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Inhoudsopgave

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Jos Kleijne, Lucy Kubiak-Martens, Tania Oudemans & Jørn Zeiler

Keywords: Bronze Age; foodcrusts; subsistence; honey; horse

Introduction

During the last decade, several new studies have appeared, focusing on Neolithic cooking practices in the Dutch wetlands: both on Single Grave culture (*e.g.* Kubiak-Martens *et al.* 2015; Oudemans/Kubiak-Martens 2013) and Swifterbant culture (Raemaekers *et al.* 2013; Demirici *et al.* 2021) communities. For the Bronze Age, no such large-scale projects have taken place and our paradigm is still governed by the statement of Clason in 1999: *"What's new in the Bronze Age?"* (Clason 1999), as a great deal of continuity is being observed in the subsistence of coastal communities. However, the site of Velsen Waterland provides a new perspective.

This site was discovered in 1970 by the AWN-Velsen during the digging of a trench for a gas pipeline south of the village of Velsen Zuid (Vons 1971; see figure 1). Tentatively, Waterland rendered one of the earliest domestic horse identifications in the Netherlands, possible in association with Bell Beaker pottery (Van Wijngaarden-Bakker 1975). Additionally, the presence of organic residues on sherds from various layers can enhance our understanding of the development of coastal culinary practices. Thus, a reinterpretation of Waterland can help understand the development of changing culinary practices at the transition from the 3rd to the 2nd millennium BC. In this paper the results from various analyses are presented.

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Methodology

Velsen Waterland was re-examined by returning to the old excavation drawings and photos, and by conducting a study of the pottery, stone, and metal artefacts. New radiocarbon dates were obtained from bone and foodcrusts. The bone assemblage was studied focusing on identifying species, size, and age distribution as well as other characteristics such as butchering traces and artefact production (Zeiler 2017). In addition, a combined botanical and chemical study of organic residues encrusted on ceramic vessels was undertaken using Scanning Electron Microscopy (SEM) for the

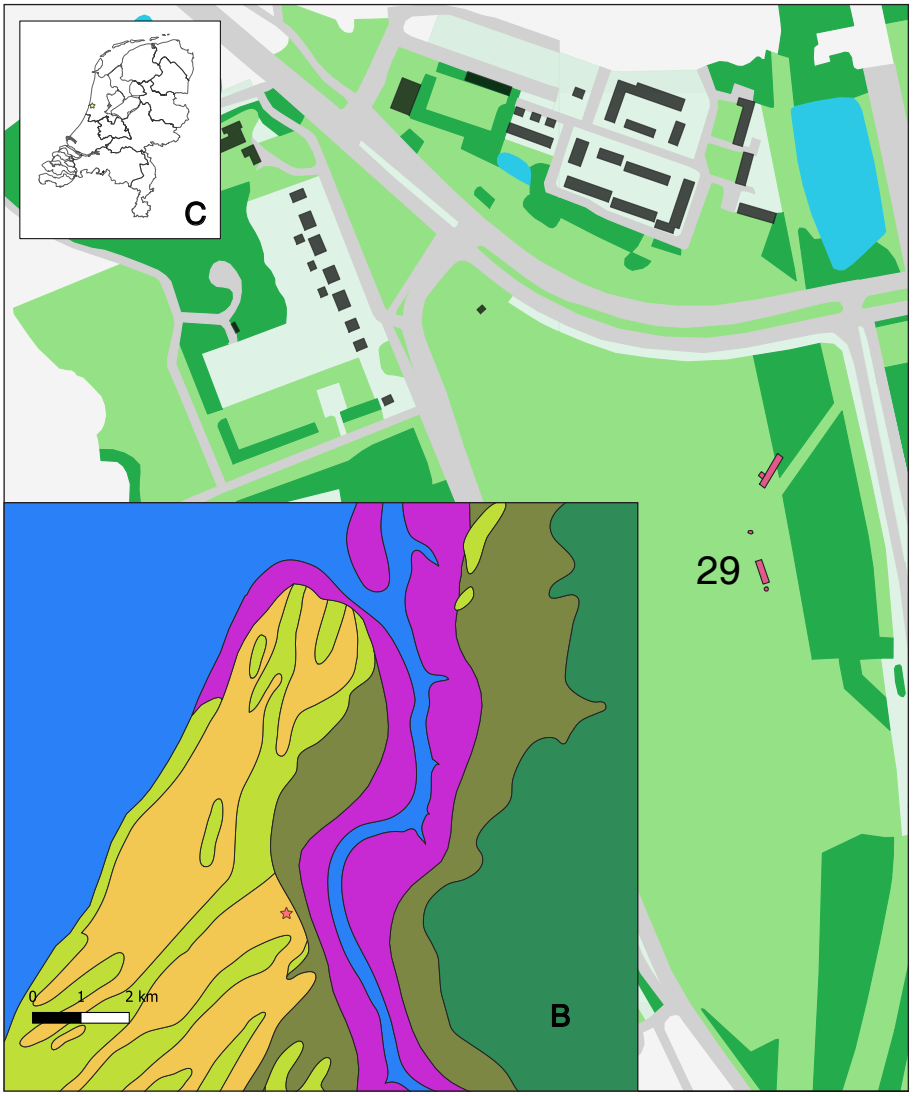

Figure 1. Location of Velsen-Waterland. A: The recorded trenches on the current topography (trench 29 is the location described here), B: The palaeogeographical situation around Velsen c1500 BC (after Vos et al. 2011); C: Location of the site in the Netherlands.

identification of minute fragments of plant and animal tissues, and both FTIR (Fourier Transform Infrared Spectroscopy) and DI-MS (Direct Inlet Mass Spectrometry) for the chemical identification of original vessel contents (Kubiak-Martens/Oudemans 2018). Additional palynological analyses were carried out on some components of the residues (by Van der Linden, in Kubiak-Martens/Oudemans 2018).

Results

The site and its finds

At Velsen Waterland, trench 29 contains five organic-rich occupation horizons (layer I to V, see figure 2). The bottom of layer III and both the top and bottom of layer IV show traces of plough marks. Between several of the layers (between I and II, between II and III), thick deposits of aeolian sand were observed.

From the five organic-rich layers, a considerable number of ceramics, stone, and metal artefacts could be obtained. Regarding ceramics, most sherds are wall fragments of thick-walled undecorated pottery vessels of unclear shapes. Noteworthy are however the spatula-impressed sherds of (possibly intrusive) Bell Beaker pottery found in layer III. Foodcrusts were observed on five sherds in total: four from layer I (VG02-VG05) and one from layer III (VG01).

A single flint artefact was found in layer IV. This artefact, measuring 4.3cm in length, 1.7cm in width at its widest point, and 9mm thick, is made from Scandinavian flint. The shape and thickness suggest that it is a dagger fragment (probably type VI), datable to the Early/Middle Bronze Age (1900-1500 BC; Lomborg 1973).

Layer I revealed a bronze pin of 14.5cm in length with a round cross-section and a groove on the slightly thickened head. This can be characterised as a *Nagelkopfnadel Variant Vorwohlde* (see Laux 1976, 58) dating to the Middle Bronze Age-B. From layer IV a copper awl with a squared to chisel-shaped cross-section, was recovered, measuring 5.67 cm in length and 3.18 mm thick. Such awls are known from the Late Neolithic and Early Bronze Age all over Northwest Europe (Butler/Tulp 2001, 135-139; Thomas 1968).

Only layers I and IV contained bone fragments, and in both layers domestic animals (cattle, sheep/goat, and pig) prevail (Zeiler 2017; see also table 1). The remains of horse include a fragment of a *radius* from layer I and a deciduous incisor from layer IV. Neither element could be positively ascribed to domestic horse based on the bone morphology. Interesting are also the presence of marine mammals (a whale species) and a marine coastal fish species (thin lipped mullet), indicating the use of coastal resources. The limited size of the bone assemblage makes any statements about the nature and intensity of subsistence activities impossible. Scratches on a sheep *tibia* from layer I show that this bone was probably a waste product from the production of bone artefacts.

New radiocarbon dating was carried out on a bone of *Bos taurus* from layer IV, and on three foodcrusts (VG01, VG03, VG05). The foodcrusts unfortunately gave unreliable radiocarbon dates, the reasons for which are unknown. The radiocarbon dated bone from layer IV gave a result of 1884-1736 cal BC (87.5%, Poz-102890, 3470 +/- 30 BP).

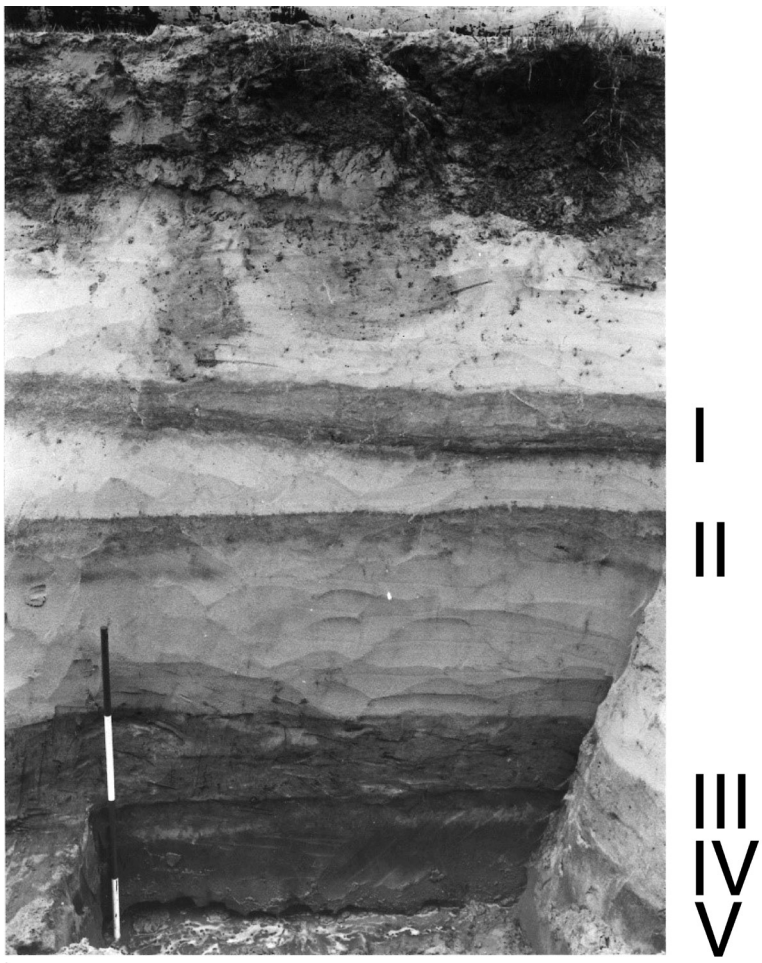

Figure 2. Profile of trench 29, with the five cultural layers clearly visible.

The site is situated in a dynamic Holocene landscape of coastal beach barriers prograding in westward direction, on which aeolian sand dunes developed (Vos *et al.* 2011). The formation of the Waterland beach barrier was dated by Van Der Valk (1992) to *c*2200 BC, presenting a *terminus post quem* for all occupation in this coastal dune landscape. Based on the ceramics, flint and metal artefacts, and the radiocarbon dating, we can date layers V, IV and III between the Late Neolithic and Middle Bronze Age-A and layers II and I to subsequent phases within the Middle Bronze Age-B.

Organic residues

The SEM analysis revealed that most of the residues contained only a thin crust of brown to black amorphous material in which no distinct botanical remains could be observed (Kubiak-Martens/Oudemans 2018). Only VG03 contained the aleurone tissue of barley (*Hordeum vulgare*), which suggests that this residue originated from food that was at least partly prepared from barley grain.

More intriguing is the presence of pollen found in VG04, preserved as a cluster of three pollen grains from the Compositae Liguliflorae, and single pollen grains of heather (*Calluna vulgaris*), alder and hazel. Compositae Liguliflorae is a subfamily of the daisy family, which includes a variety of plants with dandelion-like flowers. Many plants in this subfamily are pollinated by insects, including bees. The presence of pollen in a cluster of three grains is, unlike a natural deposit, where pollen occurs as individual grains. Clusters of pollen grains are normally formed when honeybees compress them while carrying them to the hive.[1] Altogether, the cluster of three pollen grains found in VG04 residue, suggests that bees should be considered as agents here. Furthermore, even though only a few pollen grains were found in this residue, they represent plants from completely different habitats. Compositae Liguliflorae grow in many anthropogenic landscapes, often in pastures/grasslands, arable fields and/or forest edges. While the pollen of heather must have come from heathland, which obviously made part of the local/regional vegetation. Additionally, the pollen of hazel and alder indicate forest margins and riparian forest, respectively. In conclusion, it seems that the pollen grains must have been brought from a wide area. Considering that they all ended up in one cooking event, further suggests that their way of entry might have been honey. In the VG05 residue, there were tiny fragments of wood charcoal (possibly from Pomoideae) embedded in the residue matrix.[2]

Chemical analysis using FTIR and DI-MS provided evidence for various food components as well as for the presence of beeswax and/or honey (Kubiak-Martens/Oudemans 2018). FTIR spectra showed the presence of beeswax and intact carbohydrates (possibly originating from honey) in combination with some fats in two residues from layer I (VG02 and VG05). DI-MS indicated that both residues consisted of lightly heated mixed organic materials including carbohydrates, fats/oils, and proteins and – in case of VG05 – beeswax. DI-MS could thus confirm the presence of a "bee-product" in VG05 but not in VG02. DI-MS analysis identified beeswax in an additional residue from layer I (VG04) – the same residue that contained the clump of pollen. In the case of VG05, the good preservation shows a mixed material consisting of proteins, fats/oils (at least partially of plant origin) and a small amount of beeswax. This composition suggests that the beeswax originated from honey that was added to the food, rather than from any kind of exclusive wax production process. An overview of the results is given in table 1.

Combined botanical and chemical analysis show that, from layer I, one vessel contained a barley porridge (VG03), and three vessels (VG02, VG04 and VG05) contained foods that were sweetened with honey. Whether honey was originally added to the barley porridge remains unknown, since this residue was severely degraded, and no chemical markers could be detected. Whether the residues containing honey were originally barley porridge, is not clear either for they did not show any evidence of barley. Even though no evidence speaks against this combination, it remains unknown whether we are looking at one kind of food or at two different foods.

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1 http://www2.palomar.edu/users/warmstrong/beepoo1.htm

2 Identification remarks by Laura Kooistra, BIAX *Consult.*

Sample	Layer	Colour	Thickness	SEM microscopy	Palynology	FTIR spectroscopy	DI-MS spectrometry
VG01	III	Black	3 mm	Amorphous matrix	No analysis	Strongly degraded	No organics
VG02	I	Light brown/ black	1 mm	Amorphous matrix	No analysis	Intact carbohydrates (honey?), beeswax and some fats	Lightly heated mixed organic material (no confirmation for beeswax)
VG03	I	Brown/black	2 mm	Aleurone tissue *Hordeum*	No analysis	Strongly degraded	Strongly degraded (unknown origin)
VG04	I	Brown/black	2 mm	Amorphous matrix	Clump Compositae Liguliflorae, also *Calluna vulgaris* pollen grains Possibly from honey?	No organics	Degraded fat (unknown origin) and beeswax
VG05	I	Brown	2 mm	Fungal spores, Pomoideae charcoal	*Betula* pollen grains	Intact carbohydrates (honey?), beeswax and some fats	Lightly heated mixed organic material including fats/oils, proteins and carbohydrates (honey?) and beeswax.

Table 1. The context and contents of the different organic residues from Velsen-Waterland.

Bronze Age bees at Velsen?

The use of bees in prehistory has been a topic of much research. Most early studies focus particularly on evidence from rock-art depictions (*e.g.* Clark 1942, 209), ethnographic descriptions (Crane 1983), possible beehives (Lehmann 1966), and palynological studies (*e.g.* Troels-Smith *et al.* 2018).

More recently, chemical studies have contributed to this picture (*e.g.* Heron *et al.* 1994; see also Needham/Evans 1982). Beeswax has been regularly detected in archaeological sites from Central Europe in lipid extractions from vessel contents. The earliest evidence for pure beeswax was recovered from potsherds from Early Neolithic settlements in Central Europe (Regert *et al.* 2001).

Whether beeswax or honey should be considered is a matter of interpretation. Honey is known from the Iron Age Hallstatt *Fürstengräber* of Hochdorf and Glauberg in southern Germany (Rösch 1999), and from several Bronze Age graves in Denmark (Troels-Smith *et al.* 2018), where containers containing a honey-based drink were found.

While honey is the most striking and eye-catching as the content of containers, the use of beeswax as sealant for megalithic monuments (Frade *et al.* 2014), making pottery watertight (*e.g.* Mayyas *et al.* 2012), use in bronze casting (Baron *et al.* 2016), as a component in tar used to haft stone tools (*e.g.* Van Gijn/Boon 2006), as antibiotic (Pascoal *et al.* 2014), and use in dental fillings (Bernardini *et al.* 2012), should also be noted here.

Discriminating all these uses of "bee-products" should be done by using multiple strands of evidence: most important is the context of the sample taken. When obtaining organic residues from ceramic containers absorbed residues (absorbed into the ceramic material over a lifetime of use) may tell a different story from residues of the last use-phase(s) adhering to the inner surface of the vessel (see also Miller *et al.* 2020, Oudemans 2007, 2021). In addition, palynological and botanical analyses can be used to detect additional flavours added (*e.g.* Dickson 1978) or the pollen present in honey as we observed at Velsen-Waterland.

One further notable element in studies of bee-products on archaeological materials should be modern contamination. In our study this issue is adequately covered, by using multiple methods that trace independent characteristics (DI-MS, FTIR, SEM and palynology). The absence of honey and/or beeswax on some of the sherds further strengthens the interpretation.

Conclusion

The site of Velsen-Waterland consists of several occupation layers that can be dated between 2200 and 1200 BC. The earliest horse remains can be dated to the period 2200-1700 BC and are found in association with several notable artefacts.

Honey and beeswax were part of a sweetened food, possibly a kind of porridge, that was cooked in coarse Bronze Age pottery between 1500-1200 BC. It seems that the beeswax would have entered the pots with a portion of added honey used in cooking, rather than from the use of vessels for processing wax combs or waterproofing the pottery vessels.

However, to better understand the chronology of occupation, and the character of the oldest occupation layers (the possible house floor level, and the precise stratigraphic position of Bell Beaker pottery), new fieldwork would be necessary.

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References

Baron, J., Miazga, B., Ntaflos, T., Puziewicz, J. & Szumny, A. 2016. Beeswax remnants, phase and major element chemical composition of the bronze age mould from Gaj Oławski (SW Poland), *Archaeological and Anthropological Sciences* 8, 187-196.

Bernardini, F., Tuniz, C., Coppa, A., Mancini, L., Dreossi, D., Eichert, D., Turco, G., Biasotto, M., Terrasi, F., De Cesare, N., Hua, Q. & Levchenko, V. 2012. Beeswax as dental filling on a Neolithic human tooth, *PLoS One* 7, e44904.

Butler, J.J. & Tulp, C. 2001. Metaal, in: Schoneveld, J. & Gehasse, E. F. (eds.), *Archeologie in de Betuweroute. Boog C-Noord, een vindplaats bij Meteren op de overgang van Neolithicum naar Bronstijd*. Amersfoort: ROB (Rapportage Archeologische Monumentenzorg 84), 135-139.

Clark, J.G.D. 1942. Bees in Antiquity, *Antiquity* 16, 208-215.

Clason, A.T. 1999. What's New in the Bronze Age? In: Sarfatij, H., Verwers, W.J.H. & Woltering, P.J. (eds.), *In Discussion with the Past. Archaeological studies presented to W.A. van Es*. Zwolle/Amersfoort: Foundation for Promoting Archaeology, 34-40.

Crane, E. 1983. *The archaeology of beekeeping*, London: Duckworth.

Demirici, Ö., Lucquin, A., Çakirlar, C., Craig, O.E. & Raemaekers, D.C.M. 2021. Lipid residue analysis on Swifterbant pottery (c. 5000-3800 cal BC) in the Lower Rhine-Meuse area (the Netherlands) and its implications for human-animal interactions in relation to the Neolithisation process, *Journal of Archaeological Science: Reports* 36, 102812.

Frade, J.C., Monge Soares, A.M., Candeias, A., Ribeiro, M.I.M., Nunes da Ponte, T., Serra, M. & Porfírio, E. 2014. Beeswax and propolis as sealants of funerary chambers during the Middle Bronze Age in the South-Western Iberian Peninsula, in: Scott, R.B., Braekmans, D., Carremans, M. & Degryse, P. (eds.), *Proceedings of the 39th International Symposium for Archaeometry*. Leuven: Centre for Archaeological Science, 141-145.

Heron, C., Nemcek, N., Bonfield, K.M., Dixon, D. & Ottaway, B.S. 1994. The chemistry of Neolithic beeswax, *Naturwissenschaften* 81, 266-269.

Kubiak-Martens, L., Brinkkemper, O. & Oudemans, T.F.M. 2015. What's for dinner? Processed food in the coastal area of the northern Netherlands in the Late Neolithic, *Vegetation History and Archaeobotany* 24, 47-62.

Kubiak-Martens, L. & Oudemans, T.F.M. 2018. Zoete Kost – Over honing in voedselresten op bronstijd scherven uit Velsen-Waterland. *Biaxiaal* 1051, 1-28.

Laux, F. 1976. *Die Nadeln in Niedersachsen*, München: Beck (Prähistorische Bronzefunde 13).

Lehmann, H. 1966. Ein Dreitausendjahriger Klotzstulper aus Berlin-Lichterfelde, *Berliner Blätter für Vor- und Frühgeschichte* XI, 45-98.

Lomborg, E. 1973. *Die Flintdolche Dänemarks. Studien über Chronologie und Kulturbeziehungen des südskandinavischen Spätneolithikums*, København: Det kgl. nordiske Oldskriftselskab (Nordiske Fortidsminder Serie B – in quatro Bind 1).

Mayyas, A.S., Al-Qudah, M.A., Douglas, K.A. & Al-Ajlouny, F.K. 2012. Beeswax preserved in archaeological ceramics: function and use, *Annals of Faculty of Arts, Ain Shams University* 40, 343-371.

Miller, M.J., Whelton, H.L., Swift, J.A., Maline, S., Hammann, S., Cramp, L.J.E., McCleary, A., Taylor, G., Vacca, K., Becks, F., Evershed, F.R.P. & Hastorf, C.A. 2020. Interpreting ancient food practices: stable isotope and molecular analyses of visible and absorbed residues from a year-long cooking experiment, *Nature Scientific Reports* 10, 13704.

Needham, S.P. & Evans, J. 1982. Honey and Dripping: Neolithic Food Residues from Runnymede Bridge, *Oxford Journal of Archaeology* 6 (1), 21-28.

Oudemans, T.F.M. & Kubiak-Martens, L. 2013. Broad-spectrum cooking: botanical and chemical evidence in Late Neolithic pottery, in: Kleijne, J.P., Brinkkemper, O., Lauwerier, R.C.G.M., Smit, B.I. & Theunissen, E.M. (eds.), *A Matter of Life and Death at Mienakker (the Netherlands). Late Neolithic Behavioural Variability in a Dynamic Landscape*. Amersfoort: RCE (Nederlandse Archeologische Rapporten 45), 119-146.

Oudemans, T.F.M. 2021. Onverwachte ontdekkingen – chemische analyse van amorfe organische residuen met behulp van infrarood spectroscopie, *ArtefActueel* 1, 51-60.

Oudemans, T.F.M., 2007. Applying organic residue analysis in ceramic studies in archeology – a functional approach. *Leiden Journal of Pottery Studies* 23, 5-20.

Pascoal, A., Feás, X., Dias, T., Dias, L.G. & Estevinho, L.M. 2014. The Role of Honey and Propolis in the Treatment of Infected Wounds, in: Kon, K. and Rai, M. (eds), *Microbiology for surgical infections. Diagnosis, prognosis and treatment*. Amsterdam/ Boston: Elsevier, 221-234.

Raemaekers, D.C.M., Kubiak-Martens, L. & Oudemans, T.F.M. 2013. New Food in Old Pots – Charred organic residues in Early Neolithic ceramic vessels from Swifterbant, The Netherlands (4300-4000 cal BC), *Archäologisches Korrespondenzblatt* 43, 315-333.

Regert, M., Colinart, S., Degrand, L. & Decavallas, O. 2001. Chemical alteration and use of beeswax through time: accelerated ageing tests and analysis of archaeological samples from various environmental contexts, *Archaeometry 43*, 549-569.

Rösch, M. 1999. Evaluation of honey residues from Iron Age hill-top sites in south western Germany: implications for local and regional land use and vegetation dynamics, *Vegetation History and Archaeobotany* 8, 105-112.

Thomas, N. 1968. Appendix 1: Note on the Carrickinab Awl, U*lster Journal of Archaeology 31*, 23-24.

Troels-Smith, J., Jessen, C. & Mortensen, M.F. 2018. Modern pollen analysis and prehistoric beer – A lecture by Jørgen Troels-Smith, March 1977, *Review of Palaeobotany and Palynology* 259, 10-20.

Valk, L. van der 1992. *Mid- and Late-Holocene Coastal Evolution in the Beach-Barrier area of the Western Netherlands*, Amsterdam (PhD Thesis Vrije Universiteit Amsterdam).

Gijn, A.L. van & Boon, J.J. 2006. Birch bark tar. In: Louwe Kooijmans, L.P. & Jongste, P.F.B. (eds) *Schipluiden: A Neolithic Settlement on the Dutch North Sea Coast c. 3500 cal BC*, Leiden: Leiden University Press (Analecta Praehistorica Leidensia 37/38), 261-266.

Wijngaarden-Bakker, L.H. van 1975. Horses in the Dutch Neolithic. In: Clason, A.T. (ed.), *Archaeozoological Studies*, Amsterdam: Elsevier, 341-344.

Vons, P. 1971. Velsen, *Haerlem Jaarboek* 1970, 263-264.

Vos, P.C., Bazelmans, J.G.A., Meulen M.J. van der & Weerts H.J.T. (eds) 2011. *Atlas van Nederland in het Holoceen*, Amsterdam: Bert Bakker.

Zeiler, J.T. 2017. *De paarden van Velsen (en andere dieren). Archeozoölogisch onderzoek van dierlijke resten uit Velserbroek-Hofgeest (Bronstijd) en Velsen- Zuid/Gassleuf (Laat-Neolithicum/Vroege Bronstijd en Midden-Bronstijd). ArchaeoBone rapport nr. 152*. Intern rapport Provincie Noord-Holland.