

OPERA INSTITUTI ARCHAEOLOGICI SLOVENIAE

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HOČEVARICA

ENEOLITSKO KOLIŠČE NA LJUBLJANSKEM BARJU AN ENEOLITHIC PILE DWELLING IN THE LJUBLJANSKO BARJE

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LJUBLJANA 2004

6.4 TELEKONEKCIJA KRONOLOGIJ Z NASELBIN HOČEVARICA IN PALÙ DI LIVENZA, ITALIJA

6.4 TELECONNECTION OF CHRO- NOLOGIES FROM HOČEVARICA AND PALÙ DI LIVENZA, ITALY

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Izvleček

Predstavljamo uspešno telekonekcijo prazgodovinskih kronologij širin branik s Hočevarice HOC-QUSP1 in strukture 1 koliščarske naselbine Palù di Livenza (Pordenone, SV Italija). Po radiokarbonskem datiranju je bila struktura 1 s Palùja uvrščena v prvo polovico četrtega tisočletja pr. Kr., kar se ujema z radiokarbonskim datiranjem kronologije s Hočevarice. Gradbene aktivnosti na strukturi 1 v Palùju so se končale pred zaključkom aktivnosti na Hočevarici. Opisani rezultati pomenijo prvo znano dendrokronološko ujemanje prazgodovinskih kronologij iz Slovenije in Italije.

Abstract

A successful teleconnection of the Hočevarica HOC-QUSP1 chronology and the chronology structure 1 from Palù di Livenza (Pordenone, NE Italy) is presented. According to radiocarbon dating, structure 1 in Palù is attributed to the first half of the 4th millennium B.C. This coincides with the radiocarbon dating of the chronology from Hočevarica. The building activities for structure 1 in Palù ended earlier than those at Hočevarica. The results represent the first known dendrochronological correspondence of prehistoric chronologies from Slovenia and Italy.

6.4.1 UVOD

Kot smo že omenili, so kronologije širin branik s Hočevarice predstavljene v poglavju 6.2 plavajoče oziroma nedatirane. Za njihovo dendrokronološko datiranje bi potrebovali referenčne kronologije, ki ustrezajo raziskanemu lesnim vrstam, območju in obdobju. Doslej nam v Sloveniji še ni uspelo sestaviti absolutno datiranih kronologij za prazgodovinska obdobja, zato nas še prav posebej zanima možnost telekonekcije, to je primerjave oziroma sinhroniziranja naših kronologij z datiranimi in nedatiranimi kronologijami iz drugih regij.

Med vodilnimi in geografsko najbližjimi laboratoriji, ki poseduje datirane prazgodovinske kronologije, je Dendrokronološki laboratorij pri Landesdenkmalamt Baden-Württemberg, Hemmenhofen, Nemčija. Ta laboratorij je tudi med vodilnimi na področju raziskav prazgodovinskih koliščarskih naselbin in v svojem arhivu med drugim hrani več datiranih prazgodovinskih kronologij širin branik (Billamboz 1992; 1996; Billamboz, Tegel 2001). Dendrokronološkemu laboratoriju iz Ljubljane je omogočil primerjave prazgodovinskih kronologij s svojimi referenčnimi kronologijami. Primerjave so

6.4.1 INTRODUCTION

As already mentioned, the tree-ring chronologies from Hočevarica presented in chapter 6.2 are floating i.e. undated. For their dendrochronological dating, reference chronologies suitable for the investigated species, region and period would be required. As there are no absolutely dated chronologies for the prehistoric period in Slovenia, teleconnection, i.e. cross-dating with dated or undated chronologies from other regions embodies an indispensable procedure.

The Dendrochronological Laboratory of the Landesdenkmalamt Baden-Württemberg from Hemmenhofen, Germany is among the leading and geographically nearest laboratories that possesses dated prehistoric chronologies. Furthermore, this laboratory is also one of the leading ones for pile dwelling research. It operates with several dated prehistoric chronologies (Billamboz 1992; 1996; Billamboz, Tegel 2001) and supports the attempts of the laboratory in Ljubljana to cross-date the prehistoric chronologies from Slovenia with references from southern Germany. Since the oak wood from different European regions often evidences a good teleconnec-

bile usmerjene predvsem na hrastove kronologije, ki v mnogih evropskih regijah izkazujejo dobro telekonekcijo (Baillie 1995), vendar so bili vsi poskusi datiranja doslej neuspešni. Na podobne težave so naleteli tudi kolegi iz Italije, ki se že dolgo sistematično trudijo, da bi svoje prazgodovinske kronologije sinhronizirali s tistimi z območij severno od Alp.

Laboratorij DENDRODATA s.a.s. iz Verone že leta opravlja dendrokronološke raziskave na prazgodovinskih koliščarskih naselbinah v severni Italiji. Sestavili so več kronologij za neolitik in bronasto dobo. Kronologije so bile večinoma radiokarbonsko datirane, vendar so kljub dolgoletnemu sodelovanju z dendrokronološkim laboratorijem iz Hemmenhofna in od drugod ostale dendrokronološko nedatirane.

Zdi se, da so razlogi za neuspešno sinhroniziranje prazgodovinskih kronologij iz severne Italije podobni kot za slovenske. Med glavnimi razlogi za slabo telekonekcijo hrastovih kronologij se zdijo razlike v klimi, ki jo južno od Alp definirajo alpski, celinski in sredozemski vplivi.

Zaradi relativne bližine in podobnosti med severno Italijo in Slovenijo, laboratorija iz Verone in Ljubljane redno izmenjujeta in primerjata dendrokronološke podatke. Primerjave so pokazale, da je telekonekcija kronologij nekaterih lesnih vrst možna in da je odvisna od narave posamezne drevesne vrste ter od tega, kje so rasla raziskana drevesa in kdaj. Največ uspeha sta laboratorija dosegla pri skupnem sestavljanju kronologije macesna (*Larix decidua*). Sestavila sta regionalno kronologijo, dolgo 1242 let, ki premošča obdobje od leta 756 do 1997 in jo lahko uspešno uporabljamo v severni Italiji in v Sloveniji (Levanič, Pignatelli, Čufar 2001). Njena sestava pomeni velik uspeh, saj tako v Italiji kot v Sloveniji močno primanjkuje starih dreves ter zgodovinskega in arheološkega lesa iz nekaterih obdobj. Primerjave kronologij modernih hrastov so bile v splošnem manj uspešne, najnovejši rezultati pa vendarle nakazujejo, da so za nekatera pretekla obdobja izgledi za telekonekcijo hrasta iz Italije in Slovenije boljši kot za današnje hraste.

V nadaljevanju predstavljamo prvo uspešno sinhroniziranje prazgodovinskih kronologij hrasta s Hočevarice in s koliščarske naselbine Palù di Livenza, ki leži v SV Italiji približno 150 km zahodno od Hočevarice.

6.4.2 PRIMERJAVA KRONOLOGIJ ŠIRIN BRANIK IZ HOČEVARICE IN PALÙ DI LIVENZA

Arheološki kompleks Palù (Polcenigo, Pordenone) leži ob izviru reke Livenza ob vznožju gore Massiccio Cansiglio-Cavallo v predalpski regiji SV Italije. Naselbino so odkrili po letu 1960 (Peretto, Taffarelli, 1973). Raziskave pod vodstvom *Soprintendenza Archeologica del Veneto e Friuli Venezia Giulia* in *Soprintendenza per i Beni A.A.A.A.S. del Friuli Venezia-Giulia* med leti 1983 in 1999

tion (Baillie 1995), our comparisons are focused mainly on oak chronologies.

Unfortunately, the attempts to cross-date the Slovenian prehistoric chronologies with those from Germany have proved unsuccessful so far. Similar observations have been made by Italian colleagues, who have, despite systematic and long-term efforts also failed to teleconnect their prehistoric chronologies with those from the regions north of the Alps.

The DENDRODATA s.a.s. laboratory from Verona completed several dendrochronological investigations of prehistoric pile dwellings throughout northern Italy. They constructed several prehistoric tree-ring chronologies both for the Neolithic and Bronze Age periods. They incorporate radiocarbon dates, although they remain dendrochronologically undated, despite collaboration with the laboratory in Hemmenhofen as well as other laboratories.

It seems that the reasons for the unsuccessful cross-dating of northern Italian prehistoric chronologies are similar to those for Slovenian ones. One of the difficulties concerning the teleconnection of oak wood could also be climate, which is, south of the Alps, determined by the Alpine, Continental and Mediterranean influences.

Due to the relative vicinity and similarities between northern Italy and Slovenia, the laboratories from Verona and Ljubljana regularly exchange data and compare their respective chronologies. Investigations in northern Italy and Slovenia have demonstrated that the prospect of teleconnecting tree-ring patterns varies with regard to tree species, location and time. The most successful common project was the construction of the larch (*Larix decidua*) chronology for NE Italy and Slovenia. This regional chronology is 1242 years long and spans the period between 756–1997 AD (Levanič, Pignatelli, Čufar 2001). Comparisons of modern oak chronologies were less successful but our most recent results indicate that cross-matching of prehistoric chronologies might indeed be possible.

The first successful cross-dating of prehistoric chronologies from Hočevarica and from Palù di Livenza, a pile dwelling site in NE Italy, around 150 km west from Hočevarica (fig. 6.4.1), is presented in the continuation.

6.4.2 COMPARISON OF CHRONOLOGIES FROM HOČEVARICA AND PALÙ DI LIVENZA

The archaeological complex of Palù (Polcenigo, Pordenone) is located near the river Livenza at the foot of the Massiccio Cansiglio-Cavallo mountain in the subalpine region of NE Italy. It was discovered in the 1960s (Peretto, Taffarelli 1973). The investigations of teams from *Soprintendenza Archeologica del Veneto e Friuli Venezia Giulia* and *Soprintendenza per i Beni A.A.A.A.S. del*



so pokazale, da je bilo v prazgodovini območje poseljeno s koliščarskimi naselbinami, ki so živele v poznem neolitiku in eneolitiku (Vitri 2001).

Arheološka izkopavanja med leti 1992 in 1994 (Bassetti, Cavulli 2001; Vitri 2001) so vključevala tudi vzorčenje lesa za dendrokronološke raziskave, ki jih je opravil laboratorij DENDRODATA. Sestavili so več plavajočih kronologij za več različnih ostankov konstrukcij v naselbini. Na podlagi radiokarbonskega datiranja so ugotovili, da je bilo območje poseljeno v 5. in 4. tisočletju pr. Kr. Rekonstruirali so več poselitvenih in gradbenih faz.

Več hrastovih kronologij iz naselbine Palù z nad 50 branikami smo dendrokronološko primerjali s kronologijami z Ljubljanskega barja. Izkazalo se je, da se je hrastova kronologija iz Hočevarice HOC-QUSP1 vizualno in statistično značilno ujemala s kronologijo strukture I iz strukturnega sistema III na Palùju (Vitri, Martinelli, Čufar 2002). Sinhroni položaj obeh krivulj je prikazan na sliki 6.4.2.

Rezultati kažejo, da se kronologija s Palùja prekriva s starejšim delom HOC-QUSP1 in se konča v relativnem letu 80 (sl. 6.4.2). Parametri datiranja so: koeficient skladnosti (Gleichläufigkeit) 69 %, t-vrednost po Baillie in Pilcherju (t_{BP}) 4.4 in indeks datiranja (Cross Date

Sl. 6.4.1: Lega naselbin Hočevarica, Slovenija in Palù di Livenza, SV Italija.

Fig. 6.4.1: Map showing the locations of Hočevarica, Slovenia and Palù di Livenza, NE Italy.

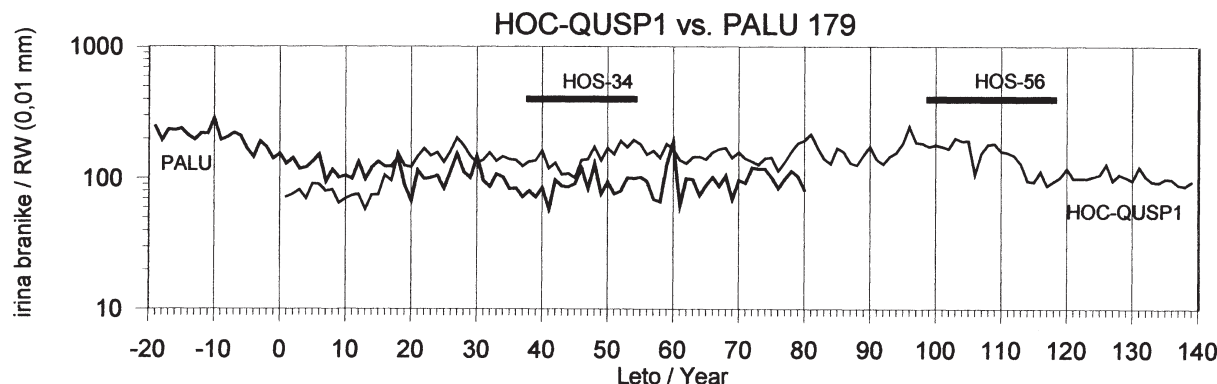
Friuli Venezia-Giulia, carried out between 1983 and 1999, established that it was a site of prehistoric pile dwellings. The dwellings were inhabited during the late Neolithic and Eneolithic (Vitri 2001).

Archaeological excavations between 1992 and 1994 (Bassetti, Cavulli 2001; Vitri 2001) also incorporated wood sampling for dendrochronological investigations, which were carried out by the DENDRODATA laboratory. They composed several floating chronologies related to different wooden structures. Based on radiocarbon dating, they established that the area was inhabited during the 5th and 4th millenniums B.C. They also succeeded in reconstructing several different phases of building activity in the pile dwelling settlement.

Several oak chronologies from Palù, each containing more than 50 tree-rings, were compared with those from the Ljubljansko barje. The Hočevarica HOC-QUSP1 oak chronology and the mean tree-ring curve of structure I belonging to the structural system III at Palù both demonstrated good visual and statistical correspondence (see also Vitri, Martinelli, Čufar 2002). The cross-dated position of the chronologies is displayed in figure 6.4.2.

The results show that the Palù chronology overlaps with the older part of the HOC-QUSP1 chronology, and ends at the relative year 80 (fig. 6.4.2). The cross-dating parameters for this position are statistically significant with a congruity coefficient (»Gleichläufigkeit« or »GLK«) of 69 %, a t-value according to Baillie and Pilcher (t_{BP}) of 4.4 and a cross-date index (CDI) of 177. The indicators are statistically significant. Furthermore, the chronologies also show good visual agreement.

The sample from the pile no. ES 373 was dated to



Sl. 6.4.2: Sinhron položaj kronologij z naselbin Hočevarica (HOC-QUSP1) in Palù di Livenza.

Fig. 6.4.2: Cross-dated position of the chronologies from Hočevarica (HOC-QUSP1) and Palù di Livenza.

Index) 177. Kazalniki so statistično značilni. Krivulji se poleg tega dobro ujemata tudi glede značilnih let.

Vzorec št. ES 373 je bil radiokarbonsko datiran 4880 ± 105 BP (Vitri, Martinelli, Čufar 2002), kar strukturo 1 s Palùja uvršča v prvo polovico 4. tisočletja pr. Kr. To datiranje se ujema z radiokarbonskim datiranjem kronologije HOC-QUSP1 s Hočevarice (*poglavje 6.3.1*) in še dodatno potrjuje ugotovitve dendrokronoloških primerjav.

Rezultati nakazujejo, da so se gradbene aktivnosti, kot jih opisuje kronologija strukture 1 s Palùja, končale prej kot aktivnosti na Hočevarici, ki jih zajema kronologija HOC-QUSP1. Glede na to, da kronologija HOC-QUSP1 najverjetneje vključuje les iz različnih gradbenih faz, jarek, kjer smo pridobili vzorce lesa, je najverjetneje sekal ostanke različno starih delov naselbine lahko sklepamo, da so se gradbene aktivnosti na strukturi 1 v Palùju zaključile nekaj let pred začetkom najstarejše faze na Hočevarici oziroma 59 let pred najmlajšo bolje dokumentirano fazo.

Rezultati pomenijo prvo uspešno sinhroniziranje prazgodovinskih kronologij iz Italije in Slovenije. Pripomogli bodo k boljšem poznavanju aktivnosti na koliščarskih naselbinah v severni Italiji in v Sloveniji in odnosov med njimi. Pričakujemo, da bodo pripomogli tudi k bodočem datiranju naših kronologij z referencami z območij severno od Alp. Rezultati tudi nakazujejo, da so težave pri telekonekciji hrasta med regijami severno in južno od Alp verjetno v veliki meri posledica različnih klimatskih dejavnikov.

4880 ± 105 BP (Vitri, Martinelli, Čufar 2002). According to this radiocarbon dating, the structure 1 at Palù is attributed to the first half of the 4th millennium B.C. This result coincides with the radiocarbon dating of the HOC-QUSP1 chronology from Hočevarica (*chapter 6.3.1*) and additionally reconfirms the dendrochronological matching.

The results evidence that the building activity accounted for by the chronology of structure 1 at Palù occurred earlier than the building phases at Hočevarica. As the HOC-QUSP1 chronology most likely contains wood samples from different building phases, and the ditch – from where the wood samples were collected – probably traversed the remains of variously aged sections of the settlement, we can conclude that the building activity at Palù ended a few years before the oldest phase at Hočevarica, or 59 years before the youngest better-documented building activity.

The results represent the first successful cross-dating of prehistoric chronologies from Italy and Slovenia. They will help to better understand and date the activities in the pile dwelling sites in NE Italy and Slovenia and to study other possible correspondences between them. Improved comprehension of the relations between these two regions could presumably help in future efforts to cross-date with reference chronologies from north of the Alps. The results also support the assumption that different climatic factors influenced the growth of the trees in the regions south of the Alps, which may also be the main reason for the faults in teleconnecting oak chronologies throughout the Alps.

Translation: Katarina Čufar & Nicoletta Martinelli