Early Neolithic population dynamics in the Eastern Balkans and the Great Hungarian Plain

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ABSTRACT – *In this study, we reconstruct population dynamics in the Early Neolithic of the Eastern Balkans and the Great Hungarian Plain using frequency of radiocarbon dates as a population proxy. The method of summed calibrated radiocarbon probability distributions is applied to a set of dates recently published in Bulgaria and Hungary. The aim is to test the hypothesis of the Neolithic demographic transition (NDT) in these regions and to compare the patterns between these two and neighbouring regions. The results show that episodes of population growth occurred in both regions, which is in partial agreement with the predictions of the NDT theory. Population growth is detected, but it is followed by a bust, rather than stabilisation as predicted for the second phase of the NDT.*

KEY WORDS – *Early Neolithic; Neolithic demographic transition; palaeodemography; radiocarbon; Southeast Europe*

Zgodnje neolitske dinamike poselitve na Vzhodnem Balkanu in v Veliki madžarski nižini

IZVLEČEK – *V članku poskušamo rekonstruirati populacijske dinamike v času zgodnjega neolitika na območju vzhodnega Balkana in Velike madžarske nižine, in sicer z uporabo pogostnosti radiokarbonskih datumov kot kazalcev poselitve. Metodo vsote verjetnostne razporeditve kalibriranih radiokarbonskih datumov smo uporabili pri analizi datumov, ki so bili nedavno objavljeni v Bolgariji in na Madžarskem. Na teh območjih smo preverjali hipotezo t.i. neolitske demografske tranzicije (NDT) in primerjali dobljene vzorce s tistimi v sosednjih regijah. Rezultati kažejo, da so se epizode rasti poselitve zgodile v obeh regijah, kar je delno v skladu z napovedmi teorije NDT. Zaznali smo sicer rast poselitve, ki pa ji sledi nenaden padec, kar ni v skladu z napovedmi za drugo fazo NDT, ki predvideva stabilizacijo.*

KLJUČNE BESEDE – *zgodnji neolitik; neolitska demografska tranzicija; paleodemografija; radiokarbonsko datiranje; jugovzhodna Evropa*

Introduction

It is commonly accepted that the Neolithic was introduced to Europe from the Near East, and new genetic and bioarchaeological evidence undoubtedly show that these processes included movements of people (*Davison* et al. *2007; Haak* et al. *2010; Brami, Heyd 2011; Fort 2012; Pinhasi* et al. *2012; Borić, Price 2013; Gurova, Bonsall 2014; Özdoğan 2014; Mathieson* et al. *2015; Szécsényi-Nagy* et al. *2015; Hofmanová* et al. *2016*). The directions and rates of spread of the Neolithic in different regions of Europe have been important issues in numerous studies, many of which offered possible models of pop-

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ulation expansion. Different models have been suggested for the process, the most frequently considered being: the wave-of-advance model, leap-frog colonisation, and diffusion of cultural novelties (cultural transmission) (*Ammerman, Cavalli-Sforza 1971, 1973; Tringham 2000; Whittle* et al. *2002; Bar-Yosef 2004; Pinhasi* et al. *2005; Davison* et al. *2007; Bocquet-Appel* et al. *2009; Borić, Price 2013*). In recent years, the process of neolithisation has been studied as a more complex combination of demic and cultural diffusion (*Wirtz, Lemmen 2003; Fort 2012; 2015*).

The Neolithic way of life brought changes in subsistence and mobility patterns, and a major shift in population structure and dynamics known as the Neolithic Demographic Transition (NDT). According to Jean-Pierre Bocquet-Appel (*2002; 2008; 2011a; 2011b; 2013; Bocquet-Appel, Bar-Yosef 2008a*), the NDT was a two-stage process – the first stage being characterised by exponential population growth caused by increased fertility, followed by a second stage marked by increased mortality and decelerating growth. It is assumed that the increase in fertility was caused by changes in lifestyle which accompanied the Neolithic – dietary (introduction of new, more nutritious food), and changes in residential mobility (sedentary lifestyle). The increase in mortality that followed, especially among infants, was a result of numerous factors – introduction of new pathogens, lack of drinking water, contamination by feces, reduced breastfeeding and higher workload (*Bocquet-Appel 2008.49; 2013.2*). When the mortality rate equaled the birth rate, population growth stopped.

The pattern of Neolithic population dynamics, based on the frequency of radiocarbon dates from Western, Northern and Central Europe, consists of a population boom that occurred at the beginning of the period, followed by a population bust after a few centuries (*Shennan* et al. *2013; Timpson* et al. *2014*). This pattern is in agreement with predictions of the NDT theory regarding its first phase, when population growth should occur. A recent study has shown that a similar pattern is observed in the Early Neolithic of the Central Balkans (*Porčić* et al. *2016*).

In this paper, we extend the paleodemographic research to the area of Eastern Balkans and the Great Hungarian Plain. The aim is to reconstruct population dynamics and to test the NDT hypothesis on two datasets from Southeast Europe, where such studies have been lacking.

Two routes of expansion of the Neolithic way of life into Europe have been proposed. The continental route led from Thessaly, where Neolithic was introduced around the middle of the 7th millennium cal BC (*Perlès* et al. *2013*) through the Balkans, and to Central, Western and Eastern Europe (*Bocquet-Appel* et al. *2009; Brami, Heyd 2011; Özdoğan 2014*). The maritime (Mediterranean) route led from the coast of the Ionian Sea, along the eastern and western Adriatic coast, and further to the western Mediterranean and Iberia. Recent studies (*Wirtz, Lemmen 2003; Bocquet-Appel* et al. *2009; Lemmen* et al. *2011; Silva, Steele 2014; Weninger* et al. *2014; Brami, Zanotti 2015*) emphasised the complexity of these processes, and different rates and timings for different European regions. These differences depended on various factors, such as geography, climate and sociocultural trends.

The present state of research suggests that the Neolithic spread to the territory of Eastern Balkans (mostly modern-day Bulgaria), along the valleys of the Vardar, Struma and Marica rivers (*Boyadzhiev 2009*). After settling in Southwestern Bulgaria and Thrace, Early Neolithic populations spread further north. The Neolithisation of this territory was gradual, in a south to north direction, and absolute dates from sites such as Poljanica-Platoto and Džuljunica-Smărdeš date the beginning of these processes to around 6200/6100 cal BC (*Boyadzhiev 2009.11; Krauß* et al. *2014.63, Tab. 1*). The Early Neolithic lasted until around 5400/5350 cal BC, with the transition to the Late Neolithic occurring between 5500/5450 and 5400/5350 cal BC, which is thought to have been a gradual and smooth process (*Gatsov, Boyadzhiev 2009.26*).

The Early Neolithic on the Great Hungarian Plain (modern-day Hungary) is represented by the Starčevo and Körös cultures. The settling of these early farming populations was concentrated in the valleys of several rivers: Tisza, Körös, Maros and Berettyó. The highest density of sites has been found on the southern part of the Great Hungarian Plain, which is explained as a result of its rich and diverse landscape (*Paluch 2012.49*). The earliest ^{14}C dates from the southernmost sites, such as Deszk-1, Pitvaros, Maroslele-Pana and Olajkút, indicate that the beginning of Körös culture can be dated to around 6000/5910 cal BC. A south-to-north expansion is also suggested, with the earliest dates for the northernmost (Upper Tisza) region covering the time span between 5630 and 5470 cal BC (*Domboróczki 2010; Domboróczki, Raczky 2010; Oross, Siklósi 2012*).

Data and method

In this study, published data from Hungary (*Anders, Siklósi 2012*) and Bulgaria (*Gatsov, Boyadzhiev 2009; Krauß* et al. *2014*) were used. A total of 179 published radiocarbon dates from 16 Bulgarian sites and 117 dates from 24 sites from the territory of Hungary were analysed (Fig. 1; Appendix 1). Dates with large standard errors (170 radiocarbon years and greater) and dates that were out of the currently accepted chronological range for the Early Neolithic in Southeast Europe (~6200–5300 cal BC) were excluded from the analysis.[1]

The population dynamics were reconstructed by applying the summed calibrated radiocarbon probability distributions (SCPD) method. The main assumption of this method is that the quantity of material culture is directly proportional to population size in a certain time interval in a given region (*Rick 1987; Shennan* et al. *2013; Williams 2012*). If the number of radiocarbon dates is large enough, then the frequency of dates from a specific time period will be directly proportional to the quantity of archaeological remains from that period, and hence to the size of the population that produced them. The method that was applied in this study was developed by Stephen Shennan *et al.* (*2013*) and Adrian Timpson *et al.* (*2014*), and it accounts for biases that can greatly affect the final result: the effects of the calibration curve, research bias and effects of taphonomy. The analysis was performed in R programming language (*R Core Team 2014*), using the Bchron package for calibrating dates (*Parnell 2014*), and the INTCAL 13 calibration curve (*Reimer* et al. *2013*).

The research bias is the result of different sampling strategies, depending on particular research questions. In other words, samples are usually not collected randomly, but in order to provide chronological information for specific archaeological contexts. In order to reduce the research bias, a binning procedure was performed at the beginning of the analysis. Radiocarbon dates were binned into site-phases, and sorted in decreasing order within each site-phase. Subdivision into bins within site-phases was performed if the difference between two adjacent dates was greater than 200 radiocarbon years. After the calibration, dates were summed within and between bins, and normalised to produce the final SCPD curve. This procedure controls for research bias due to the different number of dates from different sites and site phases, but it cannot control for the bias resulting from the selection of sites and site phases themselves. The binning procedure performed on the 179 Early Neolithic dates from Bulgaria produced 22 bins, while the same procedure performed on 117 Early Neolithic dates from Hungary produced 26.

Taphonomic bias refers to the loss of archaeological material over time due to various taphonomic factors. In order to address this source of bias, the taphonomic exponential curve equation developed by Todd A. Surovell *et al.* (*2009*) was used as a null model. The null model assumes that the population was stationary and that, apart from the shape of the calibration curve, the taphonomy is the only factor which affects the shape of the empirical SCPD curve. According to the probabilities given by the null model, calendar dates from the specified time interval were randomly sampled, which produced a large number of simulated radiocarbon datasets. The number of dates for each simulated dataset is equal to the number of bins in the empirical data set. This procedure was repeated many times; for the Early Neolithic dates from Hungary and Bulgaria, we simulated 10 000 null model SCPDs. Sampled calendar dates were then 'back calibrated' and recalibrated afterwards, and summed to produce the simulated SCPD pattern. Finally, the empirical SCPD curve was compared to the 95% confidence intervals calculated from the simulated SCPD values. When the empirical SCPD is above or below the 95% confidence intervals, there is a statistically significant growth or decline of population relative to the null model. This whole procedure was undertaken in order to assess the statistical significance of the empirical SCPD pattern.

Results

The results of the SCPD method for the territory of Bulgaria are shown in Figure 2. After ~6000 cal BC, the curve begins to increase, reaching a peak around 5700 cal BC, after which it decreases. However, none of the changes in the curve reach the threshold of statistical significance, as the curve is always within the 95% CI limits, meaning that it is consistent with the null model, which assumes uniform population (with effects of taphonomy).

1 The omitted dates are from the following Bulgarian sites: Ovčarovo-gorata (Bln-2031), Galabnik (GrN-19786), Poljanica-platoto (Bln-1571) and Džuljunica-Smărdeš (OxA–24937). From Hungarian sites, the dates that were excluded are: Ecsegfalva 23 (OxA-12857), Endrőd 6 (Deb-408, Deb-450), Maroslele-Pana (OxA-9403, Deb-2733), Szajol-Felsőföld (Deb-473, Deb-474), Szakmár-Kisülés (Deb-413), Szarvas 23 (BM-1865R) and Szarvas 56 (Deb-396).

The results of the SCPD method for the territory of Hungary are shown in Figure 3. The empirical curve increases after ~6200 cal BC and goes beyond the upper 95% CI limit between ~5750 and ~5500 cal BC, meaning that in this interval, there was a significant increase relative to the null model, which assumes uniform population (with effects of taphonomy). After this interval, the curve abruptly drops, but stays within the 95% CI limits. Around 5200 cal BC, a minor, but statistically significant drop can be observed.

Discussion

In the Eastern Balkans, the curve started to increase with the beginning of the Neolithic. The peak around 5700 cal BC occurred afterwards, and may be considered as indicative of the NDT. The lack of statistical

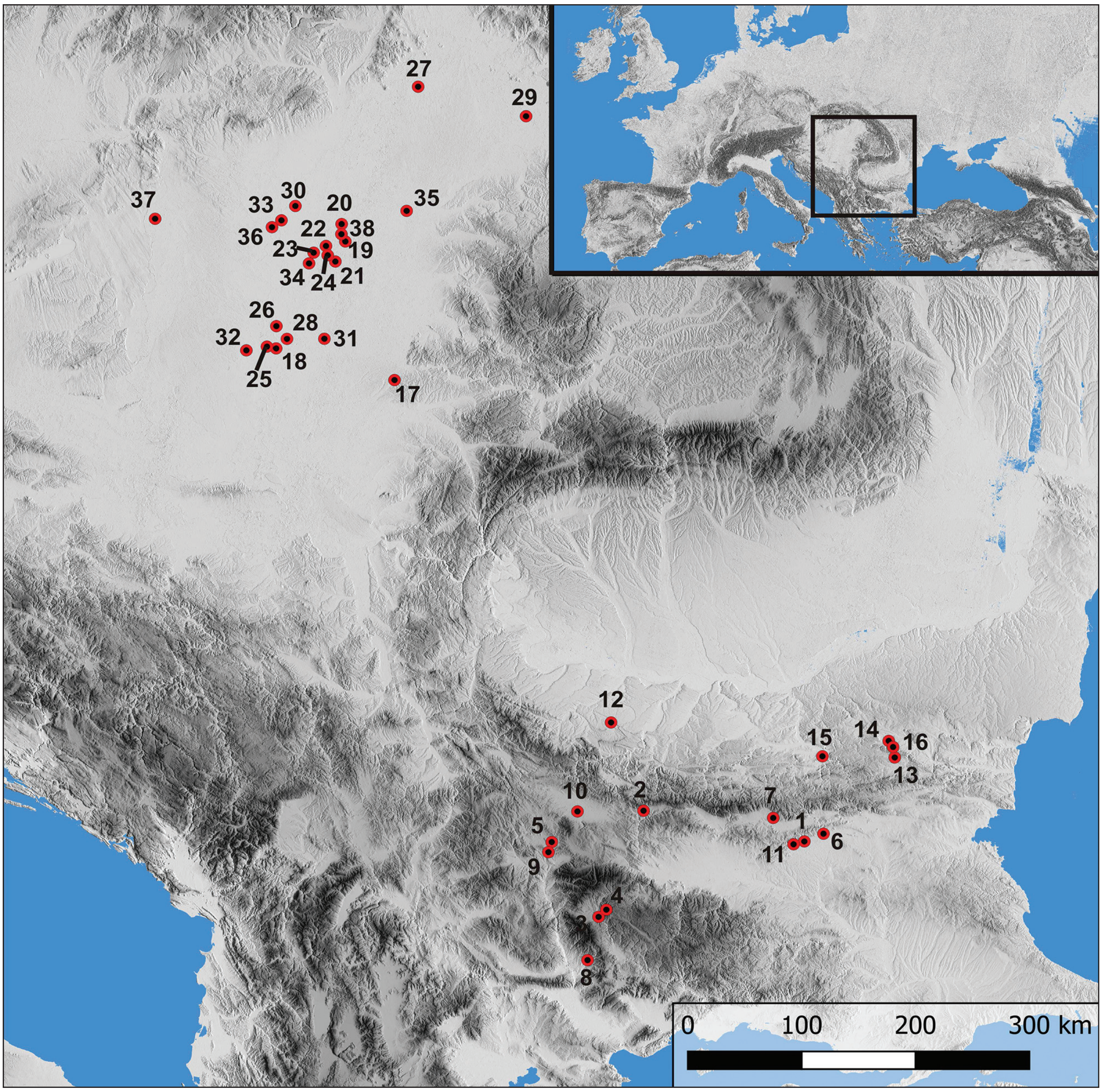

Fig. 1. Early Neolithic sites from Bulgaria (1–16) and Hungary (17–38) with radiocarbon dates included in this study: 1 Azmak, 2 Čavdar, 3 Dobrinište, 4 Elešnica, 5 Galabnik, 6 Karanovo, 7 Kazanlak, 8 Kovačevo, 9 Kremenik (Sapareva Banja), 10 Slatina, 11 Stara Zagora (Okražna bolnica), 12 Ohoden, 13 Ovčarovo-gorata, 14 Poljanica-platoto, 15 Džuljunica-Smărdeš; 16 Ovcharovo-platoto 2; 17 Battonya-Basarága, 18 Deszk-Olajkút, 19 Dévaványa-Katalszeg, 20 Ecsegfalva 23, 21 Endrőd 35, 22 Endrőd 39, 23 Endrőd 119, 24 Endrőd-Varnyai-tanya, 25 Gyálarét-Szilágyi major, 26 Hódmezővásárhely-Kotacpart-Vata-tanya, 27 Ibrány-Nagyerdő, 28 Maroslele-Pana, 29 Méhtelek-Nádas, 30 Nagykörű-TszGyümölcsös, 31 Pitvaros-Viztározó, 32 Röszke-Lúdvár, 33 Szajol-Felsőföld, 34 Szarvas 23; 35 Szentpéterszeg-Körtvélyes, 36 Szolnok-Szanda, 37 Tiszaszőlős-Domaháza-puszta; 38 Dévaványa-Réhelyi gát (map produced by Jugoslav Pendić and Kristina Penezić).

significance (at the 0.05 level) of the deviation from the null model is most probably due to the low effective sample size (the number of bins is only 22), which implies low statistical power.

The results for the Hungarian Plain dates show a significant peak around ~5750 cal BC, which can be interpreted as population growth at the beginning of the Neolithic, and the signal of the NDT. It is followed by a sharp decrease in the curve at ~5500 cal BC, suggesting a population bust in this period.

The observed pattern – a population increase at the beginning of the Neolithic, followed by a population decrease after about 150 years for Bulgaria, and about 250 years for Hungary – correspond to the boom and bust pattern observed in other regions in Europe and the Balkans (*Shennan, Edinborough 2007; Shennan* et al. *2013; Timpson* et al. *2014; Porčić* et al. *2016; Pilaar Birch, Vander Linden 2017*).

When compared to the results obtained for the territory of Serbia (*Porčić* et al. *2016*), it can be seen that they are quite similar in general, but some regional differences should be further discussed (Fig. 4). In Porčić *et al.* (*2016*) it was shown that the SCPD curve for data from Serbia had two statistically significant peaks (~6000 cal BC and ~5650 cal BC) and a major drop between. Two explanations have been proposed. The first perceives these changes as real demographic patterns that reflect major population growth followed by increased mortality or migration, with a rebound occurring after 350 years. The other explanation would be that this result is a consequence of a research bias that led to oversampling the earliest Early Neolithic contexts and that the peak around ~5650 cal BC is most probably the signal of the NDT (*Porčić* et al. *2016.6–7*). In a recent study by Suzanne Pilaar Birch and Marc Vander Linden (*2017*), which primarily deals with the correlation between environmental changes and population dynamics dur-

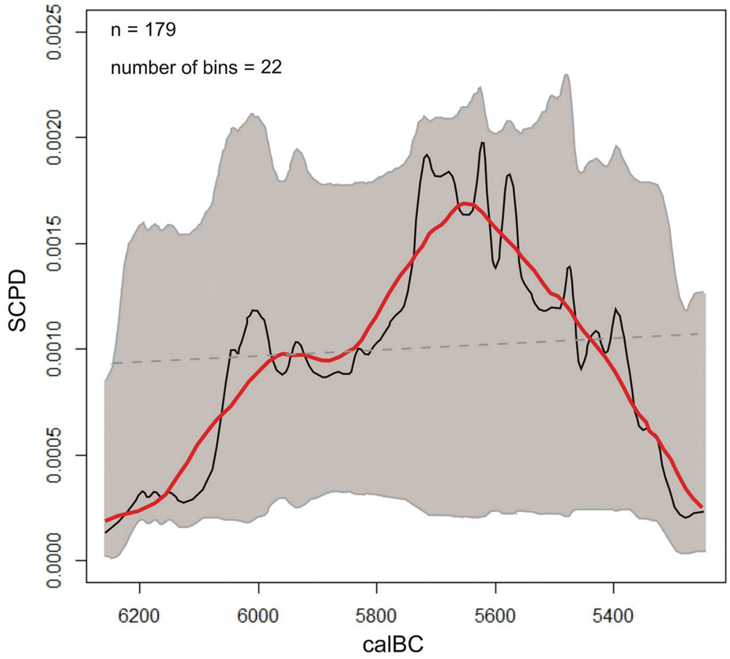

Fig. 2. Results of the SCPD analysis based on the Early Neolithic radiocarbon dates from Bulgaria. SCPD empirical curve (black line) for Early Neolithic dates, with 95% confidence intervals (shaded) based on 10 000 simulations from the null model (grey dashed line) and 200 year rolling mean (red line); number of dates = 179; number of bins = 22; global p value = 0.5516.

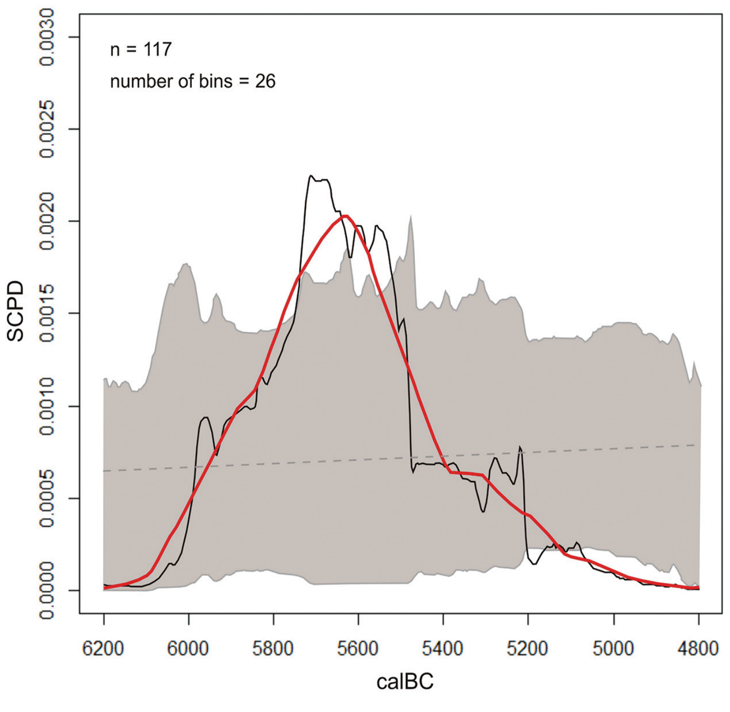

Fig. 3. Results of the SCPD analysis based on the Early Neolithic radiocarbon dates from Hungary. SCPD empirical curve (black line) for Early Neolithic dates, with 95% confidence intervals (shaded) based on 10 000 simulations from the null model (grey dashed line) and 200 year rolling mean (red line); number of dates = 117; number of bins = 26; global p value = 0.0037.

ing the Late Pleistocene and Early Holocene in the eastern Adriatic and western Balkans, the SCPD method was used in order to reconstruct population dynamics. The results have confirmed the boom and bust pattern in the Balkan region, and have also shown that these processes happened within the same time frame in the eastern Adriatic (*Pilaar Birch, Vander Linden 2017.Figs. 5 and 6*).

Additional data are available for the territory of Croatia. Botić presents the results of summed distributions of the Starčevo (Early Neolithic) and Sopot (Late Neolithic) dates from the territory of Croatia (*Botić 2016.17, Fig. 4*). A sign of possible population growth similar to the one observed in data from neighbouring regions is present. However, it should be noted that the number of dates from this study is very low (23 dates).

It is interesting to note that the peaks from the three curves (Bulgaria, Hungary, Serbia) coincide (Fig. 4), given the usual assumption that the Neolithic gradually spread from south to north. The earliest Neolithic in Serbia and Bulgaria is dated to ~6200 and ~6100–6050 cal BC, respectively (*Whittle* et al. *2002; Krauß* et al. *2014*). The earliest Körös sites in Hungary are not older than 6000 cal BC (*Anders, Siklósi 2012.153*). Therefore, it should be expected that population boom in Central and Eastern Balkans should have happened earlier than in the Great Hungarian Plain if the demographic process was the same. Given the small samples in all regions of Southeast Europe and the fact that the SCPD method is a very rough tool, these contradictions should not be given too much weight at this moment, as the precision to discriminate between the shifts of one or two centuries may be lacking in this case.

Given the increasing importance of the research focusing on the relationship between climate changes and cultural dynamics (*e.g., Wirtz, Lemmen 2003; Budja 2007; 2015; Gronenborn 2009; Weninger* et al. *2009; 2014; Clare, Weninger 2010; Shennan* et al. *2013; Lemmen, Wirtz 2012; Botić 2016; Pilaar Birch, Vander Linden 2017*), we compared the SCPD curves to a global climate proxy. In order to explore the relationship between climate and population dynamics in the three regions of Southeast Europe, the SCPD curves for Serbia, Hungary and Bulgaria are plotted against the GISP2 core curve (*Grootes, Stuiver 1997*) (Fig. 4). There is some indication that the troughs after ~5500 cal BC on SCPD curves based on dates from Serbia and Hungary may be related to the reduction in temperature which started somewhat earlier, but no strong sign of covariation is present. Unfortunately, at this point, no high-resolution climate proxies are available for the study region, and a more precise climate reconstruction is not possible. Relying on global proxies such as GISP cores when investigating populations dynamics in the central Balkan area can only be regarded as a general framework for further research.

In order to create a more accurate and precise reconstruction of population dynamics in Southeastern Europe, it is necessary to generate a new sample of radiocarbon dates according to a probabilistic sampling design, which would minimise the re-

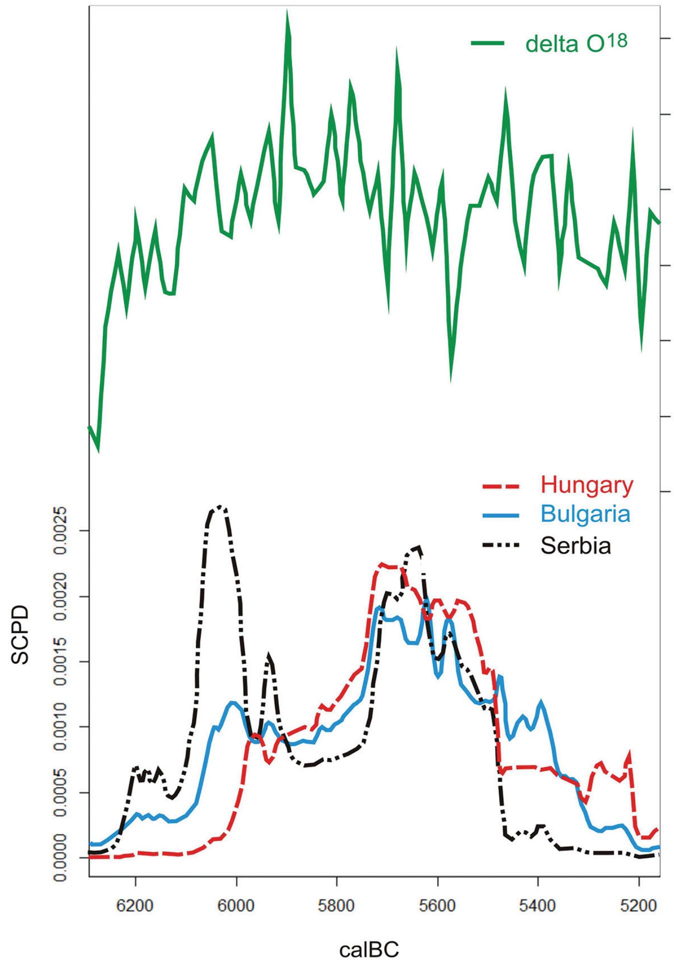

Fig. 4. Climate proxy (raw δO^{18} curve data from GISP2 core – green solid line) plotted over SCPD curves for Serbia (black dash-dotted line), Bulgaria (blue solid line) and Hungary (red dashed line)

search bias and increase statistical power. For the region of Central Balkans, the collection of new radiocarbon samples is currently under way by the authors of this paper. This sample is specifically designed for the purposes of population dynamics reconstruction with the SCPD method; an effort is made to approximate a random sample. Therefore, the results presented in this paper should be considered as preliminary and will be further refined when the new data arrive.

Conclusions

It can be concluded that in the Eastern Balkans and Great Hungarian plain, the shape of the SCPD curve is consistent with the population boom predicted by the NDT theory and empirical results from other parts of Europe and Balkans. No clear influence of climate on population dynamics patterns during the 6th millennium cal BC was detected.

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Appendix 1

List of sites from the territory of Hungary and Bulgaria, with radiocarbon dates used in this study

HUNGARY						
Site (No. on the Fig. 1)	**Coordinates**	**Lab. No**	**Uncal. BP**	**St. error**	**Cal BC**	**Reference**
Battonya-Basarága (**17**)	45°59'37.84"N 21°28'10.12"E	BM-1862R	6710	110	5840 (95.4%) 5473	*Bowman* et al. *1990.73*; *Horváth, Hertelendi 1994.123*
Deszk-Olajkút (**18**)	46°13'43.75"N 20°14'34.04"E	OxA-9396	7030	50	6010 (95.4%) 5796	*Whittle* et al. *2002.111, 115*
Deszk-Olajkút		Bln-581	6605	100	5709 (95.4%) 5374	*Quitta, Kohl 1969.240*
Deszk-Olajkút		Bln-584	6540	100	5643 (95.4%) 5317	*Quitta, Kohl 1969.240*
Deszk-Olajkút		Bln-583	6410	100	5613 (95.4%) 5083	*Quitta, Kohl 1969.240*
Deszk-Olajkút		Bln-582a	6390	100	5551 (95.5%) 5078	*Quitta, Kohl 1969.240*
Deszk-Olajkút		Bln-582	6260	100	5469 (95.4%) 4994	*Quitta, Kohl 1969.240*
Deszk-Olajkút		OxA-9376	6225	55	5315 (95.4%) 5040	*Whittle* et al. *2002.111, 115*
Dévaványa-Katalszeg (**19**)	47° 0'56.39"N 20°57'35.72"E	Bln-86	6370	100	5524 (95.4%) 5070	*Kohl, Quitta 1963.300*
Dévaványa-Réhelyi gát (**38**)	47°4'9.37"N 20°55'8.78"E	Bln-1379	6640	60	5657 (95.4%) 5482	*Oross, Siklosi 2012.Tab. 1*
Ecsegfalva 23 (**20**)	47° 8'34.42"N 20°55'17.19"E	OxA-9329	6950	45	5974 (95.4%) 5733	*Whittle* et al. *2002.110, 115*
Ecsegfalva 23		OxA-11871	6930	40	5899 (95.4%) 5726	*Bronk Ramsey* et al. *2007.175*
Ecsegfalva 23		OxA-9335	6920	50	5969 (95.4%) 5716	*Whittle* et al. *2002.110, 115*
Ecsegfalva 23		OxA-9526	6915	50	5970 (95.4%) 5712	*Whittle* et al. *2002.110, 115*
Ecsegfalva 23		OxA-11983	6915	36	5881 (95.4%) 5726	*Bronk Ramsey* et al. *2007.175*
Ecsegfalva 23		OxA-10500	6900	60	5968 (95.4%) 5667 5876 (95.4%) 5713	*Bronk Ramsey* et al. *2007.175*
Ecsegfalva 23		OxA-11984	6893	36	5876 (95.4%) 5713	*Bronk Ramsey* et al. *2007.175*
Ecsegfalva 23		OxA-12654	6889	36	5874 (95.4%) 5710	*Bronk Ramsey* et al. *2007.176*
Ecsegfalva 23		OxA-10501	6885	50	5881 (95.4%) 5671	Bronk Ramsey et al. 2007.176
Ecsegfalva 23		OxA-9327	6870	50	5877 (95.4%) 5661	*Whittle* et al. *2002.110, 115*
Ecsegfalva 23		OxA-11845	6865	40	5840 (95.4%) 5667	*Bronk Ramsey* et al. *2007.175*
Ecsegfalva 23		OxA-9333	6860	45	5844 (95.4%) 5658	*Whittle* et al. *2002.110, 115*; *Bronk Ramsey* et al. *2007.175*
Ecsegfalva 23		OxA-9334	6855	50	5844 (95.4%) 5644	*ibid.*
Ecsegfalva 23		OxA-10505	6845	50	5838 (95.4%) 5643	*Bronk Ramsey* et al. *2007.176*
Ecsegfalva 23		OxA-12655	6830	35	5777 (95.4%) 5642	*Bronk Ramsey* et al. *2007.176*
Ecsegfalva 23		OxA-12860	6826	41	5787 (95.4%) 5637	*Bronk Ramsey* et al. *2007.176*
Ecsegfalva 23		OxA-11863	6825	45	5796 (95.4%) 5633	*Bronk Ramsey* et al. *2007.175*
Ecsegfalva 23		OxA-12859	6818	44	5783 (95.4%) 5632	*Bronk Ramsey* et al. *2007.175*
Ecsegfalva 23		OxA-9328	6815	50	5797 (95.4%) 5627	*Whittle* et al. *2002.110, 115*; *Bronk Ramsey* et al. *2007.175*
Ecsegfalva 23		OxA-9331	6815	45	5778 (95.4%) 5631	*ibid.*

Site (No. on the Fig. 1)	Coordinates	Lab. No	Uncal. BP	St. error	Cal BC	Reference
Ecsegfalva 23		OxA-9332	6810	45	5771 (95.4%) 5629	*Whittle* et al. 2002.110, 115; *Bronk Ramsey* et al. 2007.175
Ecsegfalva 23		OxA-11982	6806	39	5746 (95.4%) 5632	*Bronk Ramsey* et al. 2007.175
Ecsegfalva 23		OxA-9330	6795	50	5771 (95.4%) 5621	*Whittle* et al. 2002.110, 115; *Bronk Ramsey* et al. 2007.176
Ecsegfalva 23		OxA-X-2040-07	6787	37	5731 (95.4%) 5631	*Bronk Ramsey* et al. 2007.176
Ecsegfalva 23		OxA-13511	6785	45	5739 (95.4%) 5624	*Bronk Ramsey* et al. 2007.175
Ecsegfalva 23		OxA-12858	6782	42	5733 (95.4%) 5627	*Bronk Ramsey* et al. 2007.175
Ecsegfalva 23		OxA-11850	6780	50	5752 (95.4%) 5617	*Bronk Ramsey* et al. 2007.175
Ecsegfalva 23		OxA-X-2040-09	6780	39	5728 (95.4%) 5630	*Bronk Ramsey* et al. 2007.175
Ecsegfalva 23		OxA-X-2040-08	6775	37	5726 (95.4%) 5629	*Bronk Ramsey* et al. 2007.175
Ecsegfalva 23		OxA-12854	6774	45	5736 (95.4%) 5621	*Bronk Ramsey* et al. 2007.175
Ecsegfalva 23		OxA-11868	6750	45	5728 (95.4%) 5571	*Bronk Ramsey* et al. 2007.176
Ecsegfalva 23		OxA-13510	6731	43	5720 (95.4%) 5563	*Bronk Ramsey* et al. 2007.176
Ecsegfalva 23		OxA-12140	6729	32	5711 (95.4%) 5571	*Bronk Ramsey* et al. 2007.176
Ecsegfalva 23		OxA-9325	6690	50	5707 (95.4%) 5526	*Whittle* et al. 2002.110, 115; *Bronk Ramsey* et al. 2007.176
Ecsegfalva 23		OxA-10148	6665	50	5664 (95.4%) 5491	*ibid.*
Ecsegfalva 23		OxA-11849	6660	40	5646 (95.4%) 5512	*Bronk Ramsey* et al. 2007.176
Ecsegfalva 23		OxA-12855	6596	42	5617 (95.4%) 5483	*Bronk Ramsey* et al. 2007.175
Endrőd 35 (**21**)	46°52'8.86"N 20°51'23.05"E	Bln-1940	6615	60	5635 (95.4%) 5478	*Oross, Siklosi 2012.Tab. 1*
Endrőd 35		Bln-1960	6415	60	5488 (95.4%) 5235	*Oross, Siklosi 2012.Tab. 1*
Endrőd 35		BM-1864R	6180	110	5369 (95.4%) 4840	*Bowman* et al. 1990.73
Endrőd 39 (**22**)	46°58'59.01"N 20°45'33.37"E	BM-1868R	6970	110	6047 (95.4%) 5662	*Bowman* et al. 1990.73; *Horváth, Hertelendi* 1994.122 (with Lab no. BM-1668R)
Endrőd 39		BM-1863R	6950	140	6083 (95.4%) 5571	*Bowman* et al. 1990.73; *Horváth, Hertelendi* 1994.122
Endrőd 39		BM-1870R	6950	120	6034 (95.4%) 5635	*Bowman* et al. 1990.73; *Horváth, Hertelendi* 1994.122 (with Lab no. BM-1971R)
Endrőd 39		BM-1871R	6830	120	5982 (95.4%) 5540	*Bowman* et al. 1990.73; *Horváth, Hertelendi* 1994.122
Endrőd 39		Bln-1941	6785	55	5777 (95.4%) 5573	*Oross, Siklosi 2012.Tab. 1*
Endrőd 119 (**23**)	46°56'2.43"N 20°37'53.42"E	OxA-9587	6915	45	5899 (95.4%) 5716	*Whittle* et al. 2002.110, 115
Endrőd 119		OxA-9583	6895	45	5890 (95.4%) 5676	*Whittle* et al. 2002.110, 115
Endrőd 119		OxA-9588	6855	45	5842 (95.4%) 5657	*Whittle* et al. 2002.110, 115
Endrőd 119		OxA-9586	6850	45	5839 (95.4%) 5650	*Whittle* et al. 2002.110, 115
Endrőd 119		OxA-9582	6825	45	5796 (95.4%) 5633	*Whittle* et al. 2002.110, 115
Endrőd 119		OxA-9584	6825	45	5796 (95.4%) 5633	*Whittle* et al. 2002.110, 115
Endrőd 119		OxA-9590	6815	50	5797 (95.4%) 5627	*Whittle* et al. 2002.110, 115
Endrőd 119		OxA-9585	6795	50	5771 (95.4%) 5621	*Whittle* et al. 2002.110, 115
Endrőd 119		OxA-9589	6720	45	5717 (95.4%) 5559	*Whittle* et al. 2002.110, 115
Endrőd-Varnyai-tanya (**24**)	46°54'54.34"N 20°46'37.73"E	OxA-9395	6595	50	5619 (95.4%) 5481	*Whittle* et al. 2002.111, 116
Gyálarét-Szilágyi major (**25**)	46°14'32.24"N 20° 8'50.49"E	Bln-75	7090	100	6206 (95.4%) 5746	*Kohl, Quitta* 1963.299-300; 1964.315; *Horváth, Hertelendi* 1994.122
Hódmezővásárhely-Kotacpart-Vata-tanya (**26**)	46°23'37.19"N 20°14'41.87"E	Bln-115	6450	100	5613 (95.4%) 5224	*Kohl, Quitta* 1963.299-300; 1964.315-316

Site (No. on the Fig. 1)	Coordinates	Lab. No	Uncal. BP	St. error	Cal BC	Reference
Ibrány-Nagyerdő (**27**)	48° 8'3.32"N 21°42'51.46"E	Poz-28216	6630	40	5626 (95.4%) 5491	*Domboróczki, Raczky* 2010. 214
Ibrány-Nagyerdő		Poz-28214	6570	40	5615 (95.4%) 5475	*Domboróczki, Raczky* 2010.214
Maroslele-Pana (**28**)	46°17'58.53"N 20°21'17.99"E	OxA-9399	6965	50	5981 (95.4%) 5736	*Whittle* et al. 2002.111, 115
Maroslele-Pana		OxA-10149	6845	50	5838 (95.4%) 5643	*Whittle* et al. 2002.111, 115
Maroslele-Pana		OxA-9401	6780	50	5752 (95.4%) 5617	*Whittle* et al. 2002.111, 115
Maroslele-Pana		OxA-9400	6740	50	5730 (95.4%) 5561	*Whittle* et al. 2002.111, 115
Méhtelek-Nádas (**29**)	47°55'22.39"N 22°49'57.54"E	Bln-1331	6835	60	5843 (95.4%) 5629	*Kalicz, Makkay* 1977.23; *Horváth, Hertelendi* 1994.122; *Raczky* et al. 2010.164
Méhtelek-Nádas		Bln-1332	6655	60	5665 (95.4%) 5484	*ibid.*
Méhtelek-Nádas		GrN-6897	6625	50	5628 (95.4%) 5486	*ibid.*
Nagykörű-Tsz Gyümölcsös (**30**)	47°16'28.34"N 20°26'30.85"E	VERA-3476	7065	35	6016 (95.4%) 5883	*Raczky* et al. 2010.164
-II-		Poz-23460	7040	40	6006 (95.4%) 5842	*Gulyás* et al. 2010.1462
-II-		Poz-26328	6970	40	5978 (95.4%) 5747	*Raczky* et al. 2010.164
-II-		Poz-26327	6940	40	5966 (95.4%) 5730	*Raczky* et al. 2010.164
-II-		Poz-23317	6890	40	5882 (95.4%) 5707	*Gulyás* et al. 2010.1462
-II-		VERA-3474	6890	35	5873 (95.4%) 5712	*Raczky* et al. 2010.164
-II-		Poz-26325	6860	40	5838 (95.4%) 5666	*Raczky* et al. 2010.164
-II-		VERA-3540	6850	35	5833 (95.4%) 5661	*Raczky* et al. 2010.164
-II-		VERA-3052	6755	40	5726 (95.4%) 5618	*Raczky* et al. 2010.164
Pitvaros-Viztározó (**31**)	46°18'1.09"N 20°44'32.98"E	OxA-9336	7060	45	6018 (95.4%) 5845	*Whittle* et al. 2002.110, 115
Pitvaros-Viztározó		OxA-9393	6940	50	5974 (95.4%) 5726	*Whittle* et al. 2002.110, 115
Pitvaros-Viztározó		OxA-9392	6885	50	5881 (95.4%) 5671	*Whittle* et al. 2002.110, 115
Röszke-Lúdvár (**32**)	46°12'52.36"N 19°56'1.82"E	Deb-2730	6972	59	5983 (95.4%) 5738	*Horváth, Hertelendi* 1994.122
Szajol-Felsőföld (**33**)	47°10'12.34"N 20°17'51.28"E	VERA-3531	6805	35	5738 (95.4%) 5638	*Raczky* 2006.383
Szajol-Felsőföld		VERA-3051	6725	35	5713 (95.4%) 5566	*Raczky* 2006.383
Szajol-Felsőföld		VERA-3534	6620	35	5621 (95.4%) 5491	*Raczky* 2006.383
Szarvas 23 (**34**)	46°51'19.61"N 20°35'1.11"E	OxA-9375	6855	55	5871 (95.4%) 5639	*Whittle* et al. 2002.111–115
Szarvas 23		BM-1866R	6780	110	5894 (95.4%) 5491	*Bowman* et al. 1990.73
Szentpéterszeg-Körtvélyes (**35**)	47°14'20.46"N 21°35'42.10"E	Bln-2578	6800	60	5835 (95.4%) 5617	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda (**36**)	47° 7'12.70"N 20°11'57.79"E	Bln-1938	7005	80	6018 (95.4%) 5732	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda		Bln-1946	7005	80	6018 (95.4%) 5732	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda		Bln-2576	6940	60	5981 (95.4%) 5718	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda		Poz-37861	6910	40	5886 (95.4%) 5721	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda		OxA-23754	6859	34	5836 (95.4%) 5667	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda		Bln-2577	6790	70	5837 (95.4%) 5564	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda		Poz-37860	6770	40	5726 (95.4%) 5626	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda		OxA-23756	6713	33	5707 (95.4%) 5562	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda		OxA-23755	6713	32	5707 (95.4%) 5562	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda		OxA-23753	6688	35	5665 (95.4%) 5541	*Oross, Siklosi* 2012.Tab. 1
Szolnok-Szanda		OxA-23752	6554	32	5606 (95.4%) 5474	*Oross, Siklosi* 2012.Tab. 1
Tiszaszőlős-Domaháza-puszta (**37**)	47°10'53.07"N 18°59'18.34"E	Deb-11890	6920	50	5969 (95.4%) 5716	*Domboróczki, Raczky* 2010b. 152, Tab. 1
-II-		OxA-20238	6789	37	5731 (95.4%) 5632	*ibid.*
-II-		Deb-11902	6780	65	5807 (95.4%) 5561	*ibid.*
-II-		OxA-20237	6776	34	5724 (95.4%) 5631	*ibid.*

Site (No. on the Fig. 1)	Coordinates	Lab. No	Uncal. BP	St. error	Cal BC	Reference
Tiszaszőlős-Domaháza-puszta		OxA-20239	6775	40	5729 (95.4%) 5627	*Domboróczki, Raczky 2010b. 152, Tab. 1*
-II-		Deb-11804	6740	60	5736 (95.4%) 5547	*ibid.*
-II-		OxA-20236	6673	35	5657 (95.4%) 5531	*ibid.*
-II-		Deb-12962	6657	65	5701 (95.4%) 5481	*ibid.*
-II-		Deb-11898	6550	95	5639 (95.4%) 5326	*ibid.*
-II-		Deb-13045	6462	48	5492 (95.4%) 5324	*Lászlo Domboróczki 2012.108*
-II-		VERA-4243	6245	30	5309 (95.4%) 5076	*ibid.*
			BULGARIA			
Azmak (**1**)	42°27'6.06"N 25°43'0.61"E	Bln-293	7303	150	6452 (95.4%) 5901	*Görsdorf, Bojadžiev 1996. 133–136*
Azmak		Bln-291	7158	150	6361 (95.4%) 5739	*ibid.*
Azmak		Bln-292	6878	100	5982 (95.4%) 5625	*ibid.*
Azmak		Bln-294	6768	100	5877 (95.4%) 5494	*ibid.*
Azmak		Bln-296	6779	100	5886 (95.4%) 5516	*ibid.*
Azmak		Bln-295	6720	100	5808 (95.4%) 5479	*ibid.*
Azmak		Bln-203	6870	100	5983 (95.4%) 5621	*ibid.*
Azmak		Bln-299	6812	100	5968 (95.4%) 5542	*ibid.*
Azmak		Bln-267	6758	100	5846 (95.4%) 5487	*ibid.*
Azmak		Bln-224	6650	150	5872 (95.4%) 5317	*ibid.*
Azmak		Bln-297	6675	100	5776 (95.4%) 5390	*ibid.*
Azmak		Bln-298	6540	100	5643 (95.4%) 5317	*ibid.*
Azmak		Bln-300	6426	150	5641 (95.4%) 5043	*ibid.*
Azmak		Bln-301	6483	100 (1,3)	5625 (95.4%) 5231	*ibid.*
Azmak		Bln-430	6279	120	5479 (95.4%) 4953	*ibid.*
Azmak		Bln-140A	6476	100	5622 (95.4%) 5230	*ibid.*
Chavdar (Čavdar) (**2**)	42°41'38.57"N 24° 3'1.33"E	Bln-1583	6994	55	5988 (95.4%) 5753	*Görsdorf, Bojadžiev 1996. 124–126*
Chavdar (Čavdar)		Bln-1580	7003	45	5990 (95.4%) 5775	*ibid.*
Chavdar (Čavdar)		Bln-2108	7195	65	6221 (95.4%) 5929	*ibid.*
Chavdar (Čavdar)		Bln-1663	7070	50	6034 (95.4%) 5843	*ibid.*
Chavdar (Čavdar)		Bln-1582	7020	45	6001 (95.4%) 5796	*ibid.*
Chavdar (Čavdar)		Bln-1581	7000	60	5995 (95.4%) 5749	*ibid.*
Chavdar (Čavdar)		Bln-1578	6994	55	5988 (95.4%) 5753	*ibid.*
Chavdar (Čavdar)		Bln-2662	6400	100	5606 (95.4%) 5080	*ibid.*
Chavdar (Čavdar)		Bln-2107	6550	50	5619 (95.4%) 5385	*ibid.*
Chavdar (Čavdar)		Bln-4261	7120	80	6211 (95.4%) 5837	*ibid.*
Chavdar (Čavdar)		Bln-4106	6840	50	5837 (95.4%) 5639	*ibid.*
Chavdar (Čavdar)		Bln-1241	6852	100	5981 (95.4%) 5570	*ibid.*
Chavdar (Čavdar)		Bln-1241 A	6830	100	5976 (95.4%) 5560	*ibid.*
Chavdar (Čavdar)		Bln-1162	6400	100	5606 (95.4%) 5080	*ibid.*
Chavdar (Čavdar)		Bln-1162 A	6985	100	6047 (95.4%) 5676	*ibid.*
Chavdar (Čavdar)		Bln-1251	6997	100	6059 (95.4%) 5708	*ibid.*
Chavdar (Čavdar)		Bln-1160	6680	100	5782 (95.4%) 5469	*ibid.*
Chavdar (Čavdar)		Bln-1160 A	7040	100	6085 (95.4%) 5720	*ibid.*
Chavdar (Čavdar)		Bln-908	6990	150	6207 (95.4%) 5626	*ibid.*
Chavdar (Čavdar)		Bln-911	6870	120	5998 (95.4%) 5564	*ibid.*
Chavdar (Čavdar)		Bln-909	6815	100	5970 (95.4%) 5546	*ibid.*
Chavdar (Čavdar)		Bln-910	6665	100	5753 (95.4%) 5385	*ibid.*
Chavdar (Čavdar)		Bln-910 A	6555	100	5657 (95.4%) 5323	*ibid.*
Chavdar (Čavdar)		Bln-907	6320	100	5481 (95.4%) 5046	*ibid.*
Chavdar (Čavdar)		Bln-1030	6760	100	5868 (95.4%) 5488	*ibid.*
Chavdar (Čavdar)		Bln-906	6720	100	5808 (95.4%) 5479	*ibid.*
Dobrinishte (Dobrinište) (**3**)	41°51'6.48"N 23°35'4.94"E	Bln-3785	6650	60	5661 (95.4%) 5484	*Görsdorf, Bojadžiev 1996.127*

Site (No. on the Fig. 1)	Coordinates	Lab. No	Uncal. BP	St. error	Cal BC	Reference
Dobrinishte (Dobrinište)		Bln-3786	6610	50	5623 (95.4%) 5483	*Görsdorf, Bojadžiev 1996.127*
Džuljunica-Smărdeš (**15**)	43° 7'17.50"N 25°54'17.44"E	OxA–25045	6686	39	5669 (95.4%) 5531	*Krauß* et al. *2014.51–77*
-II-		OxA–25047	7140	40	6075 (95.4%) 5920	*Krauß* et al. *2014.51–77*
-II-		OxA–25046	6950	40	5971 (95.4%) 5736	*Krauß* et al. *2014.51–77*
-II-		OxA–24981	7185	40	6205 (95.4%) 5987	*Krauß* et al. *2014.51–77*
-II-		OxA–25043	7055	40	6013 (95.4%) 5846	*Krauß* et al. *2014.51–77*
-II-		OxA–24977	7136	40	6073 (95.4%) 5919	*Krauß* et al. *2014.51–77*
-II-		OxA–24978	7054	39	6012 (95.4%) 5847	*Krauß* et al. *2014.51–77*
-II-		OxA–24939	7171	36	6094 (95.4%) 5985	*Krauß* et al. *2014.51–77*
-II-		OxA–24935	7026	35	5995 (95.4%) 5840	*Krauß* et al. *2014.51–77*
-II-		OxA–24931	7066	38	6020 (95.4%) 5878	*Krauß* et al. *2014.51–77*
-II-		OxA–24932	7053	35	6010 (95.4%) 5849	*Krauß* et al. *2014.51–77*
-II-		OxA–25040	7049	39	6008 (95.4%) 5846	*Krauß* et al. *2014.51–77*
-II-		OxA–24938	7134	35	6067 (95.4%) 5923	*Krauß* et al. *2014.51–77*
-II-		OxA–25044	7095	40	6048 (95.4%) 5896	*Krauß* et al. *2014.51–77*
-II-		OxA–24979	7145	38	6075 (95.4%) 5925	*Krauß* et al. *2014.51–77*
-II-		OxA–25033	7084	36	6026 (95.4%) 5891	*Krauß* et al. *2014.51–77*
-II-		OxA–24980	7011	38	5990 (95.4%) 5802	*Krauß* et al. *2014.51–77*
-II-		OxA–24937	7588	37	6491 (95.4%) 6396	*Krauß* et al. *2014.51–77*
-II-		OxA–25042	7095	40	6048 (95.4%) 5896	*Krauß* et al. *2014.51–77*
-II-		OxA–24934	7195	37	6205 (95.4%) 5995	*Krauß* et al. *2014.51–77*
-II-		OxA–24936	7083	36	6025 (95.4%) 5892	*Krauß* et al. *2014.51–77*
Eleshnitsa (Elešnitsa, Elešnica) (**4**)	41°54'33.91"N 23°39'54.10"E	Bln-3238	7010	60	6002 (95.4%) 5758	*Görsdorf, Bojadžiev 1996.126–127*
Eleshnitsa		Bln-3241	6960	60	5982 (95.4%) 5730	*Görsdorf, Bojadžiev 1996.126–127*
Eleshnitsa		Bln-3242	6940	50	5974 (95.4%) 5726	*Görsdorf, Bojadžiev 1996.126–127*
Eleshnitsa		Bln-3239	6920	60	5978 (95.4%) 5677	*Görsdorf, Bojadžiev 1996.126–127*
Eleshnitsa		Bln-3940	6850	50	5841 (95.4%) 5643	*Görsdorf, Bojadžiev 1996.126–127*
Eleshnitsa		Bln-3245	6730	90	5786 (95.4%) 5485	*Görsdorf, Bojadžiev 1996.126–127*
Eleshnitsa		Bln-3237	6790	50	5762 (95.4%) 5620	*Görsdorf, Bojadžiev 1996.126–127*
Eleshnitsa		Bln-3244	6720	70	5736 (95.4%) 5514	*Görsdorf, Bojadžiev 1996.126–127*
Galabnik (**5**)	42°26'49.35"N 23° 5'54.29"E	Bln-3580	7120	70	6205 (95.4%) 5842	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-3579	7030	70	6022 (95.4%) 5752	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-3579 H	7220	80	6245 (95.4%) 5920	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-3582	6950	70	5986 (95.4%) 5719	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-3581	6790	80	5870 (95.4%) 5551	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		GrN-19786	7070	180	6352 (95.4%) 5632	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		GrN-19785	7020	60	6010 (95.4%) 5763	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		GrN-19784	7070	60	6060 (95.4%) 5812	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-4095	7020	150	6211 (95.4%) 5643	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-4096	7140	80	6213 (95.4%) 5849	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-4094	6760	80	5834 (95.4%) 5527	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-4093	7100	80	6203 (95.4%) 5783	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		GrN-19783	6970	50	5981 (95.4%) 5740	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-4091	6760	60	5751 (95.4%) 5558	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-4092	6710	60	5723 (95.4%) 5529	*Görsdorf, Bojadžiev 1996.122–123*
Galabnik		Bln-3576	6670	70	5706 (95.4%) 5486	*Görsdorf, Bojadžiev 1996.122–123*
Karanovo (**6**)	42°30'45.67"N 25°54'55.43"E	Bln-4339	7090	90	6203 (95.4%) 5750	*Görsdorf, Weninger 1993; Gorsdorf, Bojadziev 1996.133–136; Kohl, Quitta 1966; Quitta, Kohl 1969.37*

Site (No. on the Fig. 1)	Coordinates	Lab. No	Uncal. BP	St. error	Cal BC	Reference
Karanovo		Bln-4336	7110	50	6067 (95.4%) 5892	*ibid.*
Karanovo		Bln-4338	6955	45	5975 (95.4%) 5736	*ibid.*
Karanovo		Bln-4337	6810	65	5842 (95.4%) 5618	*ibid.*
Karanovo		Bln-4335	6710	55	5719 (95.4%) 5535	*ibid.*
Karanovo		Bln-3942	6820	50	5803 (95.4%) 5629	*ibid.*
Karanovo		Bln-4177	7110	50	6067 (95.4%) 5892	*ibid.*
Karanovo		Bln-4179	7130	70	6206 (95.4%) 5846	*ibid.*
Karanovo		Bln-4178	6730	80	5756 (95.4%) 5490	*ibid.*
Karanovo		Bln-3943	6760	50	5736 (95.4%) 5569	*ibid.*
Karanovo		Bln-3941	6750	50	5732 (95.4%) 5565	*ibid.*
Karanovo		Bln-3944	6785	60	5794 (95.4%) 5566	*ibid.*
Karanovo		Bln-3716	6910	60	5972 (95.4%) 5674	*Görsdorf, Weninger 1993; Gorsdorf, Bojadziev 1996.133–136; Kohl, Quitta 1966; Quitta, Kohl 1969.37*
Karanovo		Bln-3716 H	6850	60	5873 (95.4%) 5635	*ibid.*
Karanovo		Bln-3586	6780	60	5788 (95.4%) 5565	*ibid.*
Karanovo		Bln-152	6807	100	5966 (95.4%) 5536	*ibid.*
Karanovo		Bln-201	6540	100	5643 (95.4%) 5317	*ibid.*
Karanovo		Bln-234	6490	150	5716 (95.4%) 5079	*ibid.*
Karanovo		Bln-3904	6375	70	5476 (95.4%) 5224	*ibid.*
Karanovo		Bln-3458	6440	60	5509 (95.4%) 5309	*ibid.*
Karanovo		Bln-3459	6420	60	5491 (95.4%) 5236	*ibid.*
Karanovo		Bln-3460	6440	60	5509 (95.4%) 5309	*ibid.*
Karanovo		Bln-3461	6480	60	5545 (95.4%) 5321	*ibid.*
Karanovo		Bln-3464	6500	50	5602 (95.4%) 5358	*ibid.*
Karanovo		Bln-3463	6350	60	5469 (95.4%) 5221	*ibid.*
Karanovo		Bln-3465	6410	60	5486 (95.4%) 5232	*ibid.*
Karanovo		Bln-3587	6380	60	5476 (95.4%) 5227	*ibid.*
Karanovo		Bln-3717	6450	60	5513 (95.4%) 5315	*ibid.*
Karanovo		Bln-3717 H	6510	60	5613 (95.4%) 5345	*ibid.*
Karanovo		Bln-158	6395	100	5558 (95.4%) 5079	*ibid.*
Kazanlak (**7**)	42°38'14.05"N 25°23'39.76"E	Bln-730	6335	160	5616 (95.4%) 4935	*Georgiev 1974; Nikolov, Karastoyanova 2003*
Kazanlak		Bln-729	6330	100	5482 (95.4%) 5053	*ibid.*
Kovachevo (Kovačevo) (**8**)	41°30'20.16"N 23°28'11.55"E	Ly-1437 (OxA)	7180	45	6207 (95.4%) 5983	*Grebska-Kulova 2008; Lichardus-Itten* et al. *2000; 2002; 2006; Kovacheva 1995; Pemitcheva 1990*
Kovachevo		Ly-1654 (OxA)	7090	70	6081 (95.4%) 5796	*ibid.*
Kovachevo		Ly-1439 (OxA)	6975	50	5982 (95.4%) 5743	*ibid.*
Kovachevo		Ly-1438 (OxA)	6990	45	5984 (95.4%) 5764	*ibid.*
Kovachevo		Ly-1620 (OxA)	6980	65	5988 (95.4%) 5737	*ibid.*
Kovachevo		Ly-6553	6760	160	5992 (95.4%) 5385	*ibid.*
Kovachevo		Ly-6554	6830	85	5963 (95.4%) 5566	*ibid.*
Kremenik (Sapareva Bania) (Sapareva Banja) (**9**)	42°22'0.09"N 23° 3'53.50"E	Bln-2554	6620	100	5720 (95.4%) 5377	*Görsdorf, Bojadžiev 1996.127–128*
Kremenik		Bln-2552	6460	60	5524 (95.4%) 5317	*Görsdorf, Bojadžiev 1996.127–128*
Kremenik		Bln-2554A	6840	60	5868 (95.4%) 5629	*Görsdorf, Bojadžiev 1996.127–128*
Kremenik		Bln-2553	6660	60	5671 (95.4%) 5483	*Görsdorf, Bojadžiev 1996.127–128*
Kremenik		Bln-2105	6530	50	5612 (95.4%) 5376	*Görsdorf, Bojadžiev 1996.127–128*
Kremenik		Bln-2556	6480	60	5545 (95.4%) 5321	*Görsdorf, Bojadžiev 1996.127–128*
Kremenik		Bln-2106	6475	40	5516 (95.4%) 5357	*Görsdorf, Bojadžiev 1996.127–128*
Kremenik		Bln-2550	6550	60	5621 (95.4%) 5379	*Görsdorf, Bojadžiev 1996.127–128*
Kremenik		Bln-2551	6450	100	5613 (95.4%) 5224	*Görsdorf, Bojadžiev 1996.127–128*

Site (No. on the Fig. 1)	Coordinates	Lab. No	Uncal. BP	St. error	Cal BC	Reference
Kremenik		Bln-2549	6350	60	5469 (95.4%) 5221	*Görsdorf, Bojadžiev 1996.127–128*
Ohoden (**12**)	43°23'7.84"N 23°42'49.36"E	KN-5655	6830	45	5803 (95.4%) 5636	*Ganetovski, G. 2007*
Ovčarovo-gorata (**13**)	43° 6'43.05"N 26°39'13.20"E	Bln-1544	6688	60	5715 (95.4%) 5511	*Görsdorf, Bojadžiev 1996.128–129*
Ovčarovo-gorata		Bln-1620	6463	50	5509 (95.4%) 5324	*Görsdorf, Bojadžiev 1996.128–129*
Ovčarovo-gorata		Bln-2032	6555	70	5625 (95.4%) 5376	*Görsdorf, Bojadžiev 1996.128–129*
Ovčarovo-gorata		Poz–16984	6890	40	5882 (95.4%) 5707	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–16985	6890	40	5882 (95.4%) 5707	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–16986	6500	40	5535 (95.4%) 5371	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–18480	6900	40	5881 (95.4%) 5716	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–18483	6750	40	5726 (95.4%) 5575	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–18484	6640	40	5632 (95.4%) 5494	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–18486	6800	40	5741 (95.4%) 5631	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–18487	6660	40	5646 (95.4%) 5512	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–18489	6750	40	5726 (95.4%) 5575	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–18490	6780	40	5730 (95.4%) 5628	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–18491	6810	40	5754 (95.4%) 5631	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–18493	6670	40	5659 (95.4%) 5522	*Krauß 2014.174–200*
Ovčarovo-gorata		Poz–18494	6690	40	5674 (95.4%) 5529	*Krauß 2014.174–200*
Ovcharovo-platoto 2 (Ovčarovo-platoto 2) (**16**)	43°11'39"N 26°38'12"E	Bln-1356	6480	60	5545 (95.4%) 5321	*Görsdorf, Bojadžiev 1996.129*
Polyanitsa-platoto (Poljanica-platoto) (**14**)	43°14'30.22"N 26°35'29.18"E	Bln-1571	7535	80	6563 (95.4%) 6230	*Görsdorf, Bojadžiev 1996.121–122*
Polyanitsa-platoto		Bln-1512	7140	80	6213 (95.4%) 5849	*Görsdorf, Bojadžiev 1996.121–122*
Polyanitsa-platoto		Bln-1613	7380	60	6392 (95.4%) 6094	*Görsdorf, Bojadžiev 1996.121–122*
Polyanitsa-platoto		Bln-1613 A	7275	60	6242 (95.4%) 6020	*Görsdorf, Bojadžiev 1996.121–122*
Slatina (**10**)	42°41'18.06"N 23°21'56.18"E	Bln-3434	6890	60	5963 (95.4%) 5661	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3435	6860	50	5869 (95.4%) 5644	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3436	6840	60	5868 (95.4%) 5629	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3437	6810	50	5789 (95.4%) 5626	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3438	6960	60	5982 (95.4%) 5730	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3439	6940	60	5981 (95.4%) 5718	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3440	6840	60	5868 (95.4%) 5629	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3441	6960	60	5982 (95.4%) 5730	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3442	6780	60	5788 (95.4%) 5565	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3443	6840	60	5868 (95.4%) 5629	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3504	6970	60	5983 (95.4%) 5736	*Görsdorf, Bojadžiev 1996*
Slatina		Bln-3555	6930	60	5980 (95.4%) 5712	*Görsdorf, Bojadžiev 1996*
Stara Zagora-Okrazhna bolnitsa (Okražna Bolnica) (**11**)	42°25'45.00"N 25°36'17.97"E	Bln-1587	7139	65	6207 (95.4%) 5886	*Görsdorf, Bojadžiev 1996*
-II-		Bln-1586	6814	65	5843 (95.4%) 5619	*Görsdorf, Bojadžiev 1996*
-II-		Bln-1589	6918	45	5902 (95.4%) 5717	*Görsdorf, Bojadžiev 1996*
-II-		Bln-1252	6844	100	5979 (95.4%) 5565	*Görsdorf, Bojadžiev 1996*
-II-		Bln-1250	6820	100	5972 (95.4%) 5556	*Görsdorf, Bojadžiev 1996*
-II-		Bln-1163	6688	150	5896 (95.4%) 5345	*Görsdorf, Bojadžiev 1996*
-II-		Bln-1588	6750	60	5743 (95.4%) 5555	*Görsdorf, Bojadžiev 1996*
-II-		Bln-1164	6723	100	5809 (95.4%) 5480	*Görsdorf, Bojadžiev 1996*
-II-		Bln-1164	6744	100	5837 (95.4%) 5487	*Görsdorf, Bojadžiev 1996*

Note: the full code for the data analysis is available from M. Porčić on request.