On the presence of the Bodrogkeresztúr culture pottery in Dąbki

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Abstract: *Year 2011 brought about groundbreaking news about the presence of imported pottery from the Bodrogkeresztúr culture* milieu *at the Pomeranian site in Dąbki. The aim of this paper is to demonstrate the weakness of the arguments put forth since then to support this thesis. This polemic is complementary to the earlier critical remarks that connected the finds with the post-Rössen ceramic making tradition, and as such does not present any alternative genetic interpretation of the presence of the discussed pottery fragments at this site. It is focused purely on the deconstruction of the context of justification of the challenged concept in this part thereof, which concerns the inferences on the pottery of the Bodrogkeresztúr culture. As the present counterargument partially relies on a reassessed absolute chronological sequence of the Polgár complex at the stage of the Middle Eneolithic/Copper Age, the underpinning 'chronological lemma' is also presented (as an appendix).*

Rezumat: *Anul 2011 a adus o veste inovatoare legată de prezența ceramicii importate din mediul cultural Bodrogkeresztúr pe situl Pomeranian din Dąbki. Scopul acestei lucrări este de a demonstra slăbiciunea argumentelor care susțin această teză prezentate atunci. Această polemică este complementară observațiilor critice anterioare care au legat descoperirile de tradiția de fabricare a ceramicii post-Rössen și, ca atare, nu prezintă nici-o interpretare genetică alternativă a prezenței fragmentelor de ceramică discutate din acest sit. Se concentrează doar pe deconstrucția contextului de justificare a conceptului contestat în această parte a acestuia, care se referă la inferențele referitoare la ceramica culturii Bodrogkeresztúr. Întrucât contraargumentul actual se bazează parțial pe o secvență cronologică absolută revizuită a complexului Polgár în etapa eneoliticului mediu / epoca cuprului, este prezentată și 'lema cronologică' de bază (ca anexă).*

Keywords: *Pomerania, Carpathian Basin, Eneolithic, Bodrogkeresztúr culture, Dąbki, typology, chronology.*

Cuvinte cheie: *Pomerania, Bazinul Carpatic, eneolitc, cultura Bodrogkeresztúr, Dąbki, tipologie, cronologie.*

◈ Introduction[1]

It will soon be a decade since the (E)neolithic finds from Dąbki, in the Polish part of Pomerania, have been highlighted on the map of European archaeological discoveries. It all started with a report regarding finds of pottery fragments allegedly originating from the Tisza River Basin – from the *milieu* of the Bodrogkeresztúr culture (A. Czekaj-Zastawny *et alii* 2011a, 2011b). Considering that during the Younger Stone Age Pomerania was extremely rarely an area of reception and the creative development of cultural patterns of such a distant provenance, the mere attempt of defining the phenomena of such geographical scale raised automatically both the narrative about and the discussion on the sherds to international level. Also, of significant importance is the fact that this discovery was disseminated by scientific

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[1] The study is a slightly modified English version of a study that appeared as two separate articles in the recent volume of Gdańskie Studia Archeologiczne (T.J. Chmielewski 2019a, 2019b).

journals of pan-European impact, or even worldwide one. This thesis, however, appears to be equally far-reaching as far from the truth.

The very concept itself seemed to me, in a sense, harmless as long as its reception was limited. In regional narratives relating to the Polish Lowland these were rather only the authors of this concept themselves who referred to it (e.g. J. Kabaciński *et alii* 2014, p. 45; but see e.g. M. Nowak 2014, p. 273; S.K. Kozłowski, M. Nowak 2019, p. 123, 246). At the same time, among the body of scholars focusing on the Carpathian Basin such references were even more sporadic, and they appeared in the works with no significant impact (M. Szilágyi 2015, p. 318). Perhaps this is due to the fact that these sensations immediately aroused scepticism of some researchers directly concerned with the prehistory of Pomerania (L. Czerniak 2012, p. 168, ftn. 168; L. Czerniak 2017, p. 469-470). At this point, the readers may begin to wonder why I waited with the following polemic for so long. Well, for all this time, I was hoping for deeper self-reflection and revision of the intellectual construction in question by its authors. Eventually, I was prompted to address this issue by the introduction of these concepts in an unchanged form to the monograph about the site of Dąbki (A. Czekaj-Zastawny 2015, p. 226-229), which is likely to sustain their impact on prehistoric narratives built by scholars not directly involved in the research on the Younger Stone Age in Central Europe (see e.g. S. Cassen *et alii* 2019, p. 567-568), and by the fact of presenting them to an even wider audience in the pages of the most recent publication of a textbook nature (A. Czekaj-Zastawny, Th. Terberger 2017, p. 114), which entails a serious concern that these ideas will be echoed by adepts of archaeology.

Not to build unnecessary scientific suspense, let me mark at the beginning that I share the above-cited opinion of Lech Czerniak, who pointed the western area of the European Plain, dominated by the post-Rössen cultural traditions, as the most likely direction from which the idea of the pottery in question (or even its imports) reached Pomerania. Accordingly, I do not intend to propose any alternative interpretation of the provenance of the discussed finds. The main goal of this paper is to contradict the line of reasoning put forward as the justification of the presence of the Bodrogkeresztúr culture pottery in Dąbki. The falsification will be performed from the standpoint of the person involved in research on the Eneolithic (Copper Age) of the Carpathian Basin. From the very beginning, the entire intellectual construction built-up by the Polish-German board of the authors was hardly acceptable to me, first and foremost, when looking at this matter from such a perspective.

◈ Reconstruction and dating of the alleged pottery vessels of the Bodrogkeresztúr culture from Dąbki

Having in mind the gravity of the allegations that I intend to formulate later in the argument, I probably should not introduce the discussion by making a reference to anecdotes. However, I cannot put out of my head a certain witty statement of Professor Jan Gurba. In the course of one of his classes devoted to the Younger Stone Age, when trying to focus attention of the audience on presented graphic content of the lecture, he noted that 'after all, archaeology is a pictorial science'. In this short ironic phrase, one of the strongest intellectual habits of archaeologists (certainly reinforced in modern times of visual culture) has been aptly captured. In the case discussed here, the dominance of this passive cognitive mechanism seems to be essential since an evident, yet generally unnoticed, graphic manipulation formed the basis of the reasoning to be undermined in the following argumentation. My first objection pertains to the method of reconstructing pottery forms using ceramic fragments allegedly associated with the earthenware-making tradition of the Bodrogkeresztúr culture.

When looking at the sherds that have been identified by the researchers investigating the site in Dąbki as of the inner-Carpathian provenance, one can see only the decorated belly fragments devoid of handles. Leaving aside, for the moment, the question of the ornamentation itself, one should notice that these fragments were used for a drawing reconstruction of entire vessels. Moreover, the resulting pottery forms have pairs of handles, which both when it comes to their form and their location on the bodies of the reconstructed pots, constitute their *differentia specifica*. Finally, the readers were offered evocative images of two types of vessels very characteristic of the Bodrogkeresztúr culture – the so-called milk jug and double-handled amphora (fig. 1; cf. A. Czekaj-Zastawny *et alii* 2011a, Fig. 7.1, 8; A. Czekaj-Zastawny *et alii* 2011b, Fig. 10). Notwithstanding the technical aspect of such creation of archaeological sources, let us have a look at the substantial correctness of these reconstructions.

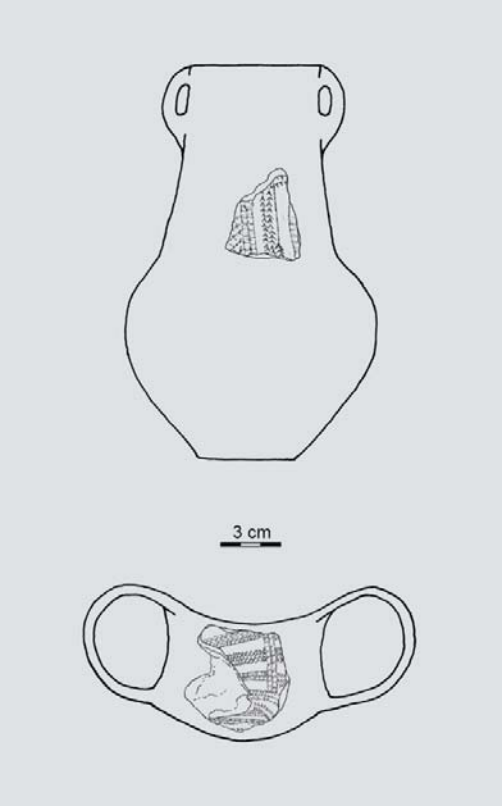

Fig. 1. The first reconstructions of the ceramic vessels made on the basis of sherds found in Dąbki representing alleged imports of the Bodrogkeresztúr culture pottery (after A. Czekaj-Zastawny *et alii* 2011b).
Primele reconstrucții ale vaselor ceramice realizate pe baza fragmentelor ceramice găsite în Dąbki reprezentând presupuse importuri de ceramică Bodrogkeresztúr (după A. Czekaj-Zastawny *et alii* 2011b).

The resulting pottery forms were associated with the late phase of the Bodrogkeresztúr culture (A. Czekaj-Zasatawny *et alii* 2011a, p. 48; A. Czekaj-Zastawny *et alii* 2011b, p. 68-69). The authors of the thesis under discussion tried to support the proposed dating, among others, by analysing the types of vessels reconstructed by them, i.e. the milk jugs and amphora with large handles protruding over the rim. The line of argumentation in respect to the latter – more chronologically diagnostic pottery form – seems to be particularly significant.

In the first of the discussed papers, published in 'Sprawozdania Archeologiczne` (A. Czekaj-Zastawny *et alii* 2011b, p. 69), the late dating of the double-handled amphorae/cups was made credible by completely ambiguous reference to the work of Stanislav Šiška (1972) dedicated to the Lažňany group. It is difficult, however, to demand explicitness, as in the long discourse dedicated to the pottery of the younger phase of the Bodrogkeresztúr culture the Slovak archaeologist does not make any observations with regard to this type of vessels. Therefore, this is nothing more than *argumentum ad verecundiam*. Perhaps in the course of the review process of the text on the same problem submitted to `Antiquity` someone made the authors aware of the purely eristic strength of their evidence, since already there, in the context of the same conclusion, appeared only references to the works of Pál Patay (1975; 2009). Admittedly, one can hardly think of a more reliable source of information than the painstaking studies of Methuselah among the scholars engaged in the studies on the Central European Eneolithic (and the Bodrogkeresztúr culture in particular). Except for the fact that the authors of the paper made an intellectual misuse of them as well.

When trying to justify the proposed dating of the allegedly southern-origin amphora as reconstructed by them, Agnieszka Czekaj-Zastawny and co-authors indicate that `[it] has analogies in Hungary, appearing during the phase B of the Bodrogkeresztúr culture and in the Hunyadi-halom culture: Tiszakeszi-Fáykert (P. Patay 1975, Tafel 12.1), Erd-Érdliget (P. Patay 1975, Tafel 12.4), Magyarhomorog-Kónyadomb (P. Patay 2008, Abb. 4.2) and Tiszadob-Borziktanya (P. Patay 1975, Tafel 12.2)`. If only had they made an effort to get acquainted not just with the illustrative material, but also with the texts of the cited works, they would have known that P. Patay does not share such an opinion. The Hungarian archaeologist wrote extensively on the subject in one of the papers referred to by them (P. Patay 2009, p. 38). Namely, he stated that: `such [pottery vessels] are not yet known in the Eneolithic [literally 'from the Copper Age' – T.J. Chmielewski (T.J.Ch.)] Tiszapolgár culture, and among the pottery of this culture there is not even a type, from which they could have been derived. In contrast, they are present in the material from each cemetery coming from the transitional period into the Bodrogkeresztúr culture, at [certain – T.J.Ch.] places even in numerous specimens. In total 12 specimens were obtained from the cemetery in Tiszavalk-Tetes consisting of 25 graves, and there was one specimen in each of five burials from among 26 graves forming the southern group of the cemetery in Magyarhomorog. Four (or five) specimens were at the cemetery in Szentes-Kistokaj consisting of 28 graves, at which in individual graves there even were pottery vessels corresponding to the types of the Tiszapolgár culture. Two [specimens – T.J.Ch.] come from Pusztaistvánháza, from four graves dating to the transitional period, while from the surface survey a third one is known. Besides these, one [such – T.J.Ch.] cup with big handles appeared in a grave in Tiszakeszi-Fáykert next to the vessel resembling the Early Eneolithic [literally 'from the Early Copper Age' – T.J.Ch.] forms. This type of [pottery vessels – T.J.Ch.] is sometimes encountered at the cemeteries, where forms referring to the Early Eneolithic ones are absent, but at such [they are present – T.J.Ch.] in much fewer numbers [literally 'at a substantially smaller rate' – T.J.Ch.] (two from grave 28 in Kiskőrös, one from grave 17 in Konyár). Single specimens of this type are also

present – albeit quite exceptionally – at such cemeteries, where elements typical of the Hunyadi-halom culture dated to the Late Middle Eneolithic are present as well (Fényeslitke, Paszab-Zádó, Tiszavalk-Kenderföld). The latter, however, represent such a variant [of this – T.J.Ch.] type, of which only one specimen is known for the transition period` [transl. T.J.Ch.].

Therefore, the pottery form suggested by the authors is primarily typical of the initial period of development of the Bodrogkeresztúr culture, defined by P. Patay as the `transitional period` (here designated as stage A1 – see Annex), as well as of its subsequent phase (here – stage A2). Such a chronology is also confirmed by radiocarbon dating of grave assemblages, in which amphorae analogous to the reconstructed vessel were present (graves from Abony 49 and Pusztataskony-Ledence; see Annex). If vessels of the kind appear later (only occasionally!), then certainly not in such a form as the one reconstructed from the sherd found at Dąbki.

Ultimately, decoration of the ceramic pieces ornamented with the use of the stab-and-drag technique (Germ. *Furchenstichtechnik*) is, to a large extent, believed to confirm the dating of these alleged imports. With regard to this style of ornamentation one can undoubtedly state that it occurs commonly in the early horizon of the handles with disc-shaped attachments (Germ. *Scheibenhenkelhorizont*), which corresponds to the traditionally defined late (B) phase of the development of the Bodrogkeresztúr culture (here referred to as stage B2). Due to very frequent co-occurrence of the mentioned elements, many researchers still follow Ida Bognár-Kutzián's line of reasoning (see I. Bognár-Kutzián 1963, p. 523; I. Bognár-Kutzián 1967, p. 55), and consider both of these dating decorative elements (though not only them) as defining the phase B of the Bodrogkersztúr culture (see e.g. P. Patay 2009, *passim*). So do the authors of the concept subjected here to criticism (A. Czekaj-Zastawny *et alii* 2011a, p. 48-49; A. Czekaj-Zastawny *et alii* 2011b, p. 66; A. Czekaj-Zastawny 2015, p. 226). However, A. Czekaj-Zastawny and co-authors are so much attached to the founding chrono-typological concept from the 1960s, that they accept it together with the assumption that the Bodrogkersztúr *Pseudofurchenstich* ornament appeared as the result of development of the patterns from Transdanubia (Balaton-Lasinja II-III culture, which they refer to as the Bajć-Retz group), which already by now has for long been anachronistic.

Meanwhile, it is already known that the beginnings of the complex with *Furchenstichkeramik* in the western part of the Carpathian Basin ought to be synchronized with the Hunyadi-halom culture, while the precedence of the Băile Herculane II culture materials (traditionally equated with the phase B of the Bodrogkersztúr culture; here – stage B2) was confirmed long ago through stratigraphic observations and cross-dating. Therefore, the Bodrogkersztúr culture drag-and-stab ornament seems to be a convergent phenomenon. Despite some far-reaching propositions set by László A. Horváth (1994, p. 93, 101) in the discourse, in which he tried to undermine the basis of the periodization of the Middle Copper Age in the eastern part of the Carpathian Basin, it was difficult even then not to share the doubts expressed by him, at the conclusion of which he allowed the possibility of an even earlier appearance of the *Pseudofurchenstich* in the Bodrogkeresztúr culture (see also A.S. Luca 1999, p. 46). Recently published 14C datings of the graves from Vinča-Belo Brdo and Urziceni-Vada ret (see Annex) corroborate these suppositions.

The dating of the occurrence of pottery decorated with the characteristic rows of points in the Bodrogkeresztúr culture is particularly important when it comes to assessing the correctness of the drawing reconstruction of the earlier discussed form, i.e. the amphora/cup with two handles. It does not seem possible that such a form could have been decorated with the ornament made in *Pseudofurchenstich* technique. These two particular elements of pottery

stylistics, i.e. the shape and ornamentation, are simply chronologically disjointed, which cannot be changed even by a slightly earlier dating of the beginnings of the discussed style of ornamentation (fig. 2). This is confirmed by all the finds known up to date. While milk jugs, pitchers with four legs, and bowls decorated in this technique are common (see P. Patay 2009, p. 23-25), not a single case of covering with such ornament of a belly of an amphora/cup of the concerned here type is known.

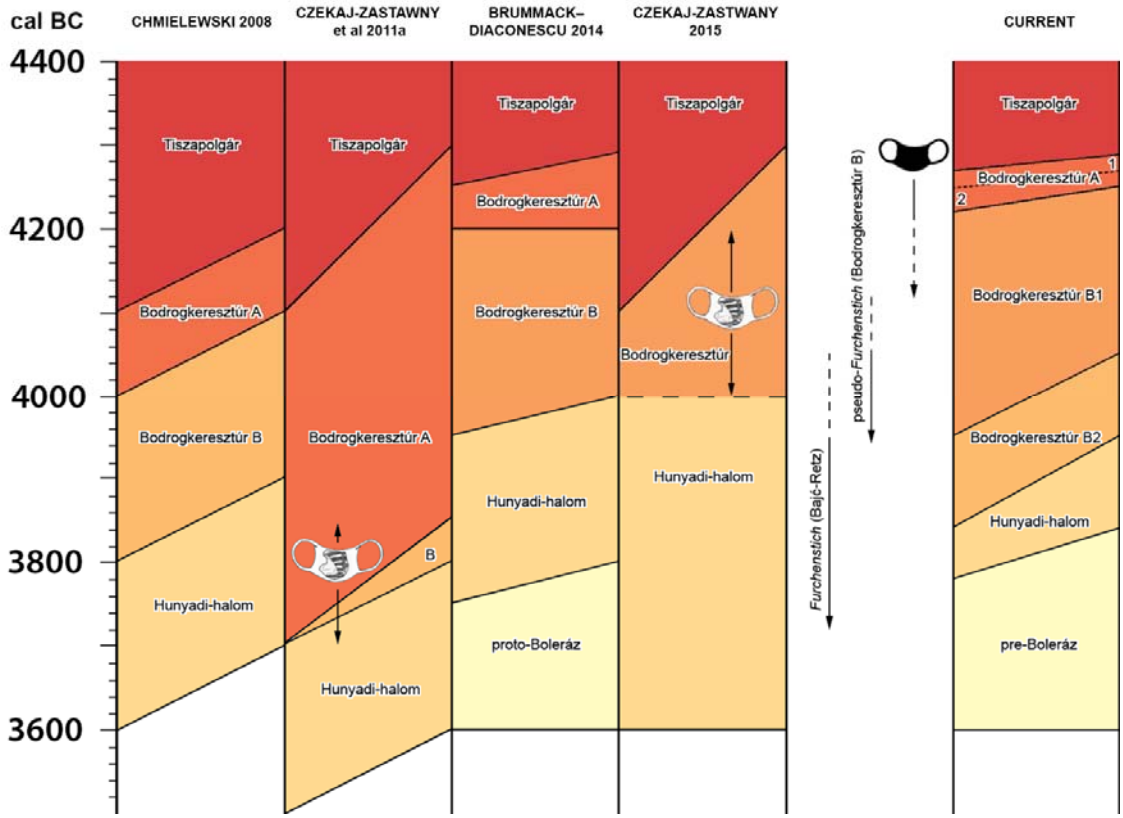

Fig. 2. On the left – the chronology of the alleged imports of the Bodrogkeresztúr culture pottery from Dąbki against chronological schemes of the Polgár complex. On the right – correlation of the important diagnostic 'stylistic elements' used in the reconstruction of the alleged imports of the Bodrogkeresztúr culture pottery from Dąbki with the comprehensive chronology of the development of the Eneolithic cultures of the Polgár complex (see Annex – fig. 5).
În stânga – cronologia presupuselor importuri de ceramică Bodrogkeresztúr din Dąbki și schemele cronologice ale complexului Polgár. În dreapta – corelația 'elementelor stilistice' importante de diagnostic utilizate la reconstrucția presupuselor importuri de ceramică Bodrogkeresztúr din Dąbki cu cronologia cuprinzătoare a dezvoltării culturilor eneolitice din complexul Polgár (a se vedea fig. 5 din Anexă).

Perhaps the authors of the criticized theory are even already aware of the substantive weakness of the reconstructions provided (and the arguments based on thereof), since recently the pottery finds from Dąbki have become the basis for a graphic reconstruction of a completely different form of the vessel (A. Czekaj-Zastawny 2015, Fig. 10). However, it is hard to say what the pot presented this time might have in common with the Bodrogkeresztúr culture at all. The situation became all the more bizarre as in the second volume of `The Past Societies` (A. Czekaj-Zastawny, Th. Terberger 2017, p. 114, Fig. I and H) the thesis of the presence of the imports from the Polgár milieu in Pomerania is illustrated, in adjacent figures, with both so different pottery forms reconstructed on the basis of the same sherd (fig. 3).

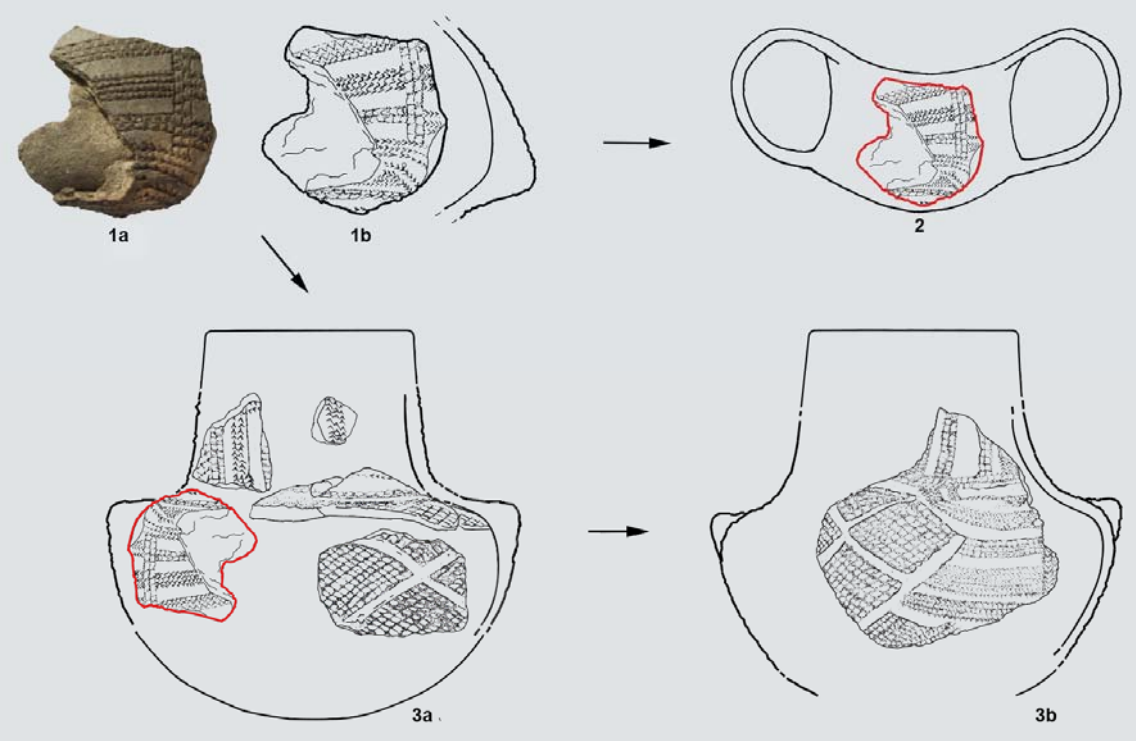

Fig. 3. One of the pottery fragments found in Dąbki representing the alleged import of the Bodrogkeresztúr culture pottery (1a-b – after A. Czekaj-Zastawny *et alii* 2011a, 2011b; A. Czekaj-Zastawny 2015) and the pottery vessels reconstructed on the basis thereof: double-handled cup/amphora (2 – after A. Czekaj-Zastawny *et alii* 2011a; 2011b) and amphora (3a – after A. Czekaj-Zastawny 2015; 3b – after A. Czekaj-Zastawny, Th. Terberger 2017).
Unul dintre fragmentele de ceramică găsite în Dąbki reprezentând presupusul import al ceramicii Bodrogkeresztúr (1a-b – după A. Czekaj-Zastawny *et alii* 2011a, 2011b; A. Czekaj-Zastawny 2015) și vasele de ceramică reconstituite pe baza acestora: cupă cu două mânere / amforă (2 – după A. Czekaj-Zastawny *et alii* 2011a, 2011b) și amforă (3a – după A. Czekaj-Zastawny 2015; 3b – după A. Czekaj-Zastawny, Th. Terberger 2017).

◈ Conclusions

In conclusion, the subsequent reconstructions made on the basis of pottery fragments linked with the Bodrogkeresztúr culture that were found in Pomerania should be considered unreliable, and the following typo-chronological `analysis` as outdated, inadequate and simply incorrect. In view of the demonstrated weakness of the whole context of justification, the thesis regarding the distant southern provenance of the discussed pottery finds becomes extremely rickety. Taking into account the burden of these and other accusations made so far against the intellectual construction under scrutiny, I believe that the authors thereof should either make the necessary corrections and present a coherent and convincing argumentation or withdraw from the interpretation of the pottery finds in question as imports from the Carpathian Basin, perhaps returning to their primary concept (see Th. Terberger, J. Kabaciński 2010). Anyway, it would be a great shame if the demonstrably unreliable thesis overshadows other results of many years of research on Dąbki.

Annex: Absolute chronology of the development of the Polgár complex at the stage of the Middle Eneolithic (Copper Age)

◈ Introduction

In order not to distract the main argument above with an excessive amount of data and extended comments, the entire reasoning relating to the fundamentals of absolute dating of the discussed cultural formation had to be presented separately. This is a seriously modified version of my earlier proposal concerning the chronology of the Eneolithic cultural formations in the Carpathian Basin (T.J. Chmielewski 2008). It includes a critical review of currently available radiocarbon dates as well as their modelling. The relatively recently published analysis by Svenn Brummack and Dragoş Diaconescu (2014) served as the starting point for this reassessment.

Developing a reliable and adequate chronology is an important task not only due to the progress in research on the Eneolithic in the Tisza River region itself. Considering the culture-generating role of the so-called Polgár community in Central Europe, also the scholars focusing on this epoch in neighbouring areas, as well as in those linked with them, are bound by the conclusions in this regard. This can clearly be demonstrated even with the example of the above counternarrative on the pottery from Dąbki.

◈ Methods and data

The potential of Bayesian statistics offered by the current version (4.3.2.) of OxCal program was used for the sequence analysis (cf. Ch. Bronk Ramsey 2009a). All the radiocarbon age determinations and their derivatives were calibrated to the absolute chronology scale (cal BC) using Radiocarbon Age Calibration Curve IntCal13 (P.J. Reimer *et alii* 2013). Stratigraphic and seriation-based pre-orderings of the dated prehistoric deposits served as the *a priori* premises used to chronologize relevant prehistoric events.

In this study the sequence of development of the Polgár complex was addressed from two perspectives: once as a series of contiguous phases, and another time allowing the possibility of their partial temporal overlapping (i.e. as overlapping phases). In the case of each of the periods of development, its chronological range was determined on the basis of summed

radiocarbon measurements obtained for assemblages typical for the given stage and deposited within a particular site. The thus obtained determinations for sequences within particular sites, as referring to a random set of independent events, were then presented as the normalized summed distribution (cf. Ch. Bonk Ramsey 2017). Although the procedure was analogous to the one in the indicated referential study of S. Brummack and D. Diaconescu (2014, p. 246), the set of 14C determinations constituting the basis for building of the chronological sequences differs substantially. Individual phases and stages were defined slightly differently as well.

The used set of 14C determinations was on the one hand supplemented by the dates that were not used in the mentioned analyses, while on the other hand some of the laboratory results included there have been eliminated in the present modelling (tab. 1). Initially, the relationship between particular measurements was established on the basis of their correspondence with targeted events, however, their usefulness and credibility were determined by the ability to specify the relationship between the latter and the possible or actual age of the organic substances subject to radiocarbon dating.

Although the subject of my direct interest is the absolute chronology of the stretch of prehistory that Hungarian archaeologists define as the Middle Copper Age, viz. the period starting with the advent of the Bodrogkeresztúr culture, also dates relating to the developed phase (B) of the Tiszapolgár culture, concluding the Early Copper Age, were used for the construction of the following models.

Unfortunately, main publications of radiocarbon measurements relating to the period antedating the Middle Copper Age describe them to an unsatisfactory extent. Researchers, while focusing on the verification of archaeological contexts of the samples collected for 14C analysis (see e.g. Zs. Siklósi, M. Szilágyi 2016, p. 66), still pay insufficient attention to describing the dated prehistoric substance itself. Sometimes even the basic specification of the dated material is missing. In the case of most bone samples their anatomical characteristics are not provided; often there are no anthropological or zooarchaeological determinations of age and sex of the individuals sampled (cf. e.g. R.W. Yerkes *et alii* 2009, appendix 1; P. Raczky, Zs. Siklósi 2013, p. 557-558, table 1). In turn, in the case of botanical samples most often we have neither indication of the species nor the anatomical determination thereof. In general, publications still do not meet the basic standards of the laboratory specification of the dated samples (cf. A.R. Millard 2014; A. Bayliss 2015, p. 681-683). This certainly is not the basis for contesting the results obtained, but in many cases it makes it difficult, or even impossible, to assess the results, thus making determinations unusable in constructing more exact chronological models. It should be also suspected that part of the already detected statistical outliers (S. Brummack, D. Diaconescu 2014, p. 248) are of non-systematic nature, i.e. not resulting from the nature of the method, and thus could have been explained thanks to such information. However, for the time being, in order to eliminate potential sources of error, from the set of radiocarbon dates that may constitute a reliable basis for the chronological sequence, some measurements have been excluded such as, for instance, the series of determinations referring to the Tiszapolgár culture obtained for the sites Vésztő-Bikeri and Körösladány-Bikeri (R.W. Yerkes *et alii* 2009, Appendix 1), for which there is no even basic information regarding the sample subject to the 14C dating.[2] Thus, the absolute dating of the developed phase of this cultural entity was based on the measurements obtained for graves from Hajdúböszörmény-Ficsori-tó-dűlő, Male Raškovce, Tiszapolgár-Basatanya, and Uivar-Gomila.

[2] This is also a self-revision (see T.J. Chmielewski 2008, p. 73-74, Fig. 13).

The dataset of the 14C measurements relating to the crystallisation stage of the Bodrogkeresztúr culture, determined by P. Patay as the `transitional period` (here stage A1), consists of the dates obtained for the graves from Abony 49 and Pusztataskony-Ledence. For the record, it must be added that the 14C age determinations (Poz-36365 and Poz-36368) obtained for chronologically similarly placed graves from Tiszapolgár-Basatanya were rejected. In the case of the latter radiocarbon measurement its poor statistical compliance with other dates attributed to this phase, and in the first case complete absence of such compliance were recognized as the ultimately disqualifying factors.[3]

Measurements made for the graves forming the west concentration at the cemetery in Rákóczifalva-Bagiföld form the core of the chronometric analysis addressing assemblages of the developed phase A (stage A2) of the Bodrogkeresztúr culture. At this stage, only the date obtained for the bones of the man from grave 204 (VERA-4201) was eliminated from this set. High value of the measurement results in its small compatibility with other determinations referring to this phase (A=57.0%; A'c=60.0%). While waiting for a comprehensive publication of the finds from Rákóczifalva, one can only assume that this grave is the oldest within the cemetery and it is associated still with the so-called transitional period. When considering the previous date sequence obtained for the cemetery in Tiszapolgár-Basatanya (see S. Brummack, D. Diaconescu 2014, p. 252), the measurements made for graves supposedly associated with this stage, i.e. no. 57 and 123, have also been rejected from modelling as systemic outliers, i.e. elements statistically not compatible with the others.

In the late phase of the development of the Bodrogkeresztúr culture two stages can be distinguished. The older one is characterised by assemblages containing younger elements (including pottery already decorated with the use of *Pseudofurchenstich* technique), but for which other forms and plastic ornamentation anticipating the pottery designs typical of the Hunyadi-halom culture are absent. In the first place, the 14C measurements relating to the burials in the eastern part of the cemetery discovered in Rákóczifalva were identified as belonging to this stage (see S. Brummack, D. Diaconescu 2014, p. 246-247). Additionally, two radiocarbon measurements obtained for the burials from Tiszapolgár-Basatanya (Poz-36370 and Poz-36372) were also included. The first of them is for grave 105, originally associated with the phase Bodrogkeresztúr A. However, in view of its low statistical compliance with the dates relating to this phase, and the revision of chrono-typological interpretation of the burial suggested by S. Brummack and D. Diaconescu (2014, p. 247-248), it was recognized as relating to the later phase. At the same time, the association of grave 130 with stage B1 is undisputed, therefore the inclusion of its 14C measurement does not require additional justification. Another radiocarbon age determination used in the present model was obtained for a similarly dated single grave from Urziceni-Vada ret (T.J. Chmielewski *et alii*, in press). The dataset for this stage should include also two dates obtained for a small burial field located on top of the tell of Vinča-Belo Brdo. However, as one of the measurements (OxA-24922), for reasons difficult to explain, occurred to be a statistical outlier, it must have been eliminated from final modelling.

Assemblages belonging to the earliest horizon of the handles with disc-shaped attachments (Germ. *Scheibenhenkelhorizont*), referred to as Băile Herculane II, were distinguished as the youngest finds relating to the Bodrogkeresztúr culture. Crucial dates

[3] Besides, it should be remembered that justified objections to the argument of P. Patay (2009, p. 42) in regard with the conventional (i.e. stratigraphic and typological) chronological ordering of the relevant burials have been also already articulated (S. Brummack, D. Diaconescu 2014, p. 252).

connected with the latest (B2) stage of the Bodrogkeresztúr culture development come from the deposits with well-established stratigraphy accumulated in the Thieves' Cave (Rom. *Peștera Hoților*) in Băile Herculane (P. Roman 1971), and in the Hungarians' Cave (Rom. *Peştera Ungurească*) in Petreştii de Jos (Gh. Lazarovici, M.C. Lazarovici 2013). The measurements are extremely important as they bridge the already observed gap in the dates relating to this period (cf. S. Brummack, D. Diaconescu 2014, p. 254).

In the case of the first of the above-mentioned sites, there is a single radiocarbon measurement (OxA-16327) obtained for the female skull deposited, together with a single vessel and a bovine rib, in a small niche of the cave (D. Nicolăescu-Plopșor, W. Wolski 1974). Petre Roman (1971, p. 76) wrote as follows about the niche in which the human remains of our interest were discovered: 'stratigraphically this spot was reached starting from the lower limit of layer I[…]` [trans. T.J.Ch]. Therefore, it seems most likely that the skull was deposited in the earlier period of the cave use. Unfortunately, in this case the pottery vessel accompanying the bone deposit is not very indicative (see P. Roman 1971, Pl. XXIV, 1). Although, due to the level at which it was unearthed during the investigations, it was associated by P. Roman with layer I (b), in the same paragraph he pays attention to its poorly diagnostic form and numerous analogies among the forms found in layer II (c). Therefore, the skull should also, most likely, be associated with the stage Băile Herculane II.

Measurements obtained for the Hungarians' Cave at Turda Gorge (Rom. *Cheile Turzii*) cause somewhat more serious problems. In this case, from the very beginning, certain difficulties were indicated in correlating the obtained radiocarbon dates with the stratigraphy of the site. The oldest two dates relate to the materials from the layers overlying strata that yielded significantly younger measurements (P. Biagi, B.A. Voytek 2006, p. 179). In accordance with the systematic approach accepted, I found it necessary to revise my earlier assumptions in this regard (T.J. Chmielewski 2008, p. 75-76). Consequently, I had to eliminate from the dataset of the 14C the measurements relating to the strata associated with the *Scheibenhenkel* horizon (layers: 2A and 2B) not only the oldest date (GrN-29014: 5350±40 BP), but also the remaining ones obtained on the basis of unspecified anthracological samples (GrN-29101: 5260±40 BP; GrN-29100: 5100±40 BP). Although I still consider it reasonable to suspect that part of the mentioned plant remains were redeposited from older layers (associated with the Petreşti culture), the possibility of the existence of an indeterminate old wood effect should be recognized as the overriding premise to eliminate these measurements. This supposition is largely confirmed by the dating of the charcoals from the underlying layer 3 (GrA-35701: 5275±35 BP), which yielded finds typical of phase B of the Petreşti culture. This measurement was published already after the publication of my paper (R. Nisbet 2010, p. 172). This date, even being a potential T-type outlier (cf. Ch. Bronk Ramsey 2009b) both due to the potential association of the dated charred plant macroremains with even older periods of the cave use and the possible old wood effect, determines *terminus post quem* for the overlying deposits containing materials of the *Scheibenhenkelhorizont*, and thus significantly narrows the range of the probability distribution of measurements relating to the said horizon. Therefore, only the 14C age measurement obtained for the bovine bone deposited in layer 2A3 (GrN-29102) can be considered as corresponding with the archaeological material.

The entire sequence of the development of the Polgár complex is currently closed with measurements obtained for the remains from settlements and cemeteries of the Vajska-Hunyadi-halom-Lažňany complex (correlated with Băile Herculane III). They come from two very well-known sites in Košice-Barca-Baloty and Tiszalúc-Sarkád. This set of measurements

is complemented with a single radiocarbon age determination (Deb-3855) from site Csincse 17. The role of these dates in the proposed model also requires a few words of comment.

Above all, the short series of dates obtained for two burials from Košice were treated slightly differently than in the reference publication (see S. Brummack 2015, p. 6-7) and in the original model (S. Brummack, D. Diaconescu 2014, p. 252). According to the recently proposed approach (T.J. Chmielewski *et alii* in press), in the present models particular human skeletal remains were considered as reservoirs of heterochronous collagen. Accordingly, the accumulated isotopic composition of the dated vertebra from the skeleton discovered in grave 21 is considered to be more closely corresponding to the near-death period, while the skull of the same individual as containing more collagen from earlier phases of ontogenesis. Therefore, this latter date designates *terminus post quem* for the measurement obtained for the vertebral column. The situation of the three 14C measurements obtained for grave 18 from the same site is slightly more complex. Unlike in the original study (cf. S. Brummack, D. Diaconescu 2014, p. 246), the oldest date (MAMS I-14243), obtained from the tooth, was eliminated from the modelling. Hypothetically, due to the order of the ontogenetic development of tissue, it could have been treated as the radiocarbon measurement of substance corresponding to the age of the individual around its birth, thus being *terminus post quem* for the remaining two dates (closely corresponding to the peri-depositional period). *De facto*, however, this measurement has no real value as the element constraining the probability distribution range of the remaining two determinations (which has been tested through Bayesian modelling using the `After` function of OxCal program). The chronological discrepancy between the date obtained for the tooth and the other 14C measurements is simply too large.[4] It should also be noted that the youngest date from Tiszalúc-Sarkad (GrN-16127) was excluded from the eventual model. It does not pass the compliance test with the other measurements for this site, corresponding well rather with the radiocarbon determinations relating to the so-called proto-Boleráz (or perhaps better – pre-Boleráz) phase obtained for the finds from Abony 49 (A. Rajna 2011b, p. 106).

Due to the lack of description of the dated substances, also the mentioned 14C dates relating to the pre-Boleráz horizon had to be eliminated from the final chronometric modelling. Consequently, the mentioned phase of the development of Eneolithic communities within the Carpathian Basin could not be precisely defined within the resulting chronological model (cf. S. Brummack. D. Diaconescu 2014, p. 254).

◈ Results

The development sequence Tiszapolgár→Bodrogkeresztúr→Hunyadi-halom obtained using the `overlapping phases` model (fig. 4), seems to confirm the possible survival of Tiszapolgár culture traditions not only during the so-called transitional period (here described as A1), but even throughout the entire early phase of the Bodrogkeresztúr culture development during the 43rd century BC (including assemblages from the A2 stage, the

[4] In the case of dating teeth one must take into account the possible impact of diagenetic factors on the result obtained. Although microsampling of dentine can provide us with datable material of great value for obtaining very precise radiocarbon dates (cf. e.g. L. van der Sluis *et alii* 2015; P. Barta 2018), results of radiocarbon age measurements performed for enamel are apparently biased (see e.g. A. Zazzo 2014). Regrettably, in this case we do not know on the basis of which exact fraction this questionable measurement was made.

separation of which, at the moment, is based purely on typological premises). On the basis of the sequencing carried out in this manner, the developed phase (B) of the Bodrogkeresztúr culture took place after the complete disappearance of the Tiszapolgár culture. The radiocarbon dating of the Bodrogkeresztúr culture assemblages belonging to the final horizon characterised by the handles with disc-shaped attachments (stage B2) could indicate that such traditions continued even at the time of development of the proper Hunyadi-halom culture. The latter would have appeared at the end of the 40th or the beginning of the 39th century BC and lasted until around 3800 BC.

However, if one treated the individual stages of the evolution of the Polgár cultural complex in accordance with the contiguous phases model than the acquired picture changes to a certain extent (fig. 5). First of all, the period of the Bodrogkeresztúr culture crystallisation is narrowed down. In this approach, the transitional stage (A1) might have lasted for a very short period of time (ca. 4290/4270-4280/4260 BC), while the entire phase lasted most probably until approximately 4250-4220 BC (68.2%). On the contrary, the early stage (B1) of the developed phase of the Bodrogkeresztúr culture covers a very long period corresponding with the calibration curve's plateau of about 4220-4060 BC. Modelling of the radiocarbon measurements relating to the final stage of this culture (B2) extends the duration of this phase into the beginning of the 4th millennium BC. Considering the results of the contiguous phases modelling, the materials of the Băile Herculane II (Bodrogkeresztúr B2) are remnants of the development stage that begun at the turn of the 5th and 4th millennium (around 4050-3950 BC) and lasted for approximately one hundred years – to the advent of the Hunyadi-halom culture. The evolution of the latter formation also in such a chronological sequence must have come to the end around 3800 BC.

◈ Discussion

The chronometric analyses for the Middle Eneolithic (Copper Age) complexes of the Polgár complex carried out again on the basis of the modified dataset of radiocarbon measurements confirmed higher overall statistical compatibility for the overlapping phases model than in the case of contiguous phases one. However, these values differ to a relatively small extent (A_{model}=123.2, $A_{overall}$=123.8 – for the first model; A_{model}=117.2, $A_{overall}$=115.1 – for the second one), and this difference is easy to explain.

An increasing number of stratigraphic observations, especially those made with respect to the late phase of the development of the Polgár complex in the Thieves' Cave and Hungarian Cave in Romania, force to question the correctness of the cultural evolution model based on the assumption of long-term survival of successive stylistic trends. For this reason, on the regional scale, the sequence of complete and fairly rapid cultural changes is easier to accept. However, when analysing the changes in this cultural complex as a whole, it is difficult to ignore the possibility of the existence of certain temporal shifts in the reception of the successive cultural trends in different areas. Only the comparison of regional sequences, for modelling of which we are still missing the relevant data, would allow us to create an exact chronological timeline. Therefore a generalized model must be used for now.

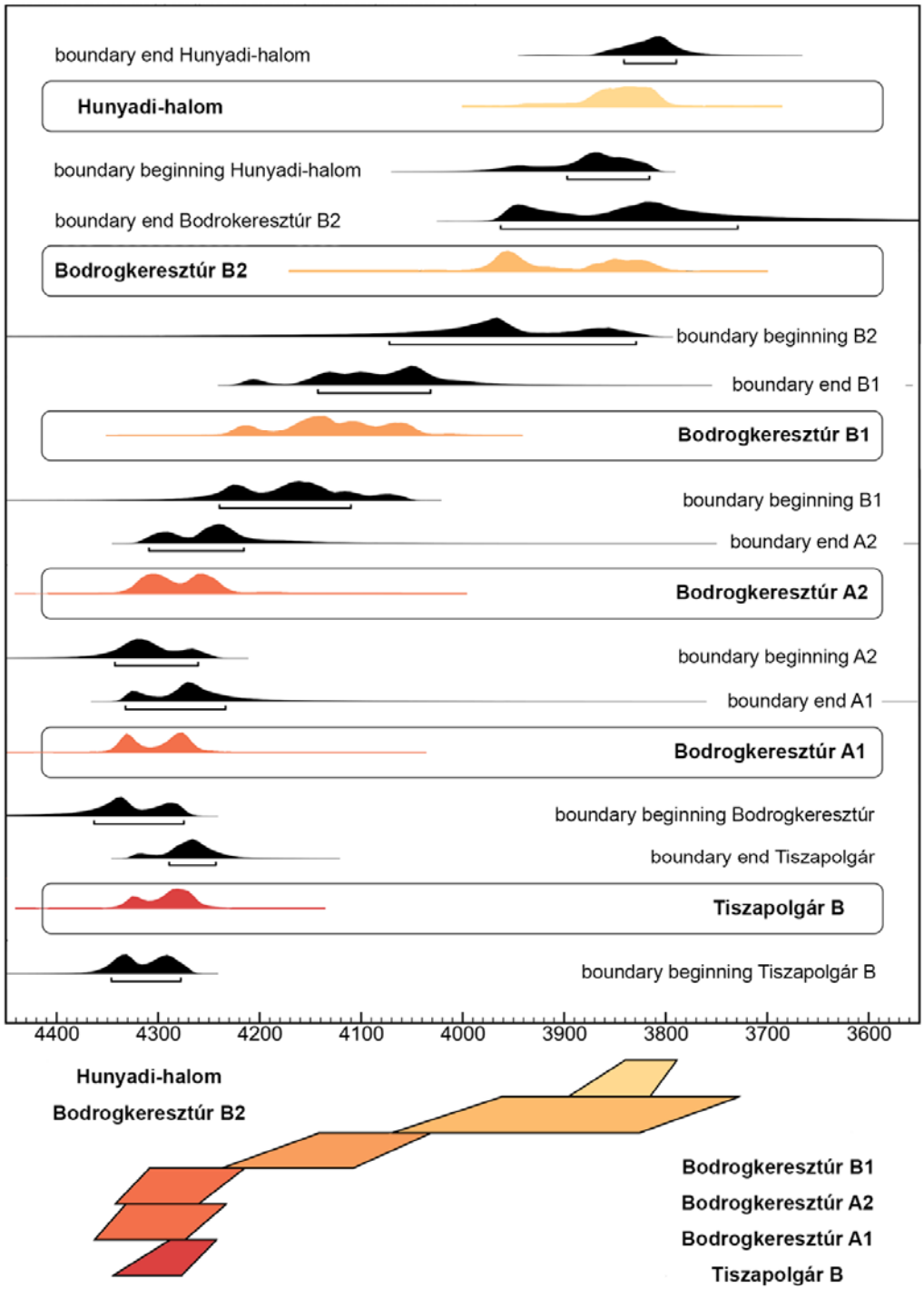

Fig. 4. Middle Eneolithic chronological sequence of the Polgár complex model assuming possible overlapping of subsequent phases (their boundaries were determined with a probability of 1σ). Note: The graph was constructed using OxCal version 4.3.2. and calibration curve IntCal13, and then modified.
Secvența cronologică a Eneoliticului mijlociu al modelului complex Polgár presupunând suprapunerea posibilă a fazelor ulterioare (limitele lor au fost determinate cu o probabilitate de 1σ). Notă: Graficul a fost construit folosind OxCal versiunea 4.3.2. și curba de calibrare IntCal13 și apoi modificat.

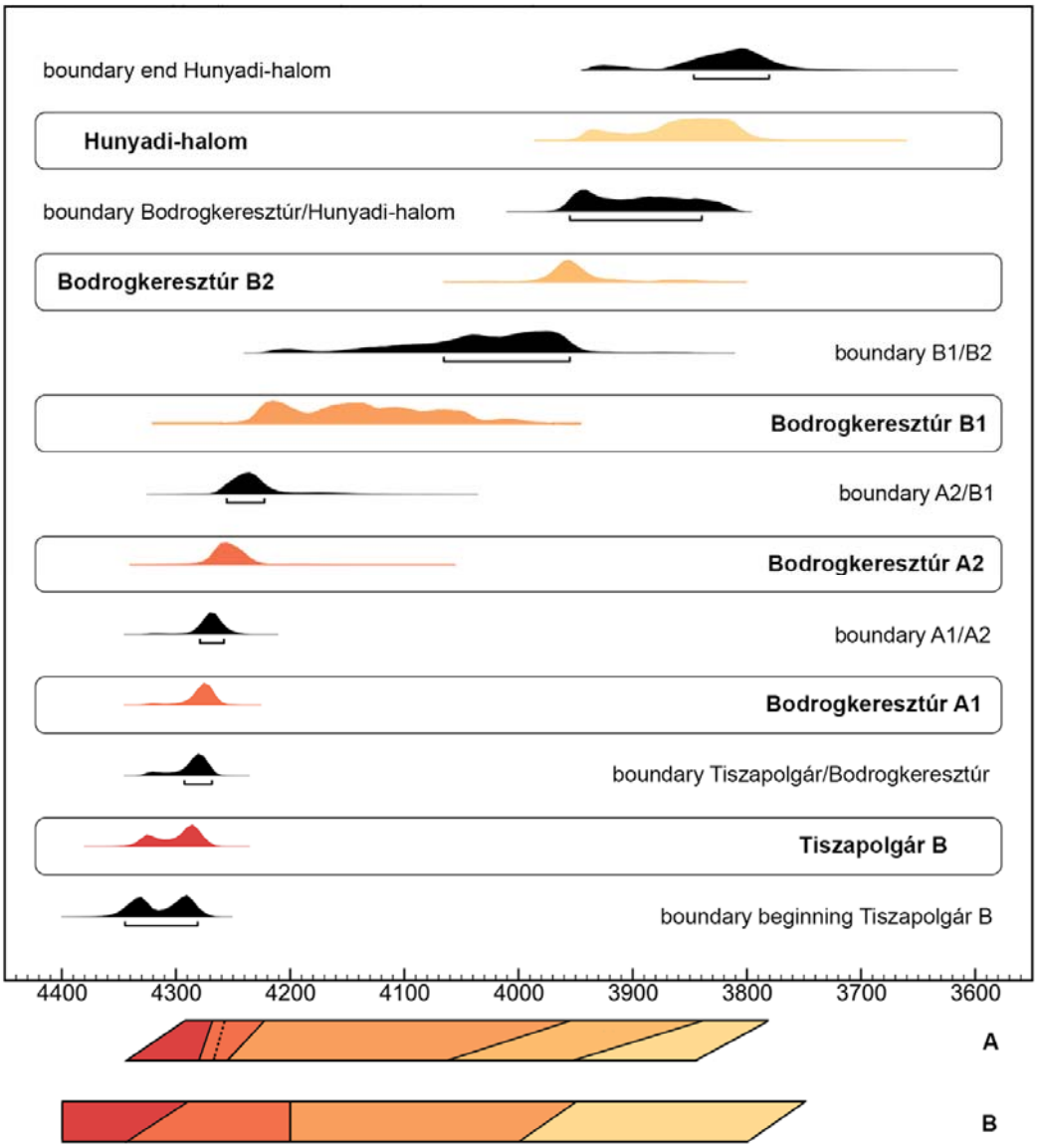

Fig. 5. Above: Middle Eneolithic chronological sequence of the Polgár complex in accordance with the contiguous sequence model. Note: the graph was made using the OxCal program version 4.3.2. and IntCal13 calibration curve, and then modified. Below: A – chronological diagram based on the above sequence (phase boundaries of the phases determined with a probability of 1σ); B – the referential chronological sequence (after S. Brummack, D. Diaconescu 2014).
Deasupra: secvența cronologică a Eneoliticului mijlociu al complexului Polgár în conformitate cu modelul de secvență contiguă. Notă: graficul a fost realizat utilizând versiunea 4.3.2 a programului OxCal. și curba de calibrare IntCal13, apoi modificat. Mai jos: A – diagramă cronologică bazată pe secvența de mai sus (limitele fazelor determinate cu o probabilitate de 1σ); B – secvența cronologică de referință (după S. Brummack, D. Diaconescu 2014).

Since the available at this time reliable 14C dating of the individual stages of development in the various regions is characterised by a very high statistical compliance (with outliers represented most often by single dates from the longer series obtained within the respective sites), it seems that the picture closer to the truth is obtained by modelling sequences as series of contiguous phases. In this perspective, the width of boundaries between the successive distinguished phases of the development of this culture corresponds to the possible interregional asynchronous evolution of societies inhabiting the Tisza River Basin. However, we cannot ignore the results obtained through the implementation of the alternative model.

Despite the differences between the presented here results of alternative modelling, undoubtedly the beginning of the Bodrogkeresztúr culture can be placed in the first half of the 43rd century BC. This is significant progress, considering that no longer than a decade ago, i.e. at the time when we did not have good radiocarbon measurements relating directly to this phase of the Polgár complex development, a slightly later dating was considered as a seemingly too bold a concept (T.J. Chmielewski 2008, p. 75-76). At this time, the result is consistent with the most recent determinations (S. Brummack, D. Diaconescu 2014, p. 258, fig. 5, 8).

Even when distancing ourselves from strongly exaggerated thesis regarding the synchronous development of the Tiszapolgár and Bodrogkeresztúr stylistics (P. Raczky, Zs. Siklósi 2013, p. 569-571), one must allow for the possibility of survival of the Early Eneolithic traditions during the early phase of development of the Bodrogkeresztúr culture (cf. S. Brummack, D. Diaconescu 2014, p. 248). In any case, solely on the basis of the radiocarbon measurements, it is very difficult to justify not only the contiguous succession of the early phase of the Bodrogkeresztúr culture development after the phase B of the Tiszapolgár culture, but also the temporal discontinuity of the transitional assemblages (here distinguished as representative for stage A1) and the finds associated with the 'proper' early phase of the Bodrogkeresztúr culture (here denoted as stage A2). What is worth at least noting though, if we accept the typological arguments of Pál Patay (2009, *passim*) in favour of the contiguous sequence: Tiszapolgár B→Bodrogkeresztúr A1→Bodrogkeresztúr A2, then the crystallization period of the Bodrogkeresztúr culture turns out to last for a very short period of time – roughly a single generation. With such assumption made, the early phase of the development of this cultural entity would have finished already in the third quarter of the 43rd century BC. However, the conclusion drawn by S. Brummack and D. Diaconescu (2014, p. 248) in accordance with which the definitive end of the early phase of the Bodrogkeresztúr culture should be marked around 4200 BC is confirmed regardless of the nature of the modelled chronological sequence.

With certainty around this time most of the Tiszapolgár culture traditions disappeared and the long period of the developed phase of the Bodrogkeresztúr culture begun. It should be noted, however, that its early stage (B1) appears currently as very long-lasting. To some extent, this results from the presence of radiocarbon plateau stretching between 4220 and 4060 BC. What is important though, regardless of the initial assumptions about the nature of the Bodrogkeresztúr culture development sequence, the said Eneolithic cultural formation from the Tisza River basin in its developed form clearly continues also into the period reaching beyond the upper limit of the mentioned plateau of the calibration curve. Therefore, the dating of the end of the phase B (stage B2) goes far beyond the range resulting from the original model (see S. Brummack, D. Diaconescu 2014, p. 252, fig. 8-9, 12-13), viz. until the beginning of the 4th millennium BC.

Taking into account the results of contiguous phase modelling the materials of the Băile Herculane II type constitute remnants of the development phase that started at the turn of the 5th and 4th millennium (about 4050-3950 BC) and ended about a century later, when the proper Hunyadi-halom culture developed. This, to a large extent, confirms my earlier conclusions in this respect (T.J. Chmielewski 2008). However, the previously proposed upper limit of the existence of the Vajska-Hunyadi-halom-Lažňany complex (Băile Herculane III) has to be subject to a serious adjustment. The end of the development of this complex took place around 3800 BC, which is consistent with the conclusions earlier reached by S. Brummack and D. Diaconescu. Unfortunately, due to systemic rejection from the analyses of probably extremely valuable dates relating to the pre-Boleráz phase (see above), the duration of this final phase of the Polgár complex development still cannot be reliably specified.

◈ Conclusions

The subsequent chronological models obtained for the development of the Polgár complex through modelling of radiocarbon dates are certainly more and more adequate. It seems that, at the current stage of the endeavour aimed at the possibly precise chronological definition of the dynamics of cultural change within the discussed cultural formation, it becomes necessary to gradually shift to the analyses of more regional ranges. Of course, the first step to build such independent regional chronological models is to increase the number of adequate (i.e. sufficiently precise and accurate) radiocarbon age measurements for assemblages crucial in this regard (S. Brummack, D. Diaconescu 2014, p. 254). In addition to the postulate of the acquisition of new measurements on a systematic and methodical basis, equally important is to encourage researchers in possession of such data, to supplement the already existing set of the radiocarbon dates with the pieces of information that would allow to critically include them in future chronometric models. After all, the difference between the main referential chronological sequence and the current one results from, among others, the use of such additional data for the selection and interpretation of the radiocarbon dates to be (or to be not) modelled[5].

[5] Hereby, I would like to express my gratitude to the Colleagues who kindly answered my requests by providing additional pieces of information regarding particular radiocarbon age measurements. Such support was given to me by: Paolo Biagi (Dipartimento di Studi sull'Asia e sull'Africa Mediterranea, Università Ca' Foscari), Klára Pusztainé Fischl (Történettudományi Intézet, Miskolci Egyetem), Renato Nisbet (Dipartimento di Studi sull'Asia e sull'Africa Mediterranea, Università Ca' Foscari), Zsuzsanna Siklósi (Régészettudományi Intézet, Eötvös Loránd Tudományegyetem), Andrei Dorian Soficaru (Institutul de Antropologie `Francisc I. Rainer`, Academia Română) and Erik Trinkhaus (Department of Anthropology, Washington University School of Medicine in St. Louis).

Tab. 1. List of the radiocarbon dates obtained for the Eneolithic stages of the Polgár complex development used as a basis for the current chronological models.
Lista datelor radiocarbon obținute pentru etapele eneolitice ale dezvoltării complexului Polgár utilizate ca bază pentru modelele cronologice actuale.

Culture	phase/ stage	site	feature	dated material: individual determinations (species, age, sex etc.); anatomical determinations	14C date (BC)	first published
TISZAPOLGÁR	B	Hajdúböszörmény-Ficsori-tó dűlő	grave 30/34	bone *Homo sapiens* (♂, 23-39 y.o. at death)[6]; no data	VERA-3785: 5370±40	K. Kovács, G. Vácsi 2007
				animal bone (no data)	VERA-3788: 5370±45	
			grave 57/61	bone *Homo sapiens* (♀, 32-38 y.o. at death)[6]; no data	VERA-3786: 5445±35	
				animal bone (no data)	VERA-3789: 5360±35	
			grave 71/75	bone: *Homo sapiens* (♂?, no data)[6]; no data	VERA-3787: 5425±35	
		Male Raškovce	grave 1/1987	bone: *Homo sapiens* (♂?, *maturus*? at death)[7]; *cranium*	MAMS-14249: 5427±29	S. Brummack 2015
		Tiszapolgár-Basatanya	grave 36	bone: *Homo sapiens* (♀, c. 25 y.o. at death); no data	Index -36364: 5470±40	P. Raczky, Zs. Siklósi 2013
			grave 56	bone: *Homo sapiens* (♀, 25-30 y.o. at death); b.d.	Index -36367: 5480±40	
		Uivar-Gomila	grave 1 (feature 3443)	bone: *Homo sapiens* (♂, 41-50 y.o. at death); no data	Poz-18972: 5440/40	W. Schier 2013
			grave 2 (feature 3476)	bone: *Homo sapiens* (♀, 20-25 y.o. at death); no data	Index -18973: 5470±40	W. Schier 2013
			grave 3 (feature 4174)	bone: *Homo sapiens* (no data); no data	Poz-19390: 5410±40	S. Brummack, D. Diaconescu 2014

[6] After Zs. Zoffmann 2013.
[7] Determination on the basis of the characteristics of the funeral rite (cf. e.g. C. Lichter 2001, p. 322-323).

Tab. 1. (continued).

Culture	phase/ stage	site	feature	dated material: individual determinations (species, age, sex etc.); anatomical determinations	14C date (BC)	first published
BODROGKERESZTÚR	A1	Abony 49	no data	bone: *Homo sapiens* (no data); no data	VERA-4743: 5460±40	A. Rajna 2011a
			no data	bone: *Homo sapiens* (no data); no data	VERA-4745: 5424±45	
		Pusztataskony-Ledence	grave 494	bone: *Homo sapiens* (♀, 48-52 y.o. at death)[8]; no data	Poz-33547: 5460±40	P. Raczky, Zs. Siklósi 2013
				bone: *Serpentes* (no data): no data	Poz-33548: 5490±40	
				bone: *Erinaceus europaeus* (no data): no data	Poz-33549: 5420±40	
				bone: *Lepus europaeus* (no data): no data	Poz-33550: 5420±40	
	A2	Rákóczifalva-Bagi föld	feature 201	bone: *Homo sapiens* (♂, 34-38 y.o. at death) [9]; no data	VERA-4759: 5415±35	M. Csányi *et alii* 2009
			feature 203	bone: *Homo sapiens* (♂, 30-36 y.o. at death)[9]; no data	VERA-4200: 5380±30	
			feature 204	bone: *Homo sapiens* (♂, 44-53 y.o. at death)[9]; no data	VERA-4201: 5450±35	
			feature 225	bone: *Homo sapiens* (♀, 26-30 y.o. at death)[9]; no data	VERA-4202: 5365±35	
			feature 244	bone: *Homo sapiens* (♂, 31-40 y.o. at death)[9]; no data	VERA-4762: 5400±45	
	B1	Rákóczifalva-Bagi föld	feature 137	bone: *Homo sapiens* (♀/♂, c. 12-14 y.o. at death)[9];no data	VERA-4198: 5285±30	M. Csányi *et alii* 2009
			feature 140	bone: *Homo sapiens* (♂, 34-40 y.o. at death)[9]; no data	VERA-4199: 5290±35	
			feature 144	bone: *Homo sapiens* (♂, 32-38 y.o. at death)[9]; no data	VERA-4758: 5285±40	
			feature 281	bone: *Homo sapiens* (♀?, *Maturus* at death)[9]; no data	VERA-4763: 5315±40	
		Tiszapolgár-Basatanya	grave 105	bone: *Homo sapiens* (♂, c. 30 y.o. at death)[10]; no data	Poz-36370: 5260±40	P. Raczky, Zs. Siklósi 2013
			grave 130	bone: *Homo sapiens* (♀, c. 25 y.o. at death)[10]; no data	Poz-36372: 5260±40	
		Urziceni-Vada ret	grave 39	bone: *Homo sapiens* (♀, c. 40-45 y.o. at death); petrous part	PSUAMS 4229: 5300±25	T.J. Chmielewski *et alii*, in press
				bone: *Homo sapiens* (♀, c. 40-45 y.o. at death); *tibia*	DeA-17598: 5334±33	
		Vinča-Belo Brdo	grave 2	bone: *Homo sapiens* (♀, c. 20 y.o. at death); *cranium*	OxA-24923: 5335±34	D. Borić 2015
	B2	Băile Herculane Peştera Hoţilor	layer II	bone: *Homo sapiens* (♀, not older than 25-30 y.o. at death)[11]; *cranium*	OxA-16327: 5123±34	Ch. Bronk Ramsey *et alii* 2009
		Cheile Turzii-Peştera Ungurească	layer 2A3	bone: *Bos primigenius* (no data); *tibia*	GrN-29102: 5120±40	P. Biagi, B.A. Voytek 2006

[8] After P. Raczky 2013.

[9] After Zs. Zoffmann 2015.

[10] After I. Bognár-Kutzián 1963.

[11] After D. Nicolăescu-Plopşor, W. Wolski 1974. Information about the context relating to the date has been agreed upon with polite indications from Erik Trinkhaus (e-mail correspondence of 11.02.2010) and Andrei D. Soficaru (a day after).

Tab. 1. (continued).

Culture	phase/ stage	site	feature	dated material: individual determinations (species, age, sex etc.); anatomical determinations	14C date (BC)	first published
HUNYADI-HALOM		Csincse 17	feature 32	bone: *Bos primigenius*[12] (no data); no data	Deb-3855: 5032±59	K. Fischl *et alii* 2000
		Košice-Barca-Baloty	grave 17	bone: *Homo sapiens* (♂?)[13]; *femur, pars distalis*	MAMS-14252: 5096±27	S. Brummack 2015
			grave 18	bone: *Sus scrofa* (no data); *ulna, pars proximalis*	MAMS-14242: 5002±29	
				bone: *Homo sapiens* (♂?)[13]; *scapula*[14]	MAMS-14244: 5102±24	
			grave 21	bone: *Homo sapiens* (♂?)[13]; *cranium*	MAMS-14250: 5074±24	
				bone: *Homo sapiens* (♂?)[13]; *vertebra*	MAMS-14253: 5102±26	
			grave 22	bone: *Homo sapiens* (no data); *femur*	MAMS-14245: 5088±27	
		Tiszalúc-Sarkád	pit 38/A	bone: *Bos primigenius f. taurus* (no data); *tibia*	GrN-16128: 5020±60	P. Patay 2005
			pit 190/A	bone: *Bos primigenius* (no data); *humerus*	GrN-16129: 5100±40	
			pit 239/A	bone: *Bos primigenius* f. *taurus* (no data); *processus cornualis*	GrN-16130: 5085±40	
			grave 2	bone: *Homo sapiens* (♀/♂, *Infans* at death)[15]; no data	Poz-36361: 5070±40	P. Raczky, Zs. Siklósi 2013
			grave 7	bone: *Homo sapiens* (♀/♂, *Infans* at death)[15]; no data	Poz-36362: 5020±40	
			grave 8	bone: *Homo sapiens* (♀/♂, *Infans* at death)[15]; no data	Poz-36363: 5050±40	

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[12] Additional information kindly provided by Klára Pusztainé Fischl (e-mail correspondence of 08.07.2019).

[13] Determination on the basis of the characteristics of the funeral rite (cf. S. Šiška 1972, p. 146).

[14] Identification in accordance with the description in the text of the paper finally unpublished (S. Brummack 2015, 6); in the table aside (see S. Brummack 2015, Table 3) the sample was described as a skull.

[15] After P. Patay 2005.

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