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Relations between the Carpathian Basin and the Dniester Region in the 9th–10th Centuries in the Light of the New Radiocarbon Data to the Timeline of the Hungarian Conquest: A Bayesian Model of Grave III/1 of Karos-Eperjesszög with Consideration to Its Possible Connections with Grave II/52

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Abstract. Grave III/11 of Karos-Eperjesszög is an exceptionally lavish assemblage of the 10th-century AD archaeological record of the Carpathian Basin; it has been interpreted by many as a leader's burial. Therefore, specifying its dating is essential for the research of the era. The grave is of key importance not only for the settlement history of the Upper Tisza Region in the first half of the 10th century AD but also, on a broader prospect, for outlining the framework and particulars of the Hungarian Conquest. With regard to this historical event, one must highlight the scarcity and incompleteness of relevant data in available written sources and the fact that about a dozen radiocarbon results became available in the past years which point to related activity before the conventional AD 895 date. The mainly lonely weapon burials of adult men interred between AD 860 and 900 may be connected with written sources that mention early Hungarian troops regularly appearing in the Carpathian Basin from as early as AD 862.This paper presents all nine radiocarbon dates from the grave and provides Bayesian models based on them, the possible chronological connections of the feature with Grave II/52, a burial dated by coins, and a recent hypothesis that men in the two graves were brothers, which was formulated based on archaeogenetical results.The paper concludes the grave clusters with early Hungarian burials from the late 9th century AD — but is dated before AD 895 — of the Upper Tisza Region.In a broader sense, the examined graves have opened a new perspective for the research of the era by making us re-evaluate the accessibility and interpretability of the pre-Conquest Period of Hungarian prehistory — for example, by highlighting the relevance and necessity of further (e.g., strontium isotope) analyses of the man from Grave III/11, who had undoubtedly been born in Etelköz in the east (cf. Subotcy horizon). Creating such a framework was our goal in 2023 upon embarking on a project to compile a Bayesian model of all available radiocarbon dates from the Hungarian Conquest Period, with a core comprising only radiocarbon data of graves dated by coins. In the

meantime, new developments in the archaeological research in Moldavia and Ukraine, together with recent results of archaeogenetical investigations in Hungary, have resulted in a reliable separation of the archaeological record representing in Eastern Europe the immediate, 9th-century predecessors of the Hungarians of the Conquest Period. The Subotcy horizon matches surprisingly well the important dates indicated by written sources (e.g., AD 836, 862, and 895); therefore, these were also reckoned with in our model.
Keywords: Hungarian Conquest Period (AD 895), Karos cemetery, radiocarbon dating, Bayesian analysis, OxCal dating model
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Связи Карпатского бассейна и Поднестровья в IX–X вв. в свете новых радиоуглеродных данных о хронологии венгерского завоевания. Байесовская модель для могилы III/1 из Карош-Эперьешсёга с учетом ее возможного соотношения с могилой II/52

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Аннотация. Могила III/11 из Карош-Эперьешсёга представляет собой исключительно богатый комплекс археологических данных о Карпатском бассейне в X в. н. э. Многие интерпретируют его как княжеское погребение. Поэтому уточнение его датировки имеет большое значение для изучения эпохи. Могила имеет ключевое значение не только для истории заселения Верхней Тисы в первой половине X в. н. э., но и, в более широкой перспективе, для определения рамок и деталей Венгерского Завоевания. В отношении этого исторического события следует отметить скудость и неполноту соответствующих сведений в имеющихся письменных источниках, а также тот факт, что за последние годы появилось около десятка новых радиоуглеродных датировок, указывающих на то, что связанные с завоеванием процессы начали происходить до общепринятой даты 895 г. н. э. Отельные погребения взрослых вооруженных мужчин, захороненных между 860 и 900 гг. н. э., и сами вооружения могут отражать регулярные проникновения венгерских отрядов в Карпатский бассейн уже с 862 г., что отражено в письменных источниках. В данной статье приводятся все девять радиоуглеродных дат из вышеупомянутой могилы и основанная на них байесовская модель, возможные хронологические связи этого объекта с могилой II/52, погребением, датированным монетами, а также сформулированная на основе результатов археогенетических исследований гипотеза о том, что эти два человека были братьями.Мы пришли к выводу, что это погребение относится к числу ранних венгерских могил относящихся к концу IX в., но датирующихся ранее 895 г. н. э., преимущественно из Верхнего Потисья. Эти погребения открывают более широкую перспективу изучения эпохи, указывая на необходимость пересмотра оценки доступности и возможности интерпретации периода венгерской доистории, предшествовавшего Завоеванию — например, подчеркивая актуальность проведения дальнейших анализов (например, изотопа стронция), погребенного из могилы III/11, который, несомненно, родился в Этелькёзе, на востоке (ср. горизонт Субботцы).

Такое исследование стало нашей целью в 2023 г., когда мы приступили к реализации проекта, направленного на создание байесовской модели всех имеющихся радиоуглеродных дат периода Венгерского Завоевания, ядром которой являются радиоуглеродные данные могил, датированных монетами. Тем временем новые достижения в археологических исследованиях в Молдавии и Украине, а также последние результаты археогенетических исследований в Венгрии, позволили надежно выделить археологические материалы, оставленные непосредственными предшественниками венгерского периода завоевания, в Восточной Европе IX в. Горизонт Субботцы удивительно хорошо совпадает с важными датами, указанными в письменных источниках (например, 836, 862 и 895 гг. н. э.), поэтому они также учитывались в нашей модели.
Ключевые слова: период венгерского завоевания (895 н. э.), могильник Карош, радиоуглеродное датирование, байесовский анализ, модель OxCal
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1. Introduction

Grave III/11 of Karos-Eperjesszög (*Figs 1–4*) is an exceptionally lavish assemblage of the 10th-century AD archaeological record of the Carpathian Basin [Türk et al. 2021]; it has been interpreted by many as a leader's burial [Révész 1996]. Therefore, specifying its dating is essential for the research of the era. The grave is of key importance not only for the settlement history of the Upper Tisza Region in the first half of the 10th century AD but also, on a broader prospect, for outlining the framework and particulars of the Hungarian Conquest. With regard to this historical event, one must highlight the scarcity and incompleteness of relevant data in available written sources and the fact that about a dozen radiocarbon results became available in the past years which point to related activity before the conventional AD 895 date. The mainly lonely weapon burials, of adult men interred between AD 860 and 900, may be connected with written sources that mention early Hungarian troops regularly appearing in the Carpathian Basin from as early as AD 862. The first comprehensive study about the burial in the focus of this study was published in 1996, while another paper presented its reassessment from costume historical and experimental archaeological points of view in 2012. In the last chapter of the latter, the authors attempted to specify the dating of the grave based on a single radiocarbon date and the connections outlined based on the results of archaeometric analyses of some metal finds in the assemblage. As the remaining eight radiocarbon dates measured from samples taken from the grave indicated an unusually early age for the feature, they were omitted from the evaluation. We have learned since that these 'early' dates cannot be considered *ab ovo* faulty, and this realisation made the reassessment of the grave find assemblage once more necessary.

2. Bayesian modelling of the radiocarbon data from Karos, Grave III/11, a 'leader's burial'

This paper presents all nine radiocarbon dates from the grave (*Table 1* and *Fig. 5*) and provides Bayesian models based on them, the possible chronological connections of the feature with Grave II/52, a burial dated by coins, and a recent hypothesis that men in the two graves were brothers, which was formulated based on archaeogenetical results.

The free OxCal program[1] was developed to provide an optimal solution for calibrating radiocarbon measurements and creating age probability models by applying Bayesian and other statistical methods [Stadler 2006]. These models may incorporate a wide range of data, including *standardised likelihoods* (calendar ages represented by calibrated radiocarbon measurements) and *a priori beliefs* (relevant data from the archaeological and historical context of the sample) [Hines, Bayliss 2013:

[1] URL: https://c14.arch.ox.ac.uk/oxcal.html.

78]. Being an ideal tool, this program was employed for calibrating the radiocarbon measurements and creating the models presented in the paper.

As the samples were taken from diverse elements of a single find assemblage — a man, a horse, and a sheep interred in the same grave, which likely died about the same time — their connection and contemporaneity cannot be doubted.

Therefore, one of the basic models — the ‘combined’ model — was created by first combining the three measurements of every specimen into a single date for each (using the *R_combine* command) and, in the following phase, combining the dates obtained this way (the calibrated distributions of the man, the horse, and the sheep) into a single date for the burial (using the *Combine* command).

We also constructed another — a single-phase basic model where the nine measurements or individual distributions were used as ones belonging to the same chronological phase but without reckoning any other links between them. While this starting point is way more broad-brush than the previous one, which deals with the actual connections between the samples, it has a significant advantage as it allows one to check the validity of the individual distributions in the series by comparing them with the combined distribution (*Fig. 6*).

The agreement index of the second measurement of the sheep (DeA-15167, 1267.21) was 29, while that of the first measurement of the human (DeA-11326, 1121.21) was only slightly above the limit of 60 (both measurements were made by the Debrecen Laboratory). The indices of the rest of the samples were above 100, and the general agreement index of the single-phase model was 67. Conclusively, it was not surprising that in the first ‘combined’ model, the individual distributions of the human and sheep bone samples were poorly matched, and the R-combined distributions of the man, the horse, and the sheep could not be satisfactorily combined, yielding a model with a general agreement index of only 29 (*Fig. 7*).

While omitting the date which pointed to the 8th century AD (DeA-15167, 1267.21) was reasonable considering the historical context, one could not leave out from calculation the other seemingly outlier date, DeA-11326 (1121.21) because this was the only value the probability distribution of which fell into the 10th century AD, i. e., the wider Hungarian Conquest Period.

In summary, we built the Bayesian models based on two basic models (a ‘combined’ and a ‘single-phase’) relying on eight radiocarbon dates. First, AD 895, the conventional date of the Hungarian Conquest, was added to them as a *terminus post quem*. The results were clear: the agreement indices of all dates but two, DeA-11326 (1121.21) and Poz-121189 (1165.30), were low, while the general agreement indices of the two models were extremely low (5 and 10, respectively), indicating that seven of the eight dates contradict an AD 895 or younger dating (*Figs. 8* and *9*). Therefore, the next *terminus post quem* we added to the basic models was AD 862, the first known date when Hungarian troops were mentioned to be in the Carpathian Basin, and the change was remarkable: the agreement indices of all the eight dates were above the threshold value of 60, indicating their probability distributions to agree with the set limits (*Figs. 10* and *11*). As the detailed chart of the combined Bayesian model illustrates, Grave III/11 from Karos was established between AD 862 and 892 with a 95,4 % probability (*Fig. 12*).

That seven of the radiocarbon dates obtained from a grave which, by burial customs and characteristics of the clothing of the deceased, undoubtedly belongs to the Hungarian Conquest Period should really point to the 9th century AD, i. e., a time before the AD 895 date conventionally representing the start of said era, has not been accepted by research for long. Lately, the ice started to melt as the overall picture was refined considerably by some novel results of the archaeological and archaeogenetical investigations of Subotcy-type sites, a horizon representing the archaeological record of early Hungarians dwelling in Etelköz in the late 9th century AD. Today, we know that the fundamental characteristics of the Conquest Period material culture had been developed by the last third of the 9th century AD, especially along the middle course of the Dniepr [Bollók 2015; Komar 2018; Türk

2021]. At the same time, historians pointed out that all known written sources to mention Magyars/early Hungarians in the Carpathian Basin before AD 895 are reliable [Bácsatyai 2017; Szántó 2018; Szőke 2014; Szőke 2019]. This relatively new and surprising result would open new perspectives for research; however, it must be validated first. An excellent way to do that is radiocarbon dating the graves of the Karos cemetery, especially all burials in cemetery III, and, possibly, other Conquest Period burials as well — all the more so because similarly 'early' dates are also known from four Conquest Period graves from Szeged-Öthalom V. homokbánya (Sand query) [Lőrinczy, Türk 2015: 100, Table 2.15–17, 22].

Based on the series of the remaining eight radiocarbon dates, we concluded that the related burial is one of the early Hungarian graves established at the end of the 9th century but before AD 895, primarily in the Upper Tisza Region. Moreover, this is the first known grave that is not the founding burial of a cemetery.

The new results corroborate the conventional early dating of the Karos cemeteries. Also, in a broader sense, they have opened a new perspective for the research of the era by making us re-evaluate the accessibility and interpretability of the pre-Conquest Period of early Hungarian history — for example, by highlighting the relevance and necessity of further (e. g., strontium isotope) analyses of the man from Grave III/11, who had undoubtedly been born in Etelköz in the east (cf. Subotcy horizon). The presented Bayesian analysis of the Conquest Period feature is also proof of the relevance and efficiency of this analytic method in outlining a 'fine' chronological framework of the 10th century AD, a task that could not be achieved by any other means available.

3. Possible chronological links between the two 'leaders' burials' from Karos and their consequences

As for the Karos cemeteries, our investigations have already revealed that Grave II/52 was undoubtedly established after AD 904 because it contained Arabian *dirhams* issued in AD 904/905 and Frank *denars* issued around 899–911. The single available radiocarbon date of this grave, together with the *terminus post quem* of the coins, was incorporated in the 'combination' model-based Bayesian model of Grave III/11 (*Fig. 13*); the results show that the two burials were established 12–15 years apart (with a 95,4 % probability) (*Figs. 14* and *15*) [Révész 2006].

As archaeogenetic results indicated that the deceased in the two graves were brothers, we also attempted to consider the chronological consequences of such a connection [Maróthi et et al. 2022]. The man in Grave III/11, the burial established earlier, was of the same age or only slightly older (50–55 years old at death) than his assumed brother interred somewhat later in Grave II/52 (45–50 years old). According to the opinion of anthropologist Ágnes Kustár, the maximum age difference between siblings of the same mother in the period in question could be 15–20 years, or 23–25 years in extreme cases. Conclusively, provided the identical maternal haplotype detected by archaeogenetical analyses is evidence of them being brothers, the age gap between their time of death, considering their age at death, could not be more than 10–15 or a maximum of 20 years. Were this the case, the applicable distributions in the related radiocarbon model would be narrowed down to the few years preceding AD 892 for Grave III/11 and those shortly after AD 904 for Grave II/52.

As an experiment, we also created a model which incorporates, besides the 'combined' model, the chronological limitations set based on anthropological and archaeogenetical results. We have chosen AD 884/885 as the earliest possible date because this was the first date before AD 892, the incorporation of which in the model results in all individual distributions of Grave III/11 having an agreement index above 60. Similarly, AD 915/916 was chosen as the latest possible date because this was the first date after AD 904, the incorporation of which resulted in the probability distribution of Grave II/52 starting with the said date, the set *terminus post quem*, at 95,4 % probability.

So, based on its agreement indices, the model is valid (*Fig. 16*). However, the perimeters of the 95,4 % probability range are at AD 881 and 916, respectively, outlining a 35-yearlong period (*Figs. 17* and *18*) and raising the possibility that the two men died more than twenty years apart, which would be unlikely if they were brothers. Conclusively, only a whole-genome mapping of their remains could provide conclusive evidence in this question, as the current radiocarbon-based models do not seem to corroborate the hypothesis that they were siblings of the same mother.

4. Broader archaeological possibilities in the chronological evidence offered by the cemeteries of Karos

Creating such a framework was our goal in 2023 upon embarking on a project to compile a Bayesian model of all available radiocarbon dates from the Hungarian Conquest Period, with a core comprising only radiocarbon data of graves dated by coins. In the meantime, new developments in the archaeological research in Moldavia and Ukraine, together with recent results of archaeogenetical investigations in Hungary [Neparáczki et al. 2018; Szeifert et al. 2023], have resulted in a reliable separation of the archaeological record representing in Eastern Europe the immediate, 9th-century predecessors of the Hungarians of the Conquest Period. The Subotcy horizon matches surprisingly well the important dates indicated by written sources (e. g., AD 836, 862, and 895); therefore, these were also reckoned with in our model. The future, complex model will also affect the dating of individual graves as, in our experience, it will probably make a specification of their dating possible.

The investigated grave from Karos is the first early (i. e., pre-AD 895) Hungarian burial in the Upper Tisza Region to be analysed this way. Albeit the region is exceptionally abundant in archaeological remains of the said era, the number of similar evaluations is very low. It is also first in another respect, as it belongs to the small cemetery of a community rather than being a lonely grave. The results have raised the possibility that the divergence between grave number in cemeteries II and III of Karos-Eperjesszög represents a chronological difference and that the line between them may be around AD 895. The generic connection of the site with the early Hungarian record, also corroborated by the current results, highlights again that interpreting the Karos site as peripheral is false, as these cemeteries represent a link between the dwelling area of early Hungarians /Magyars in Etelköz and the Carpathian Basin. Archaeological research has traced the eastern connections of conquering Hungarians back to the mid-10th century AD.

5. Conclusion

The studied grave from Karos is the first early (i. e., before AD 895) radiocarbon-dated burial from the Upper Tisza Region (and is amongst the first features analysed this way as only a few 10th-century AD phenomena from the region have been radiocarbon-dated). It is also the first among early Hungarian graves to be part of a small cemetery instead of a lonely burial. The results suggest that the marked difference in the size of the two grave groups in Karos results from their dissimilar chronological position: Cemetery III, comprising considerably more graves than Cemetery II, is somewhat younger and can be linked with the mass settling around AD 895.

The results presented above, together with some earlier conclusions, support the view that it is misleading to interpret the cemeteries of Karos and their wider surroundings as being on the fringes of the dwelling area of Hungarians because they more likely represent a missing link between the dwellings in Etelköz and the early Hungarians who had remained there and the Carpathian Basin. Currently, there is available archaeological evidence of that conquering Hungarians maintained connection with the regions of the Caucasus and the Ural in the east up to the mid-10th century AD. International research reckons with the presence of a direct Hungarian sphere of interest and a Hungarian influence in the area of the former Etelköz dwellings up to the AD 940s [Ryabtseva, Rabinovich 2007], besides, there is a possibility that at least some early Hungarians who had remained there at the time of the AD 895 wave of settling moved into the Carpathian Basin around AD 940 [Langó 2017: 77–84].

Finally, the date suggested here for Grave III/11 of Karos-Eperjesszög and the available analogies of the feature highlight once more the necessity of abandoning the conventional

AD 895 date of the Hungarian Conquest by historians and investigating the validity of another date, AD 889, mentioned by a coeval author, Regino of Prum [Veszprémy 2017].

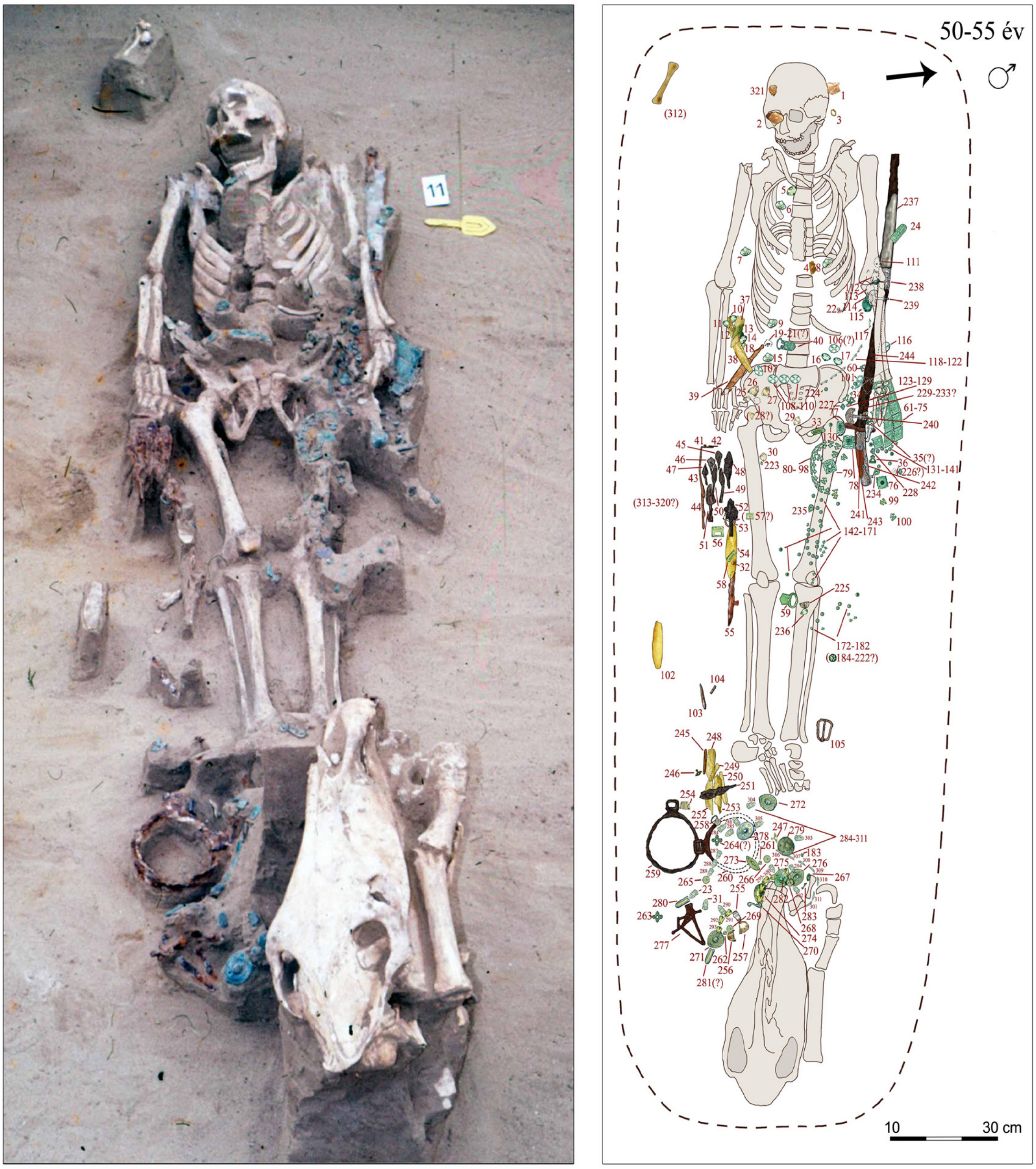

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Fig. 1. Karos-Eperjesszög, Grave III/11. 1 — photo, 2 — survey drawing (photo by L. Révész; drawing in: [Türk et al. 2021: fig. 4])
[*Илл. 1*. Карош-Эперьешсёг, могила III/11. 1 — фото; 2 — рис.]

Fig. 2. Sabre from Grave III/11 of Karos-Eperjesszög — an outstanding masterpiece of Old Hungarian (10th-century) jewelry art (in: [Türk et al. 2021: fig. 9])
[*Илл. 2*. Сабля из могилы III/11 из Карош-Эперьешсёга - выдающийся шедевр древневенгерского (X в.) ювелирного искусства]

Fig. 3. A unique open ring-type jewelry item of Western European origin from Grave III/11 of Karos-Eperjesszög. The artefact was cut from a gold sheet, has tapered ends, and is decorated (perhaps inscribed) (in: [Türk et al. 2021: fig. 14])

[*Рис. 3*. Уникальное ювелирное изделие с открытым кольцом западноевропейского происхождения из могилы III/11 могильника Карош-Эперъессёг. Артефакт вырезан из золотого листа, имеет конические концы и украшен (возможно, надписью)]

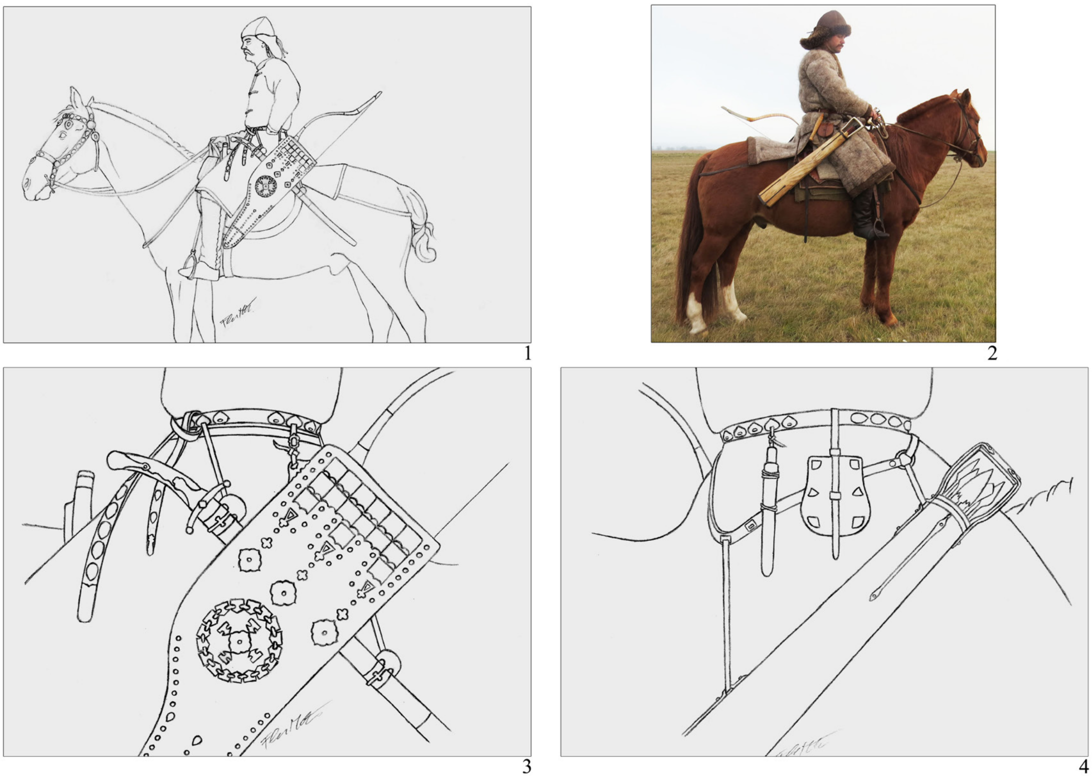

Fig. 4. Reconstructed wearing style of the accessories from Grave III/11 of Karos-Eperjesszög, different views (in: [Türk et al. 2021: fig. 15])
[*Илл. 4*. Реконструкция стиля ношения украшений из могилы III/11 из Карош-Эперьешсёга, различные виды]

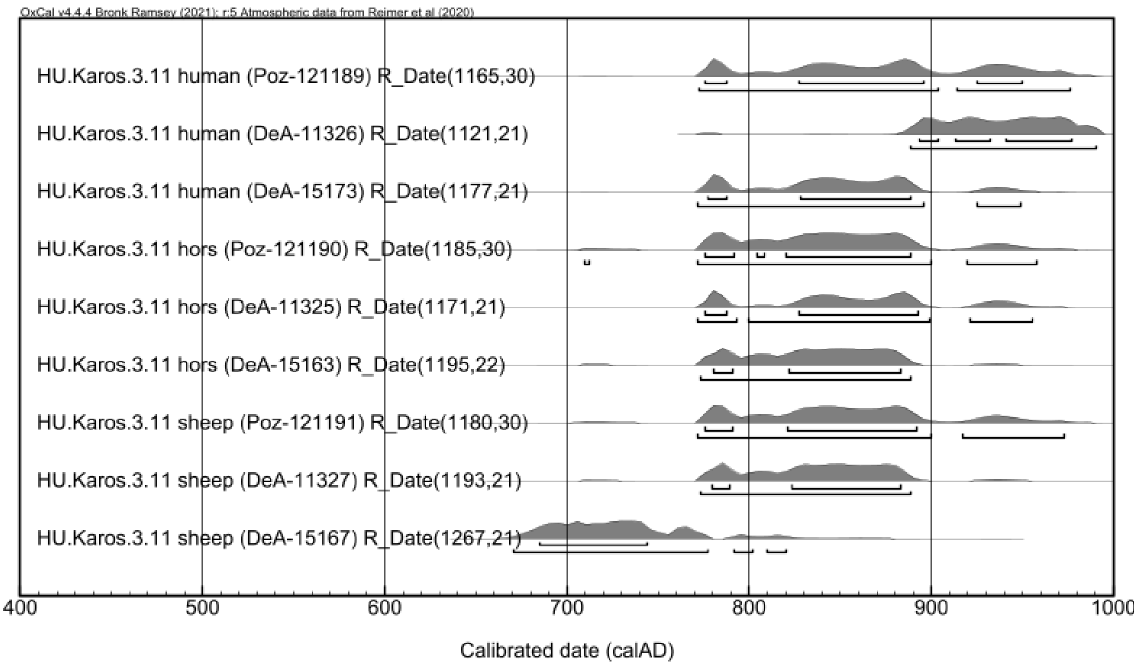

Fig. 5. Nine individual calibrated radiocarbon measurements from Grave III/11 of Karos-Eperjesszög
[*Илл. 5*. Девять калиброванных радиоуглеродных измерений из могилы III/11 в Карош-Эперьешсёг]

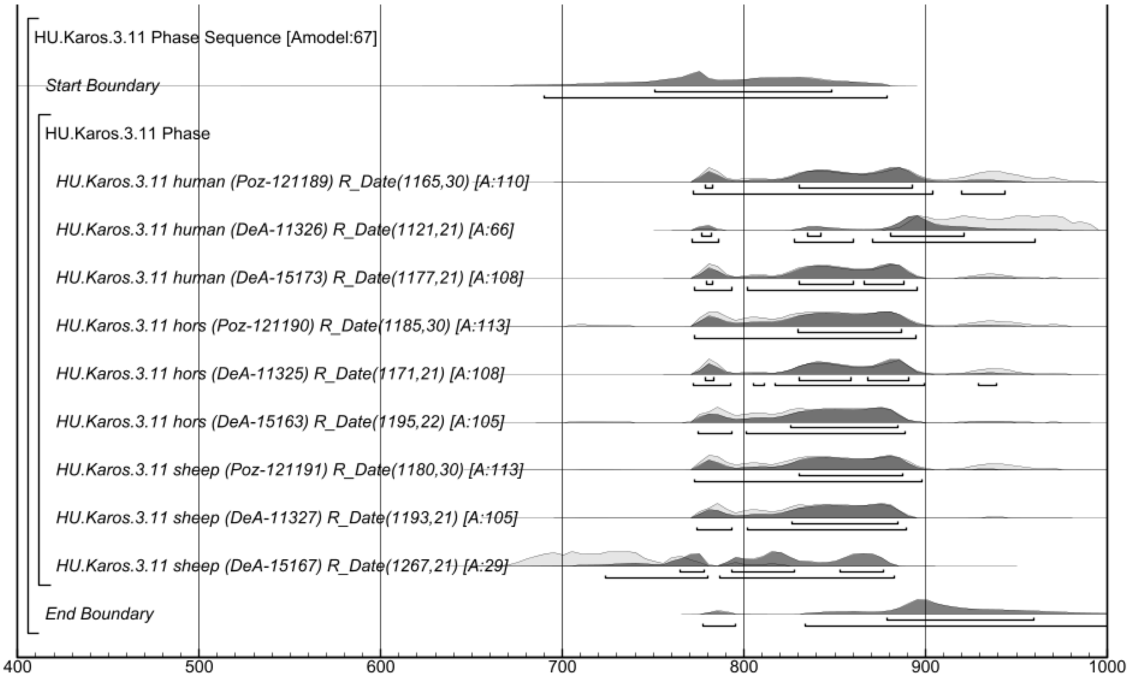

Fig. 6. Single-phase model of a series of nine radiocarbon measurements from Grave III/11 of Karos-Eperjesszög
[*Илл. 6*. Однофазная модель серии из девяти радиоуглеродных измерений из могилы III/11 могильника Карош-Эперьешсёг]

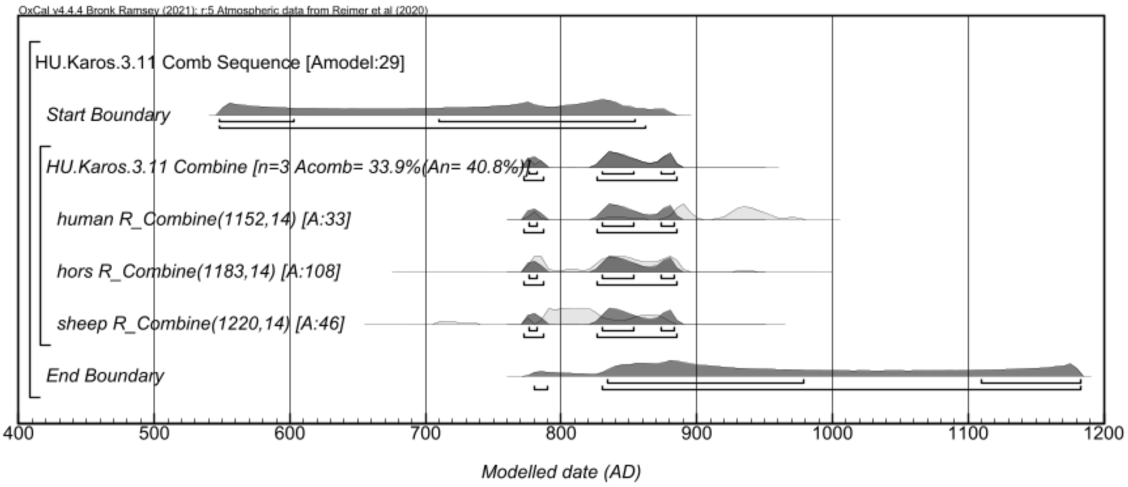

Fig. 7. Combined model of a series of nine radiocarbon measurements from Grave III/11 of Karos-Eperjesszög
[*Илл. 7*. Комбинированная модель серии из девяти радиоуглеродных измерений из могилы III/11 Карош-Эперьешсёг]

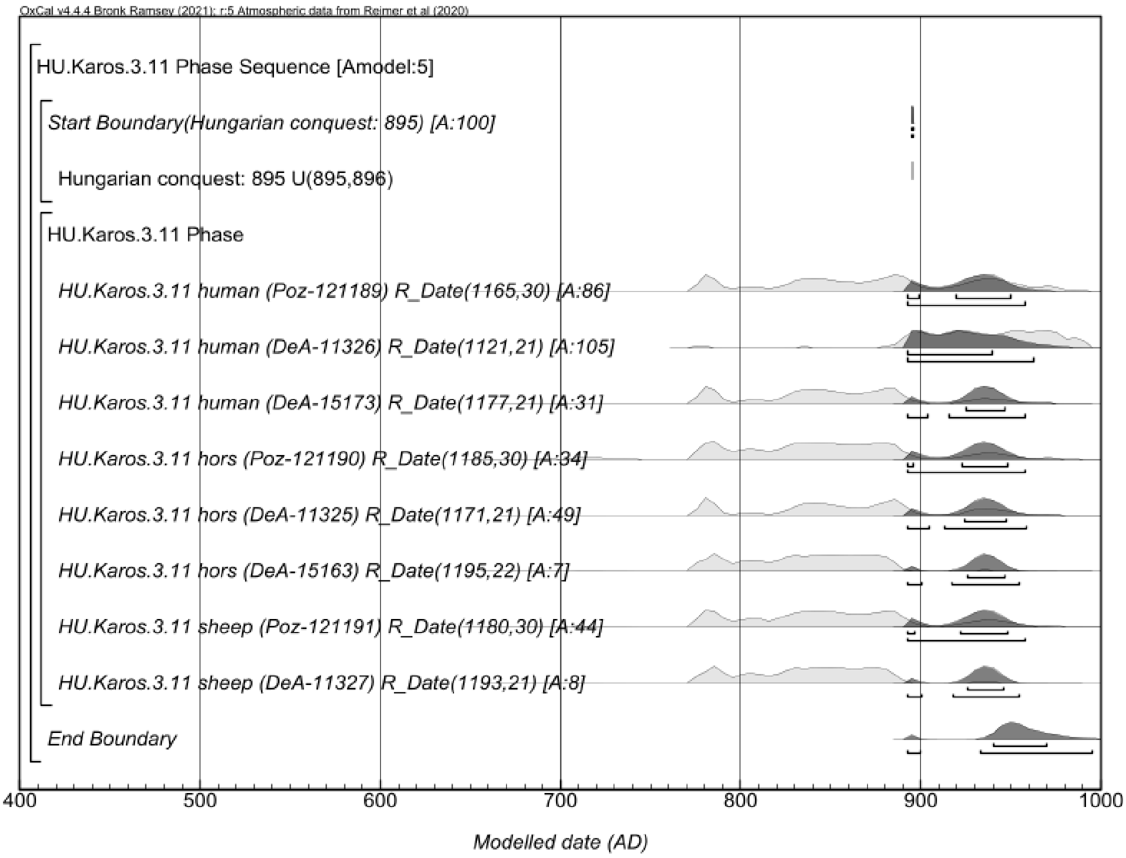

Fig. 8. Single-phase Bayesian model for Grave III/11 of Karos-Eperjesszög based on a series of eight radiocarbon measurements and the AD 895 *terminus post quem*
[*Рис. 8*. Однофазная байесовская модель для могилы III/11 из Карош-Эперьешсёга, основанная на серии из восьми радиоуглеродных измерений и конечной точке post quem 895 г. н. э.]

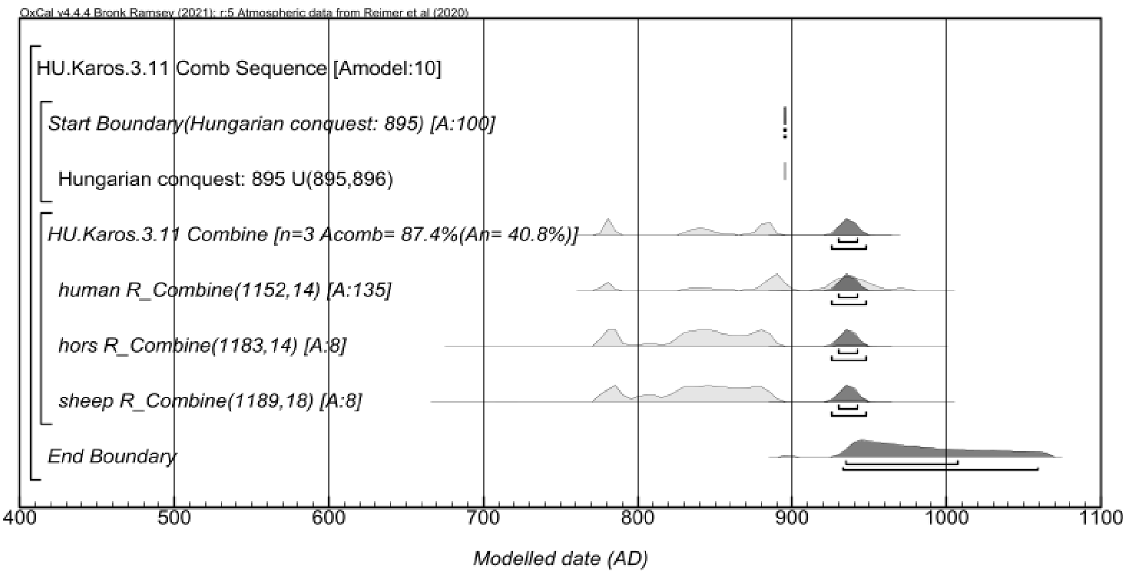

Fig. 9. Combined Bayesian model for Grave III/11 of Karos-Eperjesszög based on eight radiocarbon measurements and the AD 895 *terminus post quem*
[*Илл. 9.* Комбини рованная байесовская модель для могилы III/11 из Карош-Эперьешсёга, основанная на восьми радиоуглеродных измерениях и конечной точке *post quem* 895 г. н. э.]

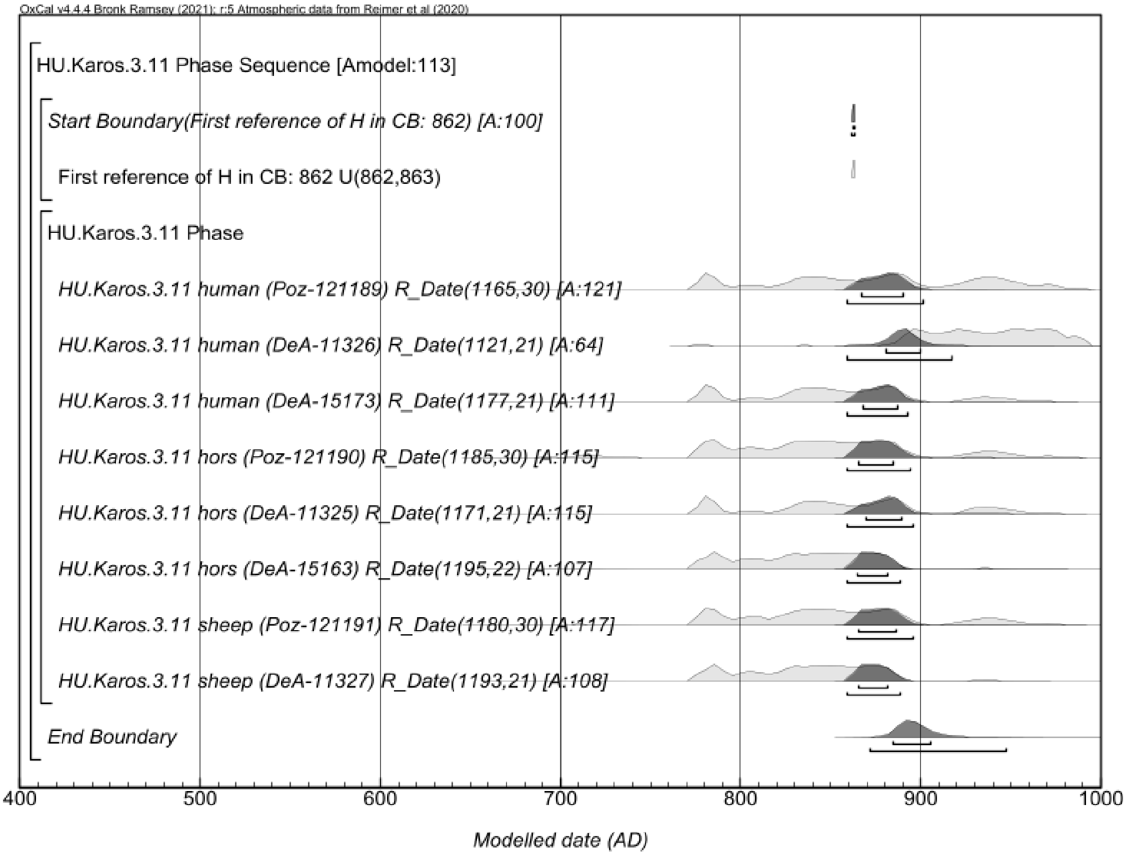

Fig. 10. Single-phase Bayesian model for Grave III/11 of Karos-Eperjesszög based on a series of eight radiocarbon measurements and the AD 862 *terminus post quem*
[*Илл. 10*. Однофазная байесовская модель для могилы III/11 из Карош-Эперьешсёга, основанная на серии из восьми радиоуглеродных измерений и конечной точке *post quem* 862 г. н. э]

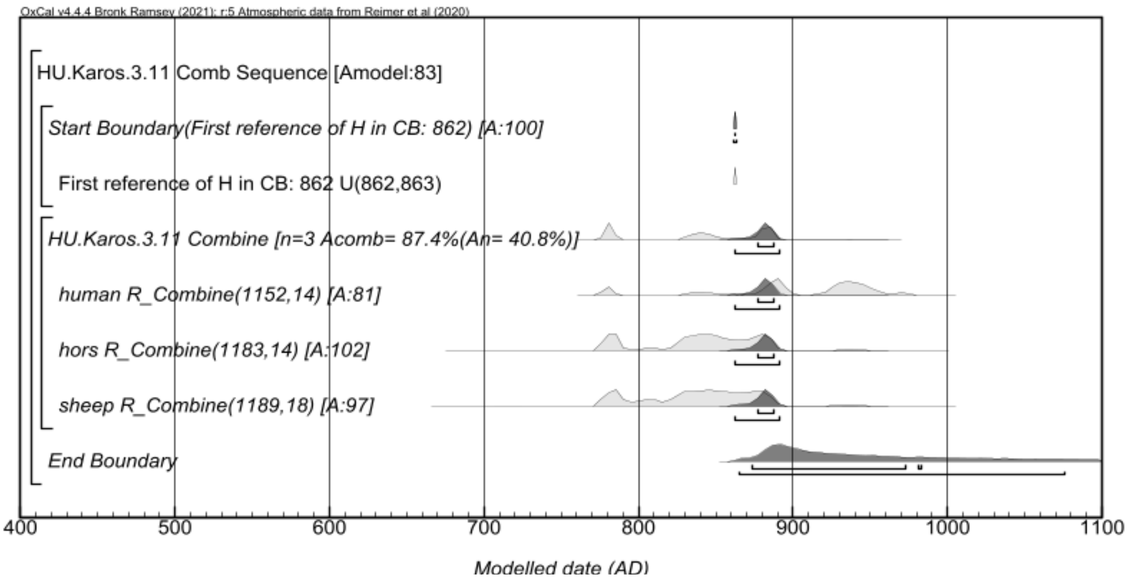

Fig. 11. Combined Bayesian model for Grave III/11 of Karos-Eperjesszög based on a series of eight radiocarbon measurements and the AD 862 *terminus post quem*
[*Илл. 11*. Комбинированная байесовская модель для могилы III/11 из Карош-Эперъессёга, основанная на серии из восьми радиоуглеродных измерений и конечной точке *post quem* 862 г. н. э].

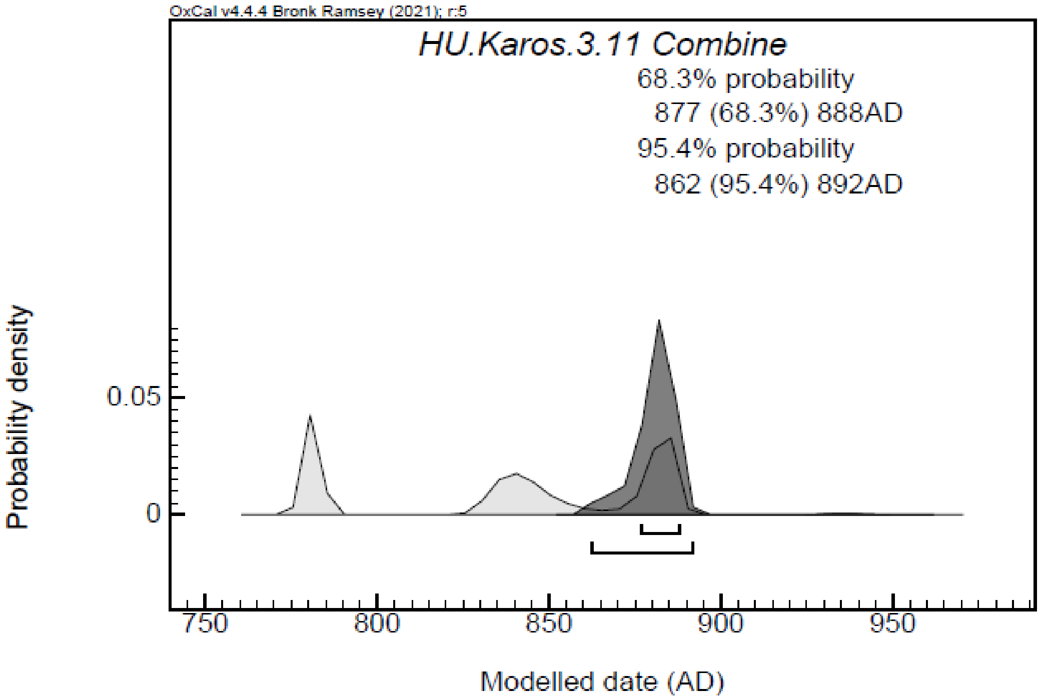

Fig. 12. Combined Bayesian model for Grave III/11 of Karos-Eperjesszög based on eight radiocarbon measurements and the AD 862 *terminus post quem*. A detailed probability distribution plot
[*Илл. 12*. Комбинированная байесовская модель для могилы III/11 из Карош-Эперьешсёга, основанная на восьми радиоуглеродных измерениях и *terminus post quem* 862 г. н. э. Детальный график распределения вероятностей]

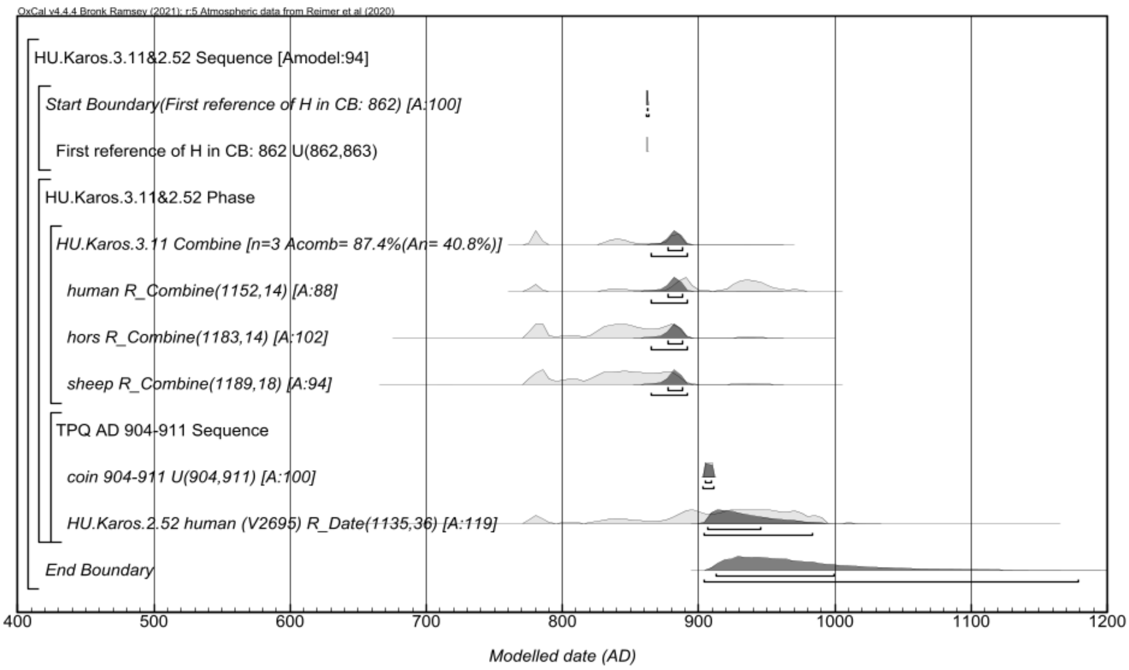

Fig. 13. Combined Bayesian model for Graves III/11 and II/52 of Karos-Eperjesszög, based on the combined model for Grave III/11 (based on a series of eight radiocarbon measurements and the AD 862 *terminus post quem*), a single radiocarbon measurement from Grave II/52, and the AD 904–911 *terminus post quem*, a range of uniform probability determined by some coins in the same grave
[*Илл. 13*. Комбинированная байесовская модель для могил III/11 и II/52 Карош-Эперьешсёга, основанная на комбинированной модели для могилы III/11 (на основе серии из восьми радиоуглеродных измерений и конечной *post quem* 862 г. н. э.), одного радиоуглеродного измерения из могилы II/52 и конечной *post quem* 904–911 гг. н. э., диапазон равномерной вероятности, определенный по некоторым монетам из той же могиле]

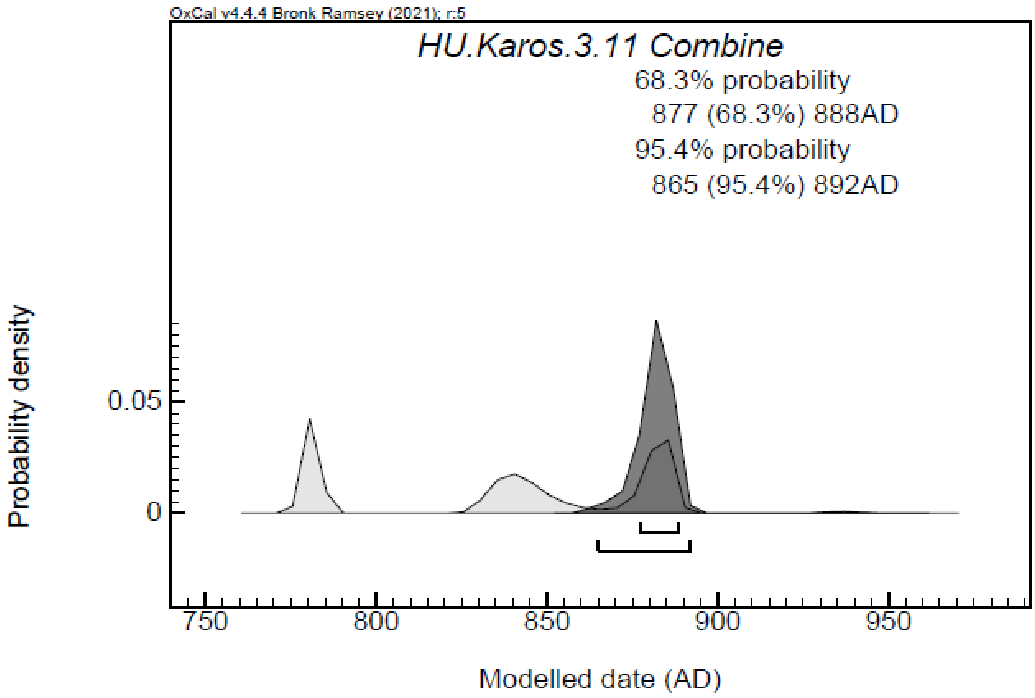

Fig. 14. Combined Bayesian model for Graves III/11 and II/52 of Karos-Eperjesszög. Probability distribution showing the Bayesian modelled date for Grave III/11
[*Илл. 14*. Комбинированная байесовская модель для могил III/11 и II/52 из Карош-Эперьешсёга. Распределение вероятностей, показывающее байесовскую модельную дату для могилы III/11]

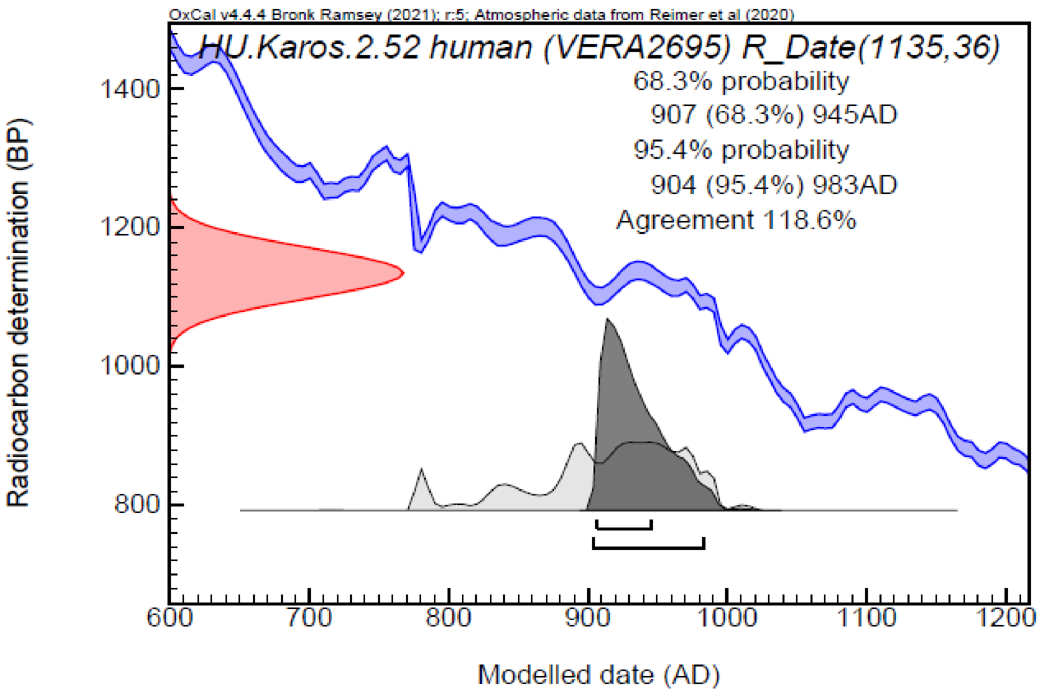

Fig. 15. Combined Bayesian model for Graves III/11 and II/52 of Karos-Eperjesszög. Probability distribution showing the Bayesian modelled date for Grave II/52
[*Илл. 15*. Комбинированная байесовская модель для могил III/11 и II/52 из Карош-Эперьешсёга. Распределение вероятностей, демонстрирующее модельную байесовскую дату для могилы II/52]

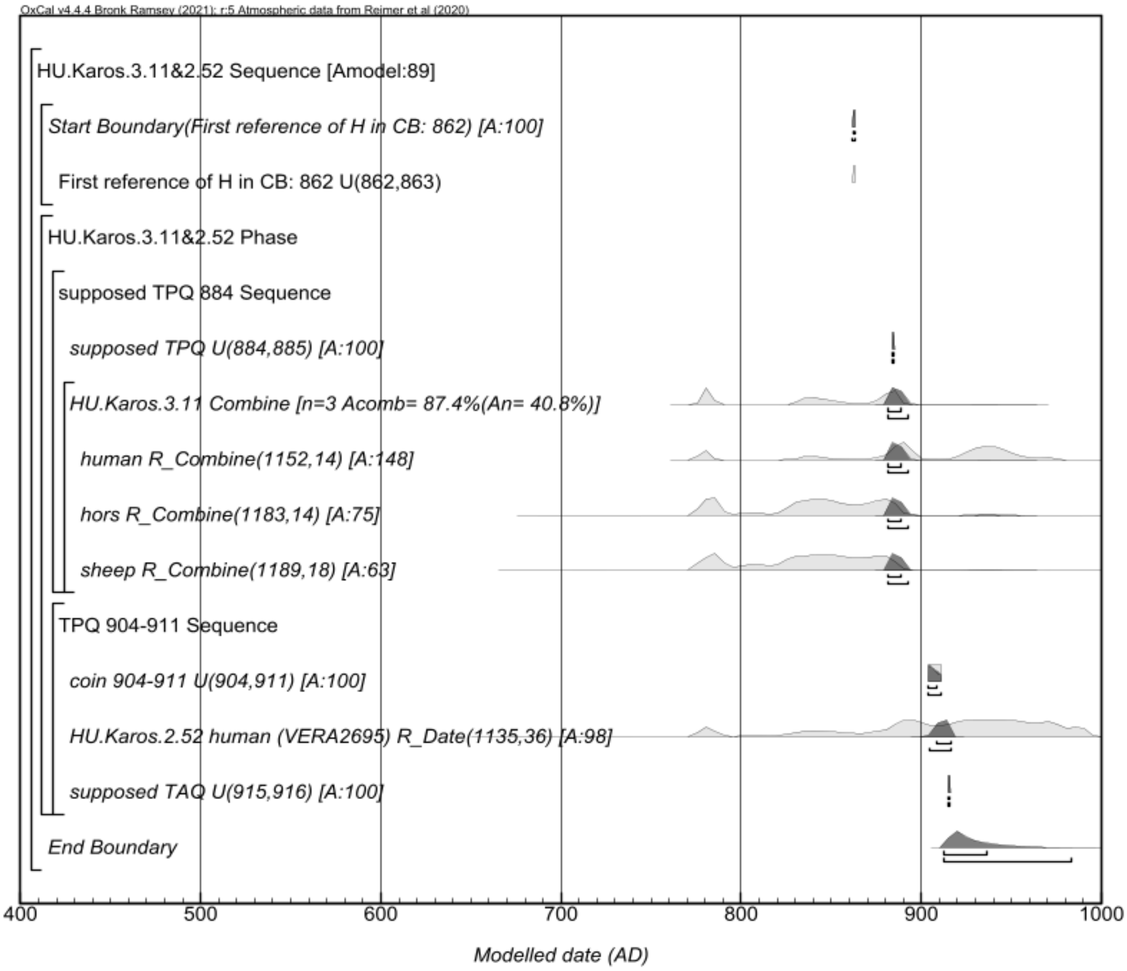

Fig. 16. Combined Bayesian model for Graves III/11 and II/52 of Karos-Eperjesszög based on the age at death of the two deceased, the hypothesis that they were brothers, the combined model for Grave III/11 (based on a series of eight radiocarbon measurements and the AD 884/5 *terminus post quem*), a single radiocarbon measurement from Grave II/52, the AD 904–911 *terminus post quem* (a range of uniform probability), and the AD 915–916 *terminus ante quem*
[*Илл. 16*. Комбинированная байесовская модель для могил III/11 и II/52 из Карош-Эперьешсёга, основанная на: оценке возраста смерти двух погребенных; гипотезе о том, что они были братьями; комбинированной модели для могилы III/11 (основанной, в свою очередь, на серии из восьми радиоуглеродных измерений и конечной *post quem* AD 884/5); одном радиоуглеродном измерении из могилы II/52; конечной *post quem* AD 904–911 (диапазон равномерной вероятности) и конечной *ante quem* AD 915–916]

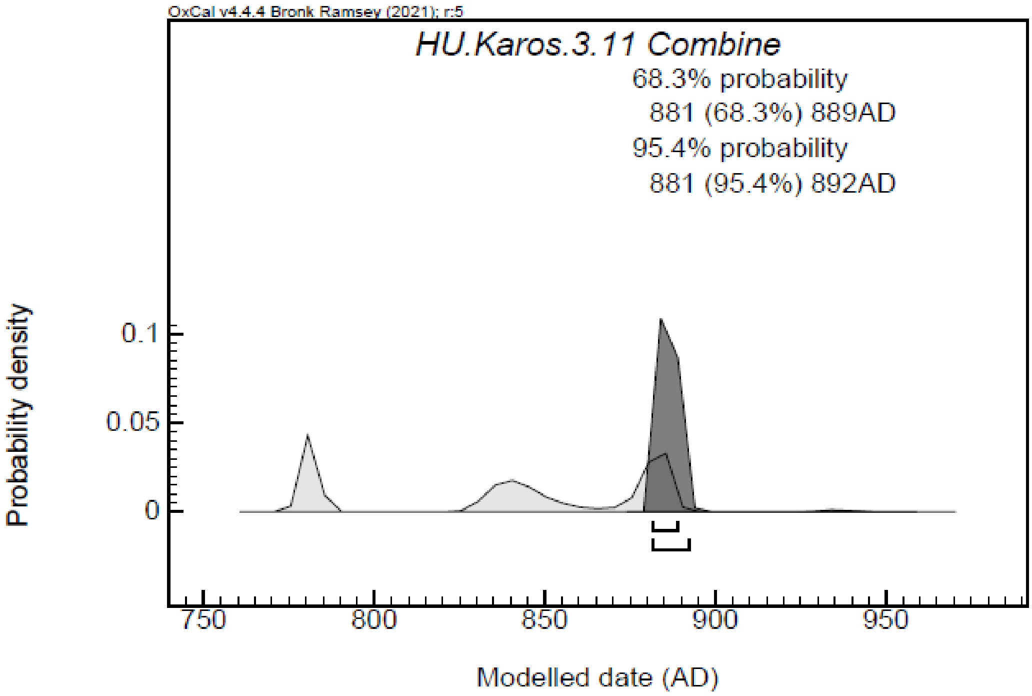

Fig. 17. Combined Bayesian model for Graves III/11 and II/52 of Karos-Eperjesszög with consideration to the age at death of the two deceased and the hypothesis that they were brothers. Probability distribution showing the Bayesian modelled date for Grave III/11
[*Илл. 17*. Комбинированная байесовская модель для могил III/11 и II/52 из Карош-Эперьешсёга. Распределение вероятностей, показывающее байесовскую модель даты для могилы III/11]

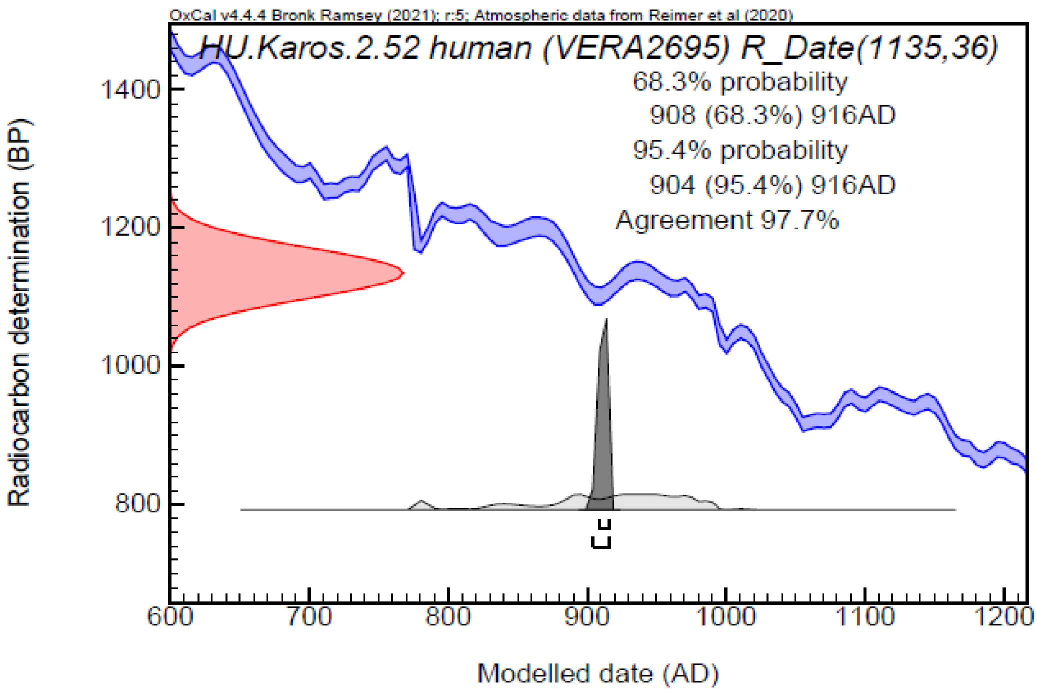

Fig. 18. Combined Bayesian model for Graves III/11 and II/52 of Karos-Eperjesszög with consideration to the age at death of the two deceased and the hypothesis that they were brothers. Probability distribution showing the Bayesian modelled date for Grave II/52
[*Илл. 18*. Комбинированная байесовская модель для могил III/11 и II/52 из Карош-Эперьешсёга с учетом возраста смерти обоих покойников и гипотезы о том, что они были братьями. Распределение вероятностей, показывающее байесовскую модель даты для могилы II/52]

Table 1. Individual calibrated AMS data from Graves III/11 and II/52 from Karos-Eperjesszög. The samples from Grave III/11 were measured in the Poznan Radiocarbon Laboratory and ATOMKI, Debrecen, respectively, while the one from Grave II/52 in the VERA laboratory in Vienna. All data were calibrated using OxCal v.4.4.4 and the IntCal 20 atmospheric curve
[*Таблица 1*. Индивидуальные калиброванные данные AMS из могил III/11 и II/52 из Карош-Эперьешсёга. Образцы из могилы III/11 были проанализированы в Познанской радиоуглеродной лаборатории и ATOMKI (Дебрецен) соответственно, а образец из могилы II/52 — в лаборатории VERA в Вене. Все данные были откалиброваны с помощью программы OxCal v.4.4.4 и атмосферной кривой IntCal 20]

Object	Sample	Mesuring code	Radiocarbon age (BP)	Individual calibration (68.3%)	Individual calibration (95.4%)	Additional measurements
Grave III/11	human bone	Poz-121189	1165±30	776–949	772–976	3.7%N 11.0%C, 12.7%coll
Grave III/11	human bone	DeA-11326	1121±21	893–977	888–990	pMC abs. 86.97 unc. 0.23
Grave III/11	human bone	DeA-15173	1177±21	777–889	772–949	pMC abs. 86.37 unc. 0.24
Grave III/11	horse bone	Poz-121190	1185±30	776–889	710–957	0.9%N 4.2%C, 2.7%coll
Grave III/11	horse bone	DeA-11325	1171±21	776–892	772–955	pMC abs. 86.44 unc. 0.24
Grave III/11	horse bone	DeA-15163	1195±22	780–883	773–889	pMC abs. 86.18 unc. 0.24
Grave III/11	sheep bone	Poz-121191	1180±30	775 – 891	771 – 973	2.3%N 9.5%C, 5%coll
Grave III/11	sheep bone	DeA-11327	1193±21	780 – 883	773 – 888	pMC abs. 86.20 unc. 0.23
Grave III/11	sheep bone	DeA-15164	1267±21	685 – 744	671 – 820	pMC abs. 86.41 unc. 0.22
Grave II/52	human bone	VERA-2695	1135±36	884 – 978	774 – 994	

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