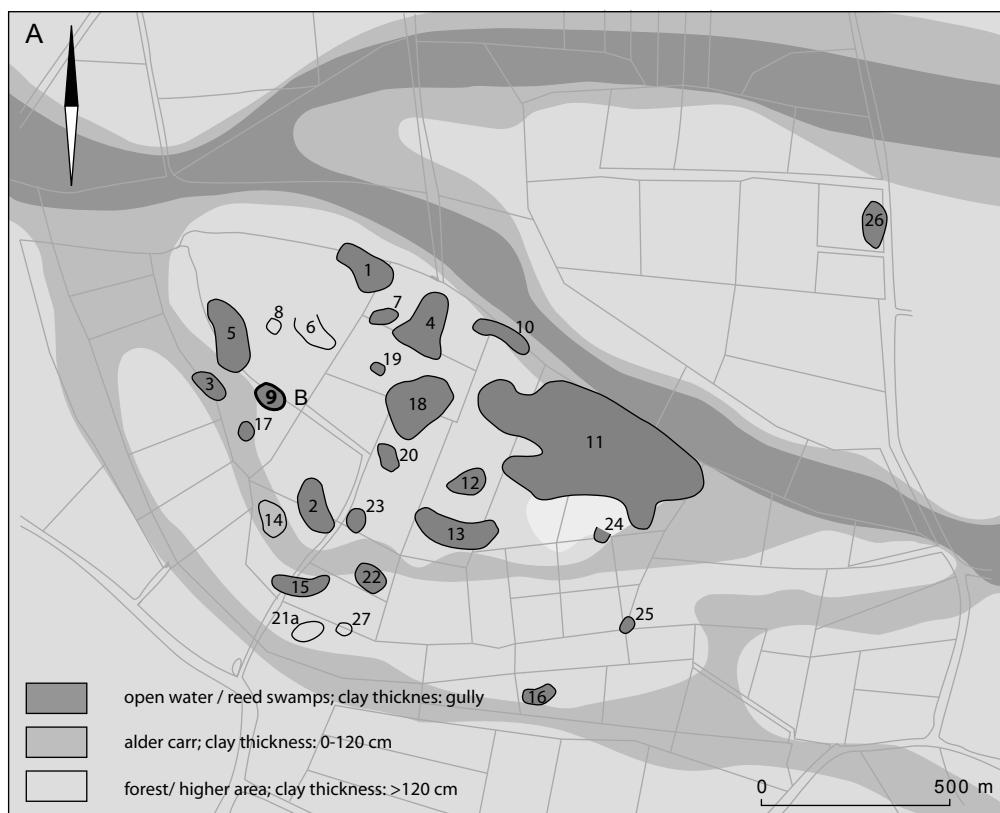


Fig. 45 Linden-De Geest. (A) simplified geomorphological and vegetation reconstruction of the Linden micro-region during the Neolithic, including distribution of stone-age sites (darker shading). (B) excavation plan of site 9 with feature distribution. Adapted from Verhart 2000, fig. 3.30, 3.31, 3.35, 3.36 and 3.41.

This is a valid interpretation yet it is hampered by the fact that much of the area had already been disturbed by sand dredging activities or erosion. Since only a limited part of the surface of the dune could be excavated, the area may also be interpreted as peripheral to the central location. The evidence of imported as well as locally collected flint, comprising not only of points but also scrapers and cores of axes, in combination with the finds of pottery, points to a more substantial use of the location. A domestic interpretation should not be ignored, especially since the area classically finds itself on an ecotone, comparable with Gassel or the Kraaienberg.

*References:*

Verhart 2000  
Verhart/Wansleeben 1990

## 30. Linden-Kraaienberg

*Location:*

The site was located on the western tip of a low sand dune northwest of the village of Linden (eastern part of the Dutch central river district). The dune is within the broad former bed of a Late Glacial river system. The Meuse flowed close by (Louwe Kooijmans/Verhart 1990, 53).

*Site characteristics:*

The site was discovered in 1977 in a sand-mining location. The initial location, 25 m west of the subsequent excavation, was destroyed shortly after. In a strip of some 100 x 400 m east of the excavation other locations with finds were documented previously. After a test excavation of 5 x 8 m, yielding finds and features, a more substantial excavation took place. In total 825 m<sup>2</sup> were excavated in 9 trenches 4 m wide and of variable length, divided in 2 x 2 m squares (trench nine was located separately to the east). The topsoil was removed mechanically and the find layer was excavated by shovel. In total two separate levels were documented. Some fills of pits and depressions were sieved (Louwe Kooijmans/Verhart 1990, 53).

*Geology/Pedology:*

On top of the bioturbated dune two layers could be identified, occasionally separated by a thin layer of yellow sand, possibly of a secondary aeolic cover of the dune. The lower layer (38-45 cm) consists of sand, is of a more orange colour and less clastic compared to the brown and more clastic upper layer (10-38 cm). Middle Neolithic finds seem to be limited to the lower layer, while the upper layer contains Iron Age material. The clastic element may be related to flooding of the Meuse before or after the Iron Age occupation. The profile might be classified as a podzol (Louwe Kooijmans/Verhart 1990).

*Taphonomy:*

In general the site suffered heavily from the sand extraction and disturbing effects of the heavy vehicles. This led to a rather intact central area measuring some 350 m<sup>2</sup>, surrounded by a partially disturbed zone (especially with respect to the

distribution of finds) of some 425 m<sup>2</sup>. Finally the extremities of the excavation are completely disturbed and comprise some 100 m<sup>2</sup> (Louwe Kooijmans/Verhart 1990, 54-55). Apart from this the lower levels of the dune are moderately to heavily bioturbated and due to the acidic soil conditions no organic material was preserved. Small and shallow features also were most likely destroyed.

#### *Ecology:*

No specific ecological research was undertaken. The sieved samples hardly yielded any results. The location of the site however is rather identical to the location of Het Vormer to the northwest. This indicates that it was situated in an ecotone at the boundary of the sandy uplands and the central river district. A variety of terrestrial and aquatic sources must have been present. Since the sand dune of the Kraaienberg is even more substantial than the one of Het Vormer, agriculture may certainly have been possible.

#### *Dating:*

The Kraaienberg yielded evidence for occupation during the Middle Neolithic, more specific during the Hazendonk 3 phase of that period (*cf.* Raemaekers 1999, 156-157), or slightly earlier, partly contemporaneous with the Hazendonk 2 occupation at the Hazendonk (*cf.* Louwe Kooijmans 2006<sup>b</sup>). Furthermore pottery and features dating to the subsequent Stein group, as well as the Bell Beaker period and the Iron Age were documented. Only two samples on charcoal concentrations were analysed for radiocarbon dating. GrN-9900 was sampled in the Middle Neolithic cluster, in feature 24 (it is not clear whether this feature was anthropogenic) but yielded a date that was too young. GrN-9901 was sampled at the edge of the Middle Neolithic cluster and most probably dates to around 4000 cal BC. This is slightly earlier than the usual 3800 cal BC usually advocated for the start of the Hazendonk-3 group (*cf.* Raemaekers 1999; Louwe Kooijmans 2006<sup>b</sup>; see also Louwe Kooijmans 2009), yet in the light of the absence of typical Hazendonk-3 pottery on the Kraaienberg (Louwe Kooijmans 2006<sup>b</sup>) an earlier date is possible. Due to the presence of MK-elements, Lanting and Van der Plicht suggest a *terminus post quem* of 3925 cal BC (1999/2000, 28). This falls within the range of GrN-9901.

#### *Features/Spatial layout:*

The central and undisturbed area comprised many features. Small features comprise U-shaped postholes (N=41), (usually Ø 25-40 cm and a mean depth of 12 cm), possible postholes (N=13) of rather shallow depth and some 75 other features of possible anthropogenic origin. Some clustering takes place in the central area

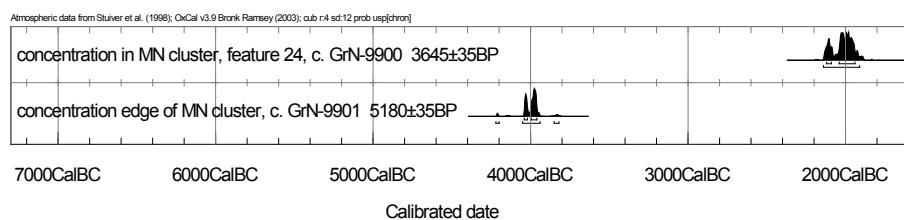


Fig. 46 Radiocarbon dates for Linden-Kraaienberg.

and the SE-corner of the excavation. No evident structures could be discerned apart from some linear alignments. The diameter of some postholes however indicates substantial structures must have been present (Louwe Kooijmans/Verhart 56-58). Large features comprise four black pits ( $\varnothing$  60-90 cm, 15-50 cm in depth) of oval and round shape. Three of these may be associated with the Middle Neolithic cluster. Apart from this eight to nine small dark brown pits ( $\varnothing$  45-110 cm, 0-42 cm in depth) were documented. These are more dispersed across the terrain. Furthermore some 35 soil discolourations of variable extent have been documented. These probably have a natural origin (Louwe Kooijmans/Verhart 1990, 58-59). Next to the features there is a clear concentration of Middle Neolithic (Kraaienberg 1) sherds in squares J/O-24/29, measuring some 10 x 12-22 m, as well as a smaller concentration of some 4 x 8 m. These are embedded within a larger area with artefacts of some 600 m<sup>2</sup> (Louwe Kooijmans/Verhart 1990, 106). The flint assemblage largely overlaps with the ceramic assemblage clustering in the main concentration and the concentration outside of the excavation. Somewhat to the north of the Middle Neolithic cluster (squares R/S-27) a substantial discolouration turned out to be the bottom of a NW-SE oriented pit belonging to the Stein group. What was left of the pit measured 190 x 290 x 20 cm. Most of the sherds were found at the base of this pit (Louwe Kooijmans/Verhart 1990, 60-61).

#### *Finds:*

Only the artefacts belonging to the Middle Neolithic (Kraaienberg 1) occupation and the Stein group (Kraaienberg 2) will be discussed here. Kraaienberg 2 comprises 60 (refitted) sherds (6000 g). Temper consists of coarse broken quartz, some chamotte and some sand. There is some polishing of the 8-13 mm thick walls of these strong S-shaped pots with flat bottoms and rounded rims. There is no decoration on the sherds. The clusters of sherds could be refitted to several complete and incomplete pots. They seem to have been deposited in different parts within the pit. Furthermore one sherd of a Protruding Foot Beaker (PFB) was found in situ within the Stein assemblage. The Kraaienberg 1 assemblage (19,731 g) consists of small fragments and some 825 sherds above 5 g. A large part (60%) of the assemblage was collected outside of the excavation in a concentration discovered earlier. The pottery was analysed as one assemblage. Most of the pottery is thin walled, hard and with a smooth surface. Quartz, chamotte and especially sand have been used as tempering agent and the pottery is coil built with H-, N- and Z-joins. Some 16% of the sherds has a roughened surface, decoration with lines or impressions is however absent. In all 70% of the sherds can be classified as coarse ware, some with a smeared surface, however brushmarks and cannelures, known from the Hazendonk assemblage are absent (Louwe Kooijmans/Verhart 1990, 70-75). Morphologically the Kraaienberg 1 assemblage and the assemblage of Het Vormer (Louwe Kooijmans 1980) are similar with respect to carinated profiles, pinprick lines, round and flat bottoms and bent rims. Differences relate to the presence of *Tüpfenleisten* and more pointed bottoms and especially the virtual absence of decoration at the Kraaienberg (Louwe Kooijmans/Verhart 1990, 79).

The flint assemblage (N=382) comprises artefacts from the Middle Neolithic, Hazendonk and Stein assemblages (N= 380, 4090 g) as well as a Bell Beaker culture component, apart from two possibly older patinated blades. The origin of half of the flint could be determined. Some 41.3% originated from local

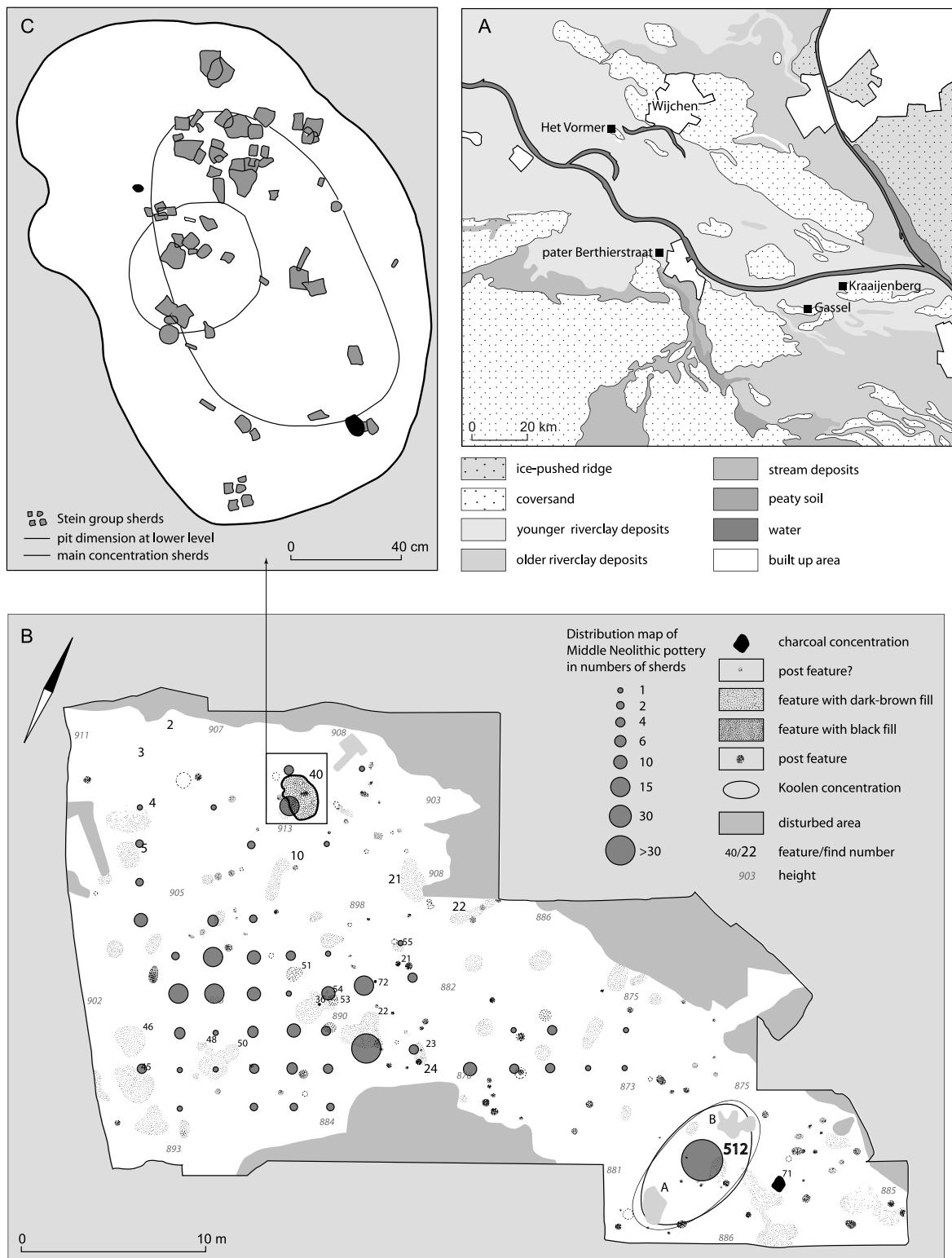
gravel deposits of the Meuse, 11.6% of the assemblage came from a primary or eluvial context and must have been imported. This element mainly consists of Rijckholt-type flint, apart from pieces of Rullen, Lightgrey Belgian, Valkenburg and Orsbach-type flint. The import component is emblematically present in a flint depot (square M-28), consisting of 3 complete Rijckholt blades that could be refitted. Some 36% of the assemblage was burnt. Soft percussion, the absence of debitage produce and a predominance of tools are characteristics of the import component. Tools comprise mainly retouched flakes and blades (N=24), scrapers (N=16), a burin (N=1), reamers (N=2), three triangular and 1 leaf-shaped point with surface retouch, as well as a small polished point-butted axe of Rijckholt flint with oval cross-section (Louwe Kooijmans/Verhart 1990, 96-97). Furthermore 731 (21062 g) pieces of natural stone were collected, predominantly quartz and quartzite, amongst these were grinding- polishing and hammering stones.

#### *Interpretation:*

The Kraaienberg is of substantial importance for understanding the Middle Neolithic occupation of the area during the phase contemporaneous with, or slightly anterior to the Hazendonk group, as well as for the subsequent phase of the Stein group. With respect to the former specific classical Hazendonk-3 pottery is lacking (Louwe Kooijmans 2006<sup>b</sup>; see also Louwe Kooijmans 2009). This has previously led Louwe Kooijmans and Verhart (1990, 104-106) to suggest a cultural affiliation with pottery assemblages of the Hazendonk 2 phase and the specific northwestern variant of the MK (see also Lanting/Van der Plicht 1999/2000, 27-28). Recently however a reassessment of the pottery assemblage of the Hazendonk 2 layer (Raemaekers 1999, 68-70; Verhart/Louwe Kooijmans 1989, note 27) indicates less heterogeneity within the assemblage. According to Raemaekers (1999, 68-70) Hazendonk 2 should now be envisaged as belonging to the SWB culture with MK style imports. Raemaekers therefore attributes the Kraaienberg 1 group to the subsequent Hazendonk-3 phase, stressing the similarities with this group (1999, 156-157). Louwe Kooijmans however stresses the differences between the Kraaienberg and Hazendonk 3 assemblages but currently is prepared to settle for an intermediate position of the Kraaienberg, slightly anterior to the classical Hazendonk-3 phase (Louwe Kooijmans 2006<sup>b</sup>). This would also be more in accordance with the available <sup>14</sup>C date (*cf. supra*). Since the pottery characteristics (see Raemaekers 1999, table 4.6) of the Kraaienberg clearly diverge from the other Hazendonk 3 assemblages, it is believed here that a trouble-free attribution to the Hazendonk-3 group is impossible. Apart from this however the site is clearly comparable to other nearby Hazendonk-3 complexes, for example with respect to the flint assemblage. It is therefore advocated here the Kraaienberg and other sites in the same spatiochronological timeframe should rather be envisaged as sitting on the interface of their SWB origin and nearby exterior MK influence. In this respect the level of contact and interaction will provide for a variety of options sometimes leaning more towards a local continuity, culminating in the Hazendonk-3 group, at other times more mirroring classic MK material culture. With respect to the overall artefact assemblage it may be concluded the Kraaienberg can be interpreted as a non-specified domestic site of limited extent (*cf. Louwe Kooijmans/Verhart 1990, 104*).

*Fig. 47 Linden-Kraaienberg.*  
(A) geological map with location of the sites in the eastern riverine area. (B) excavation plan with features and pottery distribution. (C) detail of pit 40 and concentration of sherds.  
Adapted from Louwe Kooijmans/Verhart 1990, fig. 10, 16 and 24. Area map based on Louwe Kooijmans/Verhart 1990, fig. 2 and references.

## Linden-Kraaijenberg



With respect to the subsequent Stein group, the Kraaienberg forms one of the few documented sites. The specific context of the pit, with elements of several rather complete pots, has been interpreted here as a ritual pit (Louwe Kooijmans/Verhart 1990, 70). Evidence for other options (waste pit, storage pit, trap, burial pit) was largely lacking. Another option however might be a pottery-depot. Since it is unknown to what extent the Kraaienberg was permanently inhabited during the Stein-phase, it is not unlikely that, in the light of some annual mobility, the pit may have served as a depot for the rather bulky and heavy vessels belonging to that specific period.

#### *References:*

Lanting/Van der Plicht 1999/2000  
Louwe Kooijmans 2006<sup>b</sup>  
Louwe Kooijmans 2009  
Louwe Kooijmans/Verhart 1990  
Raemaekers 1999  
Verhart/Louwe Kooijmans 1989

### **31. Lommel-Molse Nete**

#### *Location:*

The site is located on the northern hillside of the E-W oriented Molse Nete brook valley in the Belgian Campine area. This is a classical choice of location for Late Mesolithic habitation (dry valley side and open water) (Van Gils/De Bie 2003, 67; see also Van Gils/De Bie 2006<sup>a</sup>).

#### *Site characteristics:*

The site was investigated because of the construction of a gas pipeline through the valley. Previous investigations, survey and augering campaigns as well as the nearby sites of Lommel Vosvijvers indicated the high potential of the area. In 2003 the IAP and the University of Leuven investigated the site by means of augering (N=188) and a small test excavation (85 m<sup>2</sup>) by means of shovelling and sieving (6 mm). The site appears to be a small part of an extended Late Mesolithic site complex, covering possibly the entire northern valley side (2 km) (*ibid.* 68).

#### *Geology/Pedology:*

The edge of the valley consists of sandy soil. In some parts a podzol soil was present, in others the ploughzone rested upon the C-horizon. The valley slope consists of moderately wet sand (Zdg) and the valley floor consists of loamy wet sand (Sep). The top of the valley side is formed by recent dune soils (X) (*ibid.* 67).

#### *Taphonomy/Site formation:*

The site seems intact for a large part. The northern extent of the area has however suffered from the lack of a podzol soil. This was probably induced by a recent displacement of dune sand.

#### *Ecology:*

No information.

#### *Dating:*

No  $^{14}\text{C}$  dates were extracted, yet the artefacts (trapezes and microblades) clearly indicate a Late Mesolithic date (*ibid.* 68).

#### *Features/Spatial layout:*

The excavated part of the site ( $85 \text{ m}^2$ ) consists of three concentrations. The northernmost concentration is the most pronounced (one square ( $1 \text{ m}^2$ ) yielded 406 finds. The two concentrations to the south are less dense (*ibid.*). The site is part of a much larger site-complex covering the northern valley slope.

#### *Finds:*

The excavation yielded 4505 artefacts. The augering campaign yielded 120 artefacts. On the basis of typology the site can be dated to the Late Mesolithic (*ibid.*).

#### *Interpretation:*

The intrasite analysis of the 2003 excavation is still in progress, but Lommel-Molse Nete may be interpreted as a rather clean and undisturbed Late Mesolithic site. What is especially intriguing is the fact that the site is part of an enormous complex of Late Mesolithic sites, covering the northern valley slope of the Molse Nete over a distance of up to 2 km. This is emblematic for the context in which many other Late Mesolithic sites should be perceived.

#### *References:*

Van Gils/De Bie 2003

Van Gils/De Bie 2006<sup>a</sup>

## **32. Lommel-Vosvijvers 3**

#### *Location:*

The site is located just beyond the top of a SW-NE oriented dune at a distance of 60 m of the Molse Nete brook.

#### *Site characteristics:*

Years of survey activity in the vicinity led to the discovery of a concentration of Mesolithic artefacts in 1982. The site was excavated by Leuven University. Sieving took place.

#### *Geology/Pedology:*

The dune has a typical podzol profile. Most artefacts were situated in a small zone of about 20 cm in the centre of the eluvial horizon (Geerts 1984, 62, 63). Both the Ap and the illuvial soil horizon only yielded a few artefacts.

### *Taphonomy:*

Earlier digging activities, for example to construct drainage ditch, led to soil-disturbances. The horizontal distribution of artefacts however indicates this did not disturb the site to a large extent. The disturbances stopped in the illuvial horizon and did not yield many finds. Ploughing disturbed the top of the eluvial horizon.

### *Ecology:*

No ecological data were retrieved.

### *Dating:*

Two  $^{14}\text{C}$  dates were obtained on charcoal from hearths in concentration I and III. The results however deviated from what was expected. GrN-11865 yielded a date of  $3390 \pm 70$  BP and GrN-11866  $3170 \pm 35$  BP. Both dates date the site to the Middle Bronze Age, yet no Bronze Age remains were found. Therefore it is concluded both dates should be rejected. Deviant  $^{14}\text{C}$  dates are all but uncommon on the sandy uplands (e.g. Arts 1994; Gillespie *et al.* 1985; Verhart 2000).

### *Features/Spatial layout:*

The excavation yielded three concentrations located at a close distance from each other. All three were centred on a hearth. Concentrations II and III were ovaloid measuring respectively  $3 \times 1,5$  m and  $4 \times 1,5$  m (Geerts 1984, 62).

### *Finds:*

No quantitative data on the finds is published. In total 2142 artefacts were found, artefacts recovered by sieving from the plough soil are not included in this count (pers. comm. F. Geerts, December 2005). Both flint artefacts (N=1968, 91.87%) as well as Wommersom quartzite (N=174, 8.12%), sandstone and quartzite fragments were found. Some 15% of the artefacts is burnt mounting to 30% for the quartzite and sandstone fragments which also show a slight clustering around the hearth of concentration III. Wommersom-artefacts indicate a Montbani style of debitage and only few cores were found. Few tools belonging to a 'domestic' toolkit were found. Concentration one contained different groups of microliths, including points with unretouched base, yet excluding trapezes. Almost all microburins were found in concentration I. Concentrations II and III yielded some points with unretouched base, yet mostly trapezes (*ibid.* 62-63).

### *Interpretation:*

Due to the deviant  $^{14}\text{C}$  dates it is currently unknown whether the differences between concentration I and concentrations II and III are chronological or functional. The overall abundance of points and the small size of the concentrations however indicates a use as short-term hunting camps (*cf.* Geerts 1984, 64).

### *References:*

Geerts 1984

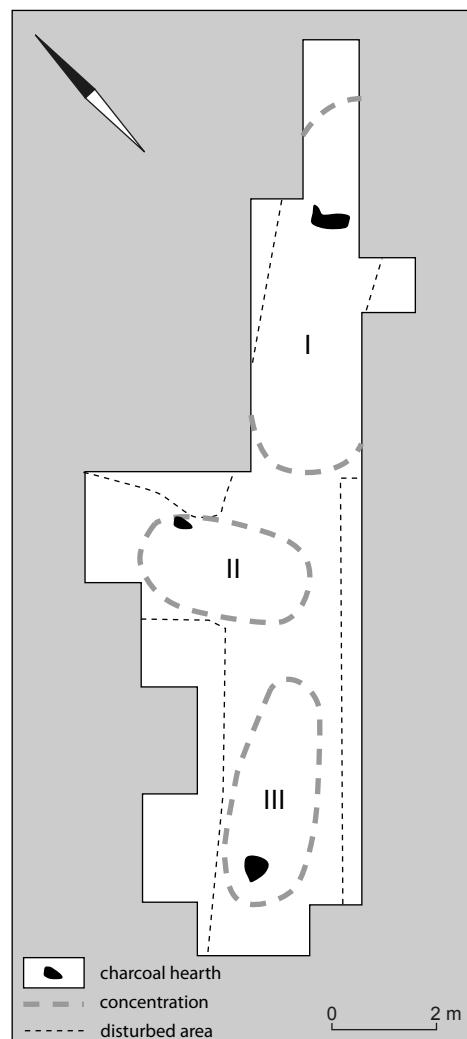


Fig. 48 Lommel-Vosvijvers.  
Excavation plan with charcoal  
hearths and location of  
concentrations (I-III). Adapted  
from Geerts 1984, fig. 1.

### 33. Mariënberg

#### *Location:*

The site Mariënberg was located on a high coversand ridge (1000 x 50-100 m) next to the valley of the Overijsselse Vecht in the east of the Netherlands (Overijssel). A 4 m high rise separated the site from a meander of the Vecht in the valley (although it could not be attested whether this channel was active in the Mesolithic).

#### *Site characteristics:*

The site was discovered around 1950 through surveying activity, which yielded thousands of artefacts. In 1975 the thin Medieval soil (es) was levelled and between 1975 and 1983 excavation (amongst others by the R.O.B.) took place in seven locations. This yielded remains from the Mesolithic, six graves from the SGC and three small urnfields dating to the Late Bronze Age. The central site 'de Schaapskooi'

deserved most attention since it yielded six possible Mesolithic burial pits. Their interpretation is, however, disputed. The Mesolithic site is approximately 350 x 30-50m and excavated over seven different locations, although this did not cover the entire site. The excavations of the Mesolithic sites comprised approximately 4500 m<sup>2</sup> and 800 m<sup>2</sup> was surveyed. The excavations of the most important part the Schaapskooi comprised 2110 m<sup>2</sup> and the other locations were located at approximately 50-300 m from the Schaapskooi area (Verlinde/Newell 2006, 84). Some soil was sieved, 41 <sup>14</sup>C samples were obtained for the Schaapskooi site and charcoal samples were examined systematically (Peeters/Niekus 2005; Verlinde 1979; Verlinde/Newell 2005, 3; Verlinde/Newell 2006).

#### *Geology/Pedology:*

The site is located on a Pleistocene coversand ridge. During the Middle Ages an anthropogenic soil (es) formed on top of it. The original Mesolithic surface was lost. It was located some 25 cm above the first shovelled level and became incorporated within the Medieval soil (Peeters/Niekus 2005, 215; Verlinde/Newell 2005, 6). During the Holocene a moderpodzol developed, changing into a bleached podzol after the Late Neolithic and before the Late Bronze Age.

#### *Taphonomy:*

The site as a whole is disturbed since there was no immediate cover after occupation, leading to a palimpsest situation with respect to the finds outside the features. Furthermore the original Mesolithic surface was lost, preserving only the features that were dug to a considerable depth. In the acidic soils no organic material was preserved. Finally bioturbation may have disturbed the internal stratigraphy of the hearthpits (Verlinde/Newell 2005, 7), although no treefalls were documented (Verlinde/Newell 2006, 134).

#### *Ecology:*

The site was located in a rich environment. The location on top of the coversand ridge provided a good vantage point over the surrounding area. The proximity of the valley of the Vecht, borded by many of the afore-mentioned coversand ridges, provided for the necessary diversity and substantial natural resources. The analyses of the charcoal in the hearth pits yielded interesting results. Almost all local species of wood were used with the exception of lime (*Tilia*). Beech (*Betula*) was found only once. Most of the charcoal consisted either of pine (*Pinus*) or oak (*Quercus*), followed by alder (*Alnus*). Noteworthy is the fact that most charcoal samples with pine were found in the light coloured hearthpits, whereas most samples with oak came from the dark hearthpits. Analysis of the <sup>14</sup>C dates of several hearthpits only containing pine charcoal indicated they dated to the first 700 years of occupation, indicative of Boreal occupation, whereas hearthpits only containing oak dated to the last 300 years, indicative of mid-Atlantic. This division most likely corresponds to the Holocene development of the Dutch forests. Around 7000 cal BC vegetation changes from a pine-dominated forest to a mixed-oak forest.

*Dating:*

In total 41  $^{14}\text{C}$  dates were obtained out of 38 of the 292 hearthpits of Mariënberg-Schaapskooi, thus including three double dates on different species of wood. Apart from these three dates originated from the other locations (Verlinde/Newell 2005; Verlinde/Newell 2006). The dates indicated the Mesolithic occupation of Mariënberg lasted approximately 2500 years. Below the afore-mentioned 41  $^{14}\text{C}$  dates derived from the locality of 'de Schaapskooi' and the three dates from 'Lange Akker' are depicted. Verlinde and Newell (2005, 5) argue the dates are separated by three substantial hiatuses, indicating a total of four (IV-I) occupation phases (table combined from Verlinde/Newell 2006, table 3).

phase	Date BP	s.d.	$^{14}\text{C}$ years	N features	charcoal
I	6510-6110	123.212	400	20	Pinus/Quercus
II	7360-7080	91.969	280	7	Pinus/Quercus
III	8030-7670	107.172	360	8	Pinus/Quercus
IV	8620-8510	46.428	110	3	Pinus

Table 7 Occupation phases identified at Mariënberg.

On statistical grounds they were able to further attest another eight short hiatuses, enabling them to define twelve chronologically and spatially separate occupation phases. These phases might however be statistical constructs.

The supposed sitting graves were dated indirectly with surrounding hearthpits. According to Verlinde and Newell (2005) a total of nine dates from surrounding hearthpits dated the graves. These dates fell within the last 300 years of the Mesolithic occupation of the site. This would correspond with the last three subphases of occupation. Since none of these hearthpits cut into another hearthpit or supposed it is suggested these are roughly contemporaneous.

Verlinde and Newell (2005) opt that because of the central position of the 'graves' within the cluster of hearthpits, in combination with the somewhat tentative assumption the graves were purposely located in an area which would not be trampled, they might be younger than the youngest hearthpit, indicating a date around 5000 cal BC (*cf.* Verlinde 2005).

Another important feature is the discovery that hearthpits with only charcoal from *Quercus* are generally younger than mixed assemblages or pits with charcoal from *Pinus* (see Verlinde/Newell 2006, 99-101). This may be related to the development of a deciduous Atlantic forest.

The abbreviations within the figure stand for the following categories: bl. = black, li. = light, A = alder, Ac = maple (*Acer*), C = hazel (*Corylus*), F = ash (*Fraxinus*), L = honeysuckle (*Lonicera*), P = pine, Pom = hawthorn-type (*Pomoideae*), Pop = poplar (*Populus*), Q = oak, S = rowan/whitebeam (*Sorbus*), Sa = willow (*Salix*), U = elm (*Ulmus*), V = Guelder rose (*Viburnum opulus*).

Louwe Kooijmans (2012, 406-409) argues against the supposed dating of the burial features by Newell and Verlinde (2006) and in favour of a dating in phase 4 or in the hiatus between phase 3 and 4, around *c.* 6000 cal BC. This is based on the appearance of *Pinus* charcoal in the surrounding pits and the absence of *Quercus* charcoal, which in relation to the spatial information and the available dates, suggests a position of these pits at an abandoned extractive location, instead of amidst hearth pits in active use (see Louwe Kooijmans 2012, 408-409).

Atmospheric data from Stuiver et al. (1998); OxCal v3.9 Bronk Ramsey (2003); cub r:4 sd:12 prob usp[chron]

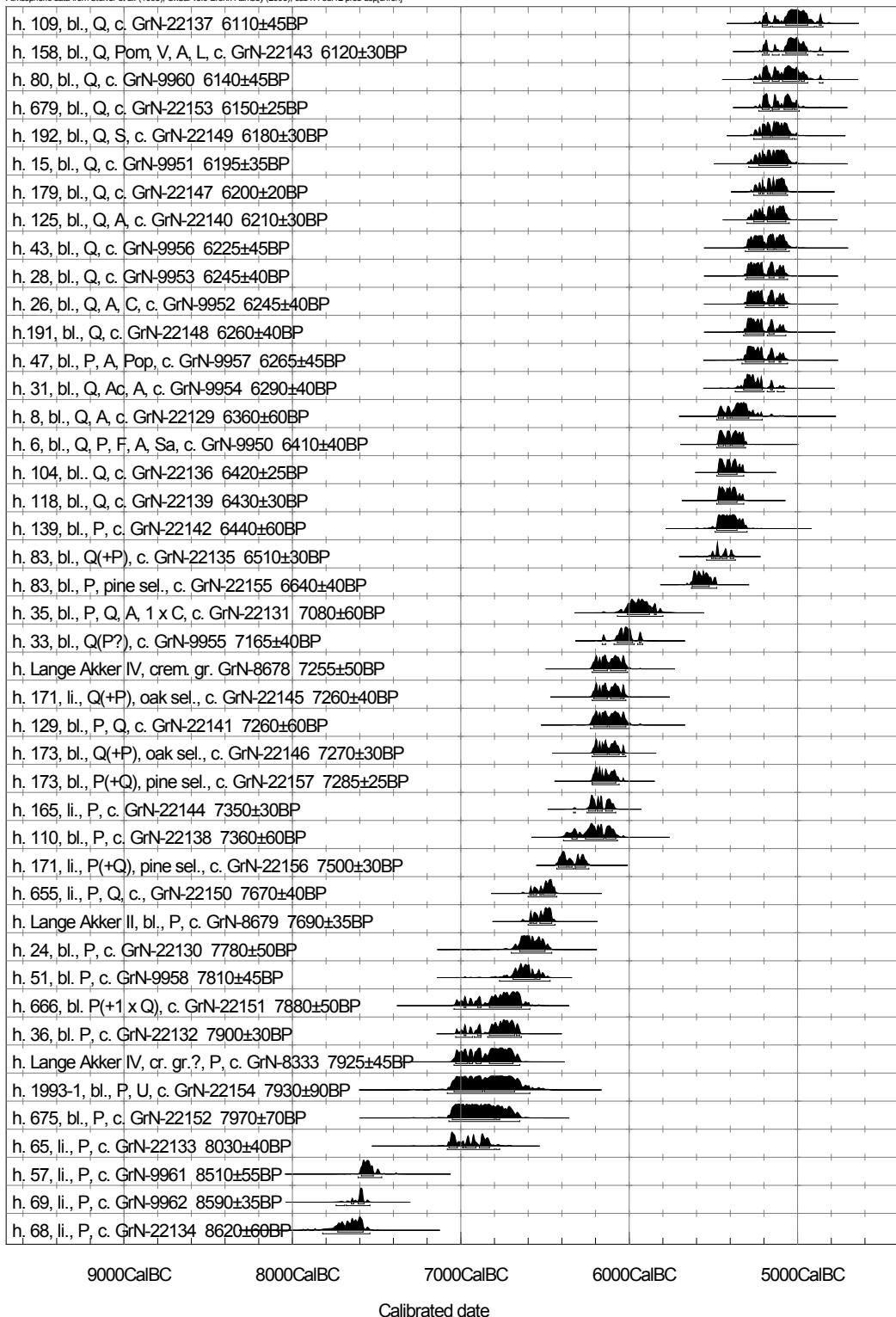


Fig. 49 Radiocarbon dates for Marienborg.

### *Features/Spatial layout:*

In total 4500 m<sup>2</sup> has been excavated, but it is estimated this may be only half of the original extent of the site. The main extension would be located further west, but could not be excavated due to the presence of a road (Hardenbergerweg) and non-threatened fields. The southern extents of the site were reached as well as the northern and northeastern perimeter, formed by the rise above the Vecht. In total 400 Mesolithic features were documented amongst which 213 hearthpits (Verlinde/Newell 2006, 84, 93-96, 147). It is estimated (on the basis of this number) that the site originally comprised 600-800 hearthpits, discounting shallow features that have been lost through soil working and ploughing (the adjacent location of Lange Akker IV already again yielded 30 hearthpits). In the intrasite analysis of the location Mariënberg-Schaapskooi 12 clusters of hearthpits were defined (see section dating as well as Verlinde/Newell 2006, 229), comprising in total 292 hearths (Ø 2-130 cm) and pits (Ø 20-100 cm) spread over 100 x 25 m and lying c. 1 m apart. Remarkably only some 10 features cut into each other. The clusters might be separated chronologically but often overlap spatially. Despite these limitations, Verlinde and Newell (2006, 229) statistically, however, define 12 discrete Mesolithic settlement units and observe shifts of occupation units in the excavated Mariënberg-Schaapskooi site. They also presume the 'graves' either form part of one of the last phases of occupation or were established shortly after the last domestic occupation (*ibid.*). Some deliberate patterning is suggested by several circle or U-shaped alignments of hearthpits around root complexes of trees. Furthermore hearthpits around the 'Schaapskooi' often were only 1 m apart, whereas elsewhere the internal distance was often almost 4 m. As already indicated (see section ecology) the lighter pits mainly contain charcoal of pine and are older than the dark-coloured pits, containing mostly charcoal of oak. It should however be noted that chronologically there is a substantial period I which both the oldest pine hearthpits as well as the youngest oak hearthpits overlap. Their coexistence may be indicative of a different function. Remarkable is the fact that hardly any of the hearthpits overlap, i.e. cut into each other. Eight out of ten times dark pits cut into light pits, yet no dark pits ever cut into each other. Apart from a chronological argument this also indicates hearthpits may have been visible at the surface for a long time. Furthermore it suggests clean soil was searched after to dig new hearthpits. Morphologically the hearthpits have a uniform solid shape and a homogeneous colour. The absence of internal stratigraphy might be related to bioturbation, or reflect anthropogenic behaviour (i.e. absence of deeper extensions and backfilling after use). Statistical analysis (*cf.* Verlinde/Newell 2006) indicated several differences between the lighter and the darker hearths (with respect to dates, dimensions, amount of charcoal, humic elements, flint, wood species). These suggest that the difference between both categories of pits might be functional in the first place and only chronological in the second (Verlinde/Newell 2005, 8).

The supposed graves (N=6) were discovered in 1978 in a cluster of hearthpits. They consist of a shallow funnelshaped oval to rounded square upper pit (with unknown function) and a cylindrical lower pit (Ø 55-140 cm and a remaining depth of 45-135 cm). On the bottom and slightly above a 30-35 cm layer of thick red-coloured sand containing artefacts was found. If these pits are graves they fall within the category of 'sitting graves' or 'funnel-pit graves'. Two of the pits seemed

to have extra space which has been interpreted as 'foot wells'. The shape of the pit and the dispersal of the red sand indicate a contracted sitting position, facing east (with one divergent orientation towards the south/southeast). The pits were filled with the sand belonging to the forest soil (Moderpodzol) as well as older disturbed yellow sand, originating from the digging of the pit in deeper soil itself (Verlinde 2005). The basic component of the red coloured layer (30-235 litres) on the bottom of the pits is the same as the layers above. The red colour is the result of secondary ferrous accretion around the grains of sand. This might have had a natural origin, or could be achieved by the admixture of red ochre (hematite), limonite, or bog iron ore. The last three options suggest a secondary solution and accretion of 'iron' in the graves around the grains of sand, which is not likely from a pedological point of view (Peeters/Niekus 2005, 215; Verlinde/Newell 2005, 8-11; however, see Louwe Kooijmans 2012). A conspicuous constellation of pits was found south of the graves where several light-coloured hearthpits cluster around a tree. The interpretation of these features as graves is disputed (see Louwe Kooijmans 2012). They are problematic since they are not dated directly and have not been documented completely. This makes an interpretation as specialist features for certain tasks, working areas or pits, depositions or Late Neolithic graves possible as well. Late Neolithic graves have been found both to the southwest as well as to the northeast. One of these was of comparable dimensions. According to Louwe Kooijmans (2012, 409) one of the funnel-shaped features should be interpreted as a Late Mesolithic grave, in view of its shape and dimensions and the grave gift of a long flint blade.

#### *Finds:*

A limited number of finds was recovered from the soil above the excavated level with hearthpits (e.g. Peeters/Niekus 2005, 215; Verlinde/Newell 2006 93). The surface collection of the amateur archaeologists who discovered the site consists of 1635 flint artefacts and 16 none-flint artefacts. This comprises 35.69% of the total number of finds, indicating how little is left (Verlinde/Newell 2006, 121). In total the Schaapskooi site yielded 4493 lithic artefacts, 144 of which were tools. Unfortunately time and money constraints prevented a 3D recording of the finds in the ploughsoil. The documented finds stem from the entire span of occupation and may be considered a palimpsest. It is more than likely the finds within the features (N=618) may also be considered intrusive and derived from the soil above, for instance when the hearths were back-filled. This may also explain the difference in frequency of finds within the older and younger hearthpits. Most of the artefact assemblage consisted of small flakes and bladelets, often broken and burnt, as well as cores and fragments of cooking stones. Points comprise B-point, C-points and trapezes. Other tools include borers, burins and scrapers (Verlinde/Newell 2006). One of the hearths next to the graves contained part of an arrowshaft sharpener of sandstone. The charcoal within the hearthpits indicates a lot of local dead wood was gathered for the fire. Furthermore only a few burnt shells of hazelnut (*Corylus avellana*) were found as well as seeds of fat hen (*Chenopodium album*) (Verlinde/Newell 2005, 3-7; Verlinde/Newell 2006, 131).

Five of the six hypothetical burial pits contained what may be interpreted as gravegoods, embedded in the red layer. Above the red layer, normal settlement refuse was found, similar to the hearthpits. The 'grave goods' were larger and of better quality and comprised several (retouched) blades (these blades were larger

and showed evidence of punch-technique indicating a possible Late Mesolithic/Early Neolithic tradition, *cf.* Peeters/Niekus 2005, 216), cores and blocks of flint, hammer stones and sandstone polishing stones. The number of grave goods varied per grave from 0-22. They were usually deposited in groups within the red layer. Two of the graves (93 and 12) contained sandstone polishing stones (arrowshaft sharpeners), placed in a row, top down. According to Louwe Kooijmans (2012, 413-414) the arrowshaft sharpeners were unfinished products. Grave 93 contained three complete sets and grave 12 contained three halves of sharpeners (Verlinde/Newell 2005, 11-12; Verlinde/Newell 2006). None of the grave goods was placed on the bottom of the burial pit. The settlement waste contained some human bone and some possibly secondary burnt fragments were found above the ochre layer in the graves. (Verlinde/Newell 2006, 132, 168). It should be noted though that both sharpeners and blades are also common in Late Neolithic grave contexts.

#### *Interpretation:*

Evidently Mariënberg was the long-term focus of Mesolithic hunter-gatherers, as attested by the large number of hearthpits and the long time-span indicated by the  $^{14}\text{C}$ -results. The hearthpits cluster in groups and these clusters are more or less separated spatially. The light and the dark pits both seem to indicate a different function as well as a chronological difference (*cf.* Verlinde/Newell 2005; 2006). Due to the absence of organic remains and other features, it will however be difficult to establish a better perspective on the site function and the changes therein. According to Louwe Kooijmans (2012, 403) the hearthpits at the site, in combination with the limited quantity and modest quality of the flint, should be interpreted as belonging to a special activity use of the site.

The abundance of natural resources as reflected in the wide variety of wood species collected as well as the evidence for hunting equipment (points and arrowshaft sharpeners) indicates the exploitation of natural resources was an important activity at the site. The specific function of the hearthpits may be related to this, although, in the light of their chronological overlap, a functional difference between the older and younger pits is also feasible. The presence of six possible inhumation graves indicates the site was an important point in the annual mobility cycle at least at the end of the occupation span of the site. This of course depends on whether or not these features may be interpreted as such. The consequent isolation of most hearthpits suggests a certain level of continuity and spatial organisation. Unfortunately no information is available on whether the area containing the pits and hearths coincides with the habitation site or the distribution of artefacts (see Verlinde/Newell 2006, 205).

Verlinde and Newell (2005, 12-13) go as far as to suggest a division in status and hierarchy on the basis of the grave-goods. This should however be questioned since there is no solid evidence for personal hierarchy or ranking at Mariënberg. It is even doubtful whether it is appropriate to use these terms for the Mesolithic in general on the basis of graves since there is no direct relation between social structure and mortuary practices. Furthermore the presence of arrowshaft sharpeners within the graves is interpreted as an indication of contacts with farmers, since this tradition is mainly documented for the Neolithic (*cf.* Verlinde 2005; Verlinde/Newell 2005). On the other hand similar sharpeners are known from Hardinxveld-De Bruin and more independent sources of data are required to substantiate a claim for contact. Finally it should be realised that although the

## Mariënberg-Schaapskooi

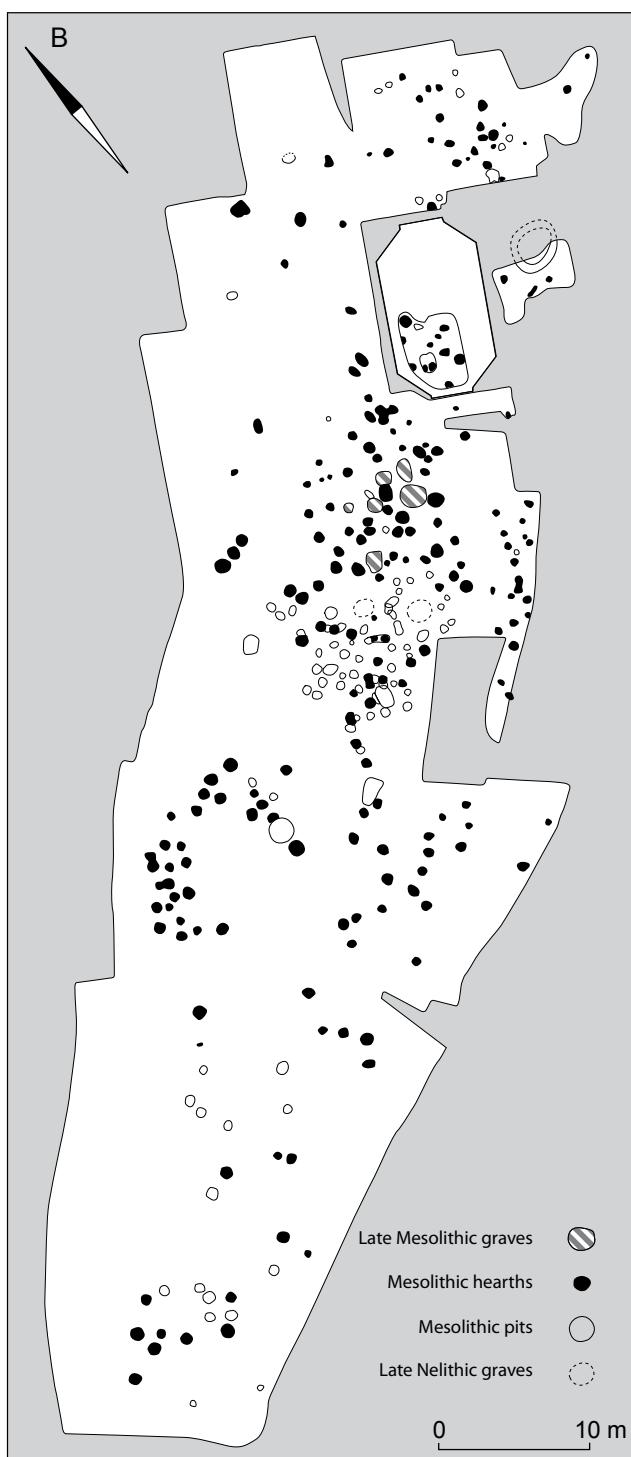


Fig. 50 Mariënberg-Schaapskooi. (A) geomorphological overview of the area with site location. (B) excavation plan including hearthpits and graves. Adapted from Verlinde/Newell 2006, fig. 4 and 6.

overall evidence is rather convincing, the indirect dating of the graves will never yield substantial proof for a date in the Late Mesolithic.

A recent analysis of the available data by Louwe Kooijmans (2012) yielded a number of new interpretative results; one of the most important being that the graves probably date to either Phase 3, or to the hiatus between Phases 3 and 4, around 6000 cal BC. They therefore do not seem related to the domestic areas (of the active hearthpits) and occur well before potential Neolithic contact. Another conclusion (*ibid.*, 414) is that the red stained sand is probably not redeposited red sand, but the result of the dissolution and diffusion of a red substance ('ochre') from an unknown source deposited at the same level. This is based on the evidence available that the sand was quarried at the settlement (including the settlement waste that was found there) as well as the fact that the artefacts were coloured as well (Louwe Kooijmans 2012, 410-411). The interpretations forwarded by Louwe Kooijmans (2012) were again reviewed and commented upon by Verlinde and Newell in 2013 (for an evaluation of their points of difference, see Verlinde/ Newell 2013, 49-51).

In line, to some extent, the conclusions by Verlinde and Newell (2006) and Louwe Kooijmans (2012) argue that it appears that the pits, because of their shape and content, were probably used for intentional deposition and probably the burial of human corpses. However, according to Louwe Kooijmans (2012, 415) and based on a comparative research into European Mesolithic burial customs, the combination of features remains very unusual within the Mesolithic burial traditions of the LRA.

#### *References:*

- Lanting/Van der Plicht 1997/1998
- Louwe Kooijmans 2012
- Peeters/Niekus 2005
- Verlinde 1979
- Verlinde 2005
- Verlinde/Newell 2005
- Verlinde/Newell 2006
- Verlinde/Newell 2013

### **34. Meeuwen-Donderslagheide 1**

#### *Location:*

The site is located on the Kempen Plateau in the eastern Belgian coversand area (Belgian Campine area). The northern part of the site was situated on a rather flat area, while the southern part was situated on a Late Glacial dune, oriented SW-NE. In the surroundings of the site several fens and marshy areas can be found (Creemers/Vermeersch 1989, 206).

#### *Site characteristics:*

The site was discovered during a survey of the Kempen Plateau in 1983 and yielded artefacts belonging to the Mesolithic, Neolithic, Iron Age, Medieval period and Post-Medieval period. The horizontal distribution of the artefacts on the surface measured some 300 x 200 m. Within this area several concentrations of sherds

were discovered. One concentration (pot 6) was discovered within the trenches of the excavation. No evident concentrations of lithic material were found, except one on the northern slope of the dune, measuring approximately 20 x 10 m. In 1986 excavation took place. Two trenches of 30 x 5 m were dug to the base of the B3 humic-iron podzol, 70 cm below the surface. Unfortunately no features were uncovered and no in situ artefacts were found (Creemers/Vermeersch 1989, 206-207). The archaeological remains that were recovered thus either stem from the surface or the plough horizon and underlying sand.

#### *Geology/Pedology:*

The substratum of the area consists of Middle Pleistocene gravels and coarse fluvial sands. A thin layer of Late Glacial coversands, on top of which some Late Glacial dunes were formed, covers these. Within these sediments a humic-iron podzol formed.

#### *Taphonomy:*

In post-medieval times sods were cut in the heather covering the area. This led to a decapitation of the podzol. Furthermore deep ploughing heavily disturbed the site (Creemers/Vermeersch 1989). The observation that most of the find remains could be found on the surface or in the plough soil also is indicative of this. Finally no organic remains were preserved due to acidic soil conditions.

#### *Ecology:*

No specific ecological information is available. However palynological analyses of the fens from the nearby site of Meeuwen-In den Damp I, indicate a heavily forested environment on the transition to the Atlantic. The forest mainly consisted of pine, birch and hazel. Also present were lime, elm and oak. Herbaceous plant pollen and pterophytes represent the wetter parts. Alder and lime appeared and increased from the Boreal-Atlantic transition (Bubel, 2002/2003, 318). According to Munaut (1967) there is evidence of deforestation from the Subboreal onwards. Creemers and Vemeersch link this to Michelsberg cattle herding (1989, 224).

#### *Dating:*

No <sup>14</sup>C dates are available. On the basis of the pottery fragments the site dates to the Middle Neolithic. There are similarities with MK material, yet an affiliation with the Hazendonk group is more likely. The lithic artefacts typologically range from the Mesolithic to the Late MK. Due to the palimpsest character of the site it is not clear whether the lithic assemblage might date to one period, indicating possible contact between MK farmers and Mesolithic hunter gatherers (*cf.* Creemers/Vermeersch 1989, 224). On the basis of its Middle Neolithic character the site might roughly be dated between 4000 and 3200 cal BC.

#### *Features/Spatial layout:*

No features were uncovered. The site consists of several surface concentrations of pottery (predominantly of type 2a) and one subsurface concentration of pottery (pot 6). One concentration of lithic material was discovered on the northern slope of the dune and measured 20 x 10 m.

Type	N	W	Temper	Build	Shape	Decoration	Other
1a	24	429	burnt flint	coil (H/N)		deep-cut parallel lines	hard
1b	11	176	flint	some coil	finished inner surface/ outward curved rims	finger nail inner/incised lines/knob/finger imprints	variety
2a	289	4509	coarse quartz (2-3 mm)	coil (Z/N)	finished inner and outer/some everted rims	one vertical knob	thick/hard
2b	13	115	quartz (up to 4 mm)	strip-built (N/Z)	moderate inner finish		one pot
2c	13	109	quartz (up to 9 mm)				thick/soft, puff-paste
2d	9	208	some quartz (2-4 mm)/organic		smoothened inner/roughened outer /flat-bottomed/one protruding foot		thick
2e	38	260	some quartz (up to 4 mm)		straight or outstanding rims	fingernail/deep channelings	thin/hard

Table 8. Sherd groups at Meeuwen-Donderslagheide 1.

*Finds:*

In total 397 sherds (< 6 kg) were found. These were classified into seven groups.

In total 234 lithic artefacts were found consisting of flint (N=214), Wommersom quartzite (N=12), chert (N=1), sandstone (N=3) and some other stones. Most of the flint is fine-grained, of greyish colour with white inclusions. The cortex is slightly rolled (Creemers/Vermeersch 1989, 213). This type of flint may be interpreted as Lightgrey Belgian. The site yielded eight cores and 180 debitage products. These, amongst others comprise seven robust (and possibly imported) blades and 30 locally produced blades and bladelets. In total 154 flakes were found. Furthermore 39 tools were recovered (none from the small concentration on the slope of the dune). The tools all are made of good quality flint. The spectrum comprises ten scrapers, one borer, one pointed robust blade and one retouched robust blade. Two robust blades showed sickle-gloss. The site also yielded three retouched blades and bladelets as well as three microliths consisting of a point with a rounded base, an obliquely truncated bladelet and a microburin.

A total of nine arrowheads was also uncovered, consisting of two triangular, two leaf-shaped, two tanged, one transverse and two unfinished arrowheads. Finally six retouched flakes were recovered.

The site also yielded a long chisel with an oval cross-section, possible of Lightgrey Belgian flint, as well as three hammer stones, a grinding stone (sandstone) and a polishing stone (sandstone) (Creemers/Vermeersch 1989, 216-219).

*Interpretation:*

Its disturbed character hampers the interpretation of the site. Not much information could be recovered spatially because of a palimpsest situation. There may be a slight concentration of Mesolithic artefacts in the south-western part of the site, but others are mixed with Neolithic material. The lithic concentration on the northern slope of the dune consists mainly of debitage material and lacks tools. Since this concentration represents the only evident knapping event it might not be associated with the rest of the site. Typologically the pottery indicates a resemblance to the MK of loamy Belgium (burnt flint temper), especially group 1. The group 2 pottery may also be seen in MK tradition (including the sherds with carination and incompletely perforated holes). The flat bases may be indicative of later stages of the MK, or of the subsequent WSV- complex, or affiliated

## Meeuwen-Donderslagheide

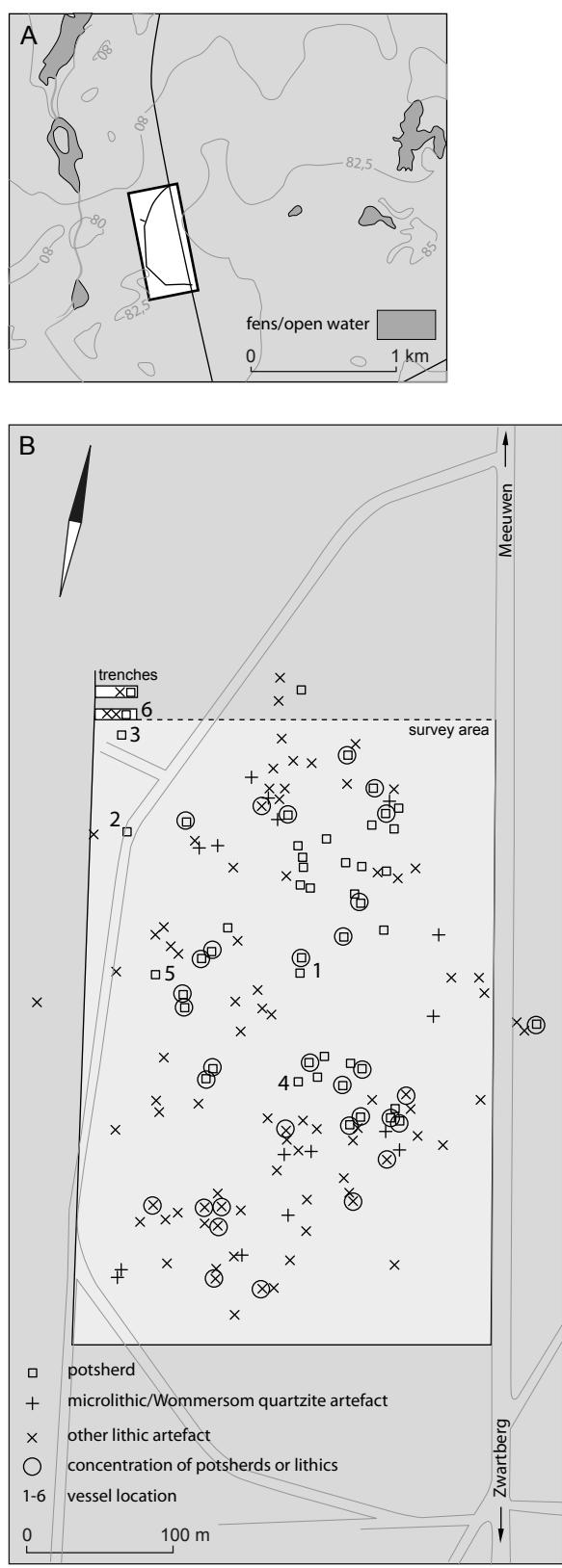


Fig. 51 Meeuwen-Donderslagheide. (A) topographical map with site location. (B) Map of the surveyed area and small excavation trenches. Adapted from Creemers/Vermeersch 1989, fig. 1 and 2.

groups such as the SOM-culture or the Gord (Deule-Escaut) group. Concerning decoration however much of the pottery might be more affiliated with a northern tradition. A sherd with everted rim and finger nail decoration at the inner side might be envisaged within a SWB tradition. The incomplete perforations could be connected with the MK or the Wartberg-group. Lugs are found at other MK sites, but are also found in the context of the Hazendonk group. Overall many elements of the pottery seem to indicate an affiliation with the Hazendonk 3 group (quartz as tempering agent, coil-built pottery and incised lines as a decorative motif) (Creemers/Vermeersch 1989, 223). The lithic assemblage contains some later elements (tanged points, chisel), but consists mostly of Mesolithic and Middle Neolithic artefacts. Since many Belgian sites in the loamy and sandy areas contain a combination of artefacts from both periods, a chronological and functional coherence is suggested (Creemers/Vermeersch 1989, 222).

The site is interpreted as a location where MK-herdsman took some rest while guarding flocks. Because of the Mesolithic armaments these herdsmen may have had a Mesolithic background. The pastoral element may be assumed since there is evidence for deforestation in the Subboreal and the soil is not considered fertile enough for growing crops (Creemers/Vermeersch 1989; Munaut 1967). This interpretation is however problematic and the authors indicate this is only one hypothetical explanation for site function (Creemers/Vermeersch 1989, 224). The site might also be a palimpsest of separate Mesolithic and Middle Neolithic activity. Furthermore a short resting place is not compatible with the presence of grinding stones and a substantial quantity of pottery. These rather befit a domestic interpretation. Apart from this, the pastoral element in the hypotheses is based upon the assumption that the area was unsuitable for agriculture. There is however no information on the specific demands of Middle Neolithic agriculture. It may not have been impossible. Limited crop cultivation is also assumed for several Hazendonk dune sites in the Dutch river district (see *e.g.* Schipluiden).

It may be concluded that Meeuwen-Donderslagheide does not shed any new light on the association of Mesolithic and Neolithic artefacts. On the other hand the absence of evidence for elaborate debitage of flint as well as the combination of local and imported (mined) flint may indicate a mobile element in the occupation of the site. This may or may not be associated with pastoralism and/or a Mesolithic background or population. If no agriculture took place at the site the blade with sickle gloss might be associated with a partial presence in a location where agriculture or contact with farming communities did take place.

Finally the presence of Hazendonk pottery this far south of the central river district indicates an intricate relationship between this group and the MK occupation surrounding it.

#### *References:*

Bubel 2002/2003  
Creemers/Vermeersch 1989  
Munaut 1967

## 35. Meeuwen-In den Damp I

### *Location:*

Meeuwen in den Damp is located on a Late Glacial dune (oriented SSW) on top of Pleistocene fluvial gravel and sand in the Belgian Campine area. Directly to the west several peat fens can be found as well as the Aabeek (a small stream). The presence of these wetter elements attracted Mesolithic hunter-gatherers (Creemers/Vermeersch 1986; 1987).

### *Site characteristics:*

The site, which consisted of four concentrations, was dug in 1986 by Leuven University. In total 684 m<sup>2</sup> was excavated (Bubel 2002/2003) in 1 x 1 m spits. Most of the chips and debris were sieved per square while c. 30 % of the finds were recorded three-dimensionally (Pilati 1999; 2001).

### *Geology/pedology:*

The subsoil consists of Pleistocene gravels and sands. Coversand was deposited on top of this and later on Late Glacial dune sands developed. In the undulating dune sand a classic humic-iron podzol formed (Creemers/Vermeersch 1986; 1987).

### *Taphonomy/ Site-formation:*

The site was discovered while digging trenches for a pine plantation although it is believed disturbance by this was minimal. Plaggen activity however disturbed part of the southern extent (concentration) of the site. The area also has been ploughed (Bubel 2002/2003, 317). Most artefacts were discovered in the E-horizon (A2) with a vertical dispersion up to 20 cm. Taphonomic research by Bubel (2002/2003) indicated that fauna-turbation was responsible for the dispersion. No organic material was preserved. The site has been on or at the surface until recent land-use (Pilati 2001).

### *Ecology:*

Palynological analyses of the fens indicate a heavily forested environment on the transition to the Atlantic. The forest mainly consisted of pine, birch and hazel. Also present were lime, elm and oak. Herbaceous plant pollen and spores of several pteridophytes may represent the wetter parts. Alder and lime appeared and increased from the Boreal-Atlantic transition (Bubel, 2002/2003, 318).

### *Dating:*

The site has not yet been dated by radiocarbon. Some <sup>14</sup>C samples for the pollen cores will be available. Typologically the site can be firmly dated to the Late Mesolithic (more specifically the 'Opglabbeek-Ruiterskuil-group'), because of the abundance of trapezes (with ventral retouch) in the microlith component, the use of Wommersom quartzite and Montbani debitage (Bubel 2002/2003; Creemers/Vermeersch 1986; 1987).

### *Features and spatial layout:*

Four concentrations of artefacts could be located clustering around N25E25, N11E17, S12E8 and S21E5 (fig. 1, Creemers/Vermeersch 1987, 72). Both northern concentrations are ovaloid-shaped measuring *c.* 8 x 4 m. (the northern concentration seems to exist of several smaller concentrations). Both southern concentrations are smaller and might be connected. Burnt sandstones and quartz indicate the former presence of hearths, which were not located. Most tools are found surrounding the concentrations (*ibid.*, 71-72). Intrasite analysis of concentration 1a (N11E17) by Pilati (1999; 2001) revealed a horseshoe-shaped feature with specific clustering of artefacts, roughly covering 212 m<sup>2</sup>. Pilati further distinguishes a smaller concentration 1b, directly north of 1a. A treefall was ruled out and on the basis of several models it was concluded the area represented a knapping spot subsequently cleaned out. The U-shape might have come into existence due to the presence of a tent. There is some chance that the feature might be a windthrow, although the available data do not yield enough information to either confirm or refute this. Apart from this habitation in a former windthrow is also not unlikely (see Pilati 2001).

### *Finds:*

More than 16,000 artefacts were uncovered. Some 3800 (4800 according to Pilati 2001) were measured in situ of which 74% is lithic and 26% burnt quartz and sandstone. About 5% of the artefacts were made of Wommersom quartzite. The microlith component mainly consists of trapezes. Debitage mainly for blades took place at the site (Creemers/Vermeersch 1987). Pilati further indicates that concentration 1a comprised 5843 finds.

### *Interpretation:*

The low density of the artefacts and the lack of a general toolkit indicate use as an ephemeral camping site (Bubel 2002/2003, 313). According to Bubel the taphonomic research (*ibid.* 363) indicates the artefacts of the southernmost of the northern concentrations can be considered to represent a single occupation of the site. Although this might be true there is no argument that indicates that solely a single occupation could have taken place. At the most a short use-time can be affirmed. It is not clear how many times and over what period the entire site was visited. The extensive intra-site studies by Pilati (2001; 2009) furthermore show that a certain level of congruence between the finds can be detected and that this can be interpreted as either reflective of the sitting or hearth model, or even of a tent. On the other hand the quality of the data does not allow him to completely refute the presence of a tree-fall, or windthrow.

### *References:*

- Bubel 2002/2003
- Creemers/Vermeersch 1986
- Creemers/Vermeersch 1987
- Pilati 1999
- Pilati 2001
- Pilati 2009

## Meeuwen-In den Damp

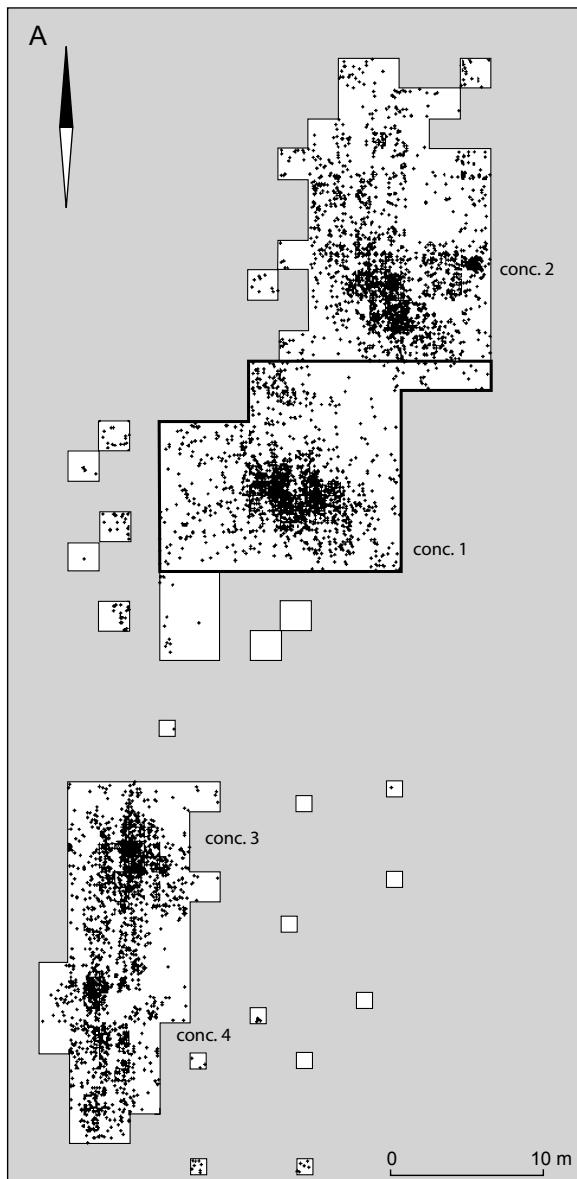
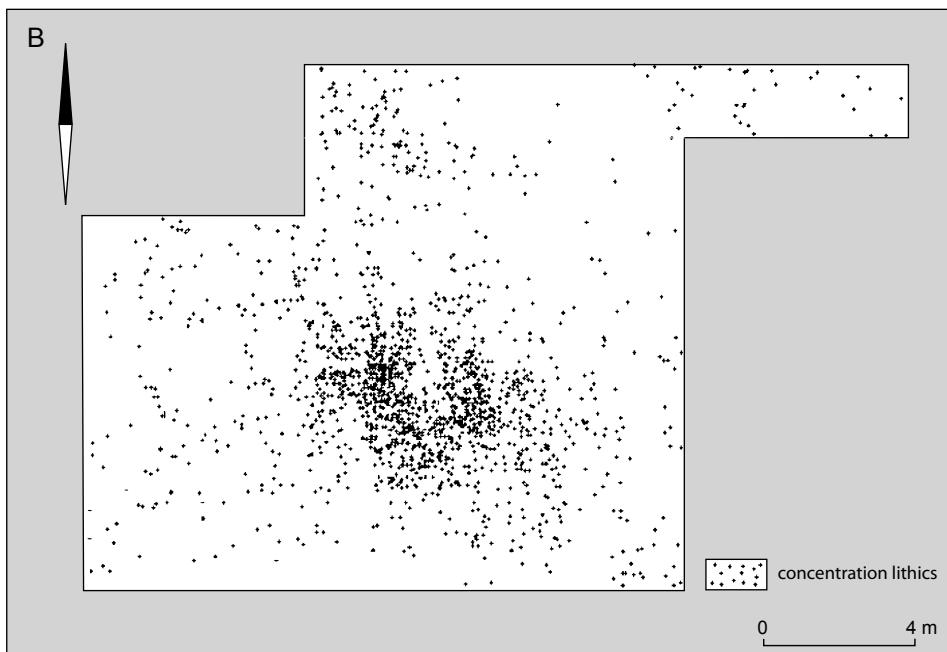


Fig. 52 Meeuwen-In den Damp. (A) Overview of the excavation trenches, concentrations (based on Pilati 2001) and lithic distribution measured three dimensionally. (B) detail of concentration 1. Adapted from Pilati 2001, fig. 2.2 and 4.1.



## 36. Melsele-Hof ten Damme

### *Location:*

The site is located on top of a Late Glacial dune (donk) at a distance of 700 m of the current riverbed of the Scheldt, in the Lower Scheldt Basin (Belgium). During occupation the site became situated in an increasingly wet environment and was covered with peat in the middle of the third millennium cal BC (Van Roeyen *et al.* 1992, 41 and 47).

### *Site characteristics:*

The site was excavated during four campaigns. Three took place between 1984 and 1986 by the *Archeologische Dienst Waasland* and one in 1990 by the same service in cooperation with the University of Illinois, and the Royal Institute for Natural Sciences in Belgium (Van Berg *et al.* 1991; 1992; Van Roeyen 1988; Van Roeyen/Van Berg 1989). In total some 100 m<sup>2</sup> were excavated (Van Berg *et al.* 1991, 37). The archaeological material has never been completely studied (Vanmontfort 2004, 271).

### *Geology/Pedology:*

The body of the dune consists of Pleistocene dune sand. The northern slope of the dune is covered by a complex stratigraphy consisting of a combination of peat, sandy and loamy sediments. Peat and alluvial deposits covered both these sediments and the dune. The complex of sediments on the northern slope was deposited in a brackish environment dating between 4330 and 3660 cal BC (Van Roeyen *et al.* 1992, 45). The clay layer on top of this complex was weathered and compacted and probably was a stable surface for a considerable span of time. The subsequent layer of peat dates to 3100 cal BC and covered the top of the dune around 2460 cal BC at the latest (*cf.* Van Roeyen *et al.* 1992, 46). This hiatus complicates a stratigraphical allocation of remains of several periods.

### *Taphonomy:*

The site has suffered heavily from bioturbation. This has led to the complete homogenisation of the top of the dune to a depth of 30 cm (Fechner/Langohr 1993; Van Roeyen *et al.* 1992). Although this may not have led to intensive horizontal displacement of artefacts, it did lead to vertical dispersal of artefacts as well as to complete and partial disturbance of features (*ibid.*). On the other hand organic material was preserved in both the dune sand as well as at the base of the peat (Van Roeyen *et al.* 1992, 43).

### *Ecology:*

Palynological research of features in the dune did not yield many results. Samples taken from the sediments on the slope of the dune however did. They point to a brackish environment (*Chenopodiaceae* and algae) with tidal influences. Pollen from these sediments indicate a heavily wooded environment comprising of alder (40%), oak (20%) and lime (10%) as well as herbaceous plants indicating a wet environment. Palynologically this may date to the Atlantic. Radiocarbon dates point to a start around 5300 BP (*ibid.*, 45). Only two pollen grains of *Triticum*-

type are indicative of anthropogenic activity. From 3100 cal BC onwards the site is covered by a peat swamp with predominance of alder and subsequently by peri-marine deposits (formerly Dunkirk II transgression). The authors argue that human influence in the landscape between 4100 and 100 cal BC was minimal (*ibid.* 45-46).

### Dating:

In total 30  $^{14}\text{C}$  dates were obtained. Fifteen of these were geological samples, the other fifteen were archaeological samples (Cromb   et al. 1999; Van Roeyen et al. 1992; Van Strydonck et al. 1995; Vanmontfort 2004). Only two of the fifteen dates derive from an archaeological feature (OxA-3087 and OxA-3092). They were obtained on bark fragments lining a storage pit. Their combined date (*cf.* Vanmontfort 2004, 272) is used here. One date (IRPA-938) is expelled since it is stratigraphically younger than the overlying final peat formation (*cf.* Vanmontfort 2004, 273), one (IRPA-933) because of suspicion of contamination (Van Roeyen et al. 1992, 44).

Since almost all dates are without context and most are obtained on charcoal, they can only give a rough estimate of the occupation of the site. In general three phases can be distinguished (see also Cromb   et al. 1999). The first phase dates to the Late Mesolithic in the 7<sup>th</sup> millennium cal BC. The second phase dates to the first half of the 5<sup>th</sup> millennium cal BC. This could be either Late Mesolithic or Early Neolithic. The last phase dates to the third millennium cal BC. The youngest date might indicate activity shortly before the dune was covered up with peat.

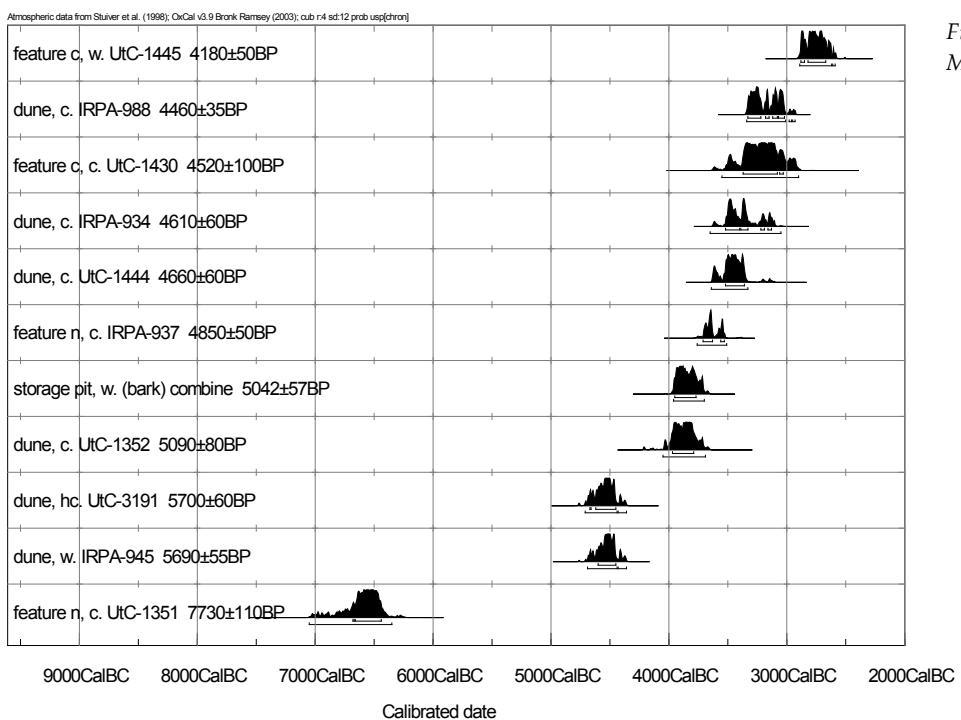


Fig. 53 Radiocarbon dates for Melsele-Hof ten Damme.

### Features/Spatial layout:

Some 15 features of round to sub-rectangular shape ( $\varnothing$  60-100 cm) and a depth of 40-70 cm were found. It is not clear to what extent some of these features might be of anthropogenic nature. The only undisputed archaeological feature is a pit with a depth of 70 cm, lined with bark. This feature is interpreted as a storage pit and was re-used for waste disposal. It dates to the second phase of occupation (*cf. supra*; Van Berg *et al.* 1992; Van Roeyen *et al.* 1991, 42). No complete site plans have been published.

### Finds:

Most of the finds were located in the features and in the heavily homogenised layer, making it difficult to allocate them to a distinct phase of occupation (Van Roeyen *et al.* 1992, 42). Some 14,000 lithic artefacts and 1500 pottery sherds (6180 g) were recovered, as well as bones and organic material.

The flint used was of variable quality (usually small rolled cobbles). Wommersom quartzite amounts to 5% of the assemblage. Typologically the assemblage seems of Late Mesolithic origin characterised by microblades and there are clear affinities with the industry of Weelde-Paardsdrank as well as with the RMS-group. On the other hand the  $^{14}\text{C}$  dates indicate it is a palimpsest assemblage spanning a long period. The tool spectrum (5%) shows a predominance of trapezes. Endscrapers, borers, burins, notched pieces and denticulates are less well represented (Van Berg *et al.* 1992, 96; Vanmontfort 2004, 275). Five tools (3 points, 1 scraper, 1 retouched piece), found close to each other, are clearly of Middle Neolithic origin. These artefacts were made on flint from the Gulpen formation, which was mined at Rijckholt (Van Berg *et al.* 1992, 96).

The pottery is tempered with a variety of agents (grog was present in 99.6% of all sherds, apart from this also organic material, flint, bone, haematite and sand). The overall fabric composition is rather homogeneous (Vanmontfort 2004, 273, *contra* Van Berg 1992, 97). The presence of conic bases, coil-technique and specific elements of decoration (compare Van Berg *et al.* 1992, fig. 7.1/7.2 with Raemaekers 1999, fig. 3.25 or Peters/Peeters 2001, fig. 56, 11-14) clearly point to the SWB culture. N-joints and spatula impressions on the shoulder (*cf.* Raemaekers 2005<sup>a</sup>, 268) indicate a date from the Middle phase of the SWB culture onwards. Raemaekers (1999, 138) suggested pottery with Blicquy affinities, yet on the basis of the morphological characteristics of the pottery this cannot be confirmed (pers. comm. A. Hauzeur 2005). Most sherds are tempered with grog making a technical attribution to the MK unlikely (*pers. comm.* Vanmontfort 2005). The presence of *Tüpfenleisten*-like rims and flint mined Middle Neolithic tools however point in the direction of intense contact. A similar situation is witnessed in the Dutch Hazendonk group. The vertical rims (*cf.* Raemaekers 1999, 238), N-joints, different tempering agents as well as decoration motifs of Melsele also point in the direction of this group. On the basis of the  $^{14}\text{C}$  dates and some rims with perforations an attribution of part of the complex to the Vlaardingen culture or Stein group may also be possible.

The faunal material comprises both burnt and unburnt bone of red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*), brown bear (*Ursus arctos*), beaver (*Castor fiber*) and wild duck. Bones of domesticated animals, (cattle, pig and sheep-goat) as well as uncarbonised human remains were also

found. All bones were found in the coversand. Botanical remains are restricted to fragments of hazelnut (Van Roeyen *et al.* 1992, 43).

#### *Interpretation:*

Due to the homogenised find layer, the  $^{14}\text{C}$  dates without contextual information and the small extent of the excavation, interpretation of Melsele is extremely difficult. On the other hand the abundance of artefacts indicates a long history of use and re-use of the site. There is one clear Late Mesolithic phase that should not necessarily be associated with pottery, yet all subsequent phases may include both lithic artefacts and pottery. The fragmented state of the sherds and the large variety in tempering agents and morphological characteristics make it difficult to pinpoint distinct cultural affiliations, yet in the light of the  $^{14}\text{C}$  dates it is most likely that the spectrum of pottery should not be designated to one single phase (*contra* Van Berg *et al.* 1992, 98 and Van Roeyen *et al.* 1992, 47). The technologically homogeneous composition (*cf.* Vanmontfort 2004, table III-23) on the other hand may indicate a certain local continuity. The presence of a large variety of faunal remains, including domesticated animals, in combination with dispersed human remains, pottery and a storage pit, argue in favour of a more substantial use of the site in post-Mesolithic times. Furthermore the presence of hearthpits this far south and this late has also been demonstrated for Schipluiden (Hamburg/Louwe Kooijmans 2006).

#### *References:*

- Cromb   *et al.* 1999
- Fechner/Langohr 1993
- Raemaekers 1999
- Van Berg *et al.* 1991
- Van Berg *et al.* 1992
- Van Roeyen/Van Berg 1989
- Van Roeyen *et al.* 1992
- Van Strydonck *et al.* 1995
- Vanmontfort 2004

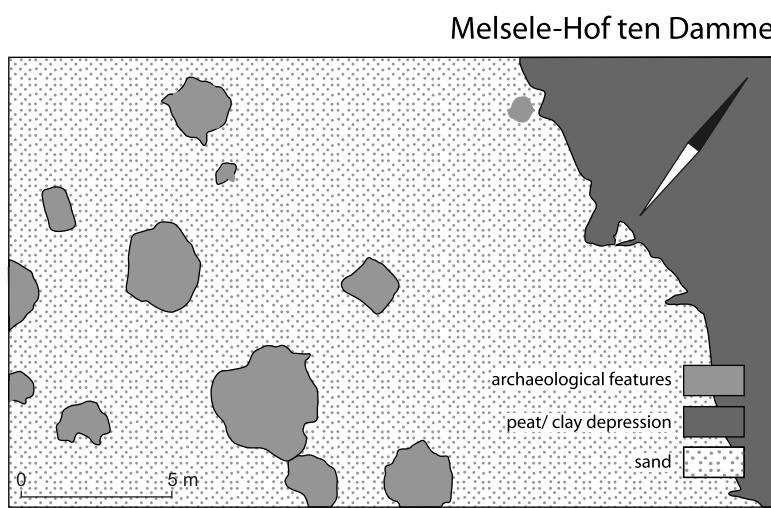


Fig. 54 Melsele-Hof ten Damme. Excavation area 84/V with archaeological features with organic fill in the vicinity of the depression. Adapted from Van Berg *et al.* 1992, fig. 2.

## 37. Merselo-Haag

### *Location:*

The site is located on a coversand ridge at the edge of the Loobek valley near Venray in Dutch Northern Limburg. Due to the presence of the ridge a pool came into existence, which later developed into a *ven* with peat growth (Verhart 2000, 58). The site consists of a scatter of Early and Late Mesolithic finds, six clusters of artefacts and 5 hearths. In total 409 m<sup>2</sup> were excavated by Leiden University in 1988.

### *Site characteristics:*

The site consists of a scatter of Early and Late Mesolithic finds that could be spatially separated in two zones, comprising in total of six clusters of artefacts and 5 hearths. In total 409 m<sup>2</sup> were excavated by Leiden University in 1988 using spits of 25 x 25 cm.

### *Geology/Pedology:*

The coversand ridge was formed in the Dryas stadial. The Loobek valley saw the development of peat in the Pre-Boreal and the Atlantic. The soil profile at the site consists of a disturbed A-level below which a leached horizon (E) of highly variable thickness had developed. Underneath a washed-in B-level was found. The underlying coversand (C) included weakly developed bog ore pans and iron fibres. Some 86% of the finds were located within 30 cm of the A-horizon (*ibid.* 68, 69).

### *Taphonomy/Site-formation:*

Most of the finds are located within either the E-or B-horizon of the podzol soil. The 21.2 % of finds from the A-horizon have probably been disturbed to a certain degree. The highly variable thickness and occasional absence of the E-horizon is indicative for the degree of disturbance the site must have suffered. On the other hand, by and large only Early and Late Mesolithic artefacts were found arguing in favour of a certain level of historical integrity. There is clear evidence of faunal and floral turbation (*ibid.* 78). No organic remains were preserved due to the acidity of the soil. It is not clear whether and when the site was covered.

### *Ecology:*

Palynological information from the western Peel indicates that during the Boreal hazel, oak and later elm grew in the valleys. On the high grounds there was a hazel and oak forest. From 8000 BP lime and ash grew in the valleys and at the start of the Atlantic also alder. On the high grounds dense forests grew, composed of lime, ash, oak, elm, birch and pine. (*ibid.* 60).

### Dating:

Two hearths were dated on the basis of charcoal. Hearth 2 was located in the Early Mesolithic zone (*cf.* below) and was dated between 4050 and 3760 cal BC (GrN-17407). Hearth 4 was located in the Late Mesolithic zone yet dated between 7460 and 7070 cal BC (GrN-17406). (Verhart (2000, 115) mentions hearth 5 was dated).

The aberrant dates are indicative of the problematic dating of Mesolithic sites on sandy soils (Arts 1989, Lanting/Van der Plicht 1997/1998, Verhart 2000). One reason is a questionable association between charcoal samples and Mesolithic remains (Vermeersch 1990, 286). Lanting/Van der Plicht suggests that the hearths are rarely associated with concentrations (1997/1998, 149). For the younger date, Verhart (2000, 115) suggests the Mesolithic may have continued over a longer

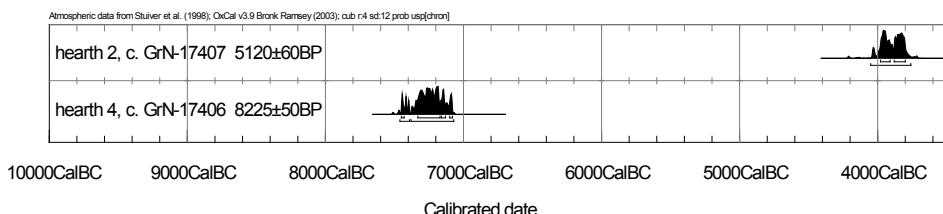


Fig. 55 Radiocarbon dates for Merselo-Haag.

period. The older sample barely dates to the Early Mesolithic and only one Middle Mesolithic artefact was found in a testpit (*ibid.* 72). Since the Middle Mesolithic is often notoriously absent (*cf.* Verbeek/Vermeersch 1995), this might also be due to typological inconsistencies. Since both dates fail to convincingly date either the Early or Late Mesolithic occupation any association should be rejected.

### Features and spatial layout:

The site can be divided in an Early and a Late Mesolithic zone. Hearths 1-3 are located in the Early Mesolithic zone, 4 and 5 in the Late Mesolithic zone. All hearths were disturbed and had no well-preserved bases, making it questionable whether they were dug or surface hearths. Some vague traces might also refer to the latter category (*ibid.* 78). Apart from the hearths the site consists of a scatter of finds within which several concentrations can be found. Five of these are located within the Late Mesolithic zone. The refit-pattern of some artefacts indicates an association with the clusters (*ibid.* 98). There seems to be no correlation between the hearths and concentrations. The division in a Late Mesolithic and an Early Mesolithic zone is based on the spread of Late Mesolithic trapezes. Some Early Mesolithic points do occur on the other side of the imaginary boundary. Although the construction of the boundary is artificial, it is a useful tool for interpretation since the distribution of the points is rather consistent.

### Finds:

In total 4565 flint artefacts were found. Twelve points could be dated to the Early Mesolithic. Trapezoids and LBK-like points are indicative for the Late Mesolithic. Apart from points other tools as well as cores and debitage-material were found. The majority of the artefacts display pebble patina, indicating they were collected

locally from the Maas gravels. Some flint of northern origin was found as well as southern types such as Rijckholt, Rullen, Simpelveld and Haspengouw flint. Apart from some quartzite and a phtanite artefact, 130 artefacts were made of Wommersom quartzite. The majority of flint was worked on the site, yet some groups such as the Wommersom quartzite clearly form an imported component. Patination prevented microscopic use-wear analysis, yet macroscopically typical use damage was recognized. (*ibid.* 83, 105). Apart from the charcoal within the hearths no other find material was collected.

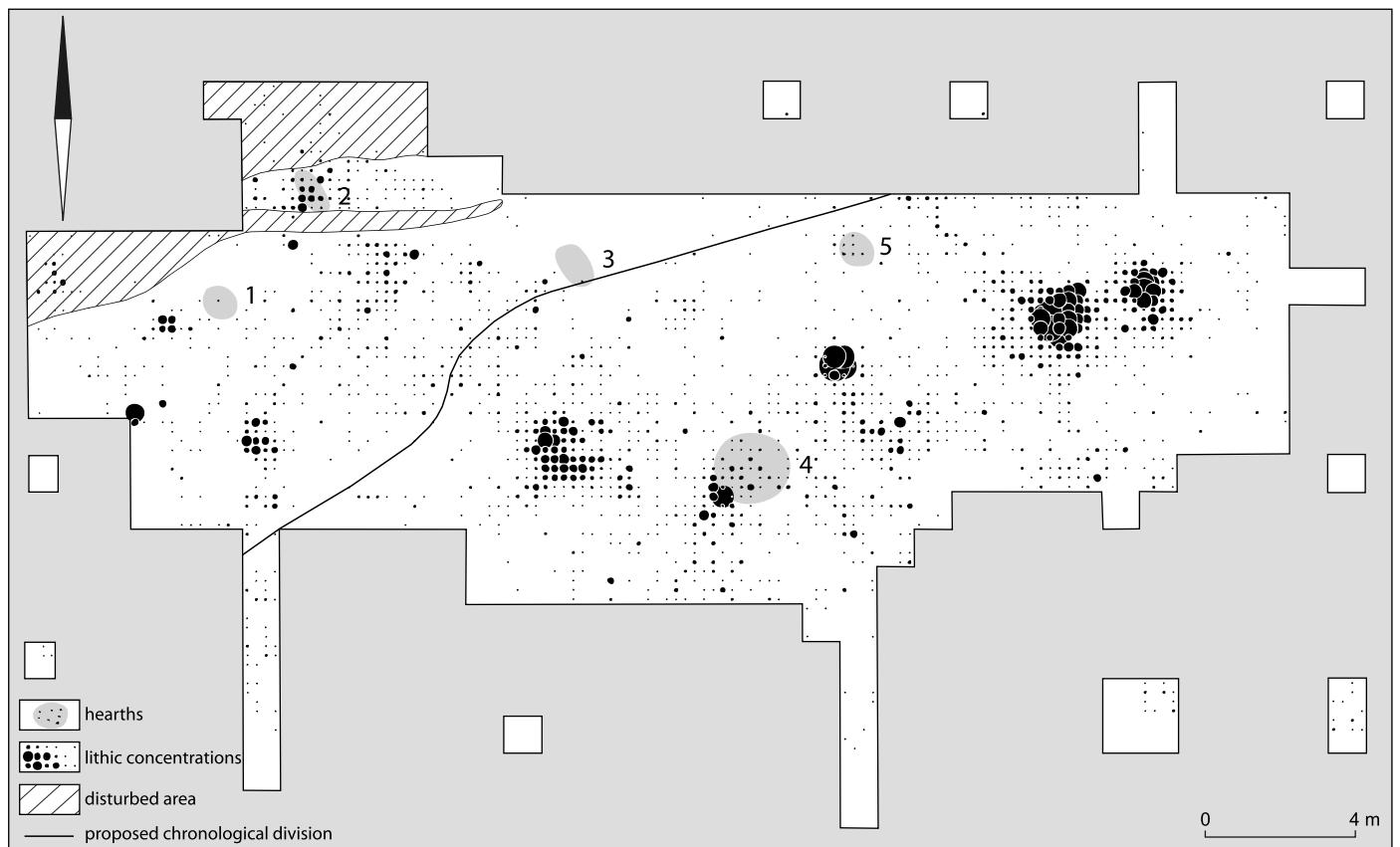
#### *Interpretation:*

The site can be considered a palimpsest of Early to Late Mesolithic activity within an extended area on the coversand ridge. Within the excavated palimpsest unassociated hearths and clusters of artefacts are located. Most of the clusters can be attributed to the Late Mesolithic (Verhart 2000, 76, 115). On the basis of the analysis of tools and debitage material, clusters 1 and 2 indicate the processing of flint (*ibid.* 116). This activity also took place in the clusters of the north-eastern part. The presence of other tools and typical point fragments point to a broader base of activities for these clusters (*ibid.* 122).

Since the overall composition of artefacts cannot be allocated to a specific use of the location and in regard of the aspect that because of the clustering one may speak of an acceptable level of coherence, the site may best be described as a base camp (*cf.* Verhart 2000, 135-137).

Fig. 56 Merselo-Haag. Excavated area with lithic distribution in undisturbed subsoil, hearths and general proposed subdivision in an Early and Late Mesolithic zone (Verhart 2000). Adapted from Verhart 2000, fig. 2.25, 2.26, 2.27 and 2.28.

Merselo-Haag



### *References:*

Lanting/Van der Plicht 1997/1998

Verhart 2000

Verhart/Groenendijk 2005

## **38. Nijmegen-‘t Klumke**

### *Location:*

Nijmegen-‘t Klumke is located in the eastern part of the Dutch central river district. The site is situated on a sand dune originally belonging to the Late Glacial river system. The elevation was located at the north-western end of a more massive and extended sandy ridge (Van den Broeke 2007<sup>b</sup>). Apart from Middle Neolithic features and finds attributed to the Hazendonk group, the site also yielded archaeological remains from the subsequent Vlaardingen group, the Iron Age, the Roman Age and the Early Middle Ages as well as sub-recent remains.

### *Site characteristics:*

In total nine trenches were excavated covering an area of *c.* 2900 m<sup>2</sup>. Since the excavation initially focused on the presence of a Roman cemetery the overall strategy had to be adjusted upon discovery of the Middle Neolithic remains. This entailed excavation in squares of 2 x 2 m in spits of 10 cm (trench 9). Furthermore features several botanical samples were taken (Van den Broeke 2007<sup>a</sup>, 9).

### *Geology/Pedology:*

During occupation the location was influenced by the Ressense stream system, although it is not clear whether new sediment was deposited on the site at that time. The Middle Neolithic material was found in these sandy deposits as well as in the layers silty and sandy layers 404 and the more clayey layer 403. The latter was also found on top of the dune. Both layers also yielded features (Van de Broeke 2007<sup>b</sup>, 15). At the south-western side of the ridge the oldest Middle Neolithic remains of the site were found in layer 405. It is not clear whether this reflects an incidental visit or already a formal occupation of the location. The super-positioned layer 501 contained an anvil stone within a lenticular deposit of charcoal, yielding the oldest date. The north-eastern slope yielded Middle Neolithic finds in layers 404 and 405. In general the site in the Middle Neolithic can be characterised as consisting of a relatively flat longitudinal elevation of *c.* 100 x 50 m surrounded by creeks and lower lying areas. Water was therefore present in the area. One of the creeks borders the site at the north-eastern slope.

Lithostratigraphic information indicates that the Middle Neolithic occupation evolved over a considerable span of time, although no actual distinction in chronology could be made (Van den Broeke 2007<sup>b</sup>, 16). This indicates the site was probably used over several centuries, most likely non-continuous (*ibid.*).

### *Taphonomy/Site-formation:*

The presence of active creeks and gullies and the deposition of sediment in parts of the site indicate erosive processes will have affected part of the find distribution. Furthermore subsequent periods of occupation have further distorted the information available for the Middle Neolithic (see Ball 2007, 25).

### *Ecology:*

During the Middle Neolithic the sand dune was located in an area characterised by creeks and swampy patches. Molluscs indicate the presence of both land and fresh water. During the Subboreal the site and surrounding area became inundated. For a long time open water was to be found on the north-western site of the ridge (Van den Broeke 2007<sup>b</sup>, 15). During the Middle Neolithic clay was deposited and later on a vegetation horizon developed. (Van den Broeke 2007<sup>b</sup>, 16). Upon arrival the Middle Neolithic inhabitants encountered a location covered with a fertile layer on top of which a dense deciduous forest would have grown. The rich surrounding environment would have provided an ample supply of game and fish, opportunities for agriculture and rich botanical sources. In time the relatively dry location became increasingly wet due to the development of the fluvial system of the Rhine.

### *Dating:*

One <sup>14</sup>C sample of hazelnut shells originated from one of the Middle Neolithic contexts. Furthermore a phalanx of a horse also dated to the Middle Neolithic. This date (Poz-15673) might be slightly too young due to a lack of collagen in the bone (Zeiler 2007). Two other dates on bone also turned out to be too young (see Van den Broeke (2007<sup>b</sup>, 18). The site should therefore be dated to 3770-3530 cal BC, based on the reliable date.

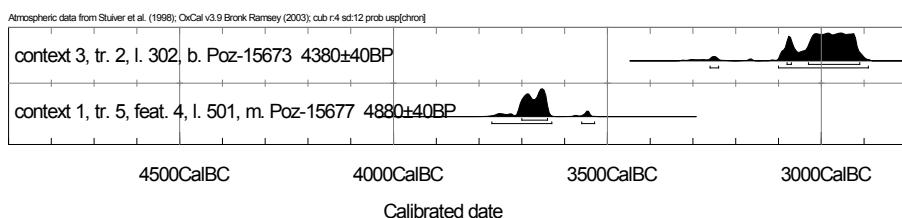


Fig. 57 Radiocarbon dates for Nijmegen-'t Klumke.

### *Features and spatial layout:*

In total only seven features could be attributed to the Middle Neolithic comprising of six pits and one posthole (Ball 2007). The features were located at the eastern and western slope of the sand ridge as well as on top. The pits are predominantly basin shaped and have a round outline with a diameter varying between 0.60-2 m. Three of the features (2 pits and 1 posthole) located on the eastern slope contained pottery which in the case of the posthole could be attributed to the Middle Neolithic. Two features on top of the sandy ridge as well as two located in trench 8 also yielded Middle Neolithic fragments of pottery. The western slope of the ridge yielded a concentration of several dozens of sherds (some decorated with spatula impressions and incisions or striations). This concentration may be a

remnant of an old surface. Pit 6 (8 cm deep) contained a concentration of faunal remains (N = 140, 138.9 gr.) The set of features is indicative of a Middle Neolithic settlement area. Their presence in different layers indicates a prolonged continuous or interspersed use of the location. The rather empty fill of most of the pits and the limited extent of the excavations hamper a functional interpretation of single features as well as their interrelatedness. Apart from the above-mentioned features the site also yielded a 16 m long row comprising five postholes (trench 4) as well as a concentration of broken stones (trench 7). Both are probably prehistoric but cannot be attributed to a specific phase.

#### *Finds:*

Most of the pottery was found on both slopes of the dune and can be attributed to the Middle Neolithic. Furthermore several features and layers with material from multiple periods yielded pottery. In total 186 sherds (including one complete vessel) from an undisputed Middle Neolithic context were used to describe the assemblage (Raemaekers 2007). Most sherds (97%) are tempered with quartz or with quartz and organic material (10%). Two sherds were tempered with organic material and two others with granite. H-joints are dominant with 83% while N-joints form the remainder (based on c. 26% of the sherd sample). Morphologically the assemblage consists of open, 'bucket-shaped' vessels, more closed barrel-shapes, beaker-shaped vessels with a distinct neck and S-shaped forms, all with flat bottoms. The surface-finish is predominantly smooth. Some 9% of the sherds were decorated on the wall of the vessel. Decoration techniques comprise finger and fingernail impressions (81%) as well as incised lines (19%). One rim fragment is decorated with spatula impressions. Most of the pots were fired in a reducing environment. There might be some chronological variation in the assemblage of 260 studied sherds and pottery group 2 (12 sherds found in two features) deviates from the main group with respect to wall thickness (thinner) and the presence of N/Z-joints. Furthermore 39 out of 78 pieces of burnt loam originated from Middle Neolithic layers.

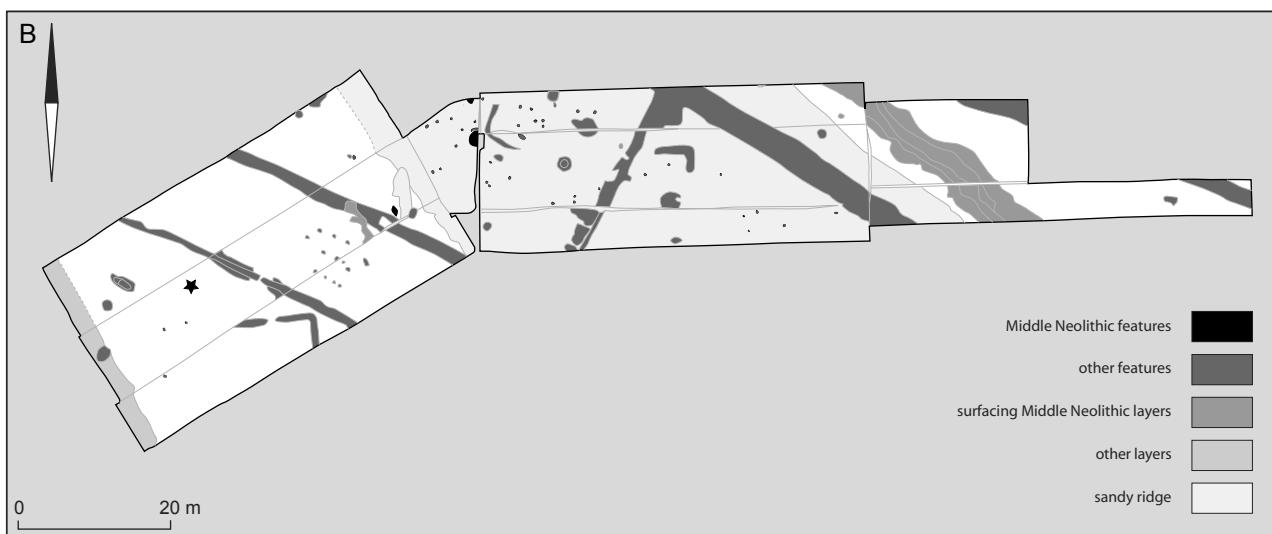
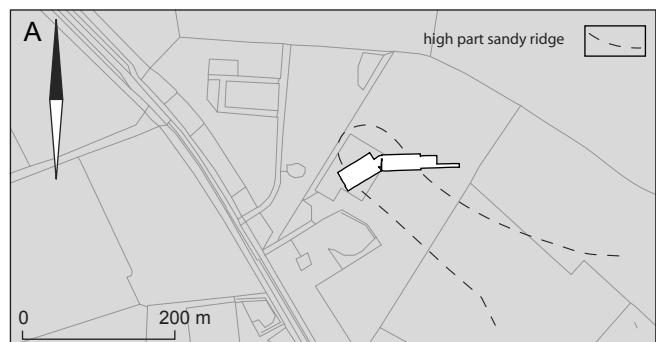
In total 321 pieces of flint were analysed as well as some microdebitage. Point types indicate activity during the whole of the Middle Neolithic and the Early Bronze Age. Most flint is of a local origin and can be collected in river gravel and former glacial sediments. Several pieces may have an eluvial origin, while one shows a *Bergfrische* cortex (Verhart 2007). The fluvial and glacial sediments contain both flint of a northern and southern origin. The flakes of polished axes and the flint out of primary context are clearly of a southern origin (e.g. Rijckholt and Simpelveld). Most pieces have thus been fabricated locally on flint of a minor quality, while a few elements have been imported. The local industry is characterised by flake debitage and hard percussion. Trench nine yielded 15 pieces of microdebitage. In total 43 pieces (12.4%) of the lithic material was burnt. Macroscopically identified traces of uses indicate a short and ad hoc use of tools. Typologically 32 tools were identified including the afore-mentioned points (N=5), a pointed MK-blade as part of a fire-toolkit, flake scrapers (N=10), blade scrapers (N=3), retouched flakes (N=10) and blades (N=3) as well as six fragments of polished axes. Most of the lithic remains originate from palimpsest contexts, two of which however can entirely be attributed to the Middle Neolithic. On the basis of the lithic analysis, part of the occupation at 't Klumke may be attributed to the Hazendonk group.

The site also yielded 799 pieces of natural stone, 44 of which with anthropological features (Kars 2007). All pieces were collected locally from the river gravels and comprised *e.g.* sandstone, quartzite, quartz, basalt, and jasper. The Middle Neolithic component was predominantly used for working stone (flint) and additionally for general hammer, grinding and other purposes.

The faunal remains (Zeiler 2007) that could be attributed to the various periods yielded 1385 pieces that dated to the Middle Neolithic, derived from three different contexts (one older and one slightly younger). All the material has been analysed together. Cattle and pig/wild boar dominate the spectrum (42.9% and 44.7% respectively). Unfortunately only one element could be attributed to the domestic pig. Furthermore horse and red deer were identified (3.6% and 8.9% respectively). The cattle seem only to have been slaughtered at the end of their first year or later. Furthermore two pieces of deer antler were found as well as five burnt fish remains (some of which were identified as belonging to *Cyprinidae*). The absence of bird remains can largely be attributed to the taphonomical conditions and the excavation strategy. Overall the remains indicate an economy largely based on domestic animals as well as hunting and fishing. The shed antlers positively indicate a presence at the site between February and April. The site also yielded 12 human skull remains attributable to an adult individual. They might date to the end of the Middle Neolithic occupation.

Nijmegen-'t Klumke

Fig. 58 Nijmegen-'t Klumke.  
(A) Topographical plan of the excavation situation. (B) excavation plan with Middle Neolithic and other features and layers. Adapted from Ball/Van den Broeke 2007, fig. 1.1, 3.1 and 4.2.



Three archaeobotanical samples from two locations were analysed. The sparse and charred remains yielded charnels and glume bases of emmer (Einkorn wheat was ruled out), *Cerealia indet.*, remains of hazelnut shells, a possible part of a fruit of sloe and a seed of goosefoot. All remains seem to point to anthropogenic interference, mainly due to their charred state. All species might have grown locally. Although no evidence is available for this, the environment was suitable for agriculture. Molluscs confirm the presence of land and fresh water.

#### *Interpretation:*

The Middle Neolithic occupation of 't Klumke can be attributed to the Hazendonk group. Although the botanical remains do not allow any conclusion on local cultivation, the combination of the presence of cereals, domestic animals, human remains and investment in the form of features, indicate the site probably had a domestic function. The location was occupied for an extended period, although probably not continuously. Overall the site fits well within what is known until now from the Hazendonk group and forms a good addition to the current pattern of distribution.

#### *References:*

- Ball 2007 in: Ball/Van den Broeke 2007
- Kars 2007 in: Ball/Van den Broeke 2007
- Out 2007 in: Ball/Van den Broeke 2007
- Raemaekers 2007 in: Ball/Van den Broeke 2007
- Van den Broeke 2007<sup>a</sup> in: Ball/Van den Broeke 2007
- Van den Broeke 2007<sup>b</sup> in: Ball/Van den Broeke 2007
- Verhart 2007 in: Ball/Van den Broeke 2007
- Zeiler 2007 in: Ball/Van den Broeke 2007

## **39. Opglabbeek-Ruiterskuil**

#### *Location:*

The site is located on a slightly elevated dune, to the north of a local fen (Ruiterskuil), in the Belgian Kempen (Campine area). The dune (NE-SW) is the eastern part of a larger parabolic dune around its own deflation horizon (Vermeersch *et al.* 1974, 85).

#### *Site characteristics:*

In 1971 Leuven University excavated 134 m<sup>2</sup> of this site in three separate pits with in total 6 squares (B, C, G, H, M, N). The south-western section of the largest pit was severely disturbed. The site consists of two separate concentrations of artefacts and several clustered or dispersed concentrations of hearthstones.

### *Geology/Pedology:*

At the basis of the Late Glacial dune there are Meuse terrace gravels and sands. These are covered by the laminated dune sand. A podzol soil formed in the top of the dune of which only the B2h and B2ir remain. The A1 and A2 horizons were transformed to an Ap (mixed by ploughing). To the west of the dune is a 'deflation basin' with an impermeable horizon on which the local fen (*ven*) formed.

### *Taphonomy/Site-formation:*

Almost the entire A2 horizon has been destroyed as well as part of the B2. Square B was severely destroyed. There was no sterile layer between the Ap and the find horizon. The authors assume that the A2 did not contain many finds. The majority of the material is located at the base of the B2ir and within the B3 and C indicating a vertical dispersion of up to 15 cm (*ibid.* 88). Several sections indicated bioturbation.

### *Ecology:*

Pollen samples taken from under the clusters of hearthstones (G8/4N) are indicative of an Early or Mid-Atlantic forested environment (*ibid.* 99-100). Although the authors suspect infiltration of younger pollen, the Late Mesolithic character of the site is not in conflict with an Atlantic spectrum.

### *Dating:*

There was not enough charcoal for radiocarbon dating. TL dating failed. On the basis of the typological aspects of the find assemblage it can be dated to the Late Mesolithic (trapezes, Wommersom quartzite). There are some older elements such as a *feuille de gui* (*ibid.* fig.7). The authors make a point of placing the Late Mesolithic habitation before the Atlantic (*ibid.* 103). In view of subsequent excavations (e.g. Huyge/vermeersch 1982) this might have been a preliminary conclusion.

### *Features and spatial layout:*

As a result of the low number of finds, the overall horizontal distribution is rather clear (the sieve fraction also has not been depicted). In general one large concentration of artefacts is visible in squares G and H. This concentration consists of two denser areas or clusters of finds. Another concentration is visible in square M. Remarkable are two concentrations of burnt quartz and quartzite fragments. They indicate the presence of former hearths in square G. Their integrity as a feature indicates only a minor disturbance in these areas. Elsewhere in squares B, H, M and N more dispersed fragments of remnant hearths were found.

### *Finds:*

In total 2102 artefacts (flint and Wommersom quartzite) were found (about 75 % of the finds was found within the excavation), comprising tools, debitage material, cores etc. Most of the material derives from local Meuse gravels. Wommersom quartzite made up 9.5% of the artefact spectrum. No cores of Wommersom quartzite were found.

## Opglabbeek-Ruiterskuil

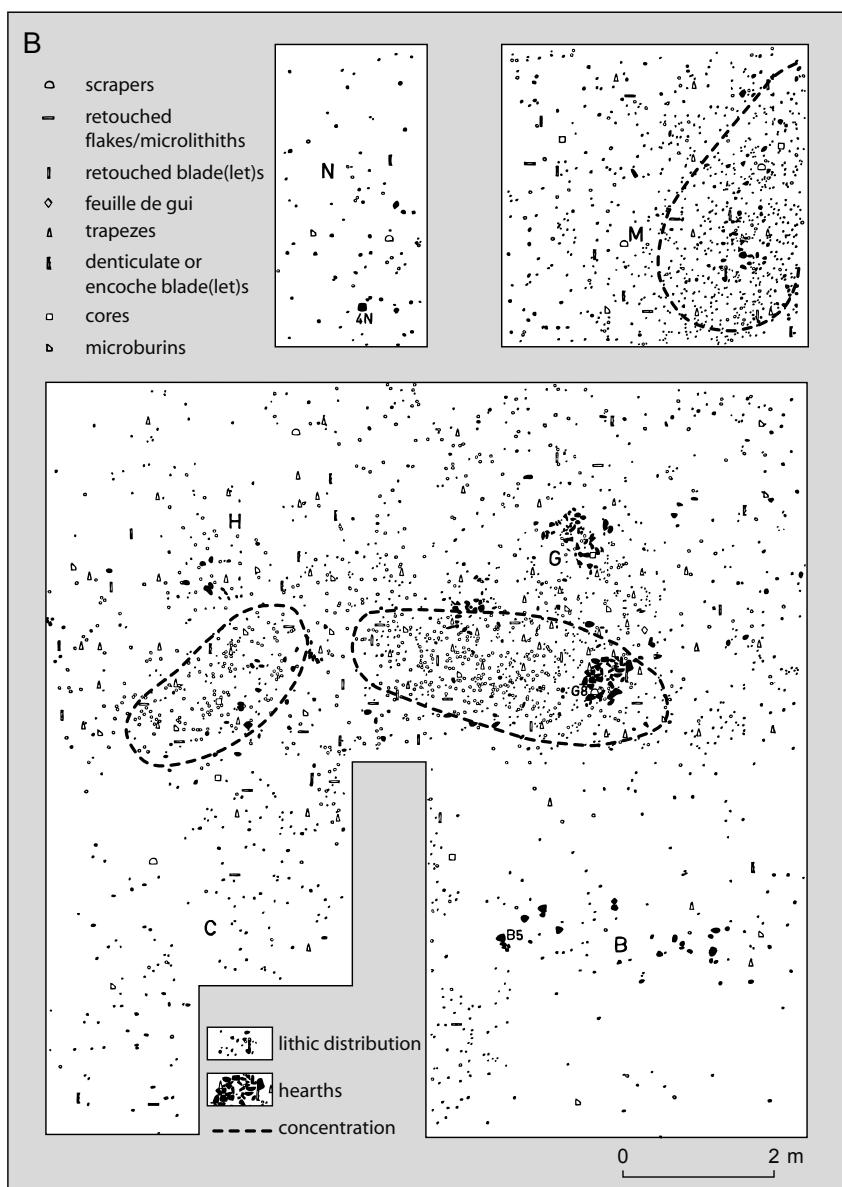
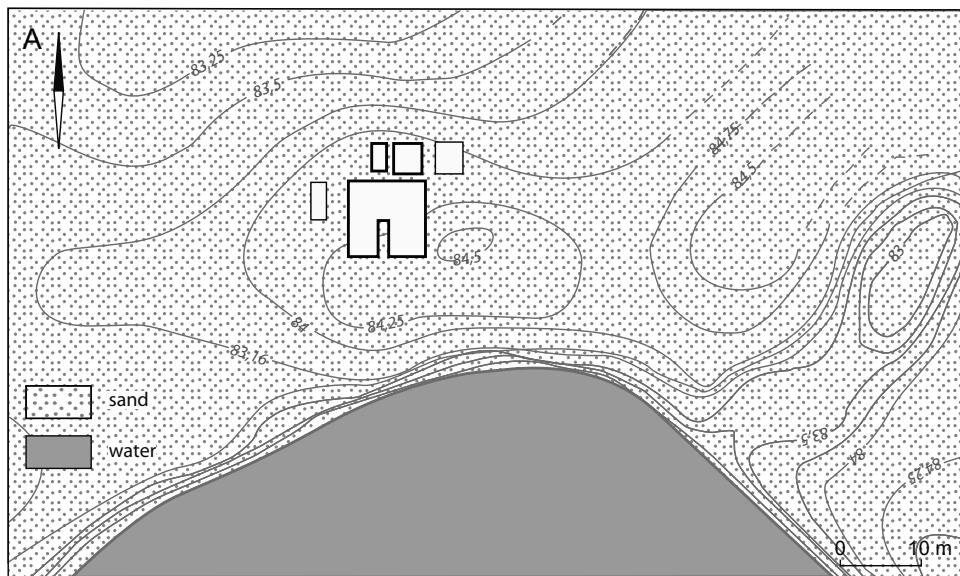


Fig. 59 Opglabbeek-Ruiterskuil. (A) geomorphological plan of the excavation situation. (B) excavation plan with lithic distribution and hearths. Adapted from Vermeersch et al. 1974, fig. 2 and 4.

About 120 larger fragments of burnt quartz and quartzite were located relating to multiple hearths, two of which still were structured. They were collected from the local Meuse-deposits. A rather large piece of stone was used as percuteur/polissoir. Five stones of *Prunus avium* (*ibid.* 98) are sub-recent (pers. comm. C.C. Bakels 2005).

#### *Interpretation:*

The site can be considered a palimpsest of repeated Late Mesolithic visits to the dune, which probably harbours more concentrations (*cf. ibid.* 103). Evidence for this was recently found by extensive auguring campaigns (Van Gils/De Bie 2006<sup>b</sup>, 23). The site extent of Opglabbeek-Ruiterskuil is estimated at least 20,000 m<sup>2</sup>. During these visits one or more hearths were constructed and flint was knapped. The many microburins attest to the fabrication of microliths. Opglabbeek-Ruiterskuil can be considered a rather clean assemblage of several Late Mesolithic visits of short duration, despite its palimpsest character.

#### *References:*

Van Gils/De Bie 2006<sup>b</sup>  
Vermeersch *et al.* 1974

## **40. Oudenaarde-Donk**

#### *Location:*

The site was located on a sand ridge belonging to a Pleistocene point-bar system of the Scheldt River in the Middle Scheldt Basin (Belgium). During occupation the area became increasingly wet before being covered up with peat and clay in protohistoric and Roman times (Parent *et al.* 1987<sup>a</sup>, 7-8).

#### *Site characteristics:*

The site was excavated during four campaigns between 1984 and 1987. During this time four Mesolithic and seven Neolithic concentrations were investigated by the NDO (*Nationale Dienst voor Opgravingen*) and VOBOV (*Verbond voor Oudheidkundig Bodemonderzoek van Oost-Vlaanderen*) (*ibid.*; Parent *et al.* 1987<sup>b</sup>). Due to time restrictions and severely difficult excavation circumstances only two sites (Meso 2 and NEO 1) were excavated properly. The total extent of the area is unknown, but recently new sites have been found in the vicinity dating to the same period (Ameels *et al.*, 2003)

#### *Geology/Pedology:*

The site is located between two Late Glacial depressions (probably of the Scheldt). In between these there is an area of interspersed 1.5 m high ridges belonging to a fossil point bar system of the Scheldt. Due to the rising groundwater table in the Holocene the depressions were gradually filled. During the Neolithic the landscape consisted of dry and sandy ridges of up to 10 m wide and humid lows. One of these (depression B) might have contained the actual stream of the Scheldt and most sites were located on this channel (Parent *et al.* 1987<sup>a</sup>, 7-9). From the Late Bronze Age onwards the site was covered with peat and later clay.

### Taphonomy:

The site has been severely disturbed prior and during excavation due to the ongoing sand reclamation and the fluctuating water table. This has seriously affected the interpretation of the site (*ibid.* 3). Since the site was first covered in the Late Bronze Age, the sand ridges may be considered palimpsests.

### Ecology:

Palynological information from the fossil channel indicates a classic vegetation pattern spanning the period between the Younger Dryas and the beginning of the Subboreal. The Atlantic and Subboreal part of the sequence indicated a forest consisting of oak (*Quercus*), hazel (*Fraxinus*), lime (*Tilia*) and elm (*Ulmus*). In the wetter parts alder (*Alnus*) replaced willow (*Salix*). The palynological research within archaeological context is indicative for the Sub-Boreal and the Sub-Atlantic. Pollen of Poaceae and several herbs (*Plantago*; *Rumex*) are indicative of anthropogenic activity and open places. Twice pollen of Cerealia show up. The first instance is only slight and dates to the first part of the Sub-Boreal (*post* 3800 cal BC). The second more pronounced instance is accompanied by a high amount of ruderal pollen and dates to the second part of the Sub-Boreal (*post* 2300 cal BC). Macrobotanical remains indicate a wet, riparian environment as well as more ruderal vegetation. Remains of some edible plants as well as hazelnut shell fragments were found (*ibid.* 10-13; De Ceunynck *et al.* 1985).

### Dating:

The different concentrations dated between the Early Mesolithic and the Late Neolithic. (MESO 1, 2 and 3: Late Mesolithic, MESO 2: Early Mesolithic, NEO 1: Middle and Late Neolithic, NEO 5: Late Neolithic, NEO 3, 4, 6, 7: Neolithic unknown). Only two sites (NEO 1 and NEO 5) were dated by <sup>14</sup>C. Except for IRPA 745 all NEO 1 dates came from the same feature. The combined probabilities of both dates obtained on charred food residue on sherds dates between 4050 and 3970 cal BC (Vanmontfort 2004, 175). This clearly points to a Middle Neolithic occupation for Oudenaarde NEO 1, with at least two distinguishable

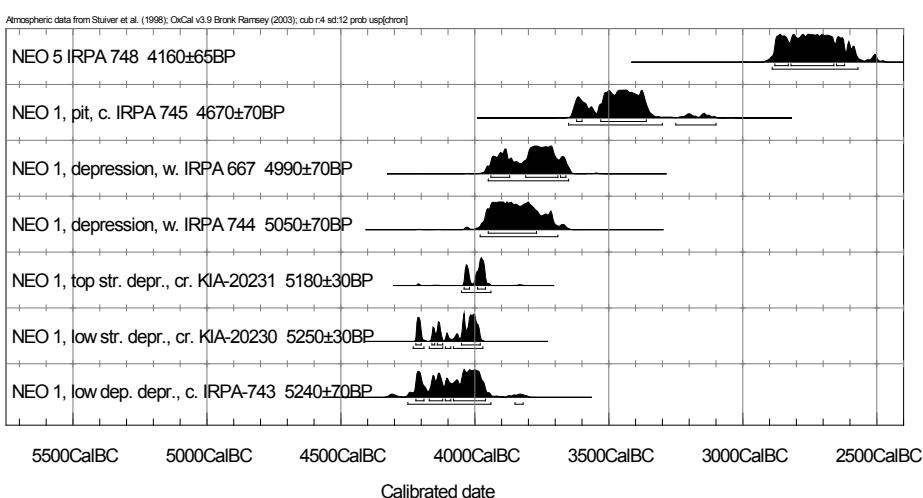


Fig. 60 Radiocarbon dates for Oudenaarde-Donk.

episodes. IRPA 745 indicates a later occupation dating between the Middle- and Late Neolithic. IRPA 748 indicates that at NEO 5 there also was Late Neolithic activity, which is confirmed by the sherds found there (a collared flask probably indicative of a Vlaardingen association, Parent *et al.* 1987<sup>a</sup>, 37).

#### *Features/Spatial layout:*

The site MESO 1 comprised a concentration measuring 13 x 5 m on the bank of the former Scheldt (*ibid.* 13). Vague features of powdery charcoal in combination with burnt bone might be indicative for hearths (*ibid.* 16). The site of NEO 1 measured 50 x 30 m and was ovaloid in shape. It contained a large depression or ditch measuring 16 x 10 m and up to 2 m deep. Both the function and anthropogenic nature of this feature are unsure (Parent *et al.* 1987<sup>a</sup>; Vanmontfort 2004). The feature was filled with a clayey matrix comprising many artefacts. This matrix was covered by tree-trunks and branches and a subsequent layer with finds (*cf. supra*). In the top layer of the ditch a row of vertical stakes and branches was found. It is unclear if this dates to the Middle Neolithic occupation. In the lower eastern part of the site two pits were uncovered as well as a zone with evidence of trampling (probably of cattle). Another trampling zone of cattle was discovered at NEO 5 (Parent *et al.* 1987<sup>a</sup>, 15, 36).

#### *Finds:*

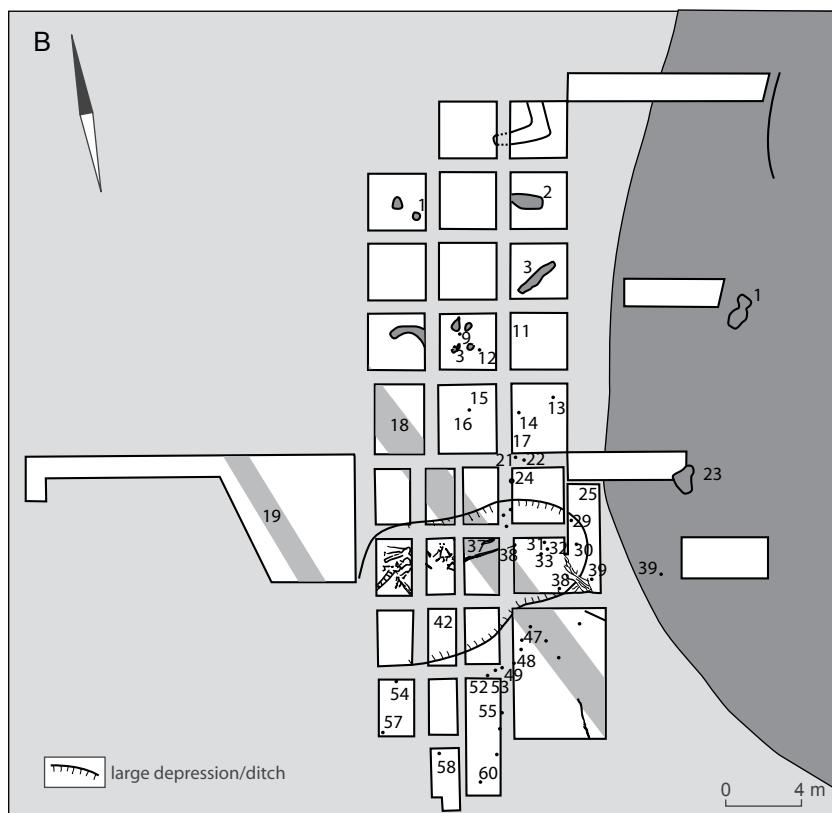
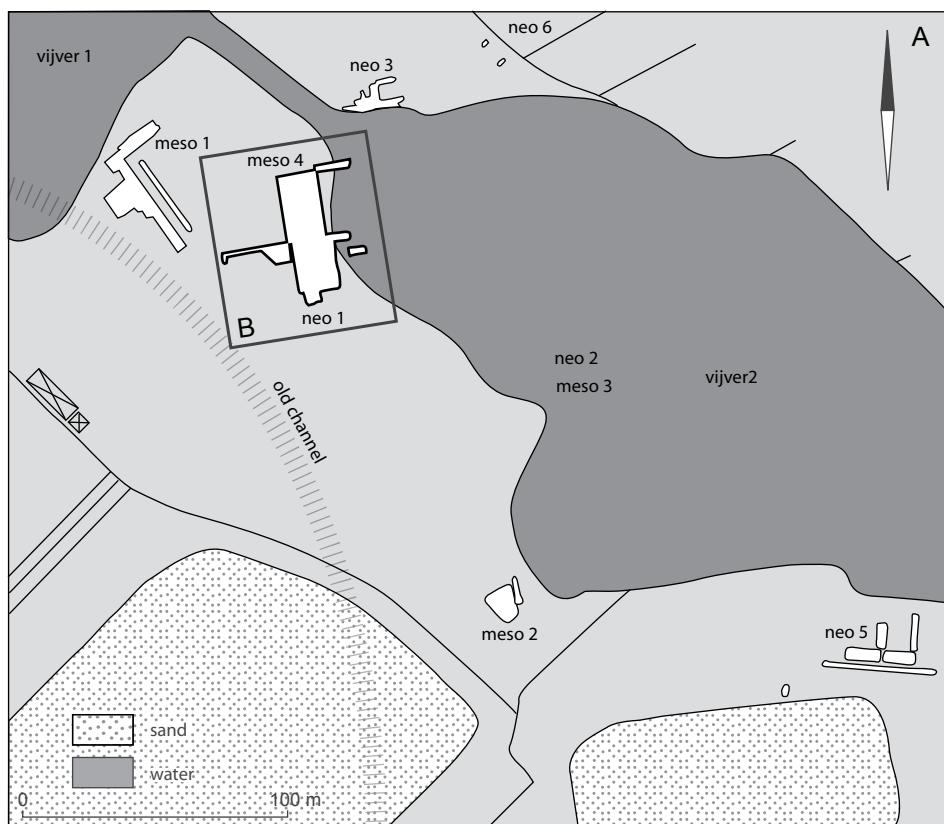
The Late Mesolithic site comprised of a toolkit in Montbani style. An abundance of trapezes and a lack of scrapers characterize the tool spectrum. Most of the flint is probably of local rolled material. Wommersom quartzite was also used. Burnt pieces of bone and the base of a shed deer antler were found (Parent *et al.* 1987<sup>a</sup>, 16). (Meso 2 also yielded trapezes, but has generally been dated to the Early Mesolithic (*ibid.*)).

The lithic assemblage of the Neolithic site (NEO 1) is characterised by a large variety in raw material. There is evidence of both a local tradition (expedient technology, irregular cores, unmodified flakes) as well as imports (blades, polished axes and fragments) of undetermined origin. The toolkit also includes, scrapers, borers, retouched and pointed blades and arrowheads.

The pottery assemblage of NEO 1 (depression: 6489 g) comprises of four different fabric groups. Interpretation is hampered by the lack of pot profiles. Only one of the fabric groups is similar to local MK assemblages. All sherds can however be interpreted as Middle Neolithic (Vanmontfort 2004, 148). Distinctly older pottery was found west of NEO 1 in association with a Mesolithic flint cluster. Initially interpreted as of Epi-Rössen origin (Parent *et al.* 1987<sup>a</sup>, 19), the vessel currently is interpreted as LBK (Vanmontfort 2004, 145) or Blicquy (pers. comm. Hauzeur, 2005). NEO 5 yielded pottery with everted perforated rims as well as a collared flask, possibly indicative of the Vlaardingen culture. (Parent *et al.* 1987<sup>a</sup>, 37).

The Middle Neolithic site yielded many tools of antler and bone. They were produced on the site and include axes, mattocks, needles and beads (*ibid.* 19-27). The Middle Neolithic faunal assemblage was excavated in three different contexts; the older and younger part of the ditch and the eastern down slope part of the site. The lowermost assemblage of the ditch comprised of a broad spectrum of wild fauna (39%) (deer, aurochs, horse, wild cat, beaver, otter, pine marten,

## Oudenaarde-Donk



*Fig. 61 Oudenaarde-Donk.*  
*(A) geomorphological plan of the excavation situation with the Mesolithic and Neolithic sites. (B) Excavation plan of the site NEO 1 with the general artificial depression containing Neolithic finds.*  
*Adapted from Parent et al. 1987<sup>a</sup>, fig. 1, 6 and 12.*

polecat, wild boar, roe deer) as well as evidence for fishing and fowling. Cattle, ovicaprids and especially pigs made up the domestic assemblage (*ibid.* 27-29). Because of the difficult morphological distinction between pig and wild boar, the actual percentage of wild fauna may exceed 50% (*cf.* Vanmontfort 2004, 151). Various fragments of human bone belonging to at least three individuals were also found (Parent *et al.* 1987<sup>a</sup>, 31).

#### *Interpretation:*

The location of Oudenaarde-Donk was a favourable settlement location from the Mesolithic to the Late Neolithic. Due to a combination of site-formative processes and recurrent use, the site has become an extensive palimpsest. Two locations have been more informative. The specific toolkit and the use-wear analysis of MESO 1 indicate this site may be interpreted as a short-term hunting camp with evidence for re-tooling, working of bone and butchery activities (Blanquert 1987, 12). The shed antler may be indicative of a presence in late winter. The Middle Neolithic assemblage of NEO 1 points to a more substantial habitation of the site. Activities include extensive digging, hunting, fishing, fowling and herding. The presence of small fry (*Siluris glanis*), specific bird species (*Anser anser*; *Anas platyrhynchos*) and shot and shed antler in the bone assemblage argue slightly in favour of a presence in winter and spring. There are no convincing indicators of summer or autumn (Vanmontfort 2004, 151-152). The deviant fabric groups of the pottery may indicate a more local tradition. Because of the above-mentioned arguments the Middle Neolithic site cannot be considered a special activity site or satellite site from the upland (*cf.* Vanmontfort 2004, *contra* Parent *et al.* 1987<sup>a</sup>). The site's limited size, and the scarce quantity of features, point to a non-permanent occupation by a small group of people.

#### *References:*

- Ameels *et al.* 2003
- Blanquaert 1987
- De Ceunynck *et al.* 1985
- Parent *et al.* 1987<sup>a</sup>
- Parent *et al.* 1987<sup>b</sup>
- Vanmontfort 2004

## **41. Schipluiden-Noordhoorn**

#### *Location:*

The Middle Neolithic site of Schipluiden-Noordhoorn was located on a low and small (0.5 ha) NE-SW oriented dune in the Delfland region (Province of South Holland). The dune was situated in the coastal area and was formed in an estuarine situation. During occupation clay sedimentation and peat formation continued resulting in a clear stratigraphy and cover up (Mol *et al.* 2006, 19; Mol 2006). Presently the site can be considered one of the most complete and informative Middle Neolithic settlements, yielding evidence for occupation between 3630 and 3380 cal BC.

### *Site characteristics:*

The site was discovered due to the construction of a new wastewater treatment plant by the waterboard of the Delfland region. The presence of Neolithic sites in the area was not clear, but an augering campaign by RAAP in 2001 indicated the presence of a low dune as well as archaeological remains in the form of flint, pottery, charcoal, bone and grains of emmer. After additional research and radiocarbon dating the Neolithic date of the site and its importance were established. Subsequent excavation of the site by Archol BV and the Faculty of Archaeology of Leiden University took place from June to September 2003.

Approximately 5500 m<sup>2</sup> was excavated in 31 trenches. In total 27 trenches were excavated in squares and spits of 1 x 1 x 0.1 m respecting the internal stratigraphy. Since the trenches were 6 m wide relevant sections could be found within 3 m. The site was excavated by trowel and shovel. From each trips 1 m strips were sieved using a mesh of 4 mm. Special faunal and botanical samples also provided for smaller fractions. After removal of the find layer all features were measured in 3D and sectioned. Furthermore specialist research took place, *e.g.* diatoms, molluscs, roots and tubers, scarred residues, insects etc.

### *Geology/Pedology:*

The Schipluiden dune was formed in an estuarine environment where deposition of clay and peat continued during occupation. Both a detailed stratigraphy of the NW and SE sections was established. Especially during occupation dissimilarities in deposition have been recorded on both sides of the dune. Most archaeological finds were stratigraphically found *in situ*. Three phases were distinguished in the site's occupation (Mol *et al.* 2006). In *Stage A* deposition prior to occupation was recorded. Comprising units 40, 26 and 25 (clay and sand) this stage gradually evolves from dry to wet conditions. A podzol formed in the sand of unit 25 forming the subsoil of the settlement. Geomorphologically unit 25 is a low dune, most probably wind blown. *Stage B* comprises deposition and formation during occupation (units 30 to 10). The landscape changes from an open tide dominated area to a closed overgrown reed marsh, with declining estuarine influence. Stage B is subdivided in occupation phases 1, 2 and 3.

### *Occupation phase 1*

In this phase different sedimentation facies were deposited on either side of the dune (19S, 19E and 19N), representing different conditions. The first stratified artefacts were found in the basal part of unit 19S. These artefacts represent occupation phase 1. The above 25 cm of 19S were archaeologically sterile. The finds were deposited during the active stage of clay sedimentation, probably in an environment of a higher tidal flat (*ibid.* 24). As a result of trampling activities the top of 19S would become the anthropogenic unit 18. At the north-eastern end of the dune the clay is interspersed by sand indicative of Aeolian deposition on top of a tidal flat (19E). After this deposition continued (Unit 18). In contrast conditions on the north-western side differed between the formation of units 26 and 10/11. Very humic clay was deposited (19N) that might have been caused by groundwater seepage from the dune and/or anthropogenic activity in the form of

the digging of wells. The unit 19N is probably separated by hiatuses. Subunit 30 was formed by the trampling of part of 19N. This probably also formed the start of the formation of the occupation layer on top of the dune.

### *Occupation phase 2*

The base of this phase is formed by Unit 18 (*cf. supra*) and its uphill humic part 17. The finds in these layers belong to occupation phase 2 and were separated by 25 cm of clay (19S). The hiatus visible in units 18 and 19 is interpreted by the authors as a widespread hiatus in archaeological deposition. Due to trampling artefacts found in layers 19N and 30 may either belong to phase 1 or 2.

After the deposition of clay (Units 18 and 19) the environment was covered by vegetation while peat formation started. The dune was now surrounded by a reed marsh. The top of the dune and its podzolic horizon were transformed into an occupation layer by trampling (unit 20). This trampling and colluviation layer also extended on the slopes (unit 15) and interspersed with units 17, 18 and 19N as well as the peat cover (10 and 11). The dark appearance of units 15 and 20 can be explained as resulting from the combination of plant remains and charcoal dust as the result of the removal of vegetation, trampling, wind erosion and slope wash. This of course disturbed the archaeological patterning. Units 15 and 16 mainly comprise archaeological remains from phase 2, while unit 20 comprises both remains from occupation phases 1 and 2 and in its central part phase 3.

### *Occupation phase 3*

Following earlier colluviation peat growth continued. Sandy peat covered the slopes of the dune (the origin of the sand is attributable to a combination of colluviation, Aeolian action and disturbance of the vegetation) and contained artefacts. Peat without sand was found further away from the dune (Unit 10) and contained fewer artefacts. The wider landscape was characterised by peat growth.

The covering stage C comprises of three deposits (Units 2, 1 and 0). The dune was abandoned and this was followed by the deposition of a thin layer of clay (Unit 2) on top of the surrounding peat. The deposition of this layer was unfortunately preceded by a phase of erosion. The covering clay probably developed in a salt-marsh environment followed by a reed swamp whose deposits (Unit 1) covered the dune completely (Unit 2 as well as the sandy peat of Unit 11 and the occupation layer of Unit 20). Often it was difficult to distinguish between Units 11 and 1. Since Unit 11 contained artefacts it was decided that its upper limit was confined to -3.4 m. Sandy deposits containing artefacts above this elevation were considered as part of Unit 20. This unit also suffered from bioturbation. Therefore a clear distinction between Unit 11 and 20 was not always possible.

After deposition the pre-Roman Gantel system eroded most of Unit 1 and replaced it by clastic sediments (Unit 0) of saline or freshwater aquatic origin.

### *Taphonomy:*

Taphonomically the site has suffered from several site formative processes leading to a secondary distribution of finds as well as intermixing of archaeological remains from various occupation phases. The main agents responsible for this were trampling (of both humans and animals) and subsequent colluviation. These activities destroyed for example the upper 30 cm of the features (Hamburg/Louwe

Kooijmans 200, 39). Colluvial layers are found both on top and on the slopes of the dune. Bioturbation in the form of root action and faunal turbation is also responsible for disturbance. Furthermore parts of layers as well as a substantial part of the top were eroded. Remains from all periods were found mixed in the occupation layer and in colluvial deposits on top and on the slopes.

Spatial analysis of the finds (Wansleeben/Louwe Kooijmans 2006) yielded further evidence for post-depositional disturbance. For example a zone on the top of the dune could be defined where the entire occupation level had disappeared due to erosion which also destroyed original distribution patterns of the finds that remained on the dune (this erosion episode of the Gantel system however did not affect the lower lying feature level (Hamburg/Louwe Kooijmans 2006, 39). Surrounding this zone, another zone yielded evidence of disappearance of part of the occupation level resulting in lower find densities. Apart from this there is a zone where selective weathering and post-depositional processes were of influence as well as a colluviation zone at the foot of the dune intermixing washed-down remains and in situ remains (see Wansleeben/Louwe Kooijmans 2006, fig. 4.4 pp. 72 for a spatial distribution of these zones).

#### *Ecology:*

During the period of settlement the coastal regression had come to a recent hold. The coast was closed and seaward progression started including the formation of new beach ridges westward (the Voorburg-Rijswijk beach barrier developed between 4000-3550). The exact location of the coastline during occupation remains elusive, especially since it built outward. Behind this barrier a tidal lagoon was formed providing excellent circumstances for habitation. Schipluiden was located on an old inactive beach barrier on top of which dune formation had taken place. Due to the tidal inlets the surrounding area became a vast marsh with extensive peat formation (Holland peat), starting between 3640-3340 cal BC. The peat was subsequently covered by clay deposited during floods, in combination with erosion by the Gantel system (*cf. supra*).

During *occupation phase 1* the dune projected above the mean water level while clay was deposited around it. The area can be characterised as estuarine including brackish conditions and tidal influence (Mol 2006, 277). To the north and the south and west of the Schipluiden site two other elevations have been localised, the northernmost of which also contained evidence for activities. *Occupation phase 2a* started during a break in sedimentation. The higher parts in the landscape will have been covered with pioneer vegetation, while reed grew in the lower areas. While the elevations had decreased in size, the inactive salt marsh became suitable for agricultural activities. At the beginning of *occupation phase 2b* the environment changed drastically. A peat marsh covered the entire area and its swaggiest parts will have been unsuitable for agriculture. Only the tips of two dunes still projected around it. During *phase 3* peat growth as well as occupation continued. Only a small strip of 30 x 100 m remained exposed (Mol 2006). The surrounding landscape can be characterised as a large swamp with sedges, reed and stands of willow and alder. Possibly open pools or channels provided access to the site.

Conditions during occupation were often characterised by ingressions of salt water during high tides, followed by a return to freshwater conditions. Since the landscape also remained dry for extended periods it can be considered suitable for agriculture (De Wolf/Cleveringa 2006). Molluscs also indicate calm saline

to brackish condition during occupation (Kuijper 2006). Further environmental evidence was provided by pollen. These indicated that during the first phase of occupation salt marshes surrounded the dune. After a deposition hiatus salt marsh vegetation was replaced by active peat (reed peat followed by sedge peat). Furthermore the pollen indicated both an absence of bodies of open water near the dune as well as trees on top of it. Pollen from coprolites seem to confirm the treeless environment apart from some stands of alder (*Alnus*). The resolution of the pollen was too low to detect anthropogenic influence (Bakels 2006, 312).

Botanical macroremains provide another source of ecological information on the environment of the site. During the early *occupation phases (1 and 2a)* brackish conditions are confirmed by seeds of halophytic plants. There is also evidence for a creek adjacent to the dune. Other bodies of water must also have been brackish. Mud flats bordered the creek and the sea also regularly flooded the bordering salt marshes. High salt marsh vegetation grew closely to the settlement, which is very suitable for grazing and hay production (Kubiak-Martens 2006<sup>a</sup>, 319). The early occupation phases also yielded evidence for freshwater marsh vegetation and some species tolerating slightly brackish conditions. These might point to the presence of depressions of fresh water between the dunes or the lower, wet slopes of the dunes themselves. The presence of aquatic plants indicative of freshwater conditions also indicates bodies of fresh open water in the vicinity of the settlement. Botanical remains characteristic for alder carr vegetation and dating to *phase 1/2a* might have come from further away (*ibid.* 321). The seed assemblage from *phase 1 and 1/2a* also provides evidence for the presence of arable fields, places trodden by animals and man, places in the vicinity of houses and ruderal habitats. Some of these are typically Neolithic (*Chenopodium album*, *Brassica rapa*, *Galium aparine*, *Solanum nigrum*, *Persicaria maculosa*, *Fallopia convolvulus*, *Vicia hirsuta*) The presence of these species in charred condition in combination with charred cereal grain provides important evidence for their interpretation as arable weeds and thus for local cultivation (*ibid.*). Other weed species provide evidence for dung heaps and rubbish dumps. Species such as crab apple (*Malus sylvestris*) and sloe (*Prunus spinosa*) point to well-developed shrub vegetation nearby probably even on the local dune slopes. Other species include hazel (*Corylus avellana*), elder (*Sambucus nigra*), hawthorn (*Crataegus monogyna*) etc.

Botanical evidence from *phase 2b* indicates decreasing marine influence, although the presence of other species indicates salt marsh vegetation was still present either further away, or in a stage of desalination. At the end of the second phase of occupation a freshwater environment was established, including wet (fresh) grasslands. This may also have been caused by human activity in the area (e.g. pasturing cattle). Again arable weeds and ruderals are present in the charred seed assemblage and sloe forms the most dominant species among the shrubs (accompanied by crab apple, hazel and dogwood (*Cornus sanguinea*)). Seed remains of the enchanter's nightshade (*Circaeae lutetiana*) in one of the wells point to the presence woodlands or shady places on calcareous soil.

In *phase 3* there is a definite freshwater environment, including a freshwater marsh. All botanical evidence for brackish habitats was charred as well as remains of arable weeds (Kubiak-Martens 2006<sup>a</sup>). Overall the local environment lacks some important wood species that were commonly used in the Mesolithic and Neolithic. The inhabitants therefore had to opt for local species (Louwe Kooijmans/Kooijstra 2006, 250). These species grew in the afore-mentioned dune shrubs, which must

have been at some distance from the sea. Alder carr (*Alnetea glutinosa*) could have developed in the low areas, although this contrasts with the palynological evidence. Therefore they should probably be situated further east at the transition of the estuarine zone to the large Holland peat. All sources probably could be found within a few kilometres. In phase 3 the continues use of wood of dune shrubs in spite of the advancing peat points to the fact that sufficient dunes must still have projected high enough to provide this resource (Kooistra 2006, 373).

### Dating:

Radiocarbon samples were used for establishing an absolute chronology which was however troubled both by wiggles in the calibration curve between 5000 and 4500 BP and reservoir effect in charred food crusts and human bones (the latter samples differed therefore considerable from dates obtained on wood, charcoal and seeds). The problems with the calibration curve could partly be solved stratigraphically. The mixed diet however unfortunately prevented an adequate correction for the reservoir effect. These dates are not presented below. Furthermore the dates obtained in the prospection could not be linked to any of the occupation phases. They do however yield an appropriate time span, most likely including the phase of occupation. Because of their inaccuracy within the time of occupation they are

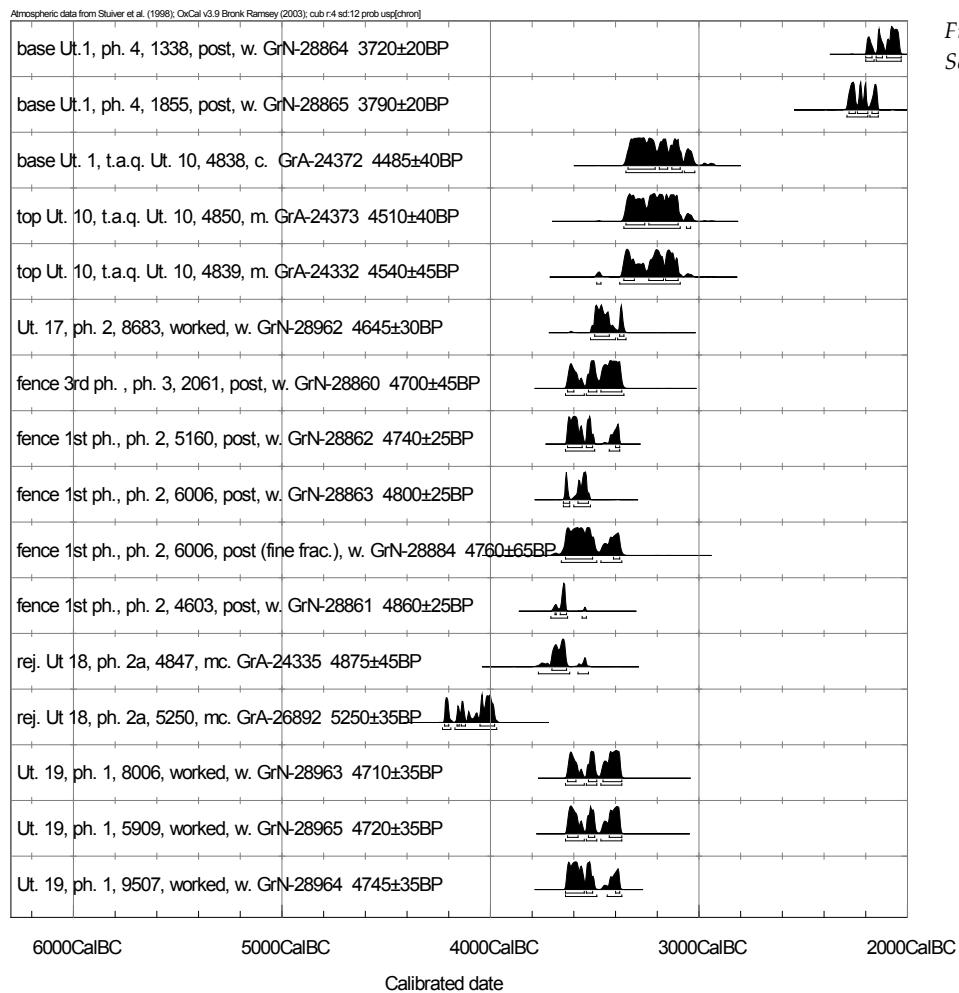


Fig. 62 Radiocarbon dates for Schipluiden-Noordhoorn.

Table 9 Occupation phases identified at Schipluiden-Noordhoorn.

phase	timespan	Units (brackets = mixed)
Occupation phase 1	3630-3550 cal BC	19S; 30; (19N); (20)
Occupation phase 2	3550-3490 cal BC	(20); (19N); 18(2a)/17(2b); (15/16)
Occupation phase 3	3490-3380 cal BC	(20?); 10/11

also left out below. Finally the excavators excluded two samples of charred cereals (340 and 4847) attributed to phase 2a since they deviated considerably from three wood samples dating to phase two. They were considered statistically unreliable for the executed sequence analysis. Since no clear reason could be given for the aberrant dates they have been included below, 340 forms a clear outlier.

The obtained dates were subsequently analysed sequentially allowing for assumptions regarding relative age differences to be included. On the basis of this analysis age constraints for the different phases were established. It should be noted that phase 1 might have started slightly earlier (prospecting dates) and the end date of 3380 should be regarded as a terminus ante quem (Mol *et al.* 2006, 35-36).

In this respect occupation of the dune lasted between 2 and 3 centuries. After disappearance of the dune, the location again was used in the Late Neolithic (between 2300 and 2050 cal BC) as was attested by wooden posts embedded in layers 1/2.

#### *Features/Spatial layout:*

In total 4609 anthropogenic features were excavated (2975 features were interpreted as natural disturbances). Due to taphonomic circumstances only features with a depth of 30 cm or more had been preserved. These were found on top of the dune as well as on the slopes (Units 19/18; 20; 25; 19N and 26). In the wetter peripheral zone of the dune the bases of some posts were preserved. The features were recorded and excavated in three levels (below the find horizon: B; 10 cm below B: C; and 30 cm below C: D) (Hamburg/Louwe Kooijmans 2006). Unfortunately only very few features could be attributed to one of the stratigraphic phases. Although some overlap between pits and postholes existed in diameter category 20-50 cm the following division could be made:

Of the large features the *pits* contained relatively few finds and were predominantly located on top of the dune as well as on the north-western slope. The *wells* were mostly grouped in a large concentration at the foot of the north-western side of the dune (a strip of 12 x 60 m). They date from all phases but most could, on the basis of their fill be ascribed to phases 1 and 2a (coinciding with the strongest marine influence). These morphologically wide-ranging pits were used for a short time (they collapsed shortly after they were dug) and might have served as a structural or occasional water supply (for example in the case of salt water flooding) by tapping into the freshwater reserve of the dune body. *Hearthpits* were found all over the dune, but especially clustered at the middle of the NW slope. Most of these pits date to phase 1 and 2. Two different types were identified, one comprising a thick layer of charcoal at the bottom, the other concentration in the fill. Such pits are predominantly known from Mesolithic sites and were probably used for various utilitarian functions. They often lie adjacent to domestic areas as was probably also the case in Schipluiden (Hamburg/Louwe Kooijmans 2006, 47-48). Six oval to subrectangular burial pits were found. Four of these were

clustered at the western end of the dune, the other two isolated on the top and the southeastern slope. Except for burial 3 probably dating to phase 3 and burial 5 dating to phase 1, the other pits could, more or less securely, be attributed to phase 2. Possibly in relation with the cemetery a deposition pit was located in which three skulls of cattle and a skull of a dog lay on top of a layer of non-carbonised fruits of sloe (*ibid.* 49; this may either relate to an ideological motivation or a storage technique, see Kubiak-Martens 2006<sup>a</sup>, 331). Apart from some isolated trenches (probably drainage ditches), the site also yielded a remarkable feature at the top of the dune. It consisted of a rounded enclosure measuring 3.5 x 6 m with an entrance in the eastern side. Although no posts were found in the trench several postholes, amongst which four large ones along the axis were located. These may have supported a ridge beam. The location of the structure and its dark fill suggest a date in the final occupation phase. Apart from these larger features many small stakes and postholes were found, some of which still contained wood. On the basis of (an analytical adaptation of the site map) (see Hamburg/Louwe Kooijmans 2006, 52-53), some clear alignments and parts of structures could be defined. Clear structures were found on the south-western, north-western and north-eastern part of the dune. Comprising 308 features (2-7 cm in diameter, paired at 5-25 cm, usually 70-80 cm apart) in total these were interpreted as parts of enclosing fences. The fences were erected at the edge of the surrounding swamp. A 50 m long fence enclosed the part of the site containing the wells. On the southern side a double and sometime triple fence stretches for almost 80 m. No clear entrances were recorded. The innermost fence dates to phase 3 while the outermost fences could be attributed to phase 2(b). Approximately 2000-2500 meters of round timber ( $\varnothing$  3-5 cm) was used, enclosing some 3000 m<sup>2</sup> (Hamburg/Louwe Kooijmans 2006, 57-58). The fence probably served to keep cattle out.

Most of the large postholes were found in a zone, measuring 120 x 20 to 5 m on top of the dune. Within this zone, four dense clusters of postholes (A, B, C/E, D) were identified as well as some minor clusters (E-K). The clusters, which might partly date from phase 1, probably mark the site of huts our houses whose groundplans cannot be identified due to current rebuilding. However several 7-12 m long rows with 3-5 relatively heavy posts were often identified. It is believed that the postholes of the wall posts were too light and have not been preserved (*ibid.* 62). The first occupants settled at the foot of the dune, but from phase 2a

small features	N
stake holes	475
stakes and stake holes of fences	293
post moulds	3086
postholes	180
postholes with postmoulds	82
postholes with poles	4
large features	N
pits	275
wells	148
deposition pits	1
hearthpits	56
graves	6
ditches, foundation trench	3

Table 10 Features identified at Schipluiden-Noordhoorn.

the inhabitants may have had to move their houses farther up the dune, due to the rising water level. There, approximately 5 contemporary houses existed for as much as 11 generations. Apart from the above-mentioned features some other rows of stakes were found, probably fences or small structures such as pens. After occupation ended some posthole clusters were defined in Units 1 and 2, dating to the Bell Beaker culture and probably part of a fishing station.

Apart from the features described above spatial information was also derived from the spatial distribution of artefacts. For flint, pottery and bone a moving average map was made filtering out the most pronounced concentrations indicating activity and deposition. A strong pattern resulting from this is a diachronic continuity of disposal areas on the south-eastern edge of the dune, correlating with clusters of occupation activity areas (A-D) on top of the dune. These areas overall decreased after phase 2a due to the gradual burial of the dune. Other patterns visible in the spatial distribution include an economic use of flint (it was rarely discarded). Pottery and bone seem to have been generally discarded in the swamp and specific butchering activities often took place on the steep NW-slope (Wansleeben/Louwe Kooijmans 2006).

### *Finds*

Schipoluiden yielded many finds and due to the wetland conditions organic remains were very well preserved. The main categories are shown below (after Wansleeben/Louwe Kooijmans 2006, table 4.3, pp. 84).

#### *Flint, stone and ornaments*

A representative sample 2666 flints was studied. Most of these originated from the dump zones at the foot of the dune, some may have been in primary position on top. Some 27.4% of the sample was burnt (less than at the contemporary site of Wateringen 4), but most artefacts (79.2%) were complete (Van Gijn *et al.* 2006). Most flint was made on rolled pebbles with a coastal origin. Some of these may have been collected as far away as Cap Blanc Nez in Northern France, but since a more local origin (estuarine gullies, pebbles from the Oude Rijn) was also possible and it was not in short supply, most of this flint is considered local. Some 5.2% of the material is of 'exotic' origin and may have been imported in the form of polished axes. This includes flint types such as Lightgrey Belgian, Obourg and possibly Spiennes or Rijckholt. Flake technology is predominant (often in a bipolar reduction sequence), especially for the pebbles, which also show evidence of decortification. Both hard- and soft hammer techniques were practised.

phase	Unit	flint (%)	pottery (%)	bone (%)
1	19S	6 (0.0)	639 (2.1)	632 (0.9)
1-2a	19N	71 (0.5)	625 (2.1)	2387 (3.2)
2a	17/28	723 (4.7)	9770 (32.6)	31697 (42.9)
2b	15/16	2021 (13.1)	5162 (17.2)	19335 (26.2)
3	11	4287 (27.8)	3752 (12.5)	6292 (8.5)
3	109	157 (1.0)	580 (1.9)	5132 (7.0)
1-3	20	8140 (52.8)	9429 (31.5)	8345 (11.3)
<b>Total</b>		<b>15405 (100)</b>	<b>29957 (100)</b>	<b>73819 (100)</b>

Table 11 Find counts for flint, pottery and bone per unit at Schipoluiden-Noordhoorn.

The tool spectrum includes triangular MK-like points which were fabricated locally, some pointed blades and other tools (less typical for Haz-3 occupation) such as burins, borers, scrapers, strike-a-lights and various retouched pieces (retouched flakes form 63% of the tool spectrum). In total 14 axes were found, but only one was complete.

Some 373 artefacts were examined for use traces and yielded evidence for activities such as wood working, plant processing, including evidence for sickles, fire-making, hide-working, bone working, shooting and working of mineral substances. Diachronically it seems that activities remained fairly stable (Van Gijn *et al.* 2006, 161). Overall the flint assemblage indicates the long-term presence of complete households as well as the importance of the long-distance exchange networks.

The stone assemblage displays a great variety in types (see Van Gijn/Houkes 2006, table 8.6, pp.184) and while small nodules may have been collected locally, most pieces must have originated from considerably farther from the gravel beds of the Rhine and Meuse, ice-pushed ridges, Southern Limburg and the Ardennes. Typologically a rich variety was documented comprising grinding stones (for shaping and maintaining axes), querns (seed processing), rubbing stones, hammer stones (for knapping), axes, retouchoirs, anvils, *Geröllkeule* etc. Burnt stones might indicate the presence of cooking and hearth stones, while crushed quartz and granite was used as tempering agent (Van Gijn/Houkes 2006).

Furthermore the site also yielded objects, beads and pendants of bone, jet (N=37) and amber (N=17). These were found by sieving and their original contribution must thus have been considerably larger. Both jet and amber could be collected on the nearby beaches and both (although to a lesser extent for amber) were manufactured at the site (Van Gijn 2006<sup>a</sup>). Two bone beads were buried as grave goods in a child's grave.

### *Pottery and daub*

The pottery on the site is typical for the Hazendonk group. It was made from locally available clay, coil-built with predominantly H-joints (and some N and Z-joints) bucket or barrel-shaped, decorated with fingertip or spatula impressions and fired in a slightly controlled open environment. Quartz, granite, shell, parts of plants and grog were used for temper. Quartz was most popular, followed by grit and shell. Usually one type of temper was used. No specific spatial patterns were available (except the already defined rubbish dumps). Some trends were observable. Between phase 1 there seems to be a gradual shift in the use of shell as tempering agent to quartz. Sherds from phase 2a are thinner than those from phase 1 and decoration is highest in phase 3. Remarkable is the fact that typologically Wateringen 4, Hazendonk and Schipluiden phase 3 coincide, while <sup>14</sup>C dates indicate the former two are contemporaneous with phase 1 and 2 (Raemaekers/Rooke 2006). Furthermore Schipluiden yielded 22 fragments of daub.

### *Human remains*

The human remains comprise seven individuals buried in six graves as well as 36 isolated bones, representing a minimum of at least eight other individuals. (Table adapted from Smits/Louwe Kooijmans 2006, tables 5.1 and 5.2, pp.92-93).

individual/grave	phase	sex	age	posture	pathology	grave gifts
1/1	2	male	38-45	stretched	+	
2/1	2	male	59-65	stretched	+/trauma	
3/2	2	male	46-49	str.flexed	+	3 strike-a-lights/1 pyrite
4/3	3	male	41-50	str.flexed	+	
5/4	2	male	25-40	str.flexed		
6/5	1-2a	unknown	8	str.flexed		
7/6	2	unknown	2	flexed		2 bone rings
isolated	2a/2b/3	male/female?	0 to 60			

Table 12 Individuals identified per grave and for the category 'isolated' at Schipluiden-Noordhoorn.

As can be seen in the table, men women and children were present on the site. It could only be positively confirmed that men and children were buried and the large number of loose remains indicates burial was not common for all deceased. Most individuals were interred in a small cemetery on the SW part of the dune dating to phase 2 and 3. Pathological evidence indicates a healthy and strong group which however witnessed hard labour as well as violence. Stable isotope analysis of carbon and nitrogen as well as dental data indicate a diet that contained a considerable quantity of freshwater fish. The  $^{87}\text{Sr}/^{86}\text{Sr}$  isotope analysis of soil and both domestic and wild animals as well as Pb, Sr and O isotope analysis of human tooth enamel confirmed this. Isolated teeth from two individuals may indicate the presence of immigrants. The divergence of the aquatic signal from the terrestrial character of the faunal remains may be explained due to taphonomic conditions affecting the survival of fish remains (Smits/Louwe Kooijmans 2006, 104). With respect to burial tradition it may be remarked that the individuals were probably buried during occupation. Only few individuals were interred and this is tentatively correlated to one of the farmyards (Smits/Louwe Kooijmans 2006, 104). This seems rather hypothetic since there is no evidence for the absence of communal space in this area. Overall a flexed position and a W-E orientation seem dominant. This tradition and the presence of strike-a-light in one grave form Neolithic elements in a predominantly Mesolithic burial tradition.

#### Faunal remains, fish and tools of bone and antler

The faunal spectrum comprises both wild and domestic species. The main emphasis was on stock farming as cattle (*Bos taurus*) contribute most to the faunal spectrum. This remains the case throughout the entire period of settlement, although the proportion decreased with time (Zeiler 2006<sup>a</sup>). Apart from the dog (*Canis familiaris*) pigs (*Sus domesticus*) formed the other component of domestic animals. The wild component is formed by ungulates such as aurochs (*Bos primigenius*), roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*) and wild boar (*Sus scrofa*). The latter two formed the main objective of hunting expeditions. Other wild species mainly include beaver (*Castor fiber*) and otter (*Lutra lutra*). Species such as for example marten (*Martes sp.*), brown bear (*Ursus arctos*) and lynx (*Lynx lynx*) occasionally ended up on the site. Sea mammals such as the common seal (*Phoca vitulina*) the grey seal (*Halichoerus grypus*), the bottle-nosed dolphin (*Tursiops truncates*) and whales (Cetaceae) also occasionally formed part of the diet. The faunal remains (especially shed/shot antler, fur animals, marine mammals and ages of kills of pig/wild boar and cattle) also yielded evidence for seasonality. Taken together they indicate human presence in all seasons, which in combination with

other evidence, confirms a permanent occupation of Schipluiden. Furthermore the variety of species indicate that many ecozones were used, comprising the coastal and estuarine area, the salt marshes, the freshwater peat swamps and perhaps more distant areas such as river valleys (see Zeiler 2006<sup>a</sup>).

Bird remains predominantly comprise a wide variety of ducks (even increasing in later phases) such as the teal or garganey (*A. crecca/ querquedula*) and the mallard (*Anas platyrhynchos*). Birds of prey such as the whitetailed eagle (*Haliaeetus albicilla*), several species of waders, swans (*Cygnus sp.*) and geese (*Anser sp.*) are also present (Zeiler 2006<sup>b</sup>). The overall quantity of results indicates fowling formed a major contribution to the diet. The main focus was on ducks. Some species such as the whitetailed eagle, the ruff (*Philomachus pugnax*) and the crane (*Grus grus*) might also have been hunted for other purposes. Seasonal evidence was provided by the presence of both summer and winter visitors, which, in combination with other analyses, is indicative of year round permanence. Ecologically the birds indicate the presence of a wet and largely open landscape with marine influences (including salt marshes, swamps and estuaries).

Fish remains (N=3368) indicate the presence of both saline and freshwater species. The main focus of exploitation was on migratory species (80-90%) such as the anadromous sturgeon (*Acipenser sturio*) and the catadromous eel (*Anguilla anguilla*) and flounder (*Pleuronectes flesus*). Other species include grey mullet (*Mugilidae*), bass (*Dicentrarchus labrax*), roker (*Raja clavata*), salmon (*Salmo salar*) and allis (*Alosa alosa*). Fished waters could be found in the direct vicinity. The shifts in fresh and saltwater boundaries through time also formed a factor in this. Overall the estuary with largely brackish conditions will have formed a major fishing ground. Fishing was in all the occupation phases a summer activity (Brinkhuizen 2006).

Both bones and antlers were also used and altered to function as tools. Most of these were found during phase 2a and 2b and comprise artefacts and ornaments such as awls and chisels followed by axes, beads, hammers, sleeved, spatulas etc. Especially the metapodial technique on red deer bone was of importance. Red deer antlers were also frequently used. The use of the typical Early Mesolithic groove and splinter technique presents a continuation or re-invention of this tradition. Use-wear analyses of the boned tools pointed to plant processing, wood working, hide working and other activities, while one of the antler tools may have been used as a punch for flint knapping (Van Gijn 2006<sup>b</sup>).

#### *Botanical remains, wooden artefacts, fibre and tar*

Both remains of cultivated plants and wild food plants were found: Cultivated plants comprise the cereal crops of emmer (*Triticum dicoccum*) and naked barley (*Hordeum vulgare*) of which grain and chaff remains (including spikelet forks and glume bases) were found. These were produced locally as may be concluded from the presence of waste from early stages of processing (Kubiak-Martens 2006<sup>a</sup>, 327). Charred cereal and chaff remains indicate the presence of processing areas on the SE and NE slope of the dune as well as on top. The presence of field weeds and charred weed species characteristic of high salt marshes form further proof for local cultivation and the presence of fields on the high salt marshes (*ibid.*). Wild food plants were dominated by sloe (*Prunus spinosa*) followed by species such as crab apple (*Malus sylvestris*), hazel (*Corylus avellana*) and many others. Seasonal indicators again point to year round occupation (sowing of cereals in spring and

harvesting in summer/autumn, collecting mainly in autumn). Apart from the above-mentioned wild species there is also abundant evidence for the collection of roots, tubers and the presence of processed plant foods on the site (see Kubiak-Martens 2006<sup>b</sup>). Sea beet roots (*Beta vulgaris* subsp. *maritima*) were collected in the coastal area. Bulbs of wild onion and leek (*Allium* sp.), mainly present in phase 2 could be found locally, while tubers of fresh and brackish plants seem to have been exploited in phase 3. It is most beneficial to collect root foods between autumn and spring and this thus points to specific winter activities. Furthermore examination of encrusted remains points to the processing of emmer for use in porridge.

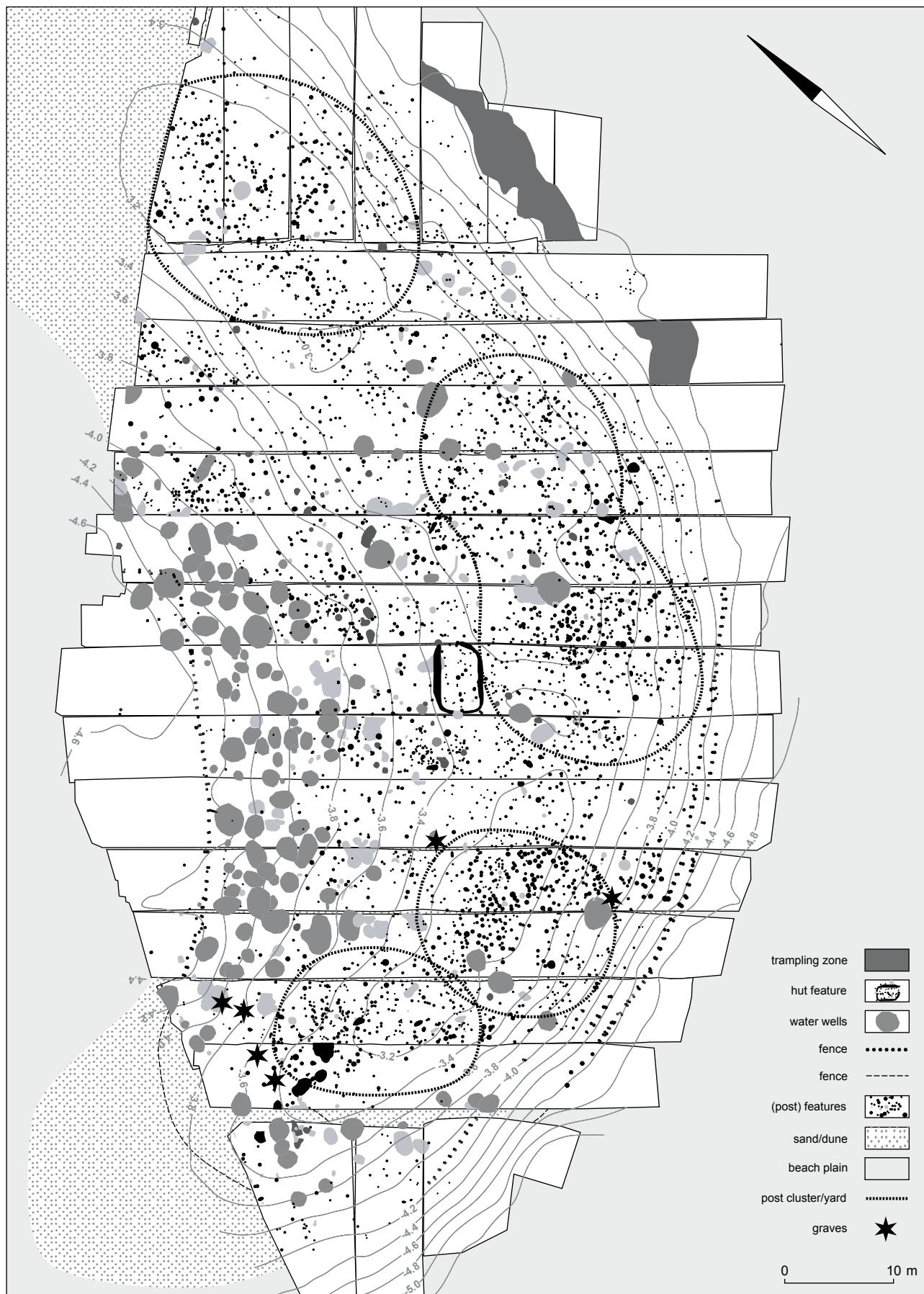
Several wood species were used, for example in construction and for artefacts or fuel. They were mainly harvested in dune shrubs and alder carr vegetation. Alder (*Alnus*), sloe (*Prunus spinosa*) and juniper (*Juniperus communis*) dominate. Mostly branches and thin tree-trunks were collected. The wood supply remained unchanged throughout the occupation. Dune shrubs existed in the near vicinity of the site and possibly on the Schipluiden dune itself. Alder culls could be found in the nearby peatland further east, all within a few kilometres (Kooistra 2006<sup>b</sup>). The site yielded many wooden artefacts most of which dated to phase 2a comprising implements or tools such as bows, paddles, (axe)hafts, sticks, poles and worked objects as well as worked pieces, waste pieces and pointed posts of fences and structures. Most fence posts were made of sloe followed by yew and alder. Pomoidaea, sloe and hazel were the main sources for implements and tools. It is not clear to what extent all wood working activities took place on the dune (Louwe Kooijmans/Kooistra 2006). Lastly the site yielded fabrics of fibres and strips of bark indicative of activities such as basketry (Kooistra 2006<sup>a</sup>).

#### *Interpretation:*

Schipluiden can be characterised as a permanent settlement of approximately four households (approximately 25 people). The consistent clusters of posts and the corresponding rubbish dumps are indicative of this. Permanency is further attested by the enclosing fence, to a lesser extent by the small cemetery and the convincing indicators for seasonality. Radiocarbon dating yields an occupation between 3630 and 3380 cal BC. In combination with the stratigraphy three general phases could be established. Pottery was made locally in typical Hazendonk 3 style. Most flint could be collected locally, but some raw materials point to extensive southern contacts. Typologically both indigenous flaking traditions are present as well as pieces that were made locally, or imported with a clear Neolithic MK-affinity. The diet of the people of Schipluiden both consisted of domestic and wild resources. Stockfarming (especially of cattle) was important and exceeded the hunting of large mammals (especially red deer and wild boar). The occupants also grew emmer and naked barley on the high salt marshes, yet wild plants, especially roots and tubers formed an important contribution to the diet. Last but not least the isotopic signal of freshwater fish indicates it was probably more important than the documented archaeological remains might suggest.

As suggested by Louwe Kooijmans (2006<sup>a</sup>, 508-510) it is not unlikely that Schipluiden functioned together with other contemporaneous Hazendonk sites, exploiting the Delfland microregion. Its place in the process of Neolithisation may be characterised as combining the best of both worlds. The Schipluiden community lived a rather Neolithic life (permanency, livestock, crops), but

## Schipoluiden - Harnaschpolder



with strong Mesolithic overtones (hunting and gathering, technology, cultural continuity). This makes it an ideal site for studying the last phase of the transition to agriculture.

However despite the excellent set of information Schipluiden yields, caution is appropriate. In the light of the variability of other sites of both Hazendonk and Vlaardingen origin, it is still difficult to define to what extent Schipluiden may be considered representative with respect to the overall Neolithic in the Delta.

#### *References:*

Bakels 2006  
Brinkhuizen 2006  
De Wolf/Cleveringa 2006  
Hamburg/Louwe Kooijmans 2006  
Jongste/Louwe Kooijmans 2006  
Kooistra 2006<sup>a</sup>  
Kooistra 2006<sup>b</sup>  
Kubiak-Martens 2006<sup>a</sup>  
Kubiak-Martens 2006<sup>b</sup>  
Kuijper 2006  
Louwe Kooijmans 2006<sup>a</sup>  
Louwe Kooijmans/Kooistra 2006  
Mol 2006  
Mol *et al.* 2006  
Raemaekers/Rooke 2006  
Smits/Louwe Kooijmans 2006, 104  
Van Gijn 2006<sup>a</sup>  
Van Gijn 2006<sup>b</sup>  
Van Gijn/Houkes 2006  
Van Gijn *et al.* 2006  
Zeiler 2006<sup>a</sup>  
Zeiler 2006<sup>b</sup>

## **42. Schokland-P14**

NB. It should be noted that the thorough and voluminous work on Schokland-P14 by Ten Anscher (2012) only became available to me in a late phase of completion of this thesis. While some of the most important results and outcomes of Ten Anscher (2012) have been used and incorporated here, it could not be fully integrated. The reader is therefore distinctly referred to that work and Gehasse (1995) for a complete compilation of the Schokland-P14 site.

*Fig. 63 Schipluiden-Harnaschpolder. Excavation plan of the site situated on the small dune. Note the clusters of posts and the specific location of the water wells. Adapted from Hamburg/Louwe Kooijmans 2006, fig. 3.2.*

#### *Location:*

P14 is located on a sandy ridge on the eastern end of an E-W boulderclay outcrop in the reclaimed area of the Noordoostpolder, Flevoland. The location was covered with aeolian sand and bordered to the east by a channel of the Vecht, active at that time. During its Neolithic occupation the site was the pre-eminent dry location in the area (Gehasse 1995; Ten Anscher 2012; Ten Anscher *et al.* 1993). Material remains from the Late Palaeolithic to the Early Iron Age were found at the site (Gehasse 1995, 2).

### *Site characteristics:*

First excavations at the site took place in 1957 by G.D. van der Heijde (archaeologist of the Polder Development Authority) and were continued between 1982 and 1991 by the IPP. The outcrop approximately measures 1400 x 300 m (Gehasse 1995, 1-2). During the many years of excavation a large number of trenches were dug on the site (e.g. Ten Anscher/Gehasse 1993, 29). Trench WP 89-17 measuring approximately 5 x 20 m holds the most important information relating to the pre-Funnelbeaker occupation of the site (Ten Anscher 2012, 537) . This trench was located in the south-eastern extent of the excavation on the banks of the former Vecht. Part of the trench was excavated in squares and 5 cm spits. The soil was sieved. In combination with the stratigraphy this enabled a subdivision in several phases (Ten Anscher/Gehasse/Bakker 1993, 460).

### *Geology/Pedology:*

On the basis of the western profile of WP 89-17 a stratigraphical subdivision was established. The actual body of the boulderclay outcrop is of Saalien age. On top of this, aeolian coversand (sp201) was deposited (the parent soil material). On top of this a layer of grey sand (sp200) (20-40 cm) was deposited of which the upper 10 cm had a gyttja-like structure probably relating to deposition in increasingly wet conditions. This layer contained most of the finds (90% of the sherds (N=20050) and 98% of the bone material (N>21000) and can be dated between 4900 and 4350 cal BC. This layer was covered by humic-grey-green clay (SP 32) deposited during the Calais III transgression phase (between 4350 cal BC and 4150 cal BC) containing 350 sherds and some 100 fragments of bone. During this time a tidal regime existed in the valley of the Vecht. On top of this layer of 20-30 cm peaty detritus-gyttja (sp31) formed containing ±145 sherds and ±100 pieces of bone. The gyttja formed under closed inland conditions between 4150 and 3700 cal BC as well as during a phase of renewed marine influence between 3700 and 3400 cal BC. This was followed by brackish Cardium clay dating to the Early Bronze Age and layers of peat covered by the topsoil (the former sea bed) (Gehasse 1995, 27, 37-38; Ten Anscher/Gehasse/Bakker 1993, 460-461). The layers sp201, sp200 and sp32 date to the Early and Middle Neolithic and are of interest here.

### *Taphonomy:*

On the basis of the gradual change in temper used in the sherds in sp201 and sp200, Ten Anscher concluded the microstratigraphy of both layers was largely intact. Part of them was, however, disturbed by soil-wash and trampling (Gehasse 1995, 25). Apart from WP 89-17 the other trenches on the northern, southern and eastern slope yielded evidence for erosion and mixing of different layers. The apparent contrast between WP 89-17 and the other trenches as well as the fact that the internal stratigraphy of WP 89-17 (containing over 90% of the finds in that trench) is based on the tempering agent used in the sherds makes internal correlation on the site difficult. The layer of sp200 itself exists of dump-activities from the site on top of the dune intermixed with slope deposits containing artefacts (Gehasse 1995, 25). This most important layer was of an undulating nature (Lanting/Van der Plicht 1999/2000, 22). The archaeological situation on top of the outcrop (west of WP 89-17) may be considered a classic palimpsest (Gehasse 1995, 75).

### *Ecology:*

The increasingly wet conditions between 4900 and 3400 cal BC had a great influence on the ecological development within the area. Between 4900 and 4350 cal BC the Vecht was bordered by reed and sedge-vegetation. Deciduous forest grew on the higher elevations changing to predominantly alder (*Alnus*) and beech (*Betula*) in the wetter parts. The increasingly wet conditions lead to peat growth. Tidal influence between 4350 and 4150 cal BC increased the ecological diversity and lead to the development of additional dry locations in the form of levees. From 4150 to 3700 marine influence decreases. The Vecht decreases to a singular channel. Due to peat growth and wet conditions the boulderclay outcrops near Urk and Schokland become the only locations with deciduous forest. This continued until 3400 cal BC, although there is renewed marine influence leading to the development of levees, overbank deposits and a substantial lake within a freshwater tidal area (Gehasse 1995, 37-38; Jansma 1990). This period is followed by renewed decreasing marine influence and a slow drowning of the dry places and deciduous forest vegetation (3400-2800 cal BC) (Gehasse 1995, 73). Around 2600 cal BC the area received renewed interest as attested by finds of the Bell Beaker culture and Bronze Age due to ameliorating conditions (Gehasse 1995; Ten Anscher 2012.).

### *Dating:*

Ten Anscher devised an internal chronology for WP 89-17 based on the stratigraphy, the development in tempering agents in the pottery as well as on  $^{14}\text{C}$  dates from charred remains on sherds. This resulted in a division in five layers (A-E) (Gehasse 1995, 27; Ten Anscher 2012).

When the AMS dates are related to their geological origin it is evident more vertical displacement took place than previously expected (Lanting/Van der Plicht 1999/2000, 22). In total three different phases of SWB occupation can be discerned (*cf. ibid.*): two shorter occupations around 4700 cal BC (Early SWB culture), and 4300 cal BC (Middle SWB culture) and a longer period of use starting around 4000 cal BC. The last date (UtC 1921) was obtained on a sherd with TRB *Tiefstich*-decoration (Lanting/Van der Plicht 1999/2000, 22, 54, 56, 58, 67). UtC-1916 and UtC-1922 might suffer from the reservoir effect, yielding older dates (Lanting/Van der Plicht 1999/2000, 54). While the actual chronological range of phase A comprises 800 years (4900-4100 cal BC) the bulk of the material dates to 4400-4100 cal BC (see Raemaekers 1999, 99).

In conclusion, the original division in five phases (Gehasse 1995, 27) (A-E, see above) should be questioned. Initial occupation of the Swifterbant culture is associated with layer sp200 and dated between 4900 and 4350. On the basis of the  $^{14}\text{C}$  dates, the oldest of which suffer from the reservoir effect and the internal stratigraphy, the bulk of the material dates to 4400 to 4200 cal BC (Raemaekers 1999, 99). A second phase of Swifterbant occupation dates between 4000 and 3400 cal BC. Geologically separated (sp 31), a last  $^{14}\text{C}$  was obtained from a crust on a TRB sherd. Around 2600 cal BC there is renewed activity at the outcrop dating to the Late Neolithic and Early Bronze Age.

Layer	Period	Geological unit
E	3600-3300 cal BC	sp31 detritus-gyttja without Late Neolithic component
D	3600-3350 cal BC	sp32 clay
C	3800-3600 cal BC	sp200 sand, internal level 1 to 8, above max. N or weight sherds
B	4100-3800 cal BC	sp200 sand, max. N. or weight sherds, internal level -1 to +1
A	4900-4100 cal BC	sp201/sp200 sand, internal level -5 to -1, below max. N or weight sherds

The AMS dates used might not all be correct since treatment of the samples might have been insufficient.

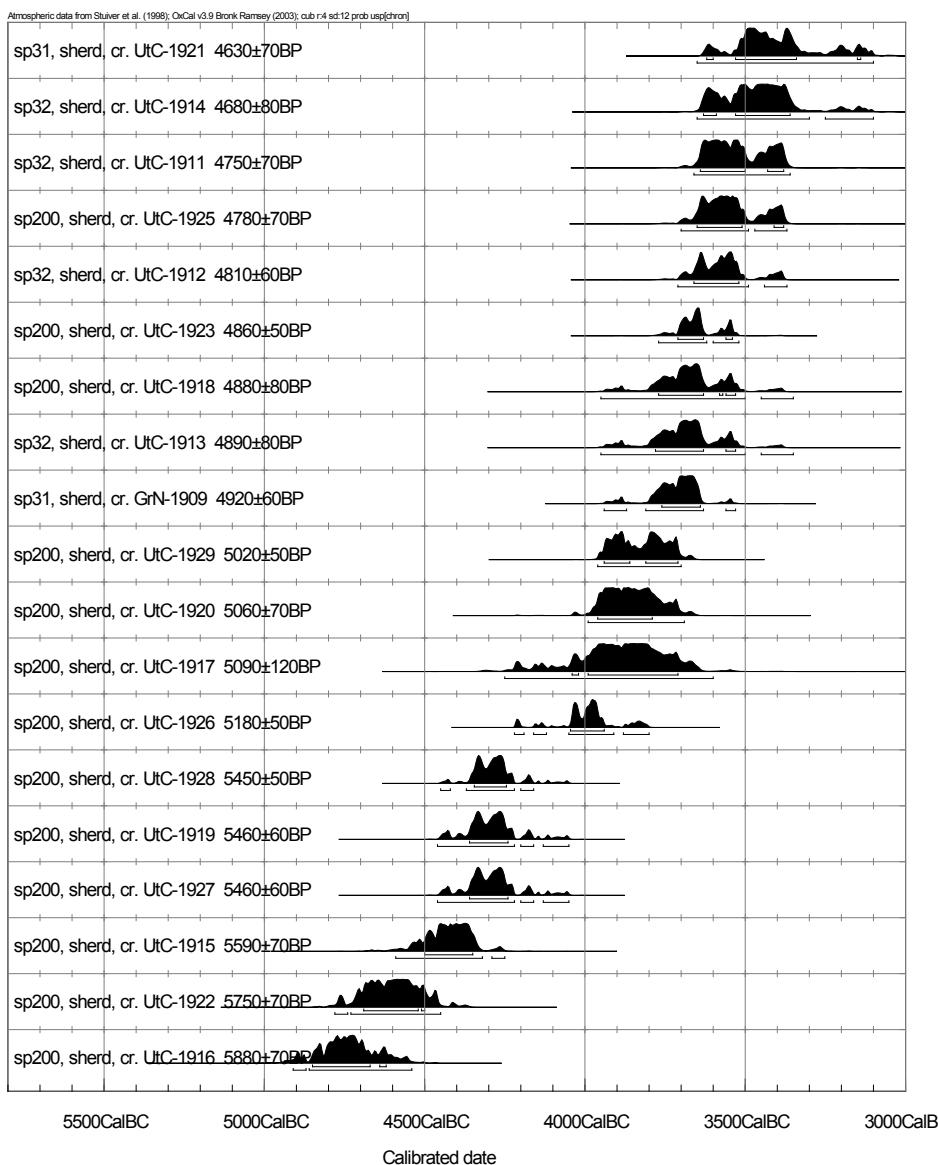


Table 13 Chronological subdivision for Schokland-P14.

Fig. 64 Radiocarbon dates for Schokland-P14.

### Features/Spatial layout:

In contrast to the feature information deriving from WP 89-17, many features dating to different periods have been uncovered on top of the outcrop (WP 90-1/2/3/4/5/6, WP 87-1/2/4, WP89-3/7/8). Amongst them are several graves belonging to different periods but also to the SWB and TRB cultures. In some of

the graves multiple, chronologically interspersed, burials had taken place (Gehasse 1995, 64; Ten Anscher 2012, table 15.1). Eight of the fifteen graves comprising at least eleven individuals are dated to the SWB Pre-Drouwen phase and yield indications for the presence of adults and children (Hogestijn 1991; Raemaekers 1999; Ten Anscher 2012; Ten Anscher/Gehasse 1993). One of the graves (grave 4) contained no less than six individuals (Ten Anscher 2012, 542). Most of the graves seem to have clustered in a small area in the eastern part of the site, one of the double graves was situated further west (Ten Anscher 2012, 542). While some individuals were buried in supine position, others were buried in a contracted position (see Ten Anscher 2012, table. 15.1).

From the many features present on top of the dune some were singled out. Ten Anscher interpreted these features as belonging to two to up to four house plans (2000/2001, 82-83; 2012, 542). On the basis of stratigraphy and pottery present within the postholes the structures were dated to the Late SWB period. Two of the structures (House I and II) are most evident. According to Ten Anscher (2000/2001, 82; 2012, 377-385, 543) they represent two-aisled rectangular to trapezoidal houses (NE-SW) measuring approximately 12 x 6 m. Although linear alignments of posts are clearly present within the constellation of features, Ten Anscher's argument loses strength because of the many missing posts due to erosion and other postdepositional processes (see Ten Anscher 2000/2001, fig. 5; Ten Anscher 2012, fig. 16.2, 16.4, 16.5). The above-mentioned post-depositional processes as well as the changed ecological circumstances are probably responsible for the lack of clear features of TRB occupation. One certain and one doubtful grave could however be dated to this period (Gehasse 1995, 75). Ten Anscher (2012, 544) only mentions one burial in contracted position that dates to the Drouwen or Havelte phase.

Apart from these features there is evidence indicating the presence of Neolithic fields as evidenced by areas with ard marks. These date from the late SGC to the late Bell Beaker culture. A number of associated ditches date to the Bell Beaker period and the Early Bronze Age (Ten Anscher 2012, 543).

#### *Finds:*

Although they are only part of the total sum, the finds from WP 89-17 are most informative on the occupation of P14 because of their stratigraphic and chronological association. Unlike earlier publications (Ten Anscher/Gehasse 1993; Ten Anscher *et al.* 1993) the pottery characteristics span more than a thousand years between 4400 and 3300 cal BC (Gehasse 1995, 27; Raemaekers 1999, 101). On the basis of the tempering agents a technological succession in tempering-practice could be observed (Ten Anscher *et al.* 1993; Gehasse 1995). Most of the pottery falls within the expected range from Early to Late SWB culture. Technologically there are many similarities between the TRB pottery and the preceding Swifterbant ceramics (Hogestijn 1991). Ten Anscher (2012, 547) argues that it is usually impossible to distinguish Swifterbant sherds, from those of Pre-Drouwen, the oldest phase of the West group of the Funnel Beaker culture. In his study they have therefore been grouped in one category of Swifterbant-Pre-Drouwen ceramics, which comprises most of the sherds uncovered at P14. Subsequent unequivocal TRB sherds were also found (Ten Anscher *et al.* 1993). The pottery was produced locally (Jansma 1990; Ten Anscher 2012). For a further internal subdivision of the ceramic assemblage (see Ten Anscher 2012, part II).

Of importance is the suggestion that the site yields evidence for a local development of TRB pottery out of Swifterbant ware (Ten Anscher 2012). This is based on a number of sherds (30 pot individuals) that are technologically similar to the Swifterbant ware, but are typologically characterized by a number of early TRB-like characteristics (such as cord arches, zigzag motifs, neck and belly fringes, collared flasks and baking plates). These sherds are attributed to layers C to E. Based on the  $^{14}\text{C}$  dates and the limited geographical spread of these traits it is argued they represent a local development of TRB-pottery and therefore a local origin of the TRB-West group (Ten Anscher 2012, 538). This means the importance of the North group for the formation of the West group is limited; there were contacts, but the latter arose independently (*ibid.*). Others downplay the importance of these traits. According to Lanting and Van der Plicht (1999/2000, 23) the presumed transitional pottery with cord (arches)-decoration bridging the gap between the SWB and TRB culture, the Pre-Drouwen TRB pottery might be interpreted within the existing stylistic variation of the Late SWB culture. It therefore remains a matter of interpretation to what extent the Pre-Drouwen phase that has been distinguished at the site according to Ten Anscher (2012) should be interpreted as the local development of the TRB West group and to what extent this replaces its interpretation as Late Swifterbant (and according to Ten Anscher *ibid.*, pp. 539) the existence of a late Swifterbant SW3 and 4 phase ).

The flint assemblage of P14 has not yet been studied integrally. An internal report on the points outside of WP 89-17 (Wilhelm 1996) has been used by Raemaekers (1999, 101). Most of the points are transverse points or trapezes (the latter being indicative for the SWB occupation). Some of the points were made on flakes of polished stone axes. In the appendix to Ten Anscher (2012) a complete version of the thesis by P. Van der Kroft (1996) is included. This work deals with a selection of the lithic finds dating to the early and Middle Neolithic and gives an overview and classification of the finds in layers A to E. One of the trends observed is a clearly diminishing contribution of microliths over time (Van der Kroft in: Ten Anscher 2012, 671-674). Ten Anscher (2012, 653) mentions several fragments of quartzite axes with a round or oval cross section (*Walzenbeile*), dating to the SWB occupation at P14. These may be indicative of southern contacts. This is also reflected by five fragments of axes made on Lousberg-type flint. Raemaekers (1999, 101) mentions that with respect to the points and apart from local material, Lightgrey Belgian-, Rijckholt- and Obourg-type flint were also used.

The faunal remains of WP 89-17 indicate the presence of both wild and domestic species. An increase in the presence of the latter type (comprising cattle (*Bos Taurus*), dog (*Canis familiaris*), sheep/goat (*Ovis/Capra*) and probably pig (*Sus domesticus*) in layers D and E might either be explained as resulting from increased importance or taphonomic circumstances (Gehasse 1995, 53). Most of the bones from layers A-C were burnt (*ibid.* 51). Furthermore it should be noted that there is evidence (cutmarks) for the consumption of dog from layers C and E (Gehasse 1995, 46). The wild fauna is dominated by beaver (*Castor fiber*) and red deer (*Cervus elaphus*) (see Raemaekers 1999, table 3.44). Sparse remains of fowl and more numerous remains of fish, predominantly Cyprinidae, were found (see Gehasse 1995, table 4.20). Bone and antler was also used to make tools (Gehasse 1995). Layer B also yielded a human tooth belonging to a sub-adult individual (*ibid.*).

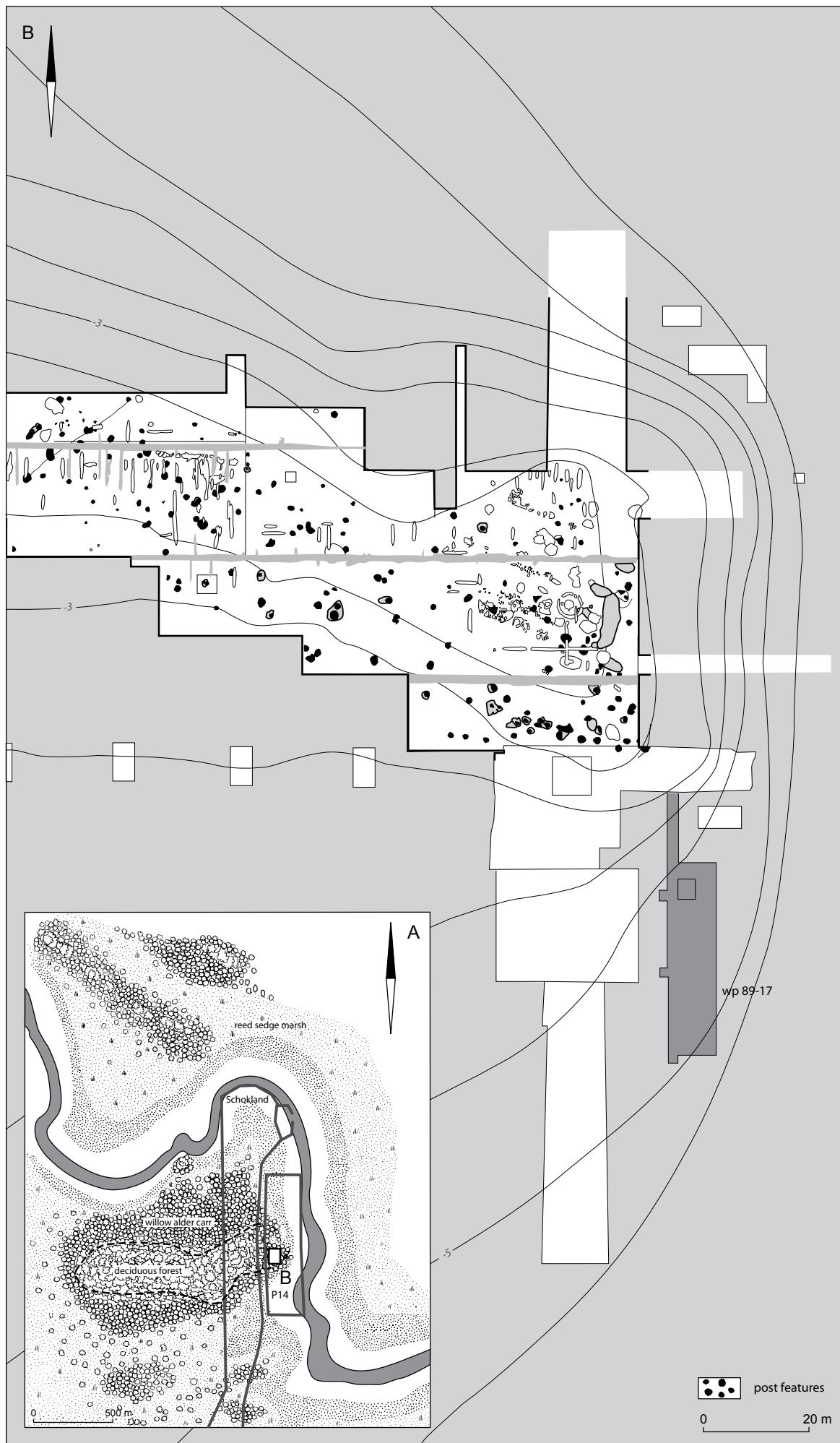
The botanical remains of WP 89-17 consist of sparse remains (N=3) of emmer (*Triticum dicoccum*) and naked barley (*Hordeum vulgare*, var. *nudum*) as well as six impressions in sherds (Gehasse 1995, 59). Pollen of both cereals was also found. This however need not be indicative of local cultivation (see Bakels 1986; 2000). Neither does the presence of several uncharred species of possible field weeds (*Artemisia*, *Chenopodium album*, *Convolvulus arvensis*, *Plantago lanceolata*, *Persicaria maculosa*, and *Stellaria media*). No other evidence pointing in the direction of local cultivation was found. Collected fruits and nuts comprise hazelnut (*Corylus avellana*), acorn (*Quercus spec.*), blackberry (*Rubus spec.*; *Rubus fruticosus*) and waternut (*Trapa natans*) (Gehasse 1995, 61). The use of wood predominantly focused on local species such as alder (*Alnus*), oak (*Quercus*), willow (*Salix*), and hazel (*Corylus*) (*ibid.* 62).

#### *Interpretation:*

The interpretation of the results from the extensive excavations at P14-Schokland is severely hampered by its specific local site formation processes and taphonomic history. The top of the outcrop is a palimpsest spanning several thousands of years. It did however yield evidence for structures as well as graves dating to the SWB culture and evidence for graves dating to the TRB. Most informative were the results from WP 89-17. If the internal division based on a combination of stratigraphy, <sup>14</sup>C dates and changes in tempering agents is considered valid (*cf.* Gehasse 1995; Ten Anscher 2012) serious problems hampering interpretation remain. Layer A for example spans a period of 800 years. Layers B and C relate to the geological layer sp200 which comprises over 90% of the find material and spans some 500 years. Since further internal subdivision is artificial one may wonder to what extent former indicators for site-use and seasonality are reflected in the material.

With respect to the pottery, and on a more positive note, Ten Anscher (2012, 537) argues that, with the exception of layer E, the general composition of sherds within each consecutive layer develops over time, although post-depositional and excavation processes hamper the chronological interpretation concerning individual sherds. The global tendency that remains has been substantiated by radiocarbon dating, although this is frustrated by the reservoir effect. Nevertheless, according to Ten Anscher (*ibid.*) a global periodisation is possible for the Early and Middle Neolithic phases of the site that witnesses a recurrent occupation from c. 4900 cal BC onwards and, perhaps, a continuous occupation between 4300 and 3400 cal BC (Ten Anscher 2012, 543).

Regarding the question of an internal development towards TRB ware at P14 and an independent development of the TRB West group out of local Swifterbant communities, evidence is again hampered by the quality and quantity of the data available. Although the presence of certain TRB-like traits seems to justify the definition of a Pre-Drouwen phase it is questionable whether this should be given the status of an attribution to the TRB culture and therewith justifies the absence of a Swifterbant S3 and S4 phase (see Ten Anscher 2012, 539). Overall the assemblage with transitory elements is rather small, the attribution at sherd level remains hampered by taphonomy, post-depositional processes and dating problems (*cf. supra*) and the presence of elements of something 'new' need not mean wholesale cultural shift (especially in the light of technological similarities and many aspects of continuity in other fields).



On the basis of the faunal and botanical sample Gehasse (1995, 67-68) concludes that the SWB occupation ranges between a minimal presence in the summer and a maximal presence year round. The site may be interpreted as a base camp for attested activities such as hunting, fishing, foraging, stockherding and pottery production. This is further substantiated by the presence of graves (indicating the presence of children and adults) as well as the presence of potentially residential structures. TRB use of the site is mainly interpreted as relating to hunting activities due to, amongst others, changed ecological conditions (Gehasse 1995, 75-76; Ten Anscher 2012, 544). On the other hand, the presence of some 70 TRB vessels as well as up to two identified TRB graves may indicate more substantial activities at P14. Although a permanent occupation is suggested for the SW2-Pre-Drouwen phase of the site (Ten Anscher 2012, 543; based, amongst others, on the number of finds, the graves and possibly the date of the structures), it is questionable to what extent the archaeology provides substantial evidence for a permanent, sedentary use of the site. The presence of complete families, structures and graves is not interpreted as an indication for sedentary occupation at other sites dating to the same period (see Swifterbant-S3). Furthermore, hunting and fishing remained an important contribution to subsistence, while a presence in the winter season is difficult to establish (see Ten Anscher 2012, 543). The increased visibility of this occupation phase alone, may not provide a substantial reason to assume a sedentary occupation in relation to, for instance, the earlier Swifterbant occupation at the site. On the other hand it may be hypothesized that the intensity in site use and therewith site function may have shifted between the initial Swifterbant and subsequent (SW2-Pre-Drouwen) occupation. During the TRB culture and later phases it, however, appears to be the case that conditions grew increasingly wet and that use of the site became increasingly extractive and less residential (Gehasse 1995; Ten Anscher 2012).

#### *References:*

Gehasse 1995  
 Hogestijn 1991  
 Jansma 1990  
 Lanting/Van der Plicht 1999/2000  
 Raemaekers 1999  
 Ten Anscher 2000/2001  
 Ten Anscher 2012  
 Ten Anscher/Gehasse 1993  
 Ten Anscher *et al.* 1993

*Fig. 65 Schokland-P14.*  
 (A) palaeo-ecological reconstruction of the site and its immediate surroundings.  
 (B) excavation plan with distribution of features tentatively attributed to house plans and the location of trench WP-89-17. Adapted from Ten Anscher 2000/2001, fig. 2 and 4 and Gehasse 1995.

### **43. St.-Odiliënberg-Neliske (HVR-22)**

#### *Location:*

Neliske is located in the Leroperveld, a fossilized valley plain of the Late Glacial Roer, in Middle Limburg. This plateau is characterized by strong relief and is a remnant part of the Roer which shifted northwards in the Early Holocene. The site is situated on a small rise (100 x 40 m) with a current height of some 2 m, surrounded by depressions (Verhart 2000, 204-205).

### *Site characteristics:*

The site was discovered in 1971 after one season of deep-ploughing. Before that some artefacts had been found on the site. Over the years the site would be visited by several amateur archaeologists and in 1991 a test excavation took place within the Meuse valley project. The trench measured 45 x 2 m, the plough soil was removed mechanically, after which shovelling and documentation of the level with features took place. The site seemed to be spatially limited and mainly yielded Middle Neolithic artefacts. This formed the incentive for a follow-up augering campaign (10 x 10 m grid). This indicated finds were present on the rise as well as on the slopes, with varying densities. Both the pilot study as well as the augering campaign indicated a small amount of the Neolithic find distribution was still present beneath the ploughsoil and justified further excavation. In 1992 approx. 4800 m<sup>2</sup> were uncovered, again mechanically removing the ploughsoil, followed by shovelling and documentation of the level. Finds were initially collected in 50 x 50 cm squares, but later recorded with infrared theodolite. The location with many finds (approx. 1900 m<sup>2</sup>) was additionally shovelled 10 cm deeper (Verhart 2000, 207-209).

### *Geology/Pedology:*

The rise on top of which Neliske is located is a fluvial deposit consisting of coarse river sand with gravel admixture. Finer sediment has been deposited on the slopes, but is absent on the top. The area came into existence in the Early Holocene (Verhart 2000).

### *Taphonomy:*

Apparently the site suffered from the ploughing and probably also from erosion. (Finer sediments were absent on the top and only part of the find distribution was still present underneath the ploughsoil). Furthermore no organic remains were preserved and treefalls and depression influenced the distribution patterns of artefacts.

### *Ecology:*

To the north and northeast of the site the Roer flows into a 500 m wide floodplain. To the southeast a meander infilled since the Middle Ages is located. A sample point in the Roer valley only yielded a spectrum attributable to the Bronze Age. Another sampling point at a distance of 2 km, near Melick contained a gap in the Early and Middle Atlantic during the occupation of Neliske. On a more abstract level the dry sands would have been covered with quite dense forests consisting of oak (*Quercus*), elm (*Ulmus*) and lime (*Tilia*) in the Atlantic. Ash (*Fraxinus*) and hazel (*Corylus*) would have grown in open areas and riverine forests, composed of alder (*Alnus*) and willow (*Salix*) would have grown in the Roer valley (Verhart 2000, 205-207).

### *Dating:*

In total eight <sup>14</sup>C dates were available, both conventional as well as AMS. The samples of charcoal were obtained from prehistoric pits, postholes and a grave. All dates however pointed to activities in the Late Neolithic, the Bronze Age and

the Iron Age. Since the artefactual assemblage predominantly can be dated to the Middle Neolithic and might be associated with the features, Verhart discards these dates and assumes the charcoal is intrusive (2000, 213). Another option would be a structural contamination of charcoal on the site. This would mean that the grave attributed to the Iron Age or Roman Age by Lanting and Van der Plicht 1999/2000, 51), might also have been older. On the basis of the flint and pottery assemblage the site can be dated to the Middle Neolithic, more specifically the MK-culture (Wansleeben/Verhart 1993). (Verhart (2000) also mentions Hazendonk 2 and 3). There are also some artefacts pointing to a presence in the Late Palaeolithic, the Early Mesolithic, the Middle Neolithic B (WSV complex) and the Iron Age, yet they are clearly a minority.

#### *Features/Spatial layout:*

The site consists of an area with relatively many finds measuring 1900 m<sup>2</sup>. Within this area however concentrations are mainly related to treefalls and depressions. Remarkable is a rather empty area on top of the rise and to the west of the cluster

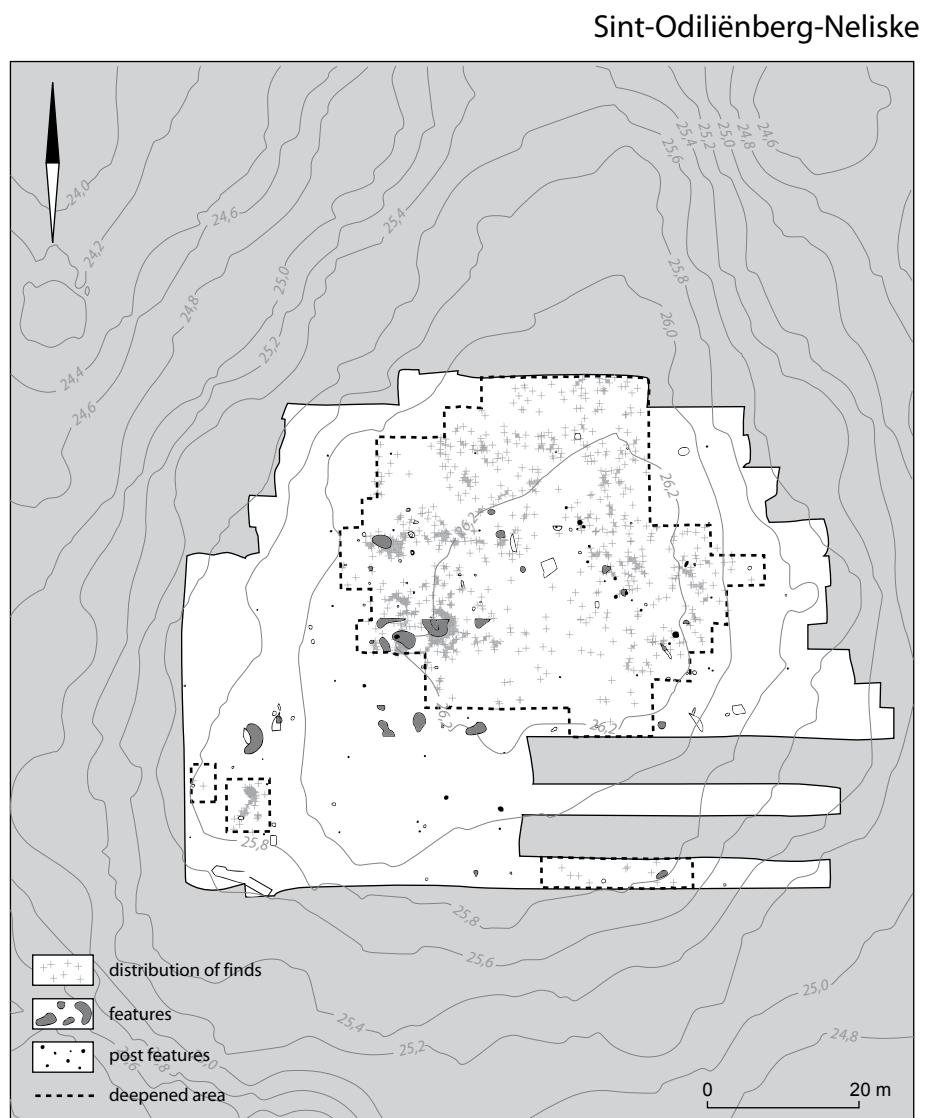


Fig. 66 Sint-Odiliënberg-Neliske. Distribution of finds and features in the excavation trench and within the deepened areas. Adapted from Verhart 2000, fig. 4.11 and 4.17.

of post traces. Since erosion could not have caused this empty zone it may be related to the post traces. Verhart (2000, 216) mentions the idea of a yard that was kept clean. In total 42 features were found, only eighteen of which were anthropogenic and prehistoric. The other features may be interpreted as treefalls and recent features, however two were dated 4400 BP. The prehistoric features consist of seven convincing and three probable postholes, two pits, one grave and five indeterminable features. The postholes have a diameter between 20-50 cm and a depth up to 31 cm. The pits are rounded to elliptical with a maximum diameter of 84 cm and a depth up to 25 cm. All features are grouped close together in the eastern part of the excavation in an area of 24 x 2 m. The features are attributed to the Middle Neolithic on the basis of shape, position and relation to the find pattern (*cf.* Verhart 2000, 212). Since there is no regularity between the spacing of the posts and only the heaviest central posts seem to have been preserved it is not possible to reconstruct a houseplan (*ibid.* 218). Therefore, and because of the <sup>14</sup>C dates, it is not evident the features indicate a Middle Neolithic structure.

The grave consists of cremation remains, but hardly any charcoal. It may originally have been 35 cm deep.

#### *Finds:*

Apart from the Middle Neolithic artefacts the surface assemblage found on the site yielded a Federmesser point, two Early Mesolithic A-points, a Late Neolithic or Early Bronze age tanged point and 20 Iron Age sherds as well as 100 Middle Neolithic sherds, amongst which one with edge perforation (WSV complex) and 300 pieces of flint. The excavation yielded a SGC sherd and sherds belonging to the Late Bronze Age or Iron Age. The remainder of the assemblage may be considered Middle Neolithic and consists of mostly fragmented sherds tempered with quartz, chamotte and a small quantity of sand. Morphologically the assemblage consists of barrel shapes, although outward bending rims are also present, a bowl or plate with inverted rim and carination, a sherd with a *Tüpfenleist*, a subcutaneous perforated lug and a sherd with nail impressions and evidence for coil building. Verhart (2000, 216) attributes the latter sherd to the Hazendonk group and the remainder to Hazendonk 2 pottery. This latter characterization might be considered as North-western MK.

The flint assemblage consists of imported pieces of Rijckholt and Valkenburg flint as well as locally available terrace gravels. A major part of the assemblage consists of waste. Furthermore points comprise an Early Mesolithic triangle, two Middle Neolithic points with semi-surface retouch, one of which is a leaf-like point and a transverse arrowhead attributable to the WSV complex. Macrolithic tools include scrapers and pointed blades dating to the Middle Neolithic A (Verhart 2000, 216). No complete axes have been found during the excavation, but small flakes of axes have been found (of Rijckholt, Valkenburg and Lousberg flint).

Many stones were found amongst which a fragment of a grinding stone and a fragment of a mill stone.

#### *Interpretation:*

Neliske is a typical palimpsest site on the sand, although a large part of the excavated assemblage is attributable to the Middle Neolithic. For this reason the main dispersion of finds may be meaningful in relation to the features. Although

no solid evidence could be found for a Middle Neolithic structure, the empty area to the west of it may be a ghost feature of the structure. No further information on subsistence or permanence could be obtained. The Middle Neolithic assemblage does have some later (Middle Neolithic B) elements pointing to a presence during the WSV phase, but the majority can be dated earlier. Verhart (2000) opts for a Hazendonk 2 occupation. Dependent on the level of cultural independence of this pottery style, this means the site may however also be seen in Northwest MK context.

#### *References:*

Lanting/Van der Plicht 1999/2000

Verhart 2000

Wansleeben/Verhart 1993

### **44. Slootdorp-Bouwlust**

#### *Location:*

The TRB site of Bouwlust is located in West-Friesland in northern North Holland. The site is situated in former salt marsh area which is rather unusual for TRB sites. This however is also related to taphonomical circumstances. At a short distance (several hundreds of meters) another site, Slootdorp-Kreukelhof was located.

#### *Site characteristics:*

The site was discovered in 1989 and excavated by the state service for archaeology (ROB) in the 1990's. The extents of the site were mapped by surveying and augering after which excavation took place in 286 units of 2 x 2 m. Some 10% of the ploughsoil was also investigated while the rest was mechanically removed. Unfortunately postdepositional activity had destroyed intact find layers, yet the site yielded a considerable number of flints, pottery sherds, bones and even features (Hogestijn/Drenth 2000/2001, 44).

#### *Geology/Pedology:*

The site is located in a former salt marsh area. The site could be located and delimited through the presence of a dark culture layer in the ploughsoil. This might be related to artificial heightening of the former living surface through deposition of organic remains and shell. No internal stratigraphy could be documented.

#### *Taphonomy:*

The site was heavily disturbed by anthropogenic activity, in particular agriculture. This resulted in the absence of an intact cultural layer and in the secondary displacement of finds. On the other hand the waterlogged conditions yielded a rich assemblage of faunal and botanical remains, albeit often heavily fragmented.

#### *Ecology:*

The faunal remains indicated the site was located in a relatively rich environment. This included freshwater resources such as fish and predominantly fowl, as well as terrestrial species dominated by red deer (*Cervus elaphus*) and roe deer (*Capreolus*

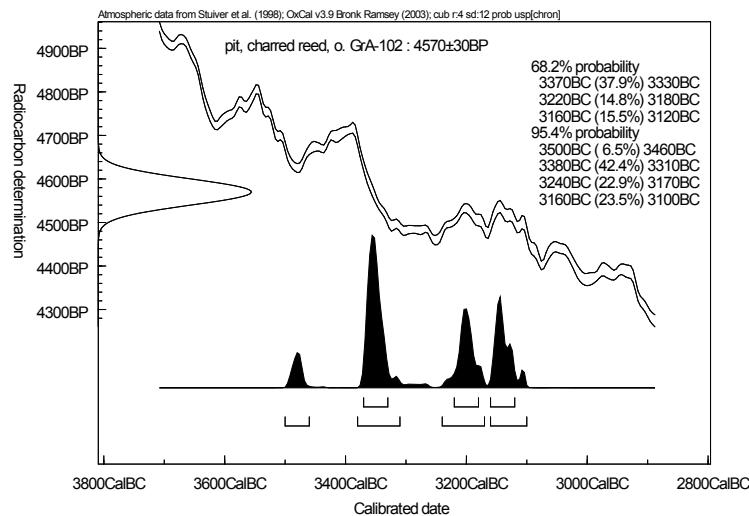


Fig. 67 Radiocarbon date for the site of Slootdorp-Kreukelhof.

*capreolus*) (Schnitger in Hogestijn/Drenth 2000/2001). The dominance of duck points to an open environment, while some of the ruminants also indicated the presence of forested terrain. The location of the site in a salt marsh is indicative for the importance and influence of water.

#### Dating:

The nearby site of Slootdorp-Kreukelhof yielded one <sup>14</sup>C date.

Slootdorp-Bouwlust might tentatively be dated between 3500 and 3100 cal BC. Furthermore the pottery could be attributed to the Early Havelte phase or horizon 4/5 (Hogestijn/Drenth 2000). This stage signifies the transition from Drouwen to Havelte style and therewith most likely dates to the very end of the 4<sup>th</sup> millennium.

#### Features/Spatial layout:

The site yielded 535 post- and stake holes (with a mean diameter of 9 cm and pointed, flat or rounded bottoms) and 14 TRB pits. The pits were mainly located on the periphery of the concentration. In the centre of the distribution of features the excavators discovered the vague contours of a possible structure measuring c. 11 x 4 m. The longitudinal axis was oriented NW-SE and in the southern part a central row of posts may be defined. This could be indicative of a two-aisled structure (Hogestijn/Drenth 2000/2001, 54). This type of structure fits in with other known house plans from the Middle- and Late Neolithic (see Hogestijn/Drenth 2000). Despite the intensive post-depositional processes the distribution of finds is suggestive of specific settlement and waste behaviour in which the central area of the house remained relatively empty of finds, while clustering takes place next to the structure. Since the site was repeatedly used, the excavators believe the spatial structure of the settlement remained more or less the same, including renewal of the house in the same place (Hogestijn/Drenth 2000/2001, 55). The frequent renewal of the north- and southwestern side of the structure may be related to the prevailing wind conditions in the predominantly wet environment.

Furthermore it is not clear where the entrance of the house was located, although south- and northeast sides seem plausible locations (*ibid.*). As argued above, there is evidence for artificial heightening of the occupation floor by layers of shell.

#### *Finds:*

The ploughzone and the pits underneath yielded bone, pottery, and flint. In total 6500 sherds were recovered increasingly fragmented in the ploughzone. Most sherds were part of TRB pots and often contained foodcrusts. The vessel spectrum included baking plates, buckets and bowls. Decoration motives typochronologically date the site to horizon 4/5 according to Brindley (1986) and the transition from Late-Drouwen to Early Havelte according to Bakker (1979). This would date the site to *c.* 3000 cal BC. Several sherds yielded impressions of naked barley (*Hordeum vulgare*) and emmer (*Triticum dicoccum*) which indicates the presence of these crops at the location of their fabrication.

Furthermore 10,137 pieces of flint were recovered including 163 flake cores, 117 tools, 3846 flakes and 6011 irregular pieces (*brokken*). The tool spectrum comprised 17 scrapers, 13 borers, 7 transversal points, 221 artefacts with encoche, 11 becs, 1 burin, 3 axe fragments and at least 46 other pieces (also see Peeters 2001, 677).

Most profuse was the faunal assemblage with 117000 fragments of bone (26.5 kg). The identified species comprised birds, fish and mammals. The fish spectrum was dominated by sturgeon (*Acipenser sturio*) (30%), followed by flounder (*Pleuronectidae*) as well as some eel (*Anguilla anguilla*) and some other species. The dominance of sturgeon might be related to their numerous and highly recognisable bony plates (Hogestijn/Drenth 2000/2001). Remarkable is the find of a bone of cod (*Gadus morhua*), since this is a marine species.

Some 98% of the bird remains is attributable to several species of duck (e.g. *Anas platyrhynchos*, *Anas querquedula/crecca*). Apart from several other species (mostly coastal dwellers) the whitetailed eagle was also hunted (*Haliaeetus albicilla*).

The mammal spectrum is represented by 878 identified bones, half of which could be attributed to red deer (*Cervus elaphus*). Including pieces of antler and the bones of roe deer (*Capreolus capreolus*), deer provide 60% of the number and 70% of the weight of all bones (*ibid.*). The spectrum is however dominated by antler and teeth fragments as well as lower leg bones. Other mammals comprise domestic species such as cattle (*Bos taurus*) (13.5%), followed by ovicapids, pig (*Sus domesticus*) and dog (*Canis familiaris*). However the strong fragmentation of the bones complicated an attribution to wild or domestic species regarding cattle and pig. Again elements of the skull (predominantly teeth) and lower leg are overrepresented. Other species comprise otter (*Lutra lutra*), harbour porpoise (*Phocoena phocoena*) and fragments of whale.

Five teeth could be attributed to humans, including children. Remarkable about the bone assemblage is the strong presence of non-meat bearing elements, both in domestic and wild species of mammal which according to the excavators cannot be totally explained by taphonomical processes. The spectrum of activities at the site seems to have been geared at fowling and the hunting of red deer and roe deer. It seems that meatbearing elements might have been transported away. The domestic animals were present at the site as livestock and might have

## Slootdorp-Bouwlust

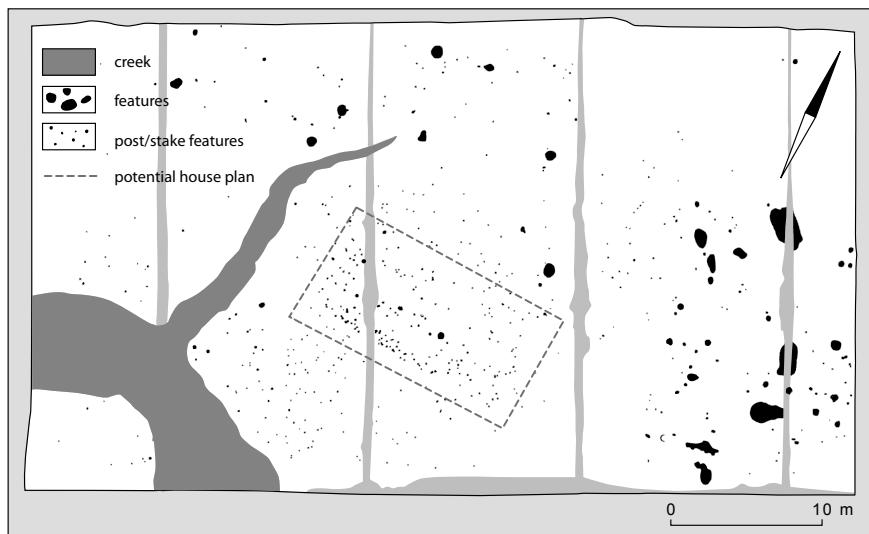


Fig. 68 Slootdorp-Bouwlust.  
Distribution of post and stake  
holes as well as other features.  
Adapted from Hogestijn/  
Drenth 2000/2001, fig. 5.

been there for grazing grounds. Most faunal evidence points to a presence in the autumn and winter (especially the antler and the species of duck), while sturgeon might represent some activity in the summer (*ibid.*).

### Interpretation:

Slootdorp-Bouwlust is an interesting site since it defies the Neolithic logic of most TRB settlement sites (although not much is known from these locations in the Netherlands). The location of the site in a salt marsh area seems to have strongly influenced the character of habitation. Activities seem to have been directed more at hunting and gathering than at keeping livestock, although domestic animals were present. Furthermore the inhabitants of Slootdorp were not entirely sedentary since most evidence seems to point to a predominance of presence in the winter half of the year. This combined evidence seems to indicate even at TRB sites there is still some effect of the process of Neolithisation. As of yet it is however not clear to what extent the non-Neolithic elements are associated with the background of the inhabitants, the opportunities of the environment or a combination of both.

### References:

Hogestijn/Drenth 2000  
Hogestijn/Drenth 2000/2001  
Peeters 2001

## 45. Sweikhuizen-de Hei

### Location:

The site is located on the upper terrace near the village of Sweikhuizen in eastern Southern Limburg (Modderman 1987). Geographically it is situated on the edge of the upper terrace overlooking the Graetheideplateau situated on the Middle terrace and separated from it by the Geleenbeek, a stream at the foot of the slope.

#### *Site characteristics:*

The site was discovered in 1980 by an amateur archaeologist in a freshly ploughed field. The site was further investigated by the IPL with small test trenches in the same year. Three trenches were opened. Trench A (124 m<sup>2</sup>) was situated at the location of a concentration of La Hoguette sherds (Ø 2.5 m). Trench B (4 m<sup>2</sup>) was located at the location of another La Hoguette sherd. Trench C (11 m<sup>2</sup>) was located at the location of a sherd with a remarkable internal ridge (Modderman 1987, 87).

#### *Geology/Pedology:*

The site is located on Pleistocene fluvially deposited, gravelly sands. Remarkable is the absence of a loess cover (which is present in the adjacent field to the east). Within the sand a podzolic soil (moderpodzol) had developed to a depth of 55 cm below the surface.

#### *Taphonomy:*

The taphonomic disturbance of the site is unknown. The absence of features may, but need not be attributable to erosion, ploughing or weathering of the soil. The location of the site close to the terrace edge may however have led to some downslope dispersal of archaeological remains. On the other hand artefacts were found up to a considerable depth. Furthermore no organic material was preserved.

#### *Ecology:*

The site is located in a characteristically promontory position, overlooking the lower terrace. The Geleenbeek flows at a distance of 600 m and some 40 m below. The sandy subsoil, in combination with the slope, the valley of the Geleenbeek and the patches of loess will have made for a diverse vegetation. The classic viewpoint location may be related to hunting activities.

#### *Dating:*

No <sup>14</sup>C dates are available. The site yielded thousands of flint artefacts dating to the Middle and Late Palaeolithic, the Mesolithic and the Middle and Late Neolithic. Furthermore sherds belonging to the La Hoguette group indicate activities in the Early Neolithic. Several other sherds may be attributable to the MK.

#### *Features/Spatial layout:*

The main trench was located at the location of a cluster (Ø 2.5 m) of La Hoguette finds. The excavation led to the discovery of two clusters of sherds with subsequent cores at approximately two meters (some of the sherds were dispersed up to 4 m by ploughing). On the basis of the presence or absence of bone temper, Modderman suggests (1987, 90), the clusters relate to two different pots. The other pottery is not clustered. No further features or internal spatial relations could be attested.

## Sweikhuizen-de Hei



Fig. 69 Sweikhuizen. Location of the Sweikhuizen site (larger dot) on its typical promontory position in view of a number of LBK sites (smaller dots) in the Geleen area on the western side of the Geleenbeek. Based on map, pp. 46 Topografische Dienst/Compact Provincie Atlas 1995, map, pp. 42-43.

### Finds:

One type of La Hoguette pottery was tempered with fragments of bone (up to 4 mm,  $\pm 25$  per  $\text{cm}^2$ ) and comprised 50 sherds (3 rim fragments). The side is marked by plastic elevated ridges, vertically separating part of the pottery and filled with horizontal ridges, marked with single and double dented spatula impressions. The pottery was mainly fired in an oxidizing environment. The other variant of La Hoguette pottery consists of 34 sherds (2 rimfragments with *Randverdickung*). The sherds were sand-tempered, but some chamotte was also present. The ridges are more heavily accentuated and applied in a V-pattern, again

accentuated with single and double spatula impressions and mainly fired in an oxidizing environment. Several of the sherds can be determined as *Begleitkeramik* (see Brounen 1999). Apart from the Early Neolithic component, MK sherds were found, predominantly in trenches B and C (among them several rim sherds with impression and two sherds with lumped and perforated ears). A previously found rim sherd with an internal ridge and quartz temper also fits into the MK tradition.

No specific information is available on the flint assemblage, although most material probably was collected during fieldwalking. Three scrapers on blade might be associated with the MK assemblage.

#### *Interpretation:*

Sweikhuizen probably was a popular location, since evidence for prehistoric activities spans several millennia. The recurrent use of the area may be related to its promontory position, overlooking the Middle terrace from a current height of 40 m. The site is well known since the first Dutch La Hoguette sherds (at the time interpreted as Limburg ware, cf. Modderman 1987) were found there. Due to the absence of features and dateable material it is unknown whether the La Hoguette site predates or was contemporaneous with LBK habitation on the Graetheideplateau. Both options are possible. Recently (see Brounen 1999), part of the La Hoguette assemblage has been reidentified as *Begleitkeramik* of La Hoguette (e.g. absence of row of doubly indented spatula impressions; see Van Berg 1990).

#### *References:*

Brounen 1999  
Modderman 1987  
Van Berg 1990

## **46. Swifterbant-S2**

#### *Location:*

S2 is located in parcel G42 of the reclaimed southeastern part of the IJsselmeer, Flevoland. The site is situated on the eastern levee of the main creek (Deckers *et al.* 1981, 125), in contrast to for example S3 located on a smaller gully (Prummel *et al.* 2008). In the vicinity several other levee sites were located (S4, S3/5/6, S31, S41, S42, S43), as well as S51 on the same levee to the northeast.

#### *Site characteristics:*

S2 was discovered in 1961. Preliminary investigations took place between 1964-1967 and the site was excavated in five campaigns between 1971-1978 (see also 2013 Excavation and augering data indicate an elongated site measuring 45 m in length and a maximum 24 m in width. The site surface is estimated at 750 m<sup>2</sup> with its main axis running parallel to the ridge of the levee. The sum total of excavated trench so far is approximately 453 m<sup>2</sup>. Approximately 60% of the site has been excavated and part of the finds were recorded spatially (Prummel *et al.* 2008), referring to a cultural layer covering an area of 24 x 50 m. The layer

was approximately 25 cm thick and fades out to the west and east bounds of the trench). The levee of S2 was probably higher and dryer than for example the levee of S3 (Deckers *et al.* 1981; De Roever 2004; Van der Waals 1977). In the summer of 2004 new trenches were opened by the GIA. A total of 26 m<sup>2</sup> was opened up. Trench 1 was located directly east of the 1978 trench on the eastern side, at the transition from levee to surrounding area and covered 16 m<sup>2</sup>. It was excavated in five levels of 5 cm and sieved. The second trench was also located on the same transition, north of the levee. It measured 10 m<sup>2</sup> (10 x 1 m). A column of 50 x 50 cm was excavated and sieved in the same manner. Furthermore augering took place up to 45 m north of the dune (Raemaekers *et al.* 2005). S2 is known for its graves located in a small cemetery. Per m<sup>2</sup>, 0.75 l of soil sample was sieved, specifically designed in order to detect botanical remains (Prummel *et al.* 2008).

#### *Geology/Pedology:*

Due to the transgression of the sea and the rising water table, increasingly wet conditions resulted in peatgrowth affecting the area around Swifterbant from 5400 cal BC onwards. Around that time the area had developed into a tidal flat resulting in a creek system with smaller and larger levees (Deckers *et al.* 1981, 115). The levees consisted of hard ripened clay (of Calais II origin, currently the Naaldwijk formation) surrounded by flood basin deposits. After 4000 cal BC the area became uninhabitable again and was flooded and covered with clay and peat (Ente 1976; De Roever 2004). S2 was recognizable in the field as a black layer of approximately 20 cm in thickness consisting of charcoal and finds and thinning towards the periphery. Elements of the section indicated two different phases within the layer, separated by intermediate clayey sediment resulting from a flooding event. The find horizon of S2 was of a less humic nature and contained less organic remains than S3. It is not clear whether this is a functional or taphonomic difference.

#### *Taphonomy:*

Preservation at S2 differs from S3. The find layer is considerably less thick, less organic remains were preserved and no hearths were found (De Roever 2004, 22). It is evident that part of this may be interpreted as a difference in site-function or use intensity. On the other hand the differences also relate to specific taphonomic circumstances. These most probably are associated to the fact that S2 is located on a higher and dryer levee. Apart from the flooding event separating part of the find horizon in two phases, no clear evidence of recurrent inundation of the site was found. This means that the layers that were deposited were either too thin to be recognised or were subsequently homogenised. This might have influenced the preservational conditions of especially the organic remains. Furthermore it meant no reed bundles or other organic remains were needed to artificially heighten the surface, nor clay bases for the fireplaces. This may be the reason for the absence of superimposed hearths and the less humic condition compared to S3 (Deckers *et al.* 1981, 128; De Roever 2004). Hearths may however have been a prominent feature of S2 as may be interpreted from the abundance of charcoal in the culture layer (pers. comm. P. De Roever 2006). It seems that taphonomic conditions linked to the dimensions and characteristics of the S2 levee partly explain its difference from, for example, S3 (in the 2004 campaign the low density of artefacts

and the absence of clustering in association with a thick blanket of charcoal and burnt bone, seemed to indicate a reworked layer to the east and north of the levee (Raemaekers *et al.* 2005). On the other hand behavioral choices may also have influenced the outcome. Some of the taphonomic conditions in combination with the vertical distribution of the artefacts may point to differences in intensity of occupation. Of the four levels identified in the most recent occupation, level four may have been used most intensively (Prummel *et al.* 2008).

#### *Ecology:*

The site was situated in a freshwater tidal area (Prummel *et al.* 2009). The geological developments in combination with the active creek system resulted in a very dynamic environment, characterised by levees and creeks and a hinterland with swamp vegetation and open water. Due to the closing of the coastline the tidal influence diminished and the brackish conditions turned into a freshwater environment. During the SWB occupation the deciduous forest vegetation consisted of oak (*Quercus*), elm (*Ulmus*), ash (*Fraxinus*), crab apple (*Pyrus malus*), lime (*Tilia*), poplar (*Populus*) and beech (*Betula*). On the slopes there was hazel (*Corylus*), hawthorn (*Crataegus monogyna*), rose (*Rosa canina/rubiginosa*) and dogwood (*Cornus sanguinea*). The trees on the levee might have been small due to the wet conditions (Van Zeist/Palfenier-Vegter 1981, 13), but this is not attested except for the small diameter of fence posts at S3 (pers. comm. P. de Roever 2006). The transitional zone to the swamp could be characterized as alder carr (*Alnion glutinosae*) (Casparie *et al.* 1977, 50; Van Zeist/Palfenier-Vegter 1981). There are also abundant synanthropic indicators such as greater plantain (*Plantago major*), knotgrass (*Polygonum aviculare*), common nettle (*Urtica dioica*) and fat-hen (*Chenopodium album*).

The new faunal analysis (Prummel *et al.* 2008) further confirmed S2 was located in a freshwater environment during its occupation. The presence of pig points to a vegetation with trees and forest fruits. These bushes were probably situated on the levees, in the swamps and on the river dunes in the vicinity. A recent diatom analysis also indicates a freshwater environment within which sedimentation took place regularly (*ibid.*).

#### *Dating:*

S2 yielded only 2  $^{14}\text{C}$  dates. One of these (sampled on bone from the cemetery) may be considered too old because of the reservoir effect (Lanting/Van der Plicht 1999/2000, 55; Prummel *et al.* 2009).

A crucial discussion concerning the occupation chronology centres on the cemetery and whether it was prior to the settlement, contemporaneous or post-occupational. The  $^{14}\text{C}$  date is of no use in this discussion (see above). Since the graves were dug in and underneath the layer with settlement refuse, it is not likely for the cemetery to have existed prior to the settlement. However, the fill of the graves cannot be distinguished from the layer with settlement refuse and no clear outline of the graves is visible, therefore homogenisation of gravefill and posterior culture layer cannot totally be ruled out (pers. comm. P. de Roever 2006). Grave

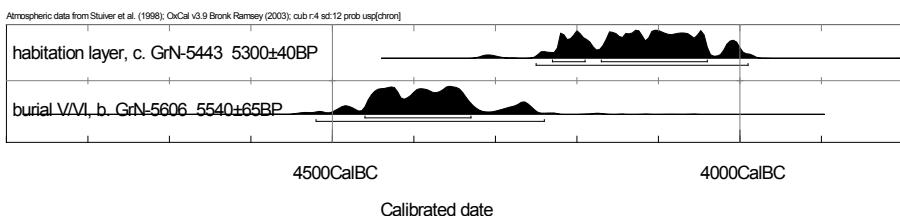


Fig. 70 Radiocarbon dates for Swifterbant-S2.

VI however seems to indicate part of the refuse layer was already formed before the grave was dug. Lanting and van der Plicht (1999/2000, 55), and to a lesser extent de Roever (2004, 25), believe the cemetery was posterior to the occupation of S2 and may be linked to settlement at other sites such as S3. Their arguments are based upon the fact that it is unlikely that the graves would have been dug into the activity areas and next to the hypothetical living structures. On the other hand the southern part of S2 might also have been in use, after which occupation might have spread further north over the cemetery. On the basis of stratigraphical arguments no evident conclusion can be reached (see also section 'interpretation').

#### Features/Spatial layout:

The site is slightly pear-shaped and longitudinally oriented on the shape of the levee. Apart from the cemetery the only features found were a row of eight stakes ( $\varnothing$  3-5 cm, 40-50 cm apart), with a length of approximately 4 m, located 5 m west of the cemetery (see Devriendt 2013<sup>1</sup>; Prummel *et al.* 2008; Van der Waals 1977). Several posts may have been missed during excavation on the northern side (Prummel *et al.* 2009). The stakes (of which at least one was made of *Alnus*) were hammered into the ground and still contained some weathered wood remains (*ibid.*). West of the row of stakes in the NW part of the dune nine (I-IX) graves were found. The graves were shallow (probably because of the high water table, *cf.* De Roever 2004), but most contained more or less complete skeletons of different preservation. The graves were generally oriented NNW-SSE, parallel to the gulley, and situated one after one another. This suggests they were recognisable during later interments. Small ditches flanked two of the graves (IV and VI). Graves II and III slightly overlap (the pit of grave III cut the pit of grave II without disturbing the interment). Furthermore grave V and VI were found superimposed and may be interpreted as a double grave (Deckers *et al.* 1981, 128). Although part of the material seems to be reworked the 2004 augering campaign indicated charcoal up to 45 m north of the site. Furthermore both 2004 trenches yielded a wooden stake (Raemaekers *et al.* 2005). Micromorphological analysis (thin sections) of the site indicates it was heavily trampled during occupation (Prummel *et al.* 2009). The vertical distribution in finds indicates differences in the intensity of occupation may have existed. The horizontal distribution of the various categories of finds indicates the existence of differences in disposal behaviour with respect to pottery, flint, stone and bone (Deckers 1979; Prummel *et al.* 2008). The distribution of finds in trench 1 point to the existence of various activity zones, while the alder post seems to point to specific use of the levee bank (Prummel *et al.* 2009).

<sup>1</sup> NB. Devriendt 2013 indicates an earlier unpublished manuscript with general descriptions of the Swifterbant sites. This has eventually been incorporated in Devriendt 2013 (pers. comm. Raemaekers 2013).

### *Finds:*

Most of the finds at S2 were located in a strip of c. 8 m wide, parallel to the creek. S2 yielded approximately 7000 sherds (De Roever 2004, 22 and 59) (De Roever 1979 and Raemaekers 1999 mention a total of 2450 sherds; see also Devriendt 2013) Most of the pottery is S-shaped, tempered with organic material and to a lesser extent grit. Coil-building with H-joins dominates. Smoothing, roughening, polishing and *Besenstrich* are used to finish the pottery. Rim decoration is present in the form of spatula and finger/nail impressions as well as some body-decoration (Raemaekers 1999; De Roever 2004). The new campaign yielded 247 sherds, most of these are tempered with grit, although sometime organic (vegetal) material has been added. Most visible coils were of the H-type, although N-types have also been found. Only two sherds were decorated with spatula impressions. According to Prummel *et al.* (2008) the pottery documented by Raemaekers (1999) and De Roever (2004) contained more organic temper. This divergence is most likely to be interpreted by differences in interpretation.

According to Deckers (1979), S2 yielded 1503 flint artefacts consisting of 11 cores, 430 flakes, and 520 blades. In total 295 tools were found. Most of the flint was of an erratic nature and could be collected in the boulder clay outcrop near Urk and Schokland. Retouched blades and a variety of scrapers dominate the tool assemblage. Furthermore it comprises trapezes, borers, combination tools, retouched flakes etc. (*cf.* Deckers 1979; Raemaekers 1999). Technologically the assemblage of S2 is dominated by blade technology, differing from for example S3 (see Raemaekers 1999, 40). No distinct informative vertical or horizontal clustering was detected. Bienenfeld (1986, 277) found use-wear evidence for soft plant working, hide processing, bone or antler working and wood working.

Remarkable furthermore is the difference in density of finds of pottery and flint at S2 and S3. In the later campaign only 25 pieces of flint were found, including a tool, some chips and a broken flake. It is not clear whether the flint is of northern or southern origin. Other stone remains comprised a considerable quantity of grit, possibly obtained from the nearby outcrop of boulderclay at Urk and Schokland.

In 1985 use-wear analyses was conducted on 127 artefacts. In total 46 tools were identified used for the processing of soft plants, hides, wood, bone and antler, indicating a diverse range of activities (Devriendt 2013). Some pottery and a stone axe dating to the Bell Beaker culture were also found on the levee in a higher level (Prummel *et al.* 2009).

Physical anthropological analysis of the graves indicated the presence of ten individuals in nine graves (Raemaekers *et al.* 2005), comprising at least eight adults (four male and four female) between 35 and 40 and a child aged four. The age and sex-distribution as well as several hereditary characteristics indicate an association with an extended family (Meiklejohn/Constandse-Westermann 1978; Deckers *et al.* 1981). According to Meiklejohn and Constandse-Westermann (1978), the cemetery must have been in use between 11.4 and 50 years by a group of 20 to 50 individuals. This is however based on year round occupation and it is agreed here with De Roever (2004, 25) that an annual occupation is unlikely. Furthermore it is well known not everyone was interred. This rather suggests a long use-life for the cemetery. In total S2 yielded 24 amber beads. Some beads and fragments were scattered loose on the site, but most could be ascribed to two

interments. Two skeletons were adorned with amber beads and pendants. Beads were found around the cranial and pelvic area of a female in grave V and around the head of a male (who also had a boar's tusk on his chest as well as a perforated pebble near his ear) in grave IX, as well as dispersed in grave IX. The latter grave was best preserved and may be interpreted as a double burial in combination with grave VII (see also Devriendt 2013). Furthermore a flake was found in grave I and a flake and a blade in grave VI (Deckers 1979, 153), although these also may pertain to the grave filling. As can be expected for this period S2 also yielded isolated finds of bone such as twenty teeth fragments a femur and a humerus, a heel-bone and vertebra (Meiklejohn/Constandse-Westermann 1978).

The 2004 campaign by the GIA did not yield a lot of material (25 flint artefacts, 16 pieces of natural stone, 37 sherds). Some 4733 fragments of bone (most of which were found in the second lowest level, 4) were found of which 80% was burnt. The fragmented state of the bones is mainly related to heavy trampling, indicating that the waste was not primarily dumped in pits. A new analysis yielded 257 identifiable bones (Prummel *et al.* 2009), most of which were found in trench 1. Of the 41 identified mammal bones domesticated species comprise pig (*Sus domesticus*) cattle (*Bos taurus*) and dog (*Canis familiaris*). Furthermore faunal remains of beaver (*Castor fiber*), wild boar (*Sus scrofa*) and red deer (*Cervus elaphus*) were found. One of the 15 fragmented bird bones was identified as wild duck (*Anas platyrhynchos*). Of the 195 fish bones several species were identified including eel (*Anguilla anguilla*), perch (*Perca fluviatilis*), bream (*Abramis brama*), catfish (*Siluris glanis*), ruffe (*Gymnocephalus cernuus*) and pike (*Esox lucius*). The oldest campaign at the site by RIJP only yielded 160 faunal remains confirming the picture sketched above, but included two bone tools (a spatula made on the bone of a deer and a burnt axe sleeve made of antler). The older BAI excavation yielded 7758 bones, of which most were sieved (3 mm) and 1183 handpicked. The fragments are generally larger than the more recently documented ones (Prummel *et al.* 2009). Again the faunal spectrum mirrors that of the more recent excavations and is dominated by pig. The ratio pig : cattle is 11:1 and no remains of sheep or goat were found. Beaver again dominates the wild spectrum. Otter (*Lutra lutra*) has also been found. The GIA excavation indicated that fish was probably more important than previously assumed. The BAI excavation even further stresses the dominance of domesticated pig over cattle. Compared to S3, S2 yielded less remains of wild animals (*ibid.*).

The new campaign also yielded several tens (N=110) of kernels of cultivated wheats (*Hordeum* and *Triticum*), including one spikelet fragment. The overall low numbers may point to the fact the material was blown in from another location (Raemaekers *et al.* 2005; Prummel *et al.* 2009). Identified wood species comprise alder (*Alnus*), from a post as well as charcoal, and ash (*Fraxinus*). According to Prummel *et al.* (2008), it is likely that some of the alder bushes were managed for obtaining wood. After the main occupation several finds attest to further use of the site. De Roever (2004, 22) attributes one of the sherds found in the vicinity of the site to the later Swifterbant period and suggests this sherd dates to a phase when the site could only be reached per boat during low water and may have served an extractive function. The continued importance of the site is evidenced by finds attributed to the Bell Beaker culture. This occupation was most likely associated with activities on the IJssel bank and may have been extractive (Raemaekers/Hogestijn 2008, 417).

## Swifterbant area

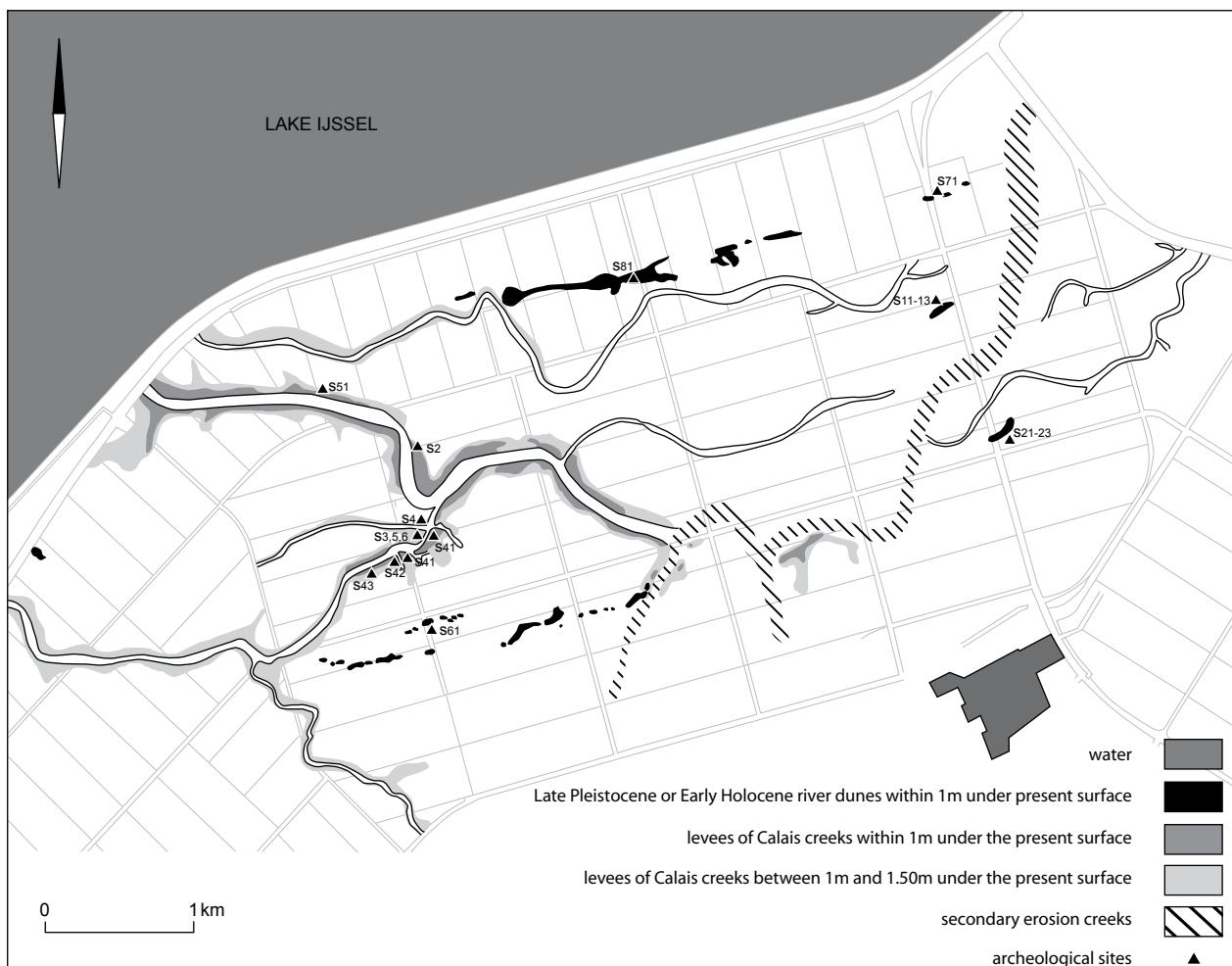


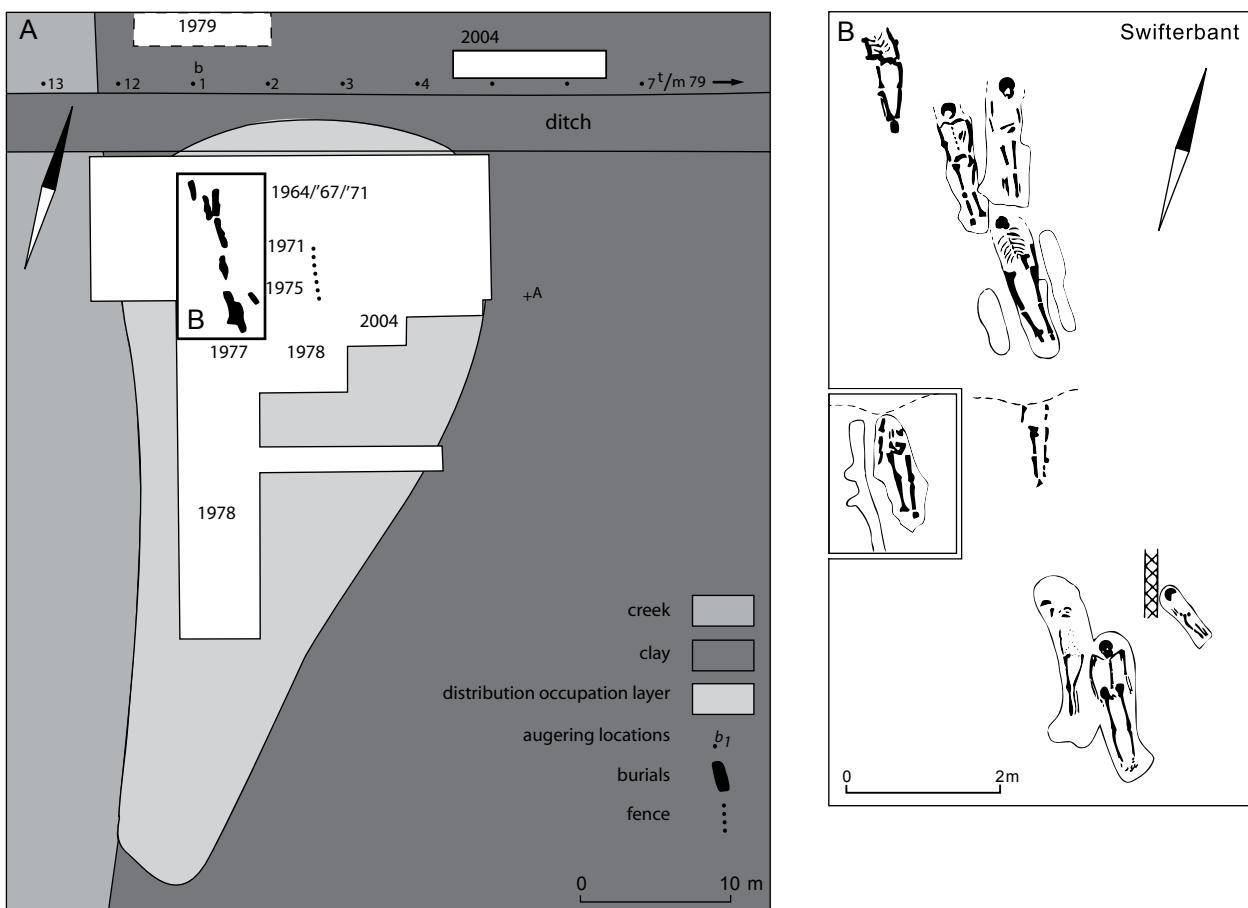
Fig. 71 Swifterbant area. Geomorphological distribution map of the sites situated on levees and river dunes in the Swifterbant area. Adapted from De Roever 2004, fig. 1, based on Deckers 1979, fig. 1.

### *Interpretation:*

Preservation at S2 is inferior to S3. The site however yielded a substantial amount of information. S2 may be interpreted as both a settlement sites as well as a cemetery, of which the specific internal chronological correlation is not yet clear (see below). Furthermore the material record, partially influenced however by taphonomic factors, indicates a less intense occupation compared to S3. Technological and typological differences in the pottery and tool assemblages are minor, although the dominance of blade technology in S2 is remarkable (Deckers 1982; Raemaekers 1999). It is suggested here that these differences might not only be explained chronologically, but also as pertaining to choices made by contemporaneous extended families within the Swifterbant area.

On the basis of stratigraphical and chronological arguments no conclusion can be reached on whether the cemetery was prior, contemporaneous or posterior to habitation at S2. All options are open as well as combinations of both (a cemetery need not have been a one-phased event). Choices however may be narrowed down. First of all grave VI seems to indicate part of the habitation layer already existed when the grave was dug. This is not evident for the other graves, but since

## Swifterbant-S2



these might have been dug deeper, this need not mean they were anterior to the occupation of the site (especially since the fill of the graves is not distinguishable from the occupation layer). It is therefore more likely the cemetery did not come into existence before occupation of the site. Furthermore it is probably justified to suggest that the spatial coherence (same orientation, no substantial cross-cutting) of the cemetery suggests some chronological coherence. This need not mean it may not have had a long use-life (although limited by the total duration of occupation on the levees, approximately 300 years). If this is assumed, interments may have started when S2 was occupied. Burial then would have taken place within the activity/living areas, which is not impossible. Another option would be that the cemetery was used when occupation shifted to another part of S2 or elsewhere. It should however be considered unlikely that the area of the cemetery was used as a settlement area proper later on, and thus 'forgotten' from collective memory. The presence of settlement refuse on top of and within the graves (*cf.* De Roever 2004, 25) should therefore rather be interpreted as already present in the matrix at the time the graves were dug. Posterior deposition of waste in the cemetery cannot be excluded as a hypothesis since nothing is known on SWB culture perception of treatment of the dead or waste. On the basis of the current evidence however it should be concluded that the cemetery of S2 was contemporaneous with and/or posterior to occupation of S2.

Fig. 72 Swifterbant-S2. (A) location of the site and various excavation trenches in relation to the creek. (B) Detail of the inhumations at Swifterbant-S2. Adapted from Meiklejohn and Constandse-Westermann 1978, fig. 5 and 6; Raemaekers et al. 2005, fig. 3.

The absence of abundant botanical and faunal information prevents specific analyses of the function, subsistence and seasonality of S2. The 2004 campaign was not able to shed any further light on the absence or presence of evidence for local cultivation (*cf.* Raemaekers *et al.* 2005). Currently S2 should be interpreted as a domestic site with a cemetery. Subsistence comprised both wild and domesticated sources, although domesticates may have been more important compared to S3. Furthermore the importance of pigs should be noted.

#### *References:*

Bienenfeld 1986  
Casparie *et al.* 1977  
De Roever 2004  
Deckers 1979  
Deckers 1982  
Deckers *et al.* 1981  
Devriendt 2013  
Ente 1976  
Meiklejohn/Constandse-Westermann 1978  
Prummel *et al.* 2009  
Raemaekers 1999  
Raemaekers *et al.* 2005  
Raemaekers/Hogestijn 2008  
Van der Waals 1977  
Van Zeist/Palfenier-Vegter 1981

## **47. Swifterbant-S3/5/6**

#### *Location:*

S3 is located on a levee wedged-in between two side-creeks of the main creek system, in parcel G43 of the reclaimed south-eastern area of the IJsselmeer, Flevoland (Van der Waals 1977). The trenches of S5 and S6 are located on the same levee and cover the slopes of the same site. S5 extends into the creek. S6 was not investigated elaborately (mainly augering data), but was located south of S3 and may be isolated from it. It yielded a small hearth and a T-shaped antler axe. In the immediate vicinity several other levee sites were located (S2, S4, S31, S41, S42, S43) (see also Devriendt 2013) S3 is located on a levee which is lower and smaller than the levee of S2.

#### *Site characteristics:*

The site was discovered in the 1960's but excavations started in 1971. In 1973 it was decided to excavate the site integrally. In 1975 this resulted in the side trench S5, extending into the creek on the eastern side of the levee (Van der Waals/Waterbolk 1977, 11-13). S6 formed the southern extension of S3 and enabled localizing the limits of the find concentration as well as finding a new one (De Roever 2004, 20). Another extension was dug in 1977 documenting the northern limits of the site. The site is ovaloid in shape and measures 15 m in width and 35 m in length. According to De Roever (2004) the site surface measures approximately 600 m<sup>2</sup> (this is smaller than 760 m<sup>2</sup>; *cf.* Van der Waals 1977; Raemaekers 1999).

The cumulative extent of the trenches is some 400 m<sup>2</sup> (see De Roever 2004, 22). If however it is accepted that 95% of the settlement was excavated this would amount to 570 m<sup>2</sup>. A large part of the settlement was excavated except the north-western extents. The main axis of the settlement runs parallel to the creek (NE-direction). There is some slight relief in the terrain resulting in a small northern and southern top (*ibid.* 20, 21).

#### *Geology/Pedology:*

Due to the transgression of the sea and the rising water table increasingly wet conditions resulted in peatgrowth affecting the area around Swifterbant from 5400 cal BC onwards. Around that time the area had developed into a tidal flat resulting in a creek system with smaller and larger levees (Deckers *et al.* 1981, 115). The levees consisted of hard ripened clay (of Calais II origin) surrounded by flood basin deposits, although the clay of S3 was less hard than the clay of the large levee of S2 (pers. comm. P. de Roever 2006). After 4000 cal BC the area became uninhabitable again and was flooded and covered with clay and peat (Ente 1976; De Roever 2004). The find layer on the site is up to 80 cm in thickness. The lower part is interspersed with clayey bands indicating sedimentation (and thus flooding) continued during habitation. Organic material was used to heighten the surface. The upper part seems to have been more stable (*ibid.* 2; Van der Waals 1977, 17).

#### *Taphonomy:*

The eastern part of the site was eroded by the creek (De Roever 2004, 20). The dated objects indicate no stratigraphical chronology and there is evidence for bioturbation and possible frost action (De Roever 2004, 33).

#### *Ecology:*

The important geological developments in combination with the active creek system resulted in a very dynamic environment. The landscape was characterised by levees and creeks and a hinterland with swamp vegetation and open water. Due to the closing of the coastline the tidal influence diminished and the brackish conditions turned into a freshwater environment. During the SWB occupation vegetation on the levees consisted of oak (*Quercus*), elm (*Ulmus*), ash (*Fraxinus*), crab apple (*Pyrus malus*), lime (*Tilia*), poplar (*Populus*) and beech (*Betula*). On the slopes there was hazel (*Corylus*), hawthorn (*Crataegus monogyna*), rose (*Rosa canina/rubiginosa*) and dogwood (*Cornus sanguinea*). The trees on the levee were probably small due to the wet conditions (Van Zeist/Palfenier-Vegter 1981, 13). The transitional zone to the swamp would have been populated by alder carr (*Alnion glutinosae*) (Casparie *et al.* 1977, 50; Van Zeist/Palfenier-Vegter 1981). There are also many synanthropic indicators such as greater plantain (*Plantago major*), knotgrass (*Polygonum aviculare*), common nettle (*Urtica dioica*) and fat hen (*Chenopodium album*). No convincing agricultural field weeds were recovered (*ibid.* 141-143). Shortly after habitation pollen in soil samples taken at the foot of S5 indicate the natural environment was dominated by reed and the creek near S3 was nearly filled. Around approximately 3000 cal BC a deciduous woodland vegetation was established on the remainder of the levees, with alder zones on the side. Finally the elevations drowned (Casparie 1977).

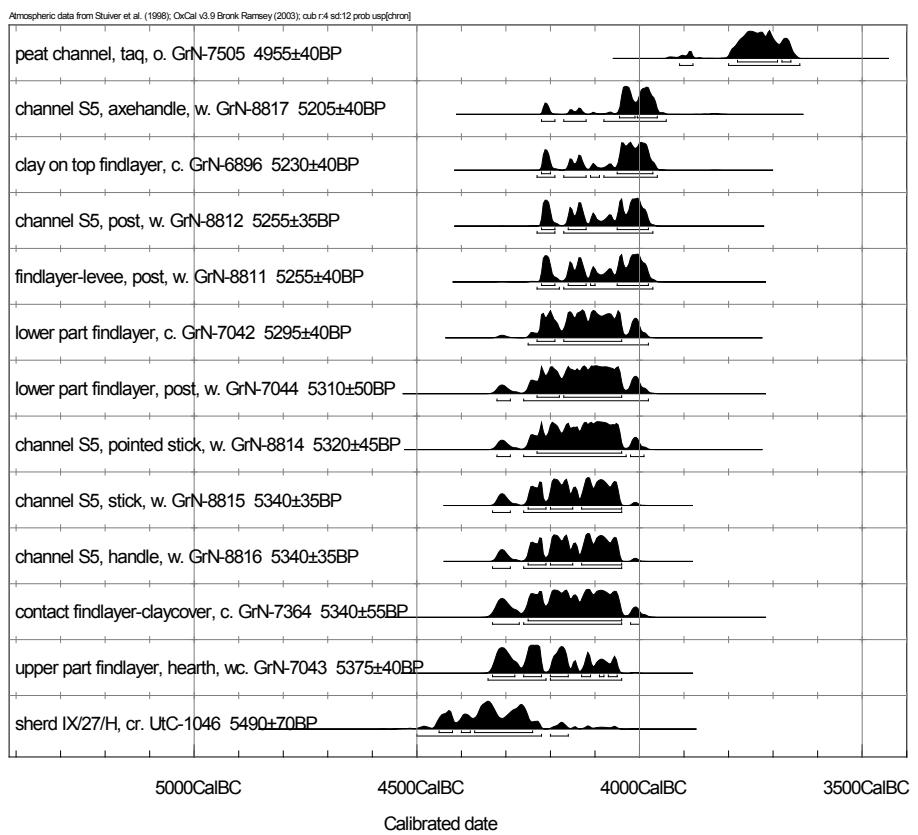


Fig. 73 Radiocarbon dates for Swifterbant-S3.

#### *Dating:*

In total 16  $^{14}\text{C}$  dates have been obtained for S3/5/6. Two of these (GrA-6488, GrA-1536) were rejected because of the reservoir effect. One dated to the Iron Age (GrN-8813) (Lanting/Van der Plicht 1999/2000, 55). The remaining dates show a clustering between roughly 4300 and 4000 cal BC. A slight difference in the later dates of the sequence may point to two phases of occupation, but this is unlikely. The oldest date might be affected by the reservoir effect (Lanting/Van der Plicht 1999/2000, 55). Unfortunately the dates do not relate to their stratigraphic location.

Van Zeist and Palfenier-Vegter (1981, 134) mention a total occupation span of 75 years. It is not clear how they arrive at this count, but it is not unlikely the total occupation span was longer. The period of 4300-4000 cal BC coincides with a relative weakening of the rising watertable (Gotjé 1993 as cited in De Roever 2004, 17).

#### *Features/Spatial layout:*

In total 110 hearths and ash-concentrations were found spread over the entire area. Most of them are in the upper more homogeneous part of the find layer and some have been re-established in the same location. In the lower part of the find layer features were recovered, dug in from a higher level. These features ( $\varnothing$  30 cm) had a rather black, charcoal-rich fill and are interpreted as rubbish or cooking pits (*cf.* De Roever 2004, 32). Many of the hearths had clay bases, others were round to rectangular patches of white ash of burnt bone, or shallow pits

encircled by charcoal (see also Devriendt 2013) Several activity areas based on the density of artefacts are distinguished. Several hundreds of postholes (N = 650), a considerable number including remains of the posts/stakes, were found. Most of the stakes/posts ( $\varnothing$  6-11 cm) were pointed. No evident structural house plans were discovered although some linear alignments could be attested. Several of the linear alignments quite convincingly form a rectangular structure measuring 4.5 x 8 m (see De Roever 2004, appendix 1). In the centre of the structure a frequently renewed hearth was located and there is a relation between the dispersal of the pottery and the structure. A second structure might have been located more to the northwest. The cluster of postholes indicates frequent renewal of the structures on the site in the same spot (De Roever 2004, 34). Several times parts of the site were heightened with bundles of reed, probably to counter the increasingly wet conditions (*ibid.* 41). According to Van der Waals (1977) S3-5 may also have yielded a possible fish weir (see Peeters 2007, 179).

#### *Finds:*

S3 yielded 20.000 sherds (De Roever 2004, 22, but see also Devriendt 2013 for smaller counts of 1738 or 12500 sherds for S3). Most of these were tempered with organic material and grit (Raemaekers 1999, table 3.1). Most frequent are rim decoration and spatula impressions. The pottery can be dated to the Middle Phase of the SWB culture (Raemaekers 1999, 108). Approximately 10.000 flint artefacts were found. Most of the flint was of local erratic nature, some exotic pieces (e.g. Rijckholt-type) as well as two flakes with polished facets were also found. Both flake and blade-technology were used (although in contrast with S2 flake-technology dominates, Raemaekers 1999) and apart from cores and debitage-material, the toolkit comprised of points (mainly trapezes, but also a triangular/leaf-shaped arrowhead), borers, retouched flakes and blades and an abundance of scrapers (Deckers 1982; Raemaekers 1999). Furthermore, several hundreds of stone artefacts were found amongst which two fragments of a *Breitkeil* (Raemaekers 1999, appendix 4). The faunal material (4047 identified bones) comprised of both domestic animals such as dog (*Canis familiaris*), cattle (*Bos Taurus*) and pig (*Sus domesticus*) as well as wild fauna with a dominance of beaver (*Castor fiber*) and otter (*Lutra lutra*) fish (a.o. catfish, pike, bream, rudd, roach, tench, common eel, perch, ruffle, flounder, thin-lipped grey mullet, sturgeon and salmon/sea trout) and fowl-remains (mallard, shelduck, pochard, tufted duck, goose, mute swan, white-tailed eagle, carrion crow, cormorant and an artefact made on the ulna of a crane) (see also Devriendt 2013).

Problematic is the group of *Sus* spec. of which it was not possible to determine the wild or domesticated nature (Raemaekers 1999, 114; Zeiler 1997, 30). Some bones of rarer species such as horses, elk, polecat and bears were also found as well as individual bones of fox, wild cat and common seal. Isolated human bones and teeth were also found (Constandse-Westermann/Meiklejohn 1979), including a jaw, a tibia and 14 teeth fragments. On the tibia as well as on other bones from graves of adjacent sites as well as loose finds, cutmarks are frequently encountered. The tibia also showed signs of gnawing (Clason/Brinkhuizen 1978, 72; Meiklejohn/Constandse-Westermann 1978, 88). In total 158 bone tools were found, comprising five T-shaped antler axes, six shafted antler axes, two socketed bone axes, one unsocketed bone axe, three gouges, 69 awls as well as seven gouges and three awl made of tusks of boar (Bulten/Clason 2001; Devriendt 2013). The

site also yielded 68 ornaments and pendants, most of which were made of amber (N = 32). Other materials include stone, teeth, bone and a vertebra of a catfish (Van der Waals 1976, as well as Devriendt 2013).

Macroremains include wooden posts, stakes, (axe)handles, edible wild fruits and nuts (hazelnut, crab apple, hawthorn, rose-hips and blackberry (*Rubus fruticosus*) as well as remains (chaff and kernels) of naked barley and emmer (cf. *supra*; Casparie *et al.* 1977; Van Zeist/Palfenier-Vegter 1981). With respect to the mean diameter of the stakes it was suggested by Casparie *et al.* (1977) selection of wood might have taken place. Remains of cultivated plants comprise charred cereal remains as well as fragments of rachis internodes (indicative of threshing) of naked barley (*Hordeum vulgare nudum*) (N=1967), grains of emmer (*Triticum dicoccum*) (N=72) and one possible grain of breadwheat (*Triticum cf. aestivum*), although its singularity and charred state makes this unlikely (Van Zeist/Palfenier-Vegter 1981).

#### *Interpretation:*

S3 was inhabited during the middle phase of the SWB culture (as attested by the  $^{14}\text{C}$  dates and the characteristics of the pottery-assemblage). On the basis of organic remains both year round occupation as well as an occupation between spring and autumn (March-September) as well as autumn/winter are suggested (Raemaekers 1999; Zeiler 1997). On the other hand it is not very likely the sites were occupied year round, although this may not be ruled out for the last phases of occupation (De Roever 2004). Strong indications for interspersed occupation are the intermittent clay-layers and the frequent renewal of structural elements on the site. However it should be concluded that no clear seasonal signal could be retrieved from the faunal and botanical assemblages (Raemaekers 1999; Zeiler 1986; 1997), although overall evidence for an occupation from spring to autumn is more substantial than winter activities (also see Louwe Kooijmans 1993<sup>a</sup>). The wet conditions during winter may indicate mainly a summer occupation. The grains, rachis and internodes that were found may be interpreted in the light of local agriculture although no absolute evidence can be given. Local crop cultivation thus is still one of the possibilities. In the light of the wet and marshy environment it is also possible cereals were transported to the site from elsewhere (cf. Bakels 1986), or that any local agriculture was of a very small scale. It is however clear that all plant remains must have been brought to the site intentionally (Van Zeist/Palfenier-Vegter 1981). Van Zeist and Palfenier-Vegter also argue for the presence of a seed composition related to and differing per activity area, indicating plants were collected for different and specified reasons.

On the basis of the pottery characteristics Raemaekers (1999, 35) argues for a possible later date of the levee sites with respect to the river dunes. De Roever (2004, 79) argues they are partly contemporaneous but there might both be an older aspect to the river dunes as well as a functional difference. S3 can be interpreted as a temporal base camp for complete households as remains of both women and children have been found. This is confirmed by the complete character of the flint toolkit. Furthermore the location on a low and rather wet levee (if compared to S2) might be related to the importance of fishing, since the site is situated at a confluence of several creeks (pers. comm. P. de Roever 2006). Finally it should be stated that the character of occupation at S3 may have differed over time, including an early phase with less intensive activity related to

### Swifterbant-S3

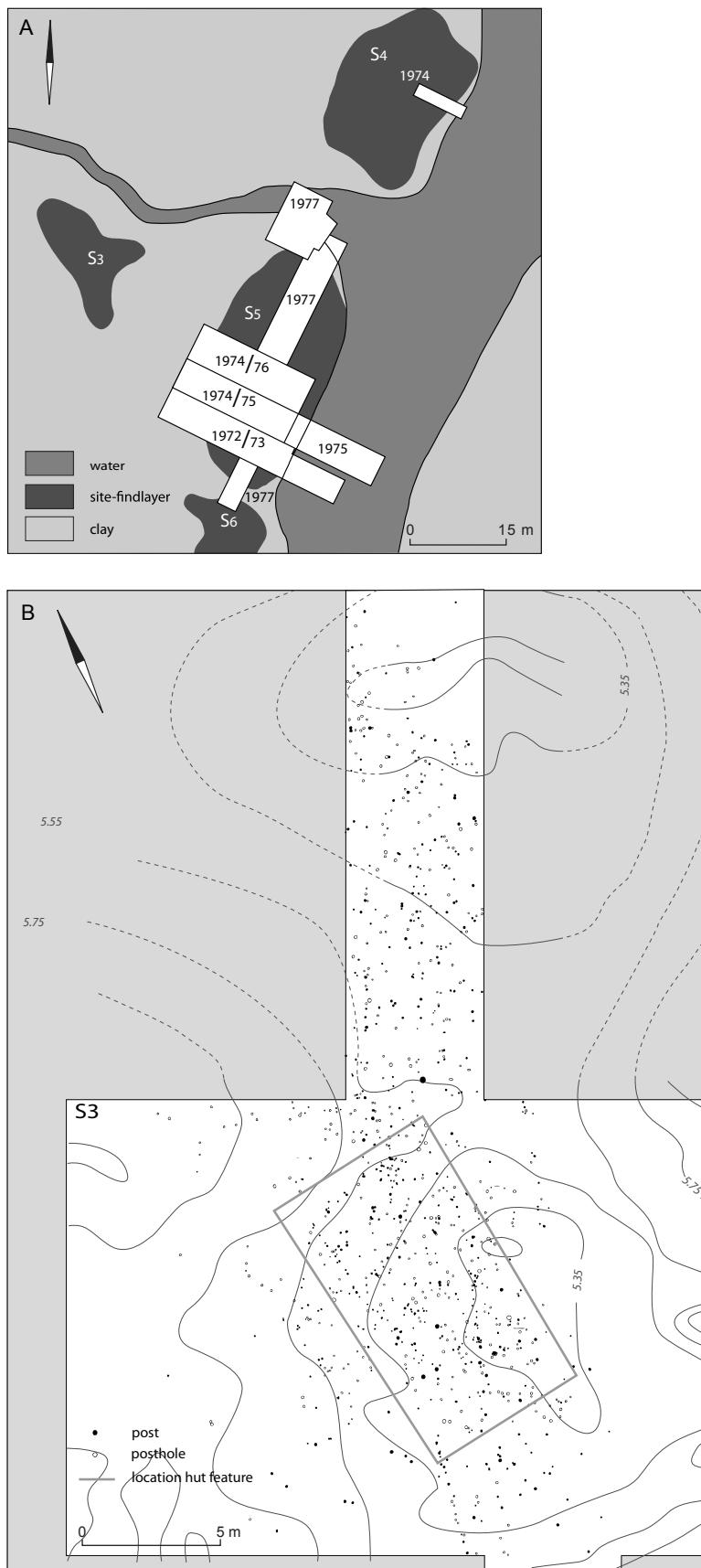


Fig. 74 Swifterbant-S3.  
 (A) location of the site, find distribution and various (dated) excavation trenches in relation to the creek and side-creek. (B) excavation plan of the S3 site with features and location of the hutfeature.  
 Adapted from De Roever 2004 (appendix map I) and Deckers et al. 1980, fig. 10.

fishing and hunting. Cereals however are present from the initial phases onwards (De Roever 2004, 36). S3 should be interpreted as a domestic site. Subsistence comprised both wild and domesticated resources. Crops may have been grown locally as evidence for small fields was found at the nearby and contemporaneous site of S4 (see S4) during the 2007 excavation campaign of the GIA (Huisman/Raemaekers 2008).

#### *References:*

Bulten/Clason 2001  
Casparie *et al.* 1977  
Clason/Brinkhuizen 1978  
Constandse-Westermann/Meiklejohn 1979  
De Roever 2004  
Deckers 1979  
Deckers *et al.* 1981  
Deckers 1982  
Devriendt 2013  
Ente 1976  
Lanting /Van der Plicht 1999/2000  
Louwe Kooijmans 1993  
Raemaekers 1999  
Van der Waals 1976  
Van Zeist/Palfenier-Vegter 1981  
Van der Waals 1977  
Zeiler 1986  
Zeiler 1997

## **48. Swifterbant S11/12/13**

#### *Location:*

S11-13 is located on a river dune at a distance of 3.5 km from the levee sites in parcel H34 in the reclaimed south-eastern area of the IJsselmeer, Flevoland. S11-13 corresponds with three small elevations on top of the dune, in the north-eastern part, the middle and the west.

#### *Site characteristics:*

S11-13 is located on a river dune at a distance of 3.5 km from the levee sites in parcel H34 in the reclaimed south-eastern area of the IJsselmeer, Flevoland. The site was excavated between 1976 and 1978. De Roever (2004, 39) mentions 525 m<sup>2</sup> for S11, 180m<sup>2</sup> for S12 and 100 m<sup>2</sup> for S13. The dimensions of the sites are difficult to determine due to the absence of a dark occupation layer. The dune measures approximately 175 x 700 m (*ibid.*) and according to Whallon and Price (1976) the occupation layer of S11 must have extended over at least 35 x 40-50 m.

### Geology/Pedology:

The dunes were formed in the Late Glacial or Preboreal and were covered by a stable wooded landscape. Transgression of the sea and a rising water table transformed the area into a tidal flat with creeks, levees and back swamps. The river dunes formed the higher elevations (Ente 1976; Hacquebord 1976). A subsequent period saw peat growth followed by open water, causing erosion of parts of the peat and part of the top of the river dunes (Ente 1976, 28; De Roevert 1976, 209). Finds were located in both the A- and B-horizon, although the pottery was usually found higher up in the profile.

### Ecology:

In the Atlantic period the stable Boreal landscape and vegetation would change due to the rising water table. Conditions became increasingly moist leading to a bog and creek system in a fresh water tidal delta environment. This environment comprised alder (*Alnus*), oak (*Quercus*) and pine (*Pinus*) vegetation as well as lime, (*Tilia*) ash (*Fraxinus*), oak and hazel (*Corylus*) on top of the river dunes (Casparie 1977). At a later stage the extensive habitats for alder gradually disappeared and due to the increasing water levels, open water was present in the creek next to the site (Casparie 1977; see also Devriendt 2013).

### Taphonomy:

S12 and 13 were largely truncated by erosion. S11 was fairly intact. The finds at S12 were reworked (De Roevert 2004).

### Dating:

A total of twenty  $^{14}\text{C}$  dates obtained on material from S11 is available. Unfortunately many samples consisted of organic material used as temper in pottery. These yielded unexpected early dates and have to be refuted. Of the dates presented here GrN-10352, GrN-10353 and GrN-10354 might be too young due to insufficient pre-treatment (see Lanting/Van der Plicht 1999/2000, 56). Nevertheless two clear

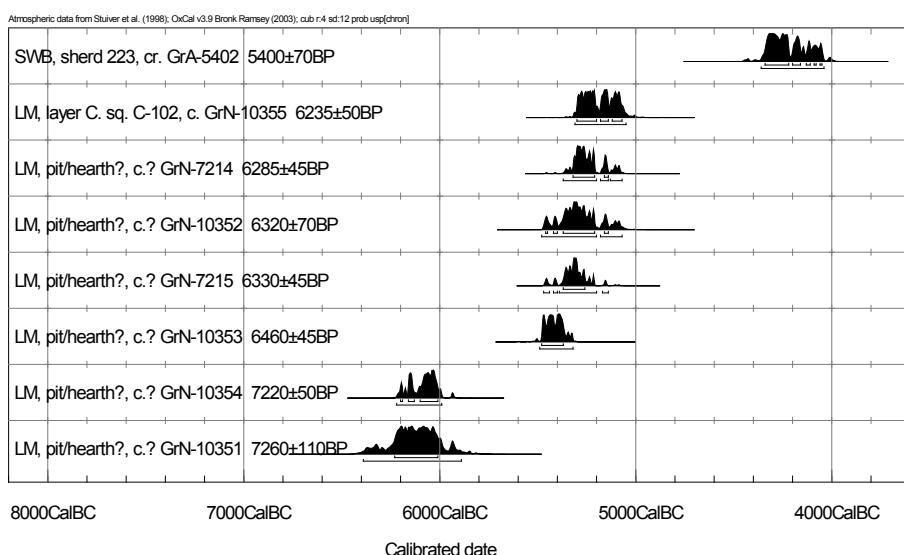


Fig. 75 Radiocarbon dates for Swifterbant S11/12/13.

Mesolithic phases of use can be detected, partially associated with the Mesolithic flint assemblage, as well as a Middle SWB phase. According to De Roever (2004, 26-27), both the pottery and the skeleton date to the younger phase. This is confirmed by the dated residue of one of the vessels.

#### Features and spatial layout:

S11 is located on the north-eastern end of the dune on a slight elevation. The trench of S12 was located on top of the dune, while S13 was located in the south-western section. De Roever (2004, 40) furthermore identified 5 concentrations of up to c. 90 sherds of variable size, belonging to c. 9 pots and possibly 4 additional

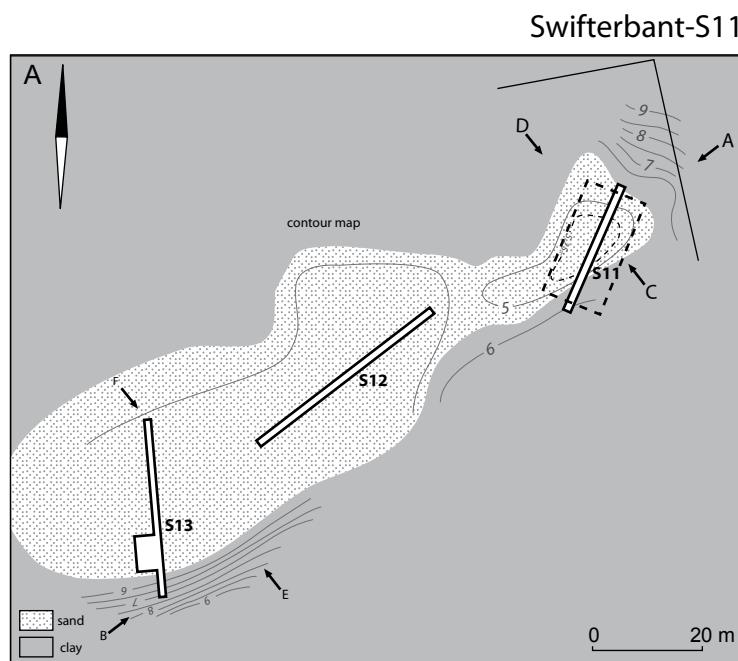


Fig. 76 Swifterbant-S11-13. (A) Location of the sites S11, S12 and S13 and the trenches on top of the river dune (1974 situation). A-F represent sections. The top of the dune at S12 and 13 eroded away. (B) excavation plan of S11, including later trenches. 1. Thin walled sherds, grit or sand tempered. 2. Thin to thick walled sherds, organically tempered, probably one vessel. 3. Thick walled sherd refits, mainly organically tempered. 4. Thick walled sherds and large pottery fragment (circled star), sand and chamoite tempered. A-E represent sherd concentrations. Adapted from Whallon and Price 1974, fig. 1 and De Roever 2004, fig.6.

vessels. There seems to be a complete overlap in the distribution of pottery, flint and features, although flint and features need not date to the SWB occupation. The site yielded many pits and hearths as well as one grave with skeletal remains. None of the features seem to overlap.

#### *Finds:*

A total of 15,000 artefacts were found (for all three localities) comprising 7000 flint artefacts (163 tools), 283 sherds, charcoal and some pieces of bone (see Whallon/Price 1976, table 1). The flint artefacts from all three locations have a clear Mesolithic signature, including lancette points, triangles, trapezes, backed blades, burins and two *pièces esquillées*. Furthermore scrapers, borers and retouched pieces were found. The site also yielded many pits and hearths, one grave with a complete skeleton and a pit (feature 42) comprising 17 teeth and some fragments belonging to one individual. The pottery is almost exclusively found in the upper layers. Five concentrations could be discerned related to some nine vessels.

#### *Interpretation:*

The site probably knew a Mesolithic and a SWB phase of occupation. De Roever (pers. comm. 2006), considers S11 as a special purpose camp due to the small number of sherds and the presence of one burial. These sites (see De Roever 2004) may have fulfilled a different function than their contemporary counterparts on the levees. On the other hand a domestic interpretation for this site is also viable, despite the limited number of pottery sherds. The burial confirms, not denies a domestic interpretation. No information is available on whether these three locations belonged to one contemporary settlement area. However the archaeological evidence indicative of the Late Mesolithic occupation should be interpreted separately due to the nature of the settlement system (mobile, relatively short-term). The absence of pottery at S13 and the Mesolithic character of the lithics there (see De Roever 2004, 27) may indicate a chronological difference between the different localities.

#### *References:*

- De Roever 2004
- Devriendt 2013
- Lanting/Van der Plicht 1997/1998
- Lanting/Van der Plicht 1999/2000
- Raemaekers 1999
- Whallon/Price 1976

## 49. Swifterbant-S21

### *Location:*

S21 is located on the north-eastern part of a river dune of Late Glacial or Preboreal age, in the reclaimed south-eastern area of the IJsselmeer, Flevoland. S22, S23 and S24 are located on the southern part of the same dune. All sites are situated in parcel H46. The sites are at a distance of 3.5 km from the SWB levee sites to the west (De Roever 1976).

### *Site characteristics:*

S21 and S22 were discovered in 1961 and excavated in several campaigns (1962, 1966, 1971 and 1973). The last two campaigns were directed by Groningen University. The University of Wisconsin excavated S23, S24 and part of S21 and S22 in 1976 (Price 1981). S24 was only excavated by a small test trench (2x4 m) and did not yield any features. Since it was located at the foot of the dune, this location submerged as early as 5050 cal BC (De Roever 2004, 28). S21 was excavated in two trenches (5x18 m and 15.5x19 m) separated by a ditch. In total 802 m<sup>2</sup> was excavated on the dune (De Roever 2004, 76). The river dune in H46 extended over approximately 200 m with a width varying between 10 and 37 m (see Devriendt 2013; De Roever 1976). Due to the absence of a clear dark occupation layer, the extents of the settlement and the relation between the various excavated locations could not be established. De Roever (pers. comm. September 2006) is of the opinion S21 should be regarded as a separate location from S22/23/24. The latter three in principle are on the other side of the dune. The distance between S21 and S22/23/24 is approximately 125 m.

### *Geology/Pedology:*

The dunes were formed in the Late Glacial or Preboreal and were covered by a stable wooded landscape. Transgression of the sea and a rising water table transformed the area into a tidal flat with creeks, levees and back swamps. The river dunes formed the higher elevations (Ente 1976; Hacquebord 1976). A subsequent period saw peat growth followed by open water, causing erosion of parts of the peat and part of the top of the river dunes (Ente 1976, 28; De Roever 1976, 209). Where the soil profile of the dune is intact a classic A-B-C profile is witnessed. Occasionally the A horizon is leached (A2). Soil formation however occurred after habitation (S21) (De Roever 1976, 211). Price (1981, 85) however indicates grave XI at S21 had been dug after the soil formation. This indicates the occupation horizons might erstwhile have been separated stratigraphically. On top of the dune fluvially redeposited sands form an erosion layer of 2-5 cm (*ibid.* 122). The top of the peatgrowth is dated at a level of -6.15 m -NAP at 4500-4360 cal BC. The top of the dune was still inhabitable by that time (Ente 1976; de Roever 2004). In the pit of S22 the profile of the northern slope of the dune is preserved. In the A1 horizon white lenses are indicative of trodden down sand from the top (De Roever 1976, 15). Between 3520 and 3350 cal BC the dune became overgrown with peat (Ente 1976).

### *Taphonomy:*

In historic times the formation of the Almere-lake caused the erosion of both peat as well as the tops of the river dunes, resulting in decapitated profiles. At S21-24 this resulted in an erosion of 45 cm of the top of the dune (Ente 1976; De Roever 1976). Bioturbation caused further disturbances (Price 1981; De Roever 2004).

### *Ecology:*

In the Atlantic period the stable Boreal landscape and vegetation would change due to the rising water table. Conditions became increasingly moist leading to a bog and creek system in a fresh water tidal delta environment. This environment comprised alder (*Alnus*), oak (*Quercus*) and pine (*Pinus*) vegetation as well as lime, (*Tilia*) ash (*Fraxinus*), oak and hazel (*Corylus*) on top of the river dunes (Casparie *et al.* 1977). At a later stage the extensive habitats for alder gradually disappeared and due to the increasing water levels, open water was present in the creek next to the site (Casparie *et al.* 1977; see also Devriendt 2013).

### *Dating:*

S21-24 yielded six  $^{14}\text{C}$  dates. One of these dates the start of the peatgrowth the others date archaeological features/remains. The oldest date GrN-6709 slightly differs in De Roever 1976, 217; De Roever 2004, 14 and Lanting/Van der Plicht 1999, 145. The oldest publication has been used here.

At S23 one of the graves overlay a hearth-pit containing a small sherd dating to 5220-5080 cal BC. It is very likely this sherd was intrusive (Price 1981, 95, 102; De Roever 2004, 27). In general two Mesolithic phases can be distinguished, and a younger SWB occupation between 4450 and 3800 cal BC (due to the large SD) after peat growth had covered part of the dune. Other evidence for this is found in the vertical distribution of artefacts at S23 indicating two phases of occupation (Price 1981). There might be a hiatus between the Late Mesolithic and the SWB occupation. According to De Roever no indications for habitation were found after 4100 cal BC (2004, 17). Raemaekers (2005b), on the basis of an analysis of the pottery, assumes part of the habitation can be dated to the late phase of the SWB culture.

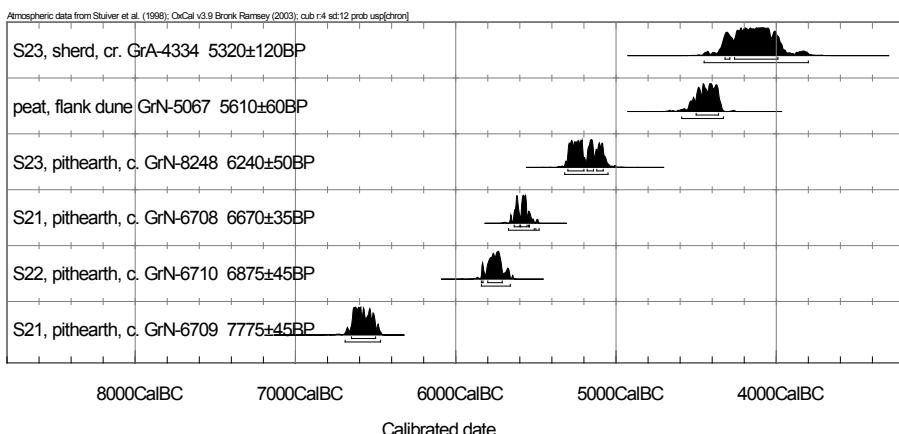


Fig. 77 Radiocarbon dates for Swifterbant-S21.

### *Features/Spatial layout:*

S21 yielded approximately 30 basin-shaped hearthpits ( $\varnothing$  50-100 cm and 40-60 cm depth). None overlap. Furthermore five ovaloid gravepits were found on the slope of the dune without any apparent orientation (III, IV, V, 744, XI). Four of these contained almost complete skeletons, in one shallower grave only the skull had been preserved (744). At a higher level isolated human remains were found (2 molar teeth, a jaw with teeth and a skull) (De Roever 1976, 214).

### *Finds:*

At S21 many artefacts (especially the sherds) were recovered in secondary position from the erosion layer. No anthropogenically induced horizontal pattern could be observed. The sherds (N=40) are small and mainly tempered with sand (De Roever 1979, 19). They consist of 38 body-fragments, a rim sherd and one near the bottom (pers. comm. De Roever 2006). The pottery of the dune sites was coil-built with round and pointed bases and occasional decoration on the rim or shoulder (De Roever 1976, 215). They were mixed with hundreds of flint artefacts from various periods. Among the abundant flint artefacts there are several microlithic points, a surface retouched point (possibly Neolithic (*cf.* Price 1981), as well as small trapezes, (micro-) scrapers, knives, borers, burins, broken and complete blades (some with use-wear) (*ibid.*). Most of the flint of S21-24 was probably obtained at the nearby boulder clay outcrop of Urk (Deckers 1982, 34). The skeletal material at S22 comprises the remains of four adult females and two adult males. S23 yielded evidence for one adult or adolescent. Furthermore skeletal remains of one possible adolescent and one possible child were recovered (Meiklejohn/Constandse-Westermann 1978, 74-80). The maximal number of individuals interred or deposited on the dune amounts to 14 (excluding the finds of isolated teeth) (Constandse-Westermann/Meiklejohn 1979, 239).

### *Interpretation:*

Habitation on S21-24 took place in two major phases. A Late Mesolithic phase comprising of hearth-pits and some typical Mesolithic points (Price 1981, 89) and a SWB phase dated by the remains of food encrusted remains on pottery comprising flint, pottery and at least 11 (S21-24) graves. The graves more than likely belong to the second phase of occupation since they were preserved due to the increasingly wet conditions on the dune (Meiklejohn/Constandse-Westermann 1978, 43; De Roever 1976, 218; 2004, 29). The techno-morphological characteristics of the pottery indicate a presence in the early and middle SWB period (Raemaekers 1999; De Roever 2004). The dated sherd indicates the dune and levee-sites were used contemporaneously around 4450-4200 cal BC (De Roever 2004, 60). Unfortunately both the heavily eroded top of the dune as well as the covering layer should be interpreted as palimpsests. This complicates a cultural attribution of the flint assemblage since there is much overlap between Late Mesolithic and SWB toolkits. On the other hand Price (1981, 98-100) did find some stratigraphic clustering of artefacts on the slope of the dune. At S23 he recorded a vertical distribution of artefacts suggesting two stages of occupation (1981, 99-102). He interpreted this as an a-ceramic and a ceramic Mesolithic. The latter should be interpreted as belonging to the SWB culture.

### Swifterbant-S21-S22

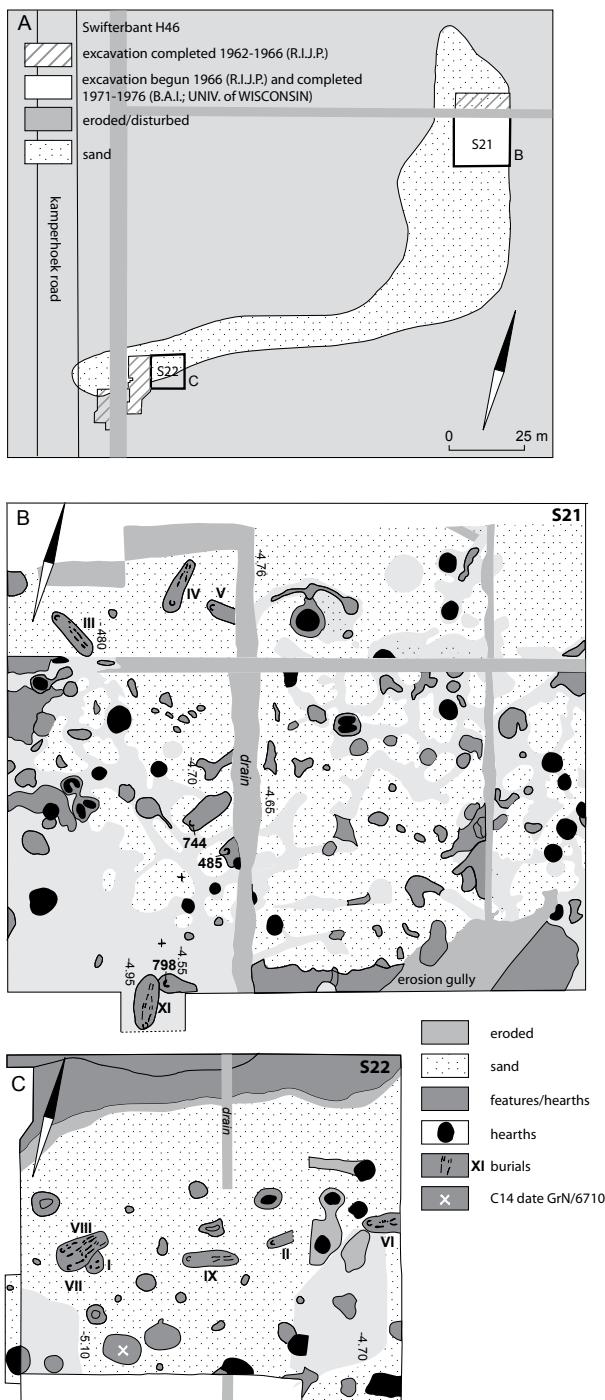


Fig. 78 Swifterbant-S21-S22.  
 (A) location of the sites S21-S22 on top of the river dune.  
 (B) detail of the excavation plan at S21 (working floors 2 and 3) and S22 (working floors 5 and 6) with hearths and burials. Adapted from De Roever 1976, fig. 1 and 5 and Meiklejohn/Constandse-Westermann 1978, fig. 2, 3 and 4.

Due to the absence of organic remains besides the graves it is difficult to speculate about site-use. The Late Mesolithic occupation may be compared to other 'hearth-pit-sites' such as Hoge Vaart-A27 (Peeters/Hogestijn 2001) or Mariënberg (Verlinde/Newell 2006.). The SWB occupation however seems to be of a domestic nature. Evidence for this may be found in the presence of pottery with food encrustations, graves as well as the broad tool spectrum and the rather low number of trapezes. Problematic is the fact that there is no clear correlation

between graves, pottery and flint assemblage in time. De Roevert argues that the use of the dune sites may be interpreted as special purpose camps, with the exception of S22. One argument is the small quantity of pottery found at the other locations (2004, 79). If S21 is an isolated site, its character does differ from S22-24 (*e.g.* small number of sherds). However since it is not clear to what extent the information from S21-S24 can be separated in space and time and since erosion has been a dominant factor in the site-history, a domestic interpretation also belongs to the possibilities.

*References:*

Casparie *et al.* 1977  
Constandse-Westermann/Meiklejohn 1979  
Deckers 1982  
De Roevert 1976  
De Roevert 1979  
De Roevert 2004  
Devriendt 2013  
Ente 1976  
Hacquebord 1976  
Meiklejohn/Constandse-Westermann 1978  
Price 1981

## 50. Swifterbant S22/23/24

*Location:*

S22, S23 and S24 are located on the southern part of a river dune of Late Glacial or Preboreal age, in the reclaimed south-eastern area of the IJsselmeer, Flevoland. Together with S21 at the opposite end of the dune all sites are located in parcel H46. The sites are at a distance of 3.5 km from the SWB levee sites to the west (De Roevert 1976).

*Site characteristics:*

S21 and S22 were discovered in 1961 and excavated in several campaigns (1962, 1966, 1971 and 1973). The last two campaigns were directed by Groningen University. The University of Wisconsin excavated S23, S24 and part of S21 and S22 in 1976 (Price 1981). S24 was only excavated by a small test trench (2x4 m) and did not yield any features. Since it was located at the foot of the dune, this location submerged as early as 5050 cal BC (De Roevert 2004, 28). S21 was excavated in two trenches (5 x 18 m and 15.5 x 19 m) separated by a ditch. The trench at S23 measured 25x6 m and covered the top and northern slope of the dune (Price 1981; De Roevert 2004, 27). S22 was located next to S23 on the western slope of the dune and excavated in two units (4 x 11 m and 11 x 20 m) (De Roevert 1976, 211, 215). According to Devriendt (2013), however, c. 364 m was excavated. In total 802 m<sup>2</sup> was excavated (De Roevert 2004, 76). The river dune in H46 extended over approximately 200 m with a width varying between 10 and 37 m (see Devriendt 2013; De Roevert 1976). Due to the absence of a clear dark occupation layer, the extents of the settlement and the relation between the various excavated locations could not be established. De Roevert (personal

communication September 2006) is of the opinion S21 should be regarded as a separate location from S22/23/24. The latter three in principle are three trenches in the same site on the other side of the dune. The distance between S22/23/24 and S21 is approximately 125 m.

#### *Geology/Pedology:*

The dunes were formed in the Late Glacial or Preboreal and were covered by a stable wooded landscape. Transgression of the sea and a rising water table transformed the area into a tidal flat with creeks, levees and back swamps. The river dunes formed the higher elevations (Ente 1976; Hacquebord 1976). A subsequent period saw peat growth followed by open water, causing erosion of parts of the peat and part of the top of the river dunes (Ente 1976, 28; De Roevert 1976, 209). Where the soil profile of the dune is intact a classic A-B-C profile is witnessed. Occasionally the A horizon is leached (A2). Soil formation however occurred after habitation (S21) (De Roevert 1976, 211). Price (1981, 85) however indicates grave XI at S21 had been dug after the soil formation. This indicates the occupation horizons might erstwhile have been separated stratigraphically. On top of the dune fluvially redeposited sands form an erosion layer of 2-5 cm (*ibid.* 122). The top of the peat growth is dated at a level of -6.15 m -NAP at 4500-4360 cal BC. The top of the dune was still inhabitable by that time (Ente 1976; de Roevert 2004). In the pit of S22 the profile of the northern slope of the dune is preserved. In the A1 horizon white lenses are indicative of trodden down sand from the top (De Roevert 1976, 15). Between 3520 and 3350 cal BC the dune became overgrown with peat (Ente 1976).

#### *Taphonomy:*

In historic times the formation of the Almere-lake caused the erosion of both peat as well as the tops of the river dunes, resulting in decapitated profiles. At S21-24 this resulted in an erosion of 45 cm of the top of the dune (Ente 1976; De Roevert 1976). At S23 erosion caused virtual absence of finds on top of the dune and at S21 some of the hearth-pits might have been obscured by erosion (De Roevert 1976, 211; 2004, 27). This would have also led to a displacement of artefacts. Bioturbation caused further disturbances (Price 1981; De Roevert 2004).

#### *Ecology:*

In the Atlantic period the stable Boreal landscape and vegetation would change due to the rising water table. Conditions became increasingly moist leading to a bog and creek system in a fresh water tidal delta environment. This environment comprised alder (*Alnus*), oak (*Quercus*) and pine (*Pinus*) vegetation as well as lime, (*Tilia*) ash (*Fraxinus*), oak and hazel (*Corylus*) on top of the river dunes (Casparie *et al.* 1977). At a later stage the extensive habitats for alder gradually disappeared and due to the increasing water levels, open water was present in the creek next to the site (Casparie *et al.* 1977; see also Devriendt 2013).

### *Dating:*

S21-24 yielded six  $^{14}\text{C}$  dates. One of these dates the start of the peat growth the others date archaeological features/remains. The oldest date GrN-6709 slightly differs in De Roever 1976, 217; De Roever 2004, 14 and Lanting/Van der Plicht 1999, 145. The oldest publication has been used here.

At S23 one of the graves overlay a hearthpit containing a small sherd dating to 5220-5080 cal BC. It is very likely this sherd was intrusive (Price 1981, 95, 102; De Roever 2004, 27). In general two Mesolithic phases can be distinguished, and a younger SWB occupation between 4450 and 3800 cal BC (due to the large SD) after peat growth had covered part of the dune. Other evidence for this is found in the vertical distribution of artefacts at S23 indicating two phases of occupation (Price 1981). There might be a hiatus between the Late Mesolithic and the SWB occupation. According to De Roever no indications for habitation were found after 4100 cal BC (2004, 17). Raemaekers (2005<sup>b</sup>), on the basis of an analysis of the pottery, assumes part of the habitation can be dated to the late phase of the SWB culture.

### *Features/Spatial layout:*

S22 yielded some 15 hearthpits as well as five graves comprising of six individuals oriented in a E-W direction along the crest of the dune (II, VI, VII/VIII, IX) (De Roever 1976; 2004). Graves VII and VIII represent a double burial adjacent to grave I in a broad oval burial pit (see also Devriendt 2013). Furthermore an isolated skull was found in the same location. S23 yielded 34 anthropogenic features. Two of these might have been pits the others were (partially) interpreted as (remnants of) hearthpits. Feature 36 may have been a grave. S23 also yielded one unambiguous grave (XII). The grave overlay hearthpit 27. This hearthpit was dated to 5220-5080 cal BC and contained a sherd. It is more than likely the sherd is intrusive (Price 1981, 95; De Roever 2004, 27). S24 did not yield any features. Apart from hearths and graves the dune also comprised some features interpreted as pits (De Roever 2004, 27).

### *Finds:*

S22 yielded a spectrum of finds comparable to S21. Some 500 sherds were found in secondary position, again tempered with sand but also with crushed quartz and organic material. There is more variation in decoration (*ibid.* 217). In total more than 434 flint artefacts were found as well as more than 56 tools (Price 1981). A total of 72 blades and 91 flakes were recovered (Deckers 1982, 37), as well as a lancette point, a scalene triangle, a borer, seven scrapers and 45 worked pieces (De Roever 1976; Price 1981). The isolated skull (I) yielded a pendant of jet and two transverse arrowheads were found associated with skeleton VIII. In 1976 the American campaign recovered a *Geröllkeul* out of hearth IV (Price 1981, 84). In total the location would yield eleven stone objects. The dune sand and erosional layer of S23 yielded 5262 pieces of flint, approximately half of which was embedded in the dune sand and half of which originated in the overlaying erosional layer, as well as 479 tools, 39 rocks and 6 bones (*ibid.*). The flint assemblage consists of many pieces shattered by heat, frost or flaking followed by blades and flakes (respectively 868 and 683 for S23 in total, Deckers 1982, 37). Scrapers, followed by retouched flakes, dominate the rather complete tool spectrum. Remarkable are

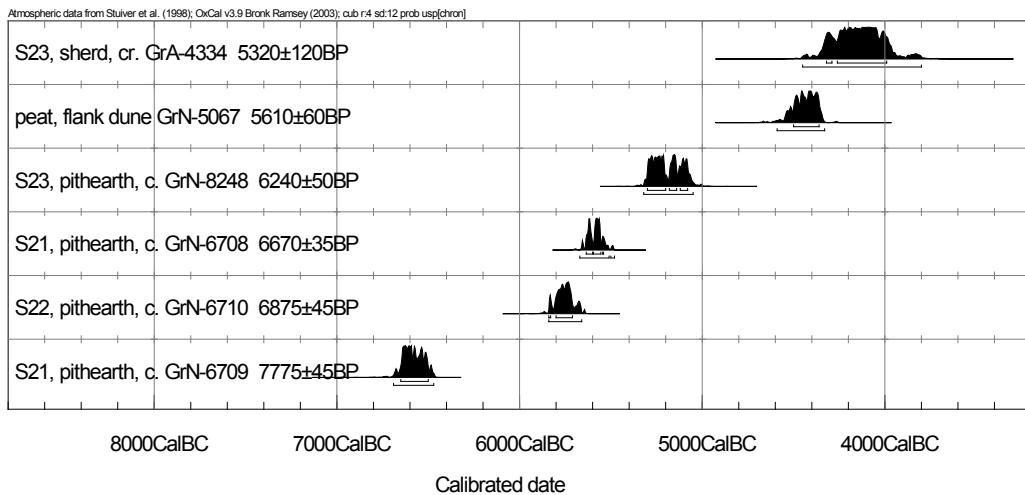


Fig. 79 Radiocarbon dates for Swifterbant-S22/23/24.

some qualitative differences between the dune sand and the erosion layer (Price 1981, 92) as well as the low number of trapezes. Some 41 sherds of coil-built vessels tempered mainly with sand were found. Nine sherds contained food crusts. S24 yielded 'a number of lithic artefacts' (*ibid.* 94). Most of the flint of S21-24 was probably obtained at the nearby boulderclay outcrop of Urk (Deckers 1982, 34). The skeletal material at S22 comprises the remains of four adult females and two adult males. S23 yielded evidence for one adult or adolescent. Furthermore skeletal remains of one possible adolescent and one possible child were recovered (Meiklejohn/Constandse-Westermann 1978, 74-80). The maximal number of individuals interred or deposited on the dune amounts to 14 (excluding the finds of isolated teeth) (Constandse-Westermann/Meiklejohn 1979, 239).

#### Interpretation:

Habitation on S21-24 took place in two major phases. A Late Mesolithic phase comprising hearth-pits and some typical Mesolithic points (Price 1981, 89) and a SWB phase comprising flint, pottery and at least 11 graves dated by food crust remains on pottery. The graves more than likely belong to the second phase of occupation since they were preserved due to the increasingly wet conditions on the dune (Meiklejohn/Constandse-Westermann 1978, 43; De Roever 1976, 218; 2004, 29). The techno-morphological characteristics of the pottery indicate a presence in the early and middle SWB period (Raemaekers 1999; De Roever 2004). The dated sherd indicates the dune and levee-sites were used contemporaneously around 4450-4200 cal BC (De Roever 2004, 60). Unfortunately both the heavily eroded top of the dune as well as the covering layer should be interpreted as palimpsests. This complicates a cultural attribution of the flint assemblage since there is much overlap between Late Mesolithic and SWB toolkits. On the other hand Price (1981, 98-100) did find some stratigraphic clustering of artefacts on the slope of the dune. At S23 he recorded a vertical distribution of artefacts suggesting two stages of occupation (1981, 99-102). He interpreted this as an a-ceramic and a ceramic Mesolithic. The latter should be interpreted as belonging to the SWB culture.

Due to the absence of organic remains besides the graves it is difficult to speculate about site-use. The Late Mesolithic occupation may be compared to other 'hearth-pit-sites' such as Hoge Vaart-A27 (Peeters/Hogestijn 2001) or Mariënberg (Verlinde/Newell 2006.). The SWB occupation however seems to be of a domestic nature. Evidence for this may be found in the presence of pottery with food crusts, graves as well as the broad tool spectrum and the rather low number of trapezes. Problematic is the fact that there is no clear correlation between graves, pottery and flint assemblage in time. De Roever argues that the use of the dune sites may be interpreted as special purpose camps, with the exception of S22. One argument is the small quantity of pottery found at the other locations (2004, 79). If S21 is an isolated site, its character does differ from S22-24 (*e.g.* small number of sherds). However since it is not clear to what extent the information from S21-S24 can be separated in space and time and since erosion has been a dominant factor in the site-history, a domestic interpretation also belongs to the possibilities.

#### *References:*

Casparie *et al.* 1977  
Constandse-Westermann/Meiklejohn 1979  
Deckers 1982  
De Roever 1976  
De Roever 1979  
De Roever 2004  
Devriendt 2013  
Ente 1976  
Hacquebord 1976  
Meiklejohn/Constandse-Westermann 1978  
Price 1981

NB. for site plan see See Swifterbant-S21.

## **51. Urk-E4**

#### *Location:*

The site is located on a Pleistocene river dune (on top of a boulder clay subsoil) in the vicinity of a palaeo-channel of the Overijsselse Vecht (plot E4). This area is the westernmost part of the Noordoostpolder in Dutch Flevoland which itself was reclaimed from the IJsselmeer at the start of the 20<sup>th</sup> century (Peters/Peeters 2001, 9).

#### *Site characteristics:*

After discovery in 1991 the site was investigated in 1996 with testpits by the ROB since it was threatened by the construction of an industrial zone (Zwolschhoek). In 1997, 880 m<sup>2</sup> of the site were excavated on the eastern part of the dune. Of these, 182 m<sup>2</sup> was excavated in squares per layer and subsequently wetsieved, 176 m<sup>2</sup> was excavated in the same manner without sieving and 522 m<sup>2</sup> mechanically lowered to the level with features. The different trenches were plotted in such a manner as to cover both the top of the dune, the refuse layers on the slope and the zone with ard-marks (*ibid.* 9-14).

### *Geology/Pedology:*

The analysis of the palaeogeological situation below was entirely based on Gotjé (1993). This means that no site-based analysis of the situation around Urk has been established. Furthermore no specific information is known concerning the rise of the water table, preventing an analysis of site size through time.

Until 4500 cal BC the site was located in an increasingly wet environment with both open water and peat growth. Around 4100 marine influence increased and part of the area developed a freshwater tidal regime. From 3450 cal BC onward marine influence decreased again and extensive peat growth took place as well as a degradation of the local environment. After a short phase of renewed marine influence another phase of extensive peat-growth set in around 1700 cal BC. At the start of the above-mentioned developments E4 was still several meters above the surrounding landscape and was easily reachable through the channel of the Vecht. Through the increasing water table peat grew and clay and detritus were deposited. After 3700 the Vecht changed its course and the site became isolated. Peat growth continued until the entire dune was covered around 3400 cal BC. The southern part of the dune was covered up between 3900 and 3600 cal BC (Peters/Peeters 2001, 17-22, 112, 117).

### *Taphonomy:*

Various post-depositional processes have disturbed the site. The top of the dune has been seriously eroded and affected by deep ploughing, virtually destroying the find horizon (Peters/Peeters 2001, 12, 115). The situation on the slopes of the dune was better although natural erosion by fluvial action also affected the site here. Apart from this the construction of drainage tubes and bioturbation led to further disturbances.

### *Ecology:*

Around 4500 cal BC vegetation on the dune consisted of forest. Around the dune there was sedge vegetation (*Cyperaceae*). In the following centuries this would develop into a deciduous forest on top of the dune, alder carr on the slopes and reed vegetation or sedge vegetation around the dune (Peters/Peeters 2001, 18-20). Macrobotanical data indicate a rather open landscape (Vernimmen 2001, 69-70).

### *Dating:*

In total 25 <sup>14</sup>C dates were obtained. Five of these date the peat growth, twelve date the hearths, six date the skeletal material, one was obtained on a food crusts and one dates a charred kernel of grain. The graves and the charred grain were dated with AMS, the other samples were dated conventionally (Peters/Peeters 2001, 14, 111). In total 21 samples yielded results. Only the archaeological dates will be presented here.

The dates of the hearthpits span a rather long period from 7050 cal BC to 5050 cal BC. These probably indicate a recurrent and discontinuous Mesolithic use of the site. What is remarkable is the presence of pottery in four of these pits roughly dating between 6000 and 5050 cal BC (Peters/Peeters 2001, 113), since this would predate the earliest dates for pottery at Polderweg (Raemaekers 2001) with up to a thousand years. The authors propose several explanations but are

unable to explain the phenomenon (Peters/Peeters 2001, 113). According to this study, the most plausible option would be to reject these early dates, since the same type of pottery is found in four different pits spanning a thousand years. Either the pottery is intrusive or the  $^{14}\text{C}$  dates of the hearthpits are contaminated. A similar conclusion was drawn for the Swifterbant dunesites (De Roever 2004, 29). Due to the loss of collagen all dates for the graves must be rejected and are not presented here. The presence of beads of amber however makes it most likely the small cemetery dates to the SWB period (Peters/Peeters 2001, 114) and since the bone probably would not have survived centuries of oxidation, the burials may also date to the latest phase and thus Late Swifterbant occupation of the site (Raemaekers 2005<sup>b</sup>). The combined dates of food crusts from two sherds belonging to the same pot date to the middle phase of SWB culture, between 4230 and 3960 cal BC. The single dated charred grain dates to the same period. Recently seven dates on charred food remains of pottery from Urk were obtained (Raemaekers 2005<sup>b</sup>). Two of these dates could reliably be placed in the Late Swifterbant period. In the publication of Peters and Peeters (2001), multiple dates appear under the same lab code (GrN-25675, GrN-25683 and GrN-25687).

#### *Features/Spatial layout:*

In general the site consists of a dunetop with features indicating habitation and slopes with refuse layers. Information and correlation is hampered by erosion of the dunetop. During occupation the inhabitable space on top of the dune seriously decreased because of peat development on the slopes. On the eastern flank four shallow hearths with pottery were found. They may date to the Neolithic. On the top of the dune at least 35 hearthpits were recovered that can be dated to the Mesolithic on the basis  $^{14}\text{C}$  dates (*cf. supra*). Four surface hearths might be of Neolithic age. Several postholes have been documented. Some 18 unidentifiable pits were recovered. Some of these might be remnants of old hearths. On top of the dune a small cemetery (trenches 2, 8, 14, 16) was found yielding the remains of at least ten individuals. Four individuals were buried in supine position and one in *Hocker*-position (d'Hollosy/Baetsen 2001; Raemaekers 2005<sup>b</sup>). Eight of the individuals were buried in five gravepits (one containing two and another three individuals). The other two skeletons were merely represented by skulls (Peters/Peeters 2001, 33-40). In (parts of) the trenches 3, 5, 6, 8A, 13 and 14 several linear traces of 2-8 cm wide, several centimetres deep and up to several meters long were located. On the basis of micromorphological analysis and palynological samples they have been interpreted as pre-TRB ard marks (Peters/Peeters 2001, 40-2). A large and complete vessel situated in the peat on the northern slope of the dune may be interpreted as a deposition (Peters/Peeters 2001, 81; Peeters 2007, 201).

#### *Finds:*

In total 5104 sherds (20.3 kg) were found. They are coil-built and mainly tempered with granite, followed by broken quartz and chamotte. Other tempering agents were only occasionally used. Pointed, round and flat bottoms are present. A small number of sherds was decorated (fingertip, nail, spatula) mostly on the rim and neck/belly section. A large percentage of the sherds contained food crusts. The sherds belong to the late and possibly also the middle phase of the SWB culture.

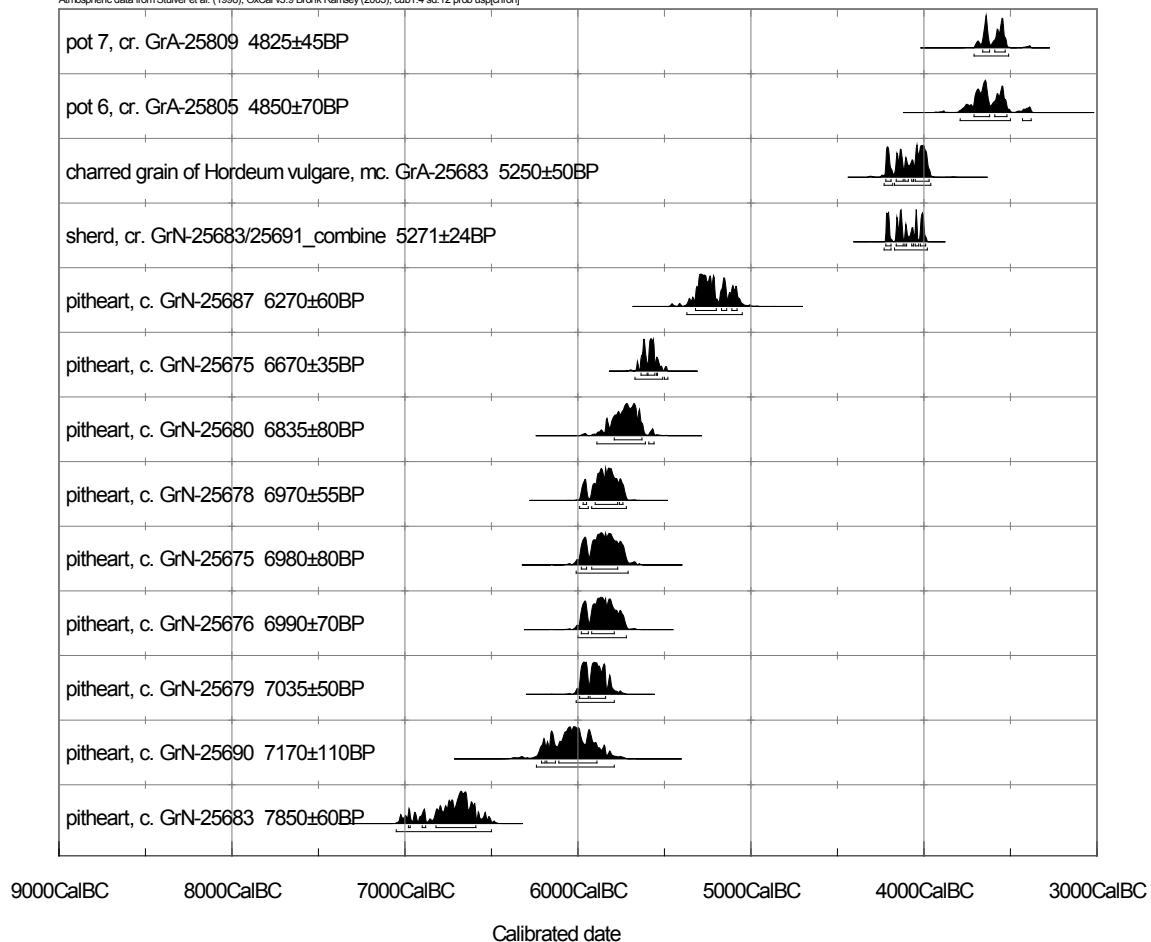


Fig. 80 Radiocarbon dates for Urk-E4.

Some sherds showed decoration with TRB affinity (Peters/Peeters 2001 77-93). Some 6120 pieces of flint larger than 1 cm<sup>2</sup> were studied. Most of the assemblage was made on raw material of local northern origin and inferior quality, resulting in many broken artefacts. Some 25% of the assemblage was burnt. Debitage was aimed at flake-production. Blades usually are of better quality flint and part may have been produced elsewhere. The tool spectrum is of a domestic nature, dominated by scraping and cutting implements (42%) and to a lesser extent (5%) by points. The latter category comprises typical Mesolithic (c-points etc.), Late Mesolithic or Early Neolithic points (trapezes) and Middle Neolithic (leaf-shaped points, triangles with surface retouch) elements.

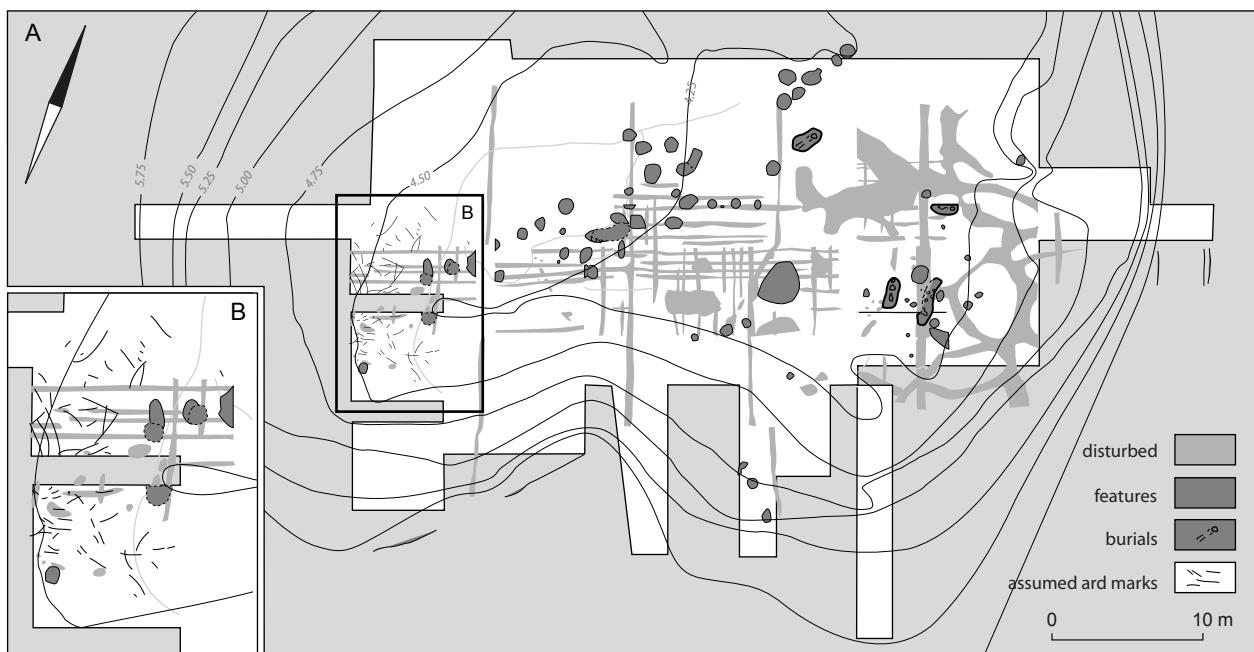
The faunal material (N=7903) was severely burnt. Only 3% of the bones could be identified on the level of species. The wild fauna comprised wild boar (*Sus scrofa*), beaver (*Castor fiber*), otter (*Lutra lutra*), wild cat (*Felis sylvestris*), badger (*Meles meles*) and mainly antler remains of red deer (*Cervus elaphus*). The domesticated assemblage comprised cattle (*Bos taurus*), ovicaprids and dog (*Canis familiaris*). Some 107 bones either belonged to wild or domesticated pig (*Sus domesticus*). Only a small number of bird and fish remains, mainly sturgeon (*Acipenser sturio*), were recovered. No convincing seasonal indicators could be identified (Oversteegen 2001, 43-48). The extremely bad state of the human remains hampered a detailed analysis. In total ten individuals could be identified,

both men and women between the age of 20-45 years. One child (9-14 years) was identified. One of the adults was buried with six amber beads (d'Hollosy/Baetsen 2001, 48-60). The macrobotanical remains only yielded substantial information on the SWB occupation. The samples from the find layer are however contaminated with subrecent material, for example from ruderal plants (Vernimmen 2001, 66). In total twelve grains of domesticated species were found. Eight were identified as naked barley (*Hordeum vulgare* spec. *nudum*) and one as einkorn (*Triticum monococcum*). Wild species comprised of substantial remains of hazelnut as well as some remains of wild apple (*Malus sylvestris*), acorn (*Quercus* spec.), hawthorn (*Crataegus monogyna*) and some others. No macroremains were found in the ard-marks and no positive correlation could be established for local produce (Vernimmen 2001, 70).

#### *Interpretation:*

Occupation at Urk-E4 can be divided in a Late Mesolithic and a SWB phase. Most of the hearthpits belong to the former period. The supposed ardmarks, small cemetery and some of the surface hearths and other features are most likely to be of SWB origin. The find layer covering part of the site is a palimpsest of several periods. On the basis of the pottery technology and morphology as well as the <sup>14</sup>C dates, the SWB occupation dates to the middle and late phase of the SWB culture between 4200 and 3400 cal BC. The tool spectrum and composition of the faunal assemblage as well as the many sherds (with food crusts) and the presence and composition of the human population at the site, point to a predominantly domestic use of E4 for the SWB period. No specific seasonal information could be retrieved.

The ardmarks of Urk are highly controversial. On the one hand palynological samples indicate the possible presence of pollen of *Triticum* as well as several taxa of ruderal species (Van Smeerdijk 2001, 75-76). Micromorphological analysis of the soil indicates the presence of many small particles of charcoal interpreted as indicative for slash-and-burn type of agriculture (Peters/Peeters 2001, 41). Furthermore macrobotanical remains of *Hordeum vulgare* and possibly *Triticum monococcum* were found as well as remains of *Trichuris* a parasite that may be related to manure (Van Smeerdijk 2001, 75). On the other hand these features seem less convincing. They differ in length (up to several meters), width (2-8 cm) and depth (several centimetres) and there is no prevailing direction. In section some of these traces appeared to be natural features (Peters/Peeters 2001, 40). They are located on the south-western slope of the dune, which is both on a slope and might have been covered with peat before the rest of the dune as early as 3940 cal BC. Erosion and deep ploughing affected (parts of) all trenches (3, 5, 6, 8A, 13, 14) yielding these features. As opposed to trenches 5 and 6 no features of this kind are visible on the map of anthropogenic features in trenches 3, 8A and 14 (see Peters/Peeters 2001 fig 15-17). The features could not be dated directly and it is unknown to what extent all of the features were uncovered sealed in underneath or in the find layer. The presence of small particles of charcoal in the soil samples need not be related to agriculture and nor do pollen of ruderals represent agricultural fields. The presence of pollen of *Triticum*, which are hard to differentiate from pollen of grasses (cf. Peters and Peeters 2001, 42; Van Smeerdijk 2001, 73), may also be related to the threshing of imported cereals from elsewhere (Bakels 1981; 1986). Since a positive interpretation of these ardmarks would



make them the oldest ardmarks in the Lower Rhine Basin (Louwe Kooijmans 2006<sup>c</sup>) more solid evidence would be in place. Until then they should not be regarded as such.

#### References:

d'Hollosy/Baetsen in: Peters/Peeters 2001  
 Gotjé 1993  
 Oversteegen in: Peters/Peeters 2001  
 Louwe Kooijmans 2006<sup>c</sup>  
 Peters/Peeters 2001  
 Raemaekers 2005<sup>b</sup>  
 Van Smeerdijk in: Peters/Peeters 2001  
 Vernimmen in: Peters/Peeters 2001

Fig. 81 Urk-E4. (A) excavation plan of Urk-E4. (B) Detail of the Urk-E4 excavation plan with assumed ard marks.

Adapted from Peters/Peeters 2001, fig. 15, 16 and 17.

## 52. Vlaardingen

#### Location:

The eponymous site of the Vlaardingen culture is located on several levees on both sides (east and west) of a meandering freshwater creek in the Dutch coastal area, within the urban area of the town of Vlaardingen, north of the Meuse estuary. The site yielded the remains of several house plans which were located on the narrow high parts of these ridges. Apart from the Vlaardingen occupation there is evidence for (synchronous) PFB and Bell Beaker culture use of the site (Van Beek 1990, 202; Glasbergen *et al.* 1961, 44, 63; Louwe Kooijmans 1987, 250). In 1991 another site was documented at Schinkelshoek in the Aalkeet-Buitenkolder, exactly at the location where the levee was highest (Van den Broeke/Van Londen 1995, 24).

### *Site characteristics:*

The site was discovered in 1958 during an urban development project after which an initial excavation (3 x 8 m) took place by the AWN in 1959. In the following years until 1964 the site was excavated in five campaigns. In total some eighteen (0-17) trenches were dug on both sides of the palaeochannel of the creek. Unfortunately a detailed stratigraphical analysis of the creek only took place in a small part of trench 17. In total 4591 m<sup>2</sup> was excavated. The separate trenches were excavated in spits of 2 x 2 m, split into four 1 m<sup>2</sup> squares (a,b,c,d). The entire area was separated in nine zones (Van Beek 1990, 57, 59-69). No specific ecological sampling took place, nor did elaborate sieving.

### *Geology/Pedology:*

Occupation took place on several levees of sandy clay. The occupation layer on top of the levees showed up as a black layer of sandy clay. Towards the former creek channel the occupation layer sank below this black sandy layer, and thus appeared to have been formed earlier. Part of the creek fill sediments were eroded and replaced by a layer of sandy clay. On the eastern levee concentrations of charcoal correspond with a dark layer on top of the previously mentioned black layer in trench 9, dating to the Bell Beaker period. Subsequently both clay and peat were deposited. Part of the peat has been redeposited again in Subatlantic times (Van Beek 1990, 66-67). Trench 17a yielded further stratigraphical information on the creek deposits. At the bottom there was a 30 cm thick layer of clay (I) with remains of reed and containing some finds. On top of this there were two layers (III and II) containing sherds, bone, stone, wood and charcoal. These were covered by several layers of clay as well as sand. Most of the material was probably dumped in the creek from the western levee at that spot and largely remained in situ (Van Beek 1990, 200).

### *Taphonomy:*

There is a distinct difference in preservation between the remains of the creek and the information from the levees. This not only pertains to the preserved organic remains and fragmentation of the finds, but also to the internal stratigraphy and attribution of finds to different periods. Apparently the find layer varies between 70 cm in the fill of the creek, to 15 cm on the banks (Glasbergen *et al.* 1961, 63). On top of the levee this layer merges with the black layer of sand (Van Beek 1990, 66-67). The Bell Beaker horizon in the creek deposits is located some 80 cm higher, but would have merged with the lower lying Vlaardingen find layer if habitation would have taken place on the levee (Glasbergen *et al.* 1961). Another disturbing factor was formed by the creek itself, transporting and removing material as well as by post-occupational activity and disturbance by later creek or channel activity.

### *Ecology:*

Pollen and diatom analysis has taken place. The diatom analysis indicated a brackish diatom environment. There is also evidence for the break-in of a secondary creek during the Vlaardingen occupation, although this did not change the environment to any large extent. The pollen diagrams show some slight fluctuations in alder and hazel at this time. Other species comprise *Pinus*,

*Betula, Quercus, Fagus, Carpinus, Tilia, Ulmus, Fraxinus, Picea, Acer, Salix.* The herb species indicate a wet environment yet *Poaceae* and *Cyperaceae* are also present (Groenman-Van Waateringe/Jansma 1969, 112). Furthermore there is evidence for pollen of *Cerealia* (*Triticum* and *Hordeum*) in several clay layers, interspersed by layers without pollen of *Cerealia*. These belong to the Vlaardingen period occupation and not to the subsequent Bell Beaker culture occupation. According to Groenman-Van Waateringe and Jansma (1969, 114), the fertile clay soils of the levees might have been attractive to establish cultivation plots. Louwe Kooijmans (1987, 250) however doubts whether agriculture was practised due to lack of space and well-drained soil. Van Regteren *et al.* (1962/1963; 1964, 54) conclude that apart from the *Cerealia* there are no convincing indicators in the pollen diagrams for either agriculture or stock-herding. Apart from the aforementioned indications the site is situated at the intersection of coastal, estuarine (Meuse estuary) and intra-coastal landscapes. These last probably consisted of swamps (Clason 1967, 10). This indicates that a wealth of natural resources must have been available, as is witnessed in the rich evidence for hunting and gathering (Clason 1967).

#### *Dating:*

In total twelve  $^{14}\text{C}$  dates were obtained (Van Beek 1990; Lanting/Van der Plicht 1999/2000; Van Regteren Altena *et al.* 1962/1963). One date (GrN-2306) dates a tree-trunk and has been discarded since any relation to the Vlaardingen occupation is unclear (*cf.* Lanting/Van der Plicht 1999/2000, 69).

The dates point directly to occupation during the Vlaardingen and Bell Beaker periods. Indirectly two dates form a *t.a.q.* for occupation during the PFB-culture. On the basis of these dates and their origin (trenches 9 and 17), Van Beek (1990, 249-250) assumes the settlement shifted south on the levee during occupation. The limited dates available however prevent actual confirmation of this pattern. Neither do they shed any light on the permanence of occupation at Vlaardingen.

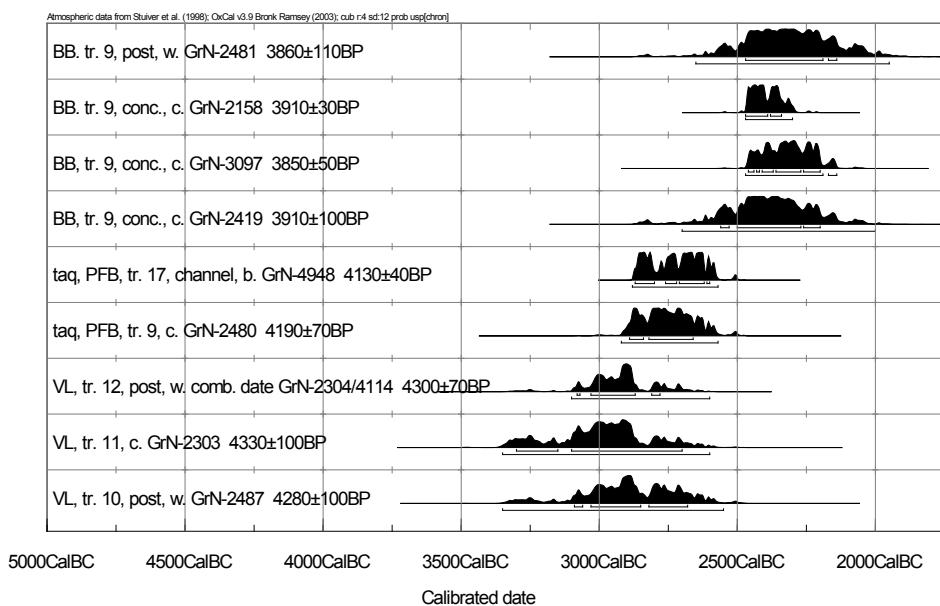


Fig. 82 Radiocarbon dates for Vlaardingen.

### *Features/Spatial layout:*

The postholes concentrate mainly, but not exclusively, on the higher parts of the levees (2283 postholes in total). No evident configurations of structures could be extracted from these clusters. They form the palimpsest derivate of multiple construction phases. Remarkably a clear difference in depth of most postholes was documented. Posts and postholes on the bank of the creek (trenches 7, 8, 9, 12, 17) are assumed to relate to fish-traps, camp-sheds etc.

Trenches 11 and 13 on top of the eastern levee revealed more or less rectangular concentrations of posts measuring 8 m x 3 to 4 m (Van Beek 1990, 224-232). More evident structures were documented in trenches 10, 13 and 15. The structure in trench 15 on top of the western levee, is of a regular nature and consists of approximately 40 posts. On the basis of the configuration of postholes in association with the distribution of finds a two-aisled structure measuring 10 x 4.5 m is suggested. Small posts may have supported the roof. The entrance is supposed to have been located in the middle of the east wall. Verhart argues that the second structure may not have been a house and probably had no walls (1992, 90-91).

Trench 10 yielded some 710 postholes interpreted as the remains of four house locations of 10 x 4 to 5 m (Van Beek 1990, 124, 234). On the basis of the estimated total number of postholes three contemporary houses are suggested. A total of 58 houses has been estimated for the 250 years of occupation (Van Beek 1990, 232-234). Some relationship could be established between the houses and the number of sherds and broken adzes/chisels. One of the structures, located in trench 15, has been attributed by Van Beek (1990, fig. 98), to the Bell Beaker culture. Other spatial evidence points to an abundance of charcoal, and thus possibly hearths, along the banks of the creek. Less evident but present is evidence for hearths within the houses as pointed out by both concentrations of burnt charcoal and flint. Burnt bone seems to have been deposited elsewhere. The enigmatic clay discs or baking plates also seem to cluster near the supposed houses (Van Beek 1990, 237-238). Furthermore there is evidence that butchering, meat and hide processing activities as well as the manufacturing of bone and antler tools mainly took place beside the creek (*ibid.* 242). According to Van Beek (1990, 242) agricultural fields would have been located on the lower parts of the levees. Cattle would have been herded in wet grassland after the vegetation of alder had been removed. The wooded area on top of the levees were used for hunting and gathering purposes.

### *Finds:*

In total some 30.506 sherds were recovered. The pottery is predominantly pear-shaped, flat-bottomed and with thick walls. The sherds are mainly tempered with quartz, but sand and chamotte are also present. Decoration comprises small holes underneath the rim, stabbing and applied knobs. Some sherds show a weak carination. Furthermore fragments of clay discs, so-called baking plates, collared flasks and spoon fragments were found (Glasbergen *et al.* 1966; Van Beek 1977; 1990). Some PFB and Bell Beaker pottery was also found. There were no evident chronological developments within the pottery assemblage. On the basis of the various elements it can be dated to Vlaardingen period Ib (or Ic according to the model proposed by Lanting and Van der Plicht 1999/2000, 32-34).

The flint assemblage (N=6794) consists of one almost complete polished axe of Western-European type and several fragments of polished axes and chisels. The tool assemblage comprises borers, blades and mostly transverse arrowheads. The raw material indicates that various sources are likely to have contributed to the flint assemblage. Some of these are clearly of southern origin (Glasbergen *et al.* 1961). The natural stone assemblage comprises a small grinding stone (complete) as well as raw material for tempering purposes. A fragment of a battle axe might chronologically be associated with the PFB sherds.

Several artefacts were made of bone (awl, chisels, roughouts and unknown artefacts) and antler (axes, adzes, pointed artefacts, roughouts). Noteworthy objects further comprise pieces of rope, a wooden staff (ash), amber beads and a small box of birchbark (*Betula*). A mere 64 tools from trench 11 have been studied for use-wear analysis (Van Gijn 1984). Tools with traces of bone and antler working were mainly found on the eastern and western bank of the levee. Evidence for the processing of meat was found on top of the levee and on the banks. Evidence for the working of (dry) hides (31%) took place on top of the levee and on the eastern slope. Wood working and plant processing clustered on top of the levee (Van Beek 1990, 143; Van Gijn 1989, 140).

The wood remains comprise several species (alder; ash; hazel; elm; maple; hawthorn; mountain-ash; *taxus*). Some of the wood was recovered as worked or pointed stakes and posts. Furthermore charred remains of bread wheat and a smaller variant (*Triticum aestivum aestivo-compactum*), emmer, naked, oats. Fragments of hazelnut and stones of cherry were also found (Van Beek 1990, 82; Glasbergen *et al.* 1961, 61; Van Zeist 1968). The faunal assemblage consists mostly (76%) of wild species (*e.g.* wild boar; red deer; roe deer; beaver; otter) with a predominance of red deer and wild boar. Within the assemblage of domesticated animals (24%) (cattle; dog; pig; sheep; goat) there is a predominance of cattle, followed by pig, sheep, goat and dog. Bird remains were dominated by mallard, followed by white-tailed eagle.

The fish remains mostly comprise of sturgeon, next to pike and undetermined species. Furthermore molluscs were found as well as some bones of sea mammals (dolphin and seal).

One human bone (*squama occipitalis*) and one deciduous tooth were also found. Of these it is not clear whether they belong to the human cremation remains found on the highest part of the western levee in trench 10 and 13 (Van Beek 1990, 131, 167; Glasbergen *et al.* 1961; Clason 1967, table 1).

Finally finds at the Schinkelshoek location point to activities such as the cutting of wood and pottery production. The site also yielded a number of human teeth (Van den Broeke/Van Londen 1995).

#### *Interpretation:*

The settlement at Vlaardingen is characterised by evidence for several contemporaneous structures that were frequently rebuilt over time. Some of these might be interpreted as house plans. It is not clear to what extent the settlement was permanently inhabited during two or three centuries, as proposed by Van Beek (1990, 249-250), or inhabited during only a part of the year as suggested by Louwe Kooijmans (1987, 250). The presence of houses and other structures, pottery, bone, antler and flint tool assemblages, grinding stones, domesticated and wild fauna indicates that a considerable time investment was made, but cannot

## Vlaardingen

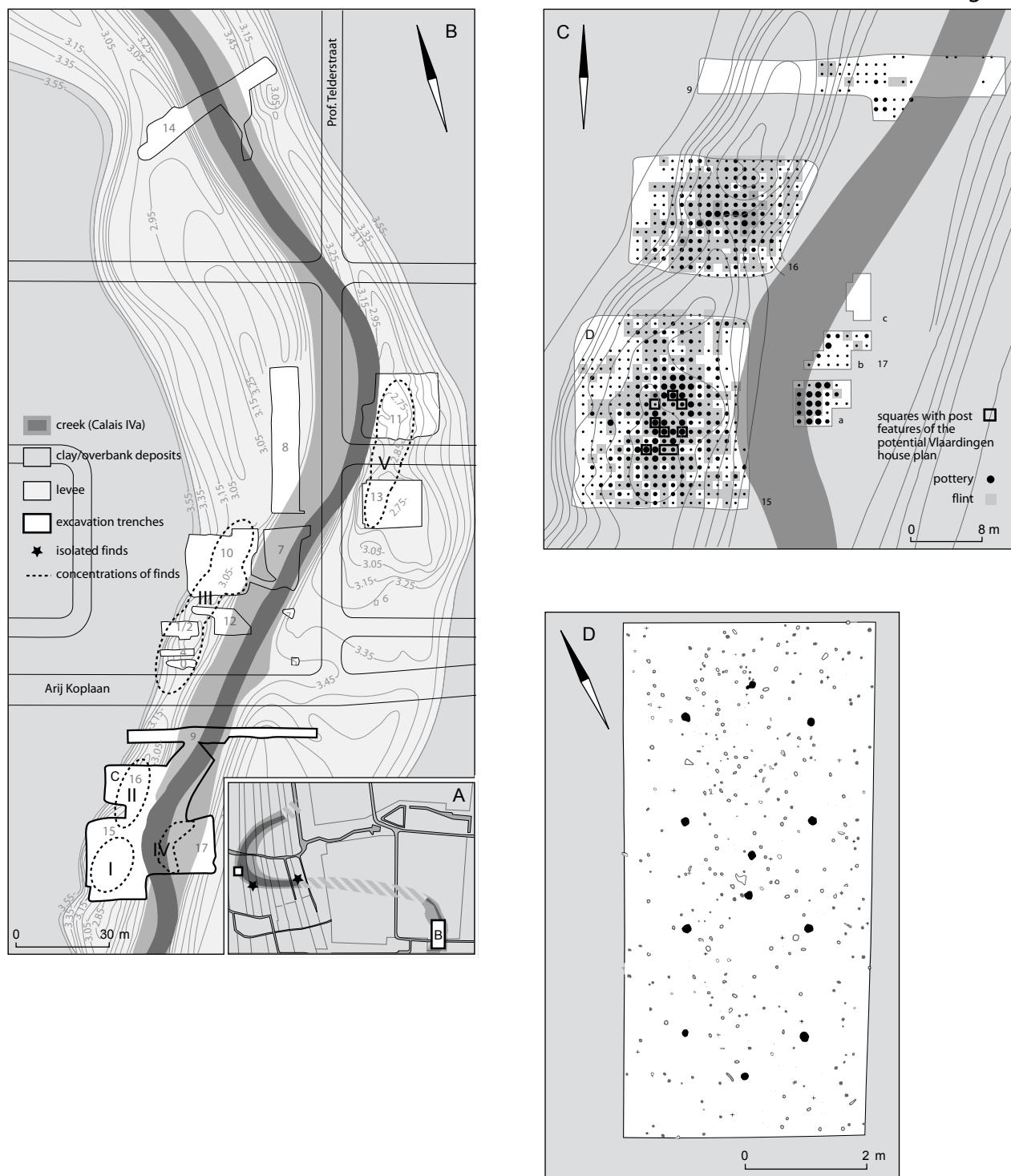


Fig. 83 Vlaardingen (A) overview of the levee with the original excavations and the Schinkelshoek location. (B) geomorphological overview of the excavation trenches and concentrations of finds. (C) detail of the distribution of pottery, lithics in trenches 9 and 15-17. (D) excavation plan of the potential house structure in trench 15/concentration I. Adapted from Van Beek 1990; Van den Broeke/Van London 1995, pp. 25 and Verhart 2010, pp. 156 and 163.

be ultimate proof of year-round presence. The seasonal indicators in the faunal assemblage point both to a presence in the summer (ageing of young red deer jaws, sturgeon remains, Dalmatian pelican) as well as winter (several species of birds such as goosander and brent) (*cf.* Louwe Kooijmans 1987, 250). An exclusive seasonal presence therefore cannot be established. The faunal assemblage does further indicate an important reliance (76%) on wild species. On the basis of a predominance of remains of wild species in the northern part of the excavation, in combination with the distribution of <sup>14</sup>C dates, Van Beek argues it might have been possible the settlement shifted south and at the same time became more agriculturally oriented (1990, 243-250). On the other hand this distribution may also be related to localised specialisation within the settlement. On the whole there is not enough evidence to suggest the above-mentioned scenario of increasing Neolithisation.

Finally it should be mentioned that the Schinkelshoek location (Van den Broeke/Van Londen 1995) indicates that more Vlaardingen sites were located on these levees.

#### *References:*

Clason 1967  
Glasbergen *et al.* 1961  
Groenman-van Waateringe/Jansma 1969  
Lanting/Van der Plicht 1999/2000  
Louwe Kooijmans 1987  
Van Beek 1977  
Van Beek 1990  
Van den Broeke/Van Londen 1995  
Van Gijn 1984  
Van Regteren Altena *et al.* 1962/1963  
Van Regteren Altena *et al.* 1964  
Van Zeist 1968  
Verhart 1992

## **53. Voorschoten-Boschgeest**

#### *Location:*

The settlement of Voorschoten was located on the western end of the extensive sand ridge between Wateringen and Voorschoten (Glasbergen *et al.* 1967, 7). The area is situated south of the current centre of Voorschoten in the Dutch coastal area, south of the former Rhine estuary.

#### *Site characteristics:*

The site was discovered in 1964 during the digging of a sewer trench. Two IPP excavation campaigns in 1965 found the site was largely disturbed by recent digging. The third campaign at the end of 1965 focused on a small depression (20 x 14 m) where occupation debris was still present. This location was stratigraphically excavated in two trenches (17 and 18, respectively approximately 100 m<sup>2</sup> and 40 m<sup>2</sup>). The top soil was removed mechanically. Furthermore palynological samples

were taken from peat profiles in the section of trench 17 and west of the sand ridge (Groenman-Van Waateringe *et al.* 1968, 105-106). Use-wear analysis of the flint tools failed because of excessive abrasion (Van Gijn 1989, 1).

#### *Geology/Pedology:*

In the geological section on the slope of sand ridge, which came into being around 4000 cal BC, fourteen layers were discerned about 1.70 m thick in the center of the sequence. The natural base of the dune consisted of yellow sand (1). On top of this was a layer of reed-sedge peat containing many finds (2/2a). This peat layer was interspersed by a layer of sand in the northern and western extension of the depression (3). Layers 4, 4a and 5 (combined thickness of 20 cm) were separated by a small band of peat and contained many fragments of charcoal, ash and archaeological material. Layer 6 (peat) and 7 (yellow sand) hardly contained any artefacts. Layers 8 (humic sand) and 10 (hardly humic sand) again contained many finds and charcoal, but were separated by an archaeologically rather empty layer of sand (9). Layers 11 and 13 consisting of humic sand neither contained many finds. Layer 14 is formed by the modern topsoil. This stratigraphy slightly deviates from the sequence on trench 18 (*cf.* Glasbergen *et al.* 1967, 9). Occupation took place on the wooded sand ridges or dunes. Surrounding these there was pastureland but peatgrowth also took place. The wetlands to the east of the dune could be reached through the Rhine-Meuse estuary (Glasbergen *et al.* 1967, 7).

#### *Taphonomy:*

A large part of the settlement on top of the dune had been disturbed by recent digging. The small depression however contained stratigraphically discernable complexes of finds. Furthermore pollen and fauna remains could be extracted. Unfortunately, the location of the depression did not yield any recognizable features.

#### *Ecology:*

Palynological samples were taken from peat profiles in the section of trench 17 and west of the sand ridge (Groenman-Van Waateringe *et al.* 1968, 105-106). The depression, produced by winderosion, probably came into existence sometime after the formation of the sand-ridge. It was slowly filled by peat and windblown sand, but always retained some open water in view of the regular occurrence of sedge roots (*Carex*) and pollen of water plants. According to the pollen analysis alder (*Alnus*) and willow (*Salix*) grew on the periphery as well as on the eastern and western slopes of the sand ridge. The ridge itself was populated with hazel (*Corylus*), oak (*Quercus*), lime (*Tilia*) and elm (*Ulmus*). A low sample from profile V2 also indicates the presence of an open vegetation with obvious saline influence (salt-marsh like) with species such as Chenopodiaceae (goosefoot family), *Plantago maritima* L. (sea plantain), Asteraceae (composites), Poaceae (grasses) and Cyperaceae (sedge). There is evidence for anthropogenic removal of fen carr vegetation (alder and willow), perhaps in order to create grazing grounds, access to open water and/or gather construction wood.

In diagram V1, three synchronous peaks occur of Cerealia in combination with ribwort plantain (*Plantago lanceolata* L.). They represent three phases of occupation, correlating with find concentrations in respectively layer 2-5, layer

8 and layer 10. The first peak correlates to layers 2-7 and also contains pollen of mugwort (*Artemisia*). There are no high values for pasture plants and this phase is interpreted as indicative of limited cultivation and no pastureland. Some evidence for pastures or fallow ground appears in the uppermost spectrum of layer 7.

The second phase correlates with layer 9 and to a lesser extent layer 10. There are indications for less agriculture, but probably more pastureland. There was no large-scale cutting of oak and domestic animals were probably not kept on the ridge themselves. There is also evidence for some regeneration of the forest in the increase of pollen of hazle and polypody (*Polydium*). Perhaps this phase witnessed a decrease in the importance of cultivation (Groenman-van Waateringe *et al.* 1968, 108). The evidence of this phase should probably be dated after occupation. The pollen was present in windblown sand, probably resulting from destruction of natural vegetation and abandonment of fields (Groenman-van Waateringe 1968, 119).

The third phase corresponds to layer 11. This phase sees a further increase of indicators for pastureland and only scarce weeds of cultivation. Furthermore there is evidence for extensive cutting of oak. Cattle might now have grazed on the sand ridge. At the end of this phase values for cultivation and pastureland decrease. In layer 13 there is evidence for the regeneration of the fen carr (*ibid.* 108).

The above-mentioned evidence points to limited cultivation during the VL-1 and VL-2 phase. There is also evidence for pastureland (off the ridge along the strand plain to the west). During the VL-2 phase fallow and abandoned fields were probably covered with pasture-like vegetation. During the subsequent PFB-occupation oak woods are cut down and cattle grazed on the dune. The subsequent Bell Beaker occupation is not present in the pollen diagrams.

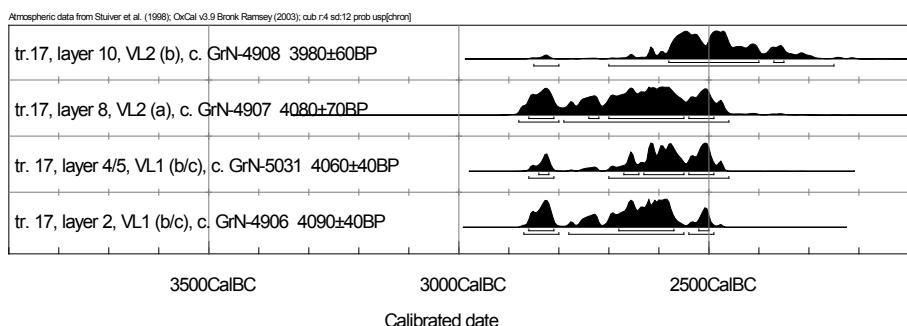
#### *Dating:*

Five  $^{14}\text{C}$  dates were available. One of these (GrN-4909) originated in the covering layer, but yielded no useable result. The other four dates are presented below.

Although the dates stem from different layers, the internal division in Vlaardingen 1(b/c) and 2 (a/b) is questionable. These subdivisions are mainly based on sparse data of pottery characteristics in combination with  $^{14}\text{C}$  dates (Lanting/Van der Plicht 1999/2000; Louwe Kooijmans 1976). The subdivision in 1a, 1b and 1c as proposed by Lanting and Van der Plicht (1999/2000, 32-34) is based on a single concentration on the Hazendonk. There are however strong similarities between their 1a and subsequent 1b concentration (Raemaekers 2005<sup>a</sup>, 273). The subdivision in 2a and 2b is based upon the absence or presence of PFB or AOO pottery (Lanting/Van der Plicht 1999/2000, 68). This however entails a structurally older date for VL-assemblages without SGC-pottery and therefore is untenable (Raemaekers 2005<sup>a</sup>, 273). Raemaekers (2005<sup>a</sup>, 273) argues that even the distinction between VL-1 and 2 is questionable since it is solely based upon the replacement of grit-temper by chamotte.

The pottery sample clearly is the result of prolonged or recurrent occupation of the site. The SGC-elements within the assemblage belong solely to the last phase (layer 10). According to Groenman-van Waateringe *et al.* (1968, 119), there is no evidence for a clear hiatus between the three occupation phases. The intermittent layers of blown-in sand could have come into existence in a rather short period of time.

Fig. 84 Radiocarbon dates for Voorschoten-Boschgeest.



Remarkable is the occurrence of a probable Bell Beaker vessel in layer 10 (Glasbergen *et al.* 1967) since, according to Lanting and Van der Plicht (199/2000, 71), this layer dates to the VL-2 occupation.

#### Features/Spatial layout:

No features were uncovered in the depression. According to the archaeological and palynological evidence the settlement was located on top of the dune. During the third occupation phase the surface of the dune may also have been used as pastureland.

#### Finds:

In total 1428 sherds were recovered from trench 17 of which approximately 1321 belong to the Vlaardingen group (some 401 sherds were recovered from trench 18 where layer E corresponds to 10-11 in trench 17) (Glasbergen *et al.* 1967). On the basis of the pottery analysis a VL-1 (hard; grey-brown-black; mostly quartz-tempered; lightly burnished; S-shaped; everted to vertical rim; flat-bottomed with sometimes weak foot; pits or perforations under rim; knobs on shoulder) and a VL-2 group (less hard; light ochre to grey; sand grit mixed with quartz or chamotte; smooth surface no burnish; truncated pear-shaped profile; vertical often flattened rim; squeezed-out foot; no ornaments) were discerned. Pottery concentrations were present in layers 2-2a, 4 and 5 (interspersed by 3), 8 and 10-11. Clay discs occurred in layers 2-8, collared flasks in 4 and 7 and thinwalled (Beaker?) pottery in 10-11. Furthermore there is no occurrence of decoration on VL-pottery in layers 8-11 and PFB and BB sherds (with the exception of one PFB sherd in layer 9), solely occurred in layers 10-11. VL-1 material thus occurs in layers 2-5, 6 and 7. VL-2 material in 6, 7, 8, 9, 10 and 11. Layers 10 and 11 also contain PFB and BB sherds (Glasbergen *et al.* 1967). Noteworthy is the fact that Van Beek (1977, 92) concludes that there is no evidence at Voorschoten trench 17 between pottery form and layer. There is correlation between tempering agent and layer.

The flint assemblage from trench 17 contains 186 fragments, mostly flakes (20 from polished axes, of which nine are reworked as scraper), 30 cores, 23 other scrapers, 5 borers, 2 blades and one triangular arrowhead with tang. Trench 18 contained 72 fragments, mostly flakes (13 from polished axes of which 5 were reworked as scraper), 14 other scrapers, 2 borers and one transverse arrowhead. Overall the flintworking technology seems to be flake base with a rather careless workmanship. There is a large quantity of flint in layers 10-11 and a recurrence of small cores. No cores were present in layers 4-9. Apparently flint was scarce at that time. This is more or less mirrored in the assemblage of trench 18. In total (trench

17 and 18) 204 other pieces of stone were found including pottery grit, shale, jet and amber pendants and flat beach pebbles as well as (parts of) some hammering and burnishing stones and querns.

In total 449 bones and 201 fragments of sturgeon were found (Groenman-van Waateringe *et al.* 1969, 110-118). Layers 2-5 contained 321 bones and 197 fragments of sturgeon (*Acipenser sturio*). Some 14% of the animals was hunted comprising auroch (*Bos primigenius*), wild pig (*Sus scrofa*), red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) grey seal (*Halichoerus grypus*) and sperm whale (*Physeter Macrocephalus*). The domestic animals (86%) comprised of cattle (*Bos Taurus*) pig (*Sus domesticus*), sheep (*Ovis aries*), goat (*Capra hircus*) and dog (*Canis familiaris*). Furthermore a perforated tooth of a bear was found as well as

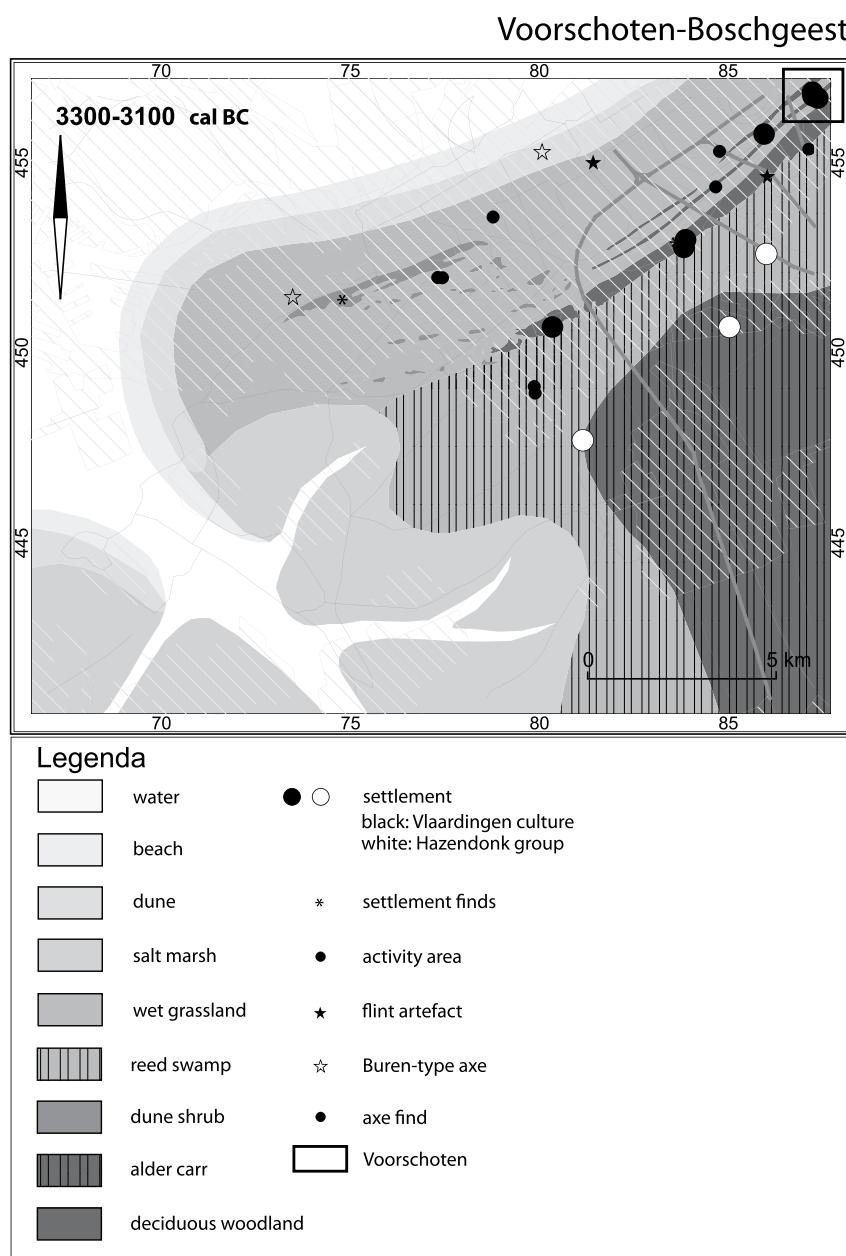


Fig. 85 Voorschoten-Boschgeest. Paleogeographical map of the Delfland area (c. 3300-3100 cal BC) and the location of Voorschoten-Boschgeest. Adapted from Louwe Kooijmans 2009, fig. 2.

9 fragments of wild or domestic cattle. Layers 6-9 contained 105 bones and three fragments of sturgeon. Hunted animals form about one third of the total (aurochs, wild pig, red deer and roe deer). Cattle was the most important domestic animal. Sturgeon fishing seems to have diminished. Layers 10-11 contained 11 fragments from cattle, pig and red deer. Layer 13 contained five fragments (cattle, pig, red deer) and a fragment of a sturgeon. Birds were also caught. Layers 2-5 yielded five bone tools, layers 10-11 one, comprising awls, a chisel a disc and a perforated tooth found (Groenman-van Waateringe *et al.* 1968, 110-118).

#### *Interpretation:*

The importance of Voorschoten-Boschgeest is mainly related to the fact that the site yielded stratigraphically discernable concentrations of pottery. Within these and to a lesser extent within the flint assemblage some trends in time are visible. There is for instance a change in form and tempering agents in the pottery assemblage and in the younger layers PFB-elements are present. Furthermore there is a shortage of flint in some of the older layers, whereas the younger assemblages seem to have suffered less from resource problems. It remains however problematic to establish certainty concerning the general value of these trends and to indicate whether an internal division of Vlaardingen pottery might be established on the basis of one of a few sites.

Another important aspect of Voorschoten is the data yielded by the faunal remains and the palynology. The presence of the Vlaardingen culture is documented by the appearance of small agricultural fields and pastureland. The cattle was however probably herded off the dune, but is well attested in the faunal spectrum. Later on the importance of sturgeon fishing decreases. In layers 6-9 however hunted animals slightly increase, but it is not evident this can be related to a change in subsistence. Layers 10-13 hardly contained animal remains. During the subsequent PFB-occupation there is strong signal of wood clearing (oak) on top of the dune in the pollen diagram. This may be related to the fact that the VL-people use the acorns for their pigs or that wood was needed for structures. Another option could be the increasingly wet environment (Pons, cited in Groenman-van Waateringe *et al.* 1968, 120). It is however also possible that the clearing of wood on top of the dune may also be related to a different and more sedentary use of the environment differing from the previous VL-occupations. Unfortunately the site suffers from the absence of features in this respect.

#### *References:*

- Glasbergen *et al.* 1967
- Groenman-van Waateringe *et al.* 1968
- Lanting/Van der Plicht 1999/2000
- Louwe Kooijmans 1976
- Raemaekers 2005<sup>a</sup>
- Van Gijn 1989

## 54. Wateringen-4

### *Location:*

The site of Wateringen-4 is located on a SE-NW oriented dune in the Dutch coastal area of Southern Holland. During the Neolithic the site was located in a diverse landscape comprising other dunes, salt marshes and creeks, all in the vicinity of the coast (Raemaekers *et al.* 1997, 143, 186).

### *Site characteristics:*

The site was located by an augering campaign of the RAAP foundation in the early nineties. The ROB subsequently dug a trial trench after which the faculty of Archaeology of Leiden University conducted extensive excavations in 1997. Since the site was threatened by construction works, possibilities for excavation were limited. Since the dune was located up to two meters below the surface and well under Dutch ordnance level, drainage was required. Because of this it was decided to excavate the entire top of the dune, where the find layer was thick, and only parts of the slope. The site was largely excavated by shovel in 1 m<sup>2</sup> units. On the slopes finds were documented per stratigraphic sequence. Underneath the culture layer a typical horizon with features was documented. Time restrictions prohibited sieving. However samples for radiocarbon dating, palynological and macrobotanical research were taken (Raemaekers *et al.* 1997, 143-145). The total excavated area consists of a large trench of approximately 1898 m<sup>2</sup> and two small trenches of 67 m<sup>2</sup> each to the northwest of that.

### *Geology/Pedology:*

Augerings and two trenches resulted in a division in six geological units (Raemaekers *et al.* 1992, figs. 2 and 4). Unit 1 consists of calcareous sands interspersed with clay layers and comprising lenses with mollusc shells. Unit 2 consists of fine sands. Morphologically a division in two SE-NW oriented ridges was discerned with a shallow depression in between. The broadest and highest ridge showed traces of occupation and was excavated. Within the aforementioned depression as well as on the dune's SE slope peat developed (Unit 3). This peat could be subdivided in a homogeneous black upper part (3a on the NE, 3c on the SW slope) and a brown lower part with recognizable plant remains (3b on the NE and 3d on the SW slope). Unit 3 did not yield any features. A lamina of sand, characteristic of Unit 2 was documented in Unit 3. Unit 4 is a thick cover of clay occasionally forming a very sharp boundary with Unit 3. Units 5 (peat) and 6 (disturbed clay) form the upper part of the sequence. With help of the <sup>14</sup>C dates the following scenario may be sketched.

chronostratigraphy	pedology	<sup>14</sup> C dating	geol./arch. events
Unit 6	disturbed clay	after 3400 cal BC	disturbance
Unit 5	peat	after 3400 cal BC	peat formation
Unit 4	clay	3400 cal BC onwards	erosion + clay sed.
Unit 3	peat	3650-3400 cal BC	peat form. + habitation
Unit 2	fine sands	approx. 3900 cal BC	dune form. + soil dev.
Unit 1	calc. sands	approx. 4000 cal BC	beach barrier formation

Table 13 Chronostratigraphic units identified at Wateringen-4.

Unit 1 is formed by sediments of a beach barrier deposit and might be dated around 4000 cal BC. On top of these low dune ridges formed (Unit 2) within which some soil formation took place. Subsequently peat started to grow in the depression and on the slopes of the dune around 3650 cal BC. At that time (or at the most within 200 years) people settled on the ridge. Peat formation continued and after abandonment a black soil developed in the upper horizons of the dune, due to the rising groundwater level. Erosion affected the eastern part of the dune around 3350 cal BC. Subsequently the dune was covered by marine sediments (Raemaekers *et al.* 1997, 145-146).

#### *Taphonomy:*

A characteristic subdivision may be made consisting of the top of the dune with a thick find layer and features and the slopes of the dune with a stratigraphical sequence. The find layer on top of the dune may be considered a palimpsest, but the find of a partial house plan indicates both the span of occupation as well as the admixture of material and reworking of the soil might have been reasonably limited. It would be expected that conditions for the preservation of organic remains (*e.g.* bones) would be more suitable on the peat-covered slopes than on top of the dune. Yet although most bones were found on the slopes, the preservation of faunal remains on top of the dune was similar. This suggests the pattern of dispersal is anthropogenic (Raemaekers *et al.* 1997, 161). Apart from this it is a further indication for limited weathering and exposure of the top of the dune. Another indication for this is the presence of wood in features on top of the dune (Raemaekers *et al.* 1997, 158-159).

#### *Ecology:*

Both the macrobotanical analyses and the pollen core located in the peat 50 m from the centre of the site yielded information pertaining to the ecological situation. The samples suggest that during occupation the vegetation underwent very few changes. The lower parts of the terrain were covered by riparian communities indicating the presence of a wetland landscape. There were however no large expanses of open water. In between the riparian plants, but especially higher up on the slope, plants favouring marshy locations were documented (*e.g.* Hemp agrimony (*Eupatorium cannabinum*) and Bittersweet nightshade (*Solanum dulcamara*)). These plants however also thrive in dryer conditions indicating the slope of the dune might have been fairly dry. A third category may be defined as belonging to a wet ruderal area. These groups yield evidence for the following environmental reconstruction (Raemaekers *et al.* 1997, 155-156). A marsh with lush vegetation surrounded the dune and, although groundwater reached the surface, open water only existed in small patches. The freshwater conditions in the area were occasionally interrupted by salt or brackish influx. The communities on top of the dune may be described as a typical dune vegetation consisting of shrubs such as elder (*Sambucus nigra*) and sloe (*Prunus spinosa*) and herbs (*e.g.* Three-nerved Sandwood (*Moehringia trinervia*); Ground ivy (*Glechoma hederacea*)). Clearance of this vegetation stimulated the growth of ruderal herbs on the dune. Evidence for the presence of salt marshes as indicated by the third group (*cf. supra*) should be positioned at some distance from the dune. The presence of several other species in the area, amongst which several trees, is attested by botanical

remains and pollen, yet these must have been transported from elsewhere since they could not have grown in the direct vicinity of the dune (Raemaekers *et al.* 1997, 156-157).

#### Dating:

In total eight radiocarbon dates were obtained. Two of these (RGD1/GrN21109 and RGD2/GrN21600) dated geological phenomena (unit 1 and 4). RGD 2 dated a sample of shells (Peppery furrow shell, *Scrobilaria plana*) from unit 4 covering the occupation layer. The dates however were too young. This may be attributed to the freshwater reservoir effect (*cf.* Lanting/Van der Plicht 1999/2000, 61; Raemaekers *et al.* 1997, 188, note 1).

Samples 4, 2 and 3 have been obtained in stratigraphical order (Lanting/Van der Plicht 1999/2000, 60). When the full ranges of both peat samples are accepted however, the sequence is not necessarily in reverse. Peat growth might thus have started around 3650 cal BC or even 3600 cal BC on the higher parts of the dune and lasted for some 150-250 years (Raemaekers *et al.* 1997, 146). The unfortunately large range of sample 4 most probably blurs the actual span of occupation of the site. The excavators therefore sought a mean date which would fall within all the ranges and arrived at  $3625 \pm 25$  cal BC. Accounting for the old wood effect this would place the occupation of Wateringen 4 somewhere between 3625 and 3400 cal BC (*ibid.*).

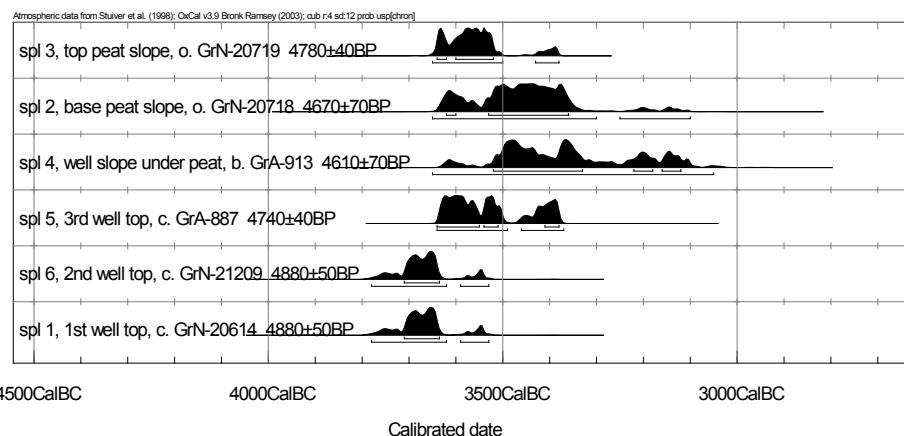


Fig. 86 Radiocarbon dates for Wateringen-4.

#### Features/Spatial layout:

A total of 97 postholes (up to 80 cm of original depth) were found, mostly on top of the dune. Nineteen of these formed a two-aisled house (10.9 x 4.1 m) located relative (E-W) to the dune's contours, with an average post depth of 71-75 cm and an average post depth of 16-40 cm (Hogestijn/Drenth 2000/2001, 57; Raemaekers *et al.* 1997, 149). The house consisted of broader and deeper central posts for which mainly alder (*Alnus*) was used and smaller wall posts containing juniper (*Juniperus*). The house may have had a saddle roof. Hardly any wood was preserved in other structures indicating posts were probably removed for reuse. A second group of fourteen features (with average dimensions of 152 cm in diameter and 78 cm in depth), mainly clustering on the eastern slope of the dune

might be interpreted as water wells. They were dug to obtain fresh water from within the dune body. The presence of one of these next to the house plan may be indicative of occupation before the house was constructed (if pollution was prevented) (Raemaekers *et al.* 1997, 149-150). Three features on the lower peat-covered northern slope of the dune may be interpreted as watering places. These were later re-used as refuse dumps. Furthermore some nineteen pits were found, mostly located on top of the dune and containing little finds. A rather large flat-bottomed feature (150 cm in diameter and 56 cm in depth) was recovered seven meters west of the house. This feature is interpreted as a hearth. (Raemaekers *et al.* 1997, 150).

Since most of the finds (pottery and flint) were found around the structure this is likely to have been the focus of activity. The slopes of the dunes may have been both activity areas or waste dumps, such as suggested by the faunal remains. Some areas such as the one containing the cluster of water wells may have been deliberately kept clean (*ibid.* 173). Like the pottery most of the flint clusters around the structure although some evidence for deliberate clearing of the area is present. Arrowheads furthermore seem to be concentrated north of the house plan. Other lithic material concentrated around the house as well as on the southern slope (Raemaekers *et al.* 1997, 179).

#### *Finds:*

In total the pottery assemblage yielded 49867 g of sherds of which 81% (3063) sherds was studied. The sherds were mainly tempered with grit (grog and organic temper also occur) and revealed mainly evidence of H-joins. Rim-decoration is sparse. Body decoration is mainly formed by double or single fingertip/fingernail impressions or impressions with the aid of an instrument. Approximately 36-42 % of the sherds must have been decorated (Raemaekers *et al.* 1997, 167-168). Flint comprised 1065 artefacts (5335 g). The assemblage may be characterised as flake-based (blades are almost absent) and contains a lot of waste material. Small chips are underrepresented due to the recovery techniques. Many implements show traces of burning. Flint axes were re-used as cores. Most of the raw material derived from river terrace sediments although imports of Rijckholt, Lightgrey Belgian, Valkenburg and Zevenwegen (sic! = Obourg) -type flint were also present. The imported flint probably arrived as complete products. Some 117 tools *sensu lato* were recovered. The assemblage is dominated by points (N=44) (mainly triangular), followed by scrapers (N=27), some borers (N=6), retouched and pointed blades and retouched waste. Furthermore two axe fragments were found. Use-wear analysis showed evidence of plant collecting or processing (no typical sickle blades were found), bone-, hide- and wood working. Noteworthy is the fact that the imported implements showed traces of more intensive use (Raemaekers *et al.* 1997, 173-178).

The stone assemblage (N=471; 7129 g.) consists mostly of quartz and quartzite probably obtained from the Meuse and Rhine gravels. A jet bead and a piece of marcasite point to long distance contacts (northern France and the Ardennes). Apart from some evidence of bead production, three fragments of quartzite stone axes, hammering stones and fragments of querns were found (Raemaekers *et al.* 1997, 186).

The mammal spectrum is dominated by domesticated cattle followed by either wild or domesticated pig and red deer. Furthermore small mammals (beaver otter, wild cat, and dog) were found. The bird bones (783) are dominated by mallard, teal/garganey and widgeon. Since they are located in distinct concentrations they might represent the remains of fowling expeditions (Raemaekers *et al.* 1997, 161-162). Fish remains (N=422) indicated the presence of freshwater species (pike, perch, and bream,), yet also species that tolerate salt or brackish water (eel, mullet, flounder, sturgeon, salmon/seatrout,). From the specific constellation of species it may be inferred that Wateringen should be placed in a freshwater environment since they all tolerate freshwater. Part of the assemblage was found in waterwell C88. This specific assemblage might have been the stomach contents of a butchered otter (Raemaekers *et al.* 1997, 164).

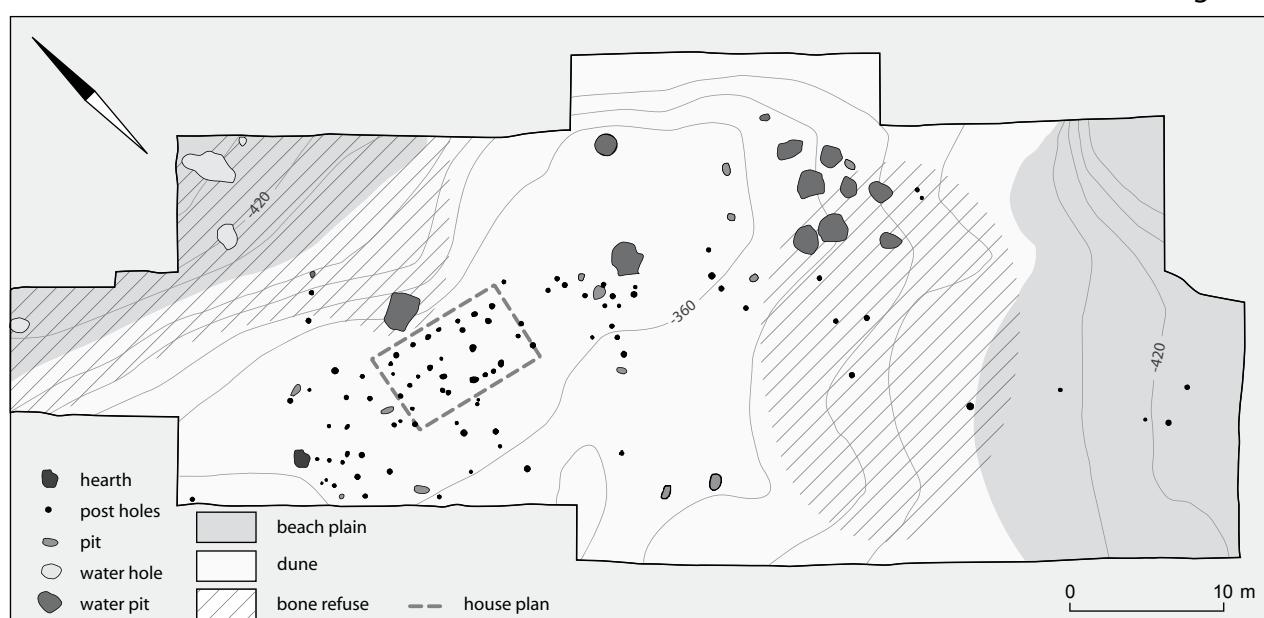
Within the botanical assemblage carbonised kernels and chaff of both naked barley (*Hordeum vulgare* var. *nudum*) and emmer wheat (*Triticum dicoccum*) are present. Typical ruderal weeds such as fat-hen (*Chenopodium album*) and black nightshade (*Solanum nigra*) were also present. Wild fruits, nuts and seeds comprise hazelnuts (*Corylus avellana*), apples (*Malus sylvestris*), dogwood (*Cornus sanguinea*) and dew blackberries (*Rubus caesius*). Non-food plants such as reed (*Phragmites australis*) were also collected (Raemaekers *et al.* 1997, 157). Finally some pieces of worked wood were found (*ibid.* 158-159).

#### Interpretation:

Wateringen 4 was located in a relatively dry freshwater environment (Raemaekers *et al.* 1997, 155-156, 186). The site is mainly characterised by the two-aisled house plan on top of the dune. This location was the main centre of activity. The slopes functioned as water extraction points, working areas and waste dumps. The range of activities on the site indicates animal husbandry and hunting and gathering activities. It is likely the occupants also practiced crop cultivation since the area was suitable and the remains were present on the site. Unfortunately, the

Fig. 87 Wateringen-4.  
Excavation plan of Wateringen-4, including location of the house plan, features and waste area. Adapted from Raemaekers *et al.* 1997, fig. 5 and Louwe Kooijmans 2009, fig. 6.

Wateringen-4



faunal assemblage did not yield convincing evidence for occupation at a specific time in the year. The mandible of a juvenile calf points to summer occupation, but the fully grown antlers and skull remains of deer indicate a presence from October to March. The bird remains contain bones of a typical winter visitor (the widgeon), but emphasis lies with summer and year-round species. The fish remains neither shed more light on the problem. Two species are indicative of summer (sturgeon and thin lipped mullet; Raemaekers *et al.* 1997, 161-162). The overall spectrum seems to point to occupation in the summer half of the year (Louwe Kooijmans 2006<sup>d</sup>, 171). The investment of labour in the site in combination with the above-mentioned activities and the lack of specific seasonal indicators has led the excavators to assume the site was inhabited on a year-round basis (Raemaekers *et al.* 1997, 187). This seems a plausible option, although the evidence of frequent renewal of structures on the site in combination with the absence of absolute arguments for year-round occupation indicates the location may also have been visited on two or more occasions during the year. Wateringen 4 may be considered important in understanding the post SWB occupation of the southern Netherlands, especially with respect to the structural remains, the Neolithic character of the subsistence and the spatial distribution of living, working and waste areas.

#### *References:*

Hogestijn/Drenth 2000/2001  
Lanting/Van der Plicht 1999/2000  
Raemaekers *et al.* 1997

### **55. Weelde-Paardsdrank**

#### *Location:*

The site of Weelde-Paardsdrank is situated on a dune at the widest part of a major Late Glacial dune sand belt in the Belgian Turnhoutse Kempen (Campine). At the foot of the dune there is a small, moist depression. This fen (*ven*) as such may not have existed in the Mesolithic, yet the depression could have been more humid (Huyge/Vermeersch 1982, 119, 137, 198).

#### *Site characteristics:*

The site comprises several high-density areas of artefacts (Weelde-Paardsdrank sector 1, 4, 5) located within a wide scatter of finds covering the entire dune (Huyge/Vermeersch 1982). In 1976 and 1977 Leuven University excavated 337m<sup>2</sup> of the site in three separate trenches focusing on the concentrations. Most 'in situ' finds have been recorded spatially, while almost all excavated soil was sieved (*ibid.*, 122).

#### *Geology/Pedology:*

The major dune-building phase took place in the Younger Dryas prior to occupation. In the Allerød and Pre-Boreal the amelioration of the climate led to the development of soils continuing into the Sub-Boreal. The surface was stable for several millennia and was only covered up by secondary aeolian activity in the Sub-Atlantic postdating the prehistoric settlement (Huyge/Vermeersch 1982, 131-

132). The area of the *ven* saw the development of a marshy forest soil maturing at the end of the Atlantic. The *ven* as such only came into existence in the Subboreal (*ibid.* 137).

#### *Taphonomy/Site-formation:*

Taphonomically the site has been on or at the surface for at least 5000 years (*cf.* dating) as sedimentation did not take place until the Subboreal. The authors also stress the presence of soil turbation related to root activity, faunal turbation and burrows of beetles (*ibid.* 132, 137). Apart from this the Ap and subjacent A2 horizon as well as the original surface are totally or partially disturbed by ploughing. All aspects indicate the site can be considered a classic palimpsest. Huyge and Vermeersch (1982, 145-149) however indicate a certain amount of finds can be termed *in situ* (55.9% for sector 1, 31.1% for sector 4 and 67.4% for sector 5). What is actually meant is that these artefacts were outside the ploughzone or other surface disturbance. Vertical dispersion of artefacts minimally amounts up to 40 cm. Some pieces have been refitted indicating a horizontal dispersal up to 25 m (*ibid.* 145, 149) caused by post-depositional processes or the slope of the dune. Only some small fragments of burnt bone were preserved in the acidic soil (*ibid.* 43). It suffices to say that due to the stability of the surface and subsequent disturbing processes only the coarsest patterns have been preserved.

#### *Ecology:*

The oldest pollen spectra analysed date after the Mesolithic occupation. In the (final) Atlantic period, vegetation consisted of an open lime-woodland with hazel and ivy (*ibid.* 143, 189).

#### *Dating:*

In total six radiocarbon dates are available. Three conventional dates (Huyge/Vermeersch 1982, 144) and 3 AMS dates (Gillespie *et al.* 1985; Vermeersch 1990). Of the conventional dates two can be discarded; one on the basis of insufficiency of material (Lv-854D) and one on the basis of material (charcoal) and the lack of association (dispersed within A2). Of the AMS-dates (OxA-141, 142 and 143) only one (OxA-141) appears to provide a secure date (*cf.* Gillespie *et al.* 1985, 239). Remarkably the dates of OxA-141 and 142 differ slightly in the publication of Vermeersch (1990). The dates by Gillespie *et al.* 1985 shall be used here. This leaves us with two reliable dates.

The site can either be dated between 7600 and 6700 cal BC (OxA-141). The association of OxA-141 with the artefacts however is less secure than Lv-959, dating to 6200-5600 cal BC. In the light of the attested typological integrity of the three sectors (Huyge/Vermeersch 1982, 191), the occurrence of LBK-like arrowheads and possibly associated pottery (*cf. infra*), the latter date is preferred.

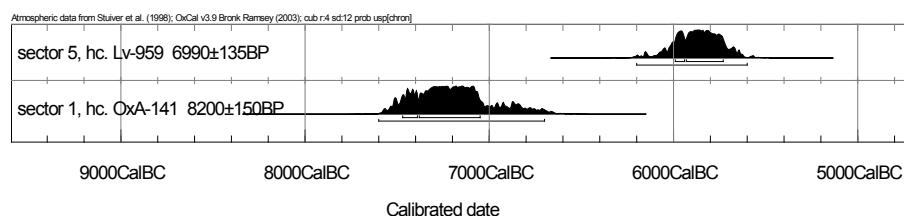


Fig. 88 Radiocarbon dates for Weelde-Paardsdrank.

### *Features and spatial layout:*

Not many features have been preserved since the original surface has been lost. In one of the test pits (KA-KB 050) a possible Mesolithic pit was uncovered. In sector 1 a diffuse pattern of artefact dispersion with some denser patches is visible. A circular pattern of burnt fragments of sandstone and quartz ( $\pm 3$  m diameter) indicates the possible presence of a former hearth. Although no charcoal remains were found the percentage of artefacts showing traces of fire is more important in sector 1 (*ibid.* 149, 197). The pattern of lithic dispersal in sector 4 is even less informative. This sector did however yield a rather large concentration of pottery sherds within the Mesolithic level (*cf. infra*). Sector 5 differs from the previous two sectors because of the rather clearly delimited oval shaped concentration of artefacts measuring 7 x 3 m along the axis (*ibid.* 150). In sector 5 two distinct concentrations of burnt hazelnut shells were located, spatially coinciding with the pattern of burnt faunal remains and charcoal, while core, core rejuvenation products, tools and microburins correspond with a vacuum in these organic remains (Huyge/Vermeersch 1982, 197). Some diffuse groupings of specific artefact types do occur.

### *Finds:*

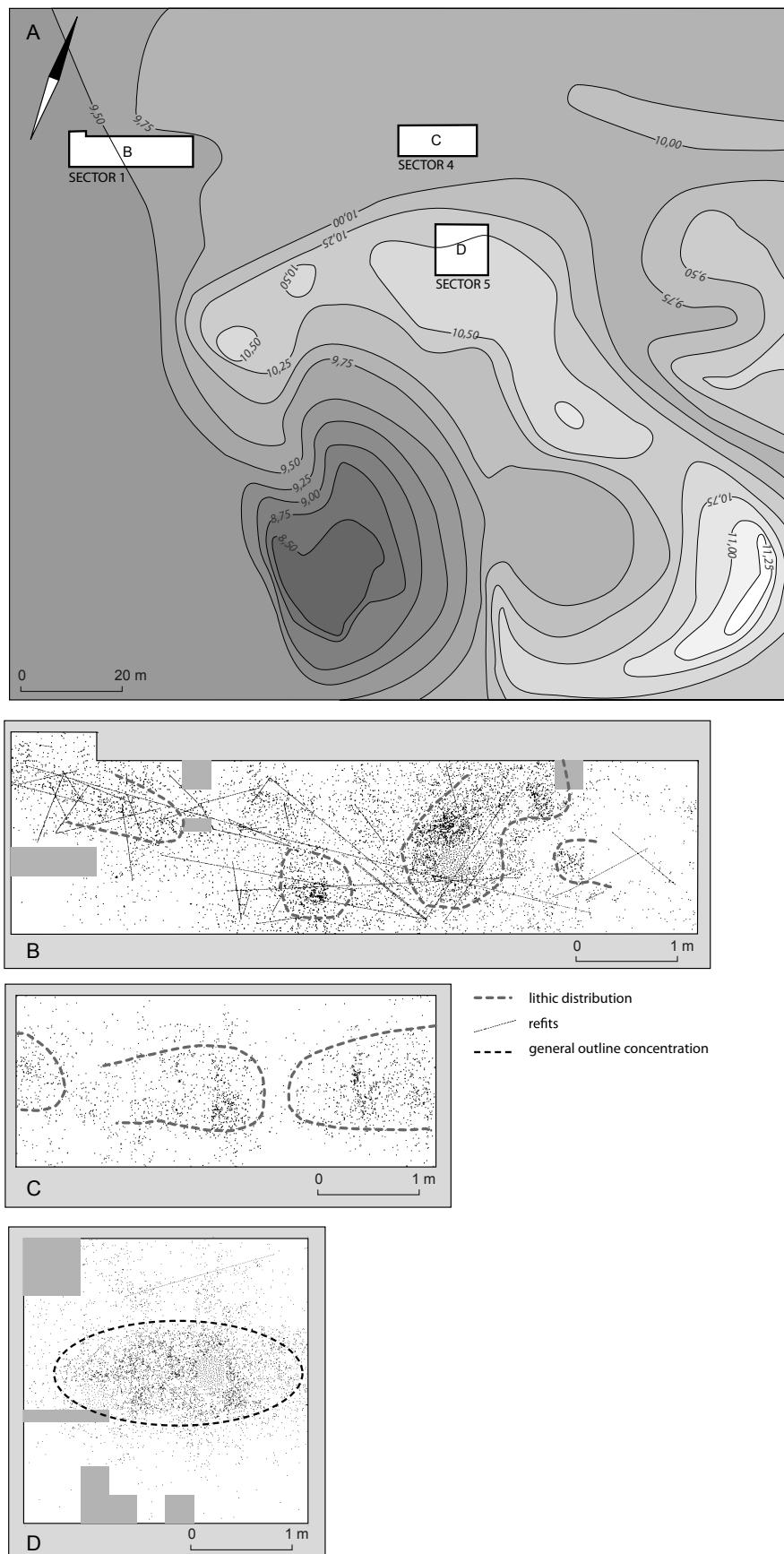
Most of the lithic material (N=30,290) was made on flint or Wommersom quartzite. Typologically the assemblages from all three sectors can be dated to the Late Mesolithic. About 5% of the total assemblage consisted of tools (NB for further specification see Huyge/Vermeersch 1982, table V, VI and VIII (not all tool and debitage counts add up!). Remarkable is the presence of in total nine LBK-like points within the Mesolithic level of the separate sectors. Of these, two show remarkable close affinities with classic LBK points, but all differ to some extent. Some artefacts of evolved Neolithic affinity were also found (*ibid.* 178). The site yielded 2 quartz cobbles possibly used as hammer stones, a quartzite nodule and a sandstone block with traces of polishing and several nodules of ochre (*ibid.* 178).

In sector 4, 130 sherds of pottery were found, in sector 5 one. The pottery was tempered with quartz, vegetal material and occasionally chamotte and, the original colour was grey or dark-brown. The sherds belong to vessels manufactured by thumb pinching, approximately 15 cm in diameter (*ibid.* 188-189). At the time of publication (1982) no known parallels for the pottery were found and these were considered to be either intrusive or of Late Mesolithic origin. According to B. Vanmontfort (pers. comm. 2005) the technological properties of the sherds do not differ to any large extent from known MK pottery in the area. Additionally the site yielded a considerable amount of broken and carbonized nutshell fragments (most numerous in sector 5), as well as small fragments of burnt bone (also sector 4 and 5). Both fox and possibly deer were identified (*ibid.* 143).

### *Interpretation:*

Weelde-Paardsdrank can be considered a classic palimpsest. The three clusters of roughly contemporaneous age are part of a larger area of concentrations within a veil of flint, as attested for example at Weelde-Voorheide 3 (Verbeek/Vermeersch 1995). The area must have been a favourable settlement location on the dune-complex. Huyge and Vermeersch (1982, 197, 198) suggest the sharply delimited

## Weelde-Paardsdrank



*Fig. 89 Weelde-Paardsdrank. (A) location of the excavation trenches at Weelde. (B) excavation trench and lithic distribution sector 1. (C) excavation trench and lithic distribution sector 4. (D) excavation trench and lithic distribution sector 5. Adapted from Huyge/Vermeersch 1982, fig. 2, plan 3, 5, 9.*

concentration in sector 5 as the result of a single not necessarily continuous occupation. Because of the large number of artefacts another option would be frequent visits whereby some sort of structure would limit artefact distribution (*ibid.*). There is however no reason to assume that the distinct concentration should not be the result of the specific taphonomic history of sector 5. There are no clear indications for the use of the site. If it is assumed sector 5 is a coherent cluster the presence of various tools and debitage elements refutes the use of special activity site. The presence of hazelnut shells indicates a use in the autumn and/or early winter (*ibid.* 197).

Concerning the Neolithic elements of Weelde-Paardsdrank, the palimpsest character of the site as well as the chronological ambiguity of certain tool types prevents the assessment of their degree of contemporaneity. The scarcity of artefacts of evolved Neolithic affinity possibly indicates their posterior intrusive character (Huyge/Vermeersch 1982, 195, 196). However, the regular occurrence of Late-Mesolithic sites with MK-artefacts could indicate coexistence and contact (*cf.* Verhart 2000, 230-232). The presence of a considerable amount of pottery with possible MK-affiliation (*cf. supra*) would substantiate the second option. At Weelde-Voorheide 3 a further 60 sherds were found (comprising three different tempers). The single plausible date available as well as the occurrence of LBK-like points however more convincingly point in the direction of contemporaneity and contact with LBK communities. A similar situation was attested at the Late Mesolithic site of Polderweg where a LBK point could stratigraphically be dated between 5500-5300 cal BC (Louwe Kooijmans 2001<sup>a</sup>, 460). Since there are no reliable parallels for the pottery, it does not contradict this option. There are no convincing arguments to reject an episodic development of the site.

#### *References:*

Huyge/Vermeersch 1982  
Gillespie *et al.* 1985  
Vermeersch 1990

## **56. Wijchen-Het Vormer**

#### *Location:*

Het Vormer was located on a Late Glacial dune southeast of Wijchen in the eastern part of the Dutch central river district. The dune, measuring some 20 ha (750 x 300 m), was located at the confluence of the Rhine and Meuse and was also part of a more extensive dune landscape to the east measuring some 70 ha (2000 x 350 m). During the Neolithic the dune protruded some 3 m above its surroundings. Due to its position the location of Het Vormer was open to contacts from many sides. The river district to the north was easy to cross and the site must have been a natural landing area for routes into the western delta (Louwe Kooijmans 1980, 118-120, 199).

#### *Site characteristics:*

The site was discovered in 1971 during sand digging activities. Under extreme difficult circumstances finds were documented at seven different sites. Apart from sherds dating to the Roman period, Iron Age, and Late Neolithic Bell Beaker

period, the main assemblage could be dated to the Middle Neolithic. Site seven contained a small flint assemblage in a shallow pit context and sites 5 and 6 harboured most of the Neolithic sherds. Furthermore a section was documented locating site 6 and 7 in stratigraphic context (Louwe Kooijmans 1980, 115-116).

#### *Geology/Pedology:*

The small dune of het Vormer was spared from wind-erosion due to its shallow height and, during its Neolithic occupation, was separated from the large dune complex of the 'Wijchense zandgronden' to the north by a small and shallow swamp. The Pleistocene dune sand is of a coarse nature, poor in loam and with a low water table compared to the surrounding riverine deposits. Nevertheless these soils may be classified as rather rich, due to the presences of some loam and occasional floodings. This prevented the development of a podzol-soil and led to the formation of a classic brown forest profile. During and after the Neolithic occupation sand became re-deposited on the slope through colluvial processes. These might have been triggered by the occupation of the site (Louwe Kooijmans 1980, 120-121).

#### *Taphonomy:*

Due to the acidic properties of the soil hardly any organic remains were preserved. Furthermore the site suffered from colluvial processes. According to the author (Louwe Kooijmans 1980, 121) this did not lead to serious displacement of artefacts. On the other hand the imprecise dating of the process of colluviation and the presence of sherds within colluviated sediments, although located in concentrations, indicates there might not have been an unambiguous *in situ* context. Furthermore the erosion and subsequent hiatus in sedimentation must have led to the destruction of information (both shallow features and finds) from the top of the dune.

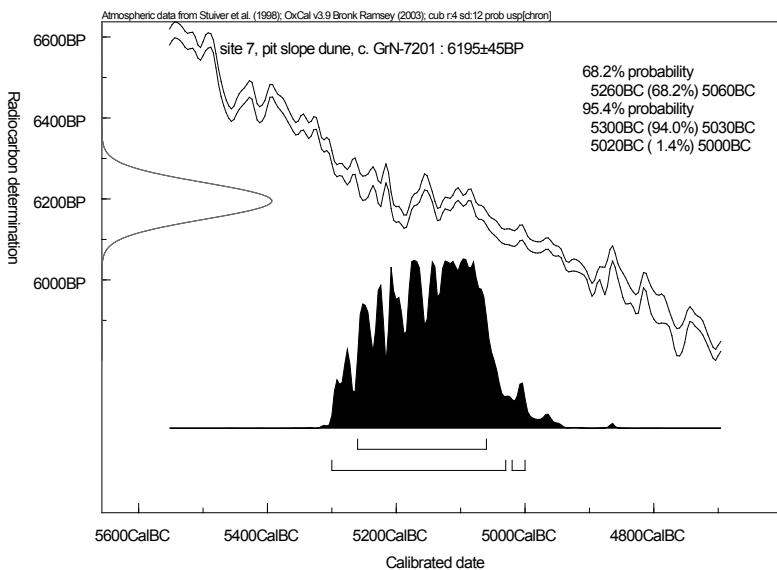
#### *Ecology:*

No specific ecological research could be conducted. The site however was situated at the boundary of two ecotones, the sandy uplands and the central river district. The rich riverine environment with an abundance of fish, fowl and wildlife contrasted with the poorer sandy uplands. Furthermore the rich soil on the dune itself as well as its substantial dimensions must have been ideal for agriculture (Louwe Kooijmans 1980, 124).

#### *Dating:*

The site yielded evidence in the form of sherds for occupation during the Middle Neolithic, Late Neolithic Bell Beaker period, Middle Bronze Age, Iron Age and Roman period. The main body of Neolithic sherds indicates a substantial period of occupation during the Hazendonk phase (Lanting/Van der Plicht 1999/2000; Raemaekers 1999). The find of 112 flint artefacts in a pit on site seven might predate the Middle Neolithic pottery, although its typological characteristics prevent a Mesolithic date. Charcoal from the feature on site 7 yielded the only  $^{14}\text{C}$  date for the site. This date evidently is too old for the Middle Neolithic occupation and can be rejected (*cf.* Lanting/Van der Plicht 1999/2000, 61). On the other hand, besides similarities, the apparent dissimilarities between the flint

Fig. 90 Radiocarbon date for Wijchen-Het Vormer.



of site 7 and the flint component of assemblages H and N might be indicative of a chronological difference. In this respect the  $^{14}\text{C}$  sample might not have been contaminated or be intrusive. In this light the flint assemblage of site 7 should then be dated to the Late Mesolithic or Early SWB culture (contra Lanting/Van der Plicht 1999/2000, 61).

#### Features/Spatial layout:

In total seven separate sites or locations were discovered at Het Vormer. Site 1 was located on top of the dune and consists of a pit ( $\varnothing$  1 m, 40-60 cm in depth still present) rich in charcoal with sherds dating to the end of the Middle Bronze Age. Site 2 consists of a grey clastic layer with charcoal on top of the dune yielding some Middle Neolithic sherds. Site 3 is also located on top of the dune and yielded a probable Bell Beaker sherd and a flint axe flake. Their association is questionable. Site 4, a pit rich in charcoal, also was located on top of the dune and yielded sherds dating to the Middle Bronze Age. Site 5 was a 12 m long elongated depression with a depth of 30 cm and filled with sand of red brown colouration, located on the upper part of the slope of the dune. The feature yielded many sherds, documented as assemblage H. Its anthropogenic nature is questionable although these features are more common on Middle Neolithic sites in this area (Louwe Kooijmans 1980, 130-131). Slightly to the NE and down slope of site 5, site 6 comprised a surface of 50 x 60 m. Most of the sherds were typologically identical to site 5 and were documented as assemblage N. Site 7 was located on the other slope of the dune. Within a prehistoric pit and the overlying layer 112 pieces of flint were recovered. On a slightly higher level 9 small sherds dating to the Middle Neolithic were found.

#### Finds:

The assemblages H (N=614 / 11082 g) and N (N=328 / 6709 g) are largely inter-comparable and are characterised by a common temper of broken white quartz with varying additions of chamotte and sand, H-joins, simple decoration of impressions and lines, roughly smeared walls of storage vessels and a wide

## Wijchen-het Vormer

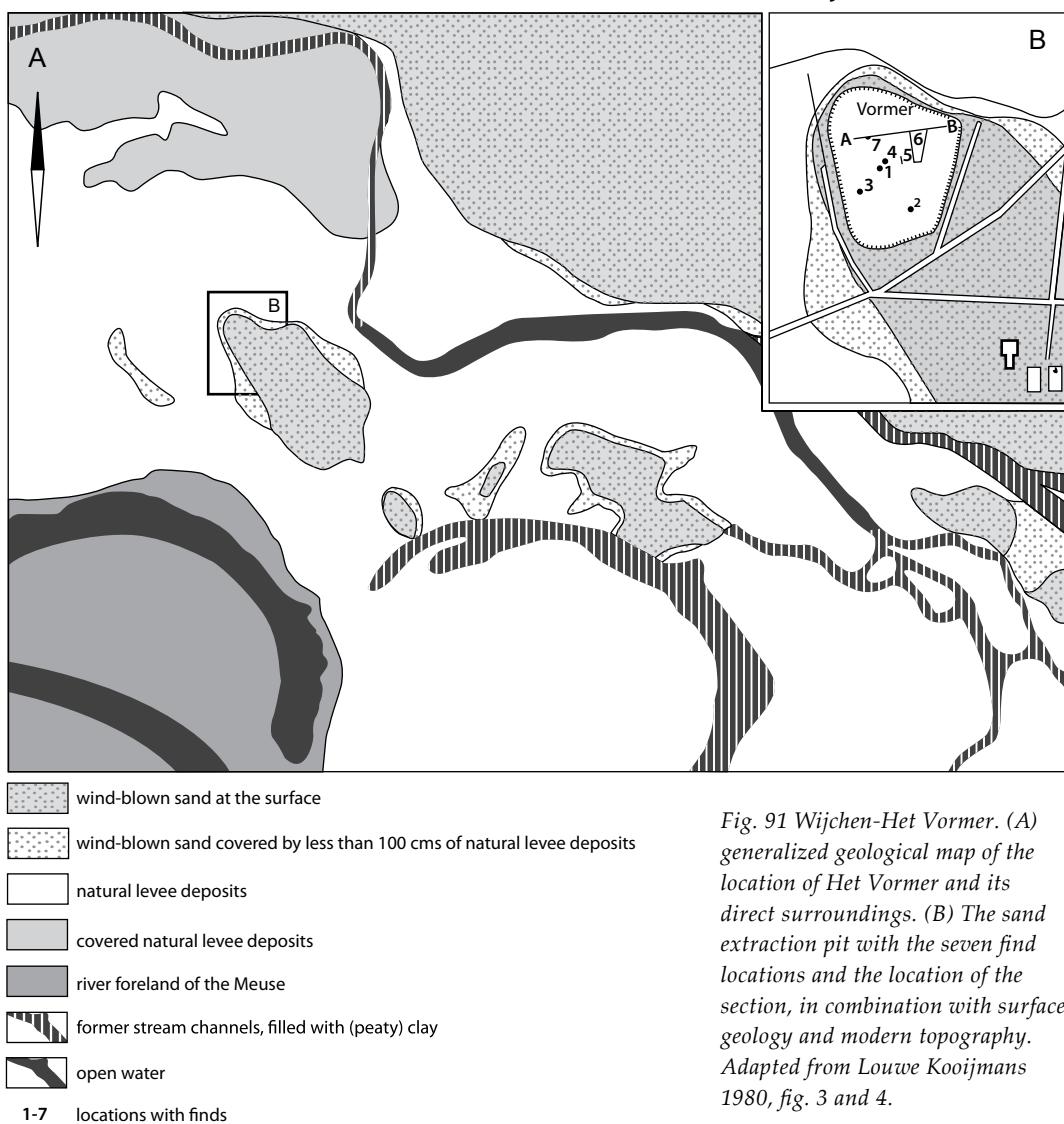


Fig. 91 Wijchen-Het Vormer. (A) generalized geological map of the location of Het Vormer and its direct surroundings. (B) The sand extraction pit with the seven find locations and the location of the section, in combination with surface geology and modern topography.  
Adapted from Louwe Kooijmans 1980, fig. 3 and 4.

variety in colour (Louwe Kooijmans 1980, 200). Morphologically the spectrum comprised dishes, some of which were carinated, beakers, barrel forms and others (*ibid.* 201). Currently the assemblage is typologically classified as belonging to the Hazendonk group (Louwe Kooijmans 1976; Louwe Kooijmans 1980; 2006<sup>b</sup>; Raemaekers 1999). There are nevertheless specific foreign elements within the assemblage (carinated bowls, thin-walled, burnished and dark pottery). They seem to indicate a certain influence from or contact with a specific north-western variant of the MK-culture (*cf.* Louwe Kooijmans 1980, 203). The strength of these contacts diminishes on Hazendonk 3 sites further west (Louwe Kooijmans 2007a). Other similarities, especially for the vessels with carinated profiles and pinpricks are found within the English Grimston and carinated bowls, the French Chasséen and German variants (Louwe Kooijmans 1980; Raemaekers 1999).

The flint associated with assemblages H and N consisted of a local industry with flaking technique on local river pebbles comprising some cores and flakes up to 4 cm as well as an import-group of blades, up to 9 cm, on Rijckholt-type flint. The second group is mainly associated with assemblage H. There is some admixture of Bell Beaker culture flint. Typologically the combined flint assemblage consisted of triangular arrowheads (N=2) retouched on both sides, retouched (pointed) blades (N=5), scrapers (N=3), other retouched pieces and fragments and flakes of polished flint axes (N=3). The 112 pieces of flint from site 7 may predate the Hazendonk 3 assemblage. They seem to be the material relicts of a knapping episode or small atelier, comprising flakes and 5 cores (cf. Louwe Kooijmans 1980, 169).

Furthermore several pieces of quartz and quartzite were found, some showing evidence for anthropogenic abrasion or hammering, as well as some burnt fragments of loam, probably functioning as weights (Louwe Kooijmans 1980, 169-171).

#### *Interpretation:*

Wijchen-Het Vormer mainly is of interest because of the specific typological aspects of the flint assemblage. These indicate both an attribution to the Hazendonk-3 groups as well as intensive contacts with the Northwest variant of the MK as well as contemporary Middle Neolithic groups. On a functional level the severe taphonomic disturbance hampers interpretation, yet the digging of pits, as well as the quantity and variety present in the pottery assemblage especially, indicate a basic domestic function for the location. Since agriculture may have been possible it is possible the site may have been of an agricultural and perhaps rather permanent nature.

#### *References:*

- Lanting/Van der Plicht 1999/2000
- Louwe Kooijmans 1976
- Louwe Kooijmans 1980
- Louwe Kooijmans 2006<sup>b</sup>
- Raemaekers 1999

## **57. Ypenburg**

#### *Location:*

The site was located on a relatively low dune in the coastal plain. The dune is currently situated several kilometres inland, on the terrain of a former airstrip outside the town of Rijswijk. The dune was elongated measuring *c.* 500 x 150 m (with an original length of approximately 750 m) (Koot *et al.* 2008, 453; Koot/Van der Have 2001, 16). On one side of the dune, which originally would have measured 1.5 to 2 m in height, there was evidence of a substantial tidal creek (Rijswijk-Zoetermeergeul) (Koot/Van der Have 2008, 44, 64, 66).

### *Site characteristics:*

The site was discovered in 1998 during a project of new housing development. The RAAP foundation used an augering and fieldwalking campaign after which preliminary investigations on the dune started. The chance discovery of several burials led to the extensive excavation of part of the dune, focusing on the burials. An area of some 40 x 20 m was excavated (*ibid.* 18). In 2000 another campaign started, focusing predominantly on the western part of the dune. Most of the material was collected by shovel, although troweling and sieving also took place (De Vries 204, 9). In 60 % of the dune was excavated.

### *Geology/Pedology:*

The dunebelt at Ypenburg is part of the oldest Holocene coastal barrier of the Netherlands and was formed around 4100 cal BC. From 4000 cal BC onwards the coastal transgression phase ended as the sea retreated again. Some 2 km to the west a new coastal barrier with dunes was formed. At approximately 3000 cal BC the current shoreline was reached. During occupation (3800-3200 cal BC) marine influence slowly decreased. Deposition by wind, however, continued. Stratigraphically the site consists of the dune body on top of which a refuse layer was formed during occupation. During this time some aeolian deposition of sand continued. During and after occupation of the site, the rising water table and the increasingly wet circumstances caused peat growth eventually covering the dune around 3000 cal BC (Koot/Van der Have 2001, 77). Initially two occupation layers, 10-20 cm thick and comprising finds and features could be discerned, later on more layers were found (De Vries 2004, 17). Eventually the western part of the dune could be subdivided in 14 different lithostratigraphical phases (A-N) and the eastern and middle part in 13 phases (1-13). The oldest and youngest phases are most interesting from an archaeological point of view and have been combined for the entire dune. They are labelled 3/C and 11/K. Layer 2/B is interpreted as a pioneer phase.

### *Taphonomy:*

The cover of peat to a great deal preserved the stratigraphical and spatial integrity of the site, apart from the preservation of organic remains. On the other hand however a substantial part of the dune, almost the entire eastern half stretching over some 250 m, was lost due to previous building activities (Koot/Van der Have 2001, 16). Another problem is formed by differential sedimentation of windblown sand crosscutting the existing stratigraphy. This leads to problems of association. For instance layer 3/C may have been covered up on several locations while occupation and enrichment of this layer continued elsewhere. Furthermore the excavation mainly focused on the actual body of the dune, therefore information from some of the slopes and direct surroundings was limited. Apart from this no information was available on the empty space between both burial concentrations, making it impossible to establish contemporaneity. Much of the bone material in the upper layers was lost due to the decreasing and oxidised peat cover. Furthermore many bones were severely fractured indicating a substantial amount of trampling (De Vries 2004, 13-15).

### *Ecology:*

Ypenburg was located in a dynamic coastal environment. During occupation direct marine influence decreased and the area ecologically became a predominantly freshwater environment (Koot/Van der Have 2001, 70; see also Van Beurden 2008<sup>a</sup>). The vegetation of the dune was composed of an open vegetation of shrubs and small groves with trees. The plant communities consisting of species such as paleyellow iris (*Iris pseudocorus*), common spike rush (*Eleocharis palustris*) and reed (*Phragmitae*) indicate a principally freshwater environment, although some salt influx may not be ruled out (*ibid.* 71). It is however remarkable that no salt marsh plants were found (Van Haaster 2001, 9). On top of the dryer high elements east of the dune trees such as hazel (*Corylus*), ash (*Fraxinus*), willow (*Salix*) and alder (*Alnus*) grew. Economically the site was in an ideal location. Marine resources in the west and internally diverse landscapes such as the peat swamp and the extensive salt marsh flat, which formed ideal grazing grounds, were located close by. Faunal remains point to an environment with a lot of water, shrubs, swamps and small forests on the dryer elements (De Vries 2004, 48).

### *Dating:*

In total eight <sup>14</sup>C dates were obtained on the skeletal material from the burial site. Four samples yielded dates that were far too young especially when accounting for the peak-values of the reservoir effect. The dates from these samples may be discarded on the basis of contamination of the collagen. The other four dates also suffer from the reservoir effect and might be more than a century younger (Lanting/Van der Plicht 1999/2000). They are presented below.

Furthermore six AMS and conventional <sup>14</sup>C dates were available on charcoal from either the habitation layers or archaeological features. These dates seem to be posterior to the graves, but since these might have been younger, both may have been partially contemporaneous. It is not clear whether GrA-9104, which originates from a stratigraphically lower and thus older layer, might be intrusive. The entire span of occupation is dated between 3860 and 3435 cal BC until 3200 cal BC (Bruning/Houkes 2008). The oldest phase 3/C lasted longer than the youngest phase 11/K, which lasted several decennia. The phases in-between all contained evidence of less intensive occupation. Phase 2/B is currently interpreted as a pioneer phase. The final publication (Bruning/Houkes 2008) yielded additional dates. On the basis of the pottery characteristics, which are of Haznedonk affinity, it is unlikely occupation started much earlier than 3800 cal BC (see Louwe Kooijmans 2009, 33).

### *Features/spatial layout:*

Several different phases of occupation could be discerned. The oldest phases were found in the western part of the dune. The middle part of the dune yielded more and younger phases. In the eastern part of the dune again two phases could be discerned. Not all of the occupation phases could be linked. In the oldest phase most of the features were located on the top, with some on the slopes of the dune, which by then was still rather small. In the subsequent occupation phases a larger area became available for settlement. The majority of the features now can be found on the landward southern side of the dune (De Vries 2004, 7). Furthermore both main phases of occupation, 3/C and 11/K were located respectively on the

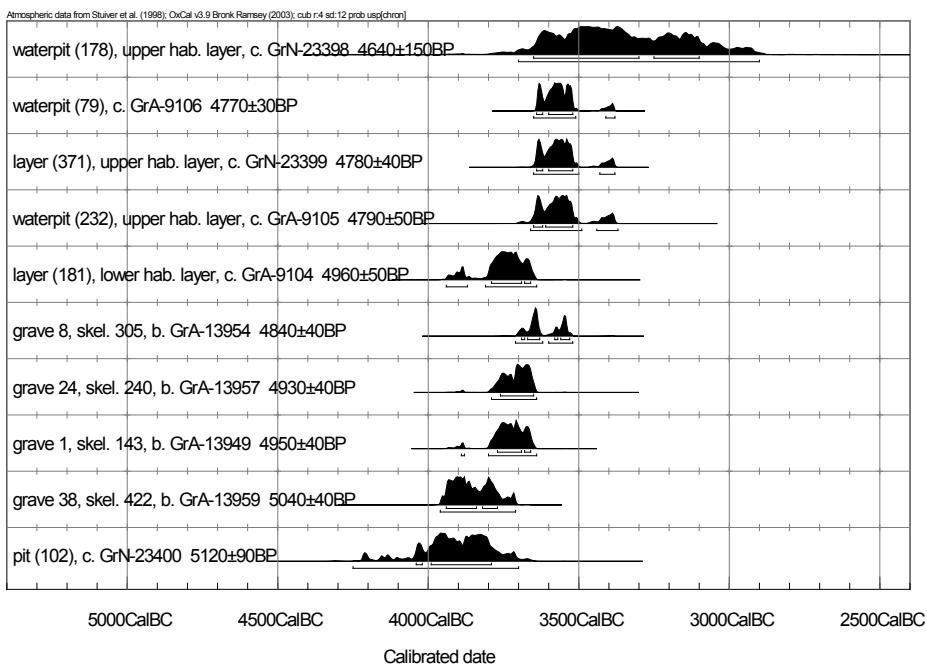


Fig. 92 Radiocarbon dates for Ypenburg.

western dune top and eastern slope, after which a shift, further west, took place during 11/K. Concerning the features a classic 'cloud' of postholes, pits and other features was documented comprising a total of 2300 features. A total of six to seven clusters of postholes were documented, three of these in phase 3/C, four in 11/K, roughly measuring 20 x 20 to 30 x 40 m. With inclusion of the associated features, such as water wells, activity areas with a diameter of 50-80 m could be defined. It is not known whether the clusters from one phase should be seen as representing contemporaneous households or the same household shifting over time, although the spacing between the different clusters argues in favour of the former option (see Houkes/Bruning 2008; Louwe Kooijmans 2006<sup>b</sup>; 2009). Concerning the posthole features a further subdivision could be made in phases 3/C, 3/C-5, 3/C-11/K and 11/K. Features belonging to clusters 1, 2 and 3 can be attributed to phase 3/C, cluster 4 to phase-range 3/C-11/K, cluster 5 to phase-range 3/C-5 and cluster 6 to phase 11/K (Houkes/Bruning 2008).

Within the clusters four separate houseplans of different structure could be defined. House 1 is dated within the oldest phase, has rounded short sides and measures 9.80 x 4.50 m. House 2 is located on the eastern part of the dune and also dates to the oldest phase. It measures 8.90 x 4 m and is two-aisled. House 3 is located on the top of the dune and through the absence of helpful stratigraphy cannot be attributed to a single phase. It is two-aisled, rectangular and measures 8.10 x 3.70 m. It may possibly be associated with the western part of the cemetery. House four is only partially represented and can be dated to phase 11/K. It is located on the western part of the dune, is 4 m in width and of rectangular shape. In the final report (Enderman 2008), only three house plans are identified. Furthermore several small structures have been discerned (Koot 2005, 274; Koot/Van der Have 2001, 136), some of which may be interpreted as granaries. Most impressive was the find of a small cemetery on top of the middle part of the dune. In an area of approximately 40 x 20 m, 31 graves comprising the remains of 42 individuals could be documented (Koot/Van der Have 2001,

24). The graves were grouped in two clusters, 5-10 m apart. One of the clusters postdates phase 3/C at that location. It is evident several graves were disturbed by later activities on top of the dune.

#### *Finds:*

Most spectacular was the find of 31 graves, comprising the remains of 42 individuals.

Most of the adult men and women died between the ages of 35-44 (only two became older). Many of the children died before they reached the age of 10 years (Baetsen 2008, 137). One foetus was present. Most of the skeletons showed signs of stress, indicating heavy labour. Remarkable is the diversity in burial traditions. Seven graves comprised more than one individual amongst which one grave containing three individuals and one grave containing five. Two individuals were buried in extended position. Five individuals were buried on their backs with a slight contraction of the legs, but most were in strong contracted position laying on either their right or left side. Only a few burial gifts (N=14) were found (ten amber beads, three jet beads and a small bone ring) (Koot 2005, 275; Koot/Van der Have 2001, 26). The evidence from the burials indicates re-opening of the graves, second and third internments and handling of the bones. Furthermore there is some loose bone material especially on the western part of the dune (trenches 8, 11, 13, 14), amongst these are some milk teeth indicative of the presence of young children on the site (De Vries 2004, 27; 2008).

In total 16,000 faunal remains (30 kg) were counted and analysed. Some 79% of these bones (mostly bird bones) could not be attributed to specific species. Many bones originated in trenches 2 (the cemetery) and 25. Some 3% of the studied remains was burnt (De Vries 2004, 9-12). The faunal remains (documented for occupation layer 2) comprised domesticated cattle (*Bos taurus*) (N=139) ovicaprids (N=1) and both domesticated and wild pigs (*Sus domesticus/scrofa*). Of the latter category 26 of 110 bones could be identified. Eight belonged to domesticated pig and 18 to wild boar. Furthermore 156 bones of dog (*Canis familiaris*) could be identified. The wild fauna was dominated by bones of red deer (*Cervus elaphus*) (N=51). Other species comprised otter (*Lutra lutra*), wild cat (*Felis silvestris*), fox (*Vulpes vulpes*) and sea mammals such as bottlenose dolphin (*Tursiops truncatus*) and seal (*Phoca vitulina*) (De Vries 2004, 19-27). Of the bird remains the Anatidae (swans, geese and ducks) form the largest group. Furthermore bones of some 15 white-tailed eagles (*Haliaetus albicilla*) and a relatively large number of bones of common crane (*Grus grus*) amongst other species, were found. Seafish comprise the largest element of the fish assemblage followed by anadromous species such as the sturgeon (*Acipenser sturio*). Freshwaterfish such as eel (*Anguilla anguilla*) and pike (*Esox lucius*) were also found (De Vries 2004, 28-40). Remarkably very few bone or antler tools were found (one half-finished pendant of wild boar tooth and two semi-finished antler axes (De Vries 2004, 51).

Most of the botanical remains (N=400) were sampled from hearths and water wells, but most were not very suitable for macrobotanical analysis. Both grains of emmer and naked barley were found on the site, although no chaff remains were found (Van Haaster 2001, 8; see also Van Beurden 2008<sup>b</sup>). Agricultural fields may have been located on a nearby levee or on the dune itself (Van Beurden 2008<sup>a,b</sup>; Kooistra 2008) and no information on the presence of agricultural fields could be obtained. Furthermore botanical remains of blue elderberry (*Sambucus nigra*),

blackthorn (*Prunus spinosa*), blackberry (*Rubus L.*), raspberry (*Rubus idaeus*), hazelnut (*Corylus avellana*), crab apple (*Malus sylvestris*) and wild pear (*Pyrus communis*) as well as ruderals indicative of settlements and human activity such as stinging nettle (*Urtica dioica*) and lambsquarters (*Chenopodium album*) (Van Beurden 2008<sup>a,b</sup>; Van Haaster 2001; Kooistra/Hänninen; Koot/Van der Have 2001, 101-106).

The flint assemblage shows a classic pattern for this period consisting of a local component of rolled or terrace flint (the exact provenience of which is unknown) combined with an import component of predominantly Rijckholt-type flint. The tool assemblage consisted of points, scrapers, burins, strike-a-lights and fragments of polished axes. Furthermore a few sickle-blades containing red ochre were found. Use-wear analyses indicated activities of wood, plant and hide-working. Several pieces of grinding or polishing stones of sandstone, quartz and granite were also present on the site (*ibid.* 106-113). Remarkable is the find of a Late Mesolithic *feuille de gui* which was probably re-used.

The natural stone assemblage consisted mainly of quartzes, quartzites, sandstone and granite and comprised grinding stones, polishing stones etc., but remarkably no (remains of) stone axes. This is similar to Schipluiden. Some of

Ngraves	Nindividuals	Ncomplete	Nmale	Nfemale	Nadult ≥20	Nsubadult <20	Nmultiple graves
31	42	25	8	10	22	20	7

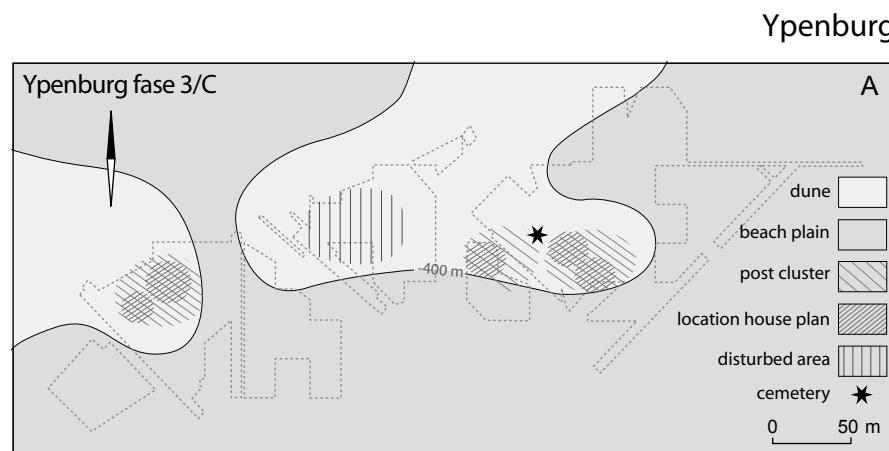


Table 14 Number of graves, individuals and age at Ypenburg.



Fig. 93 Ypenburg. (A) schematic plan of the excavation trenches and palaeogeography in phase 3/C. (B) schematic plan of the excavation trenches and palaeogeography in phase 11/K. Adapted from Louwe Kooijmans 2009, fig. 7, based on Koot et al. (eds) 2008 and Bruning/Houkes 2009, fig. 3.5 and 3.7.

the stones were clustered near the houses. Furthermore 43 pieces of jet and amber were found. The origins of the stones could be traced to the terraces of the Rhine and Meuse as well as Limburg, the Ardennes and the northern ice-pushed ridges.

The pottery assemblage consists mainly of undecorated ware. Most of the sherds point to a predominance of large vessels. Most of the decorated sherds were found in the upper layer in the eastern part of the dune. The decorated sherds (which might be somewhat later than the rest of the assemblage) indicate a cultural attribution to the Hazendonk group (*ibid.* 116-121).

#### *Interpretation:*

Ypenburg may archaeologically be considered a very rich site. Despite limited spatial information there is a profuse quantity of data deriving mainly from the organic categories of material. The faunal assemblage indicates a rather broad spectrum with a focus on domestic cattle, yet also with a predominance of bird remains (65%). Furthermore there is evidence for extensive fishing (De Vries 2004, 58; 2008). Combined with the botanical evidence (*cf.* Van Haaster 2001, 8), there is thus an emphasis on wild resources. This however does not indicate a high level of mobility. On the contrary the presence of men, women and children of varying age on the site, combined with the presence of a substantial cemetery and evidence for house plans, in possibly two contemporaneous house-sites, indicates a rather permanent settlement. Although hampered by a palimpsest-effect, this image is reflected in the data on seasonality. Permanence is reflected in the presence of juvenile animals (such as cattle and dogs). Specific summer indicators are found within the fish assemblage, while several species of birds point to winter activity (Koot/Van der Have 2001, 136; De Vries 2004, 43). Furthermore there is some, though no elaborate, evidence for agriculture in the form of sickle-blades, cereals and chaff and grinding stones. If we may consider the focus of subsistence and habitation to have remained permanent during the entire span of occupation, than it is very likely Ypenburg, apart from the hiatuses without substantial occupation, was the home of a sedentary community (see also Louwe Kooijmans 2008; 2009)

#### *References:*

- Baetsen 2008
- De Vries 2004
- De Vries 2008
- Enderman 2008
- Houkes/Bruning 2008
- Kooistra 2008
- Kooistra/Hänninen 2008
- Koot 2005
- Koot/Van der Have 2001
- Lanting/Van der Plicht 1999/2000
- Louwe Kooijmans of 2006<sup>b</sup>
- Louwe Kooijmans 2008
- Louwe Kooijmans 2009
- Van Beurden 2008<sup>a,b</sup>
- Van Haaster 2001

## 58. Zandwerven

### *Location:*

The site is located on the south-eastern end of the approximately 2 km long, NNW-SSE oriented sand ridge of Zandwerven, east of the settlement of Obdam (West-Friesland). Currently it is accepted that the ridge is not a beach barrier, but consists of reworked sand related to the Bergen tidal inlet. The site was located in a heterogeneous environment consisting of the ridge itself, an inversed landscape of palaeochannels and an area of former salt marsh (Van Iterson Scholten 1988, 237; Van Regteren Altena *et al.* 1962/1963, 8-11).

### *Site characteristics:*

The site was discovered in 1927. A test excavation (measuring approximately 11 x 3 m (30 m<sup>2</sup>)) by Van Giffen (BAI) in 1929 uncovered the first Neolithic settlement traces in the western part of the Netherlands. Van Giffen also exposed a profile in a nearby sand quarry. In 1957-1958 a new trench was dug by the IPP 50 m further south. An area of approximately 800 m<sup>2</sup> was excavated in 4 x 4 m trenches. Several profiles wererecorded, <sup>14</sup>C analysis took place as well as geological investigations and faunal analysis (Van Iterson Scholten 1988; Van Regteren Altena/Bakker 1961; Van Regteren Altena *et al.* 1962/1962).

### *Geology/Pedology:*

Apart from the ridge itself three areas of slightly different geological structure could be discerned. The subsurface of the ridge consists of a sandy complex with shells and clay lenses on top of which a shell bank and thin clay layer form a *t.p.q.* for the occupation. The deposit was formed in a sandy tidal flat area during the Early Subboreal. It is however most likely that the shells were part of Late Neolithic midden instead of belonging to the local geology (Van Iterson Scholten 1988, 242). On top of this there was a ridge of coarse sand (mostly wind- deposited) of approximately 1 m thick. The ridge consisted of humic layers (indicative of vegetation and thus interruption of wind-deposition) separated by layers of blown sand. The humic layers occasionally contained occupation remains enabling the division in a stratigraphic sequence for the campaign of 1929. Layer I contained a mussel midden in which comprising sherds, flint waste and a hammer stone. Together with layer II, both strata probably belonged to the Vlaardingen group, although a PFB(SGC)-sherd was found in layer II. The PFB(SGC)-culture was represented in layer III (Van Regteren Altena *et al.* 1962/1963, 9). Layer IV contained a charcoal patch without artefacts. During the 1957-1958 campaign only one occupation layer of 15 cm thickness was found containing both VL and PFB(SGC)-elements. On the other hand three uncovered refuse deposits (2 pits), contemporaneous with the lower part of the occupation layer, could be entirely attributed to the VL-group indicating an occupation phase without PFB(SGC)- admixture (*ibid.* 10). East of the sand ridge there is a succession of Subboreal sediment and peat layers on top of tidal flat sediments. South and west of the ridge the landscape consisted of a former salt marsh with creeks and natural levees. This salt marsh was part of a larger tidal flat area to the west, but might only have

dried up after occupation. North of the sand ridge one of two large W-E inversion ridges with their branches is located. However no Neolithic finds were found here (*ibid.* 11). For the geological and ecological history see the section ecology.

#### *Taphonomy:*

Unfortunately the site suffered from the merging of separate find layers, preventing a full internal stratification. This does not shed more light on the presence of PFB(SGC)-elements within VL-layers. No internal stratification was possible during the second campaign (1957-1958). Furthermore part of the site was destroyed by sand-digging and agricultural activities (Van Regteren-Altena *et al.* 1962-1963, 10).

#### *Ecology:*

The area prior to occupation consisted of tidal flat deposits of Atlantic and Subboreal age. On top of these (Beemster) clay was deposited in a salt marsh environment, bordering the tidal flats. Following this sand blown in from the west was held by the vegetation in the salt marsh and led to the formation of the sand ridge. Peat formation started on the (Beemster) clay and subsequently (Wieringermeer) clay was deposited in the lee of the ridge. During occupation the area east of the ridge probably was a brackish, reedy marsh area broken up by small creeks. This area would have made for excellent grazing land. Southeast of the ridge formation of *Phragmites* peat continued on top of the clay. West of the sand ridge a tidal flat area existed in the area of the former salt marsh. Adjacent to these and south of the ridge salt marshes were located, giving way to peat in the east. Salt marshes may also have existed north and west of the ridge. In time peat encroached upon the ridge eventually leaving no room for settlement, although the first West-Frisian transgression phase might have also led to this (Van Regteren Altena *et al.* 1962/1963, 11-12).

#### *Dating:*

Apart from many geological dates, only one archaeological sample of charcoal originating from a VL-pit was dated (Lanting/Van der Plicht 1999/2000, 70). The Vlaardingen pottery dates to V-1 (or VL-1c according to Lanting and Van der Plicht 1999/2000, 24) on the basis of the temper in the pottery and the holes underneath the rim. According to Louwe Kooijmans (1976) Zandwerven dated to VL-2b (Lanting and Van der Plicht (1999/2000, 34) disagree, on the basis of the pottery characteristics). The <sup>14</sup>C date differs from the date published by Clason (1967, 12), 3990±65 BP.

#### *Features/Spatial layout:*

Layer I (1929 excavation) contained a mussel-midden with artefacts, probably dating to the VL group. In the 1957-1958 campaign no separate Vlaardingen layers were found, but three features (including two pits) could be attributed to the VL group on the basis of their contents. In 1958 a concentration of postholes was found, which however did not yield a house plan. East of the postholes plough marks of an ard covered a surface of approximately 100 m<sup>2</sup>. Most furrows were WNW-ESE aligned, yet two different diagonal alignments were also documented (Van Regteren Altena *et al.* 1962/1963, 12). Finally layer IV (1929 excavation)

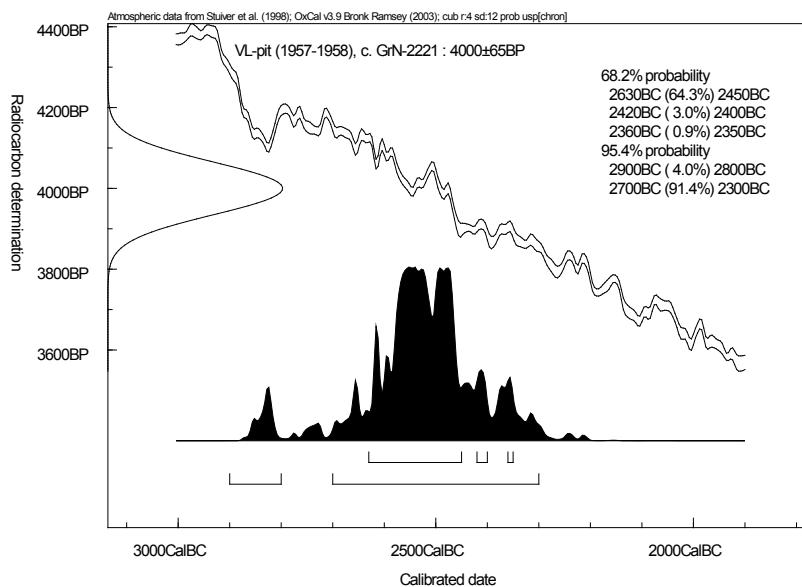


Fig. 94 Radiocarbon dates for Zandwerven.

contained a charcoal patch, probably a hearth, without any artefacts (Van Regteren Altena/Bakker 1961, 34). According to Van Regteren Altena and Bakker (1961, 38) the ard marks should be attributed to the PFB(SGC)-culture, although there are no convincing arguments why they should not date to the Vlaardingen occupation.

#### Finds:

The thick-walled pottery is mostly stone-tempered and well-fired. The surface is slightly burnished. Pots are mostly flat-bottomed and with everted rim. Some sherds had a row of perforations under the rim, or conical perforations bored after firing. Furthermore a fragment of a solid-handled spoon and three fragments of discs (soft pottery, straw-tempered) were found. Furthermore sherds belonging to some 20 PFB(SGC)-beakers were found as well as rims and fragments of thick-walled pottery.

Flint material comprises many waste flakes, a large number of (short) scrapers and fragments of polished flint axes. The flint is most likely of northern origin. Transverse arrowheads are absent. Other stone material comprises hammering stones, a fragment of a polishing stone and an atypical battle axe belonging to the PFB(SGC)-culture. Furthermore one bone chisel made from the radius of cattle was found (Van Regteren Altena/Bakker 1961; Van Regteren Altena *et al.* 1962/1963).

The faunal assemblage was recovered from the lower layers of two pits containing no PFB(SGC)-material. Some hundreds were found in a pit ( $\varnothing$  1.5 m and 0.5 m deep) containing layers of mussels (*Mytilus edulis*) divided by a clayey band. The bones were found among the shells. The assemblage comprised 44 bones of cattle (*Bos taurus*) followed by sheep or goat (*Ovis aries/Capra hircus*) (N=2), pig (*Sus domesticus*) (N=1) and Harbour porpoise (*Phocoena phocoena*). The bird spectrum was dominated by mallard (*Anas platyrhynchos*) (N=11) and single bones of Greylag goose (*Anser anser*), goose (*Branta*) and Whitetailed eagle (*Haliaeetus albicilla*) (Clason 1967, vol XIIIB, table 5). Furthermore remains of sturgeon were found (Van Regteren Altena/Bakker 1961, 37). Apart from this the

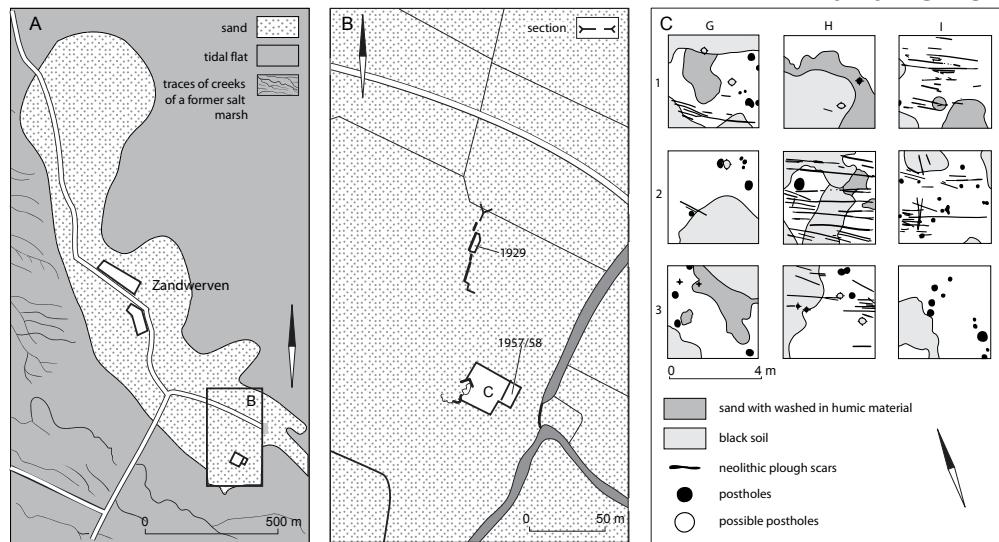


Fig. 95 Zandwerven. (A) geomorphological map of the site location. (B) location of the 1929 excavation trenches and section and the 1957-1958 excavation trenches. (C) 4 x 4 m trenches in the area containing plough marks.

Adapted from Van Regteren Altena et al. 1962/1963, fig. 2 and Van Iterson Scholten, 1988, fig. 2.

site yielded kernels of emmer (*Triticum dicoccum*) and naked barley (*Hordeum vulgare*) (Van Zeist 1968). Remarkable is also a large number of seeds of Halberd-leaved Wild Orach (*Atriplex hastata-/patula*). It is probable leaves and seeds of this species, which resembles spinach, were consumed in the past. This is for example evidenced by finds from the Ertebølle culture (Kubiak-Martens 1999).

#### Interpretation:

Zandwerven is of importance since it was the first Neolithic settlement in the coastal area, forming the base for what later would be known as the VL group. Important is especially the stratigraphy indicating there was a chronological difference between the VL group and the PFB(SGC)-culture. The presence of PFB(SGC)-elements in layer II prevented an absolute separation but the 'clean' VI pits discovered in the 1957-1958 campaign formed a further argument for a VL phase. The site was located in a diverse environment as is witnesses in both marine and terrestrial resources in the faunal assemblage. Domestic animals already formed the largest part of this assemblage. There is no positive evidence for an absolute cultural attribution of the ard marks yet the absence of other, later artefacts indicates they will probably have belonged to the PFB(SGC)-culture. An attribution to the VL-group is however not unlikely either.

#### References:

- Clason 1967
- Lanting/Van der Plicht 1999/2000
- Louwe Kooijmans 1976
- Van Iterson Scholten 1988
- Van Regteren Altena/Bakker 1961
- Van Regteren Altena et al. 1962/1963
- Van Zeist 1968



## Additional sites:

59.	AHR-32-Rijswijk-Schaapweg	103.	Nagele-J112
60.	AHR-42-Sion	104.	Nagele-J125
61.	Alblasserdam-Plan Nieuw Kinderdijk	105.	Namur-Grognon
62.	Albrandswaard-Rhoon Essendael	106.	Nieuw-Schoonebeek
63.	Albrandswaard-Rhoon Koedood	107.	Nijlen-Varenheuvel
64.	Albrandswaard-Rhoon Portland	108.	Noordoostpolder
65.	Almere-Poort	109.	Osterwick-Höve
66.	Antwerpen-Lombardenstraat	110.	Posterholt-Vinke-HVR 39
67.	Barendrecht-Gaatkensplas	111.	Remouchamps-Station LeDuc
68.	Barendrecht-Zuidpolder	112.	Rijswijk-A4
69.	Barendrecht-Hordijk West	113.	Rommertsdonk
70.	Barendrecht-Vrijenburg	114.	Rotterdam-Bergse Bos
71.	Barendrecht-Zuidpolder (20-58)	115.	Rotterdam-Beverwaard (13-17)
72.	Bazel-Sluis	116.	Rotterdam-Beverwaard-Tramremise (13-83)
73.	Beuningen-Ooigraaf-het Woerdje	117.	Rotterdam-De Donk I (14-08)
74.	Bracht 8-West	118.	Rotterdam-De Donk II (14-09)
75.	Brecht-Moordenaarsven 1	119.	Rotterdam-Van Ghentkazerne
76.	Brecht-Moordenaarsven 3	120.	Rotterdam-Groenhagen-Tuinenhoven
77.	Brecht-Overbroek I/II/III	121.	Rotterdam-'t Hart
78.	Brecht-Thomas Heyveld	122.	Rotterdam-Hordijkerveld (13-69)
79.	Buinerveen/Donkerbroek/Westerbork	123.	Rotterdam-Hordijkerveld (13-85)
80.	Coesfeld-Harle	124.	Rotterdam-Kievitsdonk (14-22)
81.	Den Haag-Wateringse Binnentuinen	125.	Rotterdam-Randstad rail-Centraal station (05-42)
82.	Denekamp-Klokkenberg	126.	Schiedam
83.	Dodewaard-Peyenkampse veldweg	127.	Schokkerhaven-E170/171
84.	Donkenproject	128.	Soest-Burgtheaterparkplatz
85.	Ede-Rietkamp (forgery)	129.	Staphorst-Olde-Meppelerdiep
86.	Emmeloord-J97	130.	Swifterbant-S4
87.	Ename-Stuw	131.	Swifterbant-S31/32/33
88.	Gieten-Gietsenveentje	132.	Swifterbant S41
89.	Gouda-Westergouwe-Deelgebied 3	133.	Swifterbant S42/43
90.	Havelte-De Doeze	134.	Swifterbant-S51
91.	Hazerswoude-Rijndijk-Spookverlaat	135.	Swifterbant-S61
92.	Heemse-Hardenberg	136.	Swifterbant-S71
93.	Hekelingen II	137.	Swifterbant-S81/82/83/84
94.	Hellevoetsluis-Ossenhoek	138.	Swifterbant-Dronten-Bisonweg
95.	Hoornaar-Lage Giessen	139.	's-Hertogenbosch-Maaspoort
96.	Hulst-Nieuw-Namen	140.	Tilburg-Kraaiven
97.	J97-Schokland	141.	81 Toterfout-Halve Mijl
98.	Leidschendam-Frekeweg	142.	Tietjerk-Lytse Geast I
99.	Linne-Mortelhof-HVR 16	143.	Turnhout-Zwarte Heide
100.	Linderbeek-1944	144.	Veen-Kaninenberg
101.	Menstede-Coldinne		
102.	Meppel-de Gaste		

145. Veldhoven-Habraken	153. Wijgaarden-De Wingerdse Donk
146. Ven-Zelderheide	154. Willemstad-Volkerak
147. Voorschoten-De Donk	155. Winsum-Wetsingermaar
148. Wateringse Veld	156. Winterswijk
149. Weelde-Voorheide 3	157. Ypenburg-Gavikavel
150. Well-Aijen	158. Zoelen-Buren
151. Westbroek-Velzerbroekpolder	159. Zwijndrecht-Vlaamse Hoofd
152. Wieringermeer-Dijkgatsweide	



Fig. 96 Map depicting the location of the additional sites and the research area of the 'donken project' (34).

AHR-32-Rijswijk-Schaapweg	28	Posterholt-Vinke-HVR	39	71
AHR-42-Sion	31	Remouchamps-Station LeDuc	74	74
Alblasserdam-Plan Nieuw Kinderdijk	41	Rijswijk-A4	28	28
Albrandswaard-Rhoon Essendael	39	Rommertsdonk	43	43
Albrandswaard-Rhoon Koedood	39	Rotterdam-Bergse Bos	35	35
Albrandswaard-Rhoon Portland	39	Rotterdam-Beverwaard (13-17)	35	35
Almere-Poort	24	Rotterdam-Beverwaard-Tramremise (13-83)	35	35
Antwerpen-Lombardenstraat	62	Rotterdam-De Donk I (14-08)	35	35
Barendrecht-Gaatkensplas	40	Rotterdam-De Donk II (14-09)	35	35
Barendrecht-Zuidpolder	40	Rotterdam-Van Ghentkazerne	35	35
Barendrecht-Hordijk West	40	Rotterdam-Groenhagen-Tuinenvennen	35	35
Barendrecht-Vrijenburg	40	Rotterdam-’t Hart	35	35
Barendrecht-Zuidpolder (20-58)	40	Rotterdam-Hordijkerveld (13-69)	35	35
Bazel-Sluis	60	Rotterdam-Hordijkerveld (13-85)	35	35
Beuningen-Ooigraaf-het Woerdje	51	Rotterdam-Kievitsdonk (14-22)	35	35
Bracht 8-West	69	Rotterdam-RandstadRail-Centraal station (05-42)	35	35
Brecht-Moordenaarsven 1	64	Schiedam	36	36
Brecht-Moordenaarsven 3	64	Schokkerhaven-E170/171	15	15
Brecht-Overbroek I/II/III	64	Soest-Burgtheaterparkplatz	58	58
Brecht-Thomas Heyveld	64	Staphorst-Old-Meppelerdiep	18	18
Buinerveen/Donkerbroek/Westerbork	7/4/5	Swifterbant-S4	16	16
Coesfeld-Harle	57	Swifterbant-S31/32/33	16	16
Den Haag-Wateringse Binnentuinen	30	Swifterbant S41	16	16
Denekamp-Klokkenberg	22	Swifterbant S42/43	16	16
Dodewaard-Peyenkampse veldweg	50	Swifterbant-S51	16	16
Donkenproject	34	Swifterbant-S61	16	16
Ede-Rietkamp (forgery)	49	Swifterbant-S71	16	16
Emmeloord-J97	11	Swifterbant-S81/82/83/84	16	16
Ename-Stuw	72	Swifterbant-Dronten-Bisonweg	17	17
Gieten-Gietseveentje	6	’s-Hertogenbosch-Maaspoort	47	47
Gouda-Westergouwe-Deelgebied 3	33	Tilburg-Kraaiven	46	46
Havelte-De Doeze	9	Toterfout-Halve Mijl	67	67
Hazerswoude-Rijndijk-Spookverlaat	29	Tietjerk-Lytse Geast I	3	3
Heemse-Hardenberg	20	Turnhout-Zwarde Heide	66	66
Hekelingen II	38	Veen-Kaninenberg	54	54
Hellevoetsluis-Ossenhoek	37	Veldhoven-Habranken	68	68
Hoornaar-Lage Giessen	44	Ven-Zelderheide	52	52
Hulst-Nieuw-Namen	59	Voorschoten-De Donk	25	25
J97-Schokland	14	Wateringse Veld	32	32
Leidschendam-Frekeweg	26	Weelde-Voorheide 3	65	65
Linne-Mortelshof-HVR 16	70	Well-Aijen	53	53
Linderbeek-1944	21	Westbroek-Velzerbroekpolder	23	23
Menstede-Coldinne	1	Wieringermeer-Dijkgatseweide	8	8
Meppel-de Gaste	12	Wijgaarden-De Wingerdse Donk	42	42
Nagele-J112	13	Willemstad-Volkerak	45	45
Nagele-J125	13	Winsum-Wetsingermaar	2	2
Namur-Grognon	73	Winterswijk	55	55
Nieuw-Schoonebeek	19	Ypenburg-Gavikavel	27	27
Nijlen-Varenheuvel	63	Zoelen-Buren	48	48
Noordoostpolder	10	Zwijndrecht-Vlaamse Hoofd	61	61
Osterwick-Höve	56			

## 59. AHR-32-Rijswijk-Schaapweg

### *Site location:*

The site (80.375/450.693) is located on an old coastal dune near Rijswijk in the western part of the Dutch delta, north of the Meuse estuary. The site was excavated by the archaeological service of the municipality of Rijswijk in June 2001.

### *Site description:*

The site was originally situated on a low beach barrier formation. The archaeological layer was found on the lower part of the slope. It is not known to what extent the top was used due to post-depositional processes. The site measures *c.* 100 m in length and of these 10 m was documented by mechanical removal and sieving of the layer with finds. The finds originate from an area of *c.* 6 x 10 m in a find layer which becomes increasingly peaty, on the lower part of the slope of the dune.

The occupation layer was documented in two spits and partially sieved over 4 mm or 1 mm. The site yielded no features, but this could be related to the limited extent of the trench and its location (in the tossing zone?). Pottery, flint and bone was found in different contexts, but analysed as a singular complex. In total 38 sherds were found, including 4 rims, 2 rim-neck fragments, a neck fragment, 26 belly sherds, 3 fragments of bottoms and two fragments of clay disks, probably baking plates. Two of the bottoms are flat, one is with foot. One sherd was decorated on the neck with a row of spatula impression. Most of the pottery was tempered with grit, although organic material and chamotte also occur, also in combination. The pottery was coil-built and includes N- and Z-joints. The pottery may typologically and technologically be attributed to the Vlaardingen culture. The protruding foot may point to a later date within the Vlaardingen culture.

The lithic assemblage (N=50) comprised five scrapers, two flakes, a retouched blade and four flakes of polished axes. Some of the flakes seem to be of lightgrey Belgian type flint. One of the scrapers, was made on a fragment of a polished axe, presumably of Rijckholt flint. Some of the pieces were identified as rolled flint, others had a fresh cortex. Use-wear analysis points to hide-working. The botanical sample included chaff remains of emmer (*Triticum dicoccum*) and possibly einkorn (*Triticum monococcum*), although the latter might also be emmer because of metrical convergence. A stone of blackberry (*Rubus fruticosus*) was also found as well as ruderal plants such as goosefoot (*Chenopodium album*). The ecological data suggest that an open oak- dominated forest grew on the beach barrier and more humid patches were located close by. Agricultural fields may have been located on the barrier.

The faunal remains (N=249) yielded mostly fragments and predominantly included cattle (including butchering marks), sheep or goat (including butchering marks), pig (consumption waste) and unidentifiable mammals of various sizes. Furthermore bones of birds (N=2), including seagull and duck, and fish (N=13), including sturgeon and salmon, were found. No distinct faunal remains of wild mammals were found, although this may be attributed to the small sample. Secondary evidence points to the presence of dogs. Bird remains point to gull and duck and sturgeon (*Acipenser sturio*) was found within the sample of fish remains. The animals were butchered and consumed on the site. No remains of wild species

were found, however this could be a problem of the limited sample. The site did not yield features, charcoal or carbonized botanical macroremains, although this may relate to the small sample or the fact that the excavated area may have been a dumpzone, related to the main settlement area.

#### *References:*

Raemaekers *et al.* 2002  
Rieffe *et al.* 2006

### **60. AHR-42-Sion**

#### *Site location:*

AHR-42 was found on a low dune in the vicinity of the site of Schipluiden (400 m to the southwest) in the intra-coastal plain in the western part of the Dutch delta.

#### *Site description:*

In total 345 m<sup>2</sup> was documented within a narrow strip with a width of 6 m, including both the slope and top of the dune. Most of the find layer was mechanically excavated. Part of the dune was covered with peat. The top yielded nine features (posts and postholes) as well as a concentration of pottery (S47). The posts may have been part of a fence since the posts/stakes were regularly spaced at 2-3m intervals. Part of the top was eroded. The slope yielded seven posts. The pottery found consisted of 67 sherds and some of it was found within the postholes. Only two sherds were decorated (with a bone tool as well as fingertip or nail impressions). H- and N-joints were documented and the grit mostly comprised a combination of quartz and chamotte, although granite was also found. Most of the sherds can be attributed to the Hazendonk group (as at Schipluiden), although one possibly older sherd was found. The site was furthermore dated by a radiocarbon date on a stone of sloe (*Prunus spinosa*), yielding a date between 3640 and 3380 cal BC (2 sigma, Poz-12996, 4750 ± 40 BP).

Only a small flint assemblage was documented due to the excavation technique. In total 90 artefacts were found, including flakes and some nodules (river gravel). Part of the assemblage was burnt. One possible axe-flake was found as well as two possible scrapers. Furthermore some 24 pieces of natural stone were found, including possible tempering material (quartz and granite), as well as a partially burnt grinding stone of northern (Scandinavian) origin, possibly diorite.

Botanical remains comprise charred remains of barley (*Hordeum*), emmer (kernels and chaff) (*Triticum dicoccum*) as well as stones of sloe, apple/pear (*Malus/ Pyrus*), indicator species for wet patches and ruderals such *Chenopodiaceae*. Charcoal analysis yielded evidence for several other species. During occupation the dune bordered to the southwest on salt marshes. The dune was mainly covered by shrubs as evidence for trees is minimal. On the other hand charcoal of alder (*Alnus*) and other species was found in the vicinity. There also is some slight botanical evidence for the presence of fields and the practice of agriculture, although no pollen of wheat has been found (also see Out 2009, 100).

Only seven bones were analysed, solely yielding evidence for the presence of cattle. It is believed AHR-42 is only a small part of a larger site. It is possible AHR-42 is part of one of the find spots of the Rijswijk-A4 sites, although pottery analysis does not suggest contemporaneity between AHR 42 and for example location 4 (pers. comm. J.M. Koot 2007/W.A. Out 2007).

*References:*

Rieffe *et al.* 2006

## **61. Alblasserdam-Plan Nieuw Kinderdijk**

*Site location:*

The site is situated on a river dune 3 to 4 m –Dutch Ordnance Datum (NAP), located near Alblasserdam in the western part of the Dutch delta.

*Site description:*

An augering campaign (carried out by Archeomedia) at the site yielded charcoal, pieces of (fish)bone and flint including a scraper dating to the Mesolithic and Neolithic. The site has been partially protected and specialists (BIAx and ArcheoPro) have selected samples for dating as well as archaeobotanical and micromorphological research.

*References:*

Proos 2007

## **62. Albrandswaard-Rhoon Essendael (19-12)**

*Site location:*

The site is probably located on a levee. It is situated in the western part of the Dutch delta, near Rotterdam (89.309/429.928).

*Site description:*

The site yielded charcoal, burnt and unburnt bone as well as an unburnt vertebra of a fish. The site could be dated between 4040-3800 cal BC (Late SWB culture or early Hazendonk group).

*References:*

Meirisman 2005

## 63. Albrandswaard-Rhoon Koedood (19-16)

### *Site location:*

The site is located on a levee. It is situated in the western part of the Dutch delta, near Rotterdam. (92.923/429.072).

### *Site description:*

The site consisted of a small location with charcoal and burnt remains of fish (*Cyprinidae* and pike) and was discovered by augering and subsequent documentation of construction activities. No <sup>14</sup>C dates are available as yet, yet due to its proximity to 20-134 and similar level below NAP, a date in the first half of the third millennium BC might be expected.

### *References:*

Stronkhorst/Moree 2006  
Proos 2007

## 64. Albrandswaard-Rhoon Portland 4 (20-134)

### *Site location:*

The site is located on a narrow levee bordering on a gully. It is situated in the western part of the Dutch delta, near Rotterdam (93.111/429.460).

### *Site description:*

The site consisted of a small location with charcoal, hazelnut fragments and both burnt and unburnt remains of fish (freshwater species such as carp, pike and eel). The site could be dated between 2877-2581 cal BC (Vl-2b) and was first investigated by augering, after which excavation (11 x 5m) of three Late Neolithic charcoal concentrations took place. The site should be interpreted as a short-term extractive location.

### *References:*

Meirsman/Moree 2004  
Meirsman/Moree 2006<sup>a</sup>

## 65. Almere-Poort

### *Site location:*

The sites are located on several coversand ridges near Almere in the province of Flevoland.

### *Site description:*

The sites are located on several coversand ridges which eventually were covered by peat. An augering campaign by RAAP yielded six clusters of sites. Five of these are presumed to have been settlement sites, based on the presence of charcoal, flint,

pottery and unburnt bone. Cluster 5 was located on the southernmost coversand ridge and yielded fragments of red ochre or hematite. The site is interpreted as the location of several burials and was covered by peat. The finds might date to the Late Mesolithic or Neolithic.

*References:*

Raemaekers *et al.* 2003

## **66. Antwerpen-Lombardenstraat**

*Site location:*

The site was located in the direct vicinity of Antwerp, possibly in the Lombardenstraat.

*Site description:*

Because of its early discovery (1862), only a more or less complete vessel was recovered (*Tulpenbecher*). This vessel might have contained cremation remains. No contextual information was available. The site is of interest because of its northern location, close to the Dutch border in combination with the classic MK characteristics of the pottery.

*References:*

Lüning 1968  
Vanmontfort 2004  
Warmenbol 1987

## **67. Barendrecht-Gaatkensplas-Zuidpolder (20-126)**

*Site location:*

The site is located on a levee in the western part of the Dutch delta, south of Rotterdam (93.285/428.756). The site was possibly situated at the confluence of a side creek and a river and might currently be the westernmost site of the SWB culture in the Netherlands.

*Site description:*

The site was discovered by augering on the housing development site of Carnisselande and could be dated between 4200-3800 cal BC. The site is chronologically situated in the late SWB period, or early Hazendonk period. Two habitation layers were discovered, separated by a sterile layer of sediment. The upper layer consisted of a continuous find layer consisting of charcoal, ash, burnt and unburnt faunal and fish remains, pottery, flint and other stones, including a fragment of a polished flint axe and also yielded remains (kernels and threshing waste) of naked barley, emmer and possibly einkorn (although the latter determination may be related to the position of the kernel in the ear (see Moree

2006, 25). The faunal remains were however severely burnt and fragmented. A <sup>14</sup>C date points to 4200-3800 cal BC (GrA-20074; 5150 ± 50 BP), although this date maybe several hundreds of years too young if suffering from the old wood effect. The lower level consists of more isolated patches of the find layer comprising charcoal. No <sup>14</sup>C date was available for this layer which must antedate the SWB occupation above. BOOR will further investigate this site in the future.

*References:*

Moree 2002<sup>a</sup>  
Moree 2002<sup>b</sup>  
Moree 2006

## 68. Barendrecht-Zuidpolder (20-58)

*Site location:*

The site is located on a levee in the western part of the Dutch delta, in the western part of Barendrecht. (94.300/428.900). The site was situated on the eastern bank of a creek. On top of the levee oak, ash, lime and beech grew and in the vicinity there were wet meadows.

*Site description:*

The site was excavated by BOOR in 1997 (20 x 8 m) and yielded charcoal, pottery, flint, (burnt and unburnt) fish remains and bone and a small stone axe. The site is rather small as the centre was probably situated outside the extent of the excavation. Apart from a pointed post the site yielded no features or evidence of structures. The pottery (N=699) may be attributed to the Vlaardingen culture, most probably to its later phases (2b). Flint (N=14) and stone (N=-8, including two axes, a rolled nodule with traces of pyrite, and a polishing stone) were found as well as part of a bone awl. Flint knapping was aimed at flake production. Two axes were also found, one made of amphibolite.

The faunal remains yielded evidence for wild boar, red deer, beaver and otter, yet the majority comprises domesticated animals, mainly cattle, as well as sheep/goat and pig. A wide variety of fish species was caught, but the spectrum is dominated by sturgeon (80%). The botanical remains only yielded one kernel of barley, which contrasted with many remains of wild plants, such as hazelnuts, hawthorn, acorns, water lily and lesser celandine. Two radiocarbon dates date the site between 3343 and 2466 cal BC. On top of the Vlaardingen level horizons with Bell Beaker/Corded ware and Hilversum pottery were found, separated by levels with no archaeological remains. The Vlaardingen occupation is characterized by the large contribution of sturgeon and the domination of wild plants. In view of other settlements in the freshwater tidal zone, most notably Vlaardingen and Hekelingen, a non-permanent function seems most likely, perhaps in relation to sedentary locations elsewhere.

*References:*

Moree *et al.* 2002

## 69. Barendrecht-Hordijk West (13-74)

### *Site location:*

The site was most probably located on a levee, although the geological information from the augering campaign was limited. The site is situated in the western part of the Dutch delta near Rotterdam and is probably comparable to Rotterdam-Hordijkerveld (96.487/431.531).

### *Site description:*

The site yielded charcoal. No  $^{14}\text{C}$  dates were available. BOOR will further investigate this site in the future.

### *References:*

Lelivelt 2005

## 70. Barendrecht-Vrijenburg (20-125)

### *Site location:*

The site is located on a levee in the western part of the Dutch delta, south of Rotterdam (94.227/430.248).

### *Site description:*

The site was discovered by augering and subsequent excavation of a trench for a sewer. A  $^{14}\text{C}$  date (two sigma) dated the site to 3650-3380 cal BC (UtC-13791;  $4789 \pm 45$  BP) and is associated with the Hazendonk group. Finds comprise charcoal, pottery of Hazendonk affiliation, flint, stone, charred remains of crops (*Hordeum vulgare var. nudum*, *Triticum dicoccum*, *Triticum dicoccum gl.b.*, *Pisum sativum*, *Corylus avelana*, *Malus sylvestris*, *Prunus spinosa* and the root of *Ranunculus ficaria*), burnt and unburnt fish remains and burnt and unburnt fauna including either wild or domesticated pig and wild species such as beaver and otter. Especially the carbonised remains of peas are new for this period. No features were documented. The site of Barendrecht 20-126 also yielded seeds of crop plants as well as internodia of naked barley (also see Out 2009).

### *References:*

Meirisman/Moree 2006<sup>b</sup>

## 71. Bazel-Sluis

### *Site location:*

Bazel-Sluis is situated on a low slope of a covered sandy ridge (possibly a levee) on the left bank of the Scheldt. Its position is comparable to Melsele-Hof ten Damme. It is situated closer to the Scheldt than for instance Doel-Deurganckdok which is situated on a lower ridge further away.

### *Site description:*

The site was discovered during construction works of a sluice (Sluis 5) and associated dykes along the Scheldt in the vicinity of Bazel by the Waasland Archaeological service (ADW) in the summer of 2010. Due to the relative depth at which the sites were situated, part of the archaeological remains was preserved in waterlogged conditions, including faunal and botanical remains. Because finds from different periods (Early Mesolithic to Middle Neolithic) were found in relatively good conditions and part of the site had already been destroyed, an excavation took place by Ghent University and the Flemish Institute of Monuments and Heritage (OE, former VIOE) in the spring and summer of 2011.

Two trenches were dug (WP1 (20 x 14 m) and 2 (15 x 35 m)). These yielded many lithic and ceramic finds. The latter indicated Swifterbant and Michelsberg occupation, comparable to the Doel-Deurganckdok finds. WP1 was situated on the higher part of the ridge, while 2 was located on the lower part of the slope, towards the Scheldt (c. 2.2-4.8 m below level). The trenches were reinforced with steel plating due to the depth of the finds and the waterlogged conditions. The site was excavated in a 5 x 5 m grid, subdivided in squares of 50 x 50 cm. The soil was excavated in spits of 5 cm and sieved over a 2 mm mesh. Several palaeo-ecological samples were taken.

The following description of the documented evidence is based on a preliminary report (see references) and therefore may only serve to interpret the site in a very general manner.

Most of the finds were found on the higher part of the dune in a well-developed soil. This soil was absent in WP2 towards the foot of the slope which ended in a peat-covered bank bordering a wet depression. Two radiocarbon dates were taken on a seeds of dogwood and two charred kernels of wheat (*Triticum aestivum*) and emmer (*Triticum dicoccum*). These dated to  $4900 \pm 40$  uncal. BP (Bèta 27611) and  $5070 \pm 40$  (uncal BP (Bèta 276210). On top of the peat, which was covered by fluvial clay, several large trunks of oak were documented. Within the covering layers and into the underlying peat features indicative of intensive trampling were found. Preservation of faunal remains in these areas was very good. The lower parts of the archaeological layers in trench WP2 were covered by clay and subsequently peat. On top of the ridge the peat lay directly on top of the sandy dune surface.

Palynological evidence for zone 1 is mainly informative with respect to the end of the Atlantic period. Tree pollen is dominated by oak and lime, followed by hazel and elm. The lower parts are characterized by an alder forest. Herbs and ruderals are only present in low percentages, indicating that there were not many open spaces. Pollen of cereals indicates that some small-scale form of crop cultivation may have taken place in the vicinity. In the second zone a strong drop in lime was documented, which relates to a more general decline of this species taking place around 4000 BP. Alder forest is again present in the wetter parts. Herbs and ruderal species increase, indicating more open patches may have characterized the landscape. Cereal pollen points to potential small-scale agriculture here as well. Several species such as Chenopodiaceae point to the existence of potential estuarine conditions. Wood identifications are dominated by alders and ash. Fruits and seeds are mainly indicative of the local vegetation and point to a rich and varied forest type that, of course, changes for the wetter parts. Apart from these finds two charred kernels were found of bread wheat and emmer. They

are the only unambiguous indicators of human activity in the palaeo-botanical samples. Mollusc evidence mainly points to freshwater conditions, while diatoms in the upper sample point to some salt influx. This need not point to brackish conditions at Bazel as strong tidal transport may have been responsible for their presence.

Concerning pottery, many hundreds of sherds were documented, sometimes in small concentrations of *c.* 0.25 cm<sup>2</sup>. Different ceramic traditions seem to have been present. The largest group is characterized by pottery and organic temper. Decoration is limited (mainly *Randkerbung*) and occasional decoration on the belly part. There are also small knob-shaped lugs. This ware is comparable to that of the Swifterbant sites at Doel. A second group is characterized by flint temper. Technologically it may be classified as MK pottery. A few sherds showed bone or mollusc temper. Other sherds showed spatula, finger, stick or hollow bone decoration in lines or impressions. Some of these sherds seem to be attributable to the Late Bandkeramik cultural tradition as well as perhaps some later Neolithic wares from the loamy (Blicquy, Limburg, Rössen/Cerny) and sandy area (Late Swifterbant and Hazendonk group). (The wide scope in possible cultural attributions may relate to the limited number of decorated sherds that was found or perhaps their size).

The lithic remains comprised flint artefacts as well as some artefacts on Wommersom and Tienen quartzite. The tool spectrum is dominated by retouched flakes and scrapers of a rather straightforward type. Flakes and blades are characterized by edge damaging and Montbani-retouche. The arrowheads are dominated by trapezes, although typical Neolithic leaf-shaped arrowheads were found as well. Other Neolithic artefacts comprise pointed blades, tranchet axes and polished artefacts. This latter group is, however, characterized by its low numbers as well as the absence of artefacts made on flint. Spatially the flint is distributed rather evenly. Some patches do exist. As with the pottery there is evidence of some sort of 'invisible' stratigraphy or distribution. Neolithic artefacts occur more frequently in the higher levels, while typical Mesolithic artefacts characterize the lower levels. This appears to be similar to the distribution in Doel-Deurganckdok-B.

Both burnt and unburnt faunal remains have been found. On top of the ridge most of the preserved faunal remains were burnt and fragmented. Further down the slope preservation of faunal remains increased, including antler, large long bones, pieces of horn pits and worked pieces. Remarkably, domestic animals seem to dominate the excavated (non-sieved) spectrum. Species include dog, pig, sheep or goat and especially cattle. Wild animals comprise red deer (mainly antler), roe deer and wild boar. The wild spectrum is dominated by aurochs. Among the non-sieved material one bone plate of sturgeon was found. It is expected that the sieved material will contain many more fish remains.

Based on the faunal remains the site has preliminarily been interpreted as a camp site where hunting and fishing was practised and where, perhaps, some domestic animals were herded. Shed red deer antlers were prepared for making tools.

Overall, it can be stated that the site of Bazel has yielded interesting and promising results for the occupation of the Scheldt valley, especially for the Late Mesolithic and Neolithic period. The presence of organic preservation and a number of interesting ceramic traditions indicates this site may be able to shed new light on the transition to agriculture in the sandy region of Flanders.

#### *References:*

Perdaen *et al.* 2011

## **72. Beuningen-Ooigraaf-het Woerdje**

#### *Site location:*

The site 'het Woerdje' is situated on a levee near Ewijk in a riverine landscape characterised by old channels of the Rhine. The site is located at a short distance from the site of Ewijkse Veld which showed clear evidence of Vlaardingen occupation. The channel along which the site was found became inactive between the Neolithic and the Iron Age.

#### *Site description:*

Due to construction activities the site was documented in 1989 by the local AWN group and a small excavation took place by the ROB. Unfortunately not much of the site could be preserved or recorded under good circumstances.

Apart from Roman finds several Neolithic finds and features were recorded, comparable to the finds of Ewijkse Veld. Several sub-sites were documented A to I. Features were found a depth of *c.* 90-250 cm underneath the surface. They are interpreted as pits and ditches. Finds comprised pottery, flint, other stone tools and pieces of bone and antler. A total of 3.4 kg of Neolithic pottery was collected especially near sub-sites H and I. the clay was tempered with quartz and chamotte and the surface most often has a smooth finish. Some sherds show evidence of *Schlickrauhung*, typical for Michelsberg pottery. Strips of clay seem to have been used in the manufacturing process. Several weak S-profiles have been documented in the pottery assemblages, although rim perforations are rare. One rim sherd is decorated with incisions or scratches typical for example for Hazendonk pottery. Furthermore two sherds had horizontal ears, linking them tentatively to the Michelsberg culture or Wartberg group. In total 85 pieces of flint, including 18 tools (amongst which scrapers and drills and many fragments of waste were recovered. Amongst these were two flakes and one part of one or several polished axes, as well as three leaf-shaped points. In contrast to the Ewijkse Veld site no transversal points were documented. Rijckholt-type flint of primary type (with fresh cortex) was identified as well as flint from rolled nodules. One tool identified as a scraper is in fact a Michelsberg *Spitzklinge*. Natural stones (gravels from the Rhine or Meuse) showed evidence for polishing etc. Faunal remains include part of the horn of a cow as well as part of the antlers or red deer (*Cervus elaphus*). Several longbones showed traces of working.

The different artifacts that were recovered distinctly indicate Neolithic occupation of 'het Woerdje'. While the nearby site of Ewijkse Velden was occupied in the Vlaardingen period, occupation at 'het Woerdje' may have been somewhat earlier including elements of the Michelsberg culture and Hazendonk group as well as early Vlaardingen culture.

*References:*

Janssen 1993

### **73. Bracht-Brüggen 8-West**

*Site location:*

Bracht is located in a flat coversand area in the Kreis Kempen-Krefeld in the German Rhineland just east of the Dutch Limburg border.

*Site description:*

After ploughing amateur archaeologists found many flint artefacts (up to 1 m in depth) indicating a former knapping place. The lithic assemblage included cores, blades, flakes and a scraper of different flint type. The blades seem of a Montbani-type industry. Some of the blades were retouched. Furthermore at least two Mesolithic points were found, one of which also showed retouch on the ventral side. Next to the flint several sherds were found, at the time identified as Beaker ceramics. Currently the sherds should be identified as Begleitkeramik of La Hoguette, because of their plastic ridges accompanied by perpendicular and obliquely situated lines. A subsequent excavation in 1964 confirmed the previous findings. More flint and pottery sherds were documented. No features were preserved or could be identified.

*References:*

Loewe 1971

### **74. Brecht-Moordenaarsven 1**

*Site location:*

The site is located on the E-NE rim of a late glacial dune in the Antwerp Campine area at a distance of c. 24 m to BM-3 and 48 m to BM-2.

*Site description:*

At BM-1 a total of c. 63 m<sup>2</sup> was excavated. The site was heavily disturbed preventing clear spatial information, although some clustering is visible. Despite that most artefacts were not found in situ the site is of importance because of its relatively clean Late Mesolithic assemblage. In total 1165 artefacts were found including 59 tools. The majority of both the tools and the debitage was fabricated from Wommersom quartzite. This type of raw material amounts to an unusual 900 artefacts indicative of the importance and fluctuation of this raw material resource

in the Late Mesolithic. The toolkit mainly consists of points (predominantly trapezes) and microburins possibly characterizing the site as a hunting camp. Blades predominate over flakes and scrapers are absent.

*References:*

Vermeersch *et al.* 1992

## 75. Brecht-Moordenaarsven 3

*Site location:*

The site is located on the E-NE rim of a late glacial dune in the Antwerp Campine area at a distance of *c.* 32 m to B-2 and 24 m to BM-1. The site could not be excavated at the time, but its location at the edge of the fen is promising.

*Site description:*

This site is complementary in information to both BM-1 and 2. Unfortunately there is a possible admixture of earlier elements as was also attested at BM-2. Again Wommersom quartzite amounts to 44% of the total assemblage (N =18). The location at the edge of the fen might functionally differ from the other two sites, yet the restricted size of the assemblage is not informative upon this.

*References:*

Vermeersch *et al.* 1992

## 76. Brecht-Overbroek I/II/III

*Site location:*

The sites Brecht-Overbroek I-III are located on and around several dunes in the Antwerp Campine area. The sites are located at a distance of *c.* 2 km from Brecht-Moordenaarsven further south. The sites were investigated partially by surveying and partially by excavating.

*Site description:*

Overbroek I comprises a concentration within an area of 67.5 m<sup>2</sup> at the southern foot of a dune. The site yielded *c.* 1203 artefacts including 72 tools and 19 microburins. Of the artefacts 22.1% was made from Wommersom quartzite. The site also yielded some phtanite. Overbroek II is situated on five separate dune bodies. Dunetops II-1 (12 x 7 m), II-2 (11 x 8) m and II 3 (14 x 9 m) each have concentrations of artefacts on top and around their crests. In between the concentrations isolated artefacts were found. The sites yielded 1052 artefacts including 61 tools. Some 16.4% of all artefacts were made on Wommersom quartzite. Overbroek III was investigated by means of two trenches (one of 5.6 m<sup>2</sup> and one of 56 m<sup>2</sup>) yielding 542 artefacts. These included 36 tools and 1 microburin. Overall 19.9 % was made on Wommersom quartzite. All sides

yielded scrapers. Most points could be classified as trapezes although six *feuilles de gui* as well as 5 LBK-like points were also documented. The combination of sites in this are provide a useful insight into the Late Mesolithic settlement pattern.

#### *References*

Vermeersch *et al.* 2005

### **77. Brecht-Thomas Heyveld**

#### *Site location:*

Brecht-Thomas Heyveld is located *c.* 400 m northwest of Brecht-Moordenaarsven and over 2 km south of Brecht-Overbroek in the north-western part of the Antwerp Campine area. The site is situated near the top of a (currently) slight sandy elevation associated to the east towards a large depression. The dune is most likely of Late Glacial age. Unfortunately the excavations indicated that most of the soil covering the area had been disturbed.

#### *Site description:*

The site, consisting of two concentrations, was discovered through surveying activities, and in 1980 some 100 m<sup>2</sup> was excavated. Most of the soil was sieved, yet most of the material originated from the disturbed upper layer. These were well-defined and some 15-20 m apart. The northern concentration was slightly larger and yielded more artefacts. Most artefacts (N = 2982) were made of flint (N = 2400), although Wommersom quartzite formed up to 20% of the material. The site yielded 55 cores, 222 tools and 85 microburins. Trapezes, Montbani blades and retouched bladelets dominate the tool spectrum. The site also yielded an LBK-like point.

Furthermore the C-horizon in the northern concentration yielded a cluster of bone fragments, densely spread over a few square meters. Near the southern concentration the C-horizon yielded a small concentration of potsherds. They are described as belonging to the irregularly shaped rim of a large egg-shaped vessel. According to L. Van Impe this pottery may date to the Iron Age. On the other hand egg-shaped vessels also have a distinctly Early Neolithic connotation.

#### *References:*

Lauwers/Vermeersch 1982

## 78. Buinerveen/Donkerbroek/Westerbork

### *Site location:*

Buinerveen and Westerbork both are located in Drenthe. Donkerbroek is situated in Friesland.

### *Site description:*

The sites represent dated finds of horn sheaths and bone of domesticated cattle. The humerus found in Donkerbroek was also worked. The following  $^{14}\text{C}$  dates are available:

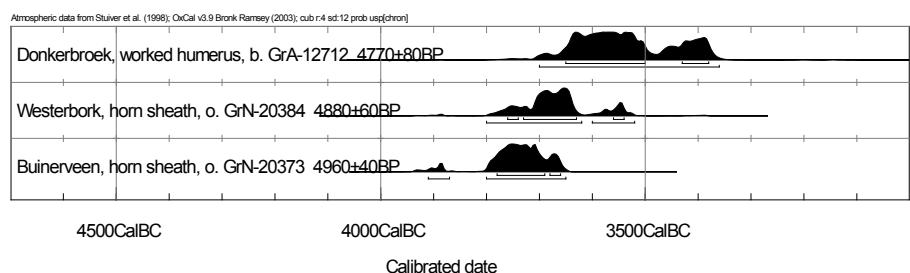


Fig. 97 Radiocarbon dates for Buinerveen/Donkerbroek/Westerbork.

### *References:*

Prummel 2001  
Prummel/Van der Sanden 1995

## 79. Coesfeld-Harle

### *Site location:*

The site is located on a Pleistocene dune on the terrace of a stream. This location is situated in a small regional loess island in the German *Bundesland* of Nordrhein-Westfalen. Together with several other MK-TRB sites, such as Osterwick, Nottuln and Soest it forms a rather remote MK-Siedlungskammer.

### *Site description:*

The site was discovered by survey after which a small excavation took place in 1955. Most finds from Coesfeld-Harle were found in a large pit. The site yielded flint, stone and pottery (amongst which baking plates and spoons) dating to the MK-period.

### *References:*

Willms 1982

## 80. Den Haag-Wateringse Binnentuinen

### *Site location:*

The site is situated in the Wateringse Veld vinex location, in the vicinity of the Hazendonk site that was discovered and excavated earlier. Instead of a location of the site on top of one of the newly formed dunes, sheltered by the old coastal barrier, this site is situated on top of the old Voorschoten-Leidschendam coastal barrier. The reason for this shift may be related to the formation of a new coastal barrier, further west, sheltering the area and making it inhabitable.

### *Site description:*

Following initial research consisting of borings, the site was discovered during excavations that mainly focused on the Roman period and Iron Age. Below these horizons an intact third find or occupation layer dated to the Late Neolithic Vlaardingen culture was discovered. A subsequent excavation by the municipality of Den Haag took place in 2011. The total research area covered *c.* 5,800 m<sup>2</sup>. The Vlaardingen level was only excavated in those areas that were threatened, i.e. the future drainage ditch locations. The site was excavated partially in 1 x 1 mm squares that were sieved. Part of the location was excavated by shovelling. This yielded flint (N=3253), pottery (N=9559; including fragments of baking plates) and faunal and fish remains (N=6354). Most of the faunal remains that could be identified belonged to cattle. Subsequently the feature level was documented. Unfortunately the small extents of the trenches and the blown-in sand prevented a proper large-scale documentation. Nevertheless, out of the 1069 features a number of at least four to eight diverging house-base camp-plans could be reconstructed. Some of these were oval-shaped, measuring *c.* 14 x 3.5 m. Other ones were more or less rectangular and demonstrated a two-aisled layout. It is not known whether the houses were contemporaneous. Apart from the houses there are indications for ditches, possibly with posts and perhaps ard marks. Furthermore, two water wells or watering holes were found. At least one of these was clearly used for cattle (hoof mark features). Another one contained a wooden structure that may have been a ladder of some sort. Although the analysis and publication of the site is still underway, it is expected to contribute to our perspective on the coastal component of the Vlaardingen culture. Especially the information on houses and overall settlement layout in relation to find patterning may be interesting, as well as the contacts and exchange networks in the lithic component and the degree to which subsistence may have been based on agriculture. Finally the fact that part of the site was found on top of the dune within eroded layers, might shed some light on the lithic signal of these locations. This may also help understand upland sites in the Pleistocene areas.

### *References:*

Stokkel 2011  
Stokkel *et al.* in prep.

## 81. Denekamp-Klokkenberg

### *Site location:*

The site is located on 'De Klokkenberg' near Denekamp in the Dutch province of Overijssel.

### *Site description:*

The site yielded the remains of a hearth as well as flint material and one sherd. One <sup>14</sup>C date was obtained (GrN-4092; 4930 ± 120BP) dating the site between 4000 and 3350 cal BC with two sigma.

### *References:*

Van der Hammen 1965

Raemaekers 2005<sup>b</sup>

## 82. Dodewaard-Peyenkampse veldweg

### *Site location:*

The site (172.035/437.058) is located in the eastern part of the Dutch central river district in an area where several crevasses have been found. Since the Neolithic finds were found in between crevasse deposits it is believed the Neolithic site was located along an active system.

### *Site description:*

After an initial documentation by RAAP the site was test-excavated in 1998 by the ROB. It was expected the site measured *c.* 70 x 50 m and possibly contained two house areas. Excavation took place in several square trenches of 4 x 4 m and in spits of 1 m<sup>2</sup>. Finds were collected in spits of 5 cm. Partial sieving took place. In total two archaeological layers were documented. While the upper one dates to the Iron Age and/or Late Neolithic (covering a surface of minimally 170 x 50 m), the lower one is probably of Middle Neolithic age and has been slightly reworked, by crevasse erosion. Several features were found including a posthole and a concentration of charcoal. A ditch (trench 12) could be attributed to the Middle Neolithic occupation on the basis of the pottery contents. Some (N=9) sherds of the first level could be identified as Bell Beaker ware (I). The second (II) level yielded 353 sherds and 905 fragments of rather good quality. The pottery was tempered with quartz and grit as well as organic temper. Furthermore several sherds yielded evidence for coil building and were rather well finished.

On the basis of these characteristics 158 sherds were identified as Middle Neolithic, most probably Hazendonk ware. Some charcoal from the ditch with pottery associated with level 2 was radiocarbon dated. The date was not known at the time of the report. The lithic material of level I (N=209) contained one transverse arrowhead which may date to the Middle Neolithic as well as a fragment of a GP-dagger (SGC-culture) and two axe flakes.

Most of the lithic artefacts were made on local rolled nodules. The lithic artefacts from layer II (N=80) did not yield addition information. Other stone from level II yielded a possible hammering stone and a polishing/rubbing stone.

Faunal remains from level II (N=2994) were not identified to species level. Of these 1105 were burnt. Species that were identified include cattle, pig, sheep/goat, possibly dog, rodents, amphibious species, fish (Cyprinidae and pike) and a mollusc.

Botanical research included a sample from a feature attributed to the Middle Neolithic. It included charred remains of *Triticum* kernels and spikelet forks.

*References:*

Bulten 1998

### **83. Donkenproject**

*Site location:*

The Donkenproject (c. 1990) involves the documentation and investigation of a series of river dunes in the Rhine-Meuse delta of the west of the Netherlands (predominantly the Alblasserwaard).

*Site description:*

The project was initiated by the Faculty of Archaeology (IPL institute) and led by M. Verbruggen and several students. The river dunes were investigated by means of an extensive augering campaign aimed at documenting and dating find layers and estimating their extent and character. Of a total of 100 river dunes with potential archaeological information, 20 were investigated. Brandwijk and the Rommertsdonk form two of the donken within this project. Apart from yielding archaeological remains such as flint, pottery, stone and bone several of these river dunes have been dated and span a period between the Late Mesolithic and the Bronze Age. It is likely that most dates were obtained on charcoal from the habitation layers. Oud Alblas 1 up to Zijdeweg 2 date to the middle phase of the SWB culture, while the younger sites yielded evidence for Vlaardingen occupation.

*References:*

Lanting/Van der Plicht 1999/2000

Verbruggen 1992<sup>a,b</sup>

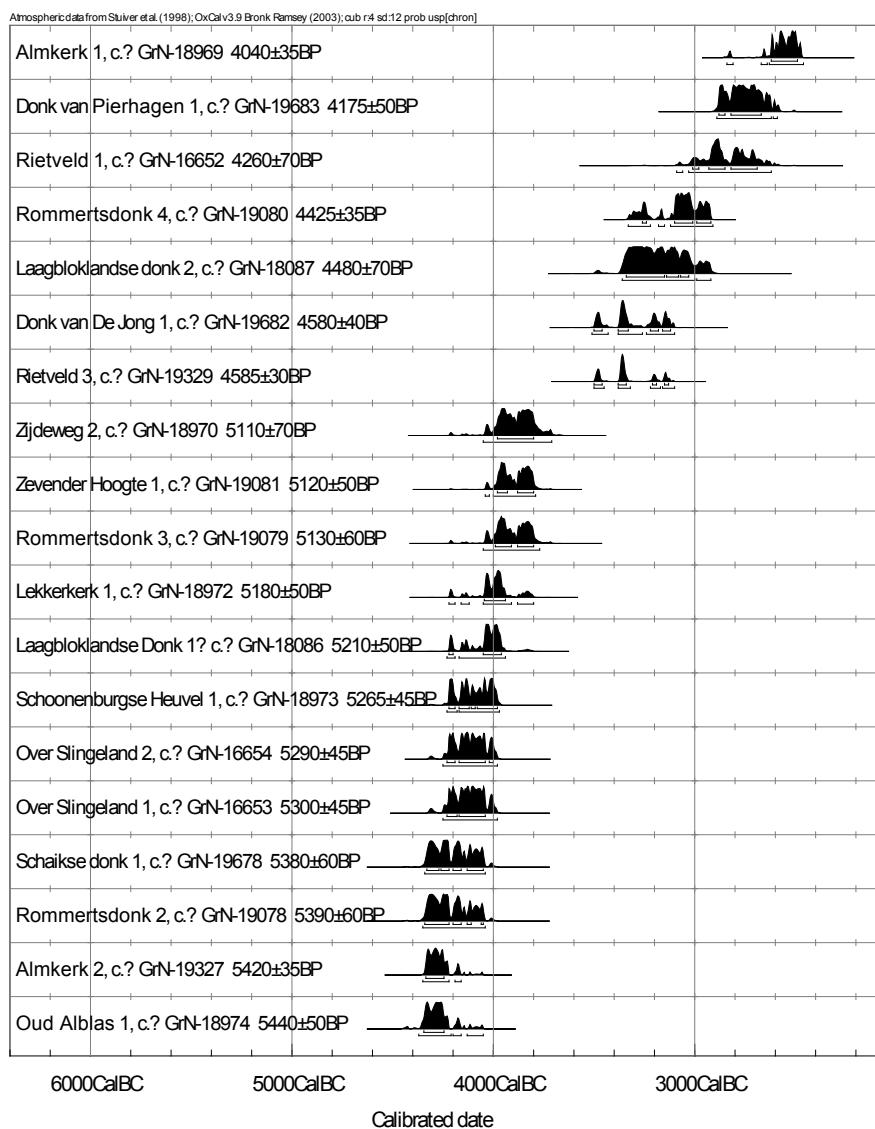


Fig. 98 Radiocarbon dates for the Donkenproject.

## 84. Ede-Rietkamp (forgery)

### *Site location:*

The site is located on a coversand ridge, north of the central river district.

### *Site description:*

Dozens of sherds, probably belonging to a single pot were collected in disturbed soil. The sherds were tempered with grit, grog and organic material. The vessel had polished surface and inward bending rim. One  $^{14}\text{C}$  date was available, dating the site to the Early SWB period. However since the organic temper of the sherd was dated, the date might deviate due to the constituent elements of the sample.

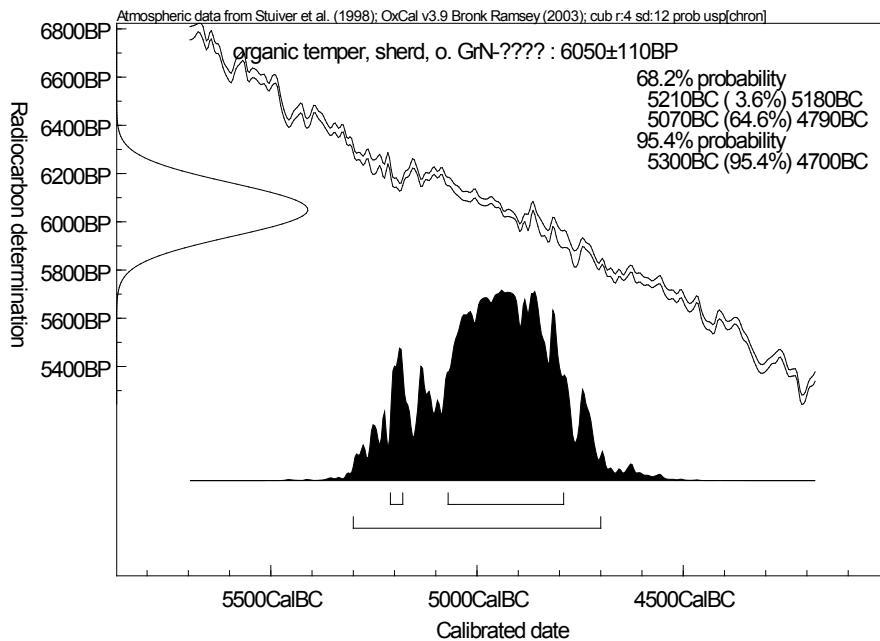


Fig. 99 Radiocarbon date for Ede-Rietkamp.

In 2010 it became apparent that the site was a forgery. The sherds documented originate from Morocco or Southern Sahara and were 'planted' there by an amateur archaeologist to hinder one of his competitors for the field. In the end someone else found the sherds and reported them to the ROB, after which the person that forged the site did not dare to come forward, until 2010.

#### References:

Hulst 1993  
Raemaekers 1999

### 85. Emmeloord-J97

#### Site location:

The site is located in the stream valley of the Vecht at a distance of 12 km from Urk-E4. The site was situated on a levee next to a creek. The creek filled up with peat between 3800 and 3500 cal BC.

#### Site description:

After its initial discovery in the 1950's, a series of excavations was carried out between 1999 and 2001. Swifterbant occupation at the site can be placed within 3650 and 3350 cal BC. Unfortunately a large part of the site should be considered a palimpsest, making it difficult to define between the Neolithic and Bronze Age occupation. Most of the Neolithic pottery, as well as the flint assemblage, can be attributed to the Late Swifterbant period. The site also yielded one *Tiefstich* TRB sherd as well as seventeen sherds of Beaker pottery and many sherds of Bronze Age ware. Recent dating of a stratigraphically uncontaminated sample of SWB pottery unfortunately could not be corrected for the aging effect, although stylistic aspects of the assemblage suggest a Late Swifterbant attribution (predominantly

tempered with quartz). In total the site yielded 6882 pieces of flint, most of which originated in the local boulder clay outcrops. Some of the lithic remains were of southern and northern origin and possibly of a primary nature. Remarkable is the overall absence of blade production. This substantiates the chronological attribution to the Late Swifterbant complex. It is not clear to what extent part of the lithic assemblage dates to the Bronze Age. Emmeloord also yielded grinding and polishing stones as well as two axes (*Fels-Oval/Fels-Rechteck Beil*). Due to the lack of a clear cultural association it is not evident whether the faunal spectrum is attributable to the SWB culture or to the Late Neolithic. The assemblage consists of wild species (beaver) and domesticated animals such as cattle and dog, but is dominated by fish remains. In combination with the finds of several fish weirs, it is therefore assumed J97 may have been a fishing and hunting camp. Apart from that many bone implements and antler axes were found. The presence of domestic debris (daub) and the continuous use of the site in different phases may be indicative of a different use of the site trough time.

The site is well-known for its elaborate fish weirs, most of which could be dated to the early part of the Late Neolithic. Two unassociated fish weirs and three fish straps could be attributed to the Swifterbant culture.

#### *References:*

Bulten *et al.* 2002  
Gehasse 1995  
Raemaekers 2005<sup>b</sup>

## **86. Enname-Stuw**

#### *Site location:*

The site is located in the floodplain of the Middle Scheldt Basin, south of Antwerp.

#### *Site description:*

The site yielded Neolithic artefacts that were found in natural gully deposits. The assemblage includes pottery, polished flint axes (N=2), antler mattocks (N=3), flint (two scrapers, a blade and a core) and faunal remains. Furthermore pointed wooden stakes were recovered, some of which were in situ. Part of the pottery can technologically and typologically be dated between 4500 and 3500 cal BC. Some pottery was flint tempered. Other fragments had nail impressions on the outside. Although not much information is available it might be possible to associate this site with occupation by the Swifterbant culture or the Hazendonk group, next to MK. In this respect the site should be compared to and correlated with locations such as Oudenaarde-Donk.

#### *References:*

Ameels *et al.* 2003  
Vanmontfort 2004

## 87. Gieten-Gietenveentje

### *Site location:*

The Gietenveentje is located on the Drenthe Plateau in the northeast of the Netherlands. Within this area sediments of a pingo scar are found containing palynological evidence for an early agricultural phase.

### *Site description:*

Recently the site has been investigated using corings in order to extract palynological information on possible Swifterbant occupation in the area and the first indications for agriculture. Bakker (2003<sup>a,b</sup>) discovered three separate Neolithic occupation phases (NOP 1-3). The first of these phases is assumed to represent Swifterbant manipulation of the vegetation. Extensive <sup>14</sup>C sampling enabled a chronological correlation. NOP-1 is dated between 4050 and 3450 cal BC. Lanting and Van der Plicht (1999/2000) criticize the validity of the <sup>14</sup>C dates because of possible contamination due to the reservoir effect.

### *References:*

Bakker 2003<sup>a,b</sup>

Lanting/Van der Plicht 1999/2000

## 88. Gouda-Westergouwe-Deelgebied 3

### *Site location:*

The sites involved are located in the Westergouwe area. Site 1 is situated in the vicinity of a Calais gully, belonging to the Gouderak stream belt. Site 2 is situated on remaining parts of the peat that was exploited in the Middle Ages. Site 3 is situated on crevasse splay deposits belonging to the Gouderak stream belt.

### *Site description:*

The site has been discovered in 2010 during an augering campaign by Archeomedia BV (Van Dasselaar 2010), subsequently an excavation with test trenches was executed by the ADC (Alma/Torres 2010). In the summer of 2011 Archol BV planned to excavate site 3 due to the promising results for the Early Neolithic period.

Site 1 was investigated by means of a test trench (26 x 2 m). The top of a residual gully was cut as well as the levee and overbank deposits. No traces pointing to human activity were found. Palynological analysis indicates the presence of a potentially used or cleared area. Since evidence for cultigens is absent the site may date to the Late Mesolithic or Early Neolithic. Site 2 was investigated by means of a test trench (80 x 5 m with extensions). The site yielded several posts of alder. No date is available, though finds in the vicinity point to the period of 1600-1750 AD. Site 3 was investigated by two test trenches of 100 and 45 m excavated in two levels at 4 and 2 m. Site 3 will now be discussed.

The augering campaign had already yielded charcoal and burnt fish bones. Since the site was located on a crevasse splay of the Gouderak system it potentially dates to the Neolithic. During excavation a site was discovered consisting of five *in*

*situ* posts and a rich find layer. The posts were made of alder (*Alnus* sp.) and were situated on the bank of the crevasse. The find layer consisted of a mix of sand and peat, pointing to human presence. Preservation conditions were excellent. Flint, stone, faunal and fish remains were found. Soil samples indicated the presence of botanical remains. One of the bones probably was a human calf bone (*fibula*). Among the faunal remains some bone tools were found, including two awls (roe deer and red deer) and two pieces of worked antler (probably axes). The stone tools include two polishing stones and fragments of cooking stones. The flint material (N=19; partially burnt) consists of flakes and blades, some retouched. Pottery has been lacking so far. Woodchips found in the peaty layer may have an anthropogenic origin, such as artefact production, but perhaps the situation is comparable to the surface reinforcements of reed and woodchips at Swifterbant-S3 and Bergschenhoek.

The faunal and fish remains shed some light on subsistence. No domesticated animals were found, except one *clavicula* of domesticated cattle although this piece was rather worn. Other species include domesticated dog (N=1-2), wild or domesticated pig (mainly calcined) (N=6), roe deer (N=1), red deer (N=3), otter (N=2) and bones of larger and smaller mammals that could not be identified. The fish remains include bream, perch, common roach, spine loach, common rudd, pike, salmon and carp (Cyprinidae). The fish species point to standing water or slow rivers. These conditions are for instance encountered in streams with a low velocity, old river beds etc. The fish species point to a bank environment possibly along a partially filled-in crevasse gully in the vicinity of a river. The fish were probably caught using nets and fish traps and cooked and eaten on the spot. Some fish were probably caught upstream. Bird bones point to duck and potentially other species. The botanical remains did not provide evidence for crop cultivation. They did point to the presence of alder woodland on the banks and species such as Black Nightshade (*Solanum nigrum*) and Pale Persicaria (*Persicaria lapathifolia*) indicative of open areas. Perhaps some fertilizing of the soil took place. The poor palynological evidence seems to confirm the situation around site 1.

The presence of the fish and faunal species points to a camp site where fish, wild animals and birds were caught and eaten. It was also a potentially good spot for catching otter.

The site is difficult to date. The crevasse deposits on top of which the site was situated were active until 5200 cal BC. The botanical investigation describes a landscape type typical of the Atlantic and hence the Late Mesolithic or Early Neolithic. Due to the absence of pottery a date in the Late Mesolithic or Early to Middle Neolithic seems most likely. It is not known at this point whether the site represents a special activity camp, or perhaps a more domestic site, or whether it was inhabited during multiple periods.

The site is important since it points out that not only the well-known river dunes (donken) were used or inhabited, but also other features in the landscape, including crevasse splays. The potentially early date for the use of these features (Late Mesolithic, Early to Middle Neolithic) in this respect is of importance. It may broaden or horizon regarding the use of the landscape and the associated settlement system.

#### *References:*

Alma/Torres 2010  
Van Dasselaar 2010

## 89. Havelte-De Doeze

### Site location:

The site of Havelte is located on the eastern side of a 'blow-out rim' surrounding a circular depression in the province of Drenthe. It could not be attested whether this depression was a pingo ruin or former lake. Southeast of the location a push moraine is located and several streams can be found in the vicinity (Price *et al.* 1974).

### Site description:

The site was excavated by the BAI between 1970 and 1972. Excavation took place in squares and artefacts were recorded in three dimensions. Furthermore palynological and botanical data was collected and phosphate analysis took place. Next to testpits, three larger trenches were opened (H1, 2 and 3) uncovering six separate concentrations of material within 765 m<sup>2</sup>. The site yielded several hearthpits (Ø 70 cm) with a remaining depth of up to 25 cm (N=10), some small pits and three shallow features. According to Lanting and Van der Plicht (1997/1998, 141) the site yielded 10 hearthpits, 2 surface hearths, 4 charcoal concentrations, 10 smaller pits and 2 larger pits. Analysis of charcoal indicated wood of pine (*Pinus*) and oak (*Quercus*) was burnt. The sites yielded various flint artefacts including points, backed blades, borers, scrapers, knives, (retouched) flakes and blades and cores. The site yielded three <sup>14</sup>C dates. Later on four additional hearthpits and possibly a surface hearth as well as a pit were dated (Niekus 2005/2006). According to Niekus (2005/2006, 88) GrA-27273 and GrA-27279 are unreliable.

Many of the dates do not coincide with the typological aspects of the concentrations. According to Lanting and Van der Plicht (1997/1998, 141) this is related to the fact that hearthpits were located outside of, or adjacent

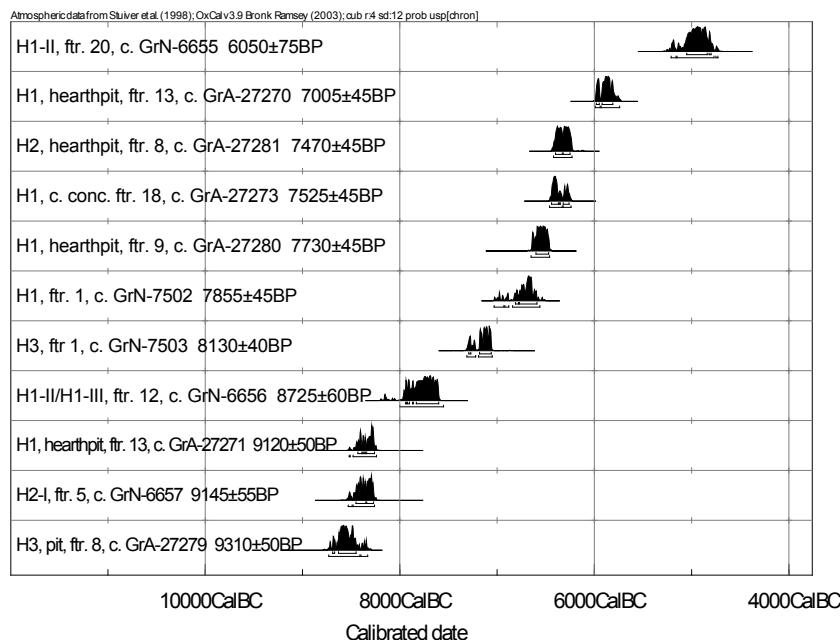


Fig. 100 Radiocarbon dates for Havelte-De Doeze.

to the concentrations they accompany. Typologically, only concentrations H1-I and II yielded trapezes. Furthermore the youngest date also stems from this concentration. Both may therefore represent a distinct Late Mesolithic element within the excavated site (also see Peeters/Niekus 2005, 207). The total time span however indicates the importance of this place throughout the Mesolithic.

#### *References:*

Lanting/Van der Plicht 1997/1998  
Niekus 2005/2006  
Peeters/Niekus 2005  
Price *et al.* 1974

## **90. Hazerswoude-Rijndijk-Spookverlaat**

#### *Site location:*

The site is located along the current N11 near Hazerswoude-Rijndijk between Leiden and Rotterdam. Sub-site 2 is located on a sandy levee, which was part of a former crevasse-complex in the freshwater-tidal zone bordering on the peat marsh area. The site is currently situated at 1.7 m –Dutch Ordnance Datum. The site has not been disturbed by later agricultural activities and has been covered by clay containing shells. The site has been excavated and documented by Archeomedia BV.

#### *Site description:*

The occupation layer on top of the sandy ridge (40-50 cm thick), partially located in trench 3, was excavated in squares of 1 x 1 m and spits of 2.5-5 cm. All the soil has been sieved over 1, 0.5 and 0.25 cm. The site yielded pottery dating to the Bell Beaker and Single Grave culture as well as sherds (amongst which fragments of baking plates) attributed to the Vlaardingen culture (*c.* 11,000 sherds). A number of these appears to have been painted. Several sherds were identified as TRB sherds of Laat Havelte 7 type, although these may also be attributed to the Vlaardingen culture. The site furthermore yielded faunal and fish remains as well as various bone artefacts (awls, chisels, needles and perforated teeth, and a possible wrist guard), artefacts of flint (*c.* 1300) and stone (*c.* 500), including a Schist chisel, a grinding/polishing stone of over 4 kg and a fragment of an amber bead. The fish remains include sturgeon, perch and eel. Faunal remains comprise pig or wild boar, sheep/goat and cattle, but are dominated by wild species (beaver, otter, fox, seal etc.). The macrobotanical remains included kernels of barley and emmer. The occupation layer also yielded several hearths of varying shape, some of which were repetitively located in the same place. Underneath the occupation layer some 60 postholes were documented out of which part of a two-aisled structure, possibly a Vlaardingen house plan, measuring 10 x 3 m could be reconstructed. The site may possibly shed more light on the transition between the Vlaardingen culture and the Single Grave Culture.

Although argued otherwise by the excavators (Diependaele/Drenth 2010<sup>a</sup>, 145), a seasonal occupation seems most likely regarding the faunal spectrum, the location and other similarities, especially regarding Vlaardingen an Hekelingen. The site may have operated in a seasonal system, or in relation to permanent settlements in the coastal area.

*References:*

- Diependaele/Drenth 2010<sup>a</sup>
- Diependaele/Drenth 2010<sup>b</sup>
- Proos 2007

## **91. Heemse-Hardenberg**

*Site location:*

The site was located in the valley of the Vecht at Heemse-Hardenberg, near the German border. It was discovered during dredging.

*Site description:*

The site yielded an antler axe (*Tüllengewehaxt*), flint artefacts, including regular blades, several sherds of rather coarse ware and a rimsherd of a funnel-shaped vessel. Furthermore bones dominated by wild species were found. The site lacks a closed context, but may be associated with both the SWB and the TRB culture.

*References:*

- Van der Waals 1972

## **92. Hekelingen II**

*Site location:*

Hekelingen II is located on the sandy levee (dating to the Early Subboreal) of a creek in the western part of the Dutch delta. The site is part of a number of settlements discovered further east (Hekelingen I is located at a distance of 660 m).

*Site description:*

The site was discovered in the trench of a sewer pipe and yielded some 100 sherds. Some of these were dark coloured, thick and tempered with quartz, others were of a lighter colour and tempered with sand and chamotte. This may indicate both VL-1 and VL-2 pottery is present. Some everted rims, perforation under the rim and one sherd with a lump further attest this. The flint assemblage comprised five scrapers, one of which was made of a broken polished axe and 19 flakes, all of blue-grey southern flint. Furthermore a large piece of sandstone was found.

Organic remains comprised bones of ovicaprids, domestic pig and cattle as well as red deer and sturgeon. One piece of bone was made into an awl. The site may also roughly be dated between 3000 and 2500 cal BC.

*References:*

Boomert 1974

### **93. Hellevoetsluis-Ossenhoek**

*Site location:*

The site Hellevoetsluis-Ossenhoek (coordinates 69.030/428.950) is located in the intra-coastal area near Rotterdam and is situated on a sandy ridge. At the time of occupation the location formed a dry site in a salt-marsh and mud flat landscape. With respect to the elevation or ridge, a small but distinct difference in height was recorded.

*Site description:*

The site was discovered by augering (BOOR), after which a small-scale excavation took place by Archol BV in 2006. The site was excavated in square meters and spits of 10 cm, sieving (25%/3mm) took place as well as botanical and <sup>14</sup>C sampling, which dated the site between 3000 and 2800 cal BC (Goossens 2009; Goossens 2010). A total of 7 trenches were excavated, 2 m wide and 12-15 m long. Apart from the level with features no internal stratigraphy could be determined in the occupation horizon. Unfortunately the limited extents of the site prevented the identification of singular structures, although many postholes were uncovered (60), some of which contained remnants of posts of a considerable diameter (+ 42 cm) and depth (c. 55 cm). The pairing of some of these postholes suggests phases of repair similar to the ones documented for Leidschendam and Haamstede-Brabers. It is most likely these posts were part of sturdy features, most probably houses. Other features comprise a fence or palisade of posts of considerable depth on the southern extents of the terrain and possibly another (part of a) fence on the northern side. The wood of the posts was predominantly alder, but also included oak and birch. This is confirmed by the charcoal analysis. The site also yielded ard marks, comparable to those at Zandwerven. Apart from features the site yielded pottery, flint, stone and a profuse quantity of faunal and fish remains. The mammal spectrum, remarkably, is dominated by cattle, followed by pig/wild boar, red deer, sheep/goat, beaver, dog and otter. If the general category pig/wild boar is attributed to the respective categories based on the positive identifications, then the ratio wild-domestic is c. 40 to 60%, instead of the 84% domesticated animals that are mentioned in the report (Goossens 2009, 135). The skeletal parts that have been retrieved from pig in general seem to confirm the importance of hunting and transport of remains. No marine mammals were found. Macroremains indicate a freshwater environment, although there is some brackish influence. They also included remains of emmer, (six-rowed naked) barley, hazelnut and sloe. This is also confirmed by the fish species, these include Cyprinidae, sturgeon, pike and perch as well as eel, smelt and flounder. The fish species point to a location in a slightly brackish environment and under tidal influence. In this sense, although only at a distance of 15 km, Hellevoetsluis is of a more marine character than Hekelingen.

It should furthermore be noted that the many fish bones indicate the importance of fish for the Vlaardingen culture, in contrast to many other sites (although this may be an issue of taphonomy and recording (sieving)). The bird spectrum includes wild duck, widgeon and white-tailed eagle, as well as geese. Swans are absent. The pottery could be attributed to the Vlaardingen culture, most probably phase 1b and/or 2a, and included several sherds with rim perforations and one or two fragments of baking plates, and a fragment of a collared flask. Most of the pottery was thick-walled, although quartz temper was limited. Furthermore the site yielded at least two TRB sherds. One sherd with incrustation (bone paste) could be attributed to Brindley phase 4, another with impressions and granite temper to Brindley phase 5. It is not clear whether a third decorated sherd can be attributed to the TRB culture. Depending on the pending dates these sherds may have been anterior to or contemporaneous with the Vlaardingen occupation. It is likely they were transported to the site. Parallels for this phenomenon may be found on the Hazendonk and at Hazerswoude. The lithic material is to a lesser extent fabricated on locally available nodules, in comparison to other VL-sites in the coastal area, but does bear similarities to the estuary sites such as Hekelingen and Vlaardingen. Most flint is of a dark to light grey colour and originates in the Belgian and Limburg limestone area (Goossens 2009, 81). Within this group there is typical Lanaye flint deriving from either Spiennes or Rijckholt. Yet another groups of flint is expected to have been transported along the coast and possibly derives from the French outcrops on the canal. Other groups have been identified as well as some pieces of Hesbaye and Rullen flint (*ibid.*, 81).

Tools comprise points, (thumb-)scrapers, borers, three transverse points and axe flakes. Stone artefacts include several fragments of querns, as well as a bead/pendant of amber and one of jet.

The site is comparable to both the older coastal Hazendonk-3 sites as well as the coastal Vlaardingen sites. The mammal spectra differ for example from the eponymous Vlaardingen site, especially with respect to the ratio between cattle and red deer (this is inverse at Vlaardingen). Furthermore the many postholes and the fence bring Schipluiden-Noordhoorn to mind. Since the site is located on a sandy ridge (30-40 m wide), probably in the vicinity of several nearby ridges, it is plausible to compare the site to Zandwerven, also located in the salt marsh area, where similar traces of ard marks were found. With respect to Hekelingen-III it is possible to envisage a relation between both locations. Domestic animals, but especially crop plants may have been transported to nearby Hekelingen. The explanation for the internal differentiation within the Vlaardingen assemblages may be related to the environment or chronology; however the comparability of Hellevoetsluis to sites of an earlier date (Schipluiden or Wateringen) favours the first option. In this respect the site is comparable to coastal sites of the Hazendonk group and Vlaardingen culture. Other evidence is not in conflict with this. Regarding seasonality, evidence indicates that fur animals and water fowl were probably hunted in winter (Goossens 2009, 138), but there is no evidence for absence in other seasons.

## References

Goossens 2009  
Goossens 2010

## 94. Hoornaar-Lage Giessen

### *Site location:*

Hoornaar-De Donk (coordinates 124.512/432.115) is located on a Late Glacial dune (donk) in the Alblasserwaard region in the western downstream part of the Dutch Rhine-Meuse delta, currently between the rivers Lek and Merwede. During occupation the site was surrounded by vast wetlands. Over time the dry habitation area slowly decreased while being covered by marsh-deposits.

### *Site description:*

The site was investigated by Archol in 2007. Part of the rather steep slope of the river dune was excavated. The excavation consisted of a trench of 4 x 20 m. Only half of the trench was threatened at an informative depth, therefore only 10 m was investigated. The small section (10 m) was excavated in squares, but finds were limited to an area of 4 x 5 m. Only a limited number of finds was documented and additional sieving did not yield many more. Some pottery (of Hazendonk 2/Swifterbant origin) was documented, as well as some flint. No features and no evident find layer were documented. It is likely the limited number of finds is related to the location of the trench on top of the dune

### *References:*

Van Hoof/Hamburg 2008

## 95. Hulst-Nieuw-Namen

### *Site location:*

The Vlaardingen site of Hulst is located in the southeastern extents of the province of Zeeland, in the southwest of the Netherlands. The site is situated at the foot of the 'Kauterheuvel'.

### *Site description:*

The site was test excavated in 1990. Two trenches of 2 x 30 and 50 m were realized as well as an extension of 9 x 13 m. The finds were located directly under the plough zone in the top of the coversand or possibly in the remainder of an old soil (probably a podzolic soil). The site yielded no features but concentrations of pottery and flint were discovered in the second of the long trenches. Most of the pottery was of limited size, in total weighing c. 400 g. The assemblage did comprise a polished rim fragment and two bottoms. The pottery is tempered with chamotte and specks of white quartz. The pottery is most likely to be attributed to the Vlaardingen culture. The lithic assemblage yielded 53 flakes, including 4 flakes of polished axes, 16 blades, 8 scrapers, an unfinished point and 2 cores. Furthermore three quartzitic polishing stones were found. It is very probable the unfinished point and the axe flakes may be associated with the pottery. This is less evident for the other material due to the presence of three small blades

of Wommersom quartzite and a small retouched blade, pointing to Mesolithic presence at the location. The flint types possibly included Obourg-type flint as well as Lighgrey Belgian type flint. One scraper had fresh cortex.

*References:*

Van Heeringen 1991

## **96. Leidschendam-Frekeweg**

*Site location:*

The site is located near Leidschendam in the coastal area of the Netherlands. The location is situated in between two older beach barriers. The site was prospected by the AWN Leidschendam-Voorburg.

*Site description:*

In total two test trenches were excavated. The second trench yielded five pieces of flint, including three flakes, a scraper and a core. Both the scraper and the core were fabricated on the same re-used axe, perhaps indicative of the scarcity of flint, characteristic for example for the Vlaardingen settlement of Leidschendam. The flint was of a grey-greenish colour and possibly derived from Belgium or France. One of the two flakes was fabricated on a rolled nodule (*Maaseitje* or 'Meuse egg'). The site furthermore yielded undecorated pottery and faunal remains, including cattle. On the slope of one of the beach barriers a vague occupation layer has been recognised. On the basis of the finds the site has been dated to the Vlaardingen culture by the GIA. The site will be further excavated.

*References:*

Proos 2007

## **97. Linderbeek-1944**

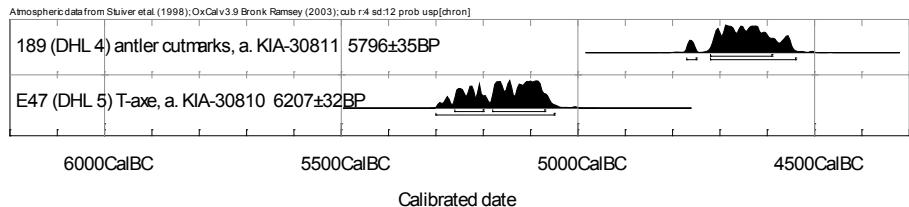
*Site location:*

The site is located along the channel of the Linderbeek in the coversand landscape of the eastern part of the Netherlands (Twente). The site was located on the border of an area of peat, probably on the outward bend of a meandering system. This makes for a rather pronounced situation within the landscape.

*Site description:*

The site yielded a concentration of faunal remains, including archaeological artefacts of supposed Late Mesolithic and Early Neolithic age. It is probable there has been admixture of material from other periods. The concentration is probably part of the dump area of a nearby settlement due to the presence of both butchering remains as well as waste of the production of antler artefacts. Remarkable is the fact that only complete tools have been found. Faunal remains include aurochs, red deer, moose, cattle, (butchered remains of) wild boar as well as dog, bear and beaver. Antler tools comprise basic axes, T-shaped axes, and a sleeve. Furthermore

Fig. 101 Radiocarbon dates for Linderbeek-1944.



four stone axes (including two Middle to Late Neolithic *Flintrechteckbeile* as well as two Neolithic *Felsrechteckbeile*) were found. Radiocarbon dates point to presence in both the Late Mesolithic and Early Neolithic. The site is one of more locations of Late Mesolithic or Early Neolithic SWB culture activity in the coversand landscape (another location along the Linderbeek is Linderbeek-2004). All of these sites were located in the vicinity of rivers or small streams such as the Regge or the Vecht. This seems to indicate the valleys of these systems might have been important communication channels to the well-known IJssel-Vecht delta or, via the Eem valley, to the Veluwe. Furthermore it may point to a specific wetland exploitation of the landscape. Palynological evidence from locations nearby points to the presence of pollen of *Cerealia* as of 3700 cal BC. (The first phases with *Cerealia* pollen dates between 3700 and 2300 cal BC at 2 sigma (GrN-6815; 4815±40 BP and GrN-6816; 3945±35 BP).

#### References:

Groenewoudt *et al.* 2007

## 98. Linne (St.-Odiliënberg)-Mortelshof-HVR 16

#### Site location:

The site is located in hilly terrain in the Roerstreek area in Middle Limburg.

#### Site description:

The site consists of two separate concentrations, northwest of the Mortelshof. Finds include five asymmetric points, the butt of a small lydite (black chert) adze, a roughout of a lydite adze, two fragments of haematite and some scrapers and borers, possibly of LBK origin. Remarkable was the find of 3 sherds of different *Begleitkeramik* pots several hundred meters apart. These sherds show parallel cordons and accompanying rows of stabs, on one sherd forming stacked V's (Brounen/Hauzeur 2010; Brounen *et al.* 2010<sup>a</sup>). Other remains include Late Palaeolithic (Tjonger) artefacts, Mesolithic and Neolithic remains. The association is not clear. The site may be regarded as a *persistent place* with a clear Early Neolithic character.

#### References:

Amkreutz *et al.* 2010  
 Brounen/Hauzeur 2010  
 Brounen *et al.* 2010<sup>a</sup>  
 Van der Graaf 1987

## 99. Lommel-Kattebos

### *Site location:*

The site was located in Lommel, directly south of the Dutch border under Eindhoven. The MK find was located in an Iron Age cemetery.

### *Site description:*

The find consists of a quartz-tempered pot (*Tulpenbecher*), which, due to its proximity to the Netherlands nuances our ideas, strongly influenced by current boundaries, about dispersal of groups and cultures during this period.

### *References:*

- De Laet/Mariën 1950
- Lüning 1968
- Vanmontfort 2004

## 100. Meppel-de Gaste

### *Location:*

Two distinct sites located on river dunes in Drenthe.

### *Site description:*

The site yielded Mesolithic and Neolithic flint tools. The pottery is tempered with granite grit and decorated with fingertip impressions on the top. The pottery probably had round or sagging bases and bears some similarity to SWB pottery.

### *References:*

- Raemaekers 1999
- Van der Waals 1972

## 101. Menstede-Coldinne

### *Location:*

The Late Mesolithic site of Menstede-Coldinne is located near Aurich in the Northwest Germany (*Ostfriesland*) and was situated on the southern side of a sandy slope. The subsoil of the site consists of glacial sands and gravels. Unfortunately the site was disturbed by ploughing which is why none of the concentrations should be regarded as *in situ*.

### *Site description:*

The site was excavated in 1982 by the *Arbeitskreis Vorgeschichte der Ostfriesischen Landschaft*. A total of 102 m<sup>2</sup> was excavated (in a field of 25 x 35 m) in 1 m<sup>2</sup> pits. The matrix was sieved over 0.5 mm. In total four more or less dense concentrations of artefacts were found. Concentration I yielded a hearth (Ø 40 cm, 5 cm in depth) containing rather large charcoal particles as well as several trapezes. Concentration

II yielded most flint and is interpreted as a knapping site. No intact hearths were found here. The other concentrations were less dense. In total the site yielded c. 750 artefacts including: 23 cores; 1 hammering stone; 101 blades (18 of which were retouched at the end, while 22 were retouched laterally; 7 calcined); 92 blade fragments; 1 Zonhoven point; 11 trapezes; 4 microlithic fragments; 2 narrow microliths; a small asymmetrical triangle; a long and narrow triangle; a (stemmed?) microlithic point with edge retouch; 3 microlithic borers (?); 6 microlithic scrapers; 9 scrapers; one other tool; 424 flakes (23 of which were retouched; 37 calcined) and c. 67 other brunt pieces of flint. The typological analysis clearly points to the Late Mesolithic (*Boberger Stufe des Spätmesolithikums*) while the Zonhoven point and the small asymmetrical triangle may be slightly older (*Haltener Stufe*), but also still occur later on. The site was radiocarbon dated by charcoal from the hearthpit yielding a date of c. 4600 cal BC (Hv-12322;  $6605 \pm 40$  BP), pointing to a date between 5630 and 5470 cal BC. The site is interpreted as a short-term camp mainly used for the fabrication of blades for which flint of an agreeable quality was selected. Remarkable is the rather high percentage of tools (c. 8.5%).

#### References:

Kitz 1986  
Niekus 2005/2006

## 102. Nagele-J112

#### Site location:

J112 is located on a large river dune in the northern part of the Vecht valley, Noordoostpolder. The site was situated on the southern slope of the valley.

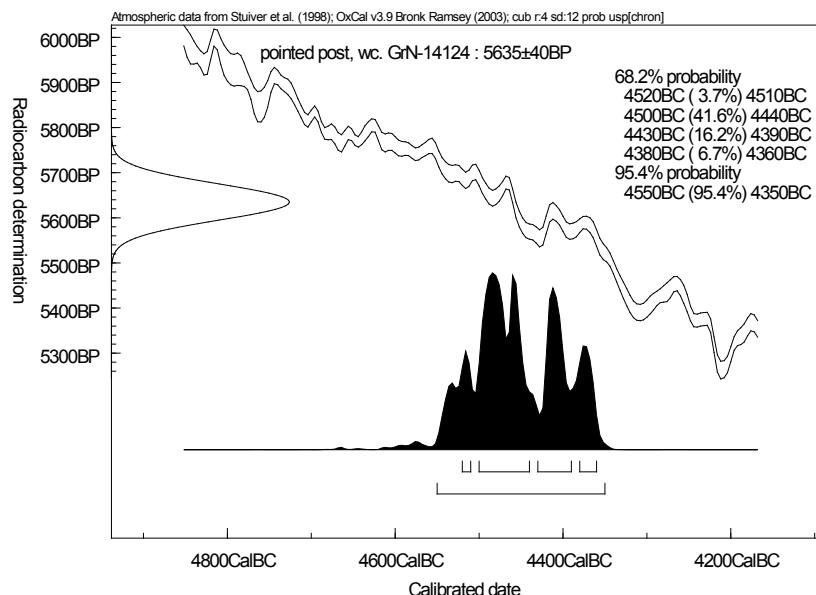


Fig. 102 Radiocarbon date for Nagele-J112.

### *Site description:*

Several sherds were found tempered with grit, grog and organic remains, although organic remains dominate, as well as number of scrapers and trapezes. One  $^{14}\text{C}$  date was available of a pointed wooden post of alder, and dates the site to the Early SWB culture. Several years before the 1985 campaign a complete quartzite *Felsovalbeil* was found at the site. Remarkably a subsequent test excavation by the ROB in the northern site of J112 yielded charcoal-filled features, possibly hearth-pits, surrounded by a superficial spread of charcoal and flint. These finds possibly are indicative of Mesolithic camps.

### *References:*

Hogestijn 1991  
Lanting/Van der Plicht 1999/2000  
Raemaekers 1999

## **103. Nagele-J125**

### *Location:*

The site is located on a small river dune, in the northern part of the Vecht valley, Noordoostpolder. During the preliminary survey J126 also yielded flint artefacts. J125 was covered by peat.

### *Site description:*

J125 was excavated using a 2 m wide test trench. The site yielded Late Mesolithic hearth-pits as well as flint. Surrounding the hearth-pits but especially on the slopes of the dune were scatters of flint. Pottery on the slope of the dune was tempered with grit and might be of SWB culture affinity. The pottery was found in the deepest level, meaning it must predate 4400 cal BC. The  $^{14}\text{C}$  sample was extracted from the peat directly above these sherds and may therefore have been contaminated with younger remains. Apart from the late Mesolithic hearth the covering layer of peat was dated.

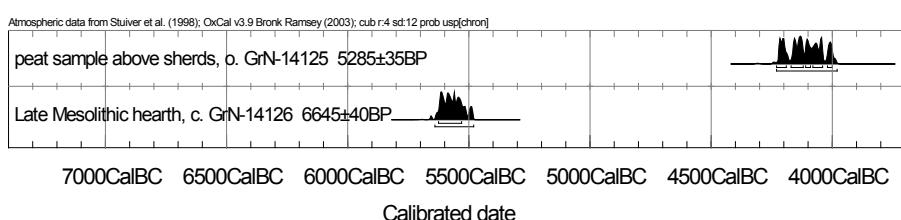


Fig. 103 Radiocarbon dates for Nagele-J125.

### *References:*

Hogestijn 1991  
Lanting/Van der Plicht 1999/2000

## 104. Namur-Grognon

### *Site location:*

The site is located in the town of Namur at the confluence of the River Meuse and the Sambre.

### *Site description:*

The site was excavated in 1994 and 1995 due to impending construction activities at the Place-St-Hilaire. Two perpendicular trenches (5.5 x 15 m) were opened and further investigations were directed at the exact location of the confluence of both streams. The location yielded a stratified site with both a Late Neolithic level and a Mesolithic level. The Late Neolithic level yielded some faunal and lithic remains, including a polished axe. The predominantly Late Mesolithic level was found at a depth of -4.05 m below the surface and measured c. 22 m<sup>2</sup> located in five different areas. The Mesolithic level yielded 1800 artefacts, associated with faunal remains, including numerous trapezes (both with oblique and straight base) as well as modified blades (*lames à bords abbatus*). The level furthermore yielded backed blades, burins, small cores and many small flakes. Many of the flakes and tools have cortex. Most of the lithic raw material was of a predominantly grey colour, which could possibly point to either Rijckholt flint or Lightgrey Belgian flint. Next to this several blades were made on Wommersom quartzite as well as locally available small rolled nodules. More or less 10% of the material was burnt.

The lithics were associated with c. 5000 faunal remains, 300 of which could be identified. Several species of microfauna were found on the sieve, but most of these should be interpreted as background fauna. The macrofauna is dominated by wild boar (*Sus scrofa*), roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*) and aurochs (*Bos primigenius*). Other species comprise beaver (*Castor fiber*) as well as several species of fish, including pike (*Esox lucius*), chub (*Leuciscus cephalus*), carp (*Cyprinidae* indet.) and indeterminable fish remains. The site also yielded bones of wild species including fox (*Vulpes vulpes*), badger (*Meles meles*), and wild cat (*Felis silvestris*). Remarkable was the find of an incisor, a milk-tooth and two phalanges of either a dog (*Canis familiaris*) or a wolf (*Canis lupus*). One of the phalanges had traces of cutmarks which could be associated with the stripping of hide. Among the intrusive fauna one unidentified bird bone was found.

The site also yielded a feature (at a depth of -4.95 m) (Ø 60 cm). The feature seemed to represent a small oval-shaped hearth and was filled with ash-coloured soil containing pieces of charcoal and several flat stones as well as artefacts. The artefacts comprised blades, 1 backed blade, 1 crested blade, 1 core, burnt flakes and a possible grinding stone (pyramid-shaped with a flat base). Another similar feature was found at a distance of c. 10 m. In total eight palynological samples could be retrieved. The sequence could be associated with the Mesolithic material. The base of the sequence yielded several species such as birch (*Betula*), pine (*Pinus*), hazel (*Corylus*) as well as some lime (*Tilia*) and alder (*Alnus*). The latter species indicate this section should be associated with the end of the Boreal period and the start of the Atlantic. During the Neolithic alder, lime and hazel become dominant species and several ruderal species start appearing (e.g. *Plantago*) as well as *Cerealiae*. The latter are however found higher in the sequence and can be associated with the first evidence for farming around Namur.

The site of Grognon forms a further point of reference for the nature of Late Mesolithic occupation in river valleys and can be associated with sites such as Liège-Place St.-Lambert and Remouchamps.

*References:*

Mees *et al.* 1994

## 105. Nieuw-Schoonebeek

*Site location:*

The site is located on a small coversand elevation (later covered by peat) near Assen in Drenthe. The coversand ridge was further shaped by the presence of several gullies.

*Site description:*

The site was excavated in 1984. In total 243 m<sup>2</sup> was excavated in large trenches using the shovel (due to time restrictions). Bioturbation (treefalls) and erosion had disturbed the site to some extent and resulted in a considerable horizontal dispersal of finds. The site yielded several features, predominantly hearths (N=11) and charcoal concentrations, as well as some heavier stones interpreted as tent-stones. The hearths had a remaining depth of up to 23 cm and either round or pointed bottoms and were mainly located to the south and west of the elevation. Burnt flint was found in some hearths. Analysis of charcoal indicated the presence of wood of pine (*Pinus*) and oak (*Quercus*), often combined. The hearths yielded three dates, indicative of at least two different moments of occupation.

In total three different zones (A, B and C) were identified within which two overlapping concentrations of settlement refuse were located. These concentrations differed in composition both typologically and technologically (predominantly based on the presence of trapezes with a straight or asymmetrical base). Both however are associated with a Late Mesolithic occupation. It is not clear what part of the assemblage could be associated with the earlier occupation. The artefact assemblage consists of 7645 pieces of flint comprising trapezes, retouched flakes and blades, points, borers, microburins, scrapers, cores, and core preparation and rejuvenation flakes. Furthermore a variety of cookingstones, hearthstones and stones possibly used to trim feathers were found.

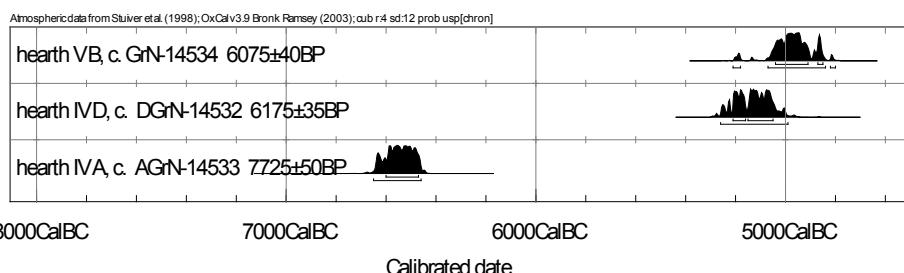


Fig. 104 Radiocarbon dates for Nieuw-Schoonebeek.

### *References:*

Beuker 1989  
Casparie 1989 (contribution in Beuker 1989)  
Lanting/Van der Plicht 1997/1998  
Peeters/Niekus 2005

## **106. Nijlen-Varenheuvel**

### *Site location:*

In contrast to most coversand sites, this site is situated in a valley floor location at the confluence of the Kleine Nete and the Aa on the eastern edge of the Flemish Valley.

### *Site description:*

The site is situated in a wet context in a valley floor location, which makes it an interesting complementary site for those location situated on nearby coversand ridges and slopes. The site was investigated by augering and testpitting in 2006. This was followed by an excavation consisting of three trenches in 2007. This yielded evidence for a site with a stratigraphical context and at least two separate periods of use or occupation. The artefacts were situated in coarse sand in an area where several gully structures were visible. The site was probably situated in an area with a series of low (*c.* 1 m) ridges which are a remnant part of the infill of the Flemish valley.

Another feature was the presence of a large gully or meander that cut into the sands and was later filled in with sediments of clay and peat. In the stratified lower part of this gully fill, of which the peat dates to 5200-4930 cal BC (2 sigma; Beta 234395), wedges between two layers of peat a small clayey band containing artefacts was documented. Apart from a palimpsest of artefacts with (amongst others) a Late Palaeolithic signature, deriving from the loam, the 30, rather fresh artefacts situated in the clayey band are characterised by many artefacts on Wommersom quartzite, trapezes and LBK points. It is very probable this band is contemporary with the radiocarbon date of the associated peat. Another concentration with *c.* 50 Wommersom artefacts was discovered in the eastern zone in secondary context. The excavators assume that the stratified assemblage may be associated with a Late Mesolithic or, perhaps more appropriate, Swifterbant occupation. The site offers an interesting perspective, through adding information to the existing Late Mesolithic and Swifterbant dataset, and potentially regarding the process of Neolithisation.

### *Reference:*

Van Peer *et al.* 2007

## 107. Noordoostpolder

### Site location:

Mesolithic and Neolithic finds were found on several other sites in the Noordoostpolder. In most cases the sites were located on river dunes.

### Site description:

Most of the sites mentioned below yielded compositions of flakes, blades, cores, scrapers, retouched pieces and pieces of natural stone. These sites mentioned to indicate the intensity of habitation that might be assumed for the Noordoostpolder.

Kavel D134; kavel E113; kavel E114; kavel E116; kavel E117; kavel E148; kavel E155; kavel E171; kavel H101 (ice-pushed ridge); kavel H102 (ice-pushed ridge); kavel H104 (ice-pushed ridge); kavel J12 (ice-pushed ridge); kavel J64; kavel J72; kavel J74; kavel J75; kavel J76 (including transverse points); kavel J89 (including a flint axe, points, a core axe and SWB pottery); kavel J100/J101 (top of a flint axe/levee?); kavel J106; kavel J113 (including fragments of bone); kavel J120; kavel J129 (including blades with use retouch an grinding stone and features); kavel M127 (including bone); kavel M128 (including bone); kavel M131 (including a transverse arrowhead and bone); kavel M132 (including an MK-like scraper of southern flint, transverse points, burnt bone, bone awl, stone and Swifterbant sherds; kavel P13 (ice-pushed ridge); kavel R1; kavel P34; kavel T72.

### Reference:

Hogestijn 1991

## 108. Nottuln

### Site location:

The site is located on a small regional loess island in the area of the Baumberge, west of Münster in the German *Bundesland* of Nordrhein-Westphalen (Ldkr. Coesfeld). Together with several other MK-TRB sites, suchs as Coesfeld-Harle, Nottuln and Soest it forms a rather remote MK-Siedlungskammer. The site was situated on a slope above the stream of the Stever.

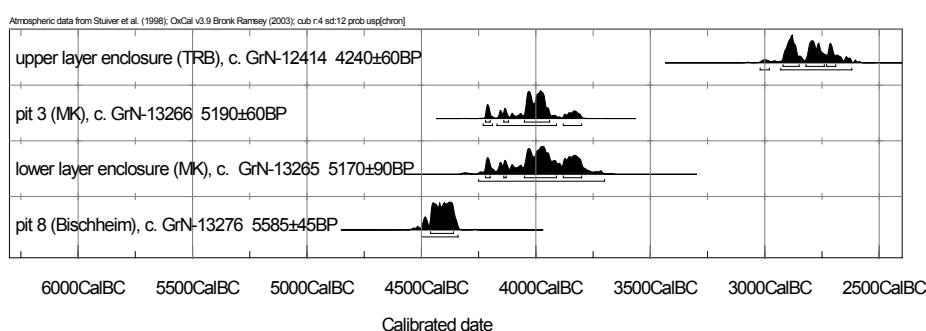


Fig. 105 Radiocarbon dates for Nottuln.

### *Site description:*

The site was excavated in 1983 and 1984 and yielded pits, postholes, ditches, the remains of a substantial enclosure (with a *Sohlgraben* of 6 m wide) as well as a possible Middle Neolithic structure. Apart from a pit with two sherds dating to the Bischheim phase of the Rössen culture, most of the ceramic and lithic artefacts in the lower layer of the enclosing ditch point to a substantial occupation during the MK-period. The upper layer of the ditch contained even more finds, now dating to the middle and late phase of the TRB period. Four  $^{14}\text{C}$  dates confirm the succession of Neolithic groups on the site.

### *References:*

Eckert 1986

## **109. Osterwick-Höve (Ldkr. Coesfeld)**

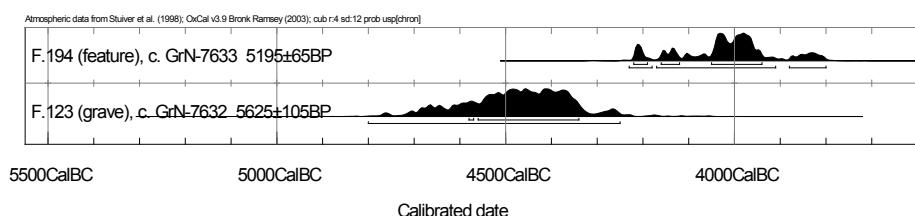
### *Site location:*

The site is located on a small regional loess island in the German Bundesland of Nordrhein-Westphalen. Together with several other MK-TRB sites, such as Coesfeld-Harle, Nottuln and Soest it forms a rather remote MK-Siedlungskammer.

### *Site description:*

During several small campaigns in the 1950's and 1960's features and finds of the MK as well as the Funnel Beaker culture (TRB) were found. The site yielded coarse rimsherds of storage vessels as well as funnel-shaped vessels. All the vessels were round-bottomed. The lithic material comprised round scrapers, blade scrapers, drop-shaped points and a large polishing stone of fine-grained quartzite. Furthermore flakes with evidence of polishing as well as a small axe with an oval cross-section were found. The TRB material consisted of lithic remains and sherds with typical decoration (*Bauchfranszenverzierung*). It is suggested both the MK sherds and the TRB sherds are chronologically contemporaneous. Several sherds with Swifterbant and Hazendonk affinity were also recovered. Furthermore a grave was found. The site is of interest because of its northern location and proximity to the Dutch border. Furthermore other MK sites in this small pocket also yielded TRB sherds. Two  $^{14}\text{C}$  dates are available although GrN-7633 differs in Lanting and Van der Plicht (5170±90). The date of GrN-7633 might be too young since it was only pretreated with acid. GrN-7632 on the other hand is considered too old and might have been contaminated.

Fig. 106 Radiocarbon dates for Osterwick-Höve.



### *References:*

Lanting/Van der Plicht 1999/2000

Wilhelmi 1971

Willms 1982

## **110. Posterholt-Vinke-HVR 39**

### *Site location:*

The site is located in hilly and dissected terrain in the coversand landscape of Middle Limburg, in the vicinity of a fen. The site was documented by both the HVR and in 1984 by the Faculty of Archaeology of Leiden University, within the Maasdal project.

### *Site description:*

The site can be regarded as a *persistent place*. Finds comprise half of the point (cutting edge) of a lydite (black chert) adze as well as a LBK point. Other remains comprise Palaeolithic and Mesolithic artefacts as well as Michelsberg (MK) artefacts and remains of the Stein group. The finds were found scattered over the terrain, therefore internal association is not clear.

### *References:*

Van der Graaf 1987

## **111. Remouchamps-Station Leduc**

### *Site location:*

The site is located at a large meander of the Amblève in a sand- and limestone area at the foothills of the Ardennes Massif, south of Liège. It is situated at the foot of the northern slope of a valley. During occupation the floodplain was dissected by numerous channels, one of which lay adjacent to the Mesolithic site. In total 65 m<sup>2</sup> were excavated between 1980 and 1983. The site was covered by colluvial deposits, during or after the Middle Neolithic, although lateral displacement of the artefacts seems to have been minimal.

### *Site description:*

The most important feature of Station Leduc is the remains of a Late Mesolithic dwelling structure consisting of accumulations of quartzitic pebbles in a rough circular configuration. In the north-western opening of the structure as well as in the southernmost parts, features were found that may be interpreted as the remains of hearths. Around these hearths seeds and nutshells were found. Furthermore it is striking that the distribution of the lithic remains clusters in the south-western part of the excavation outside of the dwelling structure.

The site yielded 1842 flaked artefacts as well as manuports, psammite slabs (with traces of smoothing and polishing) pebbles with wear traces, a polished LBK adze and an engraved sandstone pebble. Most of the flint originated from local

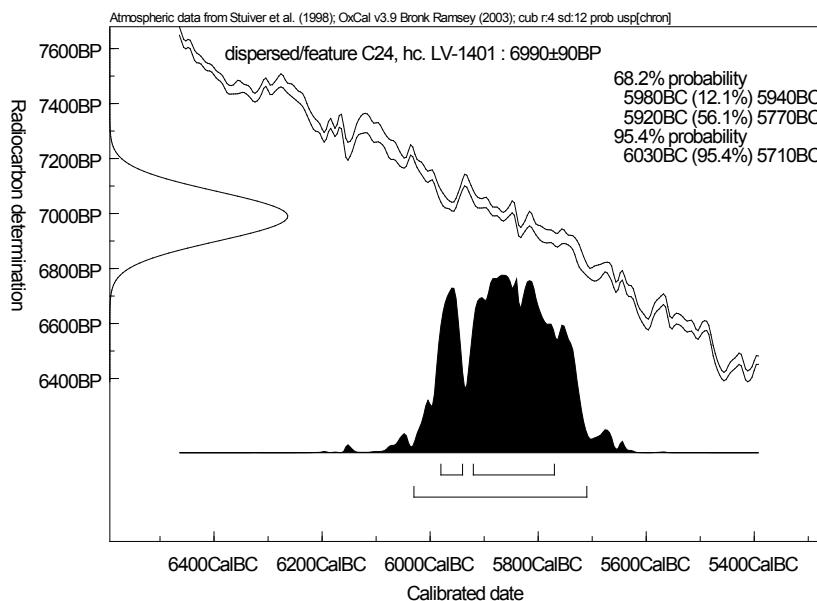


Fig. 107 Radiocarbon date for Remouchamps-Station Leduc.

outcrops, although some black homogenous pieces as well as Vetschauer flint were identified. A few pieces including one core of Wommersom quartzite were also recovered. The lithic industry was aimed at the production of blades (Montbani style). Some 55% of the retouched artefacts were microliths, mostly trapezes. The structure is interpreted as a dwelling structure with at least part of a roof, involving a considerable amount of work and investment. Since the site might have been at the surface until the Middle Neolithic there is no way to absolutely associate the adze to the Late Mesolithic assemblage. The site also yielded two aberrant and one associated  $^{14}\text{C}$  date.

#### *References:*

Gob/Jacques 1985

### **112. Rijswijk-A4**

#### *Site location:*

The site comprises four locations located in a sheltered back-barrier environment. During and after occupation clay deposition took place. Next to the site several gullies were documented dissecting the salt marsh. All sub-sites were situated on NW-SE oriented dunes on top of the beach plain. The Neolithic finds dating to the Hazendonk group (location 1 and location 4) were located several meters below the surface and were dispersed over two separate dunetops. Location 4 may be situated on two dunes separated by a tidal channel. Location 4 is situated at a short distance from AHR-32 Sion and perhaps situated on the same dune (see above).

### *Site description:*

Occupation debris was located on separate dunes, comprising pottery, flint, faunal remains and wood (predominantly location 1 and 4). Location 2 yielded the skull of a dog. In 1993 site 1 was excavated (196 m<sup>2</sup>) in two trenches divided in square meters by amateur archaeologists, the ROB and the University of Amsterdam. One trench was situated on the top, one in the depression. No sieving took place. Four dates point to an occupation between 3940 and 3200 cal BC (cf. Lanting/Van der Plicht 1999/2000), which may be narrowed down to 3900-3400 cal BC (Out 2009, 100). The discovery of two refuse layers (lower 50/51/52 and upper 30), suggests two phases of occupation. The lower layer only contained finds, the upper finds and features, including unlined wells and a ditch. Unfortunately part of the site was destroyed by erosion. Among the features on the slope of location 4 (300 m<sup>2</sup>) ten water wells were identified in layer 30. Two <sup>14</sup>C dates point to an occupation between 4250 and 3380 cal BC, yet occupation probably occurred after 4000 cal BC (Lanting/Van der Plicht 1999/2000). The faunal remains were studied by Laarman (2004, contribution in De Vries 2004). Remarkably the site yielded the remains of two buried pigs (*Sus domesticus*) (location 1). Laarman suggests these animals might have been sick (2004, 56). The buried remains of three dogs (two at location 4 and one at location 1) might have been of a different character. Apart from this, butchering remains of cattle (*Bos taurus*), pig, sheep (*Ovis aries*) and goat (*Capra hircus*) have been identified. Remarkably only a few bones of wild species were found, such as red deer (*Cervus elaphus*), wild cat (*Felis sylvestris*) and indeterminate mammals of various sizes. Several bones of pigs might have belonged to wild animals (*Sus scrofa*). Bird remains include several species of geese (*Anser albifrons*, *Anser anser*), ducks (*Anas platyrhynchos*, *Anas crecca*) as well as more 'exotic' species such as whitetailed eagle (*Haliaeetus albicilla*) and the common crane (*Grus grus*). While the bird spectrum points to winter occupation, the fish indicate presence in the summer, including species such as sturgeon (*Acipenser sturio*) as well as mullet (Mugilidae (at least 54 large individuals)), carp (Cyprinidae) and eels (*Anguilla anguilla*).

A <sup>14</sup>C date of the covering peat west of the exposure yielded a *tpq* of 4670± 65 BP (3638-3341 cal BC).

Furthermore there are unpublished archaeobotanical results (analysed by W.J. Kuijper) also see Out (2009, 101), including three carbonised remains of emmer (*Triticum dicoccum*) and barley (*Hordeum vulgare*). Importantly the indications of the importance of agriculture as represented in the bone assemblage are not confirmed by the botanical assemblage which comprises much gathered wild food plants.

The archaeological remains can most likely be attributed to the Hazendonk group.

### *References:*

- Koot 1994
- Laarman 2004, in: De Vries 2004
- Lanting/Van der Plicht 1999/2000
- Mol 2006
- Out 2009
- Van den Broeke 1994
- Van der Valk 1992

## 113. Rommertsdonk

### *Site location:*

The Rommertsdonk is one of *c.* 20 investigated donken (on a total of *c.* 100) located west of Geldermalsen in the central river district in the Netherlands. It is situated at a distance of 600 m from the Hazendonk and thus forms an important point of reference for this river dune.

### *Site description:*

The site was discovered in 1977 and further investigated by auger-borings within the 'donkenproject' of the institute for Prehistory at Leiden University. Its top is located at 1 m below the surface. During its occupation the Rommertsdonk was located in an extensive alder carr consisting of numerous lakes. In total four archaeological layers were discovered which were dated with radiocarbon dating as well as the correlation of their geological juncture points. The layers contained ceramics and small flints. Radiocarbon samples were obtained from layers 2, 3 and 4 and the results were reduced by means of the isochrones of peat formation (see Verbruggen 1992, 124). This yielded the following dates:

Rom. 4	GrN 19080	4425±35	3290-2990
Rom. 3	GrN 19079	5130±60	4000-3880
Rom. 2	GrN 19078	5390±60	4290-4170
Rom. 1			4460-4340

Table 15 Radiocarbon dates for Rommerstdonk.

The non-reduced age range of Rommertdonk layer 2 overlaps with the oldest dates for the Hazendonk, while the reduced age for Rommertsdonk layer 3 coincides with Hazendonk layer 1 and 2. However since the dates date the end of the phases due to the isochrone correction, there is no unambiguous correlation. Rommertsdonk layer 4 may be correlated with the VL1b phase at the Hazendonk. No equivalents were found for the Hazendonk 3 and VL2 layers.

### *References:*

Verbruggen 1992<sup>b</sup>

## **114. Rotterdam-Bergse Bos (06-39)**

### *Site location:*

Bergse Bos is located on a donk (Pleistocene river dune), near Rotterdam in the west of the Dutch delta (94.981/441.352)

### *Site description:*

The site yielded charcoal, burnt and unburnt bone and a burnt and unburnt vertebra of a fish (carp (Cyprinidae)) (auger hole 7; archaeological level at 478-493 cm below surface = 808-823 cm below NAP). The site was investigated through an augering campaign. On the basis of the relative rise in sea-level the site must date to 5000 cal BC and before. BOOR will further investigate this site in the future.

### *References:*

Lelivelt/Moree 2005

## **115. Rotterdam-Beverwaard (13-17)**

### *Site location:*

Beverwaard is located on a donk (Pleistocene river dune), near Rotterdam in the west of the Dutch delta (98.45/433.45).

### *Site description:*

The site was excavated by BOOR in 1981 and yielded a hearth and Mesolithic flint artefacts (a flake and a B-point). A radiocarbon date on charcoal from the hearth yielded a date of  $6805 \pm 35$  (GrN-12010), calibrated between 5740-5630 cal BC (2 sigma). Apart from this the site yielded pottery and flint attributed to the Vlaardingen culture, as well as a point dating to the Early Bronze Age. Two radiocarbon dates date drops in the curve of oak in the palynological diagram. These are  $4470 \pm 60$  BP (GrN-12223), calibrated at 2 sigma between 3360-2920 and 3310-2900.

### *References:*

Van Trierum *et al.* 1988

## **116. Rotterdam-Beverwaard-Tramremise (13-83)**

### *Site location:*

Tramremise is located on a donk (Pleistocene river dune), near Rotterdam in the west of the Dutch delta (coordinates 98.500/433.250). The dune was rather high (currently 1.92 m below Dutch ordnance date). The river dune was part of a more elaborate donken complex, north of IJsselmonde. These form the western counterparts of the Alblasserwaard and Vijfheerenland river dunes.

### *Site description:*

The site was discovered by augering and yielded charcoal and flint (auger hole 38, at a depth of 85-100 cm below surface = 221-236 cm -NAP). Subsequent excavation, following earlier test trench research pointed out that hardly any organic remains were preserved, due to the circumstances of preservation. The ecological context of the site is (therefore) mainly base on nearby parallels (see description Hardinxveld sites, Rotterdam-Central Station and Groenenhagen-Tuinenvelden).

The site is interesting because, in contrast to the Hardinxveld sites, the excavation (15 x 20 m), focused on the top of the dune instead of the slopes (Zijl *et al.*, 2011, 73). Furthermore the height of the dune enabled occupation over an extended period of time. The site yielded remains dating to the Middle Mesolithic as well as the Middle Neolithic. The Middle Mesolithic remains include three burial pits in close vicinity with cremation remains and lithic artefacts dating between 7583 and 7048 cal BC. Artefacts and surface retouched points of Wommersom quartzite were also found at the site as well as a *Geröllkeule*. The *Geröllkeule*, a flat stone (possibly a polishing stone) and some of the Wommersom artefacts originated from the graves. The cremated remains only allowed a very general analysis. Two individuals were aged between 10 and 40 and 10 and 34, while another individual was possibly a female aged between 12 and 34. Not all of the bones have been collected and buried after the cremation. Furthermore, some bones of animals were found in the two graves: crania and long bones belonging to medium sized animals, including wild boar. In the fill of one of the graves a charred tuber of Lesser celandine (*Ranunculus ficaria*) was found. Another feature has been interpreted as a hearthpit which also included some human bone. Most flint points to 'local' rolled resources. Next to this the afore-mentioned Wommersom quartzite was used. It is important to note that the diverging <sup>14</sup>C dates indicate that the deceased were not cremated within one generation. This indicates that the graves may have been visible on the surface, or that the exact spot remained of importance through oral communication spanning generations.

Following the Mesolithic occupation, two phases of Neolithic occupation have been identified. A first dates to the Swifterbant culture (Hazendonk 1 phase) between 4200-3900/3800 cal BC, a second to the Vlaardingen culture, between 3500-3400 cal BC. No evidence was found for occupation affiliated with the Hazendonk group.

Concerning the Neolithic artefacts, pointed Rijkcholt/Spiennes blades and surface retouched points point to Swifterbant occupation, while transverse arrowheads and semi-finished products point to Vlaardingen occupation. Most flint used was obtained 'locally' from rolled coastal or riverine nodules. Apart from that flint was imported as finished products (pointed blades and axes) from both Rijkcholt/Spiennes as well as Hesbaye origin. Some lithics and other stones also indicate northern sources. The latter were mostly used as temper.

The Neolithic remains were documented in two separate concentrations with an empty zone in between. Due to the palimpsest nature of the top of the dune it is not clear whether the site was repeatedly used or permanently. Activities in both concentrations point to both flint-knapping as well as domestic activities. Only a small part of the eastern concentration has been excavated.

*References:*

Lelivelt 2006<sup>a</sup>  
Lelivelt 2007<sup>b</sup>  
Zijl *et al.* 2011

## **117. Rotterdam-De Donk I (14-08)**

*Site location:*

De donk I is located in the east of the river dune complex in IJsselmonde near the site Rotterdam-tramremise on a donk (Pleistocene river dune).

*Site description:*

Augering yielded flint and charcoal.

*References:*

Carmiggelt/Van Trierum 2005  
Carmiggelt *et al.* 2005  
Van Trierum *et al.* 1988

## **118. Rotterdam-De Donk II (14-09)**

*Site location:*

De donk II is located in the east of the river dune complex in IJsselmonde near the site Rotterdam-tramremise on a donk (Pleistocene river dune).

*Site description:*

Augering yielded flint and charcoal.

*References:*

Carmiggelt/Van Trierum 2005  
Carmiggelt *et al.* 2005  
Van Trierum *et al.* 1988

## **119. Rotterdam-'t Hart (13-66)**

### *Site location:*

Rotterdam 't Hart is located on a donk (Pleistocene river dune), near Rotterdam in the west of the Dutch delta (coordinates 97.205/433.630).

### *Site description:*

The site yielded charcoal, flint and burnt bone, but no pottery. The site was discovered by augering. The find layer was located at a depth of 573 cm - NAP [boring 6] and 611 cm - NAP [boring 28]. Based on, amongst others, the relative rise in sea level, in combination with the finds, the site most probably dates to the Mesolithic and Neolithic. Subsequent research by means of augering was undertaken in the vicinity.

### *References:*

Lelivelt 2004

Lelivelt 2007<sup>a</sup>

## **120. Rotterdam-Hordijkerveld (13-69)**

### *Site location:*

The site was most probably located on a levee, although the geological information from the augering campaign was limited. The site is situated in the western part of the Dutch delta (97.466/432.154).

### *Site description:*

The augering campaign yielded charcoal. No <sup>14</sup>C date was available. BOOR will further investigate this site in the future

### *References:*

Meirsman 2004<sup>b</sup>

## **121. Rotterdam-Hordijkerveld (13-85)**

### *Site location:*

The site was most probably located on a levee, although the geological information from the augering campaign was limited. The site is situated in the western part of the Dutch delta (97.060/432.022).

### *Site description:*

The augering campaign yielded both charcoal and burnt bone. No <sup>14</sup>C date was available. BOOR will further investigate this site in the future

### *References:*

Meirsman 2004<sup>b</sup>

## 122. Rotterdam-Kievitsdonk (14-22)

### *Site location:*

Kievitsdonk is located in the east of the river dune complex in IJsselmonde near the site Rotterdam-tramremise on a donk (Pleistocene river dune).

### *Site description:*

Augering yielded flint and charcoal.

### *References:*

Carmiggelt/Van Trierum 2005

Carmiggelt *et al.* 2005

Van Trierum *et al.* 1988

## 123. Rotterdam-RandstadRail-Centraal Station (05-42)

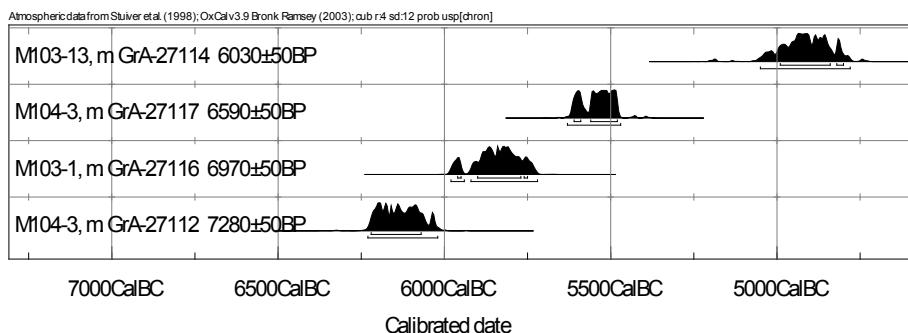
### *Site location:*

The site is located on a river dune, (*c.* 8-9 m -NAP) underneath the central station of Rotterdam in the western part of the Dutch Delta. The site was investigated by (mechanical) auguring and probing carried out between 2001 and 2003 (91.490-437.660).

### *Site description:*

The site is situated on a river dune or donk. This dune was probably part of a group of small dunes running E-W between Krimpen aan den IJssel and Schiedam. The dune was bordered on one side by a gully, partially filled with clay. Evidence for soil formation as well as evidence for anthropogenic activity was found on the dune. A black layer of *c.* 60 cm in depth yielded charcoal, burnt fish remains and pieces of flint, including a retouched artefact with cortex from the gully fill. Apart from that the site yielded macrobotanical remains (seeds) and pollen. Most of the former were found in the gully and comprise amongst others waternut (*Trapa natans*), hazelnut (*Corylus avellana*), and dogwood (*Cornus sanguinea*). These species might have formed part of the subsistence spectrum. Remarkable was the find of several pieces of twined vegetal fibre. These can possibly be interpreted as parts of fishing nets. Waternuts and hazelnuts might point to a seasonal presence during the autumn, although storage may extent this into winter. Radiocarbon dates of the macrobotanic remains point to exploitation of the area around 5500 cal BC. The pollen points to a presence of anthropogenic activity around *c.* 6000 cal BC. In this respect it is important to note that many ruderal weeds already appear to have been present before the introduction of agriculture. The fish remains, also roughly informative on this period, comprise nine species including sturgeon (*Acipenser sturio*), eel (*Anguilla anguilla*), pike (*Esox lucius*), roach (*Rutilus rutilus*), rudd (*Scardinius erythrophthalmus*), Common Dace (*Leuciscus leuciscus*), tench (*Tinca tinca*), perch (*Perca fluviatilis*) and salmon (*Salmo sala/S. truttae*). These species point to a predominantly freshwater environment and the presence of a nearby river as well as stagnant water. Furthermore pike is best caught in winter,

Fig. 108 Radiocarbon dates for Rotterdam-Randstad rail-Centraal Station



while sturgeon is typical for summer fishing. The project yielded a total of 10  $^{14}\text{C}$  dates. Four of these were sampled on macrobotanical remains, indicating a Late Mesolithic occupation of the site. The youngest date may also point to a presence during the Swifterbant period.

#### References:

Guiran/Brinkkemper 2007

### 124. Rotterdam-Groenenhagen-Tuinenhoven De Zwanen-Rietpark (13-78)

#### Site location:

Groenenhagen-Tuinenhoven is located on a donk (Pleistocene river dune), near Rotterdam in the west of the Dutch delta (98.099/433.561). The location is part of a larger dune complex north of IJsselmonde with a length of approximately 2.5-3 km.

#### Site description:

The site was investigated by augering and threatened areas have subsequently been excavated. Unfortunately only part of the dune could be excavated and this predominantly included the lesser well-preserved top of the dune. The site yielded no features but did yield charcoal, Swifterbant pottery, flint, stone and burnt bone. Charcoal analysis indicated the presence of a number of wood species, including ash, alder, oak, pine, lime and possibly willow and sloe. Oak and pine probably grew on the top, while alder and other species grew on the slopes. Only a limited number of carbonized botanical remains were recovered, including charred hazelnut shells and a stone of hawthorn. The former yielded a radiocarbon date of 4681-4450 cal BC (GrA-32299). Faunal remains include pig or wild boar, otter and large mammals, probably ungulates. West of the excavated site in a part that was researched earlier a burnt piece of red deer bone yielded a date of 4491-4355 cal BC (GrA-33544). It is furthermore remarkable that despite sieving the site yielded no fish remains. Further dates indicate that the sites in the research area were covered with peat between 3400 and 2900 cal BC.

Based on the radiocarbon dates and the finds the site was in use between 4900 and 3400 cal BC. The characteristics of a part of the Swifterbant pottery complex indicate a presence during the early part of this cultural phase (5000-4600 cal BC). Another part of the ceramics and the radiocarbon date of the red deer bone

indicate a presence during the middle phase of the Swifterbant culture (4600-3900 cal BC). The site yielded a number of finds, including 650 fragments of burnt and unburnt bone, over 600 pieces of charcoal and a number of macroremains, 811 sherds (4745 g) and 1182 lithics (3305.5 g), including 1167 flints (1918.7 g). A total of 415 sherds could be determined. This yielded a minimum of 19 pots, of which approximately 10 were decorated (spatula and finer impressions, roughening etc.). The pottery is interpreted as reflecting short-term local fabrication and use of storage and cooking vessels. The lithics may be attributed to the Swifterbant culture. Part of the artefacts was fabricated on local flint. This mainly comprises flakes and shorter blades. Some of the larger blades were probably transported to the site and some of these were made on northern type flint. Southern types of flint (Rijckholt/Spiennes and Hesbaye type flint were also documented). Most of the flint was worked locally. Tools included retouched pieces, points and scrapers. The site yielded no distinct Mesolithic finds. Most of the finds were situated in two concentrations on the northern side of the excavation trench in the east and west. These concentrations comprise both faunal remains and lithics. Burnt artefacts may indicate the presence of two hearths. There are some differences in artefact typology and raw material use between both concentrations. A third concentration was situated on the eastern side of the trench.

Based on the absence of features or a distinct find layer it is argued that the site was probably in use as a special activity site for brief periods of time. Activities included hunting, gathering, cooking, flint working and pottery fabrication and use.

#### *References:*

Meirisman/Dorst 2005  
Meirisman 2006  
Schiltmans *et al.* 2013

### **125. Rotterdam-Van Ghentkazerne (13-82)**

#### *Site location:*

The site is located on a levee in the western part of the Dutch delta, in the eastern part of Rotterdam (95.785/435.880).

#### *Site description:*

The site was discovered by augering and yielded charcoal, pottery, flint, stone and unburnt fish remains of sturgeon and carp-family. A <sup>14</sup>C date will be available. Charcoal from the find layer yielded a date, GrA-32973, 5055 ± 35 BP, calibrated between 3954-3780 cal BC (2 sigma). This indicates the site may probably be attributed to the Swifterbant culture.

#### *References:*

Lelivelt 2006<sup>b</sup>

## 126. Schiedam

### *Site location:*

The site was located near Rotterdam within peat sediments. Reconstruction of the landscape indicated an estuarine environment with freshwater tidal deposits, creeks and levees.

### *Site description:*

A point-based fragment of pottery was found with organic temper and a smoothed surface, as well as an antler object. On the basis of the relative rise in sea-level, combined with the depth of the peat layer a date *t.a.q.* date of 3800 cal BC is proposed. The site has become the first discovered SWB site in the Netherlands after being interpreted as belonging to the VL group.

### *References:*

Louwe Kooijmans 1974  
Modderman 1955  
Raemaekers 1999  
Van Regteren Altena *et al.* 1962/1963

## 127. Schokkerhaven-E170/171

### *Site location:*

The site was located on the slope of a river dune in the valley of the IJssel, in the current Noordoostpolder. The dune was part of a more elaborate dune complex, north of the former IJssel valley.

### *Site description:*

The finds were located in cover layers of peat on the slope of the dune and extending some ten meters around it. Flint (scrapers, trapezes, borers and polished axes with oval cross section) and pottery (S-shaped mainly grit-tempered (as well as organic), fingertip and spatula decoration) was found, as well as bones of aurochs, wild boar, elk, beaver, red deer, wild horse and fox. With respect to

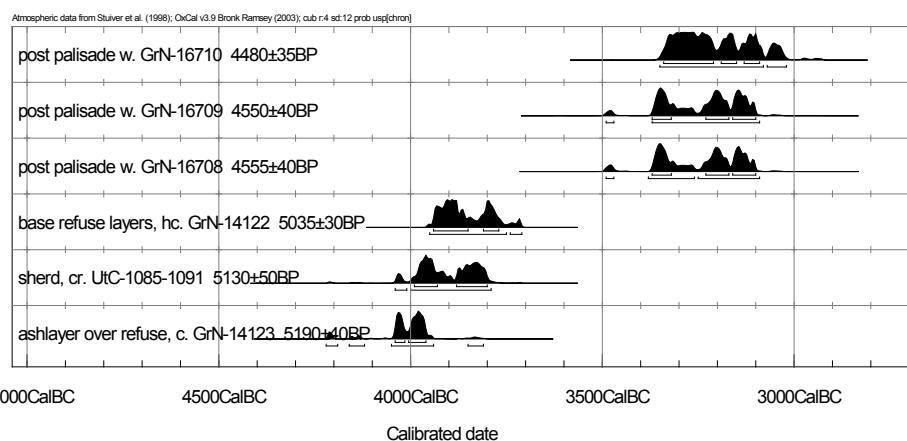


Fig. 109 Radiocarbon dates for Schokkerhaven-E170/171.

the axes Ten Anscher (2012, 507) mentions an axe with a round or oval cross section (*Walzenbeil*) were found. This may be indicative of southern contacts. Furthermore remains of emmer wheat and naked barley were found. The site also yielded remains of a wooden structure. Six <sup>14</sup>C dates were available. They date to the Late SWB period, although the stratigraphic correlation seems incorrect. Foodcrusts on the sherd were dated six times, represented is the combined date. The other three dates stem from a TRB palisade, the posts of which were driven into the Swifterbant layer.

*References:*

Gehasse 1995  
Hogestijn 1990  
Hogestijn 1991  
Lanting/Van der Plicht 1999/2000  
Raemaekers 1999  
Raemaekers 2005<sup>a,b</sup>  
Ten Anscher 2012

## **128. Soest-Burgtheaterparkplatz**

*Site location:*

The site is located in the centre of the town of Soest in the German *Bundesland* of Nordrhein-Westphalen. Geologically the area is characterised by a small patch of loess within the sandy uplands.

*Site description:*

The site yielded three non-contemporaneous ditches forming part of a MK-enclosure. Furthermore a large number of sherds were recovered, mainly tempered with grit and falling within phase III-IV/V (Lüning 1967). Furthermore flint was found as well as remains of barley, emmer, einkorn and bones of cattle, pigs and ovicaprids. The site is roughly dated between 3900-3600 cal BC, which seems to correspond to the typological aspects of the pottery assemblage. As opposed to Osterwick, there is no evidence for TRB influence in Soest, indicating the site may have been on the perimeter of Funnel beaker influence.

*References:*

Knoche 1998

## **129. Staphorst-Olle-Meppelerdiep**

*Site location:*

The site is located along the bank of the Meppelerdiep in the Dutch province of Overijssel. The finds were situated slightly south of a river dune which was partially overgrown by peat.

#### *Site description:*

The site yielded the top (cutting edge) of a flat broad adze of grey-green layered stone (possibly amphibolite). Apart from the top the adze has only been partially polished (remaining) L: 70 mm, W: 78mm, H: 13mm). Other finds were found partially in situ and partially in the fill and comprised stone and flint tools (predominantly located in the sand) as well as antler tools (predominantly located in the peat). The latter separation is probably of a taphonomic nature. The site is of interest since it may point to early northern contacts between Late Mesolithic or Swifterbant communities with the Neolithic farmers of the LBK culture. Unfortunately the association is not clear.

#### *References:*

Van der Graaf 1987  
Verlinde 1979

### **130. Swifterbant-S4**

#### *Site location:*

The site is located in parcel G43 of the reclaimed south-eastern area of the IJsselmeer, Flevoland. S4 is situated on a levee bordering a side creek and separated from the well-known site S3 located east of this creek. The distance between both sites is approximately 60 m (see also Devriendt 2013).

#### *Site description:*

A small test-pit was established in 1978 (16 m<sup>2</sup>). In total three occupation layers could be distinguished separated by intermediate strata representing flooding and erosion (e.g. Devriendt 2013; see also Deckers 1979). The old excavations yielded a hearth as well as a concentration of hazelnuts. Finds included 244 flint artefacts, two of which were found in the lower layer. Apart from cores, blades, flakes, borers, scrapers and retouched pieces, a flake of a polished axe was also found. Bienenfeld (1986, 277) found use-wear evidence for soft plant working, hide processing, bone or antler working and wood working, however no unambiguous sickle blades were found.

In 2005 a new trench was opened (5 x 25.5 m). Excavation took place in spits and part of the material was sieved. According to Deckers (1979; see also Devriendt 2013) the pottery assemblage comprised 476 sherds. The site is rich in finds and comparable with S3. The 2005 campaign yielded flint (amongst others scrapers and trapezes), pottery and natural stones (amongst others polishing and grinding stones) and concentrations of charred remains of naked barley. Furthermore a child-burial was discovered indicating a cemetery may be present. A pointed wooden stake was found in the area next to the levee.

During the campaign of 2007 micromorphological analysis of thin sections taken from the soil in combination with macroscopic evidence in the field indicated the potential presence of a small field adjacent to the creek. In the level and section of the excavation square an irregular patterning and mixing of two soil types could be observed, displaying a longitudinal pattern. The evidence from the section points to overturning of the soil. The field was situated on top of an older

habitation layer and was stratigraphically flanked by layers of anthropogenically deposited bundles of reed. It may be hypothesized that the (regular) flooding of the area by the nearby creek, provided fertile conditions for cultivation. An augering campaign established that the potential cultivation marks covered c. 180 m<sup>2</sup> and could maximally have covered c. 1000 m<sup>2</sup>. Underneath and on top of the field as well as through the supposed cultivation layers many small postholes or stakeholes were found. Other evidence for the presence of fields was provided by the presence of certain diatoms typical for arable fields, as well as the macroremains and pollen of naked barley (*Hordeum vulgare*) and species of field weeds. There is evidence more fields may have been located in the vicinity. While it is possible cereals may have grown on the field there is thus far no absolute evidence for this.

*References:*

Bienefeld 1986  
Deckers 1979  
Devriendt 2013  
Huismann/Raemaekers 2008  
Raemaekers *et al.* 2005

### **131. Swifterbant S31/32/33**

*Site location:*

These sites are located on the levee in parcel G44 on the opposite side of the creek facing S3/5/6.

*Site description:*

The locations were discovered during the 1972/1973 coring campaign and re-examined by Fokkens in 1977. No further information is available.

*References:*

Devriendt 2013  
Hacquebord 1976  
Fokkens 1978

### **132. Swifterbant-S41**

*Site location:*

The site is located on a levee in parcel G44, south of S31, at the fork of a creek.

*Site description:*

The location was discovered by Fokkens in 1977. A stratigraphic section of the ditch-slope was documented and several sherds and stone (flint?) artefacts were documented.

*References:*

Devriendt 2013  
Hacquebord 1976  
Fokkens 1978

**133. Swifterbant-S42/43**

*Site location:*

The site is located on a levee in parcel G44, south of S31 and west of S41

*Site description:*

The location was discovered in the 1972/1973 coring campaign and re-examined by Fokkens in 1977. No further information is available.

*References:*

Devriendt 2013  
Hacquebord 1976  
Fokkens 1978

**134. Swifterbant-S51**

*Site location:*

The site is located in parcel G16 of the reclaimed south-eastern area of the IJsselmeer, Flevoland. S51 is situated on a levee 750 m northwest of S2 on the main creek.

*Site description:*

Half of the settlement was lost to erosion. The remainder yielded a find layer up to 25 cm in thickness. A trench of 5 x 25 m was excavated yielding two find concentrations. (Devriendt 2013 mentions two trenches both with extensions covering a total of 133.6 m<sup>2</sup>). The culture layer was thickest at the eastern side of trench 1. Excavation took place in spits and some of the soil was sieved. According to Deckers (1979) a major part of the sites was washed away and only a strip of two meters was left *in situ*. The site yielded pottery and 225 flint artefacts comprising 4 cores, 84 flakes, 61 blades and 76 other items. The tool assemblage yielded 41 tools dominated by retouched flakes, blades and scrapers and including two trapezes. Bienenfeld (1986, 277) found use-wear evidence for soft plant working, hide processing, bone or antler working and wood working. At least two concentrations were visible in the flint assemblage. Furthermore a hearth was found in the profile underneath the find layer, separated by a sterile clay layer. Finally a feature comprising a bone axe, a wooden shaft, two stones and two flint artefacts was found next to one of the concentrations.

It may be possible to relate the hearth to a pioneer phase of settlement or envisage it within a special activity context before occupation of S51. Horizontally two flint concentrations may be distinguished (see Devriendt 2013).

*References:*

Bienzenfeld 1986  
 Deckers 1979  
 Devriendt 2013  
 De Roever 2004

## 135. Swifterbant-S61

*Site location:*

S61 is located in parcel G76 in the reclaimed south-eastern area of the IJsselmeer, Flevoland. It is situated on a river dune some 500 m south of the levee sites.

*Site description:*

The site was excavated in 1978. A trench (3 x 14 m) was dug on the slope of the dune (Other sources speak of a trench of 5 x 15 m; see Devriendt 2013), narrowing down to 3 m in the south. Peaty and clayey layers covered the foot of the dune, yielding plant remains and evidence for erosion. The site yielded mainly flint and pottery of which most was found on the slope of the dune and might have been reworked. In general most of the flint was found below the pottery and typologically also is partly of a Mesolithic character. Remarkable is the find of three fitting fragments of an amber bead (Devriendt 2013). Three layers could be discerned and three  $^{14}\text{C}$  dates are available. Two of these date to the SWB period. One of these is contemporaneous with the occupation of the levees. The other date is indicative of Late Mesolithic occupation. Layer C can be dated to the Late Mesolithic and layer K to the SWB period. Typologically the character of layer B is not clear.

*References:*

Deckers 1982  
 Devriendt 2013  
 De Roever 2004

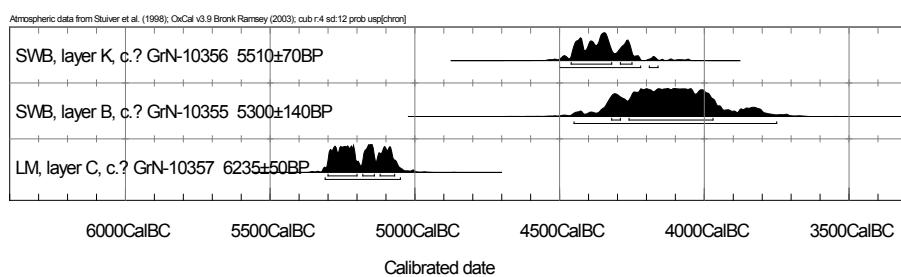


Fig. 110 Radiocarbon dates for Swifterbant-S61.

## 136. Swifterbant-S71

### *Site location:*

S71 is located in parcel H129 and is the northernmost river dune in the documented area. It measures some 350 m in length and consists of three heights.

### *Site description:*

S71 was discovered during the 1977 prospecting campaign. In a ditch section a concentration of charcoal was discovered. In 2000 RAAP investigated the site. This yielded two flint artefacts as well as charcoal originating from 14 different augerings around the highest parts.

### *References:*

Devriendt 2013  
Raemaekers 2000

## 137. Swifterbant-S81/82/83/84 (Klingenweg)

### *Site location:*

These sites are located on a high river dune (c. 1.2 km long) in the north of the documented area, currently bordering on Lake IJssel. The sites of S81-84 are located in an eastern-westerly direction within an area of approximately 450 m<sup>2</sup>.

### *Site description:*

S81 is the easternmost location comprising flint and pottery. S82 measured c. 30 m and also yielded pottery and flint, including a scraper. S83 was investigated in 2002 by the Dutch State Service of Archaeology with two 2 x 2 m test trenches. The site has a surface of 70 x 15 m. The soil was sieved and large finds were documented independently. In total 125 flint artefacts and some charcoal was found as well as five hearth pits. The presence of B-points in the lithic assemblage indicates the partially Mesolithic occupation of the site. Much of the flint (of northern origin) was broken and/or burnt; although it is unlikely this was intentional. Most of the assemblage is based on flake-technology (60%), blades only comprise 5%. Technologically the assemblage has been dated to the Middle Mesolithic. According to Jordanov (2005, 42-43) this is further confirmed by the presence of B-points and triangles (although these have been used later on too). A Late Mesolithic date is indicated by <sup>14</sup>C dates from the hearthpits.

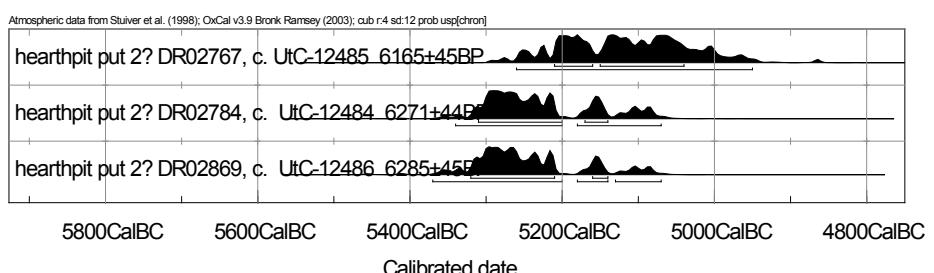


Fig. 111 Radiocarbon dates for Swifterbant-S81/82/83/84.

The cores indicated the area between S82 and S83 was also used over a length of *c.* 55 m. The westernmost site S84 yielded a number of flint artefacts. Cores taken within the space between S83 and S84 indicated the presence of another archaeological site measuring *c.* 100 x 35 m. Overall the separate locations may have been part of one and the same site. Jordanov (2005) distinguishes four separate clusters). Unfortunately the higher parts of the dune have been eroded, although features such as hearthpits may still be present.

*References:*

Devriendt 2013  
Jordanov 2005

## **138. Swifterbant-Dronten-Bisonweg**

*Site location:*

The site (coordinates 171302/506996) was discovered during construction work for the provincial road N307 between Lelystad and Zwolle in the province of Flevoland. From June to November 2010 large-scale excavations were conducted by Archol (Leiden) and ADC. The site is situated on a SW-NE oriented coversand dune.

*Site characteristics:*

The site can be dated to the Mesolithic and Early to Middle Neolithic period. It yielded some 700 hearthpits, approximately 100.000 pieces of flint and 98 kg of charcoal. The oldest finds date to *c.* 8800 cal BC, the youngest to 3500 cal BC. The majority of the occupation took place between *c.* 8000 and 5000 cal BC. The site also yielded the remains of an inhumation of a woman, dated between *c.* 5500-4800 cal BC. The intensity in occupation characterised by the digging of hearthpits increased significantly during the last phase of the Mesolithic. The burial was one of the last activities that took place before the dune drowned in the surrounding peat. The location by then was to wet for occupation and probably mainly used as a special activity site.

*References:*

Hamburg *et al.* 2012  
Müller *et al.* 2012

## **139. 's-Hertogenbosch-Maaspoort**

*Site location:*

The site was located in a suburb of Den Bosch in the southern part of the Dutch central river district.

### Site characteristics:

The site of Maaspoort was discovered by amateur archaeologists and is made up of three locations. Two of these, depots of sand west of an artificially dug reservoir and artificially deposited sand north of the Maaspoort road, are locations of secondary, re-deposited material. The other location is formed by the upper part a section on the northern bank of the reservoir. Finds included decorated bones of a Mesolithic age as well as fauna, flint and a bead. The primary site is situated in an area of donken and coversand ridges intersected by overbank areas and gullies filled with clay and peat. The site itself was located on the slope of a donk bordered by a 2.5 m deep gully filled with clay, peat and washed-in sand of the donk. A radiocarbon date of the nearby peat yielded an age of  $6610 \pm 100$  BP. Previous excavations yielded c. three hearths and a number of A- and B-points (see Lanting/Van der Plicht 1997/1998, 147). The hearths were dated and, according to Lanting and Van der Plicht (1997/1998), yielded dates that were probably too young due to insufficient pre-treatment. On the other hand, since the site also yielded Late Mesolithic material and there is no information on association, the dates may be correct.

In 1989 and 1990 the site was partially excavated. The southern slope of the donk yielded flint distributed over an area of 20 x 6 m. Further north the area was disturbed. The gully yielded charcoal. Excavation took place at the location of the primary site where the bone material had been found as well as on the body of the donk itself. In total 106 m<sup>2</sup> were investigated with nine trenches. The soil was sieved in squares of 25 x 25 cm. The first location yielded no further Mesolithic finds, probably due to recent disturbance related to the exploitation of the sand pit. The excavation on the body of the river dune measured 50 m<sup>2</sup> and yielded flint, stone, charcoal and several fragments of pottery. The overall find density was low. Furthermore four hearths were uncovered. Unfortunately the layer with finds did not extend into the peat, also due to post-depositional disturbance. The finds date to the Mesolithic and Neolithic. Part of the dune was eroded by a meandering stream. Erosive deposits of this stream contained artefacts, comprising flint, bone, Wommersom quartzite and pottery. One of the sherds could be attributed to the Michelsberg culture indicating erosion will have taken place during or after the Middle Neolithic. Most of the faunal remains were fluvially transported. Remarkable was the complete skeleton of a turtle (*Emys orbicularis*). The find of a Late Neolithic sherd is indicative of the end of the erosive phase. The peat probably dates to the Bronze Age of Iron age. The excavation indicated the Mesolithic bones probably derived from a secondary location. The site is of importance because it yielded (decorated) bones dating to the Mesolithic, including the Late Mesolithic. Domesticated fauna at the site

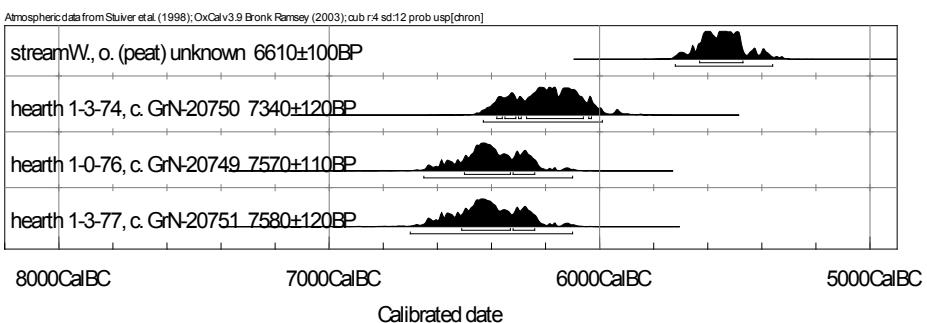


Fig. 112 Radiocarbon dates for 's Hertogenbosch-Maaspoort.

probably originated from a higher level. The bones and antlers comprised several tools including axes and chisels. One of the axes was decorated in pointillée-style. The sites also form a point of reference for both Hardinxveld sites, because of its partially similar spectrum of finds, and because of its location on the northern edge of the southern coversand landscape. The site of Maaspoort may have formed an upland component in the Late Mesolithic settlement system in the area. It demonstrates the Hardinxveld sites should not be interpreted in isolation.

*References:*

Verhagen 1991  
Verhart/Wansleeben 1991

## 140. Tilburg-Kraaiven

*Site location:*

The Late Mesolithic site of Kraaiven was located on a coversand ridge with a width of approximately 90 m. The archaeological site comprised an area of more than one ha.

*Site description:*

The site consists of numerous separate concentrations of finds lying close to each other. Some 30 of these were excavated or surface collection and documentation took place. Unfortunately the finds are distributed over ten different collections (other site names such as Tilburg-Pompstok, Labé and 35a probably also refer to the Kraaiven site). Since 1957 some 82000 artefacts have been collected, of which 5300 were tools. The abundance of sites points to a history of frequent re-occupation.

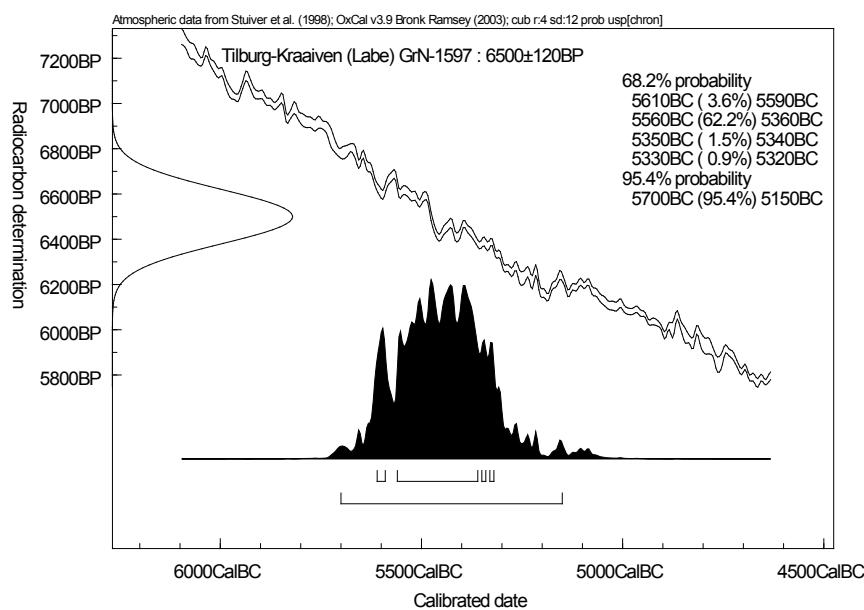


Fig. 113 Radiocarbon date for Tilburg-Kraaiven.

The site yielded approximately seven  $^{14}\text{C}$  dates. Only one of these dates to the correct period.

*References:*

Arts 1988  
Lanting/Van der Plicht 1997/1998  
Verhart/Arts 2005

## **141. Toterfout-Halve Mijl**

*Site location:*

The site was situated in the Bronze Age burial field between Toterfout and Halve Mijl. An excavation was conducted by the IPP measuring 9 x 10 m, with three separate extensions north and south of this pit.

*Site description:*

The site yielded 607 pottery sherds, mostly tempered with quartz (but also sand and chamotte), 76 pieces of flint, including axe fragments, scraper, a core rejuvenation pieces, a borer and a leaf-shaped arrowhead and 59 pieces of natural stone, including two rubbing stones and two stones with traces of red ochre. At least one of the sherds has a characteristic perforation underneath the rim. Most finds were situated in the north-western extent of the pit, indicating only part of the concentration was excavated. No features were uncovered. Groenman-van Waateringe studied a number of pollen spectra derived from samples at the site. There are no indications for large-scale deforestation. The site may be attributed to the Vlaardingen culture, but its southern location and the quartz temper would also fit an attribution to the Stein group.

*References:*

Van Beek 1977

## **142. Tietjerk-Lytse Geast I**

*Site location:*

The site of Tietjerk-Lytse Geast I is located in Friesland. Together with several other sites TLG I was located on one of many sandy hillocks. These hillocks formed dry places adjacent to valleys with open water and peat formation. The sites are located at a distance of roughly 10 km from Bergumermeer S64.

*Site description:*

TLG I and the other sites were discovered by amateur archaeologists and subsequently documented by surveying. The BAI excavated a trial trench. Other excavations were undertaken and documented by the amateur archaeologist(s). The site yielded several concentrations of flint, but, except for hearths, no other features or organic remains. The charcoal samples yielded the following dates.

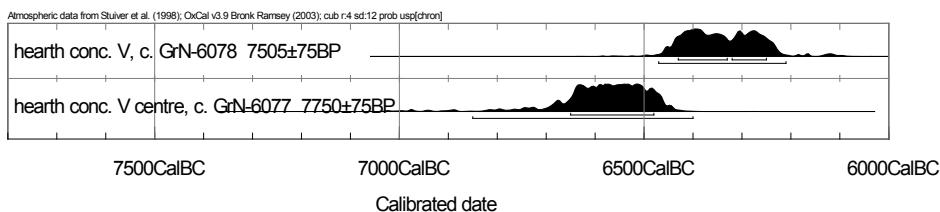


Fig. 108 Radiocarbon dates for Tietjerk-Lytse Geast.

The  $^{14}\text{C}$  dates of TLG I may be too young due to insufficient pre-treatment (Lanting/Van der Plicht 1997-1998, 138). Huiskes (1988) furthermore subdivided the site into 20 separate concentrations comprising 9 round and 11 oval concentrations. Due to the working method and subsequent disturbance, slightly less than half of the original number of concentrations was available. A spatial and functional analysis of these concentrations did not yield many results due to the small numbers of artefacts that were attributable per distinct concentration (3 to 145 per concentration). Of the 6454 artefacts, only 653 could be attributed spatially. In general the site is assumed to be a reflection of (a series of) extraction camps.

*References:*

Huiskes 1988  
Lanting/Van der Plicht 1997/1998

### 143. Turnhout-Zwarde Heide

*Site location:*

The site is located in the Antwerpian Campine area and situated on a flat coversand landscape, comprising low dune ridges and shallow fens. The site was discovered by surveying and no excavations took place.

*Site description:*

The extent of the artefact scatter is *c.* 2,300 m<sup>2</sup>. Within this a concentration of several tens of square meters was located. Both the material from the scatter and the concentration is homogeneous and in total amounts to 2,177 artefacts of flint, Wommersom quartzite, sandstone and chert. Most of the flint was obtained from local rolled nodules. Flakes from the main component of the debitage. Remarkable scrapers dominate the toolkit with 30%, while trapezes only amount to 3%. This may be indicative of a deviant function of the Turnhout site, more aimed at domestic instead of hunting activities.

*References:*

Maes/Vermeersch 1984

## 144. Veen-Kaninenberg

### *Site location:*

The site is located near Veen in Nordrhein-Westfalen. It is a multi-period site situated in a coversand area. The subsoil is described as a typical lower terrace formation in a river valley, consisting of sand and gravel. This type of soil is not very fertile.

### *Site description:*

During extensive excavations in the 1970's finds from different periods were recovered, including Mesolithic and Neolithic artefacts. A Late Mesolithic point and several microburins are indicative of hunter-gatherer activity. The Early Neolithic assemblage consists of both LBK and Limburg sherds. The LBK ware was mainly of younger character. Furthermore Bandkeramik flint artefacts and tools were found. Remarkably most of the artefacts were found in a pit. The site also yielded later early Neolithic finds in the form of decorated and undecorated pottery attributable to the Großgartach phase of the Rössen culture. The location of the latter finds was not in the vicinity of the LBK finds. Veen is of interest because of its Early Neolithic finds. Especially the presence of an LBK pit far north of the loess belt is remarkable. More (remnants of) pits may have been present, yet none could be specifically dated to the Early Neolithic.

### *References:*

Hinz 1974

## 145. Veldhoven-Habraken

### *Site location:*

The site of Velhoven is situated in the south of the province of Brabant between Velhoven and Eindhoven, in the Campine coversand region. The site was excavated by VUhbs in 2010.

### *Site description:*

The 2010 campaign at the site yielded the remarkable discovery of (rather vague) features that could be attributed to the Neolithic. In combination five houseplans could be identified that date to the early third millennium cal BC and may be attributed to the Stein/Vlaardingen culture. The houseplans are unique since no other houseplans have been discovered so far for this period. Features dating to the Neolithic usually are often no longer visible in the sandy soils. The discovery of these houseplans and their relatively large size throws new light on the type of agricultural occupation in the coversand area for this period. Apart from the Neolithic house plans the site also yielded ten house plans (partially consecutive, partially contemporaneous), dating to the Middle Bronze Age and a Medieval house site.

### *References:*

Van Kampen/Van den Brink 2013

## 146. Ven-Zelderheide

### *Site location:*

The site is located in northern Limburg near Nijmegen. The site is situated in an area with sandy ridges and lower areas shaped by Meuse and Rhine and covered with clay. The site was discovered by amateur archaeologists. In 1989 an area of c. 15m<sup>2</sup> was excavated.

### *Site description:*

Apart from several vague trench-like features the site yielded 330 Early Neolithic sherds as well as 24 pieces of flint. The pottery was rather thin, hard and well-finished. The outside was of a reddish colour and the inside black. Temper comprised quartz, organic material, sand and chamotte. Shapes comprised round bottoms and wide rims. In total five rim sherds were found, three of which had *Randkerbung*. Other sherds had fingertip impressions, or decoration with grooves or lines. Two wall fragments were decorated by filled triangles. Other elements involved spatula decoration and *Doppelstich*. Lugs and perforated ears were also found. The assemblage also yielded a fragment of a baking plate as well as two fragments of adobe.

The pottery in temper and shape and even more in decoration could be characterised as post LBK. The presence of baking plates and the character of the decoration points to the later stages of the Rössen culture, more specifically the Bischheim phase. Diverging elements are the absence of *Furchenstich* decoration and the important contribution of organic temper.

The lithic assemblage comprised flake-scrappers, a drill, a truncated blade as well as a fragment of a sickle blade. Further evidence from surveying activity in the area substantiated the finds from the excavation both for lithics and ceramics. These finds also comprise a flake axe, a fragment of a polished axe and six points. Some admixture with other periods is possible for the lithic spectrum.

The importance of the Zelderheide site lies in the fact that it forms a rather substantial assemblage dating to the Bischheim phase of the Rössen culture, located in the very north of Limburg. From the perspective of the Swifterbant communities it forms an important indication for the proximity of interaction that may have taken place. Furthermore the presence of a sickle blade is an important argument for the presence of agriculture in the area.

### *References:*

Verscharen/Mooren 1993

## 147. Voorschoten-De Donk

### *Site location:*

The Vlaardingen site 'De Donk' is located on the northern tip of a narrow beach barrier, west of the well-known Voorschoten-Wateringen beach barrier at a distance of c. 2 km from the Rhine-Meuse estuary.

### *Site description:*

The site was excavated in 1986 by students of the Leiden University Faculty of Archaeology and amateur archaeologists from the AWN section of The Hague and the Rhine area. Later excavations were supervised by the IPL and the ROB. During this later campaign two trenches measuring c. 15 x 19-24 m were investigated. Excavation took place with shovel and occasional sieving. The site yielded three occupation levels separated by windblown sand. Finds were collected per m<sup>2</sup>. The oldest features at the site can be attributed to the Vlaardingen culture and comprise hearths, pits and postholes. Some of these features may be associated with the last phase of the Vlaardingen culture (VL-2b) because of the presence of PFB-elements in the pottery assemblage, yet most information seems to derive from the VL-1b occupation (Deckers 1991, 36). No distinct house plans have been found, but it is presumed houses may have been present higher up on the dune. Some of the features were located near a peaty depression, which may have contained water during occupation. There, four activity areas were identified. Southeast of the depression there is a zone with hearths, pits, postholes and much occupation debris. West and southwest of the depression there is an activity area associated with a row of postholes and two hearths. North of the depression there is an activity area with three hearths and northeast and east of the depression there is a concentration of postholes, associated with a waste pit and again much occupation debris (Van Veen 1989, 46). A considerable number of fish remains have been found, predominantly in two pits. Other organic remains were scarce and of a bad quality, but are dominated by pig, followed by cattle and sheep/goat. Butchering of pigs may have taken place year-round (see Deckers 1991). Apart from pole cat and otter no wild species have been found. The site also yielded some unidentifiable seeds and some hazelnut shells. Pollen samples were largely uninformative, but the direct surroundings of the site comprised of forests and grassland, ideal for pigs and cattle. The pottery assemblage comprised VL-1b and 2b pottery. A rather remarkable aspect was the occurrence of granite temper in both phases as well as in the PFB pottery. Since the use of granite as a tempering agent has previously been used as a distinguishing element between the TRB culture and the Vlaardingen culture, 'De Donk' sheds new light on this presumption (Van Veen 1989, 19). The flint assemblage mainly consists of artefacts made on rolled flint (Maaseitjes) and to some extent eluvial flint originating from Belgium. Some 6.5 % of the flint was fabricated on axe flakes. The tool assemblage comprises scrapers (N=90), points (N=8) (consisting of six stemmed points and two transverse points), borers or reamers (N=10) and retouched flakes and blades (N=35). Other stone comprises quartz used as temper, hammering stones, polishing stones and quartzite grinding stones. Most of these stones could be collected nearby (the coast) or at a limited distance in the river area or the Utrechtse Heuvelrug. Slate may have derived from the Ardennes, amber could have been collected in the northern coastal area and jet may even have derived from the coastal area in Northern France.

After the Vlaardingen-SGC(PFB) occupation had ended the site was covered with windblown sand and the groundwater table rose. The site was not reoccupied until the Middle Bronze Age. For this period several agricultural fields have been documented. Later on the site was used in the Iron Age and Roman period. For

the Vlaardingen-SGC(PFB) occupation only two  $^{14}\text{C}$  dates are available. The youngest of these is too young for the Vlaardingen occupation (see Lanting/Van der Plicht 1999/2000).

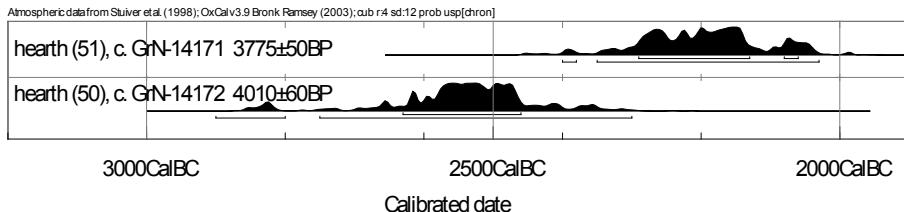


Fig. 114 Radiocarbon dates for Voorschoten-De Donk.

#### *References:*

Deckers 1991  
 Lanting/Van der Plicht 1999/2000  
 Van Veen 1989

### **148. Wateringse Veld**

#### *Site location:*

The site of Wateringse Veld is located on a low coastal dune in the Delfland area. The site was situated on top of back-barrier deposits.

#### *Site description:*

An augering campaign by RAAP yielded evidence for several localities with remains dating to the Iron Age and Roman period. Four times remains of a dunetop were documented with evidence of habitation. The depth below surface of these dunetops indicates they were probably inhabited during the Neolithic. One of the localities (vindplaats 6) yielded evidence of a rather high dunetop. Part of this site was excavated yielding many Neolithic features, but only very few finds. The site is expected to date to the Middle Neolithic Hazendonk period.

#### *References:*

Mol 2006  
 Oude Rengerink 1995  
 Oude Rengerink 1996

### **149. Weelde-Voorheide**

#### *Site location:*

The site consists of three localities and is located northeast of Weelde on the left bank of the stream the Aa. Weelde is located on a major Late Glacial dune sand belt in the Belgian Turnhoutse Kempen (Campine area). This area is characterized by a succession of dunes and fens.

#### *Site description:*

The third locality, Weelde-Voorheide 3 (WV-3) is located slightly northeast of WV2 and is located on and east-west oriented coversand ridge. Unlike WV-1 and WV-2, WV-3 is of a clear Late Mesolithic signature. Only part of the site was in situ. In total 148 m<sup>2</sup> was excavated, yet no distinct concentration could be outlined since all squares yielded artefacts. The site yielded 6000 lithic artefacts most of which were made on rolled heterogeneous terrace gravel. Some 5% of the artefacts were of Wommersom quartzite. Quartz, quartzite and sandstone were also prevalent. Most of the Wommersom artefacts were made in Montbani-style, while the other artefacts were Coincy style. The toolkit comprised cores, some 50 microburins, scrapers, burins etc. Trapezoids dominate the microliths. Three LBK-like points were found.

Remarkable the site also yielded some 60 sherds found in the undisturbed soil horizons. Three different groups could be identified based on the temper, although bone-temper dominates. One of the sherds is drilled, one other is decorated with parallel lines. Although the location also yielded a fragment of a polished axe, the excavators believe the sherds are in situ and not intrusive. They date the site within the time span of 6300-5800 BP (5320-4600 cal BC).

#### *References:*

Verbeek 1996  
Verbeek/Vermeersch 1995

## **150. Well-Aaijen**

#### *Site location:*

The site Well-Aaijen site is located north of Venlo and is part of the Zandmaas project of the Maaswerken. The site is excavated (from 2012 onwards) due to the creation of a gully for rising water in relation to the potential flooding of the Meuse.

#### *Site description:*

Prospective research in 2011 in relation to the creation of the aforementioned gully demonstrated the presence of a number of Mesolithic and Neolithic sites that were situated amongst fine-grained sediments related to the flooding of the Meuse. This offered a high potential for uncovering in situ remains of stratified Mesolithic and Neolithic occupation as well as potential for the preservation of organic remains. Apart from other periods, radiocarbon dates indicate both Mesolithic and Early Neolithic occupation, the latter potentially related to the Rössen culture. The site is currently (2013) excavated by the ADC. The RCE consulted a number of specialists in the planning phase and monitors the progress.

#### *References:*

Zuidhoff/Van der Velde 2008

## 151. Westbroek-Velzerbroekpolder

### *Site location:*

The site is located near Westbroek in the Velzerbroekpolder polder (municipality of Velsen) in the province of North Holland. The site is situated on the northern tip of the Haarlem beach barrier.

### *Site description:*

This unpublished site, dating to Late Neolithic, contains remains of Vlaardingen and SGC occupation. Apart from sherds and probably flint the site yielded faunal remains of cattle and pig (see Gehasse 1995, pp. 235, note 47). Palynological investigations yielded pollen of *Hordeum* and *Triticum* type. The site also yielded features that may be interpreted as ardmarks, although (similar to Zandwerven) it is not entirely clear whether they should be attributed to the Vlaardingen or SGC-occupation of the site. The site is rather similar to the Vlaardingen sites of Voorschoten and Leidschendam. The site yielded one <sup>14</sup>C date from organic cooking remains on a Vlaardingen sherd. This dates the site between 3340 and 2870 cal BC at two sigma (UtC-1933; 4360 ± 70 BP).

### *References:*

Gehasse 1995  
Lanting/Van der Plicht 1999/2000

## 152. Wieringermeer-Dijkgatsweide

### *Site location:*

The site (coordinates: 132.925/546.550) is located in the northern part of the west of the Netherlands in the municipality of Wieringermeer.

### *Site description:*

The site was documented by RAAP and BIAX in 2007 after remains of a possible canoe had been found during digging activities (September 6, 2007). The state of the canoe was fragmentary and deteriorating which is why excavation was necessary. The site is situated in an area where coversand elevations have been documented in the subsoil, interspersed by lower area with tidal sediments (channels and gullies). The canoe has been found in one of these Holocene gullies next to the rather steep slope of a coversand elevation (pers. comm. Raczyński-Henk, December 2007). The canoe is embedded in clay and consists of a hollowed-out tree-trunk with a length of c. 7.4 m and a maximal width of 0.86 m. Its position in the soil was slightly oblique. The rim on the western side of the canoe is absent; several centimetres remain on the eastern side. Parts of the northern and western extents of the canoe are missing. A radiocarbon sample (GrN-30113; 4570±30 BP) confirms the Middle Neolithic date (3492-3115 cal BC) at 2 sigma. The canoe was made of oak wood. The canoe has been found in the vicinity of the TRB site

of Slootdorp which is slightly younger and may be associated with habitation in the coversand elevations of the Wieringermeer and Texel, or with the salt marsh area of Western Friesland.

*References:*

Kruidhof *et al.* 2007

## **153. Wijgaarden-De Wingerdse Donk**

*Site location:*

The Wingerdse Donk (110.228/429.347) is located in the municipality of Graafstroom in the western part of the Dutch delta area (province of South Holland).

*Site description:*

The site was documented by RAAP because of the planned construction of a compressor station by the Dutch Gas Union. The preliminary research and the subsequent augering campaign (2007-2008) led to the discovery of a fossil river dune or donk. The donk seems to have been located in a peaty landscape transsected by several channels possibly belonging to the Schoonrewoerd system. In the augerings on the dune archaeological indicators were found, sometimes at different depths. Most of these indicators consisted of pieces of charcoal as well as burnt resin. Although it cannot be ruled out these indicators have a natural cause. Charcoal was, however, found in distinct concentrations. The augerings also yielded several small nodules of burnt clay, most probably of anthropogenic origin as well as small fragments of burnt bone. One piece of flint was also found, which may have been polished. Other finds include broken and burnt hazelnut shells and broken quartz, although the latter is not unambiguously anthropogenic. In total four separate locations were found on the dune that may prove to be archaeological sites. Of these locations 1 is most promising since layers with archaeological indicators have been found both on the dune and in the surrounding peat. This site will be protected. Location 4 yielded the only piece of flint. Although no absolute dates are available it is possible the site dates to the Late Mesolithic or Neolithic. This has been based on geological observations of the height of potential archaeological layers on the slope of the dune. Location 1 yields a potential date between 5250 and 4380 as well as between 4910 and 4450 cal BC. Location 2 may date between 5370 and 5070 cal BC and site 4 between 5660 and 5370 cal BC.

*References:*

Raczynski-Henk/Jansen 2009

## 154. Willemstad-Volkerak

### *Site location:*

The site was found in 1966 during the construction of large sluices near Willemstad (Volkerakssluizen) (N. Brabant).

### *Site description:*

The site was located in a freshwater tidal estuary where the periodical swift current stunted the growth of peat. It was thus located in the vicinity of the sea, but out of reach of salt water. Local workers found a small figurine between the roots of an oak tree on a sand ridge of Pleistocene date. The figurine was of an anthropomorphic character, measured 12.5 cm in height and was made of oak wood (*Quercus*). It was dated to approximately 5400 cal BC. Some (see Lanting/Van der Plicht 1997/1998, 153-154) doubt whether the figurine is genuine.

### *References:*

Van Es/Casparie 1968

Lanting/Van der Plicht 1997/1998

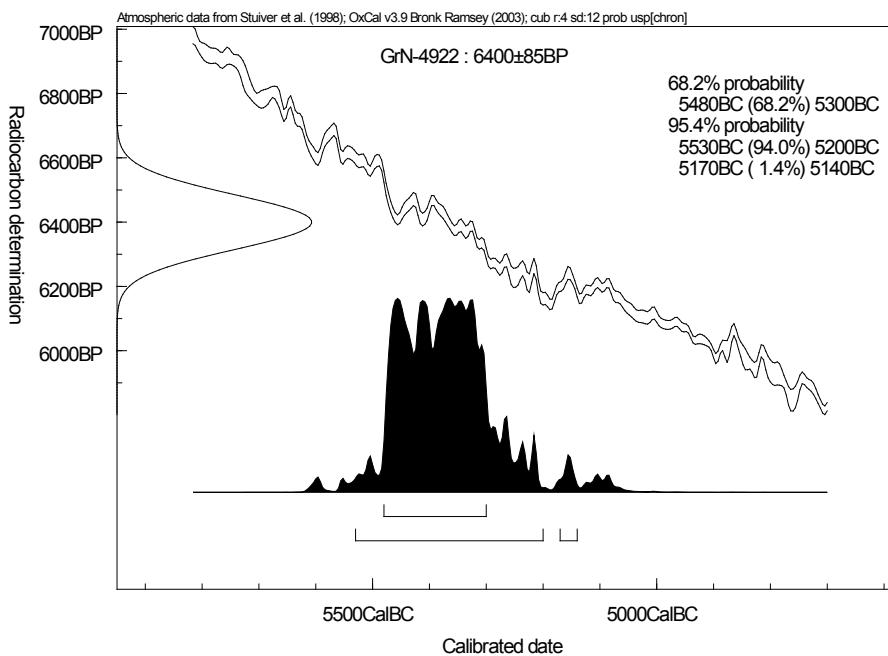


Fig. 115 Radiocarbon date for Willemstad.

## 155. Winsum-Wetsingermaar

### *Site location:*

The site is located on a boulder clay outcrop in the province of Groningen. The outcrop was covered with peat around 3700 BP.

### *Site description:*

After the initial discovery of several isolated finds an augering campaign took place and a section was documented by the GIA in 2000. The section contained a find layer comprising charcoal, burnt bones, flint and pottery. The sherds that were found may belong to the Late Swifterbant period or the early TRB period. This is mainly based on the fact of a specific decoration pattern consisting of vertical 'rope' impressions. The site may thus be interpreted as 'transitional' or represent Swifterbant occupation near a TRB settlement area. The flint that was found is of northern origin and production may be characterised as flake-based. It is possible the location was visited for flint extraction. One  $^{14}\text{C}$  date was available.

### *References:*

Feiken *et al.* 2001  
Raemaekers 2005<sup>b</sup>

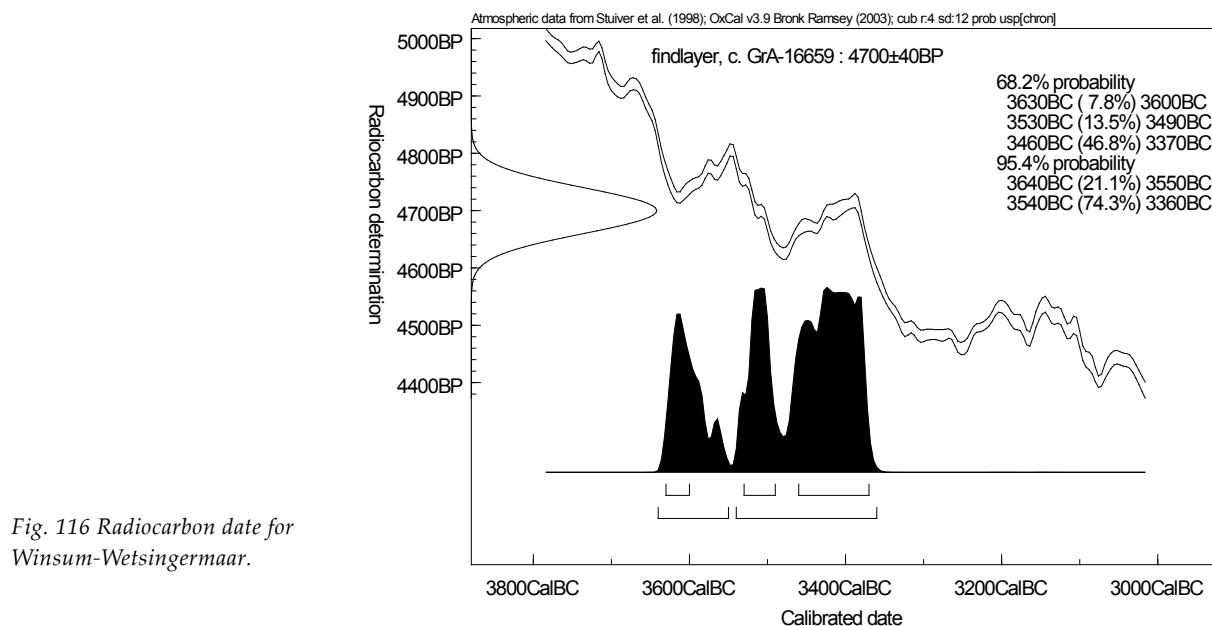


Fig. 116 Radiocarbon date for Wetsingermaar.

## 156. Winterswijk

### *Site location:*

The site was located on a sand ridge in a wetland environment in the east of the Netherlands (province of Gelderland).

### *Site description:*

Among other finds one Neolithic sherd was found. The rim-sherd was tempered with organic material and quartz-grit. Impressions of two fragments of cereals point to a rachis internode of emmer and a grain of barley. Typologically the sherd corresponds with Hazendonk 1 and 2 as well as Swifterbant finds and may hypothetically be dated between 4240 and 3700 cal BC.

### *References:*

Raemaekers 1999

Schut 1984

## 157. Ypenburg-Gavikavel

### *Site location:*

The site is located on a dune (the GAVI-dune), situated on a coastal barrier in the western part of the Netherlands in the vicinity of The Hague. In the vicinity of the site are several other locations dating to the same (Vlaardingen culture) period or earlier (Hazendonk group), most notably Ypenburg, Rijswijk-A4, Wateringen-4, Schipluiden-Noordhoorn, Voorschoten-Boschgeest; Voorschoten-De Donk and Leidschendam.

### *Site description:*

The area was initially documented by RAAP. Several sites were discovered. The former coastal barrier in the area was eroded by a gully (the Rijswijk-Zoetermeergulley), which in turn was cut-off from the sea by the formation of the Rijswijk beach barrier. This resulted in an area comprising salt marshes with initial peatgrowth in which the tops of the old dunes formed ideal locations for settlement (see Houkes/Dorenbos 2004). Gavikavel is situated on one end of the Rijswijk-Zoetermeer gulley, Ypenburg on the other. The archaeological service of the municipality of Rijswijk further investigated the site with six test trenches (E-W and N-S). These were excavated in 2 x 2 m and 50 x 50 cm squares, half of which were sieved. Per square two botanical samples were taken. Below the squares a level with features was documented.

The coastal barrier on top of which the dune is situated, dates to 4300-4100 cal BC. Peat formation in the area started between 3349 and 2899 cal BC. The dune itself yielded several possible occupation horizons, parts of which had been eroded. Ploughing and levelling have also partly disturbed the site. Underneath the occupation layers several features were documented one of which contained a flint axe, the remains of the jaw of a beaver and a fragment of bone of a large mammal. The occupation layers yielded artefacts, charcoal and at least one fishbone. Although most material remains may be attributed to the Vlaardingen

culture there are some finds that also point to an Iron Age occupation, at least in the vicinity.

The Neolithic remains from trench 6 contained 21 sherds, 17 flint flakes, a piece of loam, 5 pieces of natural stone, a piece of burnt bone and some fragments of charcoal, including wood of beech as well as apple, pear or juniper. The sherds include one round bottom or *Wackelboden*, and a fragment of the rim of a baking plat. The other sherds are rather thin, S-shaped and coil-built. The flint mostly comprised of burnt and unburnt flakes and splinters, often with evidence of rolled cortex. Most artefacts may have been made on 'Meuse eggs' (*Maas eitjes*, small rolled flint nodules). The tools included at least one scraper made on Rijckholt flint. The natural stone comprised one large chunk of quartz, probably used as a tempering agent. Trench 4 yielded the afore-mentioned axe of Rijckholt flint and with oval cross-section (11 x 6.5 x 3 cm, type s2b), characteristic for the southern part of the Netherlands, as well as a flint chip and pottery tempered with quartz and organic material. The artefacts may be attributed to the Vlaardigen culture (3600-2500 cal BC).

#### *References:*

Houkes/Dorenbos 2004

### **158. Zoelen-Buren (de Boldert/Beldert)**

#### *Site location:*

The site is located in the central river district of the Netherlands.

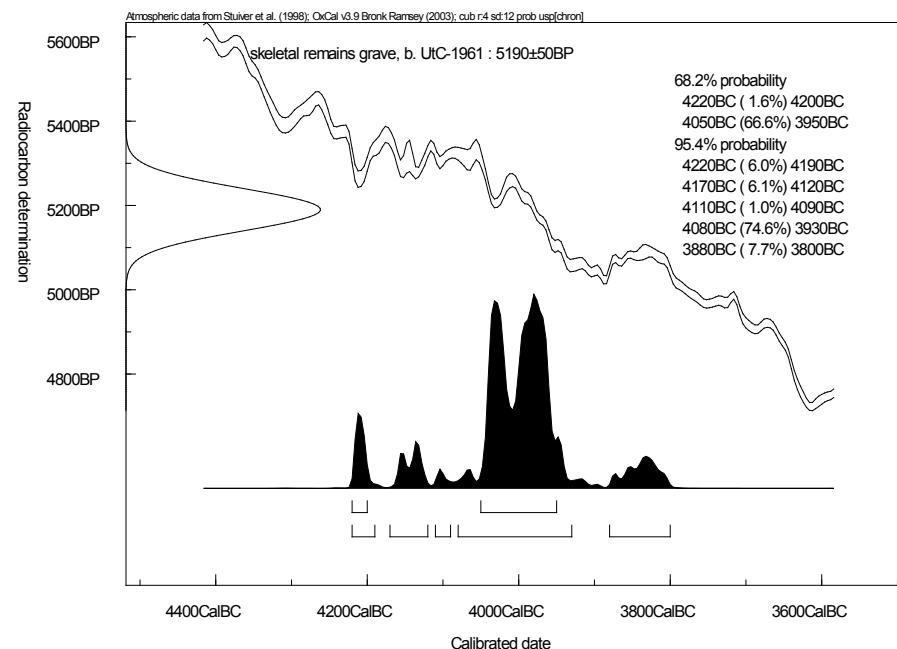


Fig. 117 Radiocarbon date for Zoelen-Buren.

#### *Site description:*

The location yielded one grave pit with three inhumations, including a child, aged seven, and a mature woman (50-70 yrs.). Separated by a layer of bark and soil, several remains of a second adult woman were found. Organic and grit tempered sherds found nearby could be attributed to the SWB culture. A <sup>14</sup>C date on bone from the grave dates to the Late SWB period. The date might be too old because of the reservoir effect.

#### *References:*

Hulst *et al.* 1993  
Hogestijn/Lauwerier 1992  
Lanting/Van der Plicht 1999/2000  
Raemaekers 1999

### **159. Zwijndrecht-Vlaams Hoofd (Antwerpen-Vlaams Hoofd)**

#### *Site location:*

The site is located in eastern Flanders, north of Antwerp and immediately south of the Dutch border. The site was discovered during the construction of a church on the eastern bank of the Scheldt. The site was situated in a floodplain and covered by a layer of peat.

#### *Site description:*

The site may have had a funerary context. It yielded the skeletal remains of a juvenile person, buried in stretched position, as well as animal bones of wild and domesticated cattle, wild boar and goat. Next to the skeleton sherds were found as well as flint artefacts, including blades (one of these was exceptionally long, measuring 19.6 cm), an endscraper and an intrusive bronze pin. In total sherds of three vessels were found comprising a so-called 'buidelbeker' and a pedestalled cup (*coupe à socle*). The site is of importance because of its clear MK signature and proximity to the Dutch sites known from this period, as well as the 'donken' sites in the Scheldt valley. Furthermore it is assumed MK-graves are associated with settlements, indicating an MK-settlement may have been located close to Antwerp. Unfortunately it is not clear whether the MK-pottery and the human and faunal remains were associated.

#### *References:*

Lüning 1968  
Vanmontfort 2004  
Warmenbol 1987

## Appendix II

### Lithic data

This appendix with lithic counts is based on the information obtained from the literature. The following subdivision is given:

- IIA: technology
- IIB: typology
- IIC: point typology
- IID: Kolmogorov-Smirnov two sample test
- IIE: Evenness index
- IIF: raw material
- IIG: Wommersom and phtanite distances and contribution
- IIH: Wommersom debitage and tools

The original sources and context information are listed in appendix I. In general the totals correspond to those in the source material. Some differences occur, however, since not all sites were originally analysed according to the same standards and terminology. Occasionally choices had to be made, merging categories or leaving them out to ensure comparability across sites. These differences are limited and do not influence the overall toolkit composition. They mainly diverge from the total counts in the literature (see IIA). While these are mentioned in the appendix, they are not used in the technological or typological analysis and only feature as a robust indication in the density analysis in the absence of more specific counts.

Differences regarding individual counts per technological or typological category between the literature and this analysis are limited. They relate to different choices made in chronological, functional (technological or typological) or other attribution, or issues of terminology and recording, such as the use of combinations of artefacts, or percentages instead of counts. Those cases where differences are considerable or where *in situ* elements could not be isolated are listed below, in combination with choices in selection per site.

Furthermore it should be noted that the selected sites and the resulting counts and attributions are influenced by different degrees of post-depositional disturbance and different excavation and documentation strategies. As argued in the text, the results can therefore only be a general indication of the actual composition. In those cases where quantitative or qualitative information did not allow an incorporation of specific sites or categories, these were excluded from the analysis. Occasionally other, contemporaneous sites, not present in the technological and typological appendix due to problems of quantitative and qualitative attribution, are included in the analysis for particular aspects or categories. For specific details and choices see ch. 5. The abbreviations used in the tables can be found in chapter 5, table 5.1. For references, see appendix I.

## *Brecht-Moordenaarsven 2*

Partially *in situ*.

Total counts in literature also comprise an Early Mesolithic component.

The Late Mesolithic component is based on an estimation (see Vermeersch *et al.* 1992, 58-64).

Tool counts are based on numbers in table 9 (Vermeersch *et al.* 1992).

## *Brecht-Moordenaarsven 3*

This site was not excavated but surveyed. Results are largely in line with those from Brecht-Moordenaarsven 1 and 2.

## *Brecht-Overbroek*

Total counts include surface and *in situ* counts (excavation at Overbroek 3).

Total tool counts for 1-3 differ in table 1 and 8, total based on 1, percentages on 8 (Vermeersch *et al.* 2005).

## *Brecht-Thomas Heyveld*

Northern and southern concentration taken together. Most material from upper layer. Cores and core fragments combined, excluding isolated mistletoe point.

## *Dilsen-Dilserheide III*

Total count is excluding Neolithic tools.

## *Hardinxveld-Polderweg and De Bruin*

The lithic composition at both sites and in particular the contribution of flakes and blades is influenced by the choice to incorporate tools in the analyses of the 'groundforms' (Van Gijn *et al.* 2001<sup>a,b</sup>). Since this was not done in the analyses of the lithic assemblages of the other sites, the contribution of flakes and blades as well as cores and core elements to both the assemblages of Polderweg (phase 0/1) and De Bruin (phase 1) have been corrected by correlating the technological counts to core, flake and blade based elements in the tool spectrum. To do this tables 6.6 and 6.7 were compared for Polderweg (Van Gijn *et al.* 2001<sup>a</sup>, 134-135) and De Bruin (Van Gijn *et al.* 2001<sup>b</sup>, 173-174). While this leads to (minimally) lower numbers in the technological counts this did not fundamentally alter the composition.

## *Havelte-De Doeze*

No technological information due to disturbance. Technological counts based on percentages table 8 (Price *et al.* 1974).

### *Helmond-Stiphoutsbroek*

Excavation and survey results have been combined unless mentioned otherwise (see Arts 1994, 86). This is based on the low numbers from the excavation and the fact that the majority of the lithics may be attributed to the Late Mesolithic (*ibid.*, 91).

### *Jardinga-Johannahoeve*

Including two hammerstones. Not including scraper.

### *Liège-Place-St.-Lambert*

Including patinated flint, Wommersom quartzite and other artefacts. Excluding Neolithic tools. At SDT/S160 13646 flints were found, not counting 919 frost-cracked pieces. Of these 3744 are not patinated and therefore probably Neolithic. 1758 pieces are burnt and could not be associated stratigraphically or culturally. Two phases of use, hard to unravel concerning flint, predominance of debitage associated with a workshop during one of both phases. Splinters and debris combined. Tool waste with debitage.

At DDD, Mesolithic patinated flint and Wommersom quartzite from both trench and 'carroyage'. Non-patinated and burnt pieces have been excluded from count. 'Lames acrète' included with blades. Splinters and debris combined. Tool waste with debitage.

### *Lommel-Vosvijvers 3*

Not including artefacts from the Ap and not including sandstone/quartzite.

### *Meeuwen-In den Damp I-Ia-Ib*

Total counts based on Pilati 2001, 30% measured in situ. Rest sieved.

### *Turnhout-Zwarte heide*

This site was not excavated but surveyed. It is included because it is in line with and confirms the general composition of the lithic assemblages of sites on the southern coversand landscape.

### *Mariënberg-Schaapskooi*

Many features of the Schaapskooi date to the LM, yet a considerable number is earlier. Due to taphonomic disturbance and decisions taken in the excavation strategy it is not possible to date the finds. The finds are included since they indicate continuity of use of a hearthpit site. In the counts microburins are included in the debitage. Hammerstones and other stone tools from the graves are included as well.

### *Merselo-Haag*

-A-level and Early Mesolithic component not included. Microburins in debitage counts. Total in literature based on RMU counts. Density (see table 5.11) calculated on actual Late Mesolithic counts.

### *Nieuw-Schoonebeek*

Including sandstone/quartzite artefacts. Only field recorded artefacts during excavation

### *Opglabbeek-Ruiterskuil*

86% in situ, combined counts used. Total in literature should be 2101 instead of 2102.

### *Liège-Place St.-Lambert, sector DDD*

Finds from trench and squares.

### *Remouchamps-Station LeDuc*

Flakes and blades have been divided equally. Utilized flakes and blades included.

### *Swifterbant-S11-13*

Majority of tools from S11.

### *Swifterbant-S11-13*

Tools including hammerstones.

### *Swifterbant-S22-23*

S22 and S23 are characterised by a Late Mesolithic and a Swifterbant occupation. The Mesolithic toolkit has a Late Mesolithic signature. Although certain tool types continue over time, similarities with S11 (Price 1981) enable an interpretation as an importantly Late Mesolithic assemblage.

### *Swifterbant-S83*

Basic debitage forms recalculated without tool component in groundforms. Indeterminate component cannot be placed.

### *Tietjerk-Lytse Geast*

Only the component with spatial information was selected.

### *Turnhout-Zwarte Heide*

Excluding one Early Bronze age arrowhead in total counts. Surveyed collection.

### *Weelde-Paardsdrank*

Tool counts based on Tables XIX and XX (Huyge/Vermeersch 1982).

## IIA Technology

	site	N	blades	flakes	chips/debris	cores	core revu.	microburins	burin spalls	tools	(total literature)
<b>coversand south</b>	Brecht-M2	2402	4432	15980	203	377	117	12	294	24185	
	Brecht-M1	402	311	371	4	22	20		39	1165	
	Brecht-M3									18	18
	Brecht-O1	109	150	772	31	25	19		70	1203	
	Brecht-O2	82	125	695	26	15			60	1025	
	Brecht-O3	55	82	337	21	1	1		39	542	
	Brecht-TH	841	871	717	70	33	141		308	2982	
	Dilsen-DIII	1692	1419	1863	55	64	131		284	5508	
	Helmond-SB	178	497	83	89	1	1		155	1048	
	Meeuwen-ID1-1a	504	3791	997	25	47	28		91	5483	
	Meeuwen-ID1-1b	51	251	76	6	5	1		17	407	
	Merselo-H	502	2173	397	31		2		70	3285	
	Opglabbeek-R	159	481	1243	17		85		116	2102	
	Turnhout-ZH	345	1431	109	94	40	2	3	150	2176	
	Weelde-P1	2017	1597	7135	107	140	133		748	11877	
	Weelde-P4	1612	1587	4960	73	66	188		629	9115	
	Weelde-P5	1513	1244	5851	86	83	95		426	9298	
<b>coversand north</b>	Havelte-DD-H1-I								71		
	Havelte-DD-H1-II	49	458	126	25	24		1	54	703	
	Mariënberg-S	393	2923	354	390	256	6	50	163	4502	
	N-Schoonebeek	2046	3375	1586	228	163	5		246	7649	
	Tietjerk-LG1								229	653	
<b>wetland/(margin)</b>	Hdx-PW phase 0/1	60	2096	14614	226	28			635	17695	
	Hdx-DB phase 1	30	102	169	10	3			33	384	
	Swifterbant-S11-13								163	7000	
	Swifterbant-S22	45	98	197	24	8			56	428	
	Swifterbant-S23	600	888	3080	111	88	1		480	5262	
	Swifterbant-S83	6	53	1	3		2		24	125	
<b>river valley</b>	Liège-PS-SDT	1889	6557	585	347	315	37	4	270	10014	
	Liège-PS-DDD	491	640	88	19	14		3	81	1338	
	Remouchamps-SD	212	212	1255	35				129	1842	
	Jardinga-J	14	5	13	1				3	34	

	flake cores	blade cores
Hardinxveld-PW 0/1	225	1
Hardinxveld-DB 1	9	1
Swifterbant-S22	4	20
Swifterbant-S23	6	105
Swifterbant-S83	3	
Mariënberg-S	254	86
Havelte-DD-H1-II	18	7
Merselo-H	20	10

## IIB Typology

	site	N	point	scraper	borer	burin	barked blade	ret. blade	ret. flake	Mbn. blade/knife	notch./dent.	hammerstone	other	tools tot.
<b>coversand south</b>	Brecht-M2	86	20				8	63	32	45	16		24	294
	Brecht-M1	20					2		2	11	3		1	39
	Brecht-M3	8	2				1	1	1		4		1	18
	Brecht-O1	21	8		1			6	19	9	6			70
	Brecht-O2	8	9	3				6	25	2	7			60
	Brecht-O3	7	8					1	14	6	2		1	39
	Brecht-TH	85	18				83	35	80			7		308
	Dilsen-DIII	77	5	15	1	10	31	30	29	18		68		284
	Helmond-SB	12	28	3			38	43		15	4	12		155
	Meeuwen-ID1-1a	15	2		1			21	41	4	5	2		91
	Meeuwen-ID1-1b	4						2	10	1				17
	Merselo-H	25	11				14	7	9		4			70
	Opglabbeek-R	36	11	1				22	6	12	26	1	1	116
	Turnhout-ZH	45	46	2	7	22	7	8	2	2		9		150
	Weelde-P1	174	53	6			52	74	71	50	90		178	748
	Weelde-P4	125	47	2	1	11	54	61	50	87			190	629
	Weelde-P5	89	35	1			19	36	45	30	53			118
														426
<b>coversand north</b>	Havelte-DD-H1-I	13	10				18	8	13	3	2		4	71
	Havelte-DD-H1-II	2	12	2	1		9	8	13	5	1		1	54
	Mariënberg-S	26	20	13	18		1	10	24	5	20	9	17	163
	N-Schoonebeek	71	99	8	1	42	10	9				4	2	246
	Tietjerk-LG1	55	28	6	1	17			27				95	229
<b>wetland/(margin)</b>	Hdx-PW phase 0/1	82	32	2	3	10	19	289		34	29	135		635
	Hdx-DB phase 1	8	5			2	1	2	6		3	3	3	33
	Swifterbant-S11-13	20	32	11	5	19	16	43	8	1			8	163
	Swifterbant-S22	3	7	1			17	21		3			4	56
	Swifterbant-S23	28	65	20	2	37	100	196	1	19	1	11		480
	Swifterbant-S83	3	2				2	17						24
<b>river valley/valley floor</b>	Liège-PS-SDT	39	45	2	3		41	34	3	92			11	270
	Liège-PS-DDD	16	33				2	13	3		7		7	81
	Remouchamps-SD	41	8		3	14	23	7	8	5		20		129
	Jardinga-J			1				1			1			3

## IIC Point typology

	site	N	points	trapezes	LBK-like points	surface R points	triangle	C/D-points	B-point	other points	backed blades
<b>coversand south</b>	Merselo-H	25	20	2		1	2			14	
	Dilsen-DIII	77	53		1	6	4		13	10	
	Meeuwen-ID1-1a	15	7			2	2			4	
	Meeuwen-ID1-1b	4	2				1			1	
	Opglabbeek-R	36	22	8	1					5	
	Weelde-P1	174	96	3	15	12			48	52	
	Weelde-P4	125	84	2	2	7			30	11	
	Weelde-P5	89	65	4	2	2			16	19	
	Brecht-M2	78	57		4				17	8	
	Brecht-M1	20	15						5	2	
	Brecht-M3	8	3			2	2			1	
	Brecht-O1	21	10	5	4	1				1	
	Brecht-O2	8	5			2				1	
	Brecht-O3	7	3			3				1	
	Brecht-TH	85	77	1	2				5		
	Turnhout-ZH	46	5		4	5	9		23	21	
	Helmond-SB+ surface	12	5		2		1		4		
	Helmond-SB exc.	1	1							17	
<b>coversand north</b>	Tietjerk-LG1	55	9			1	12	12	21		
	Mariënberg-S	26	3			7	4	7	5	1	
	Hoge Vaart-A27 eroded	34				23	3	8			
	Havelte-DD-H1-I	13	2				1	4	6	18	
	Havelte-DD-H1-II	2	1						1	9	
	N-Schoonebeek	71	59			1	7	3	1	42	
<b>wetland/(margin)</b>	Hardinxveld-PW phase 1	82	10	2		5	1	38	26	10	
	Hardinxveld-DB phase 1	8					1	4	3	1	
	Oudenaarde-D-MESO 1	38	+++						+		
	Swifterbant-S11-13	21	9			2			10	19	
	Swifterbant-S22	3				1			2		
	Swifterbant-S23	29	6		1	4			18	37	
	Swifterbant-S83	3				2		1			
	Urk-E4	1					1				
<b>river valley/valley floor</b>	Liège-PS-SDT	39	1	2	7	5	2	12	10		
	Liège-PS-DDD	16	2		7	3	1		3	2	
	Remouchamps-SD	41	13		1	3			24	14	

## IID Kolmogorov-Smirnov two-sample test

Due to the low number of sites in three of the four groups, it was decided to test the statistical significance of the differences in distribution. This type of test compares two sets of observations measured at an ordinal scale. By assessing the largest difference between two distributions of cumulative proportions it enables the user to distinguish whether two datasets differ significantly. The data was ordered in ordinal categories of 5% or 1% (in case of a limited distribution). Significance (H1) was tested for a one-tailed rejection region. Critical values (D<sub>crit</sub>) of 0.05 and 0.1 were obtained from Siegel and Castellan Jr. (1988, table L1, pp. 348-349). Because of its higher number of sites it was decided to test the distribution within the southern group against the other groups individually as well as for the other groups combined. It should be noted that significance might change when more sites are added to the dataset. The absence of significance does not mean that the distributions are the same, merely that there is insufficient evidence to suggest they are different (Shennan 1997, 60-61). The results are presented in the table below. Significance for 5% is depicted in grey.

groups	northern (4)	wetland (4)	valley floor (3)	combined (11)	artefact (5% class)	D <sub>crit</sub>
southern (15)	24.96	51.96	14.94	79.8765	points	c.05
southern (15)	40.98	13.98	9	52.9	backed bl.	38; 33; 76
southern (15)	10.98	10.98	3.105	18.96	borers (5%)	c.10
southern (15)	<b>36.78</b>	28.8	12.15	52.404	borers (1%)	34; 30; 66
southern (15)	15	0	0	15.015	burins (5%)	
southern (15)	15	10.8	21.015	42.009	burins (1%)	
southern (15)	<b>36</b>	15.75	15.03	<b>69.003</b>	scrapers	
southern (15)	<b>37.02</b>	22.02	15.03	<b>68.046</b>	notched/dent.	
southern (15)	20.04	39.96	15.03	34.8975	ret. flakes	
southern (15)	19.98	19.98	<b>30.015</b>	43.89	ret. blades	
southern (15)	28.02	40.02	21.015	80.04	Mbn. Blades/knives	
southern (15)	18.06	39.96	14.94	64.88	points/backed bl.	
southern (15)	30	6.18	<b>30.015</b>	59.94	processing cmbnd.	
southern (15)	13.02	39.96	21.015	27.951	ret. flakes/blades	

Statistically the importance of points for sites in the southern coversand landscape differs from the riverdune group, but also from all three groups combined. The importance of backed blades should however be noted as a potentially important feature of sites on the northern coversand landscape. Processing artefacts relatively form a less significant contribution to assemblages on the southern coversand landscape and on riverdune sites. While statistically not significant this is in line with the percentage counts. The distribution of retouched flakes and blades mirrors the percentage counts (there retouched blades are relatively important on the southern coversand landscape and on river valley sites. The importance of retouched blades for the group of wetland sites can be related to the counts of S22 and S23, while this is compensated for in retouched flakes by the same sites and of course Hardinxveld-Giessendam Polderweg. The latter aspect is also significantly different statistically. On the southern coversand landscape Montbani blades clearly form a relatively important and contribution to the toolkit, differing statistically from the wetland and combined group.

Table IID. Significance of 0.05 is depicted in grey, significance of 0.1 is accentuated.

## IIE Evenness index

Another way of interpreting assemblage diversity and site function is by measuring the degree of diversity within individual site assemblages. This is again based upon the basic premise that there might be sites with a more general function and those with a more specialist function (Andrefsky 2005, 214). While the time-averaged nature of most of the sites studied here prevents an appropriate analysis of site types, again different but consistent accents in assemblage composition might be informative on the absence of activities. One apposite approach, used by Chatters (1987, 363-366), to assess the degree of diversity within studied assemblages is the evenness index (also see Andrefsky 2005; Rhode 1988). This index is based upon the equation of Pielou (1966), often used in ecological studies. It measures the frequency of artefacts found in each artefact type and subsequently gives a summary value for the spread of those artefacts over the entire assemblage (see Odum 1971, cited in Andrefsky 2005, 215). The evenness index can be used as a tool to assess the degree of overall specialization. The equation is calculated as:

$$\sum = \frac{\left( \frac{n_i}{n} \right) \left( \log \frac{n_i}{n} \right)}{\log_s}$$

Where (Andrefsky 2005, 215; Chatters 1987, 363):

$n_i$  = the number of artefacts for each type

$n$  = the number of artefacts for all types

$s$  = the number of artefact types

Index ranges rank between 1.0 and 0.0. Counts of 0.0 or close to 0.0 indicate that one or a few artefact types account for all specimens in the population, while counts of 1.0 or close to 1.0 indicate a more equal representation of artefacts. From this perspective the evenness index can be used as a tool to assess the degree of overall specialization. The problem with using this equation lies in the fact that it is sensitive to the absence or presence of certain artefact types from site to site. These influence the overall outcome. With this consideration in mind the evenness index of the sites involved has been calculated and depicted below.

Most of the values per site are between 0.50 and 0.80. This is related to the fact that most tools are present on most of the sites, due to their multi-component nature. Therefore differences between sites and groups of sites are only present in a subtle manner. The scores obtained and interpreted by Chatters (1987, table 6; also see Andrefsky 2005, 215) diverge even less. This indicates that in the absence of specific sites with a limited set of tools, differences are subtle yet not necessarily unintelligible. Values for sites with a very specific set of tools (such as Jardinga) are more evident. Overall the evenness index here only allows for a very coarse-grained indication of the extent and character of the tool spectrum. The differences that *can* be noted are most articulate when retouched flakes and blades are excluded from the counts. Sites on the southern coversand landscape have on average lower values than sites on the northern coversand landscape or on riverdunes. Furthermore values in the south never exceed 0.78, while evidently higher values have been recorded in both other groups (0.81; 0.86; 0.90). The

group of riverine sites mirrors the values for the southern coversand landscape, although this does not indicate the underlying accents are the same. A similar conclusion can be reached for singular sites such as HdX-Polderweg. There appears to be a distinction of sites with more specific accents in the tool assemblage, mostly found on the southern coversand or in river valley situations, and those with an overall somewhat broader base of activity in the other two groups. This to some extent coincides with the conclusions reached above.

*Evenness index scores for individual sites and groups for the complete toolkit (not including hammerstones and 'other tools') and the complete toolkit without retouched flakes and blades. Sites and counts in grey have low overall numbers or have been recorded differently. These have not been included in the group counts.*

<b>evenness index (Pielou 1966)</b>					
<b>group</b>	<b>sites</b>	<b>toolkit overall</b>	<b>group counts</b>	<b>toolkit-ret. fl./bl.</b>	<b>group counts</b>
sandy upland south	B-M2	0.78	<b>0.76</b>	0.67	<b>0.68</b>
	B-M1	0.55		0.54	
	B-M3	0.66		0.58	
	B-O1	0.78		0.69	
	B-O2	0.76		0.76	
	B-O3	0.71		0.66	
	B-TH	0.68		0.49	
	D-DIII	0.84		0.75	
	H-SB	0.72		0.61	
	M-ID1-1a	0.65		0.64	
	M-ID1-1b	0.52		0.28	
	M-H	0.75		0.63	
	O-R	0.76		0.68	
	T-ZH	0.76		0.72	
	W-P1	0.86		0.78	
	W-P4	0.83		0.75	
	W-P5	0.85		0.77	
sandy upland north	H-DD-H1-I	0.81	<b>0.81</b>	0.70	<b>0.75</b>
	H-DD-H1-II	0.86		0.81	
	M-S	0.92		0.90	
	N-S	0.65		0.61	
	T-LG1	0.66		0.75	
wetland	HdX-PW phase 0/1	0.57	<b>0.71</b>	0.66	<b>0.74</b>
	HdX-DB phase 1	0.80		0.72	
	SWB-S11-13	0.87		0.86	
	SWB-S22	0.64		0.61	
	SWB-S23	0.75		0.81	
	SWB-S83	0.42		0.35	
valley floor	LPS-SDT	0.75	<b>0.74</b>	0.62	<b>0.63</b>
	LPS-DDD	0.66		0.54	
	RSD	0.80		0.72	
	J-J	0.32		0.00	

## IIF Raw material

site	RMU									
southern coversand N	southern gen.	Hesbaye	northern	GQW	phtanite/ chert	sandstone	quartzite	quartz	other	unknown/ burnt
Brech-M1	265			900						
Brech-M2	21492			2683	6	4				
Brech-M3	10			8						
Brech-O1	847			266	90					
Brech-O2	857			168						
Brech-O3	434			108						
Brech-TH	2400			576	6					
Dilsen-DIII	5245			226				2	40	
Helmond-SB+ surface	877			131	2	2	23	7	4	
Helmond-SB exc.	190			34				2		4
Lommel-V-3	1968			174						
Meeuwen-ID1-1a	4623			67		284		430		79
Meeuwen-ID1-1b	288			30		19		69		1
Meeuwen-ID1-2	3570			547		480		258		1218
Meeuwen-ID1-3	1878			93		86		46		108
Meeuwen-ID1-4	1868			85		69		66		259
Merselo-H	1998	41	66	135	1			6	128	951
Opglabbeek-R	1899			202						
Turnhout-ZH	1855			312	2	8				
Weelde-P1	9704			2142	16	15				
Weelde-P4	6897			2210	8					
Weelde-P5	6716			2579	3					

northern coversand N	rolled nodules	other: sand-stone/quartzite
Havelte-DD	703	
Nieuw-S	7645	4

wetland/(margin) N	rolled nodules	terrace (included in rolled)	Rijckholt	Hesbaye	GQW	northern
Hardinxveld-PW phase 0/1	638	124	27		7	2
Hardinxveld-DB phase 1	99	1	1	3	1	16
Melsele-HtD	13295				700 (estimate, 5%)	
Swifterbant-S83	125					

river valley	N	southern	northern	GQW	other
Liege-PS-SDT	9955			59	
Liege-PS-DDD	1222			116	
Jardinga-J		35		1	

## IIG GQW and Phtanite distance

site	distance km	GQW (N)	% GQW	site	distance km	GQW (N)	% GQW
Brech-Moordenaarsven 2	63	2683	11.1	Budel III	65		30
Brech-Moordenaarsven 1	63	900	77.3	Genk	41	52	28.42
Brech-Moordenaarsven 3	63	8	44	Korschenbroich	110	4	0.13
Brech-Overbroek 1	63	266	22.1	Maarheeze	70	15	18.07
Brech-Overbroek 2	63	168	16.4	Oirschot VI	80	13	36.11
Brech-Overbroek 3	63	108	19.9	Nijnsel II	88	117	4.52
Brech-Thomas Heyveld	63	576	19.3	Nijnsel III	88	247	45.49
Dilsen-Dilserheide III	71	226	4.1	Rosellen 7	122	1	0.04
Helmond-Stiphoutsbroek	96	131	12.5	Teveren 115, 1	110	2	0.01
Helmond-Stiphoutsbroek (exc.)	96	34	17.34	Tilburg	83	99	23.13
Lommel-Vosvijvers 3	58	174	8.1	Lommel	51	695	25.93
Meeuwen-In den Damp 1-1a	54	67	1.2	Bekkevoort-Huttenbos	14.3		16.1
Meeuwen-In den Damp 1-1b	54	30	7.4	Bekkevoort-Alverenberg	14.5		14.8
Meeuwen-In den Damp 1-2	54	547	9	Bekkevoort-Wijndries	14.7		8.21
Meeuwen-In den Damp 1-3	54	93	4.2	Holsbeek-Asseltberg	21.1		14.6
Meeuwen-In den Damp 1-4	54	85	3.6	Holsbeek-Chartreuzenberg	21.3		10.8
Merselo-Haag	108	135	4.1	Halen-Kluisberg	16.3		20.1
Opglabbeek-Ruiterskuil	48	202	9.6	Kessel-Lo-Kesselberg	22.1		4.98
Turnhout-Zwarte Heide	58.3	312	14.3	Nieuwrode-Benninksberg	20.3		13
Weelde-Paardsdrank 1	65	2142	18	Rillaar-Haksberg	19.5		7.5
Weelde-Paardsdrank 4	65	2210	24.2	Rillaar-Tienbunderbos	19.7		6.5
Weelde-Paardsdrank 5	65	2579	27.3	Tielt-Galgenberg	15.8		11.7
Weelde-Voorheide	65	300	5	Webbekom-Kloosterberg	6.7		6.5
Acht I	79	5	25	Wezemaal-Benninksberg	22.9		10.4
Beek 1	93	20	3.33	Wezemaal-Wijngaardberg	22.7		12.5

site	distance km	Phtanite (N)
Brech-Moordenaarsven 2	81	6
Brech-Overbroek 1	82	90
Brech-Thomas Heyveld	80	6
Helmond-Stiphoutsbroek	124.5	2
Merselo-Haag	141	1
Turnhout-Zwarte Heide	79	2
Weelde-Paardsdrank 1	85.5	16
Bekkevoort-Huttenbos	39.4	11
Holsbeek-Chartreuzenberg	33.2	16
Kessel-Lo-Kesselberg	27.4	35
Rillaar-Tienbunderbos	36.1	15
Wezemaal-Benninksberg	30.7	11
Wezemaal-Wijngaardberg	30.9	35

## IIH GQW debitage and tools

	tool flint (N)	tool GQW (N)	tot. flint (N)	tot. GQW (N)	%tool flint	%tool GQW
Brecht-M2	721	127	21492	2683	3.3	4.7
Brecht-M1	10	29	265	900	3.8	3.2
Brecht-M3	10	8	10	8	100	100
Brecht-TH	222	86	2400	576	9.2	14.9
Dilsen-DIII	256	27	5245	226	4.9	11.9
Opglabbeek-R	97	19	1899	202	5.1	9.4
Turnhout-ZH	122	27	1855	312	6.6	8.6
Weelde-P1	578	170	9704	2142	6	7.9
Weelde-P4	429	200	6897	2210	6.2	9
Weelde-P5	316	110	6716	2579	4.7	4.3

N	flakes flint	flakes GQW	blades flint	blades GQW	cores flint	cores GQW	core rejuvenation flint	core rejuvenation GQW	microburin flint	microburin GQW
Brecht-M2	3919	513	1833	569	196	7	331	44	100	17
Brecht-M1	65	246	50	352	2	2	5	17	9	11
Brecht-O1					30	1	25		1	11
Brecht-O2					26		15			
Brecht-O3					11	10	1			
Brecht-TH	775	114	572	267	55	15	26	7	85	56
Dilsen-DIII					52		54	5		
Helmond-SB					83		89			
Meeuwen-ID1-1a					25		47			
Meeuwen-ID1-1b					6		5			
Merselo-H					31					
Opglabbeek-R					17				76	9
Turnhout-ZH	1270	157	242	103	86	7	33	7	1	1
Weelde-P1	1268	329	1278	739	85	22	98	42	119	14
Weelde-P4	1167	420	862	748	61	12	40	26	178	10
Weelde-P5	938	306	862	651	78	8	46	37	76	19

	N	ret. flakes flint	ret. flakes GQW	ret. blades flint	ret. blades GQW	Mbn. flint	Mbn. GQW	point flint	point GQW	scraper flint	scraper GQW	notch./dent.flint	notch./dent.GQW	backed bl. flint	backed bl. GQW
Brecht-M2	27	5	41	22	22	23	53	33	18	2	9	7	5	3	
Brecht-M1	2	0			3	8	2	18			2	1	1	1	
Brecht-O1															
Brecht-O2															
Brecht-O3															
Brecht-TH															
Dilsen-DIII	25	4	30	1	25	4	75	2	4	1	13	5	6	4	
Helmond-SB															
Meeuwen-ID1-1a															
Meeuwen-ID1-1b															
Merselo-H															
Opglabbeek-R	6	0	19	3	12	1	28	8	11	0	26	5			
Turnhout-ZH	9	1					32	12	40	6	2	1	17	4	
Weelde-P1	53	18	60	14	32	18	136	38	40	13	62	28	48	4	
Weelde-P4	43	18	37	17	26	24	86	39	32	15	52	35	9	2	
Weelde-P5	36	9	26	10	17	13	68	21	29	6	32	21	16	3	

## Appendix III

# Ethnography

This appendix comprises a variety of ethnographical, historical and archaeological case-studies of groups combining subsistence strategies. The focus is mainly on groups using some form of agriculture or horticulture, though other groups have been included in order to show the variability in existing subsistence strategies and the degree to which mobility, interaction, and exchange, contribute to managing subsistence and settlement systems. In the text below words **in bold** characterize these communities for easy comparison, and give a cursory overview of the flexibility existing within these groups. The text is followed by a table, presenting an overview of the strategies of many of the groups mentioned. It should be stressed that there is an often incoherent and overlapping use of terminology, especially with respect to the meaning and characterization of cultivation, managing, tending, horticulture, husbandry and (incipient) agriculture (see Smith 2001, 20).

## South America and the Caribbean

### *Siriono, Bolivia*

Subsistence procurement among the Siriono horticulturalists of Bolivia consists of hunting (mainly by men), fishing, gathering (both sexes) and **small-scale** cultivation (both sexes) of various plants as maize and sweet manioc. Agricultural **gardens** are located at diverse distances from the settlements and are tended to in **conjunction** with other activities. These groups are **mobile** from June to November (rainy season) and stationary from December to May (dry season) (Kent 1989, with reference to Holmberg 1969).

### *Siona-Secoya, Ecuador*

As one of the Amazonian communities, the Siona practice swidden agriculture, forage, and hunt. The gardens are often located **near** their settlements, but sometimes can also be found **scattered** further afield, or at riverine sites reachable by **canoe**. Gardens are **relocated** every three years and generally require very **low investments** of time and labour, which are concentrated in **brief periods** of time (Vickers 1989, 50). Sometimes they are left **unattended** for longer periods.

Domesticated animals make no significant contribution to the diet, but hunting (mainly by men), fishing and collecting do. Importantly the ratios of hunting vs. fishing significantly differ with respect to **season** and local **habitat conditions** (*ibid.* 51). This means that different **contemporary** groups of Siona place **different accents** on their procurement strategies and diet. Next to their annual mobility, mostly related to hunting trips and expeditions, Siona settlement systems are **complex** and **variable** and demonstrate **settlement dynamics**

**intermediate** between those of hunter-gatherers and agriculturalists. Settlements may consist of **single house sites** or **larger aggregates** and while some endure for several years (in relation to parameters of **density**, **duration**, **mobility** and **predictability**), in general a high degree of mobility and **flexibility** is retained in overall **adaptation** (Vickers 1989, 59).

### *Nukak, Colombia*

The Nukak of the Colombian tropical rainforest **rely on mobility** for subsistence production, they actually '**move to produce**'. These groups shift camp frequently, before placing too much strain on the direct environment. During their stays they alter the surroundings of the camp by cutting down the vegetation, yet without destroying the canopy, and they **introduce seeds of useful plants**. In this sense they **create 'wild orchards'**, which in fact become the **patches of resources for future visits** (Politis 1996). In this example some form of horticulture is thus used in a very haphazard way and without investing the effort in preparing and tending fields.

### *Maku and Tukanoan, Black Water area, Brazil*

Maku hunter-gatherers inhabit the upland rainforest and **trade** game in **exchange** for carbohydrates from Tukanoan horticulturalists. The carbohydrates the Maku obtain in fact make up 80% of their diet and are thus essential for their survival in the equatorial forest. The Tukanoan horticulturalists, who inhabit the larger floodplains, fish to obtain protein, but due to the time-consuming character of this activity they prefer the relationship with the Maku (Milton 1984). It should, however, not be overlooked that despite **this symbiotic binary system of interdependence** between upland groups and floodplain groups—often referred to as the protein debate—**other more subtle strategies** exist. Several human populations living in the Black Water area, among them the Maku, have adjusted to the low productivity of the environment through **complex forms of exchange**, **subsistence specialization**, **inherited and hierarchical control over fisheries**, **lineage organization**, **settlement distribution** and bitter manioc dependence. It is evident that the native populations of these nutrient poor regions are particularly **attuned to these limitations** and have **adapted** to them in **various** ways (Moran 1991).

### *Amazonia*

In Amazonia there are many communities combining various strategies of hunting, gathering, and farming. Sponsel (1989) argues that in view of the existing ecosystem, **adaptation** should be defined as the main characteristic for these combinations. According to him, foraging and farming '...are considered to be **overlapping, interdependent, contemporaneous, coequal and complementary** domains...' (*ibid.* 1989, 37). The reason for the existence of these strategies is probably related to the scarcity of both protein (meat) and carbohydrates (wild plants), necessitating a **combination**. Interestingly this complementarity is arrived at either by combining hunting and/or fishing with farming, or through a **mutualistic** exchange between **symbiotic** societies in which one focuses on hunting and fishing, the other on farming.

### *Lacandon Maya, Chiapas and Guatemala*

Before being forced to live in large residential units, the Lacandon Maya made their living from wages, peddling craft, selling lumber, **agriculture and gathering**. They also cultivated a large number of plants of various origins in corn plots, gardens and fallow fields, yet a large portion of their food came from the forest and was obtained by **hunting, gathering and fishing**. Their settlement system consisted of semi permanent nuclear family residences that were **frequently relocated**. After breaking camp, **new clearings** for crops and domestic structures were **easily made** wherever they went and they relied **on hunting, gathering and trade for subsistence before the harvest** was in (Terrell *et al.* 2003, 341).

### *Greater Antilles, Caribbean*

Apart from being hunter-fisher-gatherers the Archaic people in the Caribbean also relied on avocado and yellow *sapote*, most probably introduced from the mainland. This implies some form of early **arboriculture** and the **manipulation** and **cultivation** of these wild resources. After the arrival from people from South America (*c.* 300 BC), a far greater range of plants was introduced, yet while these groups are often interpreted as agriculturalists, they **also still relied heavily on wild animals and plants** (Terrell *et al.* 2003 345-346).

## **Asia and Oceania**

### *Jomon, Japan*

While not directly incorporating producing modes of subsistence the analysis of long-term change within the Jomon culture indicates the existence of distinct **regional and temporal variability**. Remarkably this also includes 'inverse' changes from more sedentary collector systems to more mobile forager systems (Habu 2002). Archaeological data from southwestern Kanto indicates that over time there were **frequent shifts** between foraging and collecting strategies, in particular in the Moroiso phase (dated to *c.* 5000 BP). Next to **environmental causes** it is argued that **regional interactions and networks** also played an active role. On the basis of the information it can be concluded that there is a certain degree of '**system fluidity**' and that it is probable that Jomon subsistence-settlement systems were quite **flexible** and included **varying combinations of collecting and foraging strategies** (see Habu 2002, 66). Other evidence from several wetland sites indicates that some form of **small-scale cultivation** took place as early as 9000 BP, indicated by a range of herbaceous plants and tree species such as chestnut. The former may have been initially grown on midden areas. It was, however, not until the subsequent Yayoi culture (from *c.* 2700 BP onwards) that agriculture, in the form of wet-paddy rice became important (Matsui/Kanehara 2006).

### *Xinglongwa and Zhaobaogou, Northeast China*

The early sedentary communities of Northeast China yield indications for a **partial adoption** of domesticates and cultigens. For the slightly earlier Xinglongwa period, roughly dated between 6200 and 4500 cal BC,  $\delta^{15}\text{N}$  isotope values do suggest the existence of animal husbandry and perhaps crop cultivation. Pathological analysis

however suggests that **reliance** on agriculture must have been **low** (Shelach 2006). The Zhaobaogou occupation, dating between 5200 and 4500 cal BC yielded tentative evidence for domesticated pigs and well as artefacts associated with the clearing and tilling of fields. Most meat at the Zhaobaogou suggests that deer **hunting provided for 62%** of the meat supply (Shelach 2006). Although the evidence is limited, it seems that the early sedentary communities of Northeast China, also depended on a **combination** of domesticated and wild resources.

### *Agta, Northeastern Luzon, Philippines*

The Agta are considered foragers that use **various** subsistence **tactics**, including horticultural activities, within a larger strategy of daily and yearly food procurement. Furthermore they function within an **intricate set of relations** with dominant nearby farm-based societies, to which they **adjust** their own activities (Griffin 1989, 61). Because of this system, subsistence and settlement are very much **intertwined** and, depending on the environmental matrices, permanence and location of **residence changes** and **group composition fluctuates**. Thereby it is important to note that as horticultural activities increase, hunting activities diminish and **semi-sedentary** residences are found more often (*ibid.*). While there is a **continuum** of vegetal food procurement from gathering, over '**tending**' to actual planting and horticulture, it is noteworthy that horticulture, in contrast to hunting, is often of minor importance. Fields are often not more than 50 m across (Griffin 1989, 61) and sometimes horticulture is even used as a crude **emergency food tactic**: *'The main thrust of the style is the planting of a 'swidden' ploy of as few as three or four cuttings...seemingly useless in nature...if it might not be a single meal tucked away for future use'* (Griffin 1989, 61). Small-scale horticulture is used here as a **caching strategy** and only increases when hunting returns are inadequate. Among the Agta, and in fact in general among Philippine foraging groups, there are thus different groups with **different accents** in their routines of subsistence procurement, as well as seasonal moves, depending on the ecological situation and their relations to nearby farmers (Junkers 2002, 351). Agta today are still constantly **experimenting** with different **emphases** in food procurement (Griffin 1989, 66).

### *Punan, Penan and Batek, Borneo and Malaysia*

Junkers (2002) (drawing on Brosius 1991; Hoffman 1984 and Endicott 1988) also sees **flexibility and diversity** in forager subsistence strategies elsewhere in Southeast Asia. For example Punan and Penan groups on Borneo rely heavily on pig hunting and management of sago stands for carbohydrates and engage minimally in trade, whereas others apparently function as specialized and almost commercial hunters and collectors depending on farmers for other foodstuffs. Similarly the Batek of Malaysia **frequently switch** among hunting, forest collecting, planting swidden fields, managing concentrations of wild yams and trading forest products. Because of the complex and changing environments and associated changes in political landscapes, there is an extreme flexibility in economic choice on a year-to-year basis and in the long term (also see Griffin 1989). Most ethnographically and historically recorded patterns therefore only represent behavior at a single moment instead of the **whole range of adaptions** (Junkers 2002, 353).

### *Phi Tong Luang, Thailand*

The hunter-gatherers of the Phi Tong Luang occupy the tropical highlands of the Mae Hong Son Province in southern Thailand. According to Pookajorn (1992, 93) they were very **mobile**. They hunted small animals, fished and collected yams, bamboo shoots, wild fruits, leafy plants and mushrooms. The Phi Tong Luang never had the slightest inclination to grow plants and raise cattle. This abstinence from domesticates and cultigens was inspired by their **ancestors** who had taught them that cultivating plants and settling down would cause an evil deity to send a tiger to destroy them (*ibid.* in reference to Seidenfaden 1926). Despite this they did practice a **form of managing** by harvesting yams in such a manner that the remaining part would sprout fresh leaves after the rainy season (*ibid.*, 1992, 92-94). In recent years the danger of communist attack forced the rice-farming Maeo from Laos to Thailand into the area occupied by the Phi Tong Luang. These at first moved deeper into the forest, but in time both groups were forced to **work together**. The Phi Tong Luang became **dependent** on the Maeo for food and these again needed the Phi Tong Luang for labour (Pookajorn 1992, 98). By working with the Maeo, whose numbers rapidly rose, the Phi Tong Luang learned the important steps in cultivation. The learned how to make clearings and holes, distribute grain, harvest, thresh, but also how to saw planks, use scissors, boil rice in a pot, wear watches, glasses, shoes, listen to the radio, drink whisky and fire a gun. This of course led to an increasing need for consumer items among the Phi Tong Luang (see Pookajorn 1992, 100) and of course an increasing dependence. Instead of **trading** an array of forest products for items they did not have, as they did in the past, Phi Tong Luang **labour** became their most important trade commodity.

### *Nuaulu, Seram, eastern Indonesia*

The small group of the Nuaulu on the southern coast of Central Indonesia practise energy-intensive and visually prominent **gardening** and related activities. These are also crucial in determining settlement patterns, but **paradoxically** their **dietary contribution is very low** compared to the effort put in. Upon closer examination however, it appears that the Nuaulu have **retained important aspects** in their mode of subsistence such as **hunting, forest foraging and sago extraction** (Ellen 1988). Apart from this there are many forms of intermediate procurement activities that best qualify as some form of **tending or managing**. These include planting of trees in the forest, protection of trees, replacements of the crown of yam tubers, harvesting products from abandoned village sites or groves etc. In case of sago extraction Ellen (1988, 127) rather speaks of '**well-husbanded collecting**', instead of agriculture. Because of these particularities Ellen (1988, 128) rightfully criticizes the existing terminology. Finally the existing pattern of **regional exchange** should also be taken into account when analyzing the subsistence strategy of these groups (*ibid.*, 117).

### *Kubu, Sumatra*

The Kubu inhabit ridges covered with rainforest. These ridges form the borders **between farming and trading population enclaves**. These cultivators inhabit the intervening river valleys. The Kubu make a **distinction between foraging and cultivation** as alternating modes of subsistence. Since their main food source

is formed by tuberous vines whose harvest is energy intensive they make use of existing **forest clearances or fallow fields** or obtain tubers through **exchange**. Some Kubu make their own forest clearances, although settling down renders them more vulnerable to domination by farmers. Swiddens are abandoned as a group member dies (Layton *et al.* 1991, drawing on Sandbukt 1988).

### *Papua, Interior New Guinea*

The development of horticulture in interior New Guinea may have sprung from **already existing** practices of foragers. These were aware of the **growth habits and life histories** of many key economic plant species since the late Pleistocene and encouraged their growth through forest clearance and even physical distribution. In certain ideal places this led to populations of increasing numbers of starchy staples, suitable for transport and vegetative reproduction. These **ongoing plant management practices** in time may have formed the earliest examples of agriculture in the area, probably related to the increasing degradation of the surrounding landscape (Denham/Barton 2006; Terrell *et al.* 2003). The above indicates that agriculture as a concept and practice would have been a **far from an alien concept** to indigenous groups of hunter-gatherers.

### *Oceania*

As in New Guinea an important part of subsistence procurement in Greater Near Oceania is characterized by '**agro-forestry**'. Within this system arboreal-based communities **manipulate and maintain** forest ecosystems and forest resources. Since people are aware of the ecological and regenerative properties of forests, they use this knowledge to manipulate and manage a variety of forest ecosystems suitable for human needs, thereby often **increasing biodiversity** (Terrell *et al.* 2003, 335). These groups thus seem to inhabit an **intermediate position** between foraging and farming, making it hard to distinguish where one ends and the other begins.

## **Africa and the Middle East**

### *Precolonial South Africa*

Traditionally the Prehistory of Southern Africa has been subdivided in a Stone Age with hunter-gatherer modes of production and an Iron Age with farmer modes of production. Classically there has thus been a difference between means of production regarding these two periods. Hall (1988, 139) however argues that there are **various overlaps** that characterize the later Stone Age and the early Iron Age in the first millennium AD. There is for example evidence for Iron Age communities relying heavily on shellfish collection in combination with gathering of wild food plants. Moreover, by the 6<sup>th</sup> century herds were of small size. On the other end of the spectrum there is evidence for **active manipulation** of the environment in the later Stone Age economy, both with respect to animal and plant communities. Hall (1988, 140) therefore argues that the terms of 'hunter-gatherer; and 'farmer' only describe two economic positions within **a spectrum of complex variation**: '*Over a period of about a thousand years communities provided for themselves by obtaining a variety of resources with different technological*

*combinations...to categorize such patterns of behaviour in terms of Stone and Iron Ages oversimplifies the situation and directs attention away from the complexities of the pre-colonial past.'* Early farmers therefore still relied heavily on hunting and gathering, probably had few domestic animals and small, troubled stands of crops. Instead of distinguishing between both modes it may therefore be more instructive to consider all social formations between 1000 BC and 1000 AD (*ibid.*, 143).

#### *Basarwa and Bakgalagadi, Kalahari desert, Botswana*

In the Kalahari Desert there is substantial **interaction**, often with ancient roots, between ethnically different groups. Two of these are the Basarwa and the Bakgalagadi. The Basarwa (also known as San/Bushmen), who lived in the area for thousands of years, originally depended on hunting and gathering, but have more recently also adopted some farming, pastoralism or hired work. Their **group composition** is **fluid** and their resident pattern represents a **mobility continuum** from nomadism to sedentism (Kent/Vierich 1989, 98). The Bantu-speaking Bakgalagadi practice a **mix** of agriculture and pastoralism and generally live in dispersed sedentary settlements. Most of these groups show **some degree of interaction** with each other. For most of the time, it are the Bakgalagadi who are the more dominant partner in these relationships (*ibid.*). Nevertheless, within the Kalahari region there are thus a number of available subsistence strategies, including **gathering, hunting, farming, employment, herding, or a combination of these**. Both groups use a variety of these different options in **conjunction** with a dominant strategy, often depending on the area (Kent/Vierich 1989, 98). An important archaeological result of the ethnographic study cited here is that it pointed out that the actual site structure is much less dependent on the actual mobility or economic activity and much more on the anticipated stay. Sturdy housing and for example storage facilities may therefore be much more related to this factor, than actual site use.

#### *Mbuti and Bantu, rain forest, Zaïre*

The Mbuti are hunter-gatherers who live in **mutualistic relationship** with the horticulturalist Bantu, providing protein in **exchange** for carbohydrates. Carbohydrates are scarce in the closed evergreen forest and the Bantu provide a direct source by planting and harvesting yams as well as an indirect source through pioneer vegetation on abandoned swidden fields. The relationship between both groups is **assymetrical**. Bantu would survive without Mbuti, if they would hunt more, but conversely the Mbuti depend on Bantu carbohydrates for survival in the rainforest (Gregg 1988).

#### *Bamgombi and Efe, Central Africa*

The subsistence strategies of these two groups of pygmies are mainly based on hunting, fishing and gathering, although some households of both groups engage in some form of **small-scale** crop cultivation. Among the Efe this involves small gardens, often left **untended** due to their **intrinsic** mobility. Both groups also occasionally work for sedentary farming neighbours such as Lese Dese and Mpimu agriculturalists and products are regularly **exchanged** (Pedersen/Wæhle 1988). In this respect these groups thus **combine immediate return** strategies (hunting, gathering, fishing) with **delayed return** strategies (**occasional** horticulture) (see

Raemaekers 1999,119) and **intermediate** options such as labour and exchange. This is also expressed in the settlement system, which consists of villages, households and forest camps, households outside the villages being characteristic for Mpimu agriculturalists (Pedersen/Wæhle 1988, 78). An important point made by Pedersen and Wæhle (1988, 89-90) is their notion that the **opportunities** and **constraints** provided by agriculturalists and other groups, and the influence they have, to a large extent shape Pygmy residence choice and **group composition**. Next to the already existing differences between Efe and Bamgombi Pygmy groups and the influence of the local environment, it is thus also the **intergroup relations** that determine the composition of subsistence strategies practiced by these groups. Again much **variation** is visible between culturally associated communities.

### *Hutu, Tutsi and Twa, Rwanda*

In traditional Rwanda the Hutu are hoe cultivators (using iron tools), the Tutsi, whose forebears imposed themselves as a ruling class are cattle herders and the Twa are hunter-gatherers living in the (decreasing area of) forest. These groups **participate(d) in a system of interaction and exchange**. Both Hutu and Tutsi value meat, but do not hunt. Instead they use the meat provided by domesticated cattle. **Hunting only serves as a source of exchangeable commodities**. The Twa for example **help** the Tutsi with tracking game, however the meat is left to them, while the Tutsi obtain the leopard skins and other items. Furthermore the Hutu **provide** the Tutsi with labour and agricultural products, while these **lend custodianship** of cattle to the Hutu, yet remain owner (Layton *et al.* 1991, drawing on Maquet 1961).

### *Maasai-Kykuyu-Dorobo, Kenia and Tanzania*

The eastern African Dorobo are hunter-gatherers surrounded by pastoralists and farmers who regularly **exchange** honey for husbanded resources. Some Maasai or Kykuyu **may however become** Dorobo for a while when they suffer from crop failure or stock losses. In time these groups may **again return** to farming and herding (see Layton *et al.* 1991). Over the past decades many Dorobo have **assimilated** with the pastoralist economies of their neighbours.

### *Mikea, Madagascar*

The Mikea practice a **mixed** foraging-horticulture strategy of a seemingly **irrational** character. In general they practice **low-investment extensive horticulture**, which means they plant cultigens in patches or wilderness that largely remain **untended** till harvest time. Pay-offs on average are low, cultigens compete with wild plants and returns are vulnerable due to pests, predation and unexpected climatic conditions. **Compensation**, sometimes forming the bulk of the diet, is formed by hunting and gathering. Nevertheless, there is no intention among the Mikea to refrain from planting cultigens or to invest more to increase results (Tucker 2006). Apart from **symbolical reasons** for investing in foraging it appears that Mikea 'decision makers' do not value possible future outcomes over **direct gratification** for a number of reasons. Modeling from a behavioural ecological perspective indicates that reasons for **discounting the future** most likely include

uncertainty over the outcome and the question who will benefit from the saved resources (will offspring or future generations benefit?), as well as for example the pleasures of **immediate gratification** (Tucker 2006, 28, 39).

## **Nomads, Middle East and Central Asia**

While not confined to the Middle East and Central Asia, nomadism is one of the more common 'subsistence-modes' in these areas since prehistoric times. In an elaborate study on nomads Cribb (1991) indicates that although often associated with pastoralism, the actual **spectrum of nomadic lifeways** is much more **diverse**. There is in fact a **continuum of interaction** between **mobility** and **sedentism** and between **pastoralism** and **agriculture**. A general rule that seems to apply is that a greater degree of pastoralism results in a stronger tendency towards nomadism (mobility). In this **nexus** of options it is thus possible that a pastoral mode of subsistence may **coexist** with an agricultural mode of existence and **even involve the same social group** or **specialized sectors** within a single community, under a wider mode of production. The continuum between nomadism and sedentism may be viewed in terms of a range of productive strategies from settled agriculture, through various forms of **mixed farming** and forms of '**semi-nomadism**', to tied and ultimately untied nomadism (Cribb 1991, 59).

## **Middle and North America**

### *Pacific Coast, Southern Mexico*

While maize-based food production was firmly established on the Pacific coast in southwestern Mexico by c. 600 BC, original domestication took place some 7000 years before that and was widely dispersed around c. 5500 BC. During the Archaic period (c. 5500-1500 BC) people of the Soconusco region were foragers that **supplemented** their diet both by **cultivating morphologically wild plant species** as well as some cultigens. While not committing themselves to maize based food production, these groups did include maize between 4000 and 3000 BP (Kennett *et al.* 2006, 103). The **slow introduction** most likely relates to impediments to successful cultivation. Some of these may have been technological, but the **investment of time and energy** in planting, weeding, watering and harvesting decreased the energy gained compared to **wild alternatives**. It is modeled that increasing reliance took place at the moment higher-ranked prey items were reduced and diet breadth extended to include lower-ranked plant foods such as maize (*ibid.*, 134-135).

### *Kumeyaay, southern California*

These groups knew a low-level food production strategy without domesticates. They burnt extensive areas in order to **improve foraging** for deer and also removed competing species of plants prior to sowing of wild grain grass. Furthermore they had an extensive and far-reaching program of **transplantation and tending** of a select yet broad assemblage of wild plant species. (Smith 2001).

### *Owens Valley Paiute, eastern California*

The Owens Valley Paiute practiced **low-level food production** without domesticates. Interviews date to the 1920s and 1930s. Largely similar to the Shoshone Great Basin groups. Their economy was largely based on hunting and gathering of a **wide range of resources**. Furthermore they had specific seed and hunting territories and lived in largely permanent settlements. An important element in their subsistence strategy was focused on the **harvest of various bulbous hydrophytic food plant species** from the floodplains of the Owens river. These areas were also **managed, improved and enhanced** by irrigation. Ownership may have been an important aspect of society (Smith 2001).

### *Great Basin groups, North America*

Among the different groups inhabiting the Great Basin, an area roughly covering the states of Oregon, Utah, Nevada, Arizona and California; there have been several groups of hunter-gatherers, sharing the same language, technology and culture, but exhibiting a **wide range of adaptations** from foragers to collectors. For example the harvesting of pinyon nuts alone was paired with a wide variety of strategies, **varying** both geographically and temporally, as well as **varying in intensity** (Zeanah 2002).

### *Cocopa, lower Colorado*

Before the construction of 20<sup>th</sup> century upstream dams, the Cocopa practiced food production involving **non-domesticated plants**. This **semi-cultivation** of seed-bearing species involved **the broadcast sowing**, of seeds harvested the previous fall on thin and muddy, nutrient-rich riverbank soils, exposed by the receding floodwaters of the Colorado. Plots could be 50-100 m wide and sometimes extended up to 1.6 km along the river. They received **no further attention**. This practice existed alongside the maize-tepary-bean-pumpkin cultivation and could have preceded it (Smith 2001, drawing on various sources).

### *Eastern Woodland People, Ohio-Indiana-West Virginia-Kentucky-Arkansas-Tennessee*

The earliest evidence for the origins of plant cultivation in this area is related to Archaic foragers **manipulating** their environment and so creating **fertile patches** where many weedy early domesticates would have thrived. After c. 2000 BC cultigens become increasingly important and widespread (Watson 1989). Nevertheless, it is very difficult to decide **where to draw the line** and to say that certain groups are significantly horticultural and others are not. People expertly deployed a **wide array of forest resources**, season by season and generation by generation. Even after the undeniable presence of cultigens, it is not a situation of presence or absence, but rather a **kaleidoscopic mosaic where a small array of fully morphologically domestic plants are used in varying combinations with a much larger variety still of wild herbaceous plants, shrubs, and trees**. This system probably **further varied seasonally, geographically and according to local cultural preference** (Watson 1989, 564).

### *Fremont complex, Eastern Great Basin, Northern Colorado*

People living in the Fremont region cultivated maize between 600 and 1300 AD, yet next to this they **continued to rely on hunting and gathering** of wild plants throughout the Formative period. Archaeological evidence indicates a rather **extreme inter-assemblage diversity** in the importance of agricultural crops relative to local food sources (Barlow 2006). In fact it includes a **mosaic of behaviors**, including **full-time farmers, full-time foragers, part-time farmer-foragers** who seasonally switched modes of production and **foragers who switched to full-time farming**. There is thus a **matrix** providing a **variety of behavioral options** to people pursuing an **array of adaptive strategies**, a **true mix of symbiotic and competitive relationships** among farmers and between farmers and foragers (Madsen/Simms, 1998, 255). Over the span of a millennium the transition from foraging to farming is followed by a period of **adaptive diversity** and remarkably ends with the abandonment of farming (*ibid.*). Overall there is thus a **scale of intensification** ranging from dense populated farming communities with incipient stratification to small, widely dispersed egalitarian family groups and from autarky to **mutual interdependence**. To an important extent the existing diversity can be linked to the variation in geography and the diversity in natural ecosystems, although this should not be seen as the ultimate explanation (*ibid.*, 259; Barlow 2006). Adding the dimension of time it should be realized that even during periods as brief as a human lifetime, the lives of some people were relatively constant, while **others shifted** between foraging and farming or a **mixture** of these, ties between various groups were furthermore marked by **demographic fluidity** (Madsen/Simms 1998, 257). The Fremont complex thus offers a tantalizing perspective on the actual **array of adaptations** possible **within one cultural framework**, both with respect to space and time.

### *Mayflower settlers and Amerindians, East Coast*

The settlers of the Mayflower landed in an infertile area. This is why soon after their arrival they became **dependent** on the indigenous communities, whose economy combined maize cultivation with hunting. After establishing their own maize cultivation, their economic position increased and instead of **exchanging** European goods for maize they now demanded beaver pelts. This led to a **shift in strategy** among the Amerindians toward increased hunting for exchange, soon depleting the existing population of beavers. Shortly after the economic attention of the colonists turned to agricultural produce aided by slave labour. The **intensification** of this production soon encroached on the remaining indigenous fields. In the space of 50 years the relationship between natives and colonists was **inversed** (Layton *et al.* 1991).

## **Europe: potential archaeological parallels.**

### *Grotta dell'Uzzo, Sicily*

Archaeological evidence from the Grotta dell'Uzzo in southern Sicily indicates the existence of a **very gradual** and slow shift to agriculture. Over the span of two millennia (between *c.* 7000 and 5000 cal BC) the occupants or users of the cave slowly added cultigens (*e.g. Triticum monococcum*) to their diet as well as

domesticates, whilst **continuing** to gather the same wild resources and hunt wild animals. They thus underwent slow changes **transforming** them from foragers to crop-cultivators and thereby inevitably changing dietary habits and socio-economic conditions. It is argued that this was not just a passively accepted phenomenon, but rather a **dynamic process**, eventually including conscious improvement of cultivation, harvesting and crop-processing techniques, as well as selection of crop varieties most productive under local circumstances (Constantini 1989, 202-204).

### *The Cardial culture in southern France*

Recent research on the constitution of the Cardial culture (starting around *c.* 5600 cal BC), places the accent both on a **variety of economic systems adopted**, but also on an organization based on a **mobile system of resource exploitation**. According to Guilane and Manen (2007, 40) a rather broad **diversification** characterizing the economy can be documented. Settlements on plains with **agro-pastoral production**, are found alongside sectors focusing on exploiting **ecological niches** more favourable to **pastoral activities and hunting**. This implies a **mobile aspect** in the economy and networks structures early on. Apart from this there are no indications for a long-lasting occupation of sites, again stressing frequent moves.

### *La Hoguette, western Germany and eastern France*

Sheep and goat bones from the contested abri of Bavans in eastern France (Aimé/Jeunesse 1986) and a small excavation at Stuttgart-Bad Cannstatt (Kalis *et al.* 2001) indicate that the early Neolithic ceramic La Hoguette culture may also have practiced a form of **nomadic pastoralism**. Since these groups are often documented in association with remains of the fully Neolithic LBK, this suggests some form of **symbiosis** may have existed. There are also vague palynological indications (*e.g.* Jeunesse 2003) that may point to **some form of early crop cultivation**, although this is heavily debated (Behre 2007). In any case there are **indications of intermediate practices** between agriculture and hunting and gathering.

### *Ertebølle, northern Germany and southern Scandinavia*

Although the actual transition to agriculture in this area is rather firmly associated with the establishment of the TRB culture, and dated to *c.* 4000 cal BC, there are indications that, during the second half of the fifth millennium, Ertebølle groups were **in contact** with Neolithic groups to the south and may **occasionally** have imported domesticates as attested at Rosenhof (Hartz *et al.* 2007, however see Noe-Nygaard *et al.* 2005). While this may point to occasional **experiments** with new elements, **no major changes** took place. The situation during the early TRB was different, but perhaps less different than previously assumed. As Hartz *et al.* (2007, 587) point out, cultigens were only **of limited importance** in this first phase and **hunting and gathering continued to contribute** to the diet. Furthermore the often demonstrated **isotopic shift** from marine to terrestrial diets for south-west Scandinavia should in fact be **nuanced** and is less pronounced (Andersen 2010; Lidén *et al.* 2004). Others (*e.g.* Fischer *et al.* 2002; Price 1996; 2000; Sørensen/Karg 2012), also argue for a gradual transition during the early stages of the TRB culture.

group/culture	location	comb.	annual accents	long-term switch	'inverse'	group composition	mobility	intercultural variability	mutualism	references
<i>Siriono</i>	Bolivia	h,g,f,hc					+/-			Kent 1989
<i>Siona-Secoya</i>	Equador	h,g,f,hc	+	+	+	+	+/-	+		Vickers 1989
<i>Maku</i>	Black Water, Brazil	h,g,hc,f,tr	+			+	+	+	symbiosis	Milton 1984; Moran 1991
<i>Tukanoan</i>	Black Water, Brazil	hc,f,tr	+						symbiosis	Milton 1984; Moran 1991
<i>Several groups</i>	Amazonia	h,g,f,hc					+/-		symbiosis	Sponsel 1989
<i>Lacandon Maya</i>	Chiapas and Guatemala	h,g,f,c,tr	+				+/-		exchange	Terrell <i>et al.</i> 2003
<i>Agta</i>	Philippines	h,g,hc,t	+	+	+	+	+/-	+	symbiosis	Griffin 1989
<i>Punan, Penen,</i>	Borneo, Malaysia	h,g,tm,tr	+	+	+		+/-	+	interdep.	Junkers 2002
<i>Batek</i>	Borneo, Malaysia	h,g,c,tm,tr	+	+	+		+/-	+		Junkers 2002
<i>Nuaulu</i>	Seram, Indonesia	h,g,f,tm,hc,tr	+							Ellen 1988
<i>Kubu</i>	Sumatra	h,g,c,tr	+				+/-	+	exchange, interaction	Layton <i>et al.</i> 1991
<i>Phi Tong Luang</i>	Thailand	h,g,f,tm,hw	+				++		dependence, symbiosis	Pookajorn 1992
<i>Maeo</i>	Laos, Thailand	c,tr					-		symbiosis	Pookajorn 1992
<i>Basarwa</i>	Kalahari, Botswana	h,g,c,p,hw	+			+	+/-	+	interaction	Kent/Vierich 1989
<i>Bakgalagadi</i>	Kalahari, Botswana	c,p					+/-		interaction	Kent/Vierich 1989
<i>Mbuti</i>	rainforest Zaire	h,g,tr				+	+/-		symbiosis	Gregg 1988
<i>Bantu</i>	rainforest Zaire	hc,tr							symbiosis	Gregg 1988
<i>Bamgombi, Efe</i>	Central Africa	h,g,f,c	+			+	+/-	+	exchange, interaction	Pedersen/Wæhle 1988
<i>Hutu</i>	Rwanda	c,p,tr,l							exchange, interaction	Layton <i>et al.</i> 1991
<i>Tutsi</i>	Rwanda	h,p,tr							exchange, interaction	Layton <i>et al.</i> 1991
<i>Twa</i>	Rwanda	h,g,tr							exchange, interaction	Layton <i>et al.</i> 1991
<i>Masai-Kikuyu-Dorobo</i>	Kenia and Tanzania	h,g,tr,c,p		+	+			+	exchange	Layton <i>et al.</i> 1991
<i>nomads</i>	Middle East, Asia	p,a	+			+	+/-	+	exchange	Cribb 1991
<i>Mikea</i>	Madagascar	h,g,hc	+				+/-			Tucker 2006
<i>Stone Age</i>	Precolonial S. Africa	h,g,f,tm					++			Hall 1988
<i>Iron Age</i>	Precolonial S. Africa	a,p,h,g,f,					+/-			Hall 1988
<i>Jomon</i>	Japan	h,g,f,tm,c	+	+	+		+/-	+	interaction	Habu 2002; Matsui/ Kanehara 2006
<i>Xinglongwa; Zhaobaogou</i>	Northeast China	h,g,p?,c?					-			Shelach 2006
<i>Papua</i>	interior New Guinea	h,g,tm	+				+	+		Denham/Barton 2006; Terrell <i>et al.</i> 2003
<i>Several groups</i>	Oceania	h,g,tm	+				+			Terrell <i>et al.</i> 2003
<i>Archaic</i>	Greater Antilles	h,g,f,ab,tm					+			Terrell <i>et al.</i> 2003
<i>Nukak</i>	Colombia	h,g,hc	+				+++			Politis 1996

group/culture	location	comb.	annual accents	long-term switch	'inverse'	group composition	mobility	intercultural variability	mutualism	references
<i>Soconusco</i>	Pacific coast, Mexico	h,g,tm,c	+				+			Kennett <i>et al.</i> 2006
<i>Great Basin groups</i>	North America	h,g	+				++/+-	+		Zeanah 2002
<i>Fremont complex</i>	E. Great Basin	h,g,tm,a	+	+	+	+	++/+-	+	symbiosis, competition	Barlow 2006; Madsen/Simms 1989
<i>E. Woodland People</i>	e.g. Ohio, Indiana, Ark.	h,g,tm,c					+/-	+		Watson 1989
<i>Amerindians</i>	East coast	h,c,tr	+	+	+		+/-		dependence	Layton <i>et al.</i> 1991
<i>Grotta dell'Uzzo</i>	Sicily	h,g,p,c	+				+			Constantini 1989
<i>Cardial</i>	Southern France	h,p,a					+/-	+	interaction/exchange?	Guilane/Manen 2007
<i>La Hoguette</i>	E. France, W. Germany	h,g,p,c?	+				+		symbiosis	Kalis <i>et al.</i> 2001; Jeunesse 2003
<i>Ertebølle</i>	N. Germany, S.Scandinavia	h,g	+				+	+		Andersen 2010; Hartz <i>et al.</i> 2007

*Table appendix III.1 Selection of case-studies from ethnography, (ethno)history and archaeology, focusing on the variability existent in (complementary) subsistence strategies in forager and farmer groups. Abbreviations: h: hunting; g: gathering; f: fishing; a: arable farming; c: cultivation; ab: arboriculture; hc: horticulture; p: pastoralism; tm: tending/managing; tr: trade; l: labour. The degree of mobility is indicated by '+' and '−', '+/−' referring to semi-sedentary groups or groups with mobile and sedentary counterparts. Absence of traits is relative to the sources used.*

## References

Aimé, G. and C. Jeunesse, 1986. Le niveau 5 des abris-sous-roche de Bavans (Doubs) et la transition Mésolithique/Néolithique, in: *Actes du Xe colloque interrégional sur le Néolithique, Caen, 30 septembre-2 octobre 1983*. (Revue Archéologique de l'Ouest Supplément 1), 31-40.

Alma, X.J.F. and R. Torremans, 2010. *Gouda, Westergouwe - Deelgebied 3: een vroege vindplaats op de crevasse. Een inventariserend veldonderzoek in de vorm van proefsleuven*. Amersfoort (ADC-rapport 2552).

Ameels, V., J. Bastiaens, M. Bats, P. Crombé, K. Deforce, K. Haneca, J.-P. Parent, and M. van Strydonck, 2003. Recent Steentijdonderzoek in de regio Oudenaarde (Oost-Vlaanderen, België). *Notae Praehistoricae* 2, 61-65.

Amkreutz, L. 2004. *Bandkeramiek langs de Maas – een analyse en interpretatie van bandkeramische vindplaatsen op het laagterrassen van de Maas in Limburg*. Leiden (MA-thesis, Leiden University).

Amkreutz, L., L. Verhart and M. Wansleeben, 2008. Hazendonk layers over and over again, in: H. Fokkens, B. Coles, A. Van Gijn, J.P. Kleijne, H.H. Ponjee and C.G. Slappendel (eds), *Between foraging and farming. An extended broad spectrum of papers presented to Leendert Louwe Kooijmans*. Leiden (Analecta Praehistorica Leidensia 40), 139-152.

Amkreutz, L.W.S.W., B. Vanmontfort, M. de Bie and C. Verbeek, 2010. Bowls of contention. Mesolithic sites with pottery in the Lower Rhine Area, in: B. Vanmontfort, L.P. Louwe Kooijmans, L. Amkreutz and L. Verhart (eds), *Pots, farmers and foragers. How pottery traditions shed a light on the social interaction in the earliest Neolithic of the Lower Rhine Area*. Leiden (Archaeological Studies Leiden University 20), 15-26.

Andersen, S.H., 2010. The first pottery in South Scandinavia, in: B. Vanmontfort, L.P. Louwe Kooijmans, L. Amkreutz and L. Verhart (eds), *Pots, farmers and foragers. How pottery traditions shed a light on the social interaction in the earliest Neolithic of the Lower Rhine Area*. Leiden (Archaeological Studies Leiden University 20), 161-170.

Arnoldussen, S. 2008. *A living landscape. Bronze Age settlements in the Dutch river area (c. 2000-800 BC)*. Leiden (PhD thesis, Leiden University).

Arts, N. 1988. *De grote Laat-Mesolithische nederzetting Tilburg-Kraaien, provincie Noord-Brabant. Deel I: Een overzicht van de archeologische gegevens*. Amsterdam (Internal Report, University of Amsterdam).

Arts, N. 1994. Laat-Mesolithische nederzettingssporen en een Rössener Breitkeil in het Stiphouts Broek te Helmond, Nederland. *Notae Praehistoricae* 13, 79-94.

Arts, N. and M. Hoogland, 1987. A Mesolithic settlement area with a human cremation grave at Oirschot V, municipality of Best, the Netherlands. *Helinium* 27, 172-189.

Asmussen, P.S.G. and J. Moree, 1987. *De Ewijkse velden*. Leiden (internal report, Leiden University).

Baak, P.J., S. Bottema, R.T.J. Cappers and H. Woldring, 2002/2003. Vegetatiehistorie van Jardinga (Fr.). *Paleo-aktueel* 14/15, 38-43.

Baetsen, S. 2008. Het grafveld, in: H. Koot, L. Bruning and R. Houkes (eds), *Ypenburg-Locatie 4. Een nederzetting met grafveld uit het Midden-Neolithicum in het West-Nederlandse kustgebied*. Leiden (Hazenberg Archeologie), 119-189.

Bakels, C.C. 1981. Neolithic plant remains from the Hazendonk, province of Zuid-Holland, the Netherlands. *Zeitschrift für Archäologie* 15, 141-148.

Bakels, C.C. 1986. Akkerbouw in het moeras?, in: M.C. van Trierum and H.E. Henkes (eds), *Rotterdam Papers V, a contribution to prehistoric, Roman and medieval archaeology*. Rotterdam, 1-6.

Bakels, C.C., 1988. Hekelingen, a Neolithic site in the swamps of the Meuse estuary, in: H. Küster (ed.), *Der prähistorische Mensch und sein Umwelt, Festschrift für Udelgard Körber-Grohne zum 65. Geburtstag*. Stuttgart (Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemberg 31), 155-161.

Bakels, C.C. 2006. Pollen analysis and the reconstruction of the former vegetation, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden, A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 305-316.

Bakels, C.C. and L. van Beurden, 2001. Archeobotanie, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam Polderweg. Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 83), 325-378.

Bakels, C.C., L. van Beurden, and T.J.J. Vernimmen, 2001. Archeobotanie, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam De Bruin. Een kamplplaats uit het Laat-Mesolithicum en het begin van de Swifterbant cultuur (5500-4450 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 88), 369-434.

Bakels, C.C. and J. Zeiler, 2005. De vruchten van het land: de neolithische voedselvoorziening, in: L.P. Louwe Kooijmans, P.W. van den Broeke, H. Fokkens and A. van Gijn (eds), *Nederland in de prehistorie*. Amsterdam (Bert Bakker), 311-335.

Bakker, R. 2003<sup>a</sup>. *The emergence of agriculture on the Drenthe Plateau*. PhD thesis, Groningen University (Archäologische Berichte 16).

Bakker, R. 2003<sup>b</sup>. The process of Neolithization in the Pleistocene areas near the North Sea coast – evidence for early farming by the Swifterbant Culture around 4000 cal BC. *Archäologische Informationen* 26(2), 333-369.

Ball, E. 1997. *De vissen van Brandwijk*. Leiden (Internal Report, Leiden University).

Ball, E. and P.W. van den Broeke, (with contributions by: E. Ball, H. Kars, W.A. Out, D. Raemaekers, P. Van den Broeke, L. Verhart, and J. Zeiler), 2007. *Opgravingen op 't Klumke te Nijmegen-Oosterhout. Boeren uit het Midden-Neolithicum, de IJzertijd en de Merovingische periode op een zandrug in de oostelijke Betuwe*. Nijmegen (Archeologische Berichten Nijmegen 6).

Barlow, K.R. 2006. A formal model for predicting agriculture among the Fremont, in: D. J. Kennett and B. Winterhalder (eds), *Behavioral ecology and the transition to agriculture*. Los Angeles (University of California Press), 87-102.

Bastiaens, J., K. Deforce, B. Klinck, L. Meersschaert, C. Verbruggen and L. Vrydaghs, 2005. Palaeobotanical analysis, 251-278.

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

Bauerochse, A. and A. Metzler, 2001. Landschaftswandel und Moorwegebau im Neolithikum in der südwestlichen Dümmer Region. *Neue Ausgrabungen und Forschungen in Niedersachsen* 31, 105-133.

Beerenhout, B. 2001<sup>a</sup>. Vissen, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam Polderweg: Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v.Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 83), 243-276.

Beerenhout, B. 2001<sup>b</sup>. Vissen, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam De Bruin. Een kampplaats uit het Laat-Mesolithicum en het begin van de Swiftbant cultuur (5500-4450 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 88), 299-326.

Behre, K.-E. 2007. Evidence for Mesolithic agriculture in and around Central Europe? *Vegetation History and Archaeobotany* 16, 203-219.

Berendsen, H.J.A. and E. Stouthamer, 2001. *Palaeogeographic development of the Rhine-Meuse delta*. Assen (Koninklijke van Gorcum).

Beuker, J.R. 1989. Mesolithische bewoningssporen op een zandopduiking te Nieuw-Schoonebeek. *Nieuwe Drentse Volksalmanak* 106, 117-186.

Bienienfeld, P.F. 1986. *Stone tool use at five Neolithic sites in the Netherlands. A lithic use-wear analysis*. Binghamton (PhD thesis, State University of New York).

Binford, L.R. 1992. Seeing the present and interpreting the past - and keeping things straight, in: J. Rossignol and L. Wandsnider (eds). *Space, time and archaeological landscapes*. London (Plenum Press), 43-58.

Blanquaert, G. 1987. Typologisch en traceologisch onderzoek van een mesolithische concentratie te Oudenaarde-Donk. *Notae Praehistoricae* 7, 11-13.

Bloemers, J.H.F., L.P. Louwe Kooijmans and H. Sarfatij, 1981. *Verleden land. Archeologische opgravingen in Nederland*. Amsterdam (Meulenhoff Informatief).

Boessneck, J. 1978. Die Vogelknochen aus der Moorsiedlung Hüde I am Dümmer, Kreis Grafschaft Diepholz. *Neue Ausgrabungen und Forschungen in Niedersachsen* 12, 155-169.

Boomert, A. 1974. Hekelingen II. *Helinium* 14, 218-225.

Bottema, S. 2002/2003. Vreemde activiteit en vreemd pollen aan de Tjonger (Fr.). *Paleo-aktueel* 14/15, 45-47.

Bottema-Mac Gillavry, N. 2002/2003. Hergebruik van hout in de Prehistorie? *Paleo-aktueel* 14/15, 48-53.

Boomert, A. 1974. Hekelingen II. *Helinium* 14, 218-225.

Brandt, K.-H. 1967. *Studien über steinerne Äxte und Beile der jüngeren Steinzeit und der Stein-Kupferzeit Nordwestdeutschlands*. Hildesheim (Münstersche Beiträge zur Vorgeschichte 2).

Brinkhuizen, D.C. 2006. Fish, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden, a Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 449-470.

Brounen, F.T.S. 1985. HVR 183, vroeg-, midden- en laat-neolithische vondsten te Echt-Annendaal. *Archeologie in Limburg* 24, 66-71.

Brounen, F.T.S. 1986. *HVR 183: mesolithische, neolithische en ijzertijdvondsten te Echt-Annendaal en het belang van de vindplaats in het licht van de relatie tussen Limburg en LBK aardewerk*. Leiden (internal report, Leiden University).

Brounen, F.T.S. 1999. Vroegneolithisch Begleitkeramiek uit Limburg en Noord-Brabant. *Archeologie in Limburg* 82, 59-64.

Brounen, F.T.S. and J.P.M. de Jong, 1988. Opmerkelijke vroege neolithische vondsten bij Gassel. *Westerheem* 27, 183-192.

Brounen, F.T.S. and A. Hauzeur, 2010. The cannelured version of Begleitkeramik: a survey of finds and sites, in: B. Vanmontfort, L.P. Louwe Kooijmans, L. Amkreutz and L. Verhart (eds), *Pots, farmers and foragers. How pottery traditions shed a light on the social interaction in the earliest Neolithic of the Lower Rhine Area*. Leiden (Archaeological Studies Leiden University 20), 49-64.

Brounen, F.T.S., E. Drenth and J. Schreurs, 2010<sup>a</sup>. Ittervoort Damszand: a find of La Hoguette pottery and Begleitkeramik in the Dutch province of Limburg, in: B. Vanmontfort, L. P. Louwe Kooijmans, L. Amkreutz and L. Verhart (eds), *Pots, Farmers and Foragers. How pottery traditions shed a light on the social interaction in the earliest Neolithic of the Lower Rhine Area*. Leiden (Archaeological Studies Leiden University 20), 105-113.

Brounen, F.T.S., E. Drenth and P. Schut, 2010<sup>b</sup>. La Hoguette north of the Rhine. The Ede-Frankeneng site revisited, in: B. Vanmontfort, L. P. Louwe Kooijmans, L. Amkreutz and L. Verhart (eds), *Pots, Farmers and Foragers. How pottery traditions shed a light on the social interaction in the earliest Neolithic of the Lower Rhine Area*. Leiden (Archaeological Studies Leiden University 20), 95-104.

Brounen, F.T.S., E. Drenth and J. Schreurs 2011. Ittervoort-Damszand: een vindplaats van La Hoguette. *Informatiebulletin Streekarcheologie Peel, Maas & Kempen* 21(2).

Bubel, S. 2002/2003. *Bioturbation and its effects on the archaeological record*. Leuven (PhD thesis, Leuven University).

Bulten, E.B.B. 1998. *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 34. Dodewaard/Peyenkampse veldweg*. Amersfoort (Rapportage Archeologische Monumentenzorg 30).

Bulten, E.E.B. and A.T. Clason, 2001. The antler, bone and tooth tools of Swifterbant, the Netherlands (c. 5500-4000 cal. BC) compared with those from other Neolithic sites in the Netherland, in: A.M. Choyke and L. Bartosiewicz (eds), *Crafting bone: skeletal technologies through time and spaces. Proceedings of the 2nd Meeting of the (ICAZ) Worked Bone Research Group, Budapest, 31 August - 5th September 1999*. Oxford (BAR International Series 937), 297-320.

Bulten, E.E.B., F.J.G. van der Heijden and T. Hamburg, 2002. *Emmeloord, prehistorische viswieren en fuiken*. Amersfoort (ADC-rapport 140).

Carmiggelt, A. and M.C. van Trierum, 2005. *Archeologische vindplaatsenkaart en waardenkaart van de gemeente Ridderkerk. Instrumenten voor een gemeentelijk archeologiebeleid*. Rotterdam (datum vaststelling onbekend).

Carmiggelt, A., A.J. Guiran en M.C. van Trierum, 2005. *Lijst van archeologisch belangrijke plaatsen in de gemeente Rotterdam vastgesteld door Burgemeester en Wethouders op grond van artikel 13 van de Monumentenverordening Rotterdam 2003*. Rotterdam.

Casparie, W.A., B. Mook-Kamps, R.M. Palfenier-Vegter, P.C. Struyck, W.A. van Zeist, 1977. The palaeobotany of Swifterbant. *Helinium* 17, 28-55.

Casparie, W.A. and J.H.A. Bosch, 1995. Bergumermeer-de Leijen (Friesland, the Netherlands): a Mesolithic wetland in a dry setting. *Mededelingen Rijks Geologische Dienst* 52, 271-282.

Clason, A.T. 1967. *Animal and man in Holland's past*. Groningen (PhD thesis, Groningen University).

Clason, A.T. 1990. Ewijk, an inland Vlaardingen settlement; Archaeozoology and the amateur archaeologist, in: J. Schibler, J. Sedlmeier and H. Spycher (eds), *Festschrift für Hans R. Stampfli. Beiträge zur Archäozoologie, Archäologie, Anthropologie, Geologie und Paläontologie*. Basel (Helbing und Lichtenhahn), 63-75.

Clason, A.T. and D.C., Brinkhuizen, 1993. Bergschenhoek, in: A.T. Clason, S. Payne and H.P. Uerpmann (eds), *Skeletons in her cupboard, Festschrift for Juliet Clutton-Brock*. Oxford (Oxbow Monograph 34), 61-73.

Clason, A. and D.C. Brinkhuizen, 1978. Swifterbant, mammals, birds, fishes. A preliminary report (Swifterbant Contributions 8). *Helinium* 18, 69-83.

Constandse-Westerman, T.S. and C. Meiklejohn, 1979. The human remains from Swifterbant (Swifterbant Contributions 12). *Helinium* 19, 235-260.

Constantini, L. 1989. Plant exploitation at Grotta dell'Uzzo, Sicily: new evidence for the transition from Mesolithic to Neolithic subsistence in southern Europe. in: D.R. Harris and G.C. Hillman (eds.), *Foraging and farming: the evolution of plant exploitation*. London (One World Archaeology Series 13), 197-206.

Craig, O.E. 2005. Organic analysis of "food crusts" from sites in the Scheldevalley, Belgium: a preliminary evaluation. in: P.Crombé (ed.), *The last hunter-gatherer-fishermen in sandy Flanders (NW Belgium). The Verrebroeke and Doel excavation projects (vol. 1)*. Ghent (Archaeological Reports Ghent University 3), 435-443.

Creemers, G. and P.M. Vermeersch, 1986. Het jong-mesolithisch site van Meeuwen-In den Damp 1. *Notae Praehistoricae* 6, 107-112.

Creemers, G. and P.M. Vermeersch, 1987. De laatmesolithische vindplaats van Meeuwen-In den Damp 1 (gem. Meeuwen-Gruitrode). *Archaeologia Belgica* III, 71-72.

Creemers, G. and P.M. Vermeersch, 1989. Meeuwen-Donderslagheide: A Middle Neolithic site on the Limburg Kempen Plateau (Belgium). *Helinium* 29, 206-226.

Cribb, R. 1991. *Nomads in archaeology*. Cambridge (Cambridge University Press).

Crombé, P. 2005<sup>a</sup>, (ed.). Introduction, in: P. Crombé (ed.), *The last hunter-gatherer-fishermen in sandy Flanders (NW Belgium). The Verrebroeke and Doel Excavation Projects (Vol. 1)*. Ghent (Archaeological Reports Ghent University 3), 11-12

Crombé, P. 2005<sup>b</sup>. Situation, in: P. Crombé (ed.), *The last hunter-gatherer-fishermen in sandy Flanders (NW Belgium). The Verrebroeke and Doel Excavation Projects (Vol. 1)*. Ghent (Archaeological Reports Ghent University 3), 13-17.

Crombé, P. 2005<sup>c</sup>. General conclusions, in: P. Crombé (ed.), *The last hunter-gatherer-fishermen in sandy Flanders (NW Belgium). The Verrebroeke and Doel Excavation Projects (Vol. 1)*. Ghent (Archaeological Reports Ghent University 3), 295-300.

Crombé, P. 2005<sup>d</sup>. Steentijdonderzoek in het tracé van het Deurganckdok (2000-2003). *Vobov-info* 61, 29-40.

Crombé, P., H. Groenendijk and M. van Strydonck, 1999. Dating the Mesolithic of the Low Countries: some practical considerations, in: J. Evin, C. Oberlin, J.P. Daugas and J.F. Salles (eds), <sup>14</sup>C et archéologie. *Actes du 3ème congrès international (Lyon, 6-10/04/1998)*. (Mémoires de la Société Préhistorique Française 26), 57-63.

Crombé, P., J.-P. Van Roeyen, J. Sergant, Y. Perdaen and M. van Strydonck, 2000. Doel "Deurganckdok" (Flanders, Belgium): settlement traces from the Final Palaeolithic and the Early to Middle Neolithic. *Notae Praehistoricae* 20, 111-119.

Crombé, P., M. Bats, F. Wuyts and J.-P. van Roeyen, 2004. Een derde vindplaats van de Swifterbantcultuur in het Deurganckdok te Doel. *Notae Praehistoricae* 24, 105-107.

Cromb  , P., Y. Perdaen and J. Sergant, 2005. Features, in: P. Cromb   (ed.), *The last hunter-gatherer-fishermen in sandy Flanders (NW Belgium). The Verrebroeke and Doel Excavation Projects* (Vol. 1). Ghent (Archaeological Reports Ghent University 3), 141-179.

Cromb  , P., M. Boudin, and M. van Strydonck, 2011. Swifterbant pottery in the Scheldt basin and the emergence of the earliest indigenous pottery in the sandy lowlands of Belgium, in: S. Hartz, F. L  th and T. Terberger (eds), *Early pottery in the Baltic - dating, origin and social context*. Frankfurt (Philipp von Zabern), 465-484.

D'Hollosy, M. and S. Baetsen, 2001. Fysische antropologie, in: Peters, F.J.C and J.H.M. Peeters (red.). *De opgraving van de mesolithische en neolithische vindplaats Urk-E4 (Domineesweg, gemeente Urk)*. Amersfoort (Rapportage Archeologische Monumentenzorg 93), 48-60.

De Bie, M., F. Steenhoudt, I. Luypaert, L. van Impe and P.M. Vermeersch, 1991. Laat-Mesolithicum en/of Neolithicum te Dilsen-Dilserheide, *Notae Praehistoricae* 11, 53-61.

De Ceunynck, R., P. van der Plaetsen, J. Vanmoerkerke, M. van Strydonck and C. Verbruggen, 1985. Neolithicum-Bronstijdvondsten aan de Donk te Oudenaarde. *Archeologica Belgica* 1(1), 67-79.

De Laet, S.J.L. and M.E. Mari  n, 1950. La n  cropole de Lommel-Kattenbosch. *Archeologia Belgica* 2, 309-366.

De Ridder, T. and C. Thanos, 1993. Afval op de Donk. Prehistorische afvallagen rond Brandwijk 't Kerkhof. Amsterdam (Internal Report, Free University Amsterdam).

De Roever, J.P. 1976. Excavations at the river dune sites S21-22. (Swifterbant contribution 4). *Helinium* 16, 3-42.

De Roever, J.P. 1979. The pottery from Swifterbant - Dutch Erteb  le? (Swifterbant contribution 11). *Helinium* 19, 13-36.

De Roever, J. P. 2004. *Swifterbant-aardewerk. Een analyse van de neolithische nederzettingen bij Swifterbant, 5e millennium voor Christus*. PhD thesis, Groningen University (Groningen Archaeological Studies 2).

De Vries, L.S. (with a contribution by F.J. Laarman) 2004. *Luilekkerland aan de kust*. Amersfoort (Rapportage Archeologische Monumentenzorg 106).

De Vries, L.S. 2008. Archeozoologie, in: H. Koot, L. Bruning and R. Houkes (eds), *Ypenburg-Locatie 4. Een nederzetting met grafveld uit het Midden-Neolithicum in het West-Nederlandse kustgebied*. Leiden (Hazenberg Archeologie), 363-394.

De Wolf, H. and P. Cleveringa, 2006. Diatoms, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 285-296.

Deckers, P.H. 1979. The flint material from Swifterbant, earlier neolithic of the Northern Netherlands, I: sites S-2, S-4 and S-51. *Palaeohistoria* 21, 143-180.

Deckers, P.H. 1982. Preliminary notes on the Neolithic flint material from Swifterbant. *Helinium* 22, 33-39.

Deckers, M.J.C. 1991. *Leven op een strandwal. Een zo  archeologische studie van de Vlaardingen-site: Voorschoten-De Donk*. Leiden (MA-thesis, Leiden University).

Deckers, J.A., J.P. De Roever and J.D. van der Waals, 1981. *Jagers, vissen en boeren in een prehistorisch getijdengebied bij Swifterbant*. (ZWO Jaarboek 1980), 111-144.

Deforce, K., V. Gelorini, C. Verbruggen, L. Vrydaghs, 2005. Pollen and phytolith analyses, in: P.Cromb   (ed.), *The last hunter-gatherer-fishermen in sandy Flanders (NW Belgium). The Verrebroeke and Doel excavation projects* (Vol. 1). Ghent (Archaeological Reports Ghent University 3), 108-126.

Deichm  ller, J. 1963<sup>a</sup>. Die neuen Ausgrabungen am D  mmer. *Pr  historische Zeitschrift* 41, 205-206.

Deichm  ller, J. 1963<sup>b</sup>. Neue Ausgrabungen am D  mmer. *Nachrichten aus Niedersachsens Urgeschichte* 32, 84-73.

Deichm  ller, J. 1965. Die neolithische Moorsiedlung H  de I am D  mmer, Kr. Grscht. Diepholz. Vorl  ufiger Bericht   ber die Grabungen 1962-1964. *Neue Ausgrabungen und Forschungen in Niedersachsen* 2, 1-18.

Deichm  ller, J. 1969. Die neolithische Moorsiedlung H  de I am D  mmer, Kreis Grafschaft Diepholz, Vorl  ufiger Abschlussbericht. *Neue Ausgrabungen und Forschungen in Niedersachsen* 4, 28-36.

Denham, T. and H. Barton, 2006. The Emergence of Agriculture in New Guinea, in: D. J. Kennett and B. Winterhalder (eds), *Behavioral ecology and the transition to agriculture*. Los Angeles (University of California Press), 237-264.

Devriendt, I.I.J.A.L.M. 2013. *Swifterbant stones. The neolithic stone and flint industry at Swifterbant (the Netherlands); from stone typology and flint technology to site function*. PhD thesis, University of Groningen (Groningen Archaeological Studies).

Diependaele, S. and E. Drenth, 2010<sup>a</sup>. Archeologisch onderzoek te Hazerswoude-Rijndijk (gemeente Rijnwoude, prov. Zuid-Holland), in: T. de Ridder, L. Verhart, J. Coenraadts, G. Groeneweg, M. Lockefeer, and L. Kruyf, (eds), *Special 2010: Vlaardingen-cultuur*. (Westerheem Special nr. 2), 134-146.

Diependaele, S. and E. Drenth, 2010<sup>b</sup>. *Archeologisch onderzoek langs de rijksweg N11 (Spookverlaat) ten behoeve van de aanleg van het windturbinepark Rijnwoude te Hazerswoude-Rijndijk (gem. Rijnwoude, prov. Zuid-Holland). Een Neolithische vindplaats langs de Oude Rijn*. Capelle aan den IJssel (Archeomedia-rapport A06-286-R en A06-359-R).

Eckert, J. 1986. Ein mittel- und jungneolithischer Siedlungsplatz bei Nottuln, Kreis Coesfeld. *Ausgrabungen und Funde in Westfalen-Lippe* 4, 39-63.

Ellen, R. 1988. Foraging, starch extraction and the sedentary lifestyle in the lowland rain-forest of central Seram, in: T. Ingold, D. Riches and J. Woodburn (eds), *Hunters and gatherers. History, evolution and social change*, (vol. 1.). New York (Berg), 117-134.

Enderman, M. 2008. Huisreconstructies, in: H. Koot, L. Bruning and R. Houkes (eds), *Ypenburg-Locatie 4. Een nederzetting met grafveld uit het Midden-Neolithicum in het West-Nederlandse kustgebied*. Leiden (Hazenberg Archeologie), 111-118.

Ente, P.J. 1976. The geology of the Northern part of Flevoland in relation to the human occupation in the Atlantic time, (Swifterbant contribution 2). *Helinium* 16, 15-35.

Fechner, K. and R. Langhor, 1993. Testing of the archaeopedological checklist in the excavations of Melsele (N. Central Belgium) and Gavisse (N.E. France). *Notae Praehistoricae* 12, 95-104.

Feiken, H. M. Niekus and R. Reinders, 2001. 'Wetsingermaar'. Een neolithische vindplaats in de gemeente Winsum (Gr.). *Palaeo-aktueel* 12, 54-59.

Fischer, A. 2002. Food for Feasting? An evaluation of explanations of the neolithisation of Denmark and southern Sweden. A. Fischer and K. Kristiansen (eds), *The Neolithisation of Denmark. 150 years of debate*. Sheffield (J.R. Collis Publications), 341-393.

Fokkens, H. 1978. *Veldwerkverslag van een boorcampagne ten behoeve van nederzettings-onderzoek nabij Swifterbant (O.Fl.), 1-18 juni 1977*. Groningen (Internal Report, Groningen University).

Geerts, F. 1984. Lommel-Vosvijvers 3. A Late Mesolithic settlement. *Notae Praehistoricae* 4, 61-64.

Gehasse, E.F. 1995. *Ecologisch-archeologisch onderzoek van het Neolithicum en de Vroege Bronstijd in de Noordoostpolder met de nadruk op vindplaats P14*. Amsterdam (PhD thesis, University of Amsterdam).

Genrich, A. 1958. Untersuchungen im steinzeitlichen Siedlungsgebiet am Dümmer, Gemarkung Hüde, Kr. Diepholz. *Germania* 36, 168.

Geyh, M.A. 1971. Statistische Auswertung von 14C-Daten archäologischer Proben. *Nachrichten aus Niedersachsens Urgeschichte* 40, 199-208.

Gillespie, R., J.A.J. Gowlett, E.T. Hall, R.E.M. Hedges, and C. Perry, 1985. Radiocarbon dates from the Oxford AMS system: Archaeometry datelist 2. *Archaeometry* 27(2), 237-246.

Gilot, E. 1984. Datations radiométriques, in: D. Cahen and P. Haesaerts (eds), *Peuples chasseurs de la Belgique préhistorique dans leur cadre naturel*, Bruxelles (Institut Royal des Sciences Naturelles de Belgique), 115-125.

Glasbergen, W., J.A. Bakker, E.C.L. During-Caspers, W.A. Ettema, P.J. van der Feen, C.R. Hooijer, C. Japing, H. de Waard and M.R. Walvius, 1961. De neolithische nederzettingen te Vlaardingen (Z.-H.), in: W. Glasbergen and W. Groenman-van Waateringe (eds), *In het voetspoor van A.E. van Giffen*. Groningen, 41-65.

Glasbergen, W., W. Groenman-Van Waateringe and G.M. Hardenberg-Muller, 1967. Settlements of the Vlaardingen culture at Voorschoten and Leidschendam. *Helinium* 7, 97-120.

Gob, A. 1985. Extension géographique et chronologique de la culture Rhein-Meuse-Schelde (RMS). *Helinium* 25, 23-36.

Gob, A. and M.-C. Jacques, 1985. A Late Mesolithic dwelling structure at Remouchamps, Belgium. *Journal of Field Archaeology* 12, 163-175.

Goossens, T.A. (ed.) 2009. *Opgraving Hellevoetsluis-Ossenhoek. Een nederzetting van de Vlaardingen-groep op een kwelderrug in de gemeente Hellevoetsluis*. Leiden (Archol-rapport 87).

Goossens, T.A. 2010. Steentijdboeren in Hellevoetsluis. Sporen van permanente bewoning uit de Vlaardingen-groep op een kwelder te Hellevoetsluis-Ossenhoek, in: T. de Ridder, L. Verhart, J. Coenraadts, G. Groeneweg, M. Lockfeer, and L. Kruyf, (eds), *Special 2010: Vlaardingen-cultuur*. (Westerheem Special nr. 2), 154-171.

Gotjé, W. 1993. *De Holocene laagveenontwikkeling in de randzone van de Nederlandse kustvlakte (Noordoostpolder)*. Amsterdam (PhD thesis, VU University).

Gregg, S.A. 1988. *Foragers and farmers. Population interaction and agricultural expansion in prehistoric Europe*. Chicago (The University of Chicago Press). Griffin, P.B. 1989. Hunting, farming and sedentism in a rain forest foraging society, in: S. Kent (ed.), *Farmers as hunters - Implications of sedentism*. Cambridge (Cambridge University Press), 60-70.

Groenewoudt, B.J. 1994. *Prospectie, waardering en selectie van archeologische vindplaatsen: een beleidsgerichte verkenning van middelen en mogelijkheden*. Amersfoort (Nederlandse Archeologische Rapporten 17).

Groenewoudt, B., M. Kosian, F. Laarman and E. Rensink, 2007. *De fauna van de Linderbeek. Een analyse van de betekenis van de prehistorische faunaresten uit een Twents beekdal*. Amersfoort (Beknopte Rapportage Archeologische Monumentenzorg 7).

Groenman-van Waateringe, W., A. Voorrips and L.H. van Wijngaarden-Bakker, 1968. Settlements of the Vlaardingen Culture at Voorschoten and Leidschendam (ecology). *Helinium* 8, 105-130.

Groenman-van Waateringe, W. and M.J. Jansma, 1969. Diatom and pollen analysis of the Vlaardingen creek, a revised interpretation. *Helinium* 9, 105-117.

Guilane, J. and C. Manen, 2007. From Mesolithic to Early Neolithic in the western Mediterranean, in: A. Whittle and V. Cummings (eds), *Going Over: The Mesolithic-Neolithic transition in North-West Europe*. Cardiff (Proceedings of the British Academy 144), 21-52.

Guiran, A.J. and O. Brinkkemper, 2007. *Rotterdam-Randstad rail: Archeologisch Onderzoek 1, Emplacement Centraal Station. Onderzoek van vindplaats 05-42 uit het Laat-Mesolithicum gelegen op en bij een rivierduin door middel van mechanische boringen*. Rotterdam (BOORrapporten 318).

Gustin, M., J.-M. Leotard and M. Otte, 1994. Le mésolithique de Liège: campagne 1994. *Notae Praehistoricae* 14, 113-123.

Habu, J. 2002. Jomon collectors and foragers. Regional interactions and long-term changes in settlement systems among Prehistoric Hunter-Gatherers in Japan, in: B. Fitzhugh and J. Habu (eds), *Beyond foraging and collecting: evolutionary change in hunter-gatherer settlement systems*. New York (Kluwer Academic/Plenum Publishers), 53-72.

Hacquebord, L. 1976. Holocene geology and palaeogeography of the environment of the levee sites near Swifterbant (polder Oost Flevoland, section G36-41). *Helinium* 16, 36-42.

Hall, M. 1988. At the frontier: some arguments against hunter-gathering and farming modes of production in southern Africa, in: T. Ingold, D. Riches and J. Woodburn (eds), *Hunters and gatherers. History, evolution and social Change*, (vol. 1.). New York (Berg), 137-147.

Hamburg, T., (with contributions by: S. Knippenberg, L. van Hoof and C. Cavallo), 2005. *Neolithische bewoningsresten te Leidschendam. Begeleidend, inventariserend veldonderzoek (IVO) en opgraving (DO) Leidschendam-Prinsenhof*. Leiden (Archol-rapport 53).

Hamburg, T., A. Müller and B. Quadvlieg (eds), 2010. *Mesolithisch Swifterbant. Mesolithisch gebruik van een duin ten zuiden van Swifterbant (8300-5000 v. Chr.). Een archeologische opgraving in het tracé van de N23/N307, Provincie Flevoland*. Leiden (Archol-rapport 174/ADC-rapport 3250).

Hamburg, T., J.W.H. Hogestijn and H. Peeters, 1997. Drie visvangsystemen uit het neolithicum van de vindplaats 'Hoge Vaart' (prov. Flevoland, gem. Almere). *Archeologie* 8, 69-92.

Hamburg, T. and L.P. Louwe Kooijmans 2001. Sporen en structuren, in: L.P. Louwe Kooijmans (ed.) 2001<sup>a</sup>. *Hardinxveld-Giessendam Polderweg: Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v.Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg, 83), 73-103.

Hamburg, T., C. Kruijsaar, J. Nientker, J.H.M. Peeters, A. Rast-Eicher, 2001. Deel 13. Grondsporen: antropogene sporen en structuren, in: J.W.H. Hogestijn and J.H.M. Peeters (eds), *De mesolithische en vroeg-neolithische vindplaats Hoge Vaart-A27 (Flevoland)*. Amersfoort (Rapportage Archeologische Monumentenzorg 79).

Hamburg, T. and L.P. Louwe Kooijmans, 2006. Features, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden, A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 39-66.

Hartz, S., H. Lübke and T. Terberger, 2007. From fish and seal to sheep and cattle: new research into the process of Neolithisation in Northern Germany, in: A. Whittle and V. Cummings (eds), *Going Over: the Mesolithic-Neolithic transition in North-West Europe*. Cardiff (Proceedings of the British Academy 144), 567-594.

Heim, J. 1994. Approche palynologique du paysage végétal à l'interface Mésolithique-Néolithique dans le site de la Place Saint-Lambert à Liège. *Notae Praehistoricae* 14, 147-151.

Hinz, H. 1974. Die Steinzeitlichen und Frühbronzezeitlichen Funde der Grabung in Veen, Kreis Moers. *Rheinische Ausgrabungen* 15, 193-241.

Hogestijn, J.W.H. 1990. From Swifterbant to TRB in the IJssel-Vecht Basin; some suggestions, in D. Jankowska (ed.), *Die Trichterbecherkultur, neue Forschungen und Hypothesen, Teil I*. Poznan, 163-180.

Hogestijn, J.W.H. 1991. Archeologische kroniek van Flevoland. *Cultuur historisch jaarboek voor Flevoland* 1, 110-129

Hogestijn, J.W.H. and R.C.G.M. Lauwerier, 1992. Zoelen Beldert. *Jaarverslag Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1991, 108.

Hogestijn, J.W.H. and H. Peeters, 1996. De opgraving van de Mesolithische/ Vroegneolithische vindplaats "Hoge Vaart" bij Almere (prov. Fl.): een blik op een duistere periode van de Nederlandse prehistorie. *Archeologie* 7, 80-113.

Hogestijn, J.W.H. and E. Drenth, 2000. The TRB culture 'house-plan' of Slootdorp-Bouwlust and other known 'houseplans' from the Dutch Middle and Late Neolithic: a review, in: R. Kelm (ed.), *Vom Pfostenloch zum Steinzeithaus. Archäologische Forschung und Rekonstruktion jungsteinzeitlicher Haus- und Siedlungsbefunde im nordwestlichen Mitteleuropa*. Heide, 126-154.

Hogestijn, J.W.H. and E. Drenth, 2000/2001. In Slootdorp stond een Trechterbekerhuis? Over midden- en laatneolithische huisplattegronden uit Nederland. *Archeologie* 10, 42-79.

Houkes, R. and O. Dorenbos, 2004. *Aanvullend Archeologisch Onderzoek op het Gavikavel. Ypenburg deelplan 25, Nootdorp. Archeologisch Rapport*. Rijswijk (Gemeente Rijswijk, Bureau Monumentenzorg en Archeologie).

Houkes, R. and M. Bruning, 2008. Grondsporen en structuren, in: H. Koot, L. Bruning and R. Houkes (eds), *Ypenburg-Locatie 4. Een nederzetting met grafveld uit het Midden-Neolithicum in het West-Nederlandse kustgebied*. Leiden (Hazenberg Archeologie), 79-110.

Hübner, K.-D., R. Saur and H. Reichstein, 1988. *Die Säugetierknochen der neolithischen Seeufersiedlung Hüde I am Dümmer, Landkreis Diepholz, Niedersachsen*. Göttingen (Göttinger Schriften zur Vor- und Frühgeschichte 23).

Huiskes, B. 1988. Tietjerk-Lytse Geast I: a reconstruction of a Mesolithic site from an anthropological perspective. *Palaeohistoria* 30, 29-62.

Huisman, H. and D.C.M. Raemaekers, 2008. De akker van Swifterbant. *Nieuwsbrief Rijksdienst voor Archeologie, Cultuurlandschap en Monumenten* 3(2), 16-18.

Hulst, R.S. 1993. Archeologische kroniek van Gelderland 1992. *Bijdragen en Mededelingen der vereniging Gelre* 84, 206-215.

Hulst, R.S., J.W.H. Hogestijn, M.J.A. de Haan, R.C.G.M. Lauwerier and R.W. Mastwijk, 1993. Buren-Zoelen. *Jaarverslag Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1992, 69.

Hulst, J. and J.W. Noordam, 1974. Ewijk, gem. Ewijk (Gld.). Bewoning uit het neolithicum, ijzertijd en Romeinse Tijd. *Jaarverslag ROB* 1974, 9-10.

Hüster, H. 1983. Die Fischknochen der neolithischen Moorsiedlung Hüde I am Dümmer, Kreis Grafschaft Diepholz. *Neue Ausgrabungen und Forschungen in Niedersachsen* 16, 401-480.

Huyge, D. and P.M. Vermeersch, 1982. Late Mesolithic settlement at Weelde-Paardsdrank. *Studia Prehistorica Belgica* 1, 116-209.

Jansma, E. 1990. Diatoms from a neolithic excavation on the former island of Schokland, IJsselmeerpolders, the Netherlands. *Diatom Research* 5, 137-154.

Janssen, A.J. 1989. Een neolithische nederzetting in het Ewijkse Veld. *Westerheem* 38, 133-145.

Janssen, A.J. 1993. Neolithische vondsten van het Woerdje aan de Ooigraaf te Beuningen. *Westerheem* 42, 287-294.

Jeunesse, C. 2003. Néolithique "initial", néolithique ancien et néolithisation dans l'espace center-européen: une vision rénovée. *Revue d'Alsace* 129, 97-112.

Jongste, P. and L.P. Louwe Kooijmans, 2006. Discovery and working method, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 3-18.

Jordanov, M. 2005. *Een mesolithische vindplaats op een rivierduin in het Swifterbantgebied. Standaardrapport Klingeweg (kavel H2)*. Almere, (Archeologische Rapportages en Notities 13).

Junker, L.L. 2002. Long-term Change and Short-term Shifting in the Economy of Philippine Forager-Traders, in: B. Fitzhugh and J. Habu (eds), *Beyond foraging and Collecting: evolutionary change in hunter-gatherer settlement systems*. New York (Kluwer Academic/Plenum Publishers), 339-386.

Kalis, A.J., J. Meurers-Balke, K. van der Borg, A. von den Driesch, W. Rähle, U. Tegtmeier and H. Thiemeyer, 2001. Der La-Hoguette-Fundhorizont in der Wilhelma von Stuttgart-Bad Cannstatt. Anthrakologische, archäopalynologische, bodenkundliche, malakozoologische, radiometrische und säugetier-kundliche Untersuchungen, in: B. Gehlen, M. Heinen and A. Tillmann (eds), *Zeit-Räume. Gedenkschrift für Wolfgang Taute*. Bonn (Archäologische Berichte 14, Band 2), 649-672.

Kampffmeyer, U. 1991. *Die Keramik der Siedlung Hüde I am Dümmer, Untersuchungen zur Neolithisierung des Nordwestdeutschen Flachlandes*, Göttingen (PhD thesis, Georg-August Universität).

Kenemans, M.C. and T.A. Goossens, 2002. *Aanvullend Archeologisch Onderzoek te Helden-Panningen*. Bunschoten (ADC-rapport 131).

Kenemans, M.C. and E. Lohof, 2005. *Helden, archeologische resten in Panningen. Archeologische resten uit het midden-neolithicum, bronstijd, ijzertijd en Middeleeuwen, te Panningen, gemeente Helden*. Amersfoort (ADC-rapport 319).

Kennett, D.J., B. Voorhies and D. Martorana, 2006. An ecological model for the origins of maize-based food production on the Pacific coast of Southern Mexico, in: D.J. Kennett and B. Winterhalder (eds), *Behavioral ecology and the transition to Agriculture*. Los Angeles (University of California Press), 103-136.

Kent 1989. Cross-cultural perceptions of farmers as hunters and the value of meat, in: S. Kent (ed.), *Farmers as hunters - Implications of sedentism*. Cambridge (Cambridge University Press), 1-17.

Kent, S. and H. Vierich, 1989. The myth of ecological determinism - anticipated mobility and site spatial organization, in: S. Kent (ed.), *Farmers as Hunters - Implications of sedentism*. Cambridge (Cambridge University Press), 96-134.

Kitz, W. 1986. Die Fundstelle 13 bei Coldinne, Ldkr. Aurich - ein mesolithisches Jägerlager. *Archäologische Mitteilungen aus Nordwestdeutschland* 9, 1-10.

Knoche, B. 1998. Das Michelsberger Grabenwerk Soest-Burgtheaterparkplatz, Stadt Soest, Kr. Soest, in: J. Biel, H. Schlichtherle, M. Strobel and A. Zeeb (eds), *Die Michelsberger Kultur und ihre Randgebiete. Probleme Der Entstehung, Chronologie und des Siedlungswesens (Kolloquium Hemmenhofen, 21-23 Feb 1997)*. Stuttgart, Konrad Theiss Verlag (Materialhefte zur Archäologie in Baden-Württemberg), 55-63.

Kooistra, L. 2006<sup>a</sup>. Fabrics of fibre and strips of bark, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schippluiden, a Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 253-260.

Kooistra, L. 2006<sup>b</sup>. Wood and charcoal, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schippluiden, a Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 363-374.

Kooistra, L.I. 2008. Artefacten van hout en bast, in: H. Koot, L. Bruning and R. Houkes (eds), *Ypenburg-Locatie 4. Een nederzetting met grafveld uit het Midden-Neolithicum in het West-Nederlandse kustgebied*. Leiden (Hazenberg Archeologie), 269-275.

Kooistra, L.I. and K. Hänninen, 2008. Hout en houtskool, in: H. Koot, L. Bruning and R. Houkes (eds), *Ypenburg-Locatie 4. Een nederzetting met grafveld uit het Midden-Neolithicum in het West-Nederlandse kustgebied*. Leiden (Hazenberg Archeologie), 345-361.

Koot, J.M. 1994. *In kennen en kruiken, veertig jaar archeologisch onderzoek in Rijswijk*. Rijswijk (Rijswijkse Historische Reeks 11).

Koot, H. 2005. Steentijdboeren aan de Noordzee. Het grafveld Rijswijk-Ypenburg. in: L.P. Louwe Kooijmans, P.W. van den Broeke, H. Fokkens and A. van Gijn (eds), *Nederland in de prehistorie*. Amsterdam (Bert Bakker), 273-276.

Koot, H. and B. van der Have, 2001. *Graven in Rijswijk. De steentijdmensen van Ypenburg*. Rijswijk (Stichting Rijswijkse Historische Projecten).

Kroezen, P. J.N. Lanting, R.J. Kosters, W. Prummel and J.P. de Roever, 1991. Vondsten van de Swifterbantcultuur uit het Voorste Diep bij Bronneger (Dr.). *Paleo-aktueel* 2, 32-36.

Kruidhof, C.N., Y. Raczyński Henk and P. van Rijn, 2007. *Plangebied Dijkgatwijde. Gemeente Wieringermeer; archeologisch vooronderzoek. Waardering boomstamkano.* Amsterdam (RAAP-notitie 2456).

Kubiak-Martens, L. 1999. The plant food component of the diet at the late Mesolithic (Ertebølle) settlement at Tybrind Vig, Denmark. *Vegetation History and Archaeobotany*, 117-127.

Kubiak-Martens, L. 2006<sup>a</sup>. Botanical remains and plant food subsistence, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden, a Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC.* Leiden (Analecta Praehistorica Leidensia 37/38), 317-338.

Kubiak-Martens, L. 2006<sup>b</sup>. Roots, tubers and processed plant food in the local diet, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden, a Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC.* Leiden (Analecta Praehistorica Leidensia 37/38), 339-352.

Kuijper, W.J. 2006. Molluscs, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden, a Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC.* Leiden (Analecta Praehistorica Leidensia 37/38), 297-300.

Laarman, F.J. 2001. Deel 16. Archeozoölogie: aard en betekenis van de dierlijke resten, in: J.W.H. Hogestijn and J.H.M. Peeters (eds), *De mesolithische en vroeg-neolithische vindplaats Hoge Vaart-A27 (Flevoland).* Amersfoort (Rapportage Archeologische Monumentenzorg 79), 1-77.

Lanting, J.N. and J. van der Plicht, 1997/1998. De 14C-chronologie van de Nederlandse pre- en protohistorie, II: Mesolithicum. *Palaeohistoria* 39/40, 1-162.

Lanting, J. N. and J. van der Plicht, 1999/2000. De 14C-chronologie van de Nederlandse pre- en protohistorie III: Neolithicum. *Palaeohistoria* 41/42, 1-110.

Lauwers, R. and P. M. Vermeersch, 1982. Late Mesolithic occupation at Brecht-Thomas Heyveld. *Acta Archaeologica Lovaniensa* 21, 1-25.

Layton, R., R. Foley and E. Williams, 1991. The transition between hunting and gathering and the specialized husbandry of resources: a socio-ecological approach. *Current Anthropology* 32(3), 255-274.

Lelivelt, R.A. 2004. *Rotterdam 't Hart. Een archeologische inventarisatie door middel van grondboringen.* Rotterdam (BOORrapporten 168).

Lelivelt, R.A. 2005. *Rotterdam en Barendrecht Hordijk-West. Een archeologische inventarisatie door middel van grondboringen.* Rotterdam (BOORrapporten 215).

Lelivelt, R.A. 2006<sup>a</sup>. *Rotterdam Beverwaard tramremise. Een bureauonderzoek en een verkennend inventariserend veldonderzoek door middel van grondboringen.* Rotterdam (BOORrapporten 315).

Lelivelt, R.A. 2006<sup>b</sup>. Rotterdam Van Ghentkazerne 2. *Een karterend en waarderend inventariserend veldonderzoek door middel van grondboringen.* Rotterdam (Boorrapporten 334).

Lelivelt, R.A. 2007<sup>a</sup>. *Rotterdam 't Hart II. Een karterende veldonderzoek door middel van grondboringen.* Rotterdam (BOORrapporten 400).

Lelivelt, R.A. 2007<sup>b</sup>. *Rotterdam Beverwaard tramremise. Een karterend inventariserend archeologisch veldonderzoek door middel van grondboringen*. Rotterdam (BOORrapporten 346).

Lelivelt, R.A. and J.M. Moree, 2005. *Rotterdam Bergse Bos. een archeologische inventarisatie door middel van grondboringen*. Rotterdam (BOORrapport 257).

Léotard, J.-M., M. Otte, M. Gustin, I. López-Bayón, A. Warnotte, J.-L. Charlier, 1995. Fouilles de niveaux préhistoriques sous la Place Saint-Lambert à Liège: campagne 1995. *Notae Praehistoricae* 15, 81-90.

Liden, K., G. Eriksson, B. Nordqvist, A. Gherström and E. Bendixen, 2004. The wet and the wild followed by the dry and the tame? - or did they occur at the same time? Diet in Mesolithic - Neolithic southern Sweden. *Antiquity* 299, 23-33.

López Bayón, I. 1994. La faune mésolithique de la Place St-Lambert à Liège. *Notae Praehistoricae* 14, 125-145.

Loewe, G. 1971. *Kreis Kempen-Krefeld*. Düsseldorf, Rheinisches Landesmuseum Bonn (Archäologische Funde und Denkmäler des Rheinlandes Band 3), 134-137.

Louwagie, G. and R. Langohr, 2005. Pedolithostratigraphical analysis and Pedological analysis, in: P. Crombé (ed.), *The last hunter-gatherer-fishermen in sandy Flanders (NW Belgium). The Verrebroeke and Doel excavation projects* (Vol. 1). Ghent (Archaeological Reports Ghent University 3), 213-249.

Louwe Kooijmans, L.P. 1974. *The Rhine/Meuse delta; four studies on its prehistoric occupation and Holocene geology*. PhD thesis, Leiden University (Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden 53-54).

Louwe Kooijmans, L.P. 1976. Local developments in a borderland. A survey of the Neolithic at the Lower Rhine. *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden* 57, 227-297.

Louwe Kooijmans, L.P. 1978. Bergschenhoek, in: H. Sarfatij (ed.), Archeologische Kroniek van Holland over 1977. *Holland* 10, 297-300.

Louwe Kooijmans, L.P. 1980. The Middle Neolithic assemblage of Het Vormer near Wijchen and the culture pattern around the Southern North Sea. *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden* 61, 113-208.

Louwe Kooijmans, L.P. 1981. Spijkenisse: Hekelingen, in: H. Sarfatij (ed.), Archeologische kroniek van Holland over 1980. *Holland* 13, 257-261.

Louwe Kooijmans, L.P. 1982. *Excursion Guide. Archaeology and Geology of the Western Netherlands*. Leiden (internal report, Leiden University).

Louwe Kooijmans, L.P. 1985. *Sporen in het land: de Nederlandse delta in de prehistorie*. Amsterdam (Meulenhoff Informatief).

Louwe Kooijmans, L.P. 1986. Het loze vissertje of boerke Naas? Het een en ander over het leven van de steentijdbewoners van het Rijnmondgebied, in: M.C. van Trierum and H.E. Henkes (eds), *Rotterdam Papers V, a contribution to prehistoric, Roman and medieval archaeology*. Rotterdam, 7-25.

Louwe Kooijmans, L.P. 1987. Neolithic settlement and subsistence in the wetlands of the Rhine/Meuse delta of the Netherlands, in: J.M. Coles and A.J. Lawson (eds), *European wetlands in prehistory*. Oxford (Clarendon Press), 227-251.

Louwe Kooijmans, L.P. 1993. Wetland exploitation and upland relations of prehistoric communities in the Netherlands, in: J. Gardiner (ed.), *Flatlands and wetlands: current themes in East Anglian archaeology*. Norwich (East Anglian Archaeology Report, 50), 71-116.

Louwe Kooijmans, L.P. 2001<sup>a</sup>. Synthese, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam Polderweg. Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v. Chr.)*. Amersfoort (Rapportage archeologische Monumentenzorg 83), 441-463.

Louwe Kooijmans, L.P. 2001<sup>b</sup>. Synthese, in: Louwe Kooijmans, L.P. (ed.), *Hardinxveld-Giessendam De Bruin: Een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant-cultuur (5500-4450 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg, 88), 499-528.

Louwe Kooijmans, L.P. 2003. The Hardinxveld sites in the Rhine/Meuse Delta, the Netherlands, 5500-4500 cal BC, in: L. Larsson, H. Kindgren, K. Knutsson, D. Loeffler, and A. Åkerlund (eds), *Mesolithic on the move. Papers presented at the sixth international conference on the Mesolithic in Europe, Stockholm 2000*. Oxford (Oxbow books), 608-624.

Louwe Kooijmans, L.P. 2005. Ook de jagers worden boer, in: L.P. Louwe Kooijmans, P.W. van den Broeke, H. Fokkens and A. van Gijn (eds), *Nederland in de prehistorie*. Amsterdam (Bert Bakker), 249-271.

Louwe Kooijmans, L.P. 2006<sup>a</sup>. Schipluiden: a synthetic view, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipluiden, A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 485-516.

Louwe Kooijmans, L.P. 2006<sup>b</sup>. Nogmaals 'Hazendonk 3', in: J.H.F. Bloemers (ed.) *Tussen D26 en P14: Jan Albert Bakker 65 jaar, Festschrift J.A. Bakker*. Amsterdam (Universiteit van Amsterdam), 147-180.

Louwe Kooijmans, L.P. 2006<sup>c</sup>. Les débuts de la traction animale aux Pays-Bas et ses conséquences, in: P. Pétrequin, R.-M. Arbogast, A.-M. Pétrequin, S. Van Willigen, and M. Bailly (eds), *Premier chariots, premiers araires. La diffusion de la traction animale en Europe pendant les IV<sup>e</sup> et III<sup>e</sup> millénaires avant notre ère*. Paris (CNRS editions. Monographie du Centre de Recherches Archéologique 29), 191-206.

Louwe Kooijmans, L.P. 2007. Multiple choices. Mortuary practices in the Low Countries during the Mesolithic and Neolithic, 9000-3000 cal BC, in: L. Larsson, F. Lüth and T. Terberger (eds), *Innovation and continuity - non-megalithic mortuary practices in the Baltic. New methods and research into the development of stone age society*. Mainz am Rhein (Berichte der Romisch Germanische Kommission 88), 551-580.

Louwe Kooijmans, L.P. 2008. Delfland: een fijnschalige kijk op het neolithisatieproces, in: Flamman, J. and E.A. Besselen (eds). *Het verleden boven water. Archeologische monumentenzorg in het AHR-project*. Amersfoort-Delft (Rapportage Archeologische Monumentenzorg 148), 107-137.

Louwe Kooijmans, L.P. 2009. The agency factor in the process of Neolithisation - a Dutch case study. *Journal of Archaeology in the Low Countries* 1(1), 27-54.

Louwe Kooijmans, L.P. 2012. Reflections on the Mesolithic burial pits at Mariënberg (province of Overijssel), the Netherlands, in: M.J.L.T. Niekus, R.N.E. Barton, M. Street and T. Terberger, *A mind set on flint. Studies in honour of Dick Stapert*. Groningen (Groningen Archaeological Studies 16), 401-424.

Louwe Kooijmans, L.P. and P. Van de Velde, 1980. De opgraving Hekelingen III, gemeente Spijkenisse, voorjaar en zomer 1980. Leiden (Internal report, National Museum of Antiquities).

Louwe Kooijmans, L.P. and L.B.M. Verhart, 1990. Een middenneolithisch nederzettingsterrein en een kuil van de Stein-groep op de voormalige Kraaienberg bij Linden, gemeente Beers (N.Br.). *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden* 70, 49-108.

Louwe Kooijmans, L.P. and J. Mol, 2001. Stratigrafie, chronologie en fasering, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam Polderweg. Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v. Chr.)*. Amersfoort (Rapportage archeologische Monumentenzorg 83), 55-72.

Louwe Kooijmans, L.P. and M. Nokkert, 2001. Sporen en structuren, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam De Bruin. Een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant cultuur (5500-4450 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 88), 75-116.

Louwe Kooijmans, L.P., C.E. Vermeeren and A.M.I. van Waveren, 2001<sup>a</sup>. Artefacten van hout en vezels, in: L.P. Louwe Kooijmans, (red.), 2001<sup>a</sup>: *Hardinxveld-Giessendam Polderweg. Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 83), 379-414.

Louwe Kooijmans, L.P., J.F.S. Oversteegen and A.L. van Gijn, 2001<sup>b</sup>. Artefacten van been, gewei en tand. in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam Polderweg. Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v. Chr.)*. Amersfoort (Rapportage archeologische Monumentenzorg 83), 285-324.

Louwe Kooijmans, L.P., K. Hänninen, C.E. Vermeeren, 2001<sup>c</sup>. Artefacten van hout, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam De Bruin. Een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant cultuur (5500-4450 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 88), 435-477.

Louwe Kooijmans, L.P., A. van Gijn, J.F.S. Oversteegen and M. Bruineberg, 2001<sup>d</sup>. Artefacten van been, gewei en tand, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam De Bruin. Een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant cultuur (5500-4450 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 88), 327-368.

Louwe Kooijmans, L.P. and L. Kooistra, 2006. Wooden artefacts, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipholuiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 225-252.

Lüning, J. 1968. Die Michelsberger Kultur. Ihre Funde in zeitlicher und räumlicher Gliederung. *Berichte der Römisch-Germanischen Kommission* 48, 1-350.

Luypaert, I., M. De Bie and P.M. Vermeersch, 1993. Dilsen-Dilserheide III (prov. Limburg), midden-neolithisch aardewerk op een laat-mesolithisch site. *Archeologie in Vlaanderen* III, 7-35.

Maarleveld, T.J. 1985. *Been en tand als grondstof in de Vlaardingen-cultuur*. Leiden (internal report, Leiden University).

Madsen, D.B. and S.R. Simms, 1998. The Fremont complex: a behavioral perspective. *Journal of World Prehistory* 12(3), 255-335.

Maes, K. and P.M. Vermeersch, 1984. Turnhout Zwarte Heide, Late Mesolithic site. *Notae Praehistoricae* 4, 65-88.

Matsui, A. and M. Kanehara, 2006. The question of prehistoric plant husbandry during the Jomon Period in Japan, in: Y. Marshall (ed.), *Sedentism in non-agricultural Societies*. *World Archaeology* 38(2), 259-273.

Mees, N., J. Plumier, A.V. Munaut, A. Defgnée, W. van Neer, 1994. Premier état des recherches sur le néolithique et le mésolithique au Grognon à Namur. *Notae Praehistoricae* 14, 109-112.

Meiklejohn, C. and T.S. Constandse-Westermann, 1978. The human skeletal material from Swifterbant, earlier Neolithic of the Northern Netherlands. *Palaeohistoria* 20, 39-89.

Meirsman, E. 2004<sup>a</sup>. *Rhoon Essendaal. Een archeologisch waarderend onderzoek door middel van proefsleuven*. Rotterdam (BOORrapporten 209).

Meirsman, E. 2004<sup>b</sup>. *Rotterdam Hordijkerveld fase 2. een archeologische inventarisatie door middel van grondboringen*. Rotterdam (BOORrapporten 203).

Meirsman, E. 2005. *Albrandswaard Rhoon Essendaal. Een documenterend en waarderend onderzoek van de archeologische vindplaatsen 19-12 en 19-14 door middel van proefsleuven*. Rotterdam (BOORrapporten 209).

Meirsman, E. 2006. *Rotterdam Groenenhagen-Tuinenhoven. Het documenterend archeologisch veldonderzoek van neolithische bewoning op de top van een rivierduin: vindplaats 13-78*. Rotterdam (BOORrapporten 284).

Meirsman, E. and J. Moree, 2004. *Vinex-locatie Midden-IJsselmonde, Portland vindplaats 4 (gemeente Albrandswaard). Archeologisch onderzoek van een houtskoolplek op een oeverwal*. Rotterdam (BOORrapporten 146).

Meirsman, E. and M. C. Dorst, 2005. *Rotterdam Groenenhagen-Tuinhoven. Een waarderend inventariserend veldonderzoek door middel van proefsleuven en grondboringen op de top van een fossiel rivierduin*. Rotterdam (BOORrapporten 284).

Meirsman, E. and J. Moree, 2005. *Barendrecht Vrijenburg. Archeologische documentatie van een deel van een neolithische vindplaats in het trace van een rioolsleuf*. Rotterdam, (BOORrapporten 264).

Meirsman, E. and J. Moree, 2006<sup>a</sup>. *Albrandswaard Portland vindplaats 20-134. Opgraving van drie houtskoolplekken uit het Laat Neolithicum*. Rotterdam, (BOORrapporten 246).

Meirsman, E. and J. Moree, 2006<sup>b</sup>. *Barendrecht-Vrijenburg vindplaats 20-125. Een documenterend en waarderend onderzoek van archeologische sporen uit het Neolithicum door middel van een proefsleuf*. Rotterdam (BOORrapporten 264).

Milton, K. 1984. Protein and Carbohydrate Resources of the Maku Indians of Northwestern Amazonia. *American Anthropologist* 86(1): 7-27.

Modderman, P.J.R. 1953. Een neolithische woonplaats in de polder Vriesland onder Hekelingen (eiland Putten, Zuid-Holland). *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 4, 1-26.

Modderman, P.J.R. 1955. Neolithische vondsten bij Schiedam. *Westerheem* 4, 30.

Modderman, P.J.R. 1965. Helden-Kessel. *Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 64. Archeologisch Nieuws \*56.

Modderman, P.J.R. 1968. Helden-Kessel. *Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 67. Archeologisch Nieuws \*67.

Modderman, P.J.R. 1970. *Linearbandkeramik aus Elsloo und Stein*. Leiden (Analecta Praehistorica Leidensia 3).

Modderman, P.J.R. 1974. Die Limburger Keramik von Kesseleyk. *Archäologisches Korrespondenzblatt* 4, 5-11.

Modderman, P.J.R. 1987. Limburger aardewerk uit Sweikhuizen, gem. Schinnen, prov. Limburg. *Analecta Praehistorica Leidensia* 20, 87-94. Modderman, P.J.R. and J.A. Deckers 1984. Verblifssporen uit het mesolithicum, neolithicum en bronstijd op de Keuperheide, gem. Helden (L.). *Analecta Praehistorica Leidensia* 17, 29-55.

Mol, J. 2001<sup>a</sup>. Landschapsgenese en paleogeografie, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam Polderweg. Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 83), 35-54.

Mol, J. 2001<sup>b</sup>. Landschapsgenese en paleogeografie in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam De Bruin. Een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant cultuur (5500-4450 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 88), 57-73.

Mol, J. 2003. Landscape evolution and site formation of two Mesolithic sites in the lower Rhine-Meuse delta (Hardinxveld, the Netherlands), in: A.J. Howards, M.G. Macklin, D.G. Passmore (eds), *Alluvial archaeology in Europe*. Lisse (Balkema), 147-161.

Mol, J. 2006. Coastal evolution of Delfland and the Schipluiden microregion in relation to Neolithic Settlement, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 269-284.

Mol, J., L.P. Louwe Kooijmans and T. Hamburg, 2006. Stratigraphy and chronology of the site, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 19-38.

Mol, J. and W. van Zijverden, 2007. Prehistorische woonplaatsen in de dynamische landschappen van de Rijn-Maasdelta, in: R. Jansen and L.P. Louwe Kooijmans (eds), *Tien jaar Archol. Van contract tot wetenschap door Archol BV, 1997-2007*. Leiden (Archol BV), 89-101.

Moran, E.F. 1991. Human Adaptive Strategies in Amazonian Blackwater Ecosystems. *American Anthropologist* 93(2): 361-382.

Moree, J. 2002<sup>a</sup>. *Vinex-locatie Midden-IJsselmonde. Archeologisch vooronderzoek van het deelplan Gaatkensplas, zone Zuiderpolderse boezem-Koedood, van de nieuwbouwlocatie Carnisselande in de gemeente Barendrecht. Deel 3: eindverslag booronderzoek*. Rotterdam (BOORrapport 87).

Moree, J. 2002<sup>b</sup>. *Vinex-locatie Midden-IJsselmonde. Beschergingsplan voor vindplaats 20-126 in de nieuwbouwlocatie Carnisselande (gemeente Barendrecht)*. Rotterdam (BOORrapport 89).

Moree, J. M. 2006. *Barendrecht Gaatkensplas vindplaats 20-126*. Rotterdam (BOORrapporten 303).

Moree, J.M., A.C. Carmiggelt, T.A. Goossens, A.J. Guiran, F.J.C. Peters and M.C. van Trierum, 2002. *Archeologisch onderzoek in het Maasmondegebied: archeologische kroniek 1991-2000*. Rotterdam BOORbalans 5, 87-213.

Müller, A., T. Hamburg, S. Knippenberg, L. Kubiak-Martens, L. Kooistra, J. de Moor and M. Niekus, 2010. Synthese, in: T. Hamburg, T., A. Müller and B. Quadvlieg (eds) 2010. *Mesolithisch Swifterbant. Mesolithisch gebruik van een duin ten zuiden van Swifterbant (8300-5000 v. Chr.). Een archeologische opgraving in het tracé van de N23/N307, Provincie Flevoland*. Leiden (Archol-rapport 174/ADC-rapport 3250).

Munaut, A.V. 1967. *Recherches paléoécologiques en basse moyenne Belgique*. (Acta Geographica Lovaniensia 6).

Newell, R.R. 1980. Mesolithic dwelling structures: fact and fantasy, in: B. Gramsch (ed.), *Mesolithikum in Europa. 2e internationales Symposium Potsdam, 3-8 april 1978*. Berlin (Veröffentlichungen des Museums für Ur- und Frühgeschichte Potsdams 14/15), 235-284.

Newell, R.R. and A.P.J. Vroomans, 1972. *Automatic artifact registration and systems for archaeological analysis with the Philips P1100 computer: a Mesolithic test-case*. Oosterhout.

Niekus, M.J.L.T. 2005/2006. A geographically referenced 14C database for the mesolithic and the early phase of the Swifterbant culture in the Northern Netherlands and some remarks on the spatiotemporal distribution of these dates. *Palaeohistoria* 47/48, 41-100.

Niekus, M.J.L.T. 2009. Trapeze shaped flint tips as proxy data for occupation during the Late Mesolithic and the Early to Middle Neolithic in the Northern part of the Netherlands. *Journal of Archaeological Science* 36(2), 236-247.

Niekus, M.J.L.T. 2012. *Tussen schijn en werkelijkheid: de opgraving Bergumermeer S-64B als mijlpaal van het Steentijdonderzoek in Nederland. Verslag van het kortlopende onderzoek naar de mesolithische vindplaats Bergumermeer S-64B in het kader van het Odyssee-programma uitwerking oud onderzoek*. Groningen (Internal Report).

Noe-Nygaard, N., T.D. Price and S.U. Hede, 2005. Diet of aurochs and early cattle in Southern Scandinavia: evidence from 15N and 13C stable isotopes. *Journal of Archaeological Science* 32, 855-871.

Nokkert, M. and L.P. Louwe Kooijmans, 2001. Vooronderzoek en opgraving, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam De Bruin. Een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant cultuur (5500-4450 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 88), 13-28.

Odell, G.H. 1980. Toward a more behavioral approach to archaeological lithic concentrations. *American Antiquity* 45, 404-431.

Otte, M. 1984. Interprétation générale, in: M. Otte (ed.), *Les fouilles de la Place Saint-Lambert à Liège 1*. Liège (Études et Recherches Archéologiques de l'Université de Liège 18), 247-250.

Otte, M. 1988. Interprétation générale, in: M. Otte (ed.), *Les fouilles de la Place Saint-Lambert à Liège 2*. Liège (Études et Recherches Archéologiques de l'Université de Liège 23), 249-250.

Oude Rengerink, J.A.M. 1995. *Wateringse Veld, deelgebied II. Verslag van het karterend booronderzoek*. Amsterdam (RAAP-rapport 138).

Oude Rengerink, J.A.M. 1996. *Wateringse Veld, deelgebied I. Verslag van het karterend booronderzoek*. Amsterdam (RAAP-rapport 169).

Out, W. 2008<sup>a</sup>. Neolithisation at the site Brandwijk-Kerkhof, the Netherlands. *Vegetation History and Archaeobotany* 17, 25-39.

Out, W.A. 2008<sup>b</sup>. Selective use of *Cornus sanguinea* L. (red dogwood) for Neolithic fish traps in the Netherlands. *Environmental Archaeology* 13(1), 1-10.

Out, W.A. 2009. *Sowing the seed? Human impact and plant subsistence in Dutch wetlands during the Late Mesolithic and Early and Middle Neolithic (5500-3400 cal BC)*. PhD thesis, Leiden University (Archaeological Studies Leiden University 18).

Out, W.A. 2009 (2010). Appendices to: *Sowing the seed? Human impact and plant subsistence in Dutch wetlands during the Late Mesolithic and Early and Middle Neolithic (5500-3400 cal BC)*. PhD thesis, Leiden University (Archaeological Studies Leiden University 18).

Out, W.A. 2010. Integrated archaeobotanical analysis: human impact at the Dutch Neolithic wetland site the Hazendonk. *Journal of Archaeological Science* 37, 1521-1531.

Out, W.A. and K. Verhoeven, 2013. Late Mesolithic and Early Neolithic human impact at Dutch wetland sites: the case study of Hardinxveld-Giessendam De Bruin. *Vegetation History and Archaeobotany*, doi: 10.1007/s00334-013-0396-0.

Oversteegen, J.F.S. 2001. Archeozoölogie, in: Peters, F.J.C and J.H.M. Peeters (red.). *De opgraving van de mesolithische en neolithische vindplaats Urk-E4 (Domineesweg, gemeente Urk)*. Amersfoort (Rapportage Archeologische Monumentenzorg 93), 43-47.

Oversteegen, J.F.S., L.H. van Wijngaarden-Bakker, C.H. Maliepaard and T. van Kolfschoten, 2001. Zoogdieren, vogels en reptielen, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam De Bruin. Een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant cultuur (5500-4450 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 88), 209-298.

Parent, J.-P., P. van der Plaetsen and J. Vanmoerkerke, 1987<sup>a</sup>. *Prehistorische jagers en veetelers aan de Donk te Oudenaarde*. (Vobov-info 24-25).

Parent, J.-P., P. van der Plaetsen and J. Vanmoerkerke, 1987<sup>b</sup>. Hypothesen over de betekenis van de neolithische okkupaties te Oudenaerde-Donk. *Notae Praehistoricae* 7, 14-15.

Pedersen, J. and E. Wæhle, 1988. The complexities of residential organization among the Efe (Mbuti) and the Bagombi (Baka): a critical view of the notion of flux in hunter-gatherer societies, in: T. Ingold, D. Riches and J. Woodburn (eds), *Hunters and gatherers. History, evolution and social change*, (vol. 1.). New York (Berg), 75-90.

Peeters, H. 2001. Het vuursteenmateriaal van de trechterbekervindplaats Bouwlust bij Slootdorp (gem. Wieringermeer, prov. N.-H.), in: R.M. Van Heeringen and E.M. Theunissen (eds), *Kwaliteitsbepalend onderzoek ten behoeve van duurzaam behoud van neolithische terreinen in West-Friesland en de Kop van Noord-Holland. Deel 3 Archeologische onderzoeksverslagen*. Amersfoort (Nederlandse Archeologische Rapporten 21), 661-716.

Peeters, H. 2004. The Mesolithic to Early Neolithic occupation at the Hoge Vaart (Almere, the Netherlands): forager land-use dynamics in the context of a drowning landscape, in: P. Crombé and P.M. Vermeersch (eds), *Acts of the XIVth UISPP congress, University of Liège, Belgium, 2-8 September 2001. Section 7. The Mesolithic*. Oxford (BAR International Series 1302), 27-37.

Peeters, J.H.M. 2007. *Hoge Vaart-A27 in context: towards a model of mesolithic - neolithic land use dynamics as a framework for archaeological heritage management*. PhD thesis, University of Amsterdam (Rijksdienst voor Archeologie, Cultuurlandschap en Monumenten).

Peeters, J.H.M. and J.W.H. Hogestijn, 2001. Deel 20. Op de grens van land en water: jagers-vissers-verzamelaars in een verdrinkend landschap, in: J.W.H. Hogestijn and J.H.M. Peeters (eds), *De mesolithische en vroeg-neolithische vindplaats Hoge Vaart-A27 (Flevoland)*. Amersfoort (Rapportage Archeologische Monumentenzorg 79).

Peeters, J.H.M., E. Hanraets, J.W.H. Hogestijn and E. Jansma, 2001<sup>a</sup>. Deel 12. Dateringen: <sup>14</sup>C-analyse en dendrochronologie, in: J.W.H. Hogestijn and J.H.M. Peeters (eds), *De mesolithische en vroeg-neolithische vindplaats Hoge Vaart-A27 (Flevoland)*. Amersfoort (Rapportage Archeologische Monumentenzorg 79).

Peeters, J.H.M., J. Schreurs, and S.M.J.P. Verneau, 2001<sup>b</sup>. Deel 18. Vuursteen: typologie, technologische organisatie en gebruik, in: J.W.H. Hogestijn and J.H.M. Peeters (eds), *De mesolithische en vroeg-neolithische vindplaats Hoge Vaart-A27 (Flevoland)*. Amersfoort (Rapportage Archeologische Monumentenzorg 79).

Peeters, H. and M.J.L.T. Niekus, 2005. Het mesolithicum in Noord-Nederland, in: J. Deeben, E. Drenth, M.-F. van Oorsouw, L. Verhart, *De steentijd van Nederland*. (Archeologie 11/12), 201-234.

Perdaen, Y., J. Sergant, E. Meylemans, A. Storme, K. Deforce, J. Bastiaens, S. Debruyne, A. Ervynck, R. Langohr, A. Lentacker, K. Haneca, E. Du Rang and P. Crombé, 2011. Noodonderzoek van een wetland site in Bazel-Sluis (Kruibeke, Oost-Vlaanderen, B): een nieuwe kijk op de neolithisatie in Vlaanderen. *Notae Praehistoricae* 31, 31-45.

Peters, F.J.C. and J.H.M. Peeters, 2001. *De opgraving van de mesolithische en neolithische vindplaats Urk-E4 (Domineesweg, gemeente Urk)*. Amersfoort, (Rapportage Archeologische Monumentenzorg 93).

Pilati, M., 1999. *Meeuwen - In den Damp I. Laat-mesolithische site in Limburg*. Leuven (internal report, Leuven University).

Pilati, M. 2001. *L'utilizzo dello spazio in un accampamento di cacciatori-raccoglitori. Il caso del sito Mesolitico di Meeuwen-In den Damp I (Limburgo, Belgio)*. Venice (MA-thesis, Leuven University).

Pilati, M. 2009. U-shaped scatters: struggling between theoretical models and archaeological facts, in: F. Cavalli (ed.), *Proceedings of the XV World Congress UISPP (Lisbon, 4-9 September 2006). Session WS28. Defining a methodological approach to define structural evidence*. Oxford (BAR International Series 2045), 13-22.

Politis, G. 1996. Moving to produce: Nukak mobility and settlement patterns in Amazonia. *World Archaeology* 27(3), 492-511.

Pookajorn, S. 1991. *The Phi Tong Luang (Mlabri): A hunter-gatherer group in Thailand*. Michigan University (Odeon store).

Price, T.D. 1981. Swifterbant, Oost Flevoland, Netherlands: excavations at the river dune sites, S21-S24, 1976, Final reports on Swifterbant III. *Palaeohistoria* 23, 75-104.

Price, T.D. 1996. The first farmers of Southern Scandinavia, in: D.R. Harris (ed.), *The origins and spread of agriculture in Eurasia*. London (University College London Press), 346-362.

Price, T.D. 2000. The introduction of farming in Northern Europe, in: T.D. Price (ed.), *Europe's first farmers*. Cambridge (Cambridge University Press), 260-300.

Price, T.D., R. Whallon and S. Chappell, 1974. Mesolithic sites near Havelte, Prov. of Drenthe (Netherlands). *Palaeohistoria* 16, 7-61.

Proos, R. 2007. Archeologische Kroniek Zuid-Holland, in: A. Willemse (ed.) Archeologische Kroniek van Holland over 2006. *Holland* 39.

Prummel, W. 1987. The faunal remains from the Neolithic site of Hekelingen III. *Helinium* 27, 190-258.

Prummel, W. 2001. Dierenvondsten uit het dal van de Tjonger tussen Donkerbroek, Oosterwolde en Makkina (Fr.). *Paleo-aktueel* 12, 30-35.

Prummel, W., M.J.L.T. Niekus and A. van Gijn, 1999. Een laatmesolithische jacht- en slachtplaats aan de Tjonger bij Jardinga, (Fr.). *Paleo-aktueel* 10, 16-20.

Prummel, W. and W.A.B. Van der Sanden, 1995. Runderhoorns uit de Drentse venen. *Nieuwe Drentse Volksalmanak* 112, 8-55.

Prummel, W., M.J.L.T. Niekus, A. van Gijn and R.T.J. Cappers, 2002. A Late Mesolithic kill site of aurochs at Jardinga, Netherlands. *Antiquity* 76, 413-424.

Prummel, W. and M.J.L.T. Niekus, 2002/2003. De laatmesolithische vindplaats Jardinga: de opgravingen in 2002 en 2003. *Paleo-aktueel* 14/15, 31-37.

Prummel, W., D.C.M. Raemaekers, S.M. Beckerman, J.N. Bottema-MacGillavry, R.T.J. Cappers, P. Cleveringa, I.J.J.A.L.M. Devriendt, H. de Wolf, and J.T. Zeiler, 2009. Terug naar Swifterbant. Een kleinschalige Opgraving te Swifterbant-S2 (gemeente Dronten). *Archeologie* 13, 17-45.

Raczynski-Henk, Y. and B. Jansen, 2009. *De Wingerdse Donk. Compressorstation Wijngaarden, gemeente Graafstroom; inventariserend veldonderzoek (karterende en waarderende fase)*. Amsterdam (RAAP-rapport 1817).

Raemaekers, D.C.M. 1999. *The articulation of a 'new Neolithic', The meaning of the Swifterbant culture for the process of neolithisation in the western part of the North European Plain (4900-3400 BC)*. PhD thesis, Leiden University (Archaeological Studies Leiden University 3).

Raemaekers, D.C.M. 2000. *Natuurgebied Kamperhoek, gemeente Dronten. Een aanvullende archeologische inventarisatie (AAI-1)*. Amsterdam (RAAP-rapport 613).

Raemaekers, D.C.M. 2001<sup>a</sup>. Aardewerk en verbrande klei, in: L.P. Louwe Kooijmans, (ed.), *Hardinxveld-Giessendam Polderweg. Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v.Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 83), 105-118.

Raemaekers, D.C.M. 2001<sup>b</sup>. Aardewerk en verbrande klei, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giessendam De Bruin. Een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant cultuur (5500-4450)*. Amersfoort (Rapportage archeologische Monumentenzorg 88), 117-152.

Raemaekers, D.C.M. 2005<sup>a</sup>. Het vroeg en midden neolithicum in Noord Nederland, in: J. Deeben, E. Drenth, M.-F. van Oorsouw and L. Verhart (eds), *De steentijd van Nederland*. (Archeologie 11/12), 261-282.

Raemaekers, D.C.M. 2005<sup>b</sup>. An outline of Late Swifterbant pottery in the Noordoostpolder (province of Flevoland, the Netherlands) and the chronological development of the pottery of the Swifterbant culture. *Palaeohistoria* 45/46, 11-36.

Raemaekers, D.C.M., C.C. Bakels, B. Beerenthou, A.L. Van Gijn, K. Hänninen, S. Molenaar, D. Paalman, M. Verbruggen and C.E. Vermeeren, 1997. Wateringen 4. A coastal settlement of the Middle Neolithic Hazendonk 3 group, in: A. Van Gijn and M. Zvelebil (eds), *Ideology and social structure of stone age communities*. Leiden (Analecta Praehistorica Leidensia 29), 143-191.

Raemaekers, D.C.M., P. Deunhouwer and J.T. Zeiler, 2002. *Vindplaats Schaapweg. Gemeente Rijswijk. Een archeologische waardering*. Amsterdam (RAAP-rapport 806).

Raemaekers, D.C.M., A.J. Borsboom, and A. Müller, 2003. *Plangebied 4E-Euroquartier, Almere Poort, gemeente Almere; een inventariserend archeologisch onderzoek*. Amsterdam (RAAP-rapport 528).

Raemaekers, D. and M. Rooke, 2006. The Schipluiden pottery, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 113-128.

Raemaekers, D.C.M., I.I.J.A.L.M. Devriendt, R.T.J. Cappers and W. Prummel, 2005. Het nieuwe Swifterbant project. *Notae Praehistoricae* 25, 119-127.

Raemaekers, D.C.M. and W.H.J. Hogestijn, 2008. Weg met de Klokbeekweg? De interpretatie van vondsten van de Klokbeekcultuur in Swifterbant en de provincie Flevoland. *Westerheem* 6, 409-417.

Remacle, M., P. van der Sloot, I. López Bayón and J.-M. Léotard, 2000. Liège, place Saint-Lambert. De nouvelles traces d'occupation mésolithique et néolithique sur les berges de la Légia. *Notae Praehistoricae* 20, 137-142.

Rensink, E., E. Theunissen, A.J.F. Spek and N. Vossen, 2006. *Vage grondsporen scherp bekeken. Opgraving industrieterrein Panningen (gemeente Helden) en het onderzoek van midden-neolithische grondsporen op de Limburgse zandgronden*. Amersfoort (Rapportage Archeologische Monumentenzorg 129).

Rieffe, E.C., L.I. Kooistra, J. van Dijk and L. van Beurden, 2006. *Archeologisch onderzoek in- en effluentleidingen afvalwaterzuivering Haagse Regio*. Den Haag (Gemeente Den Haag, Afdeling Archeologie, rapport 0619), 206-259.

Rikkers, M.J. 1985. *Verslag Veldwerk Alblisserwaard, Brandwijk 1982*. Amsterdam (Internal Report, Free University Amsterdam).

Robeerst, A. 1994. *De benen werktuigen van Brandwijk*. Leiden (Internal Report, Leiden University).

Robeerst, A. 1995. *De neolithische fauna van de donk het Kerkhof bij Brandwijk, Alblisserwaard*. Leiden (Internal Report, Leiden University).

Schiltmans, D.E.A. 2013. *Rotterdam Groenengagen-Tuinenhoven De Zwanen Rietpark. en opgraving van een vindplaats uit het Neolithicum op een rivierduin op IJsselmonde (vindplaats 13-78)*. Rotterdam (Boorrapporten 491).

Schut, P. 1984. Een vroeg-neolithische scherf met graanafdrukken uit Winterswijk (Gld.). *Westerheem* 33, 214-215. Schut, P., 1988. Poteries du Néolithique ancien à Ede (Prov. de Gueldre). *Helinium* 28, 223-231.

Schütrumpf, R. 1988. Moorgeologisch-pollenanalytische Untersuchungen zu der neolithischen Moorsiedlung Hüde I, in: G. Jacob-Friesen (ed.), *Palynologische und säugertierkundliche Untersuchungen zum Siedlungsplatz Hüde I am Dümmer, Landkreis Diepholz*. Neumünster (Göttinger Schriften für Ur- und Frühgeschichte der Georg-August-Universität 23), 9-133.

Sergant, J., P. Crombé, and Y. Perdaen, 2006. The Sites of Doel “Deurganckdok” and the Mesolithic/Neolithic Transition in the Sandy Lowlands of Belgium, in: J. Guilaine and P.-L. van Berg (eds), *Acts of the XIVth UISPP Congress. Symposium 9.2: The Neolithisation Process*. Oxford (BAR International Series 1520), 53-60.

Shelach, G. 2006. Economic adaptation, community structure, and sharing strategies of households at early sedentary communities in northeast China. *Journal of Anthropological Archaeology* 25(3), 318-345.

Smith, B.D. 2001. Low-Level food production. *Journal of Archaeological Research* 9(1), 1-43.

Smits, L. and L.P. Louwe Kooijmans, 2006. Graves and human remains, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 91-112.

Sørensen, L. and S. Karg, 2012. The expansion of agrarian societies towards the north – new evidence for agriculture during the Mesolithic/Neolithic transition in Southern Scandinavia. *Journal of Archaeological Science*, dx.doi.org/10.1016/j.jas.2012.08.042.

Spek, T., E.B.A. Bisdom and D.G. van Smeerdijk, 2001<sup>a</sup>. Deel 6. Bodemkunde en landschapsecologie I: veranderingen in bodem en landschap. in: J.W.H. Hogestijn and J.H.M. Peeters (eds), *De mesolithische en vroeg-neolithische vindplaats Hoge Vaart-A27 (Flevoland)*. Amersfoort, (Rapportage Archeologische Monumentenzorg 79).

Spek, T., E.B.A. Bisdom and D.G. van Smeerdijk, 2001<sup>b</sup>. Deel 7. Bodemkunde en landschapsecologie II: Aanvullend onderzoek naar landschapsvormende processen, in: J.W.H. Hogestijn and J.H.M. Peeters (eds), *De mesolithische en vroeg-neolithische vindplaats Hoge Vaart-A27 (Flevoland)*. Amersfoort, (Rapportage Archeologische Monumentenzorg 79).

Sponsel, L.E. 1989. Farming and Foraging: a necessary complementarity in Amazonia?, in: S. Kent (ed.), *Farmers as hunters - Implications of sedentism*. Cambridge (Cambridge University Press), 37-45.

Stapel, B. 1991. *Die Geschlagene Steiningeräte der Siedlung Hüde I am Dümmen*. PhD thesis, Westfälischen Wilhelms-Universität (Veröffentlichungen der Urgeschichtlichen Sammlungen des Landesmuseum zu Hannover 38).

Stokkel, P. 2011. *Inhoudelijk evaluatieverslag. Archeologisch onderzoek op de Wateringse Binnentuinen*. Den Haag (afdeling archeologie, dienst Stadsbeheer, gemeente Den Haag).

Stokkel, P. et al. (in prep.). *Een Vlaardingennederzetting op de Wateringse Binnentuinen*. Den Haag (afdeling archeologie, dienst Stadsbeheer, gemeente Den Haag).

Stronkhorst, M. and J. Moree, 2006. *Albrandswaard Koedoodzone. Een archeologische begeleiding bij het graven van een watergang*. Rotterdam (Boorrapporten 322).

Ten Anscher, T.J. 2000/2001. Huisplattegronden uit de late Swifterbant-cultuur op P14 (gem. Noordoostpolder). *Archeologie* 10, 80-85.

Ten Anscher, T.J. 2012. *Leven met de Vecht. Schokland-P14 en de Noordoostpolder in het neolithicum en de bronstijd*. Zutphen (PhD thesis, University of Amsterdam).

Ten Anscher, T.J. and E. Gehasse, 1993. Neolithische en vroege bronstijd-bewoning langs de benedenloop van de Overijsselse Vecht, in: J.H.F. Bloemers, W. Groenman-van Waateringe, and H. A. Heidinga (eds), *Voeten in de Aarde. Een kennismaking met de moderne Nederlandse archeologie*. Amsterdam, 25-44.

Ten Anscher, T.J., E. Gehasse, and J.A. Bakker, 1993. A pre-megalithic TRB and Late Swifterbant complex at P14-Schokland, Gemeente Noordoostpolder, The Netherlands, in J. Pavúk (ed.), *Actes du XIIe Congrès International des Sciences Préhistoriques et Protohistoriques, Bratislava, 1-7 septembre 1991*, 2. Bratislava, 460-466.

Terrell, J.E., J.P. Hart, and S. Barut, N. Cellinese, A. Curet, T. Denham, C.M. Kusimba, K. Latinis, J. Palka, M.E.D. Pohl, K.O. Pope, P.R. Williams, H. Haines, J.E. Staller, 2003. Domesticated Landscapes: the Subsistence ecology of plant and animal domestication. *Journal of Archaeological Method and Theory* 10(4), 323-368.

Topografische dienst, 1995. *Compact provincie atlas*. Groningen (Noordhoff Uitgevers).

Tucker, B. 2006. A future discounting explanation for the persistence of a mixed foraging-horticultural strategy among the Mikea of Madagascar, in: D.J. Kennett and B. Winterhalder (eds), *Behavioral ecology and the transition to agriculture*. Los Angeles (University of California Press), 22-40.

Van Beek, B.L. 1977. Sporen van een neolithische nederzetting tussen Toterfout en Halve Mijl, gemeente Veldhoven (N.-Br.). *Brabantse Oudheden*, Eindhoven (Bijdragen tot de studie van het Brabantse Heem 17, opgedragen aan Gerrit Beex bij zijn 65<sup>ste</sup> verjaardag), 43-54.

Van Beek, B.L. 1990. *Steenijd te Vlaardingen*. Amsterdam (PhD thesis, University of Amsterdam).

Van Berg, P.-L. 1990. Céramique du Limbourg et néolithisation en Europe du Nord-Ouest, in: D. Cahen and M. Otte (eds), *Rubané et Cardial*. Luik (Études et Recherches Archéologiques de l'Université de Liège 39), 161-208.

Van Berg, P.L., J.-P. van Roeyen, and L. Keeley, 1991. Le site mésolithique à céramique de Melsele (Flandre-orientale), campagne de 1990. *Notae Praehistoricae* 1, 37-47.

Van Berg, P.-L., L.H. Keeley, J.-P. van Roeyen and R. van Hove, 1992. Le gisement mésolithique de Melsele (Flandre-Orientale, Belgique) et le subnéolithique en Europe occidentale. *Revue Archéologique de l'Ouest Supplement* 5, 93-99.

Van Beurden, L. 2008<sup>a</sup>. Macroresten, in: H. Koot, L. Bruning and R. Houkes (eds), *Ypenburg-Locatie 4. Een nederzetting met grafveld uit het Midden-Neolithicum in het West-Nederlandse kustgebied*. Leiden (Hazenberg Archeologie), 315-324.

Van Beurden, L. 2008<sup>b</sup>. Pollen, in: H. Koot, L. Bruning and R. Houkes (eds), *Ypenburg-Locatie 4. Een nederzetting met grafveld uit het Midden-Neolithicum in het West-Nederlandse kustgebied*. Leiden (Hazenberg Archeologie), 337-344.

Van Dasselaar, M., 2010. *Archeologisch onderzoek Westergouwe te Gouda, deelgebied 3d. Inventariserend veldonderzoek met karterende boringen*. Capelle aan den IJssel (Archeomedia-rapport A 10-069-I).

Van den Broeke, P.W. 1994. Rijswijk-Hoekpolder, in: J.-K. A. Hagers and W.A.M. Hessing (eds), Arch. Kroniek van Zuid Holland over 1993. *Holland* 26(6) 415-416.

Van den Broeke, P.W. and H. van Londen, 1995. *5000 jaar wonen op veen en klei. Archeologisch onderzoek in het reconstructiegebied Midden-Delfland*. Utrecht.

Van der Hammen, T. 1965. De Klokkenberg bij Denekamp. *Tijdschrift van het Koninklijk Nederlands Aardrijkskundig Genootschap* 82, 123-134.

Van Heeringen, R. 1991. Archeologische kroniek van Zeeland over 1990. *Archief, mededelingen van het Zeeuws genootschap der wetenschappen* 1991, 123-145.

Van Hoof, L. and T. Hamburg, 2008. *Hoornaar-Lage Giessen. Neolithische bewoning op een donk in de gemeente Giessenlanden*. Leiden (Archol-rapport 96).

Van der Graaf, K., 1987. *Inventarisatie en interpretatie van vondsten uit de eerste fase van het vroeg-neolithicum, ten noorden van de Nederlandse lössleemgronden*. Leiden (MA-thesis, Leiden University).

Van der Sloot, P., in prep. Site Saint Lambert, à Liège: analyse des industries lithiques Mésolithiques et Néolithiques des secteurs SDT et DDD (campagne de fouilles 1990-1995), in: P. van der Sloot, P., A. Warnotte, A. and J.M. Léotard (eds). *Liège-Saint Lambert 1990-1995, 2. Préhistoire. (Études et Documents, Archéologie, Namur)*.

Van der Sloot, P., M. Remacle, P. Haesaerts, I. López Bayón, and J.-M. Leotard, 2000. Nouvelles recherches menées dans le secteur "S.D.T." de la place Saint-Lambert à Liège. *Notae Praehistoricae* 20, 143-149.

Van der Sloot, P., F. Damblon, N. Debenham, K. Fechmer, A. Gob, P. Haesaerts, A. Hauzeur, I. Jadin, J.-M. Leotard, M. Remacle, and B. Vanmontfort, 2003. Le Mesolithique et le Néolithique du site Saint-Lambert à Liège dans leur contexte chronologique, géologique et environnemental. Synthèse des données et acquis récents. *Notae Praehistoricae* 23, 79-104.

Van der Valk, L. 1992. *Mid and Late Holocene coastal evolution in the beach-barrier area of the western Netherlands*. Amsterdam (PhD thesis, Free University Amsterdam).

Van der Waals, J.D., 1972. Die durchlochten Rössener Keile und das frühe Neolithikum in Belgien und den Niederlanden, in: J. Lüning (ed.), *Die Anfänge des Neolithikums vom Orient bis Nordeuropa, Teil 5a: westliches Mitteleuropa*. Köln (Fundamenta A-3), 153-184.

Van der Waals, J.D. 1976. Een tand met een beestje uit Swifterbant, in: Boersma, J.S. (ed.), *Festoen. Opgedragen aan A.N. Zadoks-Josephus Jitta bij haar zeventigste verjaardag*. Groningen/Bussum, 611-622.

Van der Waals, J.D. 1977. Excavations at the natural levee sites S2, S3/5 and S4. *Helinium* 17, 3-27.

Van der Wiel, A.M. 1982. A palaeoecological study of a section from the foot of the Hazendonk (Zuid-Holland, The Netherlands), based on the analysis of pollen, spores and macroscopic plant remains. *Review of Palaeobotany and Palynology* 38, 35-90.

Van der Woude, J.D. 1983. *Holocene palaeoenvironmental evolution of a perimarine fluvial area – Geology and paleobotany of the area surrounding the archaeological excavation at the Hazendonk river dune (Western Netherlands)*. PhD thesis, VU University Amsterdam (Analecta Praehistorica Leidensia 16).

Van Dijk, X.C.C. 2001. *Plangebieden in Egchel-Noord, bedrijven J.F. Kennedylaan en industrieerrei Panningen, gemeente Helden. Een Aanvullende Archeologische Inventarisatie*. Amsterdam (RAAP-rapport 693).

Van Es, W.A. and W.A. Casparie, 1968. Mesolithic wooden statuette from the Volkerak, near Willemstad. *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 18, 111-116.

Van Gijn, A.L. 1984. *Preliminary Report of the Microwearanalysis of the flint of Vlaardingen 11, Leidschendam 4 and Voorschoten 17*. Amsterdam (Internal Report, Amsterdam University).

Van Gijn, A.L. 1989. *The wear and tear of flint. Principles of functional analysis applied to Dutch Neolithic assemblages*. PhD thesis, Leiden University (Analecta Praehistorica Leidensia 22).

Van Gijn, A. 2006<sup>a</sup>. Ornaments of jet, amber and bone, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 195-206.

Van Gijn, A. 2006<sup>b</sup>. Implements of bone and antler: a Mesolithic tradition continued, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 207-224.

Van Gijn, A.L. and M. Verbruggen, 1992. Brandwijk - Het Kerkhof, in: W.A.M. Hessing (ed.), *Archeologische Kroniek van Holland over 1991*, II Zuid-Holland, *Holland* 24, 349-352.

Van Gijn, A., V. Beugnier, and Y. Lammers-Keijsers, 2001<sup>a</sup>. Vuursteen, in: L.P. Louwe Kooijmans (ed.) 2001<sup>a</sup>, *Hardinxveld-Giessendam Polderweg. Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 83), 119-162.

Van Gijn, A.L., Y. Lammers-Keijsers and R. Houkes, 2001<sup>b</sup>. Vuursteen, in: Louwe Kooijmans, L.P. (ed.), *Hardinxveld-Giessendam De Bruin. Een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant-cultuur (5500-4450 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 88), 153-192.

Van Gijn, A. and R. Houkes, 2006. Stone, procurement and use, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 167-194.

Van Gijn, A., V. Van Betuw, A. Verbaas, and K. Wentink, 2006. Flint, procurement and use, in: L.P. Louwe Kooijmans and P.F.B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 129-166.

Van Gils, M. and M. De Bie, 2003. Een uitgestrekt Laat-Mesolithisch site-complex langs de Molse Nete in Lommel. *Notae Praehistoricae* 23, 67-69.

Van Gils, M. and M. De Bie, 2006<sup>a</sup>. Opgraving van een laat-mesolithische site langs de Molse Nete in Lommel, in: G. Creemers and A. Vanderhoeven (eds), *Archeologische Kroniek van Limburg 2003, Limburg*. (Het Oude Land van Loon 85 (4)), 305-308.

Van Gils, M. and M. De Bie, 2006<sup>b</sup>. Uitgestrekte mesolithische site-complexen in de Kempen. Ravels Witgoor en Opglabbeek Ruiterskuilen-Turfven (boorcampagne 2002). *Relicta. Archeologie, Monumenten-en Landschapsonderzoek in Vlaanderen* 1, 11-28.

Van Haaren, H.M.E. and P.J.R. Modderman, 1973. Ein mittelneolithischer Fundort unter Koningsbosch, prov. Limburg. *Analecta Praehistorica Leidensia* 6, 1-49.

Van Haaster, H. 2001. *Archeobotanisch onderzoek naar de neolithische bewoning op de vindplaats Rijswijk-Ypenburg*. Zaandam (BIAxial 118).

Van Iterson Scholten, F.R. 1988. Inventory and protection of the archaeological monument of Zandwerven. *Helinium* 28 (2), 232-243.

Van Kampen, J.C.G. and V.B. van den Brink (eds), 2013. *Archeologisch onderzoek op de Habraken te Veldhoven. Twee unieke nederzettingen uit het Laat Neolithicum en de Midden Bronstijd en een erfuit de volle Middeleeuwen*. (Zuidnederlandse Archeologische Rapporten 52).

Van Neer, A. Ervynck and A. Lentacker, 2005. Archaeozoological analysis, in: P. Crombé (ed.), *The Verrebroeke and Doel excavation projects* (Vol. 1). Ghent (Archaeological Reports Ghent University 3), 279-294.

Van Peer P., E. Meylemans, M. van Gils and A. Verbrugge, 2007. Nijlen-Varenheuvel: Laat-Pleistocene en Holocene occupaties in fluviatiele context uit de vallei van de Kleine Nete. *Notae Praehistoricae* 27, 51-59.

Van Poecke, M. 1991. *Oogravingsverslag Brandwijk Het Kerkhof 1991: de stratigrafie*. Leiden (Internal Report, Leiden University).

Van Regteren Altena, J. F. and J.A. Bakker, 1961. De neolithische woonplaats Zandwerven (N.H.), in: W. Glasbergen and W. Groenman-van Waateringe (eds.), In het voetspoor van A.E. Van Giffen. Groningen, 33-40.

Van Regteren Altena, J. F., J.A. Bakker, A.T. Clason, W. Glasbergen, W. Groenman-van Waateringe and L.J. Pons, 1962/1963. The Vlaardingen culture I-III. *Helinium* 2, 3-35, 97-103, 215-243.

Van Regteren Altena, J. F., J.A. Bakker, A.T. Clason, W. Glasbergen, W. Groenman-van Waateringe and L.J. Pons, 1964. The Vlaardingen culture IV-V. *Helinium* 3, 39-54, 97-120.

Van Roeyen, J.-P. and P.-L. Van Berg, 1989. Les Chasseurs 'céramisés' du Pays de Waas. *Notae Praehistoricae* 9, 31-32.

Van Roeyen, J.-P., G. Minnaert, M. Van Strydonck and C. Verbruggen, 1992. Melsele-Hof ten Damme: prehistorische bewoning, landschappelijke ontwikkeling en kronologisch kader. *Notae Praehistoricae* 12, 41-51.

Van Smeerdijk, D. 2001. Palynologie, in: F.J.C. Peters and J.H.M. Peeters (eds), *De opgraving van de mesolithische en neolithische vindplaats Urk-E4 (Domineesweg, gemeente Urk)*. Amersfoort (Rapportage Archeologische Monumentenzorg 93), 70-76.

Van Strydonck, M., J.-P. Van Roeyen, G. Minnaert and C. Verbruggen, 1995. Problems in dating Stone-Age settlements on sandy soils: the Hof ten Damme site near Melsele. *Radiocarbon* 37(2), 291-297.

Van Strydonck, M. and P. Cromb  , 2005. Radiocarbon dating, in: Cromb  , P. 2005<sup>a</sup>, (ed.), *The last hunter-gatherer-fishermen in Sandy Flanders (NW Belgium). The Verrebroeke and Doel excavation projects* (Vol. 1). Ghent (Archaeological Reports Ghent University 3), 180-212.

Van Trierum, M.C., A.B. D  bken and A.J. Guiran, 1988. *Archeologisch onderzoek in het Maasmondgebied, Bijdragen aan de bewoningsgeschiedenis van de Maasmond 1976-1986*. Rotterdam BOORbalans 1, 11-105.

Van Veen, M.M.A. 1989. *Voorschoten-De Donk. Bewoning op de oude duinen, vanaf het late neolithicum tot in de Romeinse tijd*. Leiden (Internal Report, Leiden University).

Van Wijngaarden-Bakker, L.H., C. Cavallo, T. van Kolfschoten, C.H. Maliepaard and J.H.S. Oversteegen, 2001. Zoogdieren, vogels, reptielen, in: L.P. Louwe Kooijmans (ed.), *Hardinxveld-Giesendam Polderweg. Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v. Chr.)*. Amersfoort (Rapportage Archeologische Monumentenzorg 83), 181-242.

Van Zeist, W. 1968. Prehistoric and early historic food plants in the Netherlands. *Palaeohistoria* 14, 41-173.

Van Zeist, W. and R.M. Palfenier-Vegter, 1981. Seeds and fruits from the Swifterbant S3 site. *Palaeohistoria* 23, 105-168.

Vanmontfort, B. 2004. *Converging Worlds. The Neolithisation of the Scheldt basin during the late fifth and early fourth millennium cal BC*. Leuven (PhD thesis, Leuven University).

Verbeek, C. 1996. Relaties tussen vroeg-mesolithische concentraties te Weelde-Voorheide. *Notae Praehistoricae* 16, 91-99.

Verbeek, C. and P.M. Vermeersch, 1995. Vroeg- en Laat-Mesolithicum te Weelde-Voorheide. *Notae Praehistoricae* 15, 61-72.

Verbruggen, M. 1992<sup>a</sup>. Alblasserwaard: Donkenproject, in: W.A.M. Hessing (ed.), Archeologische Kroniek van Holland over 1991, II Zuid-Holland. *Holland* 24, 348-349.

Verbruggen, M. 1992<sup>b</sup>. Geoarchaeological prospection of the Rommertsdonk. *Analecta Praehistorica Leidensia* 25, 117-128.

Verbruggen, M. in prep. *Neolithicum op de donken. Donken als prehistorische vestigingspunten, een geoarcheologische verkenning*. Leiden (PhD thesis, Leiden University).

Verhagen, A.J.C.E. 1991. 'De Hoogaard' een kultusplaats in Maaspoort, Den Bosch. *Archeologie* 3, 99-129.

Verhart, L.B.M. 1983. *Het vuursteen uit de opgraving Hekelingen III*. Leiden (internal report, National Museum of Antiquities).

Verhart, L. 1987. Refitting and the problems of simultaneous Habitation: The Hekelingen example, in: E. Cziesla, E. Eickhoff, N. Arts and D. Winter (eds), *The big puzzle. International symposium on refitting stone artefacts*. Bonn (Studies in Modern Archaeology 1), 568-582.

Verhart, L.B.M. 1989. Nederzettingssporen uit het midden-neolithicum langs de Pater Berthierstraat te Grave. *Westerheem* 38, 190-197.

Verhart, L.B.M. 1992. Settling or trekking? The late neolithic house plans of Haamstede-Brabers and their counterparts. *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden* 72, 73-99.

Verhart, L.B.M. 2000. *Times fade away. The Neolithization of the Southern Netherlands in an anthropological and geographical perspective*. PhD thesis, Leiden University (Archaeological Studies Leiden University 6).

Verhart, L.B.M. 2010. *De geur van veen. Vlaardingen en de ontdekking van de Vlaardingen cultuur*. Utrecht (Matrijs).

Verhart, L.B.M. and L.P. Louwe Kooijmans, 1989. Een midden-neolithische nederzetting bij Gassel, gemeente Beers (N.-Br.). *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden* 69, 75-117.

Verhart, L.B.M. and M. Wansleeben, 1990. Tussen America en Siberië: enkele aspecten van het Maasdalproject, in: A.T.L. Niklewicz-Hokse, and C.A.G. Lagerwerf (eds.), *Bundel van de steentijddag 1 april 1989*. Groningen, 45-54.

Verhart, L. and M. Wansleeben, 1991. 's-Hertogenbosch-Maaspoort. *Brabants Heem* 43, 108-110.

Verhart, L. and N. Arts, 2005. Het Mesolithicum in Zuid-Nederland, in: J. Deeben, E. Drenth, M.-F. van Oorsouw, L. Verhart (eds), *De steentijd van Nederland*. (Archeologie 11/12), 235-260.

Verhart, L.B.M. and H. Groenendijk, 2005. Leven in overvloed. Midden- en laat-mesolithicum, in: L.P. Louwe Kooijmans, P.W. van den Broeke, H. Fokkens and A. van Gijn (eds), *Nederland in de prehistorie*. Amsterdam (Bert Bakker), 161-178.

Verlinde, A.D. 1979. Archeologische kroniek van Overijssel over 1977/1978. *Overijsselse Historische Bijdragen* 94, 99-117.

Verlinde, A.D. 2005. Mesolithicum langs de Overijsselse Vecht. Kampplaatsen en grafkuilen bij Mariënberg, in: L.P. Louwe Kooijmans, P.W. van den Broeke, H. Fokkens and A. van Gijn (eds), *Nederland in de prehistorie*. Amsterdam (Bert Bakker), 179-182.

Verlinde, A.D. and R.R. Newell, 2005. Zes laat-mesolithische 'sitting graves' tussen honderden haardplekken uit 7600-5000 voor Chr. te Mariënberg (Ov.). *Westerheem* 54, 2-13.

Verlinde, A.D. and R.R. Newell, 2006. A multi-component complex of Mesolithic settlements with Late Mesolithic grave pits at Mariënberg in Overijssel, in: B. Groenewoudt, R.M. van Heeringen and G.H. Scheepstra (eds), *Het zandelandenrijk van Overijssel*. Amersfoort (Nederlandse Archeologische Rapporten 22), 83-271.

Verlinde, A.D. and R.R. Newell, 2013. *The Mesolithic cemetery at Mariënberg (NL), a rebuttal to alternative interpretations*. Amersfoort (Nederlandse Archeologische Rapporten 42).

Vermeersch, P.M. 1990. La transition du Mesolithique au Neolithique en basse et moyenne Belgique, in: D. Cahen, D., and M. Otte (eds), *Rubané et Cardial. Actes du Colloque de Liège, novembre 1988*. Liège (Études et Recherches Archéologiques de l'Université de Liège 39), 95-103.

Vermeersch, P.M. 2006. Reliability of the stratigraphy and spatial structures of Late Pleistocene and Holocene sites in sandy areas - Mesolithic-Neolithic contacts in Central Benelux?, in: C.J. Kind (ed.), *After the ice age. Settlements, subsistence and social development in the Mesolithic of Central Europe. Proceedings of the international conference of 9th to 12th of September Rottenburg/Neckar, Baden-Württemberg*. Stuttgart (Materialhefte zur Archäologie in Baden-Württemberg 78), 297-303.

Vermeersch, P.M., A.V. Munaut and E. Paulissen, 1974. Fouilles d'un site du Tardenoisien final à Opglabbeek-Ruiterskuil (Limbourg Belge). *Quartär* 25, 85-104.

Vermeersch, P.M., R. Lauwers and P. Gendel, 1992. The Late Mesolithic sites of Brecht-Moordenaarsven (Belgium). *Helinium* 32, 3-77.

Vermeersch, P.M., E. Scheltens and R. Foblets, 2005. Laat-Mesolithicum te Brecht-Overbroek. De collectie R. Foblets, in: *Jubileumboek. Honderd jaar Koninklijke Geschied- en Oudheidkundige Kring voor Brecht en Omstreken*. Baarle Nassau (Koninklijke Geschied- en Oudheidkundige Kring, Brecht/De Jong), 65-82.

Vernimmen, T. 2001. Archeobotanie: macroresten, in: F.J.C. Peters and J.H.M. Peeters (eds), *De opgraving van de mesolithische en neolithische vindplaats Urk-E4 (Domineesweg, gemeente Urk)*. Amersfoort (Rapportage Archeologische Monumentenzorg 93), 60-70.

Verscharen, H. and J. Mooren, 1993. Een vroegeolitische nederzetting in Ven-Zelderheide. *Westerheem* 42, 278-286.

Vickers, W.T. 1989. Patterns of foraging and gardening in a semi-sedentary Amazonian community, in: S. Kent (ed.), *Farmers as hunters - Implications of sedentism*. Cambridge (Cambridge University Press), 46-59.

Wansleeben, M. and L. Verhart, 1993. Sint Odiliënberg. Nederzetting van de Michelsberg-cultuur, in: H. Stoepker (ed.), *Archeologische Kroniek van Limburg over 1992 en 1993. Publications de la Société historique et archéologique dans le Limbourg* 129, 309-313.

Warmenbol, E. 1987. Het Neolithicum in het Antwerpse. Sporen van de Michelsbergcultuur, in: E. Warmenbol (ed.), *Het ontstaan van Antwerpen. Feiten en fabels*. Antwerpen, 33-36.

Watson, P.J. 1989. Non-affluent foragers: resource availability, seasonal shortages, and the emergence of agriculture in Panamanian, tropical forest, in: D.R. Harris and G.C. Hillman (eds.), *Foraging and farming: the evolution of plant exploitation*. London (One World Archaeology Series 13), 553-571.

Werning, J.A. 1983. Die Geweihartefakte der neolithischen Moorsiedlung Hüde I am Dümmer, Kreis Grafschaft Diepholz. *Neue Ausgrabungen und Forschungen in Niedersachsen* 16, 21-187.

Whallon, R.J. and T.D. Price 1976. Excavations at the river dune sites S11-13. *Helinium* 16, 222-229. Wilhelm, K. 1971. Neuartige Funde des Jungneolithikums auf der Osterwicker Platte (West-Westfalen). *Archäologisches Korrespondenzblatt* 1, 33.

Willms, C. 1982. *Zwei Fundplätze der Michelsberger Kultur aus dem Westlichen Münsterland, Gleichzeitig ein Beitrag zum Neolithischen Silexhandel in Mitteleuropa*. Hildesheim (Münstersche Beiträge zur Ur- und Frühgeschichte 12).

Zeanah, D.W. (2002). Central place foraging and prehistoric pinyon utilization in the Great Basin, in: B. Fitzhugh and J. Habu (eds), *Beyond foraging and collecting: evolutionary change in hunter-gatherer settlement systems*. New York (Kluwer Academic/Plenum Publishers), 231-256.

Zeiler, J.T. 1986. Swifterbant: dwelling place for a season or throughout the whole year? An archaeozoological contribution, in: H. Fokkens, P. Banga and M. Bierma (eds), *Op zoek naar mens en materiële cultuur (feestbundel aan geboden aan J.D. van der Waals ter gelegenheid van zijn emeritaat)*. Groningen (Rijksuniversiteit Groningen), 85-95.

Zeiler, J.T. 1991. Hunting and animal husbandry at Neolithic sites in the western and central Netherlands; interaction between man and the environment. *Helinium* 31, 60-125.

Zeiler, J.T. 1997. *Hunting, fowling and stock-Breeding at Neolithic sites in the Western and Central Netherlands*. Groningen (PhD thesis, Groningen University).

Zeiler, J.T. 2006<sup>a</sup>. Mammals, in: L.P. Louwe Kooijmans and P. F. B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 375-420.

Zeiler, J.T. 2006<sup>b</sup>. Birds, in: L.P. Louwe Kooijmans and P. F. B. Jongste (eds), *Schipoluiden. A Neolithic settlement on the Dutch North Sea coast c. 3500 cal BC*. Leiden (Analecta Praehistorica Leidensia 37/38), 421-442.

Zijl, W., M.J.L.T. Niekus, P.H.J.I. Ploegaert and J.M. Moree, 2011. *Rotterdam Beverwaard Tramremise. De opgraving van de top van een donk met sporen uit het Mesolithicum en Neolithicum (vindplaats 13-83)*. Rotterdam (BOORrapporten 439).

Zuidhoff, F.S. and H.M. van der Velde, 2008. *Hoogwatergeul Well-Aijen/Maaspark Well (gemeente Bergen) deelgebieden 5 en 6. Een archeologisch bureauonderzoek*. Amersfoort (ADC-rapport 723).

Met dank aan/Many thanks to:



Rijksmuseum van **Oudheden**



# APPENDICES

## PERSISTENT TRADITIONS

The adoption of agriculture is one of the major developments in human history. Archaeological studies have demonstrated that the trajectories of Neolithisation in Northwest Europe were diverse. This book presents a study into the archaeology of the communities involved in the process of Neolithisation in the Lower Rhine Area (5500-2500 cal BC). It elucidates the role played by the indigenous communities in relation to their environmental context and in view of the changes that becoming Neolithic brought about.

This volume contains the appendices to the thesis 'Persistent traditions. A long-term perspective on communities in the process of Neolithisation in the Lower Rhine Area (5500-2500 cal BC)'. These constitute a comprehensive inventory of 159, mostly excavated, archaeological sites in the Lower Rhine Area for which general characteristics were recorded. Their analysis shows that the succession of Late Mesolithic, Swifterbant culture, Hazendonk group and Vlaardingen culture societies represents a continuous long-term tradition of inhabitation of the wetlands and wetland margins of this area, forming a culturally continuous record of communities in the transition to agriculture. The site catalogue forms both an overview of, and detailed introduction into, the site-based archaeology of this time frame.

After demonstrating the diversity of the Mesolithic, the subsequent developments regarding Neolithisation are studied from an indigenous perspective. Foregrounding the relationship between local communities and the dynamic wetland landscape, the archaeological evidence regarding its regional inhabitation points to long-term flexible behaviour and pragmatic decisions being made.

For the interpretation of Neolithisation this study offers a complementary approach to existing research. Instead of arguing for a short transition based on the economic importance of domesticates and cultigens at sites, the emphasis is placed on the persistent traditions of the communities involved. New elements, instead of bringing about radical changes, are shown to be attuned to existing hunter-gatherer practices. By documenting indications of the *mentalité* of the inhabitants of the wetlands, it is demonstrated that their mindset remained essentially 'Mesolithic' for millennia.

*Luc Amkreutz was a member of the NWO (Malta Harvest) archaeological research project 'From Hardinxveld to Noordboorn – From Forager to Farmer' between 2004 and 2008. He is currently the curator of the Prehistory collections of the National Museum of Antiquities. His research interests include the Mesolithic and Neolithic archaeology of Northwest Europe, ethnoarchaeology and archaeological theory.*

Sidestone Press

ISBN: 978-90-8890-211-6



9 789088 902116 >