

10. The Absolute Chronological Framework

Almost no period of European prehistory is as amply attested with ^{14}C dates as that of the South-eastern European Early Neolithic, and, hence, a very dense series of dates is available, particularly for the transition from the Mesolithic to Neolithic. The basis of the current work was supplied by the extensive data series in CalPal³⁰ and 14SEA,³¹ supplemented by a few dates only obtained in recent years which had not yet been integrated within these databases, together with some further information from current academic literature.

For as long as radiocarbon methods have been applied within archaeology, they have been employed time and again to answer the question as to the advent of sedentarism and the introduction of agriculture to Europe. However, precisely because recourse was already made to these methods so early in studying the beginning of the Neolithic, the data created is not entirely unproblematic. Over the course of time, the measuring methods have been ever further refined, and are able to deliver measurements with very little in the way of standard deviation from very small sample sizes of organic materials. At the beginning of the history of research, comparatively large quantities of material were still required to obtain results at all. Accordingly, carbonised wood was overwhelmingly tested, and in large quantities to boot. So as to acquire sufficient amounts of dateable material, multiple different samples from an archaeological context were often combined. The conventional methods

of measuring initially also only supplied results with very high standards of deviation. It was only with the establishment of accelerator mass spectrometry (AMS) dating that smaller sample quantities could also be dated precisely. It thus happened that many key sites within the Aegean and Balkan-Carpathian sphere that were excavated until into the 1990s were solely dated from charcoal series. The problem in dating settlement layers with wood has already been commented upon many times (SCHIFFER 1986. – BAYLISS 2009).

This problem is very aptly demonstrated in the case of the data series from Bucova Pusta IV (Fig. 195). The settlement's earliest three samples came from charcoal (Poz-58612; Poz-51355; Poz-51356), which only indicate the period in which the wood had grown (with their calibrated values between 5930 and 5680 calBC), this then being used later for the construction of houses within this settlement. The relatively secure succession of dates from short-lived samples (animal bones and carbonised seeds) only begins markedly later, so that a beginning of occupation might be presumed at around 5750 calBC. That the carbonised wood occurs in the same refuse pits is unsurprising as these were presumably also deposited along with the food refuse within these respective contexts. Accordingly, the ^{14}C date measured states nothing as to this wood's period of use, but instead must be located by necessity in a period prior to the advent of occupation. Should Bucova Pusta IV be taken as an example, then it is evident that a chronological distance of 100 years may well lie between the ^{14}C age of the wood charcoal deposited within the settlement contexts and their actual phase of use.

In precisely estimating the beginning of the Neolithic, if only the old data series such as those from Achilleion,

30. My heartfelt thanks go to Bernhard Weninger, who gave me his comprehensive database for this work.

31. <http://www.14sea.org/> (last accessed 19.01.2022).

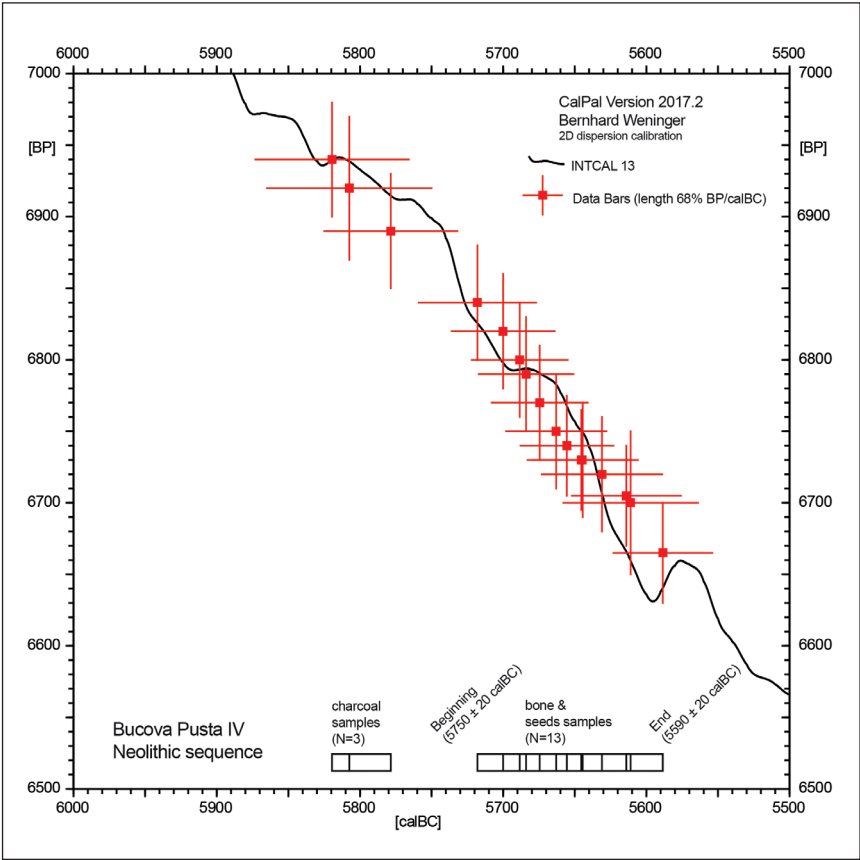


Fig. 195: Bucova Pusta IV. Calibration of radiocarbon dates (R. Krauß).

Anzabegovo, Azmak, Chavdar, Divostin, and Grivac, all almost exclusively composed of charcoal (to name just a few of the best-known examples), are used, then one inevitably arrives at a false estimation of some 80–100 years too early. Notable, in turn, are the very high standard deviations, which can push the data back further decades or entire centuries.

10.1. Beginnings and Persistence

Yet, the newer AMS data series from short-lived samples are not without their difficulties. At some sites, ¹⁴C samples from Early Neolithic features have been demonstrated to date to the period prior to the beginning of the site’s occupation. Alasdair Whittle supplies the example of a cattle bone from Ecsegfalva 23, Trench 23B (OxA-12857) and reference to equally isolated, very early dates from Topole-Bač (OxA-8504) and Maroslele-Pana (OxA-X-922-30) (Whittle 2007, 174). He suggests thereby that he has identified an otherwise all but intangible pre-Neolithic settlement by means of these skeletal remains (Whittle 2007, 728). To this might now be added further examples. A reservoir effect due to predominantly aquatic nutrition with human

skeletal remains must always be assumed; this could be the case with the sample OxA-8504 from Topole-Bač and the sample OxA-9403 from Maroslele-Pana. On the other hand, data on animal bones from ruminants can hardly be ignored. I should like to cite two examples here as extreme cases (Fig. 196; Tab. 4). At the celebrated Early Neolithic site of Ohoden, a deposit of three antlers date to the first half of the 7th millennium BCE according to ¹⁴C. This appears to be a Late Mesolithic feature unrelated to the Early Neolithic. Further ¹⁴C dates confirm a chronological placement of the Early Neolithic settlement of Ohoden only from the 57th century BCE onwards; thus, more than 1000 years lie between the Mesolithic feature found within the settlement and Neolithic occupation itself!

Despite this, there is clear evidence for earlier, pre-Neolithic occupation of Ohoden on account of the deposited deer antlers. There are also many other cases, however, of samples dated very early from later find contexts where no further intimations of pre-Neolithic settlement might be found. In much the same vein, the bone of a bovid was found at Foeni Gaz, the measurement of which (Poz-38230) indicated a date within the first half of the 7th millennium BCE;

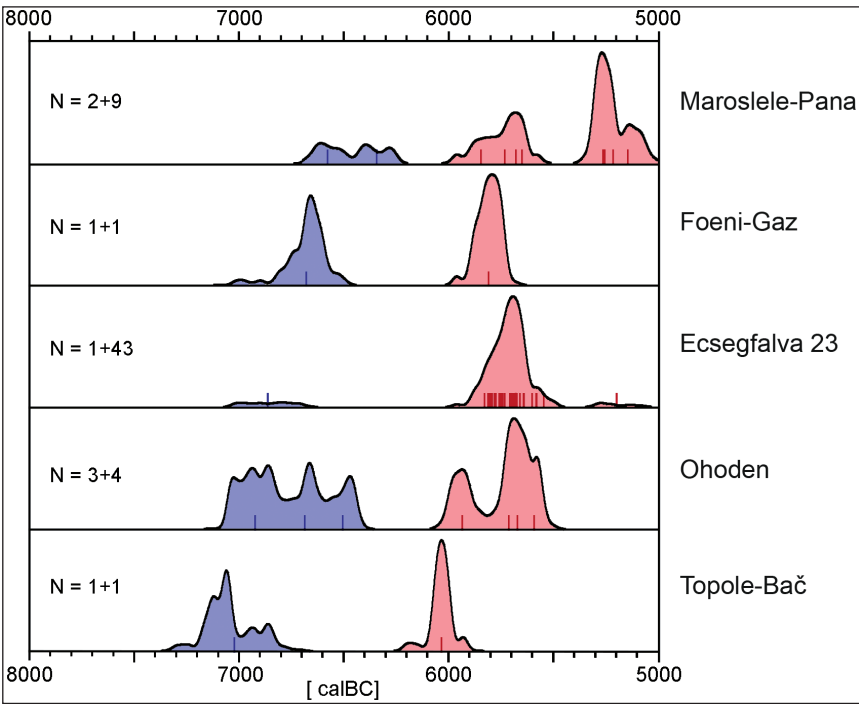


Fig. 196: Barcode calibration in CalPal of Mesolithic (blue) and Neolithic (red) radiocarbon dates from Early Neolithic sites in South-east Europe. Clearly visible is their offset in comparison to the chronological position of their find context (R. Krauß).

Site	Labcode	¹⁴ C age BP	STD	δ ¹³ C	Material	Species	Context	Source
Topole-Bač	OxA-8504	8085	55	-19.8	bone	<i>Homo</i>	human skeleton in contracted position	WHITTLE et al. 2002
Ohoden	Poz-82519	7650	50	n.d.	antler	<i>Cervus elaphus</i>	Mesolithic deposition in an Early Neolithic settlement	this study
	Poz-88723	7840	40	n.d.	antler	<i>Cervus elaphus</i>	Mesolithic deposition in an Early Neolithic settlement	this study
	Poz-88724	8010	40	n.d.	antler	<i>Cervus elaphus</i>	Mesolithic deposition in an Early Neolithic settlement	this study
Ecsegfalva 23	OxA-12857	7944	44	-12.3	bone	<i>Bos</i>	single cattle bone from Neolithic settlement context	WHITTLE 2007
Foeni Gaz	Poz-38230	7830	50	n.d.	bone	<i>Bos</i>	single cattle bone from a multi-phase prehistoric settlement	KRAUSS, CIOBOTARU 2014
Maroslele-Pana	OxA-9403	7765	55	-22.4	bone	<i>Homo</i>	isolated human bone	WHITTLE et al. 2002
	Deb-2733	7497	56	n.d.	bone		from an Early Neolithic pit	HORVÁTH, HERTELENDI 1994

Tab. 4: Isolated Mesolithic ¹⁴C dates from Early Neolithic sites in South-east Europe.

this bone was discovered in a feature certainly belonging to the early 3rd millennium BCE on the strength of the pottery and a series of further ¹⁴C dates.

There have been attempts in previous chapters to demonstrate the dynamics of dispersal for respective

regions, preferably on the strength of vessel ceramics. Unfortunately, larger series of ¹⁴C dates are only available for a few of the sites mentioned there. Conversely, there are numerous radiocarbon dates, the trajectories of which cannot be reconstructed from their published find material.

Regardless, the overlap between those sites with well published material and those sites with sufficient ^{14}C dates is large enough for a meaningful comparison to be undertaken. Nevertheless, a few preliminary remarks are necessary regarding the selection of data, as it would be naive simply to juxtapose the earliest respective dates from Early Neolithic sites in the study region: such an approach risks gravely false interpretations. Quite rightly, each earliest date of a sequence of dates should, indeed, be approached sceptically, particularly when it occurs detached from the dates' usual sequence. In general, the following rules could be established for the determination of the beginning of the Neolithic within a region. Only sites with more than one ^{14}C date should be taken into account. Preferably, only dates from short-lived samples should be included. Carbonised wood can only be considered if it originates from bushes proven not to have been used as construction material for houses. Accordingly, the many charcoals from the Cornelian cherry (*Cornus mas*) may be used, but those from oaks (*Quercus*) are best avoided. Naturally, no samples displaying the reservoir effect such as those from fish-bones or mussel and snail shells should be used. Indeed, human bones (much like those of pigs) may prove problematic. Finally, dates displaying minimal standard deviations within their values are to be preferred. The selection of dates must hence be stringent, and can only come about through decisions made on a case-by-case basis. Automated processes such as the consideration only of the second oldest date from a site or the sole use of dates from short-lived samples cannot by any means replace this case-by-case determination. The list of dates employed here (Tab. 7) accordingly displays a chosen date which should mark in the best possible way the advent of settlement at each respective site. The aforementioned criteria were employed in the overwhelming majority of these selections; however, for those sites for which only earlier dates from charcoal with high standard deviations are available, a date was chosen which fitted best with the remaining 'safe' dates from sites from the entire region. Hence, for example, the earliest ^{14}C date from Achilleion could be used, despite this originating from a conventionally measured charcoal displaying a comparatively high standard deviation, as it does not exceed the bounds of comparable other dates from sites in Thessaly originating from ephemeral sample material. For precisely the same reason, the two earliest ^{14}C dates from Nea Nikomedeia must be excluded. Here, the rule of thumb is that a conventionally measured charcoal date should not be older than AMS dates from short-lived samples from the same region. The same procedure was used in order to select one date from each of the Epi-Palaeolithic/

Mesolithic sites marking the respective end of settlement or at least its near-approximation (Tab. 8).

The basis of the following evaluation is the weighted mean from the 2-sigma range of the calibration of the ^{14}C dates on the curve INTCAL20. In order to represent the Neolithic settlement, the inverse distance weighting (IDW) interpolation process was applied by Lennart Brandtstätter with a radius of 500 km around each site and a doubled intensification of the colour value (Fig. 197). The dark red tones mark areas with very early dates for the Neolithic, and the light red those with late dates. For greater precision, areas with the same colour values were marked with contours construable as chronological isochrones. By means of comparison, the isochrones with the latest Epi-Palaeolithic/Mesolithic dates were overlaid following the same procedure, although here the IDW was performed with a radius of 1000 km around the sites.

When compared with the conclusions drawn in the preceding chapters, this image is extremely telling. Clearly evident is the chronological advance of the Neolithic within the Aegean, together with hotspots of the neolithisation process within central western Anatolia, Thessaly, and Greek and North Macedonia. From thence, the Neolithic spreads within the Balkans generally along the north-southerly running river valleys of the Axios/Vardar, Struma, and Nestos/Mesta following the climatic fluctuations during the 8.2 ka event. Interestingly enough, the radiocarbon dates from the Marmara region do not form a hotspot, which corresponds with archaeological observations on the strength of the ceramic find material. Thrace is of equally little relevance to the earliest foray of the Neolithic into South-eastern Europe; this is also in agreement with the present work's archaeological remarks on this point. The corridor of the central Balkans very clearly demonstrates itself to be the Neolithic's route of dispersal into the Carpathian Basin. Along the course of the Tisza and from the Danube Gorges to northern Bulgaria and Transylvania, further hotspots may be noted from the period shortly after 6000 calBC. Here, a very expansive coverage of the Thracian Plain by the Neolithic may be noted. After c. 5900 calBC, hotspots of neolithisation (both great and small) can be discerned within the eastern arc of the Carpathians. Within the Carpathian Basin, the expansion process comes to a halt along the CEB AEB, before continuing further northwards and northwestwards after 5500 calBC. The dynamics of dispersal in the regions north of the Danube's delta appear to stem from a few hotspots in the period following 5800 calBC, as the area between north-eastern Bulgaria and the interior of the Carpathian arc, on the one hand, and the north-western Pontus, on the other, is strikingly bright. Nevertheless, the ^{14}C

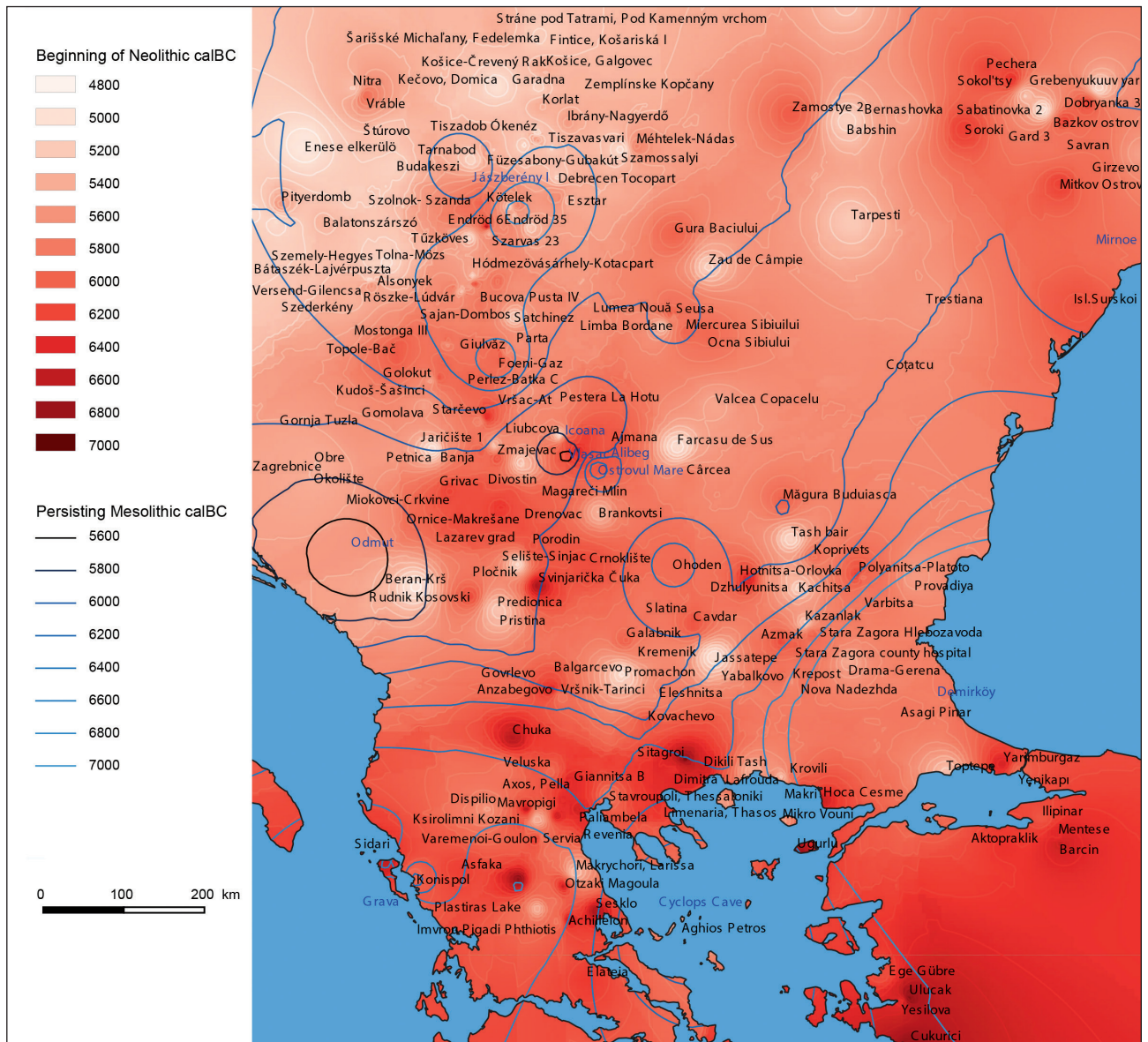


Fig. 197: Expansion dynamics of the Neolithic in South-east Europe. Visualisation of the last Mesolithic and earliest Neolithic ^{14}C dates using the Inverse Distance Weighting (IDW) interpolation method (L. Brandstätter, R. Krauß, datalist in Tab. 7 and 8).

dates from Moldova intimate very little about the character of the Early Neolithic, which sets itself apart very markedly from other areas in South-eastern Europe in terms of its economic basis. There, the criterion for the advent of the Neolithic is the introduction of ceramic production. This pottery predominantly possesses pointed or rounded bases, and need not have been adopted from the Balkans or the Carpathian Basin. Rather, this seems more connected to the wide-ranging sphere of ceramics with pointed and rounded bases in Eastern Europe and the circum-Baltic zone, where hunter-gathering continued until much later.

Before further exploring the aspect of economic basis, it is worthwhile considering once more the latest Mesolithic settlement. Within the entire study region, isolated hotspots of enduring hunter-gatherer communities might still be attested, the ^{14}C dates of which correspond to those of the Neolithic occupation. Interestingly, the replacement of Mesolithic settlement with that of the Early Neolithic is particularly visible in the Aegean. By means of contrast, Mesolithic communities can still be attested until well into the 6th millennium BCE within the Balkan-Carpathian sphere. These are concentrated in areas particularly rich in aquatic resources (such as the

Site	Labcode	¹⁴ C Age BP	STD	Species	Source	Mean_2sigma calBC
Argissa	UCLA-1657 A	8130	100	<i>Ovis</i>	CalPal	7083
Çukuriçi Höyük	VERA-5025	7145	40	<i>Ovis</i>	CalPal	5997.5
Youra, Cyclops Cave	Beta-74	7120	80	<i>Ovis/Capra</i>	CalPal	6010
Nea Nikomedeia	OxA-3874	7370	80	<i>Capra</i>	CalPal	6236
Drama-Gerena	Erl-12317	6385	50	<i>Ovis</i>	CalPal	5348.5
Nova Nadezhda	SUERC-53071	6746	30	<i>Ovis</i>	CalPal	5645.5
Anište-Bresnica	BRAMS-2331	7306	28	<i>Ovis/Capra</i>	PORČIĆ et al. 2020	6153.5
Bakovača-Ostra	BRAMS-2329	7299	27	<i>Ovis/Capra</i>	PORČIĆ et al. 2020	6151.5
Bataševo	BRAMS-2227	7331	27	<i>Ovis aries</i>	PORČIĆ et al. 2020	6159
Lepenski Vir	OxA-16212	7041	35	<i>Capra</i>	CalPal	5924
Vinogradi-Bečej	OxA-8565	7120	55	<i>Ovis/Capra</i>	CalPal	5963.5
Dzhulyunitsa	OxA-24939	7171	36	<i>Ovis</i>	CalPal	6005
Ovcharovo-Gorata	Poz-16985	6890	40	<i>Ovis/Capra</i>	CalPal	5777.5
Varbitsa	Poz-108842	6895	35	<i>Ovis/Capra</i>	this study	5799
Alsónyék	SUERC-5145	6903	35	<i>Ovis/Capra</i>	CalPal	5801
Szederkény	OxA-30520	6168	33	<i>Ovis/Capra</i>	CalPal	5112
Versend-Gilencsa	SUERC-58569	6247	33	<i>Ovis/Capra</i>	CalPal	5189.5
Bucova Pusta IV	Poz-76963	6665	35	<i>Ovis/Capra</i>	CalPal	5569.5
Ecsegfalva 23	OxA-9329	6950	45	<i>Ovis/Capra</i>	CalPal	5852.5
Endrőd 119	OxA-9587	6915	45	<i>Ovis</i>	CalPal	5841.5
Movila lui Deciov	Poz-120498	6930	40	<i>Ovis/Capra</i>	this study	5844
Ribnjak-Bečej	OxA-8564	6750	65	<i>Ovis/Capra</i>	CalPal	5643.5

Tab. 5: Oldest dated bone samples from *Ovis/Capra* bones in the research area (cf. Fig. 198).

zone around the Danube Gorges) in the extended wetlands between the Middle Danube and the Tisza, and in Montenegro. Mesolithic communities quite evidently continued to exist in parallel to those of the Early Neolithic for some time. The processes of neolithisation nevertheless seems not to have been inhibited by this, as the dispersal proceeded to circumvent the Mesolithic zones. This seems logical as these groups made use of differing environments, and thus needed not necessarily have come into conflict.

It is also worth investigating the existing dataset of samples extracted from this novel economic mode’s produce. The products of agriculture and husbandry are meant specifically here. Caution must be advised in distinguishing domesticated species from among those taxa also occurring in their wild forms in South-eastern Europe, as it is only occasionally possible to distinguish aurochs and wild boars from domesticated cattle and pigs. Nevertheless, the bones of sheep and goats are a good choice, as both species originating from the regions of the Fertile Crescent may be demonstrated to have first arrived in Europe in their domesticated forms. Much in the same way, it can be stated that the wheat species of einkorn (*Triticum monococcum*) and emmer (*Triticum dicoccum*) as well as barley

(*Hordeum*) first reached Europe in their already cultivated forms. The values in Tables 5 and 6 present the various examples of each animal or grain species at a site with their earliest respective ¹⁴C dates.

Mapping the earliest respective appearances of sheep and goat bones within the dataset very clearly displays the process of dispersal (Fig. 198). The earliest evidence comes from the Greek mainland. From thence, these domesticated animals had only spread to central Serbia and northern Bulgaria by 6000 calBC. It is only in the following centuries that dated remains of domesticated sheep and goats are also attested in Thrace and the Carpathian Basin. While the absence of dated sheep and goat bones from the Marmara region may well be due to the research history, the complete void in the areas northwest of the Black Sea is real. No domesticated animals had yet appeared during the period pertinent to the neolithisation. The diffusion of grain cultivars displays a somewhat different image. The earliest evidence from the period prior to 6000 calBC also originates from northern Greece and the immediately neighbouring areas. It is only following this juncture that cultivated grain is also attested outside of the SMAB zone. The expansion after 6000 calBC encompasses the entire

Site	Labcode	¹⁴ C Age BP	STD	Species	Source	Mean_2sigma calBC
Nea Nikomedeia	OxA-1605	7400	90	<i>Hordeum</i>	CalPal	6250.5
Galabnik	Bln-4093	7100	80	<i>Triticum</i>	CalPal	5985.5
Kovachevo	OxA-20246	7245	36	<i>Triticum</i> sp.	CalPal	6123.5
Veluška	Tx-1786	6890	140	<i>Triticum</i>	CalPal	5806.5
Vršnik-Tarinci	Bln-339	6950	100	<i>Triticum dicoccum/monococcum</i>	CalPal	5838.5
Aşağı Pınar	KIA-19258	6320	30	<i>Hordeum</i>	CalPal	5289.5
Azmak	Bln-292	6878	100	<i>Triticum dicoccum/monococcum</i>	CalPal	5803
Makri	GrA-45962	6895	40	<i>Cerealia</i>	CalPal	5780.5
Slatina	Bln-3440	6840	60	<i>Grain</i>	CalPal	5752
Yabalkovo	OxA-23558	6930	45	<i>Grain</i>	CalPal	5845.5
Okolište	KIA-41403	6194	36	<i>Triticum dicoccum</i>	CalPal	5164
Svinjarička Čuka	MAMS-40136	6734	25	<i>Hordeum</i>	CalPal	5641.5
Zagrebnice	KIA-45627	6565	30	<i>Triticum dicoccum</i>	CalPal	5544.5
Măgura Buduiasca	OxA-21405	6868	38	<i>Hordeum</i>	CalPal	5753
Bucova Pusta IV	Poz-88721	6820	40	<i>Hordeum</i>	CalPal	5703.5
Ecsegfalva 23	OxA-11871	6930	40	<i>Cerealia</i>	CalPal	5844
Miercurea Sibiului	OxA-19739	7131	34	<i>Hordeum</i>	CalPal	5994
Parța	Lv-2149	6160	90	<i>Cerealia</i>	CalPal	5080

Tab. 6: Oldest dated samples of charred cereal grains in the research area (cf. Fig. 198).

Balkan-Carpathian sphere. Nevertheless, securely dated grain cultivars are first evidenced throughout the entire lowlands of the Lower Danube only from c. 5700 calBC onwards. According to multiple samples, these cultivars appear in Thrace markedly earlier. The absence of early dated grain cultivars in the southern and western zones of the Carpathian Basin may well be understood as a consequence of the state of research considering the two early attestations in the region of the Tisza and in southern Transylvania. The situation in north-western Anatolia is to be understood analogously. Here, the aforementioned problem of the old data series from wood seems once again at work. More recently, animal bones have been dated in preference, and the preservation of grain may potentially play a role here. For the present author, the complete lack of dated grain cultivars in the zone north of the Danube’s estuary is conversely also to be taken as fact; the Neolithic there is solely defined by its ceramic production, whereas animal husbandry and crop cultivation are initially lacking.

10.2. Regional Dynamics

This is the general image of the dispersal of the Neolithic in South-eastern Europe. Yet, how are the dynamics of this process constituted within the discrete regions? In order to trace these according to the radiocarbon dates, the present author has subdivided the entire greater region into

nine geographic units (Fig. 199). Zone 1 corresponds to the northern Aegean with the Great Meander serving as its southern boundary in western Anatolia, and the Greek mainland with Boeotia and the island of Euboea as its south-western extremes. In contradistinction to this, Zone 2 comprises the region around the sea of Marmara with the islands of Samothraki and Imbros/Gökçeada off the Dardanelles. Zone 3 encompasses the current countries of Albania and North Macedonia along with the catchment area of the Struma in south-western Bulgaria bordering to the east. Zone 4 comprises the historical territory of Thrace. Southern and middle Serbia up to the Danube along with Bosnia and Montenegro constitute Zone 5. East of this, Zone 6 describes the regions on the lower course of the Danube, namely northern Bulgaria and Wallachia. The Carpathian Basin is subdivided into Zone 7 to the west and Zone 8 to the east respectively. Zone 9 describes the northern Pontic regions beyond the eastern Carpathians, roughly up to the Dnieper in the east, and with an artificially selected boundary to the north roughly at the latitude of the cities of L’viv and Vinnytsia.

In Zone 1, an extended phase of Mesolithic settlement may be noted, this reflecting the intensive networks mirrored in the distribution of obsidian from the island of Melos (REINGRUBER 2018). In relation to these networks, the comparatively early establishment of the Neolithic along both

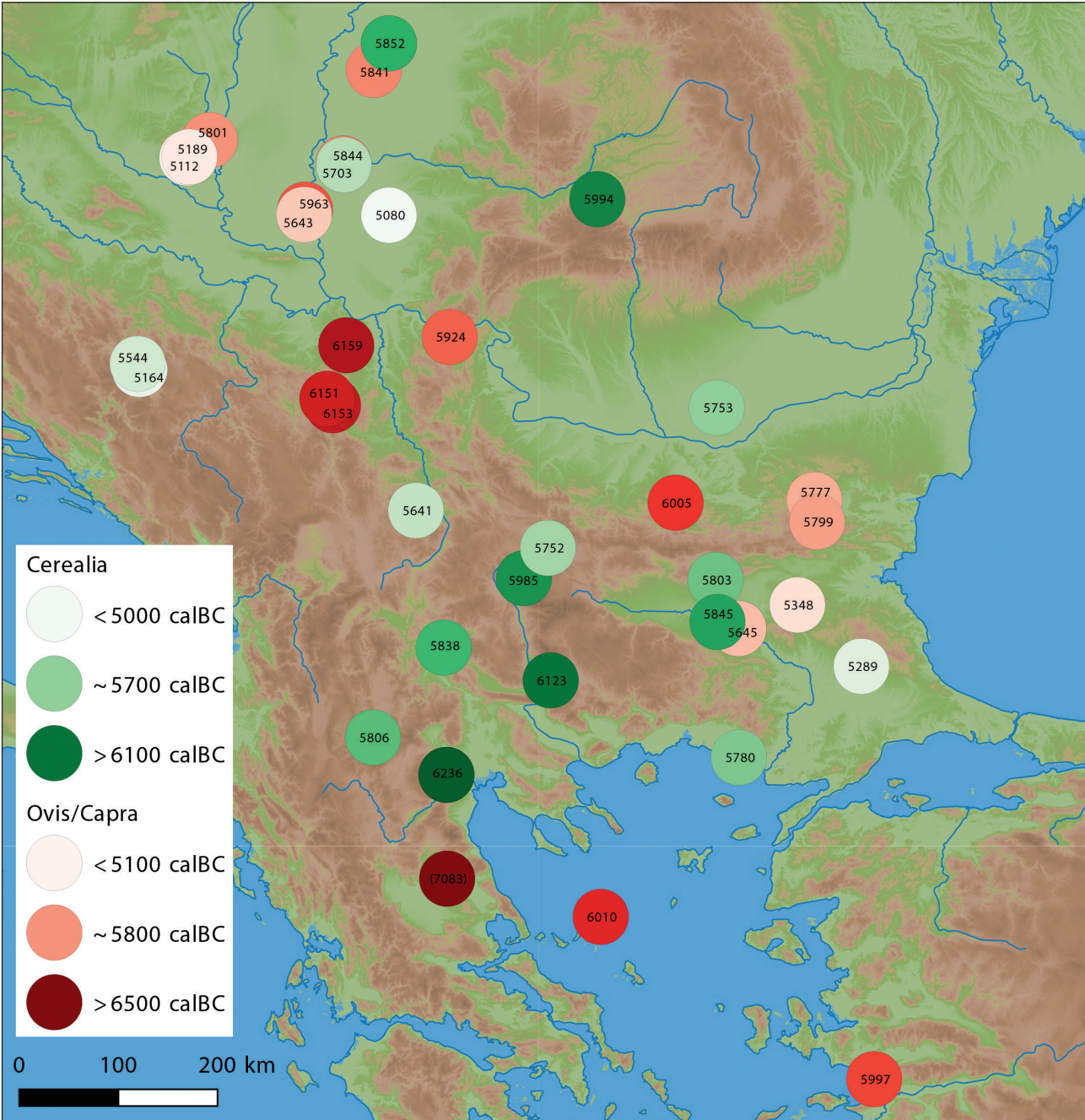


Fig. 198: Mapping of earliest calibrated radiocarbon dates on cereal grains and ovicaprid bones in South-east Europe (R. Krauß, datalist in Tab. 5 and 6).

the eastern and western coasts of the Aegean might, in turn, be observed (Fig. 200). Neolithic settlement begins at Ulucak and Çukuriçi during the 67th century calBC (WENINGER et al. 2014, 19–20). The sequence of dates from the sites of Paliambela-Kolindros and Mavropigi-Filotsairi start only a little later (KARAMITROU-MENTESSIDI et al. 2013); there, an onset of the Neolithic settlement from 6600 calBC onwards may be assumed. It seems as if the Mesolithic settlement would have ended come the advent of the Neolithic; thus,

Neolithic deposits may be identified c. 6600 calBC at all sites with late Mesolithic levels, including those at Theopetra, in the Cyclops Cave, at Sidari, and at Konispol. With the coming of the 8.2 ka event around 6200 calBC, the Early Neolithic sites in Zone 1 multiplied. Interestingly, their number markedly decreases following the subsiding of the climatic oscillations around 6200 calBC. This decrease is possibly connected with the beginning of the Neolithic settlement in the neighbouring regions to the north. This notion might at

Zone	Site	Labcode	¹⁴ C Age BP	STD	Material	Species	Source	Mean_2sigma calBC
Zone 1	Achilleion	LJ-3180	7750	60	charcoal		CalPal	6574.5
Zone 1	Agios Petros	BM-2020	6400	80			CalPal	5367
Zone 1	Argissa	UCLA-1657 D	7990	95	bone		CalPal	6908.5
Zone 1	Asfaka	I-1959	7380	240			CalPal	6251.5
Zone 1	Avgi Kastoria	GrN-28445	6660	40			CalPal	5568
Zone 1	Axos, Pella	DEM-668	7589	112			CalPal	6453
Zone 1	Çukuriçi Höyük	Erl-14514	7900	74	bone	<i>Sus</i>	CalPal	6821.5
Zone 1	Dimitra	Bln-3189	7470	60			CalPal	6334.5
Zone 1	Dispilio	Ly-6021	6850	35	seed/fruit		CalPal	5744
Zone 1	Ege Gübre	Beta-215599	7290	50	bone		CalPal	6135.5
Zone 1	Elateia	GrN-2973	7480	70	charcoal		CalPal	6286.5
Zone 1	Giannitsa B	DEM-961	7528	65			CalPal	6355
Zone 1	Grammi, Apsalos Aridaia	DEM-1320	7092	25	charcoal		CalPal	5961
Zone 1	Imvrou Pigadi Phthiotis	DEM-1434	6962	25			CalPal	5857.5
Zone 1	Konispol	Beta-56415	7060	110	charcoal		CalPal	5968
Zone 1	Lefkopetra	DEM-1428	7752	40			CalPal	6562.5
Zone 1	Limenaria, Thasos	DEM-566	6577	70	charcoal		CalPal	5505
Zone 1	Makrychori, Larissa	DEM-2158	6417	30	charcoal		CalPal	5398.5
Zone 1	Mavropigi-Filotsair	DEM-1685	7858	60			CalPal	6803
Zone 1	Megali Toumba Agiou Dimitriou	Beta-48508	6150	90	charcoal		CalPal	5077
Zone 1	Megalo Nisi Galanis	DEM-1341	6719	30	charcoal		CalPal	5638
Zone 1	Nea Nikomedeia	P-1202	7557	91	charcoal		CalPal	6413
Zone 1	Orfeas Cave, Alistrati	DEM-1999	7640	30			CalPal	6499
Zone 1	Otzaki Magoula	H-905/3284	7100	90	charcoal		CalPal	5983
Zone 1	Paliambela-Kolindros	DEM-2460	7700	30			CalPal	6530
Zone 1	Plastiras Lake	OxA-18194	7040	34	charcoal		CalPal	5917
Zone 1	Platia Magoula Zarkou	DEM-163	7083	44	charcoal		CalPal	5953
Zone 1	Porta, Ksirolimni Kozani	DEM-1294	7261	28	charcoal		CalPal	6142.5
Zone 1	Prodromos	DEM-2110	6449	35	charcoal		CalPal	5405.5
Zone 1	Revenia Korinos	MAMS-23036	7505	25	bone	<i>Homo</i>	CalPal	6345.5
Zone 1	Servia	BM-1157	6905	87	charcoal		CalPal	5809.5
Zone 1	Sesklo	P-1681	7755	97	charcoal		CalPal	6725
Zone 1	Sidari	GX-771	7670	120	charcoal		CalPal	6570
Zone 1	Stavroupoli, Thessaloniki	DEM-1084	6891	60	charcoal		CalPal	5814
Zone 1	Sykeon	Ly-6468	6990	40	charcoal		CalPal	5868.5
Zone 1	Theopetra Cave	DEM-360	7995	73	charcoal		CalPal	6864
Zone 1	Toumba Kremastis Koiladas	DEM-1188	6469	20	charcoal		CalPal	5427.5
Zone 1	Ulucak	Beta-345837	7990	40	bone		CalPal	6876
Zone 1	Varemenoi-Goulon	DEM-1336	7503	35			CalPal	6342.5
Zone 1	Vrysi, Pontokomi	DEM-1156	7247	23			CalPal	6125.5
Zone 1	Yeşilova	KN-5811	7505	30	charcoal		CalPal	6344.5
Zone 2	Aktopraklık	OxA-20596	7444	37	bone	<i>Homo</i>	CalPal	6319.5
Zone 2	Barcın Höyük	GrA-52848	7750	40	charcoal		CalPal	6561.5
Zone 2	Hoca Çeşme	Bln-4609	7637	43	charcoal		CalPal	6506
Zone 2	Ilıpınar	GrN-19351	7195	40	charcoal		CalPal	6101
Zone 2	Menteşe	GrN-25819	7550	50	charcoal		CalPal	6363
Zone 2	Mikro Vouni	DEM-505	6657	37	charcoal		CalPal	5560.5

Tab. 7: Selected single radiocarbon date for the beginning of the Neolithic per site (cf. Fig. 199).

Zone	Site	Labcode	¹⁴ C Age BP	STD	Material	Species	Source	Mean_2sigma calBC
Zone 2	Toptepe	GrN-16476	6290	25	charcoal		CalPal	5263.5
Zone 2	Uğurlu	Beta-448093	7890	30	charred material		CalPal	6834.5
Zone 2	Yarımburgaz	GrN-15533	7640	90	charcoal		CalPal	6455
Zone 2	Yenikapı	ISGS-A2107	7080	20	twig		CalPal	5958.5
Zone 3	Anzabegovo	LJ-2519	7560	70	charcoal		CalPal	6404
Zone 3	Balgarchevo	BlN-2614	6100	50	charcoal		CalPal	5030.5
Zone 3	Čuka	Z-494	7680	160	charcoal		CalPal	6634.5
Zone 3	Dikili Tash	Ly-5018	7655	45	charcoal		CalPal	6512.5
Zone 3	Galabnik	BlN-4096	7140	80	wood		CalPal	6031.5
Zone 3	Govrlevo	Poz-82188	6960	50	bone	<i>Homo</i>	CalPal	5855.5
Zone 3	Kovachevo	OxA-20246	7245	36	seed/fruit	<i>Triticum</i> sp.	CalPal	6123.5
Zone 3	Kremenik	BlN-2555	6840	60	charcoal		CalPal	5752
Zone 3	Promachon-Topolnitsa	BlN-3381	6270	60	charcoal		CalPal	5210.5
Zone 3	Sitagroi	BlN-885	7980	150	charcoal		CalPal	6916.5
Zone 3	Veluška	Tx-1785	6950	120	wood		CalPal	5842.5
Zone 3	Vršnik-Tarinci	BlN-339	6950	100	seed/fruit	<i>Triticum dicoccum/ monococcum</i>	CalPal	5838.5
Zone 4	Aşağı Pınar	BlN-4996	6909	48	seed/fruit		CalPal	5820.5
Zone 4	Azmak	BlN-293	7303	150	charcoal	<i>Quercus</i>	CalPal	6172
Zone 4	Chavdar	BlN-1583	7208	52	charcoal		CalPal	6104
Zone 4	Dobrinishte	BlN-3785	6650	60	charcoal		CalPal	5571
Zone 4	Drama-Gerena	Erl-12312	6474	48	bone	<i>Bos</i>	CalPal	5424.5
Zone 4	Eleshnitsa	BlN-3238	7010	60	charcoal		CalPal	5870.5
Zone 4	Jassatepe	BlN-338	6080	80	charcoal	<i>Quercus</i>	CalPal	5005
Zone 4	Karanovo	BlN-4179	7130	70	charcoal		CalPal	6028.5
Zone 4	Kazanlak	BlN-729	6330	100	charcoal		CalPal	5262
Zone 4	Krepost	OxA-31444	6760	33	bone	<i>Homo</i>	CalPal	5673
Zone 4	Krovili	OxA-14353	6980	65	charcoal		CalPal	5859.5
Zone 4	Lafrouda	OxA-14531	6397	36	charcoal		CalPal	5391.5
Zone 4	Makri	GrA-34389	7320	100	charcoal		CalPal	6206
Zone 4	Nova Nadezhda	SUERC-53068	6979	33	bone		CalPal	5866
Zone 4	Slatina	BlN-3504	6970	60	charcoal		CalPal	5857.5
Zone 4	Stara Zagora County Hospital	BlN-1587	7139	65	charcoal		CalPal	6031
Zone 4	Stara Zagora Hlebozavoda	BlN-2512	7020	50	charcoal		CalPal	5893.5
Zone 4	Toumba Kokkinochoma, Proskinites	DEM-23	6368	63	charcoal		CalPal	5346
Zone 4	Yabalkovo	OxA-20173	7040	32	bone	<i>Homo</i>	CalPal	5916.5
Zone 5	Ajmana	AA-58322	7219	51	bone	<i>Homo</i>	CalPal	6107.5
Zone 5	Alibeg	BlN-1193	7195	100	charcoal		CalPal	6089
Zone 5	Anište-Bresnica	BRAMS-2331	7306	28	bone	<i>Ovis/Capra</i>	PORČIĆ et al. 2020	6153.5
Zone 5	Bakovača-Ostra	BRAMS-2329	7299	27	bone	<i>Ovis/Capra</i>	PORČIĆ et al. 2020	6151.5
Zone 5	Banya	BlN-873	7048	100			CalPal	5901.5
Zone 5	Bataševo	BRAMS-2227	7331	27	bone	<i>Ovis aries</i>	PORČIĆ et al. 2020	6159
Zone 5	Belovode	OxA-14684	6354	36	bone	<i>Bos</i>	CalPal	5343.5
Zone 5	Beran-krš	Z-491	6030	60	charcoal		CalPal	4967.5

Tab. 7 continued.

Zone	Site	Labcode	¹⁴ C Age BP	STD	Material	Species	Source	Mean_2sigma calBC
Zone 5	Blagotin	OxA-8608	7480	55			CalPal	6335
Zone 5	Crnoklište	BRAMS-2290	7293	29	bone	<i>Bos taurus</i>	PORČIĆ et al. 2020	6150.5
Zone 5	Divostin	BlN-899	7200	100			CalPal	6091.5
Zone 5	Drenovac	BRAMS-2244	7309	28	bone	long bone <i>Mammalia</i>	PORČIĆ et al. 2020	6154.5
Zone 5	Golokut	OxA-10147	6590	50			CalPal	5549
Zone 5	Gomolava	Poz-82186	6520	40	bone	<i>Homo</i>	CalPal	5493
Zone 5	Gornja Tuzla	GrN-2059	6640	75	charcoal		CalPal	5593
Zone 5	Grivac	BlN-869	7250	100	charcoal		CalPal	6147
Zone 5	Jaričište 1	OxA-22284	6729	36	bone	<i>Homo</i>	CalPal	5641.5
Zone 5	Kudoš-Šašinci	OxA-8558	6770	60			CalPal	5671
Zone 5	Lazarev grad	BRAMS-2225	7225	28	bone	<i>Cervus elaphus</i>	PORČIĆ et al. 2020	6117
Zone 5	Lepenski Vir	OxA-2176-18	7285	45	bone	<i>Cervus elaphus</i>	CalPal	6147.5
Zone 5	Ludaš-Budžak	OxA-8554	6875	55			CalPal	5772
Zone 5	Magareći Mlin	GrN-15973	7130	60			CalPal	6025.5
Zone 5	Međureč	BRAMS-2251	7316	29	bone	<i>Bos taurus</i>	PORČIĆ et al. 2020	6155.5
Zone 5	Miokovci-Crkvine	BRAMS-2323	7366	29	bone	<i>Bos</i>	PORČIĆ et al. 2020	6225
Zone 5	Obre	UCLA-1605F	6430	60	charcoal		CalPal	5353
Zone 5	Okolište	KIA-32110-B	6351	48	bone	<i>Bos taurus</i>	CalPal	5343
Zone 5	Oreškovica-Selište	OxA-31571	6265	38	antler	<i>Cervus elaphus</i>	CalPal	5195.5
Zone 5	Ornice-Makrešani	BRAMS-2223	7335	31	bone	<i>Cervus elaphus</i>	PORČIĆ et al. 2020	6160
Zone 5	Padina	OxA-11103	7315	55			CalPal	6210
Zone 5	Petnica	OxA-14754	6091	37	bone		CalPal	5029
Zone 5	Pločnik	OxA-14691	6193	37	bone	<i>Mammal</i>	CalPal	5163
Zone 5	Porodin	KN-1596	7240	55	seed/fruit		CalPal	6120
Zone 5	Predionica	BlN-453	6279	80	charcoal		CalPal	5250
Zone 5	Pristina	BlN-435	6280	80	charcoal		CalPal	5251
Zone 5	Rudna Glava	OxA-14623	7198	36	bone	<i>Cervus elaphus</i>	CalPal	6101.5
Zone 5	Rudnik Kosovski	BRAMS-2413	7343	27	bone	<i>Homo</i>	PORČIĆ et al. 2020	6162.5
Zone 5	Selevac	Z-233	6366	100	seed/fruit		CalPal	5292
Zone 5	Selište-Sinjac	BRAMS-2303	7300	30	bone	<i>Bos taurus</i>	PORČIĆ et al. 2020	6152
Zone 5	Sremski Karlovci	BRAMS-2423	7233	28	bone	<i>Homo</i>	PORČIĆ et al. 2020	6119.5
Zone 5	Svinjarička Čuka	MAMS-34885	7857	32	charcoal		CalPal	6710.5
Zone 5	Topole-Bač	OxA-8693	7170	50	bone	<i>Homo</i>	CalPal	6066.5
Zone 5	Vinča-Belo Brdo	OxA-28638	6757	34	bone	<i>Homo</i>	CalPal	5673
Zone 5	Vinogradi-Bečej	OxA-8565	7120	55	bone	<i>Ovis/Capra</i>	CalPal	5963.5
Zone 5	Zagrebnice	KIA-45627	6565	30	seed/fruit	<i>Triticum dicoccum</i>	CalPal	5544.5
Zone 5	Zmajevac	BRAMS-2264	7328	27	bone	<i>Bos taurus</i>	PORČIĆ et al. 2020	6159
Zone 6	Brankovtsi	Poz-120640	6410	40	charcoal	<i>Cornus</i> sp.	this study	5394.5
Zone 6	Ćircea	OxA-17818	6894	37			CalPal	5780.5
Zone 6	Cuina Turcului	OxA-19205	7650	36	bone	<i>Homo</i>	CalPal	6510

Tab. 7 continued.

Zone	Site	Labcode	¹⁴ C Age BP	STD	Material	Species	Source	Mean_2sigma calBC
Zone 6	Dzhulyunitsa	OxA-24937	7588	37	bone	<i>Sus</i>	CalPal	6446
Zone 6	Farcasu de Sus	Bln-2285	6080	60			CalPal	5025
Zone 6	Hotnitsa-Orlovka	KN-5769	6370	40	charcoal		Cologne database	5346.5
Zone 6	Icoana	Bln-1056	7445	80	charcoal		CalPal	6265.5
Zone 6	Kachitsa	Bln-1686	6190	50	charcoal		CalPal	5150
Zone 6	Koprivets	Poz-63237	7090	80	bone	<i>Bos</i>	CalPal	5920.5
Zone 6	Liubcova	Bln-2133	6175	85	charcoal		CalPal	5084.5
Zone 6	Măgura Buduiasca	PSUAMS-2334	7140	25	bone	<i>Homo</i>	CalPal	5996.5
Zone 6	Ohoden	Poz-81112	7060	50	bone	<i>Homo</i>	CalPal	5931
Zone 6	Ovcharovo-Gorata	Poz-18480	6900	40	bone	<i>Bos</i>	CalPal	5801
Zone 6	Polyanitsa-Platoto	Bln-1571	7535	80	pottery		CalPal	6399
Zone 6	Provadiya	SUERC-31399	6560	35	bone	<i>Bos</i>	CalPal	5544
Zone 6	Samovodene	KIA-42165	6635	30	bone	<i>Bos</i>	CalPal	5554.5
Zone 6	Tash Bair	Poz-120370	6170	40	bone	<i>Cervus elaphus</i>	this study	5107
Zone 6	Vâlcea Copăcelu	KN-1102	6480	75			CalPal	5462
Zone 6	Varbitsa	Poz-108842	6895	35	bone	<i>Ovis/Capra</i>	this study	5799
Zone 7	Alsónyék	OxA-X-2583-19	6906	34	bone	<i>Sus scrofa</i>	CalPal	5802
Zone 7	Balatonszárszó	OxA-13655	6339	32	bone	<i>Bos</i>	CalPal	5338.5
Zone 7	Bátaszék-Lajvérpuszta	Poz-82584	6115	35	bone	<i>Homo</i>	CalPal	5075
Zone 7	Becsehely I-Bükkaljai-dűlő	VERA-3081	6185	30			CalPal	5156.5
Zone 7	Budakeszi	MAMS-14140	6171	25	bone	<i>Homo</i>	CalPal	5125
Zone 7	Enese elkerülő	Beta-310035	6040	30	bone	<i>Homo</i>	CalPal	4934
Zone 7	Enese M85	Beta-31035	6040	40	bone	<i>Homo</i>	CalPal	4923
Zone 7	Esztergályhorváti	OxA-6367	6040	55	bone	<i>Homo</i>	CalPal	4997
Zone 7	Kustánszeg-Lisztessarok	Bln-1203	6120	100			CalPal	5051
Zone 7	Nitra	OxA-24095	6298	33	bone	<i>Homo</i>	CalPal	5284.5
Zone 7	Petrivente-Újkúti-dűlő	Deb-8713	6250	50			CalPal	5186
Zone 7	Pityerdomb	VERA-218	6610	40	charcoal	<i>Cornus</i>	CalPal	5550.5
Zone 7	Štúrovo	Bln-559	6260	100	charcoal	<i>Quercus</i>	CalPal	5215.5
Zone 7	Szederkény	SUERC-48423	6366	34	bone	<i>Homo</i>	CalPal	5345.5
Zone 7	Szemely-Hegyes	Beta-310041	6140	30	bone	<i>Homo</i>	CalPal	5103.5
Zone 7	Tolna-Mözs	MAMS-14145	6233	23	bone	<i>Homo</i>	CalPal	5184.5
Zone 7	Versend-Gilencsa	SUERC-58578	6399	31	bone	<i>Bos</i>	CalPal	5392.5
Zone 7	Vráble	Poz-90168	7030	50	seed/fruit		CalPal	5902
Zone 7	Zalavár	Bln-87	6180	100	organic temper		CalPal	5102
Zone 8	Battonya-Basarága	BM-1862R	6710	110	charcoal		CalPal	5629
Zone 8	Berettyóújfalu-Morotva-Liget	OxA-28101	6726	35	bone	<i>Homo</i>	CalPal	5640.5
Zone 8	Nosa-Biserna Obala	OxA-6875	6875	55			CalPal	5772
Zone 8	Bucova Pusta IV	Poz-58612	6940	40	charcoal		CalPal	5848.5
Zone 8	Debrecen Tocopart	OxA-27858	6207	30	bone	<i>Homo</i>	CalPal	5172.5
Zone 8	Deszk-Olajkút	OxA-9396	7030	50			CalPal	5902
Zone 8	Déványa-Katalszeg	Bln-86	6370	100	organic temper		CalPal	5294
Zone 8	Déványa-Réhelyi gát	Bln-1379	6640	60	charcoal		CalPal	5567.5
Zone 8	Donja Branjevina	GrN-15974	7155	50	bone		CalPal	6055.5
Zone 8	Ecsegfalva 23	OxA-9329	6950	45	bone	<i>Ovis/Capra</i>	CalPal	5852.5
Zone 8	Endrőd 119	OxA-9587	6915	45	bone	<i>Ovis</i>	CalPal	5841.5
Zone 8	Endrőd 35	Bln-1940	6615	60			CalPal	5557

Tab. 7 continued.

Zone	Site	Labcode	¹⁴ C Age BP	STD	Material	Species	Source	Mean_2sigma calBC
Zone 8	Endrőd 39	BM-1868R	6970	110	charcoal		CalPal	5859
Zone 8	Endrőd 6	OxA-1058	6680	100	charcoal		CalPal	5593.5
Zone 8	Esztar	Bln-2580	6340	60			CalPal	5342.5
Zone 8	Fajsz-Garadomb	Poz-83633	6060	40	bone	<i>Homo</i>	CalPal	5022
Zone 8	Fintice, Košariská I	DSH-4410	6292	53	bone		CalPal	5222
Zone 8	Foeni Gaz	GrA-25621	6925	45	bone		CalPal	5844.5
Zone 8	Foeni Sălaș	GrN-28455	7510	60	bone	<i>Bos primigenius</i>	CalPal	6348.5
Zone 8	Füzesabony-Gubakút	Deb-5906	6600	55	bone		CalPal	5551
Zone 8	Füzesabony-Szikszói-Berek	Deb-5959	6525	75	bone		CalPal	5476
Zone 8	Garadna	OxA-27732	6185	34	bone	<i>Homo</i>	CalPal	5150.5
Zone 8	Giulvăz	GrN-28456	6720	80	bone	<i>Cervus elaphus</i>	CalPal	5610.5
Zone 8	Gorzsa	Deb-1202	6050	60			CalPal	5000
Zone 8	Gospodinci	BRAMS-2367	7169	28	bone	long bone <i>Mammalia</i>	PORČIĆ et al. 2020	6030.5
Zone 8	Gura Baciului	GrA-24137	7140	45	bone		CalPal	5995.5
Zone 8	Gyálarét-Szilágyi	Bln-75	7090	100	organic temper		CalPal	5977
Zone 8	Hajdúnánás-Eszlári út	Poz-83631	6220	40	bone	<i>Homo</i>	CalPal	5175.5
Zone 8	Hejőkürt-Lidl logisztikai központ	Poz-88115	6100	40	bone	<i>Homo</i>	CalPal	5032
Zone 8	Hódmezővásárhely-Kotacpart	Bln-115	6450	100	pottery		CalPal	5416
Zone 8	Ibrány-Nagyerdő	Poz-28216	6630	40	bone	fish	CalPal	5553.5
Zone 8	Kečovo, Dmica	GrN-2435	6080	75	charcoal		CalPal	5006
Zone 8	Kökénydomb	Deb-1263	6190	60			CalPal	5149
Zone 8	Kompolt-Kígyósér	Deb-5352	6285	105	bone		CalPal	5238.5
Zone 8	Korlat	Bln-119	6440	100	pottery		CalPal	5414.5
Zone 8	Košice, Galgovec	VERA-748	6310	40	charcoal		CalPal	5291
Zone 8	Košice-Červený Rak	Poz-22131	6520	50	organic temper		CalPal	5493.5
Zone 8	Kötelek	VERA-3478	6780	35			CalPal	5677.5
Zone 8	Limba Bordane	GrN-28457	6580	60	bone	<i>Bos</i>	CalPal	5509
Zone 8	Lumea Nouă	Poz-19379	7420	50			CalPal	6256.5
Zone 8	Maroslele-Pana	OxA-9403	7765	55	bone	<i>Homo</i>	CalPal	6579.5
Zone 8	Méhtelek-Nádas	Bln-1331	6835	60	charcoal		CalPal	5734
Zone 8	Mezőszemere-Kismari-Fenék	Deb-5879	6310	80	bone		CalPal	5266.5
Zone 8	Miercurea Sibiului	OxA-19739	7131	34	seed/fruit	<i>Hordeum</i>	CalPal	5994
Zone 8	Mostonga III	GrA-24117	6750	50	bone	<i>Cervus elaphus</i>	CalPal	5648
Zone 8	Movila lui Deciov	GrN-28111	6990	50	bone	<i>Cervus elaphus</i>	CalPal	5865
Zone 8	Nagykörű-Tsz Gyümölcsös	VERA-3476	7065	35	bone		CalPal	5933
Zone 8	Ocna Sibiului	GrN-28110	7120	60	bone	<i>Bos</i>	CalPal	5962.5
Zone 8	Öcsöd-Kováshalom	Deb-1710	6240	60			CalPal	5170.5
Zone 8	Ószentiván VIII	Bln-479	6460	80	charcoal	<i>Quercus</i>	CalPal	5418
Zone 8	Pața	Lv-2145	6560	140	charcoal		CalPal	5474.5
Zone 8	Pața Tell II	GrN-28460	6860	60	bone	<i>Cervus elaphus</i>	CalPal	5758.5
Zone 8	Pestera La Hotu	Sac-2001	6710	80			CalPal	5606.5
Zone 8	Pitvaros-Vízártározó	OxA-9336	7060	45	charcoal		CalPal	5931
Zone 8	Polgár Ferenci hát	OxA-27861	6237	32	bone	<i>Homo</i>	CalPal	5185
Zone 8	Polgár-Csőszhalom	Deb-1772	6300	40	charcoal		CalPal	5253

Tab. 7 continued.

Zone	Site	Labcode	¹⁴ C Age BP	STD	Material	Species	Source	Mean_2sigma calBC
Zone 8	Ribnjak-Bečej	OxA-8564	6750	65	bone	<i>Ovis/Capra</i>	CalPal	5643.5
Zone 8	Röszke-Lúdvár	Deb-2730	6972	59	bone		CalPal	5858
Zone 8	Sajan-Dombos	OxA-8566	6815	55			CalPal	5726.5
Zone 8	Šarišské Michaľany, Fedelemka	VERA-768	6210	50	charcoal	<i>Quercus</i>	CalPal	5160
Zone 8	Satchinez	Deb-2579	6270	40	charcoal		CalPal	5197
Zone 8	Şeuşa-La Cărarea Morii	GrN-28114	7070	60	bone	<i>Bos</i>	CalPal	5935
Zone 8	Starčevo	GrN-6628	7615	50			CalPal	6492
Zone 8	Stráne pod Tatrami, Pod Kamenným vrchom	VERA-1821	6415	35	charcoal	<i>Quercus</i>	CalPal	5397.5
Zone 8	Szajol-Felsőföld	Deb-473	7100	230	bone	<i>Homo</i>	CalPal	5998.5
Zone 8	Szamossályi	BlN-404	6136	100	charcoal	<i>Fraxinus</i>	CalPal	5056
Zone 8	Szarvas 23	OxA-9375	6855	55	bone	<i>Homo</i>	CalPal	5756
Zone 8	Szarvas 56	OxA-1059	7900	120	charcoal		CalPal	6775
Zone 8	Szentpéterszeg-Körtvélyes	BlN-2578	6800	60	charcoal		CalPal	5698.5
Zone 8	Szolnok- Szanda	BlN-1938	7005	80	charcoal		CalPal	5874.5
Zone 8	Tape-Lebö-A	Deb-1643	6370	60	charcoal		CalPal	5346
Zone 8	Tarnabod	BlN-123	6280	100	pottery	organic temper	CalPal	5237.5
Zone 8	Tarnaszadany	BlN-676	6155	80	pottery	organic temper	CalPal	5078.5
Zone 8	Tărtăria-Gura Luncii	R-1631	6310	65			CalPal	5270
Zone 8	Tiszadob Ókenéz	Poz-83630	6110	40	bone	<i>Homo</i>	CalPal	5072.5
Zone 8	Tiszasziget	BlN-1631	6285	60			CalPal	5259
Zone 8	Tiszaszőlős-Domaháza	Deb-11890	6920	50	bone		CalPal	5844
Zone 8	Tiszavasvári	BlN-505	6305	100	charcoal	<i>Ulmus</i>	CalPal	5253.5
Zone 8	Tűzköves	Deb-1254	6210	60			CalPal	5157.5
Zone 8	Vésztő-Mágor	BlN-1628	6250	60			CalPal	5199
Zone 8	Vršac-At	OxA-8594	6615	70	bone	<i>Bos taurus</i>	CalPal	5538
Zone 8	Zau de Câmpie	Ly-8934	6230	55	charcoal		CalPal	5175.5
Zone 8	Zemplínske Kopčany	BlN-1785	6420	60			CalPal	5352
Zone 9	Babshin	Ki-6656	6200	55			CalPal	5153
Zone 9	Baz'kov Ostrov	KI-8166	7410	65	bone	animal	CalPal	6253
Zone 9	Bernashovka	Ki-6681	6510	55			CalPal	5489
Zone 9	Coţatcu	PSUAMS-1747	6755	30	bone	<i>Homo</i>	CalPal	5672
Zone 9	Dobryanka 3	KI-11105	7400	130	bone	animal	CalPal	6244.5
Zone 9	Gard 3	Ki-6655	6930	55			CalPal	5847
Zone 9	Girzevo	Le-1703	7050	60			CalPal	5922
Zone 9	Grebenyukuv yar	Ki-6155	6165	55			CalPal	5123
Zone 9	Isl. Surskoi	Ki-6691	7245	60			CalPal	6119
Zone 9	Mitkov Ostrov	KI-6695	7375	60	bone	animal	CalPal	6233
Zone 9	Okopi	Ki-6671	6330	65			CalPal	5278.5
Zone 9	Pechera	Ki-6693	7305	50			CalPal	6195.5
Zone 9	Pugach 2	Ki-6679	6560	60			CalPal	5502.5
Zone 9	Sabatinovka 2	Ki-6737	6100	55			CalPal	5030
Zone 9	Savran	Ki-6654	6985	60			CalPal	5862
Zone 9	Sokol'cy	Ki-6697	7470	60			CalPal	6334.5
Zone 9	Soroki	BlN-587	7420	80	charcoal	<i>Ulmus</i>	CalPal	6256.5
Zone 9	Târpeşti	BlN-801	6245	100			CalPal	5207.5
Zone 9	Tătărauca Nouă	KIA-3705b	6340	70	organic temper		CalPal	5279
Zone 9	Trestiana	GrN-17003	6665	45			CalPal	5572
Zone 9	Zamostye 2	GIN-7988	7200	90	bone		CalPal	6047

Tab. 7 continued.

Zone	Site	Labcode	¹⁴ C Age BP	STD	Material	Species	Source	Mean_2sigma calBC
Zone 1	Youra, Cyclops Cave	Beta-73	7060	80	bone	<i>Ovis/Capra</i>	CalPal	6574.5
Zone 1	Grava	OxA-3401	8840	85	bone		CalPal	5367
Zone 1	Konispol	Beta-79999	7410	80			CalPal	6107.5
Zone 1	Sidari	GXO-770	7770	340			CalPal	6319.5
Zone 1	Theopetra Cave	CAMS-21773	8070	60	bone	<i>Homo</i>	CalPal	6089
Zone 4	Demirköy	OxA-12489	9890	45	seed/fruit	<i>Lathyrus</i>	CalPal	5802
Zone 5	Ajmana	AA-58323	7065	48	bone	<i>Homo</i>	CalPal	6153.5
Zone 5	Alibeg	BlN-1193	7195	100	charcoal		CalPal	6404
Zone 5	Hajdučka Vodenica	AA-57773	6995	83	bone	<i>Homo</i>	CalPal	6908.5
Zone 5	Lepenski Vir	AA-58319	6605	56	bone	<i>Homo</i>	CalPal	5820.5
Zone 5	Odmut	SI-2223	6530	75	charcoal		CRISTIANI, BORIC 2016	6251.5
Zone 5	Padina	AA-57769	7078	85	bone	<i>Homo</i>	CalPal	5568
Zone 5	Vlasac	Z-264	6335	92	charcoal		CalPal	6453
Zone 6	Icoana	AA-65563	7245	62	bone	<i>Sus</i>	CalPal	6172
Zone 6	Măgura Buduiasca	PSUAMS-2334	7140	25	bone	<i>Homo</i>	CalPal	5153
Zone 6	Ohoden	Poz-82519	7650	50	bone	<i>Cervus elaphus</i>	this study	6151.5
Zone 6	Ostrovul Corbului	GrN-12675	7640	80	charcoal		CalPal	5338.5
Zone 6	Ostrovul Mare	AA-66379	7890	78	bone	<i>Sus</i>	CalPal	5030.5
Zone 6	Schela Cladovei	OxA-9358	6695	55	bone	animal	CalPal	5901.5
Zone 8	Jászberény I	Deb-3155	7154	62	soil		CalPal	6561.5
Zone 8	Lumea Nouă	Poz-19379	7420	50			CalPal	6159
Zone 9	Mirnoe	Le-1648	7200	80			CalPal	5075
Zone 8	Foeni Gaz	Poz-38230	7830	50	bone	<i>Bos</i>	KRAUSS, CIOBOTARU 2014	5629
Zone 8	Ecsefalva 23	OxA-12857	7944	44	bone	<i>Bos</i>	CalPal	6253
Zone 8	Maroslele-Pana	OxA-9403	7765	55	bone	<i>Homo</i>	CalPal	5156.5

Tab. 8: Selected single radiocarbon date for the end of the Mesolithic per site (see Fig. 197).

least be presumed, if the advent of Neolithic settlement in Zone 3 is considered.

First, however, an examination of Zone 2, the Marmara region, is necessary (Fig. 201). Unfortunately, no ¹⁴C dates are yet available for the supposed pre-Neolithic sites at the transition of the Bosphorus into the Black Sea. The data series from Uğurlu and Barcın Höyük indicate that a date at around 6600 calBC for the establishment here of the Neolithic might be assumed. In contrast to central western Anatolia, there is no significant break in settlement following the close of the 8.2 ka event, as the data series from sites such as Ilıpınar, Yarımburgaz, Menteşe, and Hoca Çeşme continue after this point.

As previously mentioned, the Neolithic settlement in Zone 3 immediately follows the break in the data series in Zone 1, and more precisely with the end of the 8.2 ka event (Fig. 202). Only a few earlier dates are known from Dikili Tash. Nevertheless, this site also lies closer to the coast, and

can also be ascribed to the Aegean zone with good reason, being less heavily affected by the climatic caprices during the 8.2 ka event. The data series of Anzabegovo, Kovachevo, and Galabnik beginning after 6200 calBC are significant for the expansion of the Neolithic along the river valleys of the Axios/Vardar and the Struma. The dates cluster once more after 6000 calBC, which might be attributed to an increase in the number of settlement sites. Radiocarbon dates from the period prior to the Neolithic occupation are also entirely lacking here, should one wish to avoid overvaluing the individual older data from Sitagroi and Čuka.

There are also no attestations for an occupation immediately preceding the Early Neolithic within Zone 4, the Thracian countryside (Fig. 203). The three dates from Demirköy in the Strandzha region belong to the early Holocene, and thus to a much earlier period. Tellingly, the Early Neolithic dates prior to 6000 calBC come exclusively from the site of Chavdar situated at the transition to Zone 4 on the plateau of



Fig. 199: Zoning for the evaluation of the radiocarbon dates in South-east Europe (R. Krauß).

Sofia, which immediately borders upon the drainage basin of the Struma River. The two earliest dates from the series from Karanovo should not be overestimated, as these comprise old conventional measurements on wood. The earliest date from Makri is conversely interesting, as this site lies on the Aegean, where continued settlement during the 8.2 ka event is not unusual. More striking is rather the swift introduction of the Neolithic settlement in the Thracian plain after 6000 calBC, that is, following the Neolithic occupation of not only the central Balkans, but also northern Bulgaria. It might accordingly be presumed that the neolithisation did not proceed from the Marmara region bordering to the south-east,

but rather from the Struma Valley or from northern Bulgaria. This observation based upon ceramic analysis would seem to be confirmed by the ¹⁴C dates.

Zone 5 encompasses the Serbian parts of the Danube Gorges (Fig. 204). Accordingly, the uninterrupted series of the Mesolithic sites such as Padina, Vlasac, Hajdučka Vodenica, and Lepenski Vir may be studied. Within this particular environment, a lifestyle focused particularly on fishing continues until well into the 6th millennium BCE. A similar phenomenon may be noted at Odmut in Montenegro (to name an example). Even if these merely comprise multiple individual dates from sites, an onset of Early

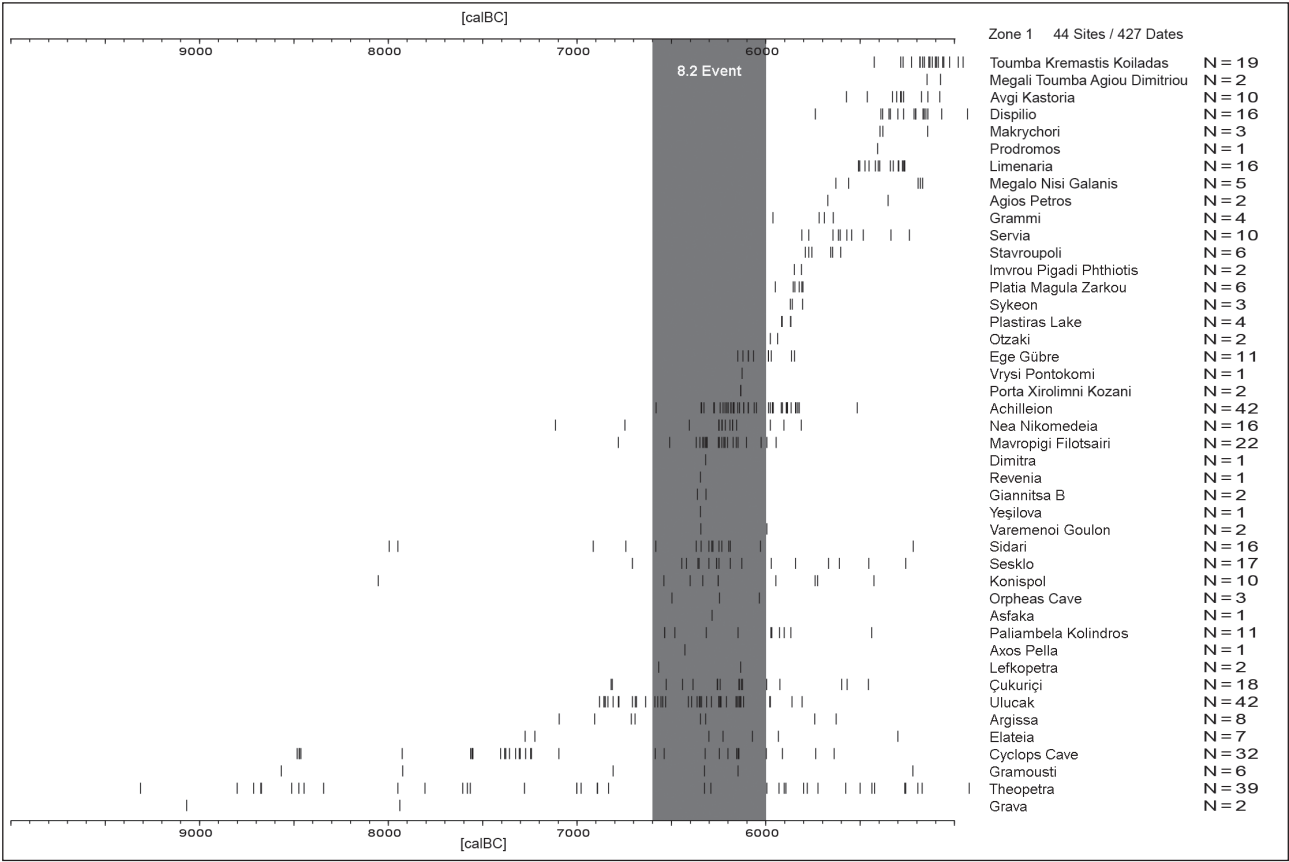


Fig. 200: CalPal barcode calibration of radiocarbon dates (CalPal database © Bernhard Weninger) of the sites in Zone 1 (northern Aegean, see Fig. 199) sorted by leading edge (P=40%).

Neolithic settlement can clearly be seen here immediately following the 8.2 ka event. Naturally, differences may also be discerned within this expansively delineated area additionally subdivided by high mountain chains. Accordingly, the earliest Neolithic dates from Bosnia and Croatia all fall after 6000 calBC.

Zone 6 (its neighbour to the east encompassing the lowlands of the Lower Danube) presents a highly comparable trajectory (Fig. 205). As an artificial boundary has been drawn along the Danube, the sites of the Romanian bank of the Danube Gorges fall within this area. Accordingly, we also witness here a continuous data series of the Mesolithic sites such as Icoana, Schela Cladovei, and Cuina Turcului. The series from Răzvrata, Ostrovul Banului, and Ostrovul Corbului end earlier. Beyond the zone of the Danube Gorges, three Mesolithic dates are first to be found at the site of Ohoden. The beginning of the Neolithic settlement in the region is also to be placed briefly after 6100 calBC according to the present author’s evaluation of the dates on the basis of the settlement stratigraphy of Dzhulyunitsa (KRAUSS et al. 2014). The two earliest dates from this site are to be viewed critically, much akin to the old measurements from organic

ceramic admixtures from Polyanitsa-Platoto. From 5700 calBC, a significant intensification of dates may be described, which is not only the product of a definitely real densification in occupation from this period onwards but is also based on the good state of research on these sites. The dates from this chronological and spatial context have already been discussed in depth in connection with the evaluation of excavations at Ovcharovo-Gorata (KRAUSS 2014, 280–294. – MARINOVA, KRAUSS 2014). Until the recent research at Măgura Buduiasca and Varbitsa, there was a lacuna in the dates between the Early and Late Neolithic; this may now be closed by means of good data series from these two sites. The dataset from Varbitsa is currently unpublished, and will be presented by Brandtstätter within his dissertation.

The two-stage development of the Neolithic in the regions south and north of the CEB AEB is described in the Early Neolithic data series of Zone 7, the western Carpathian Basin (Fig. 206). Hence, the data series from Alsónyék begins around 5800 calBC, followed by those from Pityerdomb. In the northern regions, the Neolithic starts with the LBK after 5500 calBC, and then displays a very swift intensification. The sudden increase in dates

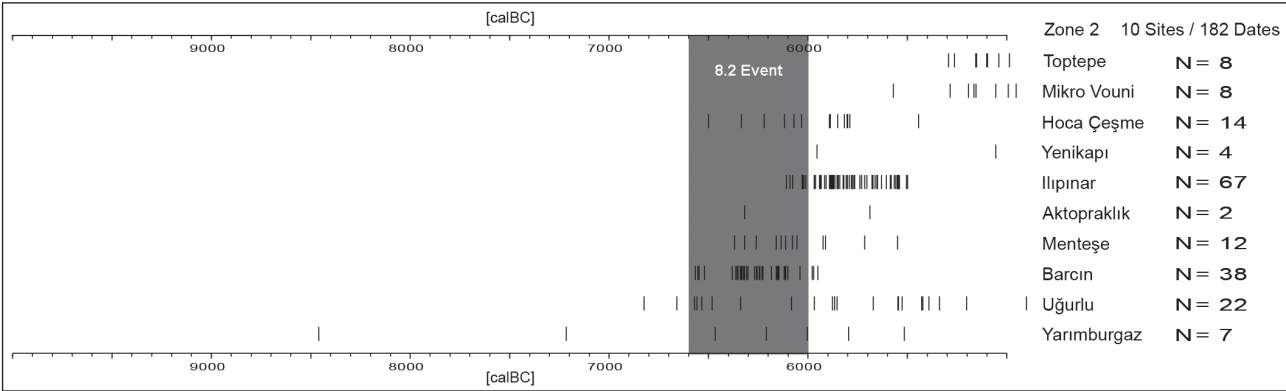


Fig. 201: CalPal barcode calibration of radiocarbon dates (CalPal database © Bernhard Weninger) of the sites in Zone 2 (Marmara region) sorted by leading edge (P=40%).

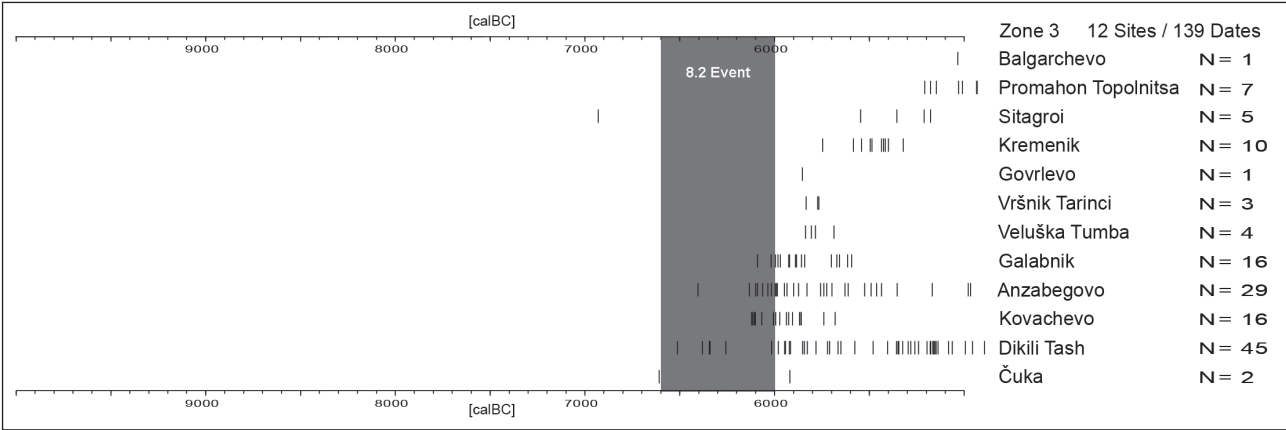


Fig. 202: CalPal barcode calibration of radiocarbon dates (CalPal database © Bernhard Weninger) of the sites in Zone 3 (Albania, North Macedonia and the Struma River Valley) sorted by leading edge (P=40%).

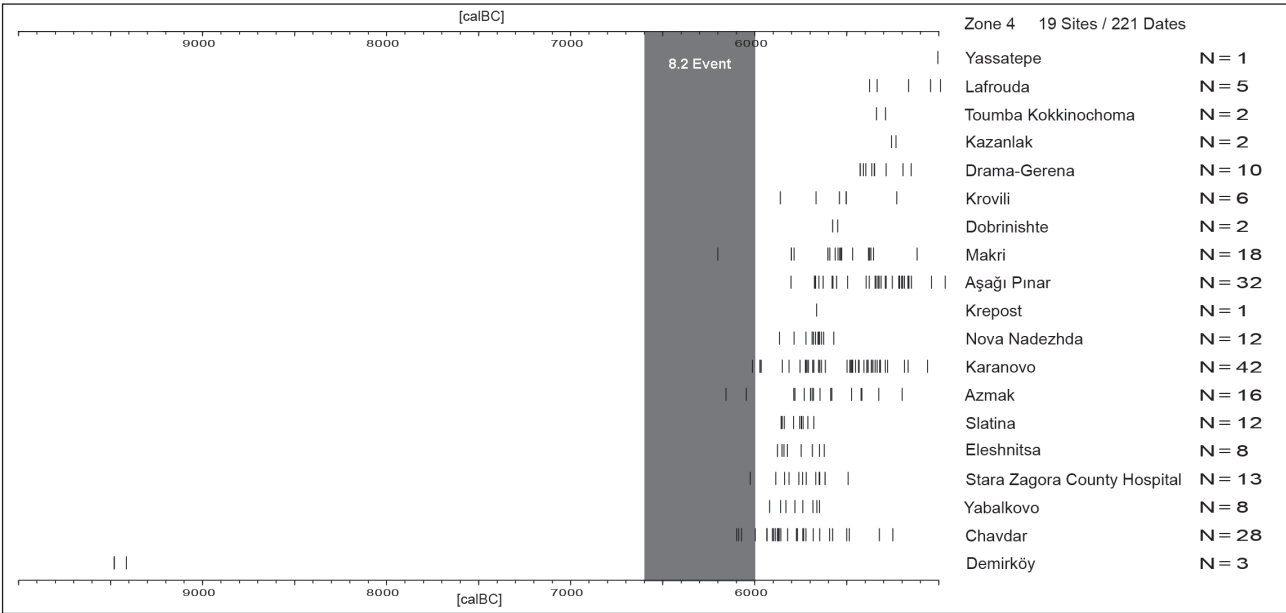


Fig. 203: CalPal barcode calibration of radiocarbon dates (CalPal database © Bernhard Weninger) of the sites in Zone 4 (Thrace) sorted by leading edge (P=40%).

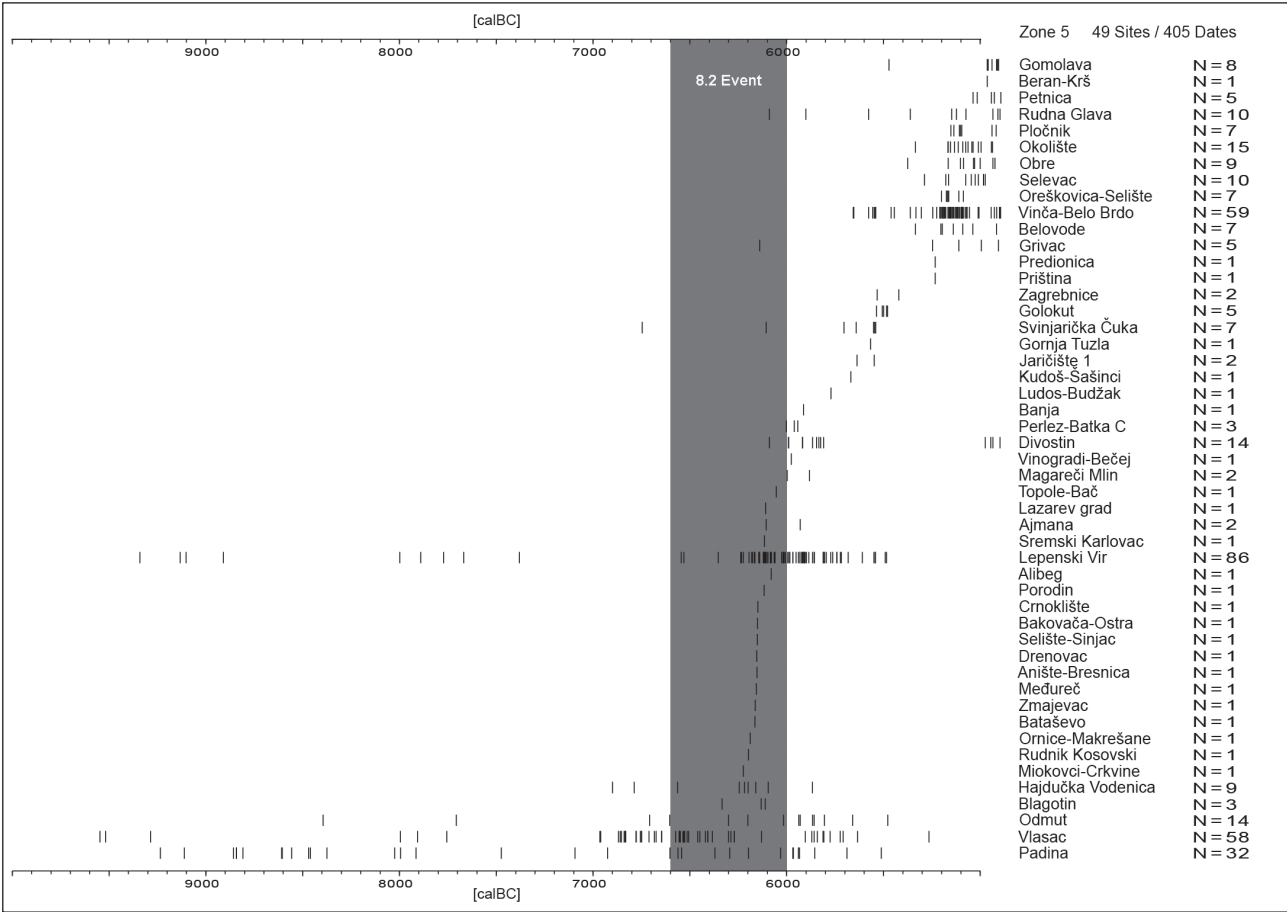


Fig. 204: CalPal barcode calibration of radiocarbon dates (CalPal database © Bernhard Weninger) of the sites in Zone 5 (southern and middle Serbia, Bosnia and Montenegro) sorted by leading edge (P=40%).

is remarkable. The cultural-historical processes for Transdanubia have been plausibly explained (BÁNFFY 2004, 317–352). Roughly at the elevation of the Balaton, the expansion of the Balkan Neolithic encounters a natural barrier, which might be termed more ecologically than topographically (SÜMEGI, KERTÉSZ 2001). After 5500 calBC, a volatile expansion of the Neolithic into the northern regions occurred with the emerging LBK; this might be explained for the most part by a population migration (HOFMANOVÁ et al. 2016). Unfortunately, no ¹⁴C dates currently exist for the pre-Neolithic settlement from this zone.

Despite this, individual dates from the Mesolithic exist from Zone 8, the eastern Carpathian Basin (Fig. 207), including the site of Jászberény I; these fall chronologically parallel with the Early Neolithic from the central Balkans bordering to the south. As previously mentioned, individual Mesolithic dates occur time and again within Early Neolithic contexts, the interpretation of which is accordingly difficult. The introduction of Neolithic settlement is to be expected from 6000 calBC onwards, initially

pertaining to the southern areas. A successive expansion northwards without any significant jumps in the data series may be established. This is a decisive difference to the trajectory of the dates within Zone 7. This dispersal took place, on the one hand, directly from the south up the course of the Tisza and, on the other hand, from Transylvania travelling downwards from the source of the Tisza (BOMBORÓCZKI, RACZKY 2010). The existing networks for supplying Neolithic communities with obsidian from the northern bend of the Carpathians served as the impetus for this; these were originally purely Mesolithic in character (KOZŁOWSKI, NOWAK 2010). The successive and, in contrast to the western Carpathian Basin, not erratic spread of the Neolithic could be a further indication that neolithisation within this zone did not primarily occur through the expansion of an agrarian population, but rather through cultural adoption of Neolithic innovations by the local Mesolithic populace.

The situation in the area defined as Zone 9 is once more fundamentally different (Fig. 208). Dates from its

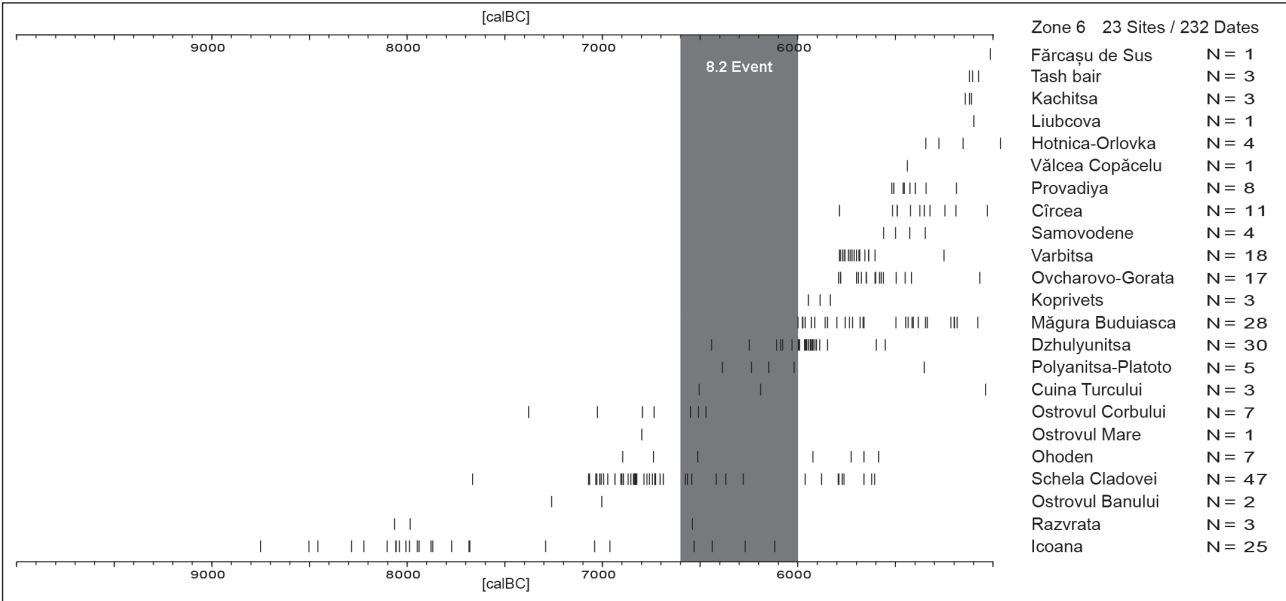


Fig. 205: CalPal barcode calibration of radiocarbon dates (CalPal database © Bernhard Weninger) of the sites in Zone 6 (Lower Danube) sorted by leading edge (P=40%).

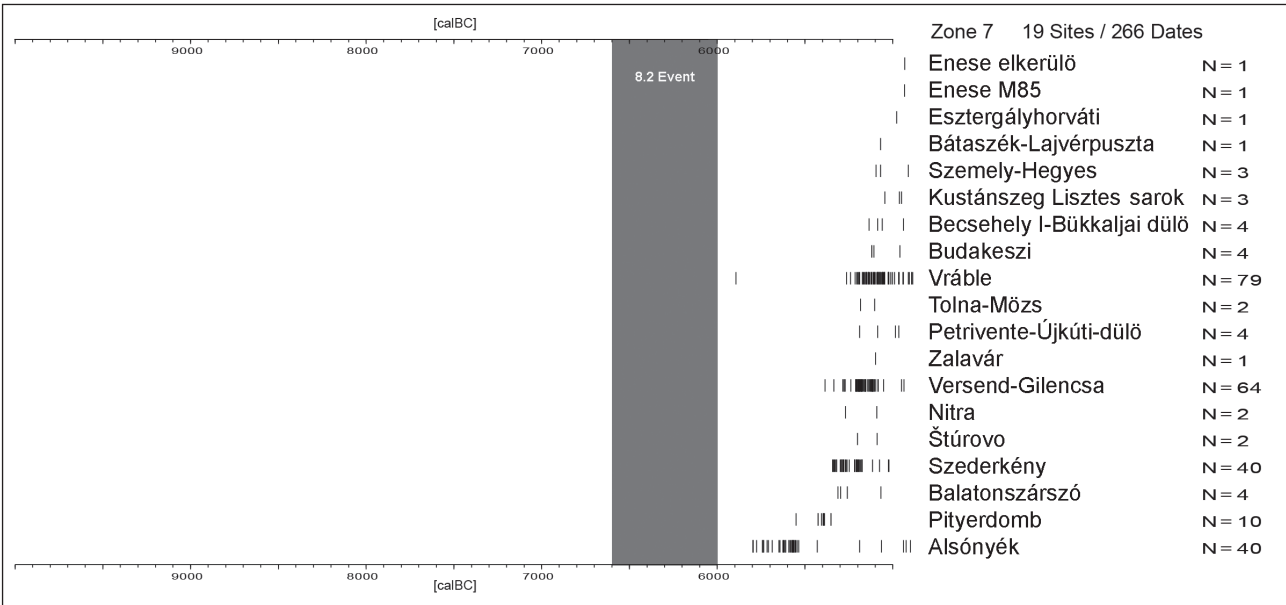


Fig. 206: CalPal barcode calibration of radiocarbon dates (CalPal database © Bernhard Weninger) of the sites in Zone 7 (western Carpathian Basin) sorted by leading edge (P=40%).

settlements already begin at the end of the 7th millennium BCE; these were demonstrably established by groups using and producing pottery. By means of contrast with the Mesolithic data series from Soroki and Mirnoe, those from settlements with pottery are strikingly brief. This is a decisive contrast to all other zones and a clear attestation for the settlements’ brief duration of occupation. The dates

constantly develop further and demonstrate no significant interruptions. Finally, the complete lack of dates from domesticated animal bones and carbonised grains is remarkable. This may well serve as independent evidence that this zone presents an economy that was set up fundamentally differently to that of the Neolithic regions bordering to the west and south.

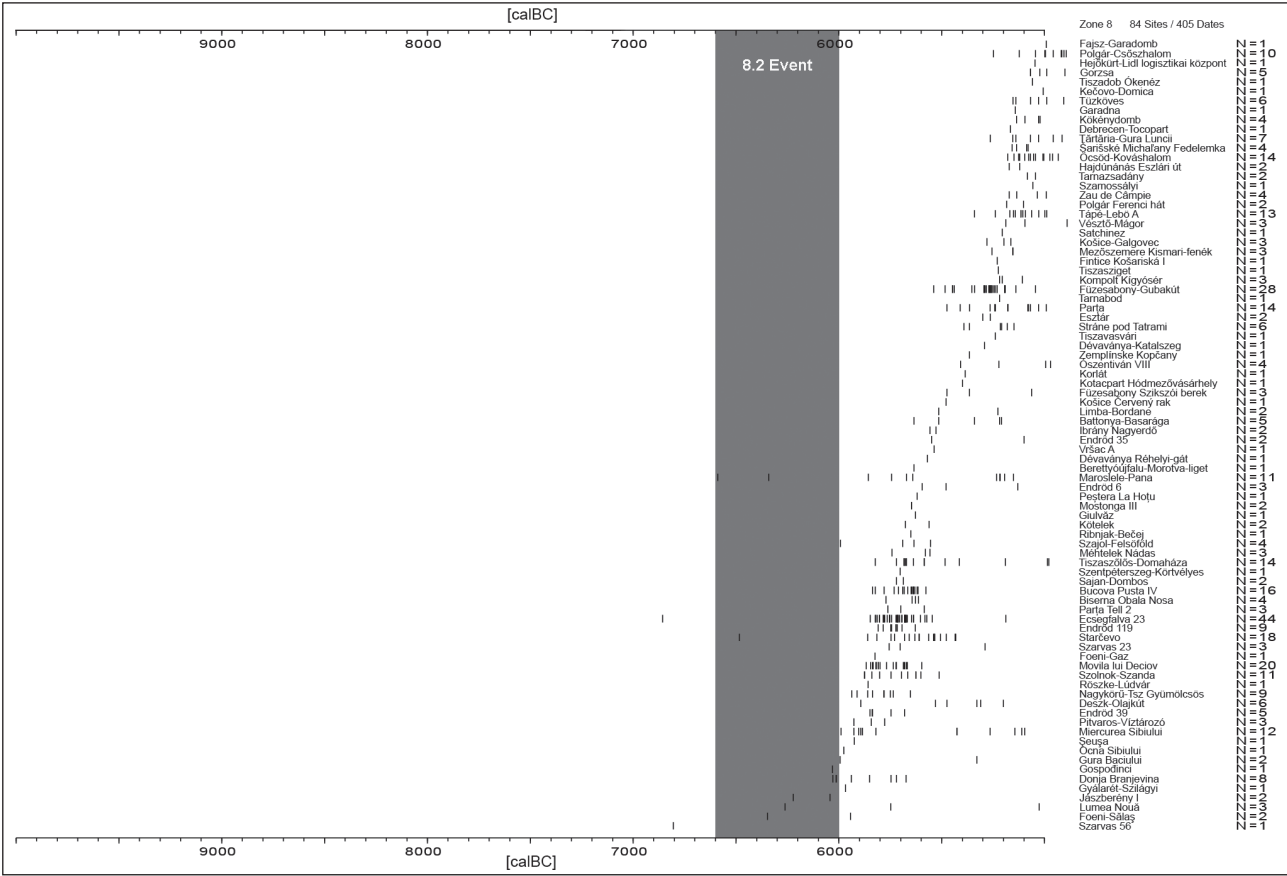


Fig. 207: CalPal barcode calibration of radiocarbon dates (CalPal database © Bernhard Weninger) of the sites in Zone 8 (eastern Carpathian Basin) sorted by leading edge (P=40%).

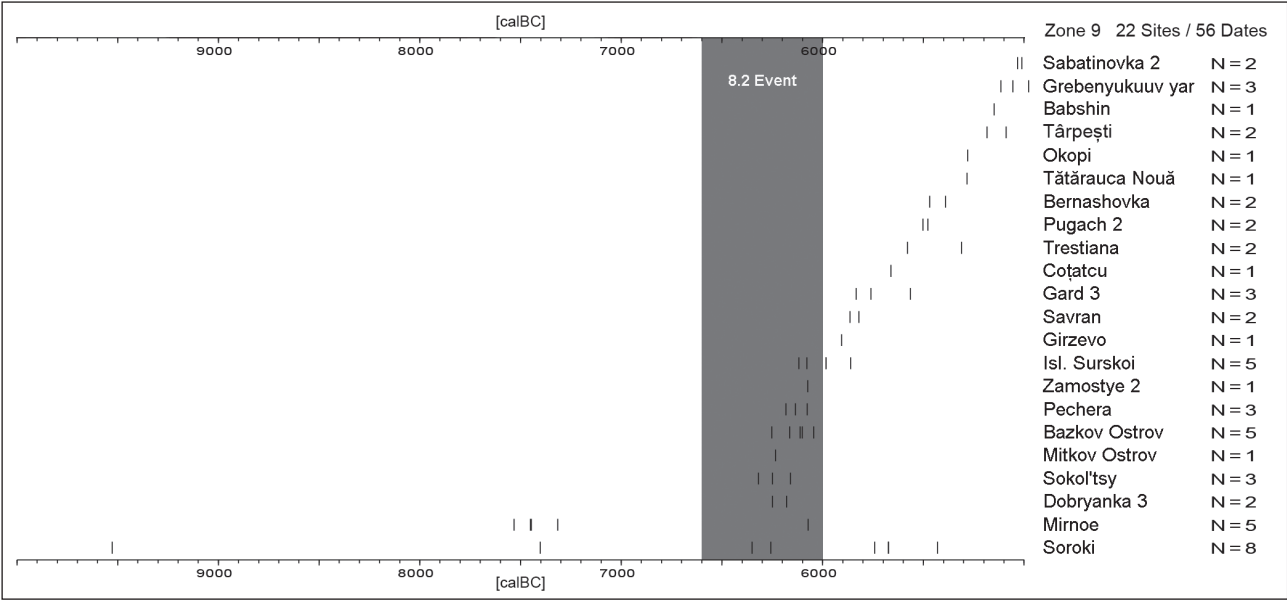


Fig. 208: CalPal barcode calibration of radiocarbon dates (CalPal database © Bernhard Weninger) of the sites in Zone 9 (north-western Pontic) sorted by leading edge (P=40%).