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# The Neolithic woodland – archaeoanthracology of six Funnel Beaker sites in the lowlands of Germany

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## ABSTRACT

Charcoal from six Neolithic Funnel Beaker sites in the lowlands of Germany was investigated, providing information on the woods used at these sites. The species assemblages reflect the composition of the woodlands surrounding the sites, and represent the individual natural site conditions. Two of the sites are situated in wetlands (Oldenburg and Wolkenwehe). Here, high values of *Alnus* and *Fraxinus* were found, both typical taxa on wet soils. These taxa are also common at sites with a smaller proportion of wetlands (Triwalk and Flintbek), where *Quercus* is more important. At the two sites which are situated on dry soils further south-east (Lüdelsen and Belleben), *Quercus* is the dominant taxa, and *Pinus* is more frequent. Besides the reflection of the forest composition, the impact of human activity on the landscapes can be seen in the assemblages. Light demanding species as *Corylus* and Maloideae show high values indicating an opening of the forests by Neolithic farmers. The Maloideae values are only low at Wolkenwehe and Lüdelsen. At Wolkenwehe this can be explained by the potential activity range for wood collection on the surrounding wetlands and at Lüdelsen by nutrient-poor soil conditions, which are also indicated by *Pinus*. An important aspect of charcoal analysis is to compare different sampling methods. In this study, results from handpicked charcoal can be compared with those from floated sediment samples for two sites. Some differences appear, for example higher values of *Pinus* in the floated samples. This may be explained with fragmentation processes or displacement.

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## 1. Introduction

The openness of palaeolandscapes is an issue that is often discussed (e.g. Kreuz, 2008). One subject of this discussion is the natural openness due to herbivores (Mitchell, 2005; Svenning, 2002; Vera, 2000; Whitehouse and Smith, 2010). Another, archaeologically relevant aspect is the anthropogenic landscape opening (Iversen, 1973; Kalis and Meurers-Balke, 1998). Changes in Neolithic subsistence strategy – such as the rise of agriculture and the onset of permanent settlements – resulted in changing land uses. Farmers needed arable fields for cultivation and therefore deforestation of these areas was necessary. After this onset settling period with a start of deforestation, the activity of the people further impacted the woodlands and thereby the openness of the landscape. Humans changed their environment by expanding their cereal fields and pastured areas and by fire wood and timber

exploitation. With an extended use of the same place over longer periods the impact on the environment increased and may have affected the wood usages of the Neolithic settlers itself. Wood usages over a long period of time affect the size of the used timber. A shortage is visible, e.g. in the diameter decrease of timber for construction (e.g. Billamboz, 2008; Marguerie and Hunot, 2007).

At the same time, the environment changed due to migration and spread of species. This resulted in the appearance and increase of new and the decrease of already established wood species. Most of these changes took place during the Mesolithic period. However, the immigration of *Fagus sylvatica* (European Beech) into Central Europe coincided with the Neolithic period (Lang, 1994). These processes of areal extensions are well-documented for most woody species in pollen diagrams. The discussion on the actual presence of a taxon in a region continues and cannot be proven based solely on pollen studies. Reliable evidence of an early occurrence is possible with the dating of macro remains (Kullman, 1995, 1998).

Pollen analysis enables the reconstruction of vegetation changes on a regional scale and with a broad taxonomic base. In contrast, wood charcoal analysis in archaeological contexts (archaeoanthracology, Vernet, 2002) is focused on the used wood

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spectra (e.g. Asouti and Austin, 2005; Badal et al., 1994; Dufraisse, 2008; Figueiral, 1996; Heinz and Thiébault, 1998; Heiss and Oegg, 2008; Salisbury and Jane, 1940; Thiébault, 2002). Along with other carbonized material (fruits and seeds) it provides the only possibility to obtain information on the usage of wood resources by the people in non-waterlogged contexts. Wood was the most important construction and tool material, as well as an energy source of the Neolithic societies. The acquisition of wood was a regular task. Two collection strategies for fire wood are put forward by Marston (2009): One is based on the “principle of the least effort” (Shackleton and Prins, 1992), in which all available taxa were used resulting in a taphonomic spectrum representing the wood taxa of a site’s vicinity. The second is based on the selection of wood species for different functions resulting in a spectra affected by the selection factors. For example, it is postulated that soft wood species such as *Tilia* or *Salix* were not used as fire wood because of their inferior burning qualities (low calorific value), while hard wood species like members of the Rosaceae family, especially of the subfamily Maloideae, were preferred (Kreuz, 1990, 1992; Out, 2010). Even if some species are over- and under-represented due to preference and avoidance, it is widely assumed that for the Neolithic period the charcoal spectra represents the available wood in the surroundings of a site and longer transportation of wood was unimportant.

While charcoal was previously analysed from several selected Linear Pottery Culture sites mostly in southern and western Germany and Austria (Kreuz, 1990, 1992, 2008), as well as from Dutch sites of the Swifterbant Culture and Hazendonk Group (Out, 2010), we are now able to give a first, comprehensive insight into the used wood resources of the Funnel Beaker Culture for the German lowlands. Here, we present new wood charcoal data from six Neolithic sites in northern Germany, located in a south-north transect from the more continental Loess area east of the Harz Mountains, to the sub-oceanic Weichselian young moraine area in the north. We aim to investigate 1) which wood taxa were used in the Neolithic, 2) the information about the environment around the sites given by the charcoal spectra, 3) the impact of Neolithic people on the woodlands within their activity range, and 4) if different sampling approaches affect species assemblages.

## 2. Material and methods

### 2.1. Study sites

All sites investigated in this study were used during the Funnel Beaker period. According to Müller et al. (2010, Northern Plain Chronology) the culture started in the Early Neolithic (c. 4000 cal. BC) and was replaced by the Single Grave group in the Younger Neolithic (c. 2800 cal. BC). Four of the six sites (Flintbek, Oldenburg, Wolkenwehe, and Triwalk) are situated in North Germany, which has a temperate oceanic climate with a c. 8.5 °C mean annual temperature and approximately 750 mm mean annual precipitation (climatological data of station Kiel Holtenau for the period 1961–1990, German Weather Service [DWD], 2012). The other two sites (Belleben and Lüdelsen) are located in Central Germany, which has a more semi-continental climate with a c. 8.7 °C mean annual temperature and approximately 500 mm mean annual precipitation (climatological data of station Magdeburg for the period 1961–1990, German Weather Service [DWD], 2012) (Fig. 1, Table 1). Today, the woodlands of Schleswig-Holstein are mainly composed of temperate mixed deciduous and planted coniferous forest. *Fagus sylvatica* is the main deciduous tree species. In the area of Belleben and Lüdelsen most forests are afforested with coniferous trees, mainly *Pinus*.

### 2.1.1. Oldenburg

At present, several archaeological sites are known in the region of the “Oldenburger Graben”, a linear depression with fen systems. One of these sites is a Middle Neolithic (3500–3000 cal. BC) settlement situated on a former small island near Oldenburg-Dannau, and surrounded by Weichselian moraine landscape. The site is situated at a 5 km distance from the modern coastline of the Baltic Sea. Since 2009, excavations of this settlement were carried out by the team of Jan Piet Brozio from the Institute of Pre- and Protohistory, University of Kiel (Brozio et al., in this issue). To date, several houses, a well, and a settlement burial have been found. The preservation of organic material is very good due to the waterlogged ground. Visible charcoal (handpicked single charcoal, and multiple fragments) was sampled during the excavation from the different features of the settlement layers.

### 2.1.2. Flintbek

Excavations of the megalithic tomb field of Flintbek by the archaeological state agency of Schleswig-Holstein from 1977 to 1996 yielded archaeological material from the Neolithic period until the Iron Age. The area is located on Weichselian moraine material and bordered by the Eider River to the west and by three mires (“Kleinflintbeker Moor”, “Kirchenmoor” and “Fehlmoor”) to the east. During the Neolithic period, more than 25 megalithic tombs were built (Diers et al., in this issue; Mischka, 2011). Fire was used (for example for the preparation of the chamber ground), thus charcoal was found in several layers. Only visible charcoal was sampled during the excavations, and no charcoal from floated sediment samples was available. Charcoal samples (multiple fragments) were available from various features, such as fire places, flint roast places, and fillings of the grave. The samples were connected to the construction and the usage of the graves. Only samples dating to the Early and Middle Neolithic period were used for the comparison. Diers et al. (in this issue) compare these charcoal results with new palynological investigations from the region.

### 2.1.3. Wolkenwehe

The Neolithic station Wolkenwehe is situated within a fen system (“Brenner Moor”) of a diameter of about 1 km. The site was discovered in 1950, and shortly afterwards first excavations took place (Hartz et al., 2007). During the time of usage, it was situated on a peninsula in a lake basin. Charcoal was found together with bones and artifacts in a peaty layer overlaying lake sediments. Today, the river Trave borders the fen to the north and to the east. From 2006 until 2009, the team of Doris Mischka and Jan Piet Brozio from the Institute of Pre- and Protohistory, University of Kiel, carried out further excavations (Mischka et al., 2007). The site was used intermittently between 3500–3100, 2800–2700, and 2400–2200 cal. BC. At first it was considered to be a settlement site. However, this is still debated because of the findings and the location in the centre of a river fen complex. It was possibly used as a temporary site and its function is linked with the occurrence of salty springs in the fen. The preservation of organic material is very good thanks to the waterlogged ground.

### 2.1.4. Triwalk

The settlement is situated on a Weichselian moraine 5 km south of the Wismar bay (Baltic Sea), near Triwalk. It was discovered in the 1970s, but the site was only excavated in 1995 because of the construction of the A 20 motorway. The archaeological findings date to the Neolithic and Bronze Age periods (Staude, 2011). The charcoal samples belong to the Funnel Beaker period dated to the Middle Neolithic (Staude, 2011). As in Flintbek, only charcoal which was seen during excavation was sampled (resulting in samples with few pieces) and available for determination.

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