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Plants and environment: results of archaeobotanical research of the Bronze Age settlements in the Carpathian Foothills in Poland

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ABSTRACT

The first permanent occupation in the micro-region localized around Janowice, in the middle valley of the Dunajec river in the Polish Carpathian Foothills, begun at the turn of the Middle Bronze Age and the Late Bronze Age. Different landscape forms were settled, in which the highest part of the hills or areas located in the proximity of the river were especially chosen for stable settlement. All of them were characterized by the presence of fertile loess and alluvial soils. Macroscopic plant remains found in different occupational phases of six archaeological sites represent cultivated and wild plants. The remains of cultivated plants confirmed that plant resources formed an important part of the past subsistence strategies. It was observed that the same spectrum of cultivated species was utilized during about one millennium of occupation in the forelands, from the beginning of the occupation until the end of the Early Iron Age. *Hordeum vulgare*, *Triticum diccocon*, *Triticum spelta* and *Panicum miliaceum* were the dominant cereal crops. A consistent choice of varied cereal species, along with pulses, may indicate that both winter and summer crops were cultivated and the works dedicated to crop farming were distributed along various months. This strategy could also provide higher and more reliable yields. In addition, the edaphic requirements of weed remains may confirm that people used rich and moderately moist soils for cereal cultivation. Overall, a relatively early cultivation of spelt wheat and millet should be emphasized in the Carpathian Foothills since the oldest phase can be dated back to ca. 1500–1300 cal. BC. A relatively high abundance and ubiquity of spelt wheat resulted very interesting in the context of other cereal remains found in the Late Bronze Age in Poland. In addition, an *Agricultural Predictive Model* was prepared for the closest regions of the settlements in order to demonstrate areas with optimal environmental conditions for agricultural practices. Altogether, macroscopic plant remains are related mainly to synanthropic habitats from fields to ruderal ones. Moreover, human activities could be also responsible for the development of steppe-like plant communities, which are inferred after the finding of feather grass (*Stipa* sp.). The remains of wood preserved as charcoals represent a separate group of plants. They were associated to firewood collections and therefore their analysis may be used for the reconstruction of local woodlands. A major formation is the oak-hornbeam forest. Interestingly, at the end of the Subboreal period, woodlands were dominated by late-arriving species to the Polish territory, such as *Carpinus betulus* and *Fagus sylvatica*. *Abies alba* is also well represented, especially in settlements located on the hills. It seems that forest formations were also subjected to anthropization and the main changes included the presence of more open forests and appearance of unstable stands in different successional stages.

1. Introduction

A joint Polish–German scientific project, which focuses on the Neolithic and the Bronze Age settlement pattern (Kienlin et al.,

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2011) provided an opportunity for carrying out the first systematic archaeobotanical studies in the Carpathian Foothills in Poland. This was of special importance since hitherto the archaeological macroscopic plant remains from these periods from the Carpathian Mountains were only sporadically studied (Calderoni et al., 1998/2000; Lityńska-Zając and Garncarski, 2003; Lityńska-Zając, 2003; Lityńska-Zając et al., 2014, in press) and generally remained unknown in a broader European context (Stika and Heiss, 2013). The new archaeological excavation campaigns and prospection works offered a chance to fulfill an existing gap in the knowledge about the history of plants in the Carpathian region and their relationship with human occupation. This paper presents the data retrieved from six archaeological sites dated to the Late Bronze Age and/or Early Iron Age (Brzozowa, sites 107-65/83 and 107-65/104, Janowice, site 106-65/61, Tworkowa, site 107-63/80, Wróblowice, site 106-65/57; Zakliczyn, site 107-64/8) that were found in the central part of the Dunajec river valley, in the Little Poland (Małopolska) region (Figs. 1 and 2). In addition, archaeobotanical data contribute to the knowledge of past vegetation in this area, which contains no recognized deposits suitable for pollen analysis. However, palynological investigations conducted in other sites of the Carpathians enabled a general reconstruction of the vegetation in different periods of the Holocene (e.g. Szczepanek, 1989; Ralska-Jasiewiczowa and Latałowa, 1996; Wacnik et al., 2001; Ralska-Jasiewiczowa et al. Eds., 2004; Margielewski, 2006; Margielewski et al., 2010; Obidowicz et al., 2013).

The aim of our research was to obtain palaeoethnographic and palaeoecological information about the different uses of plants by people settled in the Bronze Age/Early Iron Age near the Dunajec river and to understand their interaction with the natural environment in different occupational phases. Macroscopic plant remains found in archaeological settlements contribute to our knowledge about the history of cultivated and gathered plants as they give significant evidence of ancient habits related to food preparation, former agricultural practices and exploitation of plant resources for different purposes. A reconstruction of ancient flora, based both on cultivated and wild plants, may also be used for the characterization of diverse habitats existing near human settlements (e.g. Jacomet and Kreuz, 1999; Bogaard, 2004, 2005; Lityńska-Zając, 2005; Lityńska-Zając and Wasylikowa, 2005; Zohary et al., 2012). It is worth to call attention to wood remains being a result of long-lasted firewood collection ("dispersed charcoal"), which may serve for the reconstruction of local forest communities (e.g. Chabal, 1988, 1997; Badal García, 1992; Heinz and Thièbault, 1998; Figueiral and Mosbrugger, 2000; Ntinou, 2002; Asouti and Austin, 2005; Carrión Marco, 2005; Théry-Parisot et al., 2010; Moskal-del Hoyo, 2013).

1.1. Biogeographical and archaeological background

The archaeological sites are located to the east and west of the Dunajec river, in the Rożnów and Wiśnicz Foothills (Kondracki, 2002), respectively. They form part of the West Carpathians (Starkel, 1988) (Fig. 1). These regions are characterized by the presence of hills with an average altitude between 350 and 550 m. a.s.l., which are covered by loess and loess-like sediments. Climate is moderately warm, with an average annual temperature of 6–8 °C (Obrębska-Starklowa and Leśniak, 1988). The landscape is dominated by crop fields, and the patches of the natural vegetation mainly cover strongly inclined slopes (oak-hornbeam forests of *Tilio-Carpinetum stachyetosum* and *Tilio-Carpinetum typicum*, mixed oak-pine forests *Pino-Quercetum*) and valleys of the watercourses (willow-poplar forests *Salici-Populetum* and alder woods *Circaeo-Alnetum*) (Towpasz, 1988). According to the map of the potential natural vegetation of Poland (Matuszkiewicz, 2008), this area would be suitable for the development of oak-hornbeam forests *Tilio-Carpinetum* in colline and submontane forms, the latter with higher frequency of beech. Other forest communities include oak-pine forests and riverine communities.

Archaeological excavations supervised by T.L. Kienlin were conducted by a team coming from five German and Polish universities: the University of Bochum, the University of Cologne, the University of Tübingen, the University of Leipzig and the Jagiellonian University. Archaeological features dated to the Middle Bronze Age, Late Bronze Age and Early Iron Age were documented, but the main occupation took place during the Late Bronze Age (Kienlin and Valde-Nowak, 2008; Kienlin et al., 2011). This mountainous area with access to an important communication route along the Dunajec river is very interesting since it presents different cultural influences from the regions situated north and south of the

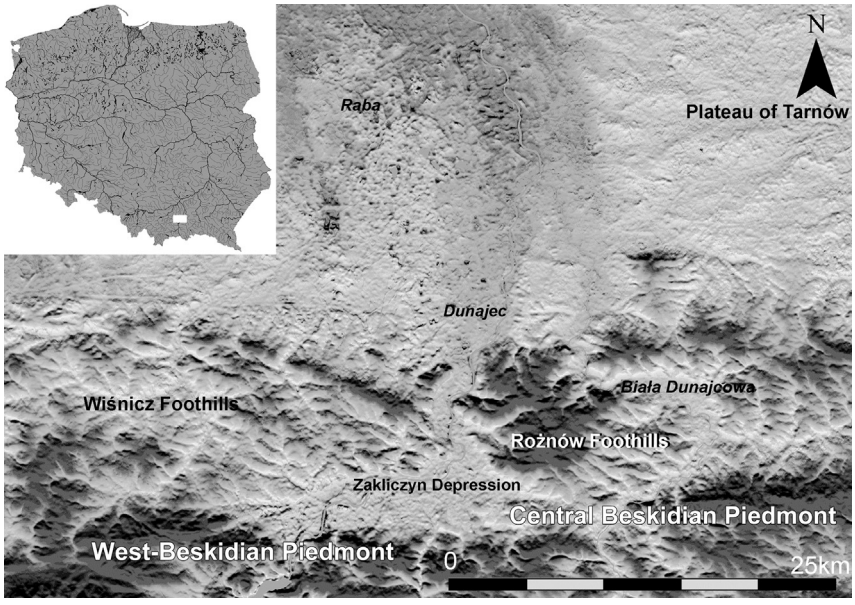

Fig. 1. The research area in Polish Western Carpathians: the Wiśnicz and Rożnów Foothills.