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SADRŽAJ
CONTENTS

OPVSC. ARCHÆOL. VOL. 37/38 STR. / PAGES 1–434 ZAGREB 2013/2014.

PROSLOV

S velikim zadovoljstvom i u ime cijelog uredništva predstavljamo dvobroj 37/38 časopisa Opuscula Archaeologica koji je utemeljen 1956. godine, te s više ili manje poteškoća izlazi više od pet desetljeća. Usprkos trenutnim financijskim poteškoćama pred nama je časopis koji i ovoga puta, i to sa 19 članaka od 25 autora, na preko četiri stotine stranica, objavljuje znanstvene, pregledne i stručne tekstove visoke kvalitete.

No, ovaj dvobroj časopisa Opuscula archaeologica se razlikuje od prethodnih izdanja jer se sastoji od dva tematska poglavlja. U prvom poglavlju je jedanaest radova koji su, u skladu s tradicijom našeg časopisa, posvećeni različitim arheološkim problemima koji će kako znanstvenicima, tako i drugima, dati mogućnost dobivanja uvida, ne samo u nepoznatu arheološku građu, nego i mogućnost upoznavanja s najnovijim razmišljanjima o određenim problemima kao i njihovim mogućim rješenjima. Drugi dio broja 37/38 časopisa Opuscula archaeologica nas posebno raduje jer se sastoji od osam radova posvećenih 30-godišnjici smrti uglednog hrvatskog profesora prapovijesne arheologije Stojana Dimitrijevića. Radovi su prezentirani na skupu posvećenom Stojanu Dimitrijeviću na Filozofskom fakultetu u Zagrebu 13.12.2011.

Napor koji je uredništvo časopisa uložilo u izlazak ovoga broja nije nas obeshrabrio nego potaknuo da i dalje činimo sve potrebno da bi autori i dalje imali priliku objavljivati članke za koje smatraju da doprinose arheološkoj znanosti. Za kvalitetu objavljenih priloga brinuo se cijeli tim recenzenata, čije je mišljenje i omogućilo da svaki prilog ima onu kvalitetu kakvu naš časopis i zaslužuje. Stoga na kraju svim autorima i suradnicima najsrdačnije zahvaljujemo na prilozima tiskanim u ovome broju časopisa Opuscula archaeologica.

Glavni i odgovorni urednici

PROLOGUE

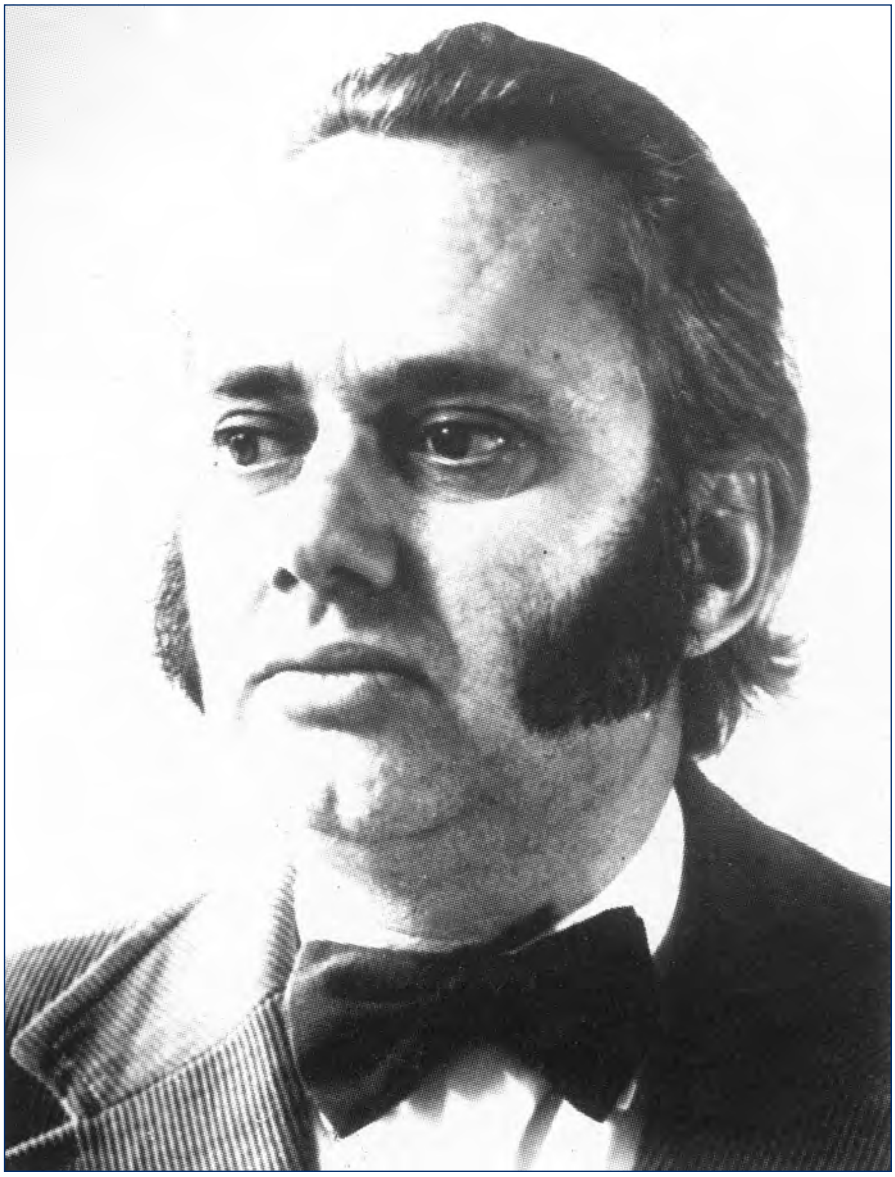
We are proud to present a double volume 37/38 of Opuscula archaeologica on behalf of the Editorial board. Since its first volume in 1956, journal Opuscula archaeologica has been publishing scientific articles in the field of archaeology and other historical disciplines. Despite current financial challenges we were able to publish 19 articles by 25 authors on more than 400 pages containing high quality original scientific articles and professional papers.

The structure of this double volume differs from previous ones because it is divided into two sections. The first section consisting of 11 articles that are, in the tradition of this journal, facing specific archaeological issues. We hope that these articles will provide information to readers on new, unpublished material and current debates. The second section contains 8 papers dedicated to the 30th anniversary of death of Professor Stojan Dimitrijević, a distinguished professor of Prehistoric Archaeology at the University of Zagreb. These papers were originally presented at the conference organized by the Faculty of Humanities and Social Sciences, University of Zagreb on December 13th 2011.

Various challenges presented to us during the preparation of this volume were not discouraging, but, on the contrary, gave us the additional motivation to secure the future of this journal as a platform for publication of quality scientific and professional papers by fellow scholars. Extensive team of domestic and international reviewers is the quality assurance of the published articles, and the journal as a whole.

We would like to express our gratitude to all contributors whose articles are published in this double volume.

Editors



RADOVI SA SKUPA ODRŽANOG U SPOMEN STOJANU DIMITRIJEVIĆU
NA FILOZOFSKOM FAKULTETU SVEUČILIŠTA U ZAGREBU 13. 12. 2011.

PAPERS PRESENTED AT THE CONFERENCE IN HONOUR OF
STOJAN DIMITRIJEVIĆ AT UNIVERSITY OF ZAGREB,
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Bine KRAMBERGER

Evaluation of Dimitrijević's definition of the Sopot Culture in the light of radiocarbon dates

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Introduction

Dimitrijević's definition of the Sopot Culture, his studies of related material culture and establishment of its relative chronology in the late 1960s and in the 1970s (Dimitrijević 1968; 1979b) were very important steps in the history of archaeological research. His works are still today the basis for every researcher who is working with this problematic. However, new methods have been developed in the last decades, which make it possible to look again on this questions.

The aim of this paper is to evaluate Dimitrijević's thesis of evolution and termination of the Sopot Culture on the basis of absolute radiocarbon dates. We will therefore examine radiocarbon (^{14}C) dates known from the Starčevo and the Sopot cultures, the Linear Band Pottery Culture, the Vinča and the Lengyel cultures, the Lasinja and Baden cultures.

S. Dimitrijević defined the Sopot Culture by observing pottery assemblages and assessing their variability in space on two levels. On the first level he observed variability of pottery assemblages in vertical segments of tell settlements Klokočevnik, Otok, Sopot and Bapska. The second level was observation of pottery variability on a wider area of central and south-eastern Europe (the area of today's Croatia, Serbia, Bosnia, Slovenia, Hungary, Austria, Czech Republic and Slovakia). S. Dimitrijević founded the Sopot Culture with observation of variability of pottery assemblages in vertical segments of tell settlements. He determined the basic features of this culture and its relative chronology (phases Sopot Ia, Ib, II and III[1]). Observation of pottery variability on a wider area of central and south-eastern Europe defined relations of the Sopot Culture to neighbouring cultures (see Dimitrijević 1979b: 263-303).[2]

[1] Dimitrijević's chronology of the Sopot Culture is generally valid today. The only addition to his chronology is dissection of Phase II to two phases (Phase Sopot IIa and IIb), which is a result of later excavations at the tell site Sopot (Krznarić Škrivanko 2002).

[2] After this paper was given as a manuscript a lot of new articles were published which yielded further 14C dates and are connected with this problematic. However, at this point we can only mention the most important ones without detailed discussions.

Radiocarbon dates of the Neolithic, Early and Middle Eneolithic cultures in south-eastern and central Europe

The Starčevo Culture

There are two core sites, which define absolute dating of the Starčevo Culture in Croatia. These are Brod-Galovo and Zadubravlje-Dužine. Excavations at the site Brod-Galovo resulted in discovery of two construction phases of the settlement, while the radiocarbon dates indicate a possibility of the existence of a third phase. The earliest phase of the settlement was dated to between 6100 and 5700 cal BC, followed by a phase dated roughly to 5700 cal BC, while the latest phase of the settlement, identified by ^{14}C dating, existed between 5300 and 5000 cal BC (68.2% probability) (Minichreiter & Bronić 2006; see also Obelić, Bronić & Horvatinčić 2002: 616).

The site of Zadubravlje offers five ^{14}C dates (Z-2921 - Z-2925). The radiocarbon date of sample Z-2923 from the earth house 10 is consistent with the early phase of the site Brod-Galovo, while dates gained from samples Z-2921 and Z-2922 are slightly later and correlate with the late phase of Brod-Galovo. The radiocarbon date of sample Z-2925 corresponds with the latest phase of the site Brod-Galovo. The fifth sample from Zadubravlje (Z-2924) deviates significantly as it is approx. 500 years earlier than the earliest phase at Brod-Galovo (Minichreiter & Bronić 2006: 13-15; Obelić *et al*. 2002: 620).

Radiocarbon dates of the Hungarian Starčevo (Körös) Culture correlate to those in Croatia (see Hertelendi *et al*. 1995; 1998). Dating of the Starčevo Culture to the end of the 7th and the 6th millennium BC is furthermore confirmed by sites from Serbia, Montenegro, Macedonia and Bosnia (see Minichreiter & Bronić 2006: 15).[3]

The Linear Band Pottery Culture

The earliest dates of the Linear Band Pottery Culture in Austria come from the settlement Brunn am Gebirge – Wolfholz, sites IIa and IIb. 26 ^{14}C dates are available for both sites. The earliest part of the settlement is, based on these dates, dated to between 5540 and 5210 cal BC (68.2% probability).[4] Phases IA and IB of the LBK are later. They lasted between 75 and 150 years, in the period between 5380 and 5200 cal BC (Lenneis & Stadler 2002: 200; Lenneis 2001: 106).[5, 6] Somewhat later dates emerged from the earlier to later LBK transition. Site 1 of the settlement Brunn am Gebirge - Wolfholz is dated to between 5310 and 5060 cal BC (Stadler 2005: 270), while a comparable site Mold dates to between 5260 and 5040 cal BC (Stadler 2010). Late LBK in Austria is dated to between 5280 and 4800/4750 cal BC (Lenneis 1995: 27)[7].

^{14}C dates of the Hungarian LBK are known from sites Szentgyörgyvölgy-Pityerdomb, Petrivente, Becsehely, Kustánzeg and Pári (28 dates). Dates can be divided into three groups. Dates from Szentgyörgyvölgy-Pityerdomb are the earliest (15 dates) and they place the site, where pottery, typologically comparable to sites IIa and IIb of the settlement Brunn am Gebirge – Wolfholz was discovered, roughly between 5480 and 5360 Cal BC (Stadler, Carneiro & Bánffy 2005: 253). The second group of dates is slightly later (seven dates). They date to a period between 5300 and 4900 cal BC, and the third group of dates (six dates) dates to between 5050 and 4800 cal BC (68.2%) (Kalicz *et al*. 2007: 44; see also Horváth & Kalicz 2001: 20).[8]

The Vinča Culture

Two relative chronologies of the Vinča culture are valid at present; the chronology, developed by Menghin (1931), Holste (1939) and Milojčić (1949), and the chronology developed by M. Garašanin (1951). The first and the most established relative chronology is based on observations of the variability of pottery forms within arbitrary segments of the tell settlement Vinča-Belo Brdo. According to this chronology, the Vinča Culture is divided into phases Vinča A, B1, B2, C, D1 and D2. The second relative chronology of the Vinča Culture was proposed by M. Garašanin (1951), who, apart from Vinča-Belo Brdo, included other sites as well (the most important being Tordoš, Pločnik and Gradec). According to this chronology, the Vinča Culture

[3] It has to be noted that most of the dates date to approx. between 6000 and 5200 cal BC (68.2% probability) with only rare examples being earlier or later.

[4] Researchers claim that the first date is perhaps too early. Namely, most of the samples were oak charcoal and the old wood effect is possible (Stadler 2005: 270).

[5] Some of the 14C dates from Rosenburg do not fall within this period (Stadler 2009: 88-92; Lenneis 2009: 92).

[6] H. Stäuble (1995) came to similar results while dating the Early Linear Band Pottery Culture.

[7] For the relative chronology of the Early LBK in Austria see Lenneis (2010) and for the overview of the absolute ^{14}C dates see Lenneis, Stadler & Windl (1996).

[8] No dates for the Linear Band Pottery Culture are available in Croatia (the Korenovo Culture). Comparisons of this culture with the Early LBK sites (see for example Bánffy 2005: 192) suggest a period between 5500 and 5200 cal BC.

consists of Vinča-Tordoš phases I-II, Vinča-Pločnik I-II and the Gradec Phase.

The latest absolute chronology of the Vinča Culture was published in 2009 (Borić 2009). 47 samples of animal and human bone were analysed and 37 of them had enough collagen preserved to be successfully dated. Samples originated from sites Rudna Glava, Belovode, Pločnik Divostin II, Gomolava I, Petnica and Vinča-Belo Brdo and were dated by the Oxford Radiocarbon Accelerator Unit. After this absolute chronology, the Vinča A Phase dates to between 5400/5300 and 5200 cal BC, Vinča B between 5200 and 5000 cal BC, Vinča C between 5000/4950 and 4850 and Vinča D between 4850 and 4650/4600 cal BC (Borić 2009: 234).

The Sopot Culture

The Rudjer Bošković Institute in Zagreb analysed 25 ^{14}C samples from different sites, assigned to the Sopot Culture (Obelić *et al*. 2004). These were 22 samples of charcoal, two cereal grains (Z-2761 and Z-2913, both from the site of Otok – Mandek's Vineyard) and one human bone (Z-2831, from Osijek - Hermann's vineyard). Five of the analysed samples came from the site Zupanja – Dubovo - Kosno. Pottery from this site is typologically attributed to Phase Sopot Ib. Further 12 samples were taken from sites of Privlaka-Gradina, Vinkovci-Sopot, Osijek – Hermann's Vineyard and Otok – Mandek's Vineyard (pottery assemblages are attributed to Phase Sopot II) and 5 samples were taken from sites Privlaka - Gradina, Vinkovci - Sopot, Otok – Mandek's Vineyard and Osijek–Hermann's Vineyard (pottery assemblages attributed to Phase Sopot III). Three ^{14}C dates came from Nova Gradiška-Slavča, which has not been published yet, but ^{14}C dates place the site to Phase Sopot II.

According to the results of ^{14}C analyses, the Sopot Culture Phase Ib was dated roughly to a period between 5480 and 5070 cal BC, Phase IIa between 5030 and 4770 cal BC, Phase IIb between 4800 and 4250 cal BC and Phase III between 4340 and 3790 cal BC (Fig. 1; Obelić *et al*. 2004: Tab. 3).

Two absolute dates of the Sopot Culture are furthermore known from the site Novi Perkovci kod Đakova. The first ^{14}C date shows 4900-4540 cal BC (68.2% probability) and the second one 5060-4790 cal BC (66.8% probability) (Marković & Botić 2008: Fig. 1). Pottery context of the second date is unfortunately unknown, while the first date dates a fragment of a biconical bowl with a special incised decoration (Marković & Botić 2008: 17). According to publication, the second date correlates to the earliest horizon of the Sopot Culture at the site, which is dated to transition of the Sopot Culture Phase Ib to Phase II (Marković & Botić 2008: 23). However, it does not seem to deviate from the dates of the Sopot Culture Phase IIa (sites Sopot and Nova Gradiška- Slavča - see Fig. 1).

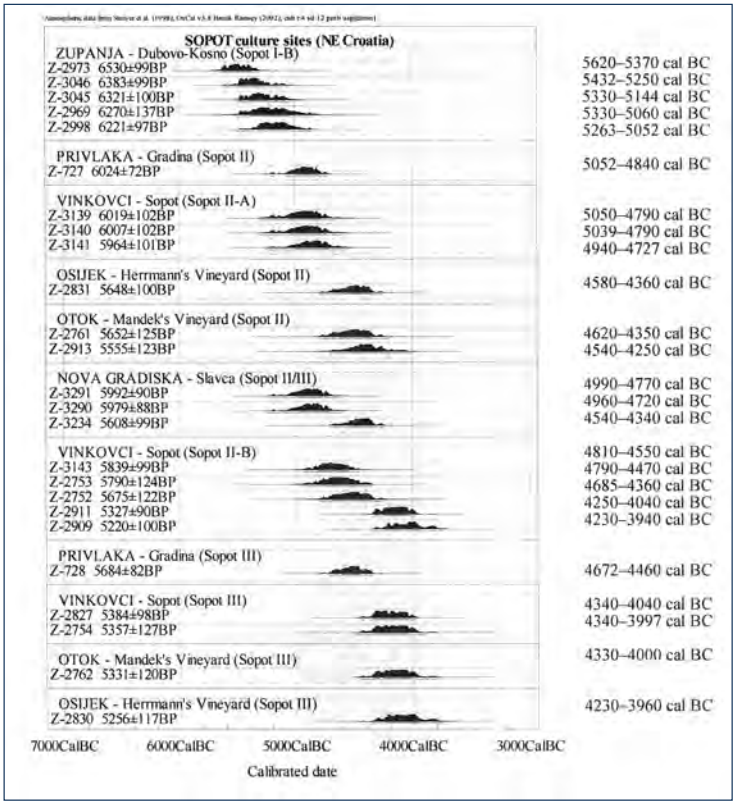

Fig. 1: ^{14}C AMS dates of the Sopot Culture sites in Eastern Croatia (after Obelić et al. 2004: Table 2).

More radiocarbon dates are known from Ivandvor-Šuma Gaj (Balen *et al*. 2009: Tab. 3), where pottery, comparable to the Sopot Culture Phase Ib and II was discovered (comparable to sites Otok, Klokočevnik, Štrbinci and Hermann's Vineyard). Six ^{14}C dates date the site to between 5050 and 4490 cal BC (68.2% probability). It should be noted however, that the earlier samples came from charcoal (5050-4780 cal BC) while the later samples were mostly material with short life span (4940-4490 cal BC) (68.2% probability). Absolute dates from Ivandvor–Šuma Gaj are therefore contemporary with the Sopot Culture phases IIa and IIb and not with Phase Ib, which was, beside Phase II, identified by typological comparisons of pottery assemblages (Balen *et al*. 2009: 33).

N. Kalicz mentioned a date from Gornji Brezovljani, the eponym site after which the Brezovljani type of the Sopot Culture was named, in a paper dated to 2007. Only rounded value of a calibrated date is

mentioned, with no conventional age or standard deviation and it is not clear whether the date is calibrated to 68.2% or 95.4% probability. Based on the date mentioned, the site Gornji Brezovljani is dated to a period between 4900 and 4700/4600 cal BC (Kalicz *et al*. 2007: 45).

In Hungary, ^{14}C dates of the Sopot Culture are known from the following sites: Petrivente, Becsehely, Baláca - cave 9, Ajka (see Kalicz *et al*. 2007: 45) and Sormás- Török- Földek (Barna 2007: 367). According to these ^{14}C dates, the emergence of the Sopot Culture in Hungary can be placed to the late sixth millennium BC. It terminated in the late 48th century BC or the first half of the 47th century BC (see Fig. 2). This suggests that the Hungarian Sopot Culture was, in its final stages, perhaps contemporary with the initial phase of the Lengyel Culture and its earlier episode was probably contemporary with the late phase of the LBK (Kalicz *et al*. 2007: 30, see also Horváth, Kalicz 2001: 20[9]).

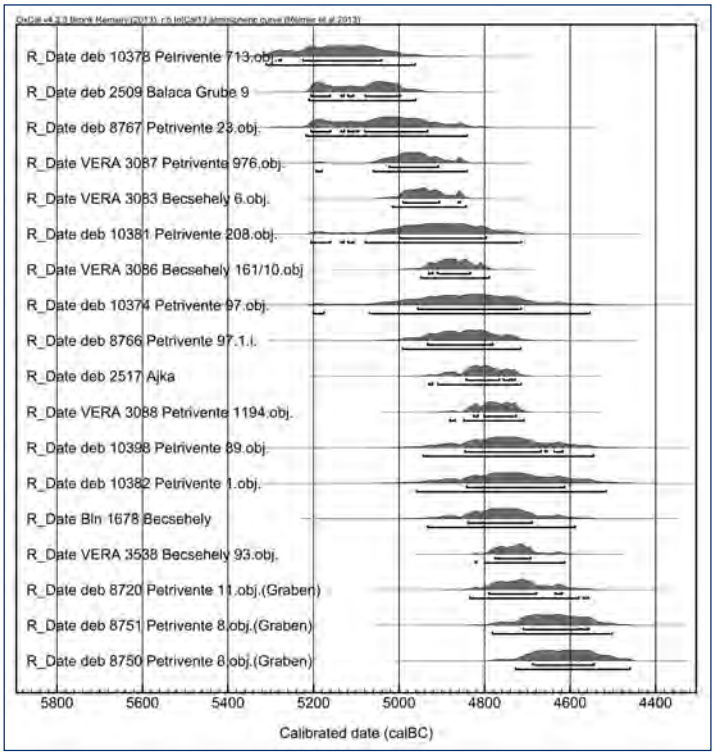

Fig. 2: ^{14}C AMS dates of the Sopot Culture sites in Hungary (produced after Kalicz et al. 2007: 45).

The Stichband Culture

Based on the dating of Frauenhofer and on the basis of ^{14}C dates of comparable contexts from other countries, the Stichband Culture in Austria was set into a period between 4910 and 4650/4600 cal BC (68% probability) (Lenneis 1995: 46). However, the Stichband pottery was obtained from contexts containing pottery typical for the formation phase (Phase Ia0) and the early phase (Phase Ia) of the Moravian- East Austrian Painted Ware Group (MOG), particularly at sites Friebritz, Wilhelmsdorf, Kamegg and Unterwölbling (Lenneis 1995: 44-46). We can now therefore date the Stitchband Culture more precisely. Phase IVa is paralleled to the early phase (4688 - 4615 cal BC) and Phase II / III is contemporary with the formation phase of MOG (4800 - 4688 cal BC). The earliest phase of this culture, Phase Stichband I, is not present in Austria.

The Lengyel Culture

Several good-quality absolute dates are available for dating of the Moravian- East Austrian Painted Ware Group (MOG). Namely, short life-span samples (animal and human bones) were used for ^{14}C dating. These yielded from well-documented stratigraphic contexts and were found together with typical pottery finds (Stadler & Ruttkay 2006b). These samples originate from Esztergályhorváti (the formative phase of the Lengyel Culture in Hungary[10]), Unterwölbling, Friebritz (all MOG Ia0), Kamegg (MOG Ia and Ib), Winden bei Melk (phase MOG Ia), Hollabrunn (MOG Ib), Michelstetten, Reichersdorf, Oberbergern 1, Antonshöhe (all MOG IIa), Unterlanzendorf, Bernhardsthal, Wetzleinsdorf, Ebelsberg and Bisamberg Parkring (all MOG IIb).

P. Stadler established a chronological model of the MOG Culture based on the ^{14}C dates and stratigraphic data. It was set up using the OxCal (Stadler *et al*. 2006; Stadler & Ruttkay 2007). According to the mean value of the calibrated ^{14}C dates (68.2% probability), Phase MOG Ia0 dates to between 4800 and 4688 cal BC, Phase MOG Ia to between 4688 and 4615, MOG Ib to between 4615 and 4523, MOG IIa to between 4523 and 4375 and MOG IIb to between 4375 and 4115 cal BC.

On the other hand, there is not enough data to be able to form an absolute chronology of the Lengyel Culture in Hungary. In addition to the already mentioned date from the site of Esztergályhorváti, another ^{14}C date of the earliest Lengyel Culture is known. It came from the site of Sormás - Török-Földek dated to between 4800-4610 cal BC (68.2

[9] Publication from 2001 assigned sample deb-8769 to the Sopot Culture, while the same sample is assigned to the Transdanubian LBK in 2007. No explanation is given.

[10] See also Kalicz *et al*. 2007, 45.

% probability) (Barna 2007: 367). Some ^{14}C dates are available for Phase Lengyel III. Five ^{14}C dates are known from the Late Lengyel Culture site Zalaszentbalázs-Szőlőhegyi mező (Hertelendi 1995: 105-107). Three of them date approximately to 4690- 4450 cal BC, while two dates are slightly later and date to 4550- 4370 cal BC (68.2%)[11]. Comparable, but slightly later, are three dates from the site Szombathely - Metro that were calibrated to 4470 - 4260 cal BC (68.2% probability) (Oross *et al*. 2010: 397, Tabelle 2).

Settlement, dating to the first half of the fifth millennium BC, was also recognised in north-eastern and central Slovenia, Bela Krajina and the Kolpa region. Typological analysis of pottery correlates the settlement in central Slovenia, Bela Krajina and the Kolpa region to the Sava group, which belongs to the lengyel Cultural horizon (Guštin 2005), while in the northeastern Slovenia were present both, west of the river Drava the Sava group and east of the river Drava the Late Lengyel Culture (Kramberger 2014).[12] Settlements Čatež-Sredno polje, Dragomelj, Resnikov prekop (central Slovenia) and Moverna vas (Bela Krajina) which belongs to the Sava group were thoroughly excavated and have greater number of 14C dates available. In northeastern Slovenia one 14C date is available from the Structure I from Stoperce which belongs to the Sava group (Kramberger 2014: Figs. 9 and 10), one 14C date from the Late Lengyel stucture in Andrenci (Kramberger 2014: Figs. 4 and 5) and two from the Late Lengyel pit in Bukovnica (Sraka 2014: Fig. 5).

The Late Neolithic section of Čatež - Sredno polje yielded 20 ^{14}C dates of charcoal. 12 of them were calibrated to between 4800 and 4600 cal BC, one to between 4900 and 4800 cal BC and seven to between 4600 and 4545 cal BC (68.2% probability). This suggests that the settlement Čatež - Sredno polje existed at some stage between 4800 and 4545 cal BC (Guštin 2005: 15, Fig. 2).

Neolithic settlement at Dragomelj yielded four radiocarbon dates, which date the site to the 47th and 46th century BC (68.2% probability) (Turk & Svetličič 2005: 69; Turk 2010: 43).

Typologically comparable site Resnikov prekop is believed to be more or less contemporary with Dragomelj and Čatež-Sredno polje (see for example Velušček 2006: 36). Three 14C dates were until recently known from this site. Two of the dates came from a laboratory in Zagreb and were published by Dimitrijević (see Dimitrijević 1979a: 179; Budja 1994: Fig. 5). The third date came from a laboratory in Heidelberg (Velušček 2006: 36). All three dates are related to the wooden structures and coincide with those from Čatež– Sredno polje and Dragomelj. The first date from Zagreb sets the settlement to a period between 4800 and 4500 cal BC, the second one to a period between 4800 and 4600 and the third to a period between 4650 and 4500 cal BC (68.2% probability).[13]

Multi-period site of Moverna vas, where the earliest phases (phases 2 - 6) were assigned to Neolithic, yielded 37 ^{14}C dates (Sraka 2012: Fig. 2; Sraka 2013; Sraka 2014: 373-374; see also Budja 1993: Fig. 5, Žibrat Gašparič 2008: Fig. 5.1). Comparison of ^{14}C dates from Moverna vas and Čatež - Sredno polje, Dragomelj, and Resnikov prekop confirm that phases 2 and 3 of Moverna vas are contemporary with other sites, while dates of Neolithic phases 4, 5 and 6 are later. Dates from Moverna vas settlement phase 6 are well correlated to the Lasinja Cultural Group, which was supposedly only present in Moverna vas settlement phase 7.

The Lasinja Culture

Until recently, the state of research set the origins of the Lasinja Culture in north-eastern Slovenia and Croatia, of the Kanzianiberg-Lasinja Culture in Austria and the Balaton Lasinja Culture in Hungary to approx. 4300 cal BC. However, new ^{14}C dates and recently published material culture from the settlement Ptuj-Šolski center shows the possibility that certain elements of the Lasinja Culture appeared

[11] It has to be said at this point that the later samples, in contrast to the earlier ones, came from short life-span material (Oross *et al*. 2010, 397, Tabelle 2).

[12] It has to be noted, that most of the forms of Sava group are comparable with forms of the Lengyel culture, but not most of decoration. Some of decoration is comparable to decoration from the later, Lasinja Culture (bunches of incisions, grooves, channeled decoration). Other decoration has better comparisons with the Brezovljanov type of the Sopot Culture (lines of awl/fingertip impressions in combination with applied decoration and complex motives made with techniques of awl/fingertip impressions). Some pottery forms are also comparable to the Brezovljanov type of the Sopot Culture. Pottery foot of the "Sopot type" has to be mentioned, while pots with short necks, dishes and bowls with everted rims, some containing a ringfoot, are present in the Lengyel as well as Brezovljanov type of the Sopot Culture. Other researchers also noticed similarities with the Brezovljanov type of the Sopot Culture (see e.g. Tomaž 2005: 122; Turk & Svetličič 2005: 72; Marković & Okroša 2003: 34; Tomaž 2010: 189; Velušček 2006: 31).

[13] These ^{14}C dates were recently complemented by ten new AMS radiocarbon dates obtained from organic residue on the surface of the pottery. Five of dates obtained from organic residue are much older dates than the dates of wood structures; three of them are slightly younger and show the time span between 4535 and 4250 cal BC (95,4% probability). However, according to the authors, without further we cannot exclude the possibility that dates older than expected are not the result of the hard water effect (Mlekuž *et al*. 2013: 132-133).

in northeastern Slovenia even earlier, perhaps even before 4400 cal BC (Kramberger 2014: 240-241, Fig. 25, Pls. 5-6). Most of the dates from the sites belonging to the Lasinja Culture in Slovenia date their termination to the 42nd, 41st or 40th century BC.[14] The only exception is the site of Ivankovci, where two dates indicate that the site perhaps existed in the 38th and in the first half of the 37th century BC (Tušek & Kavur 2011: Fig. 38, 39).

^{14}C dates from archaeological sites in Croatia, Hungary and Austria confirm the early dating of the Lasinja Culture, namely between 4300 and 3900 cal BC, but some dates are later and they indicate that it perhaps lasted until 37th century BC (e.g. Minichreiter & Marković 2011: Fig. 2, Balen 2008: Fig. 3; Bekić 2006: 22, 95, 184; Oross *et al*. 2010: Tab. 1; Ruttky 1996: Fig. 4).

The Baden Culture

In 2001, colleagues from the the Vienna Environmental Research Accelerator (VERA) published 32 new ^{14}C dates from different sites of the Baden Culture. The analysis of absolute dates also included previously published dates so that the total number of dates, on which absolute chronology is based, consists of 75 dates (mainly charcoal samples). Based on these dates, the Boleráz Phase cannot be distinguished from the Proto-Boleráz Phase, as the dates overlap. On the other hand, the Classic Phase of the Baden Culture is clearly separated from the Early (Boleráz) Phase. The Early Baden Culture – Baden- Boleráz Phase (Ia, Ib – Ic - IIa, IIb) has been dated roughly to between 3630 and 3360 cal BC, while the Classic Baden Culture, which follows the Early Phase, dates to a period between 3510 and 2870 cal BC (68% probability) (Wild *et al*. 2001).

Hungarian archaeologists came to similar conclusions while dating the Baden Culture. One of the most important sites for dating the Baden Culture in Hungary is Balatonőszöd-Temetői dűlő. This site has been populated during the Boleráz Phase, the transitional phase and the Early Classic Phase of the Baden Culture. Dating of the contexts has been performed mainly on bone samples. Results of ^{14}C analysis of samples from Balatonőszöd-Temetői dűlő date the Boleráz 1B-C phases to between 3519/3373 - 3027 cal BC (Phase Ib-c), and the Early Classical IIB-III phases to between 3016 and 2687 cal BC (68.3% probability). ^{14}C dates from other sites, assigned to the Baden Culture in Hungary correspond with the dates from Balatonőszöd-Temetői dűlő. The authors agree with the analytical results, which were published in 2001 (Wild *et al*. 2001) and are based on the correlation of dates from different sites in Hungary. Based on these dates, the Boleráz Phase cannot be distinguished from the Proto-Boleráz Phase as the dates overlap. However, the Classic Phase of the Baden Culture can clearly be separated from the Early (Boleráz) Phase (Horváth *et al*. 2008).

Evaluation of Dimitrijević's definition of the Sopot Culture and hypotheses of its origin, evolution and termination

S. Dimitrijević claimed that the Sopot Culture was created under the influence of the Vinča Culture to the Starčevo Culture. This reflected in gradual 'bikonisation' of fine pottery and gradual 'extinction' of painted pottery (Dimitrijević 1979b: 262, 293-294, 297-298). Radiocarbon dates do not entirely support this. Instead, they suggest that the Sopot Phase Ib and the Early Phase of the Vinča Culture coexisted.[15] Phase Sopot Ia, which has so far been identified at only one site (the earliest horizon at Klokočevnik), is not dated.

In contrary, the impact of the Starčevo Culture is vast. S. Dimitrijevič recognized many similarities between the two cultures. He concluded that the Sopot Culture is more similar to the Starčevo as the Vinča Culture (Dimitrijević 1979b: 262). Most of the available dates of the Starčevo Culture are earlier than the earliest phase of the Vinča Culture and as the earliest dated phase of the Sopot Culture. The latest ^{14}C dates of the Starčevo Culture suggest possible simultaneity to the Early Sopot Culture and the early phase of the Vinča Culture, which indicates that the Starčevo Culture could directly influence the emergence of the Sopot Culture.

[14] In north-eastern Slovenia the dates of Lasinja Culture came from Sodolek (Guštin 2005: Fig. 3), Hardek (Žižek 2006: Fig. 2), Malečnik (Guštin 2005: Fig. 3), Turnišče-Gorice (Plestenjak 2010: Fig. 86, 93, 94),Turnišče (Tomaž 2012: Fig. 59), Popava 1 (Šavel & Karo 2012: Fig. 48, 49), Brezje near Turnišče (Meier Grootes & Josée Nadeau 2013: 126), Kalinovnjek near Turnišče (Kerman 2013: Fig. 46), Pri Muri near Lendava (Šavel & Sankovič 2011: Fig. 52), Stoperce (Kramberger 2014: Figs. 9-10), Ptuj-Šolski center (Kramberger 2014: 13-14) and Zgornje Radvanje (Kramberger 2014: 22 23), while most of the dates from central Slovenia have been obtained from Ajdovska jama (Bonsall *et al*. 2007: Tab. 1; for an overview see Kramberger 2014: Fig. 36).

[15] The earliest dates of the Sopot Ib Phase are somewhat earlier than the earliest dates of the Vinča Culture. It has to be noted, however, that charcoal (long life-span material) was used for dating of the Sopot Culture, while bones (short life-span material) were used for dating of the Vinča Culture.

According to S. Dimitrijević, the Sopot Culture expanded to North Bosnia, Transdanube and towards the West at the end of Phase Sopot Ib. It supposedly eliminated the Late LBK of the Hungarian Danubian Basin, which, under its influence, transformed into the Classic Lengyel Culture. In addition, in Slovakia, Moravia and north-eastern Austria local Lengyel cultural groups developed under the influence of the Sopot Culture (Dimitrijević 1979b: 263-265, 267, 299-300). Radiocarbon dates support this hypothesis on the expansion of the Sopot Culture, which was developed by Dimitrijević. The Transdanubian LBK is partly earlier than the Sopot-Bicske Cultural Group, while the latter is earlier than the Classic Lengyel Culture. The 'Protolengyel character of the Sopot Culture' is hereby approved. Moreover, three dates of the Sopot Culture in Hungary correlate to the earliest phases of the Sopot Culture in Transdanube with Phase Sopot Ib (sites Balaca, Petrivente and Becsehely).

While spreading towards the West, the Sopot Culture supposedly eliminated the Korenovo Culture and this lead to the development of a regional type of the Sopot Culture – the Brezovljani type (Dimitrijević 1979b: 267, 298). ^{14}C date of the Brezovljani type of the Sopot Culture, gained from Gornji Brezovljani, does not confirm correlation to Phase Sopot Ib. The radiocarbon date is later and coincides with the dates of Phase Sopot IIa. However, Dimitrijević suggested that links between the Brezovljani type of the Sopot Culture and the Stichband Culture exist (Dimitrijević 1979b: 337, 344) and this can be confirmed. The two cultures are contemporary and this is validated by radiocarbon dating.

Dimitrijević's definition of the area of influence of the Sopot Culture in Praistorija Jugoslavenskih zemalja can even be improved (Dimitrijević 1979b: 267). Namely, the area of influence can be slightly expanded to the north-west. Newly discovered sites, their pottery assemblages and radiocarbon dates can enlarge the area of influence to central Slovenia and the Sava region. Elements of the Brezovljani type of the Sopot Culture occur in those areas.

Finally, we have to be critical about Dimitrijević's definition of the termination of the Sopot Culture. He claimed that the Eneolithic Lasinja or the Early Baden Culture, depending on the area, succeeded the Lengyel, as well as the Sopot Culture (see Dimitrijević 1979b: 300-301). Absolute radiocarbon dates disprove this. Namely, the entire Baden Culture is later than the Lasinja Culture, while the Lasinja Culture is contemporary with the Sopot III Phase. These conclusions question Dimitrijević's key definition of the Sopot Culture, namely that the Sopot Culture was the parent Middle and Late Neolithic culture (Dimitrijević 1979b: 262).

Conclusions

Evaluation of Dimitrijević's definition of the Sopot Culture, based on ^{14}C dating, generated the following conclusions:

1. Absolute dates indicate that the Early Sopot Culture (Phase Ib) and the early phase of the Vinča Culture (Vinča A) coexisted. The influence of the Vinča Culture in the emergence of the Sopot Culture is therefore highly questionable. In contrary, impact of the Starčevo on the Sopot Culture is possible, as the majority of ^{14}C dates place it to a period earlier than the Sopot Culture (first half of the sixth millennium BC), while the latest dates coincide with the earlier dates of the Sopot Culture.

2. ^{14}C dates suggest that the Transdanubian LBK is partly earlier than the Sopot-Bicske variant of the Sopot Culture, while the latter is partly earlier than the Lengyel Culture. This confirms the 'Protolengyel character' of the Sopot Culture and the 'Protosopot character' of the LBK in Hungary is validated. Dimitrijević's thesis on the expansion of the Sopot Culture to Transdanube, where, under its influence, the Late LBK has been transformed into the Classic Lengyel Culture, are therefore possible.

3. The radiocarbon date from Gornji Brezovljani is analogous to the dates of Phase Sopot IIa and it is therefore possible to disprove correlation of the Brezovljani type of the Sopot Culture to Phase Sopot Ib. However, Dimitrijević's hypothesis on connection of the Brezovljani type of the Sopot Culture to the Stichband Culture is possible. Radiocarbon dates confirm that these two cultures were contemporary.

4. Dimitrijević's definition of the area of influence of the Sopot Culture in Praistorija Jugoslavenskih zemalja can even be improved. Namely, the area of influence can be slightly expanded to the north-west. Newly discovered sites, their pottery assemblages and radiocarbon dates can enlarge the area of influence to central Slovenia and the Sava region. Elements of the Brezovljani type of the Sopot Culture occur in those areas.

5. Dimitrijević's definition of the termination of the Sopot Culture is questionable, because absolute radiocarbon dates disprove his theory that the Lasinja or the Early Baden Culture, depending on the area, succeeded the Lengyel as well as the Sopot Culture. The entire Lasinja Culture is earlier than the Baden Culture, while the Lasinja Culture is contemporary with the Sopot III Phase. It is therefore possible to assume about not only the Middle Eneolithic and Late Neolithic Sopot Culture, but also the Early Eneolithic Sopot Culture (see for example Marković 2012: 60-64). The reasonableness of such a designation can, of course, be questioned, since not even a single copper object (or an object that could be reliably associated with the production of copper) has been found in the contexts of the Sopot Culture.

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