

New dendroarchaeological evidence of water well constructions reveals advanced Early Neolithic craftsman skills



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ABSTRACT

The first European settlements accompanied by crop and livestock farming occurred approximately 7500 years ago. In this agrarian society, wood was one of the most important raw materials, most notably for construction, but only a little is known about wood use and woodworking technology. Hence, archaeological wooden finds are of particular importance. Dendroarchaeological studies combine the analysis of external and internal characteristics of archaeological wood: traces of tools on the wooden surfaces and the shape of timbers provide information about woodworking techniques, the tree rings allow dendrochronological dating and provide a paleoecological archive. In 2015 and 2016, two water wells with wooden linings from the Early Neolithic Period were discovered in the Czech Republic close to the towns of Velim (Bohemia) and Uničov (Moravia). The timbers were excellently preserved under waterlogged conditions. Here, we present a dendroarchaeological study including tree-ring and woodworking analyses. Furthermore, we consider former forest species composition. Overall, 15 lumbers from both wells were successfully dated by dendrochronology. The oaks used for the wells from Velim and Uničov were felled in 5196/5195 BCE and 5093–5085 BCE, respectively. Additionally, the taxa of 1859 wooden fragments, such as charcoals, branches and chips, were wood anatomically identified. The well lining from Velim with a hollowed tree trunk is already known from other Central European locations. In contrast, the construction from Uničov is unique for this period. Until now, the advanced construction design formed by four corner posts with longitudinal grooves and inserted horizontal planks was only known several thousands years later. The Early Neolithic wells from Uničov and Velim are the oldest archaeological discoveries of wooden artefacts in the Czech Republic that have been dendrochronologically dated. The tree-ring width series extend the Czech oak tree-ring width chronology more than 300 years into the past.

1. Introduction

The availability of water is an important pre-condition for human settlements. Aside from natural watercourses, water supply can be ensured by man-made wells. The existence or non-existence of wells in a settlement may also be due to reasons not yet fully understood, such as social prestige, pollution of surface water or the distance and accessibility of surface water (Scarborough, 1991).

It was the domestication of water that enabled the consolidation and spread of farming lifestyles, which ignited the exponential population

growth that has occurred since the Neolithic times, more than 10 000 years ago (Mithen, 2010). The oldest wells in Central Europe appear as early as 5400 BCE in the context of the Early Neolithic Period, associated with the first European farmers (Lüning, 2000). These communities belonged to the Linear Pottery Culture (Linearbandkeramik (LBK), 5400–4700 BCE), characterized by distinctive and remarkably homogeneous patterns of pottery shape and decoration. Spreading along the middle Danube and its tributaries in Eastern Europe (recently e.g., Bánffy and Oross, 2010) within a period of less than two hundred years, small farming villages appeared across an area stretching from

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Transdanubia to eastern Romania and through Central Europe as far away as to eastern Belgium and the Paris Basin. The colonization of the landscape was not continuous but occurred as scattered clusters of hamlets and farmsteads situated on loess soils in well-watered valleys (Price, 2000).

For the construction of Neolithic water wells, a pit was dug using bone and antler tools or, most frequently, wooden tools, to reach below the level of the groundwater (Weiner, 1992, 1994). The deepest wells from this period reached 14 m deep. To prevent the sandy loess walls from collapsing, wooden linings were erected in the pits using different types of carpentry techniques (Tegel et al., 2012). The majority of known Neolithic water wells show log constructions timbered with square boards. In some cases, hollowed-out trunks of deciduous trees, fitted vertically to the bottom, have been used (Přichystal, 2007). Those two mentioned techniques also appear combined in constructions of some wells, e.g., at Eythra and Brodau in Saxony and Mohelnice in Moravia (Tegel et al., 2012).

Archaeological finds of Neolithic water wells are generally rare. However, they constitute important sources due to the excellent conservation of organic materials such as wood, bast, bark, plant or animal fibres and botanical macrofossils. They demonstrate the sophistication of carpentry skills and reflect the importance of organic material for various artefacts (e.g., containers, tools). The composition of plant macrofossils preserved in well fillings provides insights into previous agriculture and the environment (Herbig et al., 2013). Dendrochronological analyses allow a precise dating of the well construction through annually resolved felling dates of the trees used.

To date, no more than forty documented Neolithic water wells with wood preservation are known. They are confined to the area between eastern France and north-eastern Hungary (Tegel et al., 2012; Király and Tóth, 2015; Kretschmer et al., 2016; Weiner, 2016) (Fig. 1). Three Neolithic wells have been discovered in the Czech Republic during the last forty years – one in the eastern part of Bohemia, at Most (Rulf and

Velímský, 1993), and two in Moravia, at Mohelnice (Neustupný and Veselý, 1977) and Brno (Přichystal, 2008). In 2016, another two Early Neolithic water wells with preserved wood construction were unexpectedly discovered, at Uničov (Rybníček et al., 2017) and Velim (Chlup, 2017). This paper presents the dendroarchaeological analyses of these new finds. Our results display precise chronological classification and offer insights into woodland use and woodworking techniques during the Early Neolithic Period. The differences between the constructions are put in context with other Central European Early Neolithic wells. Finally, the study highlights the importance of such findings for compiling tree-ring width chronologies.

2. Material and methods

The excellent conservation of the timbers from both Neolithic wells allowed a detailed description of their structure and dating with dendrochronological as well as radiocarbon methods.

One Neolithic water well was discovered during archaeological excavations at the western border of the town of Uničov (49°45'44.18"N, 17° 6'44.27"E, 233–234 m ASL) in 2015, as part of a LBK settlement with ten houses and a total of 554 settlement features. The wooden lining of the well was found at a depth of 1.74 m below the ground surface. A chest-like well lining was formed by four corner posts (length approx. 1.3 m), each with two longitudinal grooves, in which oak boards were inserted horizontally. The boards were split from tree trunks, and their edges were tapered to fit into the grooves of the corner posts. The boards formed the wall of the well lining and simultaneously ensured its cross reinforcement (Fig. 2A). The surfaces of the boards showed tool marks typical for stone adzes (Elburg et al., 2015). The lengths of the boards varied between 80 and 86 cm, their width was between 11 and 25 cm, and their thickness was between 3 and 8 cm. There were 47 pieces of wood in total, including those in the centre of the well.

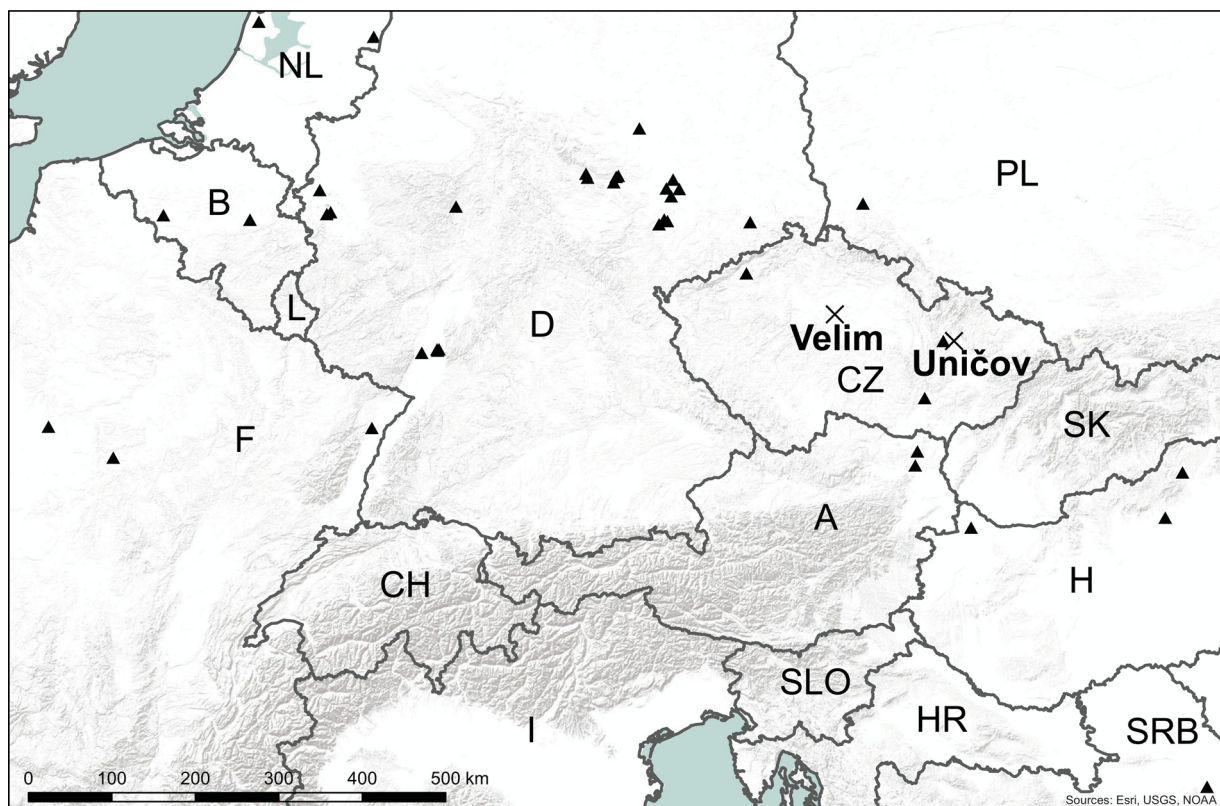


Fig. 1. Map of Neolithic wells with wooden constructions from LBK culture in Central Europe (crosses – new Neolithic wells from Uničov and Velim), modified according to Elburg (2011); Tegel et al. (2012); Király and Tóth (2015); Kretschmer et al. (2016) and Weiner (2016).

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