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SHORT ARTICLE

Medieval oak chronology from the Vilnius Lower Castle

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Abstract

The paper describes the results of a dendrochronological investigation on historical oak (*Quercus robur* L.) timbers from the Vilnius Lower Castle excavations. In Lithuania, oak was used only in specific cases during the Middle Ages. Therefore, historical material for tree ring chronology building is lacking. However, the construction of a local oak chronology is of great importance as it can help to determine the provenance of many imported timbers that are part of wooden cultural heritage in Western Europe. Oak samples make 9.2% of the analysed timbers excavated in the Vilnius Lower Castle territory – the largest present-day collection of historical timbers in Lithuania. The main material for Vilnius oak chronology was obtained from the 'bridge foundation (BF)' construction found close to the Royal Palace gate at a depth of 4–5 m. Ring-width series of the oak beams of the 'BF', together with other excavated oak logs were cross-dated and a mean chronology of 217-year length was constructed. The chronology was dated to AD 1202–1418 against the Baltic reference chronologies BALTIC1 ($t = 7.57$), BALTIC2 ($t = 4.52$) and WINCHCOL ($t = 5.74$) (authors J. Hilliam, I. Tyers, D. Mills). The average date of the hardwood – sapwood boundary on the 'bridge' samples that have partially preserved sapwood is between 1406 and 1407. As the average number of oak sapwood rings is considered to be 16, the most probable felling date of trees used for the 'BF' is situated around 1423.

Keywords: Dendrochronology; Dendroarchaeology; *Quercus robur* L.; Historical timber trade; Lithuania

Introduction

Fluctuations in tree ring width depend on changing environmental conditions that are specific to the region. This means that dendrochronologists dating wooden objects have to use reference chronologies from the region off-origin of the wood. As opposed to the living trees, localisation of historical wood provenance is not so easy. Owing to trade relations wood was transported not only locally, but all over Europe (Eckstein et al., 1986; Baillie, 1995).

It is well known that in medieval times a lot of wood was exported to Western Europe from less densely populated and therefore not so deforested East and North European countries (Wazny and Eckstein, 1987; Bonde, 1992). In the 15–16th century, one of those important wood-exporting countries was the Great Duchy of Lithuania. One of the earliest written sources of wood export from Lithuania is a 1405 letter from the Great Master of the German Order to the Grand Duke of Lithuania Vytautas the Great, mentioning that Lithuanian wood is of great importance in the Danzig

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port (Ivinskis, 1934). The number of citations on Lithuanian wood export increases in documents after the defeat of the German order in the Grünwald battle in 1410. These notes show that wood has been regularly floated down the Nemunas (Memel) river to Prussia since the beginning of the 15th century (Ivinskis, 1934). Already in the first half of the 15th century the main assortments exported from Lithuania have been "Wagenschoss" (wainscots) made of oak (Ivinskis, 1934). Wainscots were an important part of the timbers exported from Gdansk/Danzig (Wazny, 1992), and were also traded in Riga (Zunde, 1998–1999). The 1472–1473 Normedia waterage register of timbers exported from Lithuania (stored in the Königsberg archive before the WWII and lost during the war), besides to oak timbers named "Wagenschoss" and "Klappholz", list such assortments as "Knarrholz", "Koggenbort", "Eibenholz", "Fassholz", "Stabholz" and "Maste" (Ivinskis, 1934). The exploitation of Lithuanian forests intensified when an office of Hanseatic League was set up in Kaunas in 1445. In the middle of the 16th century Lithuanian forests were heavily exploited, what made the Vilnius Seimas (the parliament) decide in 1547 to take wood export under a state monopoly (Ivinskis, 1933).

Historical written sources show that the main rout of the 15–16th centuries Lithuanian timber trade passed via Königsberg, the port with the right of timber resorting, to Danzig, the centre "par excellence" of timber trade around the Baltic sea (Ivinskis, 1934). The lack of documents prevents to estimate the volume of exported timbers. However, it is certain that some part of timbers shipped from Danzig to western European countries originates from the basin of Nemunas river and other parts of the Great Duchy of Lithuania.

At present day in Lithuania the largest collection of historical timbers is collected at the Vilnius Castle excavations. This administrative centre of the Great Duchy of Lithuania was destroyed during the wars with Russia in the middle of the 17th century and demolished at the turn to the 19th century (Tautavičius, 1995). The current reconstruction activities and archaeological investigation of the Lower Castle territory allowed collecting a big amount of medieval and post-medieval timbers. The main tree species used in wooden constructions of the Lower Castle territory was Scots pine (Pukienė, 2004). Oak elements are rarely found. In order to build an oak chronology, a special effort was made to collect and analyse every oak sample suitable for dendrochronological analysis. In this paper, by studying the growth patterns of the selected oak specimens from the Vilnius Castle we assess the possibility to establish the first medieval local oak chronology for Lithuania and explore its relations with the existing Baltic oak reference chronologies.

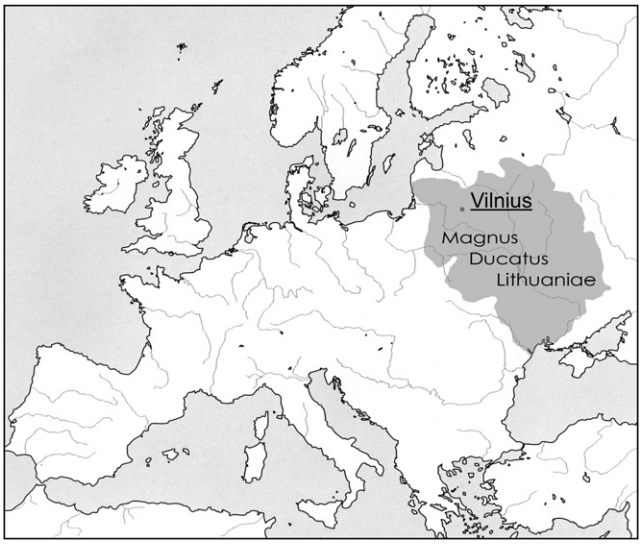

Fig. 1. The Great Duchy of Lithuania in the 15th century.

Site, material and methods

In the middle of the last millennium the Great Duchy of Lithuania spread over a vast territory in the central east Europe from the Baltic to the Black sea (Fig. 1). Vilnius is known as an administrative centre of Lithuania at least since 1323. The Lower Castle of Vilnius castle complex has been rebuilt several times and changed its use from the fortification system in the 14th century to the rulers' residence complex in later centuries (Kitkauskas, 1989).

During the long history up to 8 m thick cultural layer has been accumulated in the Castle territory. The upper layers represent a period of brick and stone constructions mainly of the 15–17th and later centuries. In the depth of approximately 4 m the layers rich with remnants of timber constructions (pavements, houses, piles, etc.) of previous centuries start. In some places the thickness of successive timber constructions is up to 4 m. Because of wet and peaty ground some stone basements of the Royal palace (Fig. 2) were built on wooden raft constructions too (Ožalas, 2001).

Dendrochronological material was collected by taking cross-sections of elements of excavated wooden constructions suitable for dendrochronological analysis. Depending on the availability at least 5 elements were sampled of each construction or a phase. Cross-sections were wrapped into plastic bags in order to avoid desiccation. Oak samples were selected from the wood collection for this study.

The largest assemblage of oak samples for oak chronology building came from a massive wooden construction excavated by the Castle Research Centre "Lietuvos pilys" in 1996–1999 and in 2002–2005 (Figs. 2 and 3).