Research Article

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Different Paths of Neolithisation of the North-Eastern Part of Central Europe

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Abstract: Origins of the Neolithic in the north-eastern part of Central Europe were associated with migrations of groups of the Linear Pottery culture after the mid-sixth millennium BC, as in other parts of Central Europe. During these migrations, a careful selection of settlement regions took place, in terms of the ecological conditions most favourable for agriculture. The enclave-like pattern of the Neolithic settlement persisted into the fifth millennium BC when these enclaves were inhabited by post-Linear groups. The remaining areas, inhabited by hunter-gatherers, were not subject to direct Neolithisation. However, there are some indications of contact between farmers and hunter-gatherers. This situation changed from c. 4000 BC onwards because of the formation and spectacular territorial expansion of the Funnel Beaker culture (TRB). This archaeological unit for the first time covered in a relatively compact way the territory under consideration. The human substratum of this process consisted of both hunter-gatherers and farmers. Consequently, one can discourse about Neolithisation as such only in the former case. Not all Late Mesolithic hunter-gatherers accepted TRB patterns. Those communities still successfully carried on traditional lifestyle, gradually supplementing it with pottery (para-Neolithic). Their Neolithisation ended perhaps only in the first half of the second millennium BC.

Keywords: Poland, Neolithisations, LBK, TRB, Late hunter-gatherers

1 Introduction

The geographical extent of this contribution has been defined as the north-eastern part of Central Europe (Figure 1). This term could be an equivalent of present-day Poland (although the notion of Central Europe itself is undoubtedly far from being clear – e.g. Johnson, 1996; Kłoczowski, 2003; Magocsi, 2018). Part of Europe under consideration constituted and still constitutes not only a transitional territory between different environmental but also cultural, prehistoric and historic, formations. It was also a case during the period of dawn and the development of the Neolithic.

And precisely for this reason, investigating processes of Neolithisation in this area may be exceptionally valuable. We are dealing here with a situation unique on a European scale, in which Neolithisation took different forms and proceeded according to different scenarios. This was due, among other things, to the occurrence of phenomena that were either not subject to Neolithisation at all or only to a limited extent. These different versions of Neolithisation and different cultural formations, Neolithic and non-Neolithic,

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Figure 1: The location of the study area with basic historical regions and archaeological sites mentioned in the text and figures.

co-occurred for a relatively long time. They can, therefore, be better characterised by capturing local contrasts. Their confrontations can also be described, as they interacted with each other in various ways. This situation, moreover, creates a very rewarding field for consideration and reflection on the understanding of concepts such as Neolithisation and Neolithic.

2 First Neolithisation and Early Neolithic

In archaeological terms, origins of the Neolithic in the north-eastern part of Central Europe are associated with the appearance of the Linear Band Pottery culture (LBK), which is, for us, perhaps the most paradigmatic example of a Neolithic unit. This is so because this culture comprises all elements of the so-called Neolithic Package. These elements, both qualitatively and quantitatively, seem to be conspicuous or even spectacular when compared to later Neolithic groupings. It is even a bit paradoxical that if we consider the overall time perspective of the “Polish” (but not only!) Neolithic, then after the LBK one can even speak of some (apparent?) weakening of the importance of Neolithic elements, at least in some units. It should certainly be stressed that the complete Neolithic Package is represented in the LBK from the very beginning, as in other areas within its range. This is very telling and relevant to the question of the genesis of the LBK and consequently of the Central European Neolithic.

Despite a relatively large number of radiocarbon dates, there are considerable problems with precise dating of the beginnings of the LBK, caused in large part by plateaux of the calibration curve in the relevant period. To

start with, some considerations about the dawn of the LBK in areas considered as its cradle should be done. Its chronology inevitably influences the dating of the LBK beginnings north of the Carpathians and Sudetes.

In the first place, the recent monographic study of the Lower Austrian site Brunn 2a should be quoted (Stadler & Kotova, 2019). According to its authors, the earliest LBK, defined as an earlier part of the so-called Formative Phase, should be dated to 5660–5480 BC. This sub-phase would be represented only in Lower Austria, whereas the later sub-phase of the Formative Phase would also cover north-western Transdanubia and can be dated from the early fifty-fifth to the mid-fifty-fourth century BC.

This is a slightly different point of view than schemes proposed by the Hungarian-British team (Jakucs et al., 2016; Oross et al., 2020) where beginnings of the LBK Formative Phase were placed most probably within the fifty-sixth century BC (with an indication of the middle of that century in the second of the cited articles), while ending in the fifty-fourth century BC. This phase would territorially cover both the north-western Transdanubia and Lower Austria. The thesis of the early LBK origins in SW Slovakia and Moravia (early fifty-fifth century BC?) has often been raised in the literature, but we do not have sufficient support for such a view in the form of radiocarbon dating (Beljak Pažinová & Daráková, 2019, further citations therein). The available, and importantly reliable, dates there go back at most to the fifty-fourth century BC (Furholt et al., 2014; Griffiths, 2013;

Figure 2: The spread of the LBK in the north-eastern part of Central Europe (based on Kozłowski & Nowak, 2019, Figure 4; Nowak, 2019, Figure 3, with modifications). (1) Enclaves settled by LBK communities (in the period of the greatest territorial extent, i.e. in the classical and late phases); (2) basic routes of migrations of the LBK groups (in the period of stabilisation they became axes of contacts between settlement enclaves); (3) averaged datings of the appearance of the LBK in a given area; (4–6) the main, Late Mesolithic units; (4) Late Komornica; (5) post-Maglemose; and (6) Janistawice.

Jakucs et al., 2016; Whittle et al., 2013, p. 105). This could fit the schemes, proposed in the quoted papers by the Hungarian-British team (Jakucs et al., 2016; Oross et al., 2020) which demonstrate that the long-range, Central European expansion of the LBK started only in the fifty-fourth century BC (from “formative cradle?”).

This view can be extended to Polish territories as well. In light of currently available 14C dates (admittedly the most representative only in case of the western Lesser Poland and the Kuyavia/Chełmno Land zone), and, in a measure, typological premises, it is possible to hypothesise the first occurrence of the LBK in western Lesser Poland around the beginnings of the fifty-fourth century BC (Figure 2). It took roughly 50 years to move along the Vistula River to Kuyavia and Chełmno Land (cf. Kozłowski & Nowak, 2019, pp. 34, 39–45; Pyzel, 2019). If we accept single dates from western Ukraine, especially from the Rivne site (Dębiec & Saile, 2015; Kiosak & Salavert, 2018), they could indirectly indicate the presence of the LBK in the zone of the upper Bug River basin already c. mid-fifty-fourth century BC, due to geographical reasons.

One way or another, all these data and their interpretations suggest that the LBK beginnings in the north-eastern part of Central Europe were later than previously believed, by c. 100/250 years (compare e.g. Czekaj-Zastawny, 2017; Czekaj-Zastawny et al., 2020; Kozłowski & Nowak, 2019, pp. 29–50). However, such a scenario is not without problems. One of them is the lack of sites in Transdanubia, and probably in Lower Austria as well, other than formative ones before c. 5350/5300 BC (Bánffy et al., 2018, p. 128; Oross et al., 2020; Stadler & Kotova, 2019). Therefore, how do we explain the LBK dates in southern Poland of about 5400/5350 BC and not much later in Polish lowlands, knowing that it is difficult to speak of a Formative Phase in these areas? It would seem, therefore, that already around the end of the existence of formative style (after the mid-fifty-fifth century BC?), early styles started to develop and essentially only such styles “reached” the lands in the Vistula basin. Otherwise, even dates of 5400/5350 BC should be considered too early, ergo the first appearance of the LBK in southern Poland should be reckoned in the last quarter of the fifty-fourth century BC at the earliest. Thus, we would have to do in such an alternative with a literal usage of proposals by Stadler and Kotova (2019) as well as Oross et al. (2020). In other words, the aforementioned first occurrences of the LBK in Lesser Poland and Kuyavia/Chełmno Land should be younger by at least 50 years. This could, among other things, correspond to the suggested dating of the start of the LBK settlement at Gwoździec, recently studied and published, where some materials are stylistically related to phase I (cf. Czekaj-Zastawny et al., 2020, p. 27).

However, it seems that the first alternative should not be immediately abandoned. The dates pointing to the fifty-fourth century BC are simply too numerous to all be considered unreliable in advance (Czekaj-Zastawny et al., 2020; Kozłowski & Nowak, 2019, pp. 41–44). This dilemma can only be resolved by obtaining a further, larger series of 14C dates, from both southern and lowland Poland.

Notwithstanding the above, currently, it seems highly probable that traditionally understood ceramic phases would be ceramic styles that more or less functioned in parallel (Czekaj-Zastawny et al., 2020, p. 27; Nowak, 2004). At this point, it is worth noting the surprisingly late dates obtained freshly for the Lower Silesian sites at Gniechowice, Stary Zamek, and Dankowice, ranging around 5300–5150 BC (Grześkowiak, Furmanek, Abłamowicz, Dreczko, & Mozgała-Swacha, 2016, p. 43; Furmanek, Dreczko, Mozgała-Swacha, & Kopec, 2019a, p. 58). The surprise arose from the fact that these dates came from the context of pottery of the so-called Gniechowice style/phase, commonly considered to be the oldest in Poland (cf. Kulczycka-Leciejewiczowa, 1979, pp. 48–50).

Observations of this kind, which are becoming more and more numerous and are not limited to the Polish lands (e.g. Stäuble, 2005; Stäuble & Veit, 2016), indicate increasingly clear that the assumed chronological transformations of the LBK pottery, which were supposed to define the basic stages in the development of communities of this culture, in fact, never existed. It seems very likely that from the very beginning of the LBK in its particular territories vessels were decorated in both the early and later fashions (in our traditional understanding). Only the cradle area would be an exception to some extent. The situation of pottery stylistic intermixture largely persisted until the end of the LBK.

The question of how separate (for us!) decorative styles coexisted in practice obviously requires detailed investigations. It cannot be ruled out, judging by some data (e.g. Czekaj-Zastawny, Rauba-Bukowska, & Kukułka, 2021; Kulczycka-Leciejewiczowa, 1997), that there were situations in which

contemporaneous houses were characterised by a predilection for different ways of ornamenting vessels. These dissimilarities would therefore highlight group differences within settlements.

However, certainly this subject matter is complex and controversial (cf. Bánffy et al., 2018; Strien, 2017); we will not be tempted to settle it definitively here, as it goes beyond the purpose as well as the size of the article.

One way or another, after the fifty-fourth century BC (or alternatively after the late fifty-fourth century and the first half of the fifty-third century BC), more western and eastern, as well as northern LBK movements apparently took place (Felczak, 2020, pp. 29–42; Kozłowska, 2004; Kozłowski & Nowak, 2019,

Figure 3: The LBK pottery from the extreme northern Lowlands. (1–5) Szczecin-Płonia (after Kozłowska, 2004), and (6–10) Kościelna Jania (after Czerniak, Pyzel, & Wąs, 2016).

pp. 46–49) (Figure 2). Regardless of the chronological aspects, the very bold entry of the LBK groups into the lowland zone is certainly noteworthy (Figure 3). They settled i.a. areas in western and eastern Pomerania, located near the shores of the Baltic Sea (Felczak, 2020, pp. 29–42; Kozłowska, 2004) (Figure 2).

Genetic data from Austria, Germany, or Hungary, and other ones referring also to hunter-gatherers (Brandt, Szécsényi-Nagy, Roth, Alt, & Haak, 2015; Bramanti et al., 2009; Haak et al., 2005, 2010; Hofmanová et al., 2016; Lazaridis et al., 2014; Lipson et al., 2017; Mathieson et al., 2018; Szécsényi-Nagy et al., 2015) have made the genesis of the LBK based on the First Temperate Neolithic substratum (Anatolian component in aDNA perspective), and – consequently – the dispersion of the LBK as an effect of folk migrations the most probable scenarios. So far, there is only one identification of fossil DNA for the LBK in Poland, from the site at Samborzec. It is, moreover, an mtDNA identification, not a whole-genome one. Significantly, however, a very typical, even specific for the LBK haplogroup N1a is represented here (Chyleński et al., 2017). However, the aforementioned data from other Central European countries strongly suggest that we should view the genesis of the LBK on Polish soil in a similar way.

With genetic data, the genesis of the LBK has become theoretically very simple. However, the attractive vision of the formation of the LBK based on the Starčevo-Körös cultural background (e.g. Bánffy, 2019) and the Central European migration of its creators, spreading the LBK cultural model in a complete and unchanging form, does not settle everything. The chronology of the LBK's origins outlined above, both in the area of departure and in the area under consideration, implies an even more rapid expansion than previously assumed. It had to take place on a time scale (two/three human generations), perceptible to a single human being. It was, therefore, clearly present in human behaviour and in human consciousness. It may be justified at this point to cite Shennan's (2018, pp. 96–97) hypothesis that such relatively rapid expansion can be explained by the so-called ideal despotic distribution. In short, it is a principle that the advantage was gained by those who were the first in a given territory ("founder advantage"). Hence, there would be a tendency for rapid movements in search of new territories, suitable, due to favourable conditions, for early farming settlement.

Such a hypothesis would explain to some extent the migration mechanism itself. However, it is still extremely difficult to answer a number of fundamental questions. For example, why did groups of people with the Starčevo-Körös cultural tradition suddenly begin to change their material culture? What were the root causes of these relatively rapid migrations? What was the role of the environment in these processes, and what was the role of internal socio-organisational, ideological, and mental transformations? Finally, what was the role of possible interactions with the Mesolithic populations?

Referring once again to the ideas in the seminal monograph by Shennan (2018), it is extremely difficult to assess whether, in fact, the genesis and expansion of the LBK can best be described in evolutionary terms of "peripatric speciation" (Shennan, 2018, pp. 86–87). At the very least, it is difficult to firmly describe the formative LBK groups in Lower Austria and/or Transdanubia as geographically and culturally isolated, peripheral populations, in relation to Starčevo-Körös ones. One might also wonder whether the genetically studied LBK skeletons from areas more distant from the Middle Danubian cradle (e.g. from Germany) should not then be more differentiated relative to the LBK and Starčevo-Körös skeletons from the Carpathian Basin than they actually are (Mathieson et al., 2018).

During the LBK movements, a careful selection of settlement regions took place, in terms of ecological conditions most favourable for agriculture, similarly to other LBK territories. In southern Poland, these are usually areas covered by soils developed on loess parent rock, while in Polish lowlands, they are covered by black earths and in places by soils developed on boulder clays (Czekaj-Zastawny, 2008, 2009; Furmanek, Łuczak, & Podgórski, 2019b, pp. 16–19; Kukawka, Małecka-Kukawka, & Wawrzykowska, 2002; Nowak, 2009; Pyzel, 2010; Pyzel, Mueller-Bieniek, & Moskal-del Hoyo, 2020). This causes the distribution of the LBK to have an enclave-like layout. This correlation is visible even in the case of small settlement concentrations, which are associated with small, local patches of fertile soils. This does not mean that settlements were established only within such soils; they were also founded, for example, on sands, but what is characteristic, always at a small distance from the border with fertile soils (Nowak, Zajac, & Zakrzewska, 2020, further citations therein). For the sake of completeness, let us add that we have isolated, scarce (usually ceramic) traces of the LBK at greater distances from the aforementioned enclaves (Kozłowski &

Nowak, 2019, pp. 61–63); these are undoubtedly only remnants of the contacts that must have been maintained between settlement “islands.”

We can conclude that LBK populations were associated with distinct ecological niches. These niches, under relatively favourable climatic conditions that persisted until the end of the sixth millennium BC, generated ecological conditions that were not dramatically different from the original, Middle Danubian ones and were characterised by a relative openness of some of their fragments (e.g. Dobrowolski et al., 2016; Jamrichová et al., 2014; Moskal-del Hoyo et al., 2017; Moskal-del Hoyo, 2020; Pokorný et al., 2015; Sánchez Goñi et al., 2016; Starkel et al., 2013). It seems possible, therefore, that the opportunities created within such niches by global and local environmental conditions were a factor that, if not triggered, at least encouraged and facilitated LBK groups to migrate. Maybe it was also a relevant factor that these enclaves were bypassed by hunter-gatherers, although it is not true that they were not exploited at all by them (Nowak et al., 2020). This in turn, in the language of Shennan (2018, p. 1), “enabled people to be reproductively successful by colonising new territories that had low-density forager populations” (cf. also Shennan, 2018, pp. 9–10).

The strong, recurring link with enclaves of fertile soils indicates that efforts have been made to maintain the original cultural pattern at all costs, at least in terms of subsistence. It may, therefore, be appropriate to recall the term conservative colonists, used at one time by Bogucki (1995, pp. 94–95). Bogucki used ethnographic analogies, referring to such a variety of the so-called frontier situation, in which “the conservative aspects of frontier social dynamics can also be extremely significant” (Bogucki, 1995, p. 95). Although this idea refers mainly to material culture and social relationships, we can assume (cf. Kozłowski & Nowak, 2019, pp. 63–64) that it also includes settlement and subsistence. In other words, the settlement-economic system of LBK people who were already in the target areas was conservative, strictly environmentally conditioned and in practice undevelopable. Perhaps, moreover, it was to some extent a derivative of ideological “conservatism.”

Such an idea is highlighted because in the present author’s belief (cf. Kozłowski & Nowak, 2019, p. 39; Nowak, 2009, pp. 536–537) there are interesting hypotheses that assume human migrations as often triggered by a willingness of escape or retreat of certain segments of given communities because of some social conditions in their home areas that were unacceptable to them. These may be social segments that contested reality by means of opposition and rebellion against the established or being under consolidation social structures, ways of exercising control, ideology, etc. (see Hofmann, 2020; Özdoğan, 1997, pp. 16–17; Zilhão, 2000, pp. 171–173). Consequently, which is interesting for us, the established meaning system of the components of material culture, related to these traditional, stable elements, was also contested. This may have resulted in the creation of an own, different system, which was particularly nurtured and sustained as a symbol of a break with the past and with dependence on the “old” world, as well as a symbol of self-definition in a situation of – rather mental – confrontation with local gatherer-hunter communities.

Situations of this kind generated a psychological need for a distant wandering, and a quick, literal and symbolic, detachment and a final break with the contested reality. Thus, constructions of this kind may well explain the relatively rapid and far-reaching spread of the LBK in Central Europe, especially since the realisation of the above need was facilitated by favourable, as previously mentioned, natural conditions that did not necessitate far-reaching ecological adaptations.

In the fifth millennium BC, after vanishing off the LBK c. 4900/4800 BC, different groups of the post-Linear character (the Stroked Linear Pottery culture and so-called Lengyel-Polgár complex) essentially still concentrated within enclaves of the fertile soils (Czerniak et al., 2016; Furmanek et al., 2019b, pp. 19–23; Kadrow, 2017; Kulczycka-Leciejewiczowa, 1979, Figure 43; Nowak, 2009, Figure 18; Nowak, 2019). However, some areas outside these enclaves were penetrated and even settled and exploited by Neolithic groups, like in some parts of Greater Poland, Lower Silesia, Lubusz Land, eastern and western Pomerania or even Mazuria. But this does not change the fact that until the end of the fifth millennium BC, still c. 70% of the territory under discussion remained beyond the extent of the compact Neolithic settlement.

The issue of relationships between the LBK and post-LBK communities remains complicated and controversial. All kinds of hypotheses can be found in the literature, from those assuming a distinct hiatus to those indicating only an evident continuity (Nowak, 2009, pp. 111–128, further citations therein; Bogucki, 2020; Czerniak, 2017; Czerniak & Pyzel, 2019, pp. 61–62, 77–80; Kozłowski & Nowak, 2019, pp. 88–94). As

this question is not relevant to the main issues raised in this article (i.e. it is not connected with the Neolithisation), it will be left open.

3 Late Mesolithic

This 70% was still inhabited by hunter-gatherers. The fact that Mesolithic communities did not participate in the first Neolithisation does not mean that they were not important in the reality of the sixth and fifth millennia BC. On the contrary, in such a situation the Mesolithic should be viewed as an essential, independent element of the cultural situation, parallel to the Neolithic phenomena. This is because, first of all, north of the Carpathians and Sudetes there is a lot of the Late Mesolithic, even in the immediate vicinity of the LBK and post-LBK enclaves (Furmanek & Rapiński, 2019; Kozłowski & Nowak, 2019, pp. 175–230; Nowak, 2009; Nowak et al., 2020). Secondly, it was not a static phenomenon. There are transformations and changes visible within it, mainly the progressing uniformisation of flint industries (Castelnovisation) (Nowak et al., 2020). What is more, some of them underwent even a local ceramisation (Nowak, 2019, pp. 106–107, further citations therein).

Contacts between farming and hunting-gathering groups in the second half of the sixth and fifth millennium BC seem to be fairly limited, at least archaeologically. This is even somewhat bizarre, given the evident spatial proximity of the two formations, especially in certain regions (upper Vistula, middle Oder, western Pomerania, lower Vistula). These contacts are evidenced mainly by single finds of pottery and stone tools of the LBK and post-LBK beyond their oecumene (Kozłowski & Nowak, 2019, pp. 235–257, further citations therein). There are also pottery in direct hunter-gatherer contexts (Figure 4) (Czekaj-Zastawny et al., 2011a, 2011b; Czekaj-Zastawny, 2015; Gumiński, 2011). However, this phenomenon refers essentially to the period after the disappearance of LBK. And similarly, some goods that may originate from the Mesolithic groups or were influenced by Mesolithic traditions, among them ornaments of amber and wild animal teeth, some decorations on bone jewellery, T-shaped axes (Czerniak & Pyzel, 2019, pp. 80–81; Kabaciński et al., 2014), have been recorded in the post-LBK contexts. From the above, one can suppose that some intensification of the relations between post-LBK and Late Mesolithic communities took place in the fifth millennium BC.

At this point, we should also emphasize a very modest but quite consequent and ubiquitous proportions of hunter-gatherer ancestry in quoted, European genetic data, including even the Balkan Neolithic (Mathieson et al., 2018; Nikitin et al., 2019). Thus, some contacts between incoming early farmers and local hunter-gatherers had to exist, even if these contacts were limited only to casual sex. It is also characteristic that, when considering Carpathian Basin and Central Europe, participation of hunter-gatherer component is higher in Germany than in Transdanubia and in the post-LBK units than in the LBK (Lipson et al., 2017). This would mean that during the LBK spread outside the “cradle” area, the Neolithic–Mesolithic contacts became slightly more intense. This intensity was also growing with time. Consequently, such scenarios can be also applied to the LBK spread and the post-LBK development in the north-eastern part of Central Europe.

It will be appropriate to point out in this regard that possible Mesolithic traces have been recorded in the DNA of some post-LBK groups, in Kuyavia (Fernandes et al., 2018; Juras et al., 2017; Lorkiewicz et al., 2015) and western Lesser Poland (Chyleński et al., 2017). But certainly, as stated in the cited study by Fernandes and others, the Brześć Kujawski culture (one of the units of the so-called Lengyel-Polgár complex), excluding the two (“Mesolithic”) outliers, is composed of the same genetic component present among Anatolian and LBK Early Neolithic farmers. In essence, then, the situation is like that of well-known ethnographic situations, where material items are transferred between farmers to hunter-gatherers in small measure but women in more significant measure (e.g. Jolly, 1996).

It seems very telling that above-mentioned ceramisation was essentially not a process based on pottery of the LBK and post-LBK. Technologically and stylistically this pottery, which appeared in the second half of the fifth millennium BC, stands very close to the Eastern European Neolithic units, for instance, Dnieper-Doniec or Narva (Gumiński, 2020; Józwiak, 2003; Kempisty & Sulgostowska, 1991; Piezonka, 2015).

Figure 4: Pottery recorded at Dąbki (1–3) (after Czekaj-Zastawny, 2015), attributed to the Bodrogkeresztúr culture by its discoverers (Czekaj-Zastawny, 2015; Czekaj-Zastawny, Kabaciński, & Terberger, 2011a, 2011b; Czekaj-Zastawny, Kabaciński, Terberger, & Ilkiewicz, 2013). Such attribution has been contested by some researchers, who claim the possible Rössen connections (Chmielewski, 2020; Czerniak, 2018); this criticism is not shared by the present author. One way or another, this pottery certifies contacts between the Late Mesolithic and Neolithic worlds.

We should not forget that recent genetic data from the territorially close Baltic countries (Mittnik et al., 2018) and also older analyses of mtDNA including three skeletons from NE Poland (Bramanti et al., 2009) corroborates that this phenomenon, apparent also in period later than the fifth millennium BC, was connected with local, hunter-gatherer populations.

To make the issue more complicated, a similar phenomenon, dating to the fifth millennium BC, was recorded in the northern outskirts of Poland. Let us mention pottery from the most important sites, such as Tanowo, Dąbki, and Rzućewo (Galiński, 2016; Kabaciński, Hartz, Raemaekers, & Terberger, 2015; Król,

2018). Its beginnings can be dated to 4800/4700 BC. The cited pottery is more or less similar to the pottery of the Ertebølle culture.

To recapitulate, it can be claimed that in the second half of the sixth and fifth millennium BC a rather sharp Neolithic–Mesolithic dichotomy was maintained, in which we hardly observe any intermediate forms. This does not mean, of course, the absence of any contacts and interactions. It is quite likely that the proximity and even the involuntary participation of local hunter-gatherer groups in the LBK/post-LBK systems of information flow triggered certain changes on both sides, which were a kind of mental response or counter-reaction to disruptions of functioning such systems of both farmers and hunter-gatherers.

4 Second Neolithisation and Middle Neolithic

From the late fifth millennium BC onwards, the spread of a new model of farming culture can be seen within a significant part of Central Europe, including also territory under consideration (Nowak, 2009, 2017). Its archaeological legacy is known as the Funnel Beaker culture (TRB). In the final result of this process, Neolithic formation filled, in a relatively compact manner (e.g. Wierzbicki, 2013, Figure 4), the majority of the foregoing European areas, that is to say not only fertile enclaves settled by LBK and post-LBK

Figure 5: Pottery of the Ertebølle culture (1) and TRB (2–4) from the site at Tanowo (after Galiński, 2005).

communities. Therefore, in Central Europe, the spread of the “Beaker” Neolithic to areas outside previous Neolithic occupation can be called the second stage of Neolithisation (Nowak, 2001, 2009).

At present, it is possible to consider the sites in the broadly defined south-western Baltic zone as the earliest within the TRB (Kotula, Piezonka, & Terberger, 2015; Nowak, 2019, p. 111, further citations therein), including i.a. already mentioned Pomeranian sites of Tanowo, Dąbki, and Rzucewo (Galiński, 2016; Kabaciński et al., 2015; Król, 2018). Radiocarbon dates obtained in this zone point to the period c. 4200–3950 BC, although these dates are by no means without problems, due, among other things, to the reservoir effect and the lack of evident stratigraphy (Kozłowski & Nowak, 2019, pp. 176–181; Nowak, 2019, pp. 111–112). On sites located there remains of the early TRB were identified, which appear in the already quoted context of local hunter-gatherers that had undergone ceramisation (Figure 5) and had been slightly influenced by the Neolithic groupings, perhaps mainly of the Michelsberg origin, as a result, both of the transfer of ideas and material products and of some migrations (e.g. Mischka, Roth, & Struckmeyer, 2015). The latter claim could be indirectly supported to some extent by the regrettably few genomic DNA data from Sweden, mostly related to the late TRB (Coutinho et al., 2020; Mitnik et al., 2018; Skoglund et al., 2012, 2014). Pottery containing features of both the Ertebølle or rather its local derivative and the TRB, like so-called transitional vessels in Dąbki (Czekaj-Zastawny & Kabaciński, 2015) and perhaps some forms in Rzucewo and Tanowo (Czekaj-Zastawny & Kabaciński, 2018; Galiński, 2016) are also significant in this context.

Consequently, it is possible to assume that the zone extending along the south-western coast of the Baltic, from eastern Holstein to eastern Pomerania, was the area in which the new cultural model was formed, and from this zone the spread of this model took place. Perhaps the borders of this zone should be extended further west, to the Netherlands (Raemaekers, 2015; Ten Anscher, 2015). In any case, this area is located on the northern peripheries of the post-Linear Neolithic as well as beyond its range.

One has to honestly add that not all researchers, especially Polish ones, would agree with such a vision of the origin of the TRB. Indeed, in the Polish literature, there has long been presented a rather canonical vision that connects these processes with the Polish lowland zone (i.a. Czerniak, 2018; Kukawka, 2015; Kukawka & Małecka-Kukawka, 2016; Rzepecki, 2011). This vision is less likely for the present author, due to the possible chronological anteriority of the first TRB in the south-western Baltic zone (comp. e.g. the newest dating of the Kuyavian site Redecz Krukowy, not earlier than 3950/3900 BC – Papiernik & Brzejszczak, 2018) and the presence of the complex, Late Mesolithic substratum, influenced by the Neolithic, there.

Perhaps it would be adequate, in relation to the proposed, south-western Baltic cradle of the TRB and the mechanism of its crystallisation, to evoke the illuminating metaphor of “the Middle Ground,” introduced in 1991 by American historian White (2011). As he says in the preface to the twentieth-anniversary edition “The Middle Ground is a book about, among other things, mutual misunderstandings and the ways that new meanings are derived from them” (White, 2011, p. xi). Let us straightaway add that this is because the desired effects could not be achieved (solely) by force. The middle ground is, therefore, the art of functioning together and of compromising on problems that inevitably arise in borderland encounters.

In specific places and times, the middle ground illustrates relationships of this type between native Indians and foreign whites in the Great Lakes region. The most relevant are relations between Algonquians and French in the last quarter of the seventeenth century (in essence, these were relations between Algonquian men and women and French men), described as the earliest stage of the middle ground (White, 2011, p. 50). This is perhaps the situation most appropriate as an analogy for the context under consideration. As one can judge from accounts, Algonquians and French successfully arrived “[...] at some common conception of suitable ways of acting [...]” (White, 2011, p. 50). Compromises and problem solving, particularly related to issues of sex, violence and material exchange, worked both in everyday life and in formal, diplomatic relations.

These processes have caused, willingly or unwillingly, modifications in the existing patterns and conventions of behaviour, as well as created new ones. As the quoted author claims “The result of each side’s attempts to apply its own cultural expectations in a new context was often change in culture itself. In trying to maintain the conventional order of its world, each group applied rules that gradually shifted to meet the exigencies of particular situations. The result of these efforts was a new set of common conventions, but these conventions served as a basis for further struggles to order or influence the world of action.

[...] Perhaps the central and defining aspect of the middle ground was the willingness of those who created it to justify their own actions in terms of what they perceived to be their partner's cultural premises. Those operating in the middle ground acted for interests derived from their own culture, but they had to convince people of another culture that some mutual action was fair and legitimate" (White, 2011, p. 52).

Of course, one must bear in mind, when invoking such a metaphor, radically different cultural and historical realities of the Great Lakes zone in the seventeenth and eighteenth centuries AD and the south-western Baltic zone at the turn of the fifth and fourth millennia BC. It should also be kept in mind that the cited book focuses on historical events rather than on material culture. It is also impossible not to notice

Figure 6: Spread of the TRB in the north-eastern part of Central Europe in the context of the late post-LBK (late Lengyel-Polgár complex) and para-Neolithic groups (based on Kozłowski & Nowak, 2019, Figure 51, with modifications). (1 and 2) Main territories of the late Lengyel-Polgár complex settlement (1 – the Lengyel complex sensu largo, mainly the Jordanów culture, 2 – groups with “Polgár” features); (3) the area of formation of the TRB c. 4200–4000 BC (“the Middle Ground”); (3 and 4) range of the TRB c. 4000–3900 BC; (3–5) range of the TRB, c. 3800/3700 BC; (3–6) range of the TRB after 3700/3600 BC; (7) sites with the Ertebølle and Ertebølle-like pottery (T – Tanowo 3, D – Dąbki 9, KD – Koszalin-Dzierżęcino, RZ – Rzućewo, Ch – Chobienice); (8) selected sites with the early TRB pottery (T – Tanowo 3, K – Kosin 6, R – Renice 5–6, D – Dąbki 9, RZ – Rzućewo, B – Bielawki 5, Ł – Łącko 6, SK – Strzelce Krzyżanna 56, RK – Redecz Krukowy, S – Sarnowo 1); (9) range of the Neman culture in the late fifth millennium BC; (10) range of the Zedmar culture; (9 and 11) range of the Neman culture in the fourth and third millennia BC.

that the concept of middle ground has met with a positive, but also negative reception (e.g. Lipman, 2016). Even taking into account the former ones, opinions should be noted that the described relationships in the Great Lakes region were exceptional and unique (Lipman, 2016, p. 27).

Nevertheless, we believe that the middle ground may well reflect and describe borderland conditions of prolonged contact, where the roles of “perpetrator” and “victim” were not always clearly separated, where negotiations and compromises were possible, where the balance of power was possible, where the economic interests of the indigenous peoples and newcomers intersected, and where cultural and biological hybridity was often also possible. It was thanks to such relations, between the Mesolithic and Neolithic, that a new phenomenon was constituted, visible to us in the form of the TRB.

The spread of the TRB (Figure 6) from the assumed south-western Baltic cradle had to be related to an adaptation of farming to ecological zones not yet used for agriculture. Perhaps the appearance of indicators of extensive slash-and-burn system of cultivation in that time mirrors such adaptation (e.g. Poręba, Śnieszko, & Moska, 2012; Poręba, Śnieszko, Moska, Mroczek, & Malik, 2019). But for sure it does not concern the whole range of the TRB. Possibly, techniques of so-called woodland management, postulated based on some palynological premises, were also such adaptations (Latałowa, 1992; Nowak, 2001). Evidently, this issue remains still an open question. In any case, in the course of the expansion of the cultural model we call TRB, which encompassed very diverse environments, including poor sandy soils, there must have been some cultural evolution of subsistence practices (Shennan, 2018, p. 11). The fact that the TRB patterns gained general acceptance not only in the Late Mesolithic hunter-gatherer groups but also in the late post-LBK ones is equally not well understood so far. There are i.a. cautious opinions that this may have been related to some crisis situations among the post-LBK communities (Bogucki, 2020, p. 211; Nowak, 2009, pp. 552–572). As a result, they could abandon their previous cultural patterns and quite readily adopt new, that is TRB, ones.

It should be emphasised in this context that Mesolithic and Neolithic echoes are, in fact, fairly well perceptible within the TRB flint industries (Kozłowski & Nowak, 2018, 2019, pp. 264–266). Actually, there is not a specific TRB flint industry. Regional or even local groupings are characterised by their separate state, which originates from an earlier background, be it late-Mesolithic or Neolithic (i.e. late post-LBK).

Unfortunately, there are not too many genetic data for the TRB in the north-eastern part of Central Europe yet. As a matter of fact, this statement refers also to all other parts of the TRB. In an already quoted publication by Fernandes et al. (2018), we can read, based on only three skeletons from Kuyavia, that the TRB individuals shared a similar genetic composition as that of the Brześć-Kujawski culture individuals, but with a slightly higher hunter-gatherer component (Fernandes et al., 2018, p. 3). It, actually, corroborates a hypothesis about population continuity between late branches of the post-LBK and TRB. It must be emphasised, however, that in light of the above views on the TRB origins and spread such a hypothesis cannot be generalised. It has a regional dimension, that is it refers only to one of the former LBK/post-LBK enclaves.

One way or another, based on all the above-mentioned observations, we can figuratively say that the TRB was a kind of cultural mantle which wrapped various groups and different (Late Mesolithic and post-LBK) cultural traditions.

5 Para-Neolithic

To complete our Neolithisation history, we should also add that the TRB “mantle” did not cover all hunter-gatherer communities in the north-eastern part of Central Europe. Such communities, frequently with pottery (Figure 7) similar to the East European one, were still present in the fourth millennium BC and also in the third millennium BC (Józwiak, 2003; Kozłowski & Nowak, 2019, pp. 161–174; Nowak, 2009; Nowak et al., 2020; Sobieraj, 2017; Wawrusiewicz, 2013; Wawrusiewicz, Kalicki, Przeździecki, Frączek, & Manasterski, 2017). It was a continuation of the phenomena that had emerged, as we already know, in the second half of the fifth millennium BC, that is to say of the Neman and Zedmar cultures. Surprisingly enough, after c. 4000 BC ceramicised hunter-gatherers became more and more common. Their

Figure 7: Para-Neolithic pottery (Neman culture) from the site 1 at Grądy Woniecko (1–5) (after Wawrusiewicz et al., 2017).

archaeological remains have been recorded in surprisingly vast areas, throughout almost all Poland, although the largest number of sites with such ceramics were recorded in NE Poland.

Fairly intensive contacts of these groups with Middle and Late Neolithic as well as even Early Bronze groups are corroborated by some admixtures of the Neolithic and Early Bronze pottery traits (so-called Linin type) (Józwiak, 2003; Kempisty, 1973) and by the TRB ceramic imports in some Neman and Zedmar sites (Gumiński, 2011), as well as by “foreign” technology and decorations on vessels in many TRB sites (Adamczak, Kukawka, & Małecka-Kukawka, 2018; Kukawka, 2010).

Neolithisation of this phenomenon, when understood in subsistence terms, are very poorly recognised. It most probably proceeded only within the Early Bronze Age and finally ended in the first quarter/middle(?) of the second millennium BC. On the other hand, according to the Eastern European tradition, which places an equal sign between ceramics and the term “Neolithic,” these groupings would have been included in the Neolithic. In our opinion, however, this is not fully justified, because, apart from the pottery, other elements regarded as Neolithic are represented only very sporadically, for two/three thousand years. Therefore, for such a situation, the term “para-Neolithic” may be appropriate. It describes a formation that can be incorporated into neither the classic Mesolithic nor the classic Neolithic. It demonstrates an alternative, but basically hunting-gathering, trajectory of development in the age of the Neolithisations and Neolithic (Gumiński, 2020; Nowak, 2019, pp. 119–120).

6 Conclusions

It is possible to speak about at least two separate forms of Neolithisation in the north-eastern part of Central Europe.

The LBK type of Neolithisation, which took place c. 5400/5300–5100 BC was a process consisting of folk migrations and colonisations of strictly selected, due to ecological factors, island-like areas. Migrating people brought a complete Neolithic Package as well as socio-organisational, ideological, and mental structures, different from the local hunter-gatherer ones. Settlement and economic behaviours connected with this form of Neolithisation required a relatively small space.

Neolithisation of the TRB type, which took place c. 4100–3600 BC, consisted basically of a cultural transformation of local hunter-gatherers, frequently equipped with their own pottery, and influenced by different Neolithic factors. The pattern of the Neolithic shaped during these processes consisted of i.a. flexible settlement and economic behaviours, highly adaptable to different ecological conditions as well as – usually – a subsistence requiring large spaces. This TRB pattern turned out to be so attractive that it was also accepted by the last, post-LBK communities.

Not all Late Mesolithic hunter-gatherers accepted TRB patterns. Such communities successfully carried on traditional lifestyle, gradually supplementing it with pottery (para-Neolithic). Their Neolithisation ended perhaps only around 1800/1700 BC. Such a hypothesis may give rise to protests, but we know very well from many historical and ethnographic circumstances that farmers and hunter-gatherers have co-existed and interacted almost until today. This is not only the case in the commonly cited situations from North America, South Africa, or East Asia (e.g. Quensel-von Kalben, 1994). We can observe a bit similar phenomenon even in our area in non-distant past. It is enough to refer to the marshy region of Polesie, on the border between Belarus, Ukraine, Poland, and Russia. Even in the pre-war period, the economy of the local population, called Poleszuks (Pol. *Poleszuchy*, Bel. *Палешукі*, Ukr. *Поліщуки*), was still in the great measure based on fishing, hunting, and gathering (Obrębski, 2007, pp. 120–140).

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